1. Agenda

    Documents:

        AGENDA - JUNE 22, 2020.PDF

2. Executive Summary

    Documents:

        AGENDA - JUNE 22, 2020_ES.PDF

AGENDA

REGULAR MEETING AGENDA
Council of the City of Lacombe
Monday, June 22 2020 at 5:00 p.m.
in Council Chambers

Time	Agenda Item	Representative
5:00	**1. CALL TO ORDER**	
	2. ADOPTION OF AGENDA	
	2.1 Additions	
	2.2 Deletions	
	2.3 Reordering	
	3. PRESENTATIONS	
	3.1 N/A	.
	4. PUBLIC HEARINGS	
	4.1 N/A	
	5. REQUESTS FOR DECISION	
	5.1 Highway 2 Corridor Study	*Dir Thompson*
	5.2 Committee Review Report – Arts Endowment Committee	*Dir Juch*
	5.3 Committee Review Report – Lacombe Art Collection Committee	*Dir Juch*
	5.4 Committee Review Report – Lacombe & District Rikubetsu Friendship Soc.	*Dir Juch*
	5.5 Energy Audit – Gary Moe Auto Group Sportsplex	*Dir Juch*
	6. INFORMATION	
	6.1 Administrative Reports	
	6.1.a N/A	
	6.2 Council Mailbox	
	6.2.a Gov AB Letter: Gas Tax Fund allocation, June 10	
	6.2.b Parkland Regional Library Financial Statements, 2019	
	6.3 Commission, Board, Committee Reports and Minutes	
	6.3.a Lacombe Police Commission Minutes, May 21	*Clr. Konnik*
	6.4 Councillor Reports	
	6.4.a Mayor Creasey	

6.4.b Councillor Gullekson

6.4.c Councillor Ross

6.4.d Councillor Hoekstra

6.4.e Councillor Jacobson

6.4.f Councillor Hibbs

6.4.g Councillor Konnik

7. ADOPTION OF MINUTES

7.1 June 15, 2020 Regular Council Meeting Minutes

8. NOTICES OF MOTION

8.1 N/A

9. IN CAMERA

9.1 N/A

10. ADJOURNMENT

Next Meetings:

- Wednesday, June 24, 2020
  - Special Council Committee Meeting (In Camera): 1:00 p.m., Council Chambers
- Monday, July 13, 2020
  - Regular Council Meeting: 5:00 p.m., Council Chambers
- Monday, August 10, 2020
  - Regular Council Meeting: 5:00 p.m., Council Chambers
- Monday, August 17, 2020
  - Council Committee Meeting: 5:00 p.m., Council Chambers

REQUEST FOR COUNCIL DECISION

CITY OF LACOMBE

SUBJECT:	**Highway 2 Corridor Improvement Study - Final**
PREPARED BY:	**Jordan Thompson, Director of Operations and Planning**
PRESENTED BY:	**Jordan Thompson, Director of Operations and Planning**
DATE:	**June 22, 2020**

FILE: 38/914

PURPOSE:

To advise Council that Alberta Transportation (AT) has completed its study on the long-term improvement needs for the Highway 2 corridor. Administration received this final report in June 2020.

RECOMMENDED MOTION(S):

1. THAT Council accept this report as information.

RELATED PRIOR MOTION(S):

1. THAT Council direct Administration to prepare a letter to the Minister of Transportation requesting additional consultation with municipalities prior to the adoption of the draft recommendations of the Highway 2 Corridor Improvement Study, specifically as they relate to municipalities taking on full or partial responsibility for the planning and construction of provincial interchange improvements.

EXECUTIVE SUMMARY:

The corridor improvement plan (CIP) makes several long term recommendations for the improvement of Highway 2 to keep up with traffic growth in the region. Within 10 years the CIP recommends widening most of Highway 2 to 6 lanes, including around the City of Lacombe. This work requires upgrades to various bridges and interchanges to accommodate the additional lanes. In the long term (50+years), the highway needs to be widened again to 8 lanes to accommodate projected growth. However, the CIP recommends AT study the feasibility of constructing a bypass from south of Red Deer to north of Lacombe in advance, as it may be more advantageous than widening the highway again.

ANALYSIS:

The report, despite being high level, is comprehensive in its content. The following excerpts from the report are most relevant to the City of Lacombe:

- *Highway 2's National Highway function will ultimately migrate to, or be supported by, new route segments that bypass the congested sections north of Leduc, passing Red*

Deer and south of Airdrie. An entirely new Highway 2 corridor may ultimately be required beyond the study's 50-year planning horizon. However, the province's present objective is to extend the service life of the existing corridor for as long as possible.

- *Therefore, to sustain long-term regional growth and mobility, it is incumbent on the adjoining municipalities to work together in the planning, design and construction of off-highway connections, both road and transit, that are attractive to users, before an expanded Highway 2 fails.*

- *Highway 2 CIS does not emphasize specific funding scenarios. Priorities and funding outcomes will be determined in the future on a location-by-location basis*

- *Highway 2 CIS prepared an Implementation Plan that is strategic in nature, defining what form the solution-finding should take, and what options Alberta Transportation should pursue with its municipal partners, including management and operations, over the next approximately 50 years.*

- *The Province should establish five Growth Management Boards (GMBs) along the Highway 2 corridor. It is becoming increasingly urgent that the Highway 2 corridor connecting Calgary and Edmonton, and serving the almost 30 municipalities in between, be managed in a more comprehensive and deliberate fashion. A senior level authority is needed (supported by the three regional infrastructure, development and bridge groups) to engage the municipalities and jurisdictions and develop a consistent approach to reaching shared understandings of the implications of urban growth and development on the Highway 2 corridor, to encourage the protection and development of inter-municipal road and transit networks, and to oversee the integration of emerging transportation technologies with municipal systems.*

- *Alberta Transportation has established the following guidelines to determine when additional lanes should be provided on a divided highway:*
    - *Less than 31,000 vehicles per day (vpd): 4 lanes*
    - *31,000 – 50,000 vpd: 6 lanes*
    - *Over 50,000 vpd: 8 or more lanes*

From various sources in the CIP, Administration has found this addition information relevant to the City of Laocmbe:

- The Highway 2/12 interchange is the 10 highest in average number of collisions per year (20/year) along the Highway 2 corridor. When adjusted for traffic volumes this interchange is actually the 6th highest for collision rates along the corridor

- Between 2020-2030 Highway 2 needs to be 6 laned between 597 (Blackfalds) and Milton Road (north of Lacombe) along with much of the rest of the corridor – although the report highlights the greatest need will be around Red Deer.

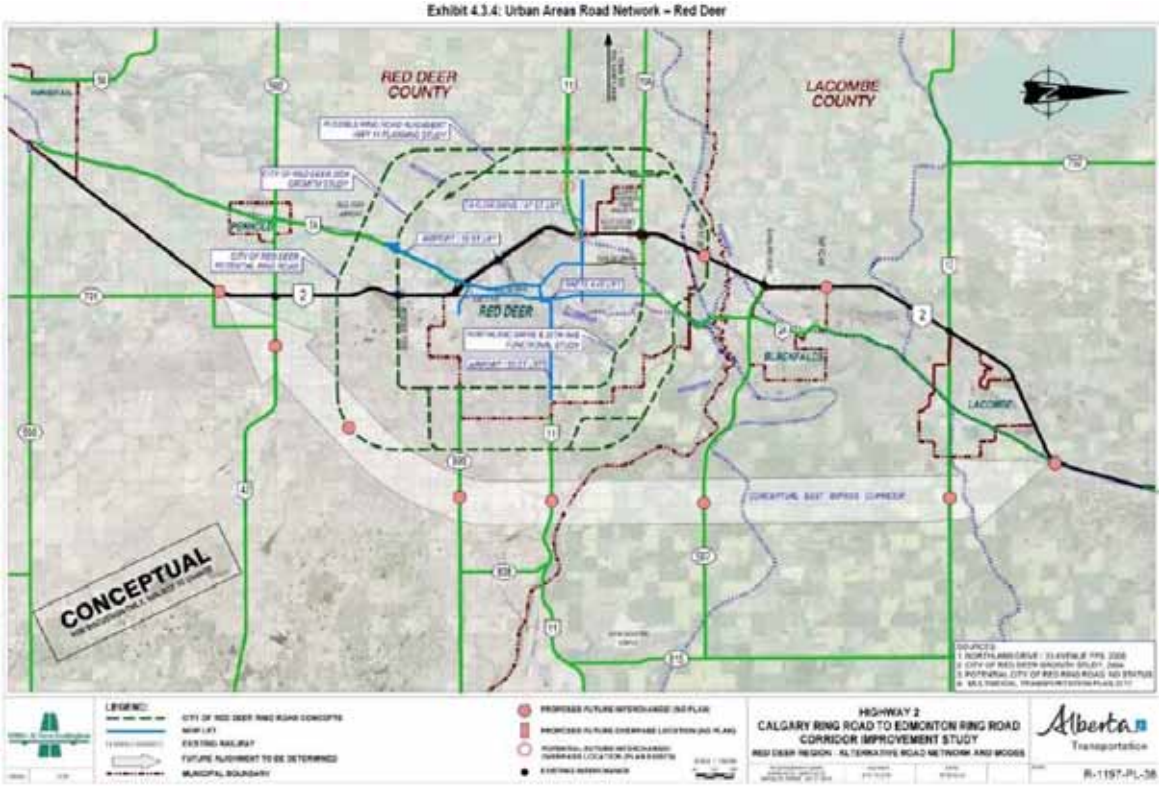
- Between 2040-2050 Highway 2 needs to be 8 laned and or a bypass constructed between 2060-2080.

- Highway 12 interchange upgrade is required in 10-25 years. It is recommended that long term planning for this interchange be conducted.
- The Highway 604 interchange upgrade is not required until beyond 25years.

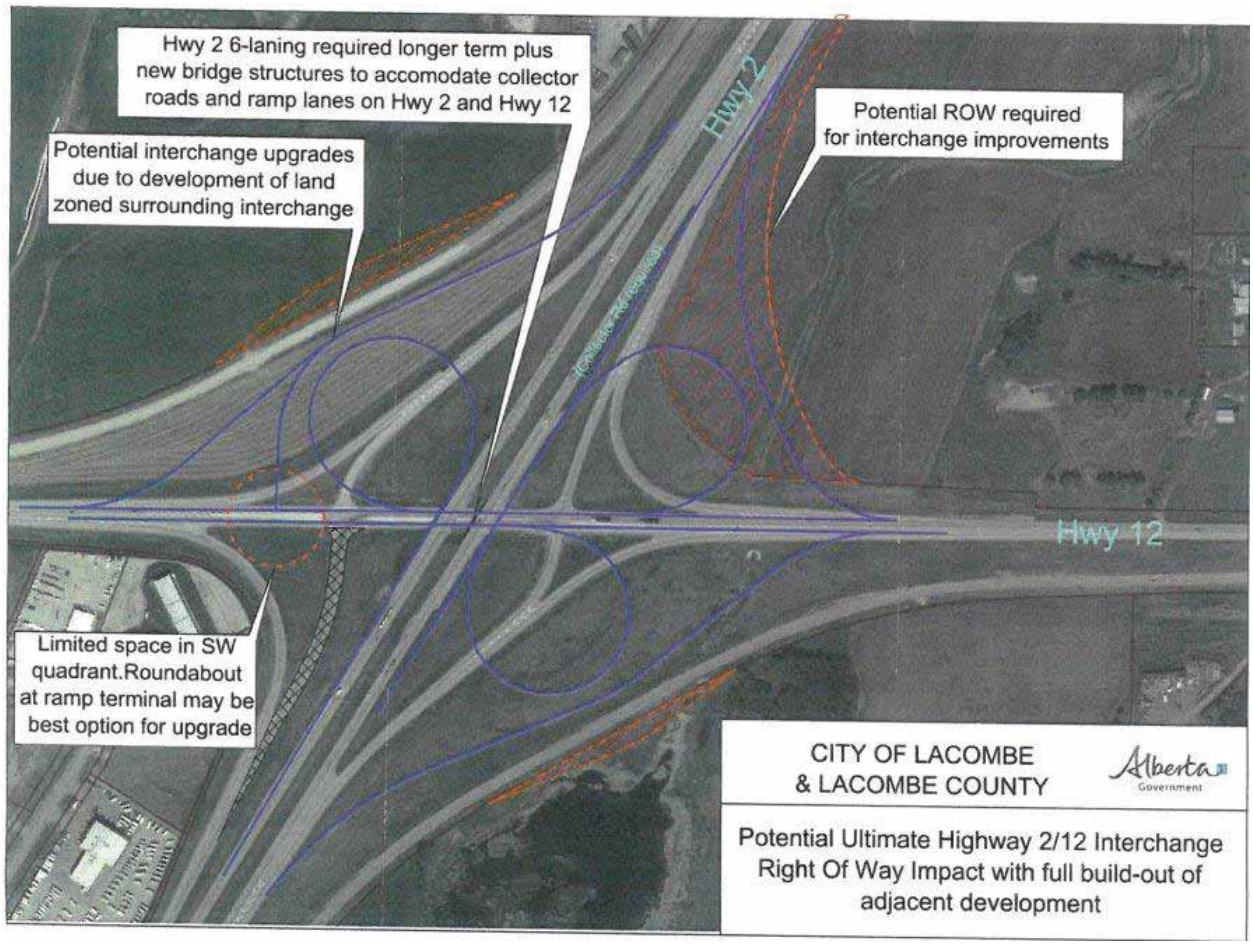
- 6 lane widening of Highway 2 including all bridge upgrades between Highway 11A and Morningside is estimated to cost $200M+

- The figures below depict the conceptual bypass route around Red Deer, Blackfalds and Lacombe.

Exhibit 4.3.4: Urban Areas Road Network – Red Deer



- The CIP indicates the Highway 2/12 interchange will be upgraded to a partial cloverleaf design in the future. There is no sketch in the report what this would look like but the sketch below was supplied to the City by AT in 2017. Note the potential ROW needs conflict with Midway Centre development. The Developer is aware of this conflict and has choosen, for now, to focussing on developing Phase 1 before addressing this conflict with AT with the development of future Phases.



Administration will await further information from the Province regarding the formation of the recommended regional Growth Management Boards.

STRATEGIC PLAN ALIGNMENT:

This report is presented to inform Council on the future plans for Highway 2 corridor and is not directly tied to a Strategic Goal.

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

No public engagement is planned.

ALTERNATIVE MOTION(S):

1. THAT Council accept this report as information.

2. THAT Council directs Administration how it wished to proceed.

ATTACHMENTS:

Highway 2 Corridor Improvement Study – Proposed Final Report May 14, 2018

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BEST EMPLOYER
PLATINUM | CANADA | 2018

May 14, 2018 File No. E00663A

Stuart Richardson, P.Eng.
Infrastructure Manager
Alberta Transportation
Central Region
4th Floor, Provincial Building
4920 - 51 Street
Red Deer, AB T4N 6K8

Subject: Highway 2 Corridor Improvement Study
Proposed Final Report

Dear Mr. Richardson:

Enclosed for sign-off by the department is the proposed final report for the Highway 2 Corridor Improvement Study. It is understood that the summary for the municipal engagement sessions will be contained in a separate report, to be completed once the third (information) session occurs following sign-off.

Highway 2 CIS was a unique and challenging undertaking for our combined project team, Al-Terra Engineering, CastleGlenn Consultants and CIMA Canada Inc. The study's success would not have been possible without the leadership provided by the department's three infrastructure groups.

The study examined not only future planning, design and construction requirements along the 265 km long corridor, but developed a template for overall corridor management with Alberta Transportation's municipal partners. The proposed new model is an unprecedented opportunity for the department to establish long-term partnerships to jointly develop and manage transportation infrastructure along the province's busiest and most populated corridor.

Yours sincerely,

Kelly Yuzdepski, P.Eng. ENV SP
Partner, Regional Vice-President – Western Canada

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Edmonton (Alberta) T5J 3G1
CANADA

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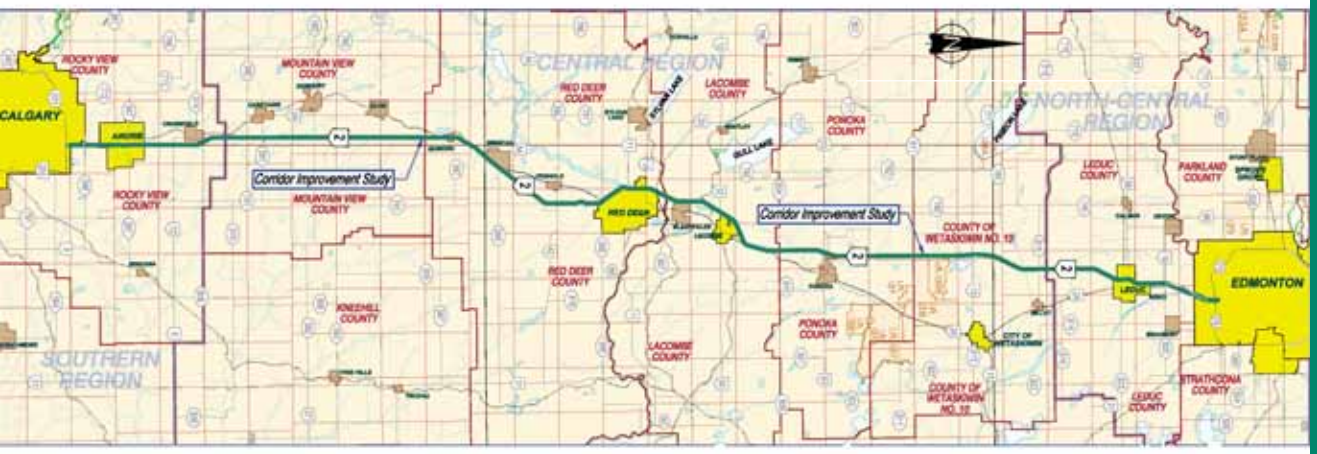

Alberta Transportation

Highway 2
Calgary to Edmonton
Corridor Improvement Study

Final Report

May 2018

CIMA+ Al-Terra Castleglenn

ALBERTA TRANSPORTATION

CORRIDOR IMPROVEMENT STUDY
FINAL REPORT

Highway 2
Calgary to Edmonton
Project No. E00663A

Prepared by:

Henry Devos, P.Eng.
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CIMA Canada Inc. (CIMA+)

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Corry Broks, P.Eng.
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Al-Terra Engineering Ltd

Reviewed by:

Sheldon Hudson, P.Eng.
Vice-President
Al-Terra Engineering Ltd.

CIMA+ Al-Terra Castleglenn

May 2018

CORRIDOR IMPROVEMENT STUDY
Highway 2, Calgary to Edmonton

FINAL REPORT

CIMA+ Al-Terra Castleglenn

Kelly Yuzdepski, P.Eng.
Project Manager
CIMA Canada Inc.

May 2018

PERMIT TO PRACTICE
CIMA CANADA INC.
Signature
Date MAY 31, 2018
PERMIT NUMBER: P8204
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Government of Alberta
Transportation

Accepted by:

Neal Reynolds
Regional Director
North Central Region
Date: JUNE 12, 2018

Russell Watts
Regional Director
Central Region
Date: June 1, 2018

Darren Davidson
Regional Director
Southern Region
Date: June 8/18

EXECUTIVE SUMMARY

Overview

Highway 2 between Edmonton and Calgary is a National Highway Route and the province's most significant economic corridor. Approximately 75% of Alberta's 4 million population resides in the broad study corridor bounded by Alberta's two largest metropolitan centers. Growth and development throughout the corridor, and the associated growth in traffic volumes, has resulted in upgrading demands along most of its length, exacerbated by the need to rehabilitate or replace an increasing number of aging bridge structures.

The study corridor connects the Stoney Trail ring road in Calgary with the Anthony Henday Drive ring road in Edmonton. Continued urban expansion has begun to absorb the ring roads, and the adjoining sections of Highway 2, into their respective developed metropolitan environments. As a result, as Highway 2 enters the Calgary and Edmonton regions and as it passes Red Deer, it increasingly serves as a short-distance, inter-municipal, commuter route, as well as providing access to local development. The greatest congestion levels along the study corridor are experienced in these three increasingly urban environments. Much of the corridor already warrants highway widening.

The province has designated the study corridor as a future freeway with the capacity to function as a high speed, high capacity and safe multilane roadway. The primary function of freeways is the efficient movement of traffic under free-flow conditions. Ultimately, land development in the three urban areas will generate traffic demand that exceeds the capacity of an expanded Highway 2. There are presently no effective contiguous parallel corridors, municipal or provincial, with potential to divert significant local, development-driven, traffic growth off of Highway 2.

Highway 2's National Highway function will ultimately migrate to, or be supported by, new route segments that bypass the congested sections north of Leduc, passing Red Deer and south of Airdrie. An entirely new Highway 2 corridor may ultimately be required beyond the study's 50-year planning horizon. However, the province's present objective is to extend the service life of the existing corridor for as long as possible. The province undertook the Highway 2 corridor Improvement Study to address a range of factors affecting travel in this highly-used corridor, including competing upgrading priorities, aging bridge structures, uncertain funding levels, municipal development aspirations, development of inter-municipal road networks, and understanding the impacts of other modes, intelligent transportation systems and emerging vehicle technologies on Highway 2.

Historically, Alberta Transportation's mandate has been to maintain LOS B on national (Level 1 provincial) highways throughout the province. However, LOS B is not sustainable where highways pass through urban and suburban environments. Driver expectations (throughout North America) already permit transitioning from LOS B through long rural stretches, to LOS C through suburban zones, and LOS D through developed urban (high commute) environments. These three LOS thresholds have now been approved for highways and freeways in Alberta.

Much more than an upgraded Highway 2 will be needed in the two metropolitan centres within the 50-year planning horizon. The traffic forecasts, and associated modal splits, are increasingly speculative with increasingly distant planning horizons, particularly when the still evolving transportation technologies are considered. Highway 2 will achieve its ultimate cross-section in response to increasing demand (and public expectations), long before the key transit and effective parallel road network options are likely to be in place. The province will soon need to consider where and how it's National Highway System[1] (NHS) mandate will be met.

The province's traffic modelling results also confirmed that demand for Highway 2 by commuters in the urban regions will reach capacity before significant travel shifts to other inter-urban connections, whether road or transit. Therefore, to sustain long-term regional growth and mobility, it is incumbent on the adjoining municipalities to work together in the planning, design and construction of off-highway connections, both road and transit, that are attractive to users, before an expanded Highway 2 fails. Incremental development of the three regional bypasses will initially support growth and development, but will not begin to meaningfully divert traffic off of existing Highway 2 before full free-flow bypass connections are established.

Responding to growth, new development initiatives and the corresponding transportation requirements, particularly at the inter-municipal level, is best achieved using a multi-jurisdictional approach. Inter-municipal involvement is critical to the development of future transportation solutions that harmonize municipal, and regional, growth aspirations with the corresponding infrastructure requirements.

Alberta Transportation's interest in fostering inter-municipal cooperation is to help establish the needed regional infrastructure in support of development along the Highway 2 corridor. Alberta Transportation's involvement will result in better overall understanding of the impact that the growth and development plans will have on provincial and municipal transportation infrastructure. Highway 2 CIS does not emphasize specific funding scenarios. Priorities and funding outcomes will be determined in the future on a location-by-location basis.

Long-term transportation planning, at both the regional and provincial levels, can bring both predictability and support for protection and development of the transportation infrastructure needed for sustainable communities in the Highway 2 corridor. In the absence of integrated long-term transportation plans, adjacent municipalities have expanded outward with developments and local road networks that are potentially discontiguous across municipal boundaries, and resulting in almost complete reliance on Highway 2 for all mobility needs. The resulting incremental impact on Highway 2, and other transportation infrastructure, is then often not recognized in a timely fashion, leading to increasingly disruptive and costly outcomes in an effort to retrofit highway and regional transportation upgrades.

Recommendations

The Highway 2 CIS report is intended as a tool to assist Alberta Transportation in making better technical and economic decisions along the Highway 2 corridor. Highway 2 CIS prepared an Implementation Plan that is strategic in nature, defining what form the solution-finding should take, and what options Alberta Transportation should pursue with its municipal partners, including management and operations, over the next approximately 50 years.

Growth Management Boards

The Province should establish five Growth Management Boards (GMBs) along the Highway 2 corridor. The recommended approach to managing growth in the overall highway corridor is for the department to work with the various municipalities and jurisdictions in reaching shared understandings of the transportation upgrading required as a result of the various growth and development scenarios and identify sustainable and equitable delivery strategies

[1] Canada's NHS consists of existing primary routes that support inter-provincial and international trade and travel by connecting, as directly as possible, capital cities, major provincial population or commercial centers, major ports of exit / entry with the US; and with other transportation modes. All NHS routes should provide a minimum operating speed of 90 km / h, in recognition of the role played in support of efficient interprovincial and international transportation.

This partnership, to manage transportation in the overall Highway 2 corridor, is best established through the Growth Management Boards (or equivalent) that were recently recommended in updates to the Municipal Government Act.

Long-Term Planning

The Province should undertake on-going long-term planning in cooperation with its municipal partners, to achieve several corridor management objectives, which include:

- Coordinating regional growth and development plans with the associated road and transit corridors, minimizing future disruption of existing developments and residents;
- Aligning inter-regional system plans with municipal and industry needs;
- Integrating emerging technologies with relevant municipal systems;
- Achieving sustainable outcomes across adjoining jurisdictions; and
- Defining future priorities and associated funding needs.

Provincial planning initiatives for the immediate Highway 2 corridor should focus on the identified highway safety priorities, followed by the many long-term planning requirements, including evaluation and integration of HOV and ITS initiatives. Long-term regional planning is needed to establish inter-municipal arterial roads, inter-municipal transit corridors and regional bypass routes for Highway 2 as warranted in each of the corridor's five distinct regions.

Incorporating bridge upgrading was one of the main challenges for Highway 2 CIS. The corridor needs were assessed based on highway requirements first, not the bridge requirements, since typically the highway needs will govern. Where a bridge becomes an immediate priority, then planning its replacement should take into account the long-term vision for the relevant section of the highway corridor.

Project bundling (potentially combining several initiatives) to improve cost effective delivery and minimize travel disruption, could not be recommended at this early stage, in the absence of supporting planning studies and known funding commitments.

Corridor Management

The Province should appoint a director-level manager to champion the Highway 2 corridor, similar to the two almost-completed metropolitan area ring roads and the focus brought to Highway 63 and the road network in the Fort McMurray region during its recent growth period.

It is becoming increasingly urgent that the Highway 2 corridor connecting Calgary and Edmonton, and serving the almost 30 municipalities in between, be managed in a more comprehensive and deliberate fashion. A senior level authority is needed (supported by the three regional infrastructure, development and bridge groups) to engage the municipalities and jurisdictions and develop a consistent approach to reaching shared understandings of the implications of urban growth and development on the Highway 2 corridor, to encourage the protection and development of inter-municipal road and transit networks, and to oversee the integration of emerging transportation technologies with municipal systems.

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Acronyms and Short Forms	
AADT	Annual Average Daily Traffic
AHD	Anthony Henday Drive
ASDT	Annual Summer Daily Traffic
ASP	Area Structure Plan
BRT	Bus Rapid Transit
CAV	Connected-Automated Vehicles
CBDP	Congestion Based Dynamic Pricing
CIS	Corridor Improvement Study
CMA	Contract Maintenance Area
CMO	Congestion Management Options
CNR	Canadian National Railway
CPR	Canadian Pacific Railway
CRB	Capital Region Board
EIA	Edmonton International Airport
EMRB	Edmonton Metropolitan Region Board
EW	East West
FBO	Finance Build Operate
GMB	Growth Management Boards
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HSR	High Speed Rail
HTCB	High-Tension Cable Barrier
IDP	Inter-Municipal Development Plan
ITS	Intelligent Transportation System
LOS	Level-of-Service
LRT	Light Rail Transit
MEV	Million Entering Vehicles
MGB	Municipal Government Board
MVK	Million Vehicle Kilometers
NHS	National Highway System
NS	North South
PDO	Property Damage Only
PMS	Pavement Management System
RCMP	Royal Canadian Mounted Police
RR	Range Road
RTM	Regional Transportation Model
RTMC	Regional Traffic Management Centre
SHAW	Shaw Communications
SRA	Safety Rest Areas
SRIS	Smart Roadside Inspection System
TAZ	Traffic Analysis Zone
TIA	Traffic Impact Assessment
TUC	Transportation Utility Corridor
VIS	Vehicle Inspection Station
VO	Vehicle Occupancy
VPD	Vehicles Per Day
VPML	Variably-Priced Managed Lanes
VSL	Variable Speed Limits
VSLS	Variable Speed Limit Signs
WIM	Weigh in Motion
WRI	Wireless Roadside Inspection
YYC	Calgary International Airport
YVB	Yankee Valley Boulevard

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1.0 Introduction

1.1 General

Alberta's population passed 4 million in 2015, a 215% increase from 1960, when planning for the current Highway 2 corridor between Calgary and Edmonton began. Approximately 75% of the province's population resides in the broad study corridor bounded by Alberta's two largest metropolitan centers[2].

Highway 2 between Calgary and Edmonton is a 'Level 1' provincial highway. Level 1 highways are core routes in the National Highway System, intended to serve long trip lengths. Highway 2's Roadside Management (access management) Classification is 'Freeway'. The primary function of freeways is the efficient movement of traffic under free-flow conditions.

The limits of this Corridor Improvement Study (CIS) are the Stoney Trail ring road in Calgary and the Anthony Henday Drive (AHD) ring road in Edmonton. The two ring roads are also part of the National Highway System and, when originally planned, followed the developed perimeter of both cities. Serving as hubs in the provincial highway network, both ring roads connect with 3 other Level 1 provincial highway legs[3], as well as other provincial highways and local arterial roads. Continued urban expansion has begun to absorb the ring roads, and adjoining sections of Highway 2, into their respective developed metropolitan environments.

As Highway 2 enters the Calgary and Edmonton regions and as it passes Red Deer, it increasingly serves as a short-distance, inter-municipal, commuter route, as well as providing access to local development. The greatest congestion levels along the study corridor are experienced in these three increasingly urban environments, where there are no contiguous parallel routes, municipal or provincial, with potential to divert significant local, development-driven, traffic growth off of Highway 2.

In the two long sections, between the three urban centers, the many rural and urban municipalities along the highway generally propose competing growth and development scenarios in the study corridor, increasing demand for access and constraining the highway upgrading footprint.

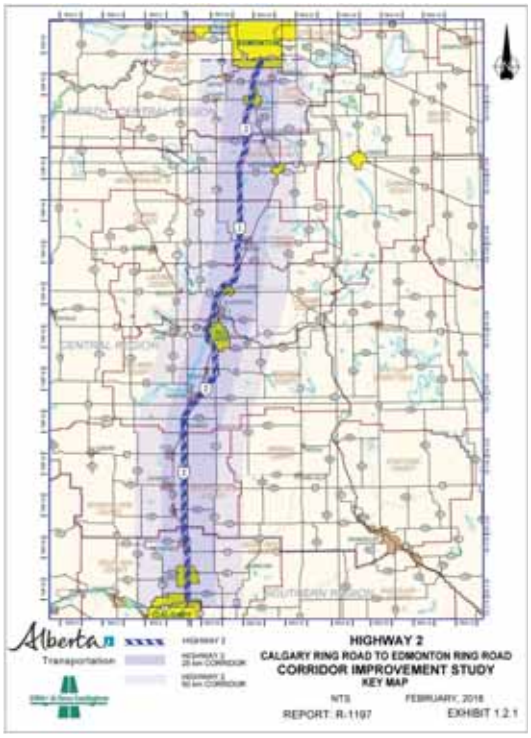
The many past highway planning and design studies along the 265 km long corridor addressed local issues and involved the affected municipalities based on predictions of growth and priorities that continue to evolve and change. The separate study processes and associated municipal consultations did not include a corridor wide assessment of relative priorities, broader network opportunities, examination of alternative modes or ultimate system requirements.

In response to these competing mobility needs, development pressures and upgrading priorities, Highway 2 CIS prepared an Implementation Plan that is strategic in nature, defining what form the solution-finding should take, or what options Alberta Transportation should pursue with its municipal partners, over approximately the next 50 years. This report is intended to be a tool to assist Alberta Transportation to make better technical and economic decisions on the Highway 2 corridor.

On May 23, 2005, the province designated Highway 2 between Calgary's north and Edmonton's south city limits as the Queen Elizabeth II Highway. Since the limits of the Highway 2 CIS extend to the ring roads, within the two city's limits, this study will reference the entire corridor as "Highway 2."

1.2 Study Area

The study area served by the section of Highway 2 connecting Calgary's Stoney Trail with Edmonton's Anthony Henday Drive is approximately 265 km long with a sphere of influence approximately 50 km wide and is illustrated in Exhibit 1.2.1: Highway 2 Corridor Improvement Study – Key Map. The 50 km wide land captures all municipalities engaged by the study team and the parallel roadways identified in the study TOR.



[2] The study team engaged the cities of Edmonton and Calgary and all rural and urban municipalities in between regarding their interest in the Highway 2 corridor, which, taken together, comprises 75% of Alberta's population.

[3] The other Level 1 highway legs connecting to the ring road in Calgary are Highway 1 East, Highway 1 West, Highway 2 South; and in Edmonton these are Highway 16 East, Highway 16 West and Highway 63 North.

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1.3 Study Purpose

The study purpose is two-fold. First, to preserve the National Highway System mandate for the efficient inter-regional and inter-provincial movement of people, goods and services while also accommodating growth and development in the study corridor. Second, to develop an upgrading strategy that addresses highway safety, capacity and bridge upgrading requirements.

1.4 Background – Problem Statement

The study corridor serves 31 municipal (and other) jurisdictions between Calgary and Edmonton, comprising 7 cities, 15 towns, 7 counties, the Edmonton International Airport (EIA) and the Maskwacis area First Nations.

Alberta's two major cities were originally connected along what is now Highway 2A. The present Highway 2 alignment was established beginning approximately 50 years ago, bypassing all urban municipalities at the time; however, the highway has not yet achieved full freeway standards. In addition, to maintain capacity and safety, many of the original bridge structures require upgrading, replacement or expansion; and the existing highway cross-section is considered narrow based on current design standards, particularly as the highway carries increasing traffic volumes.

The Cities of Airdrie, Red Deer and Leduc have since expanded across the original bypass segments, significantly constraining current options to upgrade Highway 2 through the corridor's most congested sections. Planning for the Calgary and Edmonton ring roads began circa 1970, with completion of Calgary's South West Stoney Trail now anticipated by 2021, also approaching a 50-year timeline. The sections under the greatest pressure are:

- *Calgary to Crossfield:* This section accommodates the commute to / from Airdrie, to / from Crossfield and to / from the CrossIron Mills mall. Increased access to development will ultimately displace the existing vehicle inspection station (VIS). Much of the highway corridor is constrained by the CPR on its immediate west and by Nose Creek, which meanders through the corridor. Airdrie continues to expand, both east across and south along the highway, further constraining the corridor.
- *Passing Red Deer:* This section accommodates local travel through the City of Red Deer, inter-urban travel between Innisfail and Lacombe, and provides primary access to Sylvan Lake. The City of Red Deer has jumped west across the highway, where the corridor is now constrained by adjoining industrial development. In Red Deer, highway upgrading is constrained by a major river crossing and the adjacent CPR line.
- *Leduc to Edmonton:* This section accommodates the commute to / from the City of Leduc, to / from the Edmonton International Airport (EIA) and to / from Leduc County's Nisku industrial zone. The highway passes between the EIA, Nisku, the CPR mainline, and threads its way between the EIA and Leduc, which has jumped west across, and constrains, the highway corridor.

As these three sections of the corridor continue to be absorbed by the expanding urban environments, the increasing congestion levels threaten the efficiency and purpose of the province's National Highway System, i.e. inter-regional / inter-provincial travel, impacting the level of mobility and economic competiveness in the province's most prolific, heavily-used, corridor.

Development pressures along the two rural highway sections, between the three major urban centers, has generally tended to be highway commercial land uses, or other land uses that benefit from exposure to highway traffic and access to a major transportation corridor, that seek either new or expanded access to Highway 2.

Highway 2 CIS compiled the various upgrading plans along the 265 km long study corridor prepared over the past 15 or more years, and assessed the corridor at a high level, looking for network-level opportunities, and solutions involving other modes to address the following issues related to urban growth and increasing congestion levels affecting Alberta's premier economic corridor:

- Residents and travelers depend on Highway 2 for almost all mobility needs in the corridor connecting Calgary and Edmonton.
- The declining service life of an ultimately upgraded highway facility, particularly through the three urban areas.
- The increasing erosion of Highway 2's ability to efficiently serve long-distance, interprovincial, travel as a national highway route.

1.5 Study Rationale

Specifically, Highway 2 CIS was prompted by the convergence of several factors, including:

- *High Growth*: The corridor has experienced high average growth in traffic volumes and increasing congestion levels, particularly in the three urban sections.
- *Local Travel*: Increasing volumes of short local trips are using the National Highway, largely in the absence of robust parallel local road or transit networks.
- *Aging Bridge Structures*: Bridge rehabilitation, widening or replacement must be integral to the highway upgrading / widening program to minimize traffic disruption and achieve optimal cost outcomes.
- *Development Plans*: Highway, and local, transportation planning requires comprehensive development impact studies and applications from industry and its municipal partners to adequately understand the cumulative effects on the Highway 2 corridor.
- *Sustainability & Funding*: The province's ability to fund highway upgrading meeting stakeholder expectations, both municipal and user, is an increasing challenge. The response to growth and development must consider other modes and inter-municipal options; adding highway lanes alone is not a sustainable response.
- *Transparency*: Competing municipal expectations along the corridor require a transparent strategy to rationalize, prioritize and balance corridor-wide upgrading.
- *Partnering*: Responding to growth, new development initiatives and the corresponding transportation requirements / expectations, particularly at the inter-municipal level, needs a multi-jurisdictional approach.

1.6 Study Goals and Objectives

1.6.1 Goals

The Highway 2 CIS emphasized the following study goals:

- *Competitiveness, Market Access and Economic Growth* by assuring the efficient, effective and timely movement of people, goods and services along the Highway 2 corridor between Calgary and Edmonton, Stoney Trail to Anthony Henday Drive.
- *Safety and Security* by enhancing technological and infrastructure improvements for residents and drivers using the corridor, e.g. design cross-section, safety rest areas, alternate routes.
- *Long-Term Sustainability* by encouraging integration of municipal land-use strategies with planning of inter-municipal arterial road and transit corridors.

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- *Affordability* by maximizing the service life of the existing highway corridor, e.g. graduated Level-of-Service targets, corresponding to the highway environment.
- *Innovation and Technology* integration by assessing potential to advance Alberta's ITS Strategy using current/emerging software, hardware and communication technologies.
- *Municipal Involvement* in the development of future transportation solutions that harmonize municipal growth aspirations with the corresponding infrastructure requirements.

1.6.2 Objectives

The following objectives were established for Highway 2 CIS between Calgary and Edmonton:

- *Define* the highway's future role and function in the broader study corridor to a 50-year horizon.
- *Consolidate* past planning and design work and develop an Implementation Plan to determine the highway's future programming needs.
- *Develop* a combination of traditional highway upgrading and, where practical, non-traditional improvements to ensure that the highway's, and the corridor's, current and future mobility needs are identified and met.
- *Prioritize* implementation to ensure that the current highway and corridor are sustainable and that future traffic demands are addressed.

1.7 Highway Classification

As stated in the introduction, Highway 2 between Calgary and Edmonton is a 'Level 1' provincial highway. Level 1 highways are defined as core routes in the National Highway System (NHS) and serve long trip lengths. These highways are intended to accommodate the movement of people, goods and services inter-provincially and internationally. This category comprises the provincially known systems such as the Trans Canada, the Yellowhead and the North / South CANAMEX Trade Corridor. Access to this type of facility is restricted, generally only connecting with arterial roads.[4]

The NHS[5] was defined and endorsed by the Council of Ministers and consists of existing primary routes that support inter-provincial and international trade and travel by connecting, as directly as possible, capital cities, major provincial population or commercial centers, major ports of exit / entry with the US; and with other transportation modes, e.g. ferry and freight terminals, airports.

Minimum design and operational standards were established as follows:

- Geometric Design Standard; All NHS routes should meet a 100 km/h design speed.
- Serviceability (Capacity): All NHS routes should provide a minimum operating speed of 90 km / h, in recognition of the role played in support of efficient interprovincial and international transportation.

The roadside management classification for the Highway 2 is freeway. The primary function of a freeway is the efficient movement of traffic under free-flow conditions. The highest level of access management is warranted because of the strategic and functional importance of these routes (primarily Level 1) to the provincial network. Strict access management serves to preserve the functionality and safety of the freeway system. [6]

Although Highway 2 is designated as a freeway, it currently operates at an expressway standard in several locations due to at-grade access along the corridor.

1.8 Interchange Spacing

In urban areas, the preferred minimum spacing between local, service, interchanges is 2 km. System interchanges are preferably spaced a minimum of 3 km from adjacent service interchanges. Spacing requirements relate to the need for adequate distances for weaving and directional signing. In rural areas, the intensity of development and the local road system will determine interchange spacing requirements, with desirable spacing ranging between 8 km and 16 km as a guideline.

Where development demand and / or existing roadway systems complicate the application of these spacing requirements, frontage roads and collector / distributor roads should be considered to maintain the integrity of the basic spacing requirements. Grade-separated 'flyovers' may also be considered to allow traffic and / or pedestrians to cross a freeway without access to the freeway. These connections reduce the number of short trips on a specific section of freeway.[7]

1.9 Strategic Questions

The study's two-year long mandate provided an opportunity to engage the various municipalities along the corridor in this strategic planning initiative, as the objectives, constraints, issues, opportunities and priorities were examined, and strategies were identified for inter-jurisdictional governance mechanisms.

The strategic questions Highway 2 CIS examined included:

- *Continued Expansion of Existing Highway 2:* Is there is a practical limit to expanding the existing highway based on right-of-way requirements and optimal cross-sections?
- *Sustainable Level-of-Service (LOS)*: Is the current LOS target 'B' for Alberta's National Highway System sustainable, particularly through suburban and urban environments? Driver expectations (throughout North America) already permit transitioning from LOS 'B' through long rural stretches, to LOS 'C' through suburban zones, and LOS 'D' through developed urban (high commute) environments.
- *Cross-Section:* What is the desirable cross section for the corridor and how should high tension cable barrier be used in the development of that cross section?
- *Parallel Inter-Municipal Arterial Roads*: Should the growth strategies, particularly in the three urban areas, include new or upgraded local arterials to accommodate growing development-driven commuter flows, instead of defaulting to what is intended to be a free-flow Highway 2?
- *Inter-Municipal Transit Corridors:* Identifying and protecting transit solutions, e.g. Bus Rapid Transit (BRT) migrating to Light Rail Transit (LRT), linking the growing urban satellite communities to the metropolitan core.
- *High Occupancy Vehicle (HOV) Lanes*: What would be the impact of introducing HOV lanes to the Highway 2 corridor in the metropolitan regions?

[4] HGDG, Design Bulletin #27 / 2005, Provincial Highway Service Classification, 2008
[5] National Highway Policy for Canada, Update 1997, Council of Ministers Responsible for Transportation and Highway Safety.
[6] HGDG, Chapter I, Access Management Guidelines, 2005
[7] HDDG, Design Bulletin #30/2005, Best Practices for Planning and Design of Freeway Facilities, 2004

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- *Bypassing the Major Congested Sections:* Will developing regional bypass routes maintain the serviceability of the existing highway facility through the three urban areas? If so, what will be required within the study's 50-year planning horizon to inform future planning studies?
- *Future Regional Bypasses*: If ultimately warranted, where these facilities would intersect Highway 2 is identified, preserving future potential to maximize mobility and National Highway System objectives through and passing the Calgary and Edmonton metropolitan regions.
- *New Parallel Highway Corridor*: Will a new parallel corridor ultimately be required? If so, what would be the timeframe for future planning?
- *Congestion Management Options (CMO):* Are there CMO strategies that would defer highway upgrading, particularly around the major urban centres? Examples of CMO strategies include HOV lanes, variable speed limit signs and ramp metering.
- *User-Pay Strategies:* Are there user-pay strategies that would defer highway upgrading? Examples of user-pay strategies include high occupancy toll lanes and congestion-based dynamic pricing.
- *Intelligent Transportation Systems (ITS)*: What are the timelines and potential application of emerging ITS technologies to improve roadway capacity and safety?
- *Programming*: What is a logical implementation plan for the corridor that is based on trend-line, or background, growth, yet recognizes the impact and future needs that are driven by development growth?
- *Managing Development Pressures:* Given the development aspirations for all the municipalities along the corridor, how should the province manage the impact to the Highway 2 corridor?

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2.0 Study Methodology and Procedures Overview

2.1 Introduction

To undertake the Highway 2 corridor Improvement Study, the study corridor between Calgary and Edmonton was divided into three regions (five sub-sections) for management and analysis purposes.

Region 1: Alberta Transportation's Southern Region

- Urban sub-section in the Calgary Metropolitan Region, extending from the north boundary of Rocky View County to Stoney Trail in Calgary.

Region 2: Alberta Transportation's Central Region

- Rural sub-section through Mountain View County.
- Rural-suburban sub-section, Red Deer and Lacombe Counties, passing the City of Red Deer.
- Rural sub-section through Wetaskiwin and Ponoka Counties.

Region 3: Alberta Transportation's North-Central Region

- Urban sub-section in the Edmonton Metropolitan Region, extending from Anthony Henday Drive in Edmonton to the south boundary of Leduc County.

2.2 Study Management

The Highway 2 Corridor Improvement Study was managed by Alberta Transportation's Central Region, Infrastructure Group. Seventy five percent of the corridor's length and municipal stakeholders are located in Alberta Transportation's Central Region.

The three study regions were undertaken by the consulting team, as follows:

- Region 1 was undertaken by CIMA+. CIMA+ was already preparing a functional plan for the Highway 2 interchange at Township Road 264, south of Airdrie.
- Region 2 was undertaken by Al-Terra Engineering. Al-Terra had a long history along the Highway 2 corridor through the Central Region.
- Region 3 was undertaken by Castleglenn Consultants. Castleglenn was already active in the Edmonton-Leduc corridor addressing many transportation issues for municipal stakeholders.

2.3 Analysis Approach

The numerous study disciplines or investigations involved in Highway 2 CIS were divided into two broad groups. The first group were those tasks undertaken for the corridor as a whole to provide an understanding of the existing conditions and issues common to, and generally supporting, the solution-finding in both the rural and urban areas. The second group were the investigations performed unique to the circumstances and opportunities in the five study sub-sections and development of scenarios and strategies specific to each of the sub-sections.

2.3.1 Common Analysis

The first group were the study components generally common to the corridor as a whole. These are mostly reflected in Section 3, Corridor Review and Assessment, and include the following:

- Review of traffic volume history and trend-line forecasting.
- Assessment of traffic operations and level-of-service (LOS).
- Review of collision experience, including geometric, cross-section and safety assessment.
- Assessment of bridge structure rehabilitation, widening and replacement, by Terrace Engineering.
- Origin-destination (O-D) survey for the entire corridor with screen-lines at Edmonton, Leduc, Red Deer, Airdrie and Calgary, by Cellint Traffic Solutions.
- Vehicle Occupancy Survey for two urban segments, Edmonton to Leduc and Airdrie to Calgary, by ME2 Transportation Data Corporation.
- Assessment of the potential application of ITS Solutions along the corridor, including potential congestion management options in the urban areas.
- Consultation with the major utility agencies active in the corridor.
- Reconnaissance-level cost estimates.

2.3.2 Separate Analysis

The second group were the study components undertaken separately for the different corridor segments, i.e., rural versus urban sections. These are mostly reflected in Section 4, Transportation Planning, and include the following:

- The collection and assembly of existing and proposed land use plans for all five segments along the corridor, including compilation of updated land use and trip generation data for each of the study area's traffic analysis zones (TAZ).
- EMME traffic modelling for the transportation scenarios in the Southern and North-Central Regions was undertaken by Alberta Transportation's Regional Traffic Modelling group.
- Scenario development and traffic analysis was undertaken separately for the three urban sections.
- In consultation with the municipal stakeholders, identification of potential future interchange locations, additional to the currently designated locations documented by provincial Order-in-Council No. O.C. 587 / 2009, Highways Development and Protection Act, Freeways and Access Locations Designation Order.
- Review and development of potential inter-municipal road networks, incorporation of inter-municipal transit corridor options, identification of potential regional bypasses and consultation with municipal (and other) stakeholders.
- Development of the Implementation Plan, including priority upgrade requirements.
- Implications for the Vehicle Inspection Stations (VIS) located in the North-Central and Southern Regions.
- Implications for the Safety Rest Areas (SRA) located in the Central and Southern Regions.

3.0 Corridor Review and Assessment

3.1 Existing Conditions

3.1.1 Data Summary

The existing conditions for Highway 2 are summarized in Appendix A - Existing Conditions Summary. The information is organized by Highway 2 control section and kilometer. Information includes:

- Interchange name and configuration.
- Existing lane configuration with cross-section details at interchange and basic sections.
- Existing traffic – Year 2016 AADT and ASDT based on Alberta Transportation data.
- Existing LOS using HCS methodology, indicating the worst peak hour movement.
- Existing interchange exit and entrance geometry, as required for 130km / h design speed.
- Horizontal and vertical deficiencies as compared with Alberta Transportation 3R / 4R guidelines. All deficient sections are summarized in Appendix B - Geometric Deficiencies Summary.
- Average collision rates for each section between interchanges, illustrated in number of collisions per 100-million vehicle kilometers traveled per year.
- Predicted year of next overlay based on 2016 PMS Summary Report.
- Notes pertaining existing plans and studies (or lack thereof) with key recommendations and cost estimates, if available.

3.1.2 Travel Speeds

The posted speed on Highway 2 is 110 km / h; however, a survey conducted in 2013 identifies the 85th percentile speeds at Airdrie and Red Deer as 120-122 km / h and 116 km / h north of Nisku.[8]

3.1.3 Existing Cross Section

Highway 2 has a variety of cross sections between Calgary and Edmonton. The cross section in the rural areas are generally characterized as having a 22.0m centerline spacing (with median cable barrier) south of Red Deer and a 30.5m centerline spacing (no barrier) north of Red Deer. The median barrier was added in 2010 to reduce the number of severe collisions due to median cross over movements.

The cross sections are modified in the urban areas around Calgary / Airdrie and Leduc / Edmonton as the network increases in complexity. A complete summary of the cross-section elements throughout the study area are included in Table 3.1.1.

Table 3.1.1: Highway 2 – Cross Section Summary

Location	# Basic Lanes	Median Width (m)	Centerline Spacing (m)
Stoney Trail (Calgary) to Yankee Valley Boulevard (YVB) (Airdrie)	6	23.0	30.5
Yankee Valley Blvd (Airdrie) to south of 581 (Crossfield)*	6	Transition Median to 14.6m	
South of 582 (Crossfield) to McKenzie Road (Red Deer) **	4	14.6	22.0
McKenzie Road (Red Deer) to 32 Street (Red Deer)	6	Transition Median to 22.6m	
32nd Street (Red Deer) to South of Highway 2A	4	23.1	30.5
South of Highway 2A to Highway 39	4	Transition Median to 12.2m	
Highway 39 to 50th Street (Leduc)	6	Transition Median to 118.4m	
50th Street (Leduc) to South of 41st Avenue (Edmonton)	6	110.0	118.4
South of 41st Ave. (Edmonton) to Ellerslie Road (Edmonton)	6	Transition Median to 19.6m	

** Construction underway to complete 6-laning south of Carstairs.*
*** Existing 6-lane cross section from Crossfield to Carstairs and 6 lane grading between Bowden / Innisfail and Highway 11 / 11A*

3.1.4 Access Summary

The following is a summary of access points to the Highway 2 corridor:

- 39 interchanges
- 4 over passes, 1 public underpass, 1 private underpass, 5 cattle passes
- Existing at-grade intersections:
  - In Highway Section 2:20
    - Township Road 310 - Bergthal Road too be replaced with Diamond Interchange
    - Township Road 320 - Bergen Road – to be removed
    - Township Road 322 Amerada Road – to be removed
    - Township Road 331 Wimborne Road – to be removed
  - In Highway Section 2:22:
    - Township Road 340 Netook Road – to be replaced with Diamond Interchange
    - Highway 2A southbound Exit – to be removed
  - In Highway Section 2:24:
    - Township Road 362 Old Pole Road – to be replaced initially with fly-over and then with Interchange
  - In Highway Section 2:26:
    - Township Road 392 Blindman Drive Right in / Right out northbound – to be removed
    - Entrance Ramp southbound south of Highway 597 Interchange – to be removed
    - Private all directional access – North of Blackfalds (east side)
- Other Facilities include:
  - 2 Vehicle Inspection Stations (North of Airdrie and South of Leduc) to be relocated

[8] Information provided by Alberta Transportation

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- 5 Safety Rest Areas:
  - South of Highway 72 / 2A southbound (Crossfield)
  - Bowden northbound / southbound
  - Alberta Sports Hall of Fame Museum Southbound, South of Red Deer River
  - West of Lacombe southbound (Wolf Creek)
  - South of Louis Bull Flyover - Northbound
- 11 non-standard roadside turnouts at various locations within 4 lane cross section, including the shoulder parking southbound immediately north of Highway 39 at Leduc.
- 2 Commercial Sites
  - North of Highway 72 / 2A Northbound (Esso, Humpty's, Petro-Canada)
  - North of Highway 587 Northbound (Fas Gas)

3.2 Study Time Horizons

In general, the time horizons used for this study are as follows:

- Within 10 years
- Beyond 10 years but less than 25 years
- Beyond 25 years

To develop a priority ranking for implementation planning, we used the following time horizons which were subsequently collapsed into the study time horizons listed above.

- Less than 5 years
- 5-10 years
- 10-20 years
- 20-25 years
- Beyond 25 years

3.3 Traffic

Exhibit 3.3.1 illustrates the 2016 Annual Average Daily Traffic (AADT) volumes along the Highway 2 corridor between Calgary and Edmonton. An auto journey between Calgary and Edmonton generally takes in the range of 2½ to 3 hours with congestion occurring primarily on the approaches to the metropolitan areas of Calgary and Edmonton where intercity travel combines with local urban commuter traffic from the outlying areas (i.e. Leduc, Airdrie) which have developed over the last two decades as significant commercial, business, industry, employment centers along with expanded residential communities.

Exhibit 3.3.1: Highway 2 Corridor (2016) AADT



3.3.1 Historical Traffic Growth

The historical traffic growth was analyzed to help estimate future growth. The existing 2016 data from Alberta Transportation's traffic counts and permanent traffic counters were used to develop plans showing the 2016 AADT on the entire corridor, which are illustrated as Exhibit 3.3.2 (7 Plans). The historical annual traffic growth throughout the corridor is included in Appendix C – Historical Traffic Data (10 Years).

A process of balancing the traffic was required to correct for any anomalies within the data sets. In the past 10-years, the average annual traffic growth (linear) was 2.4% with a range between 1.5% and 4.8%. Some notable points in the data include:

- The highest growth occurred in Balzac area, in the proximity to the CrossIron Mills Shopping Centre (3.7-4.8%).
- Growth over 3% occurred in Airdrie, near Crossfield, in Red Deer County - north of Highway 11 to Blackfalds.
- The northern section of Leduc-Edmonton corridor shows a 10 year average of 3.8%. (See Section 4.4.5).
- All the other areas indicate traffic growth close to 2.5% provincial average or lower. (1.5%-2.6%).

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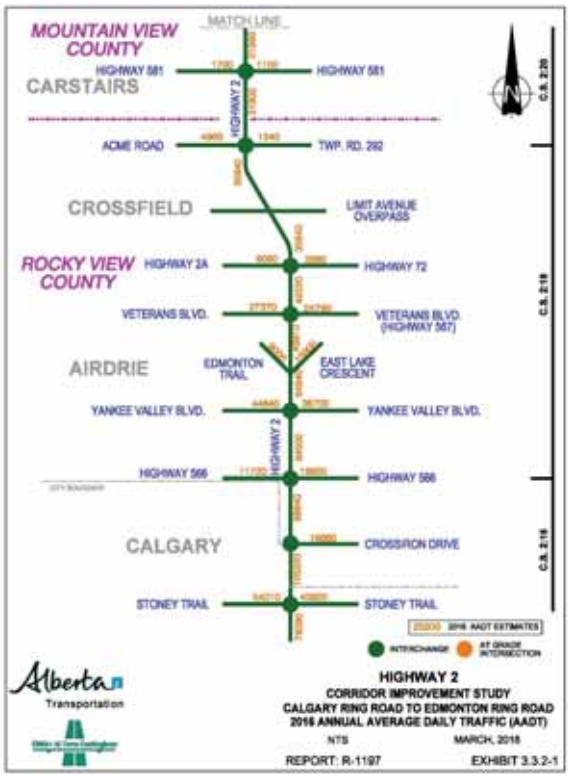
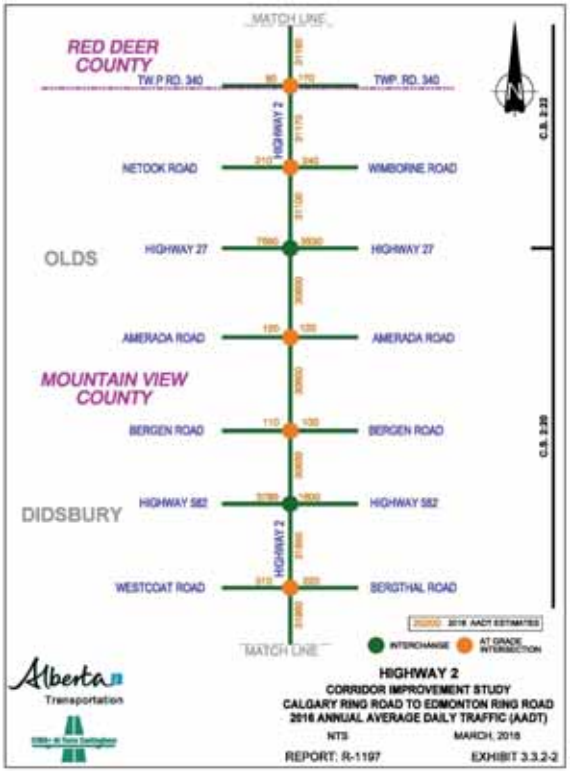
Exhibit 3.3.2: Calgary to Edmonton 2016 AADT (7 Plans)





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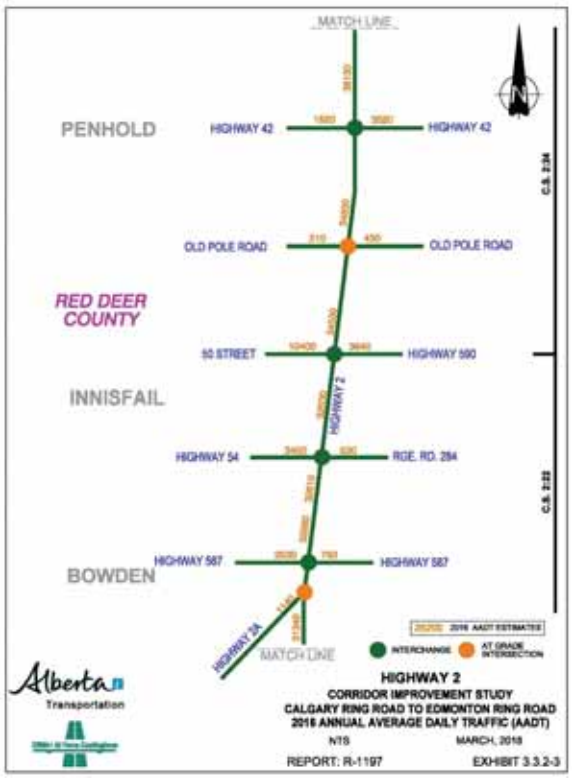

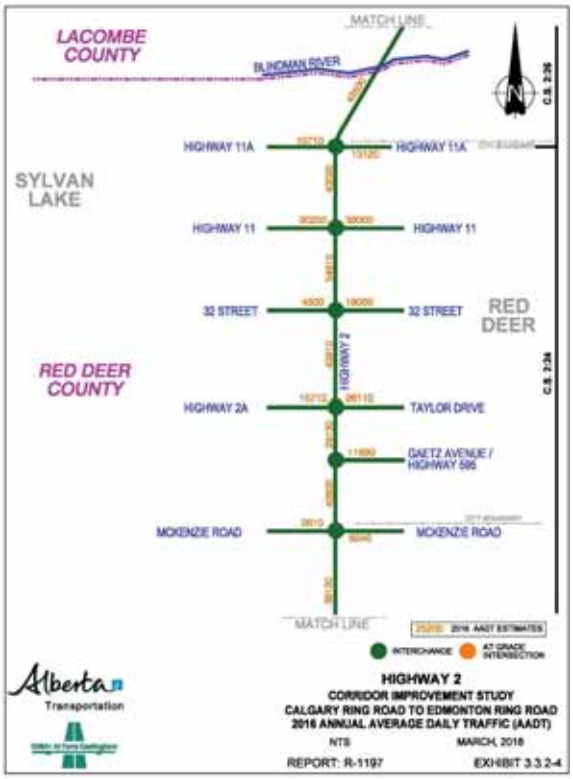

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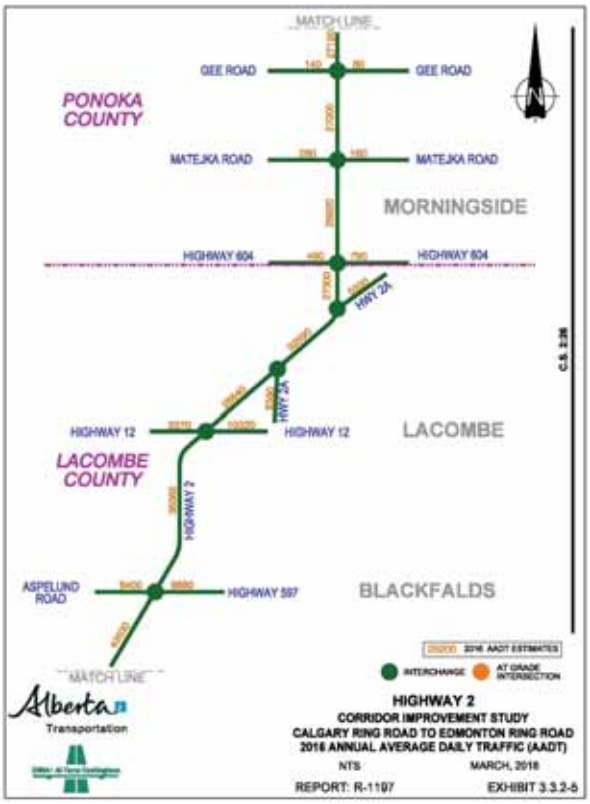

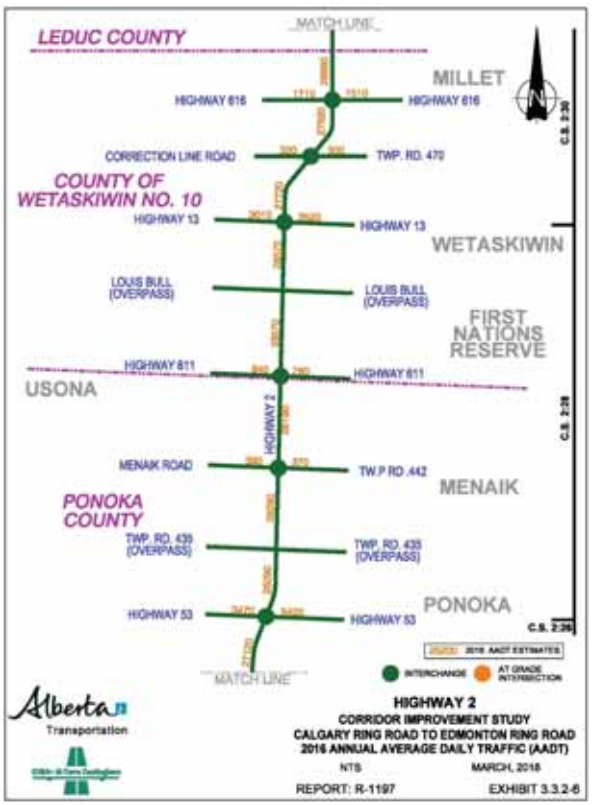

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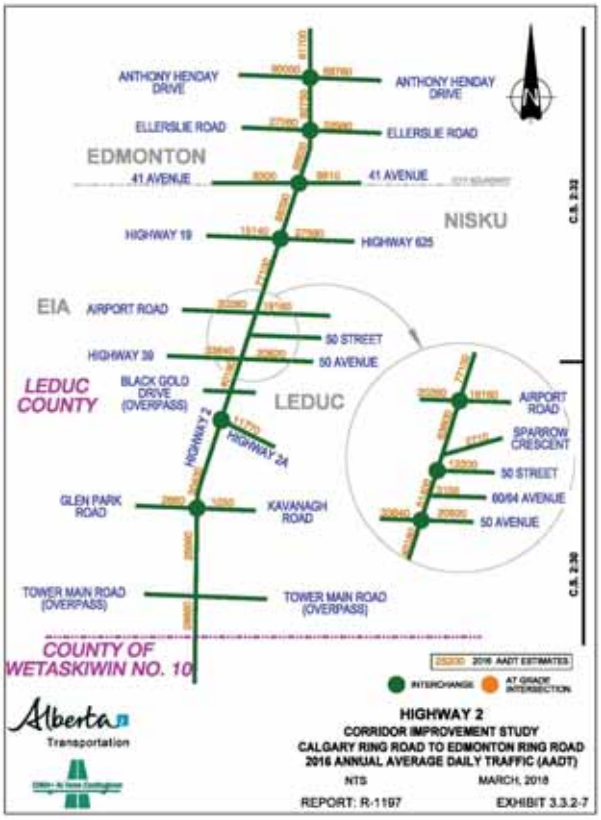

3.3.2 Traffic Operations – Level of Service (LOS)

3.3.2.1 Level of Service Evaluation

Alberta Transportation has established the following guidelines to determine when additional lanes should be provided on a divided highway:

- Less than 31,000 vehicles per day (vpd): 4 lanes
- 31,000 – 50,000 vpd: 6 lanes
- Over 50,000 vpd: 8 or more lanes

Design guidelines generally indicate that additional lanes on a divided highway should be considered when the LOS C is reached. The AADT at which this would occur is dependent on factors such as terrain, speed and traffic type. The exceptions to this guideline have been made for the Calgary and Edmonton ring roads, where the target is LOS C in the first stage and LOS D in the long term.

Maintaining LOS B on Highway 2 is not sustainable, particularly in sections passing through suburban and urban environments. Driver expectations (throughout North America) already permit transitioning from LOS B through long rural stretches, to LOS C through suburban zones, and LOS D through developed urban (high commute) environments. To address this concern, we prepared a working paper on the subject, which included a review of other transportation jurisdictions around the world. This paper is included in Appendix D for reference.

The LOS analysis concluded that it is reasonable to apply three LOS thresholds for highways and freeways in Alberta. Upgrades should occur in advance of the LOS transitions. The proposed thresholds are:

- LOS B transitioning to C (B / C) in rural areas passing adjacent communities with a population less than 5,000
- LOS C / D in suburban areas (>50,000 population) and transitional area (>5,000 population)
- LOS D / E in urban areas (>500,000 population) and transitional areas

Using the above criteria, the target level of service used in our Highway 2 analysis is as follows

- LOS B / C (Rural Areas):
  - Acme Road (Crossfield) to Highway 42 (Penhold)
  - North of Highway 597 (Blackfalds) to North of Highway 616 (Millet)
- LOS C / D (Suburban Area):
  - Highway 567 (Airdrie) to Acme Road (Crossfield)
  - Highway 42 (Penhold) to Highway 597 (Blackfalds)
  - North of Highway 616 (Millet) to South of Highway 2A (Leduc)
- LOS D / E (Urban Areas):
  - City of Calgary to Highway 567 (Airdrie)
  - South of Highway 2A (Leduc) to City of Edmonton

It is important to note that the LOS locations will change over time and are only one factor in assessing the timeline for future improvements. As areas develop, rural areas may become suburban and suburban may become urban, which

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may change the analysis. With those developments, other improvements may be required (i.e. a new or reconfigured interchange) which is an opportunity to advance roadway improvements.

3.3.2.2 Analysis Background

The performance of Highway 2 was analyzed using Highway Capacity Manual (HCM) methodology for freeway facilities, excluding existing at grade intersections. This methodology allows us to analyze continuous sections of freeways composed of the following highway segments:

- Basic
- Merge and diverge
- Weaving

This analysis determines the level of service (LOS) and capacity of the corridor segments during peak hours for each direction of travel. The software used in the analysis was McTrans Highway Capacity Software (HCS 2010).

LOS for freeway facilities are primarily defined in terms of density, measured in passenger cars / km / lane (pc / km / ln), with demand to capacity ratios and segment speeds also factoring into the analysis. Each segment is given a weighting, so a weighted average density can be calculated for the corridor being analyzed. The weighted average density is then used to determine the corresponding LOS using the basic freeway criteria, which is illustrated in Table 3.3.1.

Table 3.3.1: Level of Service Criteria[9]

Level of Service	Density (pc / km / ln)
A	≤7
B	>7-11
C	>11-16
D	>16-22
E	>22-28
F	>28

If any section of the facility has demand volume greater than its capacity the LOS is F.

The input information to determine LOS includes existing 2016 traffic information:

- 100th highest hour traffic volume balanced along the Highway 2 corridor during AM and PM peaks
- Traffic composition (% of cars, SU's, RV's Bus's and TT's)
- Free Flow Speed (FFS) – used 120km / h speed
- Terrain Type – used level terrain for majority of the corridor with rolling terrain in Red Deer area
- Geometry of acceleration and deceleration lanes and lengths of weaving or overlapping sections of roadway, which is based on existing ramp geometry

3.3.2.3 Analysis Summary & Results

Due to the length of the project, the corridor was divided into 6 sections for analysis:[10]

1. Stoney Trail (Calgary) – North of Highway 567 (Veterans Boulevard - Airdrie)
2. South of Highway 72 (Crossfield) to North of Highway 582 (Didsbury)
3. South of Highway 27 (Olds) to North of Highway 42 (Penhold)
4. South of McKenzie Road (Red Deer County) to North of Highway 604 (Morningside)
5. South of Matejka Road to North of Glen Park / Kavanagh Road
6. South of Highway 2A (Leduc) to Anthony Henday Drive (Edmonton)

Reports from the operational analysis of the existing traffic include the following information for each segment:

- Traffic demand (veh / h)
- Capacity (veh / h)
- Volume to capacity ratio
- Average Speed (km / h)
- Density (pc / km / ln)
- Mainline Delay (min / veh)
- System Delay (min / veh)
- Vehicle Kilometer Traffic (VKT)
- Demand (veh-min)
- LOS of the section

A summary of each section performance is shown as weighted average of all section segments for each peak hour and direction. Highway 2 segments not achieving the target LOS levels are also highlighted in the reports. The Highway Capacity Software Analysis Reports are included in Appendix E.

Based on the analysis existing operations are typically acceptable, except for the segment between 32nd Street and Highway 11 in Red Deer; however, there are areas that indicate requirement for improvements to maintain acceptable LOS in a near future (within 5 years). These results are key input parameters to our implementation plan that is outlined in Section 5.

3.3.3 Traffic Origin-Destination Movements

Origin-Destination (O-D) information along the Highway 2 corridor provides a more detailed picture of the trip patterns made by users of the facility. The information allows stakeholders to go beyond recorded traffic volumes at specific points

[9] Highway Capacity Manual, 2010, LOS for Freeway Facilities, Exhibit 10-7 (converted to metric)

[10] These sections are specific to the LOS analysis, not to be confused with the 5 study sub-regions.

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along the Highway 2 corridor by providing an appreciation of the travel patterns and characteristics of where the vehicle traffic originated from and are destined to. The information is useful in identifying the extent to which various segments of the highway corridor are being used by "local" traffic as opposed to the satisfying "inter-municipal" travel requirements. In addition, the information proves useful in providing input into travel demand model development, travel demand forecasting, and planning for are-wide transportation infrastructure requirements, needs and services; and can be used as a tool to monitor progress when implementing transportation policies.

3.3.3.1 The Origin-Destination Survey

A comprehensive origin-destination survey was undertaken to identify travel patterns / trends on the Highway 2 corridor between Calgary and Edmonton. The survey involved a collection of the travel pattern information of all Rogers Cell phone subscribers as they traveled between each of the established cell tower boundaries / zones over a three-month period (from September 3rd to December 4th, 2016). The Rogers network makes up approximately 23% of all wireless service subscribers within the Province yielding a significant representation, or sample, of the travelling public. The survey monitored all active phones / devices in the network, passively and anonymously which are then geo-referenced. Data collection and analysis and traffic matrices generation was performed by Cellint Traffic Solutions. In accordance to Cellint's privacy policy only aggregated data was included in the output data and any sample smaller than 25 samples was discarded. Matches between zones indicate travel had occurred. Travel information was collected, and estimates of inter-regional travel demand were then determined for the average weekday and average weekend day for seven time periods:

- 3 AM to 6 AM
- 6 AM to 9 AM
- 9 AM to 12 Noon
- 12 Noon to 3 PM
- 3 PM to 6 PM
- 6 PM to 9 PM
- 9 PM to 12 Midnight

Holidays within this period (Labor Day, Thanksgiving and Remembrance Day) were classified as weekend days.

Exhibit 3.3.3 illustrates the 59 zones that were established to undertake the OD survey. The zone system boundaries are not arbitrarily defined, but rather are a function of cell phone tower locations and assigned areas or networks used to collect the information. For the purposes of this Highway 2 CIS study, where an emphasis was placed on identifying region-wide trends, the predefined zone boundaries were sufficient to approximate traffic trends along the Highway 2 corridor.

The cell tower zone system was defined by:

- *Calgary-Airdrie Area*:
  - 4 distinct zones inclusive of the northern portion of the Calgary area in the vicinity of Stony Trail, CrossIron Mills, Airdrie and Crossfield.
- *Red Deer Area:*
  - 22 distinct zones which spanned from Penhold in the south to Lacombe on the north.
  - 4 external zones which define the outlying boundaries to the Red Deer area (which consisted of covering the larger areas to the N, E, W & S.)
- *Edmonton-Leduc Area:*
  - 23 distinct zones which spanned from north of Whitemud Drive through to south of the Highway 2A interchange at Highway 2.
  - 6 external zones which define the outlying boundaries to the Edmonton-Leduc area (which consisted of larger areas to the N, E, NE, NW, W & S.)

Exhibit 3.3.3: Origin-Destination Zone System (Cellint)



The Rogers network data for the survey period was analyzed and a database was created that contained for each identified user (by way of monitored mobile device) the start and end times over continuous time periods along with the location zones where signals were received. This information was then analyzed to define trips. The sequence of cellular locations was considered as a "trip" when the monitored phone was identified to move between at least 2 zones, and as long as the monitored mobile phone did not stay for more than one hour in any one zone, (excluding the initial origin and final destination zones). A stay of more than one hour in a specific zone (before the trip was resumed) was defined as two separate "trips" whereas a stay of less than one hour was defined as a "pass-by" or "diverted linked" trip. Stays of less than 1 hour were defined by a single trip with the original origin zone being the start of the trip and the final destination zone being defined as the end of the trip. All trips with the same origin and destination zones were aggregated separately for weekdays and weekends and then disaggregated per the seven individual time periods noted above.

3.3.3.2 Origin-Destination Survey Results

Exhibit 3.3.4 and Exhibit 3.3.5 illustrate the resulting outbound and inbound inter-urban travel trends that were derived from the origin-destination survey. Table 3.3.2 serves to summarize in an origin-destination format the weekday inter-urban travel trends derived from the 2016 travel demand survey. Table 3.3.3 and Table 3.3.4 provide the percentage or proportion of traffic generated by, and arriving at, each of the various urban centers along the Highway 2 corridor.

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The following serves to summarize existing travel trend information:

Northbound Inter-Urban Travel Trends:

- Of the 42,200 vpd travelling northbound on Highway 2 south of Yankee Valley Blvd (Airdrie) approximately 5,000 vpd (12%) are destined to Edmonton-Leduc and 2,500 vpd (6%) are destined to Red Deer.
- Of the 21,100 vpd travelling northbound on Highway 2 north of Airdrie approximately 6,400 vpd (31%) are destined to Edmonton-Leduc and 3,500 vph (17%) are destined to Red Deer.
- This infers that the Airdrie component (excluding CrossIron Mills) of northbound travel to Edmonton-Leduc would be 1,400 vpd (6,400 less 5,000 vpd) and 1,000 vpd to Red Deer (3,500 less 2,500 vpd).

Red Deer Region Inter-Urban Travel Trends:

The Red Deer Region represents a significant market on its own generating and attracting significant travel demands. The large size of the Red Deer zone (from Innisfail to Morningside) represents a major draw from the surrounding rural areas emphasizing its role as a major employment hub and urban base for shopping and entertainment. During a typical weekday, the survey indicates that approximately:

- 3,500 vpd are generated from Calgary, Cross-Iron Mills and Airdrie to the Red Deer Region.
- 4,000 vpd are generated from the rural communities (between Airdrie and Innisfail) to the south of the Red Deer Region. (The communities include Bowden, Olds, Wimborne, Didsbury, Sundre etc.).
- 1,600 vpd are generated from the rural communities between Morningside and Leduc to the Red Deer Region. (The communities include Ponoka, Rimbey, etc.).
- 3,800 vpd are generated from the Red Deer Region to the Leduc-Edmonton area to the.

Similar trends were observed in the outbound direction from the Red Deer Region.

Southbound Inter-Urban Travel Trends:

- Of the 42,600 vpd travelling southbound on Highway 2 south of 41st Avenue (which represents travel demand from the City of Edmonton) approximately 5,500 vpd (13%) are destined to Calgary-Airdrie and 3,500 vpd (8%) are destined to Red Deer.
- Of the 14,900 vpd travelling southbound on Highway 2 south of Highway 2A (which represents travel demand from the City of Edmonton and Leduc / Nisku) approximately 5,800 vpd (39%) are destined to Calgary-Airdrie and 3,800 vph (27%) are destined to Red Deer.
- This infers that the Leduc / Nisku component of southbound travel to Calgary-Airdrie would be 300 vpd (5,800 less 5,500 vpd) and 300 vpd to Red Deer (3,800 less 3,500 vpd).

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Exhibit 3.3.4: Outbound Weekday Daily Travel Trends

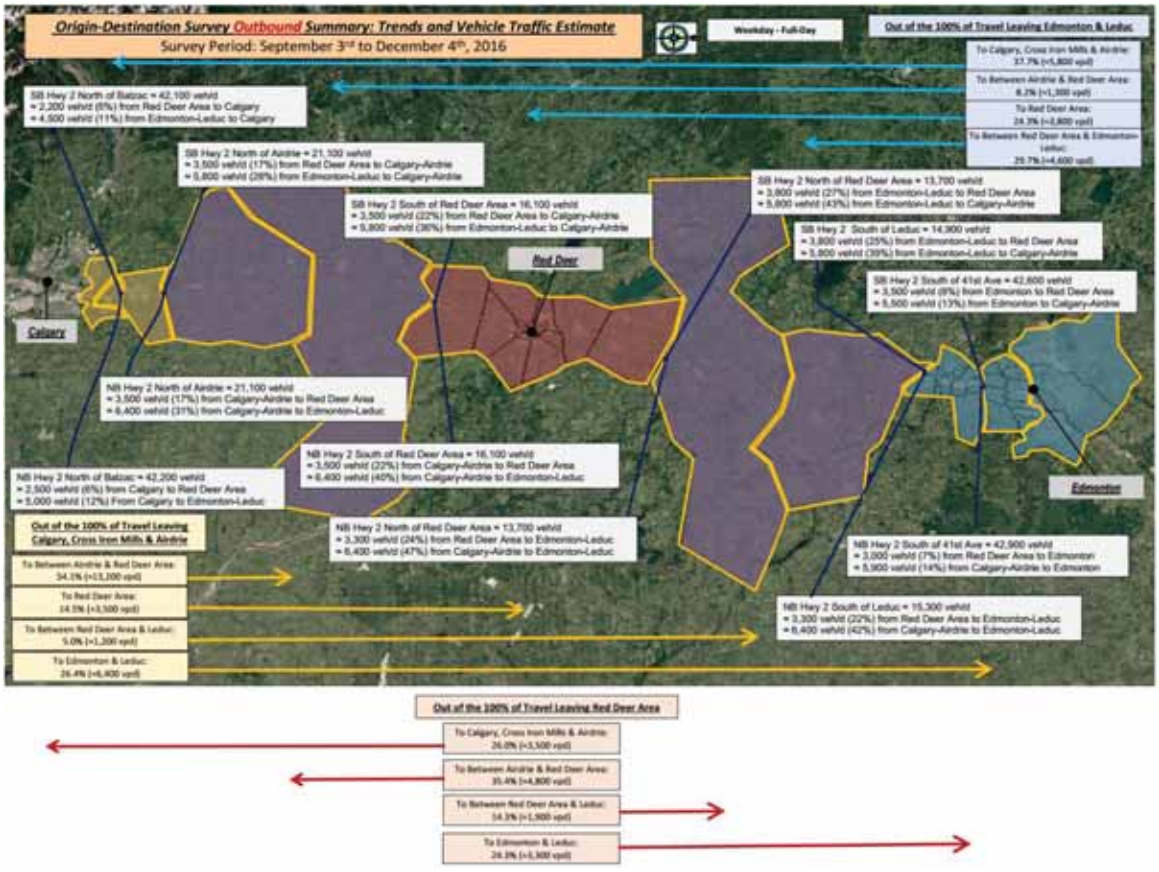

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Exhibit 3.3.5: Inbound Weekday Daily Travel Trends

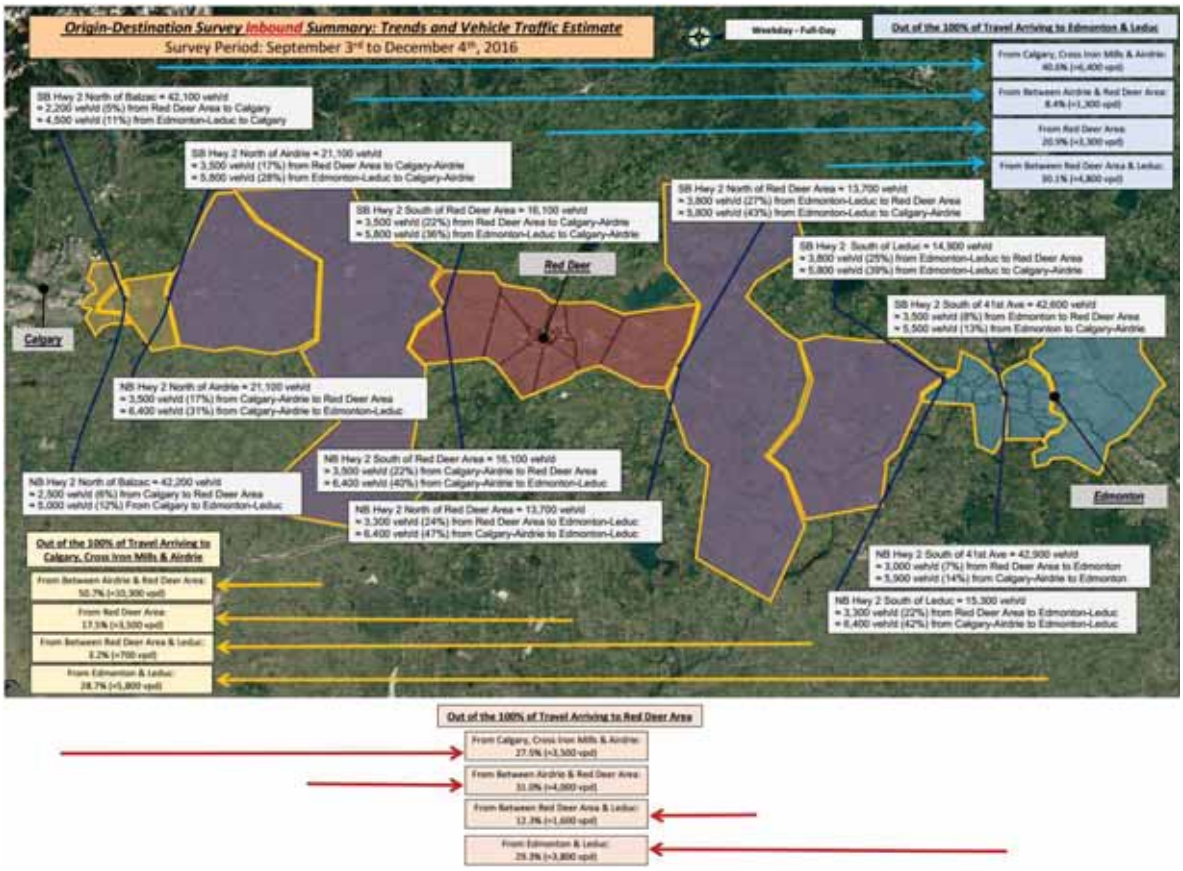

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Table 3.3.2: Inter-Urban Weekday Travel Trends (Vehicles-per-day)

		Destination District							
	Corresponding Area	Calgary & CrossIron Mills	Airdrie	Rural South: Airdrie to Innisfail	Red Deer Region: Innisfail to Morningside	Rural North: Morningside to Leduc	Leduc & Nisku	Edmonton	Total
Origin District	Calgary & CrossIron		30,030	4,270	2,510	480	400	4,580	*42,270*
	Airdrie	30,060		5,790	1,020	220	110	1,3640	*38,540*
	Rural South	4,430	5,870		3,970	290	110	1,220	*15,890*
	Red Deer	2,540	1,010	4,820		1,950	350	2,970	*13,640*
	Rural North	430	230	460	1,580		930	3,840	*7,470*
	Leduc & Nisku	220	110	100	260	950		28,870	*30,510*
	Edmonton	4,250	1,250	1,170	3,490	3,650	29,980		*42,790*
	Total	41,930	38,500	16,610	12,830	7,540	30,880	42,820	191,110

Table 3.3.3: Inter-Urban Weekday Travel Trends (Percent of Traffic from Origin)

		Destination District							
	Corresponding Area	Calgary & CrossIron Mills	Airdrie	Rural South: Airdrie to Innisfail	Red Deer Region: Innisfail to Morningside	Rural North: Morningside to Leduc	Leduc & Nisku	Edmonton	Total
Origin District	Calgary & CrossIron		72.3%	8.6%	5.9%	1.1%	1.1%	11.1%	100.0%
	Airdrie	82.1%		10.4%	2.8%	0.6%	0.4%	3.8%	100.0%
	Rural South	22.9%	24.3%		33.4%	3.4%	1.4%	14.7%	100.0%
	Red Deer	14.4%	5.8%	30.8%		18.1%	3.2%	27.6%	100.0%
	Rural North	2.5%	1.2%	2.8%	16.8%		32.3%	44.4%	100.0%
	Leduc & Nisku	0.9%	0.2%	0.4%	1.0%	11.3%		86.1%	100.0%
	Edmonton	6.6%	2.0%	3.7%	7.6%	12.3%	67.7%		100.0%

Table 3.3.4: Inter-Urban Weekday Travel Trends (Percent of Traffic to Destination)

		Destination District						
	Corresponding Area	Calgary & CrossIron Mills	Airdrie	Rural South: Airdrie to Innisfail	Red Deer Region: Innisfail to Morningside	Rural North: Morningside to Leduc	Leduc & Nisku	Edmonton
Origin District	Calgary & CrossIron		82.4%	22.6%	14.1%	2.5%	0.8%	6.8%
	Airdrie	71.9%		23.4%	5.7%	1.2%	0.2%	2.0%
	Rural South	8.7%	10.3%		29.7%	2.8%	0.4%	3.4%
	Red Deer	6.1%	2.7%	33.5%		16.6%	1.0%	7.0%
	Rural North	1.1%	0.6%	3.3%	17.8%		11.3%	12.2%
	Leduc & Nisku	1.2%	0.4%	1.4%	3.2%	32.4%		68.6%
	Edmonton	11.0%	3.6%	15.8%	29.5%	44.5%	86.2%	
	Total	100%	100%	100%	100%	100%	100%	100%

3.3.3.3 Comparison to 2013 Bluetooth Survey

In the fall of 2013 (Oct. 7-through-19), Alberta Transportation undertook a "Bluetooth Survey" which involved positioning receiving stations in both directions of the Highway corridor at the following 4 locations:[11]

- 5.9 km north of Highway 19 (and south of 41st Avenue)
- 4.6 km south of Highway 567 (and south of Yankee Valley Blvd)
- 0.1 km north of Highway 11A (Red Deer North and south of Lacombe)
- 2.6 km north of Highway 42 (North of Penhold and south of Red Deer)

Estimates of stop-over trips in Red Deer (i.e. at Gasoline Alley) were determined by assigning those trips between Calgary and Edmonton (in both directions) which were found to be more than 10 minutes than the "prevailing travel time" as a Red Deer Stop trip.

In total, over the entire Bluetooth survey period:

- 111,862 matches between Bluetooth stations were determined.
- Roughly 21% (23,746 matches) were determined to be valid in terms of the identified trip patterns (i.e. an "invalid" vehicle trip would be one that enters and exits through the same blue tooth station).
- The bluetooth information was expanded by effectively weighting the captured information at each station by the daily traffic counts collected by the permanent traffic counting stations at each site.

[11] A fifth station at the Highway 1 / Highway 22 interchange was also positioned, but for the purposes of this Highway 2 study it was excluded from the evaluation.

The raw data from the 2013 survey was provided for comparison purposes to the 2016 survey results. A review of the 2013 Bluetooth information indicated that in general Monday and Friday survey days do not reflect the average activity levels on roadway corridors. For example:

- The Edmonton southbound permanent traffic recorder exhibited significantly lower traffic volumes on Monday, October 7th, 2013 resulting in significantly lower proportions of travel to Calgary and Red Deer when compared to other weekdays surveyed. This was felt to underestimate average weekday demand.
- Monday, October 14th, 2013 was the Thanksgiving Statutory Holiday and traffic volumes exhibited at the permanent counting stations were significantly higher. This was determined to be atypical and resulted in average weekday demand being over-emphasized.
- The two Friday survey days (October 11th and 18th) exhibited high traffic volumes at the permanent traffic counting stations and were also felt to overemphasize average weekday demand.

Table 3.3.5 compares the 2013 Bluetooth weekday survey results to the new 2016 survey information.

The percentage results presented as Survey Results (2016) in Table 3.3.5 are calculated based on actual average daily (AADT) station counts undertaken south of Edmonton and south of Airdrie over the September to December 2016 survey time frame. These AADT station counts included all non-holiday Tuesday, Wednesday and Thursday counts to make sure that the averages reflected just the weekdays of the 2016 Survey Results. This higher base results in the percentages nominally higher than the Bluetooth survey results. These AADT values differ from the values referenced from Tables 3.2 and 3.3 which were based upon Table 3.1's traffic volumes which in turn were derived by weighting the entire survey results to reflect all vehicle traffic independent of individual stations.

The comparison of the 2013 Bluetooth survey with the 2016 Origin-Destination results indicated that the two sets of data provide similar travel trend approximations of inter-urban patterns along the Highway 2 corridor.

Table 3.3.5: Comparison of Weekday Travel Trend Survey Results

	Bluetooth Survey Results (2013)		Cellular Survey Results (2016)	
EDMONTON: Highway 2: South of 41st Ave (Excludes Leduc)				
	Southbound	Northbound	Southbound	Northbound
AADT at Station	49,250[1]	48,555[1]	42,559[2]	42,896[2]
% - Calgary (S of Airdrie)	11.8%	8.1%	10.0%	10.6%
Est Daily Veh Trips - Calgary	5,828 vpd	3,920 vpd	4,250 vpd	4,580 vpd
% - Red Deer	3.7%	2.9%	8.2%	6.9%
Est Daily Veh Trips - Red Deer	1,806 vpd	1,398 vpd	3,500 vpd	2,970 vpd
CALGARY: Highway 2: South of Yankee Valley Blvd & North of Balzac (Hwy 566) (Excludes Airdrie)				
	Southbound	Northbound	Southbound	Northbound
AADT at Station	43,302[1]	42,410[1]	40,600[3]	39,490[3]
% - Edmonton (S of 41st Ave)	13.5%	9.2%	10.5%	11.6%
Est Daily Veh Trips - Edmonton	5,828 vpd	3,920 vpd	4,250 vpd	4,580 vpd
% - Red Deer	6.9%	5.2%	6.2%	6.3%
Est Daily Veh Trips - Red Deer	2,927 vpd	2,242 vpd	2,540 vpd	2,510 vpd

1. *AADT Drawn from AADT Station 60023210 on Mon, Oct 7-thru-Sat, Oct. 19, 2013 – Including Thanksgiving. Weekday averages were referenced from Tues-thru-Thursday information.*
2. *Station 60023210 taking Average Monthly AADT (Tuesdays, Wednesdays & Thursdays) travel over the Survey Period for Sept 6-thru-Dec 1st, 2016.*
3. *Unfortunately, AADT counts for Station 60021810 were unavailable for the Sept-thru-Dec, 2016 survey period. The AADT values used for this station were based on the 2016 survey estimates of AADT at this station.*

3.3.4 Existing Vehicle Occupancy Characteristics

3.3.4.1 Vehicle Occupancy Survey

A vehicle occupancy (VO) survey was conducted to determine the existing characteristics of travel demand along the Highway 2 corridor and evaluate the potential demand for High Occupancy Vehicle (HOV) lanes based upon existing traffic trends. It was recognized from the outset that HOV lanes, once implemented (in concert with a comprehensive marketing campaign and recognition of a distinct travel time saving), may serve as a catalyst that would further encourage additional ride sharing behavior. However, understanding current travel trends was thought to serve as the "baseline" to which HOV facilities could be compared.

The VO survey was conducted from 7 - 9 AM and 4 - 6 PM at the following two locations:

- Immediately south of the Highway 566 interchange (and north of the CrossIron Drive interchange) for the Calgary-Airdrie area (on November 8th, 2016).
- Immediately south of the 41st Avenue interchange for the Edmonton-Leduc area (on November 10th, 2016).

These two locations, both on the periphery of the urban areas of the Province's major cities, were selected as each corridor was at one time or another considered as potential candidate to implement HOV solutions.

The Edmonton Metropolitan Region Board (EMRB) had recently[12] assigned the Highway 2 corridor as a "Rank 1" "HOV Lane / Transit Priority" project and the EMRB's transit committee voted to explore a carpool lane project along the Highway

[12] "2016 Regional Transportation Priorities, Integrated Regional Transportation Master Plan", Table 3.6 Project Functional Planning or Study – Transit, Page 12

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2 corridor in response to an HOV study.[13] The study advocated achieving HOV 2+ Lanes by "converting the existing median lane in each direction to 24 / 7 HOV operation".[14]

Table 3.3.6 indicates the results of the VO survey and indicates the approximate percentage of traffic crossing the above two stations with 2+ occupants. The results indicate that, in general, 2+ occupancy was found to be significantly higher in the afternoon peak hour than the morning, this could well be attributed to the additional shopping and non-home-based-work traffic being generated. As well, it was observed that the occupancy on Highway 2 is higher crossing the Leduc-Edmonton (41st Avenue) boundary than the crossings of the Airdrie-Calgary (Highway 566 - Balzac) boundary. This could well be attributed to the impact of the Edmonton International Airport (EIA) in that air passenger travel is often characterized by pick-ups, drop-offs, taxis, shuttles etc. which could well lead to significantly higher occupancy levels as this traffic must cross the 41st Ave VO station between Edmonton and the EIA. This is not repeated at the Airdrie-Calgary (Highway 566 - Balzac) station where the Calgary International Airport (YYC) is located well south of this station and airport traffic does not influence the counts.

Table 3.3.6: Percent of Vehicles with 2+ Occupants

Time / Location	Edmonton (41st Avenue)	Calgary (Highway 566)
Morning Peak Hour	15.2%	7.4%
Afternoon Peak Hour	25.4%	11.9%

3.3.4.2 Results of the VO Survey

To interpret the VO survey results, several assumptions were made:

- Existing 2+ VO completely shifts to the HOV lane.
- Ignored the potential additional attraction achieved through marketing of the HOV concept.
- Ignored additional attraction advantages of offering a higher level-of-service and significantly better travel time than using the regular Highway 2 lanes.
- Ignored the potential diversion of single occupant vehicle (SOV) away from Highway 2 to other corridors.
- Ignored the potential for motorists to shift the time of their trips to avoid congestion.

With the assumptions above, we found the conversion of an existing Highway 2 lane to HOV exclusive use (leaving 2 lanes per direction, for SOV traffic) would result in the following for the 2016 traffic volumes:

- The level-of-service on the dedicated HOV lane would be LOS B or better in Calgary and Edmonton.
- In Edmonton, in the southbound direction in the morning a LOS E would result on the remaining Highway 2 through lanes.
- In Calgary, in the southbound direction in the morning peak hour and in the northbound direction during the afternoon peak hour, failure (LOS F) levels of service would result on the remaining Highway 2 through lanes.

When we assume the construction of new additional HOV lane (i.e. 4 lanes per direction) leaving the existing facility (3 lanes per direction) for SOV, we found:

- The level-of-service on the HOV lanes was found to be LOS B or better in both Calgary and Edmonton.
- The level-of-service on all remaining three Highway 2 through lanes would be LOS D or better in Calgary and LOS C or better in Edmonton in both directions.
- The relatively short ultimate interchange spacing in both metropolitan corridors would mean that a dedicated median-side HOV lane would introduce additional weaving during the peak hours, potentially reducing overall level-of-service and safety.
- In the case of Edmonton, consideration of implementing HOV along the future core lane configuration has merit given the longer distance between transfer lanes and greater available distance for HOV traffic.

3.3.5 Conclusion

The Highway 2 corridor between Calgary and Edmonton has developed over time to serve as an essential life-line and reliable travel route that provides not only travel and access opportunities for residents of the province but also serves the major Provincial economic and resource markets by enabling for the transportation of provincially significant good, services, commodities and materials. The foregoing review of current traffic volumes, historical traffic growth, traffic operations, origin-destination travel trends and vehicle occupancy characteristics served to provide valuable insight into the historical and current usage of the Highway 2 corridor. The following findings were determined from this information.

- Traffic volumes on the urban portions of the Highway 2 corridor are double-to-triple that of the rural portions of the corridor.
- The urban portions of the Highway 2 corridor were found to exhibit lower operating speeds, greater main line delay, higher demand and lower levels-of-service than the rural portions of the corridor.
- The current proportion of "local-commuter" traffic in contrast to longer distance "highway-through" traffic on the urban sections of the Highway 2 corridor is significant and is forecast to continue to grow faster than "highway-through" traffic component.
- 72% - The proportion of weekday Highway 2 traffic that can be defined as the "local-commuter" traffic component between Calgary-and-Airdrie.
- 68% - The proportion of daily weekday Highway 2 traffic between Leduc-and-Edmonton that can be defined as the combination of "local-commuter" traffic and Edmonton International Airport traffic.
- 46% - The proportion of traffic that can be defined as the "local-commuter" traffic component that makes use of the Red Deer Regional portion of the Highway 2 corridor during the average weekday.

This underscores the need to develop parallel municipal corridors and transit solutions independent of the Highway 2 corridor.

[13] The "Capital Region High Occupancy Vehicle / Transit Priority Study", September 2016, Section 6.1.1 (page 72) was endorsed by the Capital Region Board on May 11, 2017, Source: CRB Agenda Pkg. June 8 / 17 Page 5 of 6

[14] Ibid. Section 7.1 (pg. 81)

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- 12,260 - The number of weekday trips estimated to travel the entire length of the Highway 2 corridor between Calgary-Airdrie and Edmonton-Leduc.
- 7,080 - The number of weekday trips estimated to travel the length of the Highway 2 corridor between Calgary-Airdrie and Red-Deer.
- 7,070 - The number of weekday trips estimated to travel the length of the Highway 2 corridor between Edmonton-Leduc and Red-Deer.
- The current proportion of "local-commuter" traffic on the urban sections of the Highway 2 corridor is forecast to grow at a faster rate than the "highway-through" traffic component (see Exhibit 4.4.6). This is expected as the metropolitan areas continue to expand and infill. This is also significant, in that the urban areas (Calgary-Airdrie, Edmonton-Leduc, Red Deer) which represent approximately 20% of the length of the entire 265km long corridor, require significantly more investment given the closer interchange spacing, the greater freeway width (number of lanes) that must be provided and the value of adjacent property, if required.
- Current vehicle occupancy information has led to the conclusion that implementing High Occupancy Vehicle (HOV) lanes along the QE II corridor assuming the existing configuration would result in unacceptable levels of service on the remaining travel lanes. Consideration of an HOV concept along the urban sections of the Highway 2 corridor is best left to a time when the future widening of the urban sections of the corridor are envisioned.

3.4 Safety Analysis

3.4.1 Background

Safety along the Highway 2 corridor was examined for three reasons:

1. Identify locations that warrant special attention.
2. Assess the safety outcomes associated with the high-tension cable barrier installation between Red Deer and Airdrie (completed June 2010) where the median width is 14.6m.
3. Recommend a widening cross section between Red Deer and Leduc.

3.4.2 Collision Data Overview

The primary data used in the safety analysis was collision experience for the 5-year period from 2010 to 2014. During that period 8,290 collisions, involving 12,995 vehicles, were reported on the corridor. The collision types experienced along the Highway 2 corridor is shown in Table 3.4.1.

Table 3.4.1: Overview of Highway 2 Collision Experience

Collision Code	Description	Percentage Of Total
61	Run-off-road and strike fixed object on left / median side	19.3
28	Rear-end, not including parked vehicles	18.9
94	Miscellaneous-strike animal	15.1
36	Side-swipe, the same direction	12.2
68	Run-off-road and strike fixed object - all other than left side	6.0
58	Run-off-road and overturn - all other than left side	5.5
93	Miscellaneous-strike non-fixed object on roadway	5.2
51	Run-off-road and overturn on left / median side	5.0
41	Run-off-road only on left / median side	3.0
71	Run-off road, strike fixed object and overturn on median side	1.2
31	Sideswipe cross through median	0.6
11	Head-on cross through median	0.2

** Approximately 29% of collisions involved median incidents.*

Exhibit 3.4.1 and Exhibit 3.4.2 shows collision frequency by year and severity for each Control Section (2010 to 2014.)

Exhibit 3.4.1: Collision Frequency by Year (Calgary to Edmonton)



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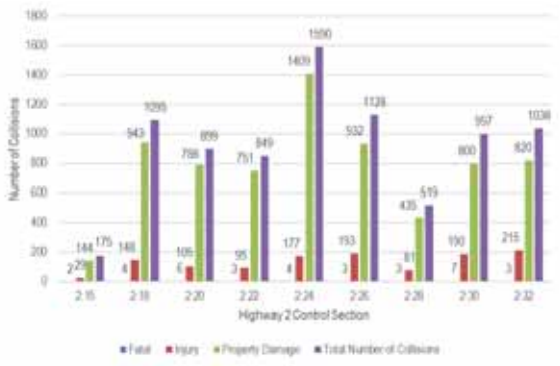
Exhibit 3.4.2: Collision Frequency by Severity (Calgary to Edmonton)



3.4.3 Collision Prone Locations

3.4.3.1 Highway 2 Collision Rates by KM

Based on the data provided by Alberta Transportation, the 5-year average collision rates, illustrated in number of collisions per 100 million vehicle kilometers (mvk) per year, were determined by individual kilometer in each control section to identify the high collision locations. This information is presented on the Exhibit 3.4.3. As a comparison, we have included the following for the 2010 – 2014 period:

- 5-year provincial collision rate average for divided highways, 59.04 collisions per 100mvk per year
- 5-year study average collision rate for the Highway 2 corridor, 50.4 collisions per 100mvk per year.

As indicated on the graph, some locations have significantly higher than average collision rates (rates over 100 collisions per 100mvk per year):

- Highway 27 interchange – Olds Access (183.2 collisions per 100 mvk)
- Gaetz Avenue / Highway 2A / Taylor Drive interchange area (169.2 collisions per 100 mvk, but under construction)
- 32 Street interchange area – Red Deer (127.6 collisions per 100 mvk)
- Highway 11 interchange area – Red Deer (121.0 collisions per 100 mvk)
- Highway 2A interchange area – Leduc (230.2 collisions per 100 mvk)
- Highway 39 / 50 Avenue interchange area – Leduc (159.6 collisions per 100 mvk)
- Highways 19 / 625 interchange area – Leduc (145.8 collisions per 100 mvk)

These locations should be considered for detailed safety reviews, as well as a priority for possible upgrading.

3.4.3.2 Interchange / Intersection Collision Rates by Million Entering Vehicles (MEV)

Another measure of collision rates are the interchange / intersection collision rates that are measured by the number of collisions per Million Entering Vehicles (MEV). This rate not only includes Highway 2 at the specific interchange / intersection location, but also the crossing road and interchange ramps. The higher collision frequency at interchange locations is largely attributed to the increasing traffic volumes and weaving maneuvers through the merge and diverge areas (traffic entering and exiting), despite acceptable geometric standards in some cases.

The intersection collision rates were also determined for period from 2010 to 2014. Table 3.4.2 summarizes the intersection / interchange collision rates, as well as an average number of collisions. Data is sorted by collision rate and average number of collisions per year from the highest to lowest for all intersections and interchanges in the study area.

Exhibit 3.4.3: Highway 2 – 5 Year Average Collision Rates

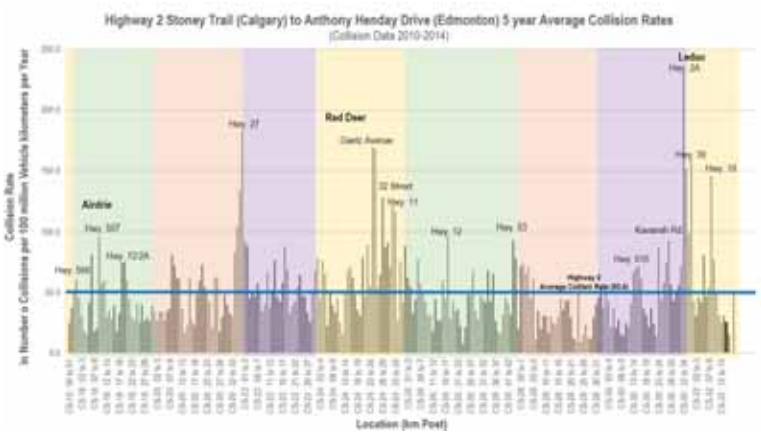


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Table 3.4.2: Highway 2 – Intersection / Interchange Collision Rates (2010-2014)

A) Sort by Highest Collision Rate		
Interchange	Average Collisions (# / year)	Collision Rate (MEV / year)
Hwy 27 - Olds	29.8	2.42
Highway 11A	35.8	2.00
50th Avenue Leduc	48.6	1.88
Highway 19	56.4	1.64
Highway 11	43.4	1.58
Hwy 12 Lacombe	20	1.52
Hwy 2A South Leduc	18.6	1.33
32nd Street (Red Deer)	22.6	1.13
Hwy 590 Innisfail	14	1.13
Hwy 587 - Bowden	13	1.12
Highway 597/Aspelund Road	17	1.11
Hwy 567 Airdrie	23.8	1.00
Hwy 42 - Penhold	13.2	1.00
Gatez Avenue Red Deer	13	0.97
Hwy 72 Crossfield	13.6	0.94
Hwy 2A - Taylor Dr.	17	0.91
Hwy 581 Carstairs	10	0.90
Hwy 53 Ponoka	9.2	0.86
McKenzie Road	11	0.83
Airport Road Interchange	24.2	0.79
Hwy 2A Morningside South	8.8	0.78
Hwy 582 Didsbury	8.8	0.77
Yankee Valley - Twnshp Rd 270	27.2	0.75
Hwy 490 - Glen Park Road	7.8	0.73
Hwy 13 - Wetaskiwin	7	0.67
Highway 616 - Millet	6.2	0.61
Hwy 54 Innsifail S	6.6	0.57
292 Acme Rd	6.8	0.55
Hwy 2A Morningside North	5.2	0.49
Hwy 611 - Maskwacis	3.8	0.39
Twnshp Rd 320 (Bergen Rd)	4	0.37
Hwy 604 Morningside	3.2	0.35
Hwy 424 - Matejka	2.8	0.31
50th Street On/Off Ramps	6.2	0.29
Twnshp Rd 322 (Amerada Rd)	3	0.29
Twnshp Rd 334 (Wimborne Rd)	2.4	0.23
Hwy 425 - Gee	2	0.22
Hwy 566 - Balzac Interchange	6.8	0.21
Twnshp Rd 362 (Old Pole Rd)	2.2	0.19
Correction Line TWP Rd 470	1.4	0.15
Twp. Rd 310 (Berghtal Rd)	1.4	0.13
Hwy 442 - Menaik	1.2	0.13
41 Avenue - City of Edmonton	3.2	0.09

B) Sort by Highest Average Collisions		
Interchange	Average Collisions (# / year)	Collision Rate (MEV / year)
Highway 19	56.4	1.64
50th Avenue Leduc	48.6	1.88
Highway 11	43.4	1.58
Highway 11A	35.8	2.00
Hwy 27 - Olds	29.8	2.42
Yankee Valley - Twnshp Rd 270	27.2	0.75
Airport Road Interchange	24.2	0.79
Hwy 567 Airdrie	23.8	1.00
32nd Street (Red Deer)	22.6	1.13
Hwy 12 Lacombe	20	1.52
Hwy 2A South Leduc	18.6	1.33
Highway 597/Aspelund Road	17	1.11
Hwy 2A - Taylor Dr.	17	0.91
Hwy 590 Innisfail	14	1.13
Hwy 72 Crossfield	13.6	0.94
Hwy 42 - Penhold	13.2	1.00
Hwy 587 - Bowden	13	1.12
Gatez Avenue Red Deer	13	0.97
McKenzie Road	11	0.83
Hwy 581 Carstairs	10	0.90
Hwy 53 Ponoka	9.2	0.86
Hwy 2A Morningside South	8.8	0.78
Hwy 582 Didsbury	8.8	0.77
Hwy 490 - Glen Park Road	7.8	0.73
Hwy 13 - Wetaskiwin	7	0.67
292 Acme Rd	6.8	0.55
Hwy 566 - Balzac Interchange	6.8	0.21
Hwy 54 Innsifail S	6.6	0.57
Highway 616 - Millet	6.2	0.61
50th Street On/Off Ramps	6.2	0.29
Hwy 2A Morningside North	5.2	0.49
Twnshp Rd 320 (Bergen Rd)	4	0.37
Hwy 611 - Maskwacis	3.8	0.39
Hwy 604 Morningside	3.2	0.35
41 Avenue - City of Edmonton	3.2	0.09
Twnshp Rd 322 (Amerada Rd)	3	0.29
Hwy 424 - Matejka	2.8	0.31
Twnshp Rd 334 (Wimborne Rd)	2.4	0.23
Twnshp Rd 362 (Old Pole Rd)	2.2	0.19
Hwy 425 - Gee	2	0.22
Correction Line TWP Rd 470	1.4	0.15
Twp. Rd 310 (Berghtal Rd)	1.4	0.13
Hwy 442 - Menaik	1.2	0.13

The intersection / interchange collision rates range from 0.09 to 2.42 collisions per MEV per year. There is no provincial MEV collision rate for intersections / interchanges. The highest intersection collision rates are similar to Highway 2's high collision rates along the corridor, since most of the collisions occur in the merge/diverge areas, and near structures at interchange locations.

When looking at the collision data, the challenge is identifying specific actions that can reasonably be undertaken to improve safety, given that the corridor as a whole requires significant upgrading within a 10 year horizon. Funding availability and construction programming decisions should be a significant factor in determining when a full safety review should be completed and whether any remedial action is taken separately or as part of a larger construction project.

Another challenge is that the data set used for this report is old. Although the data we have does show historical trends, which is typically relevant, the information is out of date in areas where improvements have been completed either during or after our collision data set date range. Examples of areas with dated information include Highway 27 at Olds, Gaetz Avenue at Red Deer, Highway 11A at Red Deer, and Highway 12 at Lacombe. All of which show high collision rates.

In general, as part of any road or bridge upgrade on Highway 2, a safety review should be a key component of any design assignment. The safety review can help inform the scope of work as well as engineering decisions through the design process. From the information we have today, the following comments address the 15 highest priority safety locations along the corridor, in order from south to north:

- ***Highway 567 at Airdrie:*** Conduct a safety review and identify improvements for immediate action as well as potential capital improvements that could be incorporated into the Highway 2 8-lane widening that is expected within 10 years.
- ***Highway 72 at Crossfield:*** The interchange was recently upgraded from a Parclo A to a simple Diamond configuration to accommodate six-laning. A safety review is not warranted at this time. The collision rate should be monitored to understand the impact that this change has had on collision experience.
- ***Highway 27 at Olds:*** Interim improvements were completed recently on the interchange, there is a design for a new interchange configuration that will be required to accommodate the 6 lane upgrade expected within 5 years. Given the expected construction timeline, monitoring should continue to confirm that the new configuration resulted in improvements to the collision rates. If construction is not advanced within 5 years, a safety review should be conducted immediately.
- ***Highway 587 at Bowden:*** A design for a new interchange at Highway 587 is complete and will be required to accommodate the 6 lane upgrade expected within 5 years. Given the expected construction timeline, monitoring should continue to confirm that the new configuration resulted in improvements to the collision rates. If construction is not advanced within 5 years, a safety review should be conducted immediately.
- ***Highway 590 at Innisfail:*** The existing configuration of Highway 590 will not accommodate the planned 6 lane widening expected within 5 years. Planning and design of the new structure should be initiated immediately, which should also include a safety review to inform the design team.
- ***McKenzie Road at Red Deer:*** Conduct a safety review and identify improvements for immediate action. No major capital improvements are expected in the short term, other than a potential for ramp intersection improvements. Major corridor or interchange upgrades at this location are likely beyond the 10 year horizon.
- ***Gaetz Avenue at Red Deer:*** This area has very high collision rates; however, the entire Gaetz Avenue / Highway 2A interchanges are currently under construction. Following construction, monitoring should continue to confirm that the new configuration resulted in improvements to the collision rates.

- *32nd Street at Red Deer:* Conduct a safety review and identify improvements for immediate action. No major capital improvements are expected in the short term, since corridor or interchange upgrades at this location are likely beyond the 10 year horizon.
- *Highway 11 at Red Deer:* Requires a structure replacement within 5 years in conjunction with the planned 6 lane upgrade. Given the interchange configuration is relatively new, but still experiences high collision rates, a safety review is recommended prior to design to identify root causes of the poor safety performance. This safety audit is expected to help inform the scope of work for the design assignment.
- *Highway 11A at Red Deer:* This location was recently upgraded from a clover leaf to a diamond configuration. Bridge upgrades to a spread diamond configuration are expected to be triggered by area development. Monitoring of collision data at this location should continue to identify if the high collision rates are still occurring with the diamond configuration. If collision rates for the diamond configuration remain high, a safety review should be undertaken to inform the scope of work for the future spread diamond design.
- *Highway 597 at Blackfalds:* Conduct a safety review and identify improvements for immediate action. No major capital improvements are expected, since corridor or interchange upgrades at this location are likely beyond the 10 year horizon.
- *Highway 12 at Lacombe:* This location was recently upgraded from a clover leaf to a diamond configuration. Monitoring of collision data at this location should continue to identify if the high collision rates are still occurring with the diamond configuration. If collision rates for the diamond configuration remain high, a safety review should be undertaken to inform the scope of work for the future spread diamond design.
- *Highway 2A at Leduc:* This interchange is planned to either be closed or converted to a fly-over structure that would provide EW access over Highway 2 which is expected to be upgraded to 6 lanes in less than 10 years. Given the planned closure or conversion, investing in safety improvements may not be the best use of resources at this location. A safety review should be completed with design assignment for the new Highway 2A interchange location immediately.
- *Highway 39 at Leduc:* This interchange is planned to be reconfigured and Highway 2 in the area is expected to be upgraded to 8 lanes in less than 10 years. Given the planned reconfiguration of the interchange and Highway 2, investing in significant safety infrastructure improvements may not be the best use of resources at this location. However, a safety review should still be completed. Along with the design assignment for the new interchange configuration. This safety review and design should be initiated immediately.
- *Highway 19 / 625 Interchange Area:* The bridge condition of this existing interchange indicated the need for replacement or major maintenance beyond the 10-year timeframe. Recent construction activity involved the development of a new 4th SB lane on Highway 2 approaching this interchange and the twinning of Highway 19 corridor to the west. There are currently no detailed design plans to address the interchange requirements. This location should be considered for a safety review assessment.

In summary, Table 3.4.3 lists specific actions that should be considered for the top 15 collision prone locations:

Table 3.4.3: Highway 2 Safety Review Summary for High Collision Locations

Location	Conduct safety review immediately	Conduct safety review with future design[1]	No safety review monitor collision rates
Highway 567 at Airdrie	✓		
Highway 72 at Crossfield			✓
Highway 27 at Olds			✓
Highway 587 at Bowden			✓
Highway 590 at Innisfail		✓	
McKenzie Road at Red Deer	✓		
Gaetz Avenue at Red Deer			✓
32nd Street at Red Deer	✓		
Highway 11 at Red Deer	✓		
Highway 11A at Red Deer			✓
Highway 597 at Blackfalds	✓		
Highway 12 at Lacombe			✓
Highway 2A at Leduc		✓	
Highway 39 at Leduc		✓	
Highway 19 / 625 at Leduc	✓		

[1] *Meaning, conduct the safety review as part of the design assessment. Good design practice should include a safety review, which would be expected for any future designs.*

3.4.4 Substandard Geometry and Safety Performance

A review of the horizontal and vertical data indicated numerous locations which have geometric parameters below the guidelines for a 130 km / h design speed. Basic geometric design parameters include:

- Minimum desirable radius for horizontal curves is 950m with a maximum super elevation of 6%.
- Minimum desirable k values for vertical curves are k=50 for crests and k=35 for sags.
- Maximum desirable grade is 3%.

As noted earlier, the summary the horizontal and vertical geometry is found in Appendix B with the areas that fall below the 3R / 4R guidelines highlighted in red. Approximately 60% of deficient horizontal and approximately 40 % of deficient vertical curves along corridor curves exhibit higher than average collision rates. Alberta Transportation recognizes two approaches to determine the design standards for a proposed improvement:

- New Construction: The geometric parameters should meet or exceed design speed guidelines.
- Reconstruction: The 3R / 4R design guidelines relaxes the geometric criteria, permitting up to a 20km / h reduction of the 85th percentile average running speed, assuming no safety concerns exist.

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For the Highway 2 corridor, geometric improvements could be accomplished during roadway widening or structure replacement, which should be guided by the safety and economics of the horizontal or vertical curve reconstruction. The issues to be considered include, collision history, traffic accommodation and safety, traffic disruption during construction, and costs.

Some locations with high collision rates are currently being addressed through active construction, such as the Highway 2A / Taylor Drive / Gaetz Avenue interchange at Red Deer, or through advanced planning and design, such as the Highway 2A / Highway 39 interchange area at Leduc.

3.4.5 Evaluation of Narrow Median with Cable Barrier

3.4.5.1 Background

One of the study objectives was to recommend widening strategy based on the appropriate median width.

In the two rural sections, existing Highway 2 was originally constructed with two distinct cross-sections:

- *South Section:* From north of Airdrie to south Red Deer, the cross-section uses a 22m wide centerline spacing, which results in a 14.6m median width, the distance between opposing directions of travel along the existing 4-lane cross-section. This substandard median width has required high-tension cable barrier (HTCB) along the median side to mitigate cross-median collisions.
- *North Section:* From north of Red Deer to south of Leduc, the cross-section uses a 30.5m wide centerline spacing, which results in a 23.1m wide median. HTCB has not been required along the median.

Along the south section, additional lanes could only be added by widening to the outside in both the six and eight lane stages, and still retain a rural cross-section. The original 91.4m wide right-of-way (300') needs to be widened to 100m (roughly an additional 5m each side) to ultimately accommodate a typical 8-lane rural cross-section.

Along the north section, there are two options to ultimately achieve an 8-lane cross-section:

1. An additional lane could be added to both the inside and outside of the existing two lanes, matching the cross-section, and 14.6m wide median, along the south section. The original 91.4m wide right-of-way would need to be widened to 100m, roughly an additional 5m each side. The substandard median width would require HTCB to mitigate cross-median collisions.
2. Both additional lanes could be added to the outside of the existing two lanes, retaining the existing 23.1m wide median. The original 91.4m wide right-of-way would need to be widened to 110m, roughly an additional 10m on each side. The standard median width would not normally require HTCB along the median side.

In total, the south section has 123km with the substandard median width and HTCB installed along the median; and the north section represents 137km of the corridor with a median width that has not warranted the HTCB.

3.4.5.2 Median Collision Cost Analysis

Safety analysis was completed to evaluate which widening option should be used for the north section, between Red Deer and Leduc, and provide the greatest overall benefit. Median collision costs were estimated to identify savings applicable to the narrow median with (and without) the barrier, as well as the narrow versus the wide median treatment. Table 3.4.4 shows estimates of the costs for the median type collisions.

Table 3.4.4: Median Type Collisions – Cost Estimate

Median Type - Collisions Cost Estimates

Collision Severity	Fatal Collision	Injury Collision	PDO Collision
Rural	$ 9,120,400	$ 66,700	$ 5,900

Note: Collision Costs provided by Alberta Transportation Traffic Safety Branch. The social cost values reflected in 2014 dollars.

Narrow Median - Highway Length	123.5 km
Wide Median - Highway Length	137.5 km

Highway 2 Calgary to Edmonton - Median Collisions Only Collision Types: 11,31,41,51,61,71 Included				
Time Period	2005-2009		2010-2014	
	Narrow Median	Wide Median	Narrow Median with Barrier	Wide Median No Barrier
Fatal Collisions	13	14	9	4
Injury Collisions	214	159	152	179
Property Damage	419	369	1583	485
Totals	646	542	1744	668
Collision Totals / Time Period	1188		2412	
Number of Collision per km over 5 years				
Fatal Collisions	0.105	0.102	0.073	0.029
Injury Collisions	1.733	1.156	1.231	1.302
Property Damage	3.393	2.684	12.818	3.527
Totals	5.231	3.942	14.121	4.858
Cost of Collisions / km / year				
Fatal Collisions	$ 192,008	$ 185,725	$ 132,929	$ 53,064
Injury Collisions	$ 23,115	$ 15,426	$ 16,418	$ 17,366
Property Damage	$ 4,003	$ 3,167	$ 15,125	$ 4,162
Totals (Rounded)	$ 219,100	$ 204,300	$ 164,500	$ 74,600
Analyses of collisions excluding year 2010 - installation of cable barrier in narrow median section. *Note: Year 2010 Collisions are not included for the narrow median section considering data may be distorted by the cable barrier installation, following driver's familiarization.*				
	All Median Collisions Types		Collision Types 11,31,61,71	
	Narrow Median 2011-2014	Wide Median 2010-2014	Narrow Median 2011-2014	Wide Median 2010-2014
Fatal Collisions	9	4	8	1
Injury Collisions	116	179	82	41
Property Damage	1373	485	295	196
	Number of Collision per km over time period		Number of Collision per km over time period	
Fatal Collisions	0.073	0.029	0.065	0.007
Injury Collisions	0.939	1.302	0.664	0.298
Property Damage	11.117	3.527	2.389	1.425
	12.130	4.858	3.117	1.731
	Cost of Collisions / km / year		Cost of Collisions / km / year	
Fatal Collisions	$ 166,161	$ 53,064	$ 147,699	$ 16,583
Injury Collisions	$ 15,662	$ 17,366	$ 11,072	$ 3,978
Property Damage	$ 16,398	$ 4,162	$ 3,523	$ 1,682
Totals (Rounded)	$ 198,200	$ 74,600	$ 162,300	$ 22,200

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Societal collision costs by severity (fatal, injury, PDO) used in the cost estimates was provided by Alberta Transportation Traffic Safety Branch (2014 dollars).

Collision records from 2005 to 2014 permitted analyzing 5 years before, and 5 years after, the installation of HTCB along the median side of the narrow median section, to determine the cable barrier's effect on collision experience. Collisions that occurred in the wide median section were analyzed during the same period.

All historical collision experience involving the median was extracted from the corridor collision records and included the following types:

- Collision Code 11: Head-on cross through median
- Collision Code 31: Sideswipe cross through median
- Collision Code 41: Run-off-road only on left / median side
- Collision Code 51: Run-off-road and overturn on left / median side
- Collision Code 61: Run-off-road and strike fixed object on left / median side
- Collision Code 71: Run-off-road and strike fixed object and overturn on left / median side

For the analysis, collision rates by severity, for the narrow and the wide median sections, were used to estimate collision costs per km per year.

The top half of Table 3.4.4 estimates the cost for all collisions involving left and median side records. The table shows that total collision costs were lower for the period from 2010 to 2014, than the period from 2005 to 2009, which indicates a positive trend.

However, although installation of the cable barrier in the narrow median section significantly reduced the number of fatalities and injuries, it did not eliminate these collisions. The property damage collisions increased substantially after the cable barrier was installed. The estimated average annual cost for all median collision types along the narrow median section is $198,000 / km / year, and $75,000 / km / year along the wide median, in 2014 dollars.

The lower portion of Table 3.4.4, shows a comparative analysis of only four types of median collisions:

- Collision Code 11: Head-on cross through median
- Collision Code 31: Sideswipe cross through median
- Collision Code 61: Run-off-road and strike fixed object on left / median side
- Collision Code 71: Run-off-road and strike fixed object and overturn on left / median side

These collision types were used to estimate future collision cost savings applied to the wide and narrow median sections, assuming that collision rates remain similar to recent historical trends.

Based on these four collision types, the estimated collision costs are:

- $162,000 / km / year for the narrow median with a cable barrier
- $22,000 / km / year for the wide median without a cable barrier

3.4.5.3 Comparative Cost Analysis

With the information above, we completed a cost analysis of the widening options (to the inside with cable barrier or to the outside). The results are illustrated in Table 3.4.5.

Table 3.4.5: Median Type Comparison Cost Analysis

Median Type - Collisions Cost Estimates

Based on the Calculations:

Considering All Median Collisions

Potential Cost of Collisions in case of widening to outside	**$ 10,258,000 /year**
Potential Cost of Collisions in case of widening to inside	$ 27,253,000 /year
Potential Collision Cost Saving	**$ 16,995,000 /year**

Considering Median Collision Types: Head-on and Sideswipe Through Median and Run-off-Road Striking Object (Barrier or Other) Only

Potential Cost of Collisions in case of widening to outside	**$ 3,053,000 /year**
Potential Cost of Collisions in case of widening to inside	$ 22,316,000 /year
Potential Collision Cost Saving in 2014 Dollars	**$ 19,263,000 /year**
Potential Collision Cost Saving in 2016 Dollars	**$ 19,496,000 /year**

Note: Inflation rates to recalculate costs for relevant years are based on Statistics Canada Calculator, released in February 2017 for Alberta

Cable Barrier Installation (123.5km)

Contract Costs	$	7,500,000	
Engineering Cost	$	1,000,000	
Total (2009 Dollars)	$	8,500,000	
Total in 2016 $	**$**	**9,365,000**	**$ 76,000 /km**

Yearly Maintenance Cost (Assumed) $ 5,000 /km/year

		One Time Cost	Over 20 Years @4% - Discounted Value
Cost of Cable Barrier Maintenance (137.5km)	**$ 687,500 /year**		**$9,717,000**
Cost for the 137.5km Installation (rounded)		**$10,500,000**	
Potential Collision Cost Savings over 20 years			**$266,307,700**
Additional Costs of Structures (Estimate: 10 structures, 7.4 to 9m longer @ $5,000/m^2)		**$8,000,000**	
Cost of Right-of-Way Acquisition (~400 acres @ $10,000/acre)		**$4,000,000**	

In 2016 dollars (rounded)

Potential Cost Savings for Retaining the Wide Median: - Potential Collision Saving Costs over 20 years ($266.3M) - Cable Barrier Installation ($10.5M) and Maintenance ($9.7M) - necessary with a narrow median	**$286,500,000**
Additional Costs for Retaining the Wide Median: - Cost of Right-of-Way Acquisition - Additional Costs of Longer Structures	**$12,000,000**

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The collision cost savings to retain the wide median is estimated at $17.0M / year for all median collision types and $19.3M / year for collisions involving median objects or median crossings. The final collision cost estimate was adjusted to represent year 2016 dollars.

Over the 20-year period, potential collision cost savings by not widening to the inside, including the costs to install and maintain cable barrier, are estimated at approximately $287M expressed as present value. The total cost of right-of-way acquisition to accommodate widening to the outside and retaining a wide median is estimated at $4M, not including right-of-way requirements at interchanges, which is not likely to be significant.

In addition to the above, it should be noted that narrowing the median increases the probability of errant vehicles striking and damaging the supports of bridge structures located in the median, which may result in additional costs not reflected here.

It is not anticipated that cable barrier will be installed within the wide median section north of Red Deer unless the collision experience begins to indicate that increasing traffic volumes are leading to cross-over collisions.

In addition to collision and cost outcomes which justify retaining the wide median, other benefits include:

- Lower head-light glare improving visibility at night.
- Lower driver work-load and distraction improving driver comfort and comprehension of the roadway conditions.
- Flatter slideslopes in the median.
- More snow storage and less snow drifting from one embankment to the other.
- More independent gradeline design.
- Easier drainage design.
- More crash friendly median crossover locations with flat approach slopes.
- A wider median with flatter slopes may also give future designers choice on barrier placement (edge of pavement vs. centre of median).

This analysis was not intended to be a detailed economic or statistical analysis. Rather, it was intended to determine "order-of-magnitude" benefits of retaining a wide median during future upgrade of Highway 2 between Red Deer and Leduc based on site specific historical data.

These results were subjected to a peer review by Dr. John Morrall, P.Eng., Highway Safety Specialist, and reflects the review comments provided.

3.4.5.4 Conclusion & Recommendation

The above analysis clearly illustrates the significant benefits, including both improved safety and cost savings, of retaining the wide median for the north section of the Highway 2 corridor between Red Deer and Leduc. Increasing traffic volumes may one day warrant a median barrier; however, a wider median has flatter road slopes which will allow flexibility for a future cable barrier to be installed in the middle of the median. Installation in the middle of the median with acceptable approach slopes may reduce the nuisance barrier strikes, reducing the road user costs of the barrier, while at the same time significantly reducing the occurrences of a vehicle crossing the median and causing a head-on collision. As

experience is gained with cable barrier, further study is expected to determine the best location for cable barrier in a wide median with forgiving side slopes.

For this reason, we recommend the 23m wide median be retained along the north section; and that protecting and acquiring the associated right-of-way needed to support widening to the outside be considered a priority by Alberta Transportation.

3.5 Right-of-Way Review & Cross Section Elements

3.5.1 Basic Cross Section

When Highway 2 was originally constructed to a 4-lane cross section north of Red Deer, a 30.5m (100') centerline spacing was utilized assuming a 91.5m (300') right-of-way would accommodate future widening to the outside at the 6-lane stage and, if required, additional widening to the inside for an ultimate 8 lanes.

When the second stage of Highway 2 twinning began south of Red Deer, the decision was made to reduce centerline spacing to 22.0m, but maintain a 91.5m (300') right-of-way. At that time a 6-lane configuration was considered the long-term cross-section, with future widening to occur to the outside, if required.

With the traffic growth on the corridor, it is now apparent that an 8-lane cross section will be required for the corridor. With the current standards and a modern clear zone design philosophy, the original 91.5m (300') basic right-of-way is no longer adequate. Exhibits 3.5.1 and 3.5.2 illustrate the new design cross sections.

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Exhibit 3.5.1: Typical Cross Section South of Red Deer

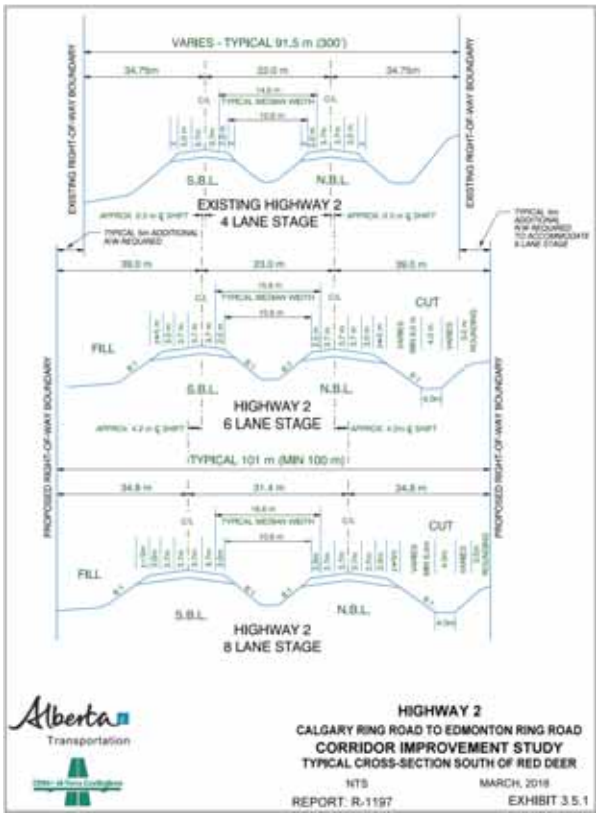
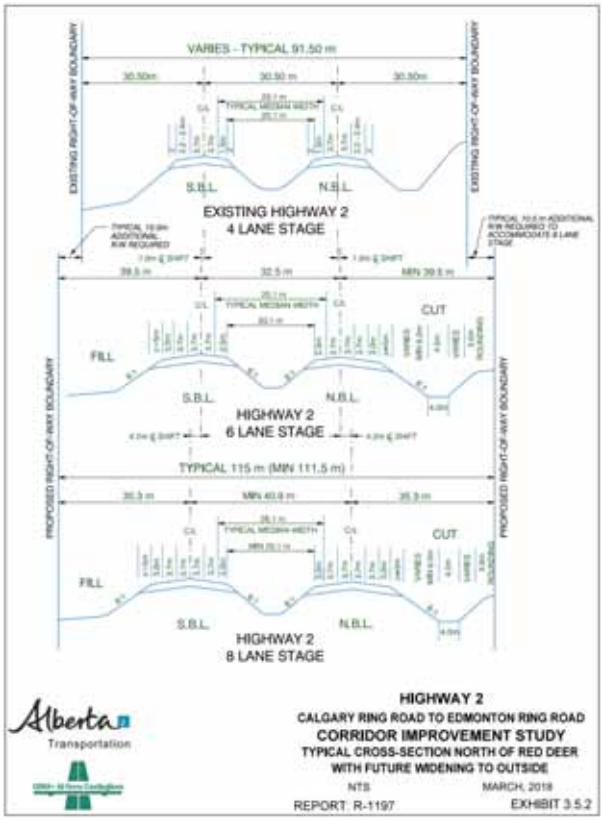


Exhibit 3.5.2: Typical Cross Section North of Red Deer



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Additional right of way required to accommodate the expansion of Highway 2 is illustrated in Highway 2 Right-of-Way Requirements Summary Table which is found in Appendix O. The summary illustrates the additional right-of-way width and area required for the east and west sides of Highway 2. Additional site-specific notes listing constraints based on existing conditions are also included. The follow highlights the right-of-way requirements:

- An additional 5.0m is required on both sides of Highway 2 to maintain the existing 10.6m shoulder to shoulder width south of Red Deer.
- An additional 10.0m is required on both sides of Highway 2 to maintain the existing 20.1m shoulder to shoulder width north of Red Deer.
- Where frontage service road is existing or will be required in the future, an additional 30m right-of-way should be protected.
- Right-of-way requirements at interchanges vary and follow site specific requirements related to terrain and interchange configuration. Where long term plans are not available, right-of way will need to be determined through future planning studies.

3.5.2 Property Impact Mitigation Options

In areas where the cross section is constrained, and property is not available for right-of-way expansion, innovative alternatives should be explored. These alternatives will be unique in each circumstance, but may include:

- Unconventional drainage such as shared ditches with municipalities or underground piping for water.
- Retaining walls to reduce the highway footprint. These should be placed well outside the upper range of the clear zone requirements to reduce collision risk and avoid the need for roadside protection.
- Design exceptions to reduce cross sectional requirement where safety will not be compromised.

3.5.3 Development Setbacks

It is Alberta Transportation's practice is to adopt a minimum development setback to allow for the ultimate 8-lane highway cross section or future interchange configuration. This means planning studies should be undertaken where none exist to ensure enough land is adequately protected. Access to future developments must also be considered.

3.6 Land Use Plans

To assess impacts of future development on the Highway 2 corridor, land use plans were collected from each municipality along the corridor to review potential impact from traffic generated by proposed development. Our objective in reviewing the land use plans was to understand the long term implications and cumulative effects for the corridor as a whole. Land use plans (found in section 4) illustrate the future development visions of each local municipality along the corridor.

3.7 Bridge Structures

There are 96 existing bridge sites located along the Highway 2 corridor between Calgary and Edmonton. These consist of 51 interchange and grade separation locations and 45 stream and river crossings. Many of these bridge sites involve structures that were installed 50 or more years ago during the original implementation of the highway corridor. In addition, there are many new interchanges and / or grade separations that are proposed in the future where no bridges currently exist.

The 51-existing interchange and grade separation locations involve 64 separate bridge structures, with about half of these structures (34) constructed over 50 years ago in the 1960's. These older structures are of advanced age and are getting near to the end of their economic life as they were originally designed for a 50-year structure life. In addition, the original highway design criteria were based on a 4-lane roadway and many of these older bridges cannot be modified to accommodate additional lanes along Highway 2. Another 13 structures are less than 20 years old and are either replacements for previous old bridge structures or are new crossings of the highway. These newer structures have been designed with the flexibility to accommodate additional lanes being added to Highway 2. The balance of the structures fall between these two age categories and may or may not have flexibility for additional Highway 2 lanes.

The structural condition of the interchange and grade separation bridges is highly correlated with the age of each bridge. Of the 51 interchange and grade separation sites it is anticipated that 21 sites (involving 30 older structures) will require replacement or major maintenance within the next 10 years regardless of whether additional lanes are added to the highway or not. Numerous other bridge sites will require replacement when additional lanes are added to Highway 2 as they are not compatible with a wider highway.

The 45 stream and river crossings are mostly smaller culvert structures crossing smaller streams, however there are a few larger bridges. The largest river crossing is the Red Deer River crossing at Red Deer. Larger bridges are also found crossing the Blindman River and the Battle River between Red Deer and Edmonton. Almost all of these stream and river crossings were built over 50 years ago in the 1950's and 1960's with the exception of a few replacements and / or reconstructions such as Wolf Creek near Ponoka and Waskasoo Creek at Red Deer.

Many of the stream and river crossings use culverts and these culverts generally have remaining life or can be maintained (or replaced) at a reasonable cost; however, the major bridge structures from the original construction have an advanced age and are nearing the end of their economic lives. It is anticipated that the bridges over the Red Deer River, Blindman River, Battle River and the northbound bridge over Blackmud Creek will require replacement within the next 10 years. It is also anticipated that the culvert crossings will need to be replaced or lengthened at the time that additional lanes are added to Highway 2.

Three-time horizons were used to identify potential timelines for improvements:

- Improvements required within 10 years. These include structure replacement or modification to accommodate a wider roadway cross section. Most of these bridge sites are not currently identified on the 3 year or 5 year funding programs. While some structure changes may have been identified as part of a roadway functional planning assignment, most have not had planning or design efforts put forth towards the eventual bridge work required.
- Improvements required beyond 10 years. These structures are not anticipated to require any immediate major action. Detailed planning, design and funding commitments will be required matching the anticipated need.
- Improvements required beyond 25 years. These structures are usually newer structures, although any structure with an extended life span that are not significantly affected by roadway widening are also included.

The Existing Bridge Inventory and Assessments are included in separate report found in Appendix F. The estimated costs of bridge replacements are included in the implementation section of this report.

3.8 Utilities

Owners of the utility infrastructure were contacted to enquire of future plans regarding the crossings for which there was minimal response. At the time of Highway 2 widening, the impacts to the pipelines would need to be reviewed and assessed in detail.

3.8.1 Background

A typical issue and risk factor to be addressed in the development of any major linear infrastructure development, including highways, is the management of utility conflicts. In the case of the Highway 2 corridor, there is extensive existing utility infrastructure crossing and running parallel to the roadway. Examples of existing infrastructure in place include the following.

Underground Infrastructure:

- Oil and oil products transmission pipelines
- Natural gas distribution and transmission pipelines
- Municipal utilities (i.e. potable water, sanitary sewer and storm sewers)
- Distribution level power transmission lines (i.e. less than 72 kV operating voltage)
- Telecommunications cables (i.e. twisted pair copper and fiber optic cables)

Above-ground Infrastructure:

- Distribution level power transmission lines (i.e. less than 72 kV operating voltage)
- Transmission level power transmission lines (i.e. greater than 72 kV operating voltage)
- Telecommunications cables (i.e. twisted pair copper and fiber optic cables)

In the development of a typical roadway Functional Planning Study, utility conflicts are considered as an integral part of selection of a preferred alternative. The intent of utility coordination at this stage of design is to help mitigate impacts through reducing the number of utility conflicts and adapting the design to confirm with existing infrastructure. It is recognized that any roadway infrastructure development will have an impact to existing utility infrastructure to some degree.

Along the Highway 2 corridor, there are numerous conflicts with existing utility infrastructure that must be mitigated as part of the preliminary and detailed design process of future roadway improvements. The majority of these conflicts involve overhead and underground distribution level power, natural gas distribution pipelines and telecommunications cables, the management of which can be accomplished through existing Alberta Transportation practices and procedures.

A smaller amount of impacts will occur to larger infrastructure, including oil, oil product, and natural gas transmission pipelines, overhead power transmission lines and municipal utilities. Impacts to these utility infrastructure components are typically associated with greater cost and schedule risks, however Alberta Transportation has practices and procedures in place to mitigate these impacts through preliminary detailed design as well.

An inventory of pipeline utility crossing is shown in Appendix G. Information includes pertinent information regarding location, license details, size and material of the pipe, substance carried and pressure, current owner and status (Operating, Abandoned, and Decommissioned) for all known existing high and low pressure natural gas, oil and other related pipelines crossing the Highway 2 corridor.

As the purview of the Highway 2 Corridor Management Study is to consider future upgrades to the roadway, it is understood that the mitigation of existing utility conflicts is not a key consideration. With respect to utilities, the primary focus in this study will be the accommodation of future utilities along and crossing the corridor.

3.8.2 Future Utility Infrastructure Accommodation

One consideration for the Highway 2 Corridor Improvement Study is to gauge the level of interest within the utility industry for the development of a Transportation Utility Corridor (TUC) along the route. The TUC would take a form similar to those found around the Cities of Calgary and Edmonton carrying Stony Trail and Anthony Henday Drive, respectively.

The development of a TUC provides several advantages, including:

- Defining a set alignment for utility infrastructure, thereby removing the need for each individual infrastructure owner to acquire right-of-way for their own use;
- Providing certainty to utility infrastructure owners, adjacent landowners and other interested stakeholders in the construction of future utility infrastructure;
- Guide land use decisions on areas adjacent to a major transportation corridor, and;
- Reduced overall cost of utility infrastructure upgrades through efficiencies in right-of-way acquisition.

To determine if the development of a TUC is a viable alternative along the Highway 2 corridor, consultation was undertaken with identified key industry players to determine the interest in developing such a facility. The following sections provide details upon the industry organizations contacted and the responses provided.

3.8.3 Utility Consultations

As part of the Study, key utility infrastructure owners with an identified potential interest in development of a TUC along the Highway 2 corridor were contacted to gather information on future infrastructure plans and to garner their degree of interest in a TUC. Pertinent regulatory authorities and industry groups were also contacted in order to gain feedback from a higher level in the industry.

Table 3.8.1 provides a list of all organizations contacted as part of the study, along with their roles and / or interests with respect to the Highway 2 corridor.

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Table 3.8.1: Utility Infrastructure Owners, Regulators and Industry Groups

Organization	Role / Interest
Alberta Utilities Commission Alberta Electric System Operator	Regulatory Authority
Canadian Energy Pipeline Association Canadian Association of Petroleum Producers Federation of Alberta Gas Co-Ops	Industry Interest Groups
ATCO Pipeline Cenovus Energy Enbridge Gibsons Energy Keyera Energy Kinder Morgan Husky Energy InterPipeline Pembina Pipelines Plains Midstream Suncor Energy TransCanada Pipelines	Oil, Oil Products and / or Natural Gas Transmission Pipeline Owner
ATCO Gas AltaGas	Natural Gas Distribution Pipeline Owner
ATCO Electric EPCOR Enmax	Distribution and / or Power Transmission Infrastructure Owner
Axia NetMedia Bell Canada Shaw Communication TELUS	Telecommunications Infrastructure Owners

Letters addressed to each of the organizations identified above were sent by the project team in September and December 2016 to provide notification of the project and to offer a face - face meeting with project team representatives if interested. Generic copies of these letters are included in Appendix G. Of the twenty-six organizations, face - face meetings were held with six organizations and a further four written responses were provided to the project team.

3.8.4 Industry Engagement Feedback

The following sections summarize the feedback provided by the key industry groups noted in Table 3.8.1 above. It should be noted that no response was provided from either the Regulatory Authority, Industry Interest Groups or Natural Gas Distribution Pipeline Owners contacted as part of the engagement activities undertaken in concert with this study.

3.8.4.1 Oil, Oil Products and Natural Gas Transmission Pipelines

In discussions with this group of industry players, there was overall little interest in the development of a TUC to accommodate oil, oil product and natural gas transmission pipelines paralleling the Highway 2 corridor.

One issue with a TUC that was identified by industry groups is that the majority of the Province's oil and natural gas processing infrastructure is located within the Edmonton region. Development of similar infrastructure in the Calgary region is not viable due to a lack of synergy with existing infrastructure, land use considerations and a lack of market access.

It was noted that if a TUC extended to an export market area, such as the British Columbia, Saskatchewan or United States borders, then interest by this industry group would increase. Consideration of the extension of a TUC beyond the study limits is, however, beyond the scope of this report.

ATCO Pipelines, one of the industry organizations contacted as part of this study, noted that they own natural gas transmission infrastructure running parallel to the Highway 2 corridor for the majority of the study area supplying communities along the route. Within the section between Carstairs and Calgary, ATCO Pipelines was noted as having interest in the development of a TUC to accommodate a replacement of existing infrastructure. Since preliminary design has not commenced on this proposed project, ATCO Pipelines did not have certainty as to if a TUC would be utilized or if their existing pipeline right-of-way would be utilized.

3.8.4.2 Transmission Power Lines

Over the past 5 to 10 years, Alberta's power transmission grid has undergone significant enhancement. Several new power transmission lines between the Calgary and Edmonton areas have been constructed following two paths, one located west of Highway 2 roughly paralleling Highway 22 and a second located east of Highway 2 roughly paralleling Highway 36 and 21. These improvements are expected to meet the demands places on the provincial power grid for the next 25 years or more.

In discussions with industry representatives, it was noted that any future power transmission upgrades would be constructed parallel to existing lines to make use of substations and other connection points. As these corridors have been already established, the likelihood of developing new transmission infrastructure along the Highway 2 corridor is considered low. On this basis, development a TUC concept to accommodate transmission power lines was not considered to be viable.

3.8.4.3 Telecommunications Infrastructure

Of the utility infrastructure owners contacted as part of this study, those operating telecommunication infrastructure within the Highway 2 corridor expressed the most interest regarding development of a TUC.

In terms of existing infrastructure, Shaw Communications (Shaw) and TELUS both own fiber optic duct banks running the full length of the study area, which will be directly impacted by future roadway upgrades. Bell Canada leases a portion of Shaw's fiber optic duct bank and would impacted to a similar degree as to both Shaw and TELUS in terms of roadway upgrades. Lastly, TELUS also owns extensive twisted pair copper telephone line infrastructure running the entire length of the Highway 2 corridor.

Existing utility master agreements with Alberta Transportation dictate that Shaw and TELUS must relocate their infrastructure if required for roadway improvements at no cost. In recent years, both Shaw and TELUS have invested significant monies as a result of upgrades to the Highway 2 corridor at the 41 Avenue SW interchange in Edmonton, the Gaetz Avenue interchange near Red Deer and six lane upgrading between Airdrie and Carstairs. Shaw and TELUS have also invested in capacity upgrades to their fiber optic infrastructure in support of increasing internet traffic demands.

While both Shaw and TELUS recognize the cost apportionment terms of their master agreements with Alberta Transportation, both entities wish to minimize the costs incurred by their firms as a result of roadway upgrades.

Concern raised by both Shaw and TELUS is in regards the timing of line moves with respect to infrastructure upgrades and establishment of a defined corridor where fiber optic duct banks can be installed without requiring relocation in conjunction with future roadway upgrades.

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The latter point above alludes to the desire for a TUC to be established for telecom infrastructure. Indeed, both Shaw and TELUS have expressed the desire for the establishment of a TUC along the Highway 2 corridor. The main desire behind the establishment of a TUC is not for future infrastructure growth, but rather to avoid future infrastructure relocations.

The right-of-way requirements to accommodate this infrastructure is minimal compared to other types of utility infrastructure. Since this infrastructure can be safely accommodated within road right-of-way way, establishment of a telecommunications infrastructure only TUC is not considered to be feasible.

3.8.4.4 Distribution Power Infrastructure

One distribution power line infrastructure owner, Enmax, did note future plans for installation of distribution power infrastructure, potentially within road right-of-way, in support of future residential and commercial growth adjacent to the Highway 2 corridor immediately north of the Highway 2 / Stony Trail interchange. At the time of writing, growth in this area may not occur for 15 to 20 years and, as such, actual infrastructure requirements have yet to be determined.

This future infrastructure would likely consist of buried power cables which could safely be accommodated within road right-of-way under the terms of existing master agreements with Alberta Transportation. Considering the relatively small land requirements for this type of infrastructure and the lack of planning for future growth in this area, Enmax did not support establishment of a TUC within this area.

3.8.5 Conclusions

Based upon feedback received through consultations, it is recommended that a TUC not be established along the Highway 2 corridor due to a lack of industry support. While two key telecommunication infrastructure owners (Shaw and TELUS) have expressed interest in the establishment of a TUC, their existing infrastructure can be safely accommodated within the highway right-of-way limits. To help address concerns raised about infrastructure impacts, it is recommended that ongoing engagement be undertaken by Alberta Transportation to make telecommunication infrastructure owners aware of proposed roadway improvements and allow for these entities to undertake proactive planning with respect to infrastructure relocations and upgrades.

3.9 Railways Crossings

Highway 2 corridor is crossed several times by Canadian National (CNR) and Canadian Pacific (CPR) Railways and these include:

- Crossing at existing Calgary city boundary – CPR (culvert underpass)
- South of Highway 11 – CPR (CIP Box culvert underpass)
- North of Highway 11A – CNR (3 span major bridges) – current bridge replacement project
- North of Highway 597 – CPR (3 span major bridges)
- North of Highway 2 Leduc – Black Gold Drive and CPR (4 span major bridges)

CP Rail was not prepared to provide specific details, apparently to protect the safety and security of their trains, and would not speculate on their future plans. They provided the following average estimated frequency:

- South of Balzac to North of Red Deer – approximately 14 to 19 per day
- Leduc – approximately 9 to 14 per day

Their trains operate around the clock, 7 days a week. Trains can be up to 125 cars in length with 1 to 3 engines. CP reserved the right to use their full right-of-way where highway improvements are being considered. If CP has information to share publicly, they will post on their website at www.cpr.ca.

3.10 Existing Ancillary Roadside Facilities

3.10.1 Safety Rest Areas

There are seven existing safety rest areas along the Highway 2 corridor:

- Dickson-Stevenson Stopping House (southbound) – South of Highway 72 interchange. Ramp modifications are required to accommodate 6-lane widening. Future access relocation to accommodate Highway 72 / 2A Interchange reconfiguration.
- Commercial Development (northbound) – Crossfield. Currently in a 6-lane section and is designated for removal at the 8-lane stage.
- Bowden Safety Rest Area (southbound / northbound) – Town of Bowden.
- Commercial Development (northbound) – North of Bowden. Ramp modifications required at 6 lane stage.
- Alberta Sports Hall of Fame Museum (northbound) – Red Deer. Access / ramps will need reconstruction to accommodate highway widening with possible impact on museum's parking. Other option includes access relocation via 32nd Street. Ramps are currently used by trucks for parking.
- Wolf Creek SRA (southbound) – South of Milton Road – future expansion to provide additional parking at the site.
- Safety Rest Area (northbound) - South of Highway 13 at Louis Bull First Nation – Access modification in conjunction with proposed development adjacent to existing site.

The existing safety rest areas provide an important safety feature for Highway 2; however, they will need upgrading or replacement at the time Highway 2 is upgraded to a 6 lane facility. Previous work addressing safety rest area requirements along the corridor include the Pomen's Group Report (2005) as well as Safety Rest Area, Highway 2 Corridor Addendum, Al-Terra (2007). A new study is current underway to assess the viability of commercial safety rest areas along the corridor, but this work is ongoing so its impact on the previously identified future safety rest areas is unknown.

3.10.2 Roadside Turnouts

One unique location that deserves attention is the extra wide shoulder on the southbound lanes of Highway 2 north of the Highway 2 / Highway 39 (50th Avenue) that is used as a staging area of trucks. This facility is approximately 200m in length and is configured as a paved surface which extends 9m beyond the shoulder of the freeway lanes. The extra-wide surface continues to taper to a 3m wide shoulder approximately 400m from the start of 9m section.

The existing 11 roadside turnouts, listed in Table 3.10.1, do not meet current standards and should be replaced with new facilities on or before this 6-lane stage to address driver needs on a freeway facility. The new facilities could be either new Safety Rest Areas or new Commercial Safety Rest Areas having appropriate ramp and parking geometry. A separate study is currently underway to address each potential commercial viability of rest areas along the corridor and how they may be integrated with traditional facilities.

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Table 3.10.1 Roadside Turnouts

Site Count	Highway 2 Section	Northbound (Approx. km)	Southbound (Approx. km)	Notes
1	2:20		24.2	North of Highway 582
2	2:22	7.6		North of Highway 27
3	2:24	4.2		North of Innisfail
4	2:24		4.3	Historic Site: Anthony Henday meets Archithinue
5	2:26		1.8	North of Highway 11A: Welcome to Red Deer Sign
6	2:26	37.2		North of Highway 604
7	2:28	5.3		North of Highway 53
8	2:28		13.8	North of Matejka Road (Twp. Rd. 442)
9	2:30		10	North of Correction Line Int'c
10	2:30	19.2		North of Highway 616
11	2:32		1.3	Wide Shoulder, North of Highway 39 Interchange

3.10.3 Vehicle Inspection Stations

Existing two Vehicle Inspection Station (VIS) are:

- Balzac VIS – Northbound, north of Highway 566
- Leduc VIS – Southbound, south of Highway 2A interchange

Both VIS locations will require additional planning as they will be relocated to provide adequate separation from proposed future interchanges.

A permanent Vehicle Inspection Station exists to the west of the southbound Highway 2 lanes approximately 2.4km south of the existing Highway 2A interchange site. These facilities include "weigh-in-motion" technology that was originally installed as a pilot project in 2012 on the southbound Highway 2 lanes in advance of the VIS sites. The technology serves as an automated electronic screening system to assist commercial enforcement officers in selecting commercial vehicles for inspection.

3.10.4 Active Transportation Modes Crossing

Based on Alberta Transportation policy for trails in highway rights-of way, trail crossings for freeways will require grade separated crossings and where feasible, consideration should be given to incorporate a proposed crossing with an existing interchange.[15]

Trails should not be permitted at system interchanges or across high speed ramps due to safety concerns.

Existing trail crossings within the study corridor include:

- Airdrie: Yankee Valley Boulevard interchange, north side under Highway 2. Includes pedestrian actuated warning flashers on the westbound to southbound and westbound to northbound ramps.
- Airdrie: Grade separated crossing 1.4km north of Yankee Valley Boulevard.
- Airdrie: Highway 567 / Veterans Boulevard interchange, south side over Highway 2. Includes pedestrian actuated warning flashers on the northbound to east bound ramp and pedestrian activated signals at the west signalized ramp intersection.
- Leduc: Black Gold Drive, south side under Highway 2 (Trans Canada Trail).
- Leduc: Highway 39 interchange, south side under Highway 2. Includes pedestrian actuated signals at the east and west signalized ramp intersections.
- Edmonton: Ellerslie Road interchange, south side over Highway 2. Crosses the east and west signalized ramp intersections, with pedestrian actuation on the west ramp intersection only.

Potential future active transportation mode crossings within the corridor, aside from the local road crossings in urban areas, include a location between Highways 11 and 11A at Red Deer as well as a new Highway 2 crossing adjacent to the Red Deer River. These locations should be evaluated based on Alberta Transportation's Trails in Highway Rights-of-Way Policy.

3.11 Existing On-going Projects

Existing on-going planning, design and construction projects include:

- Township Road 264 Interchange Functional Planning Study – Draft report completed 2017
- Township Road 265 Interchange (40th Avenue) – Preliminary design complete, led by the City of Airdrie
- Highway 2, 2A and 72 (Diamond Interchange Upgrade) – Completed 2018
- Highway 567 (Airdrie) to North of Highway 2A (Crossfield) – 6-laning completed 2018
- Highway 2 Interchange upgrades at Gaetz Avenue / Taylor Drive – Completed 2018
- Highway 2 and 53 Intersection improvements – Completed 2017
- 65 Avenue Interchange in Leduc – Design underway funded by Alberta Transportation, City of Leduc and EIA
- Various repaving projects within study area scheduled for the 2018 to 2020 construction seasons.

[15] Alberta Transportation. (2015). *Trails in Alberta Highway Rights-of-Way – Policies, Guidelines, and Standards*. Edmonton, AB

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4.0 Transportation Planning

4.1 Long Term Transportation Network

36 plans at 1:20,000 scale were prepared for the corridor. These are included in Appendix H as drawings R-1197-PL-01 through R-1197-PL-36.

The plans illustrate information regarding Highway 2 existing and future lane requirements, existing and future interchange configurations, deficient horizontal and vertical alignment locations, auxiliary services, major utility crossings, right-of-way requirements and any other relevant data.

The plans include anticipated widening time horizon and indicate structures which may be affected by the widening or would need to be replaced based on the structure's life expectancy.

4.2 Calgary – Crossfield

The Calgary-Crossfield section of the study corridor extends a distance of 35 km, from the north side of Stoney Trail in Calgary to just north of Township Road 292 (Rocky View County's north boundary).

Significant recent infrastructure improvements in the area include Stoney Trail; the Highway 567 Interchange; Yankee Valley Blvd interchange; 6-laning Highway 2 north of Airdrie; and the CrossIron Drive partial interchange. Recent planning efforts include the Highway 566 (Balzac) interchange, the Township Road 265 (40 Avenue) partial diamond interchange and the Township Road 264 interchange.

The study area is growing at about 7% per year and approved ASPs between Yankee Valley Blvd and Township Road 264 could potentially accommodate another 40,000 residents. Over the last several years, daily traffic volumes on the Highway 2 corridor within the vicinity of Township Road 265 have grown by 40 percent. Growth in south Airdrie is served by the already congested Yankee Valley Blvd Interchange with a now 2-lane northbound exit ramp; leading to requests that Alberta Transportation consider an interim Highway 2 southbound on-ramp, in advance of a Township Road 265 (40 Avenue) interchange. Current planning contemplates a 10-lane cross-section south of Yankee Valley Boulevard.

4.2.1.1 Corridor Constraints

In addition to the specific property constraints that were outlined in Appendix O, there are some key constraints that will have a significant impact on the improvements to the corridor:

- The existing developments in the urbanized area of Airdrie precludes widening beyond eight lanes. If the corridor requires additional capacity beyond eight lanes, a bypass or other traffic management options will need to be explored.
- Nose Creek and its tributaries flow along and traverse the Highway 2 corridor south of Airdrie, where the creek continues to meander its way southward along the Highway 2 corridor into Calgary and to the Bow River.
- Between Airdrie and Calgary, the west side is constrained by a CP Rail corridor. Although this rail line is not directly adjacent to Highway 2, it is located as close as 200m from the right-of-way and will likely require future grade separation as part of future interchange construction.
- Future transit linkages within the Calgary metropolitan region as well as the potential for an ultimate high-speed rail line between Calgary and Edmonton.

4.2.2 Land Use (Study Sub-Area)

The study sub-area extends from Centre Street / Range Road 13 on the west to a potential Airdrie Bypass on the east, and from Stoney Trail on the south to Crossfield on the north. Centre Street and the future Airdrie Bypass are the east and west limits representing the expected geographic extent of north-south routes with potential to divert flows off of Highway 2.

To develop the land use forecast, available planning documents, historical growth and development patterns, and growth forecasts for each of the jurisdictions in the model sub-area were reviewed. It is assumed that ultimately there will be urban land use densities through Rocky View County lands between Calgary and Airdrie (particularly west of Highway 2). Since 2001 this area has experienced a growth rate of 7.8%. Growing from 56,000 people in 2001 to over 174,000 people in 2016. Growth has mostly been focused in Calgary and Airdrie. Population and employment forecasts for the sub-region are summarized in Table 4.2.1. Highlights of the information used in development of the land use forecast include:

- Population Growth (2001 to 2016):
  - 56,000 to 174,200
  - 7.8% per year (2006-2016: 6.9%)
  - Comparison with Calgary Region: Long-Term rate of 3.4%
- Development Rate (2011 to 2016):
  - Industrial / Commercial – 234 acres / year
  - Residential – 479 acres / year

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Table 4.2.1: Southern Sub-Area, Population and Employment Forecast

Year	2016		2019		2029		2039		2076	
	Population	Employment	Population	Employment	Population	Employment	Population	Employment	Population	Employment
Calgary	105,608	18,351	120,240	22,209	178,338	34,359	234,609	46,040	373,483	84,394
Airdrie	61,581	14,674	70,596	16,782	93,221	22,688	110,506	28,273	182,075	49,396
Rocky View	4,069	19,451	4,111	15,924	4,251	23,520	4,391	31,169	107,512	65,376
Crossfield	2,983	392	3,212	780	4,142	2,719	5,333	4,658	12,922	17,996
TOTAL	174,241	52,867	198,159	55,700	280,000	83,300	354,800	110,100	676,000	217,200
Growth Rate	Baseline Data		4.4%		3.7%		3.1%		2.3%	

4.2.3 Population and Employment Patterns

Exhibits 4.2.1, 4.2.2 and 4.2.3 illustrate the changing population and employment patterns, from the 2019 (existing), to the 2039 and Long-Term horizons, respectively.

The following provides a summary of the general growth projections for each of the jurisdictions in the sub-area:

- *City of Calgary*: Land uses in the City of Calgary are mainly residential west of 11 Street NE. East of 11 Street NE commercial and industrial uses surround the airport and the CPR. Additional residential lands are found bounded by Stoney Trail to the north and east, Airport Trail to the south and Metis Trail to the west. The City of Calgary Regional Transportation Model provides the population and employment projections up to the 2076 horizon. By the 2076 horizon the City anticipates a population of 2.5M, with 280,000 people in the north Calgary Area that forms part of the Highway 2 CIS sub area.
- *City of Airdrie*: Airdrie is comprised of predominantly residential land uses with industrial and commercial development along the Highway 2 corridor, and to the northeast of the City. The City's municipal development plan, the Airdrie City Plan anticipates a population of 110,000 by as early as 2040.
- *Town of Crossfield*: In 2010, the Crossfield received approval from the Government of Alberta to annex approximately 11 quarter sections from Rocky View County. As documented in the Town of Crossfield Municipal Development Plan, the growth study prepared for the 2009 annexation application projected the need to accommodate a total residential population of 12,000 to 15,000 within Crossfield to the year 2040. The annexation was approved to accommodate approximately 35 years of residential, commercial, and industrial growth.
- *Rocky View County*: The County Plan projects population growth of 2.71% to 3.11% based on a regional population of 1.9 million by 2026. This results in a population of 51,490 to 59,090 by 2026. Within the study area Rocky View anticipates country residential, a regional business centre, a highway business area and a full service hamlet area at Balzac. One of the ongoing development challenges faced by Rocky View in the study area is availability of water for servicing developments.

Detailed land uses plans for the Calgary sub-area are illustrated by: Exhibit 4.2.4 (3 Plans): Land Use Plans – Overview, South, and North (3 Plans).

The population and employment projections shown in Table 4.2.1, were developed based on a combination of existing land uses, current planning documents, historical population growth and development rates. The forecast assumes that residential areas in the City of Calgary will build out prior to higher density residential development in Rocky View County; this is mainly due to current limitations on servicing. The long-term horizon exceeds planning timelines for the City of Airdrie, Rocky View County and the Town of Crossfield. To estimate the long-term population and employment, historical population growth and land development rates were used. For Crossfield this results in a lower growth rate than projected by the Town. Projections for the City of Calgary based on anticipated land uses, densities and historical growth indicated that by 2076, the population in Calgary portion of the sub-area has potential to exceed the City of Calgary projection. Land use forecasting resulted in a long-term growth rate for the Highway 2 CIS Calgary sub-area of 2.3%. This is consistent with the long-term historical growth rates of the Calgary Region as a whole.

Exhibit 4.2.4-1: 2019 (existing):

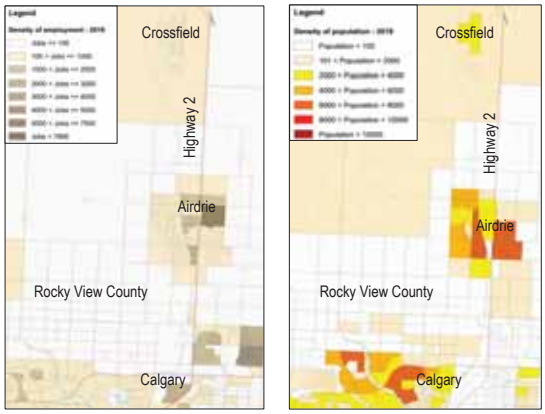

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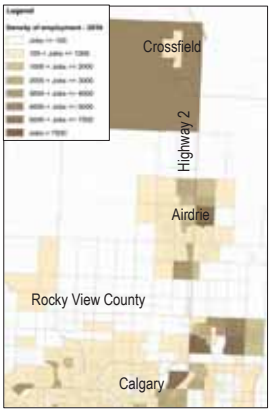
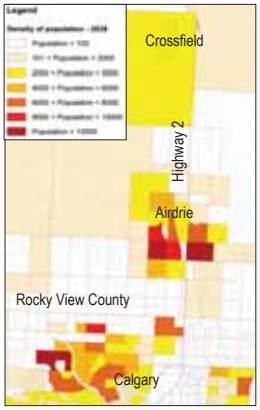
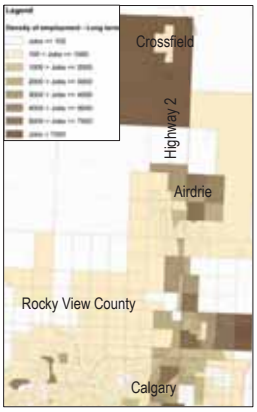
Exhibit 4.2.4-2:
2039 Horizon





The colors in the above land use plans exhibits represent the total population and employment for the province's Regional Transportation Model's (RTM) Traffic Analysis Zones (TAZ) and is not the density. This can be deceiving in areas where the zones are larger, such as around Crossfield and Airdrie. For example, in the Long-Term figure there is a bold red box around Crossfield for population. This represents 10,000 people, which would be focused near the current town boundaries, and does not mean that the whole area shown in red is anticipated to be intensely developed.

Exhibit 4.2.4-3:
Long-Term Horizon



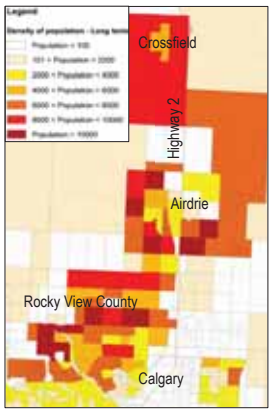


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Exhibit 4.2.4-1: Southern Region Land Use Plans – Overview

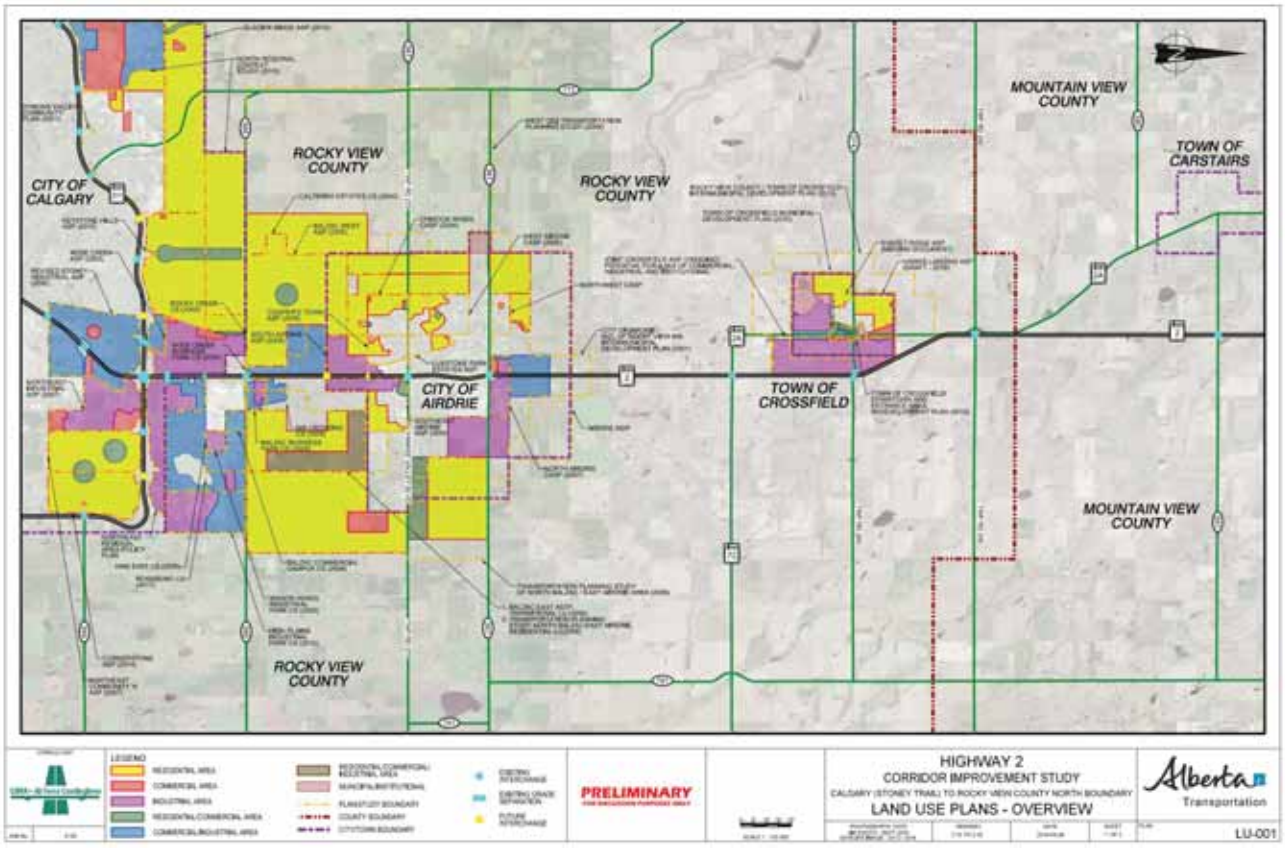

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Exhibit 4.2.4-2: Southern Region Land Use Plans – South

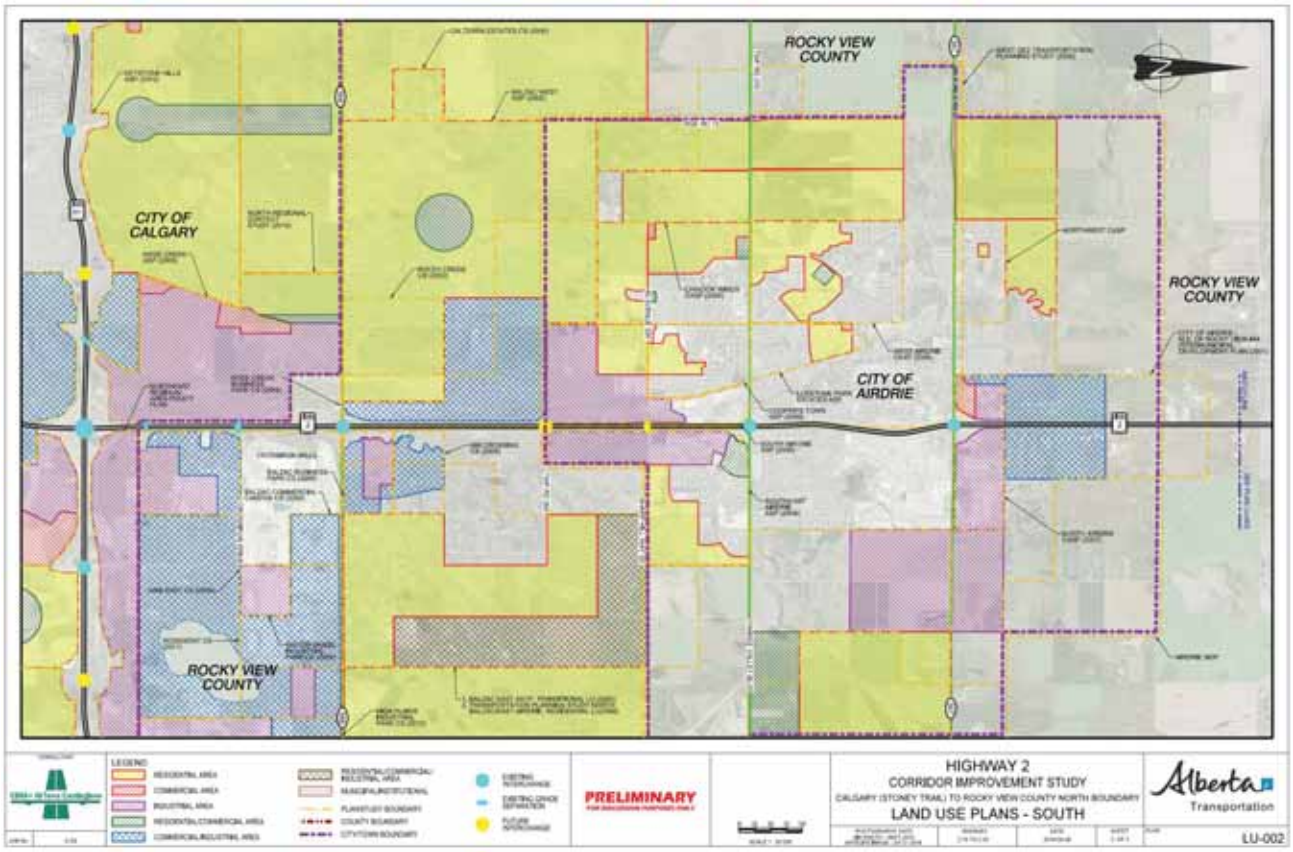

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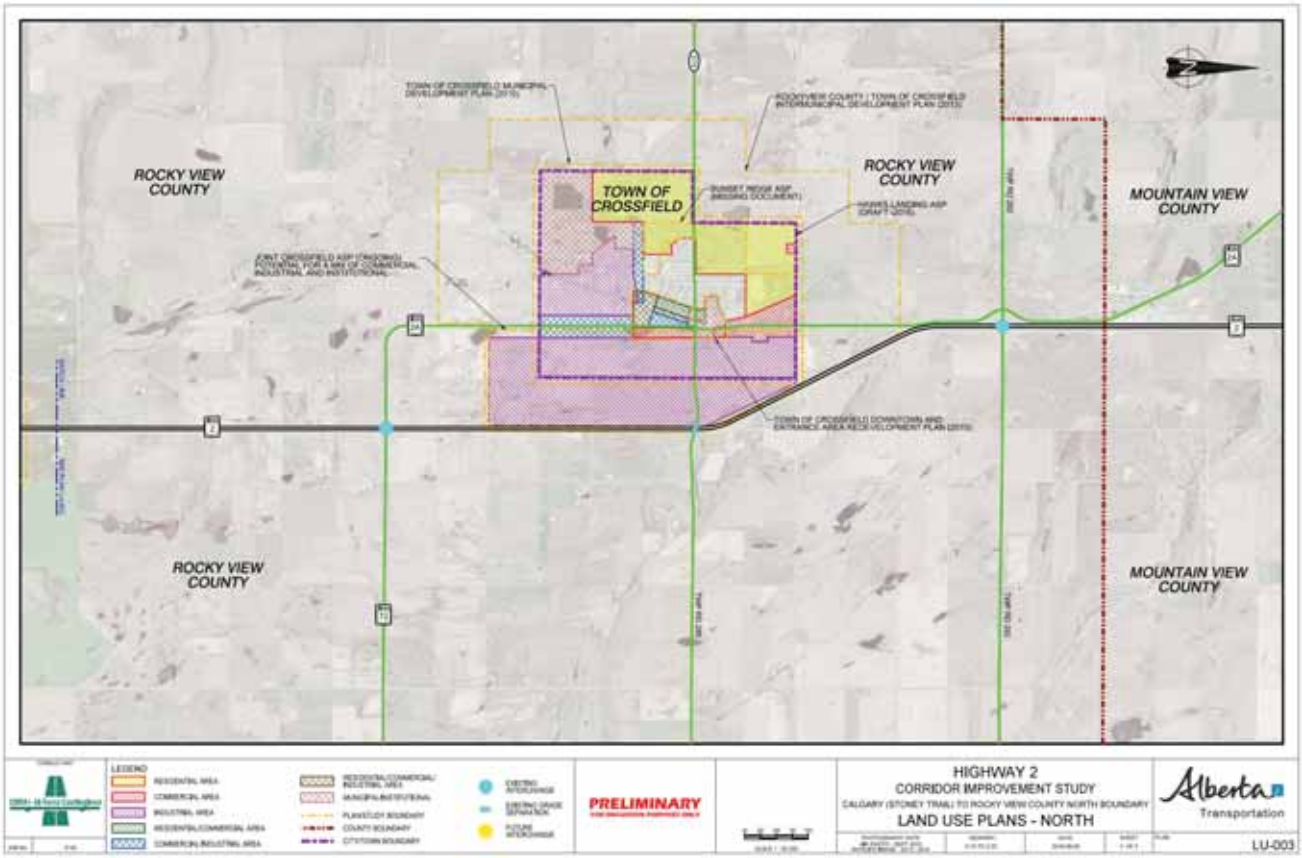
Exhibit 4.2.4-3: Southern Region Land Use Plans – North



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4.2.4 Corridor Traffic Volumes:

Table 4.2.2 shows the 2016 AADT volumes along Highway 2 from Crossfield to Calgary.

Table 4.2.2: 2016 AADT, Township Road 292 to Stoney Trail

From	To	2016 Daily Traffic Volumes	
		AADT	ASDT
To / From Calgary	Stoney Trail *	78,970	82,250
Stoney Trail *	CrossIron Drive	106,560	113,230
CrossIron Drive	Highway 566 – Balzac	89,140	94,720
Highway 566 - Balzac	Yankee Valley Boulevard	84,830	90,300
Yankee Valley Boulevard	East Lake Cres. / Edmonton Trail	65,220	69,300
East Lake Cres. / Edmonton Trail	Highway 567 – Airdrie	53,430	56,780
Highway 567 – Airdrie	Highway 72 / 2A – Crossfield	42,140	44,780
Highway 72 / 2A – Crossfield	Township Road 292 – Crossfield	36,400	41,140
Township Road 292 – Crossfield	Highway 581 – Carstairs	32,930	37,210

** Traffic details at Stoney Trail (AADT):*
- 54,010 (west) & 40,920 (east)
- Southbound traffic Highway 2 turning westbound 11,460
- Southbound traffic Highway 2 turning eastbound 9,520

Table 4.2.3 shows the 2016 turning movement pattern at the Highway 2 interchange with Stoney Trail for the AADT, AM peak hour, and the PM peak hour. The AADT flows represent the daily two-way volumes. The AM and PM peak hour flows represent the one-way peak flow direction.

Table 4.2.3: 2016 Turning Movement Pattern at Highway 2/Stoney Trail Interchange

Period	To/from Highway 2 North		
	To / from West On Stoney Trail	To / from South On Deerfoot Trail	To / from East On Stoney Trail
AADT (2-way)	22%	60%	18%
AM Peak Hour (1-way)	12%	64%	24%
PM Peak Hour (1-way)	19%	60%	21%

Observations concerning the traffic pattern along Highway 2 that can be taken from Table 4.2.2 and 4.2.3 include:

- The traffic volumes along the corridor triple between Crossfield and Stoney Trail, essentially Airdrie commuters travelling to / from Calgary.
- If a third of the traffic passing Crossfield was destined (or originated) east or south of Calgary, it would represent 10% of the volume approaching Stoney Trail, not yet a compelling justification of an Airdrie bypass.
- At the system interchange with Stoney Trail (south of Airdrie), only 18% of the daily traffic to / from Highway 2 is destined to / from the east, indicating that the volume of traffic that could be expected to use an Airdrie Bypass at this time, i.e. diverting at Crossfield, would not be enough to noticeably improve operations along the balance of the Highway 2 corridor through Airdrie to Stoney Trail.
- The volume turning east onto Stoney Trail from Highway 2 North increases to 24% during the AM peak hour, probably because Deerfoot Trail is operating at saturation flows. East Stoney Trail is the Calgary bypass for Highway 2 traffic. Variable message signs on Highway 2 indicate travel time for two parallel routes allowing drivers to make a real-time route decision.

4.2.5 Historical Growth Rates

The review of historical growth information examined both long-term and short-term periods to take into account the economic downturn in the energy sector, which in terms of vehicle traffic volumes, was generally felt in 2015. Table 4.2.4 shows the 20-year, 10-year, and 5-year growth rates at three points along the Calgary-Crossfield corridor.

Table 4.2.4: Historical Average Annual Traffic (AADT) Growth: Calgary-Crossfield Corridor

Section of Calgary-Crossfield Corridor	1996-2016 Long Term Growth	2006-2016 Ten-Year Growth	2011-2016 Five-Year Growth
North Section of Calgary-Crossfield Corridor (From south of Twp Rd 292 to north of Hwy 72)	2.4%	3.2%	3.2%
Central Section of Calgary-Crossfield Corridor (From South of Yankee Valley Blvd to North of Highway 566)	2.9%	3.4%	3.3%
South Section of Calgary-Crossfield Corridor (From South of Hwy 566 to North of Crossiron Blvd)	2.9%	3.7%	3.9%

The 5- and 10-year growth rates, particularly south of Highway 566 are significantly higher than the 2.5% average annual traffic growth rate along the entire Highway 2 corridor, however the discrepancy is less when calculated over the 20 year period.

Despite the economic downturn that occurred in the energy sector, average annual growth in traffic along the Calgary-Crossfield segment of the Highway 2 corridor over the last five years has not declined significantly, and south of Highway 566 the growth rate continues to increase. The growth in the average annual traffic closer to Calgary's urban area, accounts for the impact of traffic generators such as Crossiron Mills Mall and other commercial and employment generators in Rocky View County.

4.2.6 Traffic Warrants

Table 4.2.5 estimates the approximate timelines to the 'Target AADT' volumes that would begin to warrant expanding Highway 2 between Stoney Trail and Crossfield to 8 lanes, 10 lanes (only south of Yankee Valley Boulevard) and ultimately transitioning to an Airdrie bypass. North of YVB, the transition to the Airdrie Bypass occurs when an 8 lane cross-section reaches capacity.

The timelines are approximated based on an average annual traffic growth rate of 2.5%. Although 2.5% represents the historical trend-line assumed for the overall study corridor, it should be understood that the actual growth rate along Highway 2 may vary both year-by-year and by location, potentially ranging between 1% and 5%. The growth rate will be affected by the pace of land development, the competency of the inter-municipal arterial road network, and the existence of inter-municipal transit corridors accommodating other modes. Particularly near urbanized areas such as the Crossfield-Calgary segment. What the table does not reflect is how the upgrading might be staged (grouped or packaged) to minimize traffic disruption and optimize traffic outcomes.

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Assuming a 2.5% growth rate along Highway 2, Table 4.2.5 suggests the following:

- 8-laning:
  - Between Stoney Trail and CrossIron Drive in 5 years.
  - Between CrossIron Drive and Yankee Valley Boulevard in 5 to 10 years.
  - Between YVB and Township Road 292 in approximately 20 years.
- 10-laning:
  - Between Stoney Trail and Yankee Valley Boulevard in approximately 10 to 20 years.
- Airdrie Bypass:
  - Between Stoney Trail and Yankee Valley Boulevard in 25 to 40 years.
  - Between Yankee Valley Boulevard and Township Road 292 in approximately 50 years.

4.2.7 Traffic Modelling

The long-term horizon from the AT Calgary RTM was updated to include the land use forecasts developed for the Highway 2 CIS (approximately 2076, 3.1M population horizon) and used to review network options for the sub-area including parallel arterial roadways, LRT connections and HOV. The model was run on four different network scenarios:

- AT Network Assumptions – Includes LRT and Commuter Rail, No HOV (see Exhibit 4.2.5-1 and 4.2.5-2).
- Highway 2 CIS Run #1 – Highway 2 CIS Roadway Network with HOV & LRT (see Exhibit 4.2.5-3, to 4.2.5-5).
- Highway 2 CIS Run #2– Highway 2 CIS Roadway Network with LRT.
- Highway 2 CIS Run #3 – Highway 2 CIS Roadway Network.
- Highlights of the Highway 2 CIS network for the southern sub-area include:
  - Airdrie By-pass
    - Tying in to an Highway 2 with a directional interchange at Township Road 285
    - Three lanes each direction between Stoney Trail and Highway 567
    - Two lanes per direction between Highway 567 and Highway 2
    - Interchanges at Highway 72, Highway 567, Township Road 264, Highway 566 and Stoney Trail
  - Highway 2
    - 5 Core Lanes per direction between Stoney Trail and Yankee Valley Blvd.
    - 4 Core lanes per direction north of Yankee Valley Blvd
    - Ultimate Interchanges at Crossiron Drive, Highway 566, Twp Rd 264, 40th Avenue, Highway 567, Township Road 274, Highway 72 and Township Road 292
    - Flyover at Township Road 273
  - 4 lane parallel arterial connections between Stoney Trail and Airdrie:
    - 11th Street NE / Range Road 11 / 8th Street
    - Dwight McLellan Trail / Kingsview Blvd
    - 60th Street / Range Road 292
  - 4 lane urban boulevard and transit corridor between Stoney Trail and Airdrie:
    - Center Street / Range Road 13 / 24th Street
  - HOV lanes are assumed to occupy one the core lanes on each of the highway corridors, rather than be an additional lane
  - City of Calgary Green Line LRT Extension to Airdrie along (Centre Street)
  - City of Calgary Blue Line LRT Extension to Crossiron Drive

	6 Laning		10 Laning
	8 Laning		Bypass Required

Table 4.2.5: Approximate Timeline to 'Target AADT' at 2.5% Linear Growth Rate

Location		Corridor Environment	Target LOS	Target AADT			Existing		Approximate Time Line to "Target AADT" at 2.5% Linear Growth Rate							
From	To			To 8 Lanes	To 10 Lanes	To Bypass	2016 AADT	Basic Lanes	2020	2025	2030	2040	2050	2060	2070	2080
Stoney Trail, Calgary	Crossiron Drive	Urban	D / E	104,400	139,900	171,700	106,600	7	117,000	131,000	144,000	171,000	197,000	224,000	251,000	277,000
Crossiron Drive	Highway 566, Balzac						89,100	6	98,000	109,000	120,000	143,000	165,000	187,000	209,000	232,000
Highway 566	Yankee Valley Blvd., Airdrie						85,000	6	94,000	104,000	115,000	136,000	157,000	179,000	200,000	221,000
Yankee Valley	East Lake Cr./Edmonton Trail				n/a	139,900	65,200	6	72,000	80,000	88,000	104,000	121,000	137,000	153,000	170,000
East Lake Cr./Edmonton Trail	Highway 567, Airdrie						53,400	6	59,000	65,000	72,000	85,000	99,000	112,000	125,000	139,000
Highway 567	Highway 72 / 2A, Crossfield	Transition	C / D	71,500		95,500	42,100	6	46,000	52,000	57,000	67,000	78,000	88,000	99,000	109,000
Highway 72 / 2A	Acme Road (Twp. Rd. 292)	Rural	B / C	54,500		n/a	36,400	6	40,000	45,000	49,000	58,000	67,000	76,000	86,000	95,000

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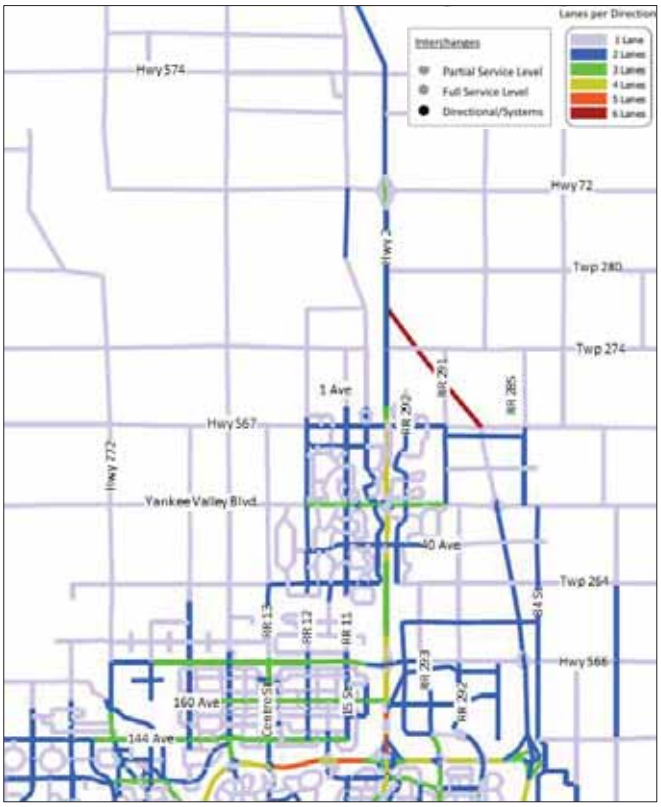
Exhibit 4.2.5-1: AT RTM 2076 Roadway Network Assumptions



Source: AT Calgary RTM

Exhibit 4.2.5-2: AT RTM 2076 LRT / Rail Network Assumptions



Source: AT Calgary RTM Sub-area Model

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Exhibit 4.2.5-3: Highway 2 CIS 2076 Roadway Network Assumptions

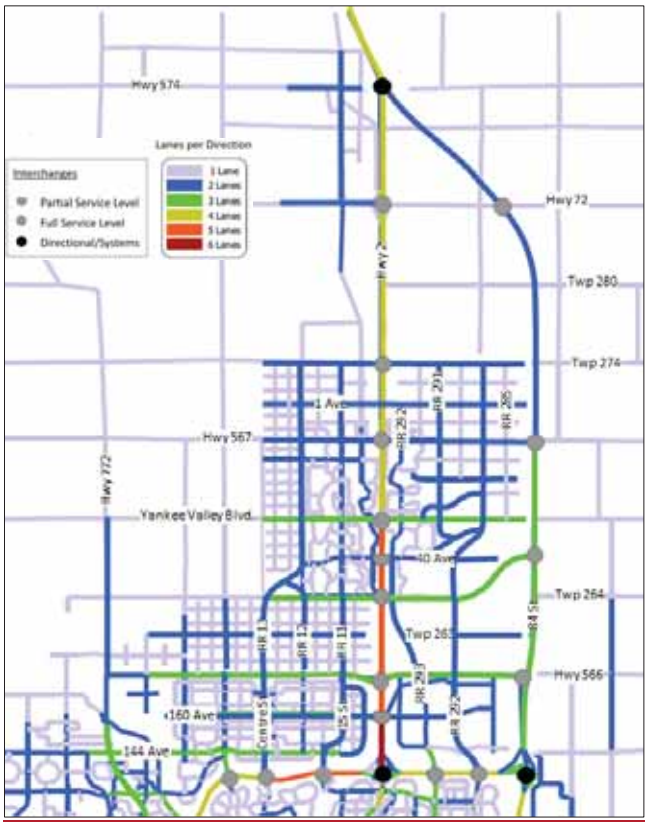

Exhibit 4.2.5-4: Highway 2 CIS 2076 HOV Network Assumptions

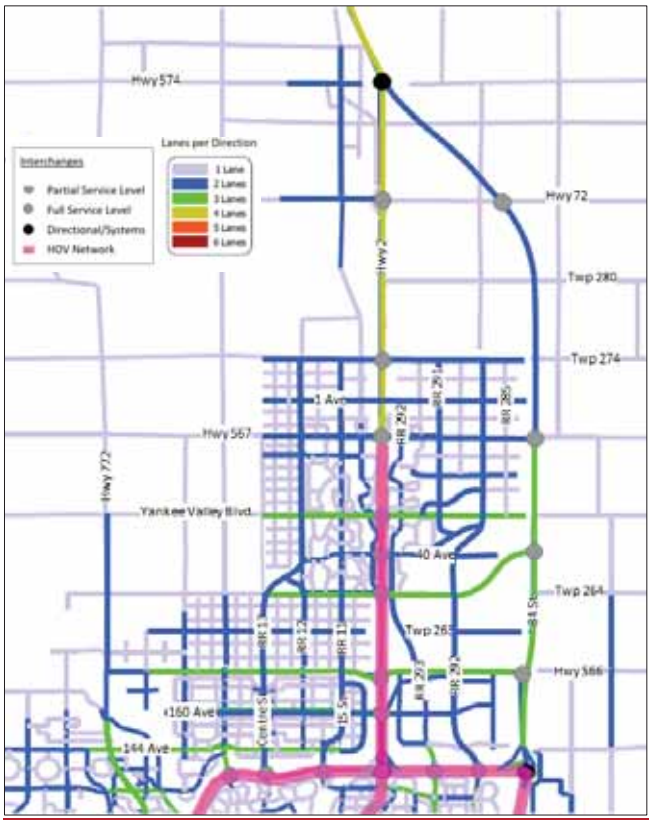

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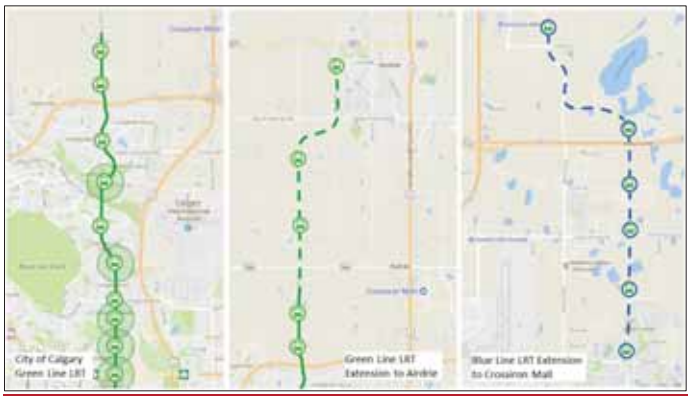
Exhibit 4.2.5-5: Highway 2 CIS 2076 LRT Network Assumptions



Comparison of the volume-to-capacity and volume data for the four model runs shows that:

- The preferred travel route for drivers is Highway 2 – volumes north of Stoney Trail and north of Highway 566 on Highway 2 near capacity for the number of lanes provided regardless of the availability of parallel routes, LRT or HOV lanes.
- The combination of the Green Line and Blue Line LRT extensions, with the parallel roadway networks modelled for the Highway 2 CIS runs, accommodates approximately 20% more trips north of Stoney Trail in the morning and afternoon peak hours when compared to the initial run with the Alberta Transportation network assumptions. North of Highway 566, the impact is more pronounced with a 30% increase in trips in both the morning and afternoon peak hours. This is partially due to the increase in lanes on Highway 2 from 3 to 5 lanes between the modelled roadway networks.
- North of Stoney Trail LRT trips account for 10% to 15% of the increase in trips. North of Highway 566, LRT trips account for approximately 10% of the increase.
- The impact of the HOV lane is negligible to the number of total trips and the number of trips on Highway 2.

The results of the screen-line analysis conducted to review and interpret the modeling results are provided in Appendix I.

4.2.7.1 Conclusions

The effectiveness of parallel routes is limited by the internal network within the City of Calgary and a lack of continuity in the north-south routes connecting into downtown. The LRT with connections to downtown along with the parallel roadway routes play a critical role in supporting growth and development in the Calgary sub-area and accommodating both local and commuter traffic.

The number of vehicles that would utilize the HOV lane is approximately equal to the number of users in each of the non-HOV lanes. Tolls would likely be needed for the HOV lane to provide a travel time benefit to users.

Without other north-south transportation alternatives to Highway 2, e.g. a contiguous local arterial road network, and/or a dedicated transit corridor, highway congestion levels may increasingly frustrate commuters. This in turn could discourage long-term growth in Airdrie, once Highway 2 has been upgraded to its ultimate cross-section. Furthermore, without alternative north-south links connecting Airdrie with Stoney Trail, constructing additional access points (interchanges) to accommodate urban growth will ultimately only exacerbate congestion levels and failure along Highway 2.

A combination of parallel roadway routes and LRT is needed to provide adequate transportation service and allow for development and growth in the Calgary sub-area. Current long-term planning should consider transit routes a network of supporting north-south parallel roadways to integrate growth and development with effective connections to Stoney Trail, such as:

- Highway 772 / Symons Valley Boulevard (Calgary)
- Centre Street (Calgary) / Range Road 13 (Rocky View) / 24 Street (Airdrie)
- 11 Street (Calgary) / Range Road 11 (Rocky View) / 8 Street (Airdrie)
- Highway 2
- Metis Trail (Calgary) / Dwight McClellan Blvd (Rocky View) / Kingsview Blvd (Airdrie)
- 60 Street (Calgary) / Range Road 291 / 292 (Rocky View) / Range Road 290 (Airdrie)
- East Airdrie Bypass

In the study area, 17 km wide from Highway 772 to East Stoney Trail, there are only four arterial road connections to Stoney Trail, not including Highway 772 and the proposed Airdrie Bypass on the west and east boundaries, respectively. This underscores the need to establish an improved secondary local roadway network; however, the task is complicated by the need to coordinate across three municipal jurisdictions, with different development objectives. Interconnectivity with the municipal arterial road system must also plan for east-west corridors. Assessment of currently envisioned development patterns needs to assure that planned provincial and municipal infrastructure can accommodate anticipated traffic demands.

4.2.8 Penetrator Agreement

The City of Calgary and Alberta Transportation established a Penetrator Agreement to ensure that traffic generated in the rural and urban areas outside the City of Calgary would have unencumbered access to Stoney Trail, a provincially-funded ring road largely constructed inside, and primarily serving, the City.

Highway Penetrators refer to the extension of primary highways, secondary highways and other major arterials of provincial significance, which ultimately connect with Stoney Trail. Relevant sections of the agreement, signed October 1991, include the following:

> *Whereas, the proper functioning of the ring road depends to a significant extent on the "Highway Penetrators" which connect to the ring road from the surrounding rural and urban areas.*

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Whereas, for the purposes of this agreement, "Highway Penetrators" refer to the extensions of primary highway, secondary highway and other major arterials of provincial significance, which connect to the ring road (Stoney Trail).

7. The "Highway Penetrators" will all be controlled-access facilities with the degree of access control consistent with each roadway's classification as mutually agreed upon.

As sections of the ring road and "Highway Penetrators" are annexed by the City, the City agrees to provide for closure of local access at the time of construction or upgrading, or as adjacent lands develop or redevelop.

The City further agrees that from the date of signing this agreement, no additional permanent accesses on the ring road or "Highway Penetrators" within City limits will be permitted unless agreed to by both parties.

9.(2) The City further agrees to maintain the Ring Road and "Highway Penetrators" within the City limits to a high standard in recognition of the importance of these facilities in accommodating both city and provincial traffic.

11. The City agrees to prohibit parking on the ring road and "Highway Penetrators".

12.(a) The City agrees to obtain acceptance from the Province for the design and construction of the ring road and "Highway Penetrators".

14. The parties understand the importance of the "Highway Penetrators" to the municipalities adjacent to the City and agree to communicate and cooperate with these municipalities in the orderly development of the network plan.

The agreement concerned planning, design, construction, maintenance and operation of the designated penetrators as integral parts of the combined provincial / inter-municipal system. Highway 772 / Symons Valley Road NW, Centre Street / Range Road 13, Highway 2 and the future Airdrie East Bypass were the designated penetrators. The potential inter-municipal road links are assessed in the following section.

4.2.9 Inter-Municipal Arterial Road Network

Given the expected concentration of development to continue along the Highway 2 corridor, it will become increasingly important to have arterial roadway connections through Rocky View County, connecting Airdrie to Stoney Trail (and Calgary), parallel to Highway 2 to help alleviate commuter and local traffic flows. Maintaining a high, consistent, access-managed standard along the inter-municipal roadways is critical to their long-term performance.

The following north-south roadways are relevant to Highway 2 CIS as inter-municipal arterial routes with potential to link growth north of Stoney Trail and Calgary with the province's Stoney Trail ring road. To help illustrate the inter-municipal network, we have included Exhibit 4.2.6: Calgary to Crossfield – Conceptual Corridor Improvements.

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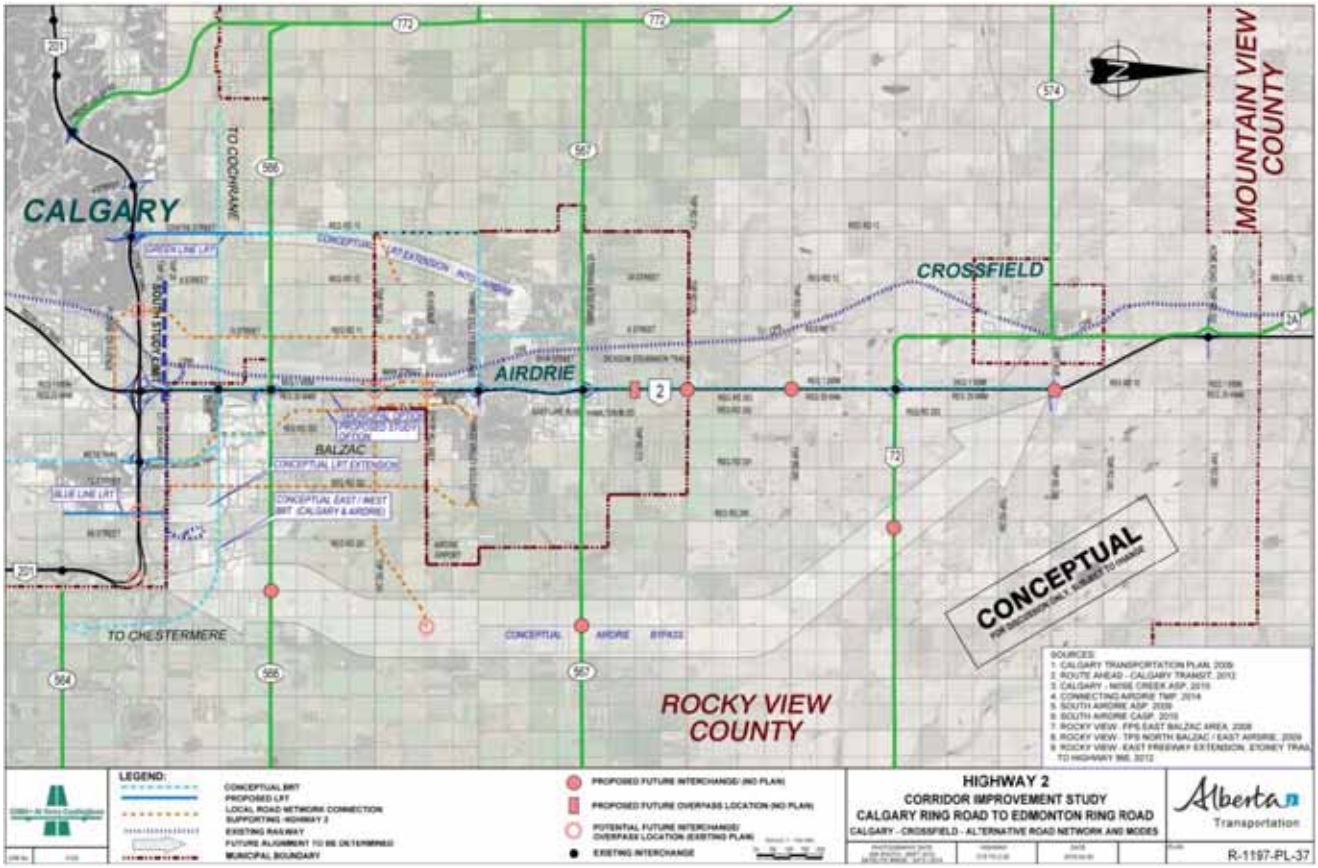
Exhibit 4.2.6: Calgary to Crossfield – Conceptual Corridor Improvements



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4.2.9.1 Symons Valley Road NW / Highway 772; Designated Highway Penetrator

Currently Highway 772 connects to Symons Valley Road NW within City of Calgary Limits. Although shown as an arterial south of 144 Avenue NW, Symons Valley Road to date has been developed more consistently as a 'local' arterial. The is demonstrated by the relatively short signalized intersection spacing, an average spacing of only 300m between signalized intersections from Stoney Trail to the City boundary. This outcome is not consistent with the intent of the Penetrator Agreement. However, future Plans in the Glacier Ridge ASP show Highway 772 connecting to Shaganappi Trail north of 144 Avenue, which is classified as arterial and also primary goods movement and HOV corridors.

Conclusion: Symons Valley Road / Highway 772 is not conducive to serving as an inter-municipal arterial serving a high-volume commuter role. The alternate alignment connecting Highway 772 with Stoney Trail is along Shaganappi Trail; however, current development patterns also show intersection spacing inside the city boundary as low as 300m. It is noted that the average intersection spacing along Shaganappi Trail south of Stoney Trail is much greater than 300m.

4.2.9.2 Centre Street / Range Road 13 (Rocky View) / 24 Street (Airdrie); Designated Highway Penetrator

North of Stoney Trail, Centre Street is a two-lane undivided rural cross-section. The Key Stone ASP defines Centre Street, north of 144 Avenue, as an Urban Collector including a regional pathway and future regional LRT alignment. This classification is not consistent with the Penetrator Agreement. Centre Street is planned as an Urban Collector road, secondary or complementary to the corridor's transit function, supporting Transit Oriented Development (TOD).

Conclusion: Centre Street's role as an inter-municipal corridor is focused on transit; however, this may be acceptable if other potential inter-municipal corridors can be protected for a more robust inter-municipal arterial function.

4.2.9.3 11 Street NE / Range Road 11 (Rocky View) / 8 Street (Airdrie)

Within the City of Calgary, 11 Street / 15 Street is seen as particularly important because Centre Street has already been confirmed as an Urban Collector and LRT corridor and community development has begun. The Nose Creek ASP, approved in late 2015, shows 11 Street / 15 Street classified as an Urban Boulevard (two tiers below arterial), which includes parking, bike lanes and a posted speed of only 50 km / h.

It is worth noting that 11 Street will ultimately extend southeasterly from its future Stoney Trail interchange to a future interchange on Deerfoot Trail at 128 Avenue (half-diamond configuration, to / from the south), a distance of only 3 km. This may better serve north-south traffic from Airdrie compared with Centre Street, which has a more indirect connection to Deerfoot Trail following Harvest Hills Boulevard and then Beddington Trail, a distance of almost 7 km. The alternate penetrator route along Shaganappi Trail connects with Crowchild Trail, west of the city core.

Conclusion: The inter-municipal road network would be better served if 11 Street's classification and posted speed were upgraded to an arterial standard to improve its capacity to accommodate regional traffic flows, particularly given that Centre Street has already been downgraded. The City acknowledged that its development of Centre Street does not meet the intent of the Penetrator Agreement. However, at this stage (with the recently approved ASP) the City has been reluctant to upgrade 11 Street's road classification to Arterial from Urban Boulevard.

Going forward, the City agreed to work with Alberta Transportation to restrict access and parking within the Urban Boulevard classification to promote the north-south connection. The City agreed to investigate available options and mechanisms to improve the through capacity of the roadway.

4.2.9.4 Balzac Boulevard (Rocky View) / Main Street (Airdrie)

This route is not a Penetrator and does not connect with Stoney Trail; however, a contiguous Balzac Boulevard / Main Street connection, between Highway 566 and Yankee Valley Boulevard, respectively, will divert local traffic off of Highway 2.

4.2.9.5 Deerfoot Trail / Highway 2; Designated Highway Penetrator

Deerfoot Trail / Highway 2 is an existing freeway facility. It can be upgraded to a maximum 10 basic lanes between Stoney Trail and Yankee Valley Boulevard.

4.2.9.6 Metis Trail / Dwight McLellan Trail (Rocky View) / Kingsview Boulevard (Airdrie)

A contiguous north-south arterial would divert traffic bound for the County's CrossIron Mills mall off of Highway 2. However, Rocky View County's current plans propose a collector road that would follow a circuitous alignment along existing township and range road alignments to avoid 5 country residential lots. This indirect alignment would require two right-angle turns and two additional crossings of Nose Creek. As well, the County's current alignment for Dwight McLellan Trail would extend north of Highway 566 along Range Road 293, through the center of a long-established country residential community.

Conclusion: To establish an effective north-south arterial, connecting Stoney Trail and the County's Dwight McLellan Trail with a southerly extension of Airdrie's Kingsview Boulevard would need to follow a more contiguous alignment, affecting several country residential lots immediately east of the northbound VIS on Highway 2. This more direct alignment would also avoid two additional crossings of Nose Creek.

4.2.9.7 60 Street / Range Road 291 / 292 (Rocky View) / Range Road 290 (Airdrie)

This future connection will serve an industrial corridor between Stoney Trail and Airdrie's Yankee Valley Boulevard (and Airdrie Airport). Between Stoney Trail and Highway 566, the connector must pass either east or west of McDonald Lake, along Range Road 291 or 292, respectively.

4.2.9.8 Airdrie East Bypass (84th Street / Range Road 290); Designated Highway Penetrator

The future Airdrie bypass will be a freeway facility and, together with East Stoney Trail, will also be the National Highway System Calgary bypass (Deerfoot Trail bypass). Its alignment should be identified early to protect needed right-of-way and to advance a regional understanding of ultimate travel patterns and access.

Based on today's observed travel patterns, the Airdrie Bypass is not the preferred response to congestion generated by local peak hour traffic flows along Highway 2 between Airdrie and Stoney Trail. It is noted that Memorial Drive, a major connector into downtown Calgary from the east, does not intersect with East Stoney Trail, making Deerfoot the more direct, free-flow, connection for commuters.

The Town of Crossfield expressed interest in converting the Highway 2 / Township Road 285 flyover (Limit Avenue) into an all-movement service interchange. However, Township Road 285 is seen as a potential terminus for the future Airdrie East Bypass (to be confirmed). The town is presently accessed from the north via the Township Road 292 interchange and from the south via the Highway 2A / 72 interchange.

Conclusion: A bypass east of Airdrie would draw little traffic off of Highway 2 in the short - medium term. An east bypass would ultimately become more attractive to commuters when development reaches Airdrie's east city limit.

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4.2.9.9 Potential West Airdrie Bypass

11 Street, Centre Street and existing Highway 772 / Beddington Trail all lead to a significantly congested Deerfoot Trail. There is no other major north-south route into Calgary, except Crowchild Trail entering from the northwest. As such, the value in considering a bypass west of Airdrie, e.g. leaving Highway 2 near Township Road 292, north of Crossfield, connecting with Highway 772 west of Airdrie, was considered.

At the Highway 2 interchange with Stoney Trail, 60% of the AADT traffic volume continues north-south, 22% of the traffic to/from the north turns west and only 18% turns east. During the AM peak hour, the split is 64%, 12% and 24%, respectively.

Conclusion: Highway 772 is 7.5 km west of Airdrie and a compelling connection into downtown Calgary from west Stoney Trail is not apparent, except perhaps for Shaganappi Trail, a signalized corridor connecting at Crowchild Trail. This is confirmed by the low (12%) peak hour turning movement to / from the west at Highway 2. A compelling argument for a west bypass is likely difficult, absent a correspondingly improved penetrator between Stoney Trail and downtown.

4.2.9.10 Inter-Municipal Arterial Road Network Conclusion

All future urban growth cannot be accommodated by Highway 2, a National Highway Route; which is not intended to primarily serve local commuting needs. It is not sustainable for the province to advance the Airdrie Bypass in response to locally generated peak hour commuter flows, particularly when the bypass will do little to divert local commuters off of Highway 2. A bypass west of Airdrie connecting with Highway 772 is also not a viable option for commuter traffic. The function of the identified local arterials, parallel to Highway 2, must be confirmed and protected immediately, including an 11 Street NE arterial road, Centre Street transit corridor and Balzac Boulevard collector road west of Highway 2; and the Metis Trail / Dwight McLellan Trail / Kingsview Boulevard and 60 Street / Range Road 291 / 292 arterials east of Highway 2.

4.2.10 Inter-Municipal Transit Planning

Calgary Transportation Plan 2009 includes drawings showing a Primary Transit Network (Drawing #2) and a Conceptual Calgary Regional Transit Plan (Drawing #4).

- An LRT Centre Street study was expected, involving all 3 municipalities, to extend the Green Line to Airdrie.
- The RouteAhead: A Strategic Plan for Transit in Calgary, Part 2, includes the following:
  - Integrate with regional transit services by working with the Calgary Regional Partnership, Airdrie Transit, the Government of Alberta and the Calgary International Airport on connections to the rapid transit network.
  - Provide transit planning and service design support to the Calgary Regional Partnership and municipalities in the Calgary region.
  - Work with the Calgary Regional Partnership to identify right-of-way requirements for future regional transit services, including commuter rail facilities. The cost of implementation of commuter rail by Calgary region municipalities will be reduced through proactive planning.
  - Review opportunities, benefits and costs of connections using portions of the provincial transportation utility corridor (TUC) for cross-town and regional transit service.

The above inter-municipal studies had not been undertaken by end 2017.

4.2.10.1 Anticipated Staging:

- *Calgary's Green Line LRT (Centre Street):*
  - Long-Term (1.6M population horizon): LRT to North Pointe (south of Stoney Trail);
  - Beyond 1.6M horizon: Extend BRT to Keystone (144 Avenue, north of Stoney Trail).
  - Beyond RouteAhead: A future extension north to Airdrie has not been defined.
- *Calgary's Blue Line LRT:*
  - Medium-Term (1.5M population horizon): NE LRT extension to 128 Avenue N, near 68 Street NE, south of Stoney Trail.
  - Beyond RouteAhead: An extension north of Stoney Trail, between Highway 2 and Metis Trail
  - Option: The possibility exists that the Blue Line could ultimately extend north of Stoney Trail to CrossIron Mills and then into east Airdrie. An extension north of Stoney Trail could potentially link up with Dwight McLellan Trail and extend along Airdrie's Kingsview Boulevard.
  - Staging: It is conceivable that the Blue Line reaches Country Hills Blvd in 10 years, Stoney Trail in 20 years and CrossIron Mills mall in 30 years. A protected transit corridor would permit advancing BRT, or other, transit service, ahead of future LRT.
- *Other Transit:*
  - Calgary also proposes an east-west BRT service along 160 Avenue (CrossIron Drive) connecting the proposed Green and Blue lines across Highway 2.
  - The North Calgary region municipalities' inter-municipal planning committee (NCRC); was to study infrastructure priorities. Alberta Transportation is funding the study, which may include LRT planning.
  - The Intercity Express (ICE) Regional Transit Service, connects Airdrie and Calgary. Three routes provide access to Calgary with transfers via Calgary Transit.
    - Route 900 – Airdrie to CrossIron Mills to McKnight Boulevard
    - Route 901 - East Airdrie to Downtown Calgary (Park n ride option at Ron Ebbesen Arena)
    - Route 902 - West Airdrie to Downtown Calgary
  - Bus service effectiveness will be affected by the congestion levels on Highway 2. Improvement of the inter-municipal road network would also benefit the ICE bus service.

The inter-municipal planning should include transit corridors extending north of Stoney Trail, Calgary to Airdrie. Calgary transit proposes BRT as precursor to LRT in several areas. An initial stage reaching Airdrie could see BRT along dedicated rights-of-way. The needed rights-of-way should be identified early, before the land use planning and development stage.

4.2.11 East-West Regional Bypass

The province halted planning of the two metropolitan area regional ring roads in 2012 (Calgary and Edmonton). At the time, these facilities were estimated as needed in the 50+ year timeline. Identifying and protecting interchange spacing along Highway 2 to accommodate an ultimate east-west regional bypass location (Township Road 280) between Airdrie and Crossfield is provisional, to preserve this future option, including National Highway System objectives.

4.2.12 Key Planning Recommendations

Key planning considerations along the Calgary-Crossfield corridor include the following:

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4.2.12.1 Inter-Municipal Arterial Road Network

Road network planning is urgent. The local arterial network should be contiguous, linking Airdrie and Stoney Trail, and ultimately Crossfield. This planning should proceed as soon as possible through Rocky View County, affecting both Airdrie and Calgary ASPs. The proposed links are summarized in Table 4.2.6, including their potential to support commuting volumes.

Table 4.2.6: Primary Inter-Municipal Road and Transit Links

Priority	Roadway			Primary Mode		Potential to Support Highway 2 Commute
	Calgary (from Stoney Trail)	Rocky View	Airdrie (to Highway 567)	Road Standard	Transit Corridor	
AB	Shaganappi Tr. (urban expressway)	Highway 772 (rural expressway)	~7.5 km west of Airdrie boundary	Expressway		Low: Too far west
2	Center Street	Range Rd 13	24 Street	Urban Collector	Green Line	Roadway: Low Transit: High
1	11 Street	Range Rd 11	8 Street	Urban Blvd		Medium: if upgraded to arterial standard
3*	n/a	Balzac Blvd (from Hwy 566)	Main Street (to YVB)	Collector		Low: Not connected to Stoney Trail
AB	Deerfoot Trail	Highway 2	Through central Airdrie	Freeway		N / A
1	Metis Trail	Dwight McLellan Trail	Kingsview Blvd/ East Lake Blvd	Arterial	Blue Line	Roadway: High, if route is contiguous Transit: High
2	60 Street	Range Rd 291 or RR 292	Range Rd 290	Arterial		Medium: East & somewhat circuitous
AB	East Stoney Trail	Airdrie Bypass	~2 km east of Airdrie boundary	Freeway	N / A	Low: Too far east and circuitous to commuters

** Recommendation from the parallel Queen Elizabeth II / Township Road 264 Interchange FPS.*

4.2.12.2 HOV System

Study the potential to establish the key commuter route for HOV, from Airdrie along both Deerfoot and Stoney Trails, including initial BRT service.

4.2.12.3 Inter-Municipal Transit Corridors

Prepare corridor plans to:

- Achieve corridor identification and protection, not transit design, north of Stoney Trail, for both the City of Calgary's Green and Blue Lines.
- Permit Airdrie/Rocky View to incorporate transit line into their municipal plans.
- Permit advancing BRT, or other transit service, ahead of transit corridor.

4.2.12.4 Airdrie Bypass (East)

Begin corridor planning to identify the preferred alignment, network connections and right-of-way requirements.

4.2.12.5 East-West Regional Bypass

Conduct long-term network study to assess the merits of protecting a corridor that would connect Highway 1 East with Highway 2 North and with Highway 1 West. This would ensure that National Highway System objectives are met as the existing Stoney Trail ring road and Highway 2 south of Crossfield are built-out to maximum cross-section through an increasingly urban and congested environment.

4.2.12.6 Highway Upgrading

Identify and protect future right-of-way requirements at the following locations:

- CrossIron Drive interchange, west leg, City of Calgary
- Township Road 264 interchange, City of Airdrie / Rocky View County
- 40th Avenue interchange, City of Airdrie
- Township Road 273, future flyover, City of Airdrie
- Township Road 274, future service interchange, City of Airdrie
- Township Road 280, provisional location for a future system interchange with potential east-west regional bypass, Alberta Transportation
- Highway 2A / 72, future modifications to accommodate proximity to southbound Safety Rest Area, Alberta Transportation
- Township Road 285 (Limit Avenue), potential future directional interchange with Airdrie Bypass, Alberta Transportation

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4.3 Carstairs – Red Deer – Millet

The Carstairs – Red Deer – Millet corridor is defined as the 195-kilometer section of Highway 2 from the Acme Road Interchange (Township Road 292) south of Carstairs to the Tower Main Road Interchange (Township Road 482) north of Millet. It is bounded by the Calgary and Edmonton metropolitan regions with Red Deer at the approximate mid-point of the corridor. The City of Red Deer (2016 population 100,418 persons / 66,237 workers) is the third largest city in Alberta and sixth largest in Western Canada and is forecast to double in population over the next 30 years.

4.3.1 Existing Conditions

4.3.1.1 Planning and Upgrading

The most recent major infrastructure improvement in the area is the upgrade of Highway 2 between McKenzie Road and 32nd Street in Red Deer. This includes major revisions to the Gaetz Avenue / Taylor Drive / Highway 2A interchange that will be compatible with the long-term plans for the corridor. Other improvements have been sporadic throughout the corridor, such as:

- 6-lane rural section from Crossfield to south of Carstairs.
- South Innisfail Interchange with provision for 6-lane widening only.
- Grading for the 6-lane cross section between Bowden and Innisfail.
- Highway 11A interchange reconfiguration with provision for 6-lane widening and grading for 6-lanes between Highway 11 and Highway 11A.
- Conversion of the Highway 12 interchange reconfiguration with provision for 6-lane widening.
- Wolf Creek Bridge replacement south of Ponoka that will accommodate the 6-lane widening.

4.3.1.2 Sub-Area Corridor Constraints

In addition to the specific property constraints that were outlined in Appendix O, there are some key constraints that will have a significant impact on the improvements to the corridor:

- The existing developments in the urbanized area of Red Deer preclude widening beyond eight lanes. If the corridor requires additional capacity beyond 8 lanes a bypass will be required.
- In the Innisfail area, there is a section south of the Highway 590 interchange where the adjacent urban service road will likely not accommodate the 8-lane configuration and it is likely that Highway 2 will need to shift east at the 8-lane stage. This constraint must be reviewed with the long-term planning for the Highway 590 interchange, which is scheduled for replacement when Highway 2 is expanded to the 6-lane cross section.
- In the rural sections of the corridor, frontage service roads are common on one or both sides of Highway 2. These local roads may not provide opportunity for right-of-way widening to accommodate expansion of Highway 2. This will result in a common ditch between Highway 2 and the service roads if the service roads are not relocated. A common ditch may require a maintenance agreement with the adjacent municipality.
- Numerous waterway crossings throughout the corridor, including a major bridge at the Red Deer River where sensitive environmental conditions and community concerns exist.
- Railway alignments adjacent to the Highway 2 right-of-way potentially impact Highway 2 as room to expand the existing cross section may be restricted. Areas with parallel railway lines include:
  - North of Bowden adjacent the Bowden Institution, west side constrained by CP Rail line.
  - Highway 2A / Taylor Drive to south of Highway 11, west side constrained by CP Rail line.
  - Highway 2A at Milton Road to Highway 2A at Morningside, east side constrained by CP Rail line.

4.3.2 Land Use (Study Sub-Area)

Exhibits 4.3.1 Central Region Land Use Plans (5 Plans) illustrate the future development visions of each local municipality along the corridor. In the majority of plans, the land uses are assigned in general terms with only boundaries defined. In some cases, municipal plans indicate very intense development over a large area with no regard to traffic impact at the adjacent access points to Highway 2. Most of the plans are not supported by Traffic Impact Assessments (TIA) and the timelines for development are unclear. In all cases, municipalities have assumed that the Highway 2 corridor will accommodate the development traffic and provide the necessary access points to existing and proposed developments.

The extent of proposed developments in rural areas along Highway 2 will not be fully realized in the short term, in fact, many of the plans may not be realized within the timeframe of this study. Although we have illustrated all the development plans along the corridor, there is enough uncertainty in the development timeline that limits our ability to use the growth plans to generate traffic projections. The City of Red Deer has the most developed plans with respect growth and traffic impacts; however, they are currently in the process of updating their regional traffic model, which was not yet available.

For the purposes of our study, we have assumed that the contribution of traffic from approved developments to the Highway 2 corridor would be a part of general background traffic growth, which historically has been 2.5% annually over last 50 years. This section of the corridor simply does not have sufficient information to generate the traffic growth forecasts using population and employment patterns, as was done for the Calgary and Edmonton areas.

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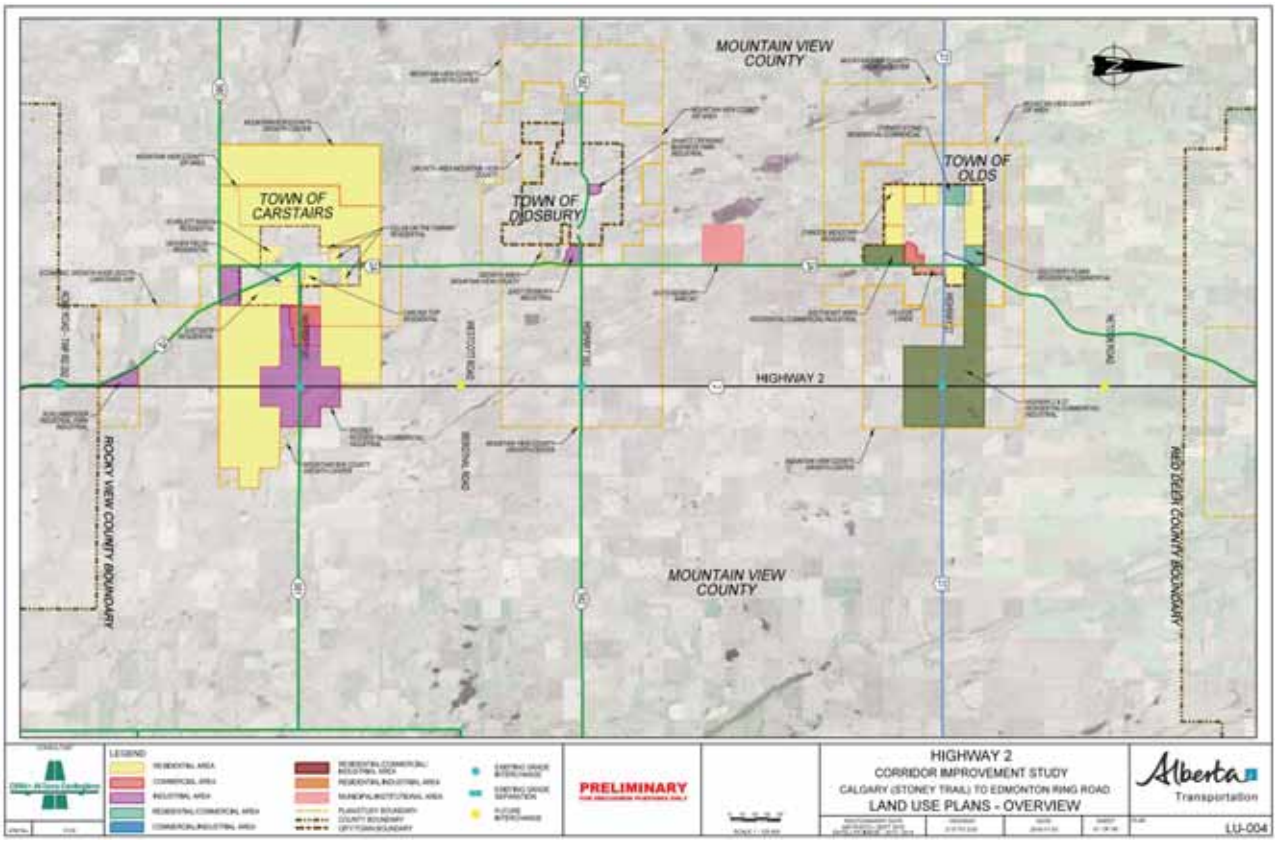
Exhibits 4.3.1-1: Central Region Land Use Plans



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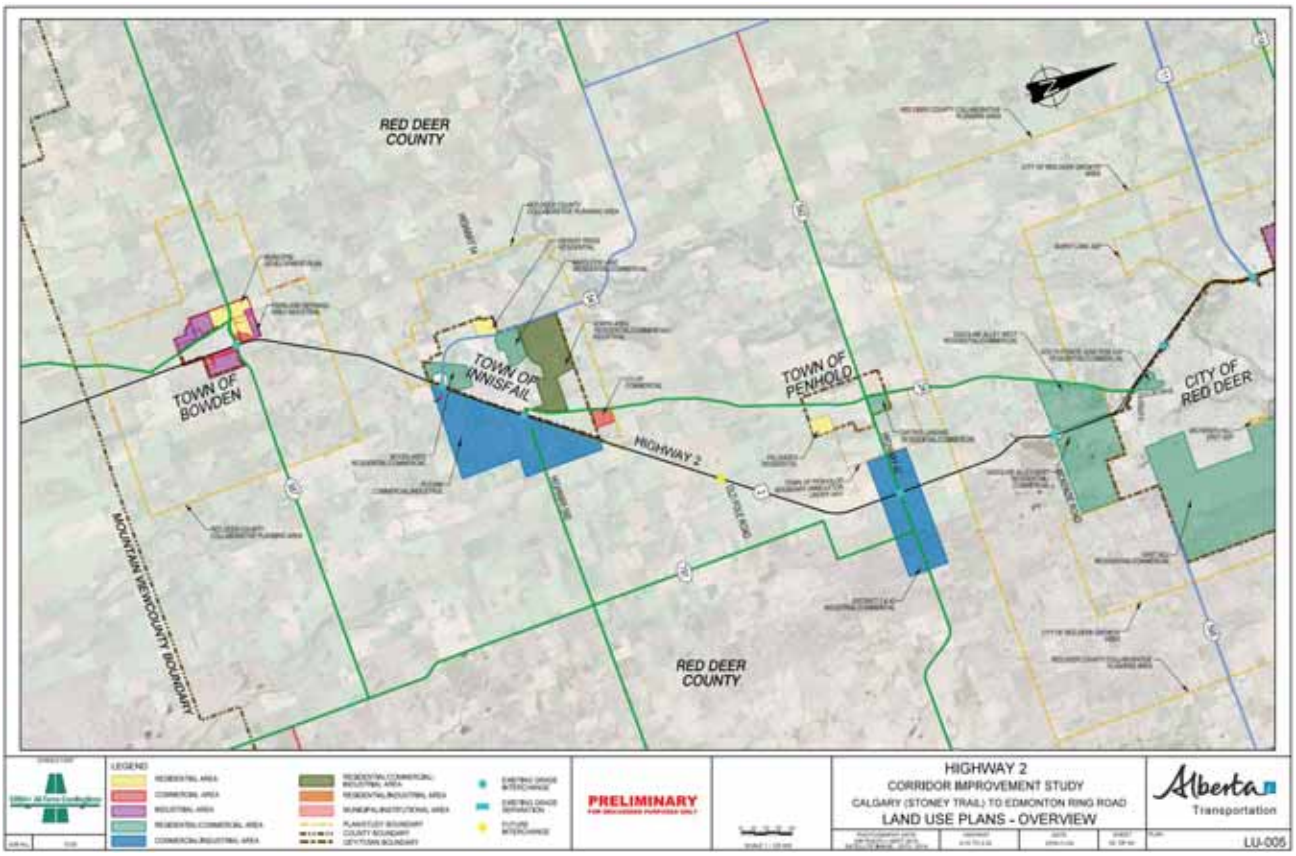
Exhibits 4.3.1-2: Central Region Land Use Plans



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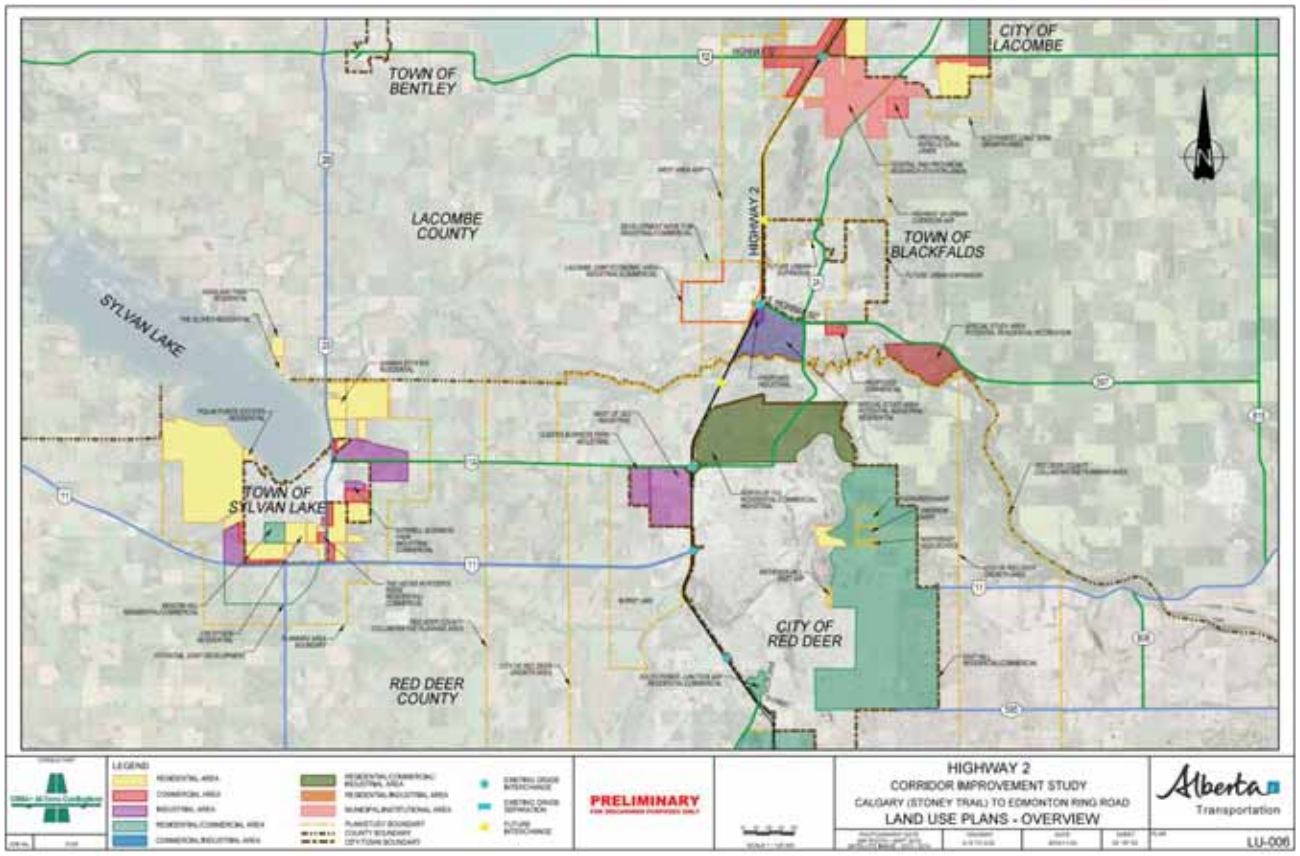
Exhibits 4.3.1-3: Central Region Land Use Plans



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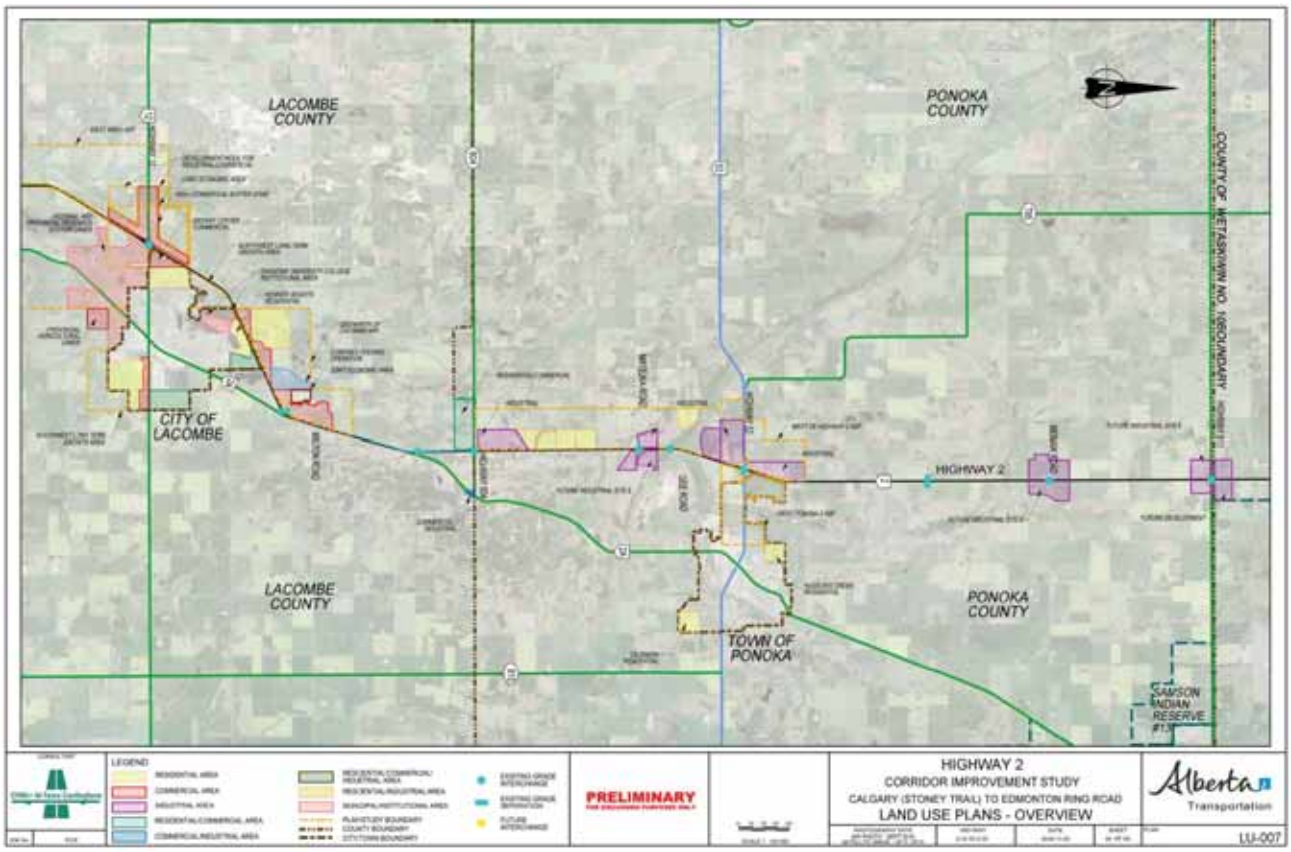
Exhibits 4.3.1-4: Central Region Land Use Plans



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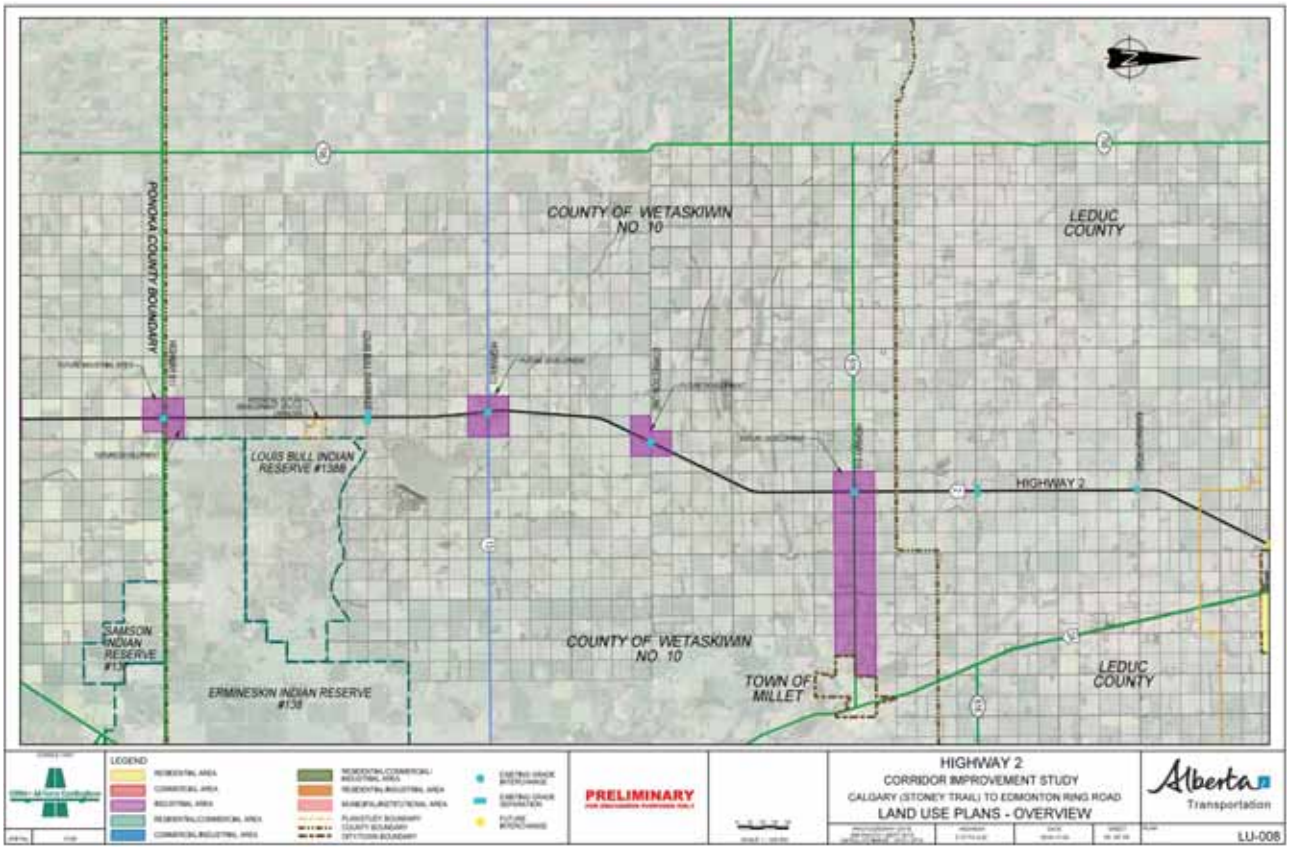
Exhibits 4.3.1-5: Central Region Land Use Plan



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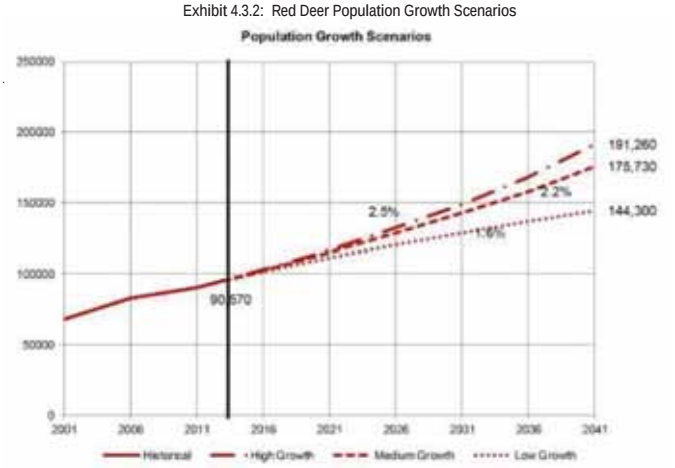
4.3.3 Population Growth

When assessing the impact of growth on the Carstairs – Red Deer – Millet sub-area, the most significant concern is around the City of Red Deer. The City of Red Deer is currently projecting 2.23% compound growth (using a "medium annual growth rate) through to the year 2041 as shown in Exhibit 4.3.2 – Red Deer Population Growth Scenarios. When we further project that growth rate through to year 2050, we find the City of Red Deer is expecting to double its existing population to more than 200,000 people in just over 3 decades.

Exhibit 4.3.2: Red Deer Population Growth Scenarios



*Source: "Statistics and Economic Profile." The City of Red Deer, 14 Feb. 2017, www.reddeer.ca/business/economic-profile/statistics-and-economic-profile/

Although the remaining land use plans along the corridor may have unknown timeframes for development, it is worthwhile noting that all of the plans are directing their expansion towards the Highway 2. All Municipalities are trying to either:

- Extend their boundaries to the Highway 2.
- Expand their boundaries adjacent to the Highway 2.
- Cross over the Highway 2 to develop on both sides of the corridor.

This potential level of growth adjacent to the Highway 2 corridor, if realized, has potential to challenge our 2.5% linear growth assumption which could accelerate necessary improvements beyond our current findings.

4.3.4 Corridor Traffic Volumes

Table 4.3.1 shows the 2016 AADT volumes along Highway 2 from Carstairs to Millet.

Table 4.3.1: 2016 AADT, Carstairs to Millet

From	To	2016 Daily Traffic Volumes	
		AADT	ASDT
Highway 581 - Carstairs	Bergthal Road	32,530	36,760
Bergthal Road	Highway 582 - Didsbury	32,360	36,570
Highway 582 - Didsbury	Highway 27 - Olds	31,090	35,140
Highway 27 - Olds	Netook Road	30.090	34,920
Netook Road	Highway 587 – Bowden	31,080	35,120
Highway 587 – Bowden	Highway 54 – South Innisfail	33,330	37,670
Highway 54 – South Innisfail	Highway 590 – North Innisfail	32,250	36,450
Highway 590 – North Innisfail	Old Pole Road	35,020	38,990
Old Pole Road	Highway 42 – Penhold	35,310	39,310
Highway 42 – Penhold	Highway 2A/Taylor Drive	27,840	30,690
Highway 2A/Taylor Drive	32nd Street – Red Deer	43,030	47,430
32nd Street – Red Deer	Highway 11 – Red Deer	53,880	59,390
Highway 11 – Red Deer	Highway 11A – Red Deer	41,900	46,430
Highway 11A – Red Deer	Highway 597 – Blackfalds	42,890	47,530
Highway 597 – Blackfalds	Highway 12 – Lacombe	35,810	39,690
Highway 12 – Lacombe	Highway 2A (North)	28,460	31,540
Highway 2A (North)	Highway 604 – Morningside	27,330	30,610
Highway 604 – Morningside	Matejka Road	26,890	30,120
Matejka Road	Gee Road	26,960	30,200
Gee Road	Highway 53 – Ponoka	27,050	30,300
Highway 53 – Ponoka	Menaik Road	28,060	31,900
Menaik Road	Highway 611 – Maskwacis	27,970	31,790
Highway 611 – Maskwacis	Highway 13 – Wetaskawin	27,270	32,130
Highway 13 – Wetaskawin	Correction Line Road	28,230	32,120
Correction Line Road	Highway 616 – Millet	28,310	32,210

The volumes on the rural areas outside Red Deer range from 27,000 vpd to 35,000 vpd, with slightly heavier volumes south of Red Deer. The volumes increase towards the City of Red Deer, which is also logical given it is a major traffic generator in central Alberta. The traffic volumes within the Red Deer area increase by close to 50%, which is due in part to the heavy local / commuter use of Highway 2 for the immediate area in and around Red Deer.

One of the concerns with this sub-region is the traffic volumes in the Red Deer area and the limited room the corridor has from McKenzie Road to Highway 11A. When we analyze the heaviest segment between 32nd Street and Highway 11 across the Red Deer River, we find the projected traffic on the facility will require 8-lanes less than 30 years and exceed the capacity of the 8-lane facility within 50 years. This analysis uses our assumed average corridor linear growth rate of 2.5%, which is less than the City of Red Deer's projected 2.23% compound growth rate. If development in the Red Deer

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area unfolds at the City's assumed rate, traffic demands will exceed the capacity of a future 8-lane facility in less than 50 years. To better understand the solution to this problem, we completed a detailed analysis of the traffic patterns within the Red Deer area.

4.3.5 Traffic Warrants

Appendix I includes the traffic projections and lane requirements for each rural section of the Highway 2 from Calgary to Edmonton. The data also includes the projected AADT for the 5, 10, 20, and 50-year horizons as well as the threshold values for the 4, 6, and 8-lane configurations to maintain the target LOS as defined in Section 3.3.2. The table also estimates the projected year that each section will require an upgrade to either 6 or 8-lane configurations. The projections are bases on an average linear growth rate of 2.5%; however, the actual historical growth rate over the last 10 years is shown for each segment for comparison.

When analyzing the Carstairs – Red Deer – Millet sub-region, the following Table 4.3.2: Red Deer Sub-Region Lane Requirements summarizes the lane requirements for each time period.

Table 4.3.2: Central Sub-Region Lane Requirements

Location		Corridor Environment	Target LOS	Target AADT			Existing		Approximate Time Line to "Target AADT" at 2.5% Linear Growth Rate							
From	To			To 6 Lanes	To 8 Lanes	To Bypass	2016 AADT	Basic Lanes	2020	2025	2030	2040	2050	2060	2070	2080
Acme Road (Twp. Rd. 292)	Highway 581, Cairstairs	Rural	B/C	34,000	54,500	83,200	32,900	4	36,200	40,300	44,400	52,600	60,900	69,100	77,300	85,500
Highway 581	Highway 582, Didsbury						32,500	4	35,800	39,800	43,900	52,000	60,100	68,300	76,400	84,500
Highway 582	Highway 27, Olds						31,100	4	34,200	38,100	42,000	49,800	57,500	65,300	73,100	80,900
Highway 27	Highway 587, Bowden						30,800	4	33,900	37,700	41,600	49,300	57,000	64,700	72,400	80,100
Highway 587	Highway 54, Innisfail						32,600	4	35,900	39,900	44,000	52,200	60,300	68,500	76,600	84,800
Highway 54	Highway 590, Innisfail						32,300	4	35,500	39,600	43,600	51,700	59,800	67,800	75,900	84,000
Highway 590	Highway 42, Penhold						35,000	4	38,500	42,900	47,300	56,000	64,800	73,500	82,300	91,000
Highway 42	McKenzie Road, Red Deer *	Suburban	C/D	47,700	71,500	95,300	37,300	4	41,000	45,700	50,400	59,700	69,000	78,300	87,700	97,000
McKenzie Road	Gaetz Avenue / Highway 2A						43,000	4	47,300	52,700	58,100	68,800	79,600	90,300	101,100	111,800
Gaetz Avenue / Highway 2A	32 Street, Red Deer						43,000	4	47,300	52,700	58,100	68,800	79,600	90,300	101,100	111,800
32 Street	Highway 11 (plus Aux. Lanes)				95,300	117,500	53,900	4	59,300	66,000	72,800	86,200	99,700	113,200	126,700	140,100
Highway 11	Highway 11A, Red Deer				71,500	95,300	41,900	4	46,100	51,300	56,600	67,000	77,500	88,000	98,500	108,900
Highway 11A	Highway 597, Blackfalds						42,900	4	47,200	52,600	57,900	68,600	79,400	90,100	100,800	111,500
Highway 597	Highway 12, Lacombe**	Rural	B/C	34,000	54,500	83,200	35,800	4	39,400	43,900	48,300	57,300	66,200	75,200	84,100	93,100
Highway 12	Highway 2 / 2A (Milton Road)						28,500	4	31,400	34,900	38,500	45,600	52,700	59,900	67,000	74,100
Highway 2/2A (Milton Road) - South	Highway 2 / 2A Morningside						32,300	6	35,500	39,600	43,600	51,700	59,800	67,800	75,900	84,000
Highway 2/2A - North	Highway 604, Morningside						27,300	4	30,000	33,400	36,900	43,700	50,500	57,300	64,200	71,000
Highway 604	Matejka Road						26,900	4	29,600	33,000	36,300	43,000	49,800	56,500	63,200	69,900
Matejka Road	Gee Road						27,000	4	29,700	33,100	36,500	43,200	50,000	56,700	63,500	70,200
Gee Road	Highway 53, Ponoka						27,100	4	29,800	33,200	36,600	43,400	50,100	56,900	63,700	70,500
Highway 53	Menaik Road						28,100	4	30,900	34,400	37,900	45,000	52,000	59,000	66,000	73,100
Menaik Road	Highway 611, Usona						28,300	4	31,100	34,700	38,200	45,300	52,400	59,400	66,500	73,600
Highway 611	Highway 13, Wetaskiwin						28,000	4	30,800	34,300	37,800	44,800	51,800	58,800	65,800	72,800
Highway 13	Correction Line						28,200	4	31,000	34,500	38,100	45,100	52,200	59,200	66,300	73,300
Correction Line	Highway 616, Millet						28,300	4	31,100	34,700	38,200	45,300	52,400	59,400	66,500	73,600
Highway 616	Kavanagh / Glen Park Road						29,100	4	32,000	35,600	39,300	46,600	53,800	61,100	68,400	75,700

* Penhold to Red Deer is at the LOS transition from rural to suburban and consideration could be given to treat as a rural environment to provide a consistent cross-section.
** Blackfalds to Lacombe is at the LOS transition from rural to suburban and may exceed rural target AADT to provide consistent cross section.

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As clearly demonstrated in the information above, much of the 197-km corridor in the Carstairs – Red Deer – Millet sub-region will require a 6-lane cross section within the 10-year horizon. Given this improvement will require significant lead time to secure funding, land, relocate utilities, and complete the planning and design, preparatory work should begin immediately.

Within the 50-year horizon, the entire corridor will require an 8-lane cross section, with the exception of the section between Highway 2A / Taylor Drive and Blackfalds, which will exceed an 8-Lane cross section requirement. The available land and practicality of a facility larger than 8 lanes limits further expansion in this area. Consequently, a Red Deer bypass route must be considered to alleviate the pressure on the existing Highway 2 and extend its capacity.

4.3.6 Inter-Municipal Arterial Roadway Network

The original inter-municipal roadway to connect the rural communities between Calgary and Edmonton was Highway 2A, which was the precursor to Highway 2. Over time, Highway 2 has become a magnet for municipal growth, which is clearly demonstrated by the current municipal land use plans. While a good transportation system is a key economic enabler, controlling growth around a major transportation corridor is critical to maintain the long-term benefits associated with the transportation infrastructure.

Because the sub-area corridor is linear with small to medium sized population and employment centers, opportunities to develop additional inter-municipal roadways, other than Highway 2, is limited. Highway 2A remains an important link between communities, but in its current form as a collector roadway, there is little opportunity to divert local / commuter traffic off the Highway 2 corridor, particularly since Highway 2A is discontinuous through Red Deer.

Conclusion: Study the potential to convert Highway 2A to an expressway standard, with urban arterials through connected communities as an inter-municipal arterial roadway and its potential to divert significant volumes of local and commuter vehicle traffic away from the Highway 2 corridor. This study should include an examination of a Red Deer regional bypass to determine infrastructure investment priorities that would deliver the best long-term value for the region.

4.3.7 Red Deer Bypass

It is critical to appreciate that the City functions not only as a stand-alone municipality but as a regional hub attracting traffic across central Alberta, including nearby communities such as Sylvan Lake, Ponoka, Lacombe, Blackfalds, Penhold, Innisfail and Bowden. The Highway 2 corridor is essential to the economic development of this regional hub. The following options were identified as part of the assessment of the Highway 2 corridor in the Red Deer region:

- Upgrades to the capacity of the Highway 2 corridor through Red Deer (up to 4 lanes-per-direction);
- The City of Red Deer's Ring Road Concept;
- Red Deer Transit: Future Enhancements; and
- A freeway by-pass option (N of Lacombe-to S of Penhold);

It can be appreciated that the Highway 2 corridor through the Greater Red Deer area accommodates both "freeway through" traffic (i.e traffic travelling through the community with at most a gas-fill-up or meal along the trip) in addition to "local" traffic (i.e. traffic that originates from, and is destined to, areas within the Red Deer area.). The distinction between these two traffic components is essential in appreciating that as "local" development intensifies within the Red Deer urban area traffic demands along the Highway 2 corridor are anticipated to increase perhaps faster than 2.5% average historical annual growth rate experienced in "freeway through" traffic. The combined effect of both "local" and "freeway through" traffic demands have been found to exceed the capacity that could be offered by additional freeway upgrades that would provide up to 4-lanes in each direction of travel. Put simply, widening the Highway 2 corridor beyond an 8 lane cross section through the urban municipality of Red Deer to accommodate a significant "local" traffic component presents constraints and costs which are indeed significant given the number of interchange, bridges and tunnels that would be required to be modified.

As such, a Highway 2 freeway by-pass option was evaluated. Exhibit 4.3.3 conceptually illustrates such a Highway 2 by-pass option that could potentially be aligned along the east side of the City of Red Deer from a point north of Lacombe (Highway 12) to a point south of Penhold (Highway 42). This concept was evaluated using the existing origin-destination information detailed in Section 3.3.3 to provide an estimate of the extent of existing traffic that would divert to such a facility if it had already existed in the fall of 2016.

Exhibit 4.3.3 Existing Traffic Diversion to Red Deer East Bypass Option

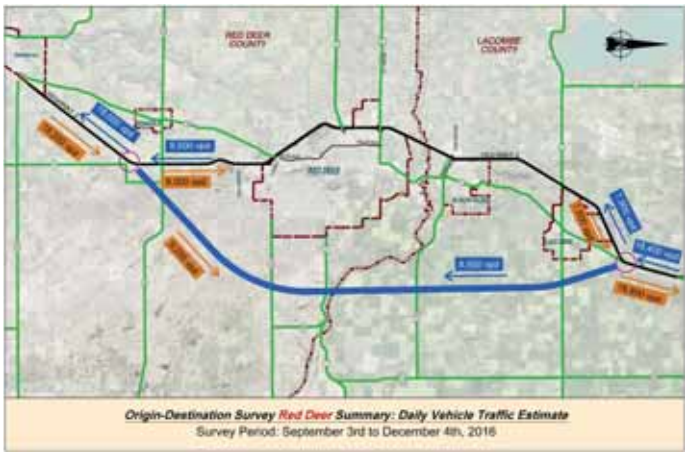

Exhibit 4.3.3 indicates that, if an eastern bypass facility did indeed exist, a review of current travel demand estimates indicates that approximately 50% - 60% of the existing vehicle traffic that currently use the Highway 2 corridor through Red Deer would divert to such a facility.

Discussions regarding such a by-pass facility highlighted concerns, advantages associated with considering such a facility which include:

- The socio-economic impact to the Greater Red Deer area including Sylvan Lake and the outlying towns, hamlets and communities.

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- The resulting timing, construction costs, physical and geometric requirements and potential staging of such a by-pass facility along with locations of potential interchanges along a new corridor.
- The alignment of a bypass. (Consultation with municipal officials indicated the desire to also assess the effectiveness of a by-pass solution along the west side of Red Deer.).
- The integration with current municipal roadway plans which include, but is not limited to, the development of an urban ring road corridor around the City of Red Deer.
- The infrastructure savings associated with no longer having to accommodate additional freeway expansions inclusive of freeway widening, bridge / tunnel widening, and interchange improvements associated with the existing Highway 2 corridor, perhaps beyond a 6-lane cross-section.
- The cost savings in terms of travel time for both "local" and "freeway through" traffic in that separate facilities would exist to accommodate both components of traffic.
- The ability to satisfy the requirements to provide additional north-south freeway capacity beyond that which could be provided by 8 lane Highway 2 cross section along the existing corridor.
- The role a bypass will play in maintaining National Highway System mandate for Alberta's major north / south corridor.

Planning for such a bypass option merits further consideration. Additional functional planning would prove worthwhile in identifying the merits, benefits and significant costs associated with entertaining such a solution. The finding that further expansion of the existing Highway 2 corridor to a 4-lane-per-direction concept fails to meet forecast demand, has significant implications, and highlights that planning for an alternative corridor, is prudent.

4.3.8 Inter-Municipal Transit Planning

Transit in this sub-area is provide by the following services:

- City of Red Deer, serving the City of Red Deer.
- BOLT Regional Transit, serving Blackfalds and Lacombe, and Red Deer.
- Red Deer County Transit, serving Gasoline Alley, Springbrook, and Red Deer.

With the introduction of BOLT and Red Deer County Transit, the area is beginning to address inter-municipal transit planning; however, with the population density significantly less than what we see around Calgary and Edmonton, potential solutions such as BRT or LRT are simply not applicable in this sub-area. Expanded regional transit may continue to occur as population increases and as demand warrants; however, it is not likely to have a significant effect on diverting traffic off Highway 2.

4.3.9 Key Planning Recommendations.

Key planning considerations as illustrated in Exhibit 4.3.4 Urban Areas Road Network – Red Deer along the Carstairs – Red Deer – Millet corridor include the following:

4.3.9.1 Highway Upgrading

Identify and protect future right-of-way requirements for the ultimate configuration for the Highway 2 corridor as well as any interchanges where the ultimate configuration is not yet identified.

4.3.9.2 Inter-Municipal Arterial Road Network – Including Red Deer Ring Road

Conduct a long-term network study to assess the potential to convert Highway 2A to an expressway standard, with urban arterials through connected communities as an inter-municipal arterial roadway and its potential to divert significant volumes of local and commuter vehicle traffic away from the Highway 2 corridor.

A Ring Road around the City of Red Deer will be an important element of an inter-municipal arterial road network in the greater Red Deer Region. This ring road would act as the link between Red Deer to the surrounding communities, allowing Highway 2 to function as the north / south Level 1 Route between Calgary and Edmonton.

4.3.9.3 Red Deer Bypass

Begin corridor planning to identify the preferred alignment and right-of-way requirements for a Red Deer Bypass that would divert the Highway 2 through traffic between Penhold (Highway 42) and Lacombe (Highway 12). This study should review the financial obligations to upgrade the Highway 2 to an 8-lane section between Penhold and Lacombe and determine whether these dollars could be diverted to a Red Deer bypass and defer or remove the need for the 8-lane facility through Red Deer.

4.3.9.4 Inter-Municipal Transit

As demand for transit service increases, additional coordination or amalgamation of transit services should be considered to provide a comprehensive regional approach to service. This includes identification of potential inter-municipal transit corridors, so they are protected for future initiatives once demand warrants are met.

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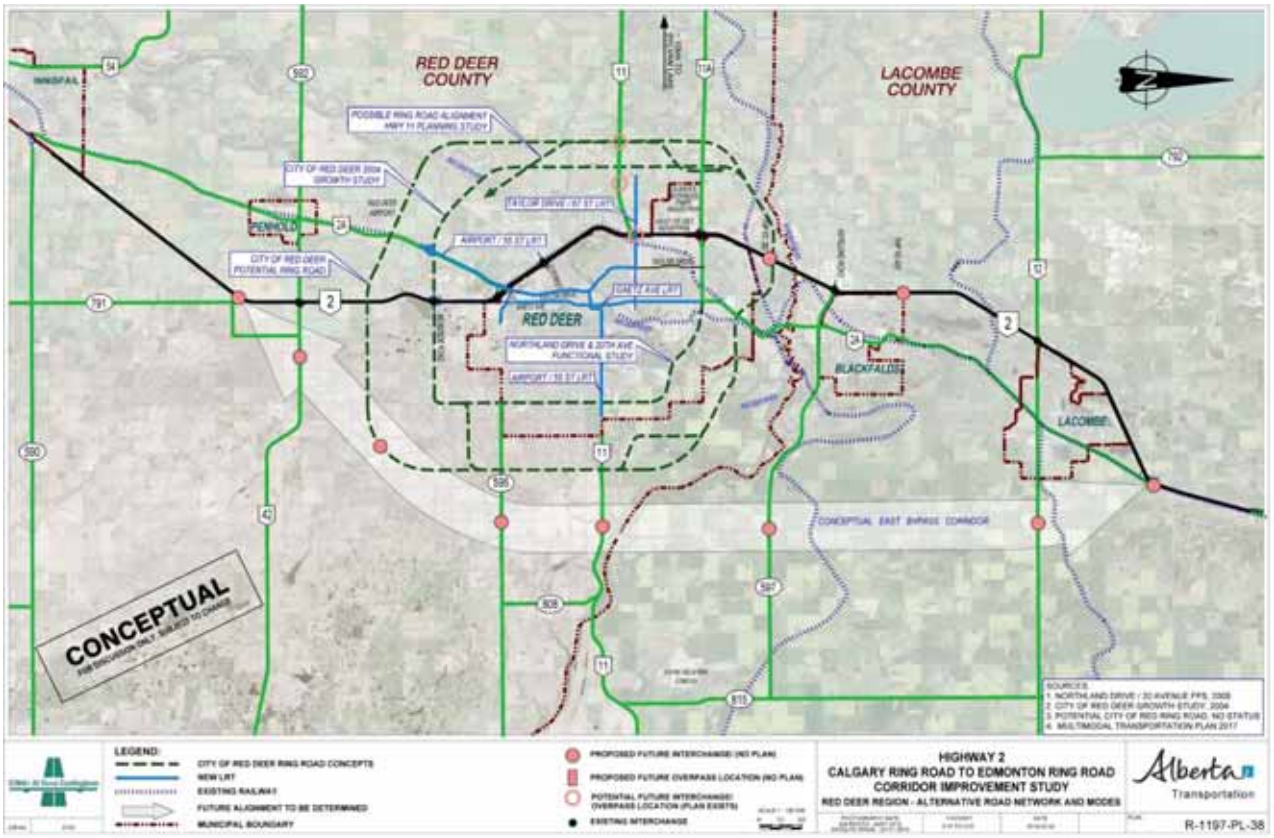
Exhibit 4.3.4: Urban Areas Road Network – Red Deer



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4.4 Leduc – Edmonton

The Edmonton-Leduc corridor is defined as the 35 kilometer section of freeway that extends from the Highway 2 – Tower Main Road (Township Road 482) Interchange to just south of the Anthony Henday Interchange. The Edmonton-Leduc area (2016 population 1.1M persons City of Edmonton / 1.3M persons Edmonton CMA / City of Edmonton Employment 825,000 workers) represents the sixth largest CMA in Canada.

Aside from its role as the Provincial Capital and its critical function as a hub for Alberta's petrochemical industries, the City's geographical location accommodates numerous distribution and logistics functions, hosting CN Rail's North American operational facility, major intermodal facilities accommodating incoming freight, boasts a reputation as one of Canada's premier research and education centres, serves as the major economic centre for Northern and Central Alberta hosting major financial centres, with both regional offices of Canada's major banks and locally based institutions. The CMA is forecast to grow over the next 30 years (2050) to accommodate 2.2M residents and long-term ultimate forecasts envision 3.6M residents.

4.4.1 Corridor Constraints

In addition to the specific property constraints that were outlined in Appendix O, there are some key constraints that will have a significant impact on the improvements to the corridor:

- In the Leduc area, a system of core lanes, cd roads, and possible ITS Traffic Management solutions (such as a video traffic management system or the installation of priority lanes) may be used to accommodate future long-term traffic; however, there is a practical limit on expansion of the existing Highway 2 corridor to meet the necessary long-term capacity requirements.
- CP Railway alignments adjacent to the Highway 2 North of Leduc to north of 41st Avenue.
- Future transit linkages within Edmonton metropolitan regions as well as the potential for an ultimate high-speed rail line between Calgary and Edmonton should be considered.
- Three geometric constraints related to interchange spacing:
  - Separation between the Highway 2A and 50th Avenue interchanges is only 1.3 km.
  - Separation between the 50th Avenue interchange and the 50th Street northbound-eastbound slip off ramp is only approximately 1.2 km.
  - The consecutive northbound egress ramps permitting access to Sparrow Crescent and the Airport Road Interchange are separated by only 450m do not comply with the requirements of the Highway Development and Protection Regulation, Freeway Access Designations Order (O.C. 587 / 2009).

4.4.2 Land Use (Study Sub Area)

Exhibit 4.4.1 serves to illustrate the Leduc-Edmonton study sub-area which is bounded by:

- Anthony Henday Drive on the north.
- Range Road 254 and Range Road 269 on the west (just east of Devon and west of the Edmonton International Airport.
- City of Leduc South Urban limits on the south.
- Range Road 245 (just west of Saunders Lake) on the south-east and Range Road 234 (extension of the East AHD corridor southward including the community of Beaumont) on the north-east.

Exhibit 4.4.1: Leduc-Edmonton Study Area



The study sub-area limits were selected to represent the anticipated geographic extent from which traffic could to divert to / from the Highway 2 corridor. Planning documents, historical growth and development patterns, and growth forecasts for each of the jurisdictions within the sub-area were reviewed to develop land use forecasts.

It is assumed that ultimately the lands located between the City of Edmonton's current urban boundary (41st Avenue) and the Edmonton International Airport (EIA) Highway 19 / 625 corridor (on both sides of the Highway 2 corridor) will be urbanized over time.

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Table 4.4.1: Leduc-Edmonton Sub-Area - Existing and Forecast Demographic Information

Year	2016		2050 RTM Horizon (35 years)		Long-Term RTM Horizon (70 years)	
	Population	Employment	Population	Employment	Population	Employment
City of Edmonton	74,100	16,400	259,000	63,500	329,000	98,800
City of Edmonton Annexation Area	500	0	169,600	24,000	224,400	100,600
Town of Beaumont	13,400	550	24,000	1,200	19,000	3,600
Town of Beaumont Annexation Area	4,800	200	21,400	1,500	71,500	8,600
Leduc County	2,900	10,100	8,700	29,400	64,600	50,700
City of Leduc*	30,500*	16,500*	54,200 - 57,500*	34,600 - 42,900*	111,000*	38,400*
TOTAL	126,200	43,750	~ 540,000	~162,000	819,500	300,700
Average Annual Rate of Growth Excluding Annexation Areas			5.4%		4.8%	
Total RTM Model	1.29M		2.52M		3.55M	
Average Annual Rate of Growth			2.7%		2.5%	

RTM – Regional Transportation Model
** Source: City of Leduc Transportation Master Plan*

The population and employment forecasts are summarized within Table 4.4.1. Highlights include:

- The average annual rate of growth based on the totals within the table are significant. (Approximately 9.3% by 2050 and 7.8% in the long term), however this is attributed to the effect of the growth within the City of Edmonton and Town of Beaumont annexation areas which currently (2016) have very low development levels. The average annual rate of growth when the two annexation areas have been excluded from the calculation results in approximately 5.4% by 2050 horizon and 4.8% in the long-term horizon. Although these growth estimates may still seem high it can be appreciated that the sub-area itself is on the urban fringe and therefore prone to higher rates of development growth.
- The land use estimates for the Edmonton International Airport (EIA) have been excluded from the table. The EIA is a significant generator of traffic and employment (estimated at 12,600 jobs) within the area, however, its traffic levels are to a much greater extent dependent upon such factors as the number of enplaned / deplaned passengers (approximately 8M total passengers in 2017), cargo operations, private (FBO resource-based) flight centre activity, in-field operations, and all of the necessary support required to maintain flight and terminal operations. Typical schedules at the EIA are not 9 - 5 for most airport / terminal employees. As well, some of the proposed future lands uses within the EIA lands can also be considered special generators such as the proposed entertainment facility which would be holding peak events involving horse racing outside of the conventional peak hour time periods. As such, the activity level within the EIA lands have been addressed separately within the RTM model as forecast travel demand could not be represented by simple population and employment estimates.

4.4.3 Population and Employment Patterns

Total population and employment levels have been referenced from the Province's Regional Transportation Model's (RTM) Traffic Analysis Zones (TAZ) in addition to estimates provided from a thorough evaluation of the Edmonton International Airport (EIA) land uses, and the City of Leduc's Transportation Master Plan. The colors in the following figures represent the relative amount of population and employment levels within each traffic zone.

An appreciation of each traffic zone is required in terms of rural vs urban characteristics, the comparative size of traffic zone to one another, and the extent of development within each zone is required to appreciate the density, such as around Leduc, Beaumont and South Edmonton in terms of population and South Edmonton, Nisku and the EIA area in terms of employment.

Exhibits 4.4.2, 4.4.3 and 4.4.4 illustrates the population and employment patterns for the anticipated level of growth within Leduc and Edmonton sub-area. When employment and residential areas are superimposed upon one another, one can appreciate that the entire corridor between the southern limit of the City of Leduc and Edmonton's current 41st Avenue south boundary is forecast to essentially be infilled or urbanized / developed by the long-term horizon.

Exhibit 4.4.2
2019 (existing):

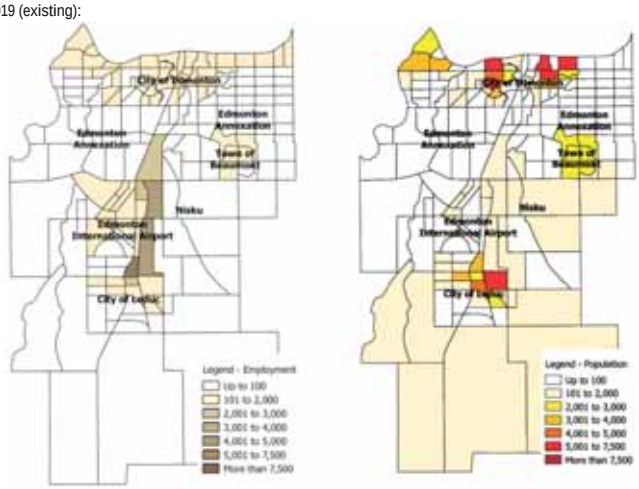

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Exhibit 4.4.3
2050 Horizon:

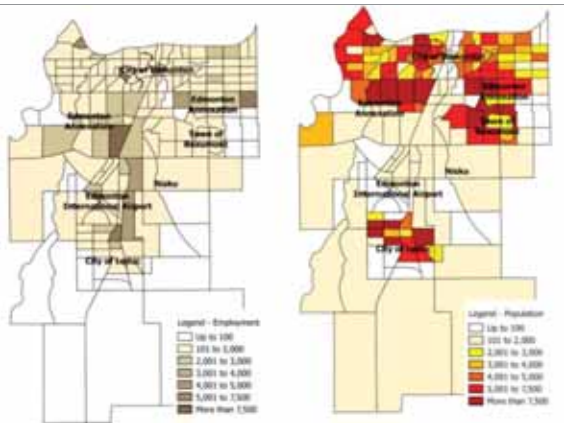
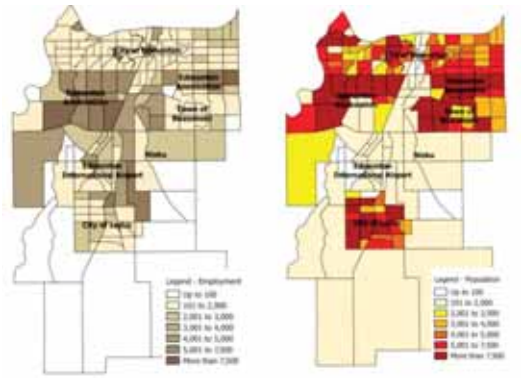


Exhibit 4.4.4
Long-Term Horizon:



The following initiatives remain worthy of note:

- *City of Leduc Lands:* The City of Leduc over the next three decades is anticipated to almost double in size as the municipality continues to actively pursue the development of the lands within it current boundaries. The 30-year land use forecast assumed within the City of Leduc's Transportation Master Plan envisions the following thresholds:
  - 54,200 persons in the entire City boundaries with 30,200 west of the Highway 2 corridor and approximately 24,000 persons east of the Highway 2 corridor;
  - 34,600 employees in the entire City boundaries with 26,500 employees west of the Highway 2 corridor and 8,100 employees east of the Highway 2 corridor. Significant employment initiatives that would directly impact the Highway 2 corridor include the development of the 65th Avenue West lands;
- *Existing City of Edmonton South Lands*: Independent of the annexation area south of 41st Avenue and north of the EIA, the lands within the current City of Edmonton boundaries are anticipated to also experience significant growth. The 30-year (2050) land use forecasts for the area bounded by Anthony Henday Drive on the north, 41st Avenue on the south, the Bow River on the west and RR 234 on the east were as follows:
  - 259,000 persons in the entire south area with 153,100 persons west of the Highway 2 corridor and 105,900 persons east of the Highway 2 corridor; and
  - 63,500 employees in the south area with 31,000 employees west of the Highway 2 corridor and 32,500 employees east of the Highway 2 corridor.
- *Town of Devon*: Although the community of Devon is located about 12 kilometers west of the Highway 2 corridor, the community depends on the Highway 2 (and Highways 19 and 39 corridors) corridor to provide access to/from the southern parts of the Province. A review of the current municipal development plan indicates that Devon is anticipated to double in size over a 30-year period from its current 6,900 persons to a level in the range of 11,800 - 14,100 persons[16].
- *Other Significant Development Initiatives:* have occurred within the Leduc area which may not have been addressed within previous studies. These include such developments as:
  - Development within the Edmonton International Airport (EIA) Lands such as the 580,000 SF Premium Outlet Collection retail development, a proposed Costco, the Century Mile Race Track / Entertainment facility, various on-site air cargo facilities, the 800,000 SF Aurora Sky facility will, collectively, serve to add additional traffic to the Highway 2 corridor;
  - The Canadian Pacific Railway has completed its first phase of its intermodal rail-truck facility where containers arriving on rail cars are moved onto trucks for the shipment of the goods / material throughout Edmonton and Northern Alberta. The facility is located on the east side of the Highway 2 corridor adjacent to the new 41st Avenue interchange.
- Lastly, the effect of the *urbanization* of lands within the City of Edmonton's Annexation area, (which is described in further detail and illustrated within Section 4.4.7) is sure to have a significant impact upon the Highway 2 corridor, particularly between Highway 19 and 41st Avenue.

To illustrate the land use plans in the Leduc – Edmonton sub-region we have included Exhibit 4.4.5.

[16] "*Town of Devon Municipal Development Plan*" (August, 2017) ISL Engineering, Page 10

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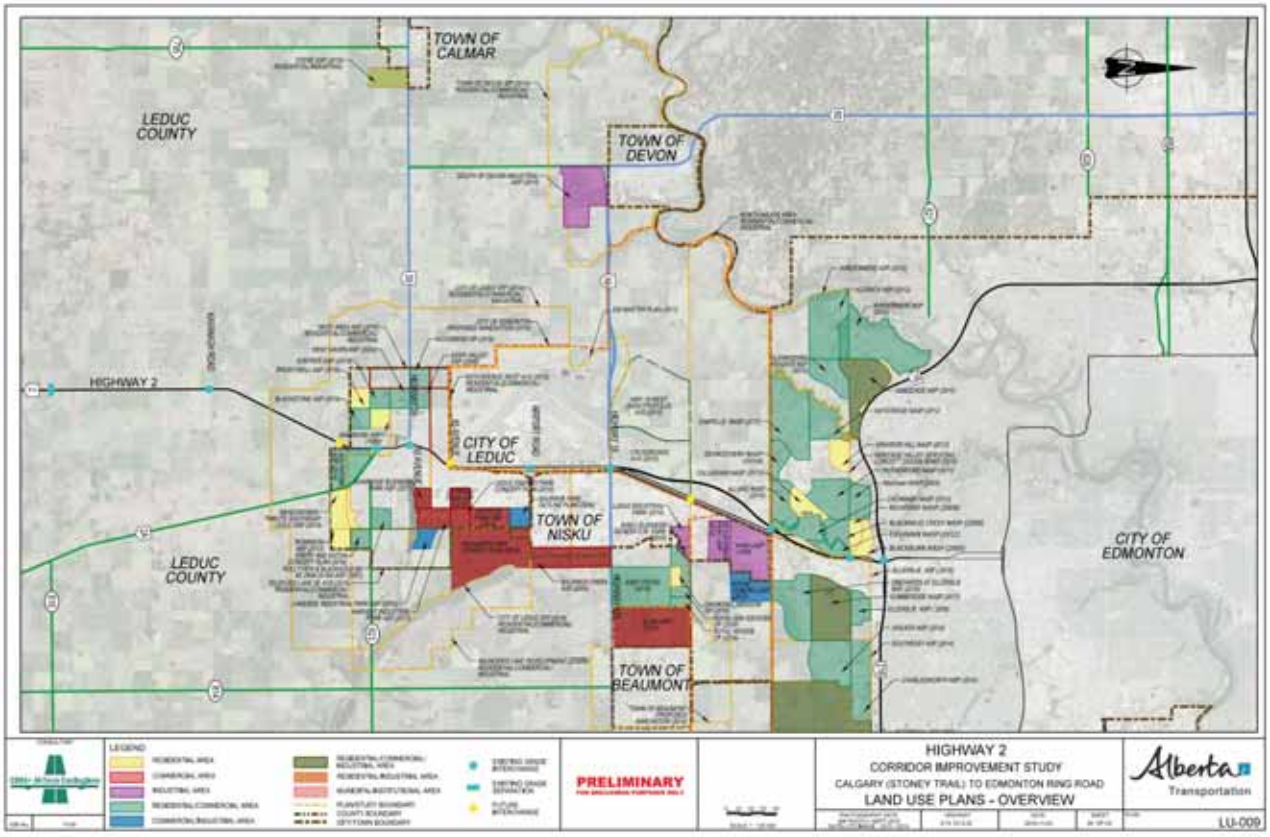
Exhibit 4.4.5: North Central Region Land Use Plans



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4.4.4 Corridor Traffic Volumes

Table 4.4.2 indicates the current traffic volumes within the Leduc-Edmonton area (south of Highway 2A to Anthony Henday Drive) based on 2016 daily traffic volumes and provides insight to current travel trends along the Highway 2 corridor.

Table 4.4.2: 2016 AADT Leduc-Edmonton Corridor

From	To	2016 Daily Traffic	
		AADT	ASDT
Highway 2A Interchange (proposed)	Old Highway 2A Interchange	42,700	48,580
Old Highway 2A Interchange	Black Gold Drive Underpass, Leduc	42,700	48,580
50 Avenue Interchange, Leduc	50th Street Fly-Over	53,100	60,420
50th Street Fly-Over	Airport Road Interchange	66,500	71,330
Airport Road Interchange	Highway 19 / 625 Interchange, Nisku	79,960	85,770
Highway 19 / 625 Interchange, Nisku	41 Avenue SW Interchange, Edmonton	84,990	91,160
41 Avenue SW Interchange, Edmonton	Ellerslie Road Interchange	88,220	94,630
Ellerslie Road Interchange	Highway 216 - AHD Systems Interchange	98,220	105,350
Highway 216 - AHD Systems Interchange	North of AHD	78,330	84,020

In general:

- Current average summer peak traffic on the Highway 2 corridor from South-of-Leduc to Anthony Henday Drive ranges from 48,000 vehicles-per-day to 105,000 vehicles-per-day during the peak summer period. In general, summer daily traffic volumes are about 14% higher than average AADT values on the rural portion of the Highway 2 corridor south of Leduc and decrease to about 7% on the section of the corridor from south of the 50th Street fly-over as the local traffic mixes with the highway-thru traffic volumes.
- The effect of the existing local Leduc-Nisku-EIA area traffic upon the Highway 2 corridor is clearly evident by comparing the relative traffic volumes along the Highway 2 corridor: Of the total daily traffic volumes on Highway 2 north of Ellerslie Road:
  - Approximately 43% originate from, or are destined to, areas south of Leduc-Nisku-EIA. This can be considered *"highway-thru"* traffic.
  - Approximately 38% originate from, or are destined to, the Leduc-Nisku-EIA area. This component can be considered *"local"* traffic which results in traffic almost doubling along the Highway 2 corridor.
  - Approximately 19% originate from, or are destined to, the portion of Highway 2 bounded by Highway 19 on the south, to a point just north of Ellerslie Road. For the most part this component is *"local"* traffic roughly split between the north Nisku area, and Edmonton South.

  Of the total traffic on Highway 2 just north of Ellerslie Road, 57% can be considered local urban commuter / commercial traffic and 43% highway-thru traffic.
- A comparison of the daily traffic north of Airport Road (84,990 vpd) to the daily traffic south of the Highway 2A interchange (42,700 vpd) indicates that the effect of Leduc-Nisku-EIA area upon the Highway 2 corridor is one that roughly doubles traffic volumes.

Table 4.4.3 highlights the directional distribution of Highway 2 traffic at the Anthony Henday (Highway 216) / Highway 2 interchange and indicates that:

- Just over half of the daily traffic volumes continue northward along Calgary Trail and don't access AHD.
- Traffic volumes between AHD West and the Highway 2 corridor to the south are, at present, higher than that between Edmonton East and the Highway 2 corridor.

Table 4.4.3: 2016 Turning Movement Pattern at Highway 2 / Anthony Henday Interchange

	Period	Description of Highway 2 Traffic	Direction on Anthony Henday Drive (Hwy 216) and Calgary Trail			
			Traffic Volume	To / from West (AHD West)	To / from North (Calgary Trail)	To / from East (AHD East)*
To / from Highway 2 South of Anthony Henday Drive (Hwy 216)	AADT	Combined NB & SB Traffic	98,200 vpd	25%	54%	21%
	AM Peak Hour	SB Traffic on Highway 2 South of Anthony Henday	4,350 vph	33%	37%	30%
		NB Traffic on Highway 2 South of Anthony Henday	4,860 vph	14%	71%	15%
		Combined NB & SB Traffic	9,210 vph	23%	55%	22%
	PM Peak Hour	SB Traffic on Highway 2 South of Anthony Henday	4,530 vph	22%	55%	23%
		NB Traffic on Highway 2 South of Anthony Henday	4,680 vph	26%	52%	22%
		Combined NB & SB Traffic	9,200 vph	24%	53%	23%

* The values within Table 4.3.3 were based on a single representative AT 2016 traffic count undertaken in August, 2016 which was prior to the opening of the north-east leg of Anthony Henday Drive which occurred on October 1, 2016. One may expect with the completion of the ring road that the proportion of travel to/from the east could have increased since the time of this traffic count.

4.4.5 Historical Growth Rates

Exhibit 4.4.6 illustrates the historical traffic growth information along the Highway 2 corridor within the study area that was referenced from Alberta Transportation sources[17].

The review of historical growth information examined both long-term and short-term periods to take into account, (and perhaps emphasize the effect of), the economic downturn in the energy sector which in terms of vehicle traffic volumes was felt in 2015 along the Highway 2 corridor.

[17] Alberta Transportation "Alberta *Highways 1 TO 986, Traffic Volume History 2004 – 2016*" Investment Strategies Branch, Transportation Modeling and Analysis

Exhibit 4.4.6 Historical AADT Graph: Leduc-Edmonton Corridor

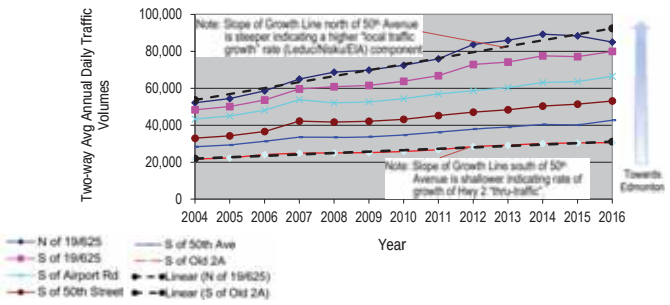

Table 4.4.4 illustrates the effect of determining average growth rates over 13-year, 10-year and 5-year periods:

- As growth is calculated over a more recent period (5-year) the effect of the economic downturn is more significantly represented in the form of average annual growth rate;
- A review of the annual growth characteristics of the northern section of the corridor in comparison to the southern section indicates that the economic downturn was found to affect the "local" traffic component to a much greater extent than highway thru-traffic component of traffic[18,19].
- Despite the economic downturn that occurred in the energy sector, average annual growth in traffic along the Highway 2 corridor over the last five years has not declined and of recent indicates signs of growth.

Table 4.4.4: Historical Average Annual Traffic (AADT) Growth: Leduc-Edmonton Corridor

Section of Leduc-Edmonton Corridor	2004-2016 Long Term Growth	2006-2016 Ten-Year Growth	2011-2016 Five-Year Growth
North Section of Leduc-Edmonton Corridor (From north of 50th Street to north of Highway 19)	4.1%	3.8%	3.1%
South Section of Leduc-Edmonton Corridor (From Hwy 2A to South of 50th Street	3.1%	2.7%	3.0%

- The average annual traffic growth rate over the last decade along the Leduc-Edmonton Highway 2 corridor:
  - North of the 50th Street flyover is 3.8%, which is significantly higher than the 2.5% average annual traffic growth rate along the entire corridor.
  - South of the 50th Street flyover the ten-year average annual growth is in the range of 2.7%.
- As one gets closer to Edmonton's urban area, the average annual traffic growth rate increases which accounts for the impact of dynamic traffic generators such Nisku and the EIA.

4.4.6 Traffic Warrants

Traffic warrants for improvements for the North-Central region were determined based on a two track approach which involved:

- *A "growth-factor" method*: This method applied a uniform rate of traffic growth along this section of the corridors length to existing traffic volumes (See Table 4.4.5) [The current average annual rate of traffic growth is indicated in Table 4.4.4. and was found to be 3% or above.];
- *A "travel demand modelling" method*: This method made use of the Regional Transportation Model (RTM) as well as travel demand models developed as part of the 65th Avenue Functional Planning Study to provide forecasts for the 10-year, 20-year and 30-year time horizons.

Although both methods are valid as regards establishing growth forecasts, the latter provides a distinction in that:

- Growth rates associated with developing lands (such as the future annexation area) are expected to be far greater than would occur on those sections of the Highway corridor which are more rural and outside of municipal boundaries. The base traffic volumes along the sections of the corridor where future interchanges are being planned are the same as the volumes on either side. This is an inaccurate assumption as it does not account for the impacts of new developments such as within the annexation area (e.g. Township Road 510).
- Applying a flat growth rate does not account for areas (or highway segments) that would experience significant growth and require either more robust infrastructure, or infrastructure sooner than what a flat growth rate would indicate (e.g. Nisku and the Edmonton International Airport lands).

Table 4.4.5 highlights the results generated from adopting a "growth-factor" approach based upon an average annual growth rate and adopted thresholds for capacity. The thresholds transition from adding additional freeway lanes to establishing the core lanes along the QE II corridor and the ultimate requirement for the Terwillegar South Extension. The table assumes that the core lanes would be required first prior to the Terwillegar South Extension as indicated by ("To By-pass"); however, this assumption remains to be validated in that, should the Terwillegar South Extension be initiated prior to the development of the Highway 2 core lanes, development of the core lanes can be delayed.

Table 4.4.6 highlights the calculation of the applicable threshold per-lane capacities when additional infrastructure would be triggered.

Table 4.4.7 illustrates the results of the second approach involving travel demand modelling which also accounted for a strategy that would see development of the Highway 2 corridor proceed from the north and make its way southward. The table:

- Respects those locations where significant development initiatives in terms of growth are anticipated to occur; such as the Edmonton International Airport and the City of Edmonton proposed annexation lands; Adopts a construction staging strategy that would assure the smooth progression of construction activities.
- Highlights the requirement to initiate the development of the Highway 2 core and transfer lanes within 10 years.

[18] A review of 2015 and 2016 traffic volume information indicated that the Nisku industrial development was particularly affected by the downturn. As well, building permit information from the City of Leduc indicated a 60% decrease in residential units permits from 2014 - 2015 and a further 40% decline from 20015 - 2016. However, 2017 appears to indicate a re-bound as evidenced by the fact that up to September 2017, residential building permits have more than doubled over 2016 levels.

[19] Edmonton International Airport (EIA) passenger travel activity declined by about 2.5% between 2014 - 2016 (from 8.2M - 7.5M passengers-per-year), however, 2017 year-end passenger statistics have been estimated at 7.8M passengers.

Table 4.4.5: Approximate Timeline to 'Target AADT' at 2.5% Linear Growth Rate

Location		Corridor Environment	Target LOS	Target AADT					Existing		Approximate Time Line to "Target AADT" at 2.5% Linear Growth Rate							
From	To			to 6 Lanes	To 8 Lanes	Plus 2 Core Lanes	Plus 3 Core Lanes	To Bypass	2016 AADT	Basic Lanes	2020	2025	2030	2040	2050	2060	2070	2080
Twp. Rd. 482	Twp. Rd. 490 (Kavanagh / Glenn Park)	Rural	B / C	36,700	55,000	n/a		73,000	30,560	4	34,000	39,000	43,000	53,000	62,000	71,000	80,000	89,000
Twp. Rd. 490 (Glenn Park Road)	New Highway 2A								30,560	4	34,000	39,000	43,000	53,000	62,000	71,000	80,000	89,000
New Highway 2A	Existing Highway 2A	Transition	C / D	49,000	73,600			98,000	42,700	4	48,000	54,000	61,000	73,000	86,000	99,000	112,000	125,000
Existing Hwy 2A Interchange	CPR / Black Gold Drive								42,700	4	48,000	54,000	61,000	73,000	86,000	99,000	112,000	125,000
CPR/Black Gold Drive	Highway 39 (50th Ave)	Urban	D / E	72,300	108,500			144,800	42,700	4	48,000	54,000	61,000	73,000	86,000	99,000	112,000	125,000
Highway 39 (50th Ave)	65th Avenue								53,100	6	59,000	67,000	75,000	91,000	107,000	123,000	139,000	155,000
65th Avenue	50th Street			na		130,000	160,000	200,000	53,100	6	59,000	67,000	75,000	91,000	107,000	123,000	139,000	155,000
50th Street	Airport Road								66,500	6	74,000	84,000	94,000	114,000	134,000	154,000	174,000	194,000
Airport Road	Highway 19								79,960	6	90,000	102,000	114,000	138,000	162,000	186,000	209,000	233,000
Highway 19	Twp. Rd. 510					130,000	160,000		84,990	7	95,000	108,000	121,000	146,000	172,000	197,000	223,000	248,000
Twp. Rd. 510	Twp. Rd. 511								84,990	7	95,000	108,000	121,000	146,000	172,000	197,000	223,000	248,000
Twp. Rd. 511	41 Avenue SW								84,990	7	95,000	108,000	121,000	146,000	172,000	197,000	223,000	248,000
41 Avenue SW	Ellerslie Road								88,220	7	99,000	112,000	125,000	152,000	178,000	205,000	231,000	258,000

Legend:

	6 Lanes
	8 Lanes
	2 Core Lanes Each Direction
	3 Core Lanes Each Direction
	To Bypass

Table 4.4.6: Calculation of Thresholds (1,990 vpd / lane)

K Factor			0.12	Pk Hr Vol / Direction	Directional Volume / Lane on	
Directional Split Collector Lanes			55%		Collector Lanes	Core Lanes
Directional Split Core Lanes			60%			
Transition to Wider Cross Section	No. of Collector Lanes	No. of Core Lanes	AADT*			
4 lanes to 6 lanes	4	0	60,300	3,980	1,990	
6 lanes to 8 lanes	6	0	90,500	5,970	1,990	
8 lanes to 10 lanes	8	0	120,600	7,960	1,990	
10 lanes to 12 lanes	8	2	148,300	9,950	1,990	1,990
12 lanes to 14 lanes	8	4	175,900	11,940	1,990	1,990
> than 14 - Bypass	8	6	203,500	13,930	1,990	1,990

* Volumes @ LOS D

Table 4.4.7: Northern Sub-Region Lane Requirement

Location		Corridor Environment	2016-2026	2026-2041	2041-2051	>2051
From	To		< 10 years	10-25 years	25-35 years	>35 Years
Township Road 482	Township Road 490	Rural	4	6	8	8
Township Road 490	New Highway 2A		4	6	8	8
New Highway 2A	Existing Highway 2A	Transition	6	6	8	8
Existing Hwy 2A Interchange	CPR / Black Gold Drive		6	6	8	8
CPR / Black Gold Drive	Highway 39 (50th Ave)	Urban	6	8	8	8
Highway 39 (50th Ave)	65th Avenue		6	8	8	8
65th Avenue	50th Street		8	8+4 Core	8+4 Core	8+4 Core
50th Street	Airport Road		8	8+4 Core	8+4 Core	8+4 Core
Airport Road	Highway 19		8	8+4 Core	8+4 Core	8+6 Core
Highway 19	Township Road 510		8	8+4 Core	8+4 Core	8+6 Core
Township Road 510	Township Road 511		8+4 Core	8+4 Core	8+6 Core	8+6 Core
Township Road 511	41 Avenue SW		8+4 Core	8+4 Core	8+6 Core	8+6 Core
41 Avenue SW	Ellerslie Road		8+6 Core	8+6 Core	8+6 Core	8+6 Core

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4.4.7 City of Edmonton / County of Leduc / Town of Beaumont Annexation

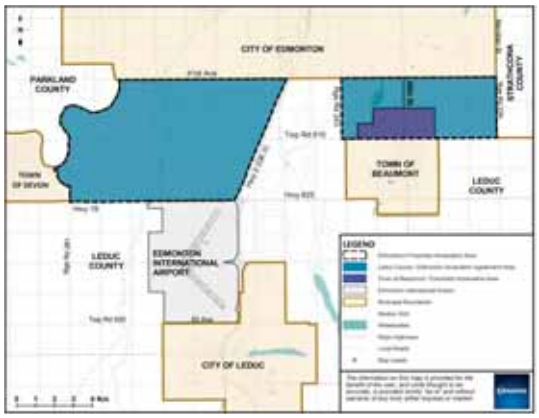
The City of Edmonton and Leduc County have reached a framework for an agreement proposed to take effect on January 1, 2019. The annexation area involves lands required to accommodate the future expansion requirements of Edmonton's urban area.

The agreement involves an annexation area as illustrated in Exhibit 4.4.7 which comprise approximately 8,860 hectares [6,235 Ha (15,400 acres) west of the Highway 2 of lands from Leduc County. Exhibit 4.4.7 also illustrates 9 quarter-sections (approximately 2,625 Ha (6,485 acres)] in the vicinity of Beaumont which had overlapped with an annexation application from the City of Beaumont. As of February, 2018, the City of Edmonton has removed the Beaumont lands from their annexation application. Also excluded are the Edmonton International Airport (EIA) and the Nisku Industrial areas.

The 30-year (2050) land use forecasts assumed for the annexation area were as follows:

- 102,900 persons in the entire annexation area with 69,150 persons west of the Highway 2 corridor and 33,750 persons east of the Highway 2 Corrido.
- 44,750 employees in the entire annexation area with 28,600 employees west of the Highway 2 corridor and 16,140 employees east of the Highway 2 corridor.
- The Town of Beaumont is anticipated to accommodate 45,700 persons and 4,300 employees.

Exhibit 4.4.7: City of Edmonton-Leduc County – Proposed Annexation Areas



Source: Leduc County and City of Edmonton Joint News Release: Edmonton and Leduc County Reach Agreement on Annexation (June 30th, 2017)

The Town of Beaumont is the 5th fastest growing community in Canada, and the fastest growing municipality in the Capital Region. The Town of Beaumont has successfully received approval in November 2016 from the Provincial Municipal Government Board (MGB) to annex approximately 1,344 hectares (3,320 acres), from Leduc County. The subject lands are illustrated in Exhibit 4.4.8.

Exhibit 4.4.8: Town of Beaumont: Newly Annexed Areas from Leduc County



Source: "Amended Notice of Proposed Annexation"

2050 travel demand forecasts as referenced from the Town of Beaumont's Transportation Master Plan indicate 2044 growth scenarios ranging from 36,800 - 59,800 persons with a planning initiative assuming a 48,300 population horizon.[20]

The City of Edmonton's annexation application as described above overlaps upon the most northern portion of Beaumont's successful application and as such the jurisdictional issues between these overlapping initiatives remains, at the time of this report, to be resolved. Independent of the outcome, the subject lands are to be urbanized and the impact upon the Highway 2 corridor could well prove to be independent of how this issue is resolved.

4.4.8 Inter-Municipal Arterial Roadway Network

The importance of developing a robust and effective inter-municipal arterial roadway network is considered essential to the future operation of the Leduc-Edmonton Highway 2 corridor.

[20] *"Our Complete Community"*, Municipal Development Plan, By-Law 887-17, Town of Beaumont

4.4.8.1 Lands West of Highway 2

Currently, the inter-municipal roadway network on the west side of Highway 2 [between Highway 60, which serves the Town of Devon; the North Saskatchewan River and the Highway 2 corridor from a point south of 41st Avenue] is characterized to the greatest extent by several Leduc County two-lane gravel Range (NS) and Township (EW) roadways which were intended, for the most part, to accommodate only local Leduc County rural country residents.

- *Leduc County Initiatives:* With the advent of the Crossroads Area Structure Plan[21] to the north of the EIA and abutting the Highway 2 corridor an opportunity arose to develop a multi-lane arterial roadway (Crossroads Boulevard) network that from the County's perspective could connect southward to Airport Perimeter Road in the EIA lands and northward to Range Road 251 transitioning onto a planned arterial roadway (141st St SW) in Edmonton.
- *City of Edmonton Initiatives:* In the past, there was limited interest in the roadway network south of 41st Avenue on the west side of Highway 2 recognizing the City of Edmonton's urban boundary.
  - Subsequent to the City of Edmonton's annexation initiative in April 2015, it appeared that the City had expressed interest in incorporating lands as far west as Range Road 261 in addition to the EIA lands within the City's boundaries. However, this has since been scaled back to include only those lands as far south as the Highway 19 corridor. [The City's current RTM model only illustrates a single 141st Street connecting roadway that would extend south past Township Road 510, all other north-south routes are off-set, or represented as being discontinuous.] With the advent of the completion of the annexation process it is likely that a comprehensive transportation planning exercise will take place within the City's newly annexed lands to assure connectivity to its north-south arterial roadway network to the north.
  - The City of Edmonton, in concert with Alberta Transportation undertook the 170th Street Planning study which was intended to confirm the short and long-term plans for the corridor as an urban freeway connecting Anthony Henday Drive to 41st Avenue. Plans for this corridor which is often referred to as the Terwillegar Road South Extension provided for grade separated interchanges at Windermere Boulevard, Ellerslie Road, 25th Avenue SW and 41st Avenue SW along with concept plans for an upgraded 170th Street interchange at Anthony Henday Drive.
- *EIA Initiatives:* The EIA's lands between 65th Avenue and Highway 19 (a distance of approx. 6.4 km) extend to the west about 4km to Range Road 254.
  - The EIA's plans to develop an internal ultimate 4-lane arterial roadway at this time concern the *Airport Perimeter Road corridor* which is being developed parallel to, and approximately 800 meters to the west of, the Highway 2 corridor. The Airport Perimeter Road corridor is intended to extend northerly to Crossroads Boulevard.
  - The EIA currently does not have established plans in place to develop the lands along the western perimeter of the EIA lands with the exception of future provisions for a third runway [Runway 3 (11-29)] that would extend over the current alignment of the Highway 19 corridor and require Highway 19's northerly realignment. For all intents and purposes, the EIA will over the next two decades continue to focus its development initiatives along the lands between the EIA terminal and the Highway 2 corridor. There appears to be little interest, in developing its most westerly lands at this time and hence any continuation of north-south arterial roadways located to the west of the EIA's runways is not of primary importance. The need for such infrastructure has not been identified by the EIA.
- *City of Leduc Initiatives:* The City of Leduc's plans for development extend as far as their current urban boundary which is as far west as Range Road 254 (74th Street in Leduc). The City of Leduc currently envisions 74th Street as a continuous north-south arterial roadway.
- The *City of Leduc, The Edmonton International Airport (EIA) and Alberta Transportation* have jointly commissioned the detailed design of the first phase of the 65th Avenue crossing of the Highway 2 corridor. This initiative involves the twinning of the 50th Street fly-over structure to connect the City's east lands to the EIA's Airport Perimeter Road and the new 65th Avenue west corridor.

Given the multiple jurisdictions involved, [City of Edmonton, Leduc County, City of Leduc, EIA, Alberta Transportation, Edmonton Metropolitan Region Board (EMRB)] it will likely remain a challenge for Alberta Transportation to ensure the development of a continuous series of inter-municipal arterial roadways similar to that envisioned within the Penetrator Agreement established to ensure urban / rural interconnectivity from / to the Stoney Trail Ring Road in Calgary-Rocky View. However, the challenge does not in any way diminish the necessity to develop a comprehensive transportation master plan addressing all of the lands west of the Highway 2 corridor extending from south of the Highway 2A interchange to Anthony Henday Drive.

4.4.8.2 Lands East of Highway 2

Currently, the only continuous parallel route on the east side of Highway 2 is the Highway 814 (50th Street SW) corridor which is 24 km to the east of Township Road 490 (Glenn Park Road / Kavanagh Road) interchange and 12 km to the east of the 41st Avenue interchange. In general, the connecting roadways on the east side of the Highway 2 corridor are characterized by several Leduc County two-lane gravel Range (NS) and Township (EW) roadways which were intended, for the most part, to accommodate only local Leduc County rural country residents.

Spine Road: The planned Nisku-Spine Road corridor which when completed would extend 91st Street SW in Edmonton, south of 41st Avenue SW along the 9th Street corridor in Leduc County as far south as Rolleyview Road; a distance of approximately 23 kilometers; and ultimately to connect directly with the Highway 2A corridor. The corridor is being planned as an ultimate 6-lane arterial corridor and is currently envisioned to be completed within 4 phases. Spine Road has been constructed as far south as 30th Avenue (Township Road 510) and construction in the immediate time frame is to proceed to the Highway 19 corridor. Subsequent phases would see the section between Highway 19 and Airport Road, followed by Airport Road to Rollyview Road (Highway 623); and lastly between Rollyview Road and the Highway 2A corridor. Additional planning is required to address the requirement, if any, to extend Spine Road between Rollyview Road, Highway 2A and further west to connect to the Highway 2 corridor. When completed, the major arterial roadway will connect the major economic centres in the region, including the Edmonton International Airport, Nisku Industrial Business Park, City of Edmonton and City of Leduc. [See Exhibit 4.3.6 Light-Brown Dashed Line]

4.4.9 Inter-Municipal Transit Planning

The Highway 2 corridor has served as the major transit route connecting the City of Leduc and the EIA to the City of Edmonton.

- Edmonton's Transit's Route 747 in 2016 provided an express service of up to 27 two-way-trips-per-day between the Century Park LRT Station and the Edmonton International Airport (EIA) by way of 23rd Avenue, The route averages 172,000 transit trips on an annual basis.

[21] "*Crossroads Area Structure Plan*" Prepared for Remington Development Corp. (Focus Group – January 2012):

- Leduc Transit's Route 1 also make use of the Highway 2 corridor with service of up to 13 two-way-trips-per-day serving Leduc West and the Nisku employment lands and the Century Park LRT Station also by way of 23 Avenue.
- Beaumont's Route 540 makes use of Highway 814 and AHD to access the Century Park LRT station. The service is offers 4 return trips in the AM and PM with half-hour headways.

Current transit ridership levels of all three transit services combined are estimated to be in the order of 250,000 transit trips-per-year. This translates into approximately 1,000 transit trips-per-day assuming a 250-day work-week during the year. However, when this is compared to the daily traffic volumes (AADT) on the Highway 2 corridor (and the 1.15 persons-per-vehicle determined from the vehicle occupancy survey), the existing transit mode share is approximately 1 percent.

Table 4.4.1 referenced the Regional Traffic Model (RTM) which forecast over the next 70 years that the North-Central Region will grow from 126,000 persons to 819,000 persons (650%) and from 34,000 jobs to 300,700 jobs (884%). It is evident that this level of growth cannot be sustained from a transportation infrastructure perspective by roadway, highway and freeway infrastructure improvements alone and that significant transit infrastructure investments are a requirement necessary to satisfy forecast demand.

Route 747 was initiated in 2012 as a pilot project with annual contributions from the EIA (totaling approximately $2.5M over the last 5-years). In April, 2017 the financial support from the EIA ended. In late November, 2017 the City proposed the option of a fare increase and reduced service levels as an immediate response in an attempt to extend the transit service to April, 2018 or until a Regional Service agreement could be developed. Transit planners suggest that with the advent of the planned Outlet Mall (scheduled to open in May 2018) and the Entertainment (Race Track) facility both of which are within the EIA lands, transit demand is likely to rise by several hundred riders-per-day in the coming year. As of February, 2018, an interim agreement was established which assured continuity of the service with negotiations concerning permanent full service to be in place by 2019.

Current, transit infrastructure initiatives that would benefit the Highway 2 corridor include:

- The engineering services for the 4.5km extension of the South LRT from Century Park to Ellerslie Road which is intended to complete a refresh of the original preliminary design. The design provides for an additional station to be incorporated into the Heritage Valley Park and Ride facility and the potential for a Twin Brooks Station.

Current, transit planning studies assessed within this study included:

- "*The Capital Regional Inter-municipal Transit Network Plan*" (2009) which presented a long-term vision that proposed continued use of Highway 2 (serving the EIA and Leduc) and Highway 814 (serving Beaumont) as transit corridors served by inter-municipal buses;
- "*The Future Region Growth Plan"* (2009) presented a City of Edmonton vision that would extend the LRT along 127th St SW as far as 41st Avenue. Further south, transit service would be provided with "Rapid Transit" service to the EIA lands stopping just to the north of Highway 19.
- "*The Integrated Regional Transportation Master Plan*" (2011) presented a modified long-term vision that identified both Highway 2 and Highway 814 as transit-priority corridors intended to be served by a Regional bus service. The plan also called for the extension of LRT service from the Century Park LRT Station nearest 23rd Avenue southward to 41st Avenue. The plan also illustrated Airport Rail Service that would extend from 41st Avenue into the Edmonton International Airport (EIA);
- "*The Edmonton International Airport Master Plan 2010-2035)"* (2011) envisioned an LRT line that would be developed parallel to, and to the west of, the Highway 2 corridor. The LRT line would traverse the Highway 19 corridor and enter EIA lands along the west side of Airport Perimeter Road and continue southward. The Master Plan envisioned 2 LRT stations on either side of Airport road and LRT transit service directed into the EIA Terminal building by way of a route on the north side of Airport Road. EIA property continues to be protected to accommodate this vision;
- "*The Long Term LRT Expansion Plan"* (2012) envisioned an extension of the LRT service south from the Century Park Station across AHD and through the Heritage Valley development terminating at a new park-n-ride facility at the 41st Avenue City Limit. An LRT line on the east side of the Highway 2 corridor was also envisioned which included stations at Grey Nuns, Millwoods and Ellerslie.
- "*The City of Leduc's Transportation Master Plan"* (on-going) currently envisions a transit route that would extend through the EIA lands southward across the 65th Avenue corridor to serve the future employment lands along the south side of 65th Avenue West and connect to what may be a future local transit storage / maintenance / terminal facility. From this point the route would extend further to the west through the planned employment lands south of 65th Avenue and west to 74th Street to serve the growing Leduc West Communities.

The Highway 2 CIS required an ultimate transit vision that would reduce vehicle demands upon the Highway 2 corridor. The CIS study evaluated alternative routes, facilities and services aimed at defining opportunities that would enhance the effectiveness of future transit and enhancing the mode share.

Exhibit 4.4.9 illustrates alternative options which, for the most part can be considered an "enriched" transit solution which would see much of the existing (indicated by the green and cyan lines) CP Rail Alignment relocated (indicated by the blue lines). The existing rail corridors would be converted to either BRT or LRT routes. [Note the additional transit only crossing between Highway 19 and the Airport Road interchanges to provide enhanced transit service to the east side of the Highway 2 corridor. As well, note the extension of LRT/BRT transit service to Leduc South of 65th Avenue.] This scenario was developed to assess the impact of a high quality and high frequency transit service upon the Highway 2 corridor.

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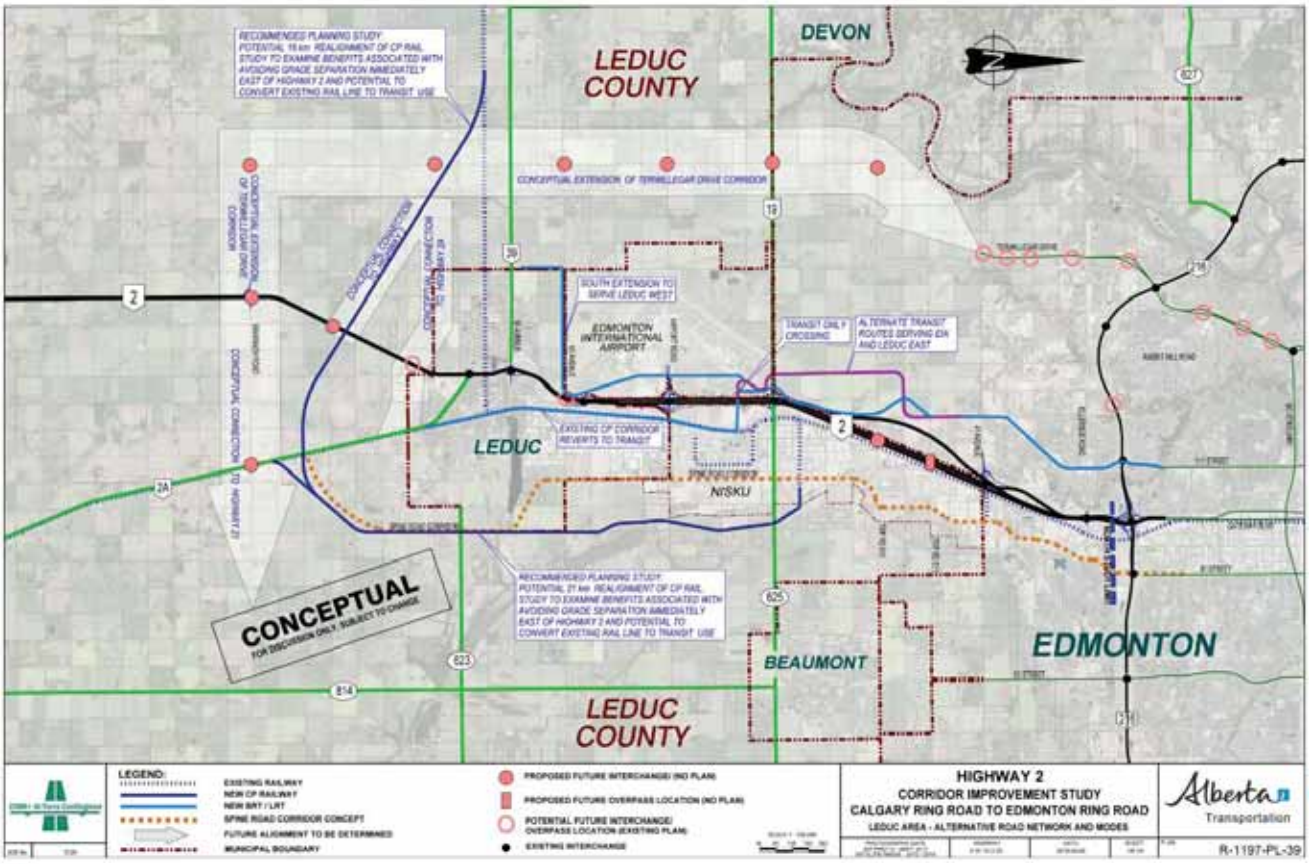
Exhibit 4.4.9: Leduc to Edmonton – Conceptual Corridor Improvements



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The enhanced 30-year transit strategy was envisioned only on a conceptual basis and requires its own functional study to assess its viability and constructability. The transit plan simulated within the traffic modelling component of this study assumed the following:

1. The extension of a Bus Rapid Transit (BRT) corridor south of the planned Heritage Valley LRT terminus that would connect through the proposed Crossroads development across the Highway 19 corridor, through the EIA lands along the west side of Airport Perimeter Road across the future 65th Avenue West corridor along the south side of the 65th Avenue corridor through the planned Aerotropolis development westward to 74th Street and southward.
2. The realignment of two CP Rail corridors is envisioned:
   - The EW CP Rail corridor is 16km long and currently accommodates only 2 trains per week. [It is understood that CP had in the past approached the City of Leduc to acquire the corridor.]
   - The NS CP Rail corridor is its main line and as illustrated in Exhibit 4.4.9 is approximately 21km in length and currently accommodates 15 trains per day.
   - Exhibit 4.4.9 illustrates the realigned NS CP Rail corridor connecting to an existing EW rail spur line just north of Highway 19 between 22nd and 23rd Avenues. This corridor can be used to assure that CP would still connect to its intermodal rail-truck facility located just to the north of 41st Avenue. It is recommended that sufficient right-of-way be protected to assure the viability of this rail access / approach.

   Based on a theoretical cost of $15M / km for new railway, the estimated costs of relocating 37km of rail would be in the order of $560M. However, it should be emphasized that the current CP Rail corridor crosses major arterials at-grade at several locations which include:
   - South East Boundary Road; (under detailed design)
   - Rollyview Road; (Current 2016 2-way AADT = 12,330 vpd)
   - Black Gold Drive
   - 50th Avenue
   - 65th Avenue (Current 2016 2-way AADT = 13,970 vpd)
   - Airport Road; (Current 2016 2-way AADT = 14,360 vpd)
   - Highway 19 (Current 2016 2-way AADT = 20,830 vpd)

   Each of the following crossing will remain candidates for consideration of rail grade-separation at a time when the cross-product of rail-vehicle traffic exceeds 200,000. Highway 19's cross product is currently 312,450; Airport Road's cross product is 215,400; 65th Avenue's cross product is 209,550 and Rollyview Road's cross product is 184,950. The long-term costs associated with grade separating each of these urban crossings may well exceed the cost of realignment of the rail corridors.

   One benefits of such a rail alignment is that the existing rail corridor becomes available for transit use be it light-rail or BRT (assuming tracks are removed). Figure 4.3.6 illustrates the potential to developing an exclusive BRT corridor (blue line) that would extend over the Highway 2 corridor between the Airport Road and Highway 19 interchanges onto the existing CP Rail corridor assuming such a realignment. In this way, the entire community of Leduc could be served by transit on either side of the Highway 2 corridor.

3. High frequency (10 minute) peak period service levels.

4.4.10 The Terwillegar South Extension

Exhibit 4.4.9 also illustrates conceptual corridors for the Terwillegar South Extension that could see a continuous freeway corridor extend from the current City of Edmonton South Boundary (41st Avenue) to as far south as the Township Road 490 (Glenn Park Rd. / Kavanagh Road) interchange. Such a facility was identified through the RTM traffic simulation exercise to be required to assure satisfactory traffic operations along the Highway 2 corridor.

Exhibit 4.4.10 illustrates the extent of diversion of traffic that is anticipated to occur by the 2044 time horizon simulated by the RTM model. A review of the simulation results indicated that:

- An average 10 - 20 percent of forecast traffic could be diverted away from the Highway 2 corridor assuming the Terwillegar S. Extension as a freeway would be in place.
- The highest extent of diversion occurs from Airport Road northward in that assuming a freeway configuration approximately 1,800 vph or more can be diverted away from Highway 2.



Exhibit 4.4.10: Diversion of Highway 2 Traffic to Conceptual Terwillegar Corridor

This analysis was undertaken as part of this functional planning study determined that:

- if the Terwillegar south extension was in place by 2044:
  - The need for additional lanes beyond the 4 collector lanes on the Highway 2 corridor could be delayed by 15 - 25 years (without such a facility in place, the Highway 2 core lanes are needed immediately after the 4-lanes capacity of the collector lanes is exceeded.)
  - Assuming an annual traffic growth rate of 3% on the Highway 2 corridor, without the advent of a Terwillegar south Extension, have resulted in the core lanes being required along the northern portion of the Highway 2 corridor within the next 10 years;
- if the Terwillegar south extension was delayed until the 2075 horizon year:
  - Significant infrastructure impacts to the Highway 2 corridor beyond the ultimate envisioned requirements (both core and collector concept) as identified in previous studies would result;
- 2060 was the interpolated horizon year that represents the latest time period at which the Terwillegar south extension would be required if additional infrastructure on the Highway 2 (beyond the envision core-collector concept) is to be avoided and a LOS "C" operational standard is to be maintained.
- The effect of adopting a lower level of service (LOS "E") standard instead of a satisfactory operational LOS standard (LOS "C") as a warrant to implement the Highway 2 core lanes, was found delay the implementation of the core lane concept for at least 10 - 15 years.

The alignment of the Terwillegar corridor and the configuration of its interchanges remains to be determined as a functional planning exercise to assure that sufficient property can be protected for such a corridor.

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4.4.11 Highway 2: The Core-Collector Concept

A previous functional planning study[22] highlighted the need to accommodate the forecast additional capacity requirements along the Highway 2 corridor by way of developing a "core-collector" configuration which would see 4 collector lanes-per-direction on either side of the Highway 2 corridor along with as many as 3 core lanes-per-direction within the existing Highway 2 median that would extend from the future 65th Avenue interchange as far north as Ellerslie Road.

Findings from the simulation exercise that assumed that the Terwillegar south extension would be developed beyond the 2050-time horizon of the RTM network and that a LOS D threshold would be adopted as the target, it was determined that the Highway 2 core lanes would best be staged, as warranted, with the following sequence:

- *Phase I:* northbound and southbound directions from a point north of the Airport Road interchange within the 10-year horizon when the 4-lane capacity of the Highway 2 collector lanes is exceeded.
- *Phase II:* The northbound Highway 2 core lanes would be extended northward from a point south of the Airport Rd Interchange but north of the 50th Street flyover to meet the core lanes. This would occur when the 4-lane Highway 2 collector capacity would be exceeded which is forecast to occur by the 10 - 25-year horizon.
- *Phase III:* The northbound and southbound Highway 2 core lane would be extended further southward from a point south of the Airport Road interchange to their ultimate transition point in the vicinity of the new 65th Avenue interchange after the 25-year horizon.

4.4.12 An East Regional By-Pass

A network simulation was conducted that envisioned an eastern by-pass route that would serve to connect Highway 21 on the east through to the Highway 2 corridor in the vicinity of the Township Road 490 (Glenn Park Road / Kavanagh Road) interchange as illustrated in Exhibit 4.4.9. The traffic forecasts resulting from the simulation indicated that the alignment:

- failed to generate sufficient traffic demand between Edmonton East and Highway 2 south corridor.
- offered limited opportunities to divert traffic in comparison to that of the Terwillegar Road South Extension.[23]

This finding was surprising given:

- the advent of the possible North-East Saskatchewan River Crossing connecting to Highway 21;
- the forecast development potential associated with Strathcona County and Fort Saskatchewan areas in terms of significant communities and employment areas; and
- that the travel demand simulation undertaken on behalf of this study was run prior to the RTM model being updated with more current land-use information;

All of the above may well serve to alter the conclusion that such a link is not warranted.

For the purposes of this Highway 2 CIS study, the development of an East Regional By-pass was viewed as being a long-term initiative with limited benefits accrued to the Highway 2 corridor, however merit exists in continuing to monitor the potential benefits to the eastern areas of Greater Edmonton.

4.4.13 Key Planning Recommendations

4.4.13.1 Inter-Municipal Arterial Road Network.

Similar to the Calgary area, road network planning in the Leduc-Edmonton corridor is defined as being "*urgent*". Development of the local arterial roadway network should be encouraged by the Province to be contiguous, continuous and serve to link Edmonton, Nisku, Leduc County, the EIA and the City of Leduc in a holistic manner independent of municipal jurisdiction. Although this is likely to be encouraged by the Edmonton Metropolitan Region Board (EMRB) the level of planning required to achieve this objective is likely required to be at a functional rather than conceptual level. This planning should proceed as soon as possible recognizing the potential impact to all municipal ASP's.

4.4.13.2 HOV System

The potential to establish Highway 2 as a key HOV commuter route between Leduc and Edmonton is discussed in greater detail within Section 5 of this report; however, developing an HOV concept assuming the existing configuration of the corridor is not recommended.

The forecast impact of converting one of the existing freeway lanes to HOV in advance of establishing additional capacity was found to result in a morning peak period southbound LOS E in the remaining non-HOV lanes with LOS B in the HOV lanes. Implementing such an initiative would fall under significant scrutiny as commuters and commercial vehicles (which for the most part operated by a single motorist), would be forced to navigate under congested conditions while the immediate adjacent HOV lane is viewed as being an under-utilized irritant.

4.4.13.3 Inter-Municipal Transit Corridors

Transit planning should not be taken in isolation of other roadway and network planning initiatives. Ideally transit planning should be independent of the municipality to which the service is being provided. A regional approach is required to be applied that takes into account not only municipal ASP objectives, but also holistic longer term planning. The merits of relocating commercial rail traffic to the outer limits of the urban area to free up existing rail corridors for future BRT use merits further study.

4.4.13.4 Terwillegar South Extension

Planning to identify the preferred Terwillegar South Extension alignment, future network connections, access management and the required right-of-way should be viewed as a Provincial objective and as such the "ultimate" designated corridor merits protection.

4.4.13.5 An East Regional Bypass

The simulation of an east Regional By-pass along the Highway 21 corridor linking to Highway 2 was found to be ineffective at diverting traffic away from the Highway 2 corridor. As well, the Highway 813 route through Beaumont and Rollyview Road was also found to result in a nominal diversion away from the Highway 2 corridor. As such, the development of an East Regional By-pass was viewed, at best, as being a very long-term initiative.

[22] *"Queen Elizabeth II Highway (Ellerslie Road to South Leduc)"*, Report No. R-1043 Trans-Tech / Focus Group (May 2010)

[23] This is attributed to the spatial separation between the two corridors. The Terwillegar Road South Extension is approximately 11km west of the Highway 2 corridor, while the Highway 21 corridor is 35-to 40 km to the east of the Highway 2 corridor. Highway 814 which is located approximately 17km to the east of the Highway 2 corridor was also found not to achieve a significant diversion of traffic away from the Highway 2 corridor.

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4.5 Congestion Management Options

Table 4.5.1 lists each of the various congestion management measures that were considered within the Highway 2 CIS study. The measures incorporate Intelligent Transportation Systems (ITS) as well as the advent of Demand Management Measures aimed at encouraging greater vehicle occupancy (through pricing mechanism) or shifting travel demand either to less congested roadways or to times when the Highway 2 corridor would be less congested. Although the user pay options are tools to adjust driver behavior and manage congestion, it is also recognized that these concepts are typically unpopular and may not be viable from a public acceptance perspective.

Table 4.5.1: Congestion Management Measures

	Congestion Management Measure	Description
Operational Options	High Occupancy Vehicles (HOV)	This measure addresses the advent of designated lanes on the Highway 2 corridor which would be reserved for High Occupancy Use (HOV). The HOV lanes are segregated from the general-purpose lanes, monitored for compliance and enforced.
	Variable Speed Limits (VSL)	Variable (or dynamic) Speed Limits (VSL) are defined as *"the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions"*. The purpose of VSL along the Highway 2 corridor would be to reduce the stop-and-go traffic which occurs most often within the urbanized sections of the corridor. VSL is intended to reduce collision probability and severity by providing greater reaction time for motorists. The measure goes beyond resolving congestion in that it also serves a traffic operational function by assuring motorists adjust their speed to account for inclement weather conditions.
	Autonomous Vehicles (AV)	Automated vehicles (AV) also known as autonomous, self-driving or driverless vehicles) are capable of driving by detecting the surrounding environment using artificial intelligence, sensors and global positioning systems. AV's are expected to start becoming common within the next 10 - 15 years and are reportedly poised to revolutionize the way people travel and goods are delivered.
	Ramp Metering (RM)	Ramp metering is achieved by adaptive traffic signals installed at the entrance of a ramp onto the mainline. The traffic signal controls are set to "red" in the absence of any traffic. Signage is used to make motorists aware that they are approaching a ramp metered location. Two lane ramps would be controlled by signals on both sides of the ramp which permit only a single vehicle (one side at a time) to advance. When a vehicle approaches the STOP bar it is detected and then permitted to advance by the light briefly turning green. The duration of the green light is short (under 2 seconds) to assure that platoons on the ramp are broken up.
	Connected Vehicles (CV)	Connected Vehicles (CV) are vehicles that receive or transmit information to other vehicles and / or to the infrastructure. CV's offer a number of safety advantages, such as warnings for other red light running vehicles, hidden upstream queues or objects on the road. CV's can also communicate to the infrastructure including traffic signals, or dynamic message signs. CV's are projected to dramatically reduce collisions and therefore prevent congestion.
	Integrated Corridor Management (ICM)	Integrated Corridor Management (ICM) considers a corridor as a connected system of all modes of travel. Efficiencies can be achieved by reducing the number single occupant vehicles on a corridor and by promoting transit, active transportation or other modes. By maximizing the capacity of a corridor, ICM can significantly reduce congestion.
User Pay Options	High Occupancy Tolls (HOT)	The HOT measure permits or licenses a controlled number of single occupant vehicles (often trucks, transport vehicles etc.) for a flat rate (or a set fee often on a per-kilometre basis) to use an HOV facility. The fee is NOT variable with the level of congestion but rather is set based on providing an overall satisfactory level of service for the facility that still offers a competitive travel time when compared to general purpose lanes. This measure is distinct from tolled facilities such as the Hwy 407 in the Greater Toronto and Hwy 30 in Montreal which are not HOT lanes but simply a tolled highway where everyone pays a toll. The authority responsible for HOT must continue to assure a minimum level of service for the HOV lane by controlling the number of permitted users provided with exemption licenses to use the HOV facility.
	Congestion-Dynamic Pricing (Variable Toll Lanes)	Congestion pricing is defined as "roadway pricing that varies by time of day based on the level of congestion in a variable toll lane". Congestion Pricing provides for Variably-Priced Managed Lanes (VPML) that respond to the level of congestion on the facility.
	Congestion Charge / Cordon Toll	Congestion charges involve charging a fee during times of excess congestion to vehicles which travel within a defined congestion zone or along a designated congestion corridor. (This measure is often referred to as a "cordon toll".) Its application is aimed at encouraging motorists to either use alternate less travelled roadways or shift the time of travel to times when the facility is not congested.

Appendix J serves to further document each of these congestion management measures providing a general description; complimentary initiatives; negative effects; the general locations where the measure may be applicable; the general findings from other jurisdictions; considerations for implementation; the potential application to the Highway 2 corridor; additional information that may be needed to be collected; analysis to be conducted; findings and conclusions in terms of traffic congestion impacts; and findings and conclusions from other jurisdictions in terms of emissions and environmental impacts.

4.6 ITS Considerations for the Highway 2 Corridor

4.6.1 Introduction

The Highway 2 corridor Improvement Study results in an implementation plan for the corridor that reflects the Province of Alberta's Transportation Strategic Plan. In many cases, the solutions identified throughout the project include an element of Intelligent Transportation Systems (ITS) as a means of increasing the capacity of the Highway 2 corridor and improving safety and, as a result, defer capital improvements.

In advance of identifying proposed ITS initiatives and future considerations, the consulting team reviewed the existing ITS systems along Highway 2 and throughout the Province, identified the future needs of the corridor in consultation with Alberta Transportation (AT), and recognized current initiatives in Alberta and elsewhere in Canada. Additionally, emerging technologies, such as connected and autonomous vehicles, were assessed for their impacts on the operations of the corridor. Details of each of these stages of the analysis and the details of the proposed ITS initiatives are contained in our complete report found in Appendix K.

While future technologies may provide traffic monitoring and management options that do not exist today, this report does not rely on unproven benefits or optimistic predictions. Rather, the consulting team used realistic assumptions to generate pragmatic timelines, particularly when considering the need for infrastructure expansion. These assumptions include moderation to the safety and capacity benefits associated with future ITS systems and conservative timelines associated with these emerging and future technologies.

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4.6.2 ITS Needs Assessment

The Provincial ITS needs identified during a workshop discussion held in February 2017 may be summarized as follows:

- Focus on the safety of carriers (e.g. commercial vehicle drivers) such as to monitor the 24-hour rest plan for drivers before the departure.
- Provide stop locations and notification of available parking spots for drivers before arrival.
- Facilitate cross border operations with electronic tags.
- Coordinate with Royal Canadian Mounted Police (RCMP) regarding ITS enforcement of commercial vehicles.
- Consider commercial vehicle operations as a component of High Occupancy Vehicle / High Occupancy Toll (HOV / HOT) lane construction and operations.
- Consider communications and power requirements along the corridor.
- Consider a Provincial Transportation Management Centre (PTMC) for the corridor (and the Province) to improve the efficiency of the various ITS systems.
- Consider the experiences from other Provinces such as British Columbia, Ontario and the States.
- Develop an integrated data collection program for multiple departments including planning, safety and real-time operations.
- Emphasize data management policies to get the most value from the data.

These needs shaped the identification and analysis of ITS options identified for the study.

4.6.2.1 Review of Safety and Capacity Data

ITS systems can also be used to supplement and provide further insight to the congestion management measures. ITS systems can be used to communicate highway upgrading activities, directing traffic to alternative diversion routes, monitor urban high occupancy vehicle (HOV) lanes efficiencies, provide comparative travel traffic management systems aimed at reducing congestion. In this way many of the ITS traffic management measures and operational functions have a synergy with congestion management measures in achieving increased vehicle throughput.

Collision information for the corridor was summarized according to major road segment and by month. The data shows that 62% of the collisions occurred between the months of October and March (i.e. winter) with the remainder (38%) occurring during the summer months (of April to September). Furthermore, there is an over-representation of winter collisions on the 30 km section of Highway 2 south of Red Deer.

The results of this analysis support winter road maintenance related ITS systems, such as road weather information systems, maintenance decision support systems and dynamic message signs. Additionally, the section of Highway 2 between Red Deer and Innisfail offers a good trial site for piloting winter related ITS systems such as, for example, variable speed limits, automated vehicle location systems for plows, traffic management systems or road condition advisory systems.

The reference map also provides projections for widening the highway. While much of Highway 2 will require 6 lanes within 10 years, the sections north of Calgary and south of Edmonton will continue to experience higher volumes. As a result, these sections may be candidates for ITS systems that manage congestion, encourage higher vehicle occupancies, and generate traveler information.

4.6.3 Proposed ITS Initiatives

A set of five ITS initiatives is recommended for the Highway 2 corridor. They are found in Table 4.6.1

Table 4.6.1 Highway 2 Corridor Recommended ITS Initiatives

ITS Initiative	Description
Commercial Vehicle Operations	The purpose of this initiative will be to enhance and deploy ITS screening, monitoring and inspection technologies to ensure that commercial vehicles will operate more safely along the studied Hwy. 2 roadway section between Calgary and Edmonton. It is also expected that this initiative will help improve the integration of commercial vehicle enforcement systems. Steps / Projects can include: ◆ Application of new mobile technologies embedded in vehicles to safely alert or remind commercial vehicle drivers of high incident areas and planned trip routes and identify legal parking and rest areas along the Hwy 2. ◆ Upgrade of the existing commercial vehicle roadside inspection system to Smart Roadside Inspection System (SRIS) (e.g. Wireless Roadside Inspection (WRI) System) to identify high-risk and problematic commercial vehicles without interfering with the commercial vehicle flow. ◆ Continued deployment of New ITS inspection technologies (e.g. electronic monitoring at fixed inspection stations, Weigh in Motion (WIM), mobile inspection sites, automated thermal imaging systems, application of inter-agency inspection data sharing models, etc.) to improve commercial vehicle's roadside inspection accuracy, as well as safety and enforcement for commercial vehicle operation. ◆ ITS deployment for commercial vehicle operation safety analysis (e.g., MOTRIS, TSIS, e-Facility, e-Collision, etc.). ◆ ITS integration with other systems to improve the process of commercial vehicle permitting, licensing and taxation (e.g., MOTRIS, MOVES, TRAVIS, IRP, etc.).
Traffic Management	The purpose of this initiative will help set up a formalized process for ongoing traffic management along the studied Hwy. 2 corridor that can be used as a model for traffic management of the rest of the highways in Alberta. This initiative will include development of traffic management policies and processes; deployment of additional monitoring and management systems along the studied Hwy. 2 corridor; as well as implementation of a Provincial Transportation Management Centre (PTMC) to carry out monitoring and response operations. This initiative will be expanded on existing traffic management processes and traffic operations by highway maintenance contractors and Alberta 511 operations, with a view to improve traffic safety and capacity in the highway network. Steps / Projects can include: ◆ Establish Alberta Transportation's Provincial Transportation Management Centre (PTMC) and collaboration with cities of Calgary, Edmonton, Red Deer and other municipalities along the studied Hwy 2 corridor. ◆ Installation and continued deployment of corridor-wide traffic detectors and mobile probes for traffic management (e.g. identifying / monitoring vehicle travel patterns, travel times, queueing, delay, and roadway efficiencies, etc.). This will serve an additional purpose of collecting data on traffic congestion and incidents to aid in prioritizing physical improvements. ◆ Deployment of information dissemination tools such as Dynamic Message Signs. ◆ Improvement of traffic monitoring and verification by installation of additional Video Traffic Management System (VTMS) cameras along the studied roadway section. ◆ Continued deployment of ITS technologies such as Variable Speed Limit Systems (VSLS) corridors, HOT / HOV lanes, lane reversal, bus priority lanes or BRT lanes to support lane management programs.

ITS Initiative	Description
Maintenance and Winter Operations	The purpose of this initiative will be to improve the application of the existing Road Weather Information Systems (RWIS) and other related road maintenance systems under different monitored weather conditions along the studied Hwy 2 section. Steps / Projects can include: ◆ Improvement of the existing RWIS on weather condition monitoring and winter road maintenance with more collected RWIS data. This will take the form of increasing RWIS sensor density along the studied Hwy. 2 section, particularly in key-problem areas. ◆ Rollout of additional mobile RWIS systems for maintenance trucks travelling along the studied Hwy 2 corridor, either through maintenance contractors' vehicles or services provided by a third party. Data would be brought into the PTMC, as well as provided into the RWIS system, and made available to highway maintenance contractors. ◆ Increased frequency of patrols and reporting by highway maintenance contractors for the purposes of increasing maintenance response, operation awareness and public dissemination. ◆ Enhanced granularity of the Maintenance Decision Support Systems (MDSS) by using additional RWIS data to provide regional highway maintenance contractors with recommended winter road treatments (e.g., chemical types and rates, plow and spread time, etc.), based on real-time road conditions and forecasted weather events. ◆ Continued deployment of additional on-route Dynamic Message Signs (DMS). These signs show information to drivers under different weather conditions and they would be deployed along several segments of the Hwy 2 to reduce levels of risks or rates of incidents.
Traveler Information	The purpose of this initiative will be to enhance the application of the existing Alberta 511 Advance Traveller Information System (ATIS), specifically to integrate new data sets from other initiatives into these 511 systems. This initiative will provide additional situational awareness regarding road, traffic and weather conditions, as well as events and incidents, based on data validated by the PTMC, the City of Calgary Transportation Management Centre, or other systems. In addition to adding new data sets into the existing 511 system, this initiative will continue to explore new channels to communicate with drivers and logistics companies, including alerts to dispatchers and data feeds that are provided directly to vehicles along the corridor for vehicle and driver awareness. Steps / Projects can include: ◆ Enhancement of the existing Alberta 511 Advanced Traveller Information System (ATIS). New Alberta 511 will continue to provide the province's official road reports based on information supported by HMC and other agencies, while adding the data sets generated from the other initiatives. This will be an expansion of the existing Alberta 511 role to provide real-time traveller information, including traffic incidents, construction, weather conditions, wildlife detection and other special circumstances. ◆ Continued deployment of the Automated Motorist Advisory Systems (AMAS) to provide more travelling information (e.g., weather condition, animal detection, travel time, queueing, over-height, etc.) to motorists, based on real-time detected and validated events. ◆ Alberta 511 integration with connected vehicles and pilots with automotive manufacturers and logistics companies. ◆ Development of contractual processes and technologies with contractors for on-highway disruptions, including lane closures and maintenance, within the contractors' work zones.
Connected/Autonomous Vehicles	The purpose of this initiative will be to enable connected vehicle technologies along the studied Hwy 2 section for safety and operational efficiency improvement. Secondly, this initiative will look to enable future automated vehicle legislative requirements and help authorize certain types of automated vehicles to operate along the studied corridor. The connected vehicle infrastructure would be taken on as short-term deployments along the corridor, and the automated vehicle research and legislation will be started with a view for longer-term operations. The connected vehicle infrastructure will be an important component to support automated vehicle operational studies. Steps / Projects can include: ◆ Connected Vehicle related research projects on Alberta Cooperative Transportation Infrastructure and Vehicular Environment (ACTIVE) Test Bed / Test Track Installation, and testing with a view to future pilots along the studied Hwy 2 corridor. ◆ Alberta Transportation is currently working with Transport Canada, University of Alberta, and others to deploy connected vehicle roadside infrastructure along Highway 2 from 41st Avenue to the Leduc vehicle weigh station. This deployment will form part of ACTIVE Phase 2. In the future, connected vehicle deployment could include the entire segment from Calgary to Edmonton. ◆ Research projects on autonomous buses and commercial vehicles. ◆ Policies for operation and enforcement of connected/automated vehicles. ◆ Research projects on how to involve this initiative with other initiatives.

Additional details, such as costs, institutional considerations and details for deployment are provided in Appendix K.

4.6.4 Future Actions

Each of the initiatives identified in the previous section encompass a number of individual projects. Table 4.6.1 lists these initiatives and the corresponding proposed projects. The Table also provides additional details for each project, including the deployment scope, candidate locations, readiness and a series of recommended objectives for future planning studies.

The deployment scope describes the magnitude of the deployment for each project. Each project is allocated one of the following four options:

- System Wide – applies to the entire provincial highway network.
- Corridor Wide – applies to the Highway 2 corridor under review in this study.
- Segment – applies to a segment of the Highway 2 corridor.
- Localized – applies to a specific location (such as an interchange or roadside station).

While specific planning studies are required to identify specific locations and limits to the recommended projects, Table 4.6.2 provides some guidance on where Alberta Transportation may wish to begin to focus. Table 4.6.2 provides an indication of 'Readiness'. This measure is applied broadly to the ITS Initiatives (not at the project level) as well as Traffic Management Initiatives which are characterized by an ITS component. The table provides an indication of how close Alberta Transportation and its stakeholders and partners may be to planning, procuring and deploying the technologies or systems associated with each project.

In all cases, the next step for each of the projects listed Table 4.6.2 is to conduct ITS project planning studies. These studies represent a critical step in the successful planning and deployment of each project. There are usually multiple objectives for each planning study. Table 4.6.3 provides descriptions for each of these candidate objectives.

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Table 4.6.2: Recommended Objectives for Future ITS Planning Study

Initiative	Project	Deployment Scope	Candidate Locations	Readiness	Identify / Confirm Stakeholders	Assess and Establish Project Limits	Identify Pre-Requisite Systems and Actions	Support Development of Functional Req.	Support Preparation of Concept of Operations	Establish Project Level Cost Estimates	Identify Strategies for Implementation	Identify Supporting Infrastructure Req.	Effectiveness to Address Congestion
Commercial Vehicle Operations	Smart Roadside Inspection System	Localized	Inspection Stations at Leduc and Balzac	Medium Term	✓		✓	✓	✓	✓	✓	✓	Significant
	Integrate with Other Commercial Vehicle Safety Systems (MOTRIS, TSIS)	System Wide	N / A		✓		✓	✓	✓	✓	✓		Moderate
	Support On-Board Connected Vehicle Systems	System Wide	N / A		✓		✓	✓	✓	✓	✓	✓	Moderate
Traffic Management	Provincial Traffic Management Centre	System Wide	N / A	Medium Term	✓		✓	✓	✓	✓	✓	✓	Significant
	Expansion of Video Surveillance System	Area Specific	Stony Trail to Acme Road, McKenzie Rd to 2:26 Hwy 597, 2:30 Hwy 2A to 2:32 AHD			✓				✓	✓		Moderate
	Ramp Metering	Localized	TBD		✓	✓		✓	✓	✓	✓	✓	Significant
	Variable Speed Limit Systems	Segment	2:15 Stony Trail to 2:18 Acme Road, 2:24 McKenzie Rd to 2:26 Hwy 597, 2:30 Hwy 2A to 2:32 AHD		✓	✓	✓	✓	✓	✓	✓	✓	Significant
	HDV/HOT/Transit Priority Lanes	Segment	ITS Placed where Operational Strategy Implemented		✓	✓	✓	✓	✓	✓	✓	✓	Moderate
Maintenance and Winter Operation	Expansion of RWIS	Localized	TBD	Short Term		✓				✓	✓		Moderate
	Mobile RWIS	Corridor Wide	Corridor Wide					✓	✓	✓	✓		Negligible
	Enhance Maintenance Decision Support System	System Wide	N / A				✓	✓	✓	✓	✓	✓	Negligible
	Expand Deployment of Dynamic Message Signs	Localized	Localized to Entrance to VSLS Corridors and Automated Motor Advisory Systems			✓				✓	✓	✓	Negligible
Traveller Information	Enhance 511	System Wide		Short Term			✓	✓	✓	✓	✓		Negligible
	Continue Deployment of Automated Motorist Advisory System	Localized	TBD at Localized Hot Spots			✓	✓				✓	✓	Negligible
	Develop Contractual Processes to Identify Disruptions	System Wide	N / A		✓				✓	✓	✓		Negligible
Connected / Automated Vehicles	Stage 2 of ACTIVE Aurora Strategy	Segment	2:30 Hwy 2A to 2:32 AHD	Long Term		✓	✓	✓	✓	✓	✓	✓	Moderate
	Identify Pilot Projects for Highway 2	Segment	TBD		✓	✓	✓	✓	✓	✓		✓	Moderate

Table 4.6.3: Descriptions of Objectives for Future Planning Studies

Recommended Objective for Future Planning Studies	Description
Identify / Confirm Stakeholders	Project Stakeholders are other departments or agencies that have an interest in the project. They may procure, construct, operate, maintain or benefit from the proposed system.
Establish Project Limits	While some systems may apply to the entire corridor (i.e. Alberta 511), others will have specific limits (such as Variable Speed Limit Lanes). This objective is to consider the specific locations and limits of the project under consideration.
Identify Pre-requisite Systems and Actions	Pre-requisite systems are those that support the proposed system. For example, on-board driver information systems support Smart Roadside Inspection Systems in that they convey messages to the drivers of commercial vehicles.
Support Development of Functional Requirements	Functional requirements are often required at the procurement stage of system development. Planning studies can help to define the intended functions of the system and form a pre-cursor to the development of functional requirements.
Support Preparation of Concept of Operations	A concept of operations is an important step in determining how the system will operate, who will use it and under what circumstances.
Establish Project Level Cost Estimates	Budgetary estimates of the recommended system are an important objective of any planning study. These estimates allow an agency to plan for the financial obligations to procure and install, as well as operate and maintain the system throughout its design life.
Identify Implementation Strategies	Infrastructure expansion projects as well as rehabilitation projects often create good opportunities to implement new systems or system components. Other opportunities may stem from the planned initiatives of other stakeholders (such as Municipalities or other Provincial departments).
Identify Supporting Infrastructure Requirements	Communications and power are generally required for any roadside components. For central systems, the infrastructure may need to consider data transmission, storage and processing. An important objective of any planning study is to identify the infrastructure needed to support the proposed system.

4.6.4.1 Foundational Needs

This report offers a snapshot of the state of the ITS industry, recent efforts by other, similar agencies and descriptions of emerging technologies and systems. However, as ITS highly leverages the IT sector, changes take place very quickly. These changes require continual monitoring to keep abreast of the industry such that Alberta Transportation can continue to leverage new systems and the experiences of other agencies.

Furthermore, as additional ITS systems are deployed or expanded on the corridor (and throughout the Province), Alberta Transportation should make a concerted effort to consolidate the operations of these systems through a Provincial Transportation Management Center. This consolidation will heighten the benefits realized from a set of disparate systems and maximize the effectiveness of limited staff resources.

Lastly, the proposed ITS systems will require diverse expertise and resources to operate and maintain. Alberta Transportation should plan for the engagement of new staff in concert with the deployment of these systems to leverage the benefits.

4.6.4.2 Supporting Infrastructure

The province should also begin to seek future opportunities to develop more detailed supporting infrastructure plans (i.e. power and telecommunications) related to connected vehicle technologies, particularly within the design of future capital projects in more urbanized areas near Calgary, Red Deer and Edmonton. For example, the deployment of fiber optic cables offers very high data bandwidths at a low risk because, even if new technologies come along to compete with the capabilities of fiber, they can be deployed in stages along the corridor to replace the fiber at the end of its design life. It is therefore most cost effective to deploy the fiber as capital projects are implemented along the corridor.

It is recommended to conduct a study to develop typical minimum infrastructure requirements as design standards that can be referenced by department staff and design consultants for implementation in parallel with any infrastructure work at key locations along the corridor. These requirements should include conduit infrastructure with pull box locations for the placement of future fiber optic cable, placement of conduits for power or placement of power access points at fixed intervals along the corridor. Continuous power should be provided in addition to any switched power that is put in place for roadway lighting. Where feasible, work duct banks crossing both the north and southbound highway segments are also recommended.

4.7 Future Considerations for Highway 2

4.7.1 New Highway Corridor

Travel demand at an ultimate population horizon, beyond the current 50-year planning horizon, is expected to warrant a new Calgary-Edmonton highway corridor. A new corridor could potentially accommodate parallel roadway, utility and high-speed rail routes. Planning work would need to begin within the current 50-year planning horizon.

4.7.2 High Speed Rail

The Calgary-Edmonton corridor has frequently been considered for the implementation of a high-speed rail service in recognition of the periods of strong Provincial economic growth in concert with corresponding growth in travel along the corridor. Almost a decade ago Alberta Transportation had commissioned an independent investment-grade study aimed at evaluating the potential for high-speed rail services along the corridor.[24] The study was used to determine existing (2005) travel patterns; included a Stated Preference survey; utilized various modelling techniques accounting for travel

[24] "Market Assessment of High Speed Rail Service in the Calgary-Edmonton Corridor, February 2008.

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time savings, competition with other modes, induced demand and various technologies (diesel, electric, turbine electric and magnetic levitation) to forecast future ridership demand and financial viability in terms of potential revenue.

The intent of this Highway 2 CIS study is not to provide a comprehensive update of the previous HSR initiative. Rather, it was preferred to supplement the last HSR initiative by making use of the existing demand (OD Survey) information collected and travel forecasts produced by this study and provide a comparison to the findings produced in the previous HSR initiative where possible.

The previous HSR study determined that:

- Traffic volumes were forecast to grow by 46% by 2016 (from 2006). [In actuality, an examination of information from Alberta Transportation's permanent traffic recorder stations indicates that traffic between 2006 and 2016 has grown by 43% north of Leduc / Nisku (near 41st Ave); 28% north of Ponoka; 41% north of 11A in Red Deer and 51% south of Airdrie (Yankee Valley Blvd)]
- In 2005, each day roughly 6,900 one-way vehicle trips occurred between the metropolitan areas of Calgary and Edmonton and 5,250 one-way vehicle trips occurred between Red Deer and the metropolitan areas of Calgary and Edmonton.[25]
- Roughly 1 - 3 percent of traffic on the Highway 2 corridor would divert to an HSR service depending on the service level provided [(1% being correlated to 125 mph (200 kph – 2 hour) service and 3% correlated to 300 mph (480kph – 1 hour) service] and the percentage diversion from competitive modes would remain largely constant over time, up to 2050.[26]

In comparison, the 2016 origin / destination results, as presented in Table 3.3.2 indicates:

- Each day roughly 12,260 one-way vehicle trips occurred between the metropolitan areas of Calgary and Edmonton and 11,510 one-way vehicle trips occurred between Red Deer and the metropolitan areas of Calgary and Edmonton.

Since the previous HSR study was commissioned in 2008, there has been significant advances in motor vehicle technology (autonomous vehicle technology) was not addressed as a demand factor within the previous HSR study. Such technology holds the promise of reduced congestion through shorter headways between vehicles, reduced travel time through higher operating speeds, less motorist attentiveness being required, reduced motoring risks and further advances in vehicle safety. In short, future advances in vehicle technology over time could well serve to compete with the services offered by HSR, and diminish the amount of traffic that would divert from the Highway 2 corridor.

The Highway 2 Calgary to Edmonton Corridor Improvement Study did not introduce a formal review of HSR. The above implementation serves primarily as a brief update of the Highway 2 data and knowledge that has been formed since 2008.

4.8 Planning Studies Requirements

Part of the Highway 2 corridor assessment included review of existing plans, designs, planning studies and land use plans. It was identified that the majority of existing interchanges need review to determine long term requirements. Some of the interchanges, especially in extensive development areas, will require planning studies. Some of the interchanges may only require a traffic review and determination of crossing road and intersection improvements.

Exhibit 4.8.1 illustrates the planning study requirements. Table 4.8.1 presents the same list in tabular form. These planning study requirements include functional and capacity reviews at interchanges as well as larger network reviews and bypass studies. The major network reviews are at the following locations:

- Airdrie Bypass – Corridor Alignment and Highway 2 tie-in at Crossfield - Location Study and Access
- Red Deer Bypass – Options of further improvement of existing Highway 2 through Red Deer or investment into Bypass Corridor – Study including alignment location, access and connections to Highway 2.
- Leduc/Edmonton Parallel to Highway 2 corridors - Connections from 170 Street (west), and Highway 21 (east) - alignment location, access requirements and Highway 2 tie-in.

In would be prudent to review area road network adjacent to the potential bypasses to identify local road upgrades to protect integrity of those bypasses. Further discussion is included in Section 5 of this Report.

Table 4.8.1 Interchange Planning Study Requirements

km	Location	Planning Study Required	Notes
Highway 2:15			
50.2	CP Rail		Railway plans to be determined.
51.3	Twp. Rd 261 (CrossIron Drive)		No road plans for west connection.
Highway 2:18			
2.2	VIS north of Balzac Interchange	Planning Needed (Minor)	Relocation being noted but no site identified
12.9	Future Interchange at TWP Rd 274 (North of Airdrie)	Interchange. Functional Planning Study	New Interchange to be considered.
12.9	Future Interchange at TWP Rd 280 (North of Airdrie)	Interchange. Functional Planning Study	New Interchange to be considered.
18.1	SRA SB	Review required (Minor)	Status to be confirmed
23.0	Commercial SRA NB - Crossfield	Review required (Minor)	Service Road Relocation at 8 lane stage
24.3	Crossfield Flyover - possible conversion to interchange	Request from Crossfield	Viability of interchange to be determined
	Calgary to Crossfield Network Study	Network Study	Highway 2 Parallel Corridors, including Connections – East and West

[25] Ibid, Page 14

[26] Ibid, Page vi

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km	Location	Planning Study Required	Notes
Highway 2:20			
0.0	Acme Road Int'c. (TWP RD. 292) - Diamond (Crossfield North Access)	Interchange Functional Planning Study	With proposed developments interchange may need capacity upgrades -
9.7	Highway 581 - Diamond (Carstairs Access)	Interchange Functional Planning Study	With proposed developments Interchange requires capacity upgrades
21.1	Highway 582 - Diamond (Didsbury Access)	Interchange Functional Planning Study	With proposed developments Interchange requires capacity upgrades,
Highway 2:22			
0.0	Highway 27 - Parclo B (Olds Access)	Functional Planning Study	Long Term Plans not finalized. Highway 27 identified as part of Connector Network -
25.0-27.9	Highway 2 widening / realignmnet	Planning Required.	R / W constraints between South and North Innisfail Interchanges at 8 lane stages
Highway 2:24			
0.0	Highway 590 - Modified Diamond (North Innisfail)	Functional Planning Study	Long Term Plans not finalized, Structure replacement in 6-lane stage required
15.7	Highway 42 - Parclo with CD Roads (Penhold)	Review Required/network study	Extensive developments proposed along Highway 42, Modifications may be required
	Red Deer Bypass	Study Required	Bypass Corridor - Location Planning Studies
22.3	McKenzie Road Interchange - Parclo B - One Loop	Functional Planning Study	Significant Developments proposed north of McKenzie Road - No Long-term Plan
28.2	32 Street - Red Deer	Capacity Review / functional plan.	Modification may be required.
Highway 2:26			
~3.5	Future Interchange at TWP Rd 392 (North Red Deer)	Functional Planning Study.	New Interchange to be considered.
7.0	Highway 597 - Diamond - (Blackfalds Access)	Capacity review / functional plan.	Significant Development, west of Highway 2 proposed
10.4	Future Interchange at TWP Rd 400 (North of Blackfalds)	Functional Planning Study.	New Interchange to be considered.
17.5	Highway 12 - Diamond (Lacombe)	Capacity review / functional plan	Significant Developments proposed in vicinity of interchange. Highway 12 identified as part of Connector Network -
26.4	Highway 2A - South Interchange - Milton Road	Long Term Plan	Developments proposed in vicinity of interchange. - west of Highway 2,
32.1	Highway 2A - North Interchange	Functional Planning Required	Existing geometry deficient.
34.4	Highway 604 Interchange - Diamond (Morningside)	Capacity review / functional plan	Industrial Developments proposed in NW quadrant of interchange. Long Term Functional Plan may be Required.
41.0	Matejka Road/Gee Road	Planning Study Consolidation two Interchanges	Significant Developments proposed in all quadrants of Matejka Road interchange.

km	Location	Planning Study Required	Notes
Highway 2:28			
0.0	Highway 53 – Interchange (Conversion to Diamond Imminent)	Capacity review/long term plan	Industrial Developments proposed in all quadrants of interchange. Highway 53 identified Connector Network -
12.5	Menaik Road - Diamond	Capacity review/long term plan	Developments proposed in all quadrants of interchange. Long Term Plan required.
18.7	Highway 611 - Diamond (Hobbema)	Capacity review/long term plan	Developments proposed in all quadrants of interchange. Long Term Plan required.
Highway 2:30			
0.0	Highway 13 - Conversion to Diamond (Wetaskiwin)	Capacity review/long term plan	Developments proposed in all quadrants of interchange. Highway 13 identified of Connector Network
6.7	Correction Line Interchange	Capacity review/long term plan	Developments proposed in all quadrants of interchange.
15.2	Highway 616 Interchange - Diamond (Millet Access)	Capacity review/long term plan	Developments proposed in all quadrants of interchange.
20.1	Kavanagh/Glen Park Road Parclo Interchange	Functional plan	Deficient geometry - Possible reconfiguration.
32.3	Highway 2A (new)	Yes - Review Needed	Review in conjunction with Network Study
34.4	CPR/Black Gold Drive	Yes - Planning Study for Black Gold Dr.	Review in conjunction with Network Study
34.5	VIS south of Leduc	Minor planning needed	Relocation to be considered.
Highway 2:32			
8.1 15.1	South of Highway 2A to Ellerslie Road - Network Study (City of Edmonton, County of Leduc, City of Leduc)	Yes - Network Study Required	Highway 2 Parallel Corridors East and West and Connections - Location Planning Studies
18.9	Ellerslie Road	Yes - Capacity review required.	Long-term Plan Required.

Note: Connector network identified by CAEP - Central Alberta Economic Partnership - Stantec Report 2011

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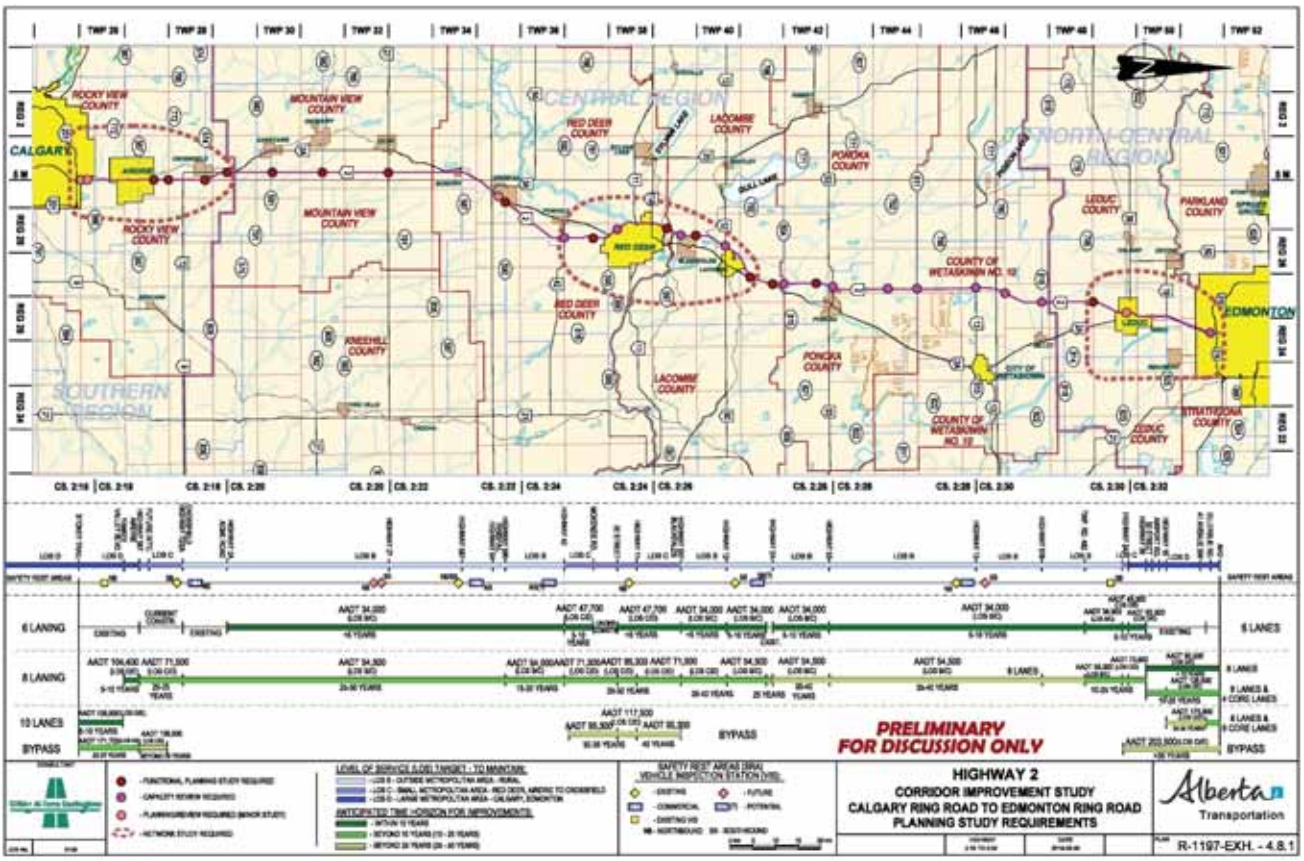
Exhibit 4.8.1 Planning Study Requirements



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5.0 Implementation Plan and Delivery

The Implementation Plan is based on trend-line, or background, growth; however, the plan also identifies future speculative interchanges and upgrades. These are tentative locations along the corridor where growth would exceed the background rate and are either development-driven or a municipal aspiration. The Implementation Plan distinguishes between upgrades resulting from background traffic growth, development growth, safety improvements, or a combination thereof.

This approach helps distinguish between the different types of future highway upgrading; however, we recognize there are circumstances where the division between background traffic growth and development driven growth is unclear. One of the guiding principles that should be referenced is found in the Highway Geometric Design Guide, *Chapter I, Access Management Guidelines, Section 4.4.2, Public Access*:

> *"In cases where the department approves applications for new means of public access or requires the improvement of an existing means of public access as a result of a particular development or subdivision, the applicant will be responsible for the cost and construction. The municipality should be the applicant even though in many cases they may require, through their development agreement process, a particular landowner(s) / developer(s) to pay for the construction and cause to have the construction undertaken. This general philosophy applies to all roads administered by the Department."*

The following sections describe the underlying framework common to the overall delivery strategies throughout the corridor.

5.1 Long Term Transportation Strategy

The long-term transportation strategy evolved differently in each of the five sub-regions comprising the study area between Calgary and Edmonton. Table 5.1.1 shows the five study sub-sections within the 3 regions.

5.1.1 Overview of Highway Upgrade Plan

An overview of the upgrading plan for Highway 2 is summarized on Exhibits 5.1.1 – Highway Widening Requirements and Exhibit 5.1.2 – Structure Requirements.

Table 5.1.1: Highway 2 CIS – Study Sub-Sections

Stakeholders	Limits and Environment	Growth Area Sub-Section
Calgary Metropolitan Region Board (NCR Committee)	Stoney Trail	Calgary- Crossfield
City of Calgary (Calgary Transit)		
Intercity Express (ICE: Regional Transit Service)		
City of Airdrie	Corridor transitions from Suburban to Urban	
Town of Crossfield		
Rocky View County	Township Road 292	
Town of Carstairs	Highway 581	Carstairs - Olds
Town of Didsbury	Rural Corridor	
Town of Olds		
Mountain View County	Netook Road	
Town of Innisfail / Town of Bowden	Highway 587	Bowden - Lacombe
Town of Sylvan Lake / Town of Penhold		
City of Red Deer		
Red Deer Transit (BOLT: Regional Transit Service)	Corridor transitions from Rural to Suburban to Rural	
Red Deer County		
City of Lacombe / Town of Blackfalds		
Town of Bentley		
Lacombe County	Highway 604	
Town of Ponoka	Highway 53	Ponoka - Wetaskiwin
Maskwacis Community (Four First Nations)		
Ponoka County	Rural Corridor	
City of Wetaskiwin		
Town of Millet		
County of Wetaskiwin	Highway 616	
Town of Calmar	Kavanagh Rd	Leduc - Edmonton
City of Leduc (City / County – Regional Transit Service)		
Town of Beaumont / Town of Devon		
Edmonton International Airport	Corridor transitions from Suburban to Urban	
Leduc County (Nisku)		
Edmonton Transit / EMRB Transit Committee		
City of Edmonton	Anthony Henday Drive	
Edmonton Metropolitan Region Board		

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Exhibit 5.1.1 Highway Widening Requirements

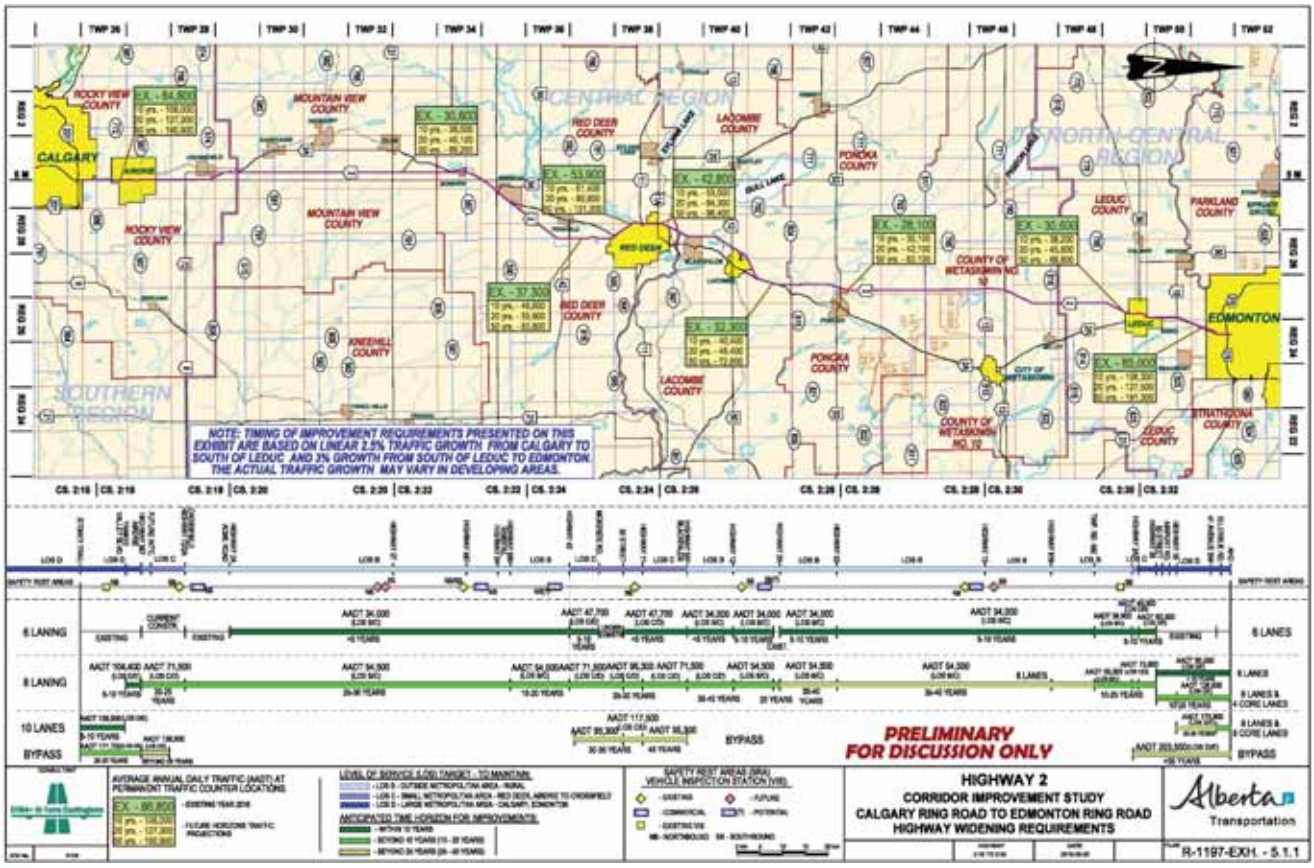

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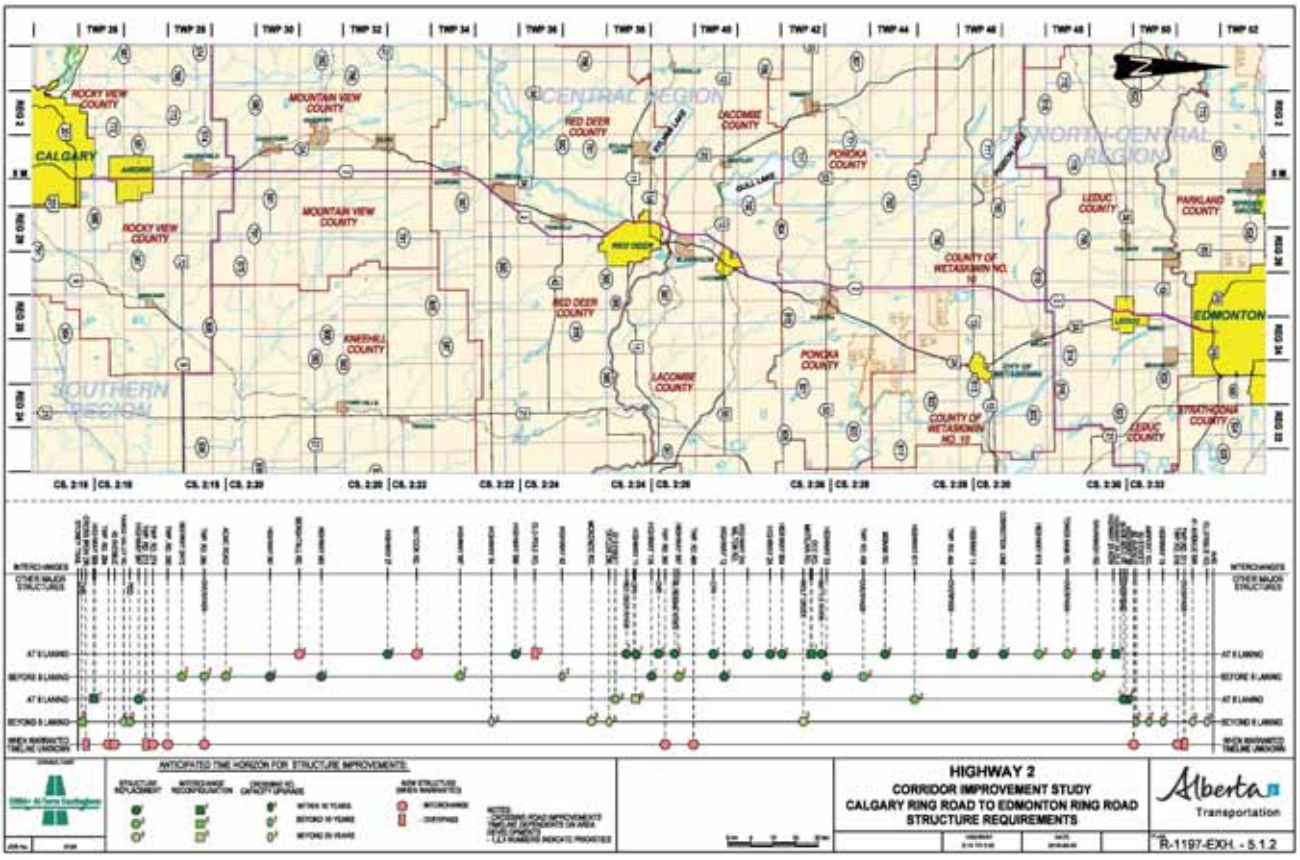
Exhibit 5.1.2 Structure Requirements



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The Implementation Plan is based on trend-line growth. The long-term historic rate for the study corridor is 2.5% linear growth. The Implementation Plan also includes future speculative interchanges, those locations that are either driven (or heavily influenced) by development growth, or are a municipal aspiration, outside the historic trend-line growth. This was accomplished using three categories:

5.1.1.1 Implementation Plan Category 1 – Baseline Investment in Highway 2

The first group includes upgrading as a result of established trend-line, or background, growth. This is upgrading of the provincial highway system that the department would expect to routinely undertake to ensure that the existing infrastructure maintains adequate highway safety and service levels based on growth in background traffic volumes. The emphasis here is on the provincial highway network and nodes. See Appendix L Implementation Plan – Base Growth Investment.

5.1.1.2 Implementation Plan Category 2 – New Investment in Highway 2

The second group includes upgrading needed to accommodate access to Highway 2 (or any provincial highway) for site-specific development and growth. These are locations where the municipality and / or developers bring a new demand to the highway, requiring infrastructure for the development to move forward and where cost-sharing arrangements should (or may) be considered to enable the upgrading. These are locations where Alberta Transportation's routine programming based on maintaining service levels would not have contemplated new infrastructure. See Appendix M – Implementation Plan – Development Growth Investment.

These locations were identified as "Development Growth" where new development seeks new or expanded access to Highway 2. Actual funding solutions and agreements would be resolved in the future and are not addressed by this study. Consistency in the approach to this strategy is important, particularly defining the parameters that place future infrastructure in the 'New Investment' table. Alberta Transportation may need to continue proactive planning at some future (new) interchange locations, e.g. in highly constrained locations; however, programming and funding will require a shared understanding of priorities and funding agreements (if any) with the development industry and their municipal partners.

5.1.1.3 Implementation Plan Category 3 – Other Options

The 'Other Options', typically non-highway, include inter-municipal arterial road networks, inter-municipal transit, urban bypasses, congestion management options and ITS solutions. These options have the potential to slow the pace at which maximum capacity is reached along existing Highway 2. These options should be understood as measures that will both delay highway upgrading and promote overall sustainability in the regional transportation networks, but are not expected to ultimately replace highway expansion. The 'Other Options' are generally more inter-jurisdictional in nature, requiring development and implementation of a shared long-term inter-municipal plan.

5.1.2 Overview of Bridge Upgrade Plan

Alberta Transportation has a systematic procedure in place to prioritize bridges in need of replacement and major maintenance subject to funding availability. It is expected that this system will remain in place and will continue to prioritize and fund the existing bridge system on the Highway 2 corridor. Upgrades or replacements to the existing bridges necessary for additional highway lanes would need to be addressed as part of the overall highway upgrading process.

For bridges that are replaced or maintaining in advance of highway improvements, the design process should address any future highway plans that may impact the bridge configuration. As a minimum any bridge replacement design needs to meet existing roadway widths and roadway improvements planned within the next 10 years. It also needs to incorporate ways to handle the ultimate Highway 2 lane cross-section in the future in a cost effective manner that considers traffic accommodation during any future staged construction. Economic consideration should be given to options where the full bridge width is built all at once so as to eliminate future traffic accommodation concerns. For locations where Highway 2 will ultimately be relocated to a different alignment careful consideration of the timing of the bridge / roadway components will be necessary so that costs are not thrown away unduly.

For bridges affected by improvements to the highway (in advance of a bridge condition trigger) a similar process will be necessary. Some bridges are already designed to accommodate a widened highway. Others cannot handle a widened roadway without being replaced and many may be more cost effective to replace instead of widening due to the age and condition of the existing bridge. As a minimum any bridge replacement or modification needs to meet the proposed roadway widths. It also needs to incorporate ways to handle the ultimate Highway 2 lane cross-section in the future in a cost effective manner that considers traffic accommodation during any future staged construction. Economic consideration should be given to options where the full bridge configuration is built all at once so as to eliminate future traffic accommodation concerns.

Traffic accommodation during construction will be an issue of high importance due to the high volume of traffic using the Highway corridor. If not considered appropriately, unacceptable traffic queues can occur. For the urban and urban fringe areas with very high traffic volumes this may require a minimum 2 lane facility in each direction with maintenance of a high travel speed. In the rural areas 2 lanes in each direction will still be required but a partial speed reduction may be possible. This will require careful analysis and consideration during design efforts for a given bridge site.

There are several traffic accommodation techniques that can be considered during bridge construction. A recent bridge replacement over Wolf Creek on the rural section of Highway 2 built new structures to 3 lanes and built the bridges ½ width at a time to allow for 2 lanes of traffic (reduced speed / minimal shoulders) at all times during construction. The contractors were also given the option to build a temporary detour bridge(s) and roadway to handle 2 lanes of traffic in each direction. A single temporary bridge could potentially be built in the median to allow one bridge to be replaced at a time rather than two separate temporary bridges.

- When a bridge replacement is being considered there are a number of factors that need to be addressed:
  - Will the new bridge be built the same length and width as the old bridge?
  - If not, what are the desirable dimensions and overall configuration for the next 75 years?
- Should the bridge be built for conditions over the next 20 years with future widening of the bridge structure be deferred (staged implementation) or should the ultimate configuration be built now?
- What is the condition and quality of the existing bridge and can it be economically widened given its structural configuration and age?
- For interchanges and grade separations, the roadway crossing Highway 2 may need to be modified to address a deeper superstructure for a replacement bridge or to meet current roadway design standards. How extensive and costly is any required roadway improvements?
- Are modifications required to the existing vertical alignment of Highway 2 to meet current design standards and if so how does that affect the bridge design and traffic accommodation?
- How is traffic going to be handled during replacement and / or renovation?
- Should the bridge be overbuilt for traffic accommodation or is a temporary bridge more effective?

A great number of the existing bridges on the Highway corridor are near the end of their economic life and the decision to replace or maintain is often not obvious at first glance. Recently many Highway 2 bridges Alberta Transportation

considered for major maintenance have been re-envisioned as bridge replacements due to the need to accommodate traffic. It is expected that most bridges with decks carrying Highway 2 traffic will not be able to accept major maintenance due to the traffic accommodation issue.

5.1.3 Detailed Corridor Plan

The 1:20,000 scale corridor plans identify requirements on an interchange-by-interchange basis. This series of 36 plans is the most convenient reference in the report, and probably the primary means of conveying study outcomes. These are included as previously noted, Plan R-1197-PL-1 through R-1197-PL-36 in Appendix H.

Some information shown on the corridor plans may become obsolete over time. Some of the requirements indicated by the plan will be unknown before the relevant planning studies are conducted. The source of future funding is unknown for the development-driven initiatives, with location specific outcomes to be determined on a case-by-case basis.

To establish consistency in the information provided on the corridor plans, the drawing notes include a unique label defining each of five criteria. Not all criteria are needed for each location. As required, the five proposed criteria are:

- Existing Infrastructure: Always shown.
- Near-Term Upgrade: Shown as needed.
- Ultimate Configuration: Always shown.
- Warrant: Shown as needed.
- Design Status: Shown as needed.

The "warrant" category is intended to define the expected conditions, or growth, leading to the anticipated highway upgrading. To address the different growth or upgrading scenarios encountered, and to ensure the associated message is understood as consistently as possible, "warrant" has been defined using one of four basic categories. These descriptions appear on the corridor plans as follows:

- Existing Safety Requirements: to address items such as backlog, access management
- Background Traffic Growth: to maintain capacity and safety levels
- Development Growth: locations where new accesses may be required due to development
- Combination Growth: where background and development growth contribute to the warrant

The "Development Growth" category does not assign responsibility to a specific stakeholder. In some scenarios there are two or more municipalities, or developers, driving the growth and the corresponding demand. There may also be warrants unique to a specific location that do not fall in one of the four categories.

5.2 Cost Estimates

Our implementation plan includes summary information regarding basic improvement requirements at the 6, 8, and sometimes 10 or 12, lane stages, which includes highway widening and bridge structures. Based on traffic growth determined by historic trend-line growth assumptions, and structure conditions, time horizons are indicated when the improvements should be completed to retain the desired LOS for the corridor environment. The implementation plan for baseline growth improvements, as previously noted in Appendix L, includes cost estimates for highway and structural improvements with notes regarding additional improvement requirements.

Additional potential costs for new or expanded access resulting from development-driven growth proposed along the highway are listed separately, as previously noted in Appendix M, with their associated estimated costs.

Cost estimates are based on previous study conclusions as well as new coarse estimates which need to be reconfirmed through additional site-specific studies. Cost estimate assumptions are documented in Appendix N.

Table 5.2.1 shows an aggregated summary of costs expected on the Highway 2 corridor, categorized by time horizon and baseline or development growth. In viewing the cost requirements for Highway 2, two key points emerge:

1. The overall investment required for the Highway 2 corridor is substantial at $6.14B.
2. The short-term investment required for the Highway 2 corridor is also substantial at $2.00B.

Given the magnitude of the required investment, particularly within the next 10 years, it is imperative that Alberta Transportation prioritize the Highway 2 corridor and begin allocating the necessary resources to deliver the necessary upgrades. Delays in programming for the short-term investment needs along the Highway 2 corridor will result in an unacceptable level of service which will negatively impact the economic benefit the corridor provides to the province.

Table 5.2.1 Highway 2 Corridor Cost Summary (in millions)

Southern Region			
	Time Horizon		
	Within 10 years	10 - 25 Years	25+ Years
Investment to Support Baseline Growth			
Road Infrastructure	$ 179.7	$ 122.0	$ 720.0
Bridge Infrastructure	$ 23.5	$ 33.1	$ 75.0
Subtotal	$ 203.2	$ 155.1	$ 795.0
Investment to Support Development Growth			
Road Infrastructure	$ -	$ -	$ -
Bridge Infrastructure	$ 50.0	$ 180.0	$ 50.0
Subtotal	$ 50.0	$ 180.0	$ 50.0
Total	$ 253.2	$ 335.1	$ 845.0
Grand Total			$ 1,433.3

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Central Region			
	Time Horizon		
	Within 10 years	10 - 25 Years	25+ Years
Investment to Support Baseline Growth			
Road Infrastructure	$ 1,066.0	$ 705.0	$ 253.0
Bridge Infrastructure	$ 234.0	$ 205.0	$ 210.0
Subtotal	$ 1,300.0	$ 910.0	$ 463.0
Investment to Support Development Growth			
Road Infrastructure	$ -	$ -	$ -
Bridge Infrastructure	$ 95.0	$ 95.0	$ 70.0
Subtotal	$ 95.0	$ 95.0	$ 70.0
Total	$ 1,395.0	$ 1,005.0	$ 533.0
Grand Total			$ 2,933.0

North Central Region			
	Time Horizon		
	Within 10 years	10 - 25 Years	25+ Years
Investment to Support Baseline Growth			
Road Infrastructure	$ 232.0	$ 281.5	$ 202.5
Bridge Infrastructure	$ 92.7	$ 284.0	$ 99.0
Subtotal	$ 324.7	$ 565.5	$ 301.5
Investment to Support Development Growth			
Road Infrastructure	$ -	$ -	$ -
Bridge Infrastructure	$ 27.0	$ 60.3	$ 492.5
Subtotal	$ 27.0	$ 60.3	$ 492.5
Total	$ 351.7	$ 625.8	$ 794.0
Grand Total			$ 1,771.5

5.3 Alternatives Evaluation

The following sections serve to provide further insight into alternatives such as highway upgrading, inter-municipal arterial roadways, inter-municipal transit corridors, urban high occupancy vehicle (HOV) lanes, urban region bypasses, congestion management options and the role of Growth Management Boards (GMB's) in the planning and future development of the Highway 2 corridor.

Current strategies, or options, for the proposed inter-municipal arterial roads, inter-municipal transit corridors and future Urban Bypasses are shown on three 1:100,000 scale plans for the three urban regions, Calgary to Crossfield; Innisfail to Lacombe; and Leduc to Edmonton, as previously identified in Section 4.

5.3.1 Highway 2

The 36 corridor plans show all potential highway system upgrading resulting from both baseline (background) growth and development-driven growth, identified during the study process. The upgrading shown on the plans is expected to extend the highway's service life to the 50-year horizon; however, this would include bypasses in the three urban regions, where growth in highway volumes will also need to be offset by the inter-municipal arterial networks and transit corridors.

Key Observation: Upgrading the provincial highway cannot be the sole solution for inter-municipal travel between adjoining urban centers.

5.3.2 Inter-Municipal Arterial Road Networks

The greatest anticipated challenge is expected to be integrating the neighboring land use plans, or absence of plans, to establish an inter-municipal arterial road network that benefits two or more jurisdictions and will support the local commutes, delaying highway upgrading, extending its ultimate service life. There are two key issues or risks.

5.3.2.1 Initial Construction

It is difficult to specify the timeline involved in establishing the proposed inter-municipal arterial roads to a standard that would begin to relieve traffic growth along Highway 2. Development in two or more municipalities would need to proceed at a similar pace to achieve a functioning contiguous link and consistent cross-section. It would be challenging to advance this issue without Growth Management Boards (GMB).

Development of the inter-municipal road network needs to advance more quickly than the slow, incremental, progression normally associated with urban growth and development. Sections that currently pass through rural jurisdictions between urban centers would normally wait for annexation, and urban servicing agreements, or provincial funding, potentially taking decades before supporting the commuter demand carried almost solely by Highway 2 in many areas.

5.3.2.2 Maintaining Standards

To be effective in diverting future local traffic growth away from Highway 2, the proposed inter-municipal roadways would need at least an expressway cross-section, high intersection spacing and maintain high access management standards. Taylor Drive in Red Deer is an example of a municipal road that was substantially funded by the province, only to see its effectiveness as a parallel route eroded by increasing accesses and signalization. Leduc's joint city / county Spine Road initiative is an example of proactive planning for an inter-municipal arterial.

5.3.2.3 Conclusion

An emphasis on establishing robust Inter-Municipal Arterial Road Networks is a key part of the solution-finding and recommendations. The risks and implications of highway failure, particularly in the three urban regions, and the need for inter-municipal cooperation and action is critical. Development-related transportation requirements is normally funded through the proponents, developers and municipalities. Provincial funding is often available through various infrastructure grants. If provincial support to help fund the inter-municipal arterials is provided, it should be contingent on establishing and maintaining the desired cross-section and access management standards.

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Key Observation: Development of competent and enduring inter-municipal arterial road networks should be made a function of the proposed Growth Management Boards. Outcomes in the two metropolitan regions should meet the intent of the Penetrator Agreements.

5.3.3 Inter-Municipal Transit Corridors

A key objective in advancing planning for inter-municipal transit corridors is sustainability and delaying highway expansion. It is recognized that there is sensitivity to ownership of this initiative by the two major cities; however, Alberta Transportation should be seen as a champion.

The inter-municipal transit corridors are outside the boundary of the two major cities (Edmonton / Calgary). The EMRB and CRP are not legal entities with authority to acquire rights-of-way. Current plans are only schematic in nature outside the city boundaries. Alberta Transportation is an enabler, with the authority, and motivation, to support identifying and acquiring the needed rights-of-way for transportation purposes. This would make the lands available for staged implementation, e.g. BRT, and permit the municipalities outside the two major cities to proactively incorporate the corridors into their municipal planning processes.

Alberta Transportation's Strategic Foresight, Strategy and Policy Branch tentatively supports the province taking a lead role in coordinating the planning of inter-municipal transit corridors. Alberta Transportation's interest is in corridor protection, not detailed planning and design. This creates the opportunity to advance BRT, whether initially as part of HOV, and ultimately migrating to a dedicated transit corridor.

On January 5, 2018, the Edmonton Journal reported:

> *"Instead of building an LRT from downtown to West Edmonton and beyond, we should go with BRT. Why? First, to avoid building an inflexible system that can't easily be changed if there are major mistakes (and / or if emerging ITS technologies make LRT less attractive to commuters). Second, BRT represents a more flexible system that moves people with LRT-like speed."*

Key Observation: Identification and protection of inter-municipal transit corridors should also be made a function of the proposed Growth Management Boards.

5.3.4 High Occupancy Vehicles (HOV)

The concept of developing designated High Occupancy Vehicle (HOV) lanes on the Highway 2 corridor (segregated from general purpose lanes) was evaluated as part of this corridor improvement study. Previous sections highlighted the following:

- HOV is a congestion management measure that if implemented along the Highway 2 corridor would be intended to increase the number of persons-per-vehicle by encouraging or rewarding multi-occupant vehicle use (i.e. car-pooling, ride sharing, etc.) with an enhanced level-of-service, faster travel time, less congestion, reduced driving stress, better fuel economy and more reliable travel time on an exclusive reserved, designated and segregated lane or lanes. HOV corridors are intended to make more efficient use of capacity by transporting more people on the same number of lanes which assumed that a "well-used" lane full of busses and carpools can more people than a standard traffic lane.
- HOV is best-suited along those sections of the Highway 2 corridor which are currently, or forecast to be, characterized by:
  - Higher levels of congestion (above 80,000 AADT) prior to consideration of implementation.
  - A significant sustainable daily commuter component; (This is intended to ensure that the HOV lane would be "well" used. Section 3.3.5 noted that the proportion of weekday Highway 2 traffic that can be defined as the "local" commuter traffic between Airdrie-Calgary and Leduc-Edmonton is in the order of 70%).
  - A demand for longer distance travel. (A minimum of 10km is thought to be appropriate given travelling along this length at 100kph would take 6 minutes and result in a noticeable travel time saving).
  - A minimum of 3-or-more existing Highway 2 lanes. (This is necessary to accommodate high levels on non-HOV traffic demand).
  - A location that travels through, or immediately adjacent to, an urbanized well-populated area. (Satellite communities with combined population/employment levels of 50,000 persons / jobs).
  - An ability to monitor the HOV corridor for compliance and ensure enforcement.

  These criteria's limit the current application of HOV candidate Highway 2 sections to the higher traffic volume areas along the corridors.
- Implementing High Occupancy Vehicle (HOV) lanes along the existing Leduc-Edmonton and Airdrie-Calgary corridors (assuming the existing configuration) was found to result in unacceptable levels of service on the remaining travel lanes and result in significant scrutiny as commuters and commercial vehicles (which for the most part operated by single motorist), would be forced to navigate under congested conditions while the immediate adjacent HOV lane is viewed as being an under-utilized irritant. This finding led to the following conclusion:
  - Consideration of an HOV concept along the urban sections of the Highway 2 corridor is best left to a time when the future widening of the urban sections of the corridor are envisioned.
  - Commercial vehicle operations merit consideration as a component of High Occupancy Vehicle lane operation; and
  - Consideration could be given to having HOV lanes ultimately migrate to a dedicated transit corridors should transit demand warrant such.
- Consideration of an HOV concept along the urban sections of the Highway 2 corridor is best left to a time when the future widening of the urban sections of the corridor are envisioned.

Conclusion: The following potential applications for HOV lanes exist:

- *Calgary:* A 6-lane rural divided Highway 2 corridor commences just north of the Irricana Township Road 567 interchange. A possible measure remaining to be evaluated should include constructing a 4th Lane in both NB and SB directions to be reserved for HOV usage.
- *Edmonton:* A 6-lane rural divided Highway 2 corridor commences just north of the 50th Avenue interchange. Possible measure to be tested should include consideration of HOV usage when constructing either the 4th Lane in both NB and SB directions or at the time of the advent of the proposed Highway 2 core lanes.

  Red Deer: The Highway 2 corridor through Red Deer is characterized predominantly as a 4-lane rural divided corridor with little opportunity to consider conversion of an existing lane to HOV operation as only a single lane would remain to accommodate remaining traffic. Future widening of the corridor merits evaluation for HOV consideration.

5.3.5 Regional Bypasses

Bypasses are anticipated in the corridor's three urban areas to support the desired serviceability levels approaching the study's 50-year planning horizon. To avoid constructing further bypasses in the future, and to preserve National Highway System performance, a minimum 5 km interchange spacing is recommended along the bypasses. This spacing will make it incumbent on the development industry to include a supporting arterial road network in the area structure plans, instead of diverting short local trips onto the National Highway.

There is an increasing risk of political sensitivity to the public perception of disruption associated with preparing plans for long-term transportation requirements, beyond simple high-level schematics. There is presently a poor ability to implement proactive long-term corridor protection, ultimately leading to right-of-way acquisition.

To mitigate the risk associated with implying future right-of-way requirements, the anticipated terminus points for the various regional bypasses are identified on the 1:20,000 corridor plans by a circle, with an arrow and label. This removes the need to show potential alignments across affected lands. The three Urban Region Plans show various high-level, conceptual, potential road and transit corridors.

Key Observation: Planning for regional bypasses is a priority Highway 2 CIS, including the access management necessary to protect long-term serviceability. The bypasses are considered part of an overall multi-modal planning process that emphasizes sustainability.

5.3.6 Congestion Management Options

The congestion management options with potential to defer highway upgrading have been divided into two groups. These measures incorporate its technologies as well as demand management measures aimed at encouraging greater vehicle occupancy (through pricing mechanisms), or shifting travel demand to other corridors or times of day where there is less congestion.

- *Operational Options:* Strategies to defer highway upgrading include High Occupancy Vehicle (HOV) lanes, Variable Speed Limit Signs (VSLS), Autonomous Vehicles (AV), ramp metering (RM), Connected Vehicles (CV), and Integrated Corridor Management (ICM).
- *User Pay Options:* High Occupancy Toll (HOT) lanes, Congestion Based Dynamic Pricing (CBDP) and Congestion Pricing / Cordon Toll are discussed, but are not considered feasible options at this time.

Key Observation: The timelines and potential application of relevant ITS technologies and operational options are discussed in the associated report sections. These include recommended ITS technologies for future deployment consideration, identification of ITS infrastructure needed to support existing and emerging ITS technologies, and the review of potential impact of connected / autonomous vehicles on Highway 2.

5.3.7 Growth Management

Responding to growth, new development initiatives and the corresponding transportation requirements/expectations, particularly at the inter-municipal level, is best achieved using a multi-jurisdictional approach. Municipal involvement is critical to the development of future transportation solutions that harmonize municipal, and regional, growth aspirations with the corresponding infrastructure requirements.

The department's approach, developed for Highway 2 CIS, is to work with the various municipalities and jurisdictions along the study corridor, e.g. through Growth Management Boards (GMB), to reach a shared understanding of the transportation upgrading required as a result of the various growth and development scenarios and identify sustainable and equitable delivery strategies.

Regional planning was first proposed in Alberta approximately 25 years ago; however, it was opposed, particularly by the rural municipalities. It will be important to demonstrate that Alberta Transportation's involvement in growth management is not a provincial intrusion into local land use planning. Alberta Transportation's interest is in helping establish the needed inter-municipal infrastructure in support of development along the Highway 2 corridor.

It should be recognized that Alberta Transportation cannot prepare aggressive worst-case highway plans that accommodate all conceivable municipal growth and transportation aspirations along the corridor, as outlined in the growth plans provided to us. It can be appreciated that designated municipal lands compete with one another for development opportunities and it is unlikely that full build-out of all rural lands will be developed within the time frame of this study. Alberta Transportation's involvement will result in better overall integration of growth and development plans, and an improved understanding of the overall impact on provincial and municipal transportation infrastructure.

The rural and urban municipalities along the corridor have expressed concern regarding various mechanisms to fund highway upgrading. Recently proposed changes to the Municipal Government Act (MGA) are intended to make the development industry more responsible for collateral infrastructure requirements. Highway 2 CIS does not emphasize specific funding scenarios. Priorities and funding outcomes need to be determined in the future on a location-by-location basis.

The 2016 report to the Metro Mayors Alliance from the Advisory Panel on Metro Edmonton's Future highlights many of the benefits associated with establishing the GMB's proposed by an amended MGA, and/or renewed Inter-Municipal Development Plans (IDPs), and the associated collaborative process in the development of adjoining land use and inter-municipal infrastructure plans.

Key Observation: The Province should establish five GMB's along the Highway 2 corridor. In the Calgary and Edmonton regions the GMB's may be a subset of the Calgary Metropolitan Region Board (North Calgary Region Committee) and the Edmonton Metropolitan Region Board, respectively.

5.3.8 Conclusions

Highway 2 CIS prioritizes planning for long-term bypasses along with planning for inter-municipal transit corridors and arterial road networks. The need for multi-modal planning can be framed economically, in terms of avoiding the costs and impacts of future disruption and preserving the province's ability to support inter-regional mobility and economic growth in a timely fashion.

The inter-municipal arterial road and transit alternatives are needed as part of an overall sustainable strategy, from both economic and environmental perspectives, to support inter-urban flows. Transportation corridors, whether municipal or provincial, can take decades to establish, requiring considerable advanced planning. The proposed Growth Management Boards will create the venue, and impetus, needed to act cooperatively for shared interests. Solutions for inter-municipal travel, particularly in adjoining urban centres, should not simply default to provincial highway upgrading.

5.4 Recommendations and Priorities

The Study Objectives asked that the Highway 2 CIS "*define the highway's future role and function in the broader study corridor*". The highway's future role is two-fold. First, it is a core route in the National Highway System, with a mandate

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to efficiently serve the inter-regional and inter-provincial movement of people, goods and services. Second, as Alberta's premier, and busiest, economic link, Highway 2 also serves to accommodate growth and development in the study corridor; however, going forward, this mandate is met together with the inter-municipal transportation systems along the corridor.

Our key recommendation for implementation and delivery is for the province to establish five growth management boards based on the sub-regional areas:

- Calgary – Crossfield
- Carstairs – Olds
- Bowden- Red Deer – Lacombe
- Ponoka – Wetaskiwin
- Leduc - Edmonton

Once the growth management boards are operational Table 5.4.1 outlines the logical division of responsibilities. Underlying these responsibilities is the need for all entities to establish mechanisms to protect the identified transportation corridors.

Table 5.4.1: Growth Management Board Responsibility Matrix

Growth Management Boards	
Alberta Transportation	Municipalities
• Finish planning for critical Highway 2 elements. • Plan for practical congestion management options relevant to the highway. • Plan for practical intelligent transportation system options applicable to the highway, and where relevant, integrate with adjoining municipal systems.	• Consolidate land use and growth management plans. • Prepare the associated comprehensive transportation impact assessments for the five sub-regions. • Plan inter-municipal transit corridors. • Plan inter-municipal arterial road networks.
Establish mechanisms to protect identified transportation corridors	

5.5 Priority Upgrade Requirements

In addition to the implementation plan outlined above, which addressed the entire corridor, it is important to identify any immediate areas priority for Alberta Transportation to direct their focus. The overriding criteria for improvements on the corridor should be safety, therefore safety performance should continue to be monitored and resources allocated to those projects that represent and unusually high or emerging safety concern.

Assuming the immediate safety issues are addressed, the following priorities include construction, right-of-way protection, and planning studies. These activities are important because of the associated timelines and to mitigate the risk of future conflict with other municipal and infrastructure planning requirements. This will better ensure that the response to future transportation demand is met in the most appropriate and sustainable fashion, improving environmental and economic outcomes throughout the corridor.

5.5.1 Southern Region

Construction:

- Replace the Highway 566 interchange;
- Expand to 8 basic lanes from Stoney Trail to CrossIron Drive.
  - Consider 10-laning to CrossIron Drive and 8-laning to Yankee Valley Boulevard.

Right-of-Way Protection:

- CrossIron Drive interchange; west leg,
- 40th Avenue interchange; and
- Township Road 264 interchange.

Planning Studies:

- Relocation of Balzac vehicle inspection station:
  - Current VIS location may have operational issues with proximity to City of Airdrie's proposed 40th Avenue interchange.
- Airdrie bypass alignment:
  - Identifying roadway location will facilitate development of local land use and road network plans, including connection with Highway 2 near Crossfield.
- Inter-municipal arterials:
  - 11 Street NE (Calgary) / Range Road 11 (Rocky View) / 8 Street (Airdrie)
  - Centre Street (Calgary) / Range Road 13 (Rocky View) / 24 Street (Airdrie)
  - Metis Trail (Calgary) / Dwight McLellan Trail (Rocky View) / Kingsview Boulevard (Airdrie)
  - 60 Street (Calgary) / Range Road 291 / 292 (Rocky View) / Range Road 290 (Airdrie)
- Inter-municipal transit corridors, Stoney Trail to Airdrie:
  - Extension of Green and Blue Lines.

5.5.2 Central Region

Construction:

- Eliminate at-grade intersections at Bergthal Road, Netook Road and Old Pole Road to allow 6-lane freeway configuration. Solutions may include construction of new interchanges or flyovers, or outright closures.
- Close remaining at-grade access north of Blackfalds.
- Complete 6-lane construction from 32nd Street in Red Deer to North of Blackfalds. This area requires the 6-lane configuration within the next 5 years to address capacity concerns and has many original bridges that are reaching the end of the useful service life. The section between 32nd Street and Highway 11 has already exceeded the new LOS threshold that indicate an improvement is required.

Right-of-Way Protection:

- The entire Highway 2 corridor, including interchange locations, should be protected for the long-term configuration. With the 6-lane upgrades expected to occur within the next 10 years, consideration should be given to start the land assembly immediately.

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Planning Studies:

- All interchanges along the corridor require, at minimum, a capacity review in light of the adjacent proposed developments. With the majority of the corridor requiring construction to upgrade to the 6-lane cross section within the next 10 years, capacity reviews and configuration confirmation should be complete in advance of the 6-lane construction activities.
- Red Deer Bypass alignment:
  - Identifying roadway location and timeframe for implementation to determine if a bypass alignment will defer or eliminate the need for an 8-lane section through the Red Deer area.

    This study should be completed prior to additional major construction on Highway 2 through Red Deer. This study would guide decisions for new infrastructure on the existing Highway 2 corridor, specifically, addressing if the infrastructure should be constructed to accommodate a future 8-lane cross section.
- Inter-municipal arterials:
  - Highway 2A
  - Red Deer Ring Road

5.5.3 North Central Region

Construction:

- *Airport Road Interchange*: Monitor requirements/warrants for further ramp improvements & Highway 2 weave lanes (Stage II), and twinning of Airport Road bridge (Stage IV) and prepare to initiate detailed design.
- 65th Avenue Interchange (Stage I) The Province is to consider participating in the construction of the twinned bridge over the Highway 2 corridor linking the EIA lands to 50th Street within the City of Leduc with benefits associated with reduced demands on the Airport Road interchange and delay of the Stage II 65th Avenue interchange for at least another decade.

Right-of-Way Protection:

- Currently the only section of the entire Highway 2 corridor in the vicinity of the Leduc-Edmonton corridor that may be the candidate for RoW protection with any degree of certainty is that section between the Airport Road and 65th Avenue corridors[27] where, for the most part, the infrastructure requirements have been relatively well defined and continues to be refined as part of the detailed design process currently taking place.
- With the advent of shifting priorities and envisioned plans (e.g. alternative visions for the corridor north of Highway 19 which include a ring road system interchange versus a Township Road 510 interchange and 511 fly-over promoted by the City of Edmonton's recent annexation; two different alignments for Highway 2 corridor in the vicinity of the new Highway 2A interchange) and yet-to-be defined elements (50th Avenue interchange design) functional planning has not advanced to the stage where RoW acquisition can proceed along much of the alignment.

Planning Studies:

- *Priority 1 Planning Projects*
  - *Highway 2 Corridor (41st Avenue to Highway 19)*: 7km: Determine ultimate Highway 2 alignment, interchange and flyover configurations, core lane and property requirements keeping in mind the need to accommodate CP Rail grade separations where required.
  - *Highway 2 Corridor (Ellerslie Road to 41st Avenue):* 3.6km: Determine functional design requirements of the planned core-collector configuration, alignment inclusive of staging requirements.
  - *Highway 2 Core Lane Design (Ellerslie Road to 65th Avenue)*: Determine functional design of the ultimate Highway 2 core-collector configuration with emphasis on the core-lane configuration, transfer lane location / configuration and staging requirements.
  - *Terwillegar S. Extension: 41st Avenue to 65th Avenue (New Realigned Highway 39) 14.5km*: Determine the alignment, interchange configuration and property requirements.
  - "*Leduc-Edmonton Comprehensive Transit Strategy*": Determine long-term transit corridor and infrastructure requirements for the area bounded by 41st Avenue on the north and the City of Leduc's urban boundary to the south inclusive of the EIA and the Town of Beaumont with consideration of conversion of existing rail routes to transit only corridors, new emerging technologies, (smaller autonomous buses without fixed stops providing Uber-like pick-ups / drop-offs which are then routed to transit-only corridors.), preferred transit corridors, type of service (LRT, BRT) to be provided, future transit station / park-n-ride locations, transit maintenance facility requirements and anticipated transit service levels and a property protection strategy.
- *Priority 2 Planning Projects*
  - *Terwillegar S. Extension: South of 50th Ave (Highway 39) to Highway 2 8km*: Assess alignment, interchange configuration and property requirements.
  - *Highway 2A Update:* Determine the implications associated with converting the existing Highway 2A interchange bridge as a "fly-over" to assure that municipal planning efforts protect sufficient property to provide for the ultimate 8-lane Highway 2 corridor and quantify benefits to reduced thru-lane requirements on the adjacent interchanges.
  - *50th Avenue Interchange Update*: Determine the implications associated with the ultimate 50th Avenue interchange requirements and the effected corridor between 65th Avenue and the Highway 2A interchange in sufficient detail to identify the ultimate property requirements.
  - *Highway 2 / 19 Interchange*: This project would serve to update and confirm the configuration, ramp, lane and structural requirements necessary to permit the design of the ultimate Highway 19 interchange inclusive of the implications associated with grade separating the existing CP Rail corridor.
  - *Township Road 482 (Tower Main Road) Fly Over - BF 75678:* Determine widening requirement for Fly-over.
- *Inter-Municipal Studies: Transit Planning:*
  - *A "Leduc-Edmonton Comprehensive Transit Strategy" should be developed with the objective of determining the long-term transit corridor and infrastructure requirements for the area bounded by 41st Avenue on the north and the City of Leduc's urban boundary to the south inclusive of the EIA and the Town of Beaumont. The strategy should not only designate preferred corridors, type of service (LRT, BRT) to be provided, transit station / park-n-ride locations, transit maintenance facility requirements and anticipated transit service levels, but also provide sufficient local level detail that would permit the designation of the appropriate*

[27] *The property requirements was found to involve property transfer agreements to be established between the Edmonton International Airport, the City of Leduc and the Province.*

Authorities / jurisdictions to protect the preferred future transit corridors, transit station and maintenance sites. - Priority 1 -

- *Inter-Municipal Studies: Arterial Planning:*
  - Planning for Inter-municipal arterials: A significant amount of planning work is necessary to address the requirements for the portions of the local area roadway network which may be used to divert traffic away from the Highway 2 corridor. These include:
    - Spine Road (Township Road 510 to Highway 2A and ultimately Highway 2); Ultimate 6-lanes
    - Advance of "continuous" parallel 6-lane arterial corridor on the west side of the Highway 2 corridor between the Terwillegar South Extension and the Highway 2 corridor.

5.5.4 General Comments on Bridge Priorities

The current condition of several bridges near Red Deer is requiring Alberta Transportation to look at several bridge replacements within the near term future. The bridges in question include the two CN and CP grade separations north of Red Deer as well as the Red Deer River and Blindman River bridge crossings. While these particular bridge sites might be seen as individual bridge replacements, the geographical locations allow these sites to be examined on a combined perspective from a planning perspective.

The need to maintain two lanes of high speed traffic during construction is a complicating issue in addition to typical design constraints, environmental issues and cost effectiveness concerns. One option that has been explored by others at the CN crossing is to build new replacement bridges on a new roadway beside the existing highway so as to provide traffic accommodation. This solution appeared to be the most cost effective for that particular site, however the analysis was restricted to the one bridge site. This realigned highway concept may have other impacts on the overall highway design standards and the related operational characteristics and might be better considered by looking at all of these bridge replacements together. An overall construction perspective may also be considered if sufficient funding can be made available to address all of the reconstructions at the same time, likely providing overall cost savings and also benefits related to coordination of traffic accommodation.

The sheer number of bridges of advanced age dating from the original highway construction will require a significant investment to reconstruct and maintain in suitable condition for the existing traffic lane configuration. It can be expected that a large expenditure of funds will be required over an accelerated time period to address the bridge reconstruction needs, similar to the concentrated funding that was required for the original implementation of the highway corridor.

Recommendation: If funding is not available to reconstruct the bridges it is anticipated that quick fix type solutions will be required to maintain the bridges for traffic and 'unanticipated' problems that need to be addressed on short notice will occur more frequently and may have an effect on traffic flows by closing traffic lanes more frequently and for longer durations. In addition, extending the life of a bridge in this manner can create situations that are not cost-effective in the longer term with more frequent smaller expenses adding up to more money over time than replacement. It is recommended that a funding plan be developed for the bridge reconstructions that considers cost optimization over an extended time period of 50 or more years as well as the impacts of traffic interruptions.

5.6 Existing and Proposed Interchange Location Summary

Table 5.6.1 – 5.6.4 provide an overview of the study corridor and identify the existing and proposed interchange locations between Calgary and Edmonton. The four tables divide the information by Alberta Transportation Region and show the following:

- Spacing between each existing and proposed interchange locations (locations shown by a black dot)
- Adjoining municipal or other jurisdiction served by the interchange,
- Existing and future interchange configurations (where known),
- Rail crossing locations and areas of rail proximity to highway,
- River crossing locations,
- Ancillary facilities, such as vehicle inspection stations, safety rest areas, pedestrian overpasses, police station,
- Existing interchange location numbers from OIC 587 / 2009[28]
- Existing and Proposed interchange without location numbers from OIC 587 / 2009[29]

Legend:

- Municipality
- Municipality
- New Interchange
- Major River Crossing
- Rail Proximity or Crossing
- Roadside Facility

[28] Order-in-Council 587 / 2009, Highways Development and Protection Act, Freeways and Access Locations Designation Order

[29] Order-in-Council 587/2009, Highways Development and Protection Act, Freeways and Access Locations Designation Order

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Table 5.6.1: Interchange Locations – Southern Region

Municipality Stakeholder		Intersecting Highway or Roadway	Current Status				
			Interchange Configuration		2009 OIC #	Spacing	
			Existing	Ultimate			
Rocky View County	City of Calgary (west side of hwy)	Stoney Trail (Highway 201)	System		35	•	
		144 Avenue Rail Crossing	pipearch			2	Rail Proximity
		Crossiron Drive (partial, to / from south & east)	Trumpet "A"	additon of west leg	35a	•	
						2	
		Hwy 566 (Balzac) - (ultimate configuration):	Simple Diamond	Parclo B4	36	•	
		Hwy 566 (Balzac) - (ultimate configuration):	Simple Diamond	Parclo B4	36	•	
		Northbound VIS (to be relocated)	-	Relocated		3	
		Township Road 264 (future)	N / A	Service	36a	•	
	City of Airdrie	Township Road 264 (future)	N / A	Service	36a	•	
						2	
		40th Ave.Sharp Hill Way (partial-future)			36b	•	
						2	
		Yankee Valley Blvd (Big Hills Springs Rd)	Parclo A4		37	•	
		Right / off-Right / on (to / from south)	-	-		3	
		Highway 567 (Veterans Boulevard)	Parclo AB3		38	•	
		Proposed Overpass (Twp Rd 273)				3	
		North Airdrie (future Interchange T.R. 274)	N / A	Service	38a	•	
		North Airdrie (future Interchange T.R. 274)	N / A	Service	38a	•	
						3	
		Twp Rd 280 (provisional for Regional Bypass)	N / A	System	38b	•	
		Southbound SRA	-	-		3	
	Town of Crossfield	Highway 2A (west) / Highway 72 (east)	Parclo A4		39	•	
		Northbound CSRA (access to TR 284 east)	-	-		10	
		Township Road 285 (to Airdrie Bypass?)	flyover	Directional Interchange		10	
	Town of Crossfield	Township Road 292	Narrow Diamond	Parclo A4 (or B4)?	40	•	

Table 5.6.2: Interchange Locations – Central Region

Municipality Stakeholder		Intersecting Highway or Roadway	Current Status				
			Interchange Configuration		2009 OIC #	Spacing	
			Existing	Ultimate			
Mountain View County						10	
	Town of Carstairs	Highway 581	Simple Diamond		41	•	
						7	
		Twp Road 310 (Bergthal / Westcott Rd)	at-grade	fly over or service	42	•	
						5	
	Town of Didsbury	Highway 582	Simple Diamond		43	•	
		Township Road 320	at-grade	close		15	
		Township Road 322	at-grade	close			
	Town of Olds	Highway 27	cloverleaf	Parclo A4 or B4	44	•	
						7	
		Twp Road 334 (Winbourne / Netook Rd)	at-grade	fly over or service	45	•	
		Township Road 340	at-grade	close		10	
Red Deer County		Highway 2A (Right / off, southbound)	-	-			
	Town of Bowden	Highway 587	Parclo B2		46	•	
		Northbound CSRA	-	-		9	
	Town of Innisfail	Highway 54 (Range Road 284 east)	1/2 Diam./Parclo B2		47	•	
						3	
		Highway 590 (east) / 50 Street (west)	1/2 Diam./Parclo B2		48	•	
		Township Road 362 (Old Pole Road)	at-grade	close		16	
	Town of Penhold	Highway 42	Parclo B4		49	•	
						7	
		McKenzie Road / Twp Rd 372	Complex Service		50	•	
		Rt / off-Rt / on (Gasoline Alley, to / from south)	existing	retained		3	
		Gaetz Avenue / Highway 595	Combined Service	Directional to / from S.	51	•	
		and	Combined Service	C / D Lanes		1	
	City of Red Deer	Highway 2A / Taylor Dr. (partial)	Combined Service	Parclo B3	52	•	
						2	
		32nd Street	Simple Diamond		53	•	
		Northbound SRA (sports hall, park access)	-	-		5	
		Red Deer River Crossing	-	-		5	
		Red Deer Rail Crossing	overpass			5	Rail Proximity

Municipality Stakeholder		Intersecting Highway or Roadway	Current Status: Interchange Configuration Existing	Current Status: Interchange Configuration Ultimate	Current Status: 2009 OIC #	Spacing	
Red Deer County	Town of Sylvan Lake	Highway 11 (future freeway to west)	Parclo A4	System	54	•	
	City of Red Deer					3	
		Highway 11A	Simple Diamond	Split Diamond	55	•	
		Blackfalds Rail Crossing	overpass			4	Rail Proximity
		Red Deer Ring Road (expressway)	N / A	Service	55a	•	
		Red Deer Ring Road (expressway)	N / A	Service	55a	•	
		Blindman River Crossing	-	-		4	
Lacombe County		Southbound Right/on (Range Road 274)	-	-		4	
	Town of Blackfalds	Highway 597 (Aspelund Road)	Simple Diamond	Parclo A4 or B4	56	•	
						3	
		Township Road 400 (future I.C?)	n/a	Service	56a	•	
		Lacombe Rail Crossing	overpass			7	Rail Proximity
	Town of Bently	Highway 12	Simple Diamond	Parclo A4 or B4	57	•	
	City of Lacombe	Highway 12	Simple Diamond	Parclo A4 or B4		•	
		Range Road 270	at-grade	close		9	
		Southbound SRA (access to RR 264)	-	-		9	
		Highway 2A (Township Road 412)	Complex Diamond		58	•	
						6	
		Highway 2A (partial, to / from northeast)	Trumpet B		59	•	
						2	
		Highway 604 (Morningside)	Simple Diamond		60	•	
Ponoka County		Highway 604 (Morningside)	Simple Diamond			•	
						7	
		Township Road 424 (Matejka Road)	Parclo B2		61	•	
						1	
		Township Road 425 (partial, to / from north)	1/2 Daimond	remove?	61.a	•	
						3	
	Town of Ponoka	Highway 53	Cloverleaf	Parclo A4 or B4	62	•	
		Township Road 435	Flyover			12	
		Township Road 442 (Meniak Road)	Parclo A2		63	•	
						7	
	Maskwacis Community	Highway 611	Simple Diamond		64	•	

Municipality Stakeholder		Intersecting Highway or Roadway	Current Status: Interchange Configuration Existing	Current Status: Interchange Configuration Ultimate	Current Status: 2009 OIC #	Spacing
County of Wetaskiwin		Northbound CSRA (access to Bull Rd)	-	-		13
		Township Road 455	Flyover			13
	City of Wetaskiwin	Highway 13	Cloverleaf	Parclo A4 (or B4)	65	•
						7
		Township Road 470 (Correction Line Road)	Spread Diamond		66	•
						9
	Town of Millet	Highway 616	Spread Diamond		67	•

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Table 5.6.3: Interchange Locations – North Central Region

Municipality Stakeholder		Intersecting Highway or Roadway	Current Status				
			Interchange Configuration		2009 OIC #	Spacing	
			Existing	Ultimate			
Leduc County		Township Road 482	Flyover			11	
		Kavanagh / Glen Park Road (Twn Rd 490)	Parclo B2	Parclo B4	68	•	
		Potential south terminus for Terwillegar	n/a	System	68a	6	
		Southbound VIS (to be relocated)	-	relocated			
	City of Leduc	Highway 2A (future relocation, all movement)	Trumpet A	Parclo B4	69	•	
		Blackgold Drive / Rail Crossing	underpass			3	Rail Proximity
	Town of Calmar	Highway 39 / 50th Avenue	Simple Diamond		70	•	
	City of Leduc	Highway 39 / 50th Avenue	Simple Diamond		70	•	
		Right/off northbound (50th Street)	-	close		2	
		65 Avenue (Twp Rd 500) (future interchange)	n/a	service level	70a	•	
				service level			
		50 Street (partial, to / from north & east)	Directional	service level	71	•	
	Edmonton International Airport	50 Street (partial, to / from north & east)	Directional	service level	71	•	
		Right / off northbound (Sparrow Crescent)	-			3	
		Airport Road (Twp Rd 502)	Parclo A4	Upgraded	72	•	
						3	
		Highway 19 / Highway 625	Parclo A4	Upgraded	73	•	
	Town of Beaumont	Highway 19 / Highway 625	Parclo A4	Upgraded	73	•	
	Town of Devon	Highway 19 / Highway 625	Parclo A4	Upgraded	73	•	
		Right/ on Northbound (Sparrow Drive)	-	close for 510 I.C	73a	4	
		Township Road 510 (future interchange)	n/a	Service	73a	•	
						4	
		41 Avenue	Parclo A4		73b	•	
City of Edmonton		41 Avenue	Parclo A4				
		Police Station in median (left / off-left / on)	-	-	73c	4	
		Elerslie Road	Simple Diamond		73c	•	
						1	
		Anthony Henday Drive (Highway 216)	System		1	•	

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6.0 Consultation Process

Consultation involved the 31 jurisdictions outlined in Table 6.1.1: Jurisdictions Consulted. Consultation was with technical or administrative staff only. Presentations or meetings with elected officials was not included.

Table 6.1.1: Jurisdictions Consulted

Stakeholders	Engagement Team	
	Consultant	A.T.
Calgary Metropolitan Region Board	N / A	Southern Region
City of Calgary (including Calgary Transit)	CIMA+	
City of Airdrie, including regional transit (ICE)		
Town of Crossfield		
Rocky View County		
Town of Carstairs	Al-Terra	Central Region
Town of Didsbury		
Town of Olds		
Mountain View County		
Town of Bowden		
Town of Innisfail		
Town of Penhold		
Town of Sylvan Lake		
City of Red Deer, including regional transit (BOLT)		
Red Deer County		
Town of Blackfalds		
City of Lacombe		
Town of Bentley		
Lacombe County		
Town of Ponoka		
Maskwacis Community (Four First Nations)	DEMA Land Services	
Ponoka County	Al-Terra	
City of Wetaskiwin		
Town of Millet		
County of Wetaskiwin		
Town of Calmar		
City of Leduc (including regional transit service)		
Town of Devon	Castleglenn	North Central Region
Town of Beaumont		
Edmonton International Airport		
Leduc County (Nisku)		
City of Edmonton (including Edmonton Transit Service)		
Edmonton Metropolitan Region Board *	N / A	

** Included the original Capital Region Board Transit Committee*

Two information sessions were held with stakeholders, late 2016 and mid 2017 in each of the 5 sub-regions. Final information sessions are planned in the future to present the study findings. A separate report documenting the consultation process will be prepared and submitted to Alberta Transportation following the final sessions.

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7.0 Conclusions

The Highway 2 Corridor Improvement Study reached the following conclusions regarding the strategic questions posed in the introduction:

- *Continued Expansion of Existing Highway 2:* The practical limits to expanding the existing highway, based on right-of-way requirements and optimal cross-sections, ranged from 8 lanes through the large rural sections, 8 to 10 lanes through the Calgary region, and a system of 8 collector lanes (and additional core lanes) through the Edmonton region.
- *Sustainable Level-of-Service (LOS)*: Driver expectations (throughout North America) permit transitioning from LOS 'B' through long rural stretches, to LOS 'C' through suburban or transition zones, and LOS 'D' through developed urban (high commute) environments. Maintaining LOS 'B' along the highway network passing urban areas would be impractical, serve to accelerate the timing of infrastructure upgrades and may prove to be unaffordable.
- *Cross-Section:* Highway safety and cost effectiveness are best achieved between Red Deer and Edmonton by preserving the existing 23.2m median width and placing the additional lanes on the outside the existing highway cross section.
- *Parallel Inter-Municipal Arterial Roads*: To support ultimate municipal growth aspirations along the highway corridor, particularly in the three urban areas, development-driven commuter flows must be supported by new or upgraded local arterials, instead of defaulting to what is intended to be a free-flow Highway 2.
- *Inter-Municipal Transit Corridors:* To support ultimate municipal growth aspirations along the highway corridor, particularly in the three urban areas, inter-municipal corridors should be identified and protected to support transit solutions, e.g. Bus Rapid Transit (BRT) migrating to Light Rail Transit (LRT), linking the growing urban satellite communities to the metropolitan core.
- *High Occupancy Vehicle (HOV) Lanes*: Implementing HOV lanes on the existing urban sections of the Highway 2 corridor will result in unacceptable levels of service on the remaining travel lanes. Consideration of an HOV concept along the urban sections of the Highway 2 corridor is best left to a time when the future widening of the urban sections of the corridor are envisioned. In the Calgary region, adding a fourth (median-side) lane as HOV would be challenging based on the relatively short interchange spacing and its attractiveness to drivers would hinge on extending HOV along Deerfoot Trail.
- *Bypassing the Major Congested Sections:* Developing north-south bypass routes, Airdrie, Red Deer and Terwillegar Drive, are ultimately required to maintain the National Highway System (provincial Level 1 / freeway facility) function and free-flow service. However, identifying and establishing the bypass routes requires early attention to protect the required right-of-way and assure a coordinated approach to municipal planning adjacent to the routes.
- *Future Regional Bypasses*: Highway 2 entering the two metropolitan regions, and the two existing ring roads, will ultimately fail as urban growth expands outward and along the corridor. The development of the future bypasses is essential if the National Highway System's (provincial Level 1 / freeway facility) function, service-levels, effectiveness and efficiency is to be assured.
- *New Parallel Highway Corridor*: A new parallel corridor will not be required within the study's 50-year time frame. Future assessments of the highway corridor, which can better gauge the effect of still emerging transportation technologies, should re-evaluate the need for a new corridor and the associated planning.
- *Congestion Management Options (CMO):* There are no reliable means to meaningfully assess the implications of the CMO strategies (e.g. CAV, VSLS and ramp metering, etc.) in deferring highway upgrading and their impact on Alberta Transportation's overall funding program for the corridor. The sensitivity associated with the traffic forecasting; the uncertainty associated with the inter-jurisdictional cooperation needed to establish inter-municipal arterials and transit; and the significant uncertainties still posed by connected / autonomous vehicles, taken together, marginalize many of these 'CMO' considerations. Their influence on Alberta Transportation's funding program cannot be reasonably measured in dollars or time, over the next 40-50 years. (For example, it cannot be concluded that a particular CMO initiative will delay a specific future funding need by 5 years.)
- *User-Pay Strategies:* High Occupancy Toll (HOT) lanes, Congestion Based Dynamic Pricing (CBDP) and Congestion Pricing / Cordon Toll are not considered feasible options to defer highway upgrading at this time.
- *Intelligent Transportation Systems (ITS)*: Current research indicates that the full extent of the consequences of connected autonomous vehicles on both the number of trips and road safety is not yet known to a level of certainty that can be used to influence the future planning of transportation corridors. Other current and emerging technologies have potential to affect roadway capacity and safety.
- *Programming*: A logical implementation plan for the corridor has been presented, based on growth forecasts, and is presented alongside the impact and future needs driven by development growth.
- *Managing Development Pressures:* Municipal involvement is critical to the development of future transportation solutions that harmonize municipal, and regional, growth aspirations with the corresponding infrastructure requirements. The department's approach is to work with the various municipalities and jurisdictions along the study corridor, e.g. through Growth Management Boards (GMB), to reach a shared understanding of the transportation upgrading required as a result of the various growth and development scenarios and identify sustainable and equitable delivery strategies.

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Appendix A

Existing Conditions Summary

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Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
Highway 2:15											
47.8	Hwy. 201 - Stoney Trail - Directional	Basic 6 Lanes Median - 23.0m Shlds.- Standard R/W Varies		NB PM Peak Basic Section - LOS C Entrance Ramp - LOS D Weaving Area N. of Int'c. - LOS E	130km/h Standard				Interchange Configuration - Ultimate Configuration, Future Improvements include Highway 216 (Stoney Trail) Capacity Upgrade		
		6 + Aux. Lanes R/W 167.6m	AADT 105,320 ASDT 112,130					2020	Basic 8 lane stage widening to outside		
50.2	Crossiron Drive Trumpet Configuration	NB-4 lanes, SB-3 lanes Median - 23.0m		NB PM Peak Basic Section - LOS D Ramps - LOS D	Tapers 130km/h Standard		29.5		Existing/Future - South Connections Only Future Expansion to the West - Stage II, Structure accommodates 10 lanes Crossing Road Structure and Roads Req'd.	(2008) II Stage -$63M	Planning Report by MMM and Others
		6 Lanes R/W 172.3m	AADT 88,640 ASDT 94,380				51.7	SB-2023, NB-2022	Basic 8 lane stage widening to outside		
Highway 2:18											
0.0	Highway 566 - Balzac Ex.- Diamond Future - Parclo B	Basic 6 Lanes Median - 23.0m Shlds.- Standard R/W Varies		NB PM Peak Basic Section - LOS C Ramps - LOS D	Defficient Accel./Decel. Geometry		53.2	NB - 2017, SB - 2022	Interchange Replacement Parclo B Configuration	Ultimate Stage $94.7M (2009) Design Level Cost ?	Planning Report AECOM 2010 Design ready for Tender - AECOM 2014
			AADT 84,500 ASDT 89,970	SB AM Peak - LOS D			48.0	NB - 2017, SB - 2022	Basic 8 lane stage widening to outside		
2.2	Vehicle Inspection Station	Basic 6 Lanes Median - 23.0m Shlds.- Standard R/W Varies		SB AM Peak - LOS D			36.0	NB - 2017, SB - 2022	To be Relocated		No Planning
		6 Lanes R/W 139.0m	AADT 84,390 ASDT 89,970	SB AM Peak - LOS D			65.8	NB - 2017, SB - 2022			
6.5	Yankee Valley Int'c. Ex.- Parclo A Highway 2 Overpass	Basic 6 Lanes Median - 23.0m Shlds.- Standard R/W Varies		Ramps - LOS D	Tapers 130km/h Standard		63.9	2021	Northbound Exit Ramp Expansion to Two Lanes and Widening Underway, 8 lanes will accomodated on existing structure.	$896,500	
		Basic 6 + Aux. Lns.. Median Varies R/W 106m	AADT 84,390 ASDT 89,970				64.1	2021	Widening to inside transition for 8 lane stage, through curves, north of Yankee Valley Int'c. Constrained area - Cemetery.		
7.9	East Lake Crescent - Exit Ramp (NB) Edmonton Trail - Entrance Ramp (SB)	Basic 6 Lanes Median - Varies Shlds.- Standard R/W Varies		LOS B			64.1	2021			
		Basic 6 Lanes Median - Varies	AADT 48,910 ASDT 52,070				68.8	2022			
9.7	Veterans Blvd. - Highway 567 Int'c. Ex. Parclo AB	6 Lanes R/W Varies		LOS B			74.8	2022	It would be difficult to accommodate 8 lanes and the loop ramps under the existing structures - barriers and design exceptions would be required.		

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
		6 Lanes Median 14.6m R/W Varies	AADT 42,220 ASDT 44,950	LOS B			77.6	2022			
10.2		4 Lanes Median 14.6m R/W 114.2-119.2m		LOS B			53.6	2022-2023	Current Construction: 6 laning - km 10.5 to km 23.126	$25,057,000	
12.9	Future Interchange	4 Lanes Median 14.6m R/W Varies		LOS B Except: SB PM Peak - Exit Ramp - LOS C							Eagle Engineering Corp. Design 2013 (Constrcution 2017 and 2018)
19.5	Highway 2/2A/72 Int'c. Ex. Parclo Crossfield Access	4 Lanes Median 14.6m R/W Varies		LOS B Except: SB PM Peak - Exit Ramp - LOS C	Deficient Geometry		70.0	2023-2024	Current Construction: Hwy. 2/2A/72 Roundabout Diamond Interchange	$7,711,000	
23.0	Commercial SRA NB	4 Lanes Median 14.6m R/W Varies	AADT 35,640 ASDT 40,360	LOS B			33.2	2019-2022	To be removed at 8 lane stage		
24.3	Crossfield Flyover	6 Lanes Median 14.6m R/W 150.8m	AADT 35,640 ASDT 40,360	LOS B			32.6	2022			No Future Plans
Highway 2:20											
0.0	Acme Road Int'c. (TWP RD. 292) - Diamond Crossfield N. Access	6 Lanes Median 14.6m R/W Varies	AADT 31,900 ASDT 36,130	Basic Sections - LOS A Ramps - LOS B	Standard		34.0	2021-2022	Crossfield Access through Hwy. 2A		No Future Plans
4.9		4 Lanes Median 14.6m R/W ~151.5m		LOS B			32.7	2021-2022,			
9.7	Highway 581 - Diamond Carstairs Access	4 Lanes Median 14.6m R/W Varies	AADT 31,890 ASDT 36,220	LOS B Except: SB PM Peak - Exit Ramp LOS C	Extended Tapers		73.3	SB - 2020;NB - 2023	With proposed developments, interchange intersections with require capacity upgrades. No Functional Plans for future upgrades	Intersections Improvements - $0.6M (2005)	
15.3	Berghtal Road Future Wide Diamond Interchange	4 Lanes Median 14.6m R/W ~151.5m		LOS B	Extended Tapers	km 11.5 - Sag 41 NB/38 SB; km 13.8 - Sag 39	62.4	2028	FPS by MMM (2008) - 1st Stg. Spread Diamond, Long Term Parclo A4 1st Detail Design Completed - AT Project	Cost Estimate "C" (2011) $19,93M	
		4 Lanes Median 14.6m R/W ~151.5m	AADT 31,850 ASDT 36,070	LOS B			42.4	2027			Highway 2 - CMS Hwy. 581 (Carstairs) to Hwy. 587 (Bowden) by CG. R-932 (2005)
21.1	Highway 582 - Diamond Didsbury Access	4 Lanes Median 14.6m R/W Varies		LOS B Except: NB AM Peak Exit Ramp - LOS C	Standard Highway 2 Tapers		61.5	2026-2027	With proposed developments, interchange intersections with require capacity upgrades. Possible Interchange reconfiguration to Parclo (loop in SE quadrant) No Functional Plans for future upgrades.		
		4 Lanes Median 14.6m R/W ~151m	AADT 30,600 ASDT 34,660				55.8	2028			

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
Highway 2:22											
0.0	Highway 27 - Parclo B Olds Access	4 Lanes Median 6.7m R/W Varies		LOS B Except: NB AM Peak Exit Ramp - LOS C SB PM Peak Entrance Ramp - LOS C	Standard		**148.9**	2020	Exiting Configuration - Recently Implemented as temporary measure to improve safety. First Stage Improvements - Conversion to Diamod Roundabout Genivar/Ourston 2011, Long Term Parclo - Based on CG FPS.		Highway 27 (Olds) Int'c. FPS by CG. R-989-2 (2006)
			AADT 31,100 ASDT 35,220				51.2	2020			
9.7	Netook Road Future Wide Diamond Interchange	4 Lanes Median 14.6m R/W ~121m		LOS B	Extended Tapers		51.9	2020	FPS by MMM (2008) - 1st Stg. Spread Diamond, Long Term Parclo A4 1st Detail Design Completed - AT Project	(2007 $) Stage 1 - Flyover $31.2 Spread Diamond $14.6 LT Parclo A4 $14.6	Hwy 2 Planning Study: Int'c.s at Netook and Berghtal Roads R-1036 (2008)
		4 Lanes Median 14.6-17.4m R/W ~121m	AADT 31,170 ASDT 35,300	LOS B			58.7	2020, SB - 2024, NB - 2022			
16.0	Highway 587 Bowden Interchange Parclo B (Hwy 587 Underpass)	4 Lanes Median 17.4m R/W ~120m		LOS B Except: NB AM Peak Entrance Ramp - LOS C SB PM Peak Entrance Ramp - LOS C	North Ramps Extended SOUTH Ramps - Deficient		68.1	SB - 2024, NB - (2017-2023)	Design by McElhanney (2013) - Interchange Conversion to Roundabout Diamond Configuration and Service Roads Improvements	Cost Estimate "C" $20.3M (2012) including $1.0M R/W	Highway 2: Bowden (Hwy. 2A to N. of Hwy. 587) FPS by CG, R-996 (2008)
		4 Lanes Median 14.6m R/W ~120m	AADT 33,610 ASDT 38,060	LOS B			47.1	SB - 2020, NB - (2020-2023)			
24.5	Highway 54 Interchange South Innisfail Parclo (Loop in SE Quadrant)	4 Lanes Median 14.6m R/W Varies 75.8-137m		LOS B Except: NB AM Peak Exit Ramp - LOS C	Extended Tapers		54.6	2020	Designed to accommodate 6 laning. Modifications and pier protection required at 8 lane stage.		
		4 Lanes Median 14.6m R/W Varies	AADT 32,530 ASDT 36,840	LOS B			47.1	2020	Constrained areas in Innisfail (42nd Avenue and Highway 2 SB, Entrance Ramp SB). 6 lanes are accomodated but 8 lanes would require special treatments: reaining walls and /or barriers. Drainage might also be a problem.		
Highway 2:24											
0.0	Highway 590 Interchange North Innisfail Modified Diamond	4 Lanes Median 13.5m R/W Varies		LOS B Except: SB AM/PM Peak Exit Ramp - LOS C	Extended Tapers		66.2	2028	Structure will not accommodate 3 lanes SB Interchange reconfiguration required.	Structure Replacement, Highway 590 Realignmnet and Service Road $8.6M (2004)	
			AADT 34,830 ASDT 38,740			km 3.8 - Sag 54 NB/52 SB; km 4.2 - Crest 76	68.5	SB - (2028-2029) NB - (2026-2028)			

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
8.2	Twp. Rd. Old Pole Road Stage 1 - Flyover Future Diamond Int'c.	4 Lanes Median 14.6m R/W Varies 91.44 - 121.8m		LOS B	Designed to current standard		42.6	SB - (2028-2029) NB - (2026-2028)	Design by CH2MHILL (2011) First Stage - Flyover only, Long term - Diamond Int'c.		
			AADT 34,530 ASDT 38,400	LOS B			40.9	SB - (2028-2029) NB - (2026-2028)			
15.7	Highway 42 Interchange Parclo B4 with Cd Roads	4 Lanes Median 14.6m R/W Varies		LOS B	Designed to current standard		67.4	SB - (2028-2029) NB - (2026-2028)	At 6 lane stage Pier protection Required (offset from travel lane 7.6m), Structure replacement at 8 lane stage.		FPS by Al-Terra R-1100 (2011)
		R/W Varies 91.44 - 152.4m	AADT 38,010 ASDT 42,410	LOS C - NB AM Peak		km 20.8 - R 860	59.5	SB - (2028-2029) NB - (2026-2028)		Hwy 42 Int'c. & 6 laning $32.1M (2011)	
22.3	McKenzie Road Interchange Parclo B - One Loop	4 Lanes Median Transition R/W Varies 91.44 - 121.8m		LOS C	Designed to current standard		68.9	SB - (2028-2029) NB - (2026-2028)	Existing Structure accomodates Highway 2 8 laning. Future overpass structure capacity to be reviewed - Planning Study required.		
			AADT 38,010 ASDT 42,410			km 25.3 - R 520 NB	**153.6**	SB - 2019 NB - (2016-2019)			Under Construction
25.9	Highway 2A/Taylor Dr./Gaetz Ave. Interchange	4 Lanes Median Transition R/W Varies	AADT 29,130 ASDT 32,190		Designed to current standard		**147.2**	2019	Future 8 laning - widening to inside; no further wideining anticipated. When additional capacity required - City bypass to be implemented.	6 laning - From McKenzie Rd to 32 Street incl. Int'c Hwy 2A/Gaetz Ave. $103M (2016)	Design by AECOM
			AADT 43,910 ASDT 48,530			km 26.2 - Crest 78 NB, 80 SB	**113.4**	2024			
28.1	32nd Steet Interchange - Diamond	4 Lanes Median 22.6m R/W Varies		LOS D SB PM Peak Exit LOS E	Designed to current standard		97.6	2020 - 2021	Undercut of sideslope under structure required to accommodate widening to outside. 8 lanes widening to inside.		
			AADT 54,610 ASDT 60,360	LOS D		km 31.3 - R 700	**102.8**	SB - (2028-2029) NB - (2026-2028)	Highway 2 Widening, Red Deer River Bridge Replacement.	6 Laning - $31.2M River Crosssing - $45,8M	FPS by Al-Terra R-1100 (2011)
33.0	Highway 11 Interchange - Parclo 4B	4 Lanes Median 22.6m R/W Varies		LOS D NB PM Peak Exit LOS E	Designed to current standard		**107.4**	SB - 2021 NB - 2020	WB Bridge Replacement required to accommodate 6 laning, Interchange Reconfiguration when capacity upgrades are needed.	Highway 2 WB Structure - 1760sq. m Interchange Reconfiguration - $91.6M	
			AADT 43,020 ASDT 48,150	LOC C			73.9	SB - 2018 NB - 2023			
Highway 2:26											
0.0	Highway 11A Interchange - Diamond	4 Lanes Median 23.1m R/W Varies		LOS C SB AM Peak Exit LOS D	Current standard, extended tapers for 6 lane stage		69.8	SB - (2019-2023) NB - (2021-2023)	Future conversion to spread diamond, including two new structures triggerd by 8 laning of Highway 2 or capacity requirement for Highway 11A.		
			AADT 43,530 ASDT 48,720	SB AM Peak LOS D			61.9	SB - (2019-2022) NB - (2021-2023)			

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
7.0	Highway 597 Interchange Blackfalds - Diamond	4 Lanes Median 23.1m R/W Varies		LOS C	Current standard, extended tapers for 6 lane stage		64.2	SB - (2019-2022) NB - (2021-2023)	Structure modification at 8 lane stage (backslope undercut).		
		R/W Varies - 91.44-146.4m	AADT 36,360 ASDT 40,690	LOS B		km 7.3 - R 880 km 14.9 - Crest 78 NB	35.7	SB - (2019-2022) NB - (2021-2023)			
17.5	Highway 12 Interchange Diamond	4 Lanes Median 23.1m R/W Varies		LOS B SB AM Peak LOS C			72.7	SB - (2018-2023) NB - (2021-2022)	Interchange recently reconfigured to diamond. Extended tapers to accommodate 6 laning. Future requirements to be reviewed due to anticipated developments in the area.		
		R/W Varies 91.44-125.6m	AADT 28,910 ASDT 32,360	LOS B		km 20.0 - Crest 79 NB	38.2	2021			
26.4	Highway 2A - South Interchange - Modified Diamond	4 Lanes Median 23.1m R/W Varies		LOS B	Deficient Geometry		55.5	SB - (2021-2023) NB - 2022	Curvature alignment under the structure, with barriers protecting structure supports. Bridge Structure will not accommodate 6 lane stage - replacement required.		
			AADT 28,910 ASDT 32,360	LOS B		km 26.5 - R 850	38.8	SB - 2019 NB - 2022	West side restricted by adjacent railway,		
32.1	Highway 2A - North Interchange - Trumpet	4 Lanes Median 23.1m R/W Varies		LOS B	Deficient Geometry		45.0	SB - 2019 NB - 2021	Review of geometry required.		
			AADT 27,300 ASDT 30,670	LOS B			54.5	SB - 2019 NB - 2020			
34.4	Highway 604 Interchange Morningside - Diamond	4 Lanes Median 23.1m R/W Varies		LOS B	Defficient Accel./Decel. Geometry		61.0	SB - 2019 NB - 2020	Gore area adjustment to accommodate Highway 2 widening.		
			AADT 26,920 ASDT 30,240	LOS B			35.2	2019			
41.0	Matejka Road Parclo 2A	4 Lanes Median 23.1m R/W Varies			Overall Deficient Geometry		40.3	2019	Consolidation of Gee Road and Matejka Road interchanges - Possible conversion to diamond - planning required.		
			AADT 27,000 ASDT 30,330	LOS B			40.8	2027			
42.5	Gee Road - Half Diamond	4 Lanes Median 23.1m R/W Varies		LOS B SB AM/PM Peak Exit LOS C	Deficient Geometry		68.6	2027	Interchange to be removed, access consolidated at Matejka Road interchange.		
			AADT 27,120 ASDT 30,470	LOS B			78.2	2027			
Highway 2:28											
0.0	Highway 53 Interchange Ponoka - Cloverleaf	4 Lanes Median 23.1m R/W Varies		LOS B	Deficient Geometry		66.4	SB - (2024-2028) NB - (2017-2019)	Conversion to Diamond - Design by ISL ready, extended tapers to accommodate 6 lane stage.	$8,754,900	

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
			AADT 28,290 ASDT 32,200	LOS B			60.3	SB - (2024-2028) NB - (2017-2019)			
7.3	Twp. Rd. 435 Flyover	4 Lanes Median 23.1m R/W Varies		LOS B			23.6	SB - (2024-2028) NB - (2017-2019)	Structure review for 6 laning suitability.		
			AADT 28,290 ASDT 32,200	LOS B		km 10.7- Sag 51.0 SB	33.3	SB - (2024-2028) NB - (2017-2019)			
17.5	Menaik Road Interchange - Parclo 2B	4 Lanes Median 23.1m R/W Varies		LOS B	Deficient Geometry		41.1	SB - (2024-2028) NB - (2017-2019)	Possible conversion to diamond - planning required		
			AADT 28,190 ASDT 32,090	LOS B			41.0	SB - (2019 -2020) NB - (2021-2022)			
18.7	Highway 611 Interchange Maskwacis - Diamond	4 Lanes Median 23.1m R/W Varies		LOS B	Defficient Accel./Decel. Geometry		41.0	SB - (2019 -2020) NB - (2021-2022)	Traffic and interchange plan review required - developments proposed in interchange vicinity.		
			AADT 28,570 ASDT 32,520	LOS B			31.5	SB - (2019 -2020) NB - (2021-2022)			
26.7	Louis Bull Flyover	4 Lanes Median 23.1m R/W Varies		LOS B			17.8	SB - (2019 -2020) NB - (2021-2022)	Structure review for 6 laning suitability.		
			AADT 28,570 ASDT 32,520	LOS B			46.9	SB - (2019 -2020) NB - (2021-2022)			
Highway 2:30											
0.0	Highway 13 - Cloverleaf	4 Lanes Median 23.1m R/W Varies		LOS B	Deficient Geometry		46.6	SB - 2023 NB - (2019-2021)	Conversion to Diamond - Design by Focus ready, extended tapers to accommodate 6 lane stage.		
			AADT 27,720 ASDT 31,550	LOS B			35.8	SB - 2023 NB - 2019			
6.9	Correction Line Interchange - Diamond	4 Lanes Median 23.1m R/W Varies		LOS B	Defficient Accel./Decel. Geometry		30.1	SB - 2023 NB - 2019			
			AADT 27,820 ASDT 31,660	LOS B		km 12.1 - Sag 44 NB km 12.2 - Sag 43 SB	52.5	SB - 2022 NB - (2019-2021)			
15.3	Highway 616 Interchange Millet Access - Diamond	4 Lanes Median 23.1m R/W Varies		LOS B SB Exit AM/PM Peak LOS C	Defficient Accel./Decel. Geometry		68.2	SB - 2022 NB - (2019-2021)			
			AADT 28,880 ASDT 32,870	LOS B			59.8	SB - 2021 NB - (2019-2021)			
20.1	Tower Main Road Flyover	4 Lanes Median 23.1m R/W Varies		LOS B			28.9	SB - 2019 NB - (2020-2021)	(Structure Replacement)		
			AADT 28,880 ASDT 32,870	LOS B			65.2	SB - 2019 NB - (2020-2021)			

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
26.6	Kavanah/Glen Park Road Interchange	4 Lanes Median 23.1m R/W Varies 91.44m		LOS B SB Exit AM/PM Peak LOS C	Defficient Accel./Decel. Geometry		77.2	SB - 2019 NB - (2019-2020)	(Interchange Reconfiguration/No Planning)		
			AADT 30,430 ASDT 34,630	LOS B			61.7	2019			
32.3	Highway 2A Interchange (proposed)	4 Lanes Median 23.1m R/W Varies		LOS B			**159.2**		A new interchange is proposed to connect Hwy 2, Hwy 2A and a future Terwillegar Extension.		Hwy 2A FPS Update (ISL, 2015) QE II FPS (Focus, 2010) Hwy 2A FPS (McElhanney, 2008)
		Median Width Transition	AADT 40,180 ASDT 45,720	LOS B			71.9				Hwy 2A FPS Update (ISL, 2015)
33.9	Old Highway 2A Interchange	4 Lanes Median 12.2m R/W Varies		LOS B NB Entrance AM/PM - LOS C SB Exit AM/PM Peak LOS C	Defficient Hwy. Alignmnet, Ramps: Standard Accel./Decel.		**170.5**	SB - 2019, NB - 2019	Proposed closure of interchange.		
			AADT 40,180 ASDT 45,720	Ramp Overlap NB AM - LOS D; SB PM - LOS D			***230.20**				QE II FPS (Focus, 2010)
34.4	Black Gold Drive Underpass	4 Lanes Median 12.2m R/W Varies				km 34.4 - Crest 54 NB/56 SB km 34.9 - Sag 48 NB/56 SB	**171.4**		Proposed new twinned bridge structures over the railway and Black Gold Drive.		QE II FPS (Focus, 2010)
35.22		4 Lanes Median 12.2m R/W Varies		Exit Ramp NB AM - LOS D Exit Ramp SB PM - LOS D		km 34.7 - R 880	144.6				QE II FPS (Focus, 2010)
Highway 2:32											
0.0	Highway 39 - 50 Avenue Interchange Leduc	4 Lanes Median 12.2m R/W Varies				km 0.0 - R 880 km 0.1 - Crest 63 NB/61 SB	123.8		Proposed new interchange will be an overpass, verus the existing underpass.		QE II FPS (Focus, 2010)
		6 lanes Median Width Transition, R/W Varies	AADT 51,400 ASDT 54,980	Weaving NB AM LOS C		km 0.0 - R 730 NB	42.0				QE II FPS (Focus, 2010)
1.9	65th Avenue (proposed interchange)			Exit Ramp SB PM - LOS D			**116.5**		Proposed new interchange.		FPS by CG. (2016)
				SB PM - LOS D							FPS by CG. (2016)
2.5	50 Street Interchange Leduc	6 Lanes, ~Median 118.4m R/W 220-250m		Entrance Ramp NB - LOS C Exit Ramp SB PM - LOS D			41.2		Proposed twinning of 50th Street bridge. Ultimately, the existing structure will be replaced.		FPS by CG. (2016)
		6 Lanes,	AADT 63,600 ASDT 68,030	LOS C			60.2				QE II FPS (Focus, 2010)
5.1	Airport Road Interchange			Exit NB PM - LOS D Exit SB PM - LOS D			59.2		Proposed new interchange.		FPS by CG. (underway)

Location (km)	Interchange	Highway 2 Lanes, Median Width (Existing)	Existing (2015) AADT, ASDT	Existing LOS (Peak Worst Movement)	Interchange Geometry (Accel./Decel.)	Alignment Geometry (Hor./Ver.)	Safety (Collision Rate)	Predicted Year of Overlay Needed Based on PMS Summary Report	Future Improvements Comments Structure, Road, Configuration	Improvement Cost Estimates per Planning/Design Documents	Planning/ Design Documents/ Other Comments
		~Median 118.4m R/W 220-250m	AADT 77,100 ASDT 82,470	LOS C			61.6				
8.4	Highway 19/625 Interchange Nisku			Entrance Ramp NB PM - LOS D Exit Ramp SB AM - LOS E			**106.1**		Proposed new interchange currenty in detailed design stage.		QE II FPS (Focus, 2010)
		8 Lanes, ~Median Varies R/W Varies	AADT 88,170 ASDT 94,800	NB PM - LOS E			**105.8**				
15.4	41 Avenue SW Interchange City of Edmonton			Entrance Ramp NB PM/SB AM - LOS D Exit Ramp NB PM - LOS D			21.9		This interchange was constructed in 2015.	Contract Cost: $205M	
			AADT 88,630 ASDT 94,800	SB AM - LOS D NB PM - LOS C							QE II FPS (Focus, 2010)
18.9	Ellerslie Road Interchange	9 Lanes, Median 19.6m R/W Varies		Exit Ramp NB AM/PM - LOS D Exit Ramp SB PM - LOS C			Collision Data was not Available from AT (Within City of Edmonton)		This interchange was constructed in 2001.		
		Multiple Roads and Lanes - Systems Interchange Area	AADT 92,750 ASDT 99,210	NB AM/PM - LOS D							
20.3	Highway 216 - AHD Interchange Systems Interchange								This interchange was constructed in 2007.		
			AADT 68,320 ASDT 73,510								

Appendix B

Geometric Deficiencies Summary

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Horizontal Curves (Design Speed 130km/h Minimum R950)						
Highway Section No.		Approximate Location (km post)	Radii (m) NB Lanes	Radii (m) SB Lanes	Location Collision Rate	Notes
2	24	20.8	960	880	93.5	McKenzie Road area
2	24	25.3	520	740	**147.2**	Gaetz Avenue Int'c. - construction scheduled
2	24	31.3	700	730	**97.8**	Red Deer River Crossing
2	26	7.3	880	880	92.9	Highway 597 interchange area
2	26	26.5	890	850	95.5	Highway 2A/Milton Road interchange area
2	30	34.7	900	880	**171.4**	S of Highway 39 Interchange
2	32	0	900	880	**123.8**	Highway 39 Interchange - Leduc
2	32	1	730	880	**116.5**	Highway 39 Interchange - Leduc

Vertical Curves (DS. 130km/h Min. Crest K140, Sag K70)

Vertical Curves Based on 85%-tile Speed and 3R/4R Guidelines (Min. Crest K80, Sag K55)

Highway Section No.		Approximate Location (km post) NB	Crest	Sag	Approximate Location (km post) SB	Crest	Sag	Location Collision Rate	Notes
2	15	51.2		65			61	29.5	Nose Creek
2	18				12.7	134		47.6	
2	18	15.8	118		15.8	132		30.8	
2	18	16.5	99		16.8	116		32.9	
2	18	18.6	105		18.7	128		**66.7**	Highway 72
2	18	20.2	108		20.2	119		**61.7**	
2	20	4.1	124		4.2	118		32.4	
2	20	5.4	134		5.5	130		32.7	Carstairs Creek Crossing
2	20	7.5	99		7.6	92		59.8	Sheep Coulee Crossing
2	20	9.2	102		9.5	98		**73.3**	Highway 581 Interchange
2	20	11	92		11	96		55.9	
2	20	**11.5**		**41**	**11.5**		**38**	55.9	Both sides low area - culvert
2	20	11.9	97		12	96		55.9	
2	20	13.1	138					26.7	
2	20	**13.8**		**39**	**13.8**		**39**	26.7	Rosebud River Crossing
2	20	14.3	88		14.4	89		40.5	
2	20	19.1	109		19.2	108		**62.6**	
2	22	15	113		15	118		50.2	
2	22	22.2	121		22.3	114		55.8	Tributary to Red Deer River Crossing
2	24	2.9	101		2.9	105		**65.8**	Cattle Pass Crossing
2	24	3.2		62	3.2		66	**68.6**	
2	24	3.5	88		3.5	81		**68.6**	
2	24	**3.8**		**54**	**3.8**		**52**	**68.6**	Antler Hill Area
2	24	**4.2**	**76**		**4.2**	**76**		**63.9**	
2	24	5.9	88		6.0	84		**63.1**	
2	24	6.8	115		6.8	113		40.9	
2	24				13.9	139		55.1	
2	24				23.3	123		**124.2**	Gaetz Ave Interchange Area
2	24	24.4	109		24.4	105		**153.6**	Gaetz Ave Interchange Area
2	24				25	105		**147.2**	
2	24	**26.2**	**74**		**26**	**80**		**113.4**	Hwy 2A Int'c - Construction Scheduled
2	24	30.3	80		30.2	99		**83.6**	Red Deer River Crossing
2	24	32.7	129		32.6	103		**106.7**	CPR Crossing

Vertical Curves (DS. 130km/h Min. Crest K140, Sag K70)

Vertical Curves Based on 85%-tile Speed and 3R/4R Guidelines (Min. Crest K80, Sag K55)

Highway Section No.		Approximate Location (km post) NB	Crest	Sag	Approximate Location (km post) SB	Crest	Sag	Location Collision Rate	Notes
2	26	2.4	98		2.4	85		52.7	CNR Crossing
2	26	4.4	89					53.0	
2	26	4.9		69				53.0	Blindman River Crossing
2	26	7.7	88		7.8	81		50.9	Highway 597 Interchange
2	26				8.2		63	43.4	
2	26	**14.9**	**78**		14.9	87		42.1	CPR Crossing
2	26	**20**	**79**		20	86		35.6	Whelp Brook Crossing
2	26	21.2	124					32.0	
2	26	22.6	88		22.6	92		26.0	
2	26				23.3	112		18.6	Local Road
2	26	34.5	93		34.5	93		**61.0**	Highway 604 Interchange
2	26				35.7	108		51.4	
2	26	37.1	120		37.2	116		19.8	Wolf Creek Crossing
2	26				41.8	131		40.8	Gee Road Interchange
2	26	43.4		63	43.4		59	**78.2**	Battle River Crossing
2	26	44	112		44	103		**78.5**	
2	26	45.1	92					**69.0**	Highway 53 Interchange
2	28				1.7		67	**70.7**	
2	28				6.1	131		46.6	
2	28	6.9	114		7	117		43.9	
2	28				7.4		68	43.9	
2	28	9.4	99		9.5	97		28.5	
2	28	10.3	110		10.3	84		27.4	
2	28	10.8		59	**10.7**		**51**	27.4	Waskwa Creek Crossing
2	30				9.4	131		19.0	
2	30	10	138		10.1	133		20.9	
2	30	10.6		61				20.9	
2	30	**12.1**		**44**	**12.2**		**43**	52.5	
2	30				12.7	132		52.5	Pipestone Creek Crossing
2	30	**34.4**	**54**		**34.5**	**56**		**171.4**	CPR Crossing/Black Gold Dr.
2	30	**34.9**		**48**	34.9		56	**171.4**	Highway 39 Interchange
2	30	35.1	86		35.1	114		**123.8**	
2	32	**0.1**	**63**		**0.1**	**61**		**116.5**	

Appendix C

Historical Traffic Data (10 Years)

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Alberta Highways 1 to 986
Traffic Volume History 2007 - 2016

Produced: 17-Feb-2017 By CornerStone Solutions Inc.

Hwy	CS	TCS	Muni	From	2007 AADT	2008 AADT	2009 AADT	2010 AADT	2011 AADT	2012 AADT	2013 AADT	2014 AADT	2015 AADT	2016 AADT	2016 ASDT
2	15	75	CofC	S OF 201 NJ, CALGARY				62080	68060	72400	73920	72200	78090	78970	82250
2	15	76	CofC	N OF 201 NJ, CALGARY				68740	73770	78460	89340	92780	105320	106560	113230
2	15	76	Rkyv	S OF TWP RD 261 (CROSSIRON DR) CALGARY 1-26-1-500000000									105320	106560	113230
2	15	76	Rkyv	N OF TWP RD 261 (CROSSIRON DR) CALGARY 1-26-1-500000000									88640	89140	94720
2	15	76	Rkyv	S OF 566 E OF BALZAC	59280	60460	64490	68740	71740	76670	79730	83210	88640	89140	94720
2	18	4	Rkyv	N OF 566 E OF BALZAC	59300	60470	61820	65890	70700	75560	78570	81990	84500	84980	90300
2	18	4	Rkyv	4.6 KM S OF 2 & 567 AIRDRIE	59380	60380	61970	66830	71020	75620	78400	82940	84390	84830	90300
2	18	4	Rkyv	S OF YANKEE VALLEY BLVD	59300	60470	61820	65890	70700	75560	78570	81990	84500	84980	90300
2	18	6	Rkyv	N OF YANKEE VALLEY BLVD	47320	48240	48520	51720	54820	58590	60930	63580	64840	65220	69300
2	18	6	Rkyv	S OF TWP RD 272, AIRDRIE 12-27-1-500000000	36610	36970	37190	39040	41880	44740	46520	47950	48910	53430	56780
2	18	8	Rkyv	N OF TWP RD 272, AIRDRIE 12-27-1-500000000	33340	33680	33890	34810	36410	38920	40150	41380	42220	42140	44780
2	18	8	Rkyv	S OF 2A & 72 SE OF CROSSFIELD	33340	33680	33890	34810	36410	38920	40150	41380	42220	42140	44780
2	18	12	Rkyv	N OF 2A & 72 SE OF CROSSFIELD	28280	28540	28710	29530	30650	32820	33780	34820	35640	36400	41140
2	18	16	MntV	S OF ACME RD 11-29-1-500000000	28280	28540	28710	29530	30650	32820	33780	34820	35640	36400	41140
2	20	4	MntV	N OF ACME RD 11-29-1-500000000	26030	26170	26280	26950	27530	29400	30260	31180	31900	32930	37210
2	20	4	MntV	S OF 581 E OF CARSTAIRS	26030	26170	26280	26950	27530	29400	30260	31180	31900	32930	37210
2	20	8	MntV	N OF 581 E OF CARSTAIRS	25990	26050	26120	26770	27610	29480	30340	31280	31980	32530	36760
2	20	8	MntV	S OF BERGTHAL RD 35-30-1-500000000	25990	26050	26120	26770	27610	29480	30340	31280	31980	32530	36760
2	20	8	MntV	N OF BERGTHAL RD 35-30-1-500000000	25990	26050	26120	26770	27500	29350	30210	31150	31850	32360	36570
2	20	8	MntV	S OF 582 E OF DIDSBURY	25990	26050	26120	26770	27500	29350	30210	31150	31850	32360	36570
2	20	12	MntV	N OF 582 E OF DIDSBURY	25220	25160	25150	25750	26900	28650	29470	30370	30630	31090	35140
2	20	12	MntV	S OF BERGEN RD 35-31-1-500000000	25220	25160	25150	25750	26900	28650	29470	30370	30630	31090	35140
2	20	12	MntV	N OF BERGEN RD 35-31-1-500000000	25260	25200	25190	25790	26870	28620	29440	30340	30600	31080	35120
2	20	12	MntV	S OF AMERADA RD 11-32-1-500000000	25260	25200	25190	25790	26870	28620	29440	30340	30600	31080	35120
2	20	12	MntV	N OF AMERADA RD 11-32-1-500000000	25280	25220	25210	25810	26880	28620	29440	30340	30600	31080	35120
2	20	12	MntV	S OF 27 E OF OLDS	25280	25220	25210	25810	26880	28620	29440	30340	30600	31080	35120
2	22	4	MntV	N OF 27 E OF OLDS	25550	25450	25400	26010	26920	28670	29510	30420	31100	30830	34840
2	22	4	MntV	2.0 KM N OF 2 & 27 OLDS	25530	25320	25350	26300	27030	28700	29370	30750	31010	30760	34840
2	22	4	MntV	S OF WIMBORNE RD 23-33-1-500000000	25550	25450	25400	26010	26920	28670	29510	30420	31100	30830	34840
2	22	4	MntV	N OF WIMBORNE RD 23-33-1-500000000	25770	25690	25410	26020	26930	28680	29520	30490	31170	30900	34920
2	22	4	RdDr	S OF NETOOK RD 35-33-1-500000000	25770	25690	25410	26020	26930	28680	29520	30490	31170	30900	34920
2	22	4	RdDr	N OF NETOOK RD 35-33-1-500000000	25820	25750	25420	26030	26940	28690	29530	30480	31160	30890	34910
2	22	4	RdDr	S OF 2A & 587 E OF BOWDEN	25820	25750	25420	26030	27380	29200	30070	30650	31340	31080	35120
2	22	12	RdDr	N OF 2A & 587 E OF BOWDEN	27280	27380	27050	27710	29230	31120	31900	32140	32860	32590	36830
2	22	12	RdDr	S OF 54 S OF INNISFAIL 17-35-28-405901430	27280	27380	27050	27710	29230	31120	31900	32800	33610	33330	37670
2	22	12	RdDr	N OF 54 S OF INNISFAIL 17-35-28-405901430	27560	27660	27330	27990	28170	30020	30760	31660	32530	32250	36450
2	22	16	RdDr	S OF 590 AT INNISFAIL	26640	26740	26450	27010	27290	30020	30760	31660	32530	32250	36450
2	24	4	RdDr	N OF 590 AT INNISFAIL	30060	30370	29170	29580	29650	31580	32220	33950	34530	35020	38990
2	24	4	RdDr	S OF OLD POLE RD 7-36-27-413000000	30060	30370	29170	29580	29850	31790	32430	33940	34530	35020	38990
2	24	4	RdDr	N OF OLD POLE RD 7-36-27-413000000	30040	30350	29220	29630	29950	31890	32530	34240	34830	35310	39310
2	24	4	RdDr	S OF 42 E OF PENHOLD	30850	31180	29950	30380	31000	33010	33670	34240	34830	35310	39310
2	24	8	RdDr	N OF 42 E OF PENHOLD	33450	33790	32380	32830	33820	36030	36760	37490	38130	37380	41620
2	24	8	RdDr	2.6 KM N OF 2 & 42 PENHOLD	33430	33580	32270	33180	33920	36050	36670	37820	38010	37250	41620
2	24	9	CoRD	S OF GAETZ AVE IN RED DEER 32-37-27-400000000	34300	35120	33650	34390	34000	37070	38460	39890	40820	38680	42640
2	24	10	CoRD	N OF GAETZ AVE IN RED DEER 32-37-27-400000000	23840	24410	23530	24050	24270	26460	27450	28470	29130	27840	30690
2	24	10	CoRD	S OF 2A & TAYLOR DR IN RED DEER	23840	24410	23530	24050	24270	26460	27450	28470	29130	27840	30690

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Hwy	CS	TCS	Muni	From	2007 AADT	2008 AADT	2009 AADT	2010 AADT	2011 AADT	2012 AADT	2013 AADT	2014 AADT	2015 AADT	2016 AADT	2016 ASDT
2	24	11	CoRD	N OF 2A & TAYLOR DR IN RED DEER	33040	33820	33990	34890	36590	39890	41380	42910	43910	43040	47440
2	24	11	RdDr	5.9 KM S OF 2 & 11 RED DEER	33070	33710	33960	35300	36760	39990	41220	43400	43740	42990	47430
2	24	11	RdDr	S OF 32 ST IN RED DEER 7-38-27-402601160	33030	33820	33990	34890	36590	39890	41380	42910	43910	43030	47430
2	24	12	RdDr	N OF 32 ST IN RED DEER 7-38-27-402601160	42180	42960	42620	43960	46200	50360	51300	53190	54610	53880	59390
2	24	12	RdDr	S OF 11 AT RED DEER	42180	42960	42620	43960	46200	50360	51300	53190	54610	53880	59390
2	24	16	RdDr	N OF 11 AT RED DEER	32960	33360	33820	35030	36160	39440	40240	41740	43020	41900	46430
2	24	16	RdDr	S OF 11A AT RED DEER	32960	33360	33820	35030	36160	39440	40240	41740	43020	41900	46430
2	26	2	RdDr	N OF 11A AT RED DEER	31680	31710	33360	34620	35980	38690	40240	41930	43530	42890	47530
2	26	2	RdDr	0.1 KM N OF 2 & 11A RED DEER	31680	31620	33440	35020	36130	38710	40120	42440	43440	42830	47530
2	26	2	Laco	S OF 597 W OF BLACKFALDS	31680	31710	33360	34620	35980	38680	40240	41930	43530	42890	47530
2	26	4	Laco	N OF 597 W OF BLACKFALDS	27980	28090	28150	29230	30370	32660	33580	35020	36360	35810	39690
2	26	4	Laco	S OF 12 W OF LACOMBE	27980	28090	28150	29230	30370	32660	33580	35020	36360	35810	39690
2	26	8	Laco	N OF 12 W OF LACOMBE	24080	24290	23980	24920	25890	27810	26710	27850	28910	28460	31540
2	26	12	Laco	3.5 KM N OF 2 & 2A LACOMBE	26070	26250	26040	27150	27680	28260	30170	32340	32490	32280	36200
2	26	12	Laco	S OF 2A SW OF MORNINGSIDE	26080	26320	26120	26890	27540	28250	30280	31980	32590	32320	36200
2	26	16	Laco	N OF 2A SW OF MORNINGSIDE	21720	21970	21900	22530	23260	23930	25520	26920	27300	27330	30610
2	26	16	Pnka	S OF 604 W OF MORNINGSIDE	21720	21970	21900	22530	23260	23930	25520	26920	27300	27330	30610
2	26	20	Pnka	N OF 604 W OF MORNINGSIDE	21620	21870	21410	22020	22740	23390	25160	26540	26920	26890	30120
2	26	20	Pnka	S OF MATEJKA RD 27-42-26-408001500	21970	22390	21950	22590	23320	23390	25160	26540	26920	26890	30120
2	26	20	Pnka	N OF MATEJKA RD 27-42-26-408001500	22130	22550	22110	22750	23480	23550	25240	26620	27000	26960	30200
2	26	20	Pnka	S OF GEE RD 27-42-26-408000250	22130	22550	22110	22750	23480	23550	25240	26620	27000	26960	30200
2	26	20	Pnka	N OF GEE RD 27-42-26-408000250	22470	22750	22310	22950	23680	23670	25360	26740	27120	27050	30300
2	26	20	Pnka	S OF 53 W OF PONOKA	22470	22750	22310	22950	23680	23670	25360	26740	27120	27050	30300
2	28	4	Pnka	N OF 53 W OF PONOKA	22950	23250	23080	23780	24550	26100	26910	27970	28290	28070	31900
2	28	4	Pnka	1.7 KM N OF 2 & 53 PONOKA	22960	23160	23020	24010	24680	26080	26800	28270	28210	28060	31900
2	28	4	Pnka	S OF MENAIK RD 12-44-26-408050000	22950	23250	23080	23780	24550	26100	26910	27970	28290	28070	31900
2	28	4	Pnka	N OF MENAIK RD 12-44-26-408050000	22870	23040	22920	23620	24390	25920	26810	27870	28190	27970	31790
2	28	4	Weta	S OF 611 E OF USONA	22870	23040	22940	23620	24390	25920	26810	27870	28190	27970	31790
2	28	8	Weta	N OF 611 E OF USONA	23100	23210	23080	23760	24530	26060	27170	28250	28570	28270	32130
2	28	8	Weta	S OF LOUIS BULL FLYOVER 25-45-26-408050000	23100	23210	23080	23760	24530	26060	27170	28250	28570	28270	32130
2	28	8	Weta	N OF LOUIS BULL FLYOVER 25-45-26-408050000	23100	23210	23080	23760	24530	26060	27170	28250	28570	28270	32130
2	28	8	Weta	S OF 13 W OF WETASKIWIN	23100	23210	23080	23760	24530	26060	27170	28250	28570	28270	32130
2	30	4	Weta	N OF 13 W OF WETASKIWIN	22620	22930	22910	23550	24380	25580	26440	27400	27720	28230	32120
2	30	4	Weta	S OF CORRECTION LINE RD 31-46-25-413600000	22620	22930	22910	23550	24380	25580	26440	27400	27720	28230	32120
2	30	4	Weta	N OF CORRECTION LINE RD 31-46-25-413600000	22790	22940	22970	23610	24440	25680	26540	27500	27820	28310	32210
2	30	4	Weta	S OF 616 W OF MILLET	22790	22940	22970	23610	24440	25680	26540	27500	27820	28310	32210
2	30	8	Weta	N OF 616 W OF MILLET	23590	23700	23840	24420	25270	26780	27660	28540	28880	29110	33120
2	30	8	Ledc	S OF KAVANAUGH/GLEN PK RD 33-48-25-408000000	23590	23700	23840	24420	25270	26780	27660	28540	28880	29110	33120
2	30	8	Ledc	N OF KAVANAUGH/GLEN PK RD 33-48-25-408000000	24910	24990	25140	25760	26680	28420	29220	30070	30430	30560	34770
2	30	8	Ledc	2.0 KM S OF 2 & OLD 2A LEDUC	24860	24910	25080	26120	26750	28390	29090	30390	30380	30560	34770
2	30	8	Ledc	S OF OLD 2A AT LEDUC	24910	24990	25140	25770	26680	28420	29220	30070	30430	30560	34770
2	30	12	Ledc	N OF OLD 2A AT LEDUC	33550	33500	33810	34670	36140	37980	39050	40370	40180	42700	48580
2	30	12	Ledc	S OF 50 AVE AT LEDUC	33550	33500	33810	34670	36140	37980	39050	40370	40180	42700	48580
2	32	4	Ledc	N OF 50 AVE AT LEDUC	42220	41730	42130	43190	45240	47040	48370	50390	51400	53100	60420
2	32	4	Ledc	S OF 50 ST, LEDUC 35-49-25-408400000	42220	41730	42130	43190	45240	47040	48370	50390	51400	53100	60420
2	32	8	Ledc	N OF 50 ST, LEDUC 35-49-25-408400000	53820	52060	52650	54370	56940	58680	60330	63110	63600	64980	69700

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Hwy	CS	TCS	Muni	From	2007 AADT	2008 AADT	2009 AADT	2010 AADT	2011 AADT	2012 AADT	2013 AADT	2014 AADT	2015 AADT	2016 AADT	2016 ASDT
2	32	8	Leds	S OF AIRPORT RD 11-50-25-4580000000	53820	52660	52650	54370	56940	58660	60330	63110	63600	66500	71330
2	32	12	Leds	N OF AIRPORT RD 11-50-25-4580000000	59000	60820	61570	63820	66830	72910	74160	77580	77100	79960	85770
2	32	12	Leds	S OF 19 & 625 W OF NISKU	59600	60820	61570	63820	66830	72910	74160	77580	77100	79960	85770
2	32	16	Leds	N OF 19 & 625 W OF NISKU	65040	68720	69860	72480	75890	83680	85990	89300	88300	84990	91160
2	33	16	Leds	5.9 KM N OF 2 & 19 NISKU	65290	68930	69780	73030	76410	83610	85990	90380	88170	85020	91160
2	33	16	CofE	S OF 41 AVENUE SW, EDMONTON										84990	91160
2	33	16	CofE	N OF 41 AVENUE SW, EDMONTON										88220	94630
2	32	16	CofE	S OF ELLERSLIE RD 20-51-24-4007000000						83080	85980	89540	88630	88220	94630
2	32	16	CofE	N OF ELLERSLIE RD 20-51-24-4007000000						87570	89990	93710	92750	98220	105350
2	32	16	CofE	S OF 216 S OF EDMONTON			70460	73070	75500	87570	89990	93710	92750	98220	105350

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Appendix D

LOS Criteria Working Paper

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WORKING PAPER

Date: September 29, 2016 File: 5129-03b

Attention: Stuart Richardson
Infrastructure Manager, Red Deer
Alberta Transportation

CC:

Prepared By: Bogusia Stapor, M.Eng., P.Eng., PTOE

Re: Highway 2 Corridor Improvement Study
Research Paper – Standards, Practices and Guidelines Used by Other Jurisdictions to Regulate Quality of Service on Freeways

This paper was prepared to briefly describe our research regarding the level of service (LOS) guidelines for freeway facilities in other jurisdictions and countries. The research was conducted as part of our Highway 2 Corridor Improvement Study to determine what guidelines other jurisdictions are using for planning freeway facilities in terms of a target LOS for the projected traffic demand for a given number of lanes. LOS is the generally accepted quality of service measure provided by a transportation facility.

1.0 Preamble

Quality of service is a traveler-based assessment of how well a facility is operating. The assessment is influenced by the surrounding area setting, which includes a rural or urban environment (development level), traffic volume and composition, operating speeds, geometry, drivers' familiarity and terrain (level, rolling, and mountainous). These elements create the drivers' expectation of what conditions are acceptable and which are not.

Level of service is a quantitative measure of the quality of service represented by six letters, where grade level 'A' represents the best LOS and level 'F' represents the worst.

LOS is determined using Highway Capacity Manual (HCM) methods. HCM is a publication by the Transportation Research Board (TRB), which contains guidelines and computational procedures for calculating the capacity and quality of service for various transportation facilities including freeways, highways, arterial roads, roundabouts, signalized and unsignalized intersections, and the effects of mass transit, pedestrians and bicycles on the performance of these systems. Performance is defined by a number of measures of effectiveness (MOE), and for freeway facilities the following measures are used to determine LOS:

- Density in vehicles per hour per lane (veh/hr/ln).
- Volume to capacity (V/C) ratio.
- Average speed, which indicates speed reduction as compared to free flow speed.

The currently used primary measure of LOS is density. As secondary measures, the average speed and the V/C value are used.

Various jurisdictions use these measures based on local preference, with value ranges to correspond to the LOS defined in the HCM with locally developed parameters.

LOS procedures are defined for planning or operational applications. The planning applications use generalized traffic conditions and correspond to daily volumes. Actual traffic analysis for specific sites are conducted for design hour condition, which are typically during the am and pm peak hours.

2.0 Level of Service Practices (LOS)

2.1 Alberta Department of Transportation

Alberta Transportation has established the following guidelines to determine when additional lanes should be provided on a divided highway.

- Less than 31,000: 4 lanes.
- 31,000-50,000: 6 Lanes.
- Over 50,000: 8 or more lanes.

Design guidelines generally indicate that additional lanes on a divided highway should be considered when the LOS reaches LOS C. The AADT at which this would occur is dependent on factors such as terrain, speed, and type of traffic. The following ranges are suggested for rural divided highways based on the level of service in 100th highest hour:

Accordingly, for Alberta Transportation, typically a target of LOS B is considered applicable in rural conditions.

In urban conditions on facilities such as the Edmonton and Calgary Ring Roads the target LOS was determined as follows:

- LOS C in the first stage, which is associated with 2044 Regional Traffic Model (RTM) and population of 1.8M in the Edmonton capital region, and the City of Calgary Traffic Model 2039 and population of 2.0M.
  Recent initiative indicates additional 400,000 population in Edmonton capital region to be reached in 30 year horizon (in total 2.2M) for which the implication on the Edmonton road system is yet to be determined.
- LOS D in the long term which is associated with a population of 3.6M in Edmonton capital region (100 year horizon) and 2.8M in the City of Calgary model (year 2076).

2.2 State of Florida Department of Transportation

Florida recently developed a guideline (2013 Quality / Level of Service Handbook) and software to be used by engineers, planners and decision makers for the evaluation of quality and level of service of multimodal transportation facilities for generalized and conceptual planning projects. The handbook provides a foundation for high quality, consistent capacity and LOS based on research and the HCM 2010 methodology.

LOS "grades" were established along with traffic volume thresholds that provide a basic standard of acceptability. These threshold volumes relate to freeway travel time reliability, which when improved, translates to time and cost savings for travelers, shippers, and carriers.

For long term planning assessments four typical generalized areas are considered:

- Rural areas (population <5,000) – LOS B.
- Urban areas or communities and transitioning urbanized areas (population 50,000+) – LOS C.
- Urban areas (population under 500,000) – LOS C (D).
- Large urban areas (population 500,000+) – LOS D (E).
  ( ) – Applicable to systems when parallel exclusive transit lanes exist

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Rural Undeveloped Areas and Development Areas Less than 5,000 Population

Uninterrupted Flow Facilities				
Freeways – AADT Traffic Volume Thresholds				
Lanes	B	C	D	E
4	28,800	43,000	52,300	60,000
6	43,000	64,000	78,300	92,500
8	57,500	85,400	104,400	123,500
Freeway Adjustments Auxiliary Lanes Present in Both Directions + 20,000				

Transitioning Areas and Areas Over 5,000 Not in Urbanized Areas

Uninterrupted Flow Facilities				
Freeways – AADT Traffic Volume Thresholds				
Lanes	B	C	D	E
4	44,100	57,600	68,900	71,700
6	65,100	85,600	102,200	111,000
8	85,100	113,700	135,200	150,000
10	106,200	141,700	168,800	189,000
Freeway Adjustments Auxiliary Lanes Present in Both Directions + 20,000			Ramp Metering + 5%	

Urbanized Areas

Uninterrupted Flow Facilities				
Freeways – AADT Traffic Volume Thresholds				
Core Urbanized				
Lanes	B	C	D	E
4	47,400	64,000	77,900	84,600
6	69,900	95,200	116,600	130,600
8	92,500	126,400	154,300	176,600
10	115,100	159,700	194,500	222,700
12	162,400	216,700	256,600	268,900
Urbanized				
Lanes	B	C	D	E
4	45,800	61,500	74,400	79,900
6	68,100	93,000	111,800	123,300
8	91,500	123,500	148,700	166,800
10	114,800	156,000	187,100	210,300
Freeway Adjustments Auxiliary Lanes Present in Both Directions + 20,000			Ramp Metering + 5%	

For freeway facilities and sections, maximum generally acceptable volumes (veh/hr/ln) depends on the generalized area type:

- Urban and rural (population <5,000) – 1,800 veh/hr/ln.
- Transitioning (population 5,000+) – 1,900 veh/hr/ln.
- Other urbanized (population 50,000+) – 2,000 veh/hr/ln.
- Large urbanized (population 500,000+) – 2,100 veh/hr/ln.

2.3 State of Arizona Department of Transportation

The Arizona Department of Transportation LOS design targets for controlled access highways are determined using HCM methodology and are as follows:

- Level terrain – LOS B (rural area).
- Rolling terrain – LOS B (rural area).
- Mountainous terrain – LOS B to LOS C (rural area).
- Urban / fringe and urban areas – LOS C to LOS D.

2.4 State of Texas Department of Transportation

The State of Texas Department of Transportation states that guidelines for acceptable degrees of congestion, urban freeways and their auxiliary facilities should generally be designed for LOS C, as defined in the Highway Capacity Manual for the design year. In heavily developed urban areas they indicate that LOS D may be acceptable.

LOS B is recommended for freeway facilities in rural areas; however, LOS C may be acceptable for auxiliary facilities (i.e., ramps, direct connections and frontage roads) carrying unusually high traffic volumes.

2.5 State of California Department of Transportation

The California Department of Transportation determines the level of service for operating state highway facilities based upon measures of effectiveness (MOE). These MOEs describe the measures best suited for analyzing state highway facilities (i.e., freeway segments, signalized intersections, on- or off-ramps, etc.). Caltrans endeavors to maintain a target LOS at the transition between LOS C and LOS D on state highway facilities; however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing state highway facility is operating at less than the appropriate target LOS, the existing MOE should be maintained. The table below summarizes MOEs for the various levels of service based on Caltrans criteria.

Basic Freeway Segments at 65 miles/hr				
LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum V/C	Maximum Service Flow Rate
A	11	65.5	0.30	710
B	18	65	0.50	1170
C	26	64.6	0.71	1680
D	35	59.7	0.89	2090
E	45	52.2	1.00	2350

2.6 Washington State Level of Service Criteria for Highways of Statewide Significance

Below are the level of service guidelines established by Washington State for highways of statewide significance (HSS):

- Urban areas – LOS D.
- Rural areas – LOS C.

2.7 British Columbia Department of Transportation

The most commonly used indicator of comfort and mobility in British Columbia is the HCM LOS criteria. LOS C or better, and speeds of 90km/hr or better are considered desirable for all freeway facilities.

When LOS D is reached it is considered congested condition, highway congestion is a term indicating that traffic conditions are impeding the users' desire to make trips at the expected level of comfort and mobility.

2.8 Highway Engineering – Scotland, Ireland, and England

Research and literature indicates that there are two approaches that are typically used to select the roadway standards:

- LOS (HCM) methodology – the quality of service delivered by a highway at a given rate of traffic flow per lane.
- Based on AADT for opening year options of standard are considered – each type of roadway corresponds to an AADT range (i.e. 4-lanes up to 41,000vpd; 6-lanes AADT 25,000vpd to 67,000vpd; 8-lanes 52,000vps to 90,000vpd).

The two options are evaluated on potentially important local factors such as cost of construction, maintenance, network effects, impacts on environment – economic and environmental effects are evaluated to choose optimal road standard. Then the future AADT is determined, based on historical growth rate including categories of vehicles, for the 20 year horizon. After the 20 year horizon, growth rate is assumed at 0%.

Economic evaluation takes into consideration:

- Cost of congestion and value of reliability (travel time reliability) – time spent in congested conditions applied to sections between junctions. With increased congestion the costs grow: road wear and tear, delays to users (fuel, time), increased risk of collisions and environmental costs – which is a social cost.
- Congestion bands:
  - No congestion – free flow speed (FFS) up to 10% FFS speed drop.
  - Mild congestion – 10% to 25% FFS drop – mild congestion is considered acceptable.
  - Serious congestion – 25% to 50% FFS drop.
  - Severe congestion – more than 50% FFS drop.

  LOS D is comparable to mild congestion condition.

Assessment is based on the product of congestion percentage and the volume of traffic affected.

2.9 Australian Department of Infrastructure and Regional Development

Similarly to UK, Australia evaluates the projection of congestion costs against the cost of improvement.

2.10 European Road Network "EURO-Network"

Declaration of Conference of European Directors of Roads: "The choice of geometric characteristics shall be such as to afford to all users proper safety, and traffic flow with a minimum congestion, bearing in mind the function of the road and general behavior of drivers."

The EURO-network establishes LOS using the HCM methodology. New freeways and expressways are designed for the 30 year horizon, where LOS should not be lower than LOS C. The LOS is based on 50th highest hour (typically), sometimes 30th highest hour.

3.0 Summary of Findings

- Level of service is determined using HCM, which is consistent for North America, Europe and Australia.
- Level of service for 30th, 50th or 100th highest hour is considered for design, which may mean that LOS C for 30th or 50th highest hour corresponds to LOS B for the 100th highest hour.
- Level of service criteria varies for urban and rural conditions. It is understood that in rural conditions higher LOS is expected for which LOS B is considered acceptable. In urban conditions some congestion is expected and tolerated, which also influences drivers' behavior, so LOS C or D is used as a target.
- HCM indicates that at LOS B, there is no change in the average speed of passenger vehicles, which is practically not affected by the traffic. Within LOS C dropping to LOS D, the average travel speed drops by approximately 10km/h as compared to free flow speed.

  Example: Considering LOS C through the Red Deer area, from Innisfail to Lacombe ~ 60km distance. Assuming Highway 2 average FFS 120km/h at LOS B, and speed 110km/h at LOS C dropping to D the time lost over 60 km distance is less than 3 min (9%).

  Note: Posted speed on Highway 2 is 110 km/h.

4.0 Conclusion

A freeway facility is intended to provide for a safe and efficient movement of people and goods.

In rural areas, with infrequent developments, consistent traffic flow, and reasonably long interchange spacing, drivers typically experience less interactions with adjacent traffic, while travelling at chosen free flow speed. These typical conditions influence drivers' behavior, which in travel for longer distances results in lower alertness and a somewhat longer reaction time to respond to roadway situations. With lower traffic volumes and a better level of service, the probability of situations requiring reaction to situations on the road is lower, which impacts the collision experience. It is desirable to maintain as high as possible level of service for rural areas. A LOS B or better has been used for years in Alberta, hence it is expected by the travelling public.

In urban conditions, typically traffic volumes are higher, with frequent exits and entrances, and drivers experience lots of interactions. The frequent need for reaction makes drivers more alert to safely execute driving maneuvers. Drivers are also prepared to accept some delay as long as they do not perceive conditions as congested. Conditions when speeds drop by 10km/h to 20 km/h, LOS D is considered as a beginning of congestion or mild congestion.

It is important to note that recent traffic analysis work on Highway 2 suggests that traffic volumes in the range of 40,000vpd, when converted to the 100th highest hourly volume, continue to yield LOS B operation on the 4-lane sections. This condition appears to exist on the majority of the rural sections of Highway 2 due to the directional splits being close to 50-50, even during the peak hours.

May 31, 2018

It would be desirable to apply at least three LOS targets for highways/freeways in Alberta, and we suggest adopting practices similar to those used in United States and other countries.

- In rural areas with adjacent communities of a population less than 5,000 – LOS B.
- In urban areas (>50,000 population) and transitional areas (>5,000 population) – LOS C.
- In dense urban areas (>500,000 population) and transitional areas – LOS D.

It might be necessary due to constraints to accept even lower levels of service in urbanized areas, but at this time we suggest the following for consideration:

As applicable to Highway 2 Corridor to use target LOS B for sections:

- Acme Road (Crossfield) to Highway 42 (Penhold).
- Highway 597 (Blackfalds) to North of Highway 616 (Millet).

And use target LOS C for areas:

- Highway 567 (Airdie) to Acme Road (Crossfield).
- Highway 42 (Penhold) to Highway 597 (Blackfalds).
- North of Highway 616 (Millet) to South of Highway 2A (Leduc).

And use target LOS D for areas:

- City of Calgary to Highway 597 (Airdrie).
- South of Highway 2a (Leduc) to City of Edmonton.

With changing area environment, the proposed LOS criteria boundaries may be adjusted in the future.

Note: After submission of the above paper, Alberta Transportation prepared a revision of Highway Geometric Design Guide (Draft Feb. 2018). The revision includes Chapter A – Basic Design Principles and Section A.6 Highway Capacity and Level of Service with Section A.6.1 Guidelines for LOS Targets and Design Options.

The LOS targets included in this Working Paper and in the Highway 2 - Corridor Improvement Study Report recommendation are consistent with Alberta Transportation Geometric Design Guidelines Draft Report Feb. 2018.

Appendix E

Highway Capacity Manual (HCM) Analysis Report

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Section 1 AM & PM Peak (Northbound and Southbound)

Section 1 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Stoney Trail-	Basic	1896	6933	0.27	121	5.5	0	0	168.1	A
-	On Ramp	4464	6928	0.64	102	14.8	0.01	0.01	66.0	C
-	Ramp Overlap	4464	6928	0.64	102	14.8	0.04	0.04	188.7	C
-	Off Ramp	4464	9238	0.48	112	10.3	0.01	0.01	66.0	B
Crossiron Mills-	Basic	4149	9249	0.45	120	9.0	0	0	282.0	B
-	Basic	4149	6937	0.6	117	12.2	0.01	0.01	220.7	C
-	Off Ramp	4149	6937	0.6	106	13.5	0.03	0.03	183.9	C
Hwy 566-	Basic	3389	6951	0.49	120	9.8	0	0	340.5	B
-	On Ramp	3521	6947	0.51	108	11.2	0.03	0.03	156.1	B
-	Basic	3521	6947	0.51	120	10.1	0.02	0.02	1491.0	B
-	Off Ramp	3521	6947	0.51	104	11.7	0.04	0.04	156.1	C
Yankee Valley-	Basic	2542	6910	0.37	120	7.3	0	0	234.4	B
-	On Ramp	2846	6936	0.41	110	8.9	0.01	0.01	34.5	B
-	Basic	3060	9245	0.33	113	7.0	0.01	0.01	45.2	A
-	Ramp Overlap	3060	9245	0.33	113	7.0	0.02	0.02	146.5	B
East Lake Crescent-	Off Ramp	3060	9245	0.33	115	6.9	0	0	45.2	B
-	Basic	2851	9220	0.31	120	6.2	0	0	159.2	A
-	Basic	2851	6915	0.41	121	8.2	0	0	32.0	B
-	Off Ramp	2851	6915	0.41	103	9.6	0.04	0.04	126.4	B
Hwy 567 Veterans-	Basic	1890	6941	0.27	121	5.4	0	0	302.1	A
-	On Ramp	2299	6890	0.33	110	7.2	0.02	0.02	101.9	B
-	Basic	2299	6890	0.33	121	6.6	0	0	339.7	A
Facility					**116**	**8.9**	**0.28**	**0.28**	**4886.0**	B

Section 1 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Stoney Trail-	Basic	3481	7117	0.49	120	9.8	0	0	308.6	B
-	On Ramp	6176	7031	0.88	90	23.1	0.03	0.03	91.2	D
-	Ramp Overlap	6176	7031	0.88	90	23.1	0.08	0.08	261.0	E
-	Off Ramp	6176	9375	0.66	107	14.8	0.01	0.01	91.2	C
Crossiron Mills-	Basic	5384	9356	0.58	118	11.7	0.01	0.01	365.9	C
-	Basic	5384	7017	0.77	108	17.0	0.03	0.03	286.4	D
-	Off Ramp	5384	7017	0.77	106	17.5	0.03	0.03	238.7	D
Hwy 566-	Basic	4454	6998	0.64	116	13.2	0.02	0.02	447.5	C
-	On Ramp	5102	7015	0.73	104	16.8	0.04	0.04	226.2	D
-	Basic	5102	7015	0.73	111	15.8	0.19	0.19	2160.5	C
-	Off Ramp	5102	7015	0.73	98	17.8	0.05	0.05	226.2	D
Yankee Valley-	Basic	2752	6886	0.4	120	8.0	0	0	253.7	B
-	On Ramp	3134	6902	0.45	109	9.9	0.01	0.01	37.9	B
-	Basic	3432	9225	0.37	113	7.9	0.01	0.01	50.7	B
-	Ramp Overlap	3432	9225	0.37	112	8.0	0.02	0.02	164.3	B
East Lake Crescent-	Off Ramp	3432	9225	0.37	112	8.0	0.01	0.01	50.7	B
-	Basic	2897	9214	0.31	120	6.3	0	0	161.8	A
-	Basic	2897	6910	0.42	121	8.3	0	0	32.5	B
-	Off Ramp	2897	6910	0.42	102	9.9	0.04	0.04	128.4	C
Hwy 567 Veterans-					121	5.0	0	0	269.7	A
-	On Ramp	2140	6817	0.31	110	6.8	0.02	0.02	94.9	B
-	Basic	2140	6817	0.31	121	6.3	0	0	316.2	A
Facility					**111**	**11.9**	**0.6**	**0.6**	**6264.2**	C

Section 1 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2134	6633	0.32	121	6.4	0	0	315.3	A
-	Off Ramp	2134	6633	0.32	106	7.3	0.03	0.03	94.6	B
Highway 567-	Basic	1769	6640	0.27	120	5.3	0	0	164.6	A
-	On Ramp	2676	6680	0.4	108	8.8	0.03	0.03	118.6	B
-	Basic	2676	6680	0.4	121	8.0	0	0	294.1	B
Edmonton Trail-	Weaving	3473	5564	0.62	97	9.5	0.1	0.1	286.3	B
Yankee Valley-	Basic	2744	6780	0.4	121	8.1	0	0	301.6	B
-	On Ramp	3991	6897	0.58	104	13.4	0.04	0.04	176.9	C
-	Basic	3991	6897	0.58	116	11.9	0	0	18.8	C
-	On Ramp	5244	6947	0.75	103	17.6	0.04	0.04	232.4	D
-	Basic	5244	6947	0.75	109	16.7	0.21	0.21	1971.1	D
-	Off Ramp	5244	6947	0.75	107	17.0	0.03	0.03	232.4	D
Balzac-	Basic	4534	6938	0.65	115	13.7	0.03	0.03	514.5	C
-	On Ramp	5450	6945	0.78	102	18.4	0.04	0.04	241.6	D
-	Basic	5450	6945	0.78	107	17.6	0.11	0.11	872.9	D
Crossiron Mills -	On Ramp	5528	6939	0.8	104	18.4	0.01	0.01	81.7	C
-	Ramp Overlap	5528	6939	0.8	102	18.8	0.05	0.05	310.4	D
-	Off Ramp	5528	6939	0.8	102	18.8	0.01	0.01	81.7	D
Stoney Trail-	Basic	3660	6945	0.53	119	10.6	0.01	0.01	484.6	B
Facility					**110**	**12.7**	**0.74**	**0.74**	**6794.3**	C

Section 1 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2482	6807	0.36	121	7.3	0	0	366.7	B
-	Off Ramp	2482	6807	0.36	106	8.3	0.03	0.03	110.0	B
Highway 567-	Basic	1918	6586	0.29	105	6.5	0	0	178.6	A
-	On Ramp	2718	6806	0.4	108	8.8	0.03	0.03	120.5	B
-	Basic	2718	6664	0.41	105	9.1	0	0	298.8	B
Edmonton Trail-	Weaving	3112	8097	0.38	103	7.9	0.07	0.07	256.6	B
Yankee Valley-	Basic	2571	6798	0.38	121	7.5	0	0	282.6	B
-	On Ramp	3141	6835	0.46	109	10.1	0.02	0.02	139.2	B
-	Basic	3141	6835	0.46	118	9.4	0	0	14.9	B
-	On Ramp	3759	6853	0.55	108	12.1	0.03	0.03	166.6	C
-	Basic	3759	6853	0.55	119	11.1	0.03	0.03	1412.9	B
-	Off Ramp	3759	6853	0.55	107	12.3	0.03	0.03	166.6	C
Balzac-	Basic	3287	6871	0.48	120	9.6	0	0	373.0	B
-	On Ramp	3923	6856	0.57	107	12.7	0.03	0.03	173.9	C
-	Basic	3923	6856	0.57	118	11.6	0.02	0.02	628.3	C
Crossiron Mills -	On Ramp	4672	6896	0.68	105	15.4	0.01	0.01	69.0	C
-	Ramp Overlap	4672	6896	0.68	99	16.5	0.06	0.06	262.3	D
-	Off Ramp	4672	6896	0.68	99	16.5	0.02	0.02	69.0	D
Stoney Trail-	Basic	2370	6818	0.35	121	6.9	0	0	313.7	B
Facility					**113**	**9.8**	**0.38**	**0.38**	**5403.3**	B

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Segment 2 AM & PM Peak (Northbound and Southbound)

Segment 2 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (veh/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
S. of Hwy 72-	Basic	2398	4573	0.52	120	25.9	0.04	0.04	1691.4	B
-	Off Ramp	2398	4573	0.52	100	31.1	0.05	0.05	106.3	C
Hwy 2A/72-	Basic	2156	4570	0.47	120	23.3	0	0	132.5	B
-	On Ramp	2225	4577	0.49	103	27.8	0.03	0.03	69.0	B
-	On Ramp	2273	4570	0.5	106	27.8	0.03	0.03	100.7	B
-	Basic	2273	4570	0.5	120	24.5	0	0	247.2	B
-	Off Ramp	2273	4570	0.5	101	29.1	0.04	0.04	100.7	C
Highway Commercial-	Basic	2162	4564	0.47	120	23.3	0	0	261.9	B
-	On Ramp	2273	4570	0.5	106	27.8	0.03	0.03	100.7	B
-	Basic	2273	6854	0.33	121	16.3	0	0	1111.0	A
-	Off Ramp	2273	6854	0.33	108	18.2	0.03	0.03	100.7	B
Acme Road-	Basic	2062	6857	0.3	121	14.8	0	0	234.0	A
-	On Ramp	2164	6822	0.32	111	16.7	0.02	0.02	95.9	B
-	Basic	2164	6822	0.32	121	15.4	0	0	750.1	A
-	Basic	2164	4548	0.48	120	23.3	0.01	0.01	780.8	B
-	Off Ramp	2164	4548	0.48	101	27.7	0.04	0.04	95.9	B
Highway 581-	Basic	2125	4548	0.47	120	22.9	0	0	325.9	B
-	On Ramp	2192	4555	0.48	106	26.9	0.03	0.03	97.2	B
-	Basic	2192	4555	0.48	120	23.7	0.02	0.02	1937.4	B
-	Off Ramp	2192	4555	0.48	100	28.3	0.05	0.05	97.2	C
Highway 582-	Basic	2014	4579	0.44	121	21.7	0	0	244.6	B
-	On Ramp	2106	4576	0.46	106	25.6	0.03	0.03	93.4	B
-	Basic	2106	4576	0.46	121	22.7	0	0	311.2	B
Facility					**118**	**21.6**	**0.45**	**0.45**	**9085.9**	**B**

Segment 2 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (veh/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
S. of Hwy 72-	Basic	1930	5139	0.38	116	21.6	0.14	0.14	1361.4	B
-	Off Ramp	1930	4588	0.42	100	25.1	0.05	0.05	85.6	B
Hwy 2A/72-	Basic	1586	4562	0.35	120	17.2	0	0	97.5	B
-	On Ramp	1659	4565	0.36	105	20.4	0.02	0.02	51.5	B
-	On Ramp	1732	4568	0.38	107	21.1	0.03	0.03	76.8	B
-	Basic	1732	4568	0.38	121	18.7	0	0	188.4	B
-	Off Ramp	1732	4568	0.38	101	22.2	0.04	0.04	76.8	B
Highway Commercial-	Basic	1620	4555	0.36	121	17.4	0	0	196.3	B
-	On Ramp	1732	4568	0.38	107	21.1	0.03	0.03	76.8	B
-	Basic	1732	6851	0.25	121	12.4	0	0	846.5	A
-	Off Ramp	1732	6851	0.25	106	14.0	0.03	0.03	76.8	B
Acme Road-	Basic	1408	6803	0.21	121	10.1	0	0	159.8	A
-	On Ramp	1597	6809	0.23	111	12.4	0.02	0.02	70.8	A
-	Basic	1597	6809	0.23	121	11.4	0	0	553.6	A
-	Basic	1597	4539	0.35	121	17.1	0	0	576.2	B
-	Off Ramp	1597	4539	0.35	101	20.4	0.04	0.04	70.8	B
Highway 581-	Basic	1502	4532	0.33	121	16.1	0	0	230.4	A
-	On Ramp	1629	4540	0.36	107	19.6	0.03	0.03	72.2	B
-	Basic	1629	4540	0.36	121	17.5	0	0	1439.8	B
-	Off Ramp	1629	4540	0.36	100	20.9	0.05	0.05	72.2	B
Highway 582-	Basic	1441	4523	0.32	121	15.4	0	0	175.0	A
-	On Ramp	1540	4532	0.34	107	18.7	0.03	0.03	68.3	B
-	Basic	1540	4532	0.34	121	16.6	0	0	227.5	A
Facility					**118**	**16.4**	**0.52**	**0.52**	**6850.6**	**A**

Segment 2 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (veh/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)	LOS (Demand)
-	Basic	1956	4382	0.45	121	20.9	0	0	289.0	B	B
-	Off Ramp	1956	4382	0.45	101	25.1	0.04	0.04	86.7	B	B
Highway 582-	Basic	1889	4383	0.43	121	20.3	0	0	239.5	B	B
-	On Ramp	2066	4386	0.47	105	25.3	0.03	0.03	91.6	B	B
-	Basic	2066	4386	0.47	120	22.2	0.01	0.01	1818.1	B	B
-	Off Ramp	2066	4386	0.47	101	26.6	0.04	0.04	91.6	B	B
Highway 581-	Basic	1965	4372	0.45	121	21.1	0	0	272.9	B	B
-	On Ramp	2020	4380	0.46	105	24.8	0.03	0.03	89.6	B	B
-	Basic	2020	4380	0.46	121	21.7	0	0	705.8	B	B
-	Basic	2020	6570	0.31	121	14.5	0	0	751.5	A	A
-	Off Ramp	2020	6570	0.31	108	16.1	0.03	0.03	89.6	B	B
Acme Road-	Basic	1949	6591	0.3	121	14.0	0	0	260.3	A	A
-	On Ramp	2156	6575	0.33	110	16.7	0.02	0.02	95.6	B	B
-	Basic	2156	6575	0.33	121	15.4	0	0	1165.9	A	A
-	Basic	2156	4384	0.49	120	23.2	0.01	0.01	478.4	B	B
-	Off Ramp	2156	4384	0.49	101	27.5	0.04	0.04	95.6	C	C
Highwat 2A/72-	Basic	2113	4378	0.48	120	22.9	0	0	176.7	B	B
-	On Ramp	2309	4394	0.53	103	29.1	0.01	0.01	34.1	C	C
-	RampOverlap	2309	4394	0.53	101	29.5	0.03	0.03	73.7	C	C
-	Off Ramp	2309	4394	0.53	101	29.5	0.01	0.01	34.1	C	C
SRA-	Basic	2288	4392	0.52	120	24.8	0	0	171.1	B	B
-	On Ramp	2309	4393	0.53	105	28.3	0.03	0.03	102.4	B	B
-	Basic	2309	4393	0.53	119	25.1	0.03	0.03	1364.7	B	B
Facility					**118**	**20.1**	**0.4**	**0.4**	**8578.2**	**B**	**B**

Segment 2 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (veh/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	1974	4382	0.45	121	21.2	0	0	291.6	B
-	Off Ramp	1974	4382	0.45	101	25.3	0.04	0.04	87.5	B
Highway 582-	Basic	1912	4370	0.44	121	20.6	0	0	242.4	B
-	On Ramp	2097	4233	0.5	105	24.8	0.03	0.03	92.9	B
-	Basic	2097	4233	0.5	120	22.7	0.02	0.02	1845.3	B
-	Off Ramp	2097	4233	0.5	101	26.9	0.04	0.04	92.9	C
Highway 581-	Basic	2043	4224	0.48	120	22.0	0	0	283.7	B
-	On Ramp	2111	4238	0.5	105	26.1	0.03	0.03	93.6	B
-	Basic	2111	4238	0.5	120	22.9	0.01	0.01	737.6	B
-	Basic	2111	6357	0.33	121	15.1	0	0	785.4	A
-	Off Ramp	2111	6357	0.33	109	16.7	0.03	0.03	93.6	B
Acme Road-	Basic	2057	6368	0.32	121	14.6	0	0	274.7	A
-	On Ramp	2185	6375	0.34	110	17.1	0.02	0.02	96.9	B
-	Basic	2185	6375	0.34	121	15.6	0	0	1181.6	A
-	Basic	2185	4250	0.51	120	23.7	0.01	0.01	484.9	B
-	Off Ramp	2185	4250	0.51	101	28.0	0.04	0.04	96.9	C
Highwat 2A/72-	Basic	2164	4248	0.51	120	23.3	0	0	181.0	B
-	On Ramp	2212	4259	0.52	103	27.7	0.03	0.03	73.2	C
-	On Ramp	2473	4304	0.57	102	31.4	0.01	0.01	36.5	C
-	RampOverlap	2473	4304	0.57	101	31.5	0.03	0.03	78.9	C
-	Off Ramp	2473	4304	0.57	101	31.5	0.01	0.01	36.5	C
SRA-	Basic	2462	4304	0.57	118	27.0	0.01	0.01	184.0	C
-	On Ramp	2473	4304	0.57	103	30.9	0.04	0.04	109.6	C
-	Basic	2473	4304	0.57	118	27.0	0.07	0.07	1461.6	C
Facility					**118**	**20.9**	**0.5**	**0.5**	**8943.0**	**B**

Segment 3 AM & PM Peak (Northbound and Southbound)

Segment 3 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Bergen Rd. Ints.	Basic	2067	4414	0.47	120	9.3	0	0	841.1	B
Amerada Rd. Ints.	Basic	2067	4414	0.47	120	9.3	0	0	651.1	B
-	Basic	2067	4414	0.47	120	9.3	0.01	0.01	1131.8	B
-	Off Ramp	2067	4414	0.47	101	11.1	0.04	0.04	91.6	C
-	Off Ramp	2042	4416	0.46	90	12.3	0.06	0.06	67.6	B
Highway 27-	Basic	1878	4410	0.43	114	8.9	0.01	0.01	46.1	B
-	On Ramp	2160	4419	0.49	104	11.1	0.04	0.04	95.7	B
-	Basic	2160	4419	0.49	120	9.8	0.01	0.01	1214.0	B
At Grade Int.	Basic	2160	4419	0.49	120	9.8	0.01	0.01	679.1	B
At Grade Int.	Basic	2160	4419	0.49	120	9.8	0.01	0.01	1201.3	B
-	Off Ramp	2160	4419	0.49	94	12.4	0.06	0.06	95.7	B
Highway 587-	Basic	2108	4421	0.48	119	9.6	0	0	112.8	B
-	On Ramp	2280	4424	0.52	103	11.9	0.01	0.01	33.7	C
-	Ramp Overlap	2280	4424	0.52	101	12.2	0.03	0.03	71.4	C
-	Off Ramp	2280	4424	0.52	101	12.2	0.01	0.01	33.7	C
Highway Commercial-	Basic	2278	4425	0.51	120	10.3	0	0	222.8	B
-	Basic	2280	6497	0.35	98	8.5	0.02	0.02	101.0	B
-	Basic	2280	4424	0.52	120	10.3	0.02	0.02	1088.1	B
-	Off Ramp	2280	4424	0.52	101	12.3	0.05	0.05	101.0	C
Highway 54-	Basic	2140	4418	0.48	120	9.7	0	0	335.1	B
-	On Ramp	2199	4421	0.5	105	11.3	0.03	0.03	97.5	B
-	Basic	2199	4421	0.5	120	9.9	0	0	202.1	B
-	Off Ramp	2199	4421	0.5	87	13.8	0.09	0.09	97.5	B
Highway 590-	Basic	2004	4452	0.45	119	9.1	0	0	153.4	B
-	On Ramp	2258	4465	0.51	106	11.4	0.03	0.03	100.1	B

Segment 3 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2258	4465	0.51	120	10.1	0	0	188.2	B
-	Basic	2258	5799	0.39	121	7.8	0	0	553.8	B
Old Pole Rd Ints.	Basic	2258	4465	0.51	120	10.1	0.01	0.01	757.3	B
-	Basic	2258	4465	0.51	120	10.1	0.02	0.02	1265.1	B
-	Off Ramp	2258	4465	0.51	101	12.0	0.04	0.04	100.1	B
Highway 42-	Basic	2206	4469	0.49	120	9.9	0	0	411.3	B
-	On Ramp	2717	4497	0.6	106	13.5	0.03	0.03	120.5	B
-	Basic	2717	4497	0.6	117	12.4	0.06	0.06	1096.7	C
Facility					**118**	**10.0**	**0.75**	**0.75**	**13358.4**	**B**

Segment 3 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Bergen Rd. Int's.	Basic	1972	4521	0.44	121	8.7	0	0	802.4	B
Amerada Rd. Int's.	Basic	1972	4521	0.44	121	8.7	0	0	621.2	B
-	Basic	1972	4521	0.44	121	8.7	0	0	1079.8	B
-	Off Ramp	1972	4521	0.44	101	10.3	0.04	0.04	87.4	B
-	Off Ramp	1944	4523	0.43	90	11.4	0.06	0.06	64.3	B
Highway 27-	Basic	1763	4520	0.39	114	8.2	0.01	0.01	43.3	B
-	On Ramp	2009	4548	0.44	105	10.1	0.03	0.03	89.1	B
-	Basic	2009	4548	0.44	121	8.8	0	0	1129.1	B
At Grade Int.	Basic	2009	4548	0.44	121	8.8	0	0	631.7	B
At Grade Int.	Basic	2009	4548	0.44	121	8.8	0	0	1117.3	B
-	Off Ramp	2009	4548	0.44	94	11.2	0.06	0.06	89.1	B
Highway 587-	Basic	1957	4544	0.43	119	8.7	0	0	104.7	B
-	On Ramp	2142	4564	0.47	104	10.9	0.01	0.01	31.6	B
-	Ramp Overlap	2142	4564	0.47	101	11.1	0.03	0.03	67.1	B
-	Off Ramp	2142	4564	0.47	101	11.1	0.01	0.01	31.6	B
Highway Commercial-	Basic	2140	4566	0.47	120	9.4	0	0	209.3	B
-	On Ramp	2142	4564	0.47	106	10.6	0.03	0.03	94.9	B
-	Basic	2142	4564	0.47	120	9.4	0.01	0.01	1022.2	B
-	Off Ramp	2142	4564	0.47	101	11.2	0.05	0.05	94.9	B
Highway 54-	Basic	1955	4555	0.43	121	8.5	0	0	306.2	B
-	On Ramp	2081	4569	0.46	106	10.3	0.03	0.03	92.2	B
-	Basic	2081	4569	0.46	120	9.1	0	0	191.2	B
-	Off Ramp	2081	4569	0.46	87	12.6	0.09	0.09	92.2	A
Highway 590-	Basic	1920	4574	0.42	119	8.5	0	0	147.0	B
-	On Ramp	2198	4590	0.48	106	10.8	0.03	0.03	97.4	B

Segment 3 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2198	4590	0.48	120	9.6	0	0	183.2	B
-	Basic	2198	6286	0.35	121	7.0	0	0	539.1	B
Old Pole Rd Int's.	Basic	2198	4590	0.48	120	9.6	0.01	0.01	737.2	B
-	Basic	2198	4590	0.48	120	9.6	0.01	0.01	1231.5	B
-	Off Ramp	2198	4590	0.48	101	11.4	0.04	0.04	97.4	B
Highway 42-	Basic	2174	4595	0.47	120	9.4	0	0	405.4	B
-	On Ramp	2367	4567	0.52	108	11.4	0.03	0.03	104.9	B
-	Basic	2367	4567	0.52	120	10.4	0.02	0.02	955.4	B
Facility					**118**	**9.1**	**0.63**	**0.63**	**12591.5**	**B**

Segment 3 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)	LOS (Demand)
-	Basic	2266	4442	0.51	120	10.2	0.02	0.02	885.2	B	B
-	Off Ramp	2266	4442	0.51	101	12.2	0.05	0.05	100.4	B	B
Highway 42-	Basic	2090	4414	0.47	120	9.4	0	0	445.9	B	B
-	On Ramp	2143	4423	0.48	106	11.0	0.03	0.03	95.0	B	B
Old Pole Rd. Int.	Basic	2143	6634	0.32	121	6.4	0	0	1262.1	A	A
-	Basic	2143	5721	0.37	121	7.5	0	0	872.6	B	B
-	Basic	2143	4423	0.48	120	9.7	0.01	0.01	630.1	B	B
-	Off Ramp	2143	4423	0.48	100	11.6	0.05	0.05	95.0	C	C
Highway 590 -	Basic	1925	4404	0.44	121	8.7	0	0	250.3	B	B
-	On Ramp	2086	4411	0.47	106	10.7	0.03	0.03	92.5	B	B
-	Basic	2086	4411	0.47	120	9.4	0	0	210.8	B	B
-	Basic	2086	6479	0.32	97	7.8	0.02	0.02	92.5	B	B
Highway 54-	Basic	2041	4411	0.46	121	9.2	0	0	322.0	B	B
-	On Ramp	2182	4419	0.49	105	11.2	0.03	0.03	96.7	B	B
-	Basic	2182	4419	0.49	120	9.9	0.01	0.01	1214.8	B	B
-	Off Ramp	2182	4419	0.49	101	11.7	0.05	0.05	96.7	B	B
Highway 587 -	Basic	2042	4400	0.46	121	9.3	0	0	415.8	B	B
-	On Ramp	2075	4403	0.47	104	10.9	0.04	0.04	92.0	B	B
-	Basic	2075	6467	0.32	105	7.2	0	0	222.6	B	B
Highway 2A Exit -	Basic	2075	6467	0.32	96	7.8	0.02	0.02	92.0	B	B
Netook Rd -At Grade-	Basic	1923	4399	0.44	121	8.7	0	0	849.0	B	B
Winborne Rd. Int.	Basic	1923	4399	0.44	121	8.7	0	0	604.6	B	B
-	Basic	1923	4399	0.44	121	8.7	0	0	1073.5	B	B
-	Off Ramp	1923	4399	0.44	91	11.6	0.07	0.07	85.3	B	B
-	Off Ramp	1867	4403	0.42	91	11.2	0.06	0.06	66.2	B	B

Segment 3 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)	LOS (Demand)
Highway 27-	Basic	1847	4405	0.42	118	8.5	0.01	0.01	103.7	B	B
-	On Ramp	2037	4404	0.46	103	10.6	0.04	0.04	90.3	B	B
At Grade Int.	Basic	2037	4404	0.46	121	9.2	0	0	1057.0	B	B
At Grade Int.	Basic	2037	4404	0.46	121	9.2	0	0	641.6	B	B
-	Basic	2037	4404	0.46	121	9.2	0	0	747.6	B	B
Facility					**118**	**8.8**	**0.55**	**0.55**	**12903.7**	**B**	**B**

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Segment 3 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2510	4471	0.56	119	11.4	0.04	0.04	980.5	C
-	Off Ramp	2510	4471	0.56	99	13.5	0.05	0.05	111.3	B
Highway 42	Basic	2091	4419	0.47	120	9.4	0	0	446.1	B
-	On Ramp	2130	4423	0.48	106	10.9	0.03	0.03	94.4	B
Old Pole Rd. Int's.	Basic	2130	6635	0.32	121	6.4	0	0	1254.4	A
-	Basic	2130	5707	0.37	121	7.4	0	0	867.3	B
-	Basic	2130	4423	0.48	120	9.6	0.01	0.01	626.3	B
-	Off Ramp	2130	4423	0.48	99	11.6	0.05	0.05	94.4	C
Highway 590 -	Basic	1727	4371	0.4	121	7.9	0	0	224.6	B
-	On Ramp	2088	4406	0.47	106	10.7	0.03	0.03	92.6	B
-	Basic	2088	4406	0.47	120	9.4	0	0	211.0	B
-	Basic	2088	6471	0.32	97	7.8	0.02	0.02	92.6	B
Highway 54	Basic	2035	4398	0.46	121	9.2	0	0	321.1	B
-	On Ramp	2244	4424	0.51	105	11.6	0.03	0.03	99.5	B
-	Basic	2244	4424	0.51	120	10.1	0.02	0.02	1249.3	B
-	Off Ramp	2244	4424	0.51	101	12.0	0.04	0.04	99.5	B
Highway 587 -	Basic	2222	4421	0.5	120	10.1	0.01	0.01	452.4	B
-	On Ramp	2255	4424	0.51	103	11.8	0.04	0.04	100.0	C
-	Basic	2255	6497	0.35	105	7.8	0	0	241.9	B
Highway 2A Exit-	Basic	2255	6497	0.35	96	8.5	0.02	0.02	100.0	B
Netook Rd. Int's.	Basic	2013	4398	0.46	121	9.1	0	0	888.7	B
Wimborne Rd. Int's.	Basic	2013	4398	0.46	121	9.1	0	0	632.9	B
-	Basic	2013	4398	0.46	121	9.1	0	0	1123.7	B
-	Off Ramp	2013	4398	0.46	91	12.1	0.08	0.08	89.2	B
-	Off Ramp	1947	4395	0.44	91	11.7	0.06	0.06	69.0	B

Segment 3 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Highway 27	Basic	1923	4390	0.44	118	8.9	0.01	0.01	108.0	B
-	On Ramp	2072	4391	0.47	103	10.9	0.04	0.04	91.9	C
At Grade Int.	Basic	2072	4391	0.47	120	9.4	0.01	0.01	1075.1	B
At Grade Int.	Basic	2072	4391	0.47	120	9.4	0	0	652.7	B
-	Basic	2072	4391	0.47	120	9.4	0	0	760.5	B
Facility					**118**	**9.0**	**0.6**	**0.6**	**13250.7**	**B**

Segment 4 AM & PM Peak (Northbound and Southbound)

Segment 4 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2717	4548	0.6	117	12.2	0.02	0.02	401.4	C
-	OffRamp	2717	4548	0.6	101	14.2	0.04	0.04	120.5	C
McKenzie Rd-	Basic	2604	4538	0.57	118	11.7	0.01	0.01	324.0	C
-	OnRamp	2888	4563	0.63	104	14.7	0.01	0.01	42.7	C
-	RampOverlap	2888	4563	0.63	104	14.7	0.02	0.02	70.0	C
Gasoline Alley Exit -	OffRamp	2888	6844	0.42	108	9.4	0.01	0.01	42.7	B
-	Basic	2581	6804	0.38	120	7.6	0	0	330.3	B
Gaetz Avenue Exit-	Basic	2581	6804	0.38	110	8.3	0.02	0.02	114.4	B
-	Basic	1931	4465	0.43	121	8.6	0	0	318.4	B
Taylor Drive -	OnRamp	3252	4553	0.71	100	17.0	0.02	0.02	48.1	C
-	RampOverlap	3252	4553	0.71	100	17.2	0.06	0.06	169.1	D
32 Street Off Ramp-	OffRamp	3252	4553	0.71	100	17.2	0.02	0.02	48.1	D
-	Basic	2973	4544	0.65	115	13.7	0.03	0.03	380.4	C
-	OnRamp	3838	4584	0.84	95	21.0	0.02	0.02	56.7	D
-	RampOverlap	3838	4584	0.84	95	21.0	0.02	0.02	52.2	D
Sports Museum RA Off-	OffRamp	3838	4584	0.84	101	19.8	0.01	0.01	56.7	D
-	Basic	3838	4584	0.84	103	19.6	0.09	0.09	395.8	D
Sports Museum RA On -	OnRamp	3849	4582	0.84	95	21.2	0.06	0.06	170.6	D
-	Basic	3849	4582	0.84	102	19.7	0.1	0.1	427.6	D
Highway 11-	OffRamp	3849	4582	0.84	93	21.6	0.07	0.07	170.6	E
-	Basic	2154	4516	0.48	119	9.6	0	0	110.2	B
Highway 11 EB -NB Ramp	OnRamp	2361	4502	0.52	106	11.8	0.04	0.04	132.6	B
Highway 11 WB-NB Ramp	OnRamp	2772	4521	0.61	104	14.0	0.04	0.04	122.9	C
-	Basic	2772	4521	0.61	117	12.6	0.02	0.02	309.6	C
-	OffRamp	2772	4521	0.61	97	15.2	0.06	0.06	122.9	C
Highway 11A-	Basic	1811	4445	0.41	121	8.1	0	0	320.0	B
-	OnRamp	2161	4443	0.49	105	10.9	0.03	0.03	95.8	B

Segment 4 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2161	4443	0.49	120	9.7	0.01	0.01	911.9	B
-	OffRamp	2161	4443	0.49	98	11.9	0.05	0.05	95.8	C
Highway 597-	Basic	1563	4375	0.36	121	7.1	0	0	204.6	B
-	OnRamp	1741	4374	0.4	105	9.0	0.03	0.03	77.2	B
-	Basic	1741	4374	0.4	121	7.9	0	0	1397.3	B
-	OffRamp	1741	4374	0.4	99	9.6	0.05	0.05	77.2	B
Highway 12-	Basic	1258	4354	0.29	121	5.8	0	0	197.8	A
-	OnRamp	1363	4332	0.31	106	7.0	0.03	0.03	60.4	B
-	Basic	1363	4332	0.31	121	6.3	0	0	803.9	A
Milton Road Exit-	OffRamp	1363	4332	0.31	101	7.5	0.04	0.04	60.4	B
-	Basic	1300	4318	0.3	121	6.0	0	0	171.3	A
Highway 2A-	OnRamp	1898	4394	0.43	106	9.6	0.03	0.03	84.1	B
-	Basic	1898	6591	0.29	121	5.7	0	0	701.6	A
Highway 2A Exit-	Basic	1898	6591	0.29	107	6.5	0.03	0.03	84.1	B
-	Basic	1628	4382	0.37	120	7.4	0	0	121.7	B
Highway 2A Entrance -	OnRamp	1630	4382	0.37	105	8.5	0.03	0.03	72.3	B
-	Basic	1630	4382	0.37	120	7.4	0	0	155.1	B
-	OffRamp	1630	4382	0.37	101	8.8	0.04	0.04	72.3	B
Highway 604-	Basic	1591	4375	0.36	120	7.3	0	0	111.0	B
-	OnRamp	1614	4372	0.37	105	8.4	0.03	0.03	71.5	B
-	Basic	1614	4372	0.37	121	7.3	0	0	238.5	B
Facility					**114**	**9.2**	**1.24**	**1.24**	**10724.1**	**B**

Segment 4 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2376	4436	0.54	119	10.8	0.01	0.01	351.1	B
-	OffRamp	2376	4436	0.54	100	12.9	0.05	0.05	105.3	C
McKenzie Rd-	Basic	2078	4392	0.47	120	9.4	0	0	258.5	B
-	OnRamp	2215	4413	0.5	106	11.4	0.01	0.01	32.7	B
-	RampOverlap	2215	4413	0.5	106	11.4	0.02	0.02	53.7	C
Gasoline Alley Exit -	OffRamp	2215	6619	0.33	108	7.5	0.01	0.01	32.7	B
-	Basic	2060	6586	0.31	121	6.2	0	0	263.6	A
Gaetz Avenue Exit-	Basic	2060	6586	0.31	110	6.8	0.02	0.02	91.3	B
-	Basic	1441	4257	0.34	121	6.7	0	0	237.6	A
Taylor Drive -	OnRamp	2601	4439	0.59	103	13.5	0.01	0.01	38.4	C
-	RampOverlap	2601	4439	0.59	100	14.0	0.05	0.05	135.3	C
-	OffRamp	2601	4439	0.59	100	14.0	0.02	0.02	38.4	C
32 Street-	Basic	2387	4421	0.54	119	10.9	0.01	0.01	305.4	B
-	OnRamp	3158	4491	0.7	101	16.7	0.01	0.01	46.7	C
-	RampOverlap	3158	4491	0.7	101	16.7	0.01	0.01	42.9	D
-	OffRamp	3158	4491	0.7	101	16.7	0.01	0.01	46.7	D
Sport Museum RA-	Basic	3147	4493	0.7	112	15.0	0.04	0.04	324.5	C
-	OnRamp	3158	4491	0.7	101	16.8	0.05	0.05	140.0	C
-	Basic	3158	4491	0.7	112	15.0	0.04	0.04	350.9	C
-	OffRamp	3158	4491	0.7	95	17.8	0.06	0.06	140.0	D
Highway 11-	Basic	1822	4370	0.42	119	8.5	0	0	93.2	B
Highway 11 EB -NB Ramp	OnRamp	1952	4369	0.45	107	10.0	0.04	0.04	109.6	B
Highway 11 WB-NB Ramp	OnRamp	2566	4429	0.58	105	13.2	0.03	0.03	113.7	C
-	Basic	2566	4429	0.58	118	11.8	0.01	0.01	286.7	C
-	OffRamp	2566	4429	0.58	100	14.0	0.05	0.05	113.7	C
Highway 11A-	Basic	2192	4391	0.5	120	10.0	0.01	0.01	387.4	B

Segment 4 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	OnRamp	2727	4398	0.62	103	14.2	0.04	0.04	120.9	C
-	Basic	2727	4398	0.62	117	12.8	0.08	0.08	1150.7	C
-	OffRamp	2727	4398	0.62	98	15.2	0.05	0.05	120.9	C
Highway 597-	Basic	1976	4316	0.46	121	9.1	0	0	258.7	B
-	OnRamp	2145	4320	0.5	104	11.4	0.04	0.04	95.1	C
-	Basic	2145	4320	0.5	120	9.9	0.02	0.02	1721.5	B
-	OffRamp	2145	4320	0.5	98	12.1	0.05	0.05	95.1	C
Highway 12-	Basic	1548	4280	0.36	121	7.2	0	0	243.3	B
-	OnRamp	1766	4255	0.42	105	9.3	0.03	0.03	78.3	B
-	Basic	1766	4255	0.42	121	8.3	0	0	1041.6	B
Milton Road Exit-	OffRamp	1766	4255	0.42	101	9.9	0.04	0.04	78.3	B
-	Basic	1704	4242	0.4	121	8.0	0	0	224.6	B
Highway 2A-	OnRamp	2206	4312	0.51	106	11.5	0.03	0.03	97.8	B
-	Basic	2206	6468	0.34	121	6.8	0	0	815.5	A
Highway 2A Exit-	Basic	2206	6468	0.34	106	7.7	0.03	0.03	97.8	B
-	Basic	1748	4273	0.41	120	8.2	0	0	130.7	B
Highway 2A Entrance -	OnRamp	1750	4273	0.41	106	9.3	0.03	0.03	77.6	B
-	Basic	1750	4273	0.41	120	8.1	0	0	166.5	B
-	OffRamp	1750	4273	0.41	101	9.7	0.04	0.04	77.6	B
Highway 604-	Basic	1694	4261	0.4	120	8.0	0	0	118.1	B
-	OnRamp	1705	4260	0.4	105	9.1	0.03	0.03	75.6	B
-	Basic	1705	4260	0.4	121	8.0	0	0	253.9	B
Facility					**115**	**9.8**	**1.13**	**1.13**	**11278.0**	**B**

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Segment 4 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)	LOS (Demand)
-	Basic	1851	4338	0.43	121	8.5	0	0	273.5	B	B
-	OffRamp	1851	4338	0.43	101	10.1	0.04	0.04	82.1	B	B
Highway 604-	Basic	1834	4345	0.42	120	8.5	0	0	130.6	B	B
-	OnRamp	1886	4353	0.43	106	9.8	0.03	0.03	83.6	B	B
-	Basic	1886	4353	0.43	121	8.6	0	0	304.3	B	B
-	OffRamp	1886	4353	0.43	101	10.3	0.01	0.01	27.8	B	B
Hwy 2A Morningside-	Basic	1882	6529	0.29	116	6.0	0.01	0.01	67.3	A	A
-	OnRamp	2266	6576	0.34	111	7.4	0.02	0.02	100.4	B	B
-	Basic	2266	6576	0.34	121	6.8	0	0	736.6	A	A
-	Basic	2266	6576	0.34	107	7.8	0.03	0.03	100.4	B	B
Hwy 2A Lacombe-	Basic	1912	4335	0.44	121	8.8	0	0	217.5	B	B
-	OnRamp	1968	4341	0.45	106	10.3	0.03	0.03	87.2	B	B
-	Basic	1968	4341	0.45	121	9.0	0	0	257.6	B	B
-	OffRamp	1968	4341	0.45	101	10.8	0.04	0.04	87.2	B	B
SR4-	Basic	1946	4342	0.45	119	9.0	0	0	101.2	B	B
-	OnRamp	1968	4341	0.45	106	10.3	0.03	0.03	87.2	B	B
-	Basic	1968	4341	0.45	121	9.0	0	0	743.8	B	B
-	OffRamp	1968	4341	0.45	101	10.8	0.04	0.04	87.2	B	B
Highway 12-	Basic	1875	4335	0.43	121	8.6	0	0	356.8	B	B
-	OnRamp	2791	4418	0.63	104	14.4	0.04	0.04	123.7	C	C
-	Basic	2791	4418	0.63	116	13.0	0.16	0.16	2064.3	C	C
-	OffRamp	2791	4418	0.63	100	15.2	0.05	0.05	123.7	C	C
Highway 597-	Basic	2444	4391	0.56	119	11.2	0.01	0.01	361.1	C	C
-	OnRamp	3426	4471	0.77	100	18.3	0.05	0.05	151.8	C	C
-	Basic	3426	4471	0.77	108	17.0	0	0	21.3	D	D
Gravel Pit Entrance-	OnRamp	3429	4470	0.77	100	18.5	0.05	0.05	152.0	C	C
-	Basic	3429	4470	0.77	108	17.0	0.26	0.26	1483.4	D	D

Segment 4 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)	LOS (Demand)
-	OffRamp	3429	4470	0.77	98	18.9	0.05	0.05	152.0	D	D
Highway 11A-	Basic	2659	4420	0.6	117	12.3	0.03	0.03	469.1	C	C
-	OnRamp	2994	4409	0.68	103	15.7	0.04	0.04	132.7	C	C
-	Basic	2994	4409	0.68	114	14.4	0.03	0.03	260.1	C	C
-	OffRamp	2994	4409	0.68	96	16.9	0.06	0.06	132.7	D	D
Highway 11-	Basic	1972	4317	0.46	119	9.3	0	0	86.8	B	B
-	OnRamp	2541	4347	0.58	105	13.2	0.03	0.03	112.7	C	C
-	Basic	2541	4347	0.58	118	11.9	0	0	69.8	C	C
-	OnRamp	3221	4405	0.73	101	17.2	0.04	0.04	142.8	C	C
-	Basic	3221	3753	0.86	101	20.4	0.27	0.27	838.5	D	D
-	OffRamp	3221	3753	0.86	96	21.4	0.06	0.06	142.8	E	E
32 Street-	Basic	2219	3470	0.64	116	13.3	0.03	0.03	264.9	C	C
-	OnRamp	2328	3512	0.66	103	15.4	0.04	0.04	103.2	C	C
-	Basic	2328	3512	0.66	114	13.9	0.02	0.02	186.4	C	C
-	OffRamp	2328	3512	0.66	99	16.1	0.05	0.05	103.2	C	C
Tytor Drive/Hwy 2A-	Basic	1867	4221	0.44	120	8.9	0	0	120.8	B	B
-	OnRamp	2018	4259	0.47	106	10.8	0.02	0.02	49.5	B	B
-	OnRamp	2890	4386	0.66	103	15.2	0.04	0.04	128.1	C	C
-	Basic	2890	6580	0.44	116	9.1	0	0	12.0	B	B
Gasoline Alley-	OffRamp	2890	6580	0.44	100	10.6	0.05	0.05	128.1	C	C
-	Basic	1736	6423	0.27	120	5.4	0	0	106.2	A	A
-	OffRamp	1736	6423	0.27	108	6.0	0.03	0.03	77.0	B	B
McKenzie Rd-	Basic	1585	6444	0.25	120	4.9	0	0	93.7	A	A
McKenzie Rd-	Basic	1585	4296	0.37	121	7.3	0	0	129.3	B	B
-	OnRamp	2284	4402	0.52	105	11.7	0.03	0.03	101.2	B	B
-	Basic	2284	4402	0.52	120	10.4	0.02	0.02	755.9	B	B
Facility					**112**	**11.6**	**1.86**	**1.86**	**13313.4**	**B**	**B**

Segment 4 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	1739	4542	0.38	121	7.6	0	0	256.9	B
-	OffRamp	1739	4542	0.38	101	9.1	0.04	0.04	77.1	B
Highway 604-	Basic	1724	4542	0.38	120	7.6	0	0	122.8	B
-	OnRamp	1737	4542	0.38	107	8.6	0.03	0.03	77.0	B
-	Basic	1737	4542	0.38	121	7.6	0	0	280.3	B
-	OffRamp	1737	4542	0.38	101	9.1	0.01	0.01	25.7	B
Hwy 2A Morningside-	Basic	1736	6813	0.25	116	5.3	0.01	0.01	62.1	A
-	OnRamp	2124	6845	0.31	111	6.7	0.02	0.02	94.2	B
-	Basic	2124	6845	0.31	121	6.2	0	0	690.4	A
-	Basic	2124	6845	0.31	107	7.0	0.03	0.03	94.2	B
Hwy 2A Lacombe-	Basic	1838	4550	0.4	121	8.0	0	0	209.1	B
-	OnRamp	1879	4554	0.41	106	9.3	0.03	0.03	83.3	B
-	Basic	1879	4554	0.41	121	8.2	0	0	246.0	B
-	OffRamp	1879	4554	0.41	101	9.8	0.04	0.04	83.3	B
SRA-	Basic	1857	4557	0.41	119	8.2	0	0	96.6	B
-	OnRamp	1879	4554	0.41	106	9.3	0.03	0.03	83.3	B
-	Basic	1879	4554	0.41	121	8.2	0	0	710.2	B
-	OffRamp	1879	4554	0.41	101	9.8	0.04	0.04	83.3	B
Highway 12-	Basic	1829	4550	0.4	121	8.0	0	0	348.1	B
-	OnRamp	2236	4553	0.49	106	11.1	0.03	0.03	99.1	B
-	Basic	2236	4553	0.49	120	9.8	0.02	0.02	1653.9	B
-	OffRamp	2236	4553	0.49	101	11.7	0.04	0.04	99.1	C
Highway 597-	Basic	2126	4565	0.47	120	9.3	0	0	314.1	B
-	OnRamp	2756	4583	0.6	104	13.7	0.04	0.04	122.1	C
-	Basic	2756	4583	0.6	117	12.4	0	0	17.1	C
Gravel Pit Entrance-	OnRamp	2759	4581	0.6	104	13.9	0.04	0.04	122.3	C
-	Basic	2759	4581	0.6	117	12.4	0.07	0.07	1193.6	C

Segment 4 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	OffRamp	2759	4581	0.6	100	14.5	0.05	0.05	122.3	C
Highway 11A-	Basic	2420	4588	0.53	119	10.6	0.01	0.01	426.9	B
-	OnRamp	2934	4588	0.64	103	14.7	0.04	0.04	130.1	C
-	Basic	2934	4588	0.64	116	13.3	0.02	0.02	254.9	C
-	OffRamp	2934	4588	0.64	97	15.8	0.06	0.06	130.1	C
Highway 11-	Basic	1991	4600	0.43	119	8.8	0	0	87.7	B
-	OnRamp	2777	4613	0.6	104	13.7	0.04	0.04	123.1	C
-	Basic	2777	4613	0.6	117	12.3	0	0	76.3	C
-	OnRamp	3435	4606	0.75	101	17.6	0.05	0.05	152.3	C
-	Basic	3435	4244	0.81	105	18.5	0.2	0.2	894.3	D
-	OffRamp	3435	4244	0.81	97	20.1	0.06	0.06	152.3	D
32 Street-	Basic	2515	4106	0.61	117	12.6	0.02	0.02	300.3	C
-	OnRamp	2873	4163	0.69	102	16.1	0.04	0.04	127.3	C
-	Basic	2873	4163	0.69	113	14.7	0.03	0.03	230.0	C
-	OffRamp	2873	4163	0.69	97	17.1	0.06	0.06	127.3	D
Tylor Drive/Hwy 2A-	Basic	1963	4508	0.44	120	8.8	0	0	127.0	B
-	OnRamp	2048	4515	0.45	106	10.3	0.02	0.02	50.2	B
-	OnRamp	2973	4575	0.65	103	15.0	0.04	0.04	131.8	C
-	Basic	2973	6863	0.43	116	8.9	0	0	12.3	B
Gasoline Alley-	OffRamp	2973	6863	0.43	101	10.3	0.04	0.04	131.8	C
-	Basic	2075	6778	0.31	120	6.2	0	0	126.9	A
-	OffRamp	2075	6778	0.31	108	6.8	0.03	0.03	92.0	B
McKenzie Rd-	Basic	1905	6753	0.28	120	5.7	0	0	112.6	A
McKenzie Rd-	Basic	1905	4502	0.42	121	8.4	0	0	155.3	B
-	OnRamp	2515	4540	0.55	105	12.6	0.03	0.03	111.5	B
-	Basic	2515	4540	0.55	119	11.2	0.03	0.03	832.4	B
Facility	**0**	**0**	**0**	**0**	**114**	**10.2**	**1.4**	**1.4**	**12563.8**	**B**

Segment 5 AM & PM Peak (Northbound and Southbound)

Segment 5 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	1625	6507	0.25	121	5.0	0	0	842.3	A
-	Off Ramp	1625	4338	0.37	94	9.5	0.06	0.06	72.0	B
Matejka Road	Basic	1623	4337	0.37	118	7.6	0	0	53.7	B
-	On Ramp	1634	4338	0.38	105	8.6	0.03	0.03	72.5	B
Gee Road	Basic	1634	4338	0.38	121	7.5	0	0	236.1	B
-	On Ramp	1649	4341	0.38	105	8.6	0.03	0.03	73.1	B
-	Basic	1649	4341	0.38	120	7.6	0	0	151.5	B
-	Off Ramp	1649	4341	0.38	101	9.0	0.04	0.04	73.1	B
Highway 53	Basic	1565	6545	0.24	119	4.8	0	0	63.8	A
-	Weaving	1589	4002	0.4	113	7.7	0.01	0.01	62.2	B
-	Basic	1559	4382	0.36	120	7.1	0	0	58.7	B
-	On Ramp	1713	4354	0.39	104	8.9	0.04	0.04	76.0	B
-	Basic	1713	4354	0.39	121	7.8	0	0	1748.9	B
-	Off Ramp	1713	4354	0.39	101	9.3	0.04	0.04	76.0	B
TWP Rd. 442 - Menaik>	Basic	1703	4352	0.39	118	8.0	0	0	51.3	B
-	On Ramp	1715	4352	0.39	104	9.1	0.04	0.04	76.0	B
-	Basic	1715	4352	0.39	121	7.8	0	0	854.5	B
-	Off Ramp	1715	4352	0.39	101	9.3	0.04	0.04	76.0	B
Highway 611	Basic	1702	4357	0.39	120	7.8	0	0	148.3	B
-	On Ramp	1744	4349	0.4	105	9.2	0.04	0.04	77.3	B
-	Basic	1744	4349	0.4	121	8.0	0	0	666.4	B
-	Off Ramp	1744	4349	0.4	101	9.5	0.04	0.04	77.3	B
SRA	Basic	1738	4349	0.4	121	8.0	0	0	233.2	B
-	On Ramp	1744	4349	0.4	109	8.9	0.03	0.03	77.3	B
-	Basic	1744	4349	0.4	121	8.0	0	0	972.0	B
-	Off Ramp	1744	4349	0.4	101	9.5	0.04	0.04	77.3	B

Segment 5 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	1693	4347	0.39	118	8.0	0	0	39.0	B
Highway 13	Weaving	1730	6027	0.29	115	5.5	0.01	0.01	74.6	A
-	Basic	1710	4353	0.39	120	7.9	0	0	28.8	B
-	On Ramp	1746	4358	0.4	104	9.3	0.04	0.04	77.4	B
-	Basic	1746	4358	0.4	121	8.0	0	0	839.4	B
-	Off Ramp	1746	4358	0.4	101	9.5	0.04	0.04	77.4	B
Correction Line	Basic	1744	4358	0.4	120	8.0	0	0	141.7	B
-	On Ramp	1762	4359	0.4	103	9.4	0.04	0.04	78.1	B
-	Basic	1762	4359	0.4	121	8.0	0	0	1163.2	B
-	Off Ramp	1762	4359	0.4	101	9.6	0.04	0.04	78.1	B
Highway 616	Basic	1758	4363	0.4	120	8.1	0	0	141.8	B
-	On Ramp	1846	4375	0.42	104	9.7	0.04	0.04	81.8	B
-	Basic	1846	4375	0.42	121	8.4	0	0	1773.9	B
-	Off Ramp	1846	4375	0.42	94	10.8	0.06	0.06	81.8	B
Glen Park	Basic	1817	4376	0.42	118	8.5	0	0	66.0	B
-	On Ramp	1993	4397	0.45	104	10.4	0.04	0.04	88.3	B
-	Basic	1993	4397	0.45	121	9.0	0	0	1141.4	B
Facility					**118**	**7.9**	**0.83**	**0.83**	**13019.7**	**B**

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Segment 5 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	1694	6865	0.25	121	4.9	0	0	878.1	A
-	Off Ramp	1694	4577	0.37	94	9.4	0.06	0.06	75.1	B
Matejka Rd	Basic	1686	4576	0.37	117	7.5	0	0	55.8	B
-	On Ramp	1693	4577	0.37	105	8.5	0.03	0.03	75.0	B
	Basic	1693	4577	0.37	121	7.3	0	0	244.6	B
-	On Ramp	1700	4574	0.37	105	8.5	0.03	0.03	75.3	B
-	Basic	1700	4574	0.37	120	7.4	0	0	156.2	B
-	Off Ramp	1700	4574	0.37	101	8.8	0.04	0.04	75.3	B
Highway 53	Basic	1640	6865	0.24	119	4.8	0	0	66.9	A
-	Weaving	1672	4206	0.4	113	7.8	0.01	0.01	65.5	B
-	Basic	1652	4581	0.36	120	7.2	0	0	62.2	B
-	On Ramp	1792	4583	0.39	104	8.9	0.04	0.04	79.4	B
-	Basic	1792	4583	0.39	121	7.8	0	0	1829.6	B
-	Off Ramp	1792	4583	0.39	101	9.3	0.04	0.04	79.4	B
TR 442 - Menaik Road	Basic	1766	4580	0.39	118	7.8	0	0	53.2	B
-	On Ramp	1770	4578	0.39	104	8.9	0.04	0.04	78.4	B
-	Basic	1770	4578	0.39	121	7.7	0	0	881.9	B
-	Off Ramp	1770	4578	0.39	101	9.1	0.04	0.04	78.4	B
Highway 616	Basic	1746	4593	0.38	120	7.6	0	0	152.2	B
-	On Ramp	1843	4578	0.4	105	9.2	0.04	0.04	81.7	B
-	Basic	1843	4578	0.4	121	8.0	0	0	704.2	B
-	Off Ramp	1843	4578	0.4	101	9.5	0.04	0.04	81.7	B
SRA	Basic	1838	4578	0.4	121	8.0	0	0	246.6	B
-	On Ramp	1843	4578	0.4	109	8.9	0.03	0.03	81.7	B
-	Basic	1843	4578	0.4	121	8.0	0	0	1027.1	B

Segment 5 PM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Off Ramp	1843	4578	0.4	101	9.6	0.04	0.04	81.7	B
-	Basic	1778	4584	0.39	118	7.9	0	0	41.0	B
Highway 13	Weaving	1799	6357	0.28	115	5.5	0.01	0.01	77.6	A
-	Basic	1776	4589	0.39	120	7.8	0	0	29.9	B
-	On Ramp	1798	4589	0.39	104	9.0	0.04	0.04	79.7	B
-	Basic	1798	4589	0.39	121	7.8	0	0	864.4	B
-	Off Ramp	1798	4589	0.39	101	9.3	0.04	0.04	79.7	B
Correction Line	Basic	1785	4588	0.39	120	7.8	0	0	145.0	B
-	On Ramp	1800	4589	0.39	103	9.1	0.04	0.04	79.8	B
-	Basic	1800	4589	0.39	121	7.8	0	0	1188.3	B
-	Off Ramp	1800	4589	0.39	101	9.3	0.04	0.04	79.8	B
Highway 616	Basic	1764	4593	0.38	120	7.7	0	0	142.3	B
-	On Ramp	1840	4591	0.4	104	9.2	0.04	0.04	81.6	B
-	Basic	1840	4591	0.4	121	8.0	0	0	1768.2	B
-	Off Ramp	1840	4591	0.4	94	10.2	0.06	0.06	81.6	B
Glen Park	Basic	1824	4596	0.4	118	8.1	0	0	66.3	B
-	On Ramp	1933	4597	0.42	104	9.6	0.04	0.04	85.7	B
-	Basic	1933	4597	0.42	121	8.4	0	0	1107.0	B
Facility					**118**	**7.7**	**0.83**	**0.83**	**13365.3**	**B**

Segment 5 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	1903	4319	0.44	121	8.8	0	0	267.1	B
-	Off Ramp	1903	4319	0.44	91	11.6	0.07	0.07	84.4	B
VIS	Basic	1892	4328	0.44	120	8.7	0	0	234.3	B
-	On Ramp	1903	4319	0.44	108	9.8	0.03	0.03	84.4	B
	Basic	1903	4319	0.44	121	8.8	0	0	582.6	B
-	Off Ramp	1903	4319	0.44	94	11.2	0.06	0.06	84.4	C
Glen Park Road	Basic	1811	4306	0.42	118	8.6	0	0	64.8	B
-	On Ramp	1847	4302	0.43	105	9.8	0.03	0.03	81.9	B
-	Basic	1847	4302	0.43	121	8.5	0	0	1724.7	B
-	Off Ramp	1847	4302	0.43	101	10.2	0.04	0.04	81.9	B
Highway 616	Basic	1774	4292	0.41	120	8.3	0	0	138.9	B
-	On Ramp	1798	4289	0.42	105	9.6	0.03	0.03	79.7	B
-	Basic	1798	4289	0.42	121	8.3	0	0	1189.1	B
-	Off Ramp	1798	4289	0.42	101	9.9	0.04	0.04	79.7	B
Correction Line	Basic	1796	4290	0.42	120	8.4	0	0	142.8	B
-	On Ramp	1800	4289	0.42	104	9.6	0.04	0.04	79.8	B
-	Basic	1800	4289	0.42	121	8.3	0	0	861.1	B
-	Off Ramp	1800	4289	0.42	101	9.9	0.04	0.04	79.8	B
Highway 13	Basic	1772	4283	0.41	118	8.5	0	0	39.3	B
-	Weaving	1862	5886	0.32	114	6.1	0.01	0.01	78.1	A
-	Basic	1842	4285	0.43	119	8.6	0	0	24.5	B
-	On Ramp	1877	4282	0.44	104	10.1	0.04	0.04	83.2	B
-	Basic	1877	4282	0.44	121	8.7	0	0	2032.8	B
-	Off Ramp	1877	4282	0.44	101	10.4	0.04	0.04	83.2	C
Highway 616	Basic	1835	4285	0.43	120	8.6	0	0	170.8	B

Segment 5 AM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	On Ramp	1877	4282	0.44	103	10.1	0.04	0.04	83.2	B
-	Basic	1877	4282	0.44	121	8.7	0	0	880.2	B
-	Off Ramp	1877	4282	0.44	98	10.8	0.05	0.05	83.2	B
TR 442 - Menaik Road	Basic	1871	4280	0.44	118	8.9	0	0	55.3	B
-	On Ramp	1895	4279	0.44	104	10.2	0.04	0.04	84.0	B
-	Basic	1895	4279	0.44	121	8.8	0	0	2006.4	B
-	Off Ramp	1895	4279	0.44	101	10.5	0.04	0.04	84.0	B
-	Basic	1838	4271	0.43	117	8.8	0	0	36.9	B
Highway 53	Weaving	1954	5959	0.33	111	6.6	0.02	0.02	84.9	B
-	Basic	1816	4283	0.42	119	8.5	0	0	42.4	B
-	On Ramp	1847	4285	0.43	104	9.9	0.04	0.04	81.9	B
-	Basic	1847	4285	0.43	121	8.6	0	0	225.4	B
Gee Road	Off Ramp	1847	4285	0.43	101	10.2	0.04	0.04	81.9	B
-	Basic	1845	4287	0.43	121	8.6	0	0	226.2	B
-	Off Ramp	1845	4287	0.43	94	10.9	0.06	0.06	81.8	B
Matejka Road	Basic	1838	6294	0.29	103	6.6	0	0	52.1	A
-	On Ramp	1838	6294	0.29	97	7.1	0.02	0.02	81.4	B
-	Basic	1838	6294	0.29	105	6.6	0	0	876.1	A
Facility					**117**	**8.5**	**0.88**	**0.88**	**13600.4**	**B**

Segment 5 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2009	4413	0.46	121	9.1	0	0	282.0	B
-	Off Ramp	2009	4413	0.46	101	10.8	0.04	0.04	89.1	B
VIS	Basic	1998	4423	0.45	121	9.0	0	0	247.4	B
-	On Ramp	2009	4413	0.46	108	10.1	0.03	0.03	89.1	B
-	Basic	2009	4413	0.46	121	9.1	0	0	615.1	B
-	Off Ramp	2009	4413	0.46	94	11.6	0.07	0.07	89.1	C
Glen Park Road	Basic	1865	4402	0.42	118	8.6	0	0	66.7	B
-	On Ramp	1885	4395	0.43	105	9.8	0.03	0.03	83.6	B
-	Basic	1885	4395	0.43	121	8.5	0	0	1760.2	B
-	Off Ramp	1885	4395	0.43	101	10.2	0.04	0.04	83.6	B
Highway 616	Basic	1753	4368	0.4	120	8.0	0	0	137.3	B
-	On Ramp	1773	4363	0.41	105	9.3	0.03	0.03	78.6	B
-	Basic	1773	4363	0.41	121	8.1	0	0	1172.6	B
-	Off Ramp	1773	4363	0.41	101	9.6	0.04	0.04	78.6	B
Correction Line-	Basic	1760	4363	0.4	120	8.1	0	0	139.9	B
-	On Ramp	1773	4358	0.41	104	9.3	0.04	0.04	78.6	B
-	Basic	1773	4358	0.41	121	8.1	0	0	848.2	B
-	Off Ramp	1773	4358	0.41	101	9.6	0.04	0.04	78.6	B
Highway 13	Basic	1739	4351	0.4	117	8.1	0	0	38.6	B
-	Weaving	1792	6024	0.3	115	5.7	0.01	0.01	75.2	A
-	Basic	1777	4361	0.41	119	8.2	0	0	23.7	B
-	On Ramp	1795	4361	0.41	104	9.4	0.04	0.04	79.6	B
-	Basic	1795	4361	0.41	121	8.2	0	0	1544.0	B
-	Off Ramp	1795	4361	0.41	101	9.8	0.04	0.04	79.6	B
Highway 616	Basic	1747	4350	0.4	120	8.0	0	0	162.6	B

Segment 5 PM Peak SB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	On Ramp	1773	4352	0.41	104	9.4	0.04	0.04	78.6	B
-	Basic	1773	4352	0.41	121	8.1	0	0	831.5	B
-	Off Ramp	1773	4352	0.41	101	9.6	0.04	0.04	78.6	B
TR 442 - Menaik Road	Basic	1766	4350	0.41	118	8.3	0	0	52.2	B
-	On Ramp	1787	4352	0.41	106	9.3	0.03	0.03	79.2	B
-	Basic	1787	4352	0.41	121	8.1	0	0	1892.0	B
-	Off Ramp	1787	4352	0.41	101	9.8	0.04	0.04	79.2	B
-	Basic	1747	4350	0.4	117	8.2	0	0	35.1	B
Highway 53	Weaving	1839	5917	0.31	113	6.0	0.02	0.02	79.9	A
-	Basic	1742	4361	0.4	119	8.0	0	0	40.7	B
-	On Ramp	1763	4365	0.4	105	9.3	0.04	0.04	78.1	B
-	Basic	1763	4365	0.4	121	8.0	0	0	215.2	B
Gee Road-	Off Ramp	1763	4365	0.4	101	9.6	0.04	0.04	78.1	B
-	Basic	1761	4364	0.4	121	8.0	0	0	215.9	B
-	Off Ramp	1761	4364	0.4	94	10.3	0.06	0.06	78.1	B
Matejka Road	Basic	1749	6406	0.27	103	6.2	0	0	49.6	A
-	On Ramp	1757	6399	0.27	97	6.6	0.02	0.02	77.9	B
-	Basic	1757	6399	0.27	105	6.2	0	0	837.5	A
Facility					**117**	**8.2**	**0.83**	**0.83**	**13298.4**	**B**

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Section 6 AM & PM Peak (Northbound and Southbound)

Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
South of Highway 2A	Basic	1700	4800	0.38	121	7.5	0	0	974.0	B
-	OffRamp	1700	4800	0.38	94	9.6	0.06	0.06	75.3	B
Highway 2A-	Basic	1644	4800	0.36	118	7.4	0	0	55.4	B
-	OnRamp	3203	4800	0.69	100	16.5	0.02	0.02	47.3	C
-	RampOverlap	3203	4800	0.69	93	17.8	0.05	0.05	114.5	D
-	OffRamp	3203	4800	0.69	93	17.8	0.02	0.02	47.3	D
Highway 39-	Basic	2921	4800	0.63	116	13.0	0.02	0.02	302.1	C
-	Weaving	4140	6000	0.71	104	13.7	0.05	0.05	254.4	C
Commercial-	Basic	3704	7200	0.53	119	10.7	0.01	0.01	361.2	B
-	OnRamp	3711	7200	0.53	108	11.9	0.03	0.03	164.5	C
-	Basic	3711	7200	0.53	119	10.8	0	0	208.3	B
50 Street-	OnRamp	4231	7200	0.61	106	13.7	0.01	0.01	62.5	C
-	RampOverlap	4231	7200	0.61	106	13.9	0.03	0.03	151.3	C
Sparrow Crescent-	OffRamp	4231	7200	0.61	106	13.9	0.01	0.01	62.5	D
-	Basic	4031	7200	0.58	115	12.1	0	0	4.7	C
-	OffRamp	4031	7200	0.58	104	13.4	0.04	0.04	178.7	C
Airport Road-	Basic	2925	7200	0.42	120	8.5	0	0	288.7	B
-	OnRamp	3498	7200	0.5	107	11.2	0.03	0.03	155.0	C
-	Basic	3498	7200	0.5	118	10.3	0	0	47.6	B
-	OnRamp	3972	7200	0.58	107	12.8	0.03	0.03	176.1	C
-	Basic	3972	7200	0.58	118	11.7	0.01	0.01	312.2	C
-	OffRamp	3972	7200	0.58	108	12.9	0.03	0.03	176.1	C
Highway 19-	Basic	3554	7200	0.52	120	10.3	0	0	281.5	B
-	OnRamp	3834	7200	0.55	107	12.4	0.02	0.02	111.0	C
-	OnRamp	4150	7200	0.6	107	13.4	0.03	0.03	183.9	C

Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	4150	7200	0.6	117	12.4	0.03	0.03	831.4	C
Sparrow Dr-	OnRamp	4310	7200	0.63	107	14.1	0.03	0.03	191.0	C
-	Basic	4310	7200	0.63	116	13.0	0.05	0.05	1052.0	C
-	OffRamp	4310	7200	0.63	109	13.8	0.02	0.02	191.0	C
41 Avenue-	Basic	4260	7200	0.62	116	12.8	0.02	0.02	445.6	C
-	OnRamp	4310	7200	0.63	108	14.0	0.03	0.03	191.0	C
-	Basic	4310	9600	0.47	118	9.6	0	0	76.4	B
-	OnRamp	4310	9600	0.47	112	10.1	0.02	0.02	191.0	B
-	Basic	4310	12000	0.38	120	7.5	0	0	277.7	B
Ellerslie Road-	OffRamp	4310	12000	0.38	116	7.8	0.01	0.01	191.0	B
-	Basic	3952	12000	0.35	120	7.0	0	0	84.1	B
-	Basic	3952	12000	0.35	108	7.7	0.03	0.03	175.2	B
-	Basic	2228	6900	0.35	97	8.4	0	0	100.7	B
Ellesile Road-	OnRamp	3505	6900	0.54	88	14.0	0.03	0.03	155.3	C
-	Basic	3505	6900	0.54	96	12.9	0	0	133.6	C
AHD EB-Calgary Trail	OnRamp	4965	6900	0.76	85	20.1	0.01	0.01	88.1	D
AHD EB-SEC	Weaving	5471	8453	0.68	76	18.8	0.13	0.13	420.5	D
-	Basic	5090	6900	0.77	96	18.6	0.01	0.01	559.5	D
Facility					**109**	**11.6**	**0.92**	**0.92**	**10151.8**	**B**

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Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
South of Highway 2A	Basic	1600	4800	4527	0.35	121	7.0	0	0	916.7	B
-	OffRamp	1600	4800	4527	0.35	94	9.0	0.06	0.06	70.9	B
Highway 2A-	Basic	1533	4800	4526	0.34	118	6.9	0	0	51.6	B
-	OnRamp	2102	4800	4582	0.46	103	10.6	0.01	0.01	31.1	B
-	RampOverlap	2102	4800	4582	0.46	93	11.9	0.06	0.06	75.1	C
-	OffRamp	2102	4800	4582	0.46	93	11.9	0.02	0.02	31.1	C
Highway 39-	Basic	1750	4800	4586	0.38	120	7.6	0	0	181.0	B
-	Weaving	2638	6053	5826	0.45	111	9.2	0.03	0.03	162.1	B
Commercial-	Basic	2510	7200	6921	0.36	121	7.2	0	0	244.8	B
-	OnRamp	2540	7200	6919	0.37	109	8.1	0.02	0.02	112.6	B
-	Basic	2540	7200	6919	0.37	120	7.3	0	0	142.6	B
50 Street-	OnRamp	3279	7200	6906	0.47	108	10.5	0.01	0.01	48.4	C
-	RampOverlap	3279	7200	6906	0.47	108	10.5	0.02	0.02	117.3	B
Sparrow Crescent-	OffRamp	3279	7200	6906	0.47	109	10.4	0.01	0.01	48.4	C
-	Basic	3143	7200	6897	0.46	116	9.4	0	0	8.7	B
-	OffRamp	3143	7200	6897	0.46	108	10.1	0.03	0.03	139.3	C
Airport Road-	Basic	2799	7200	6880	0.41	120	8.1	0	0	276.2	B
-	OnRamp	3541	7200	6923	0.51	105	11.7	0.03	0.03	157.0	C
-	Basic	3541	7200	6923	0.51	117	10.4	0	0	48.1	B
-	OnRamp	4847	7200	6853	0.71	103	16.2	0.04	0.04	214.8	D
-	Basic	4847	7200	6853	0.71	112	15.2	0.03	0.03	381.0	C
-	OffRamp	4847	7200	6853	0.71	106	16.0	0.03	0.03	214.8	D
Highway 19-	Basic	4349	7200	6842	0.64	116	13.2	0.02	0.02	344.4	C
-	OnRamp	4747	7200	6865	0.69	105	15.8	0.02	0.02	137.5	C
-	OnRamp	6060	7200	6762	0.9	96	21.7	0.06	0.06	268.6	D
-	Basic	6060	7200	6762	0.9	97	22.1	0.25	0.25	1214.1	E

Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Sparrow Dr-	OnRamp	6220	7200	6756	0.92	99	22.2	0.05	0.05	275.7	D
-	Basic	6220	7200	6756	0.92	95	23.4	0.34	0.34	1518.2	E
-	OffRamp	6220	7200	6756	0.92	109	20.3	0.03	0.03	275.7	D
41 Avenue-	Basic	6170	7200	6753	0.91	95	23.0	0.14	0.14	645.4	E
-	OnRamp	6220	7200	6756	0.92	100	22.1	0.05	0.05	275.7	D
-	Basic	6220	9600	9008	0.69	113	14.7	0.01	0.01	110.3	C
-	OnRamp	6220	9600	9008	0.69	109	15.2	0.02	0.02	275.7	B
-	Basic	6220	12000	11260	0.55	119	11.2	0.01	0.01	400.7	B
Ellerslie Road-	OffRamp	6220	12000	11260	0.55	114	11.7	0.01	0.01	275.7	C
-	Basic	5382	12000	11194	0.48	120	9.6	0	0	114.5	B
-	Basic	5382	12000	11194	0.48	98	11.7	0.05	0.05	238.5	D
-	Basic	2309	6900	5830	0.36	97	8.6	0	0	95.4	B
Ellerslie Road-	OnRamp	2987	6900	6104	0.49	89	12.6	0.02	0.02	132.4	B
-	Basic	2987	6900	6104	0.49	96	11.7	0	0	113.8	C
AHD EB-Calgary Trail	OnRamp	3549	6900	6196	0.57	88	14.9	0.01	0.01	62.9	C
AHD EB-SEC	Weaving	4037	8090	7342	0.55	76	14.7	0.14	0.14	310.2	C
-	Basic	3332	6900	6200	0.54	96	12.8	0	0	366.3	C
Facility						**103**	**13.7**	**1.65**	**1.65**	**11120.7**	**C**

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Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Calgary Tr. @ 23 Ave.	Basic	2114	6900	6765	0.31	97	7.5	0	0	329.8	B
SEC-AHD Exit SB	Weaving	2374	8195	8012	0.3	88	6.9	0.05	0.05	192.2	B
-	Basic	2018	6900	6719	0.3	97	7.1	0	0	190.9	B
Ellerslie Road -	OffRamp	2018	6900	6719	0.3	87	8.0	0.03	0.03	89.4	A
-	Basic	1623	6900	6696	0.24	96	5.8	0	0	78.2	A
AHD SB-	Basic	5107	11500	11076	0.46	85	12.1	0.04	0.04	226.4	D
-	Basic	5107	11500	11076	0.46	95	11.2	0	0	146.4	B
Ellerslie Road-	OnRamp	5877	11500	11109	0.53	90	13.4	0.02	0.02	260.5	C
-	Basic	5877	12000	11592	0.51	120	10.1	0	0	666.9	B
-	OffRamp	5877	9600	9274	0.63	115	13.2	0.01	0.01	260.5	C
41 Avenue-	Basic	5777	9600	9268	0.62	116	12.9	0.02	0.02	464.3	C
-	Basic	5777	7200	6951	0.83	103	19.3	0.05	0.05	343.1	D
-	OnRamp	5877	7200	6955	0.84	103	19.8	0.04	0.04	260.5	D
-	Basic	5877	7200	6955	0.84	102	19.9	0.41	0.41	2565.1	D
-	OffRamp	5877	7200	6955	0.84	103	19.6	0.04	0.04	260.5	E
Highway 19-	Basic	4458	7200	6943	0.64	116	13.4	0.02	0.02	440.0	C
-	OnRamp	4526	7200	6938	0.65	106	14.8	0.03	0.03	184.5	C
-	OnRamp	4621	7200	6937	0.67	105	15.2	0.03	0.03	204.8	C
-	Basic	4621	7200	6937	0.67	114	14.0	0.04	0.04	617.2	C
-	OffRamp	4621	7200	6937	0.67	99	16.2	0.05	0.05	204.8	D
Airport Road-	Basic	2524	7200	6806	0.37	120	7.4	0	0	237.2	B
-	OnRamp	2824	7200	6775	0.42	108	9.1	0.03	0.03	125.2	B
-	Basic	2824	7200	6775	0.42	117	8.5	0	0	5.9	B
-	OnRamp	3086	7200	6782	0.46	108	10.1	0.03	0.03	136.8	B
-	Basic	3086	7200	6782	0.46	118	9.2	0	0	57.5	B
50 Street Exit SB-	OffRamp	3086	7200	6782	0.46	106	10.3	0.03	0.03	136.8	C

Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	2422	7200	6737	0.36	121	7.1	0	0	531.0	B
-	OffRamp	2422	4800	4491	0.54	97	13.3	0.05	0.05	107.3	C
Highway 39-	Basic	1600	4800	4410	0.36	120	7.2	0	0	188.2	B
-	OnRamp	1926	4800	4440	0.43	104	9.9	0.01	0.01	28.5	B
-	RampOverlap	1926	4800	4440	0.43	99	10.5	0.02	0.02	38.1	B
-	OffRamp	1926	4800	4440	0.43	99	10.5	0.02	0.02	28.5	B
Highway 2A-	Basic	1458	4800	4405	0.33	115	6.9	0.01	0.01	43.9	B
-	OnRamp	1504	4800	4415	0.34	105	7.8	0.03	0.03	66.7	B
-	Basic	1504	4800	4415	0.34	120	6.8	0	0	142.7	A
-	OffRamp	1504	4800	4415	0.34	101	8.1	0.04	0.04	66.7	B
Vil-	Basic	1484	4800	4438	0.33	121	6.6	0	0	184.2	A
-	OnRamp	1504	4800	4415	0.34	109	7.5	0.02	0.02	66.7	A
-	Basic	1504	4800	4415	0.34	121	6.8	0	0	460.5	A
Facility						107	11.5	1.2	1.2	10638.2	B

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Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
Calgary Tr. @ 23 Ave.	Basic	3430	6900	6702	0.51	97	12.2	0	0	535.2	C
SEC-AHD Exit SB	Weaving	4300	4575	4461	0.96	81	13.7	0.1	0.1	346.9	C
-	Basic	2797	6900	6687	0.42	96	9.9	0	0	305.8	B
Ellerslie Road -	OffRamp	2797	7050	6832	0.41	91	10.6	0.04	0.04	124.0	C
	Basic	1622	7050	6736	0.24	103	5.5	0	0	77.6	A
AHD SB-	Basic	3904	11500	10983	0.36	90	8.8	0.02	0.02	173.1	C
-	Basic	3904	11500	10983	0.36	96	8.6	0	0	115.3	B
Ellerslie Road-	OnRamp	4515	11500	11026	0.41	91	10.3	0.02	0.02	200.1	B
-	Basic	4515	12000	11506	0.39	120	7.8	0	0	453.6	B
-	OffRamp	4515	9600	9205	0.49	117	10.1	0.01	0.01	200.1	B
41 Avenue-	Basic	4415	9600	9196	0.48	120	9.6	0	0	391.4	B
-	Basic	4415	7200	6897	0.64	116	13.3	0.01	0.01	271.4	C
-	OnRamp	4515	7200	6903	0.65	107	14.7	0.03	0.03	200.1	C
-	Basic	4515	7200	6903	0.65	115	13.7	0.11	0.11	1970.6	C
-	OffRamp	4515	7200	6903	0.65	105	14.9	0.03	0.03	200.1	D
Highway 19-	Basic	3612	7200	6946	0.52	120	10.4	0	0	356.5	B
-	OnRamp	4233	7200	6923	0.61	106	13.7	0.03	0.03	172.6	C
-	OnRamp	4405	7200	6918	0.64	106	14.4	0.03	0.03	195.3	C
-	Basic	4405	7200	6918	0.64	116	13.2	0.03	0.03	588.3	C
-	OffRamp	4405	7200	6918	0.64	106	14.5	0.03	0.03	195.3	D
Airport Road-	Basic	3520	7200	6889	0.51	120	10.3	0	0	330.8	B
-	OnRamp	4229	7200	6895	0.61	105	13.9	0.03	0.03	187.5	C
-	Basic	4229	7200	6895	0.61	116	12.6	0	0	8.7	C
-	OnRamp	4467	7200	6901	0.65	105	14.7	0.03	0.03	198.0	C
-	Basic	4467	7200	6901	0.65	115	13.5	0	0	83.1	C
50 Street Exit SB-	OffRamp	4467	7200	6901	0.65	106	14.7	0.03	0.03	198.0	D

Section 6 AM Peak NB	Analysis Segment Type	Adjusted Demand (veh/h)	Adjusted Capacity (pc/h)	Adjusted Capacity (veh/h)	v/c Ratio	Average Speed (km/h)	Density (pc/km/ln)	Mainline Delay (min/veh)	System Delay (min/veh)	VKT Demand (veh-min)	LOS (Density)
-	Basic	3617	7200	6872	0.53	119	10.6	0.01	0.01	793.0	B
-	OffRamp	3617	4800	4581	0.79	96	19.8	0.06	0.06	160.3	D
Highway 39-	Basic	2402	4800	4509	0.53	119	10.7	0.01	0.01	282.5	B
-	OnRamp	2937	4800	4545	0.65	101	15.2	0.01	0.01	43.4	C
-	RampOverlap	2937	4800	4545	0.65	95	16.3	0.03	0.03	58.2	D
-	OffRamp	2937	4800	4545	0.65	95	16.3	0.02	0.02	43.4	D
Highway 2A-	Basic	1622	4800	4419	0.37	114	7.7	0.01	0.01	48.9	B
-	OnRamp	1650	4800	4425	0.37	104	8.6	0.04	0.04	73.1	B
-	Basic	1650	4800	4425	0.37	120	7.5	0	0	156.5	B
-	OffRamp	1650	4800	4425	0.37	101	8.8	0.04	0.04	73.1	B
VIS-	Basic	1630	4800	4446	0.37	121	7.3	0	0	202.3	B
-	OnRamp	1650	4800	4425	0.37	109	8.2	0.02	0.02	73.1	A
-	Basic	1650	4800	4425	0.37	121	7.4	0	0	505.1	B
Facility						**109**	**11.2**	**0.87**	**0.87**	**10592.6**	**B**

Appendix F

Existing Bridge Inventory and Assessment

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Bridge File	Structure Type	Description/ Location	Nearest Community	Hwy 2 Station	Year Built	Bridge Condition – Replace or Major Maint. (Years)
75330	Culvert	CP Railway	Calgary	2:15 km 49.8	1971	>10
84105	Bridge	Twp Rd 261 (Crossiron Drive)	Balzac	2:15 km 51.3	2010	>25
71705	Culvert	Nose Creek	Balzac	2:15 km 51.7	1969	<=5
76850	Bridge	Highway 566	Balzac	2:18 km 0.0	1970	<=5
71706	Culvert	Nose Creek	Airdrie	2:18 km 3.1	1969	<=5
Future	Future Interchange	Twp 264	Airdrie			
Future	Future Interchange	Twp 265	Airdrie			
76849 N	Bridge	Yankee Valley Blvd	Airdrie	2:18 km 6.4	2009	>25
76849 S	Bridge	Yankee Valley Blvd	Airdrie	2:18 km 6.4	2009	>25
76222	Bridge	Pedestrian Bridge	Airdrie	2:18 km 7.8	1977	>10
84106	Culvert	Utility Culvert	Airdrie	2:18 km 7.8	1976	unk
76846 E	Bridge	Highway 567	Airdrie	2:18 km 9.7	1969	<=5
76846 W	Bridge	Highway 567	Airdrie	2:18 km 9.8	2006	>25
Future	Future Interchange	Twp Rd 274				
77919	Bridge	Highway 72	Crossfield	2:18 km 19.5	1977	>10
76123	Bridge	Twp Rd 285	Crossfield	2:18 km 24.3	1979	>10
8374	Culvert	Crossfield Creek	Crossfield	2:19 km 28.0	1956	>10
77910	Bridge	Twp Rd 292 (Acme Rd)	Crossfield	2:19 km 29.5	1964	>10
9515	Culvert	Carstairs Creek	Crossfield	2:20 km 4.9	1954	>10
74309	Culvert	Sheep Coulee	Carstairs	2:20 km 8.2	1954	>10
77426	Bridge	Highway 581	Carstairs	2:20 km 9.7	1975	<=5
74290	Culvert	Rosebud River	Carstairs	2:20 km 13.8	1954	>25
83153	Future Interchange	Westcott/Bergthal Rd				
74310	Culvert	Watercourse	Didsbury	2:20 km 17.9	1954	>10
77129	Bridge	Highway 582	Didsbury	2:20 km 21.0	1974	<=5
74552	Culvert	Watercourse	Olds	2:20 km 30.2	1951	>25
79311	Culvert	Watercourse	Olds	2:20 km 32.9	1991	>10
76158	Bridge	Highway 27	Olds	2:22 km 0.0	1966	>10
7965	Culvert	Lonepine Creek	Olds	2:22 km 6.0	1954	>10
Future	Future Interchange	Twp Rd 334				
8720	Culvert	Watercourse	Bowden	2:22 km 12.7	1954	>10
76406	Bridge	Highway 587 (Park Road)	Bowden	2:22 km 16.0	1975	>10
70295	Culvert	Watercourse	Bowden	2:22 km 18.5	1957	<=5
77747	Culvert	Watercourse	Innisfail	2:22 km 22.2	1957	>10
77731	Culvert	Watercourse	Innisfail	2:22 km 22.8	1957	>10
77730	Culvert	Watercourse	Innisfail	2:22 km 23.8	1957	>10
79076	Bridge	Highway 54	Innisfail	2:22 km 24.5	2004	>25
75945	Bridge	Highway 590	Innisfail	2:22 km 27.9	1966	<=5
74817	Culvert	Waskasoo Creek	Innisfail	2:24 km 0.7	1958	>10
74558	Culvert	Cattle Pass	Innisfail	2:24 km 2.8	1956	>10
79317	Future Grade Sep	Old Pole Road				
1842	Culvert	Watercourse	Innisfail	2:24 km 6.2	1958	>10
74985	Culvert	Cattle Pass	Innisfail	2:24 km 9.0	1959	>10

Bridge File	Structure Type	Description/ Location	Nearest Community	Hwy 2 Station	Year Built	Bridge Condition – Replace or Major Maint. (Years)
74818	Culvert	Watercourse	Innisfail	2:24 km 11.0	1958	>10
77349	Bridge	Highway 42	Penhold	2:24 km 15.7	1978	>10
79481	Bridge	McKenzie Road	Red Deer	2:24 km 22.3	1995	>25
75331 S	Bridge	Gaetz Avenue SB	Red Deer	2:24 km 25.3	2018	>25
75332 N1	Bridge	Highway 2A (Taylor Drive)	Red Deer	2:24 km 26.0	2018	>25
75332 S1	Bridge	Highway 2A (Taylor Drive)	Red Deer	2:24 km 26.1	2018	>25
75332 N2	Bridge	Highway 2A (Taylor Drive)	Red Deer	2:24 km 26.2	2018	>25
75332 S2	Bridge	Highway 2A (Taylor Drive)	Red Deer	2:24 km 26.3	2018	>25
75333	Culvert	Waskasoo Creek	Red Deer	2:24 km 27.4	1963	>10
75334	Bridge	32 Street	Red Deer	2:24 km 28.2	1962	>10
75335 N	Bridge	Red Deer River	Red Deer	2:24 km 30.8	1962	<=5
75335 S	Bridge	Red Deer River	Red Deer	2:24 km 30.7	1962	<=5
81468	Culvert	CPR Railway	Red Deer	2:24 km 32.6	1900	>25
75420 E	Bridge	Highway 11	Red Deer	2:24 km 33.0	2002	>25
75420 W	Bridge	Highway 11	Red Deer	2:24 km 33.0	1963	<=5
75336	Bridge	Highway 11A	Red Deer	2:24 km 36.4	1961	<=5
75337 N	Bridge	CN Railway	Red Deer	2:26 km 2.3	1962	<=5
75337 S	Bridge	CN Railway	Red Deer	2:26 km 2.3	1962	<=5
Future	Future Interchange	Twp Rd 392				
75338 N	Bridge	Blindman River	Red Deer	2:26 km 4.8	1962	<=5
75338 S	Bridge	Blindman River	Red Deer	2:26 km 4.8	1962	<=5
76565	Bridge	Highway 597	Blackfalds	2:26 km 7.0	1964	>10
Future	Future Interchange	Twp Rd 400				
75339 N	Bridge	CPR Railway	Lacombe	2:26 km 14.9	1962	<=5
75339 S	Bridge	CPR Railway	Lacombe	2:26 km 14.9	1962	<=5
75421	Culvert	Whelp Brook	Lacombe	2:26 km 15.4	1961	>10
75340 N	Bridge	Highway 12	Lacombe	2:26 km 17.5	1962	<=5
75340 S	Bridge	Highway 12	Lacombe	2:26 km 17.5	1962	<=5
75431	Culvert	Whelp Brook	Lacombe	2:26 km 20.5	1961	>10
75435	Culvert	Local Road (Private)	Lacombe	2:26 km 22.8	1961	>10
75428	Culvert	Wolf Creek	Lacombe	2:26 km 26.2	1961	>10
75341	Bridge	Highway 2A (Milton Rd)	Lacombe	2:26 km 26.4	1963	<=5
73668	Culvert	Tributary to Wolf Creek	Morningside	2:26 km 31.5	1963	>10
75644	Bridge	Highway 2A	Lacombe	2:26 km 32.0	1964	<=5
75624	Culvert	Wolf Creek	Morningside	2:26 km 33.6	1963	>10
75661 N	Bridge	Highway 604	Morningside	2:26 km 34.3	1963	<=5
75661 S	Bridge	Highway 604	Morningside	2:26 km 34.3	1963	<=5
361	Culvert	Wolf Creek	Morningside	2:26 km 36.7	1963	>10
75623 N	Bridge	Wolf Creek	Morningside	2:26 km 39.0	2015	>25
75623 S	Bridge	Wolf Creek	Morningside	2:26 km 39.0	2015	>25
75750	Culvert	Cattle Pass	Ponoka	2:26 km 40.2	1963	>10
75754	Bridge	Twp Rd 424 (Majerka Rd)	Ponoka	2:26 km 40.8	1964	<=5
75812 N	Bridge	Twp Rd 425 (Gee Rd)	Ponoka	2:26 km 42.1	1963	<=5
75812 S	Bridge	Twp Rd 425 (Gee Rd)	Ponoka	2:26 km 42.1	1963	<=5
75535 N	Bridge	Battle River	Ponoka	2:26 km 43.0	1964	<=5
75535 S	Bridge	Battle River	Ponoka	2:26 km 43.0	1964	<=5

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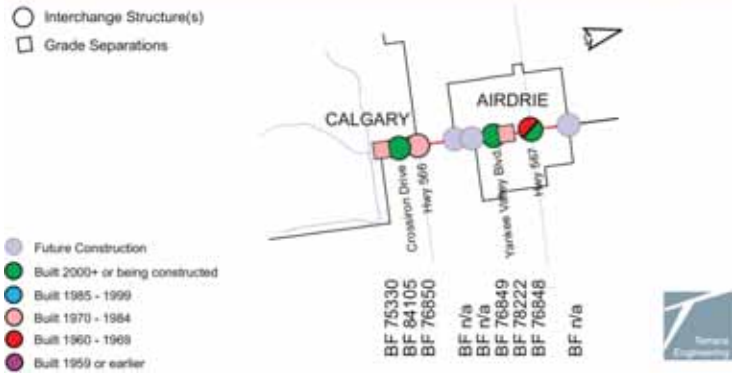
Bridge File	Structure Type	Description/ Location	Nearest Community	Hwy 2 Station	Year Built	Bridge Condition – Replace or Major Maint. (Years)
75651 N	Bridge	Highway 53	Ponoka	2:26 km 45.2	1964	<=9
75651 S	Bridge	Highway 53	Ponoka	2:26 km 45.2	1964	<=9
75726	Bridge	Twp Rd 435	Ponoka	2:28 km 7.4	1965	>10
75621	Culvert	Tributary to Maskwa Creek	Ponoka	2:28 km 10.7	1964	>10
75725	Bridge	Twp Rd 442 (Menaik Rd)	Ponoka	2:28 km 12.2	1964	<=9
75724	Bridge	Highway 611	Maskwacis	2:28 km 18.7	1965	>10
75620	Culvert	Tributary to Maskwa Creek	Wetaskiwin	2:28 km 23.2	1964	>10
75619	Culvert	Tributary to Maskwa Creek	Wetaskiwin	2:28 km 23.3	1964	>10
75723	Bridge	Twp Rd 455 (Louise Bull)	Maskwacis	2:28 km 26.8	1966	>10
75678	Culvert	Cattle Pass	Wetaskiwin	2:28 km 27.1	1965	>10
75618	Culvert	Tributary to Maskwa Creek	Wetaskiwin	2:28 km 28.2	1964	>10
75154	Culvert	Tributary to Maskwa Creek	Wetaskiwin	2:28 km30.7	1964	>10
75555	Bridge	Highway 13	Wetaskiwin	2:30 km 0.0	1963	<=9
75370	Culvert	Bigstone Creek	Wetaskiwin	2:30 km 3.5	1963	>10
75722	Bridge	Twp Rd 470 (Correction Line Rd)	Wetaskiwin	2:30 km 6.7	1964	<=9
75309	Culvert	Pipestone Creek	Wetaskiwin	2:30 km 12.0	1963	>10
75667	Bridge	Highway 616	Millet	2:30 km 15.2	1963	>10
75678	Bridge	Twp Rd 482 (Tower Main Rd)	Millet	2:30 km 20.1	1964	>10
75677	Bridge	Twp Rd 490 (Glenn Park Rd)	Leduc	2:30 km 26.6	1964	>10
75617	Culvert	Tributary to Whitemud Creek	Leduc	2:30 km 29.6	1963	<=9
75616	Culvert	Tributary to Whitemud Creek	Leduc	2:30 km 32.3	1963	>10
75522	Bridge	Highway 2A	Leduc	2:30 km 33.9	1963	<=9
75058 N	Bridge	CPR / Black Gold Drive	Leduc	2:30 km 34.4	1961	<=9
75058 S	Bridge	CPR / Black Gold Drive	Leduc	2:30 km 34.4	1961	<=9
75055 N	Bridge	Highway 39	Leduc	2:30 km 35.2	1960	<=9
75055 S	Bridge	Highway 39	Leduc	2:30 km 35.2	1960	<=9
79085	Culvert	Tributary to Whitemud Creek	Leduc	2:32 km 1.5	1980	>25
Future	Future Interchange	65 Avenue	Leduc			
77994 S	Bridge	50 Street	Leduc	2:32 km 2.5	1977	>10
75066	Bridge	Airport Road	Nisku	2:32 km 5.2	1980	>10
76845	Bridge	Highway 19	Nisku	2:32 km 8.1	1978	>10
79520	Future Interchange	Twp Rd 510	Edmonton			
70063 N	Bridge	Blackmud Creek	Edmonton	2:32 km 13.5	1936	<=9
70064 S	Bridge	Blackmud Creek	Edmonton	2:32 km 13.5	1968	<=9
85160	Bridge	41 Avenue SW – Edmonton	Edmonton	2:32 km unk	2015	>25
82153N	Culvert	Drainage Ditch	Edmonton	2:32 km 17.5		unk
85040	Bridge	Ellerslie Road – Edmonton	Edmonton	2:32 km 18.9	2001	>25

Interchanges and Grade Separations – Airdrie Area

INTERCHANGES AND GRADE SEPARATONS
Airdrie Area



BF 75330

Grade Separation - Highway 2:15 over CP Railway South of Balzac



Structure(s):
Metal Pipe Arch Culvert (7.30 x 8.83 x 142.4 m)

Year Built / Age:
1971 / 46 years old

BIM Ratings (2016):
Sufficiency: 65.9
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none since culvert extends past service roads
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Railway Changes	- replacement or abandonment

Recommendations:
- Maintain/replace culvert as conditions warrant
- Determine railway future plans, if any

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 84105

Interchange - Highway 2:15 under Twp Rd 261 (Crossiron Drive) South of Balzac





Structure(s):
2 Span Bridge (56.0-50.0 m)

Year Built / Age:
2010 / 7 years old

BIM Ratings (2016):
Sufficiency: 62.2
Structural condition: 83.3

Hwy 2 Through Lanes:
Existing: 7 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement beyond 25 years
- Other	- new adjacent bridge in future for through lanes on Crossiron Drive

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

BF 76850

Interchange - Highway 2:15 / 2:18 under Highway 566 at Balzac





Structure(s):
2 Span Bridge (38.3-36.6 m)

Year Built / Age:
1970 / 47 years old

BIM Ratings (2016):
Sufficiency: 48.4
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 2

Recent Studies:
AECOM design Issued for Tender, 2014

Recent Activities:
not tendered

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace bridge on new alignment as per design
- Bridge Condition	- replace bridge on new alignment as per design
- Upgrade Hwy 567	- replace bridge on new alignment as per design

Recommendations:
- Replace bridge on new alignment when conditions warrant or when widening occurs
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 76849 N/S

Interchange - Highway 2:18 over Yankee Valley Blvd. at Airdrie



Structure(s):
2 Span Bridges (N: 29.0-32.0 m / S: 27.0-32.0 m)

Year Built / Age:
2009 / 8 years old

BIM Ratings (2016):
Sufficiency: N: 62.0 / S: 61.0
Structural condition: N: 83.3 / S: 83.3

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none since bridges provide suitable width for 8 trhough lanes on existing decks
- Bridge Condition	- replacement beyond 25 years
- Other	- none known

Recommendations:
- Maintain bridges as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

BF 78222

Grade Separation - Highway 2:18 under Pedestrian Bridge at Airdrie



Structure(s):
4 Span Bridge (27.7-36.9-36.9-27.7 m)

Year Built / Age:
1977 / 40 years old

BIM Ratings (2016):
Sufficiency: 67.6
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 7 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 76848 E/W

Interchange - Highway 2:18 under Highway 567 (Veterans Blvd.) at Airdrie



Structure(s):
2 Span Bridges (E: 39.6-45.7 m / W: 46.0-50.0 m)

Year Built / Age:
1969 (E) & 2006 (W) / 48 & 11 years old

BIM Ratings (2016):
Sufficiency: E: 67.2 / W: 62.9
Structural condition: E: 72.2 / W: 83.3

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:

Recent Activities:

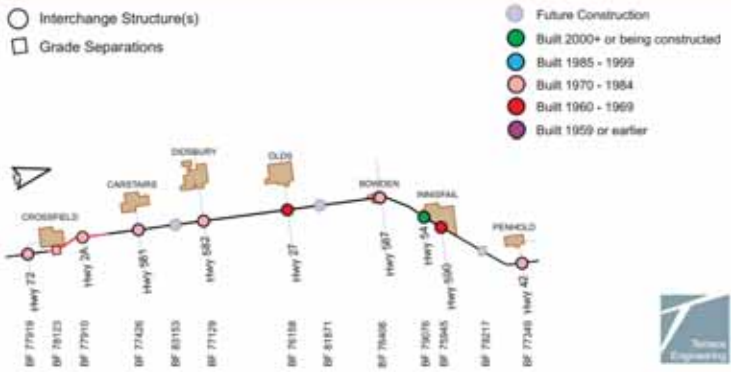
Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement of Eastbound bridge
- Bridge Condition	- replacement of Eastbound bridge within 10 years
- Other	- none known

Recommendations:
- Maintain westbound bridge / replace eastbound bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

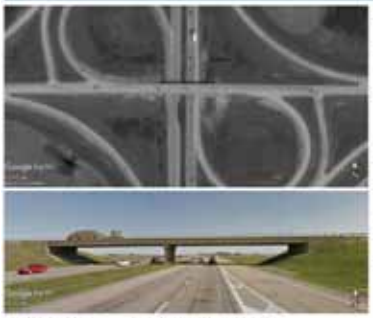
Interchanges and Grade Separations – Airdrie to Red Deer

INTERCHANGES AND GRADE SEPARATONS
Airdrie to Red Deer



BF 77919

Interchange - Highway 2:18 under Highway 72 south of Crossfield



Structure(s):
2 Span Bridge (38.1-38.1 m)

Year Built / Age:
1977 / 40 years old

BIM Ratings (2016):
Sufficiency: 44.8
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: TBD

Recent Studies:

Recent Activities:

Action Trigger
- Highway Widening
- Bridge Condition
- Other

Anticipated Bridge Action
- none for 6 lane - potential diamond I/C conversion or headslope walls for 8 lane widening
- replacement or major maintenance beyond 10 years
- none known

Recommendations:
- Maintain bridge as conditions warrant
- Carry out planning study to determine ultimate I/C configuration and lane configurations
- Diamond I/C conversion and/or headslope walls for ultimate 8 lane configuration

Alberta Transportation

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 78123

Flyover - Highway 2:18 under Twp Rd 285 east of Crossfield





Structure(s):
2 Span Bridge (39.0-39.0 m)

Year Built / Age:
1979 / 38 years old

BIM Ratings (2016):
Sufficiency: 47.6
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: TBD

Recent Studies:

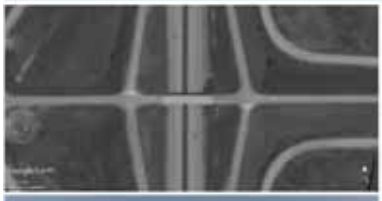
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lane - potential headslope walls for 8 lane widening
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- TBD (possible conversion from flyover to interchange)

Recommendations:
- Maintain bridge as conditions warrant
- Carry out planning study to determine possible interchange conversion
- Bridge replacement design to consider interim and ultimate lane configurations

BF 77910

Interchange - Highway 2:18 under Twp Rd 292 (Acme Road) north of Crossfield





Structure(s):
2 Span Bridge (34.0-34.0 m)

Year Built / Age:
1984 / 33 years old

BIM Ratings (2016):
Sufficiency: 51.0
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lane - potential headslope walls for 8 lane widening
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 77426

Interchange - Highway 2:20 under Highway 581 near Carstairs



Structure(s):
2 Span Bridge (36.6-36.6 m)

Year Built / Age:
1975 / 42 years old

BIM Ratings (2016):
Sufficiency: 40.7
Structural condition: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lane - potential headslope walls for 8 lane widening
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

BF 77129

Interchange - Highway 2:20 under Highway 582 near Didsbury



Structure(s):
2 Span Bridge (36.6-36.6 m)

Year Built / Age:
1974 / 43 years old

BIM Ratings (2016):
Sufficiency: 33.0
Structural condition: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lane - potential headslope walls for 8 lane widening
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 76158

Interchange - Highway 2:22 under Highway 27 near Olds





Structure(s):
3 Span Bridge (28.3-4.3-28.3 m)

Year Built / Age:
1966 / 51 years old

BIM Ratings (2016):
Sufficiency: 55.3
Structural condition: 61.1

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:
Interchange Planning Study, Castleglenn, 2006

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- bridge replacement on new Highway 27 alignment within 10 years
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Highway 27	- additional bridge structure

Recommendations:
- Replace bridge on new alignment when conditions warrant or when widening is required.
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 27 lane configurations

BF 76406

Interchange - Highway 2:22 over Highway 587 (Park Road) at Bowden





Structure(s):
Concrete Frame Bridge (14.6 x 5.4 m)

Year Built / Age:
1975 / 42 years old

BIM Ratings (2016):
Sufficiency: 44.0
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 0

Recent Studies:
Interchange Planning Study, Castleglenn, 2006
Interchange Upgrade Study, McElhanney, 2013

Recent Activities:

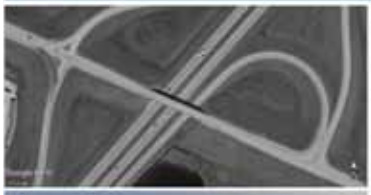
Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - sufficient room for widening with diamond interchange (6 lane) and median shift (8 lane)
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Highway 587	- additional bridge structure

Recommendations:
- Maintain bridge as conditions warrant
- Carry out planning study to determine 8 lane cross-section across existing bridge
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 79076

Interchange - Highway 2:22 under Highway 54 at Innisfail



Structure(s):
3 Span Bridge (35.0-30.0-29.0 m)

Year Built / Age:
2004 / 13 years old

BIM Ratings (2016):
Sufficiency: 57.8
Structural condition: 88.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lanes, headslope wall (SB) and tight clearances (NB) for 8 lanes
- Bridge Condition	- replacement or major maintenance beyond 25 years
- Other	- none known

Recommendations:
- Maintain bridge as conditions warrant
- Evaluate options to accommodate 8 lanes under bridge
- Bridge replacement design to consider interim and ultimate lane configurations

Alberta Transportation

BF 75945

Interchange - Highway 2:22 under Highway 590 at Innisfail



Structure(s):
4 Span Bridge (12.2-16.8-21.3-12.2 m)

Year Built / Age:
1966 / 51 years old

BIM Ratings (2016):
Sufficiency: 42.6
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

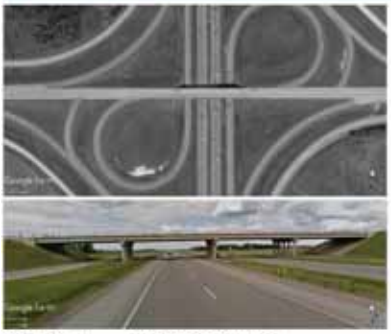
Action Trigger	Anticipated Bridge Action
- Highway Widening	- bridge replacement
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or when widening occurs
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 590 lane configurations

G:\5120 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 77349

Interchange - Highway 2:24 under Highway 42 near Penhold



Structure(s):
4 Span Bridge (22.0-26.0-26.0-26.0 m)

Year Built / Age:
1978 / 39 years old

BIM Ratings (2016):
Sufficiency: 42.7
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 6

Hwy 2 Ramp Lanes:
Existing: 3 Ultimate: 3

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

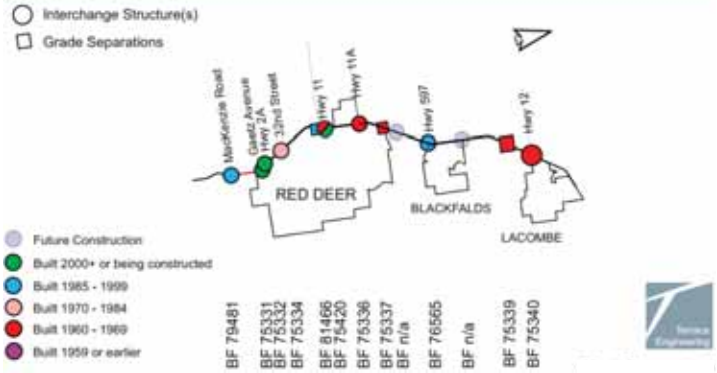
Recommendations:
- Maintain bridge as conditions warrant
- Confirm adequacy of bridge opening to accommodate 6 lanes under bridge
- Bridge replacement design to consider interim and ultimate lane configurations

Alberta Transportation

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

Interchanges and Grade Separations – Red Deer

INTERCHANGES AND GRADE SEPARATONS
Red Deer Area



BF 79481

Interchange - Highway 2:24 under McKenzie Road at Red Deer



Structure(s):
3 Span Bridge (27.0-30.0-37.0 m)

Year Built / Age:
1995 / 22 years old

BIM Ratings (2016):
Sufficiency: 66.9
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 5 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement beyond 25 years
- Other	- new adjacent bridge in future for widened McKenzie Road

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75331 S

Flyover - Highway 2:24 under Gaetz Avenue SB at Red Deer



Structure(s):
3 Span Bridge (27.0-30.0-37.0 m)

Year Built / Age:
1962 / 55 years old

BIM Ratings (2016):
Sufficiency: 61.3
Structural condition: 61.1

Hwy 2 Through Lanes:
Existing: 2 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 1

Recent Studies:

Recent Activities:
Replacement bridge under construction

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - replacement bridge opening accommodates widened Highway
- Bridge Condition	- new bridge being constructed
- Other	- none known

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

BF 75332 N/S

Interchange - Highway 2:24 over Highway 2A (Taylor Drive) at Red Deer



Structure(s):
4 Span Bridges (14.0-14.2-14.2-14.0 m)

Year Built / Age:
1962 / 55 years old

BIM Ratings (2016):
Sufficiency: N:55.6 S:55.6
Structural condition: N:38.9 / S:38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 3

Recent Studies:

Recent Activities:
Replacement bridges under construction

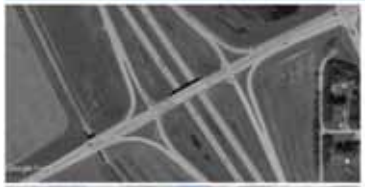
Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - replacement bridges accommodate widened Highway
- Bridge Condition	- new bridges being constructed
- Other	- none known

Recommendations:
- Maintain bridges as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705\Updated - Airdrie, Airdrie - Red Deer.

BF 75334

Interchange - Highway 2:24 under 32 Street at Red Deer





Structure(s):
2 Span Bridge (36.0-36.0 m)

Year Built / Age:
1982 / 35 years old

BIM Ratings (2016):
Sufficiency: 51.1
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

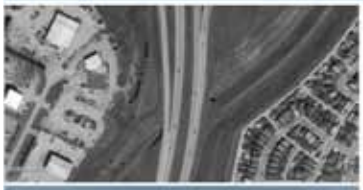
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- headslope walls or bridge replacement required to accommodate initial 6 lane widened Highway
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain or replace bridge as conditions warrant
- Headslope wall design and/or bridge replacement design to consider interim and ultimate lane configurations
- Evaluate life-cycle cost effectiveness of headslope walls versus replacement

BF 81466

Grade Separation - Highway 2:24 over CP Railway at Red Deer





Structure(s):
Concrete Box Culvert (11.75 x 9.80 x 116 m) accommodates Highway 2 & Highway 11 I/C ramps

Year Built / Age:
1990 / 27 years old

BIM Ratings (2014):
Sufficiency: 92.0
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:
Highway 11 FPS, McElhanney, 2013

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- uncertain, lengthening depends on ultimate Highway 11 I/C and interim Highway 2 widening
- Bridge Condition	- replacement or major maintenance beyond 25 years
- Railway Changes	- none known
- Other	- future Hwy 2 / Hwy 11 systems interchange will require bridge modifications

Recommendations:
- Maintain/replace/lengthen culvert when conditions warrant or if widening configuration requires
- Determine interim and ultimate Hwy 2 widening configurations and identify any impacts on structure
- Any bridge modifications should consider interim and ultimate Hwy 2 and Hwy 11 systems interchange

G:\5128 - Highway 2 Corridor Improvement Study\Submission\4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75420 E/W

Interchange - Highway 2:24 under Highway 11 at Red Deer





Structure(s):
2 Span Bridge (E: 42.0-42.0 m)
5 Span Bridge (W: 13.4-24.4-7.7-24.4-13.4 m)

Year Built / Age:
2002 (E) & 1963 (W) / 15 & 54 years old

BIM Ratings (2016):
Sufficiency: E: 64.4 / W: 45.0
Structural condition: E: 83.3 / W: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: TBD

Recent Studies:
Highway 11 FPS, McElhanney, 2013

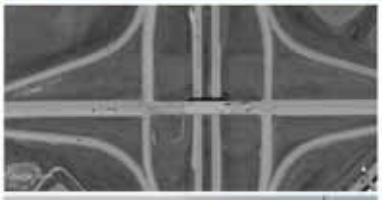
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement of Westbound bridge
- Bridge Condition	- replacement of Westbound bridge within 10 years
- Other	- future systems interchange will require additional bridges and bridge modifications

Recommendations:
- Maintain eastbound bridge / replace westbound bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 11 systems interchange

BF 75336

Interchange - Highway 2:24 under Highway 11A at Red Deer





Structure(s):
4 Span Bridge (13.7-26.5-26.5-13.7 m)

Year Built / Age:
1961 / 56 years old

BIM Ratings (2016):
Sufficiency: 48.5
Structural condition: 61.1

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
Interchange FPS, Al-Terra, 2007

Recent Activities:
I/C converted to Diamond from Cloverleaf configuration

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lanes, replacement for 8 lanes
- Bridge Condition	- replacement or major maintenance within 10 years
- Highway 11	- widening or other improvements may incur bridge replacement

Recommendations:
- Maintain or replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 11A lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission\4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer,

BF 75337 N/S

Grade Separation - Highway 2:26 over CN Railway North of Red Deer





Structure(s):
3 Span Bridges (17.7-22.6-17.7 m)

Year Built / Age:
1962 / 55 years old

BIM Ratings (2014):
Sufficiency: 67.4 / 70.6
Structural condition: 55.8 / 61.1

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
Bridge Assessment, COWI, 2012
Bridge Replacement, CH2M, ongoing

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- bridge anticipated to be replaced prior to widening
- Bridge Condition	- replacement bridge is being designed
- Railway Changes	- none known

Recommendations:
- Replace bridge when conditions warrant
- Bridge replacement design to consider interim and ultimate Highway lane configuration

BF 76565

Interchange - Highway 2:26 under Highway 597 near Blackfalds





Structure(s):
2 Span Bridge (40.0-40.0 m)

Year Built / Age:
1964 / 33 years old

BIM Ratings (2016):
Sufficiency: 45.0
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lanes, headslope walls for 8 lanes
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75339 N/S

Grade Separation - Highway 2:26 over CP Railway North of Red Deer





Structure(s):
3 Span Bridges (14.9-18.9-14.9 m)

Year Built / Age:
1962 / 55 years old

BM Ratings (2014):
Sufficiency: 57.7 / 52.8
Structural condition: 61.1 / 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
Bridge Assessment, COWI, 2012

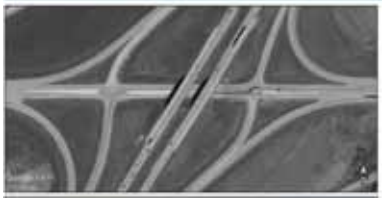
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement
- Bridge Condition	- replacement within 10 years
- Railway Changes	- bridge removal potential if railway line abandoned

Recommendations:
- Replace bridge when conditions warrant
- Bridge replacement design to consider interim and ultimate Highway lane configuration
- Determine railway abandonment potential

BF 75340

Interchange - Highway 2:26 over Highway 12 West of Lacombe





Structure(s):
3 Span Bridges (15.2-29.0-15.2 m)
Structure width provides room for 6 lanes on Highway 2

Year Built / Age:
1962 / 55 years old

BM Ratings (2016):
Sufficiency: 50.3 / 44.6
Structural condition: 44.4 / 33.3

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
Interchange FPS, Al-Terra, 2008

Recent Activities:
I/C converted to Diamond from Cloverleaf configuration

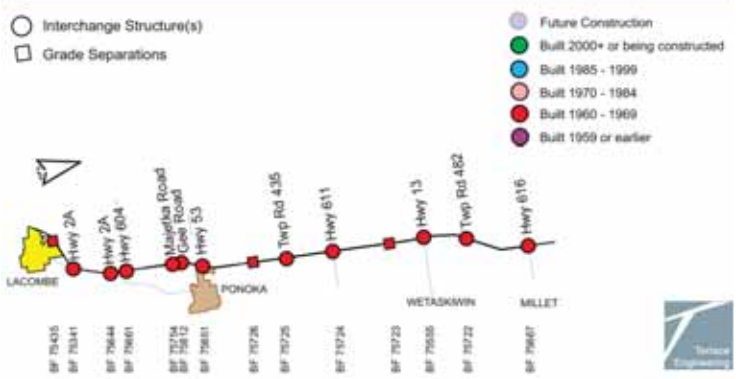
Action Trigger	Anticipated Bridge Action
- Highway Widening	- none since bridge provides width suitable for 6 lanes on existing decks
- Bridge Condition	- replacement or major maintenance within 10 years
- Highway 12	- bridge replacement beyond 10 years

Recommendations:
- Maintain/replace bridges as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 12 lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

Interchanges and Grade Separations – Red Deer to Leduc

INTERCHANGES AND GRADE SEPARATONS
Red Deer to Leduc



BF 75435

Flyover - Highway 2:26 over Private Access Road near Lacombe



Structure(s):
Concrete Box Culvert (6.1 x 4.3 m)

Year Built / Age:
1961 / 56 years old

BM Ratings (2016):
Sufficiency: 56.2
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- confirm private access road still required and if structure can be eliminated

Recommendations:
- Maintain / replace bridge as conditions warrant
- Confirm long term requirements for private access road
- Bridge replacement design to consider interim and ultimate Hwy 2 configuration

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75341

Interchange - Highway 2:26 under Highway 2A (Milton Road) north of Lacombe





Structure(s):
4 Span Bridge (14.0-28.7-28.7-19.2 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 40.5
Structural condition: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

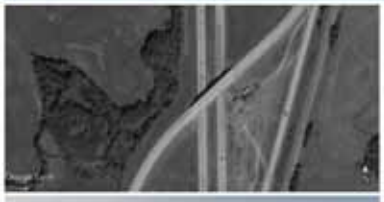
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement within 10 years
- Bridge Condition	- replacement within 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or widening occurs
- Bridge replacement design to consider interim and ultimate lane configurations

BF 75644

Flyover - Highway 2:26 under Highway 2A north of Lacombe





Structure(s):
4 Span Bridge (18.6-31.1-31.1-18.6 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 65.6
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

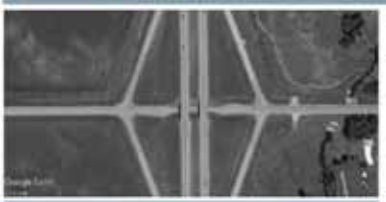
Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement within 10 years
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or widening occurs
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission\4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75661 N/S

Interchange - Highway 2:26 over Highway 604 near Morningside



Structure(s):
3 Span Bridges (12.8-10.7-12.8 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: N:60.0 S:60.0
Structural condition: N:38.9 / S:38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

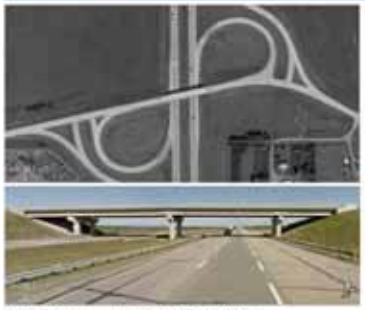
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement within 10 years
- Bridge Condition	- replacement within 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or widening occurs
- Bridge replacement design to consider interim and ultimate lane configurations

BF 75754

Interchange - Highway 2:26 under Twp Rd 424 (Majetka Road) Southwest of Pincka



Structure(s):
4 Span Bridge (13.4-27.1-27.1-13.4 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 52.7
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: TBD

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- diamond I/C conversion or bridge replacement required to accommodate initial 8 lane widening
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

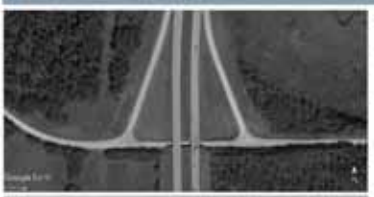
Recommendations:
- Maintain or replace bridge as conditions warrant
- Carry out planning study to determine ultimate I/C configuration
- Diamond I/C conversion and/or bridge replacement design to consider interim and ultimate lane configurations

Alberta Transportation

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75812 N/S

Interchange - Highway 2:26 over Twp Rd 425 (Gee Road) southwest of Ponoka





Structure(s):
1 Span Bridges (9.1 m)

Year Built / Age:
1963 / 54 years old (new superstructure 2001)

BIM Ratings (2016):
Sufficiency: N: 34.1 / S:34.7
Structural condition: N: 44.4 / S: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate:0

Recent Studies:

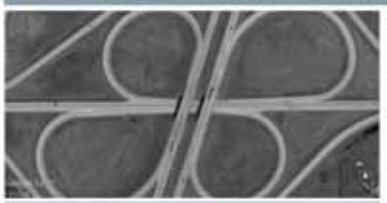
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or eliminate bridge
- Bridge Condition	- replacement, elimination or major maintenance within 10 years
- Other	- consider elimination and combining access with BF 75754 to south

Recommendations:
- Replace or eliminate bridge as conditions warrant
- Carry out planning study to determine potential for elimination
- Bridge replacement design to consider interim and ultimate lane configurations

BF 75651

Interchange - Highway 2:26 over Highway 53 near Ponoka





Structure(s):
3 Span Bridges (13.1-26.5-13.1 m)
Future Diamond conversion allows 6 lanes on Highway 2

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: N:61.3 / S: 54.1
Structural condition: N: 55.6 / S: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 0

Recent Studies:
Interchange FPS, Al-Terra, 2011

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lanes (convert to diamond), replacement for 8 lanes
- Bridge Condition	- replacement or major maintenance within 10 years
- Highway 53	- widening or other improvements may incur bridge replacement

Recommendations:
- Maintain or replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 53 lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75726

Flyover - Highway 2:28 under Twp Rd 435 north of Ponoka



Structure(s):
3 Span Bridge (30.5-9.1-30.5 m)

Year Built / Age:
1965 / 52 years old

BM Ratings (2016):
Sufficiency: 60.8
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- headslope walls or bridge replacement required to accommodate initial 6 lane widened Highway
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain or replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations
- Evaluate life-cycle cost effectiveness of headslope walls versus replacement

BF 75725

Interchange - Highway 2:28 under Twp Rd 442 (Menaik Road) northwest of Ponoka



Structure(s):
4 Span Bridge (13.7-28.0-28.0-13.7 m)

Year Built / Age:
1964 / 53 years old

BM Ratings (2016):
Sufficiency: 52.7
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: TBD

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- diamond I/C conversion or bridge replacement required to accommodate initial 6 lane widening
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Maintain or replace bridge as conditions warrant
- Carry out planning study to determine ultimate I/C configuration
- Diamond I/C conversion and/or bridge replacement design to consider interim and ultimate lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75724

Interchange - Highway 2:28 under Highway 611 near Maskwacis





Structure(s):
3 Span Bridge (25.6-17.7-25.6 m)

Year Built / Age:
1965 / 52 years old

BIM Ratings (2016):
Sufficiency: 47.5
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate:0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- headslope walls or bridge replacement required to accommodate initial 6 lane widened Highway
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain or replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations
- Evaluate life-cycle cost effectiveness of headslope walls versus replacement

BF 75723

Flyover - Highway 2:28 under Twp Rd 455 (Louise Bull) southwest of Wetaskiwin





Structure(s):
4 Span Bridge (12.2-23.2-23.2-12.2 m)

Year Built / Age:
1966 / 51 years old

BIM Ratings (2016):
Sufficiency: 60.5
Structural condition: 61.1

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

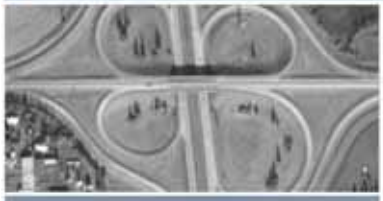
Action Trigger	Anticipated Bridge Action
- Highway Widening	- bridge replacement
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain or replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75555

Interchange - Highway 2:30 under Highway 13 near Wetaskiwin



Structure(s):
5 Span Bridge (12.8-22.9-7.6-22.9-12.8 m)
Future Diamond conversion allows 6 lanes on Highway 2

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 45.1
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 0

Recent Studies:
Interchange FPS, Al-Terra, 2011

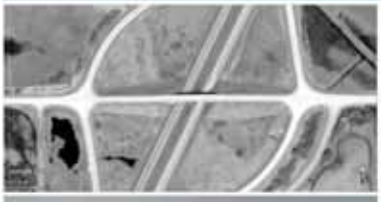
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lanes (convert to diamond), replacement for 8 lanes
- Bridge Condition	- replacement or major maintenance within 10 years
- Highway 13	- none - diamond conversion allows long turn lane bays on Highway 13

Recommendations:
- Maintain or replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 13 lane configurations

BF 75722

Interchange - Highway 2:30 under Twp Rd 470 (Correction Line) northwest of Wetaskiwin



Structure(s):
4 Span Bridge (15.2-25.6-25.6-15.2 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 52.5
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement within 10 years
- Bridge Condition	- replacement within 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or widening occurs
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5128 - Highway 2 Corridor Improvement Study\Submission\4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75667

Interchange - Highway 2:30 under Highway 616 near Millet



Structure(s):
4 Span Bridge (13.7-22.9-22.9-13.7 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 52.5
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

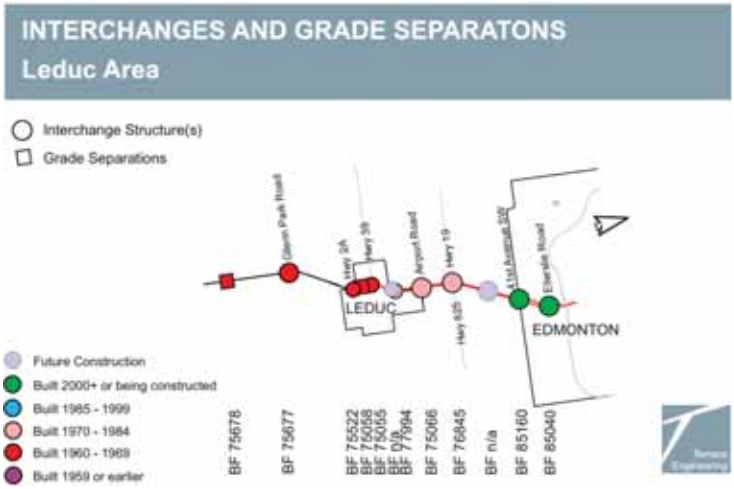
Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement within 10 years
- Bridge Condition	- replacement beyond 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or widening occurs
- Bridge replacement design to consider interim and ultimate lane configurations

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705\Updated - Airdrie, Airdrie - Red Deer.

Interchanges and Grade Separations – Leduc





G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75677

Interchange - Highway 2:30 under Twp Rd 490 (Glenn Park Road) south of Leduc





Structure(s):
4 Span Bridge (13.1-30.0-30.0-13.1 m)
Future Diamond conversion allows 6 lanes on Highway 2

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 56.6
Structural condition: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: **TBD**

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- diamond I/C conversion or bridge replacement required to accommodate initial 6 lane widening
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain or replace bridge as conditions warrant
- Carry out planning study for ultimate I/C configuration and ultimate lane configurations
- Diamond I/C conversion and/or bridge replacement design to consider interim and ultimate Highway lane configuration

BF 75522

Interchange - Highway 2:30 under Highway 2A at Leduc





Structure(s):
4 Span Bridge (12.5-21.3-21.3-12.5 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 53.6
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 3

Recent Studies:
Hwy 2/2A I/C FPS, McElhanney, 2009
QE2 FPS, Translech/Focus, 2015
Hwy 2A Interchange FPS, ISL, 2015

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement on new Hwy 2A alignment
- Bridge Condition	- replacement or major maintenance within 10 years
- Hwy 2A Modifications	- replacement on new Hwy 2A alignment
- Other	- corridor development in Leduc area may cause bridge replacement

Recommendations:
- Maintain/replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 2A lane configurations
- Update previous studies to determine location and width of new Highway 2A replacement bridge
- Study potential for new flyover or partial diamond at existing location in addition to proposed new bridge at new location

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75058 N/S

Flyover - Highway 2:30 over CP Railway & Black Gold Drive at Leduc





Structure(s):
Two 4 Span Bridges (14.6-20.1-20.1-14.6 m)

Year Built / Age:
1961 / 56 years old

BIM Ratings (2016):
Sufficiency: N: 46.2 / S: 48.9
Structural condition: N: 44.4 / S: 50.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8 (10 for weave lanes TBD)

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 1

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

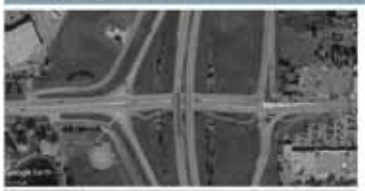
Recent Activities:
City of Leduc has protected for 4 through lanes on Black Gold Drive in TMP

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement on modified highway alignment
- Bridge Condition	- replacement or major maintenance within 10 years
- Railway Changes	- abandonment may impact replacement bridge design
- Other	- corridor development in Leduc area may cause bridge replacement on new alignment

Recommendations:
- Bridge replacement design to consider interim and ultimate Highway lane configuration
- Bridge replacement design to consider ultimate Black Gold Drive configuration
- Determine railway abandonment potential and potential for other uses (ie pathway/transit)

BF 75055 N/S

Interchange - Highway 2:30 over Highway 39 (50th Avenue) at Leduc





Structure(s):
Two 3 Span Bridges (13.7-15.8-13.7 m)

Year Built / Age:
1960 / 57 years old

BIM Ratings (2016):
Sufficiency: N: 51.7 / S: 48.5
Structural condition: N: 44.4 / S: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: TBD

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement on modified Hwy 2 alignment
- Bridge Condition	- replacement or major maintenance within 10 years
- Hwy 39 Modifications	- replacement on modified Hwy 2 alignment
- Other	- corridor development in Leduc area may cause bridge replacement on new alignment

Recommendations:
- Maintain/replace bridge as conditions warrant
- Bridge replacement design to consider interim and ultimate Hwy 2 and Hwy 39 lane configurations
- Interchange configuration (over/under) and ramp layout to be finalized

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 77994 S

Flyover - Highway 2:30 under 50th Street Ramp at Leduc





Structure(s):
3 Span Bridge (57.9-64.0-42.7 m)

Year Built / Age:
1977 / 40 years old

BIM Ratings (2015):
Sufficiency: 56.1
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 10 (core/CD)

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 2

Recent Studies:
QE2 FPS, Transtech/Focus, 2010
QE2 & 65 Ave FPS, Castleglenn, 2018

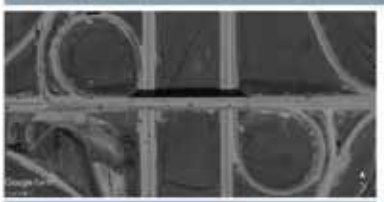
Recent Activities:
Bridge Rehab, 2018

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - structure can handle widened highway if Hwy 2 not realigned
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- bridge may be abandoned or replaced with 65 Avenue interchange plans
- Other	- corridor development in Leduc area may cause bridge replacement on new alignment

Recommendations:
- Maintain/eliminate bridge as conditions warrant
- Review recent studies that recommend significant changes with interchange staging and ultimate development issues that need to be considered prior to any bridge work.

BF 75066

Interchange - Highway 2:32 under Airport Road south of Edmonton





Structure(s):
4 Span Bridge (45.1-45.1-45.1-45.1 m)

Year Built / Age:
1980 / 37 years old

BIM Ratings (2016):
Sufficiency: 46.1
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 11 (core/CD)

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 4

Recent Studies:
QE2 FPS, Transtech/Focus, 2010
Qe2 & Airport Rd FPS, Castleglenn, 2017

Recent Activities:
Improvements to Airport Road and ramps (off bridge)

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Airport Road	- additional bridge(s) for widened roadway

Recommendations:
- Maintain/replace bridge as conditions warrant
- Address recent studies recommending additional bridges for Airport Road and ramps

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 76845

Interchange - Highway 2:32 under Highway 19 south of Edmonton





Structure(s):
4 Span Bridge (45.3-45.0-45.0-45.3 m)

Year Built / Age:
1978 / 39 years old

BIM Ratings (2016):
Sufficiency: 46.0
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 12 (core/CD)

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 0

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

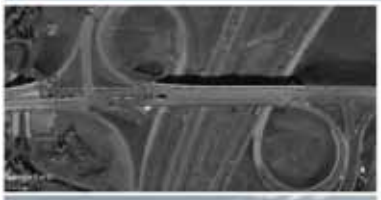
Recent Activities:
NW ramp modifications proposed (no impact on bridge)

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Highway 19	- TBD as part of future FPS

Recommendations:
- Maintain/replace bridge as conditions warrant
- Study bridge impacts from ultimate interchange configuration as part of future FPS

BF 85160

Interchange - Highway 2:32 under 41st Avenue SW at Edmonton





Structure(s):
4 Span Bridge (61.0-52.0-52.0-70.0 m)

Year Built / Age:
2015 / 2 years old

BIM Ratings (2016):
Sufficiency: 66.2
Structural condition: 72.2

Hwy 2 Through Lanes:
Existing: 7 Ultimate: 12 (core/CD)

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

Recent Activities:
Bridge constructed in 2015.

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement or major maintenance beyond 25 years
- 41 Avenue	- long term development may require wider bridge (future)

Recommendations:
- Maintain bridge as conditions warrant.
- Consider recommendations for an additional bridge over Highway 2 for EB to NB movements

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 85040

Interchange - Highway 2:32 under Ellerslie Road at Edmonton





Structure(s):
4 Span Bridge (61.0-52.0-52.0-70.0 m)

Year Built / Age:
2001 / 16 years old

BIM Ratings (2016):
Sufficiency: 54.6
Structural condition: 61.1

Hwy 2 Through Lanes:
Existing: 10 Ultimate: 12 (core/CD)

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - bridge opening accommodates widened Highway
- Bridge Condition	- replacement or major maintenance beyond 25 years
- Ellerslie Road	- none known

Recommendations:
- Maintain bridge as conditions warrant

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer,

Rivers, Streams, and Cattlepasses – Airdrie

RIVERS, STREAMS AND CATTLEPASSES
Airdrie Area



Alberta Transportation
Highway 2
Corridor Improvement Study

BF 71705

Highway 2:15 over Nose Creek
South of Balzac



Structure(s):
Twin SPCSP Arch Culverts (5.7 x 3.7 x 181.6 m)

Year Built / Age:
1969 / 48 years old

BIM Ratings (2016):
Sufficiency: 52.8
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger
- Highway Widening
- Bridge Condition
- Other

Anticipated Bridge Action
- none since culvert extends past service roads
- replacement or major maintenance within 10 years
- none known

Recommendations:
- Maintain/replace culverts as condition warrants

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 71706

Highway 2:18 over Nose Creek south of Airdrie



Structure(s):
Twin SPCSP Arch Culverts (5.7 x 3.7 x 134.1 m)

Year Built / Age:
1969 / 48 years old

BIM Ratings (2016):
Sufficiency: 52.8
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 7 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: TBD

Recent Studies:
Hwy 2 / Twp Rd 264 Interchange Planning, CIMA, ongoing

Recent Activities:

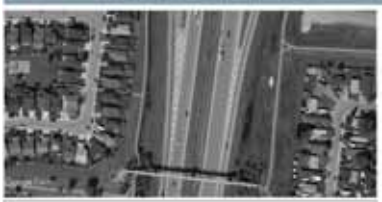
Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement or upstream extension of culverts
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- future Twp Rd 264 interchange requires Nose Creek crossing relocation

Recommendations:
- Maintain culverts as condition warrants until relocated for Twp Rd 264 interchange
- Consider temporary upstream extension if required for Highway 2 widening
- Consider delayed timing of culvert replacement due to future nearby interchange implications

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 84109

Highway 2:18 over Utility Culvert at Airdrie



Structure(s):
Concrete Box Culvert (details unknown)

Year Built / Age:
1975 / 41 years old

BIM Ratings (2016):
Sufficiency: unknown
Structural condition: unknown

Hwy 2 Through Lanes:
Existing: 7 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond ramp lanes
- Bridge Condition	- unknown
- Other	- none known

Recommendations:
- Maintain culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

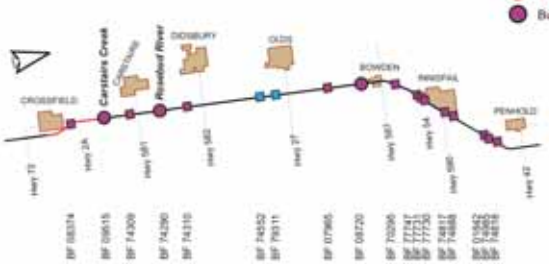
G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

Rivers, Streams, and Cattlepasses – Airdrie – Red Deer

RIVERS, STREAMS AND CATTLEPASSES
Airdrie to Red Deer

Major Bridge(s)
Standard Crossings
Culverts < 3 m Equiv. Diameter

Future Construction
Built 2000+ or being constructed
Built 1985 - 1999
Built 1970 - 1984
Built 1960 - 1969
Built 1959 or earlier



Alberta Transportation
Highway 2
Corridor Improvement Study

BF 08374
Highway 2:18 over Crossfield Creek north of Crossfield



Structure(s):
Concrete Box Culvert (3.6 x 1.8 m) with CSP extensions

Year Built / Age:
1956 / 61 years old

BIM Ratings (2016):
Sufficiency: 55.4
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 6 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger
- Highway Widening
- Bridge Condition
- Other

Anticipated Bridge Action
- lengthen west end of culvert or replace
- replacement or major maintenance beyond 10 years
- none known

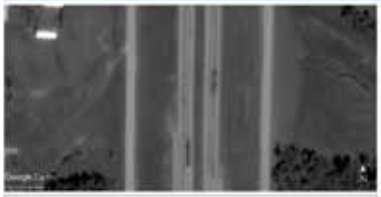
Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer...

BF 09515

Highway 2:20 over Carstairs Creek north of Crossfield



Structure(s):
Concrete Box Culvert (5.9 x 2.0 m) with CSP extensions

Year Built / Age:
1954 / 63 years old

BIM Ratings (2016):
Sufficiency: 53.5
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond service roads
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 74309

Highway 2:20 over Sheep Coulee east of Carstairs



Structure(s):
Concrete Box Culvert (4.0 x 2.0 m) with SPCSP extensions

Year Built / Age:
1954 / 63 years old

BIM Ratings (2016):
Sufficiency: 56.9
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond service roads
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

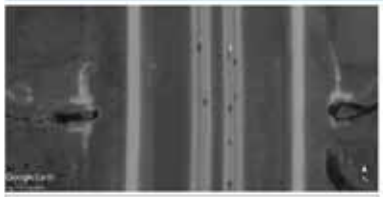
Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 74290

Highway 2:20 over Rosebud River north of Carstairs



Structure(s):
Concrete Arch Culvert (4.5 x 7.8 x 198 m)

Year Built / Age:
1954 / 63 years old

BIM Ratings (2016):
Sufficiency: 74.5
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond service roads
- Bridge Condition	- replacement or major maintenance beyond 25 years
- Other	- none known

Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 74310

Highway 2:20 over Watercourse east of Didsbury



Structure(s):
Concrete Box Culvert (4.0 x 2.0 m)

Year Built / Age:
1954 / 63 years old

BIM Ratings (2016):
Sufficiency: 63.3
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 74552

Highway 2:20 over Watercourse east of Olds



Structure(s):
CSP Culvert (2.4 dia x 145 m)

Year Built / Age:
1991 / 26 years old

BIM Ratings (2016):
Sufficiency: 66.5
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

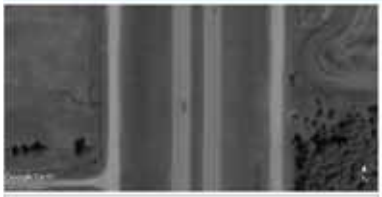
Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond service roads
- Bridge Condition	- replacement or major maintenance beyond 25 years
- Other	- none known

Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 79311

Highway 2:20 over Watercourse east of Olds



Structure(s):
CSP Culvert (2.7 dia x 146 m)

Year Built / Age:
1991 / 26 years old

BIM Ratings (2016):
Sufficiency: 58.4
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond service roads
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

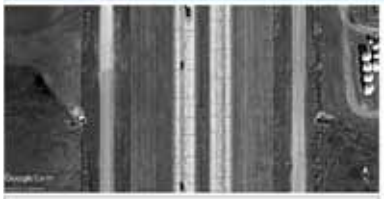
Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 07965

Highway 2:22 over Lonepine Creek north of Olds



Structure(s):
Concrete Box Culvert (3.3 x 1.7 m) with SPCSP extensions

Year Built / Age:
1954 / 63 years old

BIM Ratings (2016):
Sufficiency: 58.4
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- none - culvert extends beyond service roads
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 08720

Highway 2:22 over Tributary to Bowden Creek south of Bowden



Structure(s):
Concrete Box Culvert (7.2 x 1.7 x 54.7 m)

Year Built / Age:
1954 / 63 years old

BIM Ratings (2016):
Sufficiency: 77.1
Structural condition: 88.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

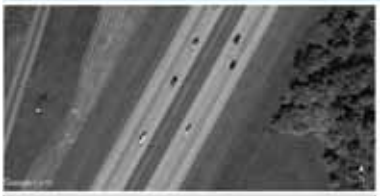
Recommendations:
- Maintain / replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer,

BF 70295

Highway 2:22 over Watercourse north of Bowden



Structure(s):
CSP Culvert (1.5 dia x 120 m)

Year Built / Age:
1957 / 60 years old

BIM Ratings (2016):
Sufficiency: 31.8
Structural condition: 33.3

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Maintain / replace culvert as conditions warrant.
- Replacement design to consider ultimate Highway 2 configuration

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 77747

Highway 2:22 over Watercourse south of Innisfail



Structure(s):
CSP Culvert (1.2 dia liner x 91 m)

Year Built / Age:
1957 / 60 years old

BIM Ratings (2016):
Sufficiency: 57.3
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\BF70705 Updated - Airdrie, Airdrie - Red Deer.

BF 77731

Highway 2:22 over Watercourse south of Innisfail



Structure(s):
Concrete Box Culvert (3.7 x 1.8 x 98.4 m)

Year Built / Age:
1957 / 60 years old

BIM Ratings (2016):
Sufficiency: 73.8
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 77730

Highway 2:22 over Watercourse south of Innisfail



Structure(s):
Concrete Box Culvert (3.7 x 1.8 x 89 m)

Year Built / Age:
1957 / 60 years old

BIM Ratings (2016):
Sufficiency: 73.8
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 74817

Highway 2:24 over Waskasoo Creek at Innisfail



Structure(s):
SPCSP Culvert (2.4 dia x 164.5 m)

Year Built / Age:
1958 / 59 years old

BIM Ratings (2016):
Sufficiency: 69.3
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 2 Ultimate: 2

Recent Studies:

Recent Activities:

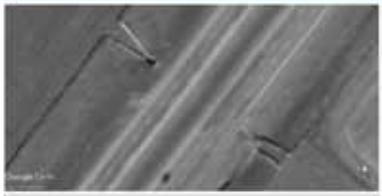
Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 74888

Highway 2:24 over Cattlepass north of Innisfail



Structure(s):
Concrete Box Culvert (2.4 x 2.1 x 55.4 m)

Year Built / Age:
1958 / 59 years old

BIM Ratings (2016):
Sufficiency: 80.5
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

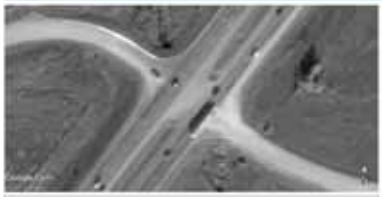
Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\BIOTOS Updated - Airdrie, Airdrie - Red Deer.

BF 01842

Highway 2:24 over Watercourse north of Innisfail



Structure(s):
Concrete Box Culvert (3.7 x 1.8 x 72 m)

Year Built / Age:
1958 / 59 years old

BIM Ratings (2016):
Sufficiency: 69.3
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- changes to intersection will impact culvert

Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 74985

Highway 2:24 over Cattlepass north of Innisfail



Structure(s):
Concrete Box Culvert (2.4 x 2.1 x 53.3 m)

Year Built / Age:
1958 / 59 years old

BIM Ratings (2016):
Sufficiency: 79.8
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 74818

Highway 2:24 over Watercourse north of Innisfail



Structure(s):
Concrete Box Culvert (3.7 x 1.8 x 65.9 m)

Year Built / Age:
1958 / 59 years old

BIM Ratings (2016):
Sufficiency: 66.3
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

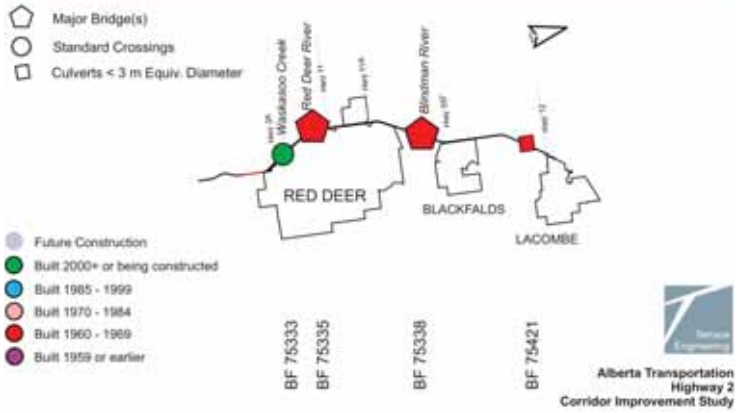
Recommendations:
- Maintain / replace /lengthen culvert as conditions warrant.

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

Rivers, Streams, and Cattlepasses – Red Deer

RIVERS, STREAMS AND CATTLEPASSES
Red Deer Area



Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75333

Highway 2:24 over Waskasoo Creek at Red Deer





Structure(s):
Concrete Arch Culvert (5.4 x 3.3 x 80 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2017):
Sufficiency: 64.8
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthening or replacement
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain/replace/lengthen culvert when conditions warrant or if widening configuration requires
- Any bridge modifications should consider interim and ultimate Hwy 2 configuration

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75335 N/S

Highway 2:24 over Red Deer River at Red Deer





Structure(s):
4 Span Bridges (39.6-50.0-50.0-39.6 m)

Year Built / Age:
1962 / 55 years old

BIM Ratings (2016):
Sufficiency: N: 56.2 / S: 60.3
Structural condition: N: 55.6 / S: 61.1

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 10

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
Highway 2 Alignment Options, AECOM, 2013

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement on shifted alignment
- Bridge Condition	- replacement beyond 10 years
- Other	- none known

Recommendations:
- Replace bridge on shifted alignment when conditions warrant or Highway is widened
- Bridge replacement design to consider interim and ultimate Highway lane configuration

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75338 N/S

Highway 2:24 over Blindman River north of Red Deer





Structure(s):
N: 4 Span Bridge (18.0-20.1-27.4-22.9 m)
S: 4 Span Bridge (18.3-23.8-27.4-26.5 m)

Year Built / Age:
1962 / 55 years old

BIM Ratings (2016):
Sufficiency: N: 48.0 / S: 50.4
Structural condition: N: 33.3 / S: 38.9

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
Bridge Assessment, COWI, 2012

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement
- Bridge Condition	- replacement within 10 years
- Other	- none known

Recommendations:
- Replace bridge when conditions warrant or Highway is widened
- Bridge replacement design to consider interim and ultimate Highway lane configuration

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75421

Highway 2:26 over Whelp Brook south of Lacombe





Structure(s):
SPCSP Culvert (2.3 x 2.6 x 104 m)

Year Built / Age:
1961 / 56 years old

BIM Ratings (2016):
Sufficiency: 71.1
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace or lengthen culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain/replace culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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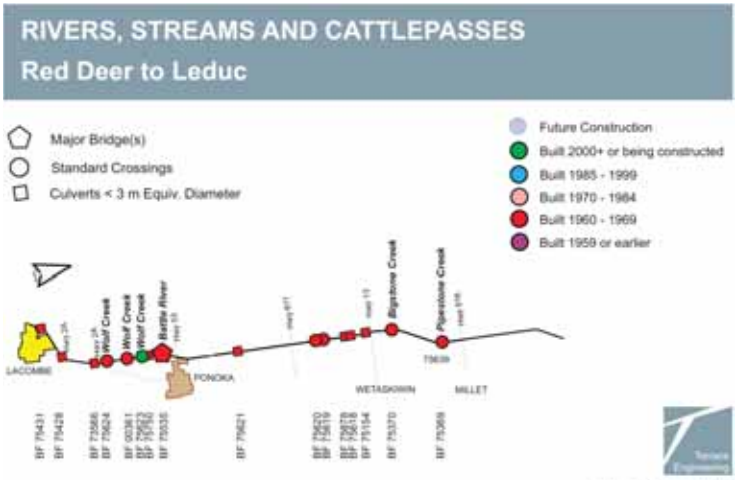
Rivers, Streams, and Cattlepasses – Red Deer – Leduc





G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75428

Highway 2:26 over Wolf Creek north of Lacombe



Structure(s):
Concrete Box Culvert (3.7 x 2.4 x 80 m)

Year Built / Age:
1961 / 56 years old

BIM Ratings (2016):
Sufficiency: 53.1
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 73566

Highway 2:26 over Tributary to Wolf Creek south of Morningside



Structure(s):
Precast Concrete Culvert (2.7 x 1.7 x 59.7 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 68.9
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 1 Ultimate: 1

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75624

Highway 2:26 over Wolf Creek west of Morningside



Structure(s):
Two SPCSP Culverts (2.7 dia & 2.6 x 2.9 x 60.5 m)

Year Built / Age:
1963 / 54 years old

BM Ratings (2016):
Sufficiency: 62.1
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culverts
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culverts as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 00361

Highway 2:26 over Wolf Creek north of Morningside



Structure(s):
SPCSP Culvert (3.5 x 3.9 x 82 m)

Year Built / Age:
1963 / 54 years old

BM Ratings (2016):
Sufficiency: 60.3
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75623 N/S

Highway 2:26 over Wolf Creek north of Morningside



Structure(s):
Single Span Bridges (20.0 m)
(Both bridges built for 3 lanes each)

Year Built / Age:
2015 / 2 years old

BIM Ratings (2016):
Sufficiency: N: 82.0 / S: 82.0
Structural condition: N: 100.0 / S: 100.0

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

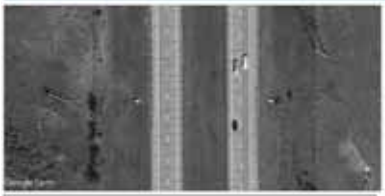
Action Trigger	Anticipated Bridge Action
- Highway Widening	- none for 6 lane as bridges have sufficient width, widen for 8 lane
- Bridge Condition	- replacement or major maintenance beyond 25 years
- Other	- none known

Recommendations:
- Maintain / replace bridge as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75750

Highway 2:26 over Cattlepass south of Ponoka



Structure(s):
SPCSP Arch Culvert (1.7 x 2.0 x 56.6 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 71.5
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

G:\5128 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix F - Bridge Inventory and Assessment\180705 Updated - Airdrie, Airdrie - Red Deer.

BF 75535 N/S

Highway 2:26 over Battle River near Ponoka



Structure(s):
3 Span Bridges (15.8-16.8-15.8 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: N: 55.8 / S: 55.0
Structural condition: N: 50.0 / S: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement
- Bridge Condition	- replacement beyond 10 years
- Other	- none known

Recommendations:
- Replace bridge for widening or as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75621

Highway 2:28 over Tributary to Maskwa Creek north of Ponoka



Structure(s):
SPCSP Culvert (2.0 x 2.2 x 128 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 65.5
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75620

Highway 2:28 over Tributary to Maskwa Creek southwest of Wetaskiwin



Structure(s):
Twin SPCSP Culverts (2.3 x 2.6 x 74 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 62.1
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75619

Highway 2:28 over Tributary to Maskwa Creek southwest of Wetaskiwin



Structure(s):
Triple SPCSP Culverts (2.6 x 2.9 x 107 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 44.2
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75878

Highway 2:28 over Cattlepass southwest of Wetaskiwin



Structure(s):
SPCSP Arch Culvert (1.7 x 2.0 x 59.1 m)

Year Built / Age:
1965 / 52 years old

BIM Ratings (2016):
Sufficiency: 67.8
Structural condition: 66.7

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75618

Highway 2:28 over Tributary to Maskwa Creek southwest of Wetaskiwin



Structure(s):
Precast Culvert (2.3 x 1.5 x 68 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 52.0
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culvert
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culvert as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75154

Highway 2:28 over Tributary to Maskwa Creek west of Wetaskiwin



Structure(s):
Twin CSP Culverts (1.8 dia x 61 m)

Year Built / Age:
1964 / 53 years old

BIM Ratings (2016):
Sufficiency: 70.0
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culverts
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culverts as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75370

Highway 2:30 over Bigstone Creek northwest of Wetaskiwin



Structure(s):
4 SPCSP Culverts (2x 2.3 x 2.6 x 66 m; 2x 2.6 x 2.9 x 66 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 36.9
Structural condition: 44.4

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culverts
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culverts as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75369

Highway 2:30 over Pipestone Creek northwest of Wetaskiwin



Structure(s):
4 SPCSP Culverts (4x 2.6 x 2.9 x 76 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 38.3
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen or replace culverts
- Bridge Condition	- replacement or major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Maintain / replace / lengthen culverts as conditions warrant

Alberta Transportation
Highway 2
Corridor Improvement Study

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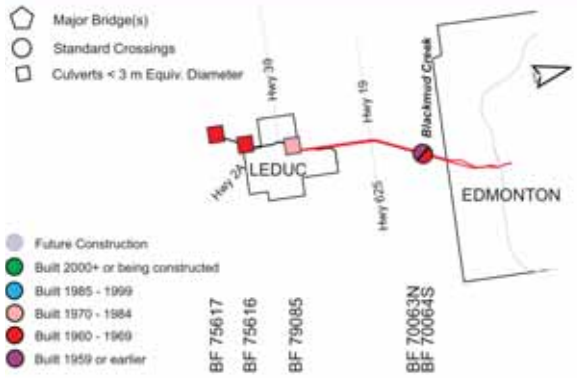
Rivers, Streams, and Cattlepasses – Leduc

RIVERS, STREAMS AND CATTLEPASSES
Leduc Area



Alberta Transportation
Highway 2
Corridor Improvement Study

BF 75617

Highway 2:30 over Tributary to Whitemud Creek south of Leduc



Structure(s):
Twin CSP Arch Culverts (twin 1.8 x 1.1 x 84 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 34.8
Structural condition: 22.2

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- lengthen culverts
- Bridge Condition	- replacement within 2 years
- Other	- none known

Recommendations:
- Bridge replacement design to consider interim and ultimate Highway lane configuration
- If already replaced, lengthen culvert when necessary for Highway widening

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 75616

Highway 2:30 over Tributary to Whitemud Creek at Leduc





Structure(s):
Twin Precast Arch Culverts (twin 2.7 x 1.7 x 56 m)

Year Built / Age:
1963 / 54 years old

BIM Ratings (2016):
Sufficiency: 69.6
Structural condition: 77.8

Hwy 2 Through Lanes:
Existing: 4 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: TBD

Recent Studies:
Hwy 2A Interchange FPS, ISL, 2015

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace culvert 0.5 km to north on new channel (new Highway 2A interchange)
- Bridge Condition	- replacement / major maintenance beyond 10 years
- Other	- none known

Recommendations:
- Bridge replacement design to consider interim and ultimate Highway lane configuration
- Channel realignment required for initial and ultimate Highway 2A interchange

Alberta Transportation
Highway 2
Corridor Improvement Study

BF 79085

Highway 2:32 over Tributary to Whitemud Creek at Leduc



Structure(s):
CSP Culverts (1.8 dia & 1.4 dia x 124 m)

Year Built / Age:
1980 / 37 years old

BIM Ratings (2015):
Sufficiency: 60.0
Structural condition: 55.6

Hwy 2 Through Lanes:
Existing: 8 Ultimate: 8

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 2

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replace culvert on new Highway 2 alignment (65 Avenue interchange)
- Bridge Condition	- replacement / major maintenance beyond 25 years
- Other	- none known

Recommendations:
- Bridge replacement design to consider interim and ultimate Highway lane configuration

Alberta Transportation
Highway 2
Corridor Improvement Study

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BF 70063 N / 70064 S

Highway 2:32 over Blackmud Creek south of Edmonton



Structure(s):
N: Concrete Frame Bridge (18.3 m)
S: SPCSP Lined Elliptical Culvert (9.8 x 4.5 x 47.5 m)

Year Built / Age:
N: 1936 / 81 years old
S: 1968 / 49 years old

BIM Ratings (2016):
Sufficiency: N: 45.2 / S: 61.4
Structural condition: N: 44.4 / S: 55.6

Hwy 2 Through Lanes:
Existing: 6 Ultimate: TBD

Hwy 2 Ramp Lanes:
Existing: 0 Ultimate: 0

Recent Studies:
QE2 FPS, Transtech/Focus, 2010

Recent Activities:

Action Trigger	Anticipated Bridge Action
- Highway Widening	- replacement (existing or new Highway alignment)
- Bridge Condition	- replacement or major maintenance within 10 years
- Other	- none known

Recommendations:
- Bridge replacement design to consider interim and ultimate Highway lane location and configuration
- Explore potential of keeping and/or extending southbound culvert if Highway alignment unchanged

Alberta Transportation
Highway 2
Corridor Improvement Study

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Appendix G

Pipeline Utility Crossings

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Highway Control Section	km	Licence/ Line #	Licence Date	Legal Land Description	Substance	Material	OD (mm)	Wall thickness (mm)	Crossing Angle	Owner	Pressure (kPa)	Status
2:15	49	1384-21	1995	4-26-29-W4	LV	Steel	219.1	4.78	90	Plains Midstream Canada ULC	0	D
2:15	49	24168-6	1989	4-26-29-W4	NG	Steel	168.3	5.56	90	Toro Oil & Gas Ltd.	0	D
2:15	49	16794-6	2004	4-26-29-W4	SW	Steel	60.3	3.91	90	Nexen Energy ULC	4140	O
2:15	49	7955-8	2005	4-26-29-W4	FG	Steel	60.3	3.91	90	Nexen Energy ULC	0	D
2:15	49	3113-26	Permit 2010	4-26-29-W4	ML	Steel	60.3	3.9	90	Nexen Energy ULC	0	A
2:15	49	16794-1	1986	4-26-29-W4	SW	Fibreglass	88.9	1.9	90	Nexen Energy ULC	0	A
2:15	49	1384-21	1995	1-26-01-W5	LV	Steel	219.1	4.78	90	Plains Midstream Canada ULC	0	D
2:15	49	16794-6	2004	1-26-01-W5	SW	Steel	60.3	3.91	90	Nexen Energy ULC	4140	O
2:15	49	3034-11	2004	1-26-01-W5	ML	Steel	60.3	3.91	90	Nexen Energy ULC	0	A
2:15	49	7955-8	2005	1-26-01-W5	FG	Steel	60.3	3.91	90	Nexen Energy ULC	0	D
2:15	49	3113-26	Permit 2010	1-26-01-W5	ML	Steel	60.3	3.9	90	Nexen Energy ULC	0	A
2:15	49	16794-1	1986	1-26-01-W5	SW	Fibreglass	88.9	1.9	90	Nexen Energy ULC	0	A
2:15	50	80113-1	2009	4-26-29-W4	NG	Steel	558.8	7.14	105	Nova Gas Transmission Ltd.	6590	O
2:18	5	3105-19	2009	33-26-29-W4	NG	Steel	168.3	4.8	90	Atco Gas and Pipelines Ltd. (South)	4960	O
2:18	9	3105-16	2003		NG	Steel	60.3	3.91	90	Atco Gas and Pipelines Ltd. (South)	0	A
2:18	9	3105-15	2005	33-26-29-W4	NG	Steel	219.1	4.78	90	Atco Gas and Pipelines Ltd. (South)	4960	O
2:18	17	52143-2	2010	3-28-29-W4	SG	Steel	88.9	3.96	90	Taqa North Ltd.	0	D
2:18	17	6574-108	2010	3-28-29-W4	SG	Steel	114.3	4.78	90	Taqa North Ltd.	0	A
2:18	17	6575-40	2010	3-28-29-W4	FG	Steel	60.3	3.18	90	Taqa North Ltd.	6500	O
2:18	17	52143-5	2010	3-28-29-W4	SG	Steel	114.3	4.8	90	Taqa North Ltd.	6500	O
2:18	18	21796-2	1985	10-28-29-W4	NG	Aluminum	48.3	2.16	90	Rockyview Gas Co-op Ltd.	2070	O
2:18	18	4687-11	1993	10-28-29-W4	NG	Steel	114.3	6.02	90	TransCanada Energy Ltd.	17240	O
2:18	19	6575-81	2015	15-28-29-W4	FG	Steel	60.3	3.2	90	Taqa North Ltd.	6500	O
2:18	19	52134-4	2014	15-28-29-W4	SG	Steel	168.3	9.99	90	Taqa North Ltd.	0	D
2:18	20	52134-15	2010	15-28-29-W4	SG	Steel	323.9	8.74	90	Taqa North Ltd.	6500	O
2:18	22	52134-9	2012	27-28-29-W4	SG	Steel	219.1	7.04	90	Taqa North Ltd.	6500	O
2:18	22	6575-27	2015	27-28-29-W4	FG	Steel	60.3	3.18	90	Taqa North Ltd.	6500	O
2:18	22	6610-1	1989	27-28-29-W4	NG	Steel	168.3	10.97	90	TransCanada Energy Ltd.	24800	O
2:18	23	4829-2	2009	27-28-29-W4	NG	Steel	323.9	6.4	90	Nova Gas Transmission Ltd.	0	A
2:18	25	80139-4	2009	36-28-1-W5	NG	Steel	610	6.4	90	Nova Gas Transmission Ltd.	6900	O
2:18	25	4687-3	1990	36-28-1-W5	NG	Steel	114.3	6.02	90	TransCanada Energy Ltd.	17240	O
2:18	25	52134-16	2015	36-28-1-W5	SG	Steel	114.3	4.78	90	Taqa North Ltd.	0	D
2:18	25	6574-212	2008	36-28-1-W5	SG	Steel	219.1	7.04	90	Taqa North Ltd.	0	D
2:18	25	6575-14	2015	36-28-1-W5	FG	Steel	60.3	3.18	90	Taqa North Ltd.	6500	O
2:18	25	27376-3	1994	36-28-1-W5	NG	Steel	323.9	12.7	90	TransCanada Energy Ltd.	17240	O
2:18	26	4687-2	1994	1-29-1-W5	NG	Steel	114.3	6.02	45	TransCanada Energy Ltd.	9930	O
2:18	26	27376-4	1995	1-29-1-W5	NG	Steel	219.1	7.9	45	TransCanada Energy Ltd.	17240	O
2:18	28	52134-13	2011	12-29-1-W5	SG	Steel	273.1	8.74	90	Taqa North Ltd.	6500	O
2:20	5	6575-48	2015	36-29-1-W5	FG	Steel	60.3	3.91	90	Taqa North Ltd.	6500	O
2:20	5	6574-202	2014	36-29-1-W5	SG	Steel	88.9	4.8	90	Taqa North Ltd.	0	D

Highway Control Section	km	Licence/ Line #	Licence Date	Legal Land Description	Substance	Material	OD (mm)	Wall thickness (mm)	Crossing Angle	Owner	Pressure (kPa)	Status
2:20	5	6574-59	2002	36-29-1-W5	SG	Steel	114.3	4.78	90	Taga North Ltd.	0	A
2:20	5	80006-1	1997	36-29-1-W5	NG	Steel	1067	12	90	Foothills Pipe Lines Ltd.	8690	O
2:20	5	80143-1	2009	36-29-1-W5	NG	Steel	864	10.31	90	Nova Gas Transmission Ltd.	6160	O
2:20	5	80143-24	2009	36-29-1-W5	NG	Steel	1067	9.5	90	Nova Gas Transmission Ltd.	6160	O
2:20	5	80064-75	2009	36-29-1-W5	NG	Steel	1219	12	85	Nova Gas Transmission Ltd.	8690	O
2:20	6	1414-8	1994	1-30-1-W5	LV	Steel	88.9	3.18	90	Plains Midstream Canada ULC	0	D
2:20	10	5386-5	1976	13-30-1-W5	FG	Steel	60.3	3.18	90	Pengrowth Energy Corporation	1720	O
2:20	10	7133-4	1997	13-30-1-W5	SG	Steel	168.3	4.78	90	Pengrowth Energy Corporation	0	A
2:20	10	38010-14	2005	13-30-1-W5	SG	Steel	168.3	7.1	90	Pengrowth Energy Corporation	8830	O
2:20	10	28485-4	1995	13-30-1-W5	FW	Polyethylene	114.3	15.6	90	Neo Exploration Inc.	1750	O
2:20	15	27691-2	1996	36-30-1-W5	FG	Steel	60.3	3.2	90	Pengrowth Energy Corporation	1720	O
2:20	15	40380-1	2003	36-30-1-W5	SG	Steel	168.3	7.1	90	Pengrowth Energy Corporation	8830	O
2:20	19	80073-11	2009	12-31-01-W5	NG	Steel	406.4	6.35	75	Nova Gas Transmission Ltd.	6900	O
2:20	19	36114-2	2003	13-31-1-W5	SG	Steel	168.3	7.1	90	Pengrowth Energy Corporation	8830	O
2:20	19	7165-4	1997	13-31-1-W5	FG	Steel	60.3	3.2	90	Pengrowth Energy Corporation	1720	O
2:20	19	7133-55	2004	13-31-1-W5	SG	Steel	168.3	7.1	90	Pengrowth Energy Corporation	8830	O
2:20	25	35157-5	2001	36-31-1-W5	SG	Steel	168.3	4.8	90	Pengrowth Energy Corporation	5680	O
2:20	25	35147	2001	36-31-1-W5	FG	Steel	60.29	3.2	90	Pengrowth Energy Corporation	4960	O
2:20	28	26552	2012	12-32-1-W5	NG	Steel	114.3	3.2	90	Taga North Ltd.	7860	O
2:20	29	13009	2005	13-32-1-W4	HV	Steel	219.1	3.96	90	Alberta Ethane Development Comp. Ltd.	9930	O
2:20	30	13009	2005	24-32-1-W5	HV	Steel	219.1	3.96	90	Alberta Ethane Development Comp. Ltd.	9930	O
2:20	32	53712	2013	25-32-1-W5	SG	Steel	168.3	6.4	90	Pengrowth Energy Corporation	9930	O
2:20	32	7165	2005	25-32-1-W5	FG	Steel	60.29	3.2	90	Pengrowth Energy Corporation	1720	O
2:22	5	40982	2004	24-33-1-W5	NG	Steel	114.3	3.2	90	Pengrowth Energy Corporation	8450	O
2:22	9	21609	2012	36-33-1-W5	NG	Aluminum	33.4	2.16	85	Crossroads Gas Co-op Ltd.	2410	O
2:22	9	21609	2012	36-33-1-W5	NG	Aluminum	60.29	2.76	85	Crossroads Gas Co-op Ltd.	4400	O
2:22	10	49183	2011	1-34-1-W5	SG	Steel	168.3	6.4	90	Pengrowth Energy Corporation	9930	O
2:22	13	57056	2012	13-34-1-W5	NG	Steel	168.3	3.2	70	Anderson Energy Inc.	0	D
2:22	17	12911	2013	25-34-1-W5	CO	Steel	114.3	3.18	85	Plains Midstream Canada ULC	0	D
2:22	19	80093	2009	36-34-1-W5	NG	Steel	168.3	4.8	60	Nova Gas Transmission Ltd.	6450	O
2:22	19	2029	2013	1-36-1-W5	NG	Steel	60.29	3.91	60	Atco Gas and Pipelines Ltd. (South)	4960	O
2:22	21	7351	2004	6-36-28-W4	NG	Steel	60.29	2.79	90	Atco Gas and Pipelines Ltd. (South)	4960	O
2:22	27	2029	2003	21-35-28-W4	NG	Steel	168.3	4.78	90	Atco Gas and Pipelines Ltd. (South)	4960	O
2:24	3	7634	2012	35-35-28-W4	LV	Steel	273.1	4.78	90	Alberta Products Pipe Line Ltd	9930	Q
2:24	5	23181	2012	2-36-28-W4	NG	Polyethylene	88.9	8.07	90	Canadian Oil & Gas International Inc.	550	O
2:24	5	23181	2012	2-36-28-W4	NG	Steel	168.3	3.2	90	Canadian Oil & Gas International Inc.	4960	O
2:24	13	80088	2009	29-36-27-W4	NG	Steel	610	7.92	70	Nova Gas Transmission Ltd.	6210	O
2:24	13	80685	2009	29-36-27-W4	NG	Steel	610	6.4	70	Nova Gas Transmission Ltd.	6200	O
2:24	14	21609	2012	33-36-27-W4	NG	Aluminum	60.29	2.76	90	Crossroads Gas Co-op Ltd.	4400	O
2:24	18	29918	2012	9-37-27-W4	FW	Steel	114.3	4	90	Canadian Natural Resources Limited	0	A

Highway Control Section	km	Licence/ Line #	Licence Date	Legal Land Description	Substance	Material	OD (mm)	Wall thickness (mm)	Crossing Angle	Owner	Pressure (kPa)	Status
2:24	19	32784	2012	17-37-27-W4	NG	Steel	406.39	7.5	80	TransCanada Pipeline Ventures Ltd.	8450	O
2:24	19	80532	2009	17-37-27-W4	HG	Steel	273.1	4.8	80	Nova Gas Transmission Ltd.	7500	O
2:24	19	80088	2009	17-37-27-W4	NG	Steel	168.3	3.96	80	Nova Gas Transmission Ltd.	6820	O
2:24	23	2029	2014	28-37-27-W4	NG	Steel	168.3	4.8	90	Atco Gas and Pipelines Ltd.(South)	4960	O
2:24	23	2029	2013	28-37-27-W4	NG	Steel	168.3	4.78	45	Atco Gas and Pipelines Ltd. (South)	4960	O
2:24	32	22045	2007	24-38-28-W4	NG	Steel	88.9	3.2	70	Westridge Petroleum Corp.	0	A
2:24	33	2595	2001	30-28-27-W4	NG	Steel	168.3	4.78	60	Atco Gas and Pipelines Ltd.(South)	4690	O
2:26	5	13268	2013	21-39-27-W4	CO	Steel	168.3	5.55	85	Plains Midstream Canada ULC	8270	Q
2:26	7	7029	2012	27-39-27-W4	NG	Steel	60.29	2.76	90	Atco Gas and Pipelines Ltd. (South)	4830	O
2:26	14	7029	2009	15-40-27-W4	NG	Steel	42.2	3.55	45	Atco Gas and Pipelines Ltd. (South)	4830	O
2:26	14	7029	2009	15-40-27-W4	NG	Steel	60.29	2.76	45	Atco Gas and Pipelines Ltd. (South)	4830	O
2:26	14	56137	2014	15-40-27-W4	OE	Steel	168.3	4.8	60	Vesta Energy Ltd.	9930	O
2:26	27	7029	2011	9-41-26-W4	NG	Steel	60.29	2.76	60	Atco Gas and Pipelines Ltd. (South)	4830	O
2:26	27	7029	2012	9-41-26-W4	NG	Steel	42.2	3.55	60	Atco Gas and Pipelines Ltd. (South)	0	A
2:26	38	22126	2005	15-42-26-W4	NG	Steel	114.3	3.2	90	Glencoe Resources Ltd.	7930	O
2:26	41	12687	2012	27-42-26-W4	HV	Steel	273.1	5.84	90	Alberta Ethane Development Comp. Ltd.	9930	O
2:26	42	54196	2012	27-42-26-W4	NG	Steel	88.9	3.2	85	Striker Exploration Corp.	9650	N
2:26	43	57388	2005	34-42-26-W4	ML	Steel	114.3	3.2	60	OES Corporation	9930	O
2:26	43	57365	2013	34-42-26-W4	OE	Steel	88.9	3.2	60	Omers Energy Inc.	0	D
2:28	2	1055	2012	12-43-26-W4	NG	Steel	88.9	3.2	90	Altagas Utilities Inc.	3448	O
2:28	4	25736	2012	24-43-26-W4	NG	Steel	114.3	3.2	90	Glencoe Resources Ltd.	9650	O
2:28	5	24741	2009	24-43-26-W4	NG	Steel	114.3	3.2	90	Omers Energy Inc.	4900	O
2:28	11	22556	2012	12-44-26-W4	NG	Steel	114.3	3.2	90	Altagas Utilities Inc.	9650	O
2:28	14	24992	2012	24-44-26-W4	NG	Steel	88.9	3.2	90	Altagas Ltd.	9650	O
2:28	21	32970	2000	12-45-26-W4	NG	Steel	168.3	4	90	Altagas Ltd.	9930	O
2:28	21	32970	2012	12-45-26-W4	NG	Steel	168.3	4.8	90	Altagas Ltd.	9930	O
2:28	21	24992	2011	12-45-26-W4	NG	Steel	114.3	4	90	Altagas Ltd.	9930	O
2:28	29	46865	2013	1-46-26-W4	NG	Polyethylene	88.9	6.57	90	Trident Exploration (Alberta) Corp.	0	A
2:30	0	48957	2008	13-46-26-W4	NG	Steel	168.3	4	90	Quicksilver Resources Canada Inc.	690	O
2:30	3	25277	2011	25-46-26-W4	NG	Steel	114.3	3.2	85	Canadian Natural Resources Limited	7590	O
2:30	20	1725	2012	9-48-25-W4	NG	Steel	60.29	3.91	45	Atco Gas and Pipelines Ltd. (South)	5520	O
2:30	20	1829	2012	16-48-25-W4	NG	Steel	88.9	3.18	90	Atco Gas and Pipelines Ltd.(South)	5510	O
2:30	25	39576	2012	33-48-25-W4	NG	Steel	114.3	3.2	90	Direct Energy Marketing Limited	9930	O
2:30	26	21719	2012	33-48-25-W4	CO	Steel	406.39	6.4	90	Plains Midstream Canada ULC	8080	Q
2:30	26	30417	2012	33-48-25-W4	NG	Steel	323.89	6	90	Atco Gas and Pipelines Ltd. (South)	9280	O
2:30	26	3015	2002	33-48-25-W4	HV	Steel	219.1	4.78	85	Keyera Energy Ltd.	9100	O
2:30	28	51517	2012	4-49-25-W4	NG	Steel	168.3	3.96	90	Quattro Exploration and Production Ltd.	0	D
2:30	29	8437	2012	9-49-25-W4	NG	Steel	114.3	4	90	NEPP Canada ULC	0	D
2:32	1	1055	2002	35-49-25-W4	NG	Steel	168.3	4	80	Altagas Utilities Inc.	4830	O
2:32	1	1055	2004	35-49-25-W4	NG	Steel	88.9	3.96	90	Altagas Utilities Inc.	4830	O

Highway Control Section	km	Licence/ Line #	Licence Date	Legal Land Description	Substance	Material	OD (mm)	Wall thickness (mm)	Crossing Angle	Owner	Pressure (kPa)	Status
2:32	7	50755	2000	23-50-25-W4	CO	Steel	219.1	8.18	45	Pembina Pipeline Corporation	0	D
2:32	7	50755	2013	23-50-25-W4	CO	Steel	219.1	8.18	45	Pembina Pipeline Corporation	0	D
2:32	7	7634	2014	23-50-25-W4	LV	Steel	273.1	5.15	90	Alberta Products Pipe Line Ltd	9930	Q
2:32	7	2045	2012	23-50-25-W4	NG	Steel	114.3	3.2	90	Atco Gas and Pipelines Ltd. (South)	4580	O
2:32	8	885	2012	26-50-25-W4	OE	Steel	219.1	0	90	Imperial Oil Resources Limited	0	D
2:32	8	885	2012	26-50-25-W4	OE	Steel	219.1	9.98	90	Imperial Oil Resources Limited	0	A
2:32	8	2960	2012	26-50-25-W4	NG	Steel	60.29	3.91	90	Atco Gas and Pipelines Ltd. (South)	5170	O
2:32	8	7000	2012	26-50-25-W4	HV	Steel	219.1	5.55	90	Imperial Oil Resources Limited	0	A
2:32	8	50727	2008	26-50-25-W4	HV	Steel	219.1	8.18	90	Keyera Energy Ltd.	0	D
2:32	9	5817	2012	26-50-25-W4	CO	Steel	219.1	6.34	80	Keyera Energy Ltd.	0	D
2:32	9	8909	2012	26-50-25-W4	NG	Steel	168.3	3.96	70	Atco Gas and Pipelines Ltd. (South)	6140	O
2:32	15	7231	2014	17-51-24-W4	NG	Steel	168.3	3.96	60	Atco Gas and Pipelines Ltd. (South)	0	R
2:32	15	7231	2014	17-51-24-W4	NG	Steel	168.3	3.96	60	Atco Gas and Pipelines Ltd. (South)	0	R
2:32	17	13452	2011	17-51-24-W4	NG	Steel	609.59	9.52	45	Atco Gas and Pipelines Ltd. (South)	o	R
2:32	18	7231	2014	20-51-24-W4	NG	Steel	42.2	3.55	90	Atco Gas and Pipelines Ltd. (South)	0	A
2:32	18	7231	2012	20-51-24-W4	NG	Steel	42.2	3.55	90	Atco Gas and Pipelines Ltd. (South)	0	A
2:32	18	935	2012	29-51-24-W4	CO	Steel	219.1	8.18	90	Imperial Oil Resources Limited	0	A
2:32	19	15440	2000	29-51-24-W4	NG	Steel	323.89	5.15	90	Imperial Oil Resources Limited	5050	O
2:32	19	37844	2012	29-51-24-W4	NG	Steel	219.1	8.18	90	Atco Gas and Pipelines Ltd. (South)	6070	O
2:32	19	15440	2010	29-51-24-W4	NG	Steel	323.89	5.59	90	Atco Gas and Pipelines Ltd. (South)	5050	O
2:32	19	13023	2011	28-51-24-W4	HV	Steel	273.1	5.84	70	Alberta Ethane Development Comp. Ltd.	9930	O

Legend:

Substance:

FG - Fuel Gas	HV - HVP Products	SW - Salt Water
M/G - Misc. Gases	NG - Natural Gas	LV - LVP products
CO - Crude Oil	ML - Misc. Liquids	SG - Sour Natural Gas
FW - Fresh Water	OE - Oil Well Effluent	

Status:

A - Abandoned	D - Discontinued	O - Operating
P - To be Constructed	R - Removed	

September 7, 2016
E00663A

ATCO Electric
400, 919 - 11 Avenue SW
Calgary AB T2R 1P3

Attn: Chris Clark
Vice President, Transmission Planning & Operations

Dear Madam,

RE: Highway 2 Corridor Improvement Study – Utility Stakeholder Engagement

Alberta Transportation has commissioned the consulting team of CIMA+, Al-Terra and Castleglenn to undertake the *Highway 2 Corridor Improvement Study*, extending from Stoney Trail (north) in Calgary to Anthony Henday Drive (south) in Edmonton. The study purpose is strategic in nature, leading to development of a long-term *Implementation Plan* for this National Highway route. The study is not intended to develop detailed roadway plans or define specific right-of-way requirements.

The study is entering Phase II, *Corridor Review and Assessment*, which includes consultation with stakeholders located along the corridor, seeking their input into development of a long-term plan connecting Alberta's two largest cities. CIMA+ is responsible for consultation with the utility agencies that are active along the study corridor. Although all relevant input is invited, our interest concerning utilities primarily involves two questions.

- First, are there plans to modify existing, or establish new, utility infrastructure affecting Highway 2 between Edmonton and Calgary? Our interest extends 300 m either side of the highway centreline.
- Second, the potential for industry interest in establishing a parallel utility corridor along parts of Highway 2 is under consideration as a possible element in a long-term vision for the corridor. This would be similar to the Transportation & Utility Corridors (TUC) established along the Anthony Henday Drive and Stoney Trail ring roads in Edmonton and Calgary, respectively. However, to be considered, provision for a TUC would require broad support and compelling justification.

If necessary, a member of our study team is available to provide a brief overview of the project and objectives, and to discuss utility requirements and accommodation. To answer any project-related questions, please contact Dan Dmytryshyn with CIMA+ in Calgary at (403) 775-0100 ext. 7640 or by email at dan.dmytryshyn@cima.ca.

We look forward to your input into this high-level review of the Highway 2 corridor.

Sincerely,
CIMA+, Al-Terra Engineering, Castleglenn

Henry Devos, P.Eng.
Lead Transportation Planning
(780) 297-2462, henry.devos@cima.ca

December 15, 2016

E00663A

ATCO Electric
400, 919 - 11 Avenue SW
Calgary AB T2R 1P3

Attn: Chris Clark
Vice President, Transmission Planning & Operations

Dear Madam,

RE: Highway 2 Corridor Improvement Study – Utility Stakeholder Engagement

Further to our previous letter dated September 7, 2016, we have not received a response from your organization regarding the Highway 2 Corridor Improvement Study project. If your organization desires to provide feedback regarding this study or would like to obtain further details on the study and its specific goals, we respectfully request that we receive your comments no later than January 31, 2017.

If you wish to discuss the specifics of this study further or to answer any project-related questions, please contact Dan Dmytryshyn with CIMA+ in Calgary at (403) 775-0100 ext. 7640 or by email at dan.dmytryshyn@cima.ca.

Sincerely,

CIMA+, Al-Terra Engineering, Castleglenn

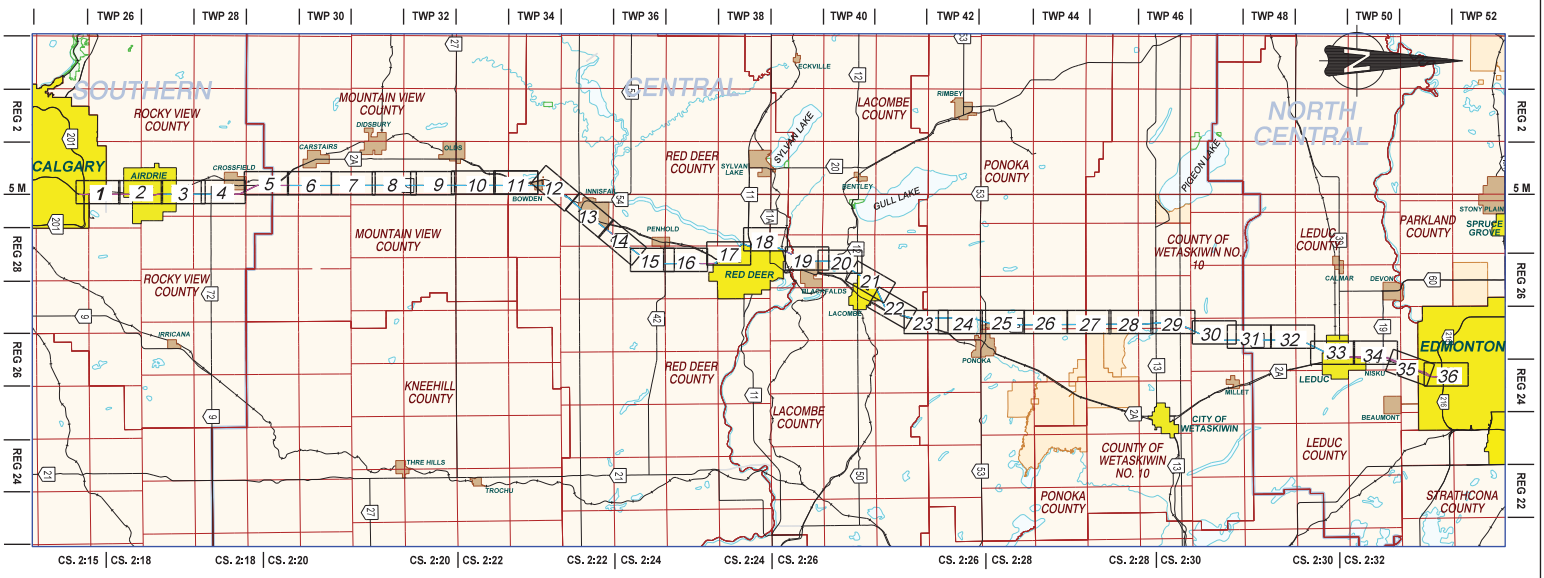
Henry Devos, P.Eng.
Lead Transportation Planning
(780) 297-2462, henry.devos@cima.ca

Appendix H

Corridor Improvement Plans

G:\5129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix H\H Plans.docx

INDEX MAP



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

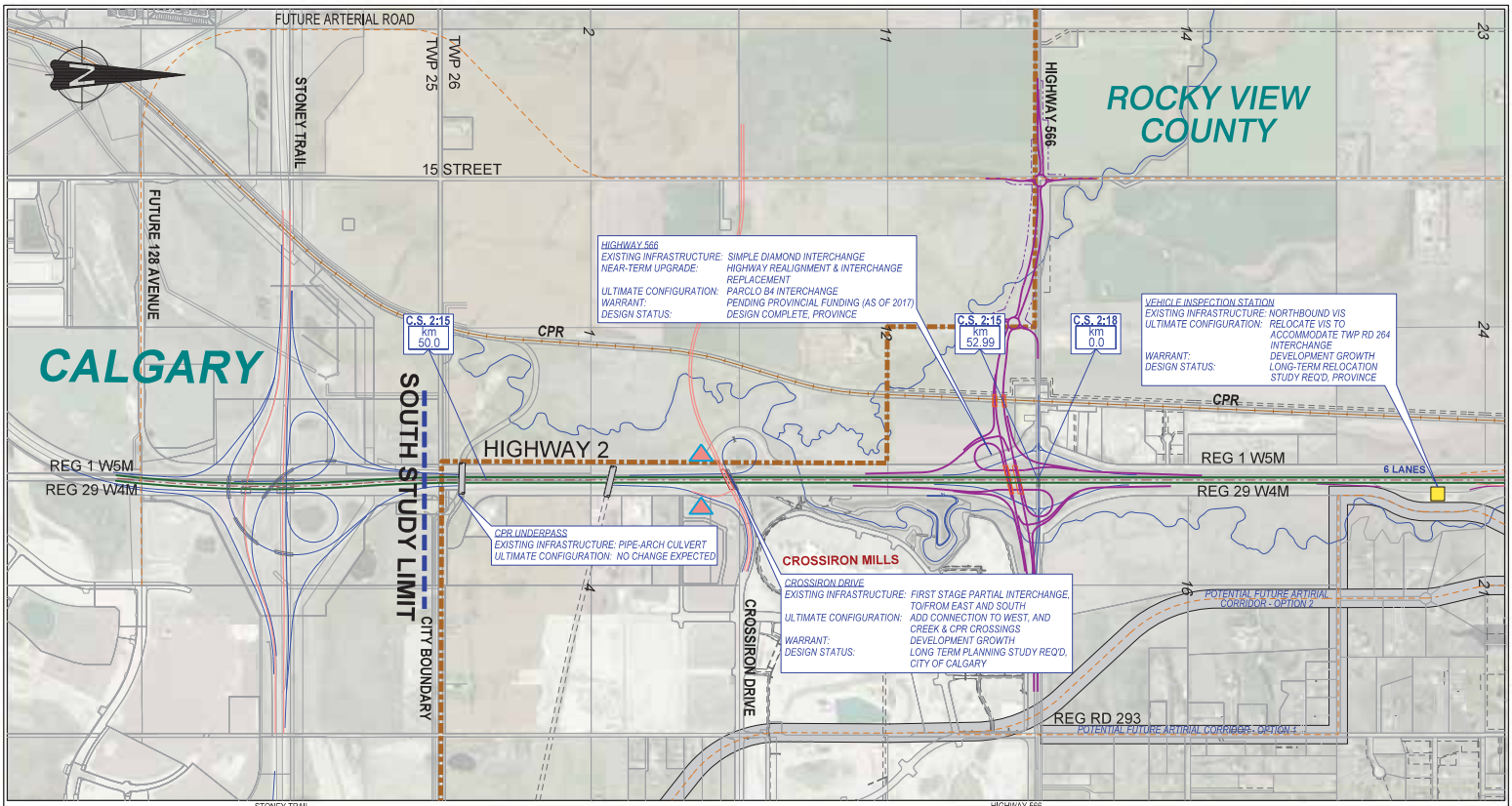
0m 5 000 10 000 15 000 20 000

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
INDEX MAP

ALBERTA MAP, 2015	HIGHWAY 2:15 TO 2:32	DATE 2016-01-05	

Alberta Transportation

PLAN R-1197-PL-00



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

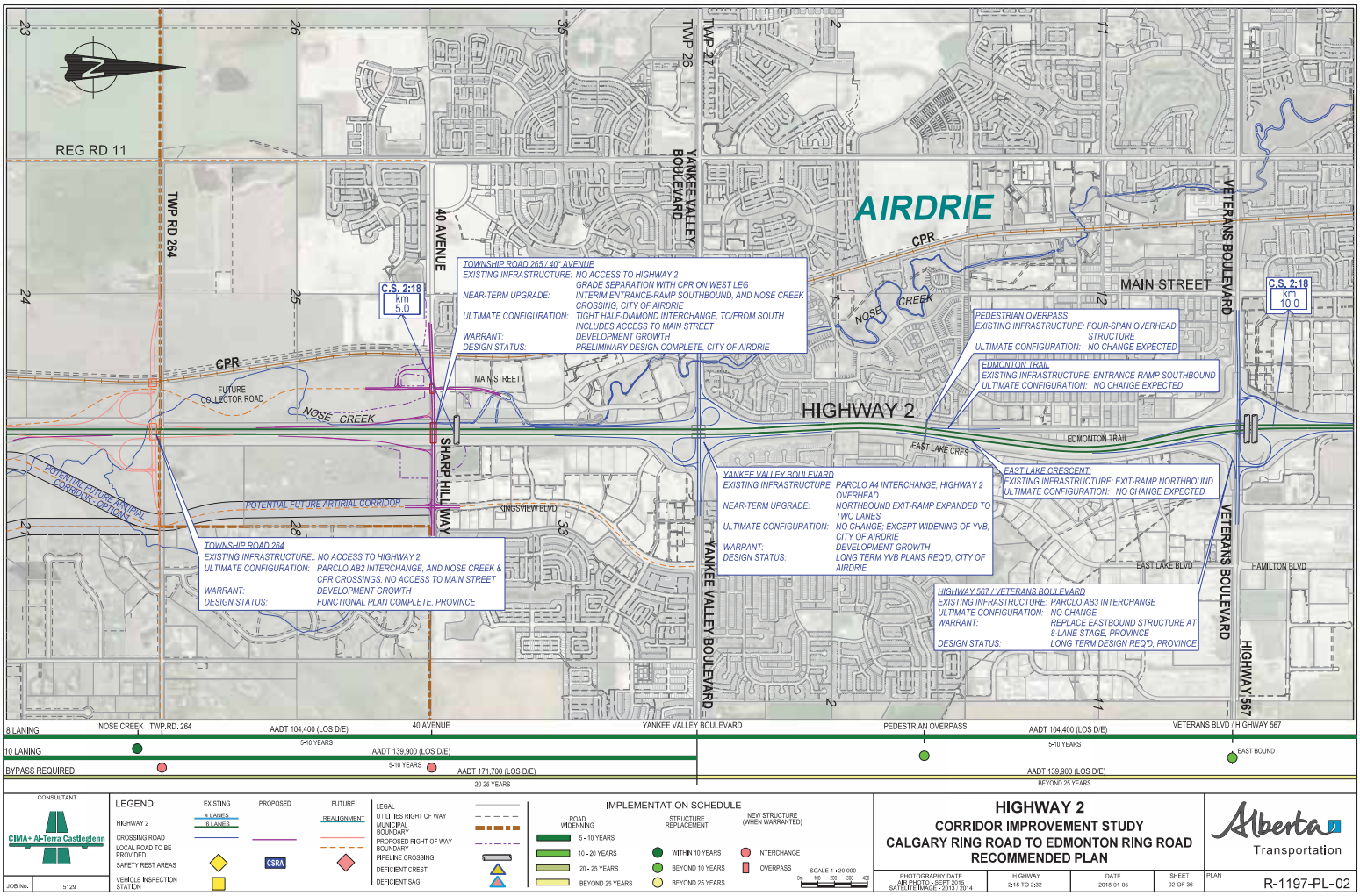
ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

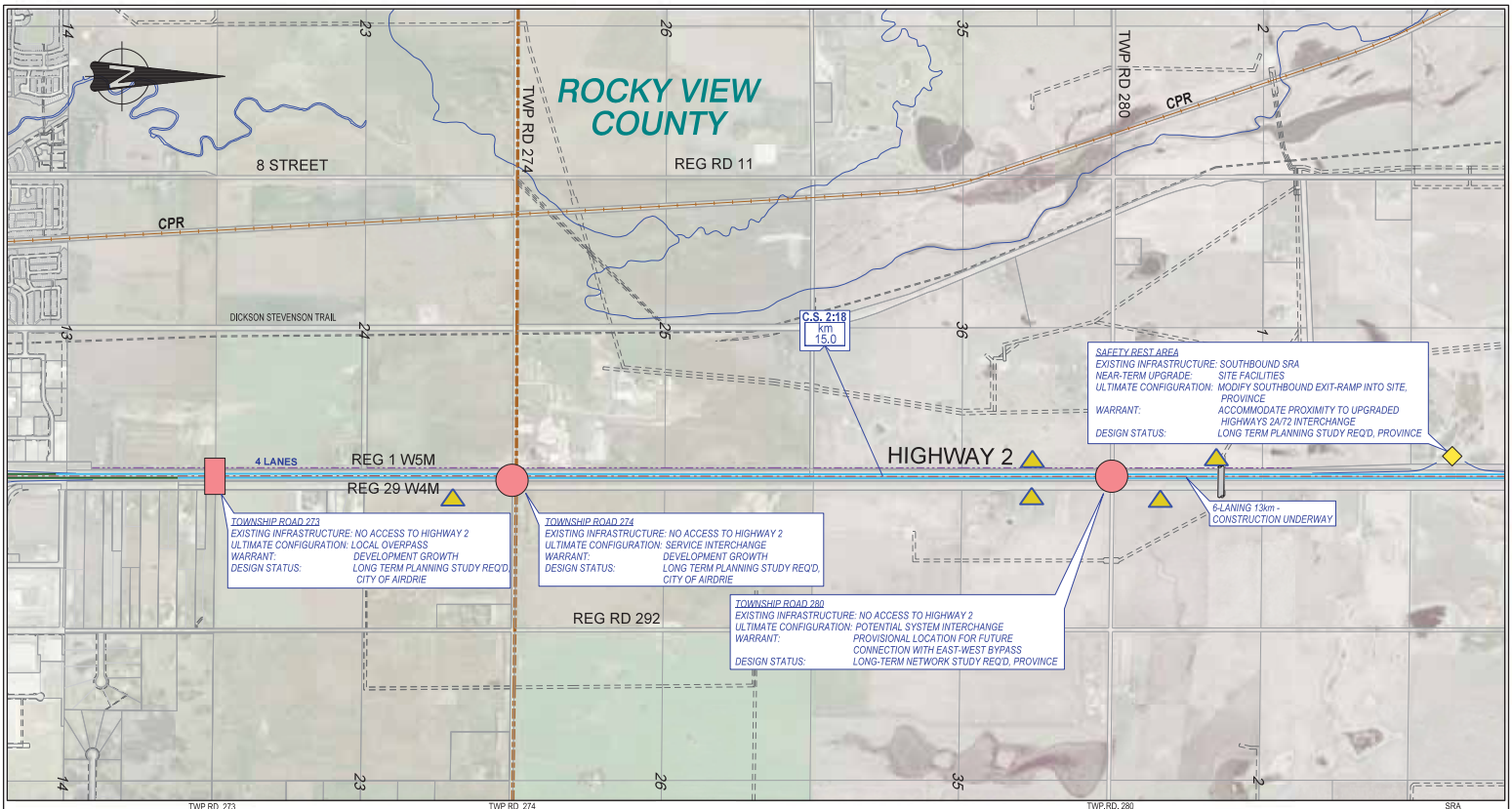
SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	01 OF 36	R-1197-PL-01


AIRDRIE
HIGHWAY 2
REG RD 11
TWP RD 264
40 AVENUE
YANKEE VALLEY BOULEVARD
SHARP HILL WAY
VETERANS BOULEVARD
HIGHWAY 567
MAIN STREET
CPR
NOSE CREEK
FUTURE COLLECTOR ROAD
KINGSVIEW BLVD
EAST LAKE CRES
EAST LAKE BLVD
EDMONTON TRAIL
HAMILTON BLVD
POTENTIAL FUTURE ARTERIAL CORRIDOR
POTENTIAL FUTURE ARTERIAL CORRIDOR - OPTION
TWP 26
TWP 27
C.S. 2:18 km 5.0
C.S. 2:18 km 10.0
TOWNSHIP ROAD 265 / 40" AVENUE
EXISTING INFRASTRUCTURE: NO ACCESS TO HIGHWAY 2
GRADE SEPARATION WITH CPR ON WEST LEG
NEAR-TERM UPGRADE: INTERIM ENTRANCE-RAMP SOUTHBOUND, AND NOSE CREEK CROSSING, CITY OF AIRDRIE
ULTIMATE CONFIGURATION: TIGHT HALF-DIAMOND INTERCHANGE, TO/FROM SOUTH INCLUDES ACCESS TO MAIN STREET
WARRANT: DEVELOPMENT GROWTH
DESIGN STATUS: PRELIMINARY DESIGN COMPLETE, CITY OF AIRDRIE
PEDESTRIAN OVERPASS
EXISTING INFRASTRUCTURE: FOUR-SPAN OVERHEAD STRUCTURE
ULTIMATE CONFIGURATION: NO CHANGE EXPECTED
EDMONTON TRAIL
EXISTING INFRASTRUCTURE: ENTRANCE-RAMP SOUTHBOUND
ULTIMATE CONFIGURATION: NO CHANGE EXPECTED
EAST LAKE CRESCENT:
EXISTING INFRASTRUCTURE: EXIT-RAMP NORTHBOUND
ULTIMATE CONFIGURATION: NO CHANGE EXPECTED
YANKEE VALLEY BOULEVARD
EXISTING INFRASTRUCTURE: PARCLO A4 INTERCHANGE; HIGHWAY 2 OVERHEAD
NEAR-TERM UPGRADE: NORTHBOUND EXIT-RAMP EXPANDED TO TWO LANES
ULTIMATE CONFIGURATION: NO CHANGE; EXCEPT WIDENING OF YVB, CITY OF AIRDRIE
WARRANT: DEVELOPMENT GROWTH
DESIGN STATUS: LONG TERM YVB PLANS REQ'D, CITY OF AIRDRIE
HIGHWAY 567 / VETERANS BOULEVARD
EXISTING INFRASTRUCTURE: PARCLO AB3 INTERCHANGE
ULTIMATE CONFIGURATION: NO CHANGE
WARRANT: REPLACE EASTBOUND STRUCTURE AT 8-LANE STAGE, PROVINCE
DESIGN STATUS: LONG TERM DESIGN REQ'D, PROVINCE
TOWNSHIP ROAD 264
EXISTING INFRASTRUCTURE: NO ACCESS TO HIGHWAY 2
ULTIMATE CONFIGURATION: PARCLO AB2 INTERCHANGE, AND NOSE CREEK & CPR CROSSINGS; NO ACCESS TO MAIN STREET
WARRANT: DEVELOPMENT GROWTH
DESIGN STATUS: FUNCTIONAL PLAN COMPLETE, PROVINCE
8 LANING
10 LANING
BYPASS REQUIRED
NOSE CREEK
TWP.RD. 264
AADT 104,400 (LOS D/E)
5-10 YEARS
40 AVENUE
AADT 139,900 (LOS D/E)
AADT 171,700 (LOS D/E)
20-25 YEARS
YANKEE VALLEY BOULEVARD
PEDESTRIAN OVERPASS
BEYOND 25 YEARS
VETERANS BLVD / HIGHWAY 567
EAST BOUND
LEGEND
HIGHWAY 2
CROSSING ROAD
LOCAL ROAD TO BE PROVIDED
SAFETY REST AREAS
VEHICLE INSPECTION STATION
EXISTING
4 LANES
8 LANES
PROPOSED
FUTURE
REALIGNMENT
CSRA
LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG
IMPLEMENTATION SCHEDULE
ROAD WIDENNING
5 - 10 YEARS
10 - 20 YEARS
20 - 25 YEARS
BEYOND 25 YEARS
STRUCTURE REPLACEMENT
WITHIN 10 YEARS
BEYOND 10 YEARS
NEW STRUCTURE (WHEN WARRANTED)
INTERCHANGE
OVERPASS
SCALE 1 : 20 000
0m 100 200 300 400
CONSULTANT
CIMA+ Al-Terra Castlegienn
JOB No. 5129
HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN
PHOTOGRAPHY DATE: AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014
HIGHWAY 2:15 TO 2:32
DATE 2016-01-05
SHEET 02 OF 36
PLAN R-1197-PL-02
Alberta Transportation



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL	
UTILITIES RIGHT OF WAY	
MUNICIPAL BOUNDARY	
PROPOSED RIGHT OF WAY BOUNDARY	
PIPELINE CROSSING	
DEFICIENT CREST	
DEFICIENT SAG	

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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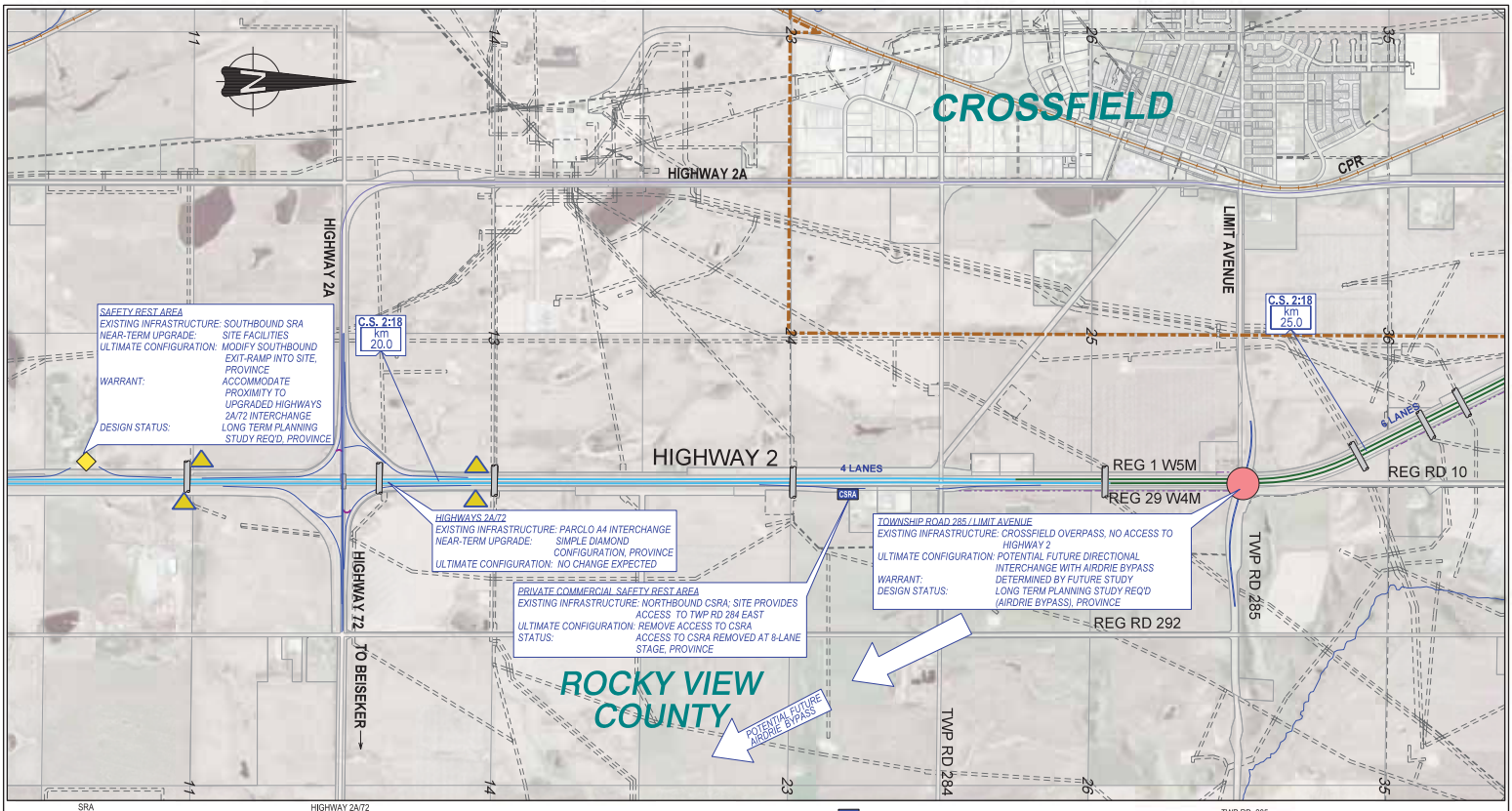

CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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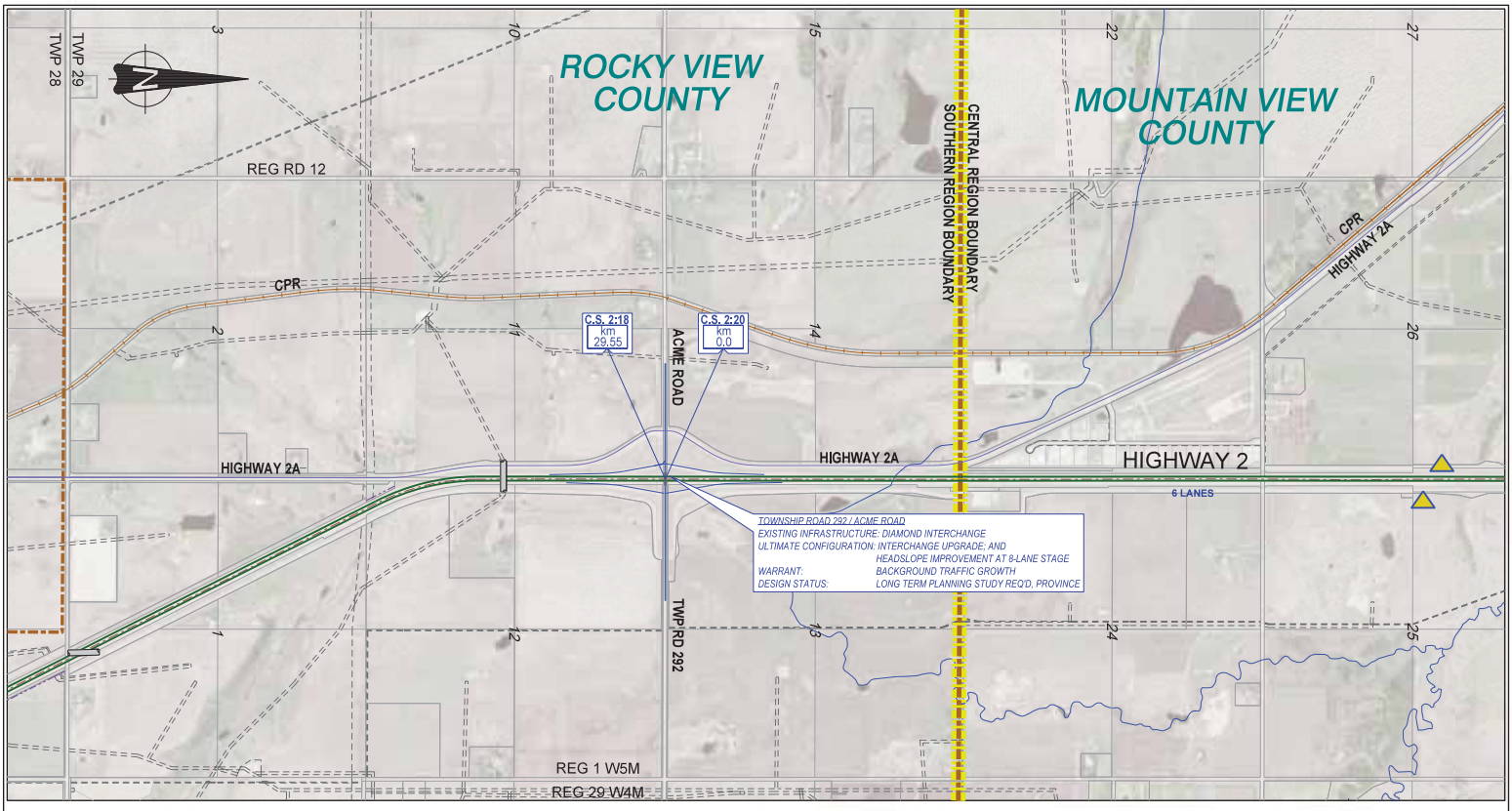

CONSULTANT

CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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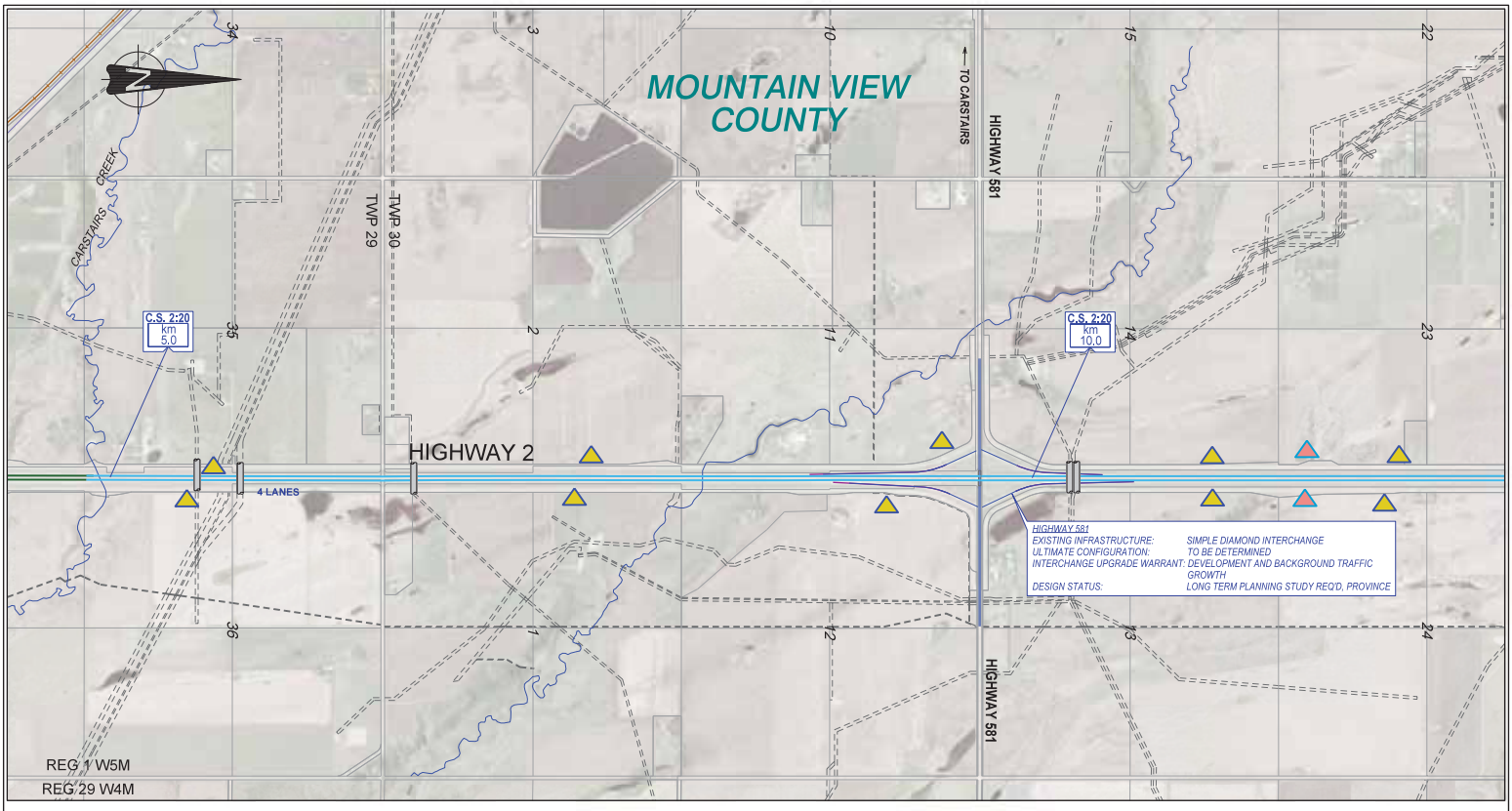

CONSULTANT: CIMA+ Al-Terra Castlegienn

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000 (0, 100, 200, 300, 400)

JOB No. 5129

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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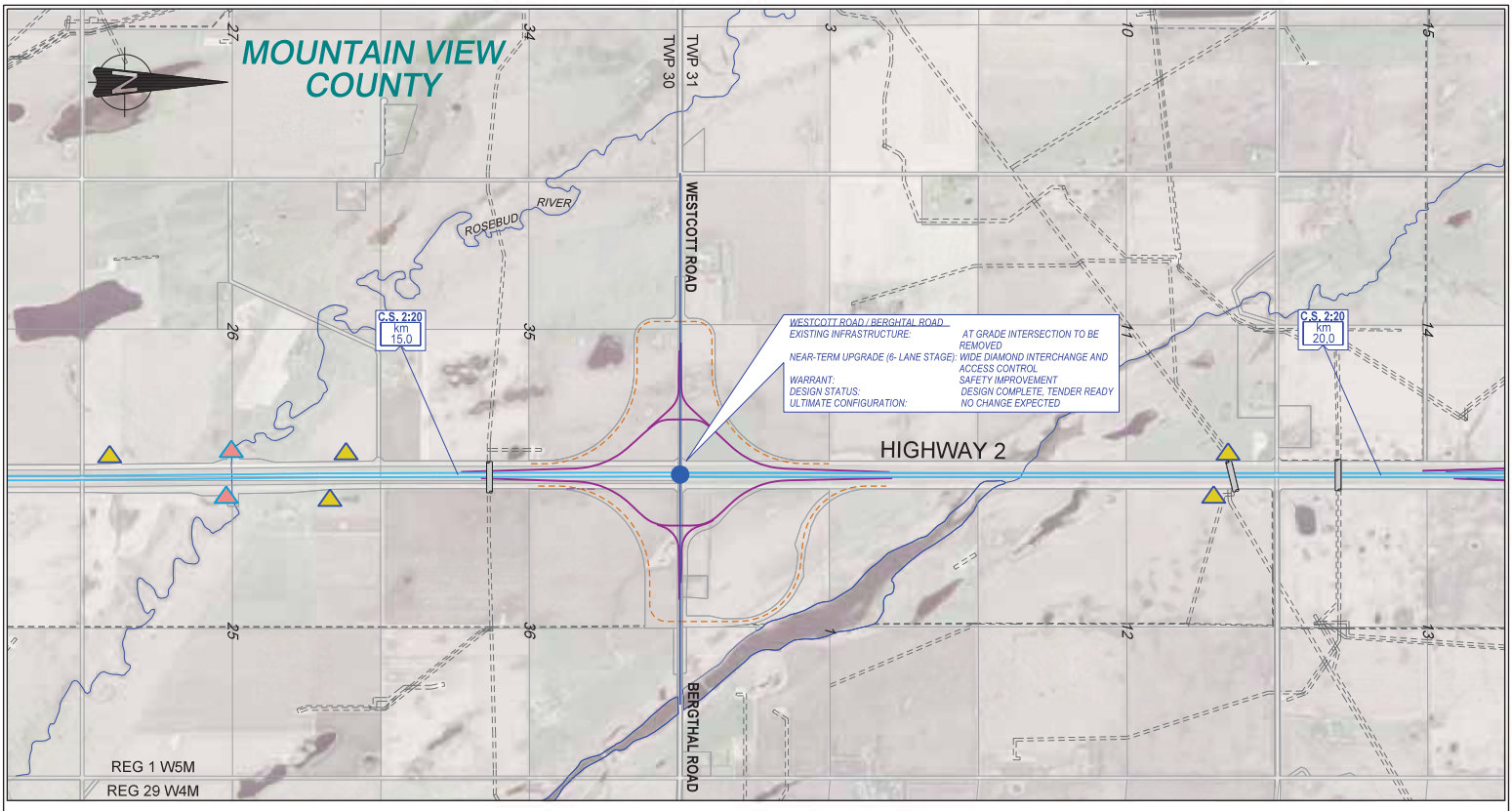
Alberta Transportation



CONSULTANT
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JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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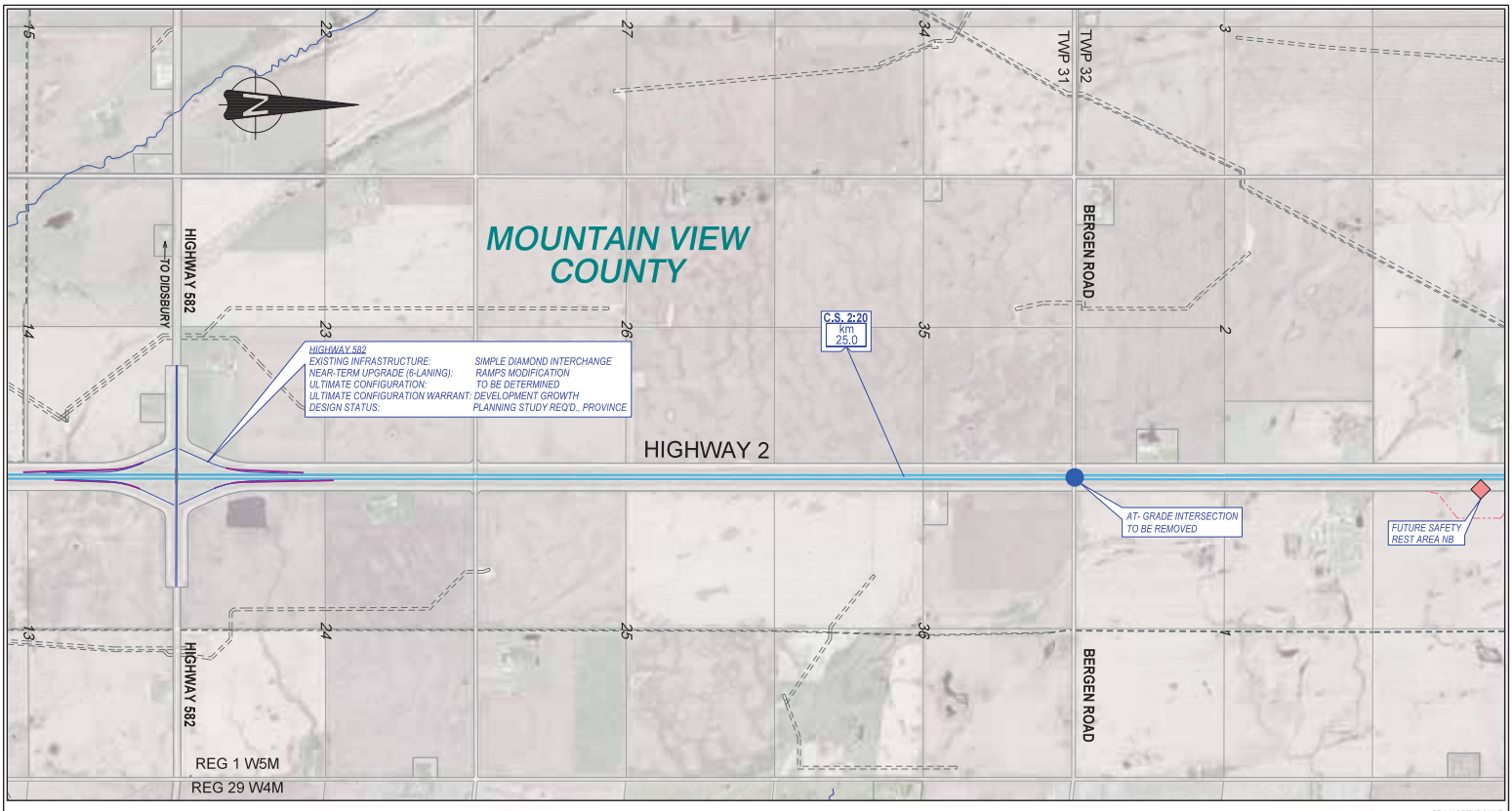

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JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
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DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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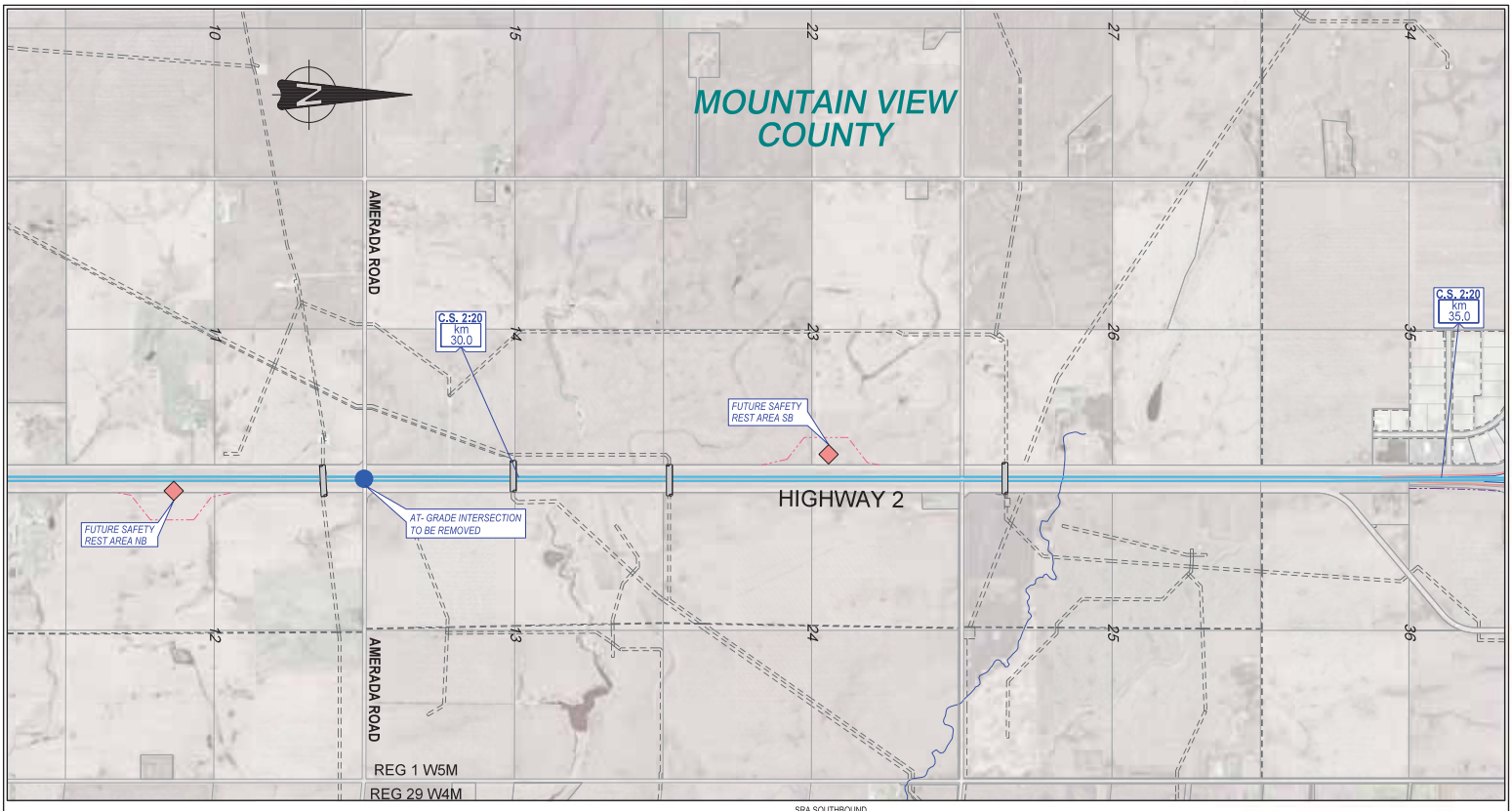

6 LANING — AADT 34,000 (LOS B/C) — 5 - 10 YEARS

SRA SOUTHBOUND

8 LANING — AADT 54,500 (LOS B/C) — BEYOND 25 YEARS

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JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000 (0, 100, 200, 300, 400)

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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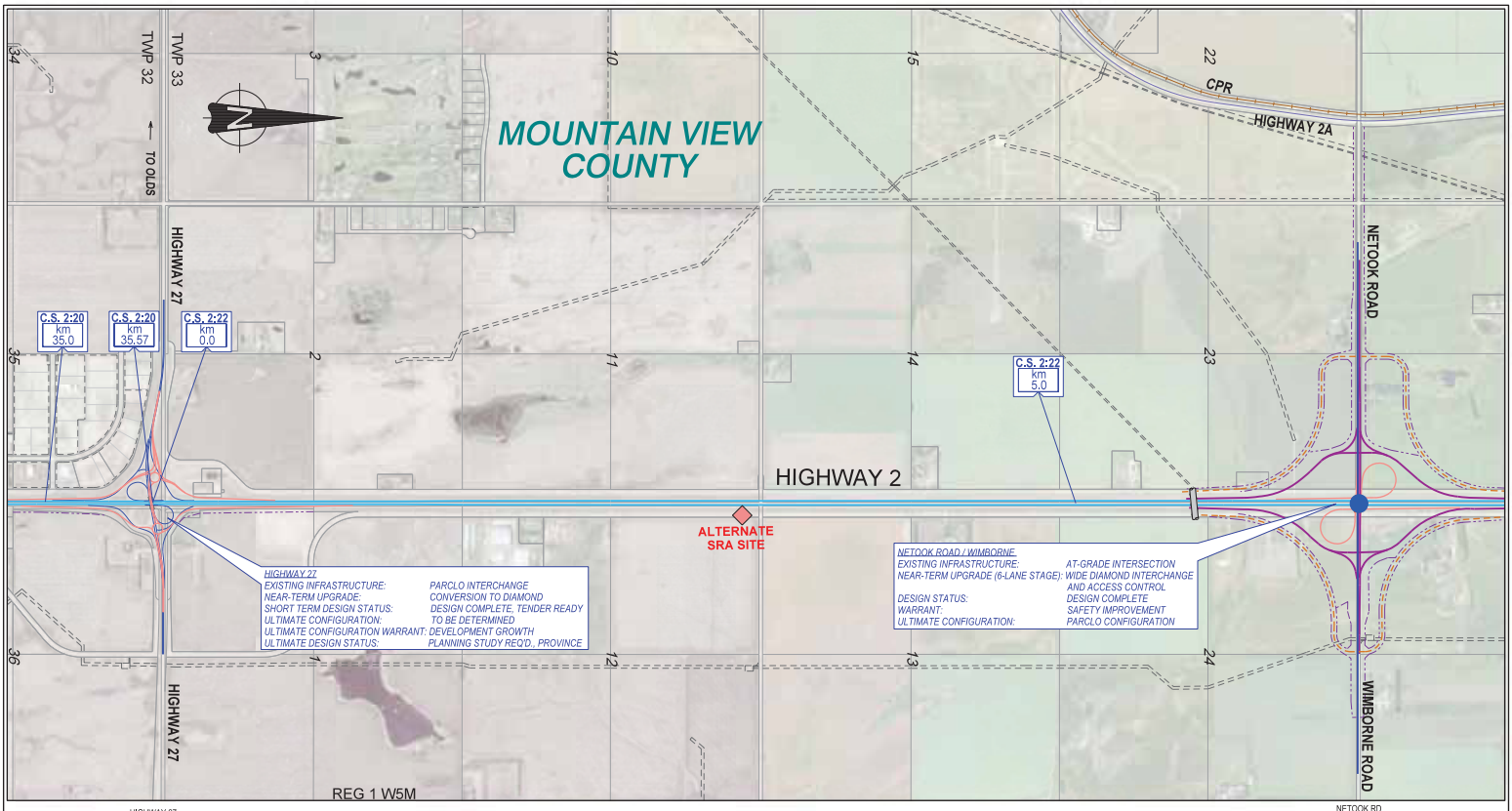
Alberta Transportation



CONSULTANT
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JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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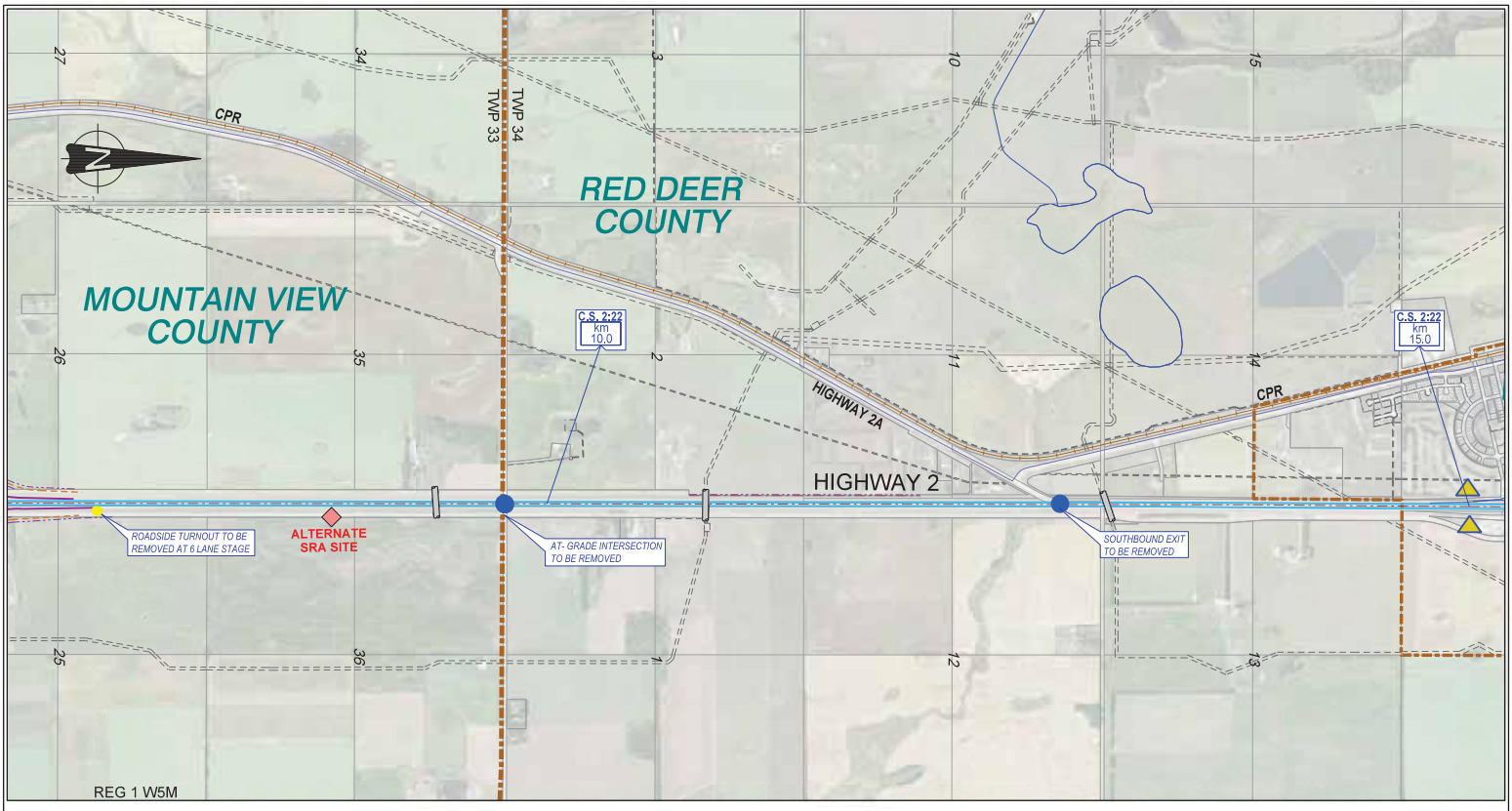

6 LANING — AADT 34,000 (LOS B/C) — 5 - 10 YEARS

8 LANING — AADT 54,500 (LOS B/C) — BEYOND 25 YEARS

CONSULTANT: CIMA+ Al-Terra Castlegenn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL	
UTILITIES RIGHT OF WAY	
MUNICIPAL BOUNDARY	
PROPOSED RIGHT OF WAY BOUNDARY	
PIPELINE CROSSING	
DEFICIENT CREST	
DEFICIENT SAG	

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000 (0, 100, 200, 300, 400)

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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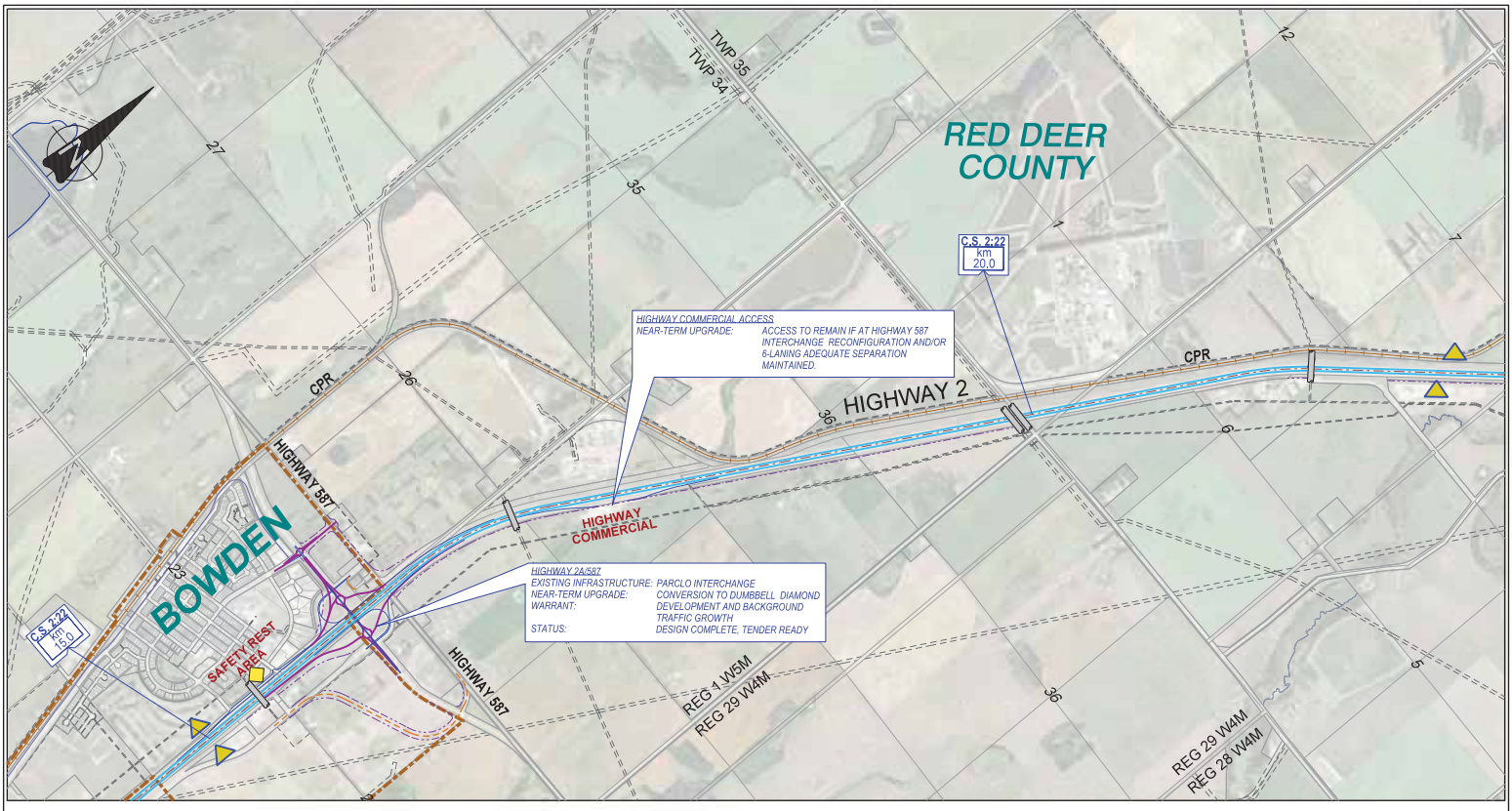
Alberta Transportation



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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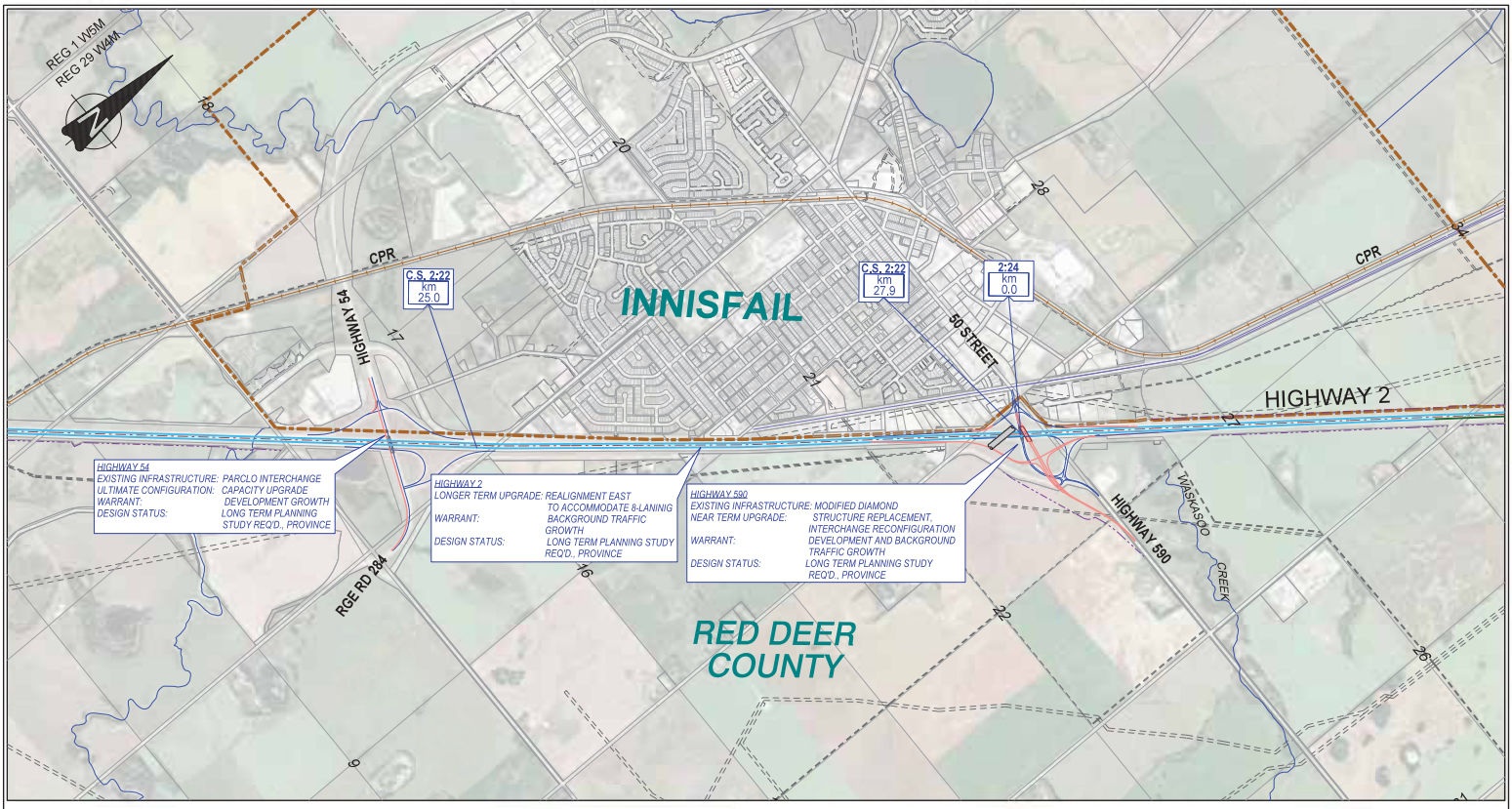

CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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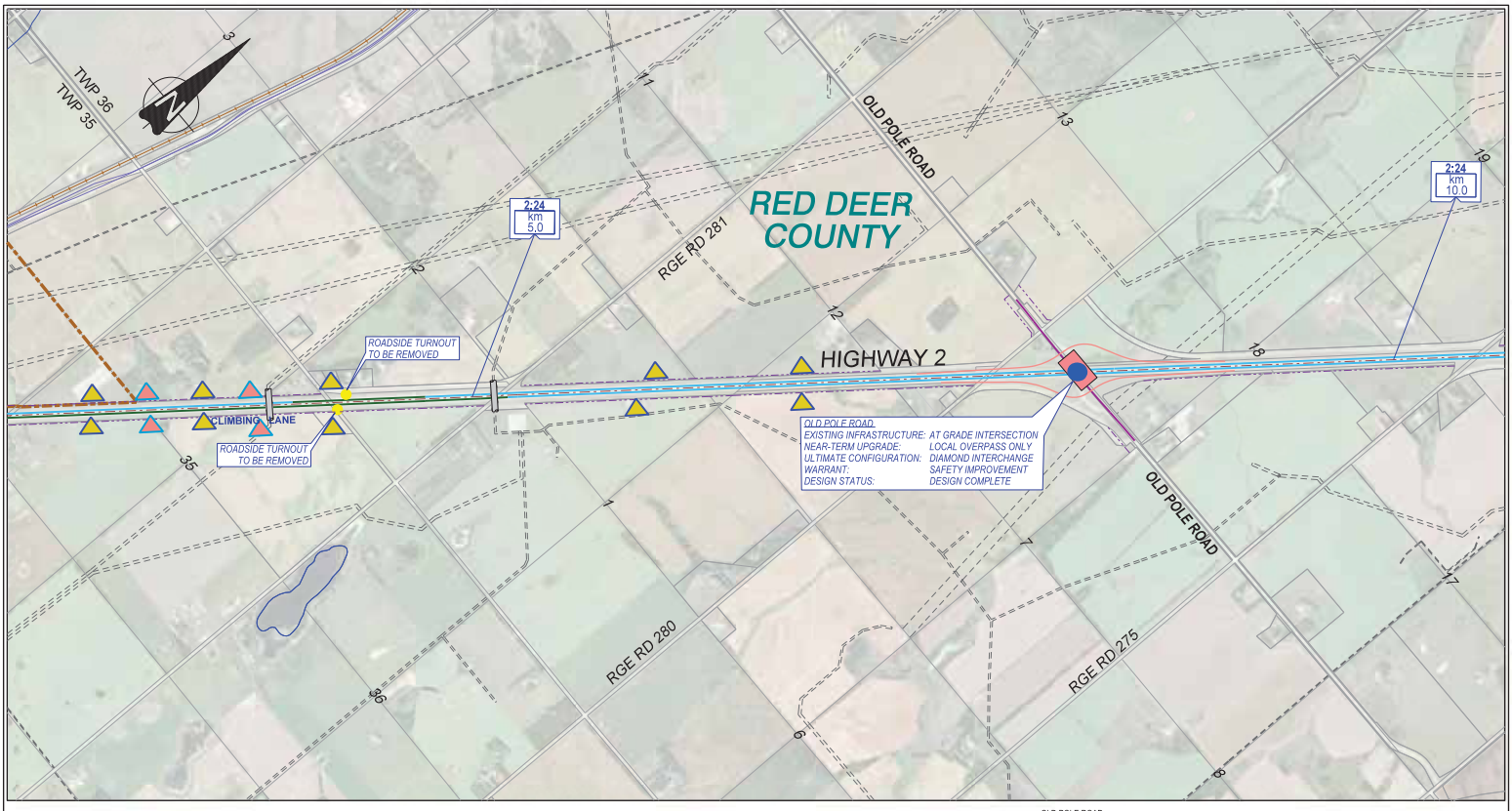
Alberta Transportation



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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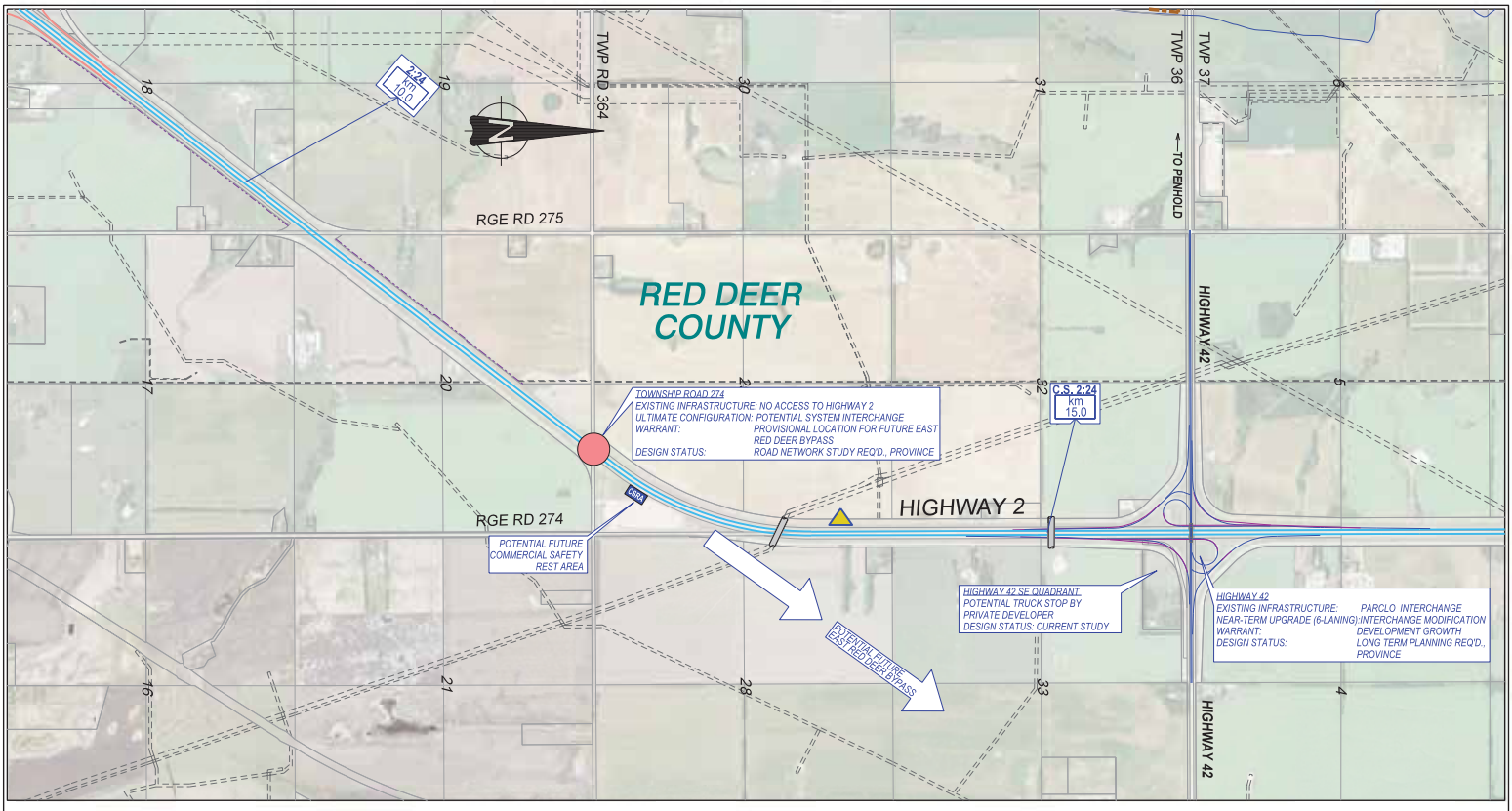

CONSULTANT

CIMA+ Al-Terra Castledenn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL	
UTILITIES RIGHT OF WAY	
MUNICIPAL BOUNDARY	
PROPOSED RIGHT OF WAY BOUNDARY	
PIPELINE CROSSING	
DEFICIENT CREST	
DEFICIENT SAG	

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000

0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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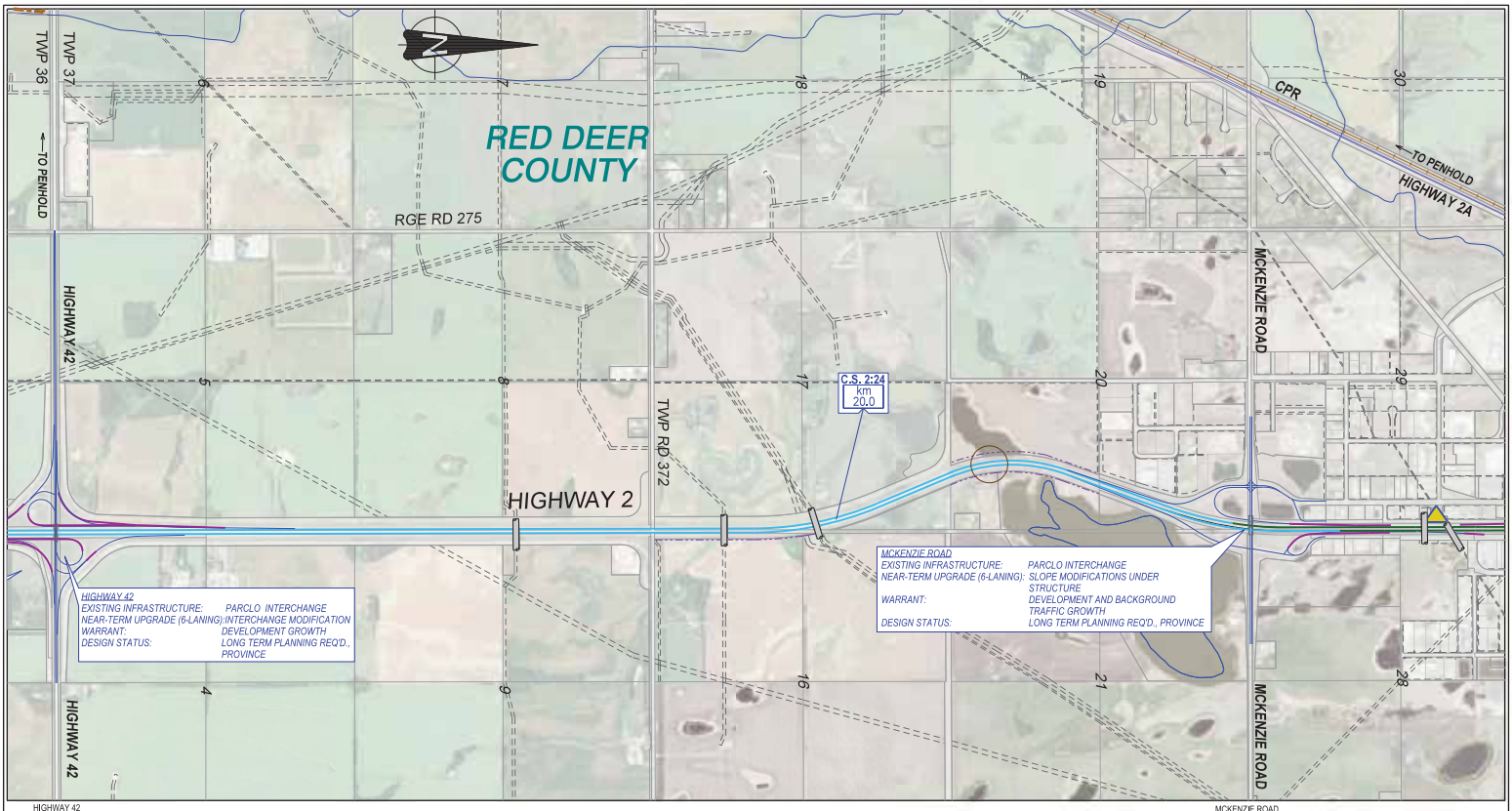


HIGHWAY 42 — MCKENZIE ROAD

6 LANING — AADT 47,700 (LOS C/D) — 10-20 YEARS — AADT 71,500 (LOS C/D) — UNDER CONSTRUCTION

8 LANING — BEYOND 25 YEARS — AADT 71,500 (LOS C/D) — BEYOND 25 YEARS — AADT 94,000 (LOS C/D) — BEYOND 25 YEARS

BYPASS REQUIRED — AADT 94,000 (LOS C/D)

CONSULTANT: CIMA+ Al-Terra Castledenn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

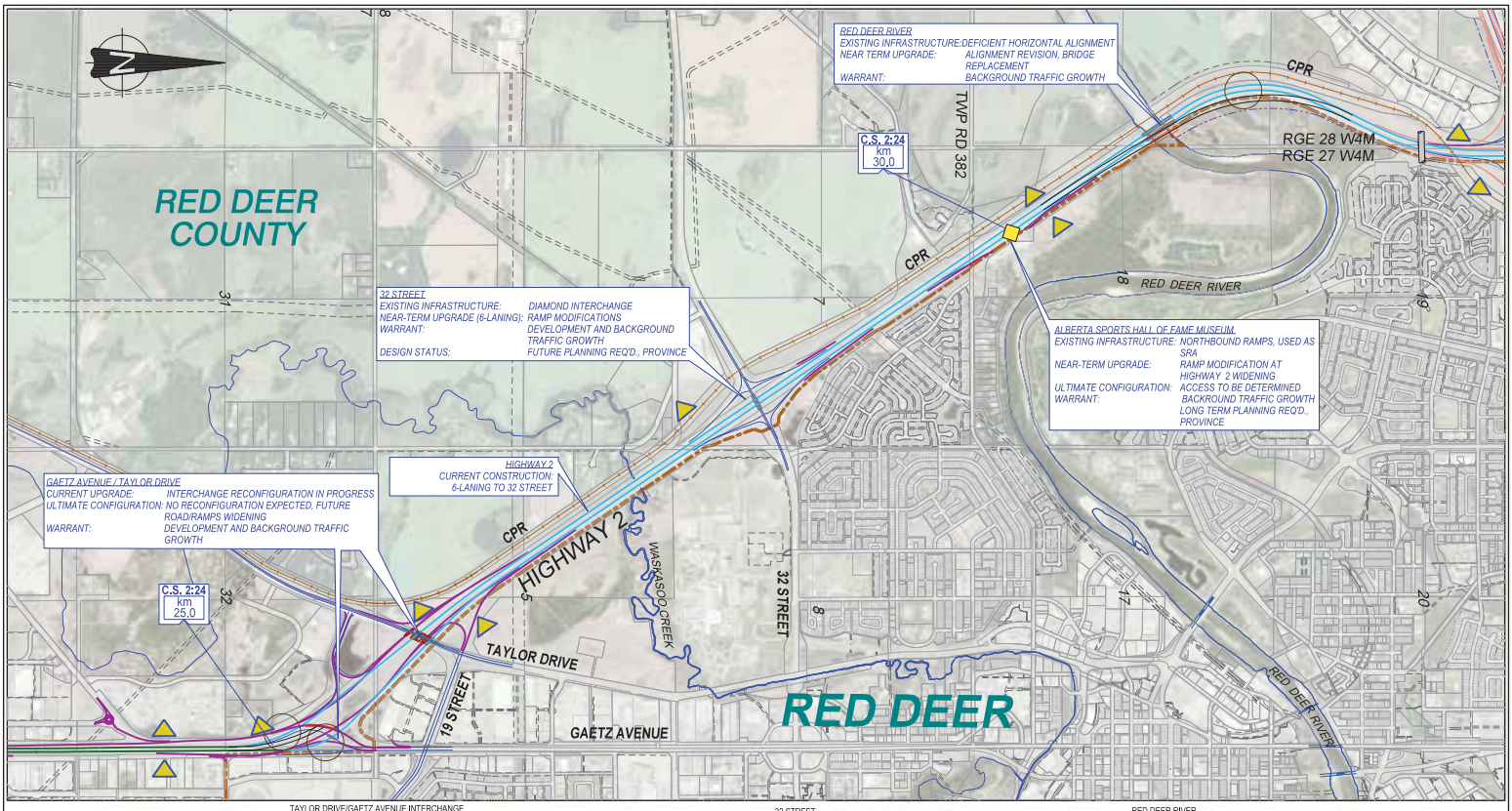
ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2-15 TO 2-32	2016-01-05	16 OF 36	R-1197-PL-16



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET
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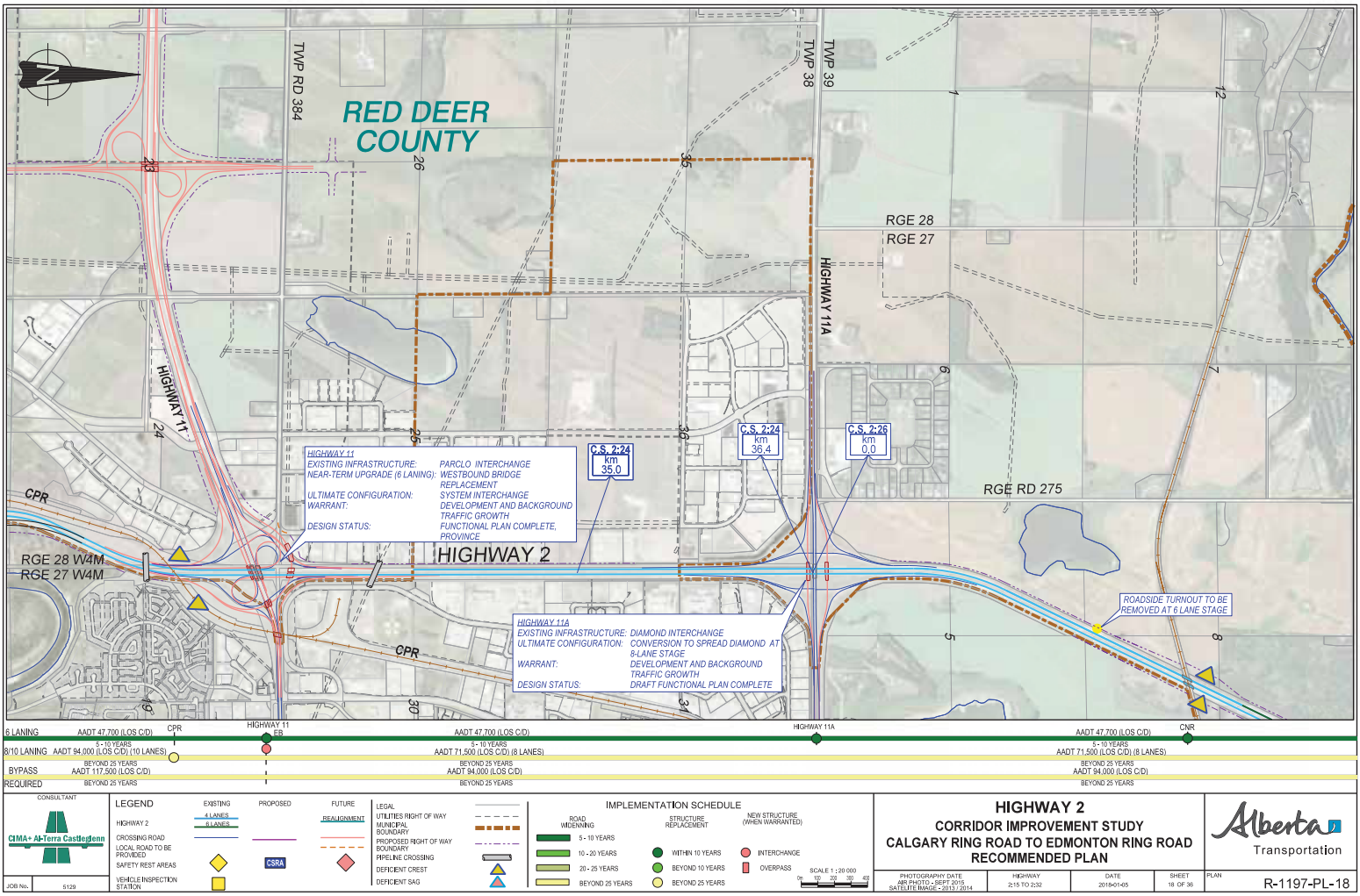
Alberta Transportation

PLAN R-1197-PL-17



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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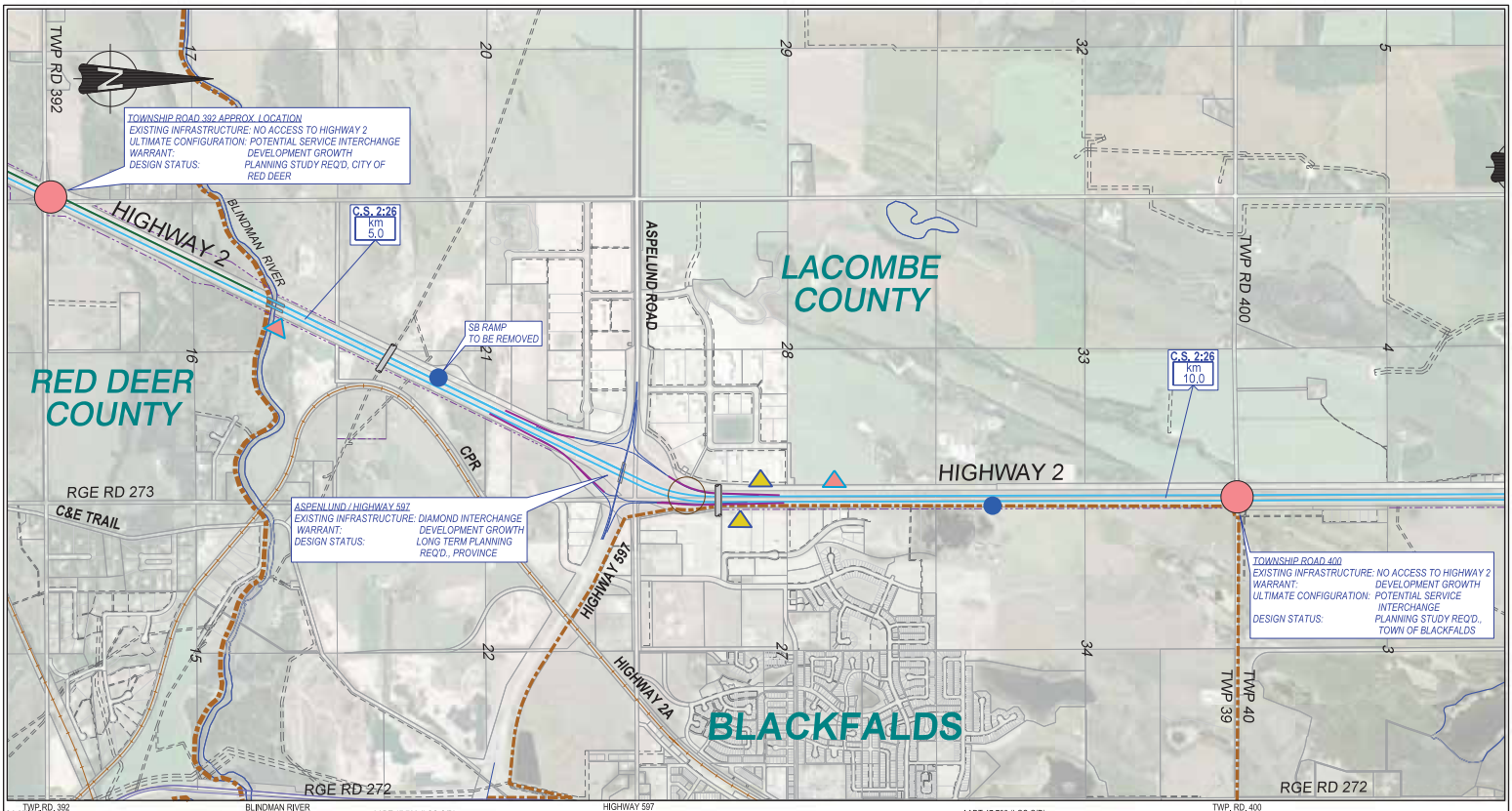

CONSULTANT

CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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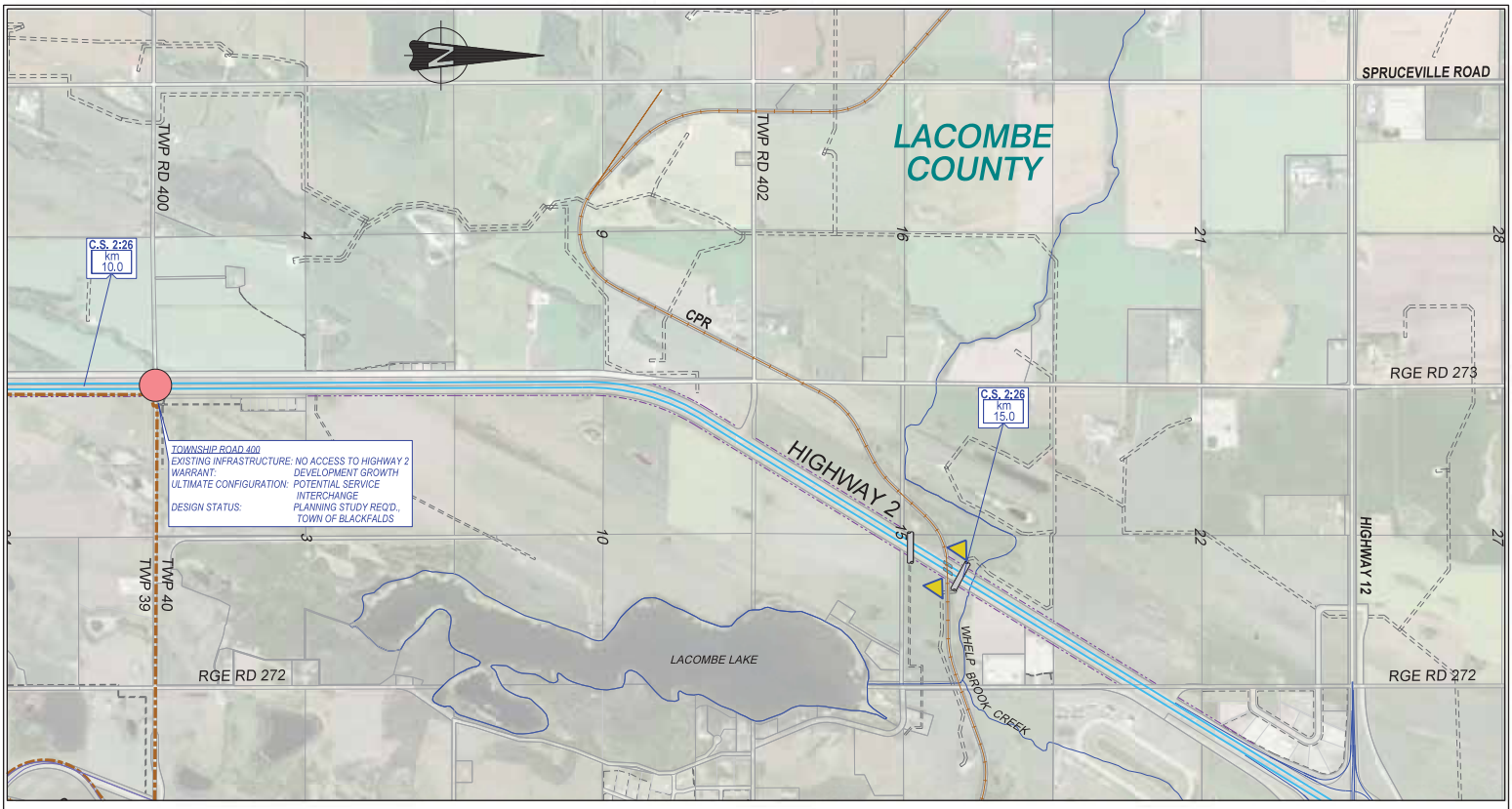


CONSULTANT
CIMA+ Al-Terra Castlegjenn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

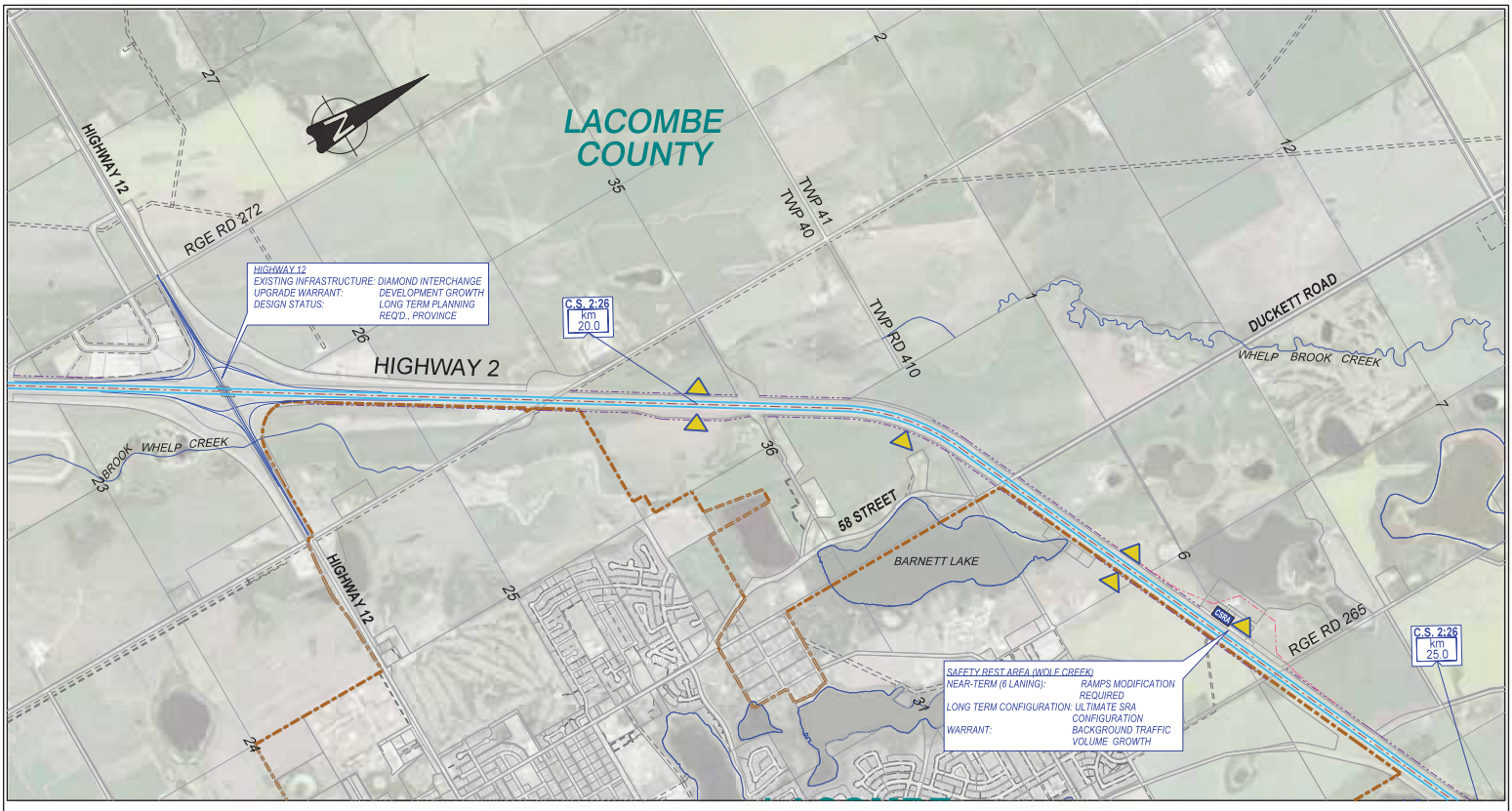
ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	20 OF 36	R-1197-PL-20



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

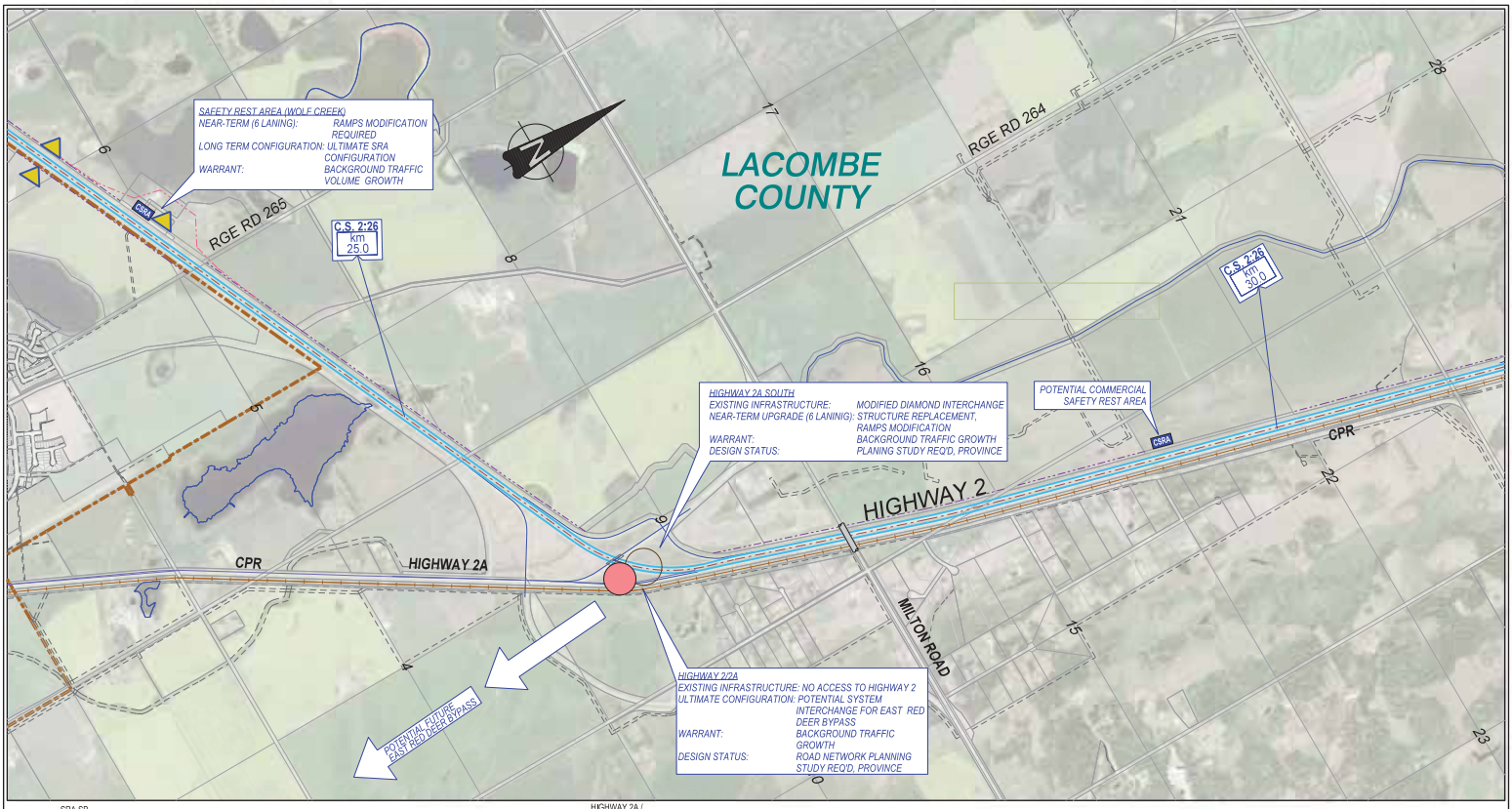
ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	21 OF 36	R-1197-PL-21



CONSULTANT
CIMA+ Al-Terra Castledenn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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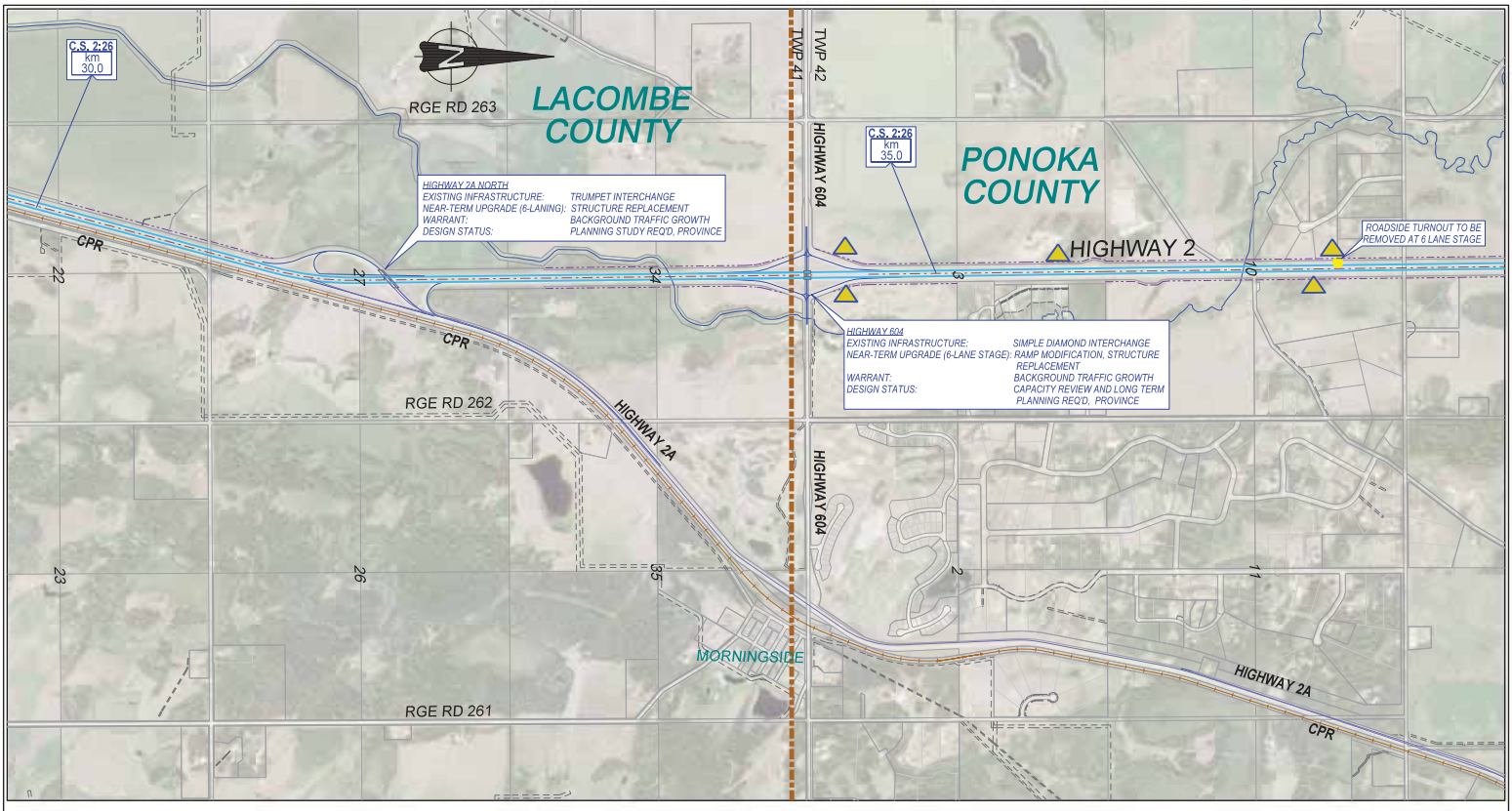

CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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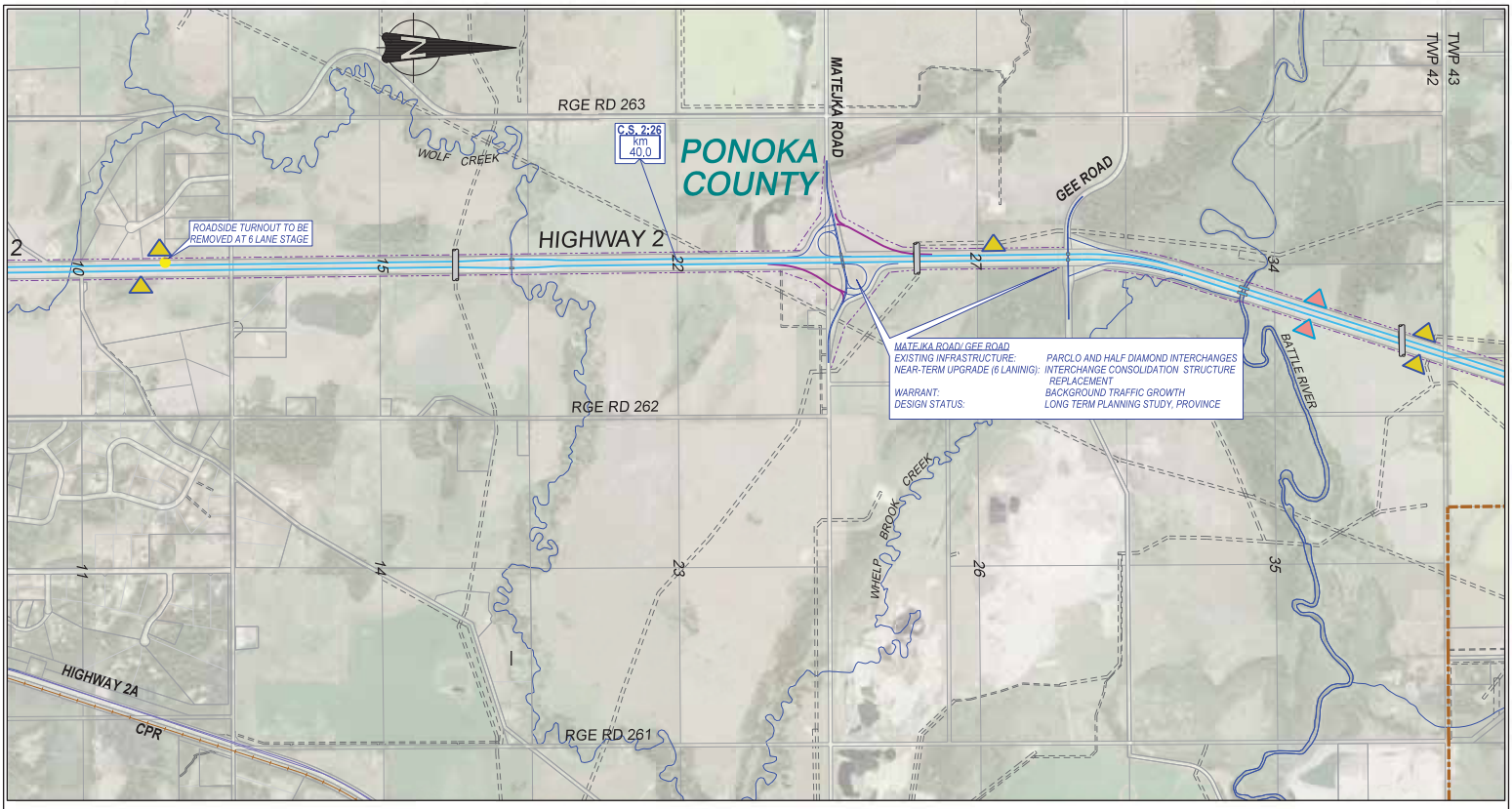

CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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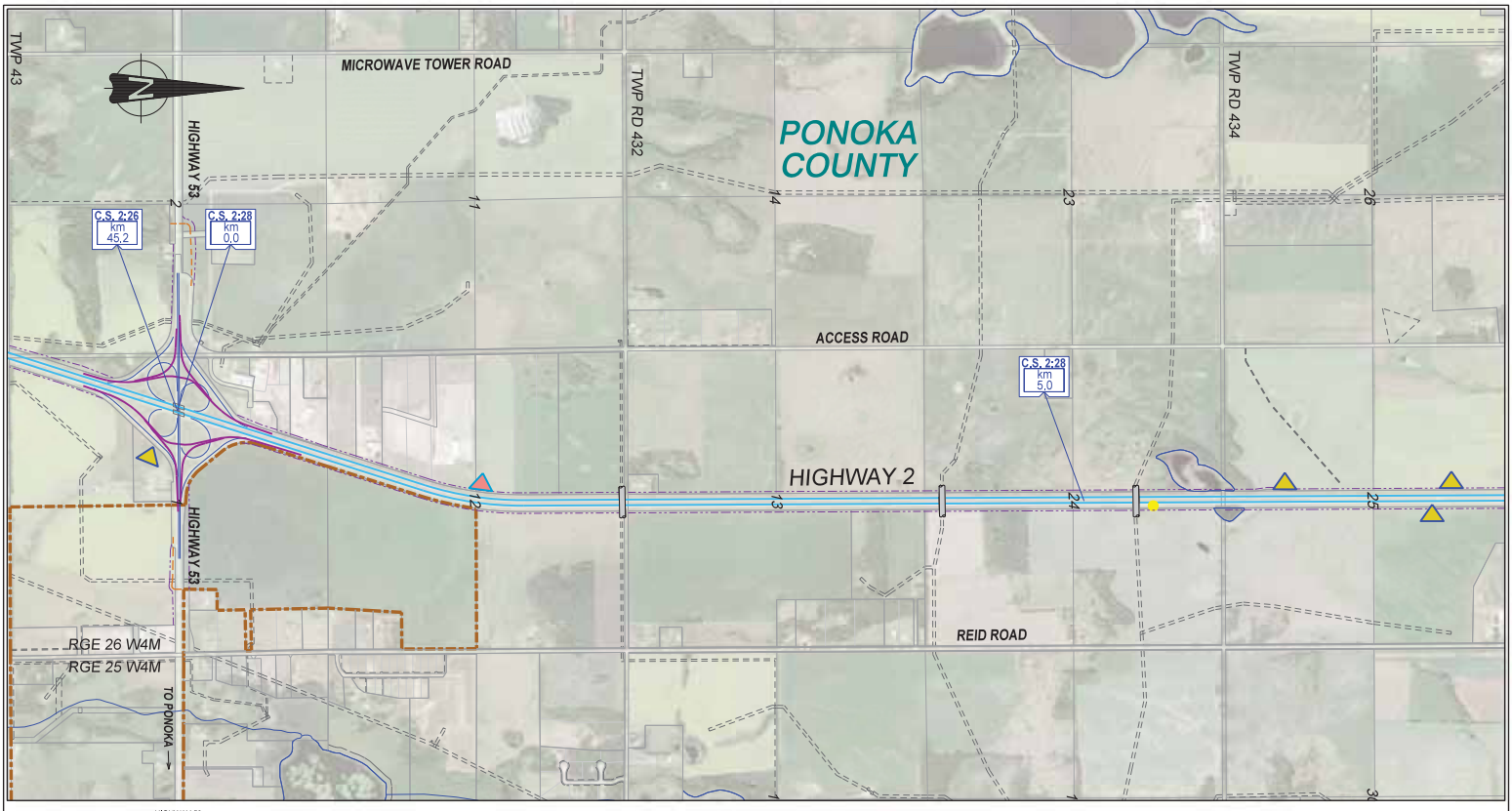

CONSULTANT: CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

EXISTING / PROPOSED / FUTURE

HIGHWAY 2 — 4 LANES / 6 LANES — REALIGNMENT

CROSSING ROAD

LOCAL ROAD TO BE PROVIDED — CSRA

SAFETY REST AREAS

VEHICLE INSPECTION STATION

LEGAL

UTILITIES RIGHT OF WAY

MUNICIPAL BOUNDARY

PROPOSED RIGHT OF WAY BOUNDARY

PIPELINE CROSSING

DEFICIENT CREST

DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000 (0 100 200 300 400)

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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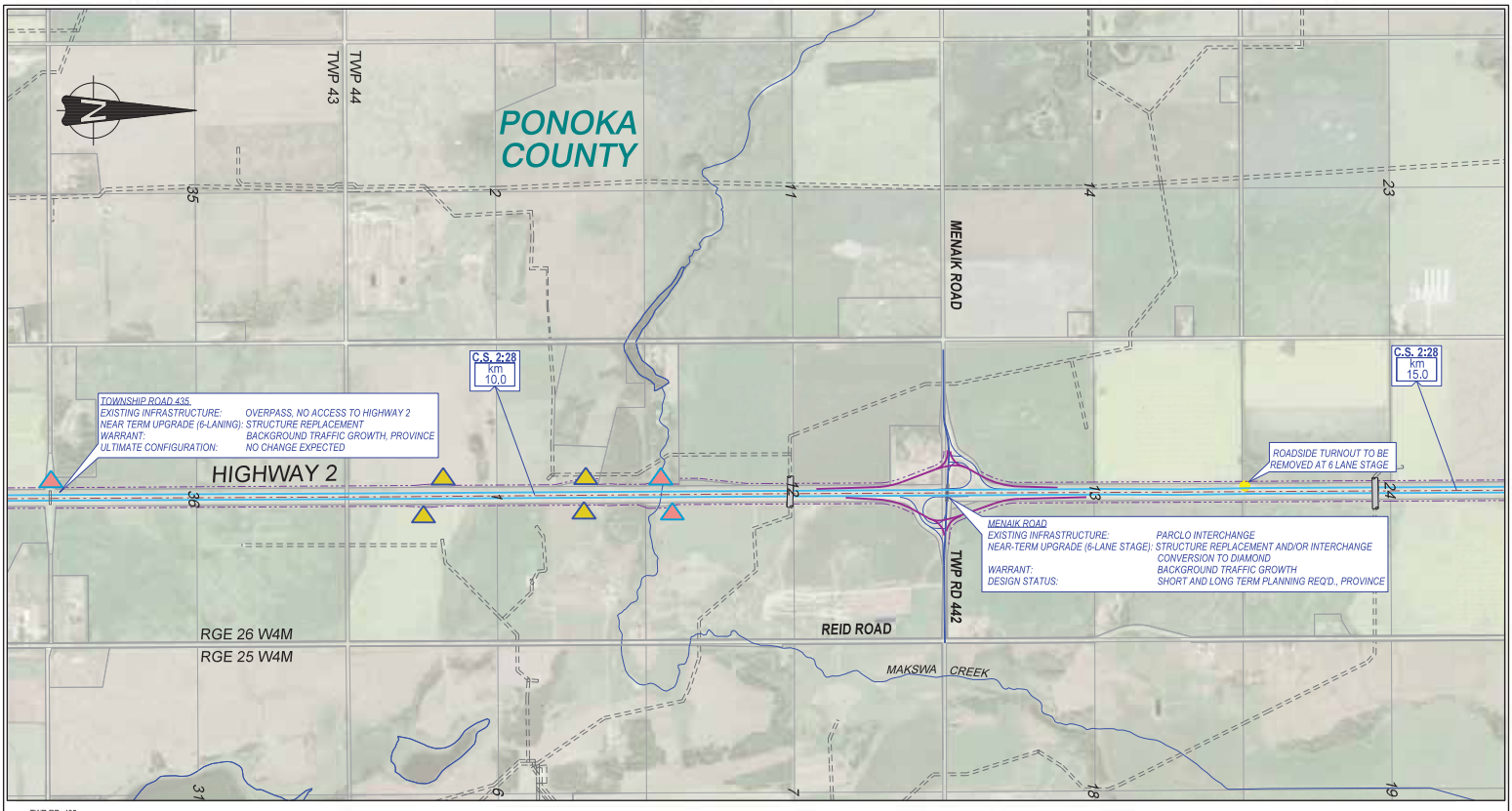

CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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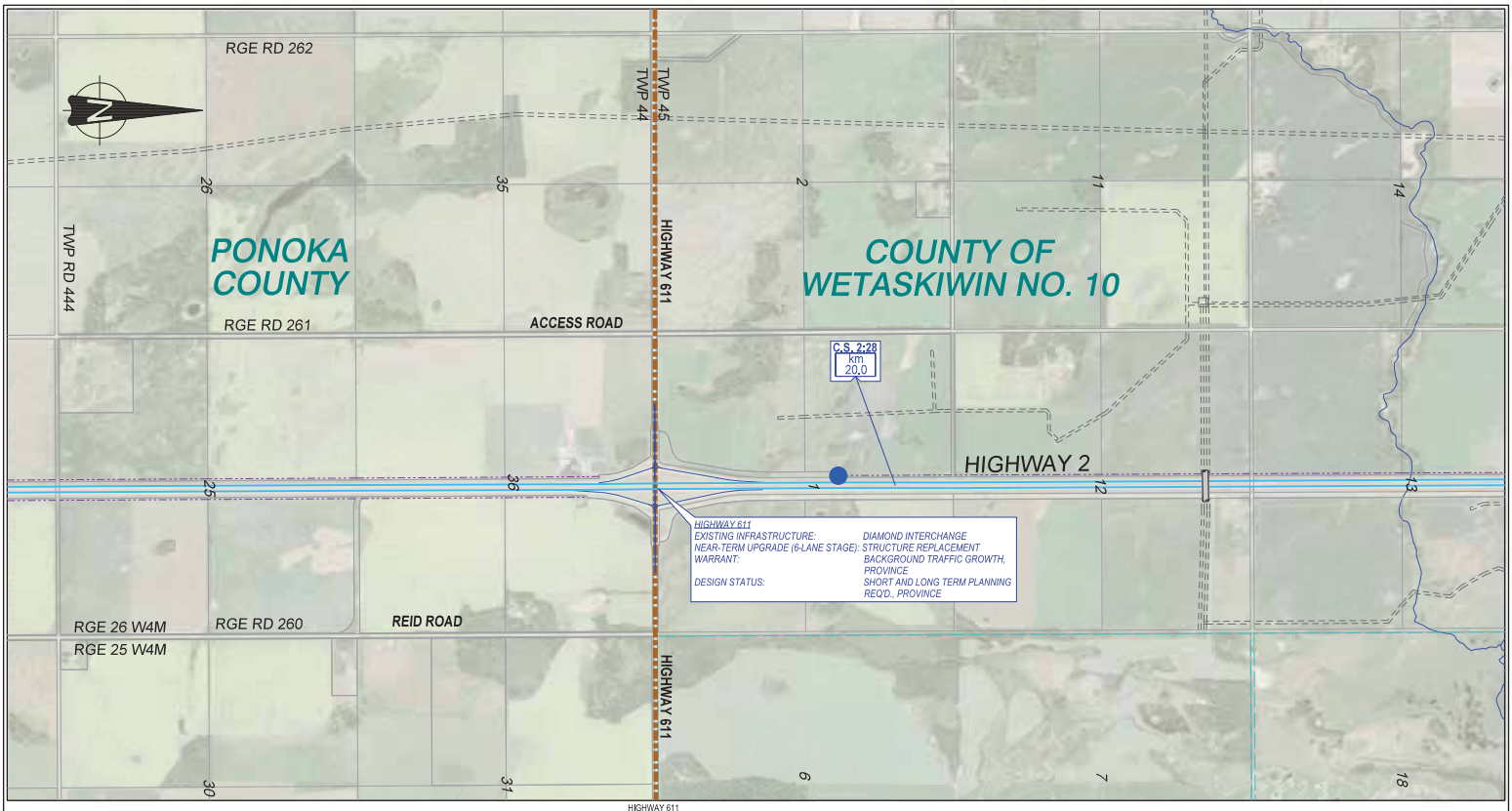

HIGHWAY 611

6 LANING — AADT 34,000 (LOS B/C) — 5 - 10 YEARS

8 LANING — AADT 54,500 (LOS B/C) — BEYOND 25 YEARS

CONSULTANT

CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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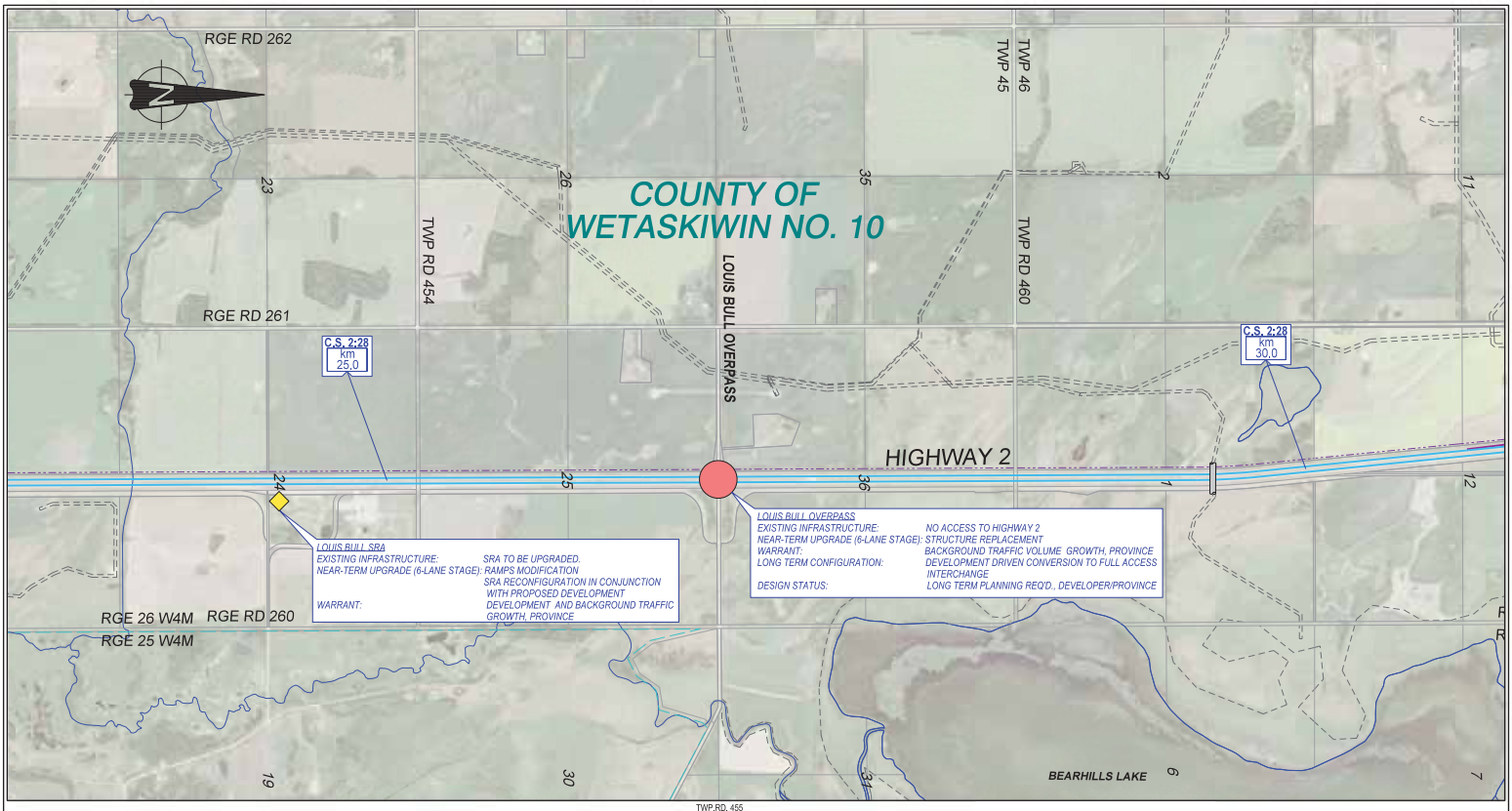

6 LANING AADT 34,000 (LOS B/C) 5 - 10 YEARS

8 LANING AADT 54,500 (LOS B/C) BEYOND 25 YEARS

TWP RD. 455 LOUIS BULL OVERPASS

CONSULTANT: CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED		CSRA	
SAFETY REST AREAS			
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000 (0, 100, 200, 300, 400)

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
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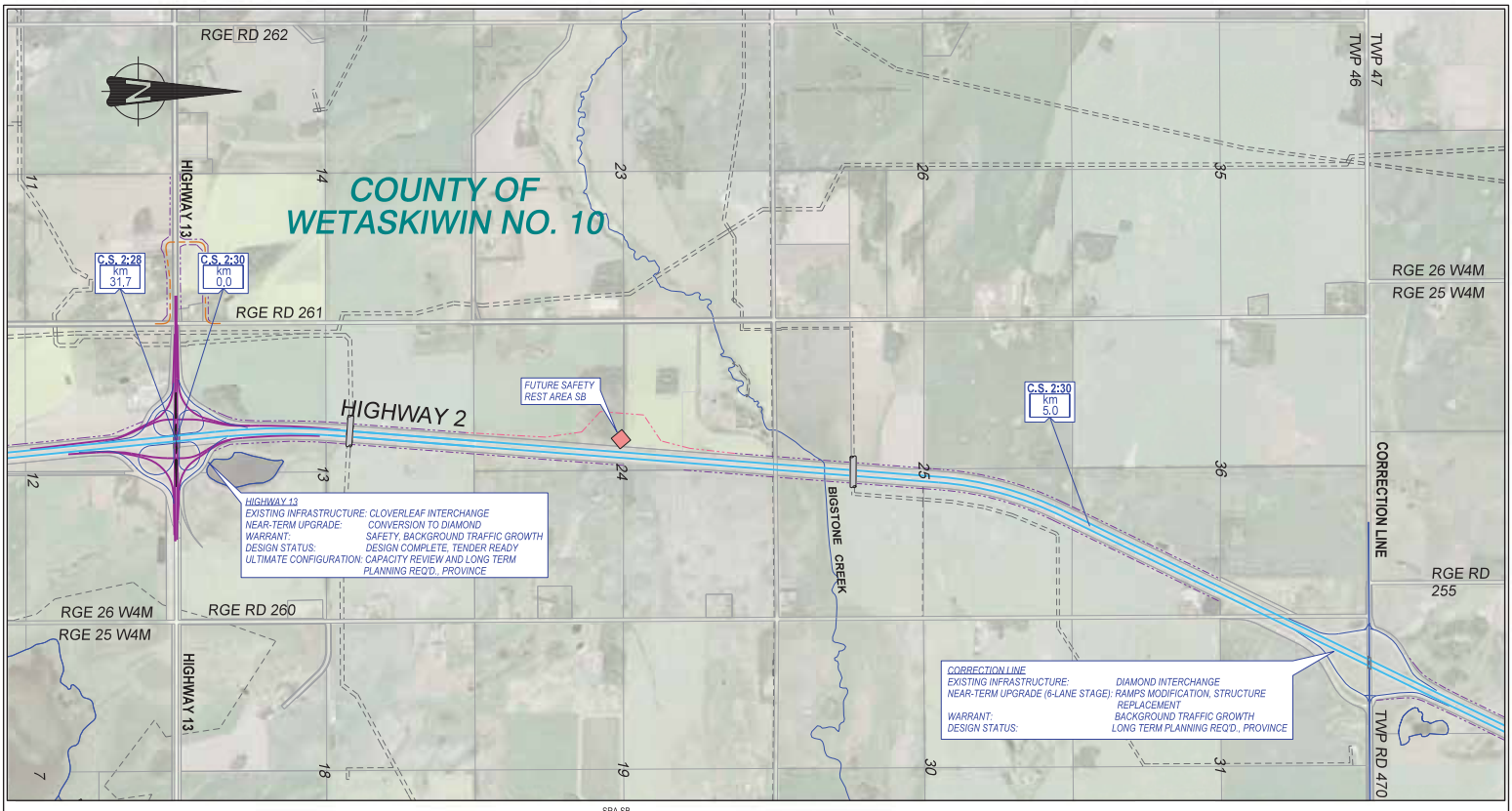


CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	29 OF 36	R-1197-PL-29



6 LANING — AADT 34,000 (LOS B/C) — 5 - 10 YEARS

8 LANING — AADT 54,500 (LOS B/C) — BEYOND 25 YEARS

CONSULTANT

CIMA+ AI-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL	
UTILITIES RIGHT OF WAY	
MUNICIPAL BOUNDARY	
PROPOSED RIGHT OF WAY BOUNDARY	
PIPELINE CROSSING	
DEFICIENT CREST	
DEFICIENT SAG	

IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000

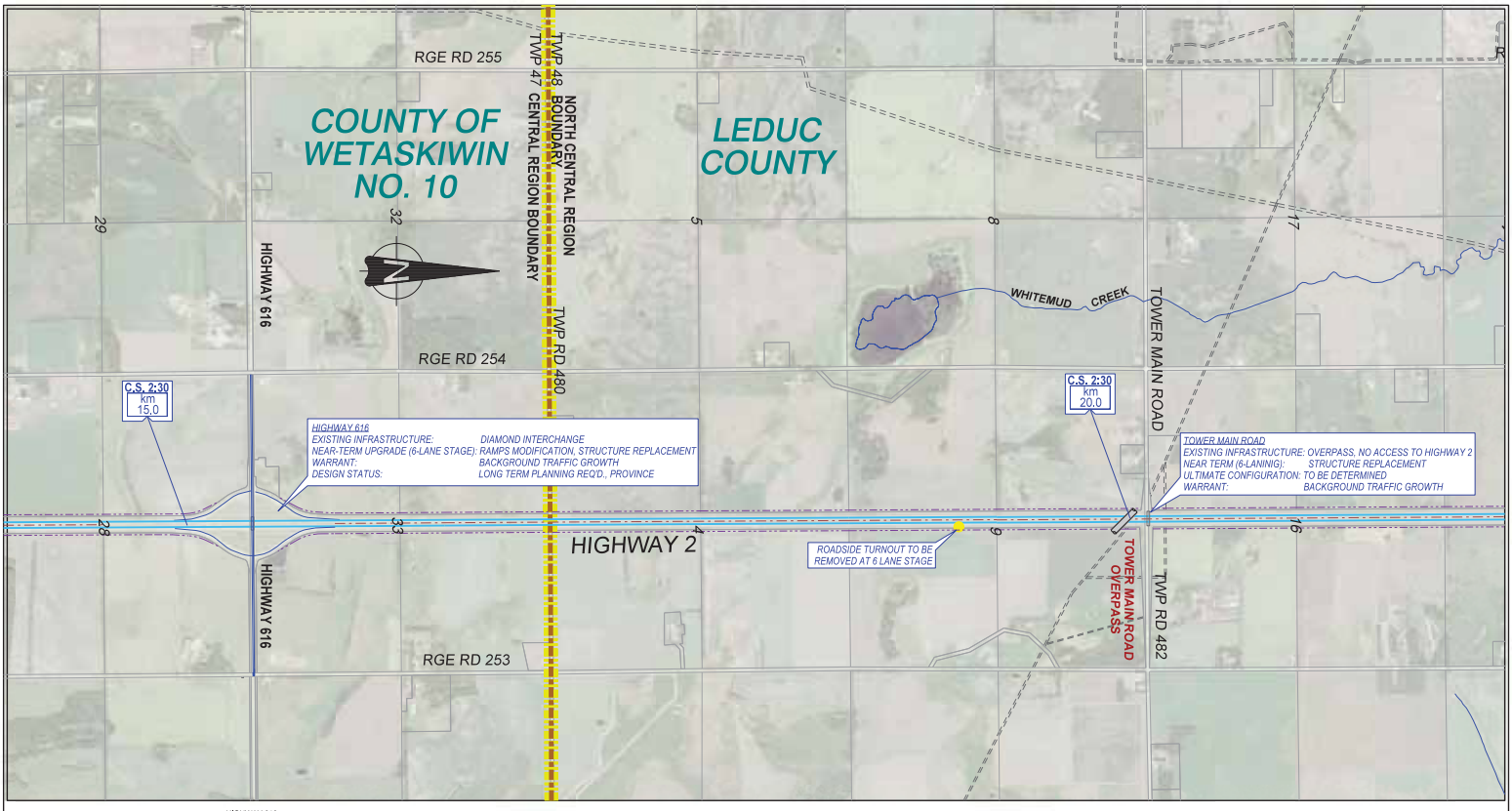
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	OF 36	30

R-1197-PL-30



CONSULTANT

CIMA+ Al-Terra Castledenn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

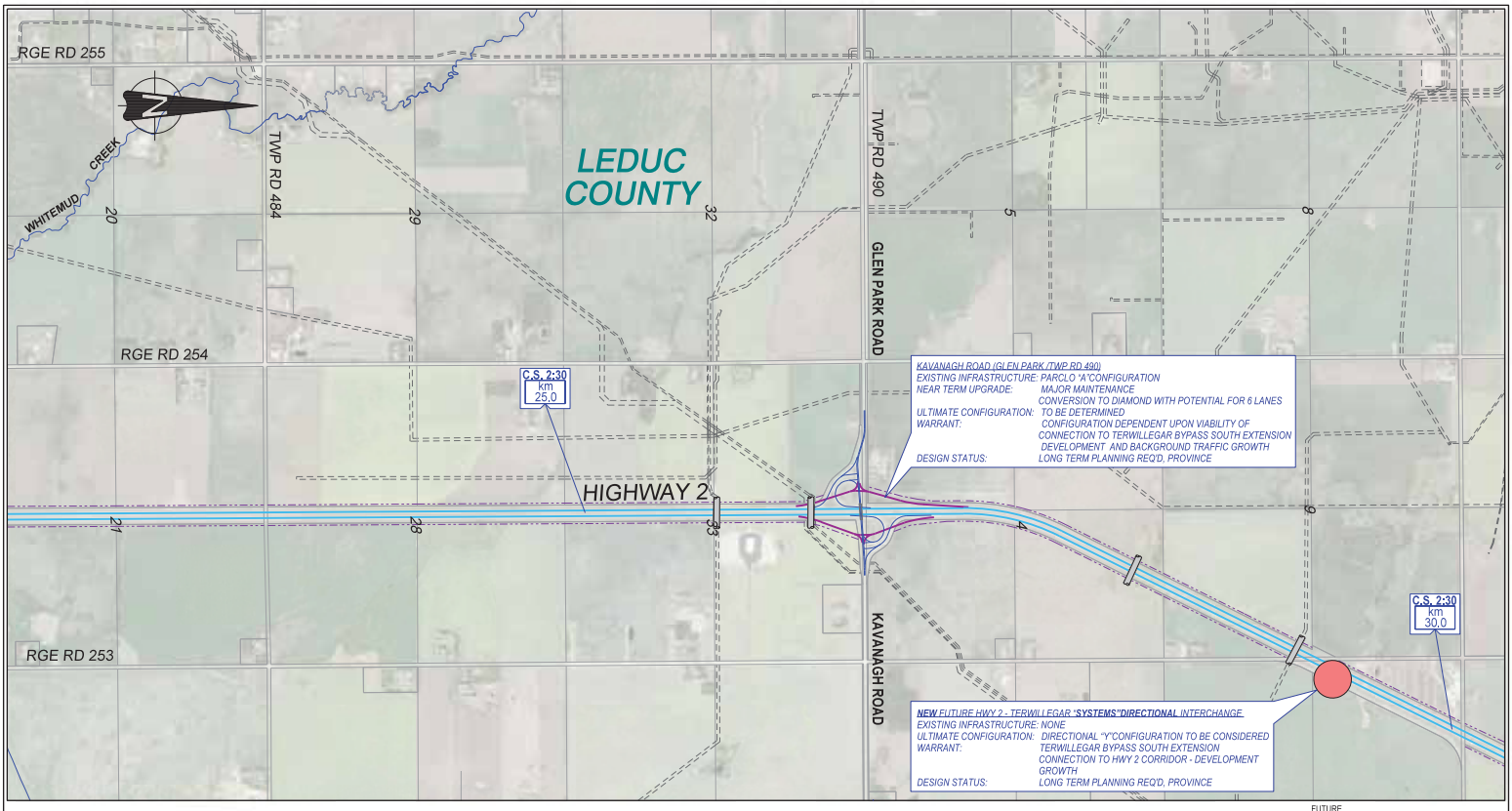
ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	31 OF 36	R-1197-PL-31



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY BOUNDARY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG

IMPLEMENTATION SCHEDULE

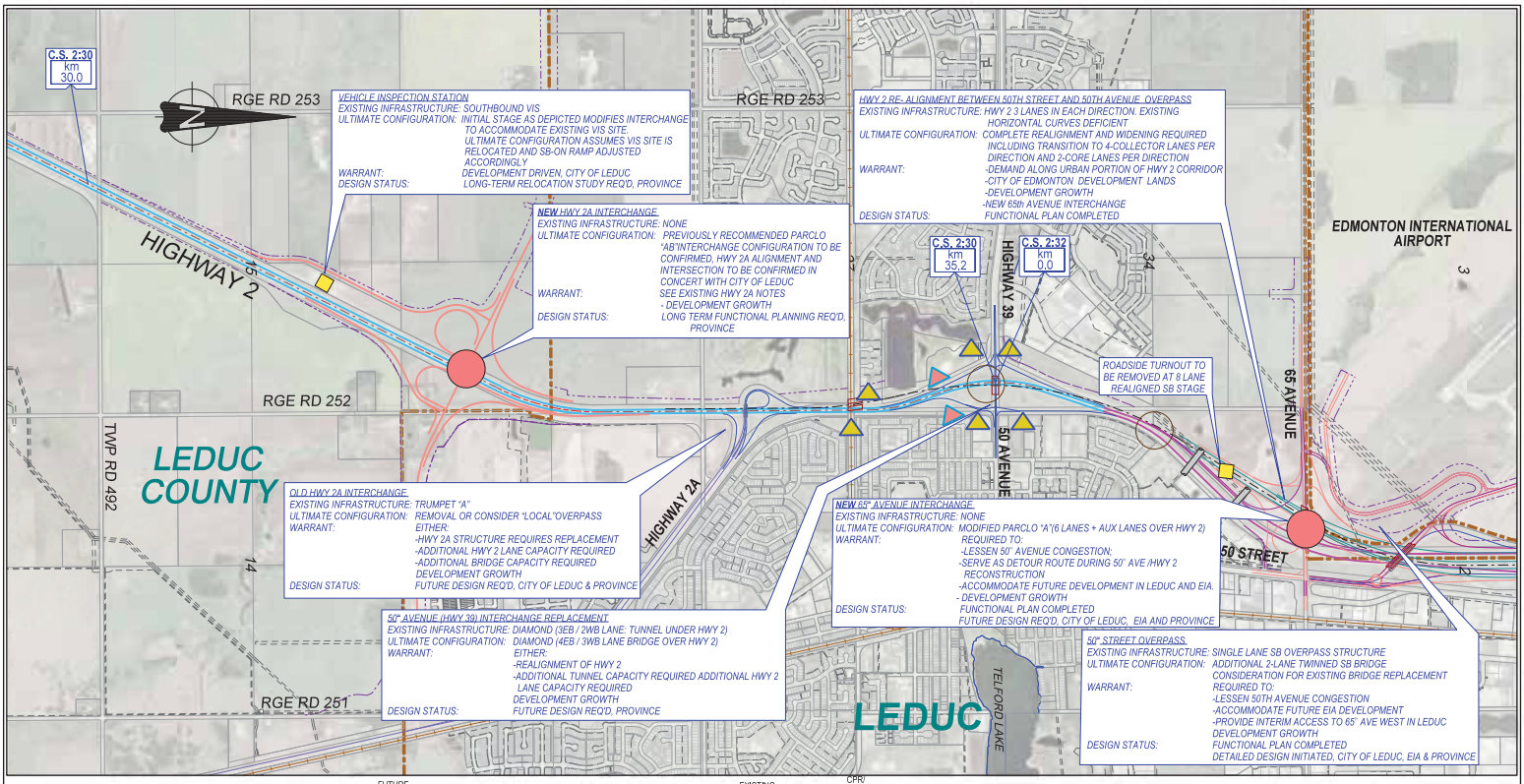
ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

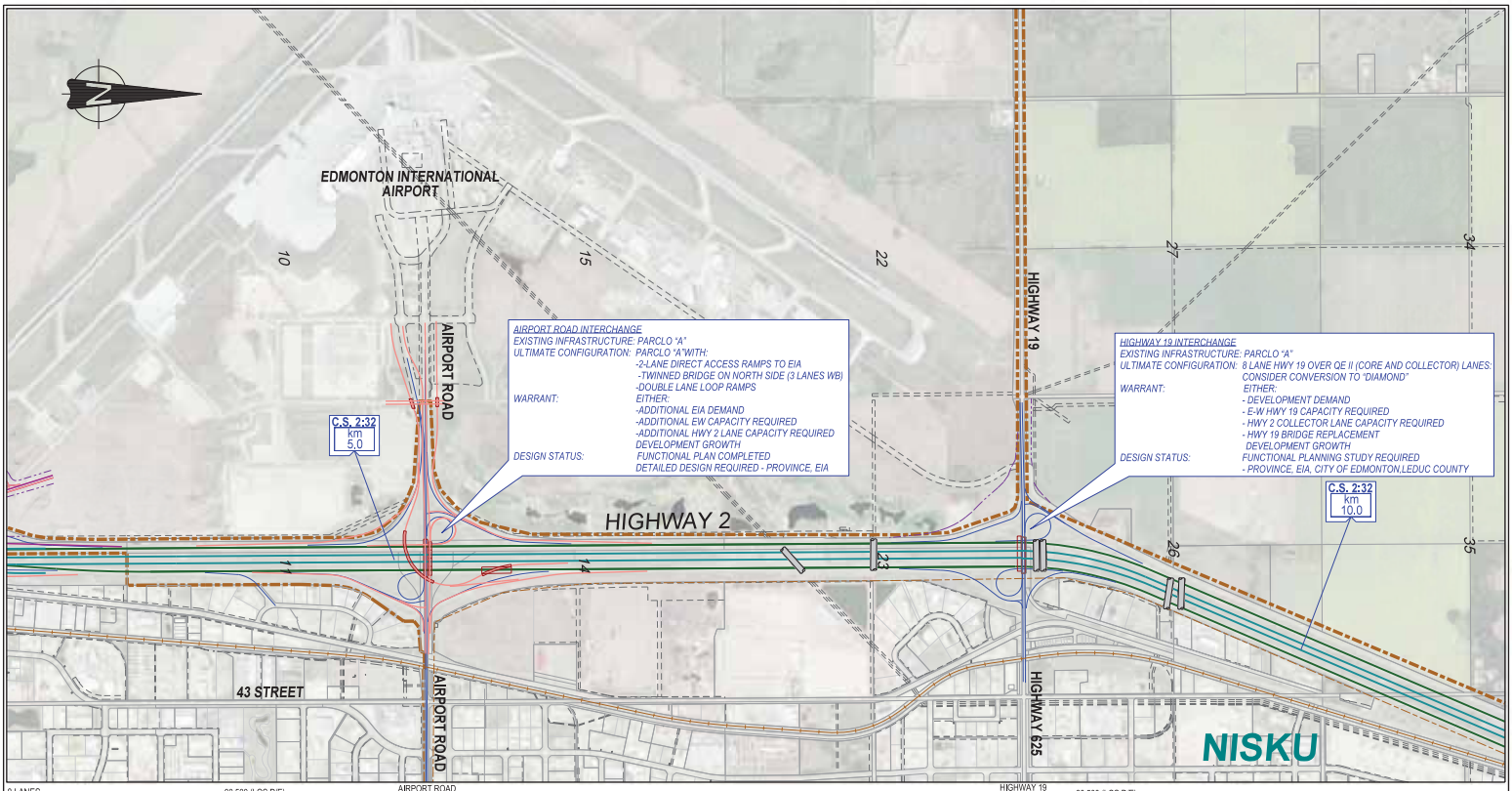
SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	32 OF 36	R-1197-PL-32


C.S. 2:30
km
30.0
RGE RD 253
VEHICLE INSPECTION STATION
EXISTING INFRASTRUCTURE: SOUTHBOUND VIS
ULTIMATE CONFIGURATION: INITIAL STAGE AS DEPICTED MODIFIES INTERCHANGE TO ACCOMMODATE EXISTING VIS SITE. ULTIMATE CONFIGURATION ASSUMES VIS SITE IS RELOCATED AND SB-ON RAMP ADJUSTED ACCORDINGLY
WARRANT: DEVELOPMENT DRIVEN, CITY OF LEDUC
DESIGN STATUS: LONG-TERM RELOCATION STUDY REQ'D, PROVINCE
RGE RD 253
HWY 2 RE- ALIGNMENT BETWEEN 50TH STREET AND 50TH AVENUE OVERPASS
EXISTING INFRASTRUCTURE: HWY 2 3 LANES IN EACH DIRECTION, EXISTING HORIZONTAL CURVES DEFICIENT
ULTIMATE CONFIGURATION: COMPLETE REALIGNMENT AND WIDENING REQUIRED INCLUDING TRANSITION TO 4-COLLECTOR LANES PER DIRECTION AND 2-CORE LANES PER DIRECTION
WARRANT: -DEMAND ALONG URBAN PORTION OF HWY 2 CORRIDOR -CITY OF EDMONTON DEVELOPMENT LANDS -DEVELOPMENT GROWTH -NEW 65th AVENUE INTERCHANGE
DESIGN STATUS: FUNCTIONAL PLAN COMPLETED
NEW HWY 2A INTERCHANGE
EXISTING INFRASTRUCTURE: NONE
ULTIMATE CONFIGURATION: PREVIOUSLY RECOMMENDED PARCLO "AB"INTERCHANGE CONFIGURATION TO BE CONFIRMED, HWY 2A ALIGNMENT AND INTERSECTION TO BE CONFIRMED IN CONCERT WITH CITY OF LEDUC
WARRANT: SEE EXISTING HWY 2A NOTES - DEVELOPMENT GROWTH
DESIGN STATUS: LONG TERM FUNCTIONAL PLANNING REQ'D, PROVINCE
HIGHWAY 2
C.S. 2:30
km
35.2
C.S. 2:32
km
0.0
HIGHWAY 39
EDMONTON INTERNATIONAL AIRPORT
ROADSIDE TURNOUT TO BE REMOVED AT 8 LANE REALIGNED SB STAGE
65 AVENUE
50 AVENUE
RGE RD 252
TWP RD 492
LEDUC COUNTY
OLD HWY 2A INTERCHANGE
EXISTING INFRASTRUCTURE: TRUMPET "A"
ULTIMATE CONFIGURATION: REMOVAL OR CONSIDER "LOCAL"OVERPASS
WARRANT: EITHER: -HWY 2A STRUCTURE REQUIRES REPLACEMENT -ADDITIONAL HWY 2 LANE CAPACITY REQUIRED -ADDITIONAL BRIDGE CAPACITY REQUIRED DEVELOPMENT GROWTH
DESIGN STATUS: FUTURE DESIGN REQ'D, CITY OF LEDUC & PROVINCE
HIGHWAY 2A
NEW 65" AVENUE INTERCHANGE
EXISTING INFRASTRUCTURE: NONE
ULTIMATE CONFIGURATION: MODIFIED PARCLO "A"(6 LANES + AUX LANES OVER HWY 2)
WARRANT: REQUIRED TO: -LESSEN 50" AVENUE CONGESTION; -SERVE AS DETOUR ROUTE DURING 50" AVE /HWY 2 RECONSTRUCTION -ACCOMMODATE FUTURE DEVELOPMENT IN LEDUC AND EIA. - DEVELOPMENT GROWTH
DESIGN STATUS: FUNCTIONAL PLAN COMPLETED FUTURE DESIGN REQ'D, CITY OF LEDUC, EIA AND PROVINCE
50 STREET
50" AVENUE (HWY 39) INTERCHANGE REPLACEMENT
EXISTING INFRASTRUCTURE: DIAMOND (3EB / 2WB LANE: TUNNEL UNDER HWY 2)
ULTIMATE CONFIGURATION: DIAMOND (4EB / 3WB LANE BRIDGE OVER HWY 2)
WARRANT: EITHER: -REALIGNMENT OF HWY 2 -ADDITIONAL TUNNEL CAPACITY REQUIRED ADDITIONAL HWY 2 LANE CAPACITY REQUIRED DEVELOPMENT GROWTH
DESIGN STATUS: FUTURE DESIGN REQ'D, PROVINCE
RGE RD 251
LEDUC
TELFORD LAKE
50" STREET OVERPASS
EXISTING INFRASTRUCTURE: SINGLE LANE SB OVERPASS STRUCTURE
ULTIMATE CONFIGURATION: ADDITIONAL 2-LANE TWINNED SB BRIDGE CONSIDERATION FOR EXISTING BRIDGE REPLACEMENT
WARRANT: REQUIRED TO: -LESSEN 50TH AVENUE CONGESTION -ACCOMMODATE FUTURE EIA DEVELOPMENT -PROVIDE INTERIM ACCESS TO 65" AVE WEST IN LEDUC DEVELOPMENT GROWTH
DESIGN STATUS: FUNCTIONAL PLAN COMPLETED DETAILED DESIGN INITIATED, CITY OF LEDUC, EIA & PROVINCE
6 LANING
AADT 36,700 (LOS B/C)
5-10 YEARS
FUTURE HIGHWAY 2A
AADT 49,000 (LOS C/D)
EXISTING HIGHWAY 2A
CPR/ BLACK GOLD DRIVE
AADT 60,300 (LOS D/E)
HIGHWAY 39
AADT 60,300 (LOS D/E)
TURNOUT SB
65 AVENUE
50 STREET
EXISTING
8 LANING
AADT 55,000 (LOS B/C)
20-25 YEARS
AADT 73,600 (LOS C/D)
5-10 YEARS
AADT 73,600 (LOS C/D)
20-25 YEARS
AADT 90,500 (LOS D/E)
15-25 YEARS
AADT 90,500 (LOS D/E)
15-25 YEARS
HIGHWAY 2 REALIGNMENT WITH CORE 4 LANE CONSTRUCTION
AADT 120,600 (LOS D/E)
10-20 YEARS
ALIGNMENT TRANSITION
AADT 90,500 (LOS D/E)
5-10 YEARS
AADT 120,600(LOS D/E)
10-20 YEARS
BYPASS REQUIRED
AADT 73,000 (LOS B/C)
BEYOND 25 YEARS
AADT 98,000 (LOS C/D)
BEYOND 25 YEARS
AADT 144,800 (LOS D/E) - BYPASS
BEYOND 25 YEARS
AADT 175,900 (LOS D/E) - BYPASS
BEYOND 25 YEARS
CONSULTANT
CIMA+ Al-Terra Castlegienn
JOB No. 5129
LEGEND
EXISTING
PROPOSED
FUTURE
HIGHWAY 2
4 LANES
6 LANES
REALIGNMENT
CROSSING ROAD
LOCAL ROAD TO BE PROVIDED
CSRA
SAFETY REST AREAS
VEHICLE INSPECTION STATION
LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
PROPOSED RIGHT OF WAY
PIPELINE CROSSING
DEFICIENT CREST
DEFICIENT SAG
IMPLEMENTATION SCHEDULE
ROAD WIDENING
5 - 10 YEARS
10 - 20 YEARS
20 - 25 YEARS
BEYOND 25 YEARS
STRUCTURE REPLACEMENT
WITHIN 10 YEARS
BEYOND 10 YEARS
BEYOND 25 YEARS
NEW STRUCTURE (WHEN WARRANTED)
INTERCHANGE
OVERPASS
SCALE 1 : 20 000
0m 100 200 300 400
HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN
Alberta Transportation
PHOTOGRAPHY DATE: AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014
HIGHWAY: 2-15 TO 2-32
DATE: 2016-01-05
SHEET: 33 OF 36
PLAN
R-1197-PL-33



CONSULTANT
CIMA+ Al-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

LEGAL
UTILITIES RIGHT OF WAY
MUNICIPAL BOUNDARY
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BOUNDARY
PIPELINE CROSSING
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IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0m 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
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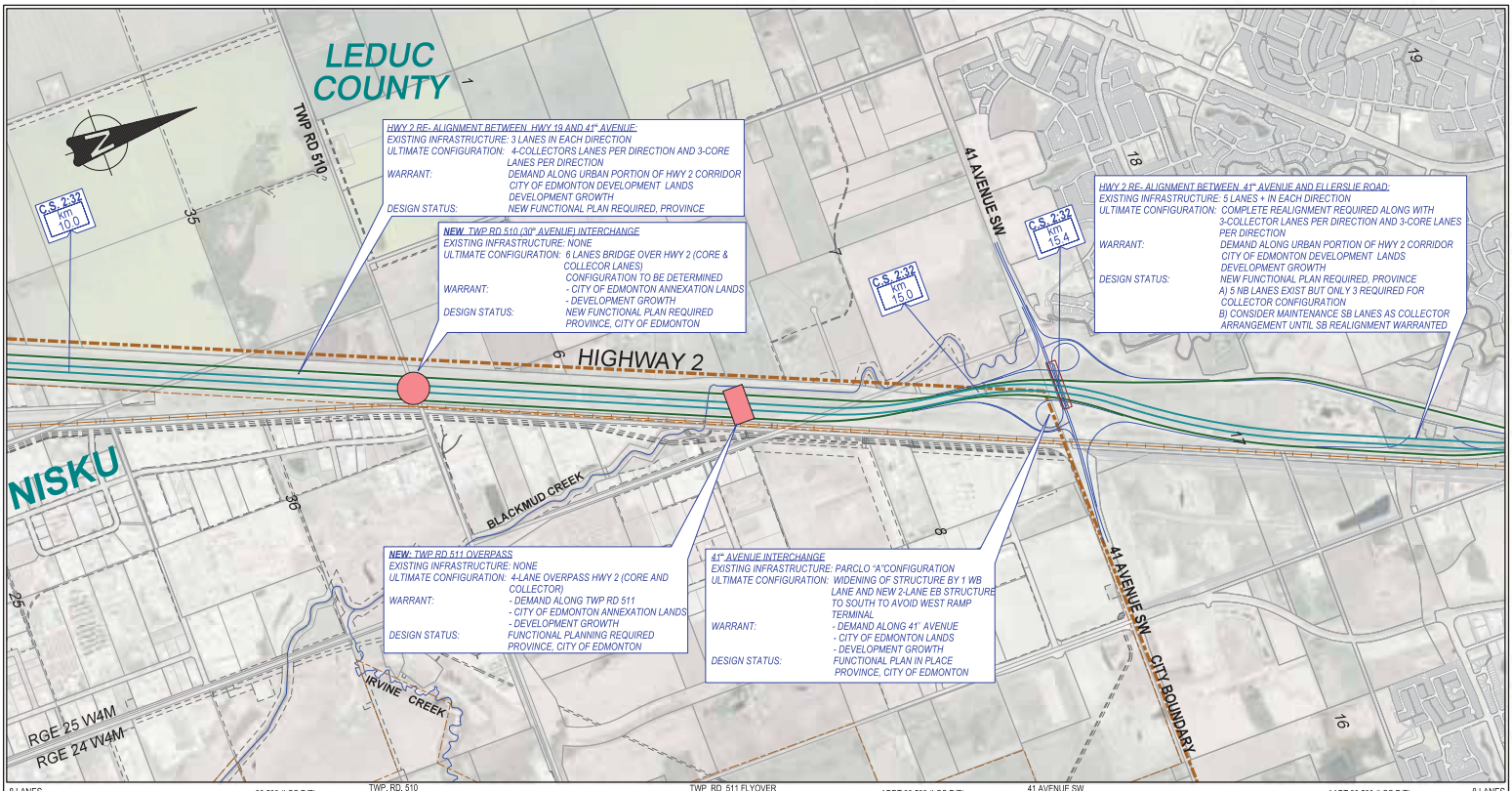
Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2016-01-05	34 OF 36	R-1197-PL-34



	TWP. RD. 510	TWP. RD. 511 FLYOVER	41 AVENUE SW	
8 LANES	90,500 (LOS D/E) <5 YEARS		ADDT 90,500 (LOS D/E) <5 YEARS	AADT 90,500 (LOS D/E) <5 YEARS 8 LANES
+ 4 CORE LANES	AADT 120,600 (LOS D/E) CORE LANE CONSTRUCTION (4 LANES)	AADT 120,600 (LOS D/E)	AADT 120,600 (LOS D/E)	+ 4 CORE LANES
	10-25 YEARS <10 YEARS		<10 YEARS	
+ 6 CORE LANES	AADT 175,900 (LOS D/E) BEYOND 25 YEARS	AADT 175,900 (LOS D/E)	AADT 175,900 (LOS D/E) 10-25 YEARS	AADT 175,900 (LOS D/E) IN 10 YEARS + 6 CORE LANES
BYPASS	AADT 203,500 (LOS D/E) BEYOND 25 YEARS	AADT 203,500 (LOS D/E) BEYOND 25 YEARS	BEYOND 25 YEARS	AADT 203,500 (LOS D/E) BEYOND 25 YEARS BYPASS

CONSULTANT
CIMA+ AI-Terra Castlegienn

JOB No. 5129

LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES 6 LANES		REALIGNMENT
CROSSING ROAD			
LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
VEHICLE INSPECTION STATION			

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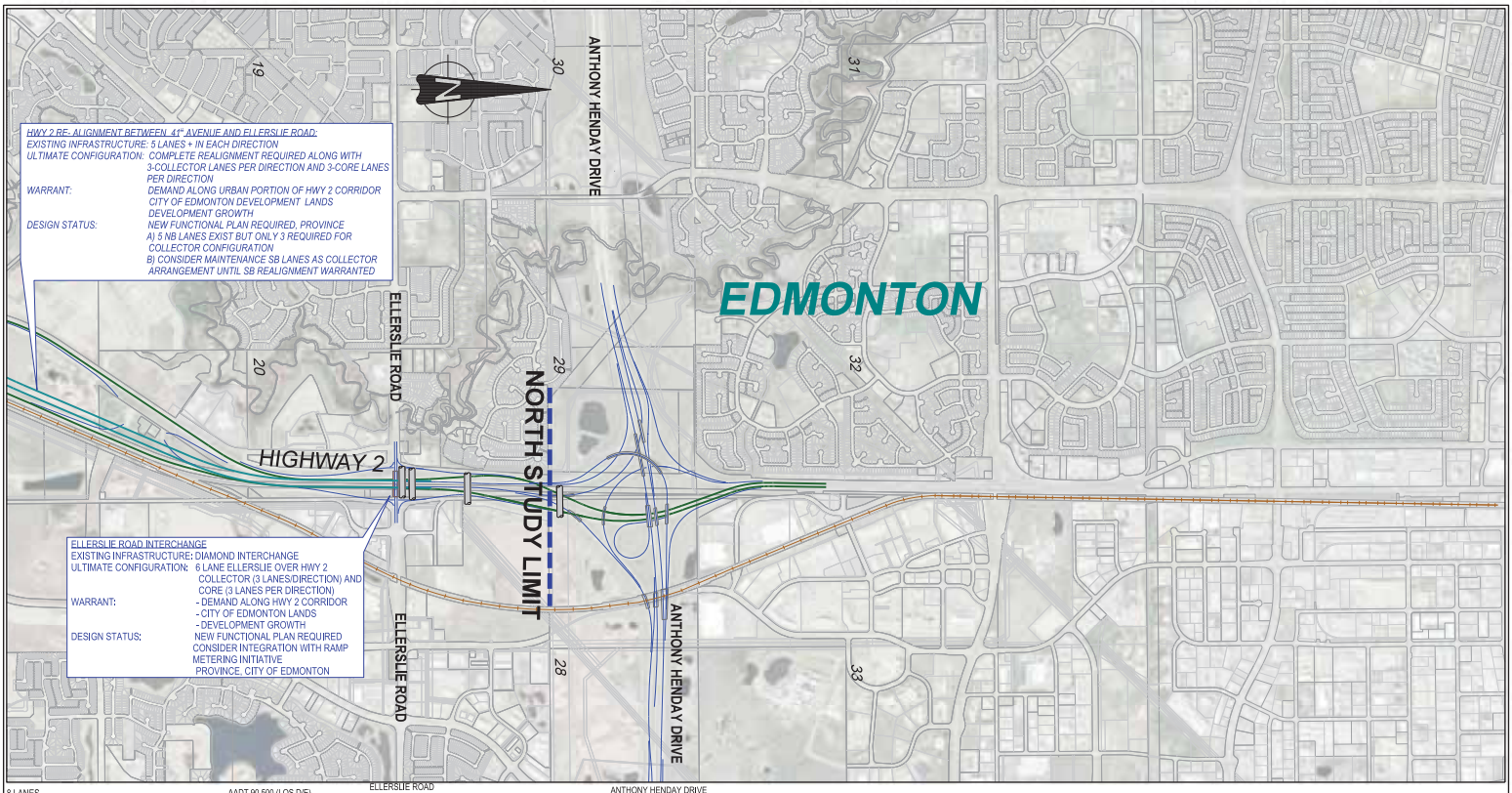
ROAD WIDENNING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2:15 TO 2:32	2015-01-05	35 OF 36	R-1197-PL-35



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LEGEND

	EXISTING	PROPOSED	FUTURE
HIGHWAY 2	4 LANES / 6 LANES		REALIGNMENT
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LOCAL ROAD TO BE PROVIDED			
SAFETY REST AREAS		CSRA	
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IMPLEMENTATION SCHEDULE

ROAD WIDENING	STRUCTURE REPLACEMENT	NEW STRUCTURE (WHEN WARRANTED)
5 - 10 YEARS		
10 - 20 YEARS	WITHIN 10 YEARS	INTERCHANGE
20 - 25 YEARS	BEYOND 10 YEARS	OVERPASS
BEYOND 25 YEARS	BEYOND 25 YEARS	

SCALE 1 : 20 000
0 100 200 300 400

HIGHWAY 2
CORRIDOR IMPROVEMENT STUDY
CALGARY RING ROAD TO EDMONTON RING ROAD
RECOMMENDED PLAN

Alberta Transportation

PHOTOGRAPHY DATE	HIGHWAY	DATE	SHEET	PLAN
AIR PHOTO - SEPT 2015 SATELITE IMAGE - 2013 / 2014	2-15 TO 2-32	2015-01-05	36 OF 36	R-1197-PL-36

Appendix I

Traffic Projections & Lane Requirements

G:\6129 - Highway 2 Corridor Improvement Study\Submission 4 Report\Appendices\Appendix Title Pages.docx

Highway	Control Section	TCS		Location	AADT	ASDT	Average Traffic Growth Last 10 years	Assumed Future Traffic Growth - Historical Provincial Average 2.5%	Projected AADT					Threshold Values to Maintain Acceptable LOS with Existing # of Lanes (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +2 (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +4 (AADT)	Existing # of Lanes Year 2016	Required # Lanes Year 2016	Lanes Required in 5 year Horizon (2021)	Lanes Required in 10 year Horizon (2026)	Lanes Required in 20 year Horizon (2036)	Lanes Required in 50 year Horizon (2066)	Year to Reach +2 Lanes Requirement	Year to Reach +4 Lanes Requirement
					2015	2015			2016	2021	2026	2036	2066										
Note: Lane requirements determined based on objective to maintain Level of Service B in rural areas along Highway 2 Corridor. Threshold Values modeled on Highway 2 traffic characteristics.																							
2	15	76	CofC	N OF 201 NJ, CALGARY	105320	112130	4.8%	2.5%	106560	119880	133200	159840	239760	104,000	139,000	171,700	6 L	8 L	8 L	8 L	10 L	Bypass	PAST	2029
2	18	4	Rkyv	S OF 566 E OF BALZAC	88640	94380	3.7%	2.5%	89140	100280	111430	133710	200570	104,000	139,000	171,700	6 L	6 L	6 L	8 L	8 L	Bypass	2023	2039
2	18	4	Rkyv	**4.6 KM S OF 2 & 567 AIRDRIE**	84390	89970	3.3%	2.5%	**84830**	**95430**	**106040**	**127250**	**190870**	104,000	139,000	171,700	6 L	6 L	6 L	8 L	8 L	Bypass	2026	2042
2	18	4	Rkyv	S OF BIG HILL SPRINGS RD 36-26-1-5	84500	89970	3.4%	2.5%	88900	100010	111130	133350	200030	104,400	139,000	171,700	6 L	6 L	6 L	8 L	8 L	Bypass	2023	2039
2	18	4	Rkyv	S OF TWP RD 272, AIRDRIE 12-27-1-5	48910	52070	2.3%	2.5%	53430	60109	66790	80150	120220	104,400	139,000	171,700	6 L	6 L	6 L	6 L	6 L	8 L	2055	2081
														LOS D/C										
2	18	8	Rkyv	S OF 2A & 72 SE OF CROSSFIELD	42220	44950	2.9%	2.5%	42140	47410	52680	63210	94820	47,700	71,900	95,300	6 L	6 L	6 L	8 L	8 L	10 L	2022	2045
2	18	12	Rkyv	N OF 2A & 72 SE OF CROSSFIELD	35640	40360	3.1%	2.5%	36400	40950	45500	54600	81900	47,700	71,900	95,300	6 L	6 L	6 L	6 L	8 L	10 L	2029	2056
2	18	16	MntV	S OF ACME RD 11-29-1-5	35640	40360	3.1%	2.5%	36400	40950	45500	54600	81900	47,700	71,900	95,300	6 L	6 L	6 L	6 L	8 L	10 L	2029	2056
														LOS C/B										
2	20	4	MntV	N OF ACME RD 11-29-1-5	31900	36130	2.7%	2.5%	32930	37050	41160	49400	73900	34,000	54,500	74,000	6 L	6 L	8 L	8 L	8 L	10 L	2018	2043
2	20	4	MntV	S OF 581 E OF CARSTAIRS	31900	36130	2.7%	2.5%	32930	37050	41160	49400	73900	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2018	2043
2	20	8	MntV	N OF 581 E OF CARSTAIRS	31980	36220	2.6%	2.5%	32530	36600	40660	48800	73190	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2018	2044
2	20	8	MntV	S OF 582 E OF DIDSBURY	31850	36070	2.5%	2.5%	32360	36410	40450	48540	72810	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2019	2044
2	20	12	MntV	N OF 582 E OF DIDSBURY	30630	34690	2.6%	2.5%	31090	34980	38860	46640	69950	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2020	2047
2	20	12	MntV	N OF BERGEN RD 35-31-1-5	30600	34660	2.6%	2.5%	31090	34980	38860	46640	69950	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2020	2047
2	20	12	MntV	S OF 27 E OF OLDS	30600	34660	2.6%	2.5%	31080	34970	38850	46620	69930	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2020	2047
2	22	4	MntV	N OF 27 E OF OLDS	31100	35220	2.1%	2.5%	30830	34680	38540	46250	69370	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2021	2047
2	22	4	MntV	**2.0 KM N OF 2 & 27 OLDS**	31010	35220	2.0%	2.5%	**30760**	**34610**	**38450**	**46140**	**69210**	34,000	54,500	74,000	4 L	4 L	6 L	6 L	6 L	8 L	2021	2047

Highway	Control Section	TCS		Location	AADT	ASDT	Average Traffic Growth Last 10 years	Assumed Future Traffic Growth - Historical Provincial Average 2.5%	Projected AADT					Threshold Values to Maintain Acceptable LOS with Existing # of Lanes (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +2 (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +4 (AADT)	Existing # of Lanes Year 2016	Required # Lanes Year 2016	Lanes Required in 5 year Horizon (2021)	Lanes Required in 10 year Horizon (2026)	Lanes Required in 20 year Horizon (2036)	Lanes Required in 50 year Horizon (2066)	Year to Reach +2 Lanes Requirement	Year to Reach +4 Lanes Requirement
					2015	2015			2016	2021	2026	2036	2066										
Note: Lane requirements determined based on objective to maintain Level of Service B in rural areas along Highway 2 Corridor. Threshold Values modeled on Highway 2 traffic characteristics.																							
2	22	4	RdDr	N OF NETOOK RD 35-33-1-5	31160	35290	2.0%	2.5%	30890	34750	38610	46340	69500	34,000	54,500	74,000	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**8 L**	2021	2047
2	22	4	RdDr	S OF 2A & 587 E OF BOWDEN	31340	35490	2.0%	2.5%	31080	34970	38850	46620	69930	34,000	54,500	74,000	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**8 L**	2020	2047
2	22	12	RdDr	N OF 2A & 587 E OF BOWDEN	32860	37210	1.8%	2.5%	32590	36660	40740	48890	73330	34,000	54,500	74,000	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**8 L**	2018	2043
2	22	12	RdDr	S OF 54 S OF INNISFAIL 17-35-28-4	33610	38060	2.0%	2.5%	33330	37500	41660	50000	73990	34,000	54,500	74,000	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**8 L**	2017	2042
2	22	12	RdDr	N OF 54 S OF INNISFAIL 17-35-28-4	32530	36840	1.7%	2.5%	32250	36280	40310	48380	72560	34,000	54,500	74,000	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**8 L**	2019	2044
2	22	16	RdDr	S OF 590 AT INNISFAIL	32530	36840	2.0%	2.5%	32250	36280	40310	48380	72560	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**4 L**	**4 L**	2019	2044
2	24	4	RdDr	N OF 590 AT INNISFAIL	34530	38400	1.6%	2.5%	35020	39400	43780	52530	78800	34,000	54,500	74,000	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**8+ L**	PAST	2039
2	24	4	RdDr	S OF OLD POLE RD 7-36-27-4	34530	38400	1.6%	2.5%	35020	39400	43780	52530	78800	34,000	54,500	74,000	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**8+ L**	PAST	2039
2	24	4	RdDr	N OF OLD POLE RD 7-36-27-4	34830	38740	1.7%	2.5%	35310	39720	44140	52970	79450	34,000	54,500	74,000	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**8+ L**	PAST	2038
2	24	4	RdDr	S OF 42 E OF PENHOLD	34830	38740	1.5%	2.5%	35310	39720	44140	52970	79450	34,000	54,500	74,000	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**8+ L**	PAST	2038
														LOS B/C									
2	24	8	RdDr	N OF 42 E OF PENHOLD	38130	42410	1.6%	2.5%	37380	42050	46730	56070	84110	**47,700**	**71,500**	**95,300**	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2028	2053
2	24	8	RdDr	**2.6 KM N OF 2 & 42 PENHOLD**	38010	42410	1.5%	2.5%	**37250**	**41910**	**46560**	**55880**	**83810**	**47,700**	**71,500**	**95,300**	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2028	2053
2	24	9	CoRD	S OF GAETZ AVE IN RED DEER 32-37-27-4	40820	45110	0.0%	2.5%	38680	43520	48350	58020	87030	**47,700**	**71,500**	**95,300**	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2026	2050
2	24	11	RdDr	5.9 KM S OF 2 & 11 RED DEER	43740	48530	2.8%	2.5%	42990	48360	53740	64490	96730	**47,700**	**71,500**	**95,300**	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**Bypass**	2021	2043
2	24	11	RdDr	S OF 11 AT RED DEER RIVER	54610	60360	3.2%	2.5%	53880	60620	67350	80820	121230	**47,700**	**95,300**	**117,500**	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**Bypass**	PAST	2047
2	24	12	RdDr	N OF 11A AT RED DEER	43530	48720	3.1%	2.5%	41900	47140	52380	62850	94280	**47,700**	**71,500**	**95,300**	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2022	2045
2	24	16	RdDr	N OF 11 AT RED DEER	43020	48150	2.4%	2.5%	41900	47140	52380	62850	94280	**47,700**	**71,500**	**95,300**	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2022	2045

Highway	Control Section	TCS		Location	AADT	ASDT	Average Traffic Growth Last 10 years	Assumed Future Traffic Growth - Historical Provincial Average 2.5%	Projected AADT					Threshold Values to Maintain Acceptable LOS with Existing # of Lanes (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +2 (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +4 (AADT)	Existing # of Lanes Year 2016	Required # Lanes Year 2016	Lanes Required in 5 year Horizon (2021)	Lanes Required in 10 year Horizon (2026)	Lanes Required in 20 year Horizon (2036)	Lanes Required in 50 year Horizon (2066)	Year to Reach +2 Lanes Requirement	Year to Reach +4 Lanes Requirement
					2015	2015			2016	2021	2026	2036	2066										
Note: Lane requirements determined based on objective to maintain Level of Service B in rural areas along Highway 2 Corridor. Threshold Values modeled on Highway 2 traffic characteristics.																							
2	26	2	RdDr	**0.1 KM N OF 2 & 11A RED DEER**	43440	48720	3.0%	2.5%	**42830**	**48180**	**53540**	**64250**	**96370**	47,700	71,500	95,300	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**Bypass**	2021	2043
2	26	2	Laco	S OF 597 W OF BLACKFALDS	43530	48720	3.1%	2.5%	42890	48250	53610	64340	96500	47,700	71,500	95,300	4 L	**4 L**	**6 L**	**6 L**	**6 L**	**Bypass**	2021	2043
														LOS C/B										
2	26	4	Laco	N OF 597 W OF BLACKFALDS	36360	40690	2.7%	2.5%	35810	40290	44760	53720	80570	34,000	54,500	74,000	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**Bypass**	PAST	2037
2	26	4	Laco	S OF 12 W OF LACOMBE	36360	40690	2.7%	2.5%	35810	40290	44760	53720	80570	34,000	54,500	74,000	4 L	**6 L**	**6 L**	**6 L**	**6 L**	**Bypass**	PAST	2037
2	26	8	Laco	N OF 12 W OF LACOMBE	28910	32360	2.0%	2.5%	28460	32020	35580	42690	64040	34,500	54,500		4 L	**4 L**	**4 L**	**6 L**	**6 L**	**Bypass**	2025	2053
2	26	12	Laco	**3.5 KM N OF 2 & 2A LACOMBE**	32490	36610	2.3%	2.5%	**32280**	**36320**	**40350**	**48420**	**72630**	54,500	74,000		6 L	**4 L**	**4 L**	**4 L**	**4 L**	**6 L**	2044	2068
2	26	12	Laco	S OF 2A SW OF MORNINGSIDE	32590	36610	2.3%	2.5%	32320	36360	40400	48480	72720	54,500	74,000	74,000	6 L	**6 L**	**6 L**	**6 L**	**6 L**	**8 L**	2044	2068
2	26	16	Laco	N OF 2A SW OF MORNINGSIDE	27300	30670	2.4%	2.5%	27330	30750	34160	41000	61490	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2026	2056
2	26	16	Pnka	S OF 604 W OF MORNINGSIDE	27300	30670	2.4%	2.5%	27330	30750	34160	41000	61490	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2026	2056
2	26	20	Pnka	N OF 604 W OF MORNINGSIDE	26920	30240	2.3%	2.5%	26890	30250	33610	40340	60500	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2027	2058
2	26	20	Pnka	S OF MATEJKA RD 27-42-26-4	26920	30240	2.2%	2.5%	26890	30250	33610	40340	60500	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2027	2058
2	26	20	Pnka	N OF MATEJKA RD 27-42-26-4	27000	30330	2.2%	2.5%	26960	30330	33700	40440	60660	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2027	2057
2	26	20	Pnka	S OF GEE RD 27-42-26-4	27000	30330	2.2%	2.5%	26960	30330	33700	40440	60660	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2027	2057
2	26	20	Pnka	N OF GEE RD 27-42-26-4	27120	30470	2.1%	2.5%	27050	30430	33810	40580	60860	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2027	2057
2	26	20	Pnka	S OF 53 W OF PONOKA	27120	30470	2.1%	2.5%	27050	30430	33810	40580	60860	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**4 L**	**6 L**	**8 L**	2027	2057
2	28	4	Pnka	N OF 53 W OF PONOKA	28290	32200	2.3%	2.5%	28070	31580	35090	42110	63160	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	28	4	Pnka	**1.7 KM N OF 2 & 53 PONOKA**	28210	32200	2.2%	2.5%	**28060**	**31570**	**35080**	**42090**	**63140**	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054

Highway	Control Section	TCS		Location	AADT	ASDT	Average Traffic Growth Last 10 years	Assumed Future Traffic Growth - Historical Provincial Average 2.5%	Projected AADT					Threshold Values to Maintain Acceptable LOS with Existing # of Lanes (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +2 (AADT)	Threshold Values to Maintain Acceptable LOS with Existing # of Lanes +4 (AADT)	Existing # of Lanes Year 2016	Required # Lanes Year 2016	Lanes Required in 5 year Horizon (2021)	Lanes Required in 10 year Horizon (2026)	Lanes Required in 20 year Horizon (2036)	Lanes Required in 50 year Horizon (2066)	Year to Reach +2 Lanes Requirement	Year to Reach +4 Lanes Requirement
					2015	2015			2016	2021	2026	2036	2066										
Note: Lane requirements determined based on objective to maintain Level of Service B in rural areas along Highway 2 Corridor. Threshold Values modeled on Highway 2 traffic characteristics.																							
2	28	4	Pnka	S OF MENAIK RD 12-44-26-4	28290	32200	2.3%	2.5%	28060	31570	35080	42090	63140	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	28	4	Pnka	N OF MENAIK RD 12-44-26-4	28190	32090	2.3%	2.5%	28270	31800	35340	42410	63610	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	28	4	Weta	S OF 611 E OF USONA	28190	32090	2.3%	2.5%	27970	31470	34960	41960	62930	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	28	8	Weta	S OF 13 W OF WETASKIWIN	28570	32520	2.3%	2.5%	28270	31800	35340	42410	63610	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	30	4	Weta	N OF 13 W OF WETASKIWIN	27720	31550	2.2%	2.5%	28230	31760	35290	42350	63520	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	30	4	Weta	N OF CORRECTION LINE RD 31-46-25-4	27820	31660	2.2%	2.5%	28310	31850	35390	42470	63700	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2025	2054
2	30	8	Weta	N OF 616 W OF MILLET	28880	32870	2.1%	2.5%	29110	32750	36390	43670	65500	34,000	54,500	74,000	4 L	**4 L**	**4 L**	**6 L**	**6 L**	**8 L**	2023	2051
														LOS B/C										
2	30	8	Ledc	N OF KAVANAUGH/GLEN PK RD 33-48-25-	30430	34630	2.1%	2.5%	30560	34380	38200	45840	68760	**49,000**	**73,600**	**98,000**	4 L	**4 L**	**4 L**	**4 L**	**4 L**	**6 L**	2041	2073
														LOS C/D										
2	30	8	Ledc	**2.0 KM S OF 2 & OLD 2A LEDUC**	30380	34630	2.0%	2.5%	**30560**	**34380**	**38200**	**45840**	**68760**	**58,500**	**104,000**	**144,000**	4 L	**4 L**	**4 L**	**4 L**	**4 L**	**6 L**	2053	2113
2	32	16	Ledc	**5.9 KM N OF 2 & 19 NISKU**	88170	94800	3.2%	2.5%	**85020**	**95650**	**106280**	**127530**	**191300**	**104,000**	**144,000**	**172,000**	6 L	**6 L**	**6 L**	**8 L**	**8 L**	**8+**	2025	2044

Calgary Screenline Analysis
Traffic Projections and Network Utilization

Traffic Projections - North of Stoney Trail

Location	2017 Existing Network AM SB	2017 Existing Network AM NB	2017 Existing Network PM SB	2017 Existing Network PM NB	2076 AT Network (Hwy 2 CIS Land Use) AM SB	2076 AT Network (Hwy 2 CIS Land Use) AM NB	2076 AT Network (Hwy 2 CIS Land Use) PM SB	2076 AT Network (Hwy 2 CIS Land Use) PM NB	2076 Run 1 (Roadway, LRT & HOV) AM SB	2076 Run 1 (Roadway, LRT & HOV) AM NB	2076 Run 1 (Roadway, LRT & HOV) PM SB	2076 Run 1 (Roadway, LRT & HOV) PM NB	2076 Run 2 (Roadway and LRT) AM SB	2076 Run 2 (Roadway and LRT) AM NB	2076 Run 2 (Roadway and LRT) PM SB	2076 Run 2 (Roadway and LRT) PM NB	2076 Run 3 (Roadway Network Only) AM SB	2076 Run 3 (Roadway Network Only) AM NB	2076 Run 3 (Roadway Network Only) PM SB	2076 Run 3 (Roadway Network Only) PM NB	No. of Lanes AT RTM SB	No. of Lanes AT RTM NB	No. of Lanes Hwy 2 CIS SB	No. of Lanes Hwy 2 CIS NB
Shaganappi Trail NW	1493	462	649	1251	3305	1396	1981	3440	4526	1492	2068	3808	4551	1491	2065	3751	4500	1499	2088	3648	2	2	3	3
Symons Valley Road NW	3093	3487	3399	3027	2988	441	1067	3267	3669	660	1342	3544	3639	658	1342	3059	3595	668	1320	3388	3	3	3	3
14 Street NW	358	174	113	551	4239	1321	2146	3578	4146	1480	2296	3233	4140	1486	2304	3197	4173	1496	2329	3111	3	3	3	3
Center Street N	980	728	561	1002	5329	1344	2155	4004	4237	1047	1786	2490	4234	1040	1794	2443	4181	1042	1841	2346	2	2	2	2
11 Street NE	N/A	N/A	N/A	N/A	3636	1233	1565	2608	3616	1540	1833	2676	3624	1555	1841	2652	3588	1513	1865	2567	2	2	2	2
Highway 2	4999	3043	3319	4721	9088	7275	7819	9202	10086	8887	8876	10647	10098	8884	8950	10663	10259	9048	9131	10600	6	6	6	6
Metis Trail NE	440	667	758	842	714	2737	4161	2138	1281	2542	3504	1999	1214	2545	3489	1958	1252	2568	3530	1870	3	3	3	3
60 Street NE	0	0	0	0	341	3371	3441	1322	311	3020	3026	1275	322	3026	3012	1264	324	2994	2947	1149	2	2	2	2
84 Street NE (Airdrie By-pass)	0	0	0	0	1626	2889	3158	3237	2401	2767	3630	4189	2413	2736	3605	4146	2375	2767	3554	4047	2	2	3	3
LRT (Person Trips)	0	0	0	0	N/A	N/A	N/A	N/A	6187	965	906	6426	6218	963	908	6487	0	0	0	0				
TOTAL	11363	8561	8799	11394	31266	22007	27493	32796	40460	24400	29267	40287	40453	24384	29310	39620	34247	23595	28605	32726	25	25	27	27
TWO-WAY TOTAL	19924		20193		53273		60289		64860		69554		64837		68930		57842		61331					
TOTAL (Vehilcle Trips Only)	11363	8561	8799	11394	31266	22007	27493	32796	34273	23435	28361	33861	34235	23421	28402	33133	34247	23595	28605	32726				
TWO-WAY TOTAL (Vehilcle Trips Only)	19924		20193		53273		60289		57708		62222		57656		61535		57842		61331					
Percent Increase from AT Network Total Trips									22%		15%		22%		14%		9%		2%					
Percent Increase from AT Network Vehicle Trips									8%		3%		8%		2%		0%		-1%					

Note: The main difference in the network is increased connectivity between Airdrie and Calgary through Rockyview.

Network Utilization - North of Stoney Trail (Percent of Total Trips)

Location	2017 Existing Network AM SB	2017 Existing Network AM NB	2017 Existing Network PM SB	2017 Existing Network PM NB	2076 AT Network (Hwy 2 CIS Land Use) AM SB	2076 AT Network (Hwy 2 CIS Land Use) AM NB	2076 AT Network (Hwy 2 CIS Land Use) PM SB	2076 AT Network (Hwy 2 CIS Land Use) PM NB	2076 Run 1 (Roadway, LRT & HOV) AM SB	2076 Run 1 (Roadway, LRT & HOV) AM NB	2076 Run 1 (Roadway, LRT & HOV) PM SB	2076 Run 1 (Roadway, LRT & HOV) PM NB	2076 Run 2 (Roadway and LRT) AM SB	2076 Run 2 (Roadway and LRT) AM NB	2076 Run 2 (Roadway and LRT) PM SB	2076 Run 2 (Roadway and LRT) PM NB	2076 Run 3 (Roadway Network Only) AM SB	2076 Run 3 (Roadway Network Only) AM NB	2076 Run 3 (Roadway Network Only) PM SB	2076 Run 3 (Roadway Network Only) PM NB
Shaganappi Trail NW	7%	2%	3%	6%	6%	3%	3%	6%	7%	2%	3%	5%	7%	2%	3%	5%	8%	3%	3%	6%
Symons Valley Road NW	16%	18%	17%	15%	6%	1%	2%	5%	6%	1%	2%	5%	6%	1%	2%	4%	6%	1%	2%	6%
14 Street NW	2%	1%	1%	3%	8%	2%	4%	6%	6%	2%	3%	5%	6%	2%	3%	5%	7%	3%	4%	5%
Center Street N	5%	4%	3%	5%	10%	3%	4%	7%	7%	2%	3%	4%	7%	2%	3%	4%	7%	2%	3%	4%
11 Street NE	N/A	N/A	N/A	N/A	7%	2%	3%	4%	6%	2%	3%	4%	6%	2%	3%	4%	6%	3%	3%	4%
Highway 2	25%	15%	16%	23%	17%	14%	13%	15%	16%	14%	13%	15%	16%	14%	13%	15%	18%	16%	15%	17%
Metis Trail NE	2%	3%	4%	4%	1%	5%	7%	4%	2%	4%	5%	3%	2%	4%	5%	3%	2%	4%	6%	3%
60 Street NE	0%	0%	0%	0%	1%	6%	6%	2%	0%	5%	4%	2%	0%	5%	4%	2%	1%	5%	5%	2%
84 Street NE (Airdrie By-pass)	0%	0%	0%	0%	3%	5%	5%	5%	4%	4%	5%	6%	4%	4%	5%	6%	4%	5%	6%	7%
LRT	0%	0%	0%	0%	N/A	N/A	N/A	N/A	10%	1%	1%	9%	10%	1%	1%	9%	0%	0%	0%	0%
	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Calgary Screenline Analysis
Traffic projections and network utilization

Screenline Analysis - North of Highway 566

Location	2017				2076																			
	Existing Network				AT Network (Hwy 2 CIS Land Use)				Run 1 (Roadway, LRT & HOV)				Run 2 (Roadway and LRT)				Run 3 (Roadway Network Only)				No. of Lanes			
	AM		PM		AM		PM		AM		PM		AM		PM		AM		PM		AT RTM		Hwy 2 CIS	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
Range Road 20	N/A	N/A	N/A	N/A	199	387	174	710	100	254	35	409	119	250	35	410	106	221	44	397	1	1	1	1
Panorama Road NW	N/A	N/A	N/A	N/A	1106	367	941	1428	441	931	824	1357	427	924	790	1338	500	935	783	1393	2	2	2	2
Range Road 14	N/A	N/A	N/A	N/A	1215	553	1167	1710	444	1029	984	933	446	1023	973	950	520	1035	962	1085	1	1	2	2
Center Street N (Range Road 13)	269	144	108	274	1663	1657	1564	1900	420	955	970	801	417	945	981	793	615	941	947	1032	1	1	2	2
6 Street NE (Range Road 12)	N/A	N/A	N/A	N/A	1497	1198	1393	2037	738	552	1309	867	732	545	1322	855	816	909	1306	978	1	1	2	2
15 Street NE/Range Road 11	681	363	294	808	1669	817	1400	2170	1175	668	1323	1490	1168	883	1297	1511	1629	940	1306	1645	1	1	2	2
Highway 2	3794	2260	2767	3692	5633	5639	7021	7810	8523	6776	7841	9227	8670	6896	7957	9325	8496	6780	8183	9384	3	3	5	5
Crossiron Blvd	0	0	0	0	750	243	660	1027	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0
Dwight McLellan Trail (Range Road 293)	168	75	122	165	981	0	92	1	1008	999	1139	1807	1023	649	1159	1820	1180	697	1161	1770	1	1	2	2
Range Road 292	160	62	53	163	731	87	654	497	852	24	187	1300	829	23	178	1251	900	24	203	1166	1	1	2	2
84 Street SE (Airdrie By-pass)	6	2	2	5	2094	1906	1940	2064	2760	2535	2856	4308	2732	2504	2828	4177	2697	2548	2830	4071	2	2	3	3
Local Roads Connections west of Hwy 2	0	0	0	0	0	0	0	0	1183	372	509	2169	1180	378	973	1210	1312	387	963	1203	0	0	9	9
LRT (Person Trips)	0	0	0	0	N/A	N/A	N/A	N/A	6187	965	163	6426	6218	963	908	6487	0	0	0	0				
TOTAL	5078	2906	3346	5107	17538	12854	17006	21354	23831	16060	18140	31094	23961	15983	19401	30127	18771	15417	18688	24124	**16**	**16**	**32**	**32**
TWO-WAY TOTAL	7984		8453		30392		38360		39891		49234		39944		49528		34188		42812					
TOTAL (Vehilcle Trips Only)	4912	2842	3291	4939	17538	12854	17006	21354	17644	15095	17977	24668	17743	15020	18493	23640	18771	15417	18688	24124				
TWO-WAY TOTAL (Vehilcle Trips Only)	7754		8230		30392		38360		32739		42645		32763		42133		34188		42812					
cent Increase from AT Network Total Trips									**31%**		**28%**		**31%**		**29%**		**12%**		**12%**					
nt Increase from AT Network Vehicle Trips									**8%**		**11%**		**8%**		**10%**		**4%**		**0%**					

Network Utilization - North of Highway 566 (Percent of Total Trips)

Location	2017				2076															
	Existing Network				AT Network				Run 1 (Roadway, LRT & HOV)				Run 2 (Roadway and LRT)				Run 3 (Roadway Network Only)			
	AM		PM		AM		PM		AM		PM		AM		PM		AM		PM	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
Range Road 20	N/A	N/A	N/A	N/A	1%	1%	0%	2%	0%	1%	0%	1%	0%	1%	0%	1%	0%	1%	0%	1%
Panorama Road NW	N/A	N/A	N/A	N/A	4%	1%	2%	4%	1%	2%	2%	3%	1%	2%	2%	3%	1%	3%	2%	3%
Range Road 14	N/A	N/A	N/A	N/A	4%	2%	3%	4%	1%	3%	2%	2%	1%	3%	2%	2%	2%	3%	2%	3%
Center Street N (Range Road 13)	3%	2%	1%	3%	5%	5%	4%	5%	1%	2%	2%	2%	1%	2%	2%	2%	2%	3%	2%	2%
6 Street NE (Range Road 12)	N/A	N/A	N/A	N/A	5%	4%	4%	5%	2%	1%	3%	2%	2%	1%	3%	2%	2%	3%	3%	2%
15 Street NE/Range Road 11	9%	5%	3%	10%	5%	3%	4%	6%	3%	2%	3%	3%	3%	2%	3%	3%	5%	3%	3%	4%
Highway 2	48%	28%	33%	44%	19%	19%	18%	20%	21%	17%	16%	19%	22%	17%	16%	19%	25%	20%	19%	22%
Crossiron Blvd	0%	0%	0%	0%	2%	1%	2%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dwight McLellan Trail (Range Road 293)	2%	1%	1%	2%	3%	0%	0%	0%	3%	3%	2%	4%	3%	2%	2%	4%	3%	2%	3%	4%
Range Road 292	2%	1%	1%	2%	2%	0%	2%	1%	2%	0%	0%	3%	2%	0%	0%	3%	3%	0%	0%	3%
84 Street SE (Airdrie By-pass)	0%	0%	0%	0%	7%	6%	5%	5%	7%	6%	6%	9%	7%	6%	6%	8%	8%	7%	7%	10%
Local Roads Connections west of Hwy 2	0%	0%	0%	0%	0%	0%	0%	0%	3%	1%	1%	4%	3%	1%	2%	2%	4%	1%	2%	3%
LRT (Person Trips)	0%	0%	0%	0%	N/A	N/A	N/A	N/A	16%	2%	0%	13%	16%	2%	2%	13%	0%	0%	0%	0%
	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Appendix J

Congestion Management Measures

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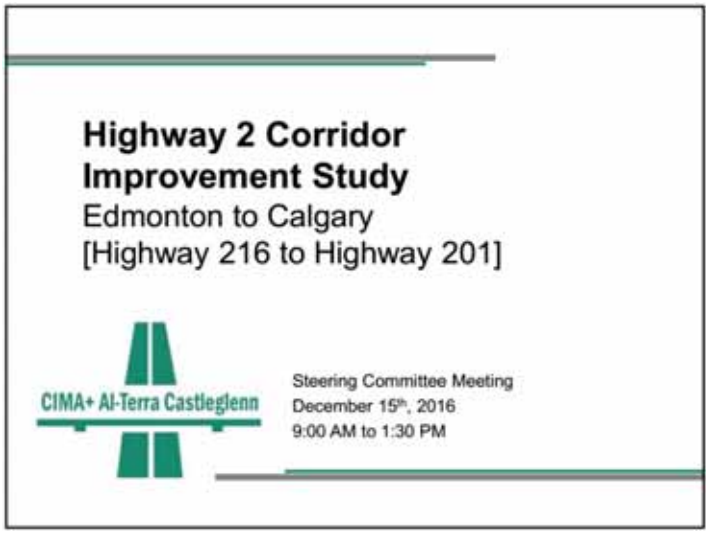



Highway 2 Corridor Improvement Study

Edmonton to Calgary
[Highway 216 to Highway 201]

CIMA+ Al-Terra Castleglenn

Steering Committee Meeting
December 15th, 2016
9:00 AM to 1:30 PM

CIMA+ Al-Terra Castleglenn

Alternative Options

Non-Modeling Measures

1. HOV Lanes
2. HOT Lanes
3. Congestion-Dynamic Pricing
4. Variable Speed Limits
5. Autonomous Vehicles
6. Congestion Charge/Cordon Toll
7. Ramp Metering

CIMA+ Al-Terra Castleglenn

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1. HOV Lanes

- A freeway lane reserved for high occupancy vehicle (HOV) use, where vehicles have 2+ occupants.
- Can be achieved by:
  - conversion of an "existing" Hwy 2 lane to HOV (minimal cost of infrastructure required for implementation; reallocation of capacity); or
  - constructing a "new" Hwy 2 lane for HOV use (requires infrastructure investment; creates additional capacity).



- HOV vehicles are rewarded with faster travel time, less congestion, reduced driving stress, better fuel economy and more reliable travel times.
- Where an "existing" lane is converted to HOV, single occupant vehicles (SOV) are constrained to fewer lanes and may be further penalized with greater congestion.
- Applicable along Hwy 2 in urban areas where 3-or-more lanes exist.
- Measure is highly popular in North America, with over 130 HOV programs in place.

2. HOT Lanes

- A freeway lane where SOVs are tolled, but HOVs are not charged.
- Typically implemented where existing HOV lanes have significant remaining capacity.
- SOV motorists who wish to pay a fare (and HOV vehicles) are rewarded with faster travel time, less congestion, reduced driving stress, better fuel economy and more reliable travel times
- Applicable in urban areas where a well established HOV lane is in place.
- Can be implemented by selling HOT lane permits; or implementing a automated system that would detect when SOV vehicles utilize the lane.
- Often criticized as "Lexus Lanes", where the rich can afforded the luxury of more reliable travel times.
- HOT lanes can raise sufficient revenue to subsidize express-bus operations or other transit infrastructure.



3. Congestion-Dynamic Pricing

- Congestion pricing varies by time of day based on the level of congestion in a toll lane.
- The pricing can be defined by:
  - A fixed "time of day" pricing; or
  - Dynamic pricing that is variable depending on real-time congestion/travel speed in the travel lane.
- A "maximum" toll is set, sometimes up to $10.50 per trip segment.
- The goal of congestion pricing is to maintain travel speeds to a set minimum (ex. 80 km/hr) on a freeway by increasing the toll to discourage motorists from wishing to enter the toll lane. This promises a consistent travel time to motorists willing to pay the fee.
- Applicable where HOV and/or HOT lanes are being over utilized and where congestion is occurring in the HOV/HOT lane itself.
- Has the potential to raise sufficient revenue to subsidize express-bus operations or other transit infrastructure.



4. Variable Speed Limits



- Variable (or dynamic) speed limits (VSL) are defined as "the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions ".
- The purpose of VSL is to reduce stop-and-go traffic, thus reducing the probability and severity of a collision by giving motorists time to react to changing road conditions.
- VSL signage can display speed limits, lane status and real-time traffic information and work with traffic sensors that collect data such as vehicle speeds, congestion and collision information.
- Signage is placed at pre-determined intervals.
- This measure is applicable along Hwy 2 in urban areas where congestion is common, or in areas where weather often results in collisions (i.e. whiteout conditions).
- "Fixed" signage is common in Europe and is weather related.



5. Autonomous Vehicles

- Autonomous vehicles are capable of driving by detecting the surrounding environment using artificial intelligence, sensors and global positioning system coordinates.
- There are four levels of automation:
  1. Minor: some features are automated, i.e. electronic stability control, automatic braking;
  2. Partial: multiple controls automated in unison on limited roadways, i.e. adaptive cruise control and lane keeping;
  3. Conditional: the vehicle controls most situations, but alerts the driver when the driver must re-take control; and
  4. Full: the vehicle performs all situations for the entire trip; the driver does not control the vehicle.
- The technology is still in development and in testing phases and is not anticipated to be available for another 20-30 years.
- When fully implemented, autonomous vehicles promise lower congestion on roadways, fewer collisions and reduced fuel emissions .





6. Congestion Charge/Cordon Toll

- Congestions charges involve charging a fee during times of excess congestion to vehicles which travel within a defined congestion zone or along a designated congestion corridor.
- A congestion zone is defined by an area with high traffic demands, typically downtown core areas.
- The purpose of the congestion charge is to encourage motorists to choose alternative modes of travel, such as transit or permitted carpool services.
- This measure is most applicable to municipalities characterized by a strong core within a major urban area which demonstrates a sufficient draw/attraction of traffic, that despite the imposition of a toll would still experience growth in pedestrian, transit and other modes of travel.
- This measure has been successfully applied in major urban areas, such as London, UK and Stockholm, Sweden.
- It is unlikely that this measure implemented within Edmonton or Calgary's urban areas would achieve the desired reduction in traffic volumes that would propagate to Highway 2.



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7. Ramp Metering

- Ramp metering is achieved by:
  - Advanced signage used to make motorists aware that they are approaching a ramp metered location; and
  - Adaptive traffic signals installed at the entrance of a ramp onto the mainline that sense when a vehicle approaches the STOP bar and permits a single vehicle to advance onto the mainline at a time by the signal briefly turning green.
- This measure is focussed on congestion reduction of urban freeway corridors by optimizing freeway/highway through-put and breaking up vehicle platoons, resulting in increased travel speeds, improved travel time, operational reliability and increased safety on the freeway/highway.
- Ramp metering is applicable in urban areas where:
  - Congestion is common;
  - Ramp junctions are placed close together;
  - Alternative parallel routes are available (as delays at the ramp meters will discourage some motorists from taking the freeway).
- Ramp metering cannot work as an single entity. For effectiveness, numerous ramp meters should be installed along consecutive ramps along a corridor.



High Occupancy Vehicle (HOV) Lanes

Improvement Measure: HOV Lanes
1A) Existing Lane Conversion or
1B) Construction of New Lane

1. General Description:

This measure addresses the advent of lanes on designated freeway/highways reserved for High Occupancy Use (HOV). The lanes are segregated from the general purpose lanes, monitored for compliance and enforced.



Dallas Texas: Designated and Delineated HOV Lanes

2. Description:

- The success of HOV is based on the premise that a corridor is intended to transport "people" and not "vehicles". By increasing the number of persons-per-vehicle, a corridor can make more efficient use of its available capacity by transporting more people on the same number of lanes. A lane full of buses and carpools can move many more people than a standard traffic lane.
- This intent of this measure is to increase the number of persons-per-vehicle by encouraging (rewarding) multi-occupant vehicle use (i.e car-pooling, ride sharing etc.) by providing an enhanced level-of-service on an exclusively reserved lane(s).
- Single occupant vehicles would be constrained to use of adjacent QE II lanes.
- This measure envisions the conversion of an "**existing**" QE II lane (Option 1A) or the **construction of a new Highway 2 lane** (Option 2A) for the exclusive use of vehicles with more than 1 occupant. The definition of HOV can be 2 or more, or 3 or more depending on the level of usage.
- The measure is intended to **re-allocate existing roadway capacity**. It does **not** create additional capacity.

3. Complimentary Initiatives:

- *Transit priority*: HOV lanes can further supplement buses and transit initiatives by assuring higher levels of service along the corridor.
- *Taxis and airport limousines* can make use of the HOV lanes permitting them to return to duty faster after dropping off a fare or arrive sooner to pick up a fare.
- *Alternative Vehicle Technology*: HOV rules can be modified to be supportive of new technologies such as electric and alternative fuel vehicles.
- *Car Pooling / Ride Sharing*: Over time, there is evidence that HOV lanes cause carpools to last longer, regardless of whether or not the Car Pool was diverted from another area.
- *Economic Encouragement*: Should large transport vehicles be permitted in the HOV lane to minimize delivery times and encourage commercial activity by reducing delays?

4. Negative Effects:

- Multi-occupant vehicles are rewarded with faster travel times, less congestion, reduced driving stress and better fuel economy however, single-occupant vehicles, which are constrained to the use of remaining lanes, are further penalized than if the HOV reserved lane was dedicated for general use.
- The approach of building a new lane as a designated HOV Lane fails to maximize the impact upon the remaining lanes. Until a time where significant congestion is felt along the general highway lanes, there is little benefit or incentives for motorists to modify their travel behaviour.
- The commercial transport trucking (heavy vehicles) industry have traditionally been accommodated by a single driver in the CAB with the attached trailer. The net effect of HOV allocated lanes results in increased congestion on the remaining lanes which in turn results in delays to the commercial transport industry.

5. General locations where Applicable:

- The measure is envisioned on those sections of the Hwy 2 (QE II) with 3 or more existing lanes located through or immediately adjacent to, urbanized areas.
- If the measure is to involve conversion of an existing highway/freeway lane, the traffic on the remaining general purpose lanes will be anticipated to experience an even worse level of congestion if the HOV usage is not significant.
- If the measure addresses allocation of a future Hwy 2 (QE II) lane widening to HOV use, little change will be experienced by the motorists continuing to use the general purpose lanes.
- The inside, median or "passing" lane would be reserved for HOV use.
- The HOV lanes can be enforced only during peak times; hence all vehicles could be permitted to use the HOV lane during designated non-peak times.

General Findings from Other Jurisdictions:

130 HOV programs operating in more than 30 North American cities, totalling over 4,000 kilometres. Many large cities in the U.S. have operated HOV lanes for over 30 years. HOV lanes are popular with commuters in states such as Texas and California, and in cities such as Washington, D.C., Atlanta, Denver, and Seattle.

Examples include HOV lanes within Vancouver, Quebec (MTQ refers to these as carpool lanes and encouraged use by electric vehicles with "privileged" access.) and Ontario's Highways 403 & 404 (Greater Toronto) and 417 (Ottawa). In addition, some Ottawa inter-provincial bridges linking to Ontario have designated HOV lanes.

Travel Time Savings:

The 2-lane HOV lane of the Shirley Hwy South of Washington DC reported travel times of 29 minutes versus 64 minutes on the standard lanes[1].

A California report estimated saving 6.7 minutes per trip[2].

[1] Peter Samuel, Jan 12. 2005 http://tollroadsnews.com/news/hov-lanes-clogged-with-hybrids--complicate-toll-plan
[2] California Path for Alternate Transport. 2007 University of California http://www.path.berkeley.edu

High Occupancy Vehicle (HOV) Lanes

The same report estimated an average time savings of 30 seconds per mile[3].

Reports indicated time savings up to 2.75 minutes per mile on the HOV compared to the major freeway lanes4.

Toronto was seeing reduced travel times, ranging from 14-17 minutes[5];

Number of Persons Transported:

The Shirley Highway south of Washington D.C was the first North American highway to implement HOV lanes in the early 1970's, 2005 statistics claim:

2 HOV lanes: Average 1,433 vphpl with an occupancy of 3.7 persons/vehicle. Travel Time of 29mins. (Minimum 3-persons per vehicle)

3-4 Hwy Lanes: Average 1,775 vphpl - 2,367 vphpl with an occupancy of 1.1 persons/vehicle. Travel Time of 64 minutes.

The 2-lanes of the Shirley Highway (I-95/395) 6:30am to 9:30am carries 31,700 people in 8,600 vehicles while the 3 or 4 general purpose lanes carry 23,500 people in 21,300 vehicles.

The Metrorail in the same corridor carried 16,700 people in the same period.

Air Quality: Studies compare the air quality and emissions in the HOV lane versus the adjacent mixed-flow lanes.

HOV lanes are characterized by less pollutant emissions per-lane and per-person as traffic flow are generally better on the HOV lanes.[4]

Under the same demand and traffic mix, the continuous access HOV lane produces about 10-15% less CO and 5-15% less HC than the limited access HOV lane. It also produces about 5- 10% less NOx and CO2

Safety: A TAC presentation *evaluated* HOV lanes and concluded an approximate 15% increase in minor collisions could be expected, with an increase in 1%-3% in injury-related collisions[3]

Violation Rates. Violation rates in all Caltrans (California) districts average 5.6%, well below the ten percent level identified as a threshold for concern.

7. Considerations for Implementation:

- *Geometry* (ie. Interchange Spacing, HOV Access/Egress points, etc) Construction of new Highway 2 lanes would provide an opportunity to ensure the design of the new lane would be compatible with HOV use.
- *Demand for HOV* - (ie. current vehicle occupancy trends, anticipated travel time savings, forecast occupancy with advent of HOV, etc)
- *Do Measured Ridesharing Increases Reflect New or Diverted Carpools?* As time goes on, the question of whether the carpools added to the freeway mix were new or diverted becomes less and less important.
  - If new, they represented an immediate improvement in the overall vehicle occupancy picture.
  - If diverted, they fill space reserved to reward ridesharing behaviour by offering a higher level of service and better travel time while freeing up capacity on the remaining lanes for non-carpoolers.

  Over time, there is evidence that the HOV lanes cause carpools to last longer, regardless of how they came to be in the lanes.
- *Operating Policies*: 3+ vs. 2+ Occupancy:
  - A 3+ HOV lane was implemented on I-580 and resulted in traffic flows of 300-to-350 vehicles per hour (vph) in the HOV lane. This left considerable excess capacity for future growth in the HOV lane but traffic demand on the adjacent non-HOV lanes remained heavy.
  - Travel demand forecasts envisioned a natural growth in HOV demand and carpooling which would see HOV lane utilization increasing to 500-550 vph, resulting in a higher speed differential between HOV lanes and non-HOV lanes increasing from 4 mph to 22 mph.
  - Studies indicated that if the occupancy requirements of the HOV lane was lowered to 2+ occupancy the demand for the HOV lane would increase and the speed differential between HOV and non-HOV lanes would drop. As a result, the "window of opportunity" when the system might benefit from the addition of a 2+ HOV lane was found to be relatively small.

8. Potential Application to this Project:

- *Calgary:* A 6-lane rural divided QE II corridor commences just north of the Irricana Twp Rd 567 interchange. Possible measure to be tested should include:

  a) Converting one NB and one SB lane to an HOV lane; and

  b) Constructing a 4th Lane in both NB and SB directions to be reserved for HOV usage.
- *Edmonton:* A 6-lane rural divided QE II corridor commences just north of the 50th Avenue interchange. Possible measure to be tested should include:

  a) Converting one NB and one SB lane to an HOV lane; and

  b) Constructing a 4th Lane in both NB and SB directions to be reserved for HOV usage.

  The *Capital Region Board (CRB)* had recently commissioned the "*Edmonton High Occupancy Vehicle/Transit Priority Study*" (AECOM, July 2016). The study represents a good starting point in terms of analysis for a potential HOV/HOT lane along Hwy 2. Consultation with stakeholders along the corridor show an interest in a pilot project that would convert the median lanes from 65th Avenue in Leduc to Ellerslie Rd in Edmonton to a HOV lane. In September 2016, the CRB voted in support of pilot projects to

/sites/default/files/publications/PRR-2007-17.pdf

[3] Matthew Colwill. 2014 TAC Conference Presentation conf.tac-atc.ca/english /annualconference/tac2014/s-34/colwill.pdf

[4] California Department of Transportation. Dec 2006.dot.ca.gov/newtech/researchreports/2002-2006/2006/ modeling_effectiveness_hov_lanes_air_quality.pdf

[5] Transport Canada. High Occupancy Vehicle Lane. 2010-08-26 data.tc.gc.ca/archive/eng/programs /environment-utsp-hovlanescanada-886.htm

High Occupancy Vehicle (HOV) Lanes

study how carpool lanes could change the future of transportation between municipalities around Edmonton.

- *Red Deer:* The QE II is characterized predominantly as a 4-lane rural divided corridor through Red Deer. There is little opportunity to consider conversion of an existing lane to HOV operation as only a single lane would remain to accommodate remaining traffic.

9. Information Needed to be collected:

- *Current Vehicle Occupancy Trends:* VOC trends along various sections of the QE II corridor will be required to be collected to assess the existing profile of 2+ and 3+ vehicles in relation to single occupant vehicles. Ideally, passenger vehicles should be distinguished from large commercial vehicles during the occupancy counts. [A single-day survey was conducted in November, 2016 to provide insight into vehicle occupancy trends along the Hwy 2 corridor.]
- *Forecast Travel Demand Estimates*: This can be provided by way of travel demand modeling, traffic simulations or by applying a simple growth rate for analysis purposes of this measure.

10. Analysis to be Conducted:

- *Demand Forecasts should be Prepared*: Based on the current occupancy profile information, short-term forecast demand estimates can be prepared in terms of:
  - the likely HOV lane usage in term of VPH during the peak periods of demand;
  - the adjacent non-HOV lanes usage in term of VPH during the peak periods of demand;
  - the average speed in the HOV lane;
  - the average speed in the adjacent non-HOV lane(s);
  - the relative speed when HOV is compared to the adjacent non-HOV lanes;
  - the relative HOV travel time **savings** per-km accounting for the above relative speed differential; and
  - the relative travel time **costs** per-km on the adjacent non-HOV lanes accounting for the above relative speed differential and the reduction in the lanes (since one has been allocated for HOV use.) available for general use.

11. Findings and Conclusions - Traffic Congestion Impacts:

- HOV lanes offer motorists a "consistent" travel time during their commute.
- This measure when considering conversion of an existing Hwy 2 lane for HOV use, would:
  - depending on the current vehicle occupancy rates, have the potential to worsen congestion on the main through-lanes (This remains to be analyzed).
  - Over time, when more motorists change their travel behaviour and use the HOV lane, congestions would be anticipated to decrease in favour of alternate routes to meet local traffic demands, ride sharing and transit use.
- This measure when considering new HOV lane construction is anticipated to reduce congestion on the current highway lanes for both the short- and long-term:
  - In the short term, the widening of the Hwy 2 corridor to one additional lane-per-direction would in itself reduce congestion along the existing lanes;
  - In the long term, it is anticipated that construction of the HOV lane would encourage HOV use and reduce the pace at which the "new" lanes becomes saturated and congested.

12. Findings and Conclusions - Emissions and Environmental Impacts:

Based on the Southern California experience which evaluated the performance characteristics of both HOV and non-HOV lanes:

- HOV lanes were found to produce less pollutants when compared to SOV lanes due to improved traffic operations and flow. Providing improved traffic operations reduces acceleration and deceleration events, thus reducing emissions and fuel consumption.
- HOV lanes were found to generate far less emissions-per-person when compared with SOV lanes, however this can be attributed to HOV having over twice the occupancy than the SOV lanes.
- Limited access HOV lanes were found to have an increase in pollutants over continuous access HOV lanes. This was attributed to the greater number of weaving movements on limited freeway/highway sections, causing congestion on both the HOV and SOV lanes. Also, weaving on these limited segments was found to encourage greater acceleration or deceleration in order to take advantage of the limited gaps, resulting in both higher emissions and higher fuel consumption. California Department of Transportation,. Prepared by University of California CE-CERT. December 2006

Occupancy Toll (HOT) Lanes

Improvement Measure #2:
High Occupancy Toll (HOT) Lanes



HOT Lanes permit vehicles to access an HOV Lane for a Set Fee

1. General Description:

An HOT measure represents an HOV facility that permits single occupants vehicles for a flat rate or a set fee per-kilometre. The fee is NOT variable with the level of congestion but rather is set based on providing a satisfactory level of service for the facility

This measure is distinct from tolled facilities. For example Hwy 407 in the Greater Toronto area is not a HOT but simply a tolled highway similar to Hwy 30 in Montreal where everyone pays a toll.

The authority must continue to assure a minimum level of service by control of the number of permitted users or by increases in the toll.

This differs from No. 3 Improvement Measure: Congestion Pricing which includes Variably-Priced Managed Lanes (VPML). which responds to the level of congestion on the facility.

2. Description: An HOT lane can represent either a designated freeway/highway lane or a completely new facility where a set fee is established open to all users willing to pay a fee. Level of service are assured by either constraining the number of eligible permitted users or improved functionality.

This measure can be established as a stand-alone facility on its own, or, where significant capacity exists, can be combined with other measures (eg. alternative fuel, electric vehicles) by assuring free access to the HOT lane.

On its own, an HOT lane is intended to provide motorists with a more reliable travel speed and a more exclusive travel lane to those wishing to pay an additional set fee to make use the facility. The premise of the measure is to establish a set price for a more reliable and improved level-of-service that is to be provided for a facility which may not have ordinarily been constructed.

The intent of the measure is to encourage carpooling/ride-sharing, but also to allow for single-occupant vehicles to make use of significant capacity provided by the HOV lane if it is not being fully utilized. The number of SOV vehicles permitted and the rate charged is strictly controlled to assure a high level of service is maintained on the HOV lane.

3. Complimentary Initiatives:

The following measures were determined to be complimentary to the development of HOT lanes:

- *Alternative Vehicle Technology*: HOT rules can be modified to be supportive of new technologies such as electric vehicles.
- *Congestion Pricing*: HOT lanes could be implemented with variable fares, depending on the level of congestion, within the HOT lane and the adjacent non HOV lanes, however this would see the HOT lane revert to a VPML as defined in No. 3 Improvement Measure Congestion Pricing as Variably-Priced Managed Lanes (VPML).

4. Negative Effects:

- Should existing lanes be converted to an HOT lanes,
  - the public would likely criticize the decision as being an additional public tax for use of "an-already-paid-for" public facility. Other criticism could take the form of developing (a "Lexus Lane") for the use of higher-income motorists.
  - less available capacity and potentially increased congestion for other motorists using the remaining lanes on the freeway/highway system would result. Increased congestion is anticipated until such time as motorists decide to shift their travel behaviour to another mode by either carpooling or transit to take advantage of the HOT lane free of charge or divert to another route.
- The establishment of an HOT lane is best considered when a new facility is required which ordinarily would not have been considered or scheduled for budgetary reasons. The HOT is intended to advance the creation of the facility by securing a source of funding separate from existing budgets.
- The advantage of HOT lanes, over an exclusive HOV designated lane, is that commercial transport vehicles are not excluded from use of the HOT lane and commercial trucking can also be provided with the opportunity to take advantage of the improved level of service for a fee.

5. General locations where Applicable:

- HOT lanes are most beneficial in urban areas that are known to have congestion and where commuting is prevalent.
- An HOT lane would be recommended in areas where there are currently at least 3 (or more) lanes per direction.

6. General Findings from Other Jurisdictions:



- *Ontario:* The Ministry of Transportation of Ontario (MTO) was the first Canadian province to have implemented HOT lanes along it's highway network. A pilot project commenced September 15th 2016 which saw the existing HOV lanes on the QEW being designated as HOT lanes. The advent permits single-occupant vehicles (The permit is $180 for a three month period). A total of 500 permits were sold by lottery. (There were over 3,400 applicants). to use the new HOT lane. The MTO is planning a new electronic tolling HOT lane to be opened by 2021 along the Hwy 427 corridor. (The fare and whether or not congestion pricing will be in effect which would make the facility fall under No. 3 Improvement Measure Congestion Pricing as Variably-Priced Managed Lanes (VPML) has yet to be determined).

7. Considerations for Implementation:

In an ideal scenario, an HOT lane can be implemented as a second phase following introduction of an HOV lane (as was done in Ontario). Staging the measures could involve:

- Stage 1: HOV lanes would be implemented restricting access to vehicles with numerous passengers. A shift from single-occupancy vehicles to carpooling will generally occur over a long period of time.
- Stage 2: Once the HOV lane is well established, the HOV lanes would be converted to HOT lanes. This allows remaining capacity of the HOV lane to be available to single occupant vehicles for a set fee. This

Occupancy Toll (HOT) Lanes

allows the 'jealous' drivers to use the lane that is often perceived by the public, and which may be, 'under used'.

An HOT lane can be provided as a first stage, however persons are more likely to "just pay" to use the lane instead of changing their traveling habits depending on the price set and the number of permits issued. The main goal with these measures is to encourage motorists to rideshare and to decrease the total amount of vehicles on the road, not to simply "tax" people to use a facility.

8. Potential Application to this Project:

- An HOT lane can be applicable as a second step to any HOV lane.
- A permit-based or automated billing system can be applied to implement HOT
- Generally, the permit-based system has a lower initial operating cost as it does not require the same infrastructure when compared to an automated billing systems.

9. Information Needed to be collected:

- Occupancy profiles for vehicles currently traveling on Hwy 2.
- Current carpooling options for commuters; number of registered carpools (if any).
- Existing traffic volume on Hwy 2.
-

10. Analysis to be Conducted:

- Pricing elasticity and demand analysis is required to establish the appropriate HOT rates.
- The Capital Region Board (CRB) has commissioned the "*Edmonton High Occupancy Vehicle/Transit Priority Study*" (AECOM, July 2016). The study represents a good starting point in terms of analysis for a potential HOV/HOT lane along Hwy 2. Consultation with stakeholders along the corridor show an interest in a pilot project that would convert the median lanes from 65th Ave in Leduc to Ellerslie Rd in Edmonton to a HOV lane. In September 2016, the CRB voted in support of pilot projects to study how carpool lanes could change the future of transportation between municipalities around Edmonton. Transportation forecasting and analysis would be required to determine the potential impact of a HOV lane along Hwy 2, in terms of travel time saved for HOV vehicles, as well as the impacts on the resulting lanes of traffic.
- Once the base analysis of an HOV lane is undertaken, a second step analysis can be undertaken to identify impacts of an HOT lane. The analysis would be required to identify the number of additional single-occupant vehicles that could be accommodated within the lane and the potential annual revenue associated with fare collection. (Traffic must be "well established" and an overall equilibrium reached in the HOV lane prior to issuing HOT permits, to ensure that the lane can accommodate additional traffic while still maintaining adequate LOS.)

11. Findings and Conclusions - Traffic Congestion Impacts:

The measure would allow for a 'second stage' improvement along the Hwy 2 corridor.
A study undertaken by RAND corporation[1] evaluating traffic in Los Angeles, USA, indicates that:

- "High-occupancy toll (HOT) lanes can maintain free-flowing travel speeds (60 to 65 mph) during peak travel hours while carrying up to twice the volume that congested general-purpose lanes do.
- HOT lanes can also raise sufficient revenue to subsidize express-bus operations."

12. Findings and Conclusions - Emissions and Environmental Impacts:

- The emission characteristics are similar to No. 1 Improvement Measure: HOV Lanes however, the vehicles paying to use the facility would assure less emissions in the remaining lanes and therefore can be used to achieve a better and sooner environmental emission reduction recognizing greater use of the lane.

[1] http://www.rand.org/pubs/research_briefs/RB9385.html

Congestion Pricing

Improvement Measure #4: Congestion Pricing



Singapore: Pricing Gantry Triggers Congestion Pricing

1. General Description:

Congestion pricing can be defined as "*roadway pricing that varies by time of day based on the level of congestion in a variable toll lane*".

2. Description:

NCHRP has identified three types of congestion pricing systems[1]:

a. *Variably-Priced Managed Lanes (VPML)* - This system involves the establishment of HOT (High Occupancy Toll) or Express Toll (ETL) Lanes that apply either a fixed (by time of day) or varying (related to real-time) congestion price schedule oriented at ensuring a fee is directly tied to a sustained minimum level of service, flow rate or travel time on specific lanes. This is intended to remove the uncertainty and variability in travel associated with un-priced lanes.

b. *Toll Facilities with Variable Pricing* - This system is applied to an entire congested corridor (all lanes) where fees are charged based on the level of congestion. The pricing is aimed to encourage a mode shift (if done in concert with HOV lanes), or to encourage travel outside of the peak travel times.

c. *Cordon and Area Pricing*: (This system is addressed as Improvement Measure No. 6.) predominantly used to address congestion in dense urban city center environments. The system involves a boundary being established where all vehicles entering the area are charged a fee which may vary with time. The goal is to reduce congestion within the urban centre environment. Examples are in Europe and Singapore. [Congestion pricing came about because highways cannot be widened indefinitely and smarter transportation management systems are required.[2]]

Generally, these measures (a and b above) are implemented in a phased manner, in that:

- a newly created lane, which may have initially been designated as an HOV Lane, is then observed/perceived as being under-utilized while the remaining lanes are congested. In order to populate the under-utilized (HOV) lane the (HOV) lane is then converted to an HOT (High Occupancy Toll) lane where HOV and other designated vehicles are not charged but single occupant vehicle (SOV) are charged a fixed toll.
- Should the combined HOT/HOV lane become congested, the value of the toll can be varied by time-of-day and day- of-week in an attempt to shift SOV trips to either outside of the peak period or off of the HOT lane with only HOV vehicles remaining.

Congestion pricing measures exceed incentive/encouragement of multi-occupancy vehicles measures as they assign a cost premium to be paid by SOV motorists. The cost premium assure those willing to pay of a travel time advantage while still maximizing the use, efficiency and level of service advantage offered by the HOV lane.

The primary goal of a congestion charging system is to reduce congestion to a more efficient level. This level is determined by:

a. the cost of the scheme to the motorist;
b. the behavioural response to it; and
c. the relation (demand elasticity) between external congestion costs and traffic volumes.

Tolling of an HOV lane to those SOV willing to pay the charge, as a secondary benefit frees up additional capacity in the remaining SOV lanes.

3. Complimentary Initiatives:

Congestion Pricing:

- can be integrated with express lanes provided for *transit, HOV and ride sharing* use in the case where adjacent SOV lanes are congested and HOV/transit/ride share use has been maximized while still resulting in relatively low-utilization;
- can be used to respond to congested *toll highways*; and
- can be used to better respond to capacity demands than a fixed-price *High Occupancy Toll (HOT) lane* system.

4. Negative Effects:

- The congestion pricing concept of introducing a fee or value on an assured travel time would meet with significant public resistance especially in areas where tolling has never been traditionally used.
- Congestion can only be reduced where it is (perceived to be) excessive to begin with. Introducing of a congestion pricing system in anticipation of excessive congestion in the future will not garner public support, because perceived benefits will be low in the absence of an "acute" problem.
- Research often indicates that LOS improvements are achieved or maintained on HOT lanes during the peak periods of operation by dynamically raising the toll price during peak usage, however, research does not comment on the additional congestion effect that the spill-over from the high priced HOT lane has upon the remaining SOV lanes.
- The public may regard the fees charged for the provision of high levels of service as an additional tax where as in the past assuring a high level of service on public roadways was assumed to be a public responsibility.
- Negative perceptions of Variably Priced Managed Lanes (VPML) has in the US led to the public referring to these as "*Lexus Lanes*" inferring that the facilities and measures benefit those who can afford it, and penalize those who can least afford it, by relegating their travel to the remaining congested lanes or other congested routes.

5. General locations where Applicable:

- The measure is envisioned on those sections of the QE II with at least 3 or more existing lanes located through or immediately adjacent to, urbanized areas characterized by congestion.
- This measure would likely only be implementable in concert with the construction of a new Hwy 2 travel lane through, or approaching the urbanized area of Calgary-Airdrie or Edmonton-Leduc.
- The inside, median or "passing" lane would be reserved for Congestion Pricing.
- In the case of Edmonton, widening to a 4th collector lane, or when one of the planned core lanes becomes

[1] NCHRP. Report 694. Evaluation and Performance Measurement fo Congestion Pricing Projects http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_694.pdf
[2] Widening Project Update: Miami-Dade County. October 2012. http://www.fdotmiamidade.com/userfiles/files/Floridas_Turnpike_Enterprise_PPT.pdf

Congestion Pricing

congested may represent opportunities of consideration of this measure.

- In the case of Hwy 2 between Airdrie and Calgary, the inside, median or "passing" lane could be reserved for Congestion Pricing measures to further encourage mode shift, and greater utilization of an HOV lane.

6. General Findings from <u>Other Jurisdictions</u>:

<u>The I-95 in Miami, Florida</u>



Miami, Florida began tolling an initial segment on December 5th, 2008. Initially 10 highway miles were constructed (with a single access/egress) and were opened in April 2015. Tolls are charged another 14 miles on a 'per segment basis'. A segment is considered from the point of entry to the first opportunity to exit. The "Express" lanes are a High-Occupancy Toll Lanes with dynamic pricing. The dynamic fee structure is "market based" with the ability to vary every 3 minutes depending on the changing levels of congestion on the express lane. The critical system components include electronic toll collection, video for pricing and enforcement, traffic management and information dissemination including traffic monitoring and detection, and traffic and pricing information display to the users[3]. The 95 Express has helped increase travel speeds by 200 percent on the local lanes and by 300 percent on the express lanes in both directions. Transit usage also increased by 145 percent compared to before launch.

Motorists pay 50 cents to $10.50 to ride in the express lanes, depending on traffic volume on the seven-mile stretch in Miami-Dade County. **<u>Contrary to what many people think, the cost is not a reflection of congestion in the free lanes, but is pegged to the number of vehicles using the toll lanes</u>**. The more cars that use the toll lanes, the higher the toll[4].

Prices vary from $0.25 to $2.65 from the Golden Glades Interchange to downtown Miami, which increases to $6.20 according to the figure below (2014). However prices were to see an increase up to a maximum of $10.50[5] as too many motorists were willing to pay the fee. **<u>Emergency vehicles, transit buses, registered vanpools, registered carpools of 3+, registered hybrid vehicles and motorcycles can use the facility free of charge</u>**.

I95 Express uses technology to monitor the highway and provides dedicated incident management resources to keep I-95 operating at free flow conditions.

FDOT[10] indicates that congestion pricing on the I-95 Express route:



- was intended to "*deliver a cost-effective improvement in a short amount of time*" when compared to traditional widening solutions;
- has helped increase travel speeds by 200 percent on the local lanes and by 300 percent on the express lanes in both directions;
- has served to increase transit usage by 145 percent as compared to before launch; and
- in concert with other options have reduced the number of cars on the road during peak travel times and enhanced travel speeds for all motorists.

95 Express combines four proven traffic management techniques to reduce congestion and promote sustainability. These options include:

- an enhanced Bus Rapid Transit service;
- a ride-sharing program;
- travel demand management incentives; and
- a dynamic tolling component offering drivers the choice of paying a toll to use the express lanes for a more reliable trip.

All of the above in concert with one another serve to increases capacity on the local lanes by shifting traffic to the HOT lanes and encouraging increased ridership / vehicle occupancy to reduce congestion.

<u>Interesting Planned Projects of Note</u>

- ***Minneapolis-St.Paul: I-35 W HOT Facility***: This planned project will involve conversion of the current carpool (HOV) lane to a high occupancy toll (HOT) lane using the MnPass technology already employed in the area. Priced Dynamic Shoulder Lanes (PDSL) will also be implemented, which allows the wide shoulder to operate as a HOT lane during heavy traffic and then switched back to a shoulder in the event of an accident by way of overhead variable message signage.
- The Minnesota Department of Transportation has MnPass Express Lanes. These lanes provide free access to vehicles with 2+ persons and are a pay-per-use rate for single occupant vehicles. The fee that is displayed on an overhead electronic sign upon entry to the lanes is what will be charged for your vehicle, regardless if the fee changes during your trip (i.e. if congestion pricing causes the rate to increase for the vehicles behind you, your rate will stay the same). The MnPass system has a "switchable tag" that can be transferred from one vehicle to another and allows the user to change between an HOV 2+ ride and a payable ride (for example, a parent drives a child to school can have the tag set to the "free" setting, then switches back to MnPass for their drive to work). The rate system is based upon a HOT lane traveling speed of 50-55 mph. The MnPass

[3] 95 Express. FDOT. http://www.95express.com/faq/
[4] Eric Barton. September 2014.Toll Lanes becoming all the rage in Florida. Miami Herald. http://www.miamiherald.com/news/local/community/miami-dade/article2198345.html#storylink=cpy - September 2014

[5] Kenny Malone. March, 2014 http://www.marketplace.org/2014/03/04/business/lexus-lanes-and-price-saving-time

Congestion Pricing

Express Lanes are only tolled on peak hours. They are open for all vehicles during off-peak weekdays and on weekends.



7. Considerations for Implementation:

The most common method of assessing the benefits of congestion pricing/managed lane projects would be a separate evaluation of options independent of other possible improvement options. Most of these independent assessments considered performance measures from the following three general categories[6]:

- Travel time, delay and level of service on the effected corridor;
- Net revenue generated; and
- Distribution of cost impacts and travel time benefits across the entire population

Assessments, (eg. Washington D.C area) can also include consideration of:

- the spill over effect upon alternate modes (transit, ridesharing, and non-motorized modes);
- environmental benefits such as emission reduction and reduced fuel consumption; and
- the potential reduction in green-house gas emissions.

An NCHRP report described a large number of 'performance monitoring' elements. However, it remains critical to establish what the goals of the congestion pricing project are from the outset in order to assess how well the measure is achieving those goals. The primary goals of a congestion pricing project are likely to include:

- congestion reduction;
- revenue generation;
- system utilization targets;
- strengthening transit service; and
- maintaining or improving safety.

The implementation of a pricing policy is likely to receive greater public support when a crisis is perceived and some form of mitigation is required to avert a worsening congestion crisis. In this regard only, there appears to be no difference in a congestion policy shift versus those in the areas of environmental, safety or macroeconomic policy[7].

8. Potential Application to this Project:

This measure would likely only be implementable in concert with the construction of a new Hwy 2 travel lane through, or approaching the urbanized area of Calgary-Airdrie or Edmonton-Leduc where the inside, median or "passing" lane would be reserved for Congestion Pricing.

- *Calgary:* In the case of Hwy 2 between Airdrie and Calgary, the inside, median or "passing" lane could be reserved for Congestion Pricing measures to further encourage mode shift, and greater utilization of the introduction of an HOV lane.
- *Edmonton:* A 6-lane rural divided QE II corridor commences just north of the 50th Avenue interchange. Future plans call for the establishment of a core lane network between Leduc and Anthony Henday. Congestion pricing may represent a future opportunity for consideration. The measure could potentially be applied to one of the core lanes or a new widened collector lane by establishing an HOT lane in each direction of travel on the future core lane network.
- *Red Deer:* This measure was thought to be unsuitable for improving levels of service further on the Hwy 2 corridor within the Red Deer Area as congestion levels have not reached the extent where motorists would be willing to pay a congestion charge for higher levels of service.

9. Information Needed to be Collected:

The following information would be necessary to collect to provide an understanding of the potential impacts associated with this measure:

- *Current Vehicle Occupancy Trends:* Vehicle Occupancy trends along various sections of the QE II corridor would be required to be collected. This is needed to assess the existing profile of 2+ and 3+ vehicles in relation to single occupant vehicles where congestion pricing is to be implemented in concert with HOV strategies. [Ideally, passenger vehicles should be distinguished from large commercial vehicles during the occupancy counts.] [A single-day survey was conducted in November, 2016 to provide insight into vehicle occupancy trends along the Hwy 2 corridor.]
- *Implementation, Maintenance and Enforcement Costs:* Overhead signage, pricing technologies, enforcement and state-of-art pricing collection methods merit review prior to consideration of implementation.

10. Analysis to be Conducted:

The following analysis should be undertaken to provide an understanding of the potential impacts associated with this measure:

- *Forecast Travel Demand Estimates*: Economic demand "elasticity" analysis should be undertaken to assess the effects of pricing on demand taking into account comparative pricing of alternative modes, value of time and socio-economic community stratification impacts.
- *Transit and HOV Forecasts*: This would be needed to assess the potential benefits and costs of sharing transit use on the HOT lanes.

11. Findings and Conclusions - Traffic Congestion Impacts:

Congestion pricing can be used to increase capacity and reduce congestion, so much so, that the *'through-put'* of vehicles on an HOT lane(s) can be potentially be doubled by incorporating a variable toll. The doubling indicated increases from a peak period "congested" 800-to-1,600 vphpl when a price is assigned to the higher level of service[8].

Based on the Florida experience alone, congestion pricing holds the potential of ...

- roughly doubling congested travel speeds on the local (collector) lanes during the peak periods;
- roughly tripling congested travel speeds on the on the express lanes;
- roughly doubling transit usage.

[6] Danhong Cheng. Graduate Paper. Louisiana State University. Case Study on I-95 Managed Lanes http://etd.lsu.edu/docs/available/etd-01172013-215017/unrestricted/danhongcheng.pdf

7 Joint Transport Research Centre. Feb 2010 http://www.internationaltransportforum.org/jtrc/discussionpapers/DP201012.pdf

[8] State Route 91 Federal Highway Administration. U.S DoT. http://ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm

Congestion Pricing

12. Findings and Conclusions - Emissions and Environmental Impacts:

When undertaken in concert with incident management, transit, HOV, ride-share and other measures, congestion pricing can be used to further address emissions by raising the average operating speed of both *Variably-Priced Managed Lanes* VPML and *Variably-Priced* freeway/highways facilities.

Variable Speed Limits (VSL) Part of Active Traffic Management (ATM)

Improvement Measure #4:
Variable Speed Limits (VSL) -
Part of Active Traffic Management (ATM)



Variable Speed Limits can responds to Congestion and Weather

1. General Description:

Variable (or dynamic) Speed Limits (VSL) are defined as *"the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions "*. The purpose of VSL is to reduce stop-and-go traffic, thus reducing collision probability and severity by providing more reaction time.

2. Description: (See the following link: http://www.wsdot.wa.gov/smarterhighways/video.htm)

Variable Speed Limits (VSL) can involve:

- *Variable Message (overhead) Signage (VMS):* This signage is clearly displayed over each travel lane. The signage would indicate a posted speed limit for the lane and the lane status. (Individual lanes can be closed due to construction/accidents if this measure is synchronized with an incident management system. Individual lanes can be closed due to inclement weather is tied to a responsive weather control system.) The signage is placed at pre-determined intervals (For example: every half mile or 800m).
- *Integration with Supporting Variable Message Signs*: The supporting VMS signage can indicated the level of congestion ahead in terms of anticipated travel times to key locations, convey incidents (collision / construction ahead) or desired motorist behavior (e.g. gradually reduce speed).
- *Traffic Sensors along the Roadway;* Sensors can be used to collect vehicle speeds, congestion information and traffic flow rates which reflect real time conditions. The information can be used to identify congestion and can be conveyed to the overhead VMS signs.

Variable Speed Limits (VSL) serve to lower the differential speed between free-flow and congested traffic streams. Panic breaking is caused by congestion, where the lead vehicle first slows, and each sequential vehicle that follows has an increasingly shorter reaction time to respond to the change in travel speed (as each vehicles must adjust from freeway operating speeds to near-STOP travel speeds). Variable Speed Limits (VSL) serves to slow the travel speed down so as to prevent "panic braking" minimizing the potential for "stop-go" congestion and the severity of collisions should they occur.

3. Complimentary Initiatives:

- This measure can be implemented in concert with real-time traffic information so motorists know what's happening ahead based on road, traffic and/or weather conditions.
- **Research[1] claimed that when considering dynamic speed limits as the sole ATM strategy, there were none-to-low benefits relating to congestion and increase in vehicle through-put.** Benefits were predominantly oriented to increased collision reduction potential.
- VSL can be conducted simultaneously with other 'smart road'/ATM measures such as: information regarding travel times, queue warnings, curve warnings, adaptive ramp metering, traffic cameras for observation, speed harmonization, junction control and other motorist warning signs.
- This measure can be integrated with managed lanes such as HOV or HOT lanes.

4. Negative Effects:

- The Variable Speed Limit (VSL) measure can lead to driver error when combined with too much or conflicting information such as travel time, collision, weather information. The amount of information may become an overload to the motorist and serve to impair operations along the freeway/highway.
- Intuitively, spacing of VSL and supporting information signage must consider both conventional and lower operating speeds, as the close spacing suitable for congested conditions (50 kph) may prove too close for conventional freeway travel speeds (110 kph). Despite this intuition, research indicates that VMS can be an accurate, effective, and safe tool for disseminating real-time travel information to motorist. There were no perceived negative effects associated with providing a large amount of information to motorists[2].
- Legislation may be needed to adapt to the advent and enforcement of VSL's. Police/RCMP must be given the authority to enforce speeds indicated on an electronic sign.

5. General locations where Applicable:

- As regards the desire to reduce stop-and-go traffic and rear-end collision probability / severity this measure would be considered most effective within the urbanized areas of the Highway 2 corridor where higher congestion levels are evident.
- As regards the desire to respond to inclement weather conditions by providing an effective way to communicate reduced travel speeds, this measure would be considered most effective in those areas known for fog or snow-squalls.

6. General Findings from Other Jurisdictions:

Lethbridge, Alberta - A Municipal Arterial Example: The City of Lethbridge's (October 2014) VSL facility addresses Whoop-Up Drive which is 3.5km in length and characterized by a 90 km/hr speed limit, varying slopes of 6%-7% and an AADT of 50,000 vehicles. The roadway was prone to collisions, including several multi-vehicle pile-ups attributed to severe weather conditions. The VSL system included two VMS trailers and seven side mounted speed limit digital signs. The message boards are solar powered with backup generators[3] while the speed limit digital signs have permanent power. Traffic By-Law amendments were required to address the advent of VSL. Results appear to be positive with the the 85th percentile speed being 60-to-70 km/h when the variable speed was reduce from 90-to-60 km/h. Also, no collisions were reported on Whoop Up-Drive during weather events when the speed limit was reduced[4].

[1] F. Soriguera et al (2013) and the University of Texas (2011)

[2] Study conducted by the Maryland Department of Transportation an *"Evaluation of Dynamic Message Signs and their potential impact on traffic flow"*

[3] The municipality also invested in a set of generators for the message boards, which experience infrequent use. The capital cost was approximately $120,000, with annual maintenance of $3,000.

[4] Ali, Ahmed. Variable Speed Limit Implemented in Lethbridge. TAC-ATC.ca. March 23, 2016

Variable Speed Limits (VSL) Part of Active Traf Management (ATM)







British Columbia: The BC Ministry of Transportation and Infrastructure is piloting a VSL strategy on three highways where weather patterns are prone to change quickly and make driving conditions challenging. The highways are:

- Highway 99 (Sea-to-Sky between Squamish and Whistler);
- Highway 5 (Coquihalla between the Portia interchange and the former toll booth plaza); and
- Highway 1 (west of Revelstoke between the Perry River Bridge and the Highway 23 South interchange).

The VSL system measures vehicle speed and weather conditions and forwards the information to the Ministry's Regional Transportation Management Centre in Coquitlam to calculate a speed limit based on the current conditions. This speed limit is sent back to the highway and is displayed on bright overhead digital sign. Speed limits are enforceable by the police.

Oregon Department of Transportation (2013): Salem, Oregon evaluated the effectiveness of two active traffic management (ATM) system projects featuring Variable speed limit (VSL) and Variable advisory speed (VAS) components installed on OR 217 (urban) and US 26/OR 35 (rural/mountain), to aid in optimizing the operation of these systems, lay the groundwork for future implementation of Active Traffic Management (ATM) and VSL systems across the State. The findings[5] concluded that:

- average congested period through-put increased in the order of 3% to 7%;
- overall capacity increased in the order of 3% to 22%;
- primary incidents decreased in the order of 3% to 30%;
- secondary incidents decreased in the order of 40% to 50%;
- speeds during congested periods became harmonized;
- headways between vehicles were decreased;
- driver behaviour became more uniform;
- trip reliability was increased and the onset of freeway breakdown was delayed;
- an overall reduction in collisions of 45% was observed; and
- a reduction in injury collisions of 20% was observed;

European Countries:

- France has permanent speed signs along their freeways that are weather dependant. The signs are permanent fixtures and identify a regular posted speed limit of 130 km/hr, with a reduced speed of 110 km/hr when precipitation is present.
- Italy has permanent signs in case of fog, where a lower speed limit would be in place depending on the severity of fog. The signs below are present on over 1,300km of highways within Italy[6].



Another European approach is that different vehicle types have different speed limits to follow. The sign illustrated below is posted at a border crossings and reinforced by way of variable speeds posted above different lanes.



The issue of differential speeds by lane is addressed by the conventional approach: slower vehicles on the right. Signage is in place with "suggested" speeds over freeway lanes. Passing on the right is not only frowned upon, but is illegal in some countries, such as Germany, France and the Netherlands.

[5] http://www.oregon.gov/ODOT/HWY/TRAFFIC- ROADWAY /docs/pdf/2013_conference/ Session_3C_Mitchell.pdf

[6] https://www.autostrade.it/en/assistenza-al-traffico/in-caso-di-nebbia/come-guidare

Variable Speed Limits (VSL) Part of Active Traffic Management (ATM)



7. Considerations for Implementation:

VSL provide the greatest benefit to reducing the frequency and severity of collisions. Implementation should be considered when:

- Safety issues and high collision rates are identified along specific corridors;
- Severe "stop-and-go" traffic conditions are present that would cause panic braking, which increases the risk of collisions; and
- Traffic congestion attributed to severe weather or sudden white-out conditions (such as a lake effect) that would require motorists to slow down ahead of the queues on the highway.

8. Potential Application to this Project:

VSL could be implemented within the urban areas, Airdrie/Calgary, Red Deer and Leduc/Edmonton, that are prone to major congestion, or in areas where weather often plays a role in collisions (such as white-out, snow squall or fog conditions.)

Specifically in cases where weather often plays a role in collisions, permanent signage with a lower posted speed in case of precipitation should be considered.

9. Information Needed to be Collected:

- Collision data: frequency, severity, time of day and weather condition.
- Traffic volumes-to-capacity ratios along the corridor.

10. Analysis to be Conducted:

- *Collision Analysis and Statistic Evaluation:* Collision frequency, severity, time of day and weather conditions should be considered. If safety concerns are identified, VSL can be considered a mitigating factor for collisions.
- *Analysis of Traffic Congestion in relation to Weather*: Collection of traffic congestion data pertaining to time lost due to weather. Reducing speed limits during severe weather events may improve safety for motorists along the corridor.
- *Corridor Analysis*: Identify bottle-neck locations where queues are likely to form.
- *Available Technology Investigation:* Investigation and research into Intelligent Transportation Systems and technology. For example, road imbedded sensors are used to evaluate traffic congestion and relate the information to the human-controlled system. Lane control changes are human-initiated, but software automates the signage update.
- *Signage Study*: A feasibility study should review signage; applying policies and standards to avoid too many signs providing too much information along a section of the corridor.
- *Feasibility Study and Cost Analysis*: A feasibility study that includes a cost analysis of implementing the VMS, road sensors, communication technologies and maintenance of the system.

11. Findings and Conclusions - Traffic Congestion Impacts:

This measure used independently is anticipated to result in an indirect improvement to traffic congestion by reducing the frequency of collisions and its associated delays. However, research and the Oregon experience would indicate that the benefit to congestion and increased vehicle through-put could, at best, only achieve a 10% benefit. The primary benefit of this measure is oriented to collision severity and probability in communicating to motorist proper driver behaviour during inclement weather conditions.

12. Findings and Conclusions - Emissions and Environmental Impacts:

Little research is available regarding the effect that this measure has upon emissions or environmental impacts.

Improvement Measure: Autonomous Vehicle

Improvement Measure #5:
Autonomous Vehicle (AV) Technology

1. General Description:

Automated vehicles (AV) also known as autonomous, self-driving or driverless vehicles) are capable of driving by detecting the surrounding environment using artificial intelligence, sensors and global positioning system coordinates.

AV's are expected to start becoming common within the next 10-to-15 years, and are reportedly poised to revolutionise the way people and goods travel.



Autonomous Vehicle Technology and Capacity

2. Description:

AV Technology holds the promise of fundamentally changing transportation with the added benefits of reduced collisions, improved energy consumption, reduced emissions and a reduction in the cost of congestion and potentially land use. AVs are on the roads today, however, the technology is still in its development stage with most commercially available vehicles reaching Level 2 as indicated in the following levels:

- Level 0: No automation - the driver completely controls the vehicle at all times;
- Level 1: Minor automation - there are some vehicle controls that are automated, such as electronic stability control or automatic braking;
- Level 2: Partial automation - at least two controls can be automated in unison on limited roadways, such as adaptive cruise control and lane keeping;
- Level 3: Conditional automation - the vehicle controls most situations, however alerts the driver when conditions sense the driver must re-take control; and
- Level 4: Full automation - the vehicle performs all situations for the entire trip; the driver does not control the vehicle.

Many of the major car companies are working on a form of AV, which include but are not limited to:

- *Cadillac*'s Super Cruise (Level 2) is anticipated to be available in 2017, it will allow vehicles to travel autonomously under certain highway conditions. The technology would include adaptive speed control and lane keeping.
- *Volvo* is launching it's DriveMe project (Level 2/3) in 2017, with 100 self-driving vehicles being placed on Sweden's public roadways. Volvo also has autonomous driving vehicles in conception, with Autopilot IntelliSafe technology in their Concept 26 (Level 2/3) vehicle.
- *Tesla* currently has the Model S and Model X with Autopilot (Level 2); the self-driving capabilities are under a "public beta phase" where the vehicle can be on Autopilot under certain highway conditions.
- *Ford* anticipates to launch their fully-automated vehicles (Level 4) in 2021, it is intended to be part of ride-sharing fleets, as opposed to on the market for consumers to purchase. Ford plans to offer Level 2 or 4 AVs; Level 3 AVs will not be produced because Ford's approach is that "there was no safe way to ensure that drivers would remain alert enough to resume control in an emergency after an extended period of automated driving"[1]
- *Google* is perhaps the best known company having prototypes offering Level 4 driverless vehicles with steering wheels being omitted. They also have self-driving Prius and Lexus vehicles (Level 3) being tested in California and Texas.

3. Complimentary Initiatives:

- *Connected Vehicles:* Connected vehicles are vehicles that "speak" to one another over wireless signals. Connected vehicles also use global positioning system coordinates and can be used in assisting with collision avoidance.
- *Safety Trucks:* Developed in Argentina, the Samsung Safety Truck[2], developed in association with software company Ingematica, trailer company Helvetica, Leo Burnett and Volvo Trucks, has heavy vehicles equipped with two cameras at the front which project live footage on four screens at the back of the truck. It is anticipated that this technology will reduce collisions that occur when vehicles try to overtake heavy vehicles on two-lane roadways.



- *Vehicle Platoons:* Technology exists where a lead vehicle, driven by a professional driver, could allow for vehicles to join a platoon (or road train). Once in the platoon, the following-vehicle driver gives up control of it's vehicle to the lead and their vehicle drives itself. The driver has the option to take over the controls and leave the platoon at any time. The SARTRE Project was successfully completed in 2012 and found that road trains are possible. Energy saved is in the range of 10-20%, and vehicles allow for better road use with a gap less than 4 m between cars.
- *Twin-Truck Platoons:* A concept exists where two heavy vehicles communicate together over a Wi-Fi

[1] http://www.forbes.com/sites/pikeresearch/2016/08/19/ford-autonomous-vehicle/#24f672122752
[2] http://theinspirationroom.com/daily/2015/samsung-safety-truck/

Improvement Measure: Autonomous Vehicle

signal, and the second truck follows the first in a platoon. DAF trucks and TNO (a Netherlands organisation for applied scientific research) currently have a prototype EcoTwin in place and are anticipating to have twin truck platoons on public roadways before 2020.

4. Negative Effects:

- The technology is still in development and is not "fool proof". Artificial intelligence is showing great progress, however for Level 3 and under AVs, drivers must be aware of their surroundings and still be prepared to take control of their vehicles at moment's notice.
- It is anticipated that weather conditions can play a role in AV's capabilities. Google's self-driving car is being developed in Texas and California, however to date, driving on Canadian roads with winter storms remains to be thoroughly tested. It is anticipated that since Ontario has launched a pilot project for AVs, adverse weather conditions will be assessed.

5. General locations where Applicable:

AVs will become part of the everyday roadway network. The technology is currently mostly limited to highway through-lanes (i.e. on-ramp to off-ramp), but vehicles will soon be capable of navigating all roadways and scenarios.

As the technology becomes more common, vehicles will be more efficient at utilizing the roadway network with the promise of capacity being maximized along the entire length of the Hwy 2 corridor.

In the short-term, consideration should be given to AVs to travelling within designated freeway lanes.

6. General Findings from Other Jurisdictions:

AV are in the research and development stages at this point and therefore findings are limited.

- The Province of Ontario was the first in Canada to launch a 10-year pilot project that would allow testing of automated and connected vehicle technologies on public roads. The Institute of Electrical and Electronics Engineers forecast that by 2040, autonomous vehicles will account for 75 per cent of all vehicles on the road.[3]
- The United States Department of Transportation is planning to mandate Vehicle-to-Vehicle (V2V) crash avoidance systems in all vehicles by 2020. Vehicles will automatically communicate with other nearby vehicles. This technology(driver advisories/warnings)[4] is anticipated to result in an 80% reduction of vehicle collisions.
- Alberta Transportation is a partner in the ACTIVE-AURORA project, which will be testing connected vehicle systems in real-life scenarios. The project represents the first connected vehicle test-site in Canada.

7. Considerations for Implementation:

- Until such a time where AVs become more common, an advantage to those motorists utilizing the technology could be provided in the form of priority lanes for AVs, such as HOV or HOT lanes.
- If/when the platoon technology becomes further advanced, dedicated platoon lanes can be offered as a service, with numerous lead vehicles traveling along the corridor at set intervals so that cars can join into the platoons.

8. Potential Application to this Project:

- It is anticipated that AVs will be slowly integrated within the roadway networks as technology becomes further advanced. The effect on the Hwy 2 corridor should be closely monitored with particular emphasis on those sections of freeway/highway that are characterized by a high proportion of "local" travel.

9. Information Needed to be collected:

- Information regarding the effects of AV upon roadway capacity is required.
- Travel demand behavioural effects associated with AV technology remain to be quantified.

10. Analysis to be Conducted:

- As technology becomes available, AT is encouraged to have a pro-active and progressive attitude towards legislation changes that can allow for these new technologies to be implemented on Alberta's roadway network.

11. Findings and Conclusions - Traffic Congestion Impacts:

- What may have the largest impact upon the Hwy 2 corridor is not the fact that AVs are available, but the potential of AVs to reduce congestion on roadways. A single ride-share vehicle can replace 9 to 13[5] privately owned vehicles. When Level 4 AVs become available, the need for privately owned vehicles is anticipated to decrease as the concept and popularity of ride sharing is anticipated to increase. The potential exists for AVs to replace privately owned vehicles at a rate of 1:2 to 1:13, it was determined that a ratio of 1:1.2 or greater could be important in reducing congestion[6].
- AV technology of Level 3-or-higher holds the promise of substantially reducing the cost of congestion, however, should history serve as a guide. each decrease in the cost-of-driving (be it vehicle operating costs, the cost of congestion or the level of attentiveness required) , has been marked by an increase in overall vehicle-miles travelled, potentially increasing rather than decreasing congestion levels.
- In conclusion: The overall effect of AV technology on congestion is uncertain recognizing that a new pool of users (eg. those under 16 years of age, the disabled, the elderly) would serve to increase the vehicle miles traveled.[7]

12. Findings and Conclusions - Emissions and Environmental Impacts:

- It has been reported that AV technology holds the promise of reducing emissions and reducing environmental impact by up to 50%[8] due to their more efficient use of the roadway network and due to the potential of having fewer vehicles on the road overall.
- AV technology is reported to improve fuel economy by 4-to-10% by offering smoother acceleration/ deceleration characteristics than a human operator.
- Platoons vehicles (road trains) can reduce emissions by 10-20%, due to the regulated lower peak but higher effective speeds (improving fuel economy with less breaking) and smaller gaps (headways)

[3] https://news.ontario.ca/mto/en/2015/10/ontario-first-to-test-automated-vehicles-on-roads-in-canada.html?_ga=1.230299548.12976491.1472480077

[4] http://www.trustpointinnovation.com/vehicle-to-vehicle/

[5] Martin and Shaheen, "The Impact of Carsharing on Household Vehicle Ownership."

[6] Conference Board of Canada, "Automated Vehicles: The Coming of the Next Disruptive Technology"

[7] Autonomous Vehicle Technology, A Guide for Policy Makers, Rand Corporation, J. M. Anderson, N.Kalra, K. D. Stanley, P. Sorenson, C. Samaras, O. Oluwatola, 2016.

[8] Myriam Alexander-Kearns, Miranda Peterson, and Alison Cassady, " The Impact of Vehicle Automation on Carbon Emissions: Where Uncertainty Lies", November 2016, Page 16.

Improvement Measure: Autonomous Vehicle

between vehicles.

Improvement Measure: Congestion Charges/Cordon Tolls

Improvement Measure #6: Congestion Charges/Cordon Tolls

1. General Description: Congestions Charges involve charging a fee during times of excess congestion to vehicles which travel within a defined congestion zone or along a designated congestion corridor. (This measure is often referred to as a "*cordon toll*".)



London: Street Markings & Signage Alert Motorists of Cordon Area Congestion Pricing

2. Description: Congestion charges have been around since the mid-70's and have transitioned from low tech manpowered systems to high tech digital systems. The measure is often implemented to reduce traffic and emissions within a particular area while simultaneously raising funds for improvements to either alternative less travelled routes, alternative travel modes, the congestion area itself and other public initiatives.

- A congestion zone or cordon is defined which is characterized by heavy traffic demands;
- In general, congestion zone have been applied to the downtown core areas of within major urban metropolitan centres, (London: 8.7M Pop, Singapore: 5.7M Pop, Paris: 9.8M Pop), characterized by major employment centres and a plentiful supply of private parking opportunities; where traffic congestion has become characterized by grid-lock. However, smaller municipalities have chosen to implement this measure, as well.
- The congestion charge works by discouraging motorists to drive and rather chose alternate modes of transportation to enter the congestion area. The charge is intended to reduce the number of vehicles on the roadway network.
- The method is often used as a "stick" to encourage the diversion of short duration/distance trips to alternative local parallel roadways and discourage unnecessary trips, (in their entirety if that is what is desired), during times of peak demand.
- Daily fares are applied to vehicles that enter and travel within the zone and are applicable during the weekdays daytime period (7:00 am to 6:00 pm).
- Discounts/exemptions/exclusion to the congestion charge can be provided for:
  - residents who live within the congestion zone;
  - registered carpool vehicles/high-occupancy vehicles;
  - persons with a disabilities;
  - electric (alternative fuel vehicles) or ultra-low emission vehicles;
  - motorcycles, mopeds & bicycles;
  - buses, emergency vehicles, public works vehicles; and
  - dignitaries. military vehicles
- Freeway/Highway traffic serving the City core experience a resulting decrease in congestion.

3. Complimentary Initiatives:

Congestion Charges / Cordon Tolls can be integrated with measures that effectively increase *parking rates* and/or decrease the amount of available parking within the designated area. Both measures are used to discourage single occupant vehicles for regular commuting. An approach similar to this was undertaken in Paris.

Congestion Charges/Cordon Tolls can be used to free-up capacity which can be reassigned to other modes to enhance their competitiveness.

- *Transit priority*: Fewer vehicles on the roadway network provide opportunities to assure higher levels of transit service.
- *Alternative Vehicle Technology*: Congestion charges can be supportive of new technologies, including electric vehicles.
- *Car Pooling / Ride Sharing*: Congestion charges for carpool vehicles can be discounted or exempt.

Congestion Charges/Cordon Tolls can be used to initiate area revitalization projects which include:

free-up capacity which can be reassigned to other modes to enhance their competitiveness.

- *Road Closures/Lane Conversions/Complete Streets*: Closing motorist access to certain roadways or converting existing roadway lanes to transit-only lanes or cycling/pedestrian paths can also deter persons from driving a personal vehicle. An approach similar to this was undertaken in Paris.

4. Negative Effects:

- Congestion charges negatively effect the areas and businesses that are located within the cordon:
- Congestion charges discriminate and serve to segregate different types of businesses. Businesses dependent on pass-by traffic and plentiful parking are more effected that those that favour tourism or office development.
- Congestion charges serve to stimulate suburban development (sprawl). Suburban developments (those outside of the cordon) are offered an unfair benefit as they remain un-penalized and unconstrained.
- Jurisdictional issues are significant in terms of implementation.
- Congestion charges have a greater effect on lower-income motorists who can least afford a daily commute charge.
- Congestion Charges/Cordon Tolls can not be implemented without alternative public transit options and other complimentary initiatives that must offer faster, reliable, convenient, and cheaper transportation option[1] than that imposed by the toll.

5. General locations where Applicable:

- This measure is thought not to be oriented to the major urban areas of Edmonton and Calgary. Unlike large metropolitan centres where congestion is characterized by a central specific downtown core area, Alberta's major urban centres congestion is distributed throughout several areas of the municipalities.
- The congestion zone boundary necessary to provide a benefit to the Hwy 2 corridor would be immense in

[1] ibid.

Improvement Measure: Congestion Charges/Cordon Tolls

size and essentially would traverse all around Anthony Henday Drive; (Roughly an area of 473 Square Kilometres or 10 times that of the area defined by Stockholm's congestion charge.) or Stoney Trail (Roughly an area of 604 Square Kilometres or 14 times that of the area defined by Stockholm.)

- If pricing is to be considered <u>at all</u>, "dynamic pricing" (Improvement Measure No. 2) when implemented along specific corridors would seem to offer greater suitability to addressing non-centralized congestions issues being experienced in on the freeways/highways adjacent to Alberta's major municipalities.

6. General Findings from <u>Other Jurisdictions</u>:

- *London, England (Population 8.7M - 9.8M including it's surrounding urban area)*: A congestion charge was implemented in London, UK, in 2003 within the downtown area, a zone roughly 21 square kilometres in size. The fee was £5 ($8.60) for vehicles on opening day, and has since increased to £11.50 ($19.75). The measure has been effective to reduce traffic within the area (a drop of 30% non-exempt vehicles occurred), reduce air pollution and had a neutral impact on the business community[2]. London is planning to further the measure by implementing a "pollution charge" by 2020 within a defined "Ultra Low Emission Zone", where all vehicles built prior to 2005 would pay an additional £12.50 fee[3] ($21.50). In London, the initial set-up cost of the congestion charge (£80.8M) represented only one third of the annual revenues (£252M) associated with the charge. [The Congestion Charge Zone in London is not to be confused with London's Low Emission Zone[4] (LEZ) established in 2012, which covers most of Greater London and is aimed at reducing vehicle emissions from vehicles (excluding cars and motorcycles). Vehicles that do not meet LEZ requirements must pay both the congestion charge and the LEZ charge.] In London, "congestion" within the zone has reduced by approximately 30%[5].
- *New York City (Population 8.6M);* A congestion charge was considered for vehicles traveling into or within the Manhattan central business district of New York City. The congestion pricing charge was aimed at improving the city's future environmental sustainability while planning for population growth[1] This would have been the first such fee scheme enacted in the United States but did not succeed as it was not put to a vote in the New York State Assembly. In comparison New York has a density 9 and 8 times greater than Edmonton and Calgary.
- *Stockholm Sweden (Population 910,000 - 1.4M including it's surrounding urban area)*; also has a congestion charge[6], which was implemented permanently in 2007 (a trial period was held in 2006) in a zone roughly 43 square kilometres in size. The congestion charge between SEK 11 and SEK 35 depending on the time of day each time you drive past a control point, up to a maximum of SEK 105 ($16.20) per day and is payable by direct debit for those vehicles equipped with an electronic tag or even in convenience stores. Emergency vehicles, buses, diplomatic vehicles, disabled persons vehicles, military vehicles, hybrid or electric cars, motorcycles and mopeds are all exempt from the charge. The congestion charge in Stockholm has been successful and Sweden has since expanded the program. The Essingeleden highway now has a congestion tax since January 1st 2016. In Stockholm, congestion charges have resulted in traffic reductions within the congestion zones of approximately 20%[7].

  The population of Stockholm compares favourably to Edmonton and Calgary (at 0.8M and 1.1M population, respectively). However, the significant difference in these municipalities is their densities of population per km^2. Stockholm has a population density 4.1 and 3.7 times greater than Edmonton and Calgary, respectively.
- *City of Gothenburg, Sweden (Population 550,000)*: has also introduced a fee (between SEK 9 and SEK 22 per control point, up to SEK 60 ($9.25) daily). In all jurisdictions, the charge is only payable on weekdays, from 6:00 am to 6:30 pm.

7. Considerations for Implementation:

- This measure is highly dependent on the willingness, cooperation and partnership practicality required from local municipalities to establish the measure.
- The funds raised through the Cordon Charge can be allocated to improving the supporting transit system and other complimentary measures.

8. Potential Application to this Project:

- Congestion charges require a designated zone to be a significant and dominant attraction for motorists.
- This measure is most applicable to those municipalities characterized by a strong core within a major urban area which demonstrates a sufficient draw/attraction of traffic, that despite the imposition of a toll, (resulting in a noticeable decrease in vehicle traffic), would still experience growth in pedestrian, transit and other modes of travel.
- **<u>It is unlikely that this measure implemented within Edmonton or Calgary's urban areas would achieve the desired reduction in traffic volumes that would propagate to Highway 2.</u>**

9. Information Needed to be Collected:

- A detailed origin-destination survey would need to be conducted for each of the major centers to determine the potential impacts to the Highway 2 corridor from reducing the number of vehicles that are destined to a defined cordon.
- The supporting transit network (routes, frequency, capacity) would require significant enhancement. In particular, transit service crossing the congestion charge cordon would be required to be significantly enhanced.

10. Analysis to be Conducted:

- Sensitivity analysis of the demands response to the toll charge and the various cordon boundaries would need to be undertaken to estimate the volume of traffic that could divert to other travel modes.
- Capacity within the existing transit network would need to be evaluated. Missing transit links would need to be identified that would allow for the accommodation of new transit patrons as a result of a mode-shift.

11. Findings and Conclusions - Traffic Congestion Impacts:

- In general, this measure holds the promise of reducing traffic congestion within the designated congestion zone in the range of 20-to-30 percent based on the London and Stockholm results.

12. Findings and Conclusions - Emissions and Environmental Impacts:

- In general, this measure holds the promise of reducing CO_2 emissions by approximately 16%, based on London's experience. [The Congestion Charge Zone in London is not to be confused with London's Low Emission Zone established in 2012, which covers most of Greater London and is aimed at reducing vehicle emissions from vehicles.]

[2] https://leftfootforward.org/20135/02/ten-years-of-the-congestion-charge/
[3] http://www.chronicclelive.co.uk/news/north-east-news/plan-north-east-congestion-charge-11908922
[4] https://tfl.gov.uk/corporate/publications-and-reports/low-emission-zone
[5] http://www.c40.org/case_studies/londons-congestion-charge-cuts-co2-emissions-by-16
[6] http://www.roadtraffic-technology.com/projects/stockholm-congestion/
[7] http://www.independent.co.uk/news/uk/home-news/the-big-question-has-the-congestion-charge-been-effective-in-reducing-londons-traffic-781505.html

Improvement Measure: Ramp Metering

Improvement Measure #7: Ramp Metering

1. General Description: Ramp metering is achieved by adaptive traffic signals installed at the entrance of a ramp onto the mainline. The traffic signal controls are set to "red" in the absence of any traffic. Signage is used to make motorists aware that they are approaching a ramp metered location. Two lane ramps would be controlled by signals on both sides of the ramp which permit only a single vehicle (one side at a time) to advance. When a vehicle approaches the STOP bar it is detected and then permitted to advance by the light briefly turning green. The duration of the green light is short (under 2 seconds) to assure the breakup vehicle platoons.



Ramps are a critical link in the transportation system, and applying ramp-appropriate management strategies can help nearby freeways and arterials operate smoothly and safely

2. Description:

- A video presentation best illustrates the concept. https://www.youtube.com/watch?v=jAWSRgFg8Qk.
- This measure is focussed on congestion reduction of urban freeway corridors by optimizing freeway/highway through-put, resulting in increased travel speeds, improved travel time, operational reliability and increased safety on the freeway/highway.
- Ramp metering regulates the flow of vehicle traffic at each on-ramp by placing traffic signals on the on-ramp (slip or loop) to regulate the flow of traffic volumes entering the freeway/highway.
- Ramp metering can be implemented at all times, or adjusted to be active only during the peak periods. Advance signage can be used to indicate when ramp metering is in effect.
- The geometric consideration of the STOP-bar location on the ramp must allow for sufficient/adequate:
  - acceleration characteristics to be achieved on the downstream merge parallel lane; and
  - Stacking/storage deceleration and taper distance on the ramp itself and the upstream arterial.
- Vehicles are permitted to enter the highway one-or-two vehicles at a time. In general, the duration of the green advance light is very short, queued vehicles are held until the next advanced green
- The incidence of congestion flow breakdown on the mainline is minimized. (The headway between on-ramp vehicles is regulated to assure low merge congestion.)
- The flow rate (headway) and amount of vehicles that are permitted to enter the freeway corridor are controlled. Vehicles are stacked on the ramp itself and/or the connecting arterial roadway.

3. Complimentary Initiatives:

- *ITS*: Ramp metering is complimentary to ITS initiatives in that variable message signage can be used to identify:
  - when ramp metering is operational;
  - the estimated wait time for ramp access on the ramp approach; and
  - the estimated travel times to access key downstream off-ramps .
- *HOV / Transit Priority Bypass Lanes*: Ramp metering can be designed to be complimentary with HOV and Transit initiatives by developing bypass lanes which avoid the queue caused by the traffic signal.
- The US Federal Highway Administration (FHA) suggests that ramp metering represents a single "puzzle piece" and is best implemented as part of a comprehensive surface transportation program that would include: HOV treatments, information dissemination, *surveillance and incident detection / incident management*
- Integrates with *weather and special event* requirements.

4. Negative Effects:

- A perception of "inequity" emerges when drivers accessing area freeways at different times and at various entrance ramps experience different ramp waiting times; essentially, some drivers are delayed by the system in order to save travel time for others. (2004 ITS Institute Annual Report, University of Minnesota, http://www.its.umn.edu/Publications/AnnualReport/2004/Research/tmmo/rm-equity.html)
- This impact is most felt by motorists wishing to undertake a "short" trip (i.e. under 7km, or 2-3 interchanges) along the freeway corridor, as they do not spend enough time on the corridor to experience the travel time-savings offered by higher freeway operating speeds.
- Wait times on the ramp itself and at ramp terminals could be significant if the bottleneck capacity of the upstream freeway lanes are exceeded: **A theoretical analysis examining the Whitemud / Anthony Henday Drive (Hwy 216) SB On-Ramp had estimated a "maximum queue length of 818 meters with an average wait time of up to 10 minutes during the heaviest 15 minute interval.[1]**
- Merging onto the main line is facilitated by the creation of gaps which occur by regulating the flow of up-stream traffic onto the corridor. It should be concluded that ramp metering can not be implemented as independent isolated individual non-integrated devices on individual ramps. Flow must be controlled and optimized along the entire corridor accounting for sequential on/off- ramps and assuring a minimum of delay on the ramps itself.
- Impacts to the adjacent arterial network can occur as ramp queues back up onto the local roadway network. Improvements to local infrastructure may be required to allow for sufficient storage of the ramp queue.
- The approach is not appropriate when alternative or parallel routes are not available as motorists have no other alternative but to wait for freeway access.
- Ramp Metering cannot be a one-time set-up-and-leave-alone initiative. The settings must continually be monitored, regulated and adjusted to assure efficiencies and respond to incidents, construction activities and emergency requirements.

5. General locations where Applicable:

- Ramp metering is considered most effective within urbanized areas where:
  - regular congestion periods are experienced;
  - ramp junctions are generally spaced closer together;
  - alternative local parallel routes are available. [This is particularly important given that motorists who use the freeway/highway for "short" distance trips have the option of diverting to local roadways.]

[1] Source: "*Suitability of Ramp Metering on Alberta Highways*", Julian Macdonald, July 2012, Page 28

Improvement Measure: Ramp Metering

6. General Findings from Other Jurisdictions:

- Ramp metering has been implemented in the USA, Europe and Australia since the 1960's/70's.
- In the US, ramp metering[2] has been found to result in:
  - reductions in collisions of up to 50% during peak periods (Detroit, MI);
  - an increase in average travel speeds up to 173% (Portland, OR);
  - a decrease in travel time of up to 37% (Denver, CO); and
  - an increase in traffic volume of up to 74% (Seattle, WA).
- In Ontario, ramp meters have been installed along the Queen Elizabeth Way in Mississauga[3] (at six interchanges on Toronto-bound ramps) since the 1970s. The meters are designed in a way that if the queue at the meter will impact local municipal streets, the meter is lifted and vehicles travel free-flow onto the highway until the queue reaches an acceptable length, so as to not impact the local roadways.
- In Minneapolis-St. Paul, an experiment[4] was undertaken where all ramp meters were turned off for a duration of 8 weeks. During this time, capacity decreased by 9%, travel times increased by 22%, freeway speeds decreased by 7% and the frequency of collisions increased by 26%. The State DOT has since revised its meters to ensure that no vehicle waits in a queue more than 4 minutes and that adjacent roadways are not impacted.

7. Considerations for Implementation:

- Generally, sequential ramps should have ramp meters for the measure to be effective, as sequential accesses work together to control traffic onto the freeway/highway lanes.
- Coordination with municipal traffic signal infrastructure would ideally be in place to monitor, regulate and respond to local arterial traffic operations.
- AT is currently reviewing the potential to apply ramp metering along its corridors and has prepared an internal discussion paper titled "*Suitability of Ramp Metering on Alberta Highways*"[5] and prepared presentations on the topic[6].

8. Potential Application to this Project:

- The following sites were found to merit consideration along the Hwy 2 (QE II) corridor:
  - *Airdrie/Calgary SB On-Ramps:* Veterans Blvd, Edmonton Trail SE, Yankee Valley Blvd SW, 176th Ave NW, Crossiron Drive.
  - *Red Deer On-Ramps:* (directions would need to be assessed): McKenzie Rd, Taylor Dr/Gaetz Ave, 32nd St, Hwy 11/David Thompson Hwy, Hwy 11A.
  - *Leduc/Edmonton: NB and SB On-ramps:* Hwy 2A, 50th Ave, 65th Street, 50th Street, Airport Rd, Hwy 19, 41st St, Ellerslie Rd.
- In general, ramp metering should be coordinated with local municipal traffic control initiatives. The City of Calgary's Roads Operation Centre (ROC) and the City of Edmonton's Traffic Management Centre (TMC) operate traffic signals, traffic cameras, message signs, and other technology to move traffic efficiently throughout the municipality.
- The municipal objectives (maximizing flow on arterial roadways) and provincial objectives (maximizing freeway/highway performance) must be rationalized. Separate Municipal and Provincial Traffic Control Centres would likely have conflicting objectives and could potentially result in motorist confusion and unpredictable effects as each adjusts its phasing and timing to meet their own objectives.

9. Information Needed to be Collected:

- On-ramp and through-traffic volumes along the corridors within the urban areas of Airdrie/Calgary, Red Deer and Leduc/Edmonton.
- The potential residual capacity for alternative routes where local traffic could divert should be confirmed.
- Measurements of available queue storage space at each of the on-ramp locations should be confirmed as should transit requirements.
- Ramp-to-ramp (OD) origin-destination information is required in each of the urban areas to determine the composition of "short" local trips (which will not benefit as much as) longer-distance trips.

10. Analysis to be Conducted:

- An evaluation of potential ramp metering performance is required to determine:
  - the extent of benefit to the majority of motorists. (If the vast majority of trips are "short" local trips then the cost of delay to entry onto the freeway are outweighed by the travel time savings offered by improved freeway/highway operations for these motorists.);
  - the potential impacts to the surrounding local arterial roadway network and diversion routes in terms of additional delay and associated improvements that would be necessary to divert short trips onto the local roadway network.
  - the required modifications to the existing infrastructure to accommodate transit, HOV, ITS etc.

11. Findings and Conclusions - Traffic Congestion Impacts:

- Ramp metering represents an improvement measure that merits further study along the Highway 2 corridor within the urban areas. The measure holds the promise of reduced collisions, improved freeway/highway travel speeds, reduces delay and increased volume through-put as a result of reduced turbulence.

12. Findings and Conclusions - Emissions and Environmental Impacts:

- An increase in average vehicle speeds, as has been demonstrated to occur with the implementation of ramp metering, which has been found to result in a a reduction in emissions and Improved fuel efficiency (reduced fuel consumption).
- In the US, ramp metering in Minneapolis alone indentified a net annual savings of 1,160 tons of emissions[7].

[2] Federal Highway Administration "Ramp Management and Control Handbook", January 2006, Page 1-7, Table 1-1 and Page 1-8, Table 1-2.
[3] http://www.mto.gov.on.ca/english/traveller/trip/compass-sio.shtml
[4] Minnesota Department of Transportation, "Twin Cities Metro Area Ramp Meter Study",
[5] "*Suitability of Ramp Metering on Alberta Highways*", Julian Macdonald, July 2012
[6] "*Ramp Meters: What, How and Why?*", Julian MacDonald, May 2013
[7] Ibid, Page 1-8.

Appendix K

ITS Review

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1.0 ITS Considerations

1.1 Introduction

The Highway 2 Corridor Improvement Study results in an implementation plan for the corridor that reflects the Province of Alberta's Transportation Strategic Plan. In many cases, the solutions identified throughout the project include an element of Intelligent Transportation Systems (ITS) as a means of increasing the capacity of the Highway 2 corridor and improving safety. Consequently, ITS systems have the potential to defer capital improvements.

In light of these unique considerations, this section of the report focuses on the ITS aspects that are proposed for the Highway 2 corridor. This is accomplished through the review of existing conditions and best practices, the identification of needs, the recognition of current initiatives, and then the description of the proposed ITS initiatives and future considerations.

While future technologies may provide traffic monitoring and management options that do not exist today, this report does not rely on unproven benefits or optimistic predictions. Rather, the consulting team used realistic assumptions to generate pragmatic timelines, particularly when considering the need for infrastructure expansion. These assumptions include moderation to the safety and capacity benefits associated with future ITS systems and conservative timelines associated with these emerging and future technologies.

1.2 Current Status of ITS

There are many active ITS initiatives throughout the Province of Alberta. These initiatives include both planning and policy related studies and ITS systems and programs. This section of the report summarizes the current ITS initiatives, both in Alberta and in neighbouring Provinces. Additionally, Section 1.5 lists the current ITS systems and programs for Alberta Transportation (AT) and for those major Municipalities along the Highway 2 corridor.

1.3 Documentation Review – Alberta

1.3.1 Alberta Transportation ITS Strategy Summary

Like most Canadian provinces, Alberta developed its first ITS plan in the early 2000s. In 2014 the Province developed an updated ITS Strategy. While this is not a public document, its focus is largely on strategic goals related to the development of supporting policies, frameworks, and organizational structures that increases ITS awareness and supports the promotion, mainstreaming, and adoption of ITS within Alberta. The strategy focuses on competitiveness, safety and sustainability, all of which are relevant to the Highway 2 corridor. Alberta recognizes that it is still in the stage of "early adopter" of ITS and a more focused adoption at a quicker pace will allow for the province to realize the benefits brought on by ITS.

The prior ITS technologies in Alberta that are relevant to the Highway 2 corridor include:

- A Smart Roadside Inspection System for management and enforcement of commercial vehicles;
- Enhancements to the Alberta 511 system;
- Expansion of Road Weather Information Systems (RWIS); and,
- Implementation of central data and traffic management centre (TMC) systems/processes including offering regional services.

The government of Alberta is also supporting the ACTIVE-AURORA partnership project, which is the first Connected Vehicle (CV) test bed project in Canada. This relationship will allow for the further implementation of future connected/automated vehicle technologies along the corridor.

1.3.2 Highway 2 Design Plans and Corridor Features Review

Starting from the Calgary city limits, Highway 2 has 6 lanes through the City of Airdrie to Crossfield where there is a 6 lane segment past the exit to Highway 2A. A short 6-lane segment exists at Red Deer between McKenzie Road and Gaetz Avenue (Gasoline Alley area). The 6-lane configuration begins again from just north of Highway 39 to the Anthony Henday Ring Road exit and entrance. There are also a number of existing climbing lanes and rest areas along the corridor.

Two inspection stations exist, one for southbound Highway 2 south of Leduc and one for northbound Highway 2 south of Airdrie.

1.3.3 Capital Region Board (CRB) HOV and Transit Priority Study

In 2016 the CRB commissioned a Capital Region HOV and Transit Priority Study. The study was a follow up to the development of both the Capital Region Growth Plan and the Intermunicipal Transit Network Plan. The purpose of the HOV and Transit Priority study was to identify potential High Occupancy Vehicle (HOV) and Transit Priority Measures (TPM) that for consideration in the Edmonton Metropolitan region.

While the study looked at all potential corridors across the metropolitan region, the section of Highway 2 (QE2 Highway) from 65 Ave in Leduc to Century Park LRT Station via 23 Ave NW was specifically included. The study recommends that CRB consider commitments to HOV/TPM as a means to decouple the tie between traffic demand and road capacity and to target investments that benefit all road users travelling in various modes. It also recommends that implementing measures now will be more achievable than in the future as the corridors are quickly becoming more physically constrained.



Source: Capital Region HOV / Transit Priority Study 2016

Of the specific corridors identified in the study, the Highway 2 corridor was identified as the strongest candidate in the region for an initial pilot project. Two of the many reasons cited for this recommendation include the significant role that the corridor plays in the region and the full array of potential market segments that the HOV facility would reach (scheduled public transit, reverse commuting, park & ride users, rural-to-city commutes, private carpooling and private shuttle bus and taxi services).

1.4 Documentation Review – Other Provinces

1.4.1 Saskatchewan

Like Alberta, the Province of Saskatchewan has a main corridor connecting its two largest cities. The Province developed its first ITS Strategic Plan in 2001, which included a broad vision and objectives for ITS, a needs assessment, and then recommended ITS strategies over a five-year action plan. In 2015, Saskatchewan developed an ITS Technical Strategy that is more "project focused" and directly mapped to the Saskatchewan Growth Plan. This new ITS Technical Strategy is a broad and high level plan encompassing 12 strategies comprised of 61 projects for the short, medium, and long terms, and prioritized as high/medium/low. The Technical Strategy identifies the following four of these projects as "core" initiatives, which address critical areas that affect other future initiatives and benefits including those within the short term such as the Regina Bypass infrastructure:

- Commercial Vehicle Enforcement Strategy;
- Data Management Centre Functional Program;

- Data Management Strategy;
- Provincial ATIS Strategy.

1.4.2 British Columbia



British Columbia (BC) developed a comprehensive provincial ITS plan and architecture in 2001, as a multi-agency effort in collaboration with regional and federal transportation authorities. The plan served as a guide to the deployment of major ITS investments over the past decade and a half, focusing on key areas such traveller information (DriveBC and Border Wait Time system), traffic management (Regional Transportation Management Centre), Road Weather Information Systems (RWIS), and commercial vehicle and goods movement applications (e-screening). More recent and upcoming ITS investments by BC include corridor specific applications such a Variable Speed Limit System (VSLS), and a Wildlife Detection System, both intended to improve safety on key corridors based on prevailing field conditions. Currently, the Province is completing the design for a rail crossing information system, intended to detect an approaching train's length, speed and direction and provide real-time data on overhead messaging signs alerting motorists of the duration that various crossings are closed.

Two areas from BC that may be of specific relevance to the Highway 2 corridor: the variable speed limit system and the BC e-screening program. The variable speed limit system utilizes a combination of road data and weather sensing equipment together with central Advanced Traffic Management System (ATMS) to make decisions on the deployment of varying regulatory speeds along critical portions of the highway in order to increase safety and capacity. On the other hand, the e-screening program focuses on goods movement efficiencies. BC's e-screening program, known and marketed as Weigh2GoBC, consists of equipment designed to maximize support for regional interoperability with neighboring jurisdictions. Weigh2GoBC has implemented back office interoperability with Alberta's Partners in Compliance (PIC) Program and Washington State. The program has been open to all Canadian and US based carriers since 2014.

1.4.3 Ontario and Quebec Smart Corridor

Transport Canada, in partnership with the Ministry of Transportation of Ontario and Ministère des Transports du Québec, completed the development of a Smart Corridor Concept of Operations for Ontario and Québec in 2012, focusing on the region from Windsor to Québec City, and south to the Canada/U.S. border.

The Smart Corridor Concept of Operations considers infrastructure components essential to the transportation networks of Ontario and Québec that facilitate international trade and support domestic flows encompassing the road, rail and marine infrastructures as well as strategic ports, airports, intermodal facilities and border crossings.

The vision of a Smart Corridor concept is to support a sustainable, secure and efficient multimodal transportation system to keep Canada's economic heartland competitive, attractive for investment and essential for trade. The study identified eleven priority program initiatives as initial steps to building the Smart Corridor. The specific areas that may be of relevance to Alberta and the Highway 2 study include:

- Network Wide Monitoring
- Integrated Real-Time Traveller Information
- Intermodal Terminal Traffic Management
- Commercial Vehicle E-screening
- Dangerous Goods Tracking
- Supply Chain Data Exchange Network
- Pre-clearance of Shipments
- Commercial Connected Vehicle



1.5 Existing ITS Infrastructure

The CIMA team conducted an inventory of the ITS Infrastructure currently deployed for the province as well as for the Cities of Calgary and Edmonton. The intent of this review is to identify current ITS systems and technologies (provincial and municipal) currently operating on the Highway 2 corridor or can be expanded onto the corridor.

Alberta Transportation		
Traveler Information	511 Alberta Website	This website provides updates on information that includes road closures, traffic incidents, construction notices, road condition information, and CCTV images. There is also information related to ferry crossings, provincial and national parks, weather, border crossings, and a wide load report. There are also links to other websites for Road Restrictions / Road Bans, and Emergency Alerts in Alberta.
	Snowplow Website	This website provides up to date information on GPS locations of snowplows and maintenance vehicles. It distinguishes between fast moving and slow moving vehicles on the map.
	Twitter	The Province also uses Twitter as a means to provide traveller information.
	Mobile Web	The Province has also developed a mobile version of its website that makes it more user-friendly on mobile devices.
	Mobile App	The Province also provides information through a mobile app that is available for use on Apple and Android devices
	Open Data	The Province also publishes a number of data sets to its open data portal that can then be consumed and used by third parties

Traffic Management	Traffic Cameras / RWIS	The province has installed approximately 119 CCTV / Road Weather Information Stations across the province to monitor road conditions and to be able to monitor and provide real-time images of road conditions. This does not include CCTV installed and / or operated by municipalities.
	Traffic Management Centre	The Province, in partnership with the City of Calgary, operates a regional traffic management centre that manages all of the cameras, signals, and incident response.
	Variable Speed Limits (Pilot)	The Province is currently in the planning stages of implementing a variable speed limit pilot along Highway 2, with the initial focus on changing speed limits as weather conditions change.

City of Calgary		
Traveller Information	City of Calgary Website	This website provides updated on information that includes travel times, special event road closures, traffic incidents, construction notices / road closures / detours , and CCTV images
	Snow and Ice Control Website	This website provides up to date information on snow and ice conditions in the City. It provides information on GPS locations of plows / sanders, snow clearing progress information, a snow route parking map and parking bans, as well as general updates related to the status of snow clearing efforts.
	Twitter	The City uses twitter as a means to provide traveller information.
	Mobile App	The City also provides information through a mobile app that is available for use on Apple, Android, and Blackberry devices
	Traffic Advisory Radio	The City's Traffic Advisory Radio station at 106.5 FM supplies current traffic information across the City.
	Open Data	The City also publishes a number of data sets to its open data portal that can then be consumed and used by third parties
Traffic Management	Signals	The City operates 980 traffic signals, 549 of which are connected to the computerized traffic signal management system that provides the ability to remotely monitor and control their operation.

City of Calgary		
	Traffic Cameras	The City has installed 73 traffic cameras to monitor traffic flow, weather conditions, and incident confirmation. They are also used as presence detection at some intersections in place of in-road sensors.
	Dynamic Message Signs (DMS)	The City owns and operates over 80 Dynamic Message Signs, with over half of these remotely controlled through cellular communications to advise motorists of incidents, travel times, or closure / detour information.
	Bluetooth	The City has installed Bluetooth detection systems along Deerfoot Trail, Crowchild Trail, and Glenmore Trail. These systems provide the travel time information that is displayed through the various traveller information systems, including DMS, the Mobile App, and the website.
	Emergency Management and Over-height Vehicle Detection	As part of a new joint initiative between Calgary Emergency Management and Calgary Roads, 15 new DMS will be installed on overpasses and free-standing poles that will provide traffic information, including information related to large-scale emergencies and evacuations. In coordination with these signs, the City is also installing an over-height vehicle detection systems at 7 locations in coordination with the new signs.
	Traffic Management Centre (TMC)	The City, in partnership with Alberta Transportation, operates a traffic management centre that manages all of the cameras, signals, and incident response. TMC controls 14 CCTV and 15 DMS belonging to the Province.
	Lane Reversal / HOV Lane	The City has deployed in 4 locations a lane reversal / HOV system that provides the ability to change the direction of certain lanes of travel based on the time of day. The system is comprised of a number of different technologies including traffic control gates, lane control signals, cameras, and Prismatic and LED Signs.

City of Edmonton		
Traveler Information	City of Edmonton Website	This website provides traffic reports on major road closures and detours, road construction, travel delays, and emergencies and special events
	Open Data	The City also publishes a number of data sets to its open data portal that can then be consumed and used by third parties

City of Edmonton		
	Smart Travel App	This app provides verbal warnings of school zones, speed limit changes, and high-collision locations, in addition to real-time warnings of weather factors, traffic disruptions, seasonal considerations, and enforcement
Traffic Management	Traffic Signals	The City operates and maintains approximately 1100 traffic signals, with over 1000 connected to a central traffic signal control system that provides the ability to coordinate the timing and monitor the operations of the signals.
	Traffic Cameras	The City has installed 57 traffic cameras to monitor traffic flow, weather conditions, and incident confirmation. They are also used as presence detection at some intersections in place of in-road sensors. Ten of these cameras belong to the Province and are located on Anthony Henday Drive and in Fort McMurray.
	Dynamic Message Signs (DMS)	The City owns and operates a number of Dynamic Message Signs to advise motorists of incidents, travel times, or closure / detour information.
	Traffic Management Centre (TMC)	The Traffic Management Centre operates traffic signals, traffic cameras, message signs, and other technology to move traffic efficiently throughout the City.
Other	Connected Vehicle Testing	In partnership with UA, UBC, and other private sector partners, the City of Edmonton is participating in testing Connected Vehicle technology.

1.6 Best Practices Review

The Consulting team reviewed practices from other jurisdictions for applicability to the unique traffic, safety, mobility, and weather conditions experienced by travellers on the Highway 2 Corridor. These practices include:

- New West Partnership Trade Agreement
- Commercial Vehicle Information System and Networks
- Managed Lanes
- Connected and Autonomous Vehicles

1.6.1 New West Partnership Trade Agreement

The New West Partnership Trade Agreement (NWPTA) is an accord between the Governments of British Columbia, Alberta, Saskatchewan and now Manitoba. Under the terms of this agreement, these jurisdictions have committed to full mutual recognition or reconciliation of their rules affecting trade, investment or labour mobility *to remove barriers to the free movement of goods, services, investment, and people* within and between the four provinces. The NWPTA came into effect July 1, 2010 and has been fully implemented since July 1, 2013.

While the NWPTA itself does not specifically reference ITS, the use of ITS in saving lives, time, money, energy and the environment is directly relevant to supporting the goals of the NWPTA in enhancing the movement of goods, services, investment and people within Western Canada. A proven application of ITS in goods movement is electronic screening (or e-screening). E-screening allows government regulatory and enforcement agencies to allow trucks operated by carriers with superior safety records to bypass highway inspection stations under prescribed conditions. E-screening programs can save driver time and reduce fuel costs for carriers, reduce greenhouse gases, accelerate the flow of goods, and allow jurisdictions to focus their limited enforcement resources on less safe truck carriers. The program has been open to all Canadian and US-based carriers since 2014.

1.6.2 Commercial Vehicle Information System and Networks

The Commercial Vehicle Information Systems and Networks (CVISN) Core and Expanded Deployment Program is a collection of information systems and communications networks that are owned and operated by state governments, motor carriers, and other stakeholders that support Commercial Vehicle Operations (CVO). The vision for this program is to improve the safety and productivity of motor carriers and their drivers and reduce regulatory and administrative costs for public- and private-sector stakeholders through improved data sharing, electronic credentialing, and targeted automated screenings and enforcement of high-risk carriers at the roadside.

CVISN provides a flexible framework that supports the ability to ensure that technological advances, updates to the National ITS Architecture and other research that might impact motor carriers are considered and incorporated. There are two levels of CVISN functionality for states and motor carrier firms:

- Core CVISN functionality provides specific capabilities in three areas: safety information exchange, electronic credentialing, and electronic screening
- Expanded CVISN leverages the functionality of the Core CVISN systems to provide further capabilities for driver information sharing, enhanced safety information sharing and data quality, smart roadside, and expanded electronic credentialing.

The applicability and importance of CVISN within the Canadian context is reflected in the fact that one of the 11 priority initiatives recommended in the Ontario – Quebec Smart Corridor Concept of Operations is establishing a Canadian CVISN for all provinces. This will require regulatory cooperation and system integration between provincial commercial vehicle enforcement agencies and will also require a national safety compliance database containing safety records and inspection records for Canadian trucking fleets operating in Canada and the US.

A critical success factor in realizing the benefits of a Canadian CVISN will be harmonization with the US program, as previous attempts to exchange carrier and safety data have not been successful. Specifically, in 2008 the FMCSA and CCMTA agreed in principle to recognize each other's safety rating, meaning that a Canadian carrier operating throughout Canada and the US would have its safety performance activity in both countries collected, calculated and monitored by its home province. Under this agreement, carriers would no longer need both a provincial and an FMCSA profile, or be subject to both provincial and FMCSA compliance reviews, thus reducing the administrative burden on both government and the industry. *To date, this has not been very successful, as the US is not utilizing the Canadian data they receive on US trucks*.

In an effort to improve trade, improve commercial vehicle operations and safety, and ultimately maximize the capacity of the Highway 2 corridor, the province should continue to liaise with the regional Provincial and State partners to ensure that goods movement and e-screening programs are as interoperable and efficient as possible.

1.6.3 Managed Lanes

Managed lanes have been in operation for many decades throughout North America in various forms. These can take the form of:

- Express lanes;
- Express toll lanes
- Truck lanes
- High occupancy toll lanes
- Toll lanes
- Bus lanes
- High occupancy vehicle lanes
- Reversible lanes

The primary purpose of managed lanes is to use the roadway infrastructure to manage varying congestion issues. Managed lanes can be relatively simple solutions, such as hard shoulder running, or involve larger, more complex or varying managed lane strategies including reversible lanes, toll lanes, etc. ITS is often applied to implement the strategies, to monitor the operations of the lanes in real-time and to assist in subsequent decision-making.

The National Cooperative Highway Research Program (NCHRP) has assessed and summarized various managed lane facility types and their relative complexity. The figure shown below describes the varying treatments at a high level.

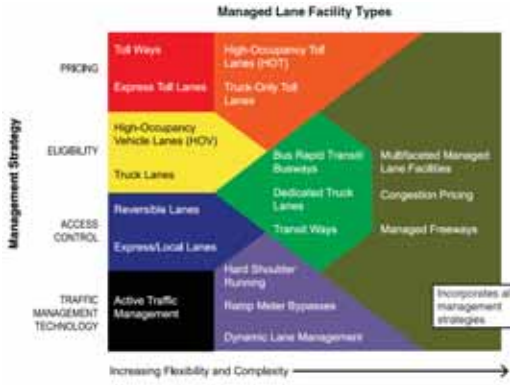


Figure 1 Source: NCHRP Research Report 835- Guidelines for Implementing Managed Lanes

1.6.4 Connected and Autonomous Vehicles

Connected Vehicles (CV) and Automated or Autonomous Vehicles (AV) are evolving rapidly, both technologically and institutionally. They are defined as:

- CV's leverage the power of wireless connectivity among vehicles (referred to as vehicle-to-vehicle (V2V) communications), the infrastructure (vehicle-to-infrastructure (V2I) communications), and mobile devices to improve highway safety, mobility, and the environmental impacts of the transportation system.
- AV's are vehicles in which at least some aspect of a safety-critical control function (e.g., steering, throttle, or braking) occurs without direct driver input. AVs may be autonomous (i.e., use only vehicle sensors) or may be connected (i.e., use communications systems such as connected vehicle technology) in which cars and roadside infrastructure communicate wirelessly.



Figure 2 - Levels of Autonomy - Autonomous Vehicles

For AVs, there are five levels of automation ranging from driver assistance (Level 1) to full self-driving vehicles (Level 5). These levels of autonomy are shown in Figure 2.

Both CV and AV will have a significant impact on the safety and capacity of our road networks. Today we are already seeing the availability of level 2 in passenger vehicles as defined by the Society of Automotive Engineers International (SAE standard J3016) in passenger vehicles where the automated systems provide some level of steering, acceleration and deceleration depending on the sensed conditions. (While news articles often describe some Level 4 vehicles, such as Waymo, these vehicles are not available for purchase by the public at this time.)

This topic is also front and centre within the US Department of Transportation's ITS Strategic Plan (2015-2019); and, similarly both the updated Canadian ITS Architecture, and the Ontario-Quebec Smart Corridor initiatives reference CV and AV as part of their ITS tool kits.

1.6.4.1 United States

The U.S. Department of Transportation has a comprehensive Connected Vehicle Program that works with state and local transportation agencies, vehicle and device makers, and the public to test and evaluate technology that will enable cars, buses, trucks, trains, roads and other infrastructure to communicate with one another. This connectivity will allow drivers to receive notifications and alerts of dangerous situations, such as a potential red-light violation, icy roads ahead, or a potential collision with an oncoming car. In this context, the USDOT is focusing much of its CV program activities on research, development, and eventual adoption of CV systems in terms of:

- Vehicle-to-Vehicle (V2V): communications based on dedicated short-range communications (DSRC) technology. DSRC-enabled devices in vehicles broadcasting safety messages may be regulated by the USDOT and thus part of this program.
- Other CV technologies and communications that are enabled by either DSRC or other networks, such as cellular, Wi-Fi, or satellite. Although the USDOT is not researching regulatory decisions related to these other communications technologies, they are part of their overall research and development focus.

In addition, the Intelligent Transportation Systems (ITS) Joint Program Office of the USDOT recently completed the "Connected Vehicle Reference Implementation Architecture (CVRIA)," as the basis to develop a Connected Vehicle Standards Development Plan. In support of future standards development and testing activities, this effort includes:

- A Connected Vehicle Reference Implementation Architecture as a basis for identifying standards. The architecture will identify the key interfaces of a connected vehicle environment that will support further analysis to identify standards.
- A standards development plan that will allow identification and prioritization of the standards needed in support of connected vehicle implementation. Adoption of existing industry standards from other areas, adaption of existing standards as well as the need for the development new standards will be considered.
- Policy considerations for certification, standards, core system, and potentially other elements of the connected vehicle environment.

1.6.4.2 Canada

The Canada-United States Regulatory Cooperation Council (RCC) was launched in February of 2011 to facilitate closer cooperation between the two countries to develop smarter and more effective approaches to regulation *to make the United States (U.S.) and Canadian economies stronger and more competitive*. Recognizing that regulatory differences and duplicative procedures impose unnecessary requirements and costs, the initial RCC Joint Action Plan - comprised of 29 initiatives to foster new approaches to regulatory cooperation and serve as a template for future efforts between Canada and the U.S. One of these 29 initiatives relates to Connected Vehicles. Under this initiative, Transport Canada and the USDoT will coordinate and collaborate on Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communications technology and applications development and implementation for light- and heavy-duty vehicles, including architecture and standards to support interoperable deployment. This will include, where appropriate, joint planning and priority-setting, collaborative research projects, as well as information exchanges to support analyses as well as architecture and standards development. This effort will support the interoperable deployment of CV through collaborative: standards development; research and testing; information-sharing, and implementation activities. Four main initiative areas have been identified to be carried out between 2015 and 2019:

- Connected Vehicle (CV) cybersecurity, equipment certification and security certificate management systems: collaborate on policy and technical requirements to develop a cross-border connected vehicle security certificate management system (SCMS); and collaborate to establish certification requirements for CV system components with a focus on device compliance needs, safety and human factors, system security and privacy requirements.
- *Spectrum Policy Analysis:* identify opportunities for collaboration and exchange on Intelligent Transportation Systems (ITS) communications platforms, spectrum allocation and spectrum policy for connected vehicle applications.
- *Standards and Architecture:* identify new or revised standards required to support large scale connected vehicle technology deployment, and Integrate detailed Connected Vehicle Reference Implementation Architecture (CVRIA) into overall Canada/US National ITS architecture updates.
- *Information Dissemination & Sharing (supporting regulatory activities):* Jointly engage stakeholders on bi-national and related international CV issues, including hosting open public meetings that would include Canadian and U.S. stakeholders.

ACTIVE-AURORA is a partnership (Governments of Alberta and Canada, University of Alberta, University of British Columbia, and City of Edmonton) project and one of the first CV test sites in Canada. With strong support from governments, industry and academia, both nationally and internationally, it will support continued research, testing, and demonstration of connected transportation system concepts, standards, applications and innovative products. ACTIVE-AURORA concepts, standards, applications and innovative products will be shared with the rest of Canada.

Leveraging both the Canadian and US national ITS Architectures, and the CVRIA, these efforts will be of great value to Alberta in planning and/or participating in CV and AV research. *For roadway authorities, a key area of interest will be the Vehicle to Infrastructure aspects and the requirements they impose on roadside ITS infrastructure*. In the future, supporting architectures, standards, and communications platforms should be incorporated into ITS designs and specifications as they become available.

While the technologies described above may have many positive impacts on the capacity and safety of Highway 2 in Alberta, there are potential scenarios where in some segments of the highway the actual volume of cars on the road network may increase as society adopts AV's. (For example, people may send their cars home rather than pay for parking in urban areas.) These and other unintended consequences of CV and AV should be monitored by the Province as they continue to penetrate the vehicles using the public roadways.

1.6.4.3 Best Practice Considerations

- The provincial government should continue its strong relationship with the regional and national CV/AV initiatives and begin consideration for ongoing policy review and adaptation to accommodate and allow for the benefits of CV/AV technologies to be translated to greater capacity and safety along the Highway 2 corridor.

1.6.5 Smart Work Zones

A "smart work zone system" is the application of computers, communications, and sensor technology to the transportation environment, which has the following characteristics:

1. Real-time: The system obtains and analyzes traffic flow data in real-time, providing frequently updated information to motorists.
2. Portable: The system is portable, hence allowing its installation (with minor modifications as necessary) at different locations.
3. Automated: The system operates in an automated manner with as minimal supervision as possible by human operators.
4. Reliable: The system provides accurate and reliable information, keeping in mind the serious consequences of misinforming motorists in work zone situations.

These systems, if properly designed and implemented, will:

- Better inform motorists and reduce their frustrations;
- Encourage motorists to take alternate routes;
- Reduce congestion and allow more freely flowing traffic;
- Clear incidents more quickly, thereby reducing secondary incidents;
- Make work zones safer for highway workers and motorists.

1.6.5.1 Best Practice Considerations

- Consider the use of Smart Work Zones during the design / planning of construction staging/traffic management
- Ensure Smart Work Zones systems are designed appropriately in order to meet the needs of the work zone and accomplish the intended benefits – each work zone is unique! While all work zones may benefit from smart work

zone applications, not all may provide equal value, so various criteria such as cost, duration of work zone, traffic volumes / expected delays should be considered when deciding on whether to include smart work zone elements in a particular work zone.

1.6.6 Traffic Management and Traveller Information

Many jurisdictions operate under the principle of moving people and goods safely and efficiently through their road network. Traffic Management and Traveller Information are two tools a jurisdiction can use to help achieve these goals. The extent to which Road Authorities use these tools typically depends on the congestion and safety conditions encountered within a jurisdiction's road network.

Traffic Management typically involves the use of various sensors, traffic control devices and communication networks operated through a traffic management centre. They are often able to share the information and data that is collected.

Traffic managed systems and third-part traffic data providers (such as Waze, Here, or Tom-Tom) typically provide the data needed to operate traveller information systems. They can provide travelers with real-time updates of events, traffic conditions, public transit schedules or even weather through various means devices to assist travelers to make choices that will minimize their delay or help them select their routes and modes of travel.

1.6.6.1 Best Practice Considerations

Best practices for the establishment of traffic management and traveller information programs includes proper preparation and planning. Each system and component should be carefully considered based on the identified needs and goals, and developed according to the ITS architecture for Canada. Capital and operational costs should also be considered, as well as incorporation into existing asset management systems.

1.6.7 Motorist Advisory Systems

Motorist advisory systems alert motorists of potentially unsafe or inaccessible downstream conditions. In their most basic form, they include some form of detection device, real-time communications, software analysis, and motorist advisory, typically in the form of roadside signs or audible warnings. They respond to an expected or confirmed safety concern, which often exists infrequently.

1.6.7.1 Best Practice Considerations

Motorist advisory systems are best implemented when other options are not practical or cost effective, and when other mitigating options have been exhausted in an attempt to resolve an existing condition or issue (such as using static signs to advise drivers that they are driving in the wrong direction on a highway before implementing wrong-way detection systems).

It is possible to implement many motorist advisory systems temporarily. The benefit of this approach is that it allows a jurisdiction an opportunity to test and record the instances of anticipated issues before installing a permanent solution. For example, a temporary system can determine the frequency of over-height vehicles to justify the need for a permanent system.

1.7 Identification of Needs

The identification of ITS initiatives must be driven by the needs of the corridor. These needs were identified through an ITS Workshop as well as a review of available safety and capacity data.

1.7.1 ITS Workshop

A half day workshop was arranged on February 23, 2017 with staff of Alberta Transportation to discuss the Highway 2 corridor in detail and to identify the needs associated with ITS. More specifically, the following objectives were identified for the workshop:

- To gain a common understanding of Intelligent Transportation Systems (ITS) Strategies relevant to the project
- To identify the future needs and priorities of the Corridor as they relate to ITS
- To facilitate subsequent project work and identify the ITS infrastructure needed to support the Corridor at various stages in the future

To assist in identifying candidate ITS systems and strategies, all agreed that they should result in a deferral of capital improvements, the ability to maintain or enhance the movement of people and goods, and improve safety by leveraging current and future ITS technologies.

The Provincial ITS needs identified from the workshop discussion may be summarized as follows:

- Focus on the safety of carriers (e.g. commercial vehicle drivers) such as to monitor the 24-hour rest plan for drivers before their departure
- Provide stop locations and notification of available parking spots for drivers before arrival
- Facilitate cross border operations with electronic tags
- Coordinate with Royal Canadian Mounted Police (RCMP) regarding ITS enforcement of commercial vehicles
- Consider commercial vehicle operations as a component of High Occupancy Vehicle/High Occupancy Toll (HOV/HOT) lane construction and operations
- Consider communications and power requirements along the corridor
- Consider a Provincial Transportation Management Centre (PTMC) for the corridor (and the Province) to improve the efficiency of the various ITS systems
- Consider the experiences from other Provinces such as British Columbia, Ontario and the States
- Develop an integrated data collection program for multiple departments including planning, safety, and real-time operations.
- Emphasize data management policies to get the most value from the data

These needs shaped the identification and analysis of ITS options identified for the study.

1.7.2 Review of Safety and Capacity Data

ITS systems can often address safety and capacity issues. For example, automated enforcement systems have shown to have a direct, positive correlation on safety, while freeway traffic management systems have shown to increase vehicle throughput.

Collision information for the corridor was summarized according to major road segment and by month. The data shows that 62% of the collisions occurred between the months of October and March (i.e. winter) with the remainder (38%) occurring during the summer months (of April to September). Furthermore, there is an over-representation of winter collisions on the 30 km section of Highway 2 south of Red Deer.

The results of this analysis support winter road maintenance related ITS systems, such as road weather information systems, maintenance decision support systems and dynamic message signs. Additionally, the section of Highway 2 between Red Deer and Innisfail offers a good trial site for piloting winter related ITS systems such as, for example, variable speed limits, automated vehicle location systems for plows, traffic management systems or road condition advisory systems.

The reference map also provides projections for widening the highway. While much of Highway 2 will require 6 lanes within 10 years, the sections north of Calgary and south of Edmonton will continue to experience higher volumes. As a result, these sections may be candidates for ITS systems that manage congestion, encourage higher vehicle occupancies, and generate traveler information.

2.0 Proposed ITS Initiatives

A set of five ITS initiatives is recommended for the Highway 2 corridor. The consulting team derived these initiatives throughout the four stages of this project:

- A review of existing conditions and best practices
- A review of safety and capacity information
- The identification of needs (during the workshop)
- Consideration of current pilots and adaptive strategies

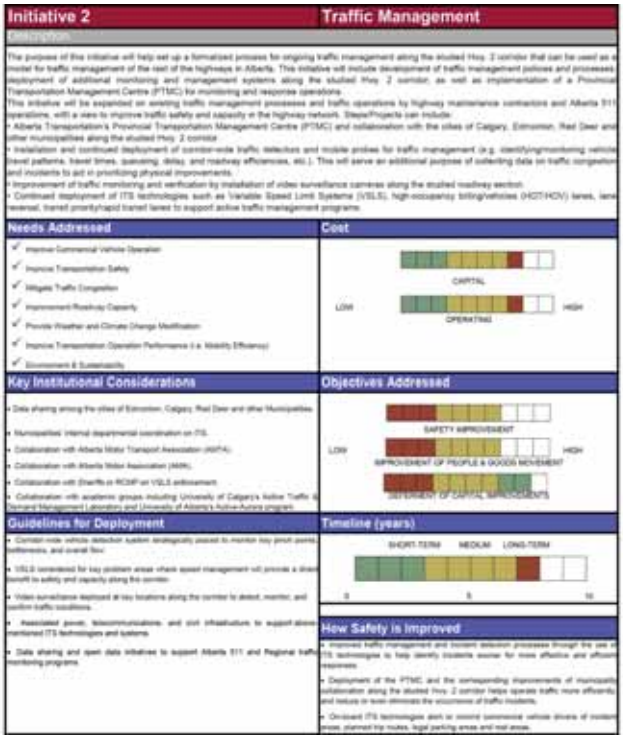
Each initiative is presented in the form of a template. The template consists of the following sections:

Template Section	Information
Description	A description is provided to convey the purpose of the initiative and to provide the steps and projects that can be undertaken to support it.
Needs Addressed	The overall needs of the corridor are identified through a list of seven criteria. Those criteria that are addressed by the initiative are shown as checked off.
Costs	Capital and operating costs are shown separately. The graphical display is used to convey the relative differences in these costs between initiatives (rather than in absolute dollars).
Key Institutional Considerations	A bullet list of key institutional considerations is provided in this section of the template. The institutions listed are likely stakeholders, but external to the Province.
Objectives Addressed	Three sets of (broad) objectives are listed in the section: Safety Improvement, Improvement of People and Goods Movement and Deferment of Capital Improvements. The extent to which each initiative meets each of these three objectives is displayed graphically. The intent is to show the relative differences between these objectives.
Guidelines for Deployment	Guidelines for deployment may include consideration of other supporting systems, supporting infrastructure, necessary contributions from other stakeholders or the expansion of existing programs. These guidelines are presented as a written bullet list.
Timeline	A timeline is provided for the next decade (10 years). The timeline graphically demonstrates the short, medium or long-term nature of the initiative.
How Safety Is Improved	Details of how the initiative will specifically influence safety are provided in this section. These details are quite specific to each initiative, but often involve the themes of providing more efficient services or providing more and better quality information to drivers and road service personnel.

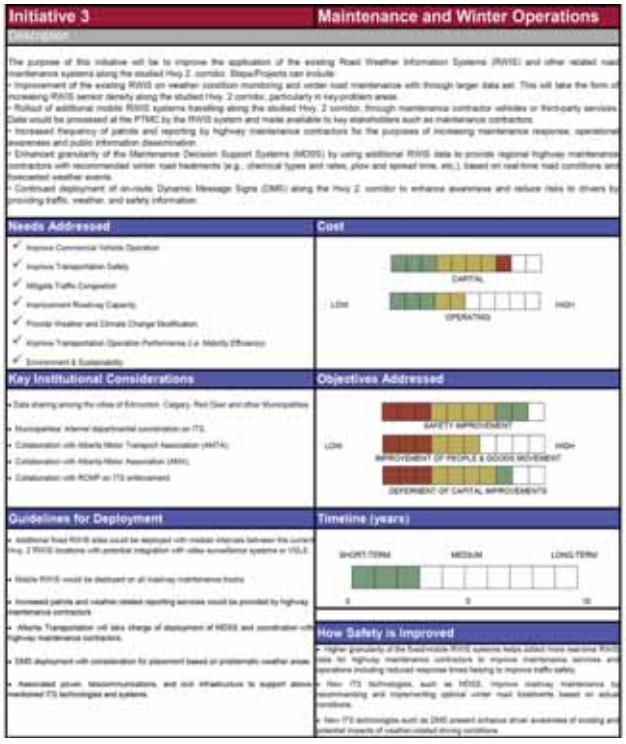
2.1 Commercial Vehicle Operations



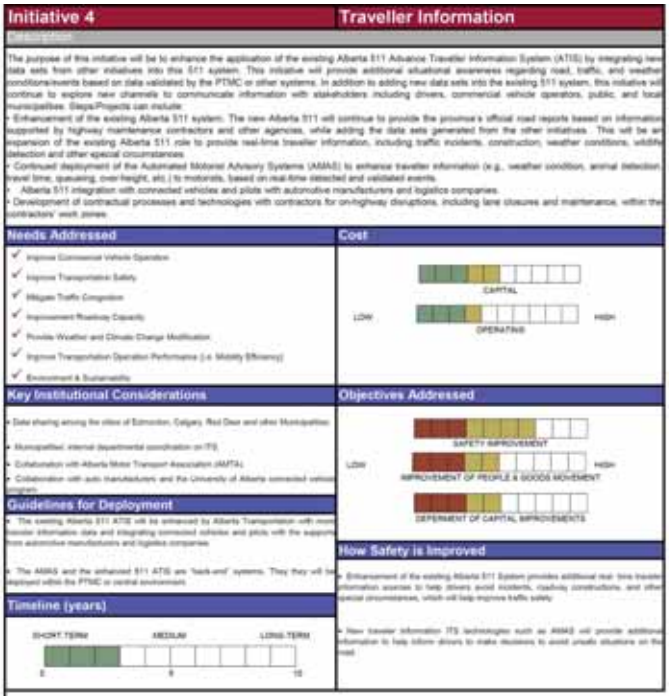
2.2 Traffic Management



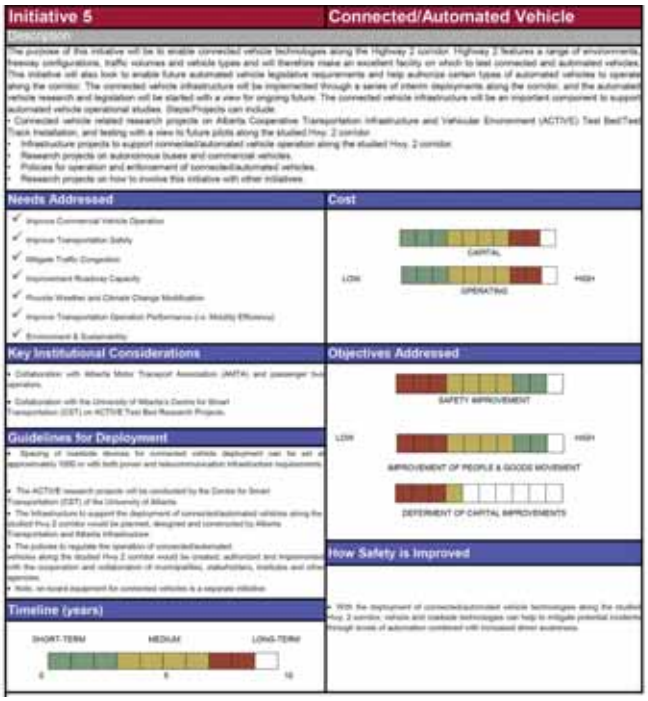
2.3 Maintenance and Winter Operations



2.4 Traveler Information



2.5 Connected/Automated Vehicles



3.0 Future Actions

Each of the initiatives identified in the previous section encompass a number of individual projects. Table 1 – Next Steps for ITS InitiativesError! Reference source not found. lists these initiatives and the corresponding proposed projects. The T able also provides additional details for each project, including the deployment scope, candidate locations, readiness and a series of recommended objectives for future planning studies.

The deployment scope describes the magnitude of the deployment for each project. Each project is allocated one of the following four options:

- System Wide – applies to the entire provincial highway network
- Corridor Wide – applies to the Highway 2 corridor under review in this study
- Segment – applies to a segment of the Highway 2 corridor
- Localized – applies to a specific location (such as an interchange or roadside station)

While specific planning studies are required to identify specific locations and limits to the recommended projects, Table 1 provides some guidance on where Alberta Transportation may wish to begin focus.

Table 1 also provides an indication of 'Readiness'. This measure is applied broadly to the initiative (not at the project level) and provides an indication of how close Alberta Transportation and its stakeholders and partners may be to planning, procuring and deploying the technologies or systems associated with each project.

In all cases, the next step for each of the projects listed in Table 1 is to conduct ITS project planning studies. These studies represent a critical step in the successful planning and deployment of each project. There are usually multiple objectives for each planning study (denoted in Tale 1 with check marks). The following list provides descriptions for each of these candidate objectives.

Recommended Objective for Future Planning Studies	Description
Identify/Confirm Stakeholders	Project Stakeholders are other departments or agencies that have an interest in the project. They may procure, construct, operate, maintain or benefit from the proposed system
Establish Project Limits	While some systems may apply to the entire corridor (i.e. Alberta 511), others will have specific limits (such as Variable Speed Limit Lanes). This objective is to consider the specific locations and limits of the system under consideration.
Identify Pre-requisite Systems and Actions	Pre-requisite systems are those that support the proposed system. For example, on-board driver information systems support Smart Roadside Inspection Systems in that they convey messages to the drivers of commercial vehicles.
Support Development of Functional Requirements	Functional requirements are often required at the procurement stage of system development. Planning studies can help to define the intended functions of the system and form a pre-cursor to the development of functional requirements.
Support Preparation of Concept of Operations	A concept of operations is an important step in determining how the system will operate, who will use it and under what circumstances.
Establish Project Level Cost Estimates	Budgetary estimates of the recommended system are an important objective of any planning study. These estimates allow an agency to plan for the financial obligations to procure and install, as well as operate and maintain the system throughout its design life.
Identify Implementation Strategies	Infrastructure expansion projects as well as rehabilitation projects often create good opportunities to implement new systems or system components. Other opportunities may stem from the planned initiatives of other stakeholders (such as Municipalities or other Provincial departments).
Identify Supporting Infrastructure Requirements	Communications and power are generally required for any roadside components. For central systems, the infrastructure may need to consider data transmission, storage and processing. An important objective of any planning study is to identify the infrastructure needed to support the proposed system.

Table 1 - Next Steps for ITS Initiatives

					Recommended Objectives for Future ITS Planning Study							
Initiative	**Project**	**Deployment Scope**	**Candidate Locations**	**Readiness**	Identify/Confirm Stakeholders	Assess & Establish Project Limits	Identify Pre-requisite Systems and Actions	Support Development of Functional Requirements	Support Preparation of Concept of Operations	Establish Project Level Cost Estimates	Identify Implementation Strategies	Identify Supporting Infrastructure Requirements
Commercial Vehicle Operations	Smart Roadside Inspection System	Localized	Inspections Stations at Leduc and Balzac	Medium Term	✓		✓	✓	✓	✓	✓	✓
	Integrate with Other Commercial Vehicle Safety Systems (MOTRIS, TSIS)	System Wide	N/A		✓		✓	✓	✓	✓	✓	
	Support On-Board Connected Vehicle Systems	System Wide	N/A		✓		✓	✓	✓	✓	✓	✓
Traffic Management	Provincial Traffic Management Centre	System Wide	N/A	Medium Term	✓		✓	✓	✓	✓	✓	✓
	Expansion of Video Surveillance System	Area Specific	- CS 2:15 Stony Trail to CS2:18 Acme Rd - CS 2:24 McKenzie Rd to CS 2:26 Hwy 597 -CS 2:30 Hwy 2A to CS2:32 AHD			✓				✓	✓	
	Ramp Metering	Localized	TBD		✓	✓		✓	✓	✓	✓	✓
	Variable Speed Limit Systems	Segment	- CS 2:15 Stony Trail to CS2:18 Acme Rd - CS 2:24 McKenzie Rd to CS 2:26 Hwy 597 -CS 2:30 Hwy 2A to CS2:32 AHD		✓	✓	✓	✓	✓	✓	✓	✓
	HOV / HOT / Transit Priority Lanes	Segment	placed where operational strategy implemente		✓	✓	✓	✓	✓	✓	✓	✓
Maintenance and Winter Operations	Expansion of RWIS	Localized	TBD	Short Term		✓				✓	✓	
	Mobile RWIS	Corridor Wide	Corridor Wide					✓	✓	✓	✓	
	Enhance Maintenance Decision Support Systems	System Wide	N/A				✓	✓	✓	✓	✓	✓
	Expand Deployment of Dynamic Message Signs	Localized	rance to VSLS corridors and Automated Motor A			✓				✓	✓	✓
Traveller Information	Enhance 511	System Wide	N/A	Short Term			✓	✓	✓	✓	✓	
	Continue Deployment of Automated Motorist Advisory Systems	Localized	TDB at localized hot spots			✓	✓			✓	✓	✓
	Develop Contractual Processes to Identify Disruptions	System Wide	N/A		✓			✓	✓	✓	✓	
Connected/Automated Vehicles	Stage 2 of ACTIVE Aurora Strategy	Segment	-CS 2:30 Hwy 2A to CS2:32 AHD	Long Term		✓	✓	✓	✓	✓	✓	✓
	Identify Pilot Projects for Highway 2	Segment	TBD		✓	✓	✓	✓	✓	✓	✓	✓

3.1.1 Foundational Needs

This report offers a snap-shot of the state of the ITS industry, recent efforts by other, similar agencies and descriptions of emerging technologies and systems. However, as ITS highly leverages the IT sector, changes take place very quickly. These changes require continual monitoring to keep abreast of the industry such that AT can continue to leverage new systems and the experiences of other agencies.

Furthermore, as additional ITS systems are deployed or expanded on the corridor (and throughout the Province) AT should make a concerted effort to consolidate the operations of these systems through a Provincial Transportation Management Center. This consolidation will heighten the benefits realized from a set of disparate systems and maximize the effectiveness of limited staff resources.

Lastly, the proposed ITS systems will require diverse expertise and resources to operate and maintain. AT should plan for the engagement of new staff in concert with the deployment of these systems to leverage the benefits.

3.1.2 Supporting Infrastructure

The province should also begin to seek future opportunities to develop more detailed supporting infrastructure plans (i.e. power and telecommunications) related to connected vehicle technologies, particularly within the design of future capital projects in more urbanized areas near Calgary, Red Deer and Edmonton. For example, the deployment of fiber optic cables offers very high data bandwidths at a low risk because, even if new technologies come along to compete with the capabilities of fiber, they can be deployed in stages along the corridor to replace the fiber at the end of its design life. It is therefore most cost effective to deploy the fiber as capital projects are implemented along the corridor.

It is recommended to conduct a study to develop typical minimum infrastructure requirements as design standards that can be referenced by department staff and design consultants for implementation in parallel with any infrastructure work at key locations along the corridor. These requirements should include conduit infrastructure with pull box locations for the placement of future fiber optic cable, placement of conduits for power or placement of power access points at fixed intervals along the corridor. Continuous power should be provided in addition to any switched power that is put in place for roadway lighting. Where feasible, work duct banks crossing both the north and southbound highway segments are also recommended.

Appendix L

Implementation Plan – Baseline Growth Investment

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Bridge File	Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 8 (or 10) Lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (8 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	8 Laning Structural Costs	8 (or 10) Laning Improvement Costs	Bypass Required	Interchange or Bridge Planning, and Other Requirements in Vicinity
SOUTHERN REGION												
Highway 2:15												
82401	Highway 201: Stoney Trail Ring Road	City of Calgary	2:15 km 47.8			multiple		Beyond 10 years	N/A	N/A		
	Widen: Stony Trail to CPR Crossing			2.4 km								
75330	CPR Underpass	Rocky View	2:15 km 50.2		**10 Lanes** (from 6 lanes)	Railway, Culvert	Structure - No work required	Beyond 10 years	$ 5,200,000		**AADT 171,700** (LOS D/E) (Estimated in 20-25 years)	Railway Plans to be Determined
	Widen: CPR Crossing to Crossiron Drive			1.1 km	**AADT 104,000** (LOS D/E) (Estimated in 5-10 years)							
84105	CrossIron Drive, Interchange (Rocky View)	Rocky View, East	2:15 km 51.3			Bridge	Structure - No work required	Beyond 25 years				Roadway Planning for West Connection
	Widen: Twp Rd 261 to Highway 566		2:15 km 52.99	1.7 km		Culvert	Nose Creek Culvert Replace (2:15 km 51.7)	Within 10 years	$ 7,800,000	$ 6,760,000		
Highway 2:18												
	Highway 566, Interchange Balzac Access	Rocky View	2:18 km 0.0			Bridge	Yes	Replace Interchange		$ 100,000,000		
	Vehicle Inspection Station - NB		2:18 km 2.2							$ 3,000,000		Relocation to be Determined
	Widen: Highway 566 to Twp Rd 264			3.2 km						$ 12,800,000		
71706	Nose Creek	Rocky View	2:18 km 3.1		**10 Lanes** (from 6 lanes)	Stream, Culvert	Extend or Replace, with Int'c. 264 Relocation	Within 10 years	$ 6,500,000		**AADT171,700** (LOS D/E) (Estimated in 20-25 years)	
Future	Township Road 264, No Current Access (Airdrie, Rocky View)	Airdrie	2:18 km 3.2		**AADT 104,000** (LOS D/E) (Estimated in 5-10 years)	Future Interchange & CPR Overpass						Study Underway
	Widen: Twp Rd 264 to 40 Avenue			1.6 km						$ 6,400,000		
Future	40 Avenue, No Current Access (Airdrie)	Airdrie	2:18 km 4.8			Future Partial Interchange						Design Underway
	Widen: 40 Avenue to Yankee Valley Blvd			1.6 km						$ 6,400,000		
76849 N	Yankee Valley Boulevard, Interchange	Airdrie	2:18 km 6.4			NB Bridge	Structure - No work required	Beyond 25 years		$ 2,000,000		
76849 S	Airdrie Access					SB Bridge				$ 2,000,000		
	Widen: Yankee Valley Blvd to Highway 567			3.4 km	**8 Lanes** **AADT 104,000** (LOS D/E) (Estimated in 5-10 years)		Utility Culvert 2:18 km 7.9	Unknown		$ 13,600,000		
78222	Pedestrian Bridge, Overpass	Airdrie	2:18 km 7.8			Bridge	Structure - No work required	Beyond 10 years			**AADT 139,000** (LOS D/E) (Estimated in 20-25 years)	
	Mid Block Exit NB to East Lake Crescent Mid Block Entrance SB from Edmonton Trail		2:18 km 7.9							$ 1,000,000		
76848 E	Highway 567, Interchange	Airdrie	2:18 km 9.7			EB Bridge	Yes	Replace within 10 years	$ 9,750,000	$ 2,000,000		
76848 W	Veterans Blvd, Airdrie Access, North	Airdrie	2:18 km 9.8			WB Bridge	Structure - No work required	Maintain, > 25 years		$ 2,000,000		

Bridge File	Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 8 (or 10) Lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (8 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	8 Laning Structural Costs	8 (or 10) Laning Improvement Costs	Bypass Required	Interchange or Bridge Planning, and Other Requirements in Vicinity
	Widen: Highway 567 to Twp Rd 273			1.6 km						$ 6,400,000		
Future	Township Road 273, No Current Access (Airdrie)	Airdrie	2:18 km 11.4			Future Overpass						Planning Study Required
	Widen: Twp Rd 273 to Twp Rd 274			1.6 km						$ 6,400,000		
Future	Township Road 274, No Current Access (Airdrie)	Airdrie, Rocky View	2:18 km 13.0		**8 Lanes**	Future Interchange						Planning Study Required
	Widen: Twp Rd 274 to Twp Rd 280			3.2 km	**AADT 71,500** (LOS C/D) (Estimated in 25-30 years)					$ 12,800,000		
Future	Township Road 280, No Current Access (Provisional for Regional Highway)	Rocky View	2:18 km 16.2			Potential System Interchange					**AADT 95,500** (LOS C/D)	Planning Study Required
	Widen: Twp Rd 280 to Highway 2A/72			3.3 km						$ 13,200,000		
	Safety Rest Area, Southbound	Rocky View	2:18 km 18.5			SRA	Access Modification			$ 3,000,000		SRA SB - Modifications
77919	Highway 2A/72, Interchange Rocky View/Crossfield Access, South	Rocky View	2:18 km 19.5			Bridge	Structure - No work required, Interchange Reconfiguration	Beyond 10 years	$ 7,150,000	$ 8,000,000		
	Widen: Highway 2A/72 to Twp Rd 285			4.8 km						$ 19,200,000		
	Commercial Safety Rest Area, Northbound	Rocky View	2:18 km 23.0		**8 Lanes**	SRA				$ 2,000,000		
78123	Township Road 285, Overpass	Rocky View	2:18 km 24.3		**AADT 54,500** (LOS B/C) (Estimated in 30 years)	Bridge	Headslope Modifications Possible	Beyond 10 years	$ 5,850,000			Bridge Upgrading
78123	Limit Avenue, Crossfield					Directional Interchange	Replace Bridge to Connect Airdrie Bypass	Estimated Beyond 25 years				Flyover - Possible Conversion to Interchange, Study Required
	Widen: Twp Rd 285 to Twp Rd 292		2:18 km 29.55	5.3 km			Crossfield Creek Culvert 2:18 km 28.0 - lengthen	Beyond 10 years	$ 1,300,000	$ 21,000,000	No Bypass	
Highway 2:20												
77910	Township Road 292, Interchange Acme Road, Rocky View/Crossfield Access, North	Rocky View	2:20 km 0.0		**8 Lanes** **AADT 54,500** (LOS B/C) (Estimated in 30 yrs)	Bridge	Headslope Modifications Possible	Beyond 10 years	$ 5,850,000	$ 4,000,000	No Bypass	Interchange Capacity Review/ Long Term Plan Req.'d.
	Widen: Twp Rd 292 to Region Boundary			1.6 km						$ 6,400,000		

Costs Summary

Highway Section	8 or 10 Laning Stage		
	Structures	Road Work	Total
Stoney Trail to Southern Region Boundary	$ 49,000,000	$ 260,000,000	**$ 309,000,000**

Bridge File	Highway 2 Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 6 lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (6 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	6 Laning Structural Costs	6 Laning Road Improvement Costs	Highway Widening to 8 lanes	Bridge Replacement/ Road Work to Accommodate Highway Widening (8 Lanes)	8 Laning or earlier Structural Costs	8 Laning Improvement Costs	Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
SOUTHERN REGION																
Highway 2:20 km 1.6 (Southern Region/Central Region Boundary)																
CENTRAL REGION																
	Widen: Region Boundary - Highway 581			8.1 km		Watercourse Culverts	Carstairs Creek Culvert - 2:18 km 4.9 - No work Req.'d.. Sheep Coulee Culvert - 2:18 km 8.2 - No work Req.'d..	Beyond 10 years	$ -	$ 32,400,000			$ 3,300,000	$ 32,400,000		
77426	Highway 581 Interchange Mountain View/Carstairs Access	Mountain View County	2:20 km 9.7			Bridge	Structure - No Improvement Req.'d., Int'c. Intersections Improvements	Within 10 years	$ -	$ 4,000,000			$ 6,500,000	$ 4,000,000		Interchange Capacity Review/ Long Term Plan Req.'d.
	Widen: Highway 581 - Twp. Rd. 310			6.5 km		Watercourse Culverts	Rosebud River Culvert 2:20 km 13.8 - No work Req.'d..	Beyond 25 years	$ -	$ 26,000,000		Rosebud River Culvert 2:20 km 13.8	$ 5,200,000	$ 26,000,000		
83153	Twp. Rd. 310 (Westcott/Bergthall Rd.) Existing at-grade intersection	Mountain View County	2:20 km 16.2		AADT 34,000 (LOS B/C) (Required in less than 5 years)	Future Interchange		Within 5 years	$ -	$ 42,000,000	AADT 54,500 (LOS B/C) (Required in 25-30 years)		$ -			Planning Study Completed, Access Control to be Implemented .
	Widen: Twp. Rd. 310 - Highway 582			4.8 km		Cattle Pass	Cattle Pass Culvert 2:20 km 17.9	Beyond 10 years	$ 400,000	$ 19,200,000			$ 1,300,000	$ 19,200,000	Not Required	
77129	Highway 582 Interchange Mountain View/Didsbury Access	Mountain View County	2:20 km 21.0			Bridge	Structure - No Improvement Req.'d., Headslope Modifications Int'c. Intersections Improvements	Within 10 years	$ -	$ 4,000,000			$ 5,900,000	$ 4,000,000		Interchange Capacity Review/ Long Term Plan Req.'d.
	Safety Rest Area - Northbound		2:20 km 2.28			SRA	Future			$ 3,000,000			$ -	$ 1,500,000		
	Safety Rest Area - Southbound		2:20 km 2.28			SRA	Future			$ 3,000,000			$ -	$ 1,500,000		
	Widen: Highway 582 - Highway 27	Mountain View County		14.6 km		Watercourse Culverts	Watercourse Culvert 2:20 km 30.2 - No work Req.'d.. Watercourse Culvert 2:20 km 32.9 - No work Req.'d..	Beyond 10 years	$ -	$ 58,280,000			$ 3,900,000	$ 58,280,000		
Highway 2:22																
76158	Highway 27 Interchange Mountain View/Olds Access	Mountain View County	2:22 km 0.0			Bridge	Structure - No work required Int'c. Intersection Improvements	Beyond 10 yrs	$ 16,900,000	$ 4,000,000		Structure Replacement Possible Parclo Configuration	$ -	$ 4,000,000		Interchange Capacity Review/ Long Term Plan Req.'d.
	Highway 2 Highway 27 - Twp. Rd. 334			6.5 km		Watercourse Culverts	Lapine Creek Culvert 2:22 km 6.0 - No work Req.'d..	Beyond 10 years	$ -	$ 26,000,000			$ 1,300,000	$ 26,000,000	Not Required	
Future	Twp. Rd 334 (Netook Rd) Existing at-grade intersection	Mountain View County	2:22 km 6.5			Future Interchange	Includes Road Widening to Highway 2A	Within 5 years		$ 50,000,000		Incl. Highway 2A Intersection Improvement	$ -			Planning Study Completed, Access Control to be Implemented.
	Widen: Twp. Rd. 334 - Highway 587			6.2 km	AADT 34,000 (LOS B/C) (Required in less than 5 years)	Watercourse Culverts	Watercourse Culvert 2:22 km 12.7 - No work Req.'d..	Beyond 10 years	$ 700,000	$ 24,800,000	AADT 54,500 (LOS B/C) (Required in 25-30 years)		$ 2,600,000	$ 24,800,000		
	Bowden Safety Rest Area - Northbound/Southbound		2:22 km 15.3			SRA	Future			$ 3,000,000			$ -	$ 1,500,000		
76406	Highway 587 Interchange Bowden Access	Red Deer County	2:22 km 16.0			Bridge	Structure - No work required	Beyond 10 years	$ -	$ 20,000,000		No	$ 8,500,000	$ 4,000,000		Interchange Improvements and Bridge Widening
	Highway Commercial - Northbound (FasGas)		2:22 km 15.3			SRA				$ 3,000,000			$ -	$ 1,500,000		
	Highway 2 Twp. Rd. 587 - Highway 54			8.5 km			Watercourse Culverts (4) - Lengthen or Replace	2:22 km 18.5 - Within 10 years; 2:22 - km 22.2; km 22.8; km 23.5 - Beyond 10 years	$ 3,600,000	$ 34,000,000			$ 5,900,000	$ 34,000,000	Not Required	
79076	Highway 54 Interchange Innisfail Access, South	Red Deer County	2:22 km 24.5		AADT 47,700 (LOS C/D) (Required in 15-20 years)	Bridge	Structure - No work required	Beyond 25 years	$ -		AADT 71,500 (LOS C/D) (Required in 50 years)	Headslope Wall SB	$ 2,600,000	$ 4,000,000		
	Widen: Highway 54 - Highway 590			3.4 km					$ -	$ 13,760,000			$ -	$ 23,400,000		Highway 2 Realignment in 8 lane stage

Bridge File	Highway 2 Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 6 lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (6 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	6 Laning Structural Costs	6 Laning Road Improvement Costs	Highway Widening to 8 lanes	Bridge Replacement/ Road Work to Accommodate Highway Widening (8 Lanes)	8 Laning or earlier Structural Costs	8 Laning Improvement Costs	Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
Highway 2:24																
75945	Highway 590 Interchange Innisfail Access, North	Red Deer County	2:22 km 0.0		AADT 47,700 (LOS C/D) (Required in 10-15 years)	Bridge	Replace Structure/Interchange Highway 590 Realignment	Within 10 years	$ -	$ 50,000,000	AADT 71,500 (LOS C/D) (Required in 35-40 years)		$ -	$ 4,000,000	Not Required	Highway 590 Realignment, Long Term Plans to be Finalized, Highway 2 Realignment, South of Int.'c.
	Widen: Highway 590 - Twp. Rd. 362			8.1 km		Watercourse Cattle Pass Culverts	Waskasoo Cr Culvert 2:24 km 0.7 Cattle Pass Culvert 2:24 km 2.6 Lengthen or Replace	Beyond 10 years	$ 1,700,000	$ 32,400,000			$ 3,300,000	$ 32,400,000		
79217	Twp. Rd. 362 (Old Pole Rd) Existing at-grade Intersection	Red Deer County	2:24 km 8.1			Bridge		Construct Fly-Over within 5 years		$ 15,000,000			$ -	$ 5,000,000		Planning Completed
	Widen: Twp. Rd. 362 - Highway 42			7.6 km		Watercourse Cattle Pass Culverts	Watercourse Culvert 2:24 km 8.2 Cattle Pass Culvert 2:24 km 9.0 Watercourse Culvert 2:24 km11.0 Lengthen or Replace	Beyond 10 years	$ 3,000,000	$ 30,400,000			$ 3,900,000	$ 30,400,000		
	Commercial SRA - Northbound	Airdrie	2:24 km 12.7			SRA	Potential			$ 3,000,000			$ -			
77349	Highway 42 Interchange Red Deer County/Penhold Access	Red Deer County	2:24 km 15.7			Bridge	Structure - No work required	Beyond 10 years	$ -	$ 4,000,000		Structure Replacement	$ 9,800,000	$ 40,000,000		Review Long Term Requirements based on Proposed Developments
	Widen: Highway 42 - McKenzie Road			6.6 km					$ -	$ 26,400,000			$ -	$ 26,400,000		
79481	McKenzie Road Interchange Red Deer County/City Access	Red Deer County	2:24 km 22.3			Bridge	Structure - No work required	Beyond 25 years	$ -	$ -			$ -			Long Term Planning Required considering proposed developments
	Widen: McKenzie Road - Gaetz Ave.			3.0 km	Current Contract				$ -	$ -	AADT 71,500 (LOS C/D) (Required in 30 years)		$ -		May be Required, if Traffic Reaches AADT 94,000	
75331 S	Gaetz Avenue Interchange	Red Deer County	2:24 km 25.3			Bridge	N/A	Beyond 25 years	$ -	$ -			$ -			
	Widen: Gaetz Avenue - Taylor Drive			1.0 km					$ -	$ -			$ -			
75332 N1	Taylor Drive	Red Deer County	2:24 km 26.0			Bridge	N/A	Beyond 25 years	$ -	$ -			$ -			
75332 S1	Taylor Drive		2:24 km 26.1			Bridge	N/A	Beyond 25 years	$ -	$ -			$ 1,300,000	$ -		Future widening
75332 N2	Taylor Drive		2:24 km 26.2			Bridge	N/A	Beyond 25 years	$ -	$ -			$ 1,300,000	$ -		Future widening
75332 S2	Taylor Drive		2:24 km 26.3			Bridge	N/A	Beyond 25 years	$ -	$ -			$ -			
	Widen: Taylor Drive - 32 Street			1.9 km		Watercourse Culvert	Waskasoo Creek Culvert 2:24 km 27.4 - Lengthen or Replace	Beyond 10 years	$ 1,300,000	$ 2,000,000			$ 2,000,000	$ 8,900,000		
75334	32 Street Interchange City of Red Deer Access	Red Deer County	2:24 km 28.2		AADT 47,700 (LOS C/D) (Required in less than 5 years)	Bridge	Headslope Walls or Replacement	Beyond 10 years	$ 2,600,000	$ 2,000,000	AADT 94,000 (LOS C/D) (Required in 25 -30 years) Incl. Aux. Lanes (10 lanes total)		$ 10,400,000	$ 4,000,000	AADT 117,500 LOS C/D (Required in 25-30 years)	Traffic Review, Modifications as Required.
	Widen: 32 Street - Red Deer River			2.5 km					$ -	$ 17,000,000			$ -	$ 10,000,000		Realignment and widening
	Alberta Museum Sports Hall of Fame Safety Rest Area - Northbound	City of Red Deer	2:24 km 12.7			SRA			$ -	$ 2,000,000			$ -	$ 3,000,000		
75335 N	Red Deer River	Red Deer County	2:24 km 30.8			2 Bridges	Replacement on Shifted Alignment	Within 10 years	$ 31,200,000				$ 35,100,000			
	Widen: Red Deer River to CP Railway			1.9 km					$ -	$ 19,000,000			$ -	$ 7,600,000		
81466	CP Railway	Red Deer County	2:24 km 32.6			Culvert	No	Beyond 25 years	$ -	$ 2,000,000			$ 5,200,000			
	Widen: CP Railway - Highway 11			0.4 km					$ -	$ 3,200,000			$ -	$ 1,600,000		

Bridge File	Highway 2 Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 6 lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (6 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	6 Laning Structural Costs	6 Laning Road Improvement Costs	Highway Widening to 8 lanes	Bridge Replacement/ Road Work to Accommodate Highway Widening (8 Lanes)	8 Laning or earlier Structural Costs	8 Laning Improvement Costs	Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
75420 E	Highway 11 Interchange - EB County of Red Deer Access	Red Deer County	2:24 km 33.0		AADT 47,700 (LOS C/D) (Required in less than 5 years)	Bridge	No	Beyond 25 years	$ -		AADT 71,500 (LOS C/D) (Required in 25 -30 years)		$ -	$ -	AADT 94,00 (LOS C/D) (Required in 45 years)	
75420 W	Highway 11 Interchange - WB City of Red Deer Access	Red Deer County	2:24 km 33.0			Bridge	Replace	Within 10 years	$ 10,400,000			Systems Interchange	$ -	$ 90,000,000		LT Plan Based on McElhanney Report
	Widen: Highway 11 to Highway 11A			3.4 km					$ -	$ 13,600,000			$ -	$ 13,600,000		
Highway 2:26																
75336	Highway 11A Interchange Red Deer County/City Access	Red Deer County	2:24 km 0.0		AADT 47,700 (LOS C/D) (Required in less than 5 years)	Bridge	No	Within 10 years	$ 14,300,000		AADT 71,500 (LOS C/D) (Required in 25-30 years)		$ -	$ 4,000,000	AADT 94,00 (LOS C/D) (Required in 45 years)	Conversion to Spread Diamond at 8 Lane stage
	Widen: Highway 11A - CN Railway			2.3 km					$ -	$ 6,440,000			$ -	$ 9,200,000		
75337 N	CN Railway	Red Deer County	2:26 km 2.3			2 Bridges	Replacement before Highway Widening	Within 10 years	$ -	$ 17,700,000			$ -			
	Widen: CN Railway Twp. Rd. 392			1.1 km					$ -	$ 4,400,000			$ -	$ 4,400,000		
Future	Twp. Rd 392, No Current Access Potential Interchange (City of Red Deer)		2:26 km 3.4			Future Interchange			$ -				$ -	$ -		Planning Study Required, if Interchange Warranted
	Widen: Twp. Rd. 392 - Blindman River			1.4 km					$ -	$ 5,600,000			$ -	$ 5,600,000		
75338 N	Blindman River	Red Deer County	2:26 km 4.8			2 Bridges	Yes	Within 10 years	$ 34,700,000				$ 27,300,000			
	Widen: Blindman River - Highway 597			2.2 km					$ -	$ 8,800,000			$ -	$ 8,800,000		
76565	Highway 597 Interchange Blackfalds Access	Lacombe County	2:26 km 7.0			Bridge	No	Beyond 10 years	$ -			Headslope Walls and Ramp Modifications	$ 8,500,000	$ 4,000,000		Long Term Planning Required considering proposed developments
	Widen: Highway 597 - Twp. Rd. 400			3.4 km	AADT 47,700 (LOS C/D) (Required in 10-15 years)				$ -	$ 13,600,000	AADT 71,500 (LOS C/D) (Required in 35-40 years)		$ -	$ 13,600,000	Not Required	
Future	Twp. Rd 400, No Current Access Potential Future Int'c., Blackfalds	Lacombe County	2:26 km 10.4			Future Interchange			$ -	$ -			$ -	$ -		Planning Required if Interchange Warranted
	Widen: Twp. Rd . 400 - CP Railway			4.5 km					$ -	$ 18,000,000			$ -	$ 18,000,000		
75339 N	CP Railway	Lacombe County	2:26 km 14.9			2 Bridges	Yes	Within 10 years	$ 23,000,000			Bridge Widening	$ 13,000,000			
	Widen: CP Railway - Highway 12			2.6 km		Watercourse Culvert	Whelp Brook Culvert 2:26 km 15.4 - Lengthen or Replace	Beyond 10 years	$ 1,300,000	$ 10,400,000			$ 1,300,000	$ 10,400,000		
75340 N	Highway 12 Interchange County and City of Lacombe Access	Lacombe County	2:26 km 17.5			2 Bridges	No	Within 10 years	$ -	$ 4,000,000			$ 18,200,000	$ 4,000,000		Significant Developments proposed, Traffic Review and Long Term Plan
	Widen: Highway 12 - Highway 2A (Milton Road)			8.9 km	AADT 34,000 (LOS B/C) (Required in 10 years)	Watercourse Culverts Private Underpass	Whelp Brook Culvert 2:26 km 20.5 Private Road Culvert 2:26 km 22.8 Wolf Creek Culvert 2:26 km 26.2 - All Structures Lengthen or Replace	Beyond 10 years	$ 3,900,000	$ 35,600,000	AADT 54,500 (LOS B/C) (Required in 25 years)		$ 6,500,000	$ 35,600,000		
	Safety Rest Area (Wolf Creek) - Southbound		2:26 km 23.5			SRA				$ 3,000,000			$ -	$ 2,000,000		

Bridge File	Highway 2 Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 6 lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (6 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	6 Laning Structural Costs	6 Laning Road Improvement Costs	Highway Widening to 8 lanes	Bridge Replacement/ Road Work to Accommodate Highway Widening (8 Lanes)	8 Laning or earlier Structural Costs	8 Laning Improvement Costs	Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
75341	Highway 2A South Int'c. (Milton Rd.) Lacombe County Access	Lacombe County	2:26 km 26.4		Existing N/A	Bridge	Replacement	Within 10 years	$ 13,000,000	$ 4,000,000	AADT 54,500 (LOS B/C) (Required in 25 years)		$ 12,400,000	$ 4,000,000	Not Required	Traffic Review and Long Term Planning Required.
	Widen: Highway 2/Highway 2A (Milton Rd. - North Int'c.)			5.6 km		Watercourse Culvert	Watercourse Culvert 2:26 km 31.5 - Lengthen or Replace	Beyond 10 years	$ 700,000	$ 22,400,000			$ 1,300,000	$ 22,400,000		
75644	Highway 2A North Interchange Lacombe/Morningside Access	Lacombe County	2:26 km 32.0			Bridge	Structure Replacement, Reconfiguration	Within 10 years	$ 14,300,000	$ 4,000,000			$ 13,700,000	$ 3,000,000		Traffic Review and Planning Required (Deficient Geometry).
	Widen: Highway 2A - Highway 604			2.3 km	AADT 34,000 (LOS B/C) (Required in 10 years)	Watercourse Culvert	Wolf Creek Culvert 2:26 km 33.6- Lengthen or Replace	Beyond 10 years	$ 1,300,000	$ 9,200,000	AADT 54,500 LOS B/C (Required in 35-40 years)		$ 2,600,000	$ 9,200,000		
75661 N	Highway 604 Interchange Lacombe County/Morningside Access	Lacombe County	2:26 km 34.3			2 Bridges	Replacement	Within 10 years	$ 10,400,000	$ 4,000,000			$ 9,100,000	$ 4,000,000		Significant Developments proposed, Traffic Review and Long Term Plan Required.
	Widen: Highway 604 - Wolf Creek Bridge			4.7 km		Watercourse Culvert	Wolf Creek Culvert 2:26 km 36.7- Lengthen or Replace	Beyond 10 years	$ 700,000	$ 18,800,000			$ 2,000,000	$ 18,800,000		
75623 N	Wolf Creek	Ponoka County	2:26 km 39.0			2 Bridges	Recently Widened, will accommodate 8 lanes	Beyond 25 years	$ -				$ 2,600,000			
	Widen: Wolf Creek Bridge - Matejka Rd			1.9 km		Cattle Pass Culvert	Cattle Pass Culvert 2:26 km 40.2 - Lengthen or Replace	Beyond 10 years	$ 400,000	$ 7,600,000			$ 700,000	$ 7,600,000		
75754	Twp. Rd. 424 (Majetka Road) Int'c. Ponoka County Access	Ponoka County	2:26 km 40.9			Bridge	Int'c Conversion or Replacement	Within 10 years	$ -	$ 50,000,000			$ -	$ 4,000,000		Significant Developments Proposed, Traffic and Reconfiguration incl. Gee Rd. - Long Term Plan Required.
75812 N	Twp. Rd. 425 (Gee Road) Int'c. Ponoka County Access	Ponoka County	2:26 km 42.1			2 Bridges	Eliminate	Within 10 years	$ 1,300,000				$ -			
	Widen: Matejka Rd - Battle River Bridge			2.1 km					$ -	$ 8,400,000			$ -	$ 8,400,000		
75535 N	Battle River	Ponoka County	2:26 km 43.0			2 Bridges	Replacement	Within 10 years	$ 25,600,000	$ -			$ 13,000,000			
	Widen: Battle River Bridge - Highway 53			2.2 km					$ -	$ 8,800,000			$ -	$ 8,800,000.00		
Highway 2:28																
75651 N	Highway 53 Interchange Ponoka County/Town Access	Ponoka County	2:26 km 0.0		AADT 34,000 (LOS B/C) (Required in 5-10 years)	2 Bridges	Replacement	Within 10 years	$ -	$ 4,000,000	AADT 54,500 LOS B/C (Required in 30-35 years)		$ 25,600,000	$ 4,000,000	Not Required	Significant Developments proposed, Traffic Review and Long Term Plan Required.
	Widen: Highway 53 - Twp. Rd. 435			7.4 km					$ -	$ 29,600,000			$ -	$ 29,600,000.0		
75726	Twp. Rd 435 Overpass No Access	Ponoka County	2:28 km 7.4			Bridge	Headslope Walls or Replacement	Beyond 10 years	$ 2,600,000	$ -			$ 5,900,000	$ -		
	Widen: Twp. Rd. 435 - Twp. Rd 442			4.8 km		Watercourse Culvert	Maskwa Creek Culvert 2:28 km 10.7 - Lengthen or Replace	Beyond 10 years	$ 400,000	$ 19,590,000			$ 1,300,000	$ 19,200,000		
75725	Twp. Rd 442 (Menaik Road) Int'c. Ponoka County Access	Ponoka County	2:28 km 12.2			Bridge	Int.'c. Conversion or Replacement	Within 10 years	$ -	$ 4,000,000			$ 6,500,000	$ 4,000,000		Capacity Review and Long Term Plan Required.
	Widen: Twp. Rd. 442 - Highway 611			6.5 km					$ -	$ 26,000,000			$ -	$ 26,000,000		
75724	Highway 611 (Maskwacis) Int'c. Ponoka/Wetaskiwin County Access	Wetaskiwin County	2:28 km 18.7			Bridge	Headslope Walls or Replacement	Beyond 10 years	$ 2,600,000	$ 4,000,000			$ 5,900,000	$ 4,000,000		Capacity Review and Long Term Plan Required.
	Widen: Highway 611 - Twp. Rd. 455			8.1 km		Watercourse Culvert	Maskwa Creek Culvert 2:28 km 23.3 Watercourse Culvert 2:28 km 23.3 - Lengthen or Replace	Beyond 10 years	$ 1,300,000	$ 32,400,000			$ 6,500,000	$ 32,400,000		

Bridge File	Highway 2 Description/ Location	Municipality	Highway 2 Station	Hwy 2 (Km)	Highway Widening to 6 lanes	Usage/ Structure Type	Bridge Replacement/ Road Work to Accommodate Widening (6 Lanes)	Bridge Major Maintenance/ Replacement Requirement.	6 Laning Structural Costs	6 Laning Road Improvement Costs	Highway Widening to 8 lanes	Bridge Replacement/ Road Work to Accommodate Highway Widening (8 Lanes)	8 Laning or earlier Structural Costs	8 Laning Improvement Costs	Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
	Louis Bull Safety Rest Area - Northbound		2:28 km 24.4		AADT 34,000 (LOS B/C) (Required in 5-10 years)	SRA	Existing to be Expanded			$ 3,000,000	AADT 54,500 LOS B/C (Required in 30-35 years)		$ -	$ 2,000,000	Not Required	Expansion and Ramps Modification
75723	Twp. Rd 455 (Louis Bull) Overpass Potential Conversion to Interchange	Wetaskiwin County	2:28 km 26.8			Bridge	Replacement	Beyond 10 years	$ 6,500,000				$ 5,900,000	$ -		Structure reaches life expectancy may be converted to Int'c.
	Widen: Twp. Rd. 455 - Highway 13			4.9 km		Watercourse/ Cattle Pass Culverts	Cattle Pass Culvert 2:28 km 27.1 Watercourse Culvert 2:28 km 28.2 Watercourse Culvert 2:28 km 30.7 - All Lengthen or Replace	Beyond 10 years	$ 1,700,000	$ 19,600,000			$ 3,300,000	$ 19,600,000		
Highway 2:30																
75555	Highway 13 Interchange Wetaskiwin Access	Wetaskiwin County	2:30 km 0.0		AADT 34,000 (LOS B/C) (Required in 10 years)	Bridge	No	Within 10 years	$ -	$ -	AADT 54,500 LOS B/C (Required in 30-35 years)	Replacement	$ 13,000,000		Not Required	Capacity Review and Long Term Plan Required.
	Safety Rest Area - Southbound		2:30 km 1.4			SRA	Future		$ -	$ 2,000,000			$ -			
	Widen: Highway 13 - Twp. Rd. 470			6.7 km		Watercourse Culvert	Bigftone Creek Culvert 2:30 km 3.5 - Lengthen or Replace	Beyond 10 years	$ 1,300,000	$ 28,100,000			$ 3,900,000	$ 26,800,000.0		
75722	Twp. Rd 470 (Correction Line) Int'c. Wetaskiwin County Access	Wetaskiwin County	2:30 km 6.7			Bridge	Replacement	Within 10 years	$ -	$ 4,500,000			$ 5,900,000			Capacity Review and Long Term Plan Required.
	Widen: Twp. Rd. 470 - Highway 616			8.5 km		Watercourse Culvert	Pipestone Cr Culvert 2:30 km 12.0 - Lengthen or Replace	Beyond 10 years	$ 1,300,000	$ 35,300,000			$ 4,600,000	$ 34,000,000.0		
CENTRAL REGION																
NORTH - CENTRAL REGION																
75667	Highway 616 Interchange Wetaskiwin County/Millet Access	Wetaskiwin County	2:30 km 15.2		AADT 34,000 (LOS B/C) (Required in 5-10 years)	Bridge	Replacement	Within 10 years	$ 6,500,000	$ 11,500,000	AADT 54,500 LOS B/C (Required in 25-30 years)		$ 6,500,000		Not Required	Capacity Review and Long Term Plan Required.
	Widen: Highway 616 - Twp. Rd. 482			4.9 km					$ -	$ 19,600,000			$ -	$ 19,600,000.0		

Costs Summary

Highway Section	6 Laning Stage			8 Laning Stage		
	Structures	Road Work	Totals per Area/Stage	Structures	Road Work	Totals per Area/Stage
Southern Region Boundary to Highway 54 Innisfail	$ 22,000,000	$ 357,000,000	**$ 379,000,000**	$ 44,000,000	$ 243,000,000	**$ 287,000,000**
Highway 54 Innisfail to Highway 12 Lacombe	$ 124,000,000	$ 325,000,000	**$ 449,000,000**	$ 143,000,000	$ 386,000,000	**$ 529,000,000**
Highway 12 Lacombe to Tower Main Road	$ 96,000,000	$ 419,000,000	**$ 515,000,000**	$ 159,000,000	$ 349,000,000	**$ 508,000,000**

Description/ Location	Usage	Municipality	Highway 2 Station	Hwy 2 (Km)	Usage/ Structure Type	Existing Bridge Major Maintenance/ Replacement Requirement.	6 Lanes			8 Lanes					More than 8 Lanes					Further Improvements & Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
							Highway Widening to 6 Lanes	Bridge Replacement/ Road Work to Accommodate 6-Lane Widening	Total Structure and Roadway Costs to Accommodate 6 Lanes	Highway Widening to 8 Lanes	Structure/Interchange Costs to Accommodate 8 lanes	Freeway/Collector Lane Costs to Accommodate 8 Lanes	Core Lane Costs to Accommodate 8 Lanes	Total Structure and Roadway Costs to Accommodate 8 Lanes	Highway Widening Required to Accommodate More than 8 Lanes	Structure/ Interchange Costs to Accommodate more than 8 lanes	Freeway/ Collector Lane Costs to Accommodate more than 8 Lanes	Core Lane Costs to Accommodate more than 8 Lanes	Total Structure and Roadway Costs to Accommodate more than 8 Lanes		
NORTH - CENTRAL REGION																					
Twp. Rd 482 (Tower Main Road) Fly Over - **BF 75678**	Grade Separation	Leduc County	2:30 km 20.1		Bridge Overpass	Replacement (Beyond 10 Years)	AADT 34,000 (LOS B/C) (Required in 5-10 years)	Replacement of Overpass required to accommodate 6 (& ultimate 8) lane Hwy 2 cross-section ($15M) (0-10 years)	$15,000,000	AADT 54,500 LOS B/C (Required in 25-30 years)	Possible conversion to Interchange from fly-over ($25M) (>25 years)		n/a	$25,000,000	LOS B/C AADT 36,700 (6 lanes) (Required in 10-25 years) AADT 55,000 (8 lanes) (Required in 25-35 years)	n/a	n/a	n/a	n/a	Functional Planning Required to Accommodate Future Twp. Rd. 482 Interchange from South of 50th Ave (Hwy 39) to connect with Hwy 2 (Required beyond 25 year time frame)	Functional Planning Required to assess widening requirement for Fly-over (Currently single lane in each direction)
Widen: Twp. Rd. 482 -to- Twp. Rd. 490 (Glenn Park Rd./Kavanagh Rd.)				6.5 km				SB and NB Lanes widened to (3rd Lane) in each direction ($26M) (10-to-25 years)	$26,000,000			SB and NB Lanes widened to (4th Lane) in each direction ($26M) (> 25 years)		$26,000,000		n/a	n/a		n/a		Functional Planning Required to determine timing, staging
Twp. Rd 490 (Glenn Park Rd./Kavanagh Rd.) **BF75677**	Interchange	Leduc County	2:30 km 26.6		Bridge	Int.'c. Conversion or Replacement Beyond 10 years		Conversion to Diamond Configuration required to accommodate 3 Hwy 2 lanes in each direction ($30M) (10-to-25 years)	$30,000,000		Interchange requires replacement to accommodate 4 Hwy 2 lanes in each direction. ($40M) (> 25 years) Decision Req'd to assess potential link to Terwillegar South Extension and Conversion to Systems Interchange			$40,000,000		n/a	n/a		n/a		Functional Planning required to determine ultimate ramp terminal locations and minimize throwaway costs. Functional Planning required to determine ultimate connection to Terwillegar South Extension and potential conversion to Systems Interchange
NEW Vehicle Inspection Station (VIS) SB	New VIS Stn Utility		2:30 km 34.5								Consider relocation of SB VIS Leduc site prior to 8 lane stage ($10M) (10-25 years)		n/a	$10,000,000		n/a	n/a	n/a	n/a		Functional Planning required to determine location and configuration of future VIS Site
Highway 2 Twp. Rd. 490 (Kavanagh/Glenn Park) -to- Highway 2A (New)				5.7 km		Watercourse 2:30 km 29.6 Within 10 years		SB Lanes to be widened to Outside by 1 lane NB Lanes widened each side ($23.5M) (10-25 years)	$23,500,000			SB Lanes - widened to Outside (4th Lane) NB Lanes - widened within Median (4th Lane) ($23.5M) (> 25 years)		$23,500,000		n/a	n/a		n/a		
NEW Highway 2A Interchange	New Interchange	Leduc	2:30 km 32.3		Bridge	Required in 15-25 years					First Stage: 3 lane Structure over 8 lane Hwy 2 ($93M) (10-to-25 years) Second Stage: Widen Bridge to 4-lanes (+ 1 Lane WB) + New 2-lane bridge to north ($49M) (>35 years)			$142,000,000		n/a	n/a		n/a		Functional Planning required with Municipality to coordinate access to new developments both east and west of Hwy 2. Assumes Existing Vehicle Inspection Station is Relocated prior to Stage II
Widen: Highway 2A new - Highway 2A Ex.				2.1 km		Watercourse 2:30 km 32.3 Within 10 years		Highway 2 Reconstruction to widen from 2-to-3 lanes per direction ($18M) (<10 years)	$24,200,000		Highway 2 Reconstruction to widen from 3-to-4 lanes per direction ($5M-to-$6M) (>25.35 years)	$6,000,000		$9,100,000	LOS C/D AADT 49,000 (6 lanes) (Required in < 10 years)	n/a	n/a		n/a		Median Widening required so Interim SB widening along the current alignment would be throw-away.
Highway 2A Existing Interchange **BF 75522**	Interchange	Leduc	2:30 km 33.9		Bridge	Major Maintenance Required within 10 years	AADT 52,500 (LOS D/E) (Required in 15-25 years)	Major Bridge Rehabilitation Required ($10M) Within the next 10 Years - Conversion to "Local" Fly-over ($2M) with opening of New Hwy 2A interchange (for additional 5 years)	$12,000,000	AADT 104,000 LOS D/E (Required in 5-15 years)	Warrants for widening to accommodate either a 3rd NB lane or 4 NB & SB Lanes would require either bridge removal ($3m Cost) or replacement if it is to stay as a fly-over ($35M) (15-to-25 years)		n/a	$35,000,000	AADT 73,600 (8 lanes) (Required in 25-35 years)	n/a	n/a	n/a	n/a		Functional Planning required with Municipality to assess viability of developing ultimate fly-over at this location and access management. Fly-over serves to divert local traffic away from 50th Ave Interchange.
Widen: Existing Hwy 2A Interchange-to- CPR/Black Gold Dr.				0.7 km				Hwy 2 to be widened from 2-to-3 lanes in each direction ($8M) (10-to-25 years)	$8,000,000		Hwy 2 to be widened from 3-to-4 lanes in each direction ($3M) (> 25 years)	$3,000,000		$3,000,000		n/a	n/a		n/a		Economic Analysis Require for Optional 6 to 8 lanes Transition
CPR / Black Gold Drive Bridges **BF 75058 N/S**	Grade Separation	Leduc	2:30 km 34.4		2 Bridges	Major Maintenance Within 10 years		Major Bridge Rehabilitation Required ($15M) Within the next 15 Years	$15,000,000		Bridges to be widened to 4-lanes in each direction and lengthen to span across a 4 lane major collector Black Gold Drive corridor ($25M) (10-to-25 years)			$25,000,000	LOS D/E AADT 72,300 (6 lanes) (Required in < 10 years) AADT 108,500 (8 lanes) (Required in 10-25 years)	n/a	n/a	n/a	n/a		Functional Planning Study required for Black Gold Dr. and CP Corridor under Highway 2
Widen: CPR/Black Gold Dr. - Highway 39 (50th Ave)			2:30 km 35.2	0.8 km								Highway 2 Realigned/Reprofiled & Widened to Provide 4 Lanes in each direction ($20M) (10-to-25 years)		$20,000,000		n/a	n/a		n/a		Widening and Re-profiling must be carried out to transition with new 50th Ave Interchange

Description/ Location	Usage	Municipality	Highway 2 Station	Hwy 2 (Km)	Usage/ Structure Type	Existing Bridge Major Maintenance/ Replacement Requirement.	6 Lanes			8 Lanes					More than 8 Lanes					Further Improvements & Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
							Highway Widening to 6 Lanes	Bridge Replacement/ Road Work to Accommodate 6-Lane Widening	Total Structure and Roadway Costs to Accommodate 6 Lanes	Highway Widening to 8 Lanes	Structure/Interchange Costs to Accommodate 8 lanes	Freeway/Collector Lane Costs to Accommodate 8 Lanes	Core Lane Costs to Accommodate 8 Lanes	Total Structure and Roadway Costs to Accommodate 8 Lanes	Highway Widening Required to Accommodate More than 8 Lanes	Structure/ Interchange Costs to Accommodate more than 8 lanes	Freeway/ Collector Lane Costs to Accommodate more than 8 Lanes	Core Lane Costs to Accommodate more than 8 Lanes	Total Structure and Roadway Costs to Accommodate more than 8 Lanes		
Highway 2:32																					
Highway 39 (50 Avenue) Interchange **BF 75055 N/S**	Interchange	Leduc	2:32 km 0.0		2 Bridges	Within 10 years	Existing N/A			AADT 104,000 (LOS D/E) (Required in 5-15 years)		Total Interchange Reconfiguration to Case II (Freeway Under 50th Ave) ($80M-to-$100M) (10-to-25 years)		$100,000,000	LOS D/E AADT 72,300 (6 lanes) (Required in < 10 years) AADT 108,500 (8 lanes) (Required in 10-25 years)			n/a		Terwillegar Bypass Required Beyond 25 Year Time Frame	4 Hwy 2 freeway lanes NB & SB configured under 6 lane arterial (Excl. Aux. Turning Lanes) 50th Avenue
Widen: 50th Avenue - 65 Avenue (Leduc)			2:30 km 35.2									Realignment/Reprofile to accommodate New 50th Avenue Interchange and new Vertical Profile ($70M-90M) (10-25 years)		$90,000,000							Hwy 2 must be re-profiled to transition to a Case II (Freeway Under 50th Ave) Configuration
Watercourse	Stream		2:32 km 1.5		Culvert	Beyond 25 years						Watercourse Culvert Extension		$1,000,000							
NEW 65 Avenue Interchange	Future Interchange	Leduc	2:32 km 1.8		Future Int'c.			Access Ramps to/from 65th West - ($21M) (5 to 15 yrs)	$21,000,000							New 65th Avenue Interchange $70M (10-25 years)	50th Street NB Off-Ramp Improvements Associated with Realignment ($5M) (10-25 years)		$75,000,000		65th Avenue is required as a diversion route during construction of 50th Avenue Interchange
Widen: 65 Avenue - 50 Street (Leduc)				0.7 km						AADT 104,000 (LOS D/E) (Required in 5-10 years)		Realignment to accommodate New 65 Avenue Interchange ($12M) (10-25 years)		$12,000,000				Extend Core Lanes to New 65th Avenue Interchange ($4M) (10-25 years)	$4,000,000	
50 Street **BF 77994 S**	Fly-Over	Leduc	2:32 km 2.5		Bridge	Beyond 10 years		50 Street Bridge Twinning and Intersection Improvements ($33M) (5-15 yrs)	$33,000,000		Assumed Replacement of Existing Fly-Over (10-25 years) ($16.5M)			$16,500,000						Implemented during 65 Avenue Interchange Construction
Widen: 50 Street - Airport Road				2.7 km				Widening and Core Road Construction				Weaving Lanes and 4th NB & SB Collector Lane in Concert with 50th Street Twinning Project ($3M)		$3,000,000				New Core Lanes 2-per Direction (5-15 yrs) ($44M)	$44,000,000	
Airport Road Interchange **BF 75066**	Interchange	Nisku	2:32 km 5.2		Bridge	Beyond 10 years	Existing N/A	Ramp Improvements ($6.7M) (5-15 yrs)	$6,700,000		Interchange Ramp Improvements Widen NB Off-Ramp to 2 lane Exit (10-25 years)			$1,700,000	LOS D/E AADT 130,000 (+2 Core lanes) (Required in 10-25 years) AADT 160,000 (+ 3 Core lanes) (Required in 35+ years)	Bridge Twinning, Ramp Upgrades and EIA Express Ramps ($133M-to-$151M) >25 years			$151,000,000	Terwillegar Bypass Required Beyond 25 Year Time Frame	Express Ramps Cost - $78M-$96M (35+ yrs)
Widen: Airport Road - Highway 19				2.9 km				n/a	n/a			8 lanes Widening ($13m) (Within 5 years)	New Core Lanes 2-per Direction (5-15 yrs) ($39M)	$52,000,000				Widen Core Lanes to 3 per direction (35+ yrs)	$20,000,000		
Highway 19 Interchange **BF 76845**	Interchange	Nisku	2:32 km 8.1		Bridge	Beyond 10 years		n/a	n/a		This will eventually be converted to a Diamond & Removal of the loop ramps will permit 4 Hwy 2 Collector Lanes if required. ($10M)			$10,000,000		Highway 19 Structure Twinning (25-35 yrs)			$70,000,000		
Widen: Highway 19 - Twp. Rd. 510				3.4 km				n/a	n/a									New Hwy 2 Core Lanes (2 per direction) from 19 to 41st required within 10 Years - ($83M)	$83,000,000		Network Functional Planning Study Required to Address Hwy 2 Re-alignment requirements and Traffic Generated by the City of Edmonton's newly Annexed Lands.
NEW Twp. Rd 510 Interchange	Future Interchange	Edmonton	Approx. 2:32 km 11.5		Future Interchange			n/a	n/a							Assumes "Ultimate" development of 8 lane Twp Rd 510 Interchange ($70M)			$70,000,000		

Description/ Location	Usage	Municipality	Highway 2 Station	Hwy 2 (Km)	Usage/ Structure Type	Existing Bridge Major Maintenance/ Replacement Requirement.	6 Lanes			8 Lanes					More than 8 Lanes					Further Improvements & Requirement for Bypass	Interchange, Bridge Planning and Other Requirements in Vicinity
							Highway Widening to 6 Lanes	Bridge Replacement/ Road Work to Accommodate 6-Lane Widening	Total Structure and Roadway Costs to Accommodate 6 Lanes	Highway Widening to 8 Lanes	Structure/Interchange Costs to Accommodate 8 lanes	Freeway/Collector Lane Costs to Accommodate 8 Lanes	Core Lane Costs to Accommodate 8 Lanes	Total Structure and Roadway Costs to Accommodate 8 Lanes	Highway Widening Required to Accommodate More than 8 Lanes	Structure/ Interchange Costs to Accommodate more than 8 lanes	Freeway/ Collector Lane Costs to Accommodate more than 8 Lanes	Core Lane Costs to Accommodate more than 8 Lanes	Total Structure and Roadway Costs to Accommodate more than 8 Lanes		
Widen: Twp. Rd. 510 - Twp. Rd. 511				2.2 km			Existing N/A	n/a	n/a			New Hwy 2 NB (4th) Collector Lane from 19 to 41st required within 10 Years ($30M)		$30,000,000	LOS D/E AADT 130,000 (+2 Core lanes) (Required in 10-25 years) AADT 160,000 (+ 3 Core lanes) (Required in 25-35 years)					Terwillegar Bypass Required Beyond 25 Year Time Frame	Network Functional Planning Study Required to Address Hwy 2 Re-alignment requirements and Traffic Generated by the City of Edmonton's newly Annexed Lands.
Blackmud Creek	Stream	Edmonton	2:32 km 13.5		NB	Within 10 years		n/a	n/a		NB Core Lane Bridge + NB 4th Lane			$1,000,000							
			2:32 km 13.5		SB			n/a	n/a		SB Core Lane Bridge			$1,000,000							
NEW Twp. Rd 511 Fly-Over	Future Fly-Over	Edmonton	Approx. 2:32 km 13.7		Future Fly-Over			n/a	n/a						Assumes "Ultimate" development of 6 lane Twp Rd 511 Flyover ($50M)				$50,000,000		
Widen: Twp. Rd. 511 - 41 Avenue SW				1.4 km				n/a	n/a	n/a	n/a	n/a					Core Lane expansion from 2 lanes to 3 lanes in each direction required beyond 25 years ($42M)	$42,000,000			
41 Avenue SW Interchange – Edmonton **BF 85160**	Interchange	Edmonton	2:32 km 15.1		Bridge	Beyond 25 years		n/a	n/a	n/a	n/a	n/a			Structure to be widened by 1 WB Lane and a New 2 Lane EB Structure leading to EB-to-NB Loop Ramp. Bridge Widening - 25-35 years				$20,000,000		
Widen: 41 Avenue SW - Ellerslie Road				3.8 km				n/a	n/a	n/a	n/a	n/a	New Hwy 2 Core Lane development (2 lanes in each direction) required before 10 years ($36M)	$36,000,000		Hwy 2 SB Lane Realignment and Widening to 4 SB Collector Lanes Configuration compatible with Core Lane Plans Required within 10-to-25 years ($67M)		Core Lane expansion from 2 lanes to 3 lanes in each direction required beyond 25 years ($18M)	$85,000,000		Functional Planning to determined future role of 5 NB lane cross-section since only 3 are required for the core lanes to link back to AHD.
Ellerslie Road Interchange – Edmonton **BF 85040**	Interchange	Edmonton	2:32 km 18.9		Bridge	Beyond 25 years		n/a	n/a	n/a	n/a	n/a			Ellerslie Road Bridge Structure (Currently 4 lanes) Requires Widening due to forecast development ($70M)			$70,000,000	Terwillegar Bypass Required Beyond 25 Year Time Frame	Functional Planning for Bridge Requirements in Coordination with City Arterial Road Requirement.

Costs Summary ($M)

Highway Section: Tower Main Road to Ellerslie Road	6 Laning Stage	8 Laning Stage	Core Road Construction	Total
	Structures incl. Roadwork	Structures incl. Roadwork	Structures incl. Roadwork	
Cost Component Attributed to Province	**$190.8**	**$566.3**	**$379.0**	**$1,136.1**
Cost Components Attributed to Others	**$23.6**	**$146.5**	**$405.0**	**$575.1**
Total	**$214.4**	**$712.8**	**$784.0**	**$1,711.2**

Appendix M

Implementation Plan – Development Growth Investment

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Location	Future Usage	Assumed Time Horizon	Municipality	Highway 2 Station	Estimated Costs	Cost Includes	Description
SOUTHERN REGION							
Highway 2:15							
Existing CrossIron Drive Interchange	Interchange Upgrade	10-25	Calgary	2:15 km 51.3	$ 25,000,000	Addition of West Leg to Interchange	Structure Widening, Creek & CPR Crossings, Road Extension
Highway 2:18							
NEW Township Road 264 Interchange	Service Interchange	10-25	Rocky View and Airdrie	2:18 km 3.2	$ 75,000,000	Service Interchange & CPR Overpass	Airdrie Expanding Southerly, Interchange Study Underway
NEW 40 Avenue Interchange	Partial Service Interchange	<10	Airdrie	2:18 km 4.8	$ 50,000,000	New Service Interchange	Airdrie Expanding Southerly, Interchange Study Underway
NEW Township Road 273 Overpass	Local Overpass	10-25	Airdrie	2:18 km 13.0	$ 30,000,000	New Overpass	Long-Term Airdrie Growth, Planning Study Required
NEW Township Road 274 Interchange	Service Interchange	10-25	Airdrie	2:18 km 16.2	$ 50,000,000	New Service Interchange	Long-Term Airdrie Growth, Planning Study Required
NEW Township Road 280	System Interchange	>25	Airdrie	2:18 km 16.2	$ 75,000,000	New System Interchange	Potential Long-Term Provincial Need, Planning Study Required
NEW Existing Township Road 285 Overpass (Limit Avenue)	Directional Interchange	>25	Rocky View and Crossfield	2:18 km 24.3	$ 50,000,000	New Directional Interchange	Medium-to-Long Term need for Airdrie Bypass
Highway 2:20							
SOUTHERN/CENTRAL REGION							
Highway 581 (Carstairs Access)	Interchange	10-25	Mountain View and Carstairs	2:20 km 9.7	$ 10,000,000	Structure Widening/ Int's. Improvement	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
Highway 582 (Didsbury Access)	Interchange	10-25	Didsbury	2:20 km 21.0	$ 10,000,000	Structure Widening/ Int's. Improvement	Interchange Capacity Review/ Long Term Plan Req.'d.
Highway 2:22							
Highway 27 (Olds Access)	Interchange	<10	Mountain View and Olds	2:22 km 0.0	$ 10,000,000	Structure Widening/ Int's. Improvement	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
Highway 2:24							
Highway 590 (North Innisfail)	Interchange	<10	Red Deer County and Innisfail	2:22 km 0.0	$ 50,000,000	Interchange Reconfiguration	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
NEW Twp. Rd. 362 Overpass (Old Pole Road)	Future Interchange	<10	Red Deer County	2:24 km 8.1	$ 10,000,000	First Stage - Overpass Only	Planning Completed
Highway 42 (Penhold Access)	Interchange	10-25	Red Deer County and Penhold	2:24 km 15.7	$ 10,000,000	Structure Widening	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
McKenzie Road (Red Deer South)	Interchange	<10	Red Deer County	2:24 km 22.3	$ 10,000,000	Structure Widening/ Int's. Improvement	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
32 Street	Interchange	<10	City of Red Deer	2:24 km 28.2	$ 5,000,000	Intersections Modification	Traffic Review, Modifications as Required.
Highway 2:26							
Highway 597 (Blackfalds)	Interchange	<10	Red Deer County and Blackfalds	2:26 km 7.0	$ 10,000,000	Structure Widening/ Int's. Improvement	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
NEW Twp. Rd 400	Future Interchange	>25	Blackfalds	2:26 km 10.4	$ 50,000,000	New Service Interchange	Planning Required if Interchange Warranted
Highway 12 (South Lacombe)	Interchange	10-25	Lacombe County and City of Lacombe	2:26 km 17.5	$ 5,000,000	Road and Intersections Modification	Extensive Developments Proposed -Interchange Capacity Review/ Long Term Plan Req.'d.
Highway 604 (Morningside)	Interchange	>25	Lacombe County and Ponoka County	2:26 km 34.3	$ 5,000,000	Road and Intersections Modification	Significant Developments proposed, Traffic Review and Long Term Plan Required.

Location	Future Usage	Assumed Time Horizon	Municipality	Highway 2 Station	Estimated Costs	Cost Includes	Description
Highway 2:28							
Highway 53 (Ponoka)	Interchange	10-25	Ponoka County and Town of Ponoka	2:26 km 0.0	$ 5,000,000	Road and Intersections Modification	Significant Developments proposed, Traffic Review and Long Term Plan Required.
Twp. Rd 442 (Menaik Road)	Interchange	>25	Ponoka County	2:28 km 12.2	$ 5,000,000	Road and Intersections Modification	Developments Proposed - Capacity Review and Long Term Plan Required.
Highway 611 (Hobbema)	Interchange	>25	Ponoka County and County of Wetaskiwin	2:28 km 18.7	$ 5,000,000	Road and Intersections Modification	Developments Proposed - Capacity Review and Long Term Plan Required.
Twp. Rd 455 (Louis Bull Overpass)	Grade Separation	10-25	Maskwacis Community	2:28 km 26.8	$ 50,000,000	Conversion to Full Interchange	Developments Proposed - Capacity Review and Long Term Plan Required.
Highway 2:30							
Highway 13 (Wetaskiwin)	Interchange	10-25	County of Wetaskiwin	2:30 km 0.0	$ 5,000,000	Road and Intersections Modification	Developments Proposed - Capacity Review and Long Term Plan Required.
Twp. Rd 470 (Correction Line)	Interchange	>25	County of Wetaskiwin	2:30 km 6.7	$ 5,000,000	Road and Intersections Modification	Developments Proposed - Capacity Review and Long Term Plan Required.
CENTRAL REGION							
NORTH - CENTRAL REGION							
Highway 616 (Millet)	Interchange	>25	County of Wetaskiwin	2:30 km 15.2	$ 5,000,000	Road and Intersections Modification	Significant Developments proposed, Traffic Review and Long Term Plan Required.
Twp. Rd 482 (Tower Main Road)	Grade Separation	>25	County of Leduc	2:30 km 20.1	$ 25,000,000	Conversion to Interchange	Long Term Planning Required
NEW Highway 2A Interchange	New Interchange	>25	Leduc	2:30 km 32.3	$ 49,000,000	Initial and Longer Term Improvements	Functional Planning Required
Highway 2A Existing Interchange **BF 75522**	Interchange	10-25 &>25	Leduc	2:30 km 33.9	$ 37,000,000	Long Term Conversion to Overpass	Functional Planning Required
CPR / Black Gold Drive Bridges **BF 75058 N/S**	Grade Separation	10-25	Leduc	2:30 km 34.4	$ 18,800,000	Structure Replacement	Functional Planning Required
Highway 2:32							
NEW 65 Avenue Interchange	Future Interchange	<10 10-25	Leduc	2:32 km 1.8	$ 38,400,000	Initial and Longer Term Improvements	Planning Study Completed
50 Street **BF 77994 S**	Fly-Over	<10 10-25	Leduc	2:32 km 2.5	$ 24,200,000	Interchange Upgrades	Planning Study Completed
Airport Road Interchange **BF 75066**	Interchange	ALL	Nisku	2:32 km 5.2	$ 151,000,000	Interchange Upgrades	Planning Study Completed
Highway 19 Interchange **BF 76845**	Interchange	>25	Nisku	2:32 km 8.1	$ 14,000,000	Interchange Upgrades	Functional Planning Required
NEW Twp. Rd 510 Interchange	Future Interchange	>25	Edmonton	Approx. 2:32 km 11.5	$ 70,000,000	New Service Interchange (Urban)	Network Study Required
NEW Twp. Rd 511 Fly-Over	Future Fly-Over	>25	Edmonton	Approx. 2:32 km 13.7	$ 50,000,000	New Overpass	
41 Avenue SW Interchange	Fly-Over	>25	Edmonton	2:32 km 15.1	$ 20,000,000	Interchange Upgrades	Functional Planning Required
Ellerslie Road Interchange	Fly-Over	>25	Edmonton	2:32 km 18.9	$ 70,000,000	Interchange Upgrades	Functional Planning Required
				Total Cost:	**$ 1,187,400,000**		

Appendix N

Cost Estimate Assumptions

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COST FOR A SINGLE LANE PER KM - WIDENING

	Unit	Quantity	Unit Cost	Price Range	Total - Low	Total - High	Notes
Stripping/Cut	cu.m.	19000	$6.0	$10.0	**$114,000**	**$190,000**	Inclusive of ditches. Assumes 0.6 deep cut
Concrete Removal and Disposal	sq.m.	500	$100.0	$100.0	**$50,000**	**$50,000**	Assumes 0.5m of existing Asphalt to be removed
Fill	cu.m.	3500	$10.0	$20.0	**$35,000**	**$70,000**	Assumes 0.6m deep fill
Barrier	m	1000	$300.0	$300.0	**$300,000**	**$300,000**	
GBC	t	4620	$25.0	$35.0	**$115,500**	**$161,700**	Assumes 0.4m deep GBC
ACP	t	3600	$75.0	$95.0	**$270,000**	**$342,000**	Assumes 0.3m deep ACP
			Subtotal		**$884,500**	**$1,113,700**	
Misc. @ 20%					**$176,900**	**$222,740**	
Mobilization @ 8%					**$84,912**	**$106,915**	
Engineering @ 15%					**$159,210**	**$200,466**	
Contingencies @ 20%					**$212,280**	**$267,288**	
TOTAL					**$1,517,802**	**$1,911,109**	
					Use	**$2,000,000**	

COST FOR A SINGLE LANE PER KM - NEW CONSTRUCTION

	Unit	Quantity	Unit Cost	Price Range	Total - Low	Total - High	Notes
Stripping/Cut	cu.m.	20500	$6.0	$10.0	**$123,000**	**$205,000**	Inclusive of ditches. Assumes 0.6 deep cut
Fill	cu.m.	4400	$10.0	$20.0	**$44,000**	**$88,000**	Assumes 0.6m deep fill
Barrier	m	1000	$300.0	$300.0	**$300,000**	**$300,000**	
GBC	t	5940	$25.0	$35.0	**$148,500**	**$207,900**	Assumes 0.4m deep GBC
ACP	t	4680	$75.0	$95.0	**$351,000**	**$444,600**	Assumes 0.3m deep ACP
			Subtotal		**$966,500**	**$1,245,500**	
Misc. @ 40%					**$386,600**	**$498,200**	
Mobilization @ 8%					**$108,248**	**$139,496**	
Engineering @ 15%					**$202,965**	**$261,555**	
Contingencies @ 35%					**$473,585**	**$610,295**	
TOTAL					**$2,137,898**	**$2,755,046**	
					Use	**$3,000,000**	

STRUCTURE REPLACEMENT COST AS PER BRIDGE ASSESSMENT

Crossing Road Over Highway 2 - Assuming existing structure width @ $4,000 per m^2 plus 30% Contingencies
Highway 2 Overpasses Minor Road or Railway - Cost of Structure @ $4,000 per m^2 plus 30% Contingencies plus $10,000,000 Traffic Accommodation and Detours
River or Creek Crossing - Cost of Structure @ $4,000 per m^2 plus 30% Contingencies plus $10,000,000 Traffic Accommodation and Detours
Culverts, Cattle Passes - per Bridge Assessment with additional 30% Contingencies

NOMINAL COST ASSUMPTION OF NEW INFRASTRUCTURE (DEVELOMENT DRIVEN) WHERE PLANS ARE NOT AVAILABLE

System Interchange	**$75,000,000**
Service Interchange	**$50,000,000**

NOMINAL COST ASSUMPTION OF IMPROVEMENTS (DEVELOMENT DRIVEN) WHERE PLANS ARE NOT AVAILABLE

Existing Interchange widening (~10m) plus Intersections Improvements	**$10,000,000**
Existing Interchange Intersections and Roadway Improvements only	**$5,000,000**

RED DEER BYPASS (East Alignment)	Unit	Quantity	Unit Cost	**Cost**
4-lane Freeway	km	50	$ 10,000,000	**$500,000,000**
System Interchange	item	3	$ 75,000,000	**$225,000,000**
Service Interchange	item	5	$ 50,000,000	**$250,000,000**
River Crossing	item	1	$ 75,000,000	**$75,000,000**
Creek Crossings	item	1	$ 30,000,000	**$30,000,000**
Right-of-Way	acres	2000	$ 10,000	**$20,000,000**
TOTAL				**$1,100,000,000**

Appendix O

Right-of-Way Requirements Summary

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From KM	To KM	Widening Width Left Side	Area (ha) Left Side	Widening Width Right Side	Area (ha) Right Side	Int.'c. Area (ha)	Road Widening (ha)	Service Road (ha)	Location Notes:
Highway 2:15									
Typical 30.5m C/L Spacing, R/W already acquired for future improvements, based on proposed interchange plans. Existing R/W - 167.6m to 172.3m, Varies at interchanges.									
Highway 2:18									
From Highway 566 to Yankee Valley Interchange - Typical 30.5m C/L Spacing, Existing R/W 167.6m to 172.3m, Varies at interchanges. Future R/W to be acquired based on proposed interchange plans - not yet completed. From Yankee Valley to Highway 567, C/L spacing transitions from 30.5m to 22.0m, Existing R/W varies. North of Highway 567 - C/L Spacing 22m, Existing Original R/W 91.4m. When Service Road present on one side R/W ~115m width, when Service Road on both sides R/W ~150m									
5.00									Sharp Hill Way- Int.'c. Study Req.'d. - Right-of-Way to be Determined.
10.73	17.22	5 m	3.25 ha						Activity Areas: ~km10.75 - Farm ~km 12.05; km 12.3 - Farms ~km 13.8 - Trailer Storage/Dealer
22.84	24.29			5 m	0.73 ha				
24.22	24.34	20 m	0.24 ha						Cemetery Impact
25.10	26.00			5 m	0.45 ha				
27.88	28.05	10 m	0.17 ha						
								Highway 2:18 R/W area requirement	**4.83 ha**
Highway 2:20									
Typical 22m C/L Spacing, Existing Original R/W 91.4m When Service Road present on one side R/W ~115m width, when Service Road on both sides R/W ~150m. R/W requirements at interchange to be determined.									
0.00									Acme Rd Int'c. - Study Req.'d. - Right-of-Way to be Determined
9.20	10.20								Highway 581- Int.'c. Study Req.'d. - Right-of-Way to be Determined.
20.60	21.60								Highway 582- Int.'c. Study Req.'d. - Right-of-Way to be Determined.
34.83	35.32					0.46 ha			At Highway 27 Int.'c.
								Highway 2:20 R/W area requirement	**0.46 ha**
Highway 2:22									
Typical 22m C/L Spacing, Original R/W 91.4m. Typical additional widening 5m per side required to accommodate 8 lane cross-section. When Service Road present on one side existing R/W ~115m width, when Service Road on both sides R/W ~150m. Interchange R/W requirements as shown to be determined.									
0.15	0.87			15 m	1.08 ha				At Highway 27 Int.'c.
5.58	7.64					35.78 ha	4.83 ha	14.00 ha	Netook Interchange
10.77	12.02	5 m	0.63 ha						
15.22	16.78					1.77 ha	1.78 ha	3.62 ha	Bowden Int.'c.
16.78	19.95			5 m	1.59 ha				
21.40	21.54			5 m	0.07 ha				
21.91	23.94			5 m	1.02 ha				
27.80								5.07 ha	Highway 590 N. Innisfail (Int.'c., SR and highway widening) - Study Req.'d. - Right-of-Way to be Determined
								Highway 2:22 R/W area requirement	**71.23 ha**

From KM	To KM	Widening Width Left Side	Area (ha) Left Side	Widening Width Right Side	Area (ha) Right Side	Int.'c. Area (ha)	Road Widening (ha)	Service Road (ha)	Location Notes:
Highway 2:24									
Typical 22m C/L Spacing, Original R/W 91.4m. Typical additional widening 5m per side required to accommodate 8 lane cross-section. When Service Road present on one side existing R/W ~115m width, when Service Road on both sides R/W ~150m. Interchange R/W requirements as shown or to be determined.									
0.71	4.13	5 m	1.71 ha						
1.03	5.06			5 m	2.02 ha				
5.26	7.23	5 m	0.99 ha						
5.28	7.72			5 m	1.22 ha				
8.26							1.55 ha		Old Pole Road R/W Requirement.
8.63	10.32			5 m	0.85 ha				
10.58	11.86	5 m	0.64 ha						
19.03	19.89			5 m	0.43 ha				
20.68	21.50	5 m	0.41 ha	5 m	0.41 ha				
33.20						8.59 ha			Highway 11 Interchange - Includes two Major Businesses, west of Highway 2
33.64	35.35	5 m	0.86 ha						
								Highway 2:24 R/W area requirement	**19.66 ha**
Highway 2:26									
Typical 30.5m C/L Spacing, Original R/W 91.4m. Typical additional widening 10m per side required to accommodate 8 lane cross-section. When Service Road present on one side existing R/W ~111m -125m. Interchange R/W requirements to be determined.									
0.47	0.82	5 m	0.18 ha						
0.82	1.89	10 m	1.07 ha						
1.66	3.60				3.04 ha				
1.89	3.60		3.36 ha						
3.53									North Red Deer Future Interchange - Study Req'd. - R/W to be determined
3.60	4.82		3.23 ha		2.74 ha				South of Blindman River
4.82	5.16	10 m	0.34 ha						
4.82	6.50			10 m	1.68 ha				
7.59	10.36			10 m	2.77 ha				North of Highway 597 Int.'c.. - Special backslope accommodation at developed lot in NW 27-39-27-4.
11.21	16.02			10 m	4.81 ha				
13.07	14.57	10 m	1.50 ha						
14.90	16.82	10 m	1.92 ha						South of Highway 12 Int.'c.
17.93	22.07			10 m	4.14 ha				
19.31	20.23	10 m	0.92 ha						
20.36	20.83	10 m	0.47 ha						
21.27	23.06	10 m	1.79 ha						
22.47	23.61			10 m	1.14 ha				South of Milton Road Int.'c.
23.63	26.16	10 m	2.53 ha						
26.40									Highway 2A - South Interchange - Study Req'd. - R/W to be determined

From KM	To KM	Widening Width Left Side	Area (ha) Left Side	Widening Width Right Side	Area (ha) Right Side	Int.'c. Area (ha)	Road Widening (ha)	Service Road (ha)	Location Notes:
26.86	29.28	15 m	3.63 ha						
30.12	30.94	15 m	1.23 ha						6 lane section, Railway constrain on right side
30.94	31.31	10 m	0.37 ha						
32.10									Highway 2A - North Interchange - Study Req'd. - R/W to be determined
32.87	34.07	10 m	1.20 ha	10 m	1.20 ha				Highway 604 Int.'c. - Study Req'd. - R/W to be determined
34.62	35.12			10 m	0.50 ha				
34.62	40.64	10 m	6.02 ha		0.00 ha				
35.91	40.56			10 m	4.65 ha				
41.00									Matejka Rd./Gee Rd. Int.'c. - Study Req'd. - R/W to be determined
41.31	42.10	10 m	0.79 ha	10 m	0.79 ha				
42.32	44.60	10 m	2.28 ha	10 m	2.28 ha				
								Highway 2:26 R/W area requirement	**62.56 ha**
Highway 2:28									
Typical 30.5m C/L Spacing, Original R/W 91.4m. Typical additional widening 10m per side required to accommodate 8 lane cross-section. When Service Road present on one side existing R/W ~116m -126m. Interchange R/W requirements as shown or to be determined.									
0.00							3.44 ha	0.92 ha	Highway 53 Int.'c. - Long term Req.'d. - Expected no additional R/W Req.'d.
0.35	11.87	10 m	11.52 ha	10 m	11.52 ha				
12.20									Menaik Rd. Int.'c. - Study Req'd. - R/W to be determined
12.60	18.38	10 m	5.78 ha	10 m	5.78 ha				
18.70									Highway 611
19.66	31.32	10 m	11.66 ha						
								Highway 2:28 R/W area requirement	**50.62 ha**
Highway 2:30									
Typical 30.5m C/L Spacing, Original R/W 91.4m. Typical additional widening 10m per side required to accommodate 8 lane cross-section. When Service Road present on one side existing R/W ~100m -131m. Interchange R/W requirements as shown or to be determined.									
0.00							3.15 ha	1.63 ha	Highway 13 Int.'c. - Long Term Plan Req.'d. - Additional R/W may be req.'d. West Side road widening and SR.
0.30	2.44			10 m	2.14 ha				
0.30	5.78	10 m	5.48 ha						
2.79	5.78			10 m	2.99 ha				
6.70									Correction Line Int.'c. Long term Plan Required to determine R/W. Req.'s.
6.89	7.60			10 m	0.71 ha				
6.89	9.44	10 m	2.55 ha						
8.48	10.20			10 m	1.72 ha				
9.53	15.17	10 m	5.64 ha						
10.30	15.17			10 m	4.87 ha				
15.30									Highway 616 Interchange. Long term Plan Required to determine R/W. Req.'s.
15.55	26.18	10 m	10.63 ha	10 m	10.63 ha				
26.50									Kavanagh/Glen Park Rd. Int.'c. Long term Plan Required to determine R/W. Req.'s.

From KM	To KM	Widening Width Left Side	Area (ha) Left Side	Widening Width Right Side	Area (ha) Right Side	Int.'c. Area (ha)	Road Widening (ha)	Service Road (ha)	Location Notes:
26.83	29.00			10 m	2.17 ha				
26.83	29.12	10 m	2.29 ha						
29.29	30.04	10 m	0.75 ha						
30.09	30.94			10 m	0.85 ha				
30.97	31.88					1.41 ha		5.12 ha	South of Highway 2A Interchange - ISL Plan - Int.'c. Area Separately
31.88	33.52					102.64 ha	20.53 ha		ISL Plan - East of Highway 2
30.97	31.5		1.00 ha		0.80 ha				South of Highway 2A Interchange - Focus Plan - Int.'c. Area Separately
31.88	33.52					32.85 ha	16.95 ha		ISL Plan - West of Highway 2
31.4	33.52					22.93 ha			Focus Plan - East of Highway 2
33.59	33.78		0.53 ha						South of Old Highway 2A
34.02	34.38		2.19 ha						North of Old Highway 2A
34.43	34.58		0.45 ha						50 Avenue Area - Highway 2 realignment determined by planning study.
								Highway 2:30 R/W area requirement	**265.59 ha**
Highway 2:32									
Interchange R/W requirements determined by planning studies.									
0.04	0.76		2.41 ha						50 Avenue Area - Highway 2 realignment determined by planning study.
1.88								0.30 ha	65 Avenue Interchange - East of Highway 2
1.88						11.15 ha		21.45 ha	65 Avenue Interchange - West of Highway 2
5.17						1.52 ha			Airport Road Interchange (SW Quadrant - Road Widening)
8.3						6.78 ha			Highway 19/625 Interchange - West
12.7						372.00 ha	168.44 ha		Regional Ring Road Interchange - Plan by Focus up to 41 Avenue
								Highway 2:32 R/W area requirement	**584.05 ha**
Right-of-Way requirement to accommodate Highway 2 widening only in sections 2:26, 2:28, 2:30.							**162 ha**	**394 acres**	

REQUEST FOR COUNCIL DECISION

CITY OF LACOMBE

SUBJECT:	**Committee Review Report #1: The Arts Endowment Committee**
PREPARED BY:	**Deborah Juch, Director of Community Services**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 22, 2020**

FILE: 11/117

PURPOSE:

This Request for Decision (RFD) will provide Council with a list of proposed amendments to the Arts Endowment Committee following direction from the Council Committee of the Whole on June 1, 2020.

RECOMMENDED MOTION(S):

THAT Council resolves to cease appointing a Councillor member to the Arts Endowment Committee effective October 2020.

RELATED PRIOR MOTION(S):

EXECUTIVE SUMMARY:

On June 1, 2020 Council Committee of the Whole (Council) reviewed the *Council Committees Review Report #1* discussing the Arts Endowment Committee (the Committee). Council directed that the City implement one of the three Review Report's options for amending the Committee, specifically, that Council cease appointing a Councillor member to the Art Endowment Committee effective October 2020.

Committee member feedback after the June 1 meeting (paraphrased) is that the members see important benefits stemming from the routine Councillor appointment and would like it continued. Administration's proposed resolution in this RFD aligns with Council's direction at the June 1 meeting.

ANALYSIS:

Background

The Arts Endowment Committee was one of three agencies reviewed in the *Committees Review Report #1* on June 1, 2020. (Click here for the full report.) The Review summarized the Committee's history, funding, City resourcing, and degree of public engagement provided by the Committee--which was found to be of the highest order with the Committee fully empowered by Council to make decisions regarding use of the proceeds from the City's Art Endowment Fund. The Review Report incorporated input from Committee members as

stakeholders, and concluded with five options for Council to amend the Committee with corresponding comments on the advisability of each. Council chose one of the options, to cease appointing a Councillor member to the Arts Endowment Committee effective October 2020.

Additional Stakeholder Input

After the meeting, Administration provided a list of Council's direction on the amendment options as well as a link to the meeting livestream, to the Committee membership for feedback. To summarize, the Art Endowment Committee feedback related to Council's chosen amendment shows that the members:

- Were of the opinion that a regular Council appointment should continue, with rationale such as:
    - "I think it's important to assign a Councillor...[t]heir connections to the community can be very beneficial to fundraising and education about the Endowment Fund."
    - "…often the Counsellor's involvement in our discussion can be very enlightening and bring a different point of view…."

Service Level Impacts

None anticipated.

Financial Implications

None anticipated.

Legislative Implications

Organizational Meeting procedures will need to be amended to eliminate a Council appointment to the Committee.

STRATEGIC PLAN ALIGNMENT:

4.1 Sustainability – Governance

4.1.1 Open and Accessible Government:
Conduct a review of Council Committees
- City board and committee members understand their roles fulfill their mandates
- Standardized reporting and support structures for City Boards.

4.5.8 Encourage Volunteerism
Strongly support volunteerism
- The City recognizes and celebrates volunteers

- Advertise volunteerism partnering opportunities to build a growing sense of community
- Groups that require volunteers see the City as a partner

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:
Administration anticipates no additional public engagement or communications bulletins on this matter.

ALTERNATIVE MOTION(S):

1. THAT Council resolves to cease appointing a Councillor member to the Arts Endowment Committee effective October 2020; OR
2. THAT Council resolves to amend the Arts Endowment Committee by _____; OR
3. THAT Council accepts all of the recommendations in the Council Committees Review Report #1 for amending the Arts Endowment Committee as information.

ATTACHMENTS:
None.

REQUEST FOR COUNCIL DECISION

SUBJECT:	**Committee Review Report #1: The Lacombe Art Collection Committee**
PREPARED BY:	**Deborah Juch, Director of Community Services**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 22, 2020**

FILE: 11/117

PURPOSE:

This Request for Decision (RFD) will provide Council with a list of proposed amendments to the Lacombe Art Collection Committee following direction from the Council Committee of the Whole on June 1, 2020.

RECOMMENDED MOTION(S):

1. THAT Council directs Administration to consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy; AND
2. THAT Council resolves to cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2020; AND
3. THAT Council directs Administration to develop updated Terms of Reference for the Lacombe Art Collection Committee to provide for a project-specific Council appointment when project procurement is valued at $75,000 or higher.

RELATED PRIOR MOTION(S):

EXECUTIVE SUMMARY:

On June 1, 2020 Council Committee of the Whole (Council) reviewed the *Council Committees Review Report #1* discussing the Lacombe Art Collection Committee (the Committee). Council directed that the City implement three of the Review Report's options for amending the Committee, specifically:

1. That the City consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy;
2. That Council cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2020;
3. That Administration develop an updated Committee terms of reference (TOR) including a temporary Councillor appointment when art procurement projects reach a specific threshold value.

Committee member feedback after the June 1 meeting (paraphrased) is that the members see great value from the routine Councillor appointment and would like it continued; they also support the other two options chosen. In this RFD, Administration proposes resolutions

aligning with Council's direction at the June 1 meeting, suggesting a TOR project value threshold of $75,000 to align with the City's Purchasing Policy.

ANALYSIS:

Background

The Lacombe Art Collection Committee was one of three agencies reviewed in the *Committees Review Report #1* on June 1, 2020. (Click here for the full report.) The Review summarized the Committee's history, funding, City resourcing, and degree of public engagement provided by the Committee--which was found to be of the highest order as the Committee is fully empowered by Council to effect the City's art collection and public art exhibition decision-making. The Review Report incorporated input from Committee members as stakeholders, and concluded with five options for Council to amend the Committee with corresponding comments on the advisability of each.

Following the review, Council directed Administration to effect three of the amendment options:

- That the City consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy;
- That Council cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2020; and
- That Administration develop an updated Committee terms of reference (TOR) including a temporary Councillor appointment when art procurement projects reach a specific threshold value.

Administration's recommended resolutions in this RFD align with Council's direction at the June 1 meeting, suggesting a project value threshold of $75,000 for the updated TOR, to align with the City's current Purchasing Policy 13/211/01 (2014) section 8e (see greater detail in Financial Implications, below).

Additional Stakeholder Input

After the meeting, Administration provided a list of Council's direction on the amendment options as well as a link to the meeting livestream, to the Committee membership for feedback. To summarize, the feedback that was related to Council's chosen amendments shows the members:

- Were of the opinion that a regular Council appointment should continue, with rationale such as:

- "It is helpful to have the opinion of someone who isn't fully immersed in the arts on a daily basis" and
- "…[a] Councillor engaged in the activities of the committee provides valued direction from their unique perspective, which help[s] the Committee come to reasonable conclusions regarding the City's public art…
- I trust that the communication from the Committee back to Council is clear and direct; without a Councillor or the Committee…the line of communication would be broken."

- Were otherwise supportive of updating the policies and the terms of reference: "…with all committees, ongoing review and refinement are necessary to provide direction and accountability...."

Service Level Impacts

None anticipated.

Financial Implications

Section 8e of the City's current Purchasing Policy 13/211/01 (2014) provides for Administrative approval of purchases up to $75,000 without Council resolution, so long as the purchase does not involve a multi-year contract (i.e., is not binding on Council's future budgetary discretion). This policy threshold coincides with Committee experience that while many public art procurement projects are high value, only a few are as high as or higher than $75,000, indicating that this amount may be an appropriate threshold trigger for special Councilor appointment.

Legislative Implications

Organizational Meeting procedures will need to be amended to eliminate a Council appointment to the Committee.

STRATEGIC PLAN ALIGNMENT:

4.1 Sustainability – Governance

4.1.1 Open and Accessible Government:
Conduct a review of Council Committees
- City board and committee members understand their roles fulfill their mandates
- Standardized reporting and support structures for City Boards.

4.5.8 Encourage Volunteerism
Strongly support volunteerism

- The City recognizes and celebrates volunteers
- Advertise volunteerism partnering opportunities to build a growing sense of community
- Groups that require volunteers see the City as a partner

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Administration anticipates engaging in no additional public engagement or issuing further communications on this matter, but to return the policy and terms of reference updates to a future public Council meeting.

ALTERNATIVE MOTION(S):

1. THAT Council directs Administration to consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy; AND
2. THAT Council resolves to cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2021; AND
3. THAT Council directs Administration to develop updated Terms of Reference for the Lacombe Art Collection Committee to provide for a project-specific Council appointment when project procurement is valued at $75,000 or higher;

OR

4. THAT Council resolves to _____ and accepts the remaining recommendations for amending the Lacombe Art Collection Committee as information;

OR

5. THAT Council accepts all the recommendations for amending the Lacombe Art Collection Committee as information.

ATTACHMENTS:

None.

REQUEST FOR COUNCIL DECISION

CITY OF LACOMBE

SUBJECT:	**Committee Review Report #1: Rikubetsu Friendship Society**
PREPARED BY:	**Deborah Juch, Director of Community Services**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 22, 2020**

FILE: 11/117

PURPOSE:

This Request for Decision (RFD) will provide Council with a list of proposed amendments to the City's working relationship with the Lacombe & District Rikubetsu Friendship Society (the Society) following direction from the Council Committee of the Whole on June 1, 2020.

RECOMMENDED MOTION(S):

1. THAT Council directs Administration to increase the City's in-kind support of the Rikubetsu Friendship Society by assigning a second manager liaison and by hosting a dedicated webpage for the Society within the City's website; AND
2. THAT Council resolves to cease appointing a Councillor liaison to the Rikubetsu Friendship Society, effective October 26, 2020.

RELATED PRIOR MOTION(S):

EXECUTIVE SUMMARY:

On June 1, 2020 Council Committee of the Whole reviewed the Council Committees Review Report #1, discussing the Lacombe & District Rikubetsu Friendship Society. The Committee recommended the City make two resolutions to amend the City's working relationship with the Society. First, increase in-kind support by a) hosting a webpage for the twinning agreement, and b) increasing the administrative liaison; and second, cease appointing a Councillor liaison to the Society effective at the October 2020 Organizational Meeting. The Committee also directed Administration to return the matter to Council after effecting the recommendations for 18 months minimum. The Society's feedback on the Committee discussion indicates they favour and look forward to assisting the increased in-kind support; they did not comment on the Councillor Liaison question. Administration has drafted resolutions in this RFD aligning with the Committee's direction.

ANALYSIS:

Background

The Lacombe & District Rikubetsu Friendship Society was one of three agencies reviewed in the Committees Review Report #1. (Click here for the full Review Report #1). The review summarized the City's and Society's partnership in the areas of history, funding, administrative

support, Councillor appointment, in-kind contributions, etc., finding the Society was "empowered" as well as supported by the City to effect the service of steering the City's twinning relationship with the Town of Rikubetsu. The report incorporated results of a survey of the Society, as stakeholder input. Finally, the report provided the Council Committee of the Whole with options to amend the City's relationship with Society, with comment on the advisability of the options.

The Committee recommended the City make two amendments to the relationship: firstly, to increase in-kind support by a) hosting a webpage for the twinning agreement, and b) increasing the administrative liaison; and secondly to cease appointing a Councillor liaison to the Society effective at the October 2020 Organizational Meeting. The Committee also directed Administration to return the matter to Council with more information after effecting the recommendations for 18 months minimum, potentially with public input.

Stakeholder Input

After the meeting, Administration provided a list of action items as well as a link to the meeting livestream, to the Society Chairperson for membership feedback on the review results. To summarize, the Society:

- were unanimous in agreeing that the Twinning Agreement should continue
- were supportive and look forward to helping formulate a webpage to include in the City 's website
- were "…happy for the extra resourcing and input [for] the various tasks involved in promoting…the cultural exchange and benefits to the community"

The feedback did not comment on the Councillor liaison issue.

Service Level Impacts

Adding to the in-kind support to the Rikubetsu Society with a webpage, related promotions, and increased administrative liaison will increase the City's service level in the cultural programming area to a small degree.

Financial Implications

None anticipated.

Legislative Implications

- Organizational Meeting amendments to eliminate a Council appointment to the Society.

- The Twinning Agreement will experience no impacts from any of the recommendations in this report.
- Organizational Capacity will be utilized to some degree, but Administration feels the impact is feasible.
- Administration will further research area comparator municipalities for strategies to promote the activities of the Japanese twinning agreement steering committee / staff: an example is the webpage and programming of the Town of Stony Plain

STRATEGIC PLAN ALIGNMENT:

4.1 Sustainability – Governance

4.1.1 Open and Accessible Government:

Conduct a review of Council Committees

- City board and committee members understand their roles fulfill their mandates
- Standardized reporting and support structures for City Boards.

4.5.8 Encourage Volunteerism

Strongly support volunteerism

- The City recognizes and celebrates volunteers
- Advertise volunteerism partnering opportunities to build a growing sense of community
- Groups that require volunteers see the City as a partner

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Administration anticipates engaging in no additional public engagement or issuing further communications on this matter, until such time as the resolutions have been implemented for at least 18 months.

ALTERNATIVE MOTION(S):

1. THAT Council directs Administration to increase the City's in-kind support of the Rikubetsu Friendship Society by assigning a second manager liaison and by hosting a dedicated webpage for the Society within the City's website; AND

2. THAT Council resolves to no longer appoint a Councillor liaison to the Rikubetsu Friendship Society, effective October 2020; OR

3. THAT Council resolves (1 or 2, above) AND accepts the remaining proposed amendments to the City's working relationship with the Rikubetsu Friendship Society as information

4. THAT Council accepts all of the proposed amendments to the City's working relationship with the Rikubetsu Friendship Society as information.

ATTACHMENTS:

None.

REQUEST FOR COUNCIL DECISION

CITY OF LACOMBE

SUBJECT:	**Level 1 Energy Audit of the Gary Moe Auto Group Sportsplex**
PREPARED BY:	**Calvin Bennefield, Manager of Parks & Facilities Maintenance**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 11, 2020**

FILE: 74/921

PURPOSE:
This request for decision is to inform Council of a Municipal Climate Change Action Centre (MCCAC) grant-funded energy audit of the Gary Moe Auto Group Sportsplex (GMAGS), which will form the basis of an engineering study and capital project proposals for rebate-qualifying retrofits.

RECOMMENDED MOTION(S):
THAT Council accepts the report on the SustainErgy Scoping Audit of the Gary Moe Auto Group Sportsplex as information, and directs Administration to continue with the MCCAC Recreation Energy Conservation Program.

RELATED PRIOR MOTION(S):
N/A

EXECUTIVE SUMMARY:
The City is participating in the Municipal Climate Change Action Centre (MCCAC)'s "Recreation Energy Conservation Program" which funds energy-efficiency retrofits to municipal recreation facilities for up to $750,000 in total grants. The City completed Step One of the program in 2019 by commissioning an Energy Scoping Audit ($10,000 grant funded) and is now awaiting grant approval to proceed with an engineering study to verify the audit findings.

The audit identified two types of energy conservation measures (ECMs) available in the Sportsplex: four low cost items which can be completed in-house with current operating funding; and five higher cost items that can be completed by contractors but which will require capital budget approval. The capital costs of the five items is $116,635, which are eligible for 75% rebates from MCCAC ($87,475) plus potential Lacombe County contributions against the remainder. The City will recover the net cost of the major item projects in under three years through reduced Sportsplex annual operating costs, and the lowered annual costs will continue for many years with the new equipment lifespans.

ANALYSIS:

Background

The City is participating in the Municipal Climate Change Action Centre (MCCAC)'s "Recreation Energy Conservation Program" which funds energy efficiency retrofits to municipal recreation facilities. The program issues grants for each of the three steps: scoping audit, engineering study, and retrofits, and municipalities can access up to $750,000 for all projects.

In late 2019, after a successful Expression of Interest submission, the City received a $10,000 grant from the program to do a scoping audit of the Gary Moe Auto Group Sportsplex (GMAGS). Administration engaged SustainErgy of Edmonton to determine the energy-conserving opportunities (report attached). Next steps in the MCCAC program will be:

1. Complete an Engineering Study: This study will verify the scoping audit analysis and recommendations. The City has applied for the grant to undertake this study, and the study will also form the basis for the department's 2021 capital project proposals if completed in time.
2. Implementation Projects: The City undertakes the recommended action items and applies for the rebates available after the work is completed. Energy Conservation Measures with a simple payback of less than one year without rebates are ineligible. Projects must have a total installed cost of $10,000 or greater.

The SustainErgy scoping audit encompassed the following:

- Energy consumption analysis
- Utility bill assessment (36 months)
- Facility inspection and staff interviews
- Evaluation of energy practices
- Greenhouse gas (GHG) generation analysis
- Energy savings opportunities and GHG reduction potential
- Identification and implementation method

The audit report summarizes recommended Energy Conservation Measures (ECMs) in the areas of facility operating changes, facility upgrades, and equipment replacements. Most* would be eligible for MCCAC rebates if the engineered study confirms the audit results. All items reduce energy consumption, operating costs, and GHG emissions.

ECMs ineligible for rebates but achievable with 2020 operating budget:

- Bay door sweeps
- T-12 Retrofits
- Install door sweeps on exit doors
- Motion sensors on vending machine plugins

* ECMs with a simple payback of less than one year and projects with a total installed cost of less than $10,000 are not eligible for rebates, but are still recommended, as their costs are recoverable in facility operating cost-savings.

ECMs eligible for rebates but requiring new capital project approvals:

- Switch to tankless water heaters Arenas
- T8 lighting retrofits Arenas
- Replace boilers pool
- Remove micro air bubbles in ice flooding water
- Add low E ceiling Arenas (not feasible now with acoustic panel install project)
- HID light bulb retrofits in parking lots

A table of the investment required for the capital project ECMs, potential MCCAC rebates, and payback timeframe follows. Administration will complete the MCCAC-funded engineering study verifying the audit results before proposing any projects.

Item/Project	Initial Investment	Rebate	Cost after rebate	Payback Term (YRS)
Switch to tankless water heaters	$10,450	$7,837	$2,612	0.81
Replace T8 fixtures w. LED/TLED	$23,293	$17,469	$5,823	2.07
Replace pool boilers	$32,500	$24,375	$8,125	2.59
Remove Micro Air bubbles	$40,320	$30,240	$10,080	0.88
Replace HID fixtures w. LED/TLED	$10,072	$7,554	$2,518	2.11
Totals	**$116,635**	**$87,475**	**$29,158**	

In addition to the MCCAC rebate on the capital projects, the City's net costs of the retrofits may be eligible for Lacombe County capital contributions, which could reduce the end-cost and payback terms by up to 30%.

The report identifies many other benefits to the EMCs including the GHG emission reductions and the estimated lifetime of the new equipment.

Service Level Impacts

There are no anticipated service level impacts from participating in the MCCAC program or executing the retrofits.

Financial Implications

- The City's costs to participate in the program and execute the projects will be reduced by 75% or more with grant revenues received.
- In less than three years (potentially within two years) the net cost of the retrofits will have been fully recovered.
- The City will continue to benefit after cost recovery through reduced operating costs--primarily, decreased energy consumption.

Legislative Implications

N/A.

Organizational Capacity

Participating in the program and implementing the in-house projects will require administrative capacity, but contractors, secured through a simple competitive quote procurement process, will complete the major retrofit work therefore minimizing workload on existing staffing.

STRATEGIC PLAN ALIGNMENT:
The recommended action aligns favourably with the following Strategic Plan Goals:

4.1.4 Fiscal Prudence: Identify and consider alternative revenue sources.

4.3.3 Sustainable Infrastructure: Complete an Asset Management Plan (the initiative is an asset management activity and delivers two outcomes:

- "…maintenance and replacement activities to minimize the overall cost of service delivery."
- "Ensure the long-term environmental…and economic sustainability of the City's physical assets…."

4.3.4 Economic Prosperity: To Benefit from City Owned Property: Create a plan for underperforming City property.

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Public promotion of the grant-funding and the City's participation in the MCCAC program could be the subject of a news release. Ongoing implementation of those projects in the public view (lighting retrofits) would also be considered.

ALTERNATIVE MOTION(S):

1. THAT Council accepts the report on the SustainErgy Scoping Audit of the Gary Moe Auto Group Sportsplex as information, and directs Administration to continue with the MCCAC Recreation Energy Conservation Program; OR

1. THAT Council accepts the report on the energy audit underway at the Gary Moe Auto Group Sportsplex as information.

ATTACHMENTS:

SustainErgy Energy Audit Report

PREPARED FOR:
City of Lacombe
5432-56 Ave
City of Lacombe, Ab T4L



Scoping Audit Report

5210 54 AVE - LACOMBE, AB T4L

9/24/2019

PREPARED BY:

Sustainergy

206 Pembina Road

Sherwood Park, T8H0L8

POINT OF CONTACT:

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1. EXECUTIVE SUMMARY

Sustainergy has completed a Level 2 Energy Audit of Gary Moe Auto Group Sportsplex, located at 5210 54 Ave Lacombe, Ab. Sustainergy performed the on-site evaluation on 7/22/2019.

The evaluation was performed using methods, procedures and calculations consistent with ASHRAE Level 2 Energy Audits and industry standards. This report will provide Gary Moe Auto Group Sportsplex with a performance baseline and relative energy usage of the facility, compared to buildings of similar size and usage. Additionally, this report will provide recommendations that will improve the energy efficiency of the facility, also known as Energy Conservation Measures (ECMs).

Gary Moe Auto Group Sportsplex was originally constructed in 1982. Gary Moe Auto Group Sportsplex is a(n) entertainment/public assembly building totaling 125,000 ft².

Energy savings for energy conservation measures:

Line Item	ECM Description	Electric Saved (kWh)	Peak Demand Savings(KW)	Annualized Demand Savings(KW)	Gas Saved (GJ)
No/Low Cost ECMs					
1	Bay Door Sweep	12	0.00	0.00	0.32
2	Empty Fridge Plugged In	2,044	0.34	4.20	0.00
3	T12 Retrofits	142	0.04	0.47	0.00
4	Installing Door Sweeps on Exit Doors	24	0.00	0.00	0.53
5	Occupancy Sensors on Vending Machines	6,144	1.20	14.40	0.00
Subtotals	-	**8,366**	**1.58**	**19.07**	**0.84**
Capital Cost ECMs					
6	Switch to Tankless Water Heaters	0	0.00	0.00	634.89
7	T8 Retrofits	21119	5.80	69.62	0.00
8	Replace Boilers	0	0.00	0.00	620.06
9	Remove Micro Air Bubbles	79132.5	9.00	108.40	193.99
10	Add Low Emission Ceiling	4591.1	0.52	6.29	102.88
11	HID Retrofits	8969	0.00	0.00	0.00
Subtotals	-	**113,812**	**15.32**	**184.31**	**1551.82**
Totals	-	**122177.6**	**16.90**	**203.38**	**1552.67**

Financial Analysis of Energy Conservation Measures:

Line Item	ECM Description	Initial Investment	Applicable Incentives/Rebates	Initial Investment w/ Expected MCCAC Rebate	Annual Cost Savings ($/year)	Simple Payback (years)	SIR	GHG Saved Per Year(TC02)	Expected Lifetime(Years)	Lifetime GHG Saved	$/TC02 Saved (Lifetime)
No/Low Cost ECMs											
1	Bay Door Sweep	$48.00	-	$48.00	$2.93	16.38	1.22	0.023945823	20	0.478916456	100.2262491
2	Empty Fridge Plugged In	$100.00	-	$100.00	$271.65	0.37	40.75	1.30816	15	19.6224	5.096216569
3	T12 Retrofits	$118.25	-	$118.25	$18.87	6.27	3.19	0.09088	20	1.8176	65.05831866
4	Installing Door Sweeps on Exit Doors	$144.00	-	$144.00	$5.91	24.35	0.62	0.042469705	15	0.63704557	226.043484
5	Occupancy Sensors on Vending Machines	$765.00	-	$765.00	$816.54	0.94	16.01	3.93216	15	58.9824	12.9699707
Subtotals	-	**$1,175.25**	-	**$1,175.25**	**$1,115.90**	**1.05**	-	**5.397615527**	-	**81.53836203**	-
Capital Cost ECMs											
6	Switch to Tankless Water Heaters	$10,450.00	$7,837.50	$2,612.50	$3,214.64	0.81	18.46	32.63357806	15	489.5036709	$5.34
7	T8 Retrofits	$23,293.06	$17,469.80	$5,823.27	$2,806.72	2.07	12.05	13.51616	25	337.904	$17.23
8	Replace Boilers	$32,500.00	$24,375.00	$8,125.00	$3,139.55	2.59	5.80	31.87125316	15	478.0687975	$17.00
9	Remove Micro Air Bubbles	$40,320.00	$30,240.00	$10,080.00	$11,498.92	0.88	17.11	60.61574937	15	909.2362405	$11.09
10	Add Low Emission Ceiling	$60,372.50	$45,279.38	$15,093.13	$1,131.06	13.34	1.12	8.226322987	15	123.3948448	$122.32
11	HID Retrofits	$10,072.00	$7,554.00	$2,518.00	$1,192.02	2.11	7.10	5.74016	15	86.1024	$29.24
Subtotals	-	**$177,141.62**	**$132,835.23**	**$44,725.89**	**$23,197.91**	**1.93**	-	**153**	-	**2,424**	-
Totals	-	**$178,316.87**	**$132,835.23**	**$45,901.14**	**$24,313.81**	**1.89**	-	**158.0008391**	-	**2505.748316**	-

Performance Metric	Pre-Implementation	Post-Implementation	% of Savings
Total Energy Use			
GJ/yr	19,065	17,072	10.45%
Energy Intensity			
Site EUI (GJ/sm/yr)	1.641697982	1.470101022	10.45%
Source EUI (GJ/sm/yr)	2.764743869	2.505361039	9.38%
Greenhouse Gas Emissions			
GHG Emissions (tCO_2e/yr)	814.9223316	743.6981198	8.74%
Energy Cost (excluding water)			
Current Year ($/yr)	$280,771.31	$256,671.37	8.58%
Cost Intensity ($/sm/yr)	$24.22	$22.07	8.58%

Sustainergy has identified a total of (11) ECM(s), of which (6) is/are capital cost (initial investment more than $1,000.00) and (5) is/are no/low cost (initial investment equal to or less than $1,000.00). The energy savings from the ECM(s) totals 2323.74 GJ, resulting in an annual cost savings of $24,098.93, and will provide a simple payback of 1.89 years.

1.1. Summary of Recommendations

Line items 1,2,3,4 and 5 should be implemented as they are easy low-cost ways for the Gary Moue Sportsplex to save on energy. The higher SIR should be completed first. Line item 11,9,6,8,7, and 8 should be considered as they have a SIR greater than 1. It would be recommended to go ahead with an engineering study for these projects. Line Item 10 is not recommended. The table below summarizes this:

Line Item	Description	SIR	Reccomendation
No/Low Cost ECMs			
1	Bay Door Sweep	0.91	Recommended
2	Empty Fridge Plugged In	40.41	Recommended
3	T12 Retrofits	2.37	Recommended
4	Installing Door Sweeps on Exit Doors	0.61	Recommended
5	Occupancy Sensors on Vending Machines	15.88	Recommended
Capital Cost ECMs			
6	Switch to Tankless Water Heaters	4.58	Engineering Study
7	T8 Retrofits	1.79	Engineering Study
8	Replace Boilers	1.44	Engineering Study
9	Remove Micro Air Bubbles	4.24	Engineering Study
10	Add Low Emission Ceiling	0.28	Not Recommended
11	HID Retrofits	7.04	Engineering Study

2. ENERGY CONSERVATION MEASURES

Through the ECM analysis process, Sustainergy selected the following ECMs for their implementation feasibility, high potential energy savings, and practical financial return. The following summarizes the recommended Energy Conservation Measures discovered at Gary Moe Auto Group Sportsplex:

2.1. T12 Retrofits

Linear fluorescent lamps are the primary alternative to incandescent sources for indoor general lighting—particularly in office, educational, and health care facility applications. 4-foot fluorescent lamps are widely used for new construction, replacement lighting, and retrofits.

Until the 1980s, much of the installed base used T12 lamps with magnetic ballasts. However, this older technology has been largely displaced by slimmer T8 lamps with higher-efficiency electronic ballasts. Lamp and ballast manufacturers continue to improve linear fluorescent light output, efficacy, operating life, and color quality. Similarly, luminaire manufacturers have made significant advances in efficiency and optical control of linear fluorescent fixtures.

2.1.1. Replace T12 Fixtures

Existing Condition:
At the time of the audit, several areas of the building were illuminated by T12 lighting.

Recommendation:
Sustainergy recommends replacing T12 fixtures with LED fixtures and TLED fixtures.

The basis for Savings:
T12 lighting is out of date and inefficient.

Key Analytical Assumptions:
Sustainergy estimated hours of operation for the T12 lighting based upon building operating hours, area specific operating hours observed while on-site and information gathered from site personnel. This data was used in order to calculate kWh savings for the recommended ECM.

Savings:
The recommended measure will provide annual electricity (blended rate) savings of 142 kwh. It has an expected lifetime of 20 years with 0.09088 TC02 reduced per year. This yields a lifetime 1.8176 TCO2 reduced.

Financial Analysis:
The recommended measure will provide a total annual cost savings of $18.87. The project is estimated to have an initial investment of $118.25. The project will have a Simple Payback of 6.27 years and an SIR of 3.19. There will be no assumed rebate for this project, it will have a rate of 65.06$/TC02 saved.

Interactions:
LED lights produce less heat than fluorescent. This could have an impact on the gas savings for ECMS related to heating.

2.2. T8 Retrofits

Linear fluorescent lamps are the primary alternative to incandescent sources for indoor general lighting—particularly in office, educational, and health care facility applications. 4-foot fluorescent lamps are widely used for new construction, replacement lighting, and retrofits.

Until the 1980s, much of the installed base used T12 lamps with magnetic ballasts. However, this older technology has been largely displaced by slimmer T8 lamps with higher-efficiency electronic ballasts. Lamp and ballast manufacturers continue to improve linear

fluorescent light output, efficacy, operating life, and color quality. Similarly, luminaire manufacturers have made significant advances in efficiency and optical control of linear fluorescent fixtures.

2.2.1. Replace T8 Fixtures

Existing Condition:
At the time of the audit several areas of the building were illuminated by T8 lighting.

Recommendation:
Sustainergy recommends replacing T8 fixtures with LED fixtures and TLED fixtures.

Basis for Savings:
T8 lighting is not as efficient as LED lighting and TLED lighting.

Key Analytical Assumptions:
Sustainergy estimated hours of operation for the T8 lighting based upon building operating hours, area specific operating hours observed while on-site and information gathered from site personnel. This data was used in order to calculate kWh savings for the recommended ECM.

Savings:
The recommended measure will provide annual electricity (blended rate) savings of 21119 kwh. It has an expected lifetime of 25 years with 13.52 TC02 reduced per year. This yields a lifetime 337.904 TCO2 reduced.

Financial Analysis:
The recommended measure will provide a total annual cost savings of $2806.72. The project is estimated to have an initial investment of $5823.27 with rebate. The project will have a Simple Payback of 2.07 years and an SIR of 12.05. The applicable MCACC rebate for this project will be $17469.80.it will have a rate of 17.23$/TC02 saved.

Interactions:
LED lights produce less heat than fluorescent. This could have an impact on the gas savings for ECMS related to heating.

2.3. HID Retrofits

High-intensity discharge lamps make more visible light per unit of electric power consumed than fluorescent and incandescent lamps since a greater proportion of their radiation is visible light in contrast to heat. Due to their high-output nature they are commonly used in high-bay and exterior lighting applications. Advancements in technologies have presented more efficient high-output options.

2.3.1. Replace HID Fixtures

Existing Condition:
At the time of the audit several areas of the building are illuminated by HID lighting.

Recommendation:
#Sustainergy recommends replacing HID fixtures with LED fixturesand TLED fixtures.

Basis for Savings:
HID lighting is out of date and inefficient.

Key Analytical Assumptions:
Sustainergy estimated hours of operation for the HID lighting based upon building operating hours, area specific operating hours observed while on-site and information gathered from site personnel. This data was used in order to calculate kWh savings for the recommended ECM.

Savings:

The recommended measure will provide annual electricity (blended rate) savings of 8969 kwh. It has an expected lifetime of 15 years with 5.74 TC02 reduced per year. This yields a lifetime 86.10 TCO2 reduced.

Financial Analysis:
The recommended measure will provide a total annual cost savings of $1192.02. The project is estimated to have an initial investment of $2518.00 with rebate. The project will have a Simple Payback of 2.11 years and an SIR of 7.10. The applicable MCACC rebate for this project will be $7554.00. it will have a rate of 29.24 $/TC02 saved.

Interactions:
LED lights produce less heat than fluorescent. This could have an impact on the gas savings for ECMS related to heating.

2.4. Replacement of Boilers

It is recommended to upgrade the arenas current boilers to higher efficiency boilers. There are currently 2 boilers with heating outputs of 18256000 BTU/h each. They are used to heat the pool.

Existing Condition:
The current boilers are running at 82% efficiency and are manufactured in 1991. It would be recommended to upgrade both of these boilers.

Recommendation:
A boiler upgrade is recommended and should be investigated more by sub-metering and a more in depth study.

Basis for Savings:
The savings would come in the increase in boiler efficiency, as well as the decrease in maintenance of the older boiler system.

Key Analytical Assumptions:
It is assumed that the current boiler is operating according to its nameplate, and it is assumed that it will be replaced with a range of efficiencies of boilers from 88%-94%.

Savings:
The recommended measure will provide an annual natural gas savings of 620.08 GJ. It has an expected lifetime of 15 years with 31.87 TC02 reduced per year. This yields a lifetime 478.09 TCO2 reduced.

Financial Analysis:
The recommended measure will provide a total annual cost savings of $3,139.55. The project is estimated to have an initial investment of $8125.00. The applicable MCACC rebate for this project will be $24375 The project will have a Simple Payback of 2.59 years and a SIR of 5.80.

2.5. Switch to Tankless Water Heaters

On demand or tankless water heaters are compact in size, taking up less space than conventional tank type water heaters. They eliminate energy wasted when hot water cools down in long pipe runs or while water is sitting in the storage tank. Tankless hot water heaters only produce heat when it is being used. When the water is no longer needed, the units are shut off and stop producing hot water.

Existing Condition:
Currently, the arena is using storage tanks for there domestic hot water.

Recommendation:

These water heaters can be 24% – 34% more energy efficient than conventional storage tank water heaters. But, tankless water heaters may cost more up front (around $800 to $1200) than storage tanks and can have higher installation costs. Given the 75% rebate available, these could be a good choice for the arena.

Basis for Savings:
The need for stored hot water can be decreased dramatically through solutions for resurfacing water treatment and switching to unheated water for the flood water. This makes a tankless water heater a viable option for any other need of warmer or hot water around the ice resurfacer station.

Key Analytical Assumptions:
It is assumed that these water heaters are 24-36% more efficient than that of a storage tank, it is also assumed that all three tanks will be replaced.

Savings:
The recommended measure will provide an annual natural gas savings of 634.91 GJ. It has an expected lifetime of 15 years with 32.63 TC02 reduced per year. This yields a lifetime 489.51 TCO2 reduced.

Financial Analysis:
The recommended measure will provide a total annual cost savings of $3,214.64. The project is estimated to have an initial investment of $2612. The applicable MCACC rebate for this project will be $7837.50. The project will have a Simple Payback of 0.81 years and a SIR of 18.46.

Interactions:
There is an interaction with this ECM and ECM line 10. There would be less demand for water on the rink if ECM 10 was implemented, thus lowered savings.

2.6. Installing Door Sweeps on Exit Doors

There were 3 doors accounted for that could benefit from doors sweeps. There were visible areas of infiltration found in these doors.

Existing Condition:
Currently, most exit doors had visible seals. Door sweeps cost approximately $40 to install per door, and can be done by maintenance personal on staff. This would result in reduced HVAC usage.

Recommendation:
It is recommended to install door sweeps to seal each door that currently has visible areas of air leakage.

Basis for Savings:
The heating load is assumed to be reduced due to less infiltration coming from the doors It is assumed that the maintenance will be done in house and that each door will cost about $40 in materials.

Key Analytical Assumptions:
Each door is assumed to have an infiltration of about 12L/s prior to sealing. After sealing is applied, the infiltration is assumed to be approximately 4-5L/s. This reduced infiltration rate is the basis for the heating load being reduced.

Financial Analysis:
The recommended measure will provide an annual natural gas savings of 0.53 GJ and an annual electricity (blended rate) savings of 24 kwh. The yearly TC02 reduction is 0.04, with expected lifetime of 15 years. This yields a lifetime GHG reduction of 0.64.

Savings:
The recommended measure will provide an annual natural gas savings of 0.53 GJ and an annual electricity (blended rate) savings of 24 kwh. The recommended measure will provide a total annual cost savings of $5.91. The project is estimated to have an initial investment of $144.00. The project will have a Simple Payback of 24.365 years and a SIR of 0.611.

2.7. Bay Door Sweep

The bay door could benefit from a doors sweep. There were visible areas of infiltration found under this door.

Existing Condition:
Door sweeps cost approximately $50 to install per door, and can be done by maintenance personal on staff. This would result in reduced HVAC usage.

Recommendation:
It is recommended to install door sweep to seal each door that currently has visible areas of air leakage.

Basis for Savings:
The heating load is assumed to be reduced due to less infiltration coming from the doors

Key Analytical Assumptions:
Each door is assumed to have an infiltration of about 15L/s prior to sealing. After sealing is applied, the infiltration is assumed to be approximately 3-6L/s. This reduced infiltration rate is the basis for the heating load being reduced.

Financial Analysis:
The recommended measure will provide an annual natural gas savings of 3 therms and an annual electricity (blended rate) savings of 12 kwh. The recommended measure will provide a total annual cost savings of $2.93. The project is estimated to have an initial investment of $48.00. The project will have a Simple Payback of 16.382 years and a SIR of 0.908.

2.8. Empty Fridge Plugged In

There was an empty fridge in the maintenance room that was plugged in.

Recommendation:
It would be suggested to unplug the fridge if it is not in use.

Basis for Savings:
The savings would come from the reduction in usage.

Key Analytical Assumptions:
It is assumed the fridge is operating 24/7

Financial Analysis and savings
The recommended measure will provide an annual electricity (blended rate) savings of 2,044 kwh. The recommended measure will provide a total annual cost savings of $271.65. The project is estimated to have an initial investment of $100.00. The project will have a Simple Payback of 0.368 years and a SIR of 40.415.

2.9. Occupancy Sensors on Vending Machines

There were 3 vending machines without occupancy sensors, meaning the machines were running 24/7. Installing occupancy sensors is an easy cost effective way to save on electricity.

Existing Condition:
3 vending machines were noted not to have occupancy sensors.

Recommendation:
Given that this is an easy install and has a good pay off period, it is recommended that occupancy sensors are installed on all vending machines. SustainErgy recommends the VendingMiser as an occupancy sensor. For more information see https://www.vendingmiserstore.ca/product/energymiser-vendingmiser-master-unit-ez-install-model-vm170 Each unit will cost approximately $255. This is a more cost effective way to get better use of a vending machine rather than buying energy star vending machines.

Basis for Savings:
Each unit will cost $255 and will reduce the usage of a machine. Given the refrigerant will run less and will not be running on weekends, each machine with refrigerant will see significant savings. Furthermore, a machine with no refrigerant but constant lighting will see significant savings.

Key Analytical Assumptions:
A vending machine uses between 2500Kwh to 5900Kwh per year on average. This usage can be reduced based on the occupancy of the building.

Financial Analysis and savings.
The recommended measure will provide an annual electricity (blended rate) savings of 6,144 kwh, with a reduction in 3.93 TC02 per year. This ECM has expected lifetime of 15 years, which yields a reduction of 12.97 TC02 lifetime.The recommended measure will provide a total annual cost savings of $816.54. The project is estimated to have an initial investment of $765.00. The project will have a Simple Payback of 0.937 years and a SIR of 12.742.

2.10. Remove Micro Air Bubbles from Resurfacing Water

Eliminate big parts of your water heating costs for your flood water and save 10% – 12% energy from your ice plant by lowering the temperature of the resurfacing water used on your ice pad. According to ASHRAE, 7% of an ice rink's total energy use is due to domestic hot water that is used in the resurfacing process of the ice.

Existing Condition:
Currently hot water is being used to resurface the rink ice. Using extremely hot water not only requires energy to heat but also increases the refrigeration load because warm water is being applied directly to the ice.

Recommendation:
The more impurities in water (both minerals and dissolved gas), the harder the refrigeration plant has to work before it will freezes. Local water sources with higher concentrations of salts of various kinds will have different freezing properties and if the concentration is elevated enough to lower the freezing temperature even further. More energy is required to lower that temperature, and the resulting ice will have poorer quality. To address these issues, most ice rinks heat the water to 140°F – 160°F to remove micro air bubbles before resurfacing the rink and in some cases where the water quality is not good, water softeners or filtration systems are in use. This is a good opportunity to reduce the utility usage by retrofitting already existing equipment.

Basis for Savings:
Using extremely hot water not only requires energy to heat but also increases the refrigeration load because warm water is being applied directly to the ice. Instead of using extremely hot temperatures for the resurfacing water, air bubbles can passively be removed and the temperature on the resurfacing water lowered. This treatment of the resurfacing water results in harder, smoother ice that requires less maintenance. De-aerated water has fewer impurities then boiled water and can therefore be frozen at a higher temperature. Savings would therefore come from lowered natural gas usage from heating water and lowered electricity usage from heating the slab on the rink.

Key Analytical Assumptions:
It is assumed there will be a reduction in the compressor run time, the dehumidification and chiller load will be eased, and the humidity will be reduced due to the hot water not being applied to the ice surface.

Savings:
The recommended measure will provide an annual natural gas savings of 193.99 GJ and an annual electricity (blended rate) savings of 79,133 kwh. This will lead to a reduction of 60.62 TC02 per year. The lifetime of this project is 15 years. This will yield a reduction of 909.24 TC02 lifetime.

Financial Analysis:

The recommended measure will provide a total annual cost savings of $11,498.92. The project is estimated to have an initial investment of $11498.92. The applicable MCACC rebate will be $30240.00. The project will have a Simple Payback of 0.88 years and a SIR of 17.11.

Interactions:
There is an interaction with this ECM and ECM line 5. There would be less gas used for water on the rink if ECM 5 was implemented, thus lowered gas savings.

2.11. Add low emission ceiling to arena

Solar radiation heat is the main heat radiation in ice arenas. Nearly 30% of the total refrigeration load in heated rinks is radiated from the arena ceiling. The temperature, color and emissivity index of the inner surface of the ceiling are the main causes of the radiation thermal load to the ice rink.

Existing Condition:
The roof build was not investigated in depth during the audit, it is assumed that the roof is constructed of wood and steel, and has an insulation value of R25.

Recommendation:
Low emissivity ceilings offer energy savings while being flexible for individual building shapes. The emissivity factor can reach 0.03, which vastly reduces roof radiation. Although the upgrade may not make financial sense, it will increase the ice quality as well as make the rink appear brighter.

Basis for Savings:
Lighting power demand is reduced as the reflectivity of low-emissivity ceilings allow for the same brightness. Reduction of condensation on the building structure. Reduction in refrigeration system consumption.

Key Analytical Assumptions:
Common materials used for ceilings (wood, steel, etc.), have an emissivity index (EM) of between 0.85 and 0.95.

Savings:
The recommended measure will provide an annual natural gas savings of 102.85 GJ and an annual electricity (blended rate) savings of 4,591 kwh. This measure will have a yearly reduction of 8.22 TC02. This project has expected lifetime of 15 years. This yields a lifetime reduction of 123.40 TC02.

Financial Analysis:
The recommended measure will provide a total annual cost savings of $1,131.06. The project is estimated to have an initial investment of $15093.13 with MCACC rebate applied. The applicable estimated MCACC rebate for this project will be $45279.38 The project will have a Simple Payback of 13.34 years and a SIR of 7.10. This will hate a rate of $122.32 $/TC02 lifetime.

Interactions:
There is an interaction with any ECM for lights in the arena as it is reducing the lighting load. Since this is insulation it is also has lowered savings for any optimization or upgrade to heating equipment as well as cooling equipment for the rink.

3. BACKGROUND INFORMATION

3.1. Contact Information

3.1.1. Sustainergy

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3.2. Audit Scope and Methodology

3.2.1. Preliminary Energy-Use Analysis (PEA)

Before the energy audit was conducted, a Preliminary Energy-Use Analysis (PEA) was conducted. The PEA evaluates the historic utility usage, peak demand, and cost; develops the Energy Cost Index (ECI) of the building (expressed in dollars per floor area per year); and develops the Energy Utilization Index (EUI) of the building (expressed in GJ/m^2). Monthly energy use and peak demand or, if available, interval billing data (such as 15 minute data), were reviewed to identify efficiency or behavioral modification opportunities.

3.2.2. Site Survey

The following steps were conducted during the on-site walk-through:

1. Sustainergy performed a walk-through survey of the facility to become familiar with its construction, equipment, operation and maintenance.
2. Sustainergy reviewed the mechanical and electrical system design, installed condition, maintenance practices, and operating methods.
3. Sustainergy reviewed existing operations and maintenance (O&M) problems and logs.
4. Sustainergy reviewed planned building changes or improvements.

5. Sustainergy measured key operating parameters and compared them to design levels, when available (e.g. operating schedules, heating/cooling water temperatures, supply air temperature, space temperature and humidity, ventilation quantities, lighting levels). Such measurements may have been taken on a spot measurement basis or logged manually or electronically.
6. Sustainergy personnel met with the owner and/or operator and the occupants to discuss any special problems or planned improvements, such as HVAC upgrades or aesthetic improvements, and any operation or maintenance issues. It was determined whether any maintenance problems and/or practices currently affect facility efficiency.

3.2.3. Analysis

1. Sustainergy performed a space function analysis to determine if facility efficiency may be affected by functions that differ from the original functional intent of the facility.
2. Sustainergy analyzed and described the energy-using systems of the building, resulting from the on-site observations, measurements and engineering calculations. The building systems documented include the following, as applicable:
    - Envelope
    - Lighting
    - Plug loads
    - HVAC
    - Domestic hot water
    - Laundry
    - Food preparation
    - Refrigeration
    - Conveying
    - Pools/saunas/spas
    - Process loads
    - Others
3. Sustainergy identified any low/no cost ECMs and estimated the approximate savings that will result from their implementation.
4. Sustainergy prepared a breakdown of the total annual energy use into end-use components.
5. Sustainergy listed all possible modifications to equipment and operations that will save energy. From this list, Sustainergy selected those that might be considered practical, with assistance from the owner/operator.
6. For each measure, Sustainergy estimated the potential savings in energy costs and its effect on the facilities EUI.
7. Sustainergy estimated the implementation costs for each measure.
8. Sustainergy estimated the impact of each measure on building operations, maintenance costs and non-energy operating costs.
9. Sustainergy prepared a financial evaluation of the estimated total potential investment.

3.2.4. Financial Analysis – Methodologies and Assumptions

Sustainergy analyzes all ECMs using multiple financial methodologies. ECMs that are considered financially viable must meet all criteria. Sustainergy prepared a financial study of each proposed ECM evaluating investment cost, energy cost savings, simple payback period and savings-to-investment ratio. The savings-to-investment ratio (SIR) of each ECM was analyzed to ensure financial practicality and feasibility.

3.2.4.1. Simple Payback Period

An energy project's simple payback period is the amount of time it will take to recover the initial investment in energy savings. This is calculated by dividing initial investment cost by the annual energy cost savings.

$$Simple\ Payback\ (years) = \frac{Initial\ Investment\ (\$)}{Annual\ Energy\ Cost\ Savings\ (\$)}$$

3.2.4.2. Savings-to-Investment Ratio (SIR)

The savings-to-investment ratio is the ratio of the present value (PV) of future savings to the current investment costs of an energy or water conservation measure. Sustainergy assumes a 3% rate of inflation for present value calculations.

$$SIR = \frac{PV\ of\ Energy\ Cost\ Savings\ (\$)}{Initial\ Investment\ Cost\ (\$)}$$

An ECM is only recommended if the SIR is greater than or equal to 1.0. An SIR of less than 1.0 indicates that the present day value of savings the ECM will generate is less than the actual investment cost.

3.3. Utility Analysis

Utility analysis is one of the primary steps in the energy audits process as it can provide insight into current facility operation, energy end uses, performance and anomalies, as well assisting to quantify savings relative to current usage patterns. Sustainergy has received utility bills from City of Lacombe for all metered energy sources at Gary Moe Auto Group Sportsplex with account number(s) A4900001117 and A10056992. From these utility bills, Sustainergy engineers were able to perform a Preliminary Energy-Use Analysis (PEA). The PEA provides the following information:

- Historical and current unit costs for energy consumption
- Data for benchmarking the facility against similar type and usage facilities
- Correlation between energy usage and weather variations
- Energy Costs and Utility Rate Structures
- Energy End-Use and Cost Allocation

3.3.1. Historical Usage and Data

Based on the historical usage data (last 12 months) provided by City of Lacombe, the following current energy rates have been determined for Gary Moe Auto Group Sportsplex. These rates are considered "blended" rates and include all associated costs (e.g. demand charges, customer fees, taxes).

Utility	Rate
Electric	$0.1329/kWh
Gas	$5.35/GJ

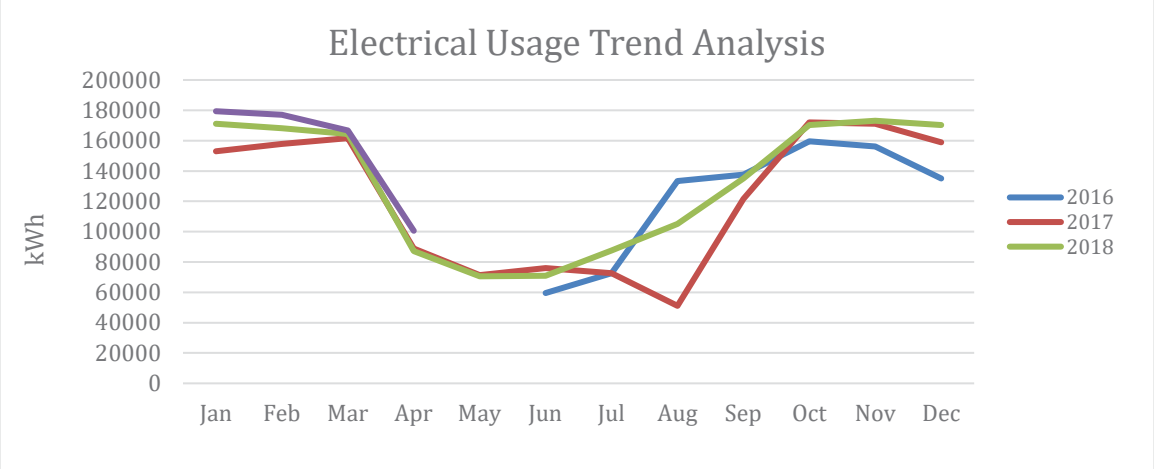
3.3.1.1. Electricity

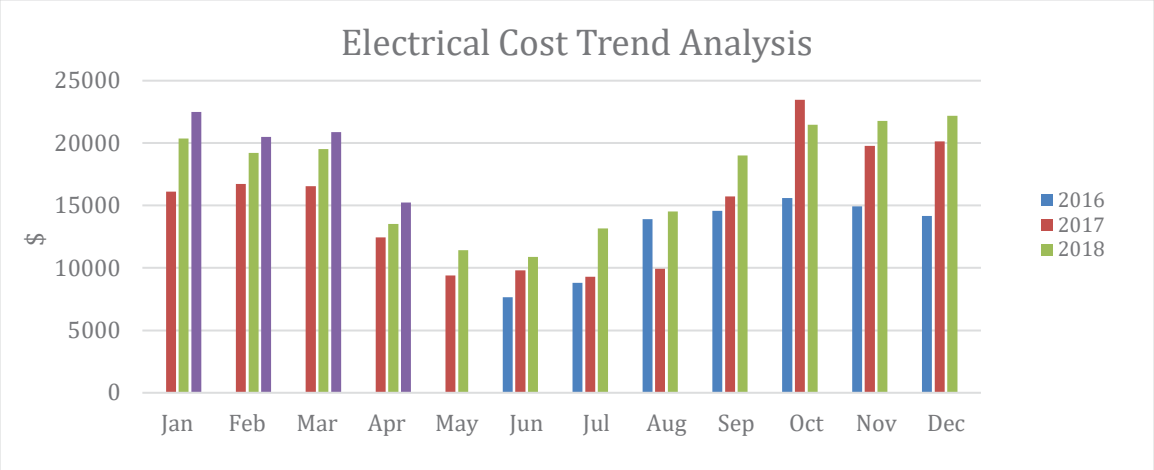
Based on June 2016 to April 2019 electrical usage was 4,507,912 kWh for a total cost of $555,134.51 with the average price paid during this period being $0.1231 per kWh. Enmax provides electrical service to Gary Moe Auto Group Sportsplex.

Meter #	Period	kWh	($)	$/ kWh
0040478700006	6/1/2016 to 6/30/2016	50,191	$5,163.19	$0.1029
0040160296005	6/1/2016 to 6/30/2016	9,357	$2,493.80	$0.2665
0040478700006	7/1/2016 to 7/31/2016	52,208	$5,227.89	$0.1001
0040160296005	7/1/2016 to 7/31/2016	20,376	$3,573.22	$0.1754

Meter #	Period	kWh	($)	$/ kWh
0040478700006	8/1/2016 to 8/31/2016	55,248	$5,597.94	$0.1013
0040160296005	8/1/2016 to 8/31/2016	78,072	$8,320.19	$0.1066
0040478700006	9/1/2016 to 9/30/2016	47,040	$5,039.89	$0.1071
0040160296005	9/1/2016 to 9/30/2016	90,504	$9,526.82	$0.1053
0040478700006	10/1/2016 to 10/31/2016	45,776	$4,543.90	$0.0993
0040160296005	10/1/2016 to 10/31/2016	113,804	$11,059.80	$0.0972
0040478700006	11/1/2016 to 11/30/2016	42,016	$4,091.65	$0.0974
0040160296005	11/1/2016 to 11/30/2016	114,132	$10,837.66	$0.0950
0040478700006	12/1/2016 to 12/31/2016	28,784	$3,409.61	$0.1185
0040160296005	12/1/2016 to 12/31/2016	106,272	$10,748.94	$0.1011
0040478700006	1/1/2017 to 1/31/2017	44,192	$4,604.89	$0.1042
0040160296005	1/1/2017 to 1/31/2017	108,864	$11,496.28	$0.1056
0040478700006	2/1/2017 to 2/28/2017	50,032	$4,827.15	$0.0965
0040160296005	2/1/2017 to 2/28/2017	107,916	$11,890.12	$0.1102
0040478700006	3/1/2017 to 3/31/2017	43,312	$4,679.69	$0.1080
0040160296005	3/1/2017 to 3/31/2017	118,366	$11,879.96	$0.1004
0040478700006	4/1/2017 to 4/30/2017	47,024	$4,911.96	$0.1045
0040160296005	4/1/2017 to 4/30/2017	41,928	$7,540.49	$0.1798
0040478700006	5/1/2017 to 5/31/2017	50,768	$5,372.51	$0.1058
0040160296005	5/1/2017 to 5/31/2017	20,503	$4,035.46	$0.1968
0040478700006	6/1/2017 to 6/30/2017	53,504	$5,527.28	$0.1033
0040160296005	6/1/2017 to 6/30/2017	22,596	$4,276.23	$0.1892
0040478700006	7/1/2017 to 7/31/2017	52,928	$5,369.88	$0.1015
0040160296005	7/1/2017 to 7/31/2017	19,764	$3,918.73	$0.1983
0040478700006	8/1/2017 to 8/31/2017	30,944	$4,040.98	$0.1306
0040160296005	8/1/2017 to 8/31/2017	20,160	$5,892.93	$0.2923
0040478700006	9/1/2017 to 9/30/2017	42,368	$4,575.50	$0.1080
0040160296005	9/1/2017 to 9/30/2017	79,196	$11,151.76	$0.1408
0040478700006	10/1/2017 to 10/31/2017	42,827	$4,507.44	$0.1052
0040160296005	10/1/2017 to 10/31/2017	129,208	$18,960.24	$0.1467
0040478700006	11/1/2017 to 11/30/2017	42,667	$4,361.22	$0.1022
0040160296005	11/1/2017 to 11/30/2017	128,467	$15,408.67	$0.1199
0040478700006	12/1/2017 to 12/31/2017	40,992	$4,494.00	$0.1096
0040160296005	12/1/2017 to 12/31/2017	117,854	$15,642.63	$0.1327
0040478700006	1/1/2018 to 1/31/2018	39,952	$4,356.45	$0.1090
0040160296005	1/1/2018 to 1/31/2018	131,242	$16,004.92	$0.1219
0040478700006	2/1/2018 to 2/28/2018	45,152	$4,507.87	$0.0998
0040160296005	2/1/2018 to 2/28/2018	123,114	$14,693.59	$0.1193
0040478700006	3/1/2018 to 3/31/2018	39,503	$4,422.45	$0.1120
0040160296005	3/1/2018 to 3/31/2018	124,885	$15,093.68	$0.1209
0040478700006	4/1/2018 to 4/30/2018	46,147	$4,937.68	$0.1070
0040160296005	4/1/2018 to 4/30/2018	41,079	$8,582.65	$0.2089
0040478700006	5/1/2018 to 5/31/2018	47,376	$5,507.54	$0.1163
0040160296005	5/1/2018 to 5/31/2018	23,188	$5,918.80	$0.2552
0040478700006	6/1/2018 to 6/30/2018	48,880	$5,358.32	$0.1096
0040160296005	6/1/2018 to 6/30/2018	21,999	$5,512.06	$0.2506
0040478700006	7/1/2018 to 7/31/2018	53,936	$5,406.70	$0.1002
0040160296005	7/1/2018 to 7/31/2018	33,650	$7,757.59	$0.2305
0040478700006	8/1/2018 to 8/31/2018	41,136	$5,183.31	$0.1260
0040160296005	8/1/2018 to 8/31/2018	63,946	$9,344.65	$0.1461

Meter #	Period	kWh	($)	$/ kWh
0040478700006	9/1/2018 to 9/30/2018	43,840	$4,743.53	$0.1082
0040160296005	9/1/2018 to 9/30/2018	91,128	$14,271.33	$0.1566
0040478700006	10/1/2018 to 10/31/2018	43,424	$5,037.11	$0.1160
0040160296005	10/1/2018 to 10/31/2018	126,889	$16,436.01	$0.1295
0040478700006	11/1/2018 to 11/30/2018	43,136	$5,104.04	$0.1183
0040160296005	11/1/2018 to 11/30/2018	129,983	$16,666.07	$0.1282
0040478700006	12/1/2018 to 12/31/2018	44,192	$5,139.84	$0.1163
0040160296005	12/1/2018 to 12/31/2018	126,202	$17,052.22	$0.1351
0040478700006	1/1/2019 to 1/31/2019	42,720	$4,555.91	$0.1066
0040160296005	1/1/2019 to 1/31/2019	136,677	$17,939.44	$0.1313
0040478700006	2/1/2019 to 2/28/2019	47,216	$4,860.65	$0.1029
0040160296005	2/1/2019 to 2/28/2019	129,857	$15,634.20	$0.1204
0040478700006	3/1/2019 to 3/31/2019	41,584	$5,059.39	$0.1217
0040160296005	3/1/2019 to 3/31/2019	125,137	$15,816.34	$0.1264
0040478700006	4/1/2019 to 4/30/2019	40,255	$4,229.52	$0.1051
0040160296005	4/1/2019 to 4/30/2019	60,328	$11,000.15	$0.1823
	Total	4,507,912	$555,134.51	$0.1231



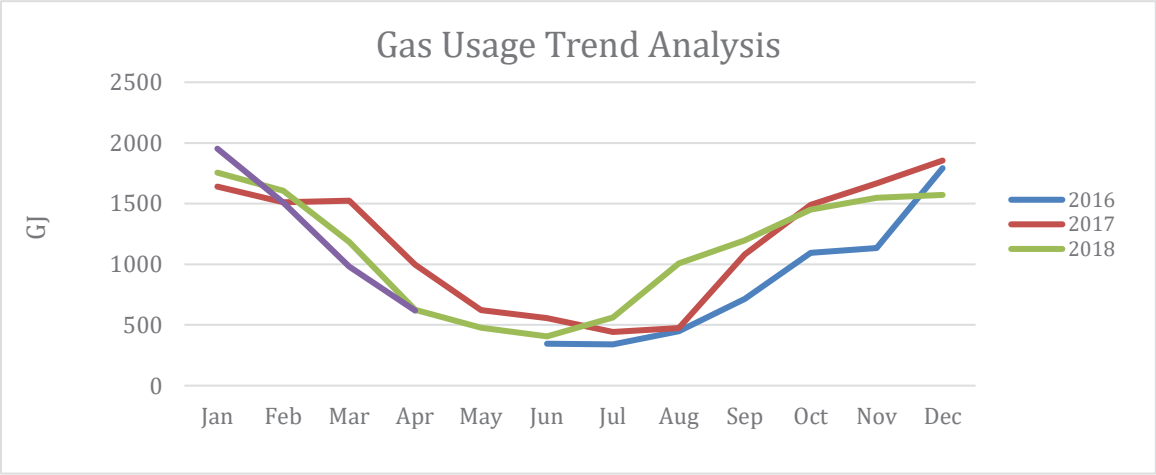


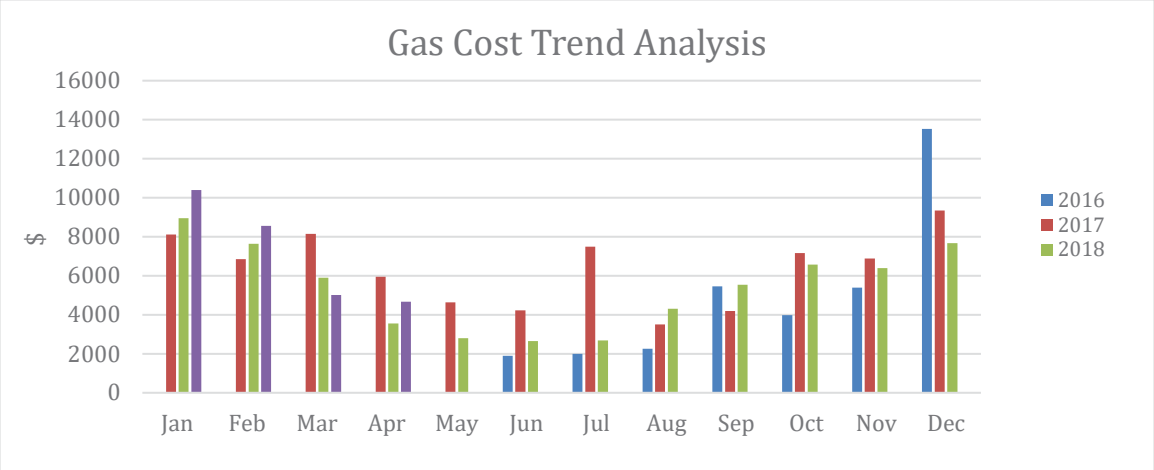
3.3.1.2. Natural Gas

Based on June 2016 to April 2019 natural gas usage was 38177 GJ for a total cost of $204,250.28 with the average price paid during this period being $5.35 per GJ. Atco provides natural gas service to Gary Moe Auto Group Sportsplex.

Meter #	Period	GJ	($)	$/ GJ
1189628612	6/1/2016 to 6/30/2016	345.9915612	$1,899.48	$5.49
1189628612	7/1/2016 to 7/31/2016	339.978903	$1,998.71	$5.88
1189628612	8/1/2016 to 8/31/2016	447.1518987	$2,248.94	$5.03
1189628612	9/1/2016 to 9/30/2016	716.0337553	$5,453.95	$7.62
1189628612	10/1/2016 to 10/31/2016	1095.042194	$3,986.92	$3.64
1189628612	11/1/2016 to 11/30/2016	1134.599156	$5,395.57	$4.76
1189628612	12/1/2016 to 12/31/2016	1792.088608	$13,530.70	$7.55
1189628612	1/1/2017 to 1/31/2017	1641.561181	$8,105.77	$4.94
1189628612	2/1/2017 to 2/28/2017	1510.654008	$6,851.02	$4.54
1189628612	3/1/2017 to 3/31/2017	1523.101266	$8,143.94	$5.35
1189628612	4/1/2017 to 4/30/2017	996.5189873	$5,942.00	$5.96
1189628612	5/1/2017 to 5/31/2017	621.6244726	$4,633.03	$7.45
1189628612	6/1/2017 to 6/30/2017	555.5907173	$4,217.56	$7.59
1189628612	7/1/2017 to 7/31/2017	442.4050633	$7,484.97	$16.92
1189628612	8/1/2017 to 8/31/2017	474.6835443	$3,499.39	$7.37
1189628612	9/1/2017 to 9/30/2017	1081.012658	$4,200.10	$3.89
1189628612	10/1/2017 to 10/31/2017	1489.556962	$7,159.80	$4.81
1189628612	11/1/2017 to 11/30/2017	1666.033755	$6,881.31	$4.13

Meter #	Period	GJ	($)	$/ GJ
1189628612	12/1/2017 to 12/31/2017	1854.957806	$9,337.14	$5.03
1189628612	1/1/2018 to 1/31/2018	1755.485232	$8,953.78	$5.10
1189628612	2/1/2018 to 2/28/2018	1605.274262	$7,645.14	$4.76
1189628612	3/1/2018 to 3/31/2018	1185.126582	$5,891.88	$4.97
1189628612	4/1/2018 to 4/30/2018	624.7890295	$3,552.59	$5.69
1189628612	5/1/2018 to 5/31/2018	476.7932489	$2,793.36	$5.86
1189628612	6/1/2018 to 6/30/2018	406.0126582	$2,654.27	$6.54
1189628612	7/1/2018 to 7/31/2018	561.1814346	$2,682.67	$4.78
1189628612	8/1/2018 to 8/31/2018	1007.278481	$4,313.75	$4.28
1189628612	9/1/2018 to 9/30/2018	1197.046414	$5,537.78	$4.63
1189628612	10/1/2018 to 10/31/2018	1450.21097	$6,563.91	$4.53
1189628612	11/1/2018 to 11/30/2018	1548.101266	$6,398.86	$4.13
1189628612	12/1/2018 to 12/31/2018	1570.56962	$7,669.50	$4.88
1189628612	1/1/2019 to 1/31/2019	1953.059072	$10,385.96	$5.32
1189628612	2/1/2019 to 2/28/2019	1508.966245	$8,559.03	$5.67
1189628612	3/1/2019 to 3/31/2019	980.5907173	$5,016.55	$5.12
1189628612	4/1/2019 to 4/30/2019	618.5654008	$4,660.95	$7.54
	Total	38177.53165	$204,250.28	$5.35



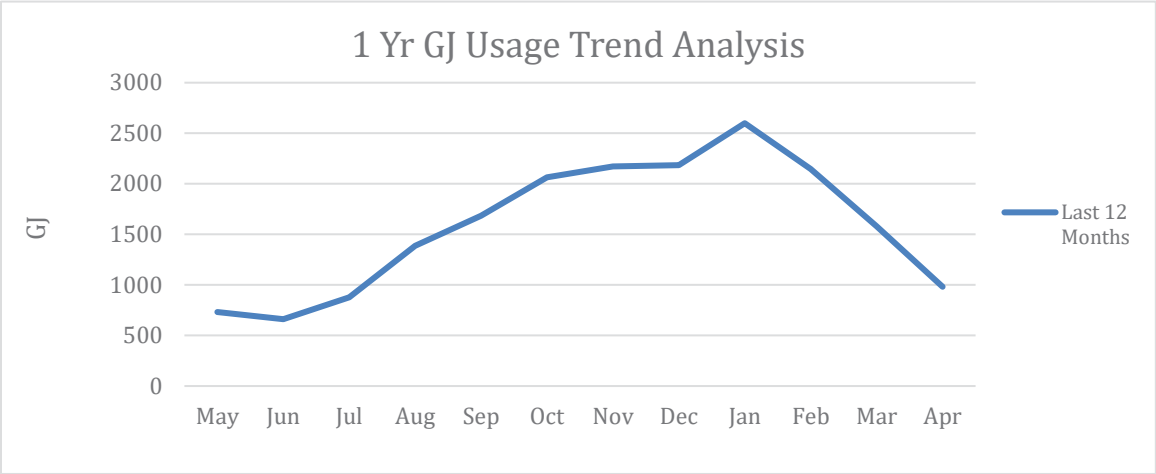


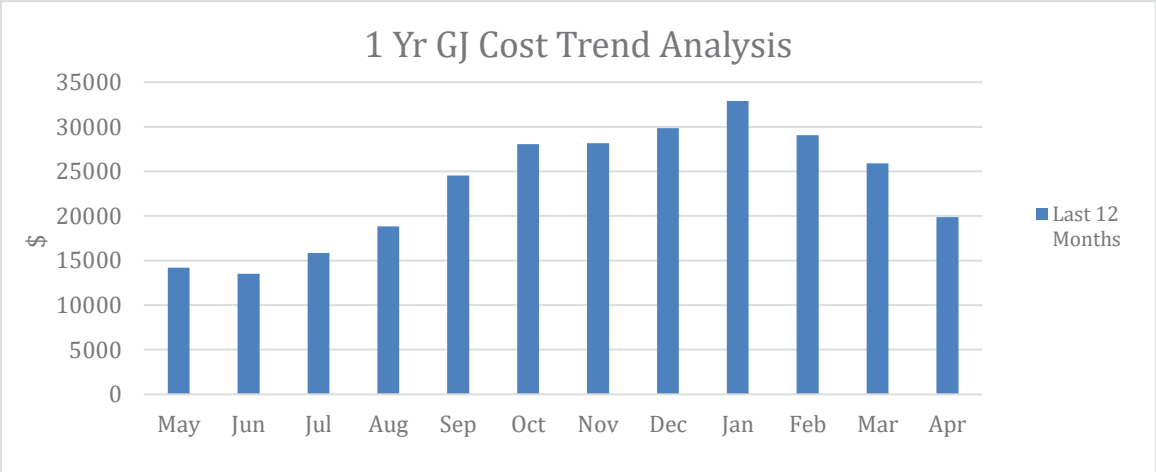
3.3.1.3. Gary Moe Auto Group Sportsplex Energy Consumption Baseline

For analysis of total energy consumption, all energy units must be converted to common units in order to be summed. The utility consumption data was converted to GJ (Gigajoule) for comparison and for energy use totaling. Gary Moe Auto Group Sportsplex has a baseline annual total energy use of 19,065 GJ and cost of $280,771.31.

The following table and charts represents the total energy consumption and cost baseline for Gary Moe Auto Group Sportsplex:

Period	GJ	($)	$/ GJ
May	731	$14,219.70	$19.45
Jun	661	$13,524.65	$20.45
Jul	877	$15,846.96	$18.08
Aug	1,386	$18,841.71	$13.60
Sep	1,683	$24,552.64	$14.59
Oct	2,064	$28,037.03	$13.59
Nov	2,172	$28,168.97	$12.97
Dec	2,184	$29,861.56	$13.67
Jan	2,599	$32,881.31	$12.65
Feb	2,147	$29,053.88	$13.53
Mar	1,581	$25,892.28	$16.38
Apr	981	$19,890.62	$20.28
Annual	19,065	$280,771.31	$14.73





3.3.1.4. Gary Moe Auto Group Sportsplex Energy Intensity Baseline

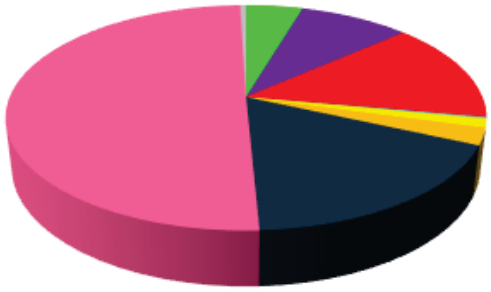
Energy Utilization Intensity (EUI) is a metric that allows for comparison of energy usage among facilities of different sizes and that utilize different fuel types. EUI is typically measured in units of GJ per square meter of building area (GJ/m²). This allows for a straight comparison of energy usage between facilities that are used for similar purposes. Gary Moe Auto Group Sportsplex has a baseline annual EUI of 1.64 GJ/m². The following table represents the baseline EUI for Gary Moe Auto Group Sportsplex:

Performance Metric	GJ/m² per Year
Energy Intensity	
Site EUI	1.641675269
Source EUI	2.764687087

3.3.2. End-Use Analysis

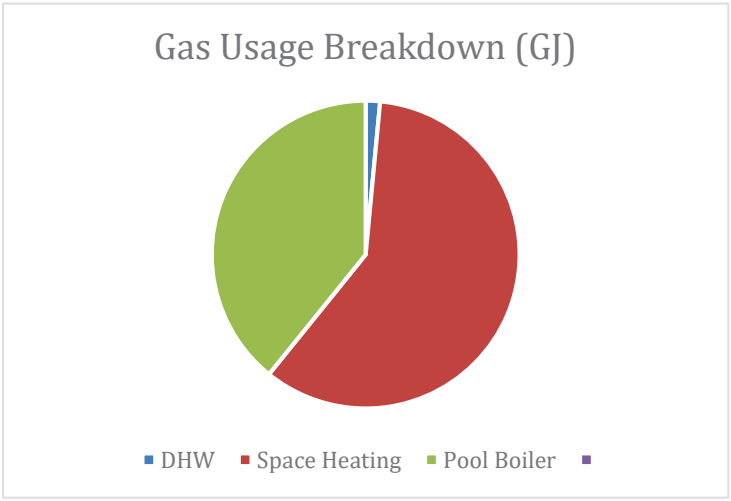
Also known as disaggregation, end-use and cost allocation is the breakdown of the energy usage at the site into separate usage categories. This helps to identify areas of energy use that could provide greater energy savings.

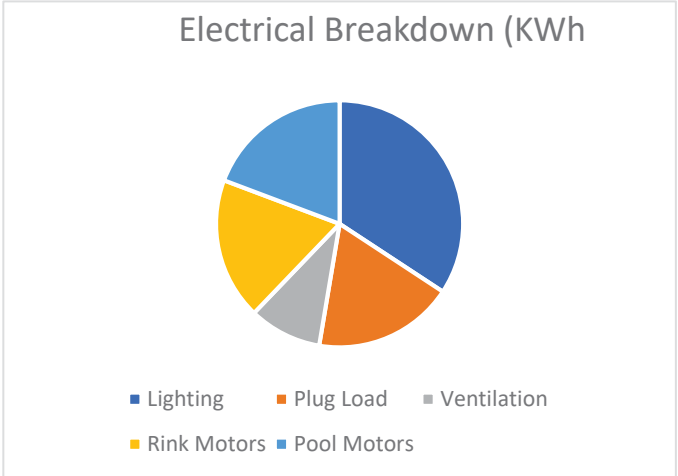
BASELINE ENERGY USAGE		
Type	Consumption (GJ)	
Lighting	869	5%
DHW	1,697	9%
Heating	2,743	14%
Cooling	36	0%
Ventilation	242	1%
Plug Load	467	2%
Ice Rinks	3,338	18%
Pools	9,585	50%
Misc.	89	0%
Total	**19,065**	**100%**



Gas Usage Breakdown (GJ)		
Type	GJ	%
DHW	350	5%
Space Heating	13,764	8%
Pool Boiler	9,094	87%
Total	**23208**	**100%**

Electrical Usage Breakdown		
Type	KWh	%
Lighting	241,434	34%
Plug Load	129,675	18%
Ventilation	67,122	10%
Rink Motors	130,818	19%
Pool Motors	135,818	19%
Total	**704,867**	**100%**





4. EXISTING BUILDING SYSTEMS

The following section contains descriptions of the existing building envelope, lighting, mechanical and any other significant energy consuming systems.

4.1. Occupancy

There are a total of 500 regular occupants at the site. Generally, the site is occupied from 9:00 AM to 7:00 PM. Weekend occupancy hours generally occur from 9:00 AM to 7:00 PM.

4.2. Lighting Systems

Gary Moe Auto Group Sportsplex interior lighting is provided predominately by 1 lamp, 20.00-watt, LED fixtures. The majority of the interior lighting is controlled by manual switch.

Gary Moe Auto Group Sportsplex exterior lighting is provided predominately by 1 lamp, 28.00-watt, LED fixtures. The majority of the exterior lighting is controlled by manual switch.

A full inventory of all lighting fixtures and lighting controls is included in the Appendices section at the end of this report.

4.3. Domestic Water Systems

4.3.1. Domestic Water Heating Systems

Sustainergy observed (6) 80 to 119 gallon storage water heaters throughout Gary Moe Auto Group Sportsplex.

See the Plumbing Schedule in the Appendices for a detailed list of all the water heaters, their specifications, and their locations.

4.4. Heating, Ventilation and Air Conditioning (HVAC)

4.4.1. Chilled Water Systems

Gary Moe Auto Group Sportsplex utilizes chilled water systems for ice cooling at the facility.

The facility is equipped with (1) Chiller. The chiller(s) is/are equipped with reciprocating compressors and HCFC-22 refrigerant. The chiller(s) was/were manufactured by Cimco. The chiller(s) was/were observed to be in good general condition at the time of the audit.

The chilled water systems utilize chilled water temperature set-point reset.

A detailed listing of all chilled water systems and equipment can be found in the Appendix of this document.

4.4.2. Hydronic Heating Systems

Gary Moe Auto Group Sportsplex utilizes hydronic heating systems for space heating at the facility.

The facility is equipped with (2) hydronic boiler(s). The hydronic boiler(s) utilize gas as the heating fuel. The hydronic boiler(s) has/have a rated efficiency of 82%. The non-staged arrangement is/are utilized for the hydronic boiler(s). The hydronic boiler(s) was/were manufactured by Raypak. The boiler(s) was/were observed to be in good general condition at the time of the audit.

A detailed listing of all hydronic heating water systems and equipment can be found in the Appendix of this document.

4.4.3. Air-Side Systems

Gary Moe Auto Group Sportsplex utilizes Constant Volume Air-Handling and Packaged Rooftop Unit systems for heating, cooling, and/or ventilating spaces throughout the facility. There are a total of (16) units serving the facility.

There are a total of (21) motors serving the air-side systems.

A detailed listing of all air-side systems and equipment can be found in the Appendix of this document.

4.4.3.1. Air Handling Units

Gary Moe Auto Group Sportsplex utilizes (2) air handling unit(s) (AHU) for conditioned air delivery.

The air-handling unit(s) was/were manufactured by Engineered air and installed in 1995. The unit(s) was/were observed to be in good general condition at the time of the audit.

A detailed listing of all air handling unit systems and equipment can be found in the Appendix of this document.

4.4.3.2. Packaged Rooftop Units

Gary Moe Auto Group Sportsplex utilizes (4) packaged rooftop unit(s) (PRTU) for conditioned air delivery to the respective conditioned spaces. The PRTU(s) has/have an individual heating capacity of 217.8, with a combined capacity of 217.8 MBH of heating. The PRTU(s) has/have a rated energy efficient ratio (EER) of 11 to 11.2.

The packaged rooftop unit(s) was/were manufactured by Carrier Corp. and Lennox and installed. The unit(s) was/were observed to be in good general condition at the time of the audit.

A detailed listing of all packaged rooftop unit systems and equipment can be found in the Appendix of this document.

4.4.3.3. Unit Heaters

Gary Moe Auto Group Sportsplex utilizes (4) unit heater(s) for space heating. The unit heater(s) has/have an individual heating capacity of 30 and 51.1821 MBH, with a combined capacity of 132.4 MBH. The unit(s) utilize electric as an energy source. The unit heater(s) was/were manufactured by Reznor and Ouelett and installed in 2009 to 2017. The unit(s) was/were observed to be in good general condition at the time of the audit. A detailed listing of all unit heater systems and equipment can be found in the Appendix of this document.

4.4.3.4. Furnaces

Gary Moe Auto Group Sportsplex utilizes (5) furnace(s) for space heating. The furnace(s) has/have an individual heating capacity of 131.1 and 67.5 MBH, with a combined capacity of 516.1 MBH. The furnace(s) was/were manufactured by Carrier and Armstrong air and installed in 2012. The unit(s) was/were observed to be in fair general condition at the time of the audit. The furnace(s) has/have a rated efficiency of 91 to 93%.

A detailed listing of all furnace systems and equipment can be found in the Appendix of this document.

5. APPENDICES

5.1. Glossary of Terms

5.1.1. General Definitions

Annual Fuel Utilization Efficiency (AFUE)
A measurement of efficiency for heating appliances. This laboratory-based figure accounts for chimney losses, equipment jacket losses, and cycling losses, but does not include distribution losses or fan/pump energy.

British Thermal Unit (Btu, BTU)
The amount of heat required to raise the temperature of 1 pound (0.454 kg) of liquid water by 1°F (0.56°C) at a constant pressure of one atmosphere. Several definitions of Btu exist, which are based on different water temperatures and therefore vary by up to 0.5 percent. A Btu can be approximated as the heat produced by burning a single wooden match. In the United States, the power of HVAC systems is sometimes expressed in Btu/hour instead of watts. Nameplates in Canada typically have the amount of BTU produced per hour

Compact Fluorescent Light (CFL)
A light bulb that uses 65 percent less energy than a traditional incandescent bulb. Compared to an incandescent bulb, a single CFL saves approximately $30 over its lifetime and will pay for itself in about six months.

Coefficient of Performance (COP)
A heat pump or air conditioner's output in watt-hours of heat moved divided by watt-hours of electrical input.

Coil
Equipment that performs heat transfer to air when mounted inside an air handling unit or ductwork, a coil is heated or cooled by electrical means or by circulating liquid or steam within it.

Ductless Mini-Split
Mini-split systems — usually called ductless air conditioners — typically produce 9,000–36,000 Btu per hour of cooling. Most ductless (split system) air conditioners still typically provide cooling to a single interior zone, just like a window air conditioner; but more powerful outside units are becoming available. Advantages of the ductless system include smaller size and flexibility for zoning or heating and cooling individual rooms.

Economizer
An HVAC component that uses outside air to reduce the need for mechanical cooling. It allows a building's mechanical ventilation system to bring in outside air when the outside air's enthalpy is less than that of the supply air for cooling.

Energy Conservation Measure (ECM)
Any type of project conducted, or technology implemented, to reduce the consumption of energy in a building.

Energy Cost Index (ECI)
A representation of the energy usage costs at a facility relative to the size of the facility. Generally ECI is expressed in the units dollars per square foot ($/m²).

Energy Efficiency Ratio (EER)
A commonly used measurement for air conditioning equipment, often used with a seasonal energy efficiency ratio (SEER). The higher the EER number for an air conditioner, the more efficiently it will perform at high outdoor temperatures. See also Seasonal Energy Efficiency Ratio.

ENERGY STAR®
An EPA (Environmental Protection Agency) designation attached to a wide variety of energy-using products that meet or exceed EPA guidelines for energy-efficient performance above the standard government minimum levels.

Gallon per Minute (GPM)

The flow rate of water through a plumbing fixture.

Heating Seasonal Performance Factor (HSPF)
An efficiency factor equal to the total heating output of a central air conditioning heat pump in BTUs during its normal usage period for heating divided by the total electrical energy input in watt-hours during the same period. A heat pump with a high HSPF is more efficient than one with a low HSPF.

High Intensity Discharge Lamp (HID)
A type of electrical gas-discharge lamp which produces light by means of an electric arc between tungsten electrodes housed inside a translucent or transparent fused quartz or fused alumina arc tube.

Kilowatt (kW)
1,000 watts, where a watt is a unit of electrical power calculated as the rate of energy transfer equivalent to one ampere flowing under a potential difference of one volt. Ten 100-watt bulbs operating at full power would require 1 kW.

Kilowatt-Hour (kWh)
A measurement that appears on your electric bill to show your usage. One thousand watt-hours equal one kWh. A typical United States household uses approximately 27,022 kilowatt-hours of electricity per year. Ten 100-watt incandescent bulbs lit for one hour consume one kWh of energy.

Light-Emitting Diode (LED)
Semiconductor devices that produce visible light when an electrical current is passed through them. LED lamps are a type of solid state lighting, as are Organic Light–Emitting Diodes (OLEDs) and Light–Emitting Polymers (LEPs). LEDs use 75 percent less electricity than incandescent bulbs to produce the same amount of light and last 25,000-50,000 hours (25 to 50 times longer).

National Renewable Energy Laboratory (NREL)
The United States' primary laboratory for renewable energy and energy efficiency research and development. The National Renewable Energy Laboratory (NREL) is a government-owned, contractor-operated facility, and is funded through the U.S. Department of Energy (DOE).

Payback Period
A payback period, in the energy efficiency industry, is the ratio of the estimated total cost of a conservation measure divided by its annual financial savings. This figure is one way to determine whether a conservation measure is cost-effective. More sophisticated versions of this calculation may take interest rates and discount rates into account.

Preliminary Energy-Use Analysis (PEA)
A PEA includes an initial analysis of historical utility usage data, demand, and costs; development of an Energy Cost Index (ECI) and Energy Utilization Index (EUI); and a comparison of the facility and its metrics to similar facilities as available.

R-Value
A measure of a material’s resistance to heat flow. The higher the R-value, the better the insulation material’s ability to resist the flow of heat through it.

Savings to Investment Ratio (SIR)
The ratio of the present value (PV) of future savings to the current investment costs of an energy or water conservation measure.

Seasonal Energy Efficiency Ratio (SEER)
A commonly used measurement for air conditioning equipment, often used with an energy efficiency ratio. The higher the SEER, the more efficient an air conditioner is during average conditions. See also EER.

Site EUI
Site EUI expresses the buildings energy use in respect to only the energy that enters the facility at the utility meters.

Source EUI

Source EUI expresses the buildings energy use in respect to source energy. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses. By taking all energy use into account, the score provides a complete assessment of energy efficiency in a building. Source EUIs are derived from Source-Site Rations developed by EPA/Energy Star (reference material found here: https://portfoliomanager.energystar.gov/pdf/reference/Source%20Energy.pdf).

GigaJoule

A standard unit for measuring the energy in the natural gas one has used. The gigajoule is the industry standard, used by most gas utilities in Canada.

Watt (W)

A watt is the unit of electrical power that can cause one ampere of current to flow under an electrical potential difference of one volt. Electrical potential is like pressure in a water piping system.

5.1.1. Sustainergy Abbreviations

CL: Change Lamp ECM Code

MH: Metal Halide

CF: Compact Fluorescent

EXLED: Exit LED Fixture

RF: Replace Fixture

IA: Install Aerator

5.2. Lighting Schedules

Line Item	ECM Code	Floor	Area	Contr.	Usage hrs/wk	Fixt. / Area	Fixture Code	Watts / Fixt	Watts / Group	Lamps / Fixt	Watts / Lamp	kWh/Yr	Light Readings	Dimensions (LxWxH)	Notes
1	CF	1	Back changerooms	Occupancy Sensor (Wall)	70	7	F412T8(32)	59	413	2	32	1,503	-	-	N/A
2	CF	1	Back changerooms - Copy	Occupancy Sensor (Wall)	70	7	F412T8(32)	59	413	2	32	1,503	-	-	N/A
3	CF	1	Back changerooms - Copy	Occupancy Sensor (Wall)	70	7	F412T8(32)	59	413	2	32	1,503	-	-	N/A
4	CF	1	Back changerooms - Copy	Occupancy Sensor (Wall)	70	5	F412T8(32)	59	295	2	32	1,074	-	-	N/A
5	-	1	Back rink	Manual Switch	70	55	F426T5HO(54)	351	19,305	6	54	70,270	-	-	N/A
6	CF	1	Back rink	Manual Switch	70	16	F412T8(32)	59	944	2	32	3,436	-	-	N/A
7	-	1	Changeroom	Manual Switch	70	7	LED(40)	40	280	1	40	1,019	-	-	N/A
8	-	1	Changeroom - Copy	Manual Switch	70	7	LED(40)	40	280	1	40	1,019	-	-	N/A
9	-	1	Changeroom - Copy	Manual Switch	70	7	LED(40)	40	280	1	40	1,019	-	-	N/A
10	-	1	Changeroom - Copy	Manual Switch	70	7	LED(40)	40	280	1	40	1,019	-	-	N/A
11	-	1	Changeroom - Copy	Manual Switch	70	7	LED(40)	40	280	1	40	1,019	-	-	N/A
12	-	1	Changeroom - Copy	Manual Switch	70	7	LED(40)	40	280	1	40	1,019	-	-	N/A
13	-	1	Community room	Manual Switch	70	21	LED(20)	20	420	1	20	1,529	-	-	N/A
14	CF	1	Curling club	Occupancy Sensor (Wall)	70	46	F424T8(32)	112	5,152	4	32	18,753	-	-	N/A
15	-	1	Curling rink	Manual Switch	70	42	LED(100)	100	4,200	1	100	15,288	-	-	N/A

Line Item	ECM Code	Floor	Area	Contr.	Usage hrs/wk	Fixt. / Area	Fixture Code	Watts / Fixt	Watts / Group	Lamps / Fixt	Watts / Lamp	kWh/Yr	Light Readings	Dimensions (LxWxH)	Notes
16	-	1	Exterior, spray park	Photo Sensor (120v)	70	12	LED-WP(28)	28	336	1	28	1,223	-	-	N/A
17	CF	1	Exterior, spray park	Manual Switch	70	8	MH-HB(400)	458	3,664	1	400	13,337	-	-	N/A
18	-	1	Hallway	Manual Switch	70	24	LED(20)	20	480	1	20	1,747	-	-	N/A
19	-	1	Hallway	Manual Switch	70	9	LED(40)	40	360	1	40	1,310	-	-	N/A
20	-	1	Iceplant	Manual Switch	70	11	LED(20)	20	220	1	20	801	-	-	N/A
21	-	1	Lobby	Manual Switch	70	18	LED(20)	20	360	1	20	1,310	-	-	N/A
22	-	1	Main rink	Manual Switch	70	54	F426T5HO(54)	351	18,954	6	54	68,993	-	-	N/A
23	CF	1	Main rink	Manual Switch	70	46	F412T8(32)	59	2,714	2	32	9,879	-	-	N/A
24	CF	1	Mec 2	Manual Switch	70	2	F412T8(32)	59	118	2	32	430	-	-	N/A
25	CF	1	Mec 3	Manual Switch	70	2	F412T8(32)	59	118	2	32	430	-	-	N/A
26	-	1	Rockets room	Manual Switch	70	9	LED(20)	20	180	1	20	655	-	-	N/A
27	-	1	Shop	Manual Switch	70	18	LED(20)	20	360	1	20	1,310	-	-	N/A
28	CF	1	Shop	Manual Switch	70	15	F412T8(32)	59	885	2	32	3,221	-	-	N/A
29	-	1	Viewing area	Manual Switch	70	29	LED(20)	20	580	1	20	2,111	-	-	N/A
30	-	1	Washroom	Manual Switch	70	16	LED(20)	20	320	1	20	1,165	-	-	N/A
31	-	1	Washroom - Copy	Manual Switch	70	16	LED(20)	20	320	1	20	1,165	-	-	N/A
32	CF	1	Washrooms back rink	Manual Switch	70	3	F412T8(32)	59	177	2	32	644	-	-	N/A
33	CF	1	Washrooms back rink - Copy	Manual Switch	70	3	F412T8(32)	59	177	2	32	644	-	-	N/A

Line Item	ECM Code	Floor	Area	Contr.	Usage hrs/wk	Fixt. / Area	Fixture Code	Watts / Fixt	Watts / Group	Lamps / Fixt	Watts / Lamp	kWh/Yr	Light Readings	Dimensions (LxWxH)	Notes
34	CF	1	Zamboni mec	Manual Switch	70	2	F412T8(32)	59	118	2	32	430	-	-	Linear
35	CF	1	Zamboni room	Manual Switch	70	2	F424T8(32)	112	224	4	32	815	-	-	N/A
36	-	2	Curling club viewing	Manual Switch	70	15	CF-PAR(26)	26	390	1	26	1,420	-	-	N/A
37	-	2	Curling club viewing	Manual Switch	70	14	CF-PARS(100)	100	1,400	1	100	5,096	-	-	N/A
38	CF	2	Curling club viewing	Manual Switch	70	18	F424T8(32)	112	2,016	4	32	7,338	-	-	Troffers
39	-	2	Mec 1	Manual Switch	70	7	LED(20)	20	140	1	20	510	-	-	N/A
40	CF	2	Mec 1	Manual Switch	70	21	F412T8(32)	59	1,239	2	32	4,510	-	-	Wire wrap
41	CF	2	Mec 1	Manual Switch	70	2	F411T8(32)	35	70	1	32	255	-	-	N/A
42	CF	2	Mec 1	Manual Switch	70	1	F411T12m(40)	57	57	1	40	207	-	-	Linear
43	-	2	Storage	Manual Switch	70	7	LED(20)	20	140	1	20	510	-	-	N/A
44	-	2	Washroom	Manual Switch	70	6	LED(20)	20	120	1	20	437	-	-	N/A
45	-	2	Washroom - Copy	Manual Switch	70	6	LED(20)	20	120	1	20	437	-	-	N/A
											Total kWh	253,315			

In the above table, "N/A" represents not available while "-" represents not applicable.

5.3. DHW Schedules

Line Item	ECM Code	Equipment Type	Location	Tag	Quantity	Manufacturer	Model #	Serial #	Year Built	Input Capacity	Fuel Type	Storage Volume (gallon)	Thermal Efficiency (%)	Energy Factor	Set Point (°F)	Insulation R-Value	Notes
1	-	Storage	Mec 2	N/A	1	HTP, Inc.	Ph10080	010313d100319	2013	100000 Btu/H	Gas	80	0	0.00	120	0.00	Changerooms
2	-	Storage	Mec 2	N/A	1	HTP, Inc.	Ph10080	062413d1020828	2013	100000 Btu/H	Gas	80	0	0.00	125	0.00	N/A
3	-	Storage	Mec 2	N/A	1	HTP, Inc.	Phe130119	031714d1090891	0	130000 Btu/H	Gas	119	0	0.00	125	0.00	N/A
4	-	Storage	Zamboni mec	N/A	1	Heat Transfer Products	Ph199119	N/A	2019	199000 Btu/H	Gas	119	0	0.00	125	0.00	N/A
5	-	Storage	Zamboni mec	N/A	1	Heat Transfer Products	Ph199119	051419e1023960	2019	199000 Btu/H	Gas	119	0	0.00	125	0.00	N/A
6	-	Storage	Mec 3	N/A	1	HTP, Inc.	Ph10080	N/A	0	100000 Btu/H	Gas	80	0	0.00	125	0.00	N/A

In the above table, "N/A" represents not available while "-" represents not applicable.

5.4. Pump Schedules

Line Item	ECM Code	Loc.	Tag	Systems Served	Manu.	Mod. #	Ser. #	Yr	GPM	Head Press.	HP	RPM	Volts	Eff.	VFD Equip	Notes
1	-	Mec 1	Hot water	Hydronic Boiler System (1)	Nema	N/A	N/A	N/A	0.0	0.0	5.0	3,600.0	460.0	89.5%	Yes	N/A
2	-	Mec 1	Hot water	Hydronic Boiler System (1)	Nema	N/A	N/A	N/A	0.0	0.0	5.0	3,600.0	460.0	89.5%	Yes	N/A

Line Item	ECM Code	Loc.	Tag	Systems Served	Manu.	Mod. #	Ser. #	Yr	GPM	Head Press.	HP	RPM	Volts	Eff.	VFD Equip	Notes
3	-	Mec 1	heating Glycol	Hydronic Boiler System (1)	Optim	N/A	N/A	N/A	0.0	0.0	1.0	1,045.0	230.0	82.5%	Yes	N/A
4	-	Mec 1	Heating glycol	Hydronic Boiler System (1)	Optim	N/A	N/A	N/A	0.0	0.0	1.0	1,045.0	230.0	82.5%	Yes	N/A
5	-	Mec 1	Whirlpool	Hydronic Boiler System (1)	Pentsair	Xfk-20/022019	N/A	N/A	0.0	0.0	3.0	3,450.0	208.0	0.0%	Yes	N/A
6	-	Mec 1	Main pool	Hydronic Boiler System (1)	Baldor	Ejmm3312t	N/A	N/A	0.0	0.0	10.0	3,475.0	208.0	89.5%	Yes	N/A
7	-	Mec 1	Main pool	Hydronic Boiler System (1)	Baldor	Jmm2514t	N/A	N/A	0.0	0.0	20.0	3,525.0	460.0	89.5%	Yes	N/A
8	-	Mec 1	Kid pool	Hydronic Boiler System (1)	Pentair	Xk20/022019	N/A	N/A	0.0	0.0	5.0	3,450.0	208.0	0.0%	Yes	N/A
9	-	Iceplant	Cooling brine	Air-Cooled Chiller System (1)	Weg	N/A	N/A	N/A	900.0	62.7	15.0	1,765.0	460.0	90.0%	Yes	N/A
10	-	Iceplant	Cooling brine	Air-Cooled Chiller System (1)	Weg	N/A	N/A	N/A	900.0	62.7	15.0	1,765.0	460.0	90.0%	Yes	N/A
11	-	Iceplant	Cooling brine	Air-Cooled Chiller System (1)	Weg	N/A	N/A	N/A	900.0	62.7	15.0	1,765.0	460.0	90.0%	Yes	N/A

Line Item	ECM Code	Loc.	Tag	Systems Served	Manu.	Mod. #	Ser. #	Yr	GPM	Head Press.	HP	RPM	Volts	Eff.	VFD Equip	Notes
12	-	Iceplant	Heating glycol return	Air-Cooled Chiller System (1)	Weg	N/A	N/A	N/A	95.0	85.6	5.0	3,500.0	208.0	88.5%	Yes	N/A
13	-	Iceplant	Heating brine	Air-Cooled Chiller System (1)	Weg	N/A	N/A	N/A	120.0	41.0	3.0	1,765.0	208.0	88.5%	Yes	N/A
14	-	Iceplant	Pump (6)	Air-Cooled Chiller System (1)	Weg	N/A	N/A	N/A	120.0	41.0	3.0	1,765.0	208.0	88.5%	Yes	N/A
15	-	Exterior, spray park	Spraypark	Hydronic Boiler System (3)	Whisperflow	Wfk12	N/A	N/A	0.0	0.0	3.0	0.0	0.0	0.0%	No	N/A
16	-	Exterior, spray park	Spraypark	Hydronic Boiler System (3)	Nema	Ew 500	N/A	N/A	0.0	0.0	5.0	0.0	208.0	0.0%	No	N/A

In the above table, "N/A" represents not available while "-" represents not applicable.

5.5. Motor Schedules

Line Item	ECM Code	Loc.	Equip Served	Quantity	Manu.	Mod. #	Ser. #	Yr	HP	BHP	RPM	Fan Type	Volts	CFM	Eff.	VFD Equip
1	-	Roof	Packaged RTU (1) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
2	-	Roof	Packaged RTU (2) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
3	-	Roof	Packaged RTU (3) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
4	-	Roof	Packaged RTU (4) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No

Line Item	ECM Code	Loc.	Equip Served	Quantity	Manu.	Mod. #	Ser. #	Yr	HP	BHP	RPM	Fan Type	Volts	CFM	Eff.	VFD Equip
5	-	Mec 1	Air Handling Unit (1) - SF	1	N/A	N/A	N/A	1995	0	0.0	767.0	N/A	0.0	76,000.0	90.2	No
6	-	Mec 1	Air Handling Unit (2) - SF	1	N/A	N/A	N/A	1995	0	0.0	508.0	N/A	208.0	20,000.0	92.4	No
7	-	Mec 1	Air Handling Unit (2) - RF	1	N/A	Lm15	22802fr1	N/A	0	0.0	382.0	N/A	208.0	21,000.0	910.0	No
8	-	Storage	Unit Heater (1) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
9	-	Mec 2	Furnace (1)	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
10	-	Mec 2	Furnace (2)	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
11	-	Mec 3	Back rink changerooms	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
12	-	Shop	Shop furnave	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
13	-	Shop	Furnace (2)	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
14	-	Iceplant	Air-Cooled Chiller (1)	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
15	-	Iceplant	Unit Heater (1) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
16	-	Iceplant	Unit Heater (2) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No
17	-	Lobby	Unit Heater (1) - SF	1	N/A	N/A	N/A	N/A	0	0.0	0.0	N/A	0.0	0.0	0.0	No

In the above table, "N/A" represents not available while "-" represents not applicable.

5.6. HVAC Schedules

Line Item	ECM Code	Equip. Type	Loc.	Tag	System	Manu.	Mod. #	Ser. #	Yr Blt	Cool Cap.	Heating Cap.	Heat Fuel	Cool Eff.	Heat Eff.	Notes
1	-	Packaged RTU	Roof	Packaged RTU (1)	Packaged Rooftop Unit System (1)	Carrier Corp.	39akso14	2500f11922	N/A	-	-	-	-	-	N/A

Line Item	ECM Code	Equip. Type	Loc.	Tag	System	Manu.	Mod. #	Ser. #	Yr Blt	Cool Cap.	Heating Cap.	Heat Fuel	Cool Eff.	Heat Eff.	Notes
2	-	Packaged RTU	Roof	Packaged RTU (2)	Packaged Rooftop Unit System (2)	Lennox	Kgb074s4bh2y	5619d06156	N/A	68,000.0 Btu/H	-	-	11 EER	-	N/A
3	-	Packaged RTU	Roof	Packaged RTU (3)	Packaged Rooftop Unit System (2)	Lennox	Kga012s4bh4g	5616jo6471	N/A	69,000.0 Btu/H	-	-	11 EER	-	N/A
4	-	Packaged RTU	Roof	Packaged RTU (4)	Packaged Rooftop Unit System (3)	Engineered air	He20/0	N/A	N/A	-	217,800.0 Btu/H	Gas	-	86 %	N/A
5	-	Hydronic Boiler	Mec 1	Hydronic Boiler (1)	Hydronic Boiler System (1)	Raypak	H31826a	1606425427	N/A	-	-	Gas	-	82 %	N/A
6	-	Hydronic Boiler	Mec 1	Hydronic Boiler (1)	Hydronic Boiler System (1)	Raypak	H31826a	1606425427	N/A	-	-	Gas	-	82 %	N/A
7	-	Air Handling Unit	Mec 1	Air Handling Unit (1)	Constant Volume Air-Handling System (1)	Engineered air	Lm-6-c	22802-as-2	1995	-	-	-	-	-	N/A

Line Item	ECM Code	Equip. Type	Loc.	Tag	System	Manu.	Mod. #	Ser. #	Yr Blt	Cool Cap.	Heating Cap.	Heat Fuel	Cool Eff.	Heat Eff.	Notes
8	-	Air Handling Unit	Mec 1	Air Handling Unit (2)	Constant Volume Air-Handling System (2)	Engineered air	Lm-15-c	22802as1	1995	-	-	-	-	-	N/A
9	-	Unit Heater	Storage	Unit Heater (1)	Unit Heater System (1)	Reznor	Udap30	Bij79y2n15433	2009	-	30,000.0 Btu/H	-	-	82 %	N/A
10	-	Furnace	Mec 2	Furnace (1)	Furnace System (1)	Armstrong air	G1d91bu125d20d	11609l07467	2012	-	125,000.0 Btu/H	Gas	-	91 %	N/A
11	-	Furnace	Mec 2	Furnace (2)	Furnace System (1)	Armstrong air	G1d91bu125d20d	11609l07467	2012	-	125,000.0 Btu/H	Gas	-	91 %	N/A
12	-	Furnace	Mec 3	Back rink changerooms	Furnace System (2)	Carrier	58mcb140	N/A	N/A	-	131,100.0 Btu/H	Gas	-	92 %	N/A
13	-	Infrared Heater	Zamboni room	Infrared Heater (1)	Infrared Heater System (1)	N/A	N/A	N/A	N/A	-	-	-	-	0 %	N/A
14	-	Furnace	Shop	Shop furnave	Furnace System (3)	Armstrong air	G1d93bu67d12b	1610b16485	N/A	-	67,500.0 Btu/H	Gas	-	93 %	N/A
15	-	Furnace	Shop	Furnace (2)	Furnace System (3)	Armstrong air	G1d93bu67d12b	1610b16485	N/A	-	67,500.0 Btu/H	Gas	-	93 %	N/A
16	-	Air-Cooled Chiller	Iceplant	Air-Cooled Chiller (1)	Air-Cooled Chiller System (1)	Cimco	N/A	N/A	N/A	-	-	-	-	-	N/A

Line Item	ECM Code	Equip. Type	Loc.	Tag	System	Manu.	Mod. #	Ser. #	Yr Blt	Cool Cap.	Heating Cap.	Heat Fuel	Cool Eff.	Heat Eff.	Notes
17	-	Unit Heater	Iceplant	Unit Heater (1)	Unit Heater System (2)	Ouelett	596091	N/A	2017	-	15.0 kW	Electric	-	98 %	N/A
18	-	Unit Heater	Iceplant	Unit Heater (2)	Unit Heater System (2)	Ouelett	596091	N/A	2017	-	15.0 kW	Electric	-	98 %	N/A
19	-	Unit Heater	Lobby	Unit Heater (1)	Unit Heater System (3)	N/A	N/A	N/A	N/A	-	-	-	-	-	N/A

In the above table, "N/A" represents not available while "-" represents not applicable.

5.7. Fenestration Schedules

5.8. Plug Load Schedules

Line Item	ECM Code	Floor	Area	Appliance Category	Appliance Type	Appliance Details	Qty	Notes
1	-	2	Mec 1	Laundry Equipment	Residential Washing Machine	N/A	1	N/A
2	-	2	Mec 1	Laundry Equipment	Residential Clothes Dryer	N/A	1	N/A
3	-	2	Curling club viewing	Kitchen Equipment	Refrigerator	N/A	2	N/A
4	-	2	Curling club viewing	Other Equipment	Television	N/A	8	N/A

In the above table, "N/A" represents not available while "-" represents not applicable.

5.9. ECM Schedules

5.9.1. T12 Retrofits ECM Schedule

ECM 1	ECM 2	Floor	Area	Fixture	Qty	Prop. Fixture	Qty	WO	CO	PS	AT	DT	kWh Savings	Fixture Cost	Control Cost	Ballast Cost	Labor Cost	$ Savings	Simple Payback (years)
CF	-	2	Mec 1	F411T12m(40)	1	TLED411(18)	1	-	-	-	-	-	142	$48.25	$0.00	$0.00	$70.00	$18.87	6.268
												Totals	142					$18.87	6.268

5.9.2. T8 Retrofits ECM Schedule

ECM 1	ECM 2	Floor	Area	Fixture	Qty	Prop. Fixture	Qty	WO	CO	PS	AT	DT	kWh Savings	Fixture Cost	Control Cost	Ballast Cost	Labor Cost	$ Savings	Simple Payback (years)
CF	-	1	Back changerooms	F412T8(32)	7	TLED412(18)	7	-	-	-	-	-	586	$233.24	$0.00	$0.00	$490.00	$77.89	9.286
CF	-	1	Back changerooms - Copy	F412T8(32)	7	TLED412(18)	7	-	-	-	-	-	586	$233.24	$0.00	$0.00	$490.00	$77.89	9.286
CF	-	1	Back changerooms - Copy	F412T8(32)	7	TLED412(18)	7	-	-	-	-	-	586	$233.24	$0.00	$0.00	$490.00	$77.89	9.286
CF	-	1	Back changerooms - Copy	F412T8(32)	5	TLED412(18)	5	-	-	-	-	-	419	$166.60	$0.00	$0.00	$350.00	$55.63	9.286
CF	-	1	Back rink	F412T8(32)	16	TLED412(18)	16	-	-	-	-	-	1,340	$533.12	$0.00	$0.00	$1,120.00	$178.03	9.286
CF	-	1	Curling club	F424T8(32)	46	TLED424(18)	46	-	-	-	-	-	6,698	$3,056.24	$0.00	$0.00	$3,220.00	$890.14	7.051
CF	-	1	Main rink	F412T8(32)	46	TLED412(18)	46	-	-	-	-	-	3,851	$1,532.72	$0.00	$0.00	$3,220.00	$511.83	9.286
CF	-	1	Mec 2	F412T8(32)	2	TLED412(18)	2	-	-	-	-	-	167	$66.64	$0.00	$0.00	$140.00	$22.25	9.286
CF	-	1	Mec 3	F412T8(32)	2	TLED412(18)	2	-	-	-	-	-	167	$66.64	$0.00	$0.00	$140.00	$22.25	9.286

ECM 1	ECM 2	Floor	Area	Fixture	Qty	Prop. Fixture	Qty	WO	CO	PS	AT	DT	kWh Savings	Fixture Cost	Control Cost	Ballast Cost	Labor Cost	$ Savings	Simple Payback (years)
CF	-	1	Shop	F412T8(32)	15	TLED412(18)	15	-	-	-	-	-	1,256	$499.80	$0.00	$0.00	$1,050.00	$166.90	9.286
CF	-	1	Washrooms back rink	F412T8(32)	3	TLED412(18)	3	-	-	-	-	-	251	$99.96	$0.00	$0.00	$210.00	$33.38	9.286
CF	-	1	Washrooms back rink - Copy	F412T8(32)	3	TLED412(18)	3	-	-	-	-	-	251	$99.96	$0.00	$0.00	$210.00	$33.38	9.286
CF	-	1	Zamboni mec	F412T8(32)	2	TLED412(18)	2	-	-	-	-	-	167	$66.64	$0.00	$0.00	$140.00	$22.25	9.286
CF	-	1	Zamboni room	F424T8(32)	2	TLED424(18)	2	-	-	-	-	-	291	$132.88	$0.00	$0.00	$140.00	$38.70	7.051
CF	-	2	Curling club viewing	F424T8(32)	18	TLED424(18)	18	-	-	-	-	-	2,621	$1,195.92	$0.00	$0.00	$1,260.00	$348.32	7.051
CF	-	2	Mec 1	F412T8(32)	21	TLED412(18)	21	-	-	-	-	-	1,758	$699.72	$0.00	$0.00	$1,470.00	$233.66	9.286
CF	-	2	Mec 1	F411T8(32)	2	TLED411(18)	2	-	-	-	-	-	124	$96.50	$0.00	$0.00	$140.00	$16.45	14.378
												Totals	21,119					$2,806.85	8.299

5.9.3. HID Retrofits ECM Schedule

ECM 1	ECM 2	Floor	Area	Fixture	Qty	Prop. Fixture	Qty	WO	CO	PS	AT	DT	kWh Savings	Fixture Cost	Control Cost	Ballast Cost	Labor Cost	$ Savings	Simple Payback (years)
CF	-	1	Exterior, spray park	MH-HB(400)	8	LED-PL(150)	8	-	-	-	-	-	8,969	$8,332.00	$0.00	$0.00	$1,240.00	$1,192.01	8.03
												Totals	8,969					$1,192.01	8.45

5.10. Photo Gallery



Roof - Packaged RTU (1)



Roof - Packaged RTU (2)



Roof - Packaged RTU (2)



Roof - Packaged RTU (3)



Roof - Packaged RTU (4)



Mec 1 - Air Handling Unit (1)



Mec 1 - Air Handling Unit (2)



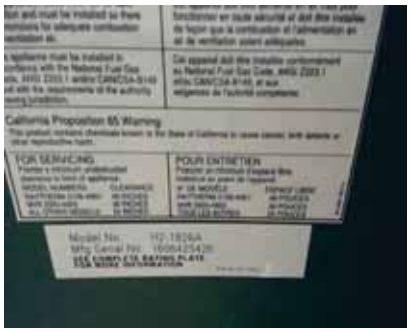
Mec 1 - Air Handling Unit (2)



Mec 1 - Hydronic Boiler (1)



Mec 1 - Hydronic Boiler (1)



Mec 1 - Hydronic Boiler (1)



Mec 1 - Hydronic Boiler (1)



Mec 1 - Hot water



Mec 1 - Hot water



Mec 1 - Hot water



Mec 1 - heating Glycol



Mec 1 - heating Glycol



Mec 1 - Whirlpool



Mec 1 - Main pool



Mec 1 - Main pool



Mec 1 - Kid pool



Mec 1



Mec 1



Mec 1



Mec 1 - Residential Washing Machine



Mec 1



Mec 1 - LED(20)



Mec 1



Main rink - F426T5HO(54)



Mec 2 - Furnace (1)



Mec 2 - Furnace (2)



Mec 2 - Storage



Mec 2 - Storage



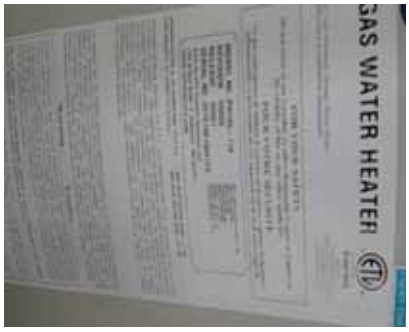
Mec 2 - Storage



Rockets room - LED(20)



Hallway - LED(40)



Zamboni mec - Storage



Zamboni mec - Storage



Mec 3 - Back rink changerooms



Mec 3 - Back rink changerooms



Mec 3 - Storage



Zamboni room - F424T8(32)



Shop - Shop furnave



Shop - Furnace (2)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Air-Cooled Chiller (1)



Iceplant - Cooling brine



Iceplant - Cooling brine



Iceplant - Cooling brine



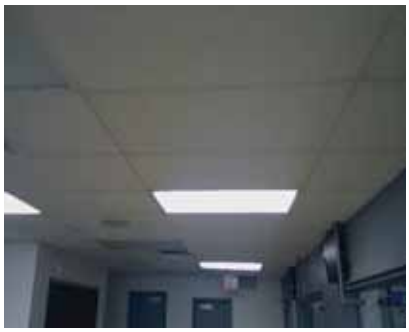
Iceplant - Heating glycol return



Iceplant - Heating brine



Iceplant - Pump (6)



Curling club



Lobby - Unit Heater (1)



Lobby - Unit Heater (1)



Exterior, spray park - Spraypark



Exterior, spray park - Spraypark



Exterior, spray park - Spraypark



Exterior, spray park - Spraypark



Exterior, spray park



Exterior, spray park



Exterior, spray park



Lacombe

ALBERTA
MUNICIPAL AFFAIRS
Office of the Minister
MLA, Edmonton-South West

AR100068

June 10, 2020

His Worship Grant Creasey
Mayor
City of Lacombe
5432 - 56 Avenue
Lacombe AB T4L 1E9

Dear Mayor Creasey,

In these extraordinarily difficult times, Alberta remains committed to working with the federal government to ensure infrastructure funding continues to flow to Alberta communities. Recognizing the urgency for local government funding and the critical role of communities in the relaunch of the economy, the federal government has recently confirmed that $244 million will be provided to our province in 2020 under the Gas Tax Fund (GTF).

The 2020 GTF allocation for the City of Lacombe is $799,966.

GTF funding amounts for all municipalities and Metis Settlements are also posted on the Government of Alberta website at open.alberta.ca/publications/gas-tax-fund-allocations.

Please note that payment of 2020 GTF allocations to municipalities and Metis Settlements is subject to the same conditions as in prior years, including submission of year-end reporting and sufficient project commitment requirements.

I look forward to continuing to work together with you and the federal government to help your community safely restart and stabilize your economy.

Yours very truly,

Kaycee Madu, QC
Minister

cc: Matthew Goudy, Chief Administrative Officer, City of Lacombe

132 Legislature Building, 10800 - 97 Avenue, Edmonton, Alberta T5K 2B6 Canada Telephone 780-427-3744 Fax 780-422-9550

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PARKLAND REGIONAL LIBRARY

FINANCIAL STATEMENTS

DECEMBER 31, 2019

PARKLAND REGIONAL LIBRARY

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DECEMBER 31, 2019

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MANAGEMENT'S REPORT

To the Members of Parkland Regional Library:

Management is responsible for the preparation and presentation of the accompanying financial statements, including responsibility for significant accounting judgments and estimates in accordance with Canadian generally accepted accounting principles. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded and financial records are properly maintained to provide reliable information for the preparation of financial statements.

The elected board is composed entirely of neither management nor employees of the Library. The board has the responsibility of meeting with management and external auditors to discuss the internal controls over the financial reporting process, auditing matters and financial reporting issues. The board is responsible for recommending the appointment of the Library's external auditors.

MNP LLP, an independent firm of Chartered Professional Accountants, is appointed by the board to audit the financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the board and management to discuss their audit findings. The accompanying financial statements are the responsibility of the management of Parkland Regional Library.

Independent Auditor's Report

To the members of Parkland Regional Library:

Opinion

We have audited the financial statements of Parkland Regional Library (the "Library"), which comprise the statement of financial position as at December 31, 2019, and the statements of operations, accumulated operating surplus, changes in net financial assets, cash flows and remeasurement gains and losses for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Library as at December 31, 2019, and the results of its operations, its remeasurement gains and losses and its cash flows for the year then ended in accordance with Canadian public sector accounting standards.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Library in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other Matter

The financial statements of the Library for the year ended December 31, 2018 were audited by another public accounting firm who expressed an unmodified opinion statements on May 23, 2019.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian public sector accounting standards, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Library's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Library or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Library's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Library's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Library's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Library to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Lacombe, Alberta

May 28, 2020

Chartered Professional Accountants

MNP

PARKLAND REGIONAL LIBRARY
STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2019

	2019	2018
FINANCIAL ASSETS		
Cash and cash equivalents *(note 3)*	$ 3,139,666	$ 2,992,473
Accounts receivable	25,609	22,145
Long-term investments *(note 4)*	753,850	722,787
TOTAL FINANCIAL ASSETS	3,919,125	3,737,405
LIABILITIES		
Accounts payable and accruals *(note 5)*	$ 99,890	$ 97,523
Book allotment	15,983	20,362
Deferred revenue *(note 6)*	2,458,167	2,421,246
TOTAL LIABILITIES	2,574,040	2,539,131
NET FINANCIAL ASSETS	1,345,085	1,198,274
NON-FINANCIAL ASSETS		
Inventory for consumption	$ 9,263	$ 13,403
Prepaid expenses	88,791	147,914
Tangible capital assets *(schedule 1)*	139,911	613,013
Tangible capital assets held for sale (*schedule 1)*	435,922	-
TOTAL NON-FINANCIAL ASSETS	673,887	774,330
COMMITMENTS *(note 7)*		
SUBSEQUENT EVENTS *(note 8)*		
ACCUMULATED SURPLUS	2,018,972	1,972,604
ACCUMULATED SURPLUS CONSISTS OF:		
Accumulated operating surplus *(note 9)*	2,005,951	1,972,791
Accumulated remeasurement gain (loss) on long-term investments	13,021	(187)
	2,018,972	1,972,604

Approved by the Library Board:

Debra Smith
Chairman

Director

The accompanying notes are an integral part of these financial statements

PARKLAND REGIONAL LIBRARY
STATEMENT OF OPERATIONS
FOR THE YEAR ENDED DECEMBER 31, 2019

	Budget	2019	2018
REVENUE			
Book and supply outside sales	$ -	$ **135,969**	$ 143,275
Investment income	27,000	**33,037**	35,458
Member fees	1,801,371	**1,803,409**	1,772,955
Miscellaneous and donations	-	**1,480**	1,937
Provincial funding *(note 10)*	1,529,193	**1,575,249**	1,579,192
	3,357,564	**3,549,144**	3,532,817
EXPENSES			
Administration and utilities	$ 60,000	$ **58,103**	$ 59,193
Amortization	-	**56,170**	88,512
Audit	16,200	**14,900**	20,700
Books and supply outside purchases	-	**135,488**	143,082
Communications, marketing and advocacy	11,500	**35,059**	13,717
Continuing education	20,000	**14,349**	14,786
Dues, fees, and memberships	11,500	**11,066**	10,745
First Nations grant expense	59,357	**105,252**	73,957
Freight and postage reimbursement	13,500	**8,818**	14,752
Insurance	13,750	**16,380**	15,924
Investment fees	4,500	**4,176**	4,014
Library materials	361,237	**378,018**	377,980
Library service grant	428,738	**428,738**	428,738
Miscellaneous	800	**800**	800
Planned member technology purchases	65,504	**41,068**	79,715
Professional fees	-	**352**	1,074
Repairs and maintenance - building	51,500	**37,607**	46,453
Salaries and benefits	1,913,629	**1,709,370**	1,702,768
Supplies and stationary	55,000	**46,409**	43,102
Technology equipment and systems	178,849	**304,143**	212,632
Travel	12,000	**7,834**	9,065
Trustee	22,000	**32,087**	26,730
Vehicle	43,000	**44,259**	40,146
Workshops and advisory group	15,000	**14,562**	16,525
	3,357,564	**3,505,008**	3,445,110
Excess of revenue over expenses, before other expenses	-	**44,136**	87,707
OTHER EXPENSES			
Loss on investments	-	**(4,595)**	(1,522)
Loss on disposal of tangible capital assets	-	**(6,381)**	(3,361)
Excess of revenue over expenses	-	**33,160**	82,824
Accumulated surplus, beginning of year	1,972,791	**1,972,791**	1,889,967
Accumulated surplus, end of year *(Note 9)*	1,972,791	**2,005,951**	1,972,791

PARKLAND REGIONAL LIBRARY
STATEMENT OF CHANGES IN NET FINANCIAL ASSETS
FOR THE YEAR ENDED DECEMBER 31, 2019

	2019	2018
Excess of revenue over expenses	**$ 33,160**	$ 82,824
Acquisition of tangible capital assets	**(25,372)**	(86,775)
Amortization of tangible capital assets	**56,170**	88,512
Proceeds on disposal of tangible capital assets	**-**	5,000
Loss on disposal of tangible capital assets	**6,381**	3,361
Change in prepaid expenses	**59,124**	(49,384)
Change in inventory for consumption	**4,140**	(1,380)
Change in accumulated remeasurement gain (loss) on long-term investments	**13,208**	(8,005)
Increase in net financial assets	**146,811**	34,153
Net financial assets, beginning of year	**1,198,274**	1,164,121
Net financial assets, end of year	**1,345,085**	1,198,274

PARKLAND REGIONAL LIBRARY
STATEMENT OF CASH FLOWS
FOR THE YEAR ENDED DECEMBER 31, 2019

	2019	2018
OPERATING ACTIVITIES		
Cash receipts from membership fees, contracts, and sales	$ 1,938,761	$ 1,940,856
Cash receipts from grants	1,565,223	1,589,218
Investment income received	84,663	78,359
Cash paid for materials and services	(1,253,460)	(1,313,129)
Cash paid for salaries and benefits	(1,709,947)	(1,704,121)
Cash paid for library service grant	(428,740)	(428,740)
Interest paid	(1,487)	(1,549)
	195,013	160,894
CAPITAL ACTIVITY		
Purchase of tangible capital assets	(25,372)	(86,775)
Proceeds on disposal of tangible capital assets	-	5,000
	(25,372)	(81,775)
INVESTING ACTIVITY		
Purchase of long-term investments	(96,449)	(107,281)
Proceeds on sale of long-term investments	74,000	85,072
	(22,449)	(22,209)
Net increase in cash	147,192	56,910
Cash and cash equivalents, beginning of year	2,992,473	2,935,563
Cash and cash equivalents, end of year	3,139,665	2,992,473

PARKLAND REGIONAL LIBRARY
STATEMENT OF CHANGES IN ACCUMULATED OPERATING SURPLUS
FOR THE YEAR ENDED DECEMBER 31, 2019

	Unrestricted (Note 9)	Reserves (Note 9)	Equity in Tangible Capital Assets (Note 9)	2019	2018
Balance, beginning of year	404,649	955,129	613,013	**$ 1,972,791**	$ 1,889,967
Excess (deficiency) of revenue over expenses	33,160	-	-	**33,160**	82,824
Reserves used for (transferred from) operations	(119,993)	119,993	-	**-**	-
Reserves used for tangible capital assets	-	(25,372)	25,372	**-**	-
Disposal of tangible capital assets	6,381	-	(6,381)	**-**	-
Annual amortization expense	56,170	-	(56,170)	**-**	-
Balance, end of year	380,367	1,049,750	575,834	**2,005,951**	**1,972,791**

The accompanying notes are an integral part of these financial statements

PARKLAND REGIONAL LIBRARY
STATEMENT OF REMEASUREMENT GAINS AND LOSSES
FOR THE YEAR ENDED DECEMBER 31, 2019

	2019	2018
Accumulated remeasurement gain (loss) on long-term investments, beginning of the year	**(187)**	$ 7,818
Increase (decrease) in market value	**13,208**	(8,005)
Accumulated remeasurement gain (loss) on long-term investments, end of year	**13,021**	(187)

PARKLAND REGIONAL LIBRARY
SCHEDULE OF TANGIBLE CAPITAL ASSETS
FOR THE YEAR ENDED DECEMBER 31, 2019
SCHEDULE 1

	Vehicles	Building - Held for sale *(1)*	Technology equipment and systems	Equipment	Furniture and fixtures	2019	2018
Original Cost:							
Balance, beginning of year	133,058	1,375,359	495,688	86,693	25,095	**2,115,893**	2,120,760
Acquisition of tangible capital assets	-	-	25,372	-	-	**25,372**	86,775
Disposals of tangible capital assets	-	-	(227,211)	(8,549)	(8,195)	**(243,955)**	(91,642)
Balance, end of year	133,058	1,375,359	293,849	78,144	16,900	**1,897,310**	2,115,893
Accumulated Amortization:							
Balance, beginning of year	66,956	939,437	415,760	56,969	23,758	**1,502,880**	1,497,649
Annual amortization	19,830	-	31,033	5,070	238	**56,170**	88,512
Disposals	-	-	(225,354)	(4,172)	(8,048)	**(237,574)**	(83,281)
Balance, end of year	86,786	939,437	221,439	57,867	15,948	**1,321,477**	1,502,880
Net Book Value	46,272	435,922	72,410	20,277	952	**575,833**	613,013

(1) At year-end, there is a contract with Tricon for the sale of the existing building to occur after year-end (see note 8). As such, this building has been classified as held for sale and amortization has not been taken in the current year.

1. Nature of activities

Parkland Regional Library (the "Library") is an independent body established under the Alberta Libraries Act for the purpose of providing a variety of support services for the public libraries of rural Central Alberta.

The Library is exempt from tax pursuant to Section 149(1)(l) of the Income Tax Act of Canada.

2.Significant accounting policies

The financial statements have been prepared in accordance with Canadian Public Sector Accounting Standards ("PSAS") and include the following significant accounting policies:

Cash and cash equivalents

Balances with original maturities of less than 3 months are included in cash and cash equivalents. Marketable securities with prices quoted in an active market are measured at fair value while those that are not quoted in an active market are measured at cost less impairment.

Revenue recognition

Member fees are recognized as revenue when the services have been provided.

Provincial funding and grants that are externally restricted are recorded as deferred contributions if the terms of the funding create a liability. These funds are recognized as revenue in the year in which the related expenses are incurred and the terms of the funding are met. Unrestricted provincial funding and grants are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

All investment income is recognized when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Expenses

Expenses are recognized as they are incurred and measurable based upon receipt of goods or services and/or legal obligation to pay.

Non-financial assets

Non-financial assets are assets that are not available to discharge existing liabilities but held for use in Library operations. Such assets have useful lives extending beyond the current year and are not intended for sale in the normal course of Library operations. The change in non-financial assets during the year, together with the excess of revenue over expenses, provides the changes in net financial assets for the year. Non-financial assets consist of the following:

i. Inventory for consumption

Inventory of materials and supplies for consumption is recorded in the financial statements at lower of the cost of the specific item or replacement cost.

ii. Tangible capital assets

Tangible capital assets are recorded at cost, which includes all amounts that are directly attributable to acquisition, construction, development or betterment of the assets. Contributed tangible capital assets are recorded in the financial statements at fair market value at the time of contribution.

The cost less residual value, of the tangible capital assets are amortized on over the estimated useful life as follows:

	Method	***Rate***
Vehicles	declining balance	30%
Building	declining balance	4%
Technology equipment and systems	declining balance	30%
Furniture and fixtures	declining balance	20%
Equipment	declining balance	20%

A full year of amortization is calculated in the year of acquisition. No amortization is calculated in the year of disposal.

Tangible capital assets are tested for impairment whenever events or changes in circumstances indicate that their carrying amounts may not be fully recoverable. An impairment loss is recognized when and to the extent that management assesses the future useful life of an asset to be less than originally estimated.

2.Significant accounting policies *(continued from previous page)*

iii. Prepaid expenses
Expenses paid in advance where services have not been performed or materials have not been received.

Use of estimates
The preparation of financial statements in accordance with PSAS requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the statement of financial position date, and the reported amounts of revenue and expenses during the reporting period. Key components of the financial statements requiring management to make estimates include the provision for doubtful accounts in respect of receivables, the cost and net realizable value of inventories, employee benefit obligations, the useful lives of long-lived assets and the potential impairment of assets. Actual results could differ from these estimates.

These estimates and assumptions are reviewed periodically and, as adjustments become necessary, they are reported in excess of revenue over expenses in the periods in which they become known.

Long-term investment
Long-term investments are recorded at fair market value, based on quoted prices in an active market, including accrued interest. Unrealized changes in fair value are recognized in the statement of remeasurement gains and losses until they are realized, when they are transferred to the statement of operations.

Foreign currency translation
These financial statements have been presented in Canadian dollars, the principal currency of the Library's operations.

Transaction amounts denominated in foreign currencies are translated into their Canadian dollar equivalents at exchange rates prevailing at the transaction date. Carrying values of monetary assets and liabilities reflect the exchange rates at the balance sheet date. Gains and losses on translation or settlement are included in the determination of excess of revenue over expenditures for the current period.

Financial instruments
The Library measures its financial instruments initially at fair value and subsequently measures them at amortized cost, except for long-term investments which are measured at fair value.

Transaction costs related to financial instruments recorded at amortized cost are added to the carrying value of the instrument. Transaction costs related to financial instruments recorded at fair value are expensed as incurred.

Reserves for future expenditures
Reserves are determined at the discretion of the board to set aside funds for future operating and capital expenditures. Transfers to and/or from reserves are reflected as an adjustment within accumulated surplus.

3. Cash and cash equivalents

	2019	2018
Unrestricted	$ 681,597	$ 581,253
Building renovation and maintenance	2,458,068	2,411,220
Total Cash	3,139,665	2,992,473

Cash accounts bear interest at bank prime rate (3.95%) less a percentage based on balance held during the year. At year-end, the unrestricted cash balances bear interest at prime less 1.60% (2.35%) on $701,152 and prime less 1.90% (2.05%) on $2,842. The building account bears interest at prime less 1.55% (2.40%).

The building renovation and maintenance account is restricted for use in the maintenance, renovation or upgrade of the Library's current facilities (note 6).

4. Long-term investments

	2019	2018
Bonds (original cost of $737,927; 2018 - $720,358)	753,850	$ 722,787

Bonds bear interest at rates ranging from 2.10% to 4.20% and have maturity dates ranging from June 2020 to September 2029. Included in long-term investments is $2,902 (2018 - $2,590) of accrued interest.

5. Accounts payable and accruals

	2019	2018
Trade accounts payable and accruals	**31,656**	$ 38,235
Employee benefit obligations	**56,133**	51,007
Goods and Services Tax payable	**12,101**	8,281
	99,890	97,523

Included in trade accounts payable and accruals is a balance of $4,556 on ATB Financial Mastercards with a total credit limit of $15,000.

Employee benefit obligation consist of estimated sick leave benefits of $35,000 (2018 - $35,000) that accumulate but do not vest, as well as vacation and lieu time of $20,801 (2018 - $16,007) that employees have earned and deferred to future years.

6. Deferred Revenue

	2019	2018
Minister of Municipal Affairs building renovation and maintenance grant	$ **2,458,167**	$ 2,411,220
Minister of Municipal Affairs Voices of Amiskwaciy grant	**-**	10,026
	2,458,167	2,421,246

In 2017, the Library received $2,400,000 from the Government of Alberta for maintenance and renovation of the Library's current headquarters or update of its existing facilities. Interest income of $51,626 (2018 - $41,877) on the cash basis has also been deferred during the year. Expenditures of $4,679 (2018 - $0) occurred in the year.

In 2018, the Library received $10,000 plus interest from the Minister of Municipal Affairs as a culture grant. Expenditures of $10,026 (2018 - $0) occurred in the year.

7. Commitments

In 2018, the Library entered into a software license agreement from July 1, 2018 to December 31, 2023 in the amount of $85,000 per year, subject to inflation increases.

The Library has a 3 year commitment for TAL core products, of which they only have 1 year remaining. Estimated commitment is $26,439 subject to exchange rate changes.

8. Subsequent events

Subsequent to year-end, the Library entered into a contract to acquire a building for the purchase price of $4,522,179. A deposit was made in the amount of $2,500,000, and the remainder payable on completion.

Subsequent to year-end, the Library entered into a contract to sell their existing building for $1,975,001. As at year-end, the building was recorded as held for sale.

Subsequent to year end, the COVID-19 pandemic is causing significant financial market and social dislocation. The situation is dynamic with various cities and countries around the world responding in different ways to address the outbreak. The Library continues to monitor its operations and assess the impact COVID-19 will have on its business activities. The extent of the effect of the COVID-19 pandemic on the Library is uncertain.

9. Accumulated operating surplus

	2019	2018
Unrestricted operating fund	**380,367**	404,649
Internally restricted		
Operating reserves		
Technology	**357,712**	282,193
Building	**250,000**	250,000
Contingent liability	**50,000**	50,000
	657,712	582,193
Capital reserves		
Amortization	**221,864**	252,762
Vehicle	**120,174**	70,174
Equipment/furnishings replacement	**50,000**	50,000
	392,038	372,936
Total reserves	**1,049,750**	955,129
Equity in tangible capital assets	**575,834**	613,013
	2,005,951	1,972,791

10. Provincial Funding

	2019	2018
Government of Alberta - Municipal Affairs		
Operating grant	$ **990,830**	$ 990,830
Library Service grant	**428,738**	428,738
Provincial First Nations grant	**145,602**	109,624
Provincial one time grant - Voice of Maskwaciy	**10,079**	-
	1,575,249	1,529,192
Alberta Culture and Tourism		
Community Initiative Program (CIP)	**-**	50,000.00
	1,575,249	1,579,192

11. Local Authorities Pension Plan

Employees of the Library participate in the Local Authorities Pension Plan (LAPP), which is on of the plans covered by the Alberta Public Sector Pension Plans Act. The LAPP serves about 259,714 people and 420 employers. The LAPP is financed by employee and employer contributions and be earning investment earnings in the LAPP fund.

Contributions for current service are recorded as expenses in the year in which they become due.

The Library is required to make current service contributions to the LAPP of 9.39% of pensionable earnings up to the year's maximum pensionable earnings under the Canada Pension Plan, and 13.84% on pensionable earnings above that amount.

Total service contributions by the Library to the LAPP in 2019 were $121,142 (2018 - $121,019). Total current service contributions by employees of the Library to the LAPP in 2019 were $104,683 (2018 - $110,416).

As at December 31, 2018, the LAPP disclosed an actuarial surplus of $3.469 billion (2017 - $4.835 billion). LAPP has not yet disclosed the actuarial surplus or deficiency as at December 31, 2019.

12. Economic Dependence

The Library is dependent on funding from government grants to maintain its operations. In 2019, the Province of Alberta contributed $1,575,249 (2018 - $1,579,192) of revenue to the Library, equalling approximately 44% (2018 - 45%) of total revenue. If funding is not received, its operations would be significantly reduced.

13. Financial instruments

The Library, as part of its operations, carries a number of financial instruments. The financial instruments consist of cash and cash equivalents, accounts receivable, long-term investments, accounts payable and accruals, and book allotment. It is management's opinion that the Library is not exposed to a significant interest, currency, market, liquidity, or credit risks arising from these financial instruments except as otherwise disclosed.

Credit risk

The Library is exposed to credit risk as it grants credit to its members in the normal course of operations. The risk is mitigated by the fact that the receivables are from municipalities. The Library is exposed to credit risk as it has purchased bonds which are included in long-term investments. The risk is mitigated by the fact that the Library has only purchased bonds issued by the Federal or Provincial governments.

Accounts receivable from two municipalities in connection with trade receivables represents 46% of total accounts receivable at December 31, 2019. The Library believes that there is minimal risk associated with the collection of these amounts. The balance of accounts receivable is widely distributed among the remainder of the Libraries municipality and customer base.

Interest rate risk

Interest rate risk is the risk that the value of a financial instrument might be adversely affected by a change in the interest rates. Changes in market interest rates may have an effect on the cash flows associated with some financial assets and liabilities, known as cash flow risk, and on the fair value of other financial assets or liabilities known as price risk. In seeking to minimize the risks from interest rate fluctuations, the Library managers exposure through its normal operating and financing activities. The Library is exposed to interest rate price risk primarily through its fixed rate long-term investments and variable rate cash.

Market rate risk

The Library is exposed to market rate risk on its long-term investments due to changes in quoted market rates on investments.

14. Comparative figures

Certain comparative figures have been reclassified to conform with current year presentation.

15. Approval of financial statements

These financial statements were approved by the Library board on May 28, 2020.

LACOMBE POLICE COMMISSION
REGULAR MEETING MINUTES
Thursday, May 21, 2020

Attendees: Corey Gish, Chair
Judy Lucht, Vice-Chair (remote)
Reuben Konnik, City of Lacombe Councillor
Sonja Dykslag, Commission Member at Large
Elaine Willette-Larsen, Commission Member at Large
John Walker, Commission Member at Large

Others: Chief Lorne Blumhagen, Lacombe Police Service
Ross Pettibone, Secretary

Regrets: Diane Piche, Director of Corporate Services
Brad Pears, Public Complaint Director
Edith McKinlay, Commission Member at Large

1. CALL TO ORDER

Chair Gish called the meeting to order with one member attending remotely.

2. ADOPTION OF AGENDA

2.1 May 21, 2020 LPC Agenda. One labour item was added for discussion In Camera.

(20.33) **MOVED by** *Elaine Willette-Larsen* to adopt the agenda as amended.

CARRIED UNANIMOUSLY

3. ADOPTION OF MINUTES

3.1 April 16, 2020 Lacombe Police Commission meeting minutes.

(20.34) **MOVED by** *John Walker* to adopt the April 16, 2020 meeting minutes as printed.

CARRIED UNANIMOUSLY

3.2 Chair Gish would confirm filing of the performance assessment (letter).

4. PRESENTATIONS

N/A

5. REPORTS

5.1 *Chief of Police Monthly Report: April 1, 2020 – May 1, 2020

Chief Blumhagen provided the Commission with an overview of activities, statistical information, budget, and human resources. The following items from the above report were highlighted:

- No billing expected for the personal protective equipment related to COVID-19 acquired from the provincial emergency operations centre.
- N-95 masks and taser cartridges obtained from another police service will assist with LPS expenditures.
- Confirmed that LPS was COVID-compliant during traffic stops regarding PPE.
- LPS assisted another police service in executing multiple search warrants.
- New SRO vehicle slightly delayed at manufacturing plant.
- Further LPS members tested for COVID-19 with negative results.
- Backfilling ALERT position for 2021 to be discussed at a later meeting in relation to recruit training.

5.1a *School Resource Officer Report and Statistics (April)

N/A

5.2 *Budget Report to May 12

Chief Blumhagen reviewed the Actual vs. Budget report to May 12. Highlighted items included the council spring adjustments, provincial grant funding (received quarterly) still outstanding, a two-year cycle for cellular phone replacement, and annual liability insurance.

5.3 *Public Complaints Director Report (No complaints). Some personal information was discussed in Camera under Item 9.2. (*FOIP Section 17*)

5.4 Chair Report

Chair Gish provided her report on meetings with the LPS Chief, city administration, and responses to email.

5.5 Vice-Chair Report

Vice-Chair Lucht had nothing to report.

5.6 Council Rep. Report

Councillor Konnik provided his report on council business and discussed budget adjustments.

(20.35) **MOVED by** *John Walker* to accept reports (5.1/5.2/5.3/5.4/5.5/5.6) as information.

CARRIED UNANIMOUSLY

6. OLD BUSINESS

6.1 Follow-up from May 8 Budget Meeting

Commission members briefly discussed budgeting process going forwards for the Lacombe Police Commission.

7. NEW BUSINESS

7.1 Next Meeting Confirmation (June 18, 2020)

Commission members confirmed June 18, 2020 as the next meeting in City Hall Council Chambers.

7.2 Contract Review – LPS Chief

It was recommended that the Chief's contract be reviewed within 12 months of expiry, during the year after August 1 of 2021.

7.3 Nomination – LPS Chief

Following an overview of the nomination process, Commissioners discussed nomination as item 9.1 (*FOIP Section 17*).

8. INFORMATION

8.1 N/A

9. IN CAMERA

(20.36) **MOVED by** *Elaine Willette-Larsen* to enter In Camera at 10:05 a.m. for discussion of labour and legal items.

CARRIED UNANIMOUSLY

9.1 Labour (*FOIP Section 17*)
9.2 Legal (*FOIP Section 18*)
9.3 Labour (*FOIP Section 17*)

(20.37) **MOVED by** *Elaine Willette-Larsen* to return to Open Meeting at 10:33 a.m.

CARRIED UNANIMOUSLY

10. STANDING ITEMS

Commissioners reviewed the following standing items for information.

10.1 LPC Annual Work Plan – A preliminary LPC budget meeting would be held at 11:00 a.m. on June 18. Councillor Konnik will obtain input from the City.

10.2 Adjustments and Personnel
10.3 Human Resource Plan – preliminary recommendations /staffing numbers pending
10.4 Commissioner Succession Planning

11. ADJOURNMENT

(20.38) **MOVED** by *Sonja Dykslag* to adjourn the meeting at 10:49 a.m.

CARRIED UNANIMOUSLY

<Original Signed>

_____ _____

Chairperson Secretary

COUNCIL MEMBER'S REPORT

TO	Members of Council
FROM	Don Gullekson
SUBJECT	• Summary of meetings/events attended as a Council representative • Key issues raised and/or comments for Council's information
DATE OF REPORT	
ORGANIZATION	**KEY POINTS OF DISCUSSION AND/OR DECISIONS**
Farmers market	June 12/20 Worked the City booth at the first Farmer's market of the season. There was good crowd on our hottest day of the year so far. The response from citizens was very positive, with only a few minor concerns being brought forward regarding recycling, traffic and road construction.
MPC	June 17/20 MPC meeting, two items on the agenda including approving a discretionary use for a Medical & Health Services Clinic, and a side yard variance.

COUNCIL MEMBER'S REPORT

TO	Members of Council
FROM	Thalia Hibbs
SUBJECT	• Summary of meetings/events attended as a Council representative • Key issues raised and/or comments for Council's information
DATE OF REPORT	April 27, 2020 (*for the period February 19, 2020 to April 21, 2020)*
ORGANIZATION	**KEY POINTS OF DISCUSSION AND/OR DECISIONS**
MPC	February 19 – One item Home Occupation 2 (Yoga Studio) - APPROVED
COUNCIL	February 24 - Regular Council Meeting
LRWSC	February 26 – Waste Commission agenda items included: Annual Audit preparations, fire at Bentley Transfer Station (in compactor), Eckville Transfer Station break in (again), OH&S Inspection at Prentiss (positive), and new track loader arrived.
Community Event	March 6 – WCPS sponsored Poverty Simulation. Invitation to participate in an exercise that attempts to mimic challenges faced by those surviving on edge of economic viability. I really appreciated the opportunity to better see the world through a different lens.
COUNCIL	March 9 – Regular Council Meeting
MPC	March 18 – One item Demolition of Detached Dwelling (greater than 50 years old) - APPROVED
COUNCIL	March 23 – Regular Council Meeting
MPC	April 1 – One item Oversized Accessory Building (Shop) with variances - APPROVED
COUNCIL	April 14 – Regular Council Meeting

COUNCIL MEMBER'S REPORT

TO	Members of Council
FROM	Thalia Hibbs
SUBJECT	• Summary of meetings/events attended as a Council representative • Key issues raised and/or comments for Council's information
DATE OF REPORT	June 22, 2020 (*for the period April 22, 2020 to June 16, 2020)*
ORGANIZATION	**KEY POINTS OF DISCUSSION AND/OR DECISIONS**
COUNCIL	April 27 – Regular Council Meeting
COUNCIL	May 11 – Regular Council Meeting
MPC	May 20 – two items 1. Subdivision - Create 2 Highway Commercial (C4) Parcels and 1 Public Utility Lot (PU) – APPROVED 2. Subdivision – Create 4 Residential lots for 4-plex - APPROVED
COUNCIL	May 25 – Regular Council Meeting
COUNCIL	June 1 – Committee of the Whole
COUNCIL	June 8 – Regular Council Meeting
COUNCIL	June 15 – Regular Council Meeting (Solid Waste Audit). No significant changes outside of Wolf Creek Site. Largely the outcome is adopting efficiencies and improvements to current system. At the Wolf Creek Recycling Depot, the site will cease accepting yard and garden waste (i.e. wood, grass etc) in the new year and redirecting. Significant advocacy required to other levels of government and to the Waste Commission.

CITY OF LACOMBE

MINUTES OF COUNCIL MEETING 20-12

Minutes of the Regular Meeting of Council held on **June 15, 2020** in the Council Chambers of the City Administration Office.

Present:	Mayor Grant Creasey Deputy Mayor Jonathan Jacobson Councillor Don Gullekson Councillor Thalia Hibbs Councillor Cora Hoekstra Councillor Reuben Konnik Councillor Chris Ross
Staff Present:	Jordan Thompson, Acting CAO, Director of Operations and Planning Services Deven Kumar, Communications Coordinator Matthew Tomnuk, Computer and IS Technician Denise Bellabono, Acting Legislative Coordinator/Executive Support (remote)
Regrets	Matthew Goudy, Chief Administrative Officer Mauricio Reyes, Senior Finance Manager Deborah Juch, Director of Community Services Diane Piche, Director of Corporate Services
Media Present:	None

CALL TO ORDER – Regular Meeting of Council

Mayor Creasey called the meeting to order at 5: 00 p.m.

ADOPTION OF AGENDA

11/178.12 20MO
THAT the Monday June 15, 2020 regular meeting agenda be adopted as presented.
20-220

MOVED BY Councillor Konnik:

THAT the Monday June 15, 2020 regular meeting agenda be adopted as presented.

CARRIED UNANIMOUSLY

REQUESTS FOR DECISION

Solid Waste System Review

Jordan Thompson, Director of Operations and Planning Services, presented the results of the Solid Waste Review. The main objective was to benchmark value for service and develop a long-term plan that would be sustainable, fiscally responsible and include public engagement in the review. Administration highlighted from the review that the City's disposal cost per tonne is higher in comparison to other waste management authorities in the area, showing the City's utility rates to be the highest of six comparable municipalities. With no tipping fee charged from Lacombe Regional Waste Services Commission (LRWSC) to private haulers using Prentiss transfer station, this cost increases the City's disposal costs to approximately $1Million per year, causing increases to the City's residential utility rates. A review of this inequity would be needed in order to bring the solid waste rates closer to the average of its comparators. From the results there were thirteen recommendations, which were discussed in detail.

Councillor Ross entered Council Chambers at 5:15 p.m.

43/661.02 20MO
THAT Council direct administration recommend a utility rate structure to Council that ensures all benefiting sectors share in the LRWSC solid waste requisition costs.
20-221

MOVED BY Councillor Hibbs:

THAT Council direct administration recommend a utility rate structure to Council that ensures all benefiting sectors share in the LRWSC solid waste requisition costs.

CARRIED UNANIMOUSLY

43/661.03 20MO
THAT Council advocate the LRWSC conduct an audit of the current financial and operations model. The purpose of this audit is to review revenue and expenses, identify existing fees charged to private haulers, and identify whether their financial and operations model should be modified from a per capita model to a weight-based model.
20-222

MOVED BY Councillor Hoekstra:

THAT Council advocate the LRWSC conduct an audit of the current financial and operations model. The purpose of this audit is to review revenue and expenses, identify existing fees charged to private haulers, and identify whether their financial and operations model should be modified from a per capita model to a weight-based model.

CARRIED UNANIMOUSLY

43/661.04 20MO
THAT Council direct administration to advocate the LRWSC to permit diversionary credits for source separated yard and garden waste.
20-223

MOVED BY Councillor Hibbs:

THAT Council direct administration to advocate the LRWSC to permit diversionary credits for source separated yard and garden waste.

CARRIED UNANIMOUSLY

43/661.05 20MO
THAT Council approve the City to maintain operation of the Wolf Creek Recycle Depot improvements as outlined with the elimination of yard waste, grass and brush.
20-224

MOVED BY Councillor Konnik:

THAT Council approve the City to maintain operation of the Wolf Creek Recycle Depot improvements as outlined with the elimination of yard waste, grass and brush.

AGAINST:	FOR:
Councillor Hoekstra	Mayor Creasey
	Councillor Hibbs
	Councillor Gullekson
	Councillor Jacobson
	Councillor Konnik
	Councillor Ross

CARRIED

43/661.06 20MO
THAT Council approve the issuing of an RFP for Wolf Creek Recycle Depot Services and residential curbside pickup every 4 years, starting in 2021, to ensure the City is receiving fair market value for service and to provide an opportunity to reevaluate condition of the recycling market.
20-225

MOVED BY Councillor Jacobson:

THAT Council approve the issuing of an RFP for Wolf Creek Recycle Depot Services and residential curbside pickup every 4 years, starting in 2021, to ensure the City is receiving fair market value for service and to provide an opportunity to reevaluate condition of the recycling market.

AGAINST:	FOR:
Councillor Hoekstra	Councillor Ross
Mayor Creasey	Councillor Hibbs
Councillor Konnik	Councillor Gullekson
	Councillor Jacobson

CARRIED

43/661.07 20MO
THAT Council direct administration to review the Wolf Creek Recycle Depot cost sharing formula with the County prior to the next ICF update.
20-226

MOVED BY Councillor Konnik:

THAT Council direct administration to review the Wolf Creek Recycle Depot cost sharing formula with the County prior to the next ICF update.

CARRIED UNANIMOUSLY

43/661.08 20MO
THAT Council direct administration to update the utility bylaw to remove any references to curb side recycling and to restrict commercial businesses from dumping yard and brush at the Wolf Creek Recycle Depot.
20-227

MOVED BY Councillor Hoekstra:

THAT Council direct administration to update the utility bylaw to remove any references to curb-side recycling and to restrict commercial businesses from dumping yard and brush at the Wolf Creek Recycle Depot.

CARRIED UNANIMOUSLY

43/661.09 20MO
THAT Council continue to advocate for provincial and national solutions to incentivize

MOVED BY Councillor Konnik:

THAT Council continue to advocate for provincial and national solutions to incentivize recycling at the municipal level.

recycling at the municipal level.
20-228

CARRIED UNANIMOUSLY

43/661.10 20MO
THAT the City continues with the current communal lane bin system instituting roll out bins only in areas where communal lane bins are not feasible.
20-229

MOVED BY Councillor Konnik:

THAT the City continues with the current communal lane bin system instituting roll out bins only in areas where communal lane bins are not feasible.

CARRIED UNANIMOUSLY

43/661.11 20MO
THAT Council direct administration to expand the downtown cardboard collection program to industrial customers. DEFEATED
20-230

MOVED BY Councillor Hibbs:

THAT Council direct administration to expand the downtown cardboard collection program to industrial customers.

DEFEATED UNANIMOUSLY

43/661.12 20MO
THAT Council direct administration to optimize current garbage routes utilizing in-house forces starting in 2021.
20-231

MOVED BY Councillor Hibbs:

THAT Council direct administration to optimize current garbage routes utilizing in-house forces starting in 2021.

CARRIED UNANIMOUSLY

ITEMS FOR INFORMATION

1. Government of Alberta Memorandum: Seniors & Housing, June 5
2. PRL Board Talk - May 28 2020

11/173.15 20MO
THAT Council receive all reports and items as information
20-232

MOVED BY Councillor Hoekstra:

THAT Council receive all reports and items as information.

CARRIED UNANIMOUSLY

Councillor Konnik left council chambers at 7:07 P.M.

ADOPTION OF MINUTES

11/179.12 20MO
THAT the June 8, 2020 regular council meeting minutes be confirmed as amended to remove the name of the Open Forum presenter.
20-233

MOVED BY Councillor Gullekson:

THAT the June 8, 2020 regular council meeting minutes be accepted as amended to remove the name of the Open Forum presenter.

CARRIED UNANIMOUSLY

NOTICES OF MOTION

Any submitted Notices of Motion are dealt with at a subsequent regular meeting of Council per City of Lacombe Procedural Bylaw No. 370 Section 6.14(10).

ADJOURNMENT

11/177.40 20MO
Adjournment
20-234

MOVED BY Councillor Hoekstra

THAT the meeting be adjourned at 7:16 PM.

CARRIED UNANIMOUSLY

_____
Mayor

_____
Chief Administrative Officer

AGENDA

REGULAR MEETING AGENDA
Council of the City of Lacombe
Monday, June 22 2020 at 5:00 p.m.
in Council Chambers

Time	Agenda Item	Representative
5:00	**1. CALL TO ORDER**	
	2. ADOPTION OF AGENDA	
	2.1 Additions	
	2.2 Deletions	
	2.3 Reordering	
	3. PRESENTATIONS	
	3.1 N/A	.
	4. PUBLIC HEARINGS	
	4.1 N/A	
	5. REQUESTS FOR DECISION	
	5.1 Highway 2 Corridor Study	*Dir Thompson*
	5.2 Committee Review Report – Arts Endowment Committee	*Dir Juch*
	5.3 Committee Review Report – Lacombe Art Collection Committee	*Dir Juch*
	5.4 Committee Review Report – Lacombe & District Rikubetsu Friendship Soc.	*Dir Juch*
	5.5 Energy Audit – Gary Moe Auto Group Sportsplex	*Dir Juch*
	6. INFORMATION	
	6.1 Administrative Reports	
	6.1.a N/A	
	6.2 Council Mailbox	
	6.2.a Gov AB Letter: Gas Tax Fund allocation, June 10	
	6.2.b Parkland Regional Library Financial Statements, 2019	
	6.3 Commission, Board, Committee Reports and Minutes	
	6.3.a Lacombe Police Commission Minutes, May 21	*Clr. Konnik*
	6.4 Councillor Reports	
	6.4.a Mayor Creasey	

6.4.b Councillor Gullekson

6.4.c Councillor Ross

6.4.d Councillor Hoekstra

6.4.e Councillor Jacobson

6.4.f Councillor Hibbs

6.4.g Councillor Konnik

7. ADOPTION OF MINUTES

7.1 June 15, 2020 Regular Council Meeting Minutes

8. NOTICES OF MOTION

8.1 N/A

9. IN CAMERA

9.1 N/A

10. ADJOURNMENT

Next Meetings:

- Wednesday, June 24, 2020
  - Special Council Committee Meeting (In Camera): 1:00 p.m., Council Chambers
- Monday, July 13, 2020
  - Regular Council Meeting: 5:00 p.m., Council Chambers
- Monday, August 10, 2020
  - Regular Council Meeting: 5:00 p.m., Council Chambers
- Monday, August 17, 2020
  - Council Committee Meeting: 5:00 p.m., Council Chambers

REQUEST FOR COUNCIL DECISION

SUBJECT:	**Highway 2 Corridor Improvement Study - Final**
PREPARED BY:	**Jordan Thompson, Director of Operations and Planning**
PRESENTED BY:	**Jordan Thompson, Director of Operations and Planning**
DATE:	**June 22, 2020**

FILE: 38/914

PURPOSE:

To advise Council that Alberta Transportation (AT) has completed its study on the long-term improvement needs for the Highway 2 corridor. Administration received this final report in June 2020.

RECOMMENDED MOTION(S):

1. THAT Council accept this report as information.

RELATED PRIOR MOTION(S):

1. THAT Council direct Administration to prepare a letter to the Minister of Transportation requesting additional consultation with municipalities prior to the adoption of the draft recommendations of the Highway 2 Corridor Improvement Study, specifically as they relate to municipalities taking on full or partial responsibility for the planning and construction of provincial interchange improvements.

EXECUTIVE SUMMARY:

The corridor improvement plan (CIP) makes several long term recommendations for the improvement of Highway 2 to keep up with traffic growth in the region. Within 10 years the CIP recommends widening most of Highway 2 to 6 lanes, including around the City of Lacombe. This work requires upgrades to various bridges and interchanges to accommodate the additional lanes. In the long term (50+years), the highway needs to be widened again to 8 lanes to accommodate projected growth. However, the CIP recommends AT study the feasibility of constructing a bypass from south of Red Deer to north of Lacombe in advance, as it may be more advantageous than widening the highway again.

ANALYSIS:

The report, despite being high level, is comprehensive in its content. The following excerpts from the report are most relevant to the City of Lacombe:

- *Highway 2's National Highway function will ultimately migrate to, or be supported by, new route segments that bypass the congested sections north of Leduc, passing Red*

Deer and south of Airdrie. An entirely new Highway 2 corridor may ultimately be required beyond the study's 50-year planning horizon. However, the province's present objective is to extend the service life of the existing corridor for as long as possible.

- *Therefore, to sustain long-term regional growth and mobility, it is incumbent on the adjoining municipalities to work together in the planning, design and construction of off-highway connections, both road and transit, that are attractive to users, before an expanded Highway 2 fails.*

- *Highway 2 CIS does not emphasize specific funding scenarios. Priorities and funding outcomes will be determined in the future on a location-by-location basis*

- *Highway 2 CIS prepared an Implementation Plan that is strategic in nature, defining what form the solution-finding should take, and what options Alberta Transportation should pursue with its municipal partners, including management and operations, over the next approximately 50 years.*

- *The Province should establish five Growth Management Boards (GMBs) along the Highway 2 corridor. It is becoming increasingly urgent that the Highway 2 corridor connecting Calgary and Edmonton, and serving the almost 30 municipalities in between, be managed in a more comprehensive and deliberate fashion. A senior level authority is needed (supported by the three regional infrastructure, development and bridge groups) to engage the municipalities and jurisdictions and develop a consistent approach to reaching shared understandings of the implications of urban growth and development on the Highway 2 corridor, to encourage the protection and development of inter-municipal road and transit networks, and to oversee the integration of emerging transportation technologies with municipal systems.*

- *Alberta Transportation has established the following guidelines to determine when additional lanes should be provided on a divided highway:*
    - *Less than 31,000 vehicles per day (vpd): 4 lanes*
    - *31,000 – 50,000 vpd: 6 lanes*
    - *Over 50,000 vpd: 8 or more lanes*

From various sources in the CIP, Administration has found this addition information relevant to the City of Laocmbe:

- The Highway 2/12 interchange is the 10 highest in average number of collisions per year (20/year) along the Highway 2 corridor. When adjusted for traffic volumes this interchange is actually the 6th highest for collision rates along the corridor

- Between 2020-2030 Highway 2 needs to be 6 laned between 597 (Blackfalds) and Milton Road (north of Lacombe) along with much of the rest of the corridor – although the report highlights the greatest need will be around Red Deer.

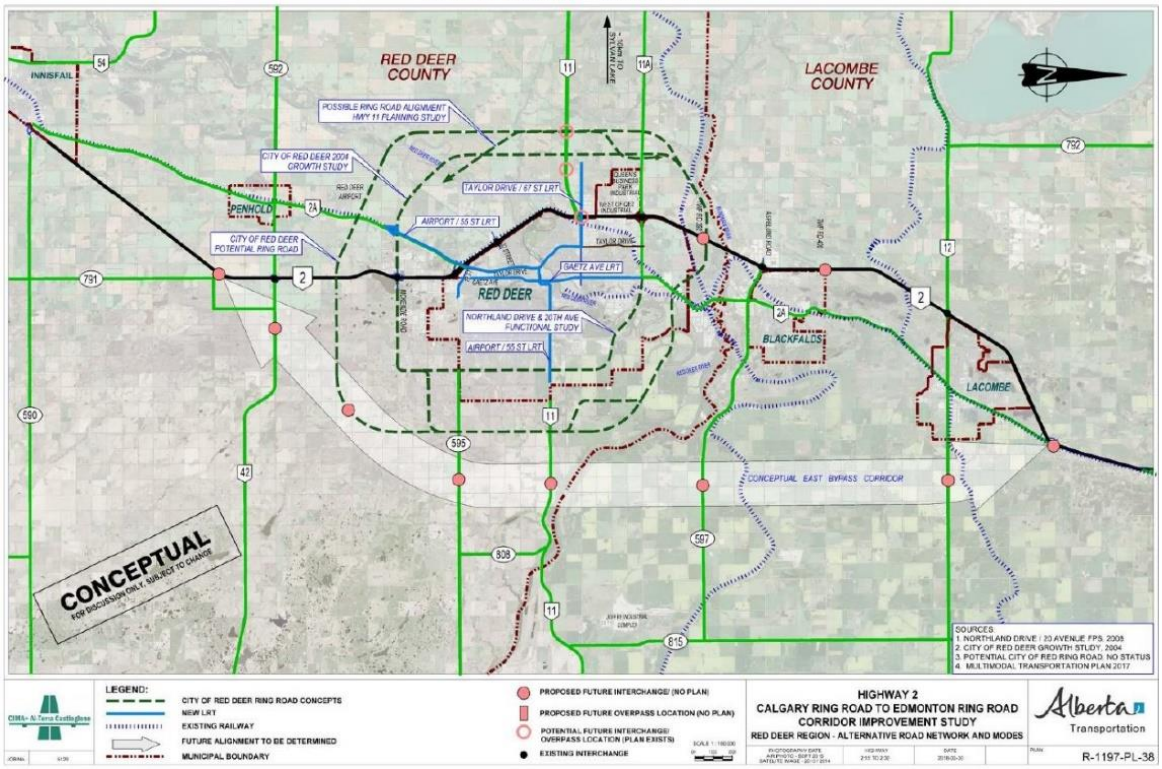
- Between 2040-2050 Highway 2 needs to be 8 laned and or a bypass constructed between 2060-2080.

- Highway 12 interchange upgrade is required in 10-25 years. It is recommended that long term planning for this interchange be conducted.
- The Highway 604 interchange upgrade is not required until beyond 25years.

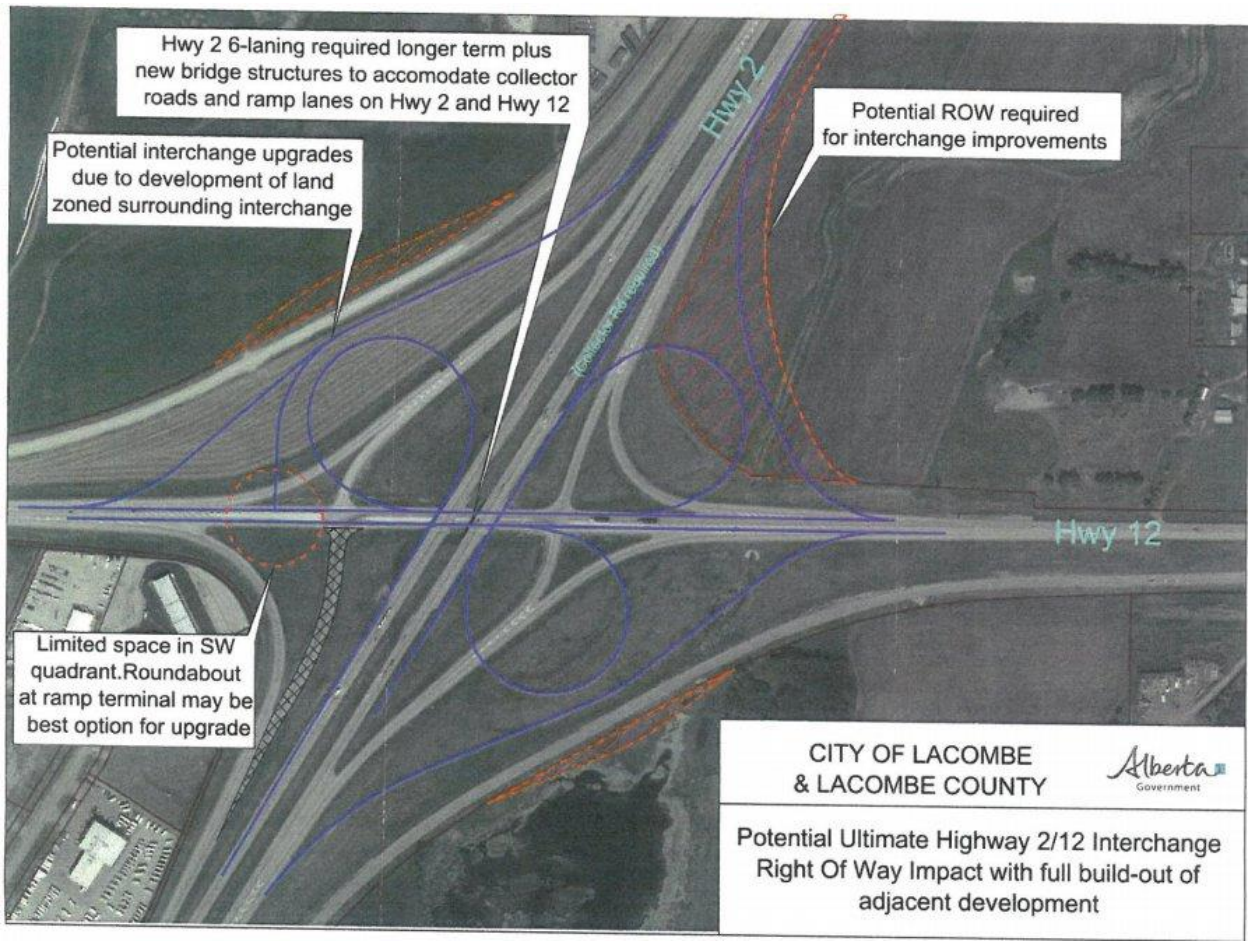
- 6 lane widening of Highway 2 including all bridge upgrades between Highway 11A and Morningside is estimated to cost $200M+

- The figures below depict the conceptual bypass route around Red Deer, Blackfalds and Lacombe.

Exhibit 4.3.4: Urban Areas Road Network – Red Deer



- The CIP indicates the Highway 2/12 interchange will be upgraded to a partial cloverleaf design in the future. There is no sketch in the report what this would look like but the sketch below was supplied to the City by AT in 2017. Note the potential ROW needs conflict with Midway Centre development. The Developer is aware of this conflict and has choosen, for now, to focussing on developing Phase 1 before addressing this conflict with AT with the development of future Phases.



Administration will await further information from the Province regarding the formation of the recommended regional Growth Management Boards.

STRATEGIC PLAN ALIGNMENT:

This report is presented to inform Council on the future plans for Highway 2 corridor and is not directly tied to a Strategic Goal.

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

No public engagement is planned.

ALTERNATIVE MOTION(S):

1. THAT Council accept this report as information.

2. THAT Council directs Administration how it wished to proceed.

ATTACHMENTS:

Highway 2 Corridor Improvement Study – Proposed Final Report May 14, 2018

REQUEST FOR COUNCIL DECISION

SUBJECT:	**Committee Review Report #1: The Arts Endowment Committee**
PREPARED BY:	**Deborah Juch, Director of Community Services**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 22, 2020**

FILE: 11/117

PURPOSE:

This Request for Decision (RFD) will provide Council with a list of proposed amendments to the Arts Endowment Committee following direction from the Council Committee of the Whole on June 1, 2020.

RECOMMENDED MOTION(S):

THAT Council resolves to cease appointing a Councillor member to the Arts Endowment Committee effective October 2020.

RELATED PRIOR MOTION(S):

EXECUTIVE SUMMARY:

On June 1, 2020 Council Committee of the Whole (Council) reviewed the *Council Committees Review Report #1* discussing the Arts Endowment Committee (the Committee). Council directed that the City implement one of the three Review Report's options for amending the Committee, specifically, that Council cease appointing a Councillor member to the Art Endowment Committee effective October 2020.

Committee member feedback after the June 1 meeting (paraphrased) is that the members see important benefits stemming from the routine Councillor appointment and would like it continued. Administration's proposed resolution in this RFD aligns with Council's direction at the June 1 meeting.

ANALYSIS:

Background

The Arts Endowment Committee was one of three agencies reviewed in the *Committees Review Report #1* on June 1, 2020. (Click here for the full report.) The Review summarized the Committee's history, funding, City resourcing, and degree of public engagement provided by the Committee--which was found to be of the highest order with the Committee fully empowered by Council to make decisions regarding use of the proceeds from the City's Art Endowment Fund. The Review Report incorporated input from Committee members as

stakeholders, and concluded with five options for Council to amend the Committee with corresponding comments on the advisability of each. Council chose one of the options, to cease appointing a Councillor member to the Arts Endowment Committee effective October 2020.

Additional Stakeholder Input

After the meeting, Administration provided a list of Council's direction on the amendment options as well as a link to the meeting livestream, to the Committee membership for feedback. To summarize, the Art Endowment Committee feedback related to Council's chosen amendment shows that the members:

- Were of the opinion that a regular Council appointment should continue, with rationale such as:
    - "I think it's important to assign a Councillor...[t]heir connections to the community can be very beneficial to fundraising and education about the Endowment Fund."
    - "…often the Counsellor's involvement in our discussion can be very enlightening and bring a different point of view…."

Service Level Impacts

None anticipated.

Financial Implications

None anticipated.

Legislative Implications

Organizational Meeting procedures will need to be amended to eliminate a Council appointment to the Committee.

STRATEGIC PLAN ALIGNMENT:

4.1 Sustainability – Governance

4.1.1 Open and Accessible Government:
Conduct a review of Council Committees
- City board and committee members understand their roles fulfill their mandates
- Standardized reporting and support structures for City Boards.

4.5.8 Encourage Volunteerism
Strongly support volunteerism
- The City recognizes and celebrates volunteers

- Advertise volunteerism partnering opportunities to build a growing sense of community
- Groups that require volunteers see the City as a partner

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Administration anticipates no additional public engagement or communications bulletins on this matter.

ALTERNATIVE MOTION(S):

1. THAT Council resolves to cease appointing a Councillor member to the Arts Endowment Committee effective October 2020; OR
2. THAT Council resolves to amend the Arts Endowment Committee by _____; OR
3. THAT Council accepts all of the recommendations in the Council Committees Review Report #1 for amending the Arts Endowment Committee as information.

ATTACHMENTS:

None.

REQUEST FOR COUNCIL DECISION

SUBJECT:	**Committee Review Report #1: The Lacombe Art Collection Committee**
PREPARED BY:	**Deborah Juch, Director of Community Services**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 22, 2020**

FILE: 11/117

PURPOSE:

This Request for Decision (RFD) will provide Council with a list of proposed amendments to the Lacombe Art Collection Committee following direction from the Council Committee of the Whole on June 1, 2020.

RECOMMENDED MOTION(S):

1. THAT Council directs Administration to consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy; AND
2. THAT Council resolves to cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2020; AND
3. THAT Council directs Administration to develop updated Terms of Reference for the Lacombe Art Collection Committee to provide for a project-specific Council appointment when project procurement is valued at $75,000 or higher.

RELATED PRIOR MOTION(S):

EXECUTIVE SUMMARY:

On June 1, 2020 Council Committee of the Whole (Council) reviewed the *Council Committees Review Report #1* discussing the Lacombe Art Collection Committee (the Committee). Council directed that the City implement three of the Review Report's options for amending the Committee, specifically:

1. That the City consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy;
2. That Council cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2020;
3. That Administration develop an updated Committee terms of reference (TOR) including a temporary Councillor appointment when art procurement projects reach a specific threshold value.

Committee member feedback after the June 1 meeting (paraphrased) is that the members see great value from the routine Councillor appointment and would like it continued; they also support the other two options chosen. In this RFD, Administration proposes resolutions

aligning with Council's direction at the June 1 meeting, suggesting a TOR project value threshold of $75,000 to align with the City's Purchasing Policy.

ANALYSIS:

Background

The Lacombe Art Collection Committee was one of three agencies reviewed in the *Committees Review Report #1* on June 1, 2020. (Click here for the full report.) The Review summarized the Committee's history, funding, City resourcing, and degree of public engagement provided by the Committee--which was found to be of the highest order as the Committee is fully empowered by Council to effect the City's art collection and public art exhibition decision-making. The Review Report incorporated input from Committee members as stakeholders, and concluded with five options for Council to amend the Committee with corresponding comments on the advisability of each.

Following the review, Council directed Administration to effect three of the amendment options:

- That the City consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy;
- That Council cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2020; and
- That Administration develop an updated Committee terms of reference (TOR) including a temporary Councillor appointment when art procurement projects reach a specific threshold value.

Administration's recommended resolutions in this RFD align with Council's direction at the June 1 meeting, suggesting a project value threshold of $75,000 for the updated TOR, to align with the City's current Purchasing Policy 13/211/01 (2014) section 8e (see greater detail in Financial Implications, below).

Additional Stakeholder Input

After the meeting, Administration provided a list of Council's direction on the amendment options as well as a link to the meeting livestream, to the Committee membership for feedback. To summarize, the feedback that was related to Council's chosen amendments shows the members:

- Were of the opinion that a regular Council appointment should continue, with rationale such as:

- "It is helpful to have the opinion of someone who isn't fully immersed in the arts on a daily basis" and
- "…[a] Councillor engaged in the activities of the committee provides valued direction from their unique perspective, which help[s] the Committee come to reasonable conclusions regarding the City's public art…
- I trust that the communication from the Committee back to Council is clear and direct; without a Councillor or the Committee…the line of communication would be broken."

- Were otherwise supportive of updating the policies and the terms of reference: "…with all committees, ongoing review and refinement are necessary to provide direction and accountability...."

Service Level Impacts

None anticipated.

Financial Implications

Section 8e of the City's current Purchasing Policy 13/211/01 (2014) provides for Administrative approval of purchases up to $75,000 without Council resolution, so long as the purchase does not involve a multi-year contract (i.e., is not binding on Council's future budgetary discretion). This policy threshold coincides with Committee experience that while many public art procurement projects are high value, only a few are as high as or higher than $75,000, indicating that this amount may be an appropriate threshold trigger for special Councilor appointment.

Legislative Implications

Organizational Meeting procedures will need to be amended to eliminate a Council appointment to the Committee.

STRATEGIC PLAN ALIGNMENT:

4.1 Sustainability – Governance

4.1.1 Open and Accessible Government:
Conduct a review of Council Committees
- City board and committee members understand their roles fulfill their mandates
- Standardized reporting and support structures for City Boards.

4.5.8 Encourage Volunteerism
Strongly support volunteerism

- The City recognizes and celebrates volunteers
- Advertise volunteerism partnering opportunities to build a growing sense of community
- Groups that require volunteers see the City as a partner

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Administration anticipates engaging in no additional public engagement or issuing further communications on this matter, but to return the policy and terms of reference updates to a future public Council meeting.

ALTERNATIVE MOTION(S):

1. THAT Council directs Administration to consolidate and update the three existing art policies (Art Exhibition in Public Spaces, Public Art Collection, and Percent for Art) into a new single Art Development Policy; AND
2. THAT Council resolves to cease appointing a Councillor member to the Lacombe Art Collection Committee effective October 2021; AND
3. THAT Council directs Administration to develop updated Terms of Reference for the Lacombe Art Collection Committee to provide for a project-specific Council appointment when project procurement is valued at $75,000 or higher;

OR

4. THAT Council resolves to _____ and accepts the remaining recommendations for amending the Lacombe Art Collection Committee as information;

OR

5. THAT Council accepts all the recommendations for amending the Lacombe Art Collection Committee as information.

ATTACHMENTS:

None.

REQUEST FOR COUNCIL DECISION

SUBJECT:	**Committee Review Report #1: Rikubetsu Friendship Society**
PREPARED BY:	**Deborah Juch, Director of Community Services**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 22, 2020**

FILE: 11/117

PURPOSE:

This Request for Decision (RFD) will provide Council with a list of proposed amendments to the City's working relationship with the Lacombe & District Rikubetsu Friendship Society (the Society) following direction from the Council Committee of the Whole on June 1, 2020.

RECOMMENDED MOTION(S):

1. THAT Council directs Administration to increase the City's in-kind support of the Rikubetsu Friendship Society by assigning a second manager liaison and by hosting a dedicated webpage for the Society within the City's website; AND
2. THAT Council resolves to cease appointing a Councillor liaison to the Rikubetsu Friendship Society, effective October 26, 2020.

RELATED PRIOR MOTION(S):

EXECUTIVE SUMMARY:

On June 1, 2020 Council Committee of the Whole reviewed the Council Committees Review Report #1, discussing the Lacombe & District Rikubetsu Friendship Society. The Committee recommended the City make two resolutions to amend the City's working relationship with the Society. First, increase in-kind support by a) hosting a webpage for the twinning agreement, and b) increasing the administrative liaison; and second, cease appointing a Councillor liaison to the Society effective at the October 2020 Organizational Meeting. The Committee also directed Administration to return the matter to Council after effecting the recommendations for 18 months minimum. The Society's feedback on the Committee discussion indicates they favour and look forward to assisting the increased in-kind support; they did not comment on the Councillor Liaison question. Administration has drafted resolutions in this RFD aligning with the Committee's direction.

ANALYSIS:

Background

The Lacombe & District Rikubetsu Friendship Society was one of three agencies reviewed in the Committees Review Report #1. (Click here for the full Review Report #1). The review summarized the City's and Society's partnership in the areas of history, funding, administrative

support, Councillor appointment, in-kind contributions, etc., finding the Society was "empowered" as well as supported by the City to effect the service of steering the City's twinning relationship with the Town of Rikubetsu. The report incorporated results of a survey of the Society, as stakeholder input. Finally, the report provided the Council Committee of the Whole with options to amend the City's relationship with Society, with comment on the advisability of the options.

The Committee recommended the City make two amendments to the relationship: firstly, to increase in-kind support by a) hosting a webpage for the twinning agreement, and b) increasing the administrative liaison; and secondly to cease appointing a Councillor liaison to the Society effective at the October 2020 Organizational Meeting. The Committee also directed Administration to return the matter to Council with more information after effecting the recommendations for 18 months minimum, potentially with public input.

Stakeholder Input

After the meeting, Administration provided a list of action items as well as a link to the meeting livestream, to the Society Chairperson for membership feedback on the review results. To summarize, the Society:

- were unanimous in agreeing that the Twinning Agreement should continue
- were supportive and look forward to helping formulate a webpage to include in the City 's website
- were "…happy for the extra resourcing and input [for] the various tasks involved in promoting…the cultural exchange and benefits to the community"

The feedback did not comment on the Councillor liaison issue.

Service Level Impacts

Adding to the in-kind support to the Rikubetsu Society with a webpage, related promotions, and increased administrative liaison will increase the City's service level in the cultural programming area to a small degree.

Financial Implications

None anticipated.

Legislative Implications

- Organizational Meeting amendments to eliminate a Council appointment to the Society.

- The Twinning Agreement will experience no impacts from any of the recommendations in this report.
- Organizational Capacity will be utilized to some degree, but Administration feels the impact is feasible.
- Administration will further research area comparator municipalities for strategies to promote the activities of the Japanese twinning agreement steering committee / staff: an example is the webpage and programming of the Town of Stony Plain

STRATEGIC PLAN ALIGNMENT:

4.1 Sustainability – Governance

4.1.1 Open and Accessible Government:

Conduct a review of Council Committees

- City board and committee members understand their roles fulfill their mandates
- Standardized reporting and support structures for City Boards.

4.5.8 Encourage Volunteerism

Strongly support volunteerism

- The City recognizes and celebrates volunteers
- Advertise volunteerism partnering opportunities to build a growing sense of community
- Groups that require volunteers see the City as a partner

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Administration anticipates engaging in no additional public engagement or issuing further communications on this matter, until such time as the resolutions have been implemented for at least 18 months.

ALTERNATIVE MOTION(S):

1. THAT Council directs Administration to increase the City's in-kind support of the Rikubetsu Friendship Society by assigning a second manager liaison and by hosting a dedicated webpage for the Society within the City's website; AND

2. THAT Council resolves to no longer appoint a Councillor liaison to the Rikubetsu Friendship Society, effective October 2020; OR

3. THAT Council resolves (1 or 2, above) AND accepts the remaining proposed amendments to the City's working relationship with the Rikubetsu Friendship Society as information

4. THAT Council accepts all of the proposed amendments to the City's working relationship with the Rikubetsu Friendship Society as information.

ATTACHMENTS:

None.

REQUEST FOR COUNCIL DECISION

SUBJECT:	**Level 1 Energy Audit of the Gary Moe Auto Group Sportsplex**
PREPARED BY:	**Calvin Bennefield, Manager of Parks & Facilities Maintenance**
PRESENTED BY:	**Deborah Juch, Director of Community Services**
DATE:	**June 11, 2020**

FILE: 74/921

PURPOSE:
This request for decision is to inform Council of a Municipal Climate Change Action Centre (MCCAC) grant-funded energy audit of the Gary Moe Auto Group Sportsplex (GMAGS), which will form the basis of an engineering study and capital project proposals for rebate-qualifying retrofits.

RECOMMENDED MOTION(S):
THAT Council accepts the report on the SustainErgy Scoping Audit of the Gary Moe Auto Group Sportsplex as information, and directs Administration to continue with the MCCAC Recreation Energy Conservation Program.

RELATED PRIOR MOTION(S):
N/A

EXECUTIVE SUMMARY:
The City is participating in the Municipal Climate Change Action Centre (MCCAC)'s "Recreation Energy Conservation Program" which funds energy-efficiency retrofits to municipal recreation facilities for up to $750,000 in total grants. The City completed Step One of the program in 2019 by commissioning an Energy Scoping Audit ($10,000 grant funded) and is now awaiting grant approval to proceed with an engineering study to verify the audit findings.

The audit identified two types of energy conservation measures (ECMs) available in the Sportsplex: four low cost items which can be completed in-house with current operating funding; and five higher cost items that can be completed by contractors but which will require capital budget approval. The capital costs of the five items is $116,635, which are eligible for 75% rebates from MCCAC ($87,475) plus potential Lacombe County contributions against the remainder. The City will recover the net cost of the major item projects in under three years through reduced Sportsplex annual operating costs, and the lowered annual costs will continue for many years with the new equipment lifespans.

ANALYSIS:

Background

The City is participating in the Municipal Climate Change Action Centre (MCCAC)'s "Recreation Energy Conservation Program" which funds energy efficiency retrofits to municipal recreation facilities. The program issues grants for each of the three steps: scoping audit, engineering study, and retrofits, and municipalities can access up to $750,000 for all projects.

In late 2019, after a successful Expression of Interest submission, the City received a $10,000 grant from the program to do a scoping audit of the Gary Moe Auto Group Sportsplex (GMAGS). Administration engaged SustainErgy of Edmonton to determine the energy-conserving opportunities (report attached). Next steps in the MCCAC program will be:

1. Complete an Engineering Study: This study will verify the scoping audit analysis and recommendations. The City has applied for the grant to undertake this study, and the study will also form the basis for the department's 2021 capital project proposals if completed in time.
2. Implementation Projects: The City undertakes the recommended action items and applies for the rebates available after the work is completed. Energy Conservation Measures with a simple payback of less than one year without rebates are ineligible. Projects must have a total installed cost of $10,000 or greater.

The SustainErgy scoping audit encompassed the following:

- Energy consumption analysis
- Utility bill assessment (36 months)
- Facility inspection and staff interviews
- Evaluation of energy practices
- Greenhouse gas (GHG) generation analysis
- Energy savings opportunities and GHG reduction potential
- Identification and implementation method

The audit report summarizes recommended Energy Conservation Measures (ECMs) in the areas of facility operating changes, facility upgrades, and equipment replacements. Most* would be eligible for MCCAC rebates if the engineered study confirms the audit results. All items reduce energy consumption, operating costs, and GHG emissions.

ECMs ineligible for rebates but achievable with 2020 operating budget:

- Bay door sweeps
- T-12 Retrofits
- Install door sweeps on exit doors
- Motion sensors on vending machine plugins

* ECMs with a simple payback of less than one year and projects with a total installed cost of less than $10,000 are not eligible for rebates, but are still recommended, as their costs are recoverable in facility operating cost-savings.

ECMs eligible for rebates but requiring new capital project approvals:

- Switch to tankless water heaters Arenas
- T8 lighting retrofits Arenas
- Replace boilers pool
- Remove micro air bubbles in ice flooding water
- Add low E ceiling Arenas (not feasible now with acoustic panel install project)
- HID light bulb retrofits in parking lots

A table of the investment required for the capital project ECMs, potential MCCAC rebates, and payback timeframe follows. Administration will complete the MCCAC-funded engineering study verifying the audit results before proposing any projects.

Item/Project	Initial Investment	Rebate	Cost after rebate	Payback Term (YRS)
Switch to tankless water heaters	$10,450	$7,837	$2,612	0.81
Replace T8 fixtures w. LED/TLED	$23,293	$17,469	$5,823	2.07
Replace pool boilers	$32,500	$24,375	$8,125	2.59
Remove Micro Air bubbles	$40,320	$30,240	$10,080	0.88
Replace HID fixtures w. LED/TLED	$10,072	$7,554	$2,518	2.11
Totals	**$116,635**	**$87,475**	**$29,158**	

In addition to the MCCAC rebate on the capital projects, the City's net costs of the retrofits may be eligible for Lacombe County capital contributions, which could reduce the end-cost and payback terms by up to 30%.

The report identifies many other benefits to the EMCs including the GHG emission reductions and the estimated lifetime of the new equipment.

Service Level Impacts

There are no anticipated service level impacts from participating in the MCCAC program or executing the retrofits.

Financial Implications

- The City's costs to participate in the program and execute the projects will be reduced by 75% or more with grant revenues received.
- In less than three years (potentially within two years) the net cost of the retrofits will have been fully recovered.
- The City will continue to benefit after cost recovery through reduced operating costs--primarily, decreased energy consumption.

Legislative Implications

N/A.

Organizational Capacity

Participating in the program and implementing the in-house projects will require administrative capacity, but contractors, secured through a simple competitive quote procurement process, will complete the major retrofit work therefore minimizing workload on existing staffing.

STRATEGIC PLAN ALIGNMENT:

The recommended action aligns favourably with the following Strategic Plan Goals:

4.1.4 Fiscal Prudence: Identify and consider alternative revenue sources.

4.3.3 Sustainable Infrastructure: Complete an Asset Management Plan (the initiative is an asset management activity and delivers two outcomes:

- "…maintenance and replacement activities to minimize the overall cost of service delivery."
- "Ensure the long-term environmental…and economic sustainability of the City's physical assets…."

4.3.4 Economic Prosperity: To Benefit from City Owned Property: Create a plan for underperforming City property.

PUBLIC ENGAGEMENT/COMMUNICATION STRATEGY:

Public promotion of the grant-funding and the City's participation in the MCCAC program could be the subject of a news release. Ongoing implementation of those projects in the public view (lighting retrofits) would also be considered.

ALTERNATIVE MOTION(S):

1. THAT Council accepts the report on the SustainErgy Scoping Audit of the Gary Moe Auto Group Sportsplex as information, and directs Administration to continue with the MCCAC Recreation Energy Conservation Program; OR

1. THAT Council accepts the report on the energy audit underway at the Gary Moe Auto Group Sportsplex as information.

ATTACHMENTS:

SustainErgy Energy Audit Report