

Traffic Operations Aspects of the ITS Strategic Plans for Edmonton and Calgary

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ABSTRACT

The ring roads located in the Transportation and Utility Corridors surrounding both Edmonton and Calgary are in various states of planning, development and construction. Guiding Principle No. 3 from Alberta's Intelligent Transportation Systems (ITS) Strategic Plan calls for ITS to be "well integrated in the planning, design, construction and maintenance of the transportation infrastructure". There is currently an opportunity to establish a coordinated plan for the deployment of ITS solutions within both corridors, and potentially fast-tracking any high-priority ITS solutions by taking advantage of current civil projects underway in these corridors.

Guiding Principle No. 1 in Alberta's ITS Strategic Plan calls for ITS to be "developed and deployed in a coordinated, systematic and cost-effective manner". Alberta Infrastructure and Transportation and the Cities of Edmonton and Calgary are in various stages of planning and deployment of ITS. The development of a plan specific to the ring roads will provide the opportunity for coordination between the cities and Alberta Infrastructure and Transportation. A well thought out plan would give Alberta Infrastructure and Transportation the tools required to assist the travelling public, Alberta Infrastructure and Transportation and the Cities of Edmonton and Calgary, with managing traffic within and around these corridors.

Building on previous studies and strategic plans, the specific objectives of this study are to:

- Assess the immediate and future needs for traffic monitoring, and safety and operation improvements that can be addressed through ITS technologies;
- Analyze costs and benefits in adopting particular ITS systems that are relevant to the ring roads;
- Integrate ITS solutions with the planning and design of the ring roads;
- Develop a need and technology-based strategy for monitoring and managing commercial vehicle operations on the ring roads; and
- Based on the above, develop an ITS plan for the Edmonton and Calgary ring roads that will address the immediate and long-term needs, and the staging options of ITS applications.

This paper reports on a study that is currently underway and will be completed in early 2005. The particular results of the study that focus on traffic operations and management (i.e., dynamic or variable messaging and traveler information) will be presented in detail.

1.0 INTRODUCTION

The ring roads located in the Transportation and Utility Corridors surrounding both Edmonton and Calgary are in various states of planning, development and construction. Guiding Principle No. 3 from Alberta's ITS Strategic Plan calls for ITS to be "well integrated in the planning, design, construction and maintenance of the transportation infrastructure". There is currently an

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2.0 BACKGROUND

2.1 Road Network:

Both the Edmonton and Calgary ring roads are in various stages of planning and development. For the most part, the ring roads are in the near to long term planning stage, but in both cases portions of the ring roads are currently operational or in stages of design and construction.

Portions of the ring roads that are currently in operation are under the authority of the respective municipal agency. Design and construction through a traditional approach is currently underway for the southwest portion of the Edmonton ring road and the northwest portion of the Calgary ring road. This work is being undertaken by Alberta Infrastructure and Transportation. Alberta Infrastructure and Transportation is currently in the initial stages of development of a public-private partnership (P3 – Design/Build/Finance/ Operate) for the southeast portion of the Edmonton ring road and is considering a similar process for future portions of both ring roads.

2.2 Existing Plans and Strategies:

The overall ITS study for the ring roads is based on existing plans and strategies. A number of these include:

ITS Strategic Plan for the Calgary Region (City of Calgary)

The primary purpose of the strategic plan is to develop a comprehensive "roadmap" setting the direction, pace and priorities of transportation technology investment within Calgary over the next ten years and beyond in a coordinated and focused manner. The strategic plan will address the growing transportation needs of Calgary through the provision of a balanced and multi-modal transportation network.

Alberta Infrastructure and Transportation ITS Strategic Plan (September 2000)

This strategic plan provides a vision for the future of ITS in Alberta's transportation system and outlines strategies to develop and deploy these technologies to improve the safety, efficiency and capacity of the provincial transportation system.

Blueprint Study for Highway 2 Between Edmonton and Calgary (Alberta Infrastructure and Transportation)

This ITS study was completed to assess the immediate and future requirements on the Highway 2 corridor between Edmonton and Calgary, to improve safety and operational functions that can be addressed through the use of ITS technologies. This corridor is one of the most travelled routes within Alberta and is also a significant segment of the CANAMEX North South Trade Corridor that links the rest of the province to the US and Mexico. This will be the focus for the development of an "Advanced Traveller Information and Traffic Management Systems Blueprint for Highway 2 Between Edmonton and Calgary". ITS network applications may include Road Weather Information Systems (RWIS) stations, Dynamic Message Signs (DMS), traffic cameras, and Highway Advisory Radios (HAR).

City of Edmonton ITS Strategy (March 2002) and Priority List (June 2003)

The City of Edmonton continues to develop and expand ITS initiatives in support of the Transportation Master Plan and the "Review of Advanced Traffic Management Needs" report. ITS initiatives are defined for the short, medium and long term and more detailed ITS initiative plans (Priority List) are continuing to be developed for a moving window of five years by updating on a year by year basis.

3.0 NEEDS ASSESSMENT

As a preceding task to the development of this plan, a review was undertaken to assess the ITS needs related to the Edmonton and Calgary ring roads. The stakeholder (user) groups included:

- City of Edmonton
- City of Calgary
- Edmonton Ring Road – Design/Construction/Operations Team
- Calgary Ring Road – Design/Construction/Operations Team
- Alberta Motor Association
- Alberta Infrastructure and Transportation Inspection Services

The analysis resulted in the identification of common needs. These are summarized in the following themes:

- Collection of traffic, incident and condition data is required in real-time for effective management of traffic, response to incidents, maintenance operations and enforcement. Historical data of this type is also required for preservation, planning and auditing of commercial carriers.
- Analysis of the data and dissemination of the resulting information is required for similar purposes.
- Planning and coordination between roadway authorities is required to ensure effective management of the overall transportation network in the region. This may result in a centralized traffic management centre for each of the Edmonton and Calgary transportation regions.

The need for planning and coordination between road authorities is common to both ring roads and was identified in all of the consultations. Some of the needs identified in this functional area are not specifically related to ITS solutions alone, but are important to recognize in both the planning, deployment and operation of ITS applications because they require the implementation of supporting institutional agreements and protocols; for example, this would include coordination of needs related to common communication corridors, traffic management centres, information sharing, emergency response, and enforcement.

4.0 ITS VISION FOR THE EDMONTON & CALGARY RING ROADS

4.1 Guiding Principles:

Some of the guiding principles that were followed in the development of the plan include:

- Optimizing available capacity in a way that does not adversely impact the provincial and municipal infrastructures and services;
- Promote exchange of data between Alberta Infrastructure and Transportation, the cities of Edmonton and Calgary, and other private sector contractors;
- Improve the safety of the ring road network; and
- Provide a migration path that allows the operation of the ring road network from multiple locations.

With the above principles in mind, there are two specific philosophies that are maintained by Alberta Infrastructure and Transportation that are recognized as part of the ITS plan development:

- There is a desire to continue to utilize private sector Highway Maintenance Contractors for the operation of the ring road network including the operation of the ITS; and
- Continue and expand on the relationship that has been established with the Alberta Motor Association as Alberta's traveller information provider.

4.2 Systems Approach:

One of the key differentiators between this plan and previous plans/deployments is that it reflects a systems approach rather than a device deployment approach. The process begins at the initial assessment stage by mapping the needs to the ITS Architecture for Canada, identifying the opportunities and challenges, and setting the background for the deployment plan. It is critical to have the supporting management systems for both traffic management and traveller information in place prior to proceeding with a full system deployment. This allows for the benefits of the field deployment to be realized more quickly.

In addition, it is also important to ensure that the basic traffic management systems for detection and management are in place prior to proceeding with information dissemination in that project area. This ensures that as Dynamic Message Signs and traveller information systems are deployed there are the supporting systems in place to enable timely and accurate information to be made available to the public. Public confidence in the information being disseminated will have a direct correlation to the overall systems usability and perceived value.

5.0 ITS DEPLOYMENT PLAN

The needs identified under this study have been categorized and those that can be partially or fully addressed through the application of ITS solutions have been mapped to the User Services in the ITS Architecture for Canada. This establishes how ITS applications can address user needs including those of both the travelling public and system operators.

Further grouping and consolidation of the needs into logical units of deployment was undertaken. These units take into account prerequisite and co-requisite requirements and are compatible with the larger implementation of the ring road segments themselves.

The ITS deployment plan for the Edmonton and Calgary Ring Roads is structured into two layers:

- A number of major "initiative" areas have been identified to provide a top level categorization of implementation streams of activities; and

- Each initiative is then broken down into a number of constituent projects.

5.1 Traffic Management:

Alberta Infrastructure and Transportation plans to continue to utilize Highway Maintenance Contractors to operate various sections of the ring road network as is currently done in the surrounding regions. The Southeast Anthony Henday portion of the ring road will be designed, constructed, operated and maintained through a Public-Private Partnership (P3). This P3 consortium will also be responsible for the maintenance of the southwest and west portions of the Edmonton ring road. The Calgary ring road will likely follow a similar model; however, the determination of any P3 type arrangements has not been made at the time of presentation of this paper.

Many of the systems being employed as part of this ITS plan directly affect the operations and response times of the Highway Maintenance Contractors. Alberta Infrastructure and Transportation's vision is that the operation of the ring road ITS systems that pertain to monitoring the road network for incidents and the subsequent field response would be most efficiently managed by the ring road maintenance contractor. The ITS Plan is based on a vision that allows for the Highway Maintenance Contractor to take on a role of Traffic Management Centre operations (TMC Operation). The TMC Operation will be required to be in a distributed nature that allows for monitoring and control to be shared by more than one operating group of TMC. With the advancements of Internet technology and transmission of larger datasets using Internet Protocol (IP) coupled with the fact that Alberta Infrastructure and Transportation has no formal infrastructure/staff in place for highway operations, Alberta Infrastructure and Transportation is in a unique position that enables the concept of virtual/multiple Traffic Management Centres to be employed.

The ***Advanced Traffic Management Systems (ATMS)*** initiative is aimed at addressing the need areas related to improving efficiency and safety of the ring roads and their approaches through enhanced incident management, road conditions reporting, and inter-agency coordination, while also optimizing operations and maintenance activities through improved environmental monitoring and data sharing.

This initiative area comprises the following projects:

- TMS-1: Base Traffic Management System (TMS)
- TMS-2: Virtual Traffic Management Centre (TMC)
- TMS-3: RWIS Integration
- TMS-4: FAST Integration
- TMS-5: DMS Integration
- TMS-6: Operations & Coordination Plan
- TMS-7: Arterial Traffic Management

5.2 Traveller Information:

The Alberta Motor Association (AMA) has taken a leadership role in Alberta by providing relevant road, weather and safety related information to the travelling public since 1927. The province has relied on the AMA for many years to collect and disseminate road related events via the telephone and the Internet. The AMA currently hosts a road report website and provide a telephone service that includes a summary of the information available on the website. In exchange for the management of the traveller information service, the AMA receive regular activity updates from the provincial Highway Maintenance Contractors. The ITS projects identified are done so with the AMA and its role as the provincial traveller information system provider in mind.

The ***Advanced Traveller Information Systems (ATIS)*** initiatives are aimed to leverage the benefits of the ATMS projects as the basis to provide real-time information to the travelling public using various media sources. The ATIS initiative will allow travellers to make more informed decisions about their route, time of travel, and mode based on prevailing conditions. In the context of the ring roads, travellers can better decide where to enter and exit the ring road based on information on the status of the highway and the adjacent arterials that serve it. By informing travellers to avoid hot-spots of congestion, incidents, and adverse weather conditions “before they get there”, the ring roads and the adjacent arterials will operate more efficiently.

The ATIS initiative area comprises the following projects:

- ATIS-1: Web based Traveller Information and Subscription Based Messaging
- ATIS-2: IVR/511

5.3 Commercial Vehicle Operations:

Both the Edmonton and Calgary regions are the major population centres in the province and the focus of economic activity. Truck movements in both regions are significant. The safety and regulatory monitoring requirements of these commercial vehicle operations (CVO) is the primary responsibility of the province. Safety and preservation of the infrastructure are the primary concerns.

Roadside vehicle inspection stations are the traditional means of monitoring CVO; however, they require a significant amount of right-of-way to provide for the safe entry and exit of trucks onto the highway. Such right-of-way is not available in the construction of the ring roads and a virtual weigh-in-motion (WIM) pilot project has been recommended within the deployment plan. The concept involves the use of WIM sensors, over-height detectors and video cameras to capture information and images. At the initial stages, information will be sufficient to determine compliance and to help determine if additional enforcement action is required.

The ***Commercial Vehicle Operations (CVO)*** initiative area is aimed at addressing the needs related to collecting CVO data and providing a mechanism to enforce weight and dimension regulations along the ring roads. This CVO initiative allows agencies to review and analyze

commercial vehicle information, such as weight, height, classification and vehicle identification, to provide for more effective enforcement through dispatch of enforcement personnel or by contacting commercial carriers for audits. This initiative area includes CVO-1: Weigh-In-Motion Pilot Project.

5.4 Data Warehousing:

Alberta Infrastructure and Transportation will continue to act as the central warehouse for all data related to ITS. This will allow for the continued collection, management and dissemination of information to neighbouring municipalities, police, consultants and maintenance contractors.

The ***Data Warehousing Systems (DWS)*** initiative area is aimed to leverage on ATMS, ATIS and CVO initiatives by making the data generated by their various subsystems centrally accessible to data users. The DWS initiative area includes the project of DWS-1: TMS Data Warehouse, which will centrally house the traffic data collected by the ATMS projects and make it accessible to authorized users through the Internet.

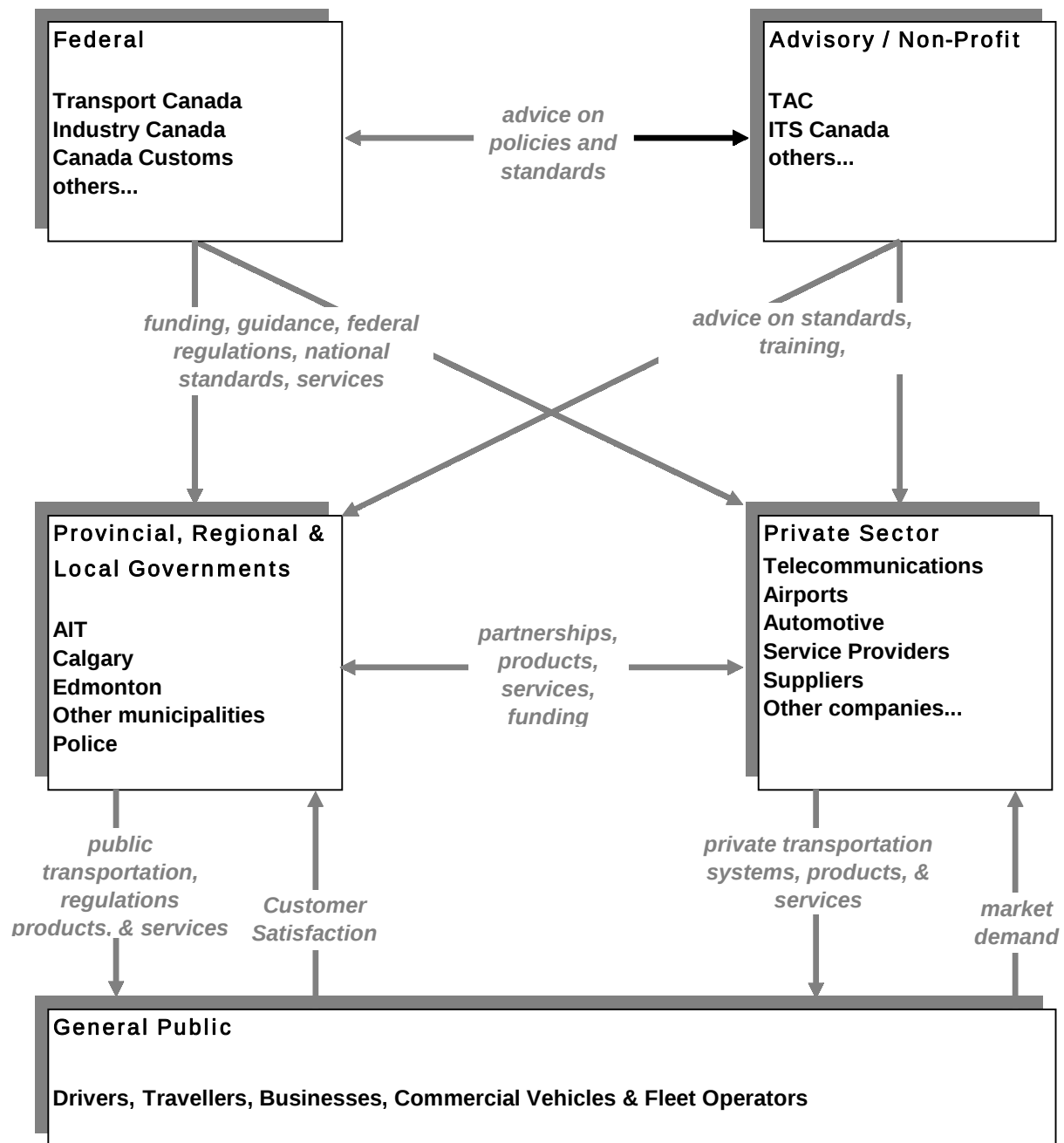
5.5 Common Systems and Services:

The ***Common Systems and Services (CMN)*** initiative area will include supporting projects that serve more than one of the initiatives and projects identified above. This system, CMN-1: Communications Backbone, will consider the overall vision such that all initiatives and projects are considered, and will provide a better framework and a more consistent, cost effective approach to the common needs.

6.0 INSTITUTIONAL FRAMEWORK

Although the ring roads are ultimately to be under provincial authority, coordination between agencies and organizations throughout the region and within each agency's organization (i.e. between specific business units) will be required. ITS can provide opportunities for partnerships and synergies within and between agencies through the sharing of data and infrastructure. A coordinated approach to the planning, design, and deployment of ITS will provide joint development and training opportunities and the opportunity for private involvement. The challenges at the agency or institutional level will be to develop a shared commitment and ownership of the individual ITS strategies, a common understanding of ITS and an understanding and acceptance of each agencies needs.

As a frame of reference, the following diagram illustrates the institutional framework as it relates to the various institutional agencies, the relationships and the roles that they play in supporting the deployment of the various ITS projects.



7.0 CONCLUSION

At the time of preparation of this paper, the ITS Plan for the Edmonton and Calgary Ring Roads, including the implementation plan and budget summary is being finalized. It is anticipated that

the final documentation of the ITS Plan will be published on Alberta Infrastructure and Transportations departmental website, which can be found through www.gov.ab.ca.

8.0 REFERENCES

Documents and published information that have been reviewed in the context of this study, are noted specifically in the text of this paper. This paper represents a summary of selected information from the formal documents produced by the study consultants within the ITS Study for Edmonton and Calgary Ring Roads on behalf of Alberta Infrastructure and Transportation. These documents are in both final forms and final draft stages. The consultant team leader was IBI Group and aspects of the project were undertaken by EBA Engineering Consultants Ltd.