

**ADVANCED TRAVELLER INFORMATION
AND
TRAFFIC MANAGEMENT SYSTEMS
FOR
HIGHWAY 2 BETWEEN EDMONTON AND CALGARY**

DETAILED WORK PROGRAM

PHASES 2 and 3

**Prepared for:
Alberta Transportation, Edmonton**

November 2002

DELSCAN

In association with
Infrastructure Systems Limited
Earth Tech Canada
Mark F. Pinet Associates limited
Western Ergonomics, Inc.

Phase 2 - Blueprint Development

Task 2.1 – Establish Objectives

In this task the needs and objectives of each of the initiatives identified in Phase 1 will be clearly stated and confirmed. For some initiatives this may vary by section of the Highway 2 corridor, particularly when an initiative will be deployed in both urban and rural sections of the highway.

Task 2.2 – Best Practices

Within this task we will identify and review applicable best practices and technologies to address the needs and associated initiatives identified in Phase 1. The intent is to undertake a state-of-the-practice review of cases with similar needs and characteristics, to gather information regarding the need, relevant practices and technologies utilized in order to perform functions or deliver services similar to the ones included in the initiatives developed in Phase 1 (i.e., how they do things and what they use). Specifically we will address:

- How other jurisdictions have applied changeable message signs (CMS), particularly with respect to rural applications and long, linear corridors;
- Use of HAR technologies including associated problems and issues, their effectiveness and recent trends in technology in this area of traveller information;
- Use of emergency telephones and the associated problems and issues, their effectiveness and recent trends in this area;
- Use of the Internet as a traveller information tool and its effectiveness, the data that is displayed to both the public and single interest agencies and how the information is collected, stored and updated;
- Use of call centres to report incidents, operational problems and issues and use of technology to reduce operational costs and/or manual methods;
- Work zone safety and the tools that are found to be most effective;
- Use of wildlife detection systems, related technology and their degree of success;
- Use of fog detection systems, related technology and their degree of success;
- 511 telephone traveller information operational experiences, information provided and trends in technology; and
- Software products and partnerships in the area of RWIS and prediction of road conditions.

Task 2.3 – Technology Assessment

For each of the initiatives identified in Phase 1, there is a set of ITS functional areas or components. Each functional area is intended to categorize the functions of available ITS technologies. For example, surveillance, communications, traveller interface and control strategies are four functional areas which all relate to the Incident Management initiative. The intent of this task is to identify all of the functional areas required to deliver each of the initiatives. There will be considerable overlap of functional areas between each of the initiatives and by undertaking this task, we will be able to identify those functional areas that are of most importance to this project.

Within each functional area, there is a set of ITS components and for each component there are various technologies that can be used to deliver the functionality required. For example, for the functional area of surveillance, ITS components include CCTV, vehicle detection stations, emergency telephones, aircraft patrol, etc. The technologies

associated with vehicle detection technologies include loops, video image, microwave, acoustic, etc. The intent of this task is to identify the various ITS components associated with each of the functional areas and those which are common to each of the functional areas identified. For those components required in the immediate (0 to 2 years) and short term (3 to 5 years), we will extend these components to identify potential ITS technologies.

The focus of this task will be on enabling technologies that are common to several initiatives and compatible from a systems perspective. It is anticipated that several technologies will be identified that are difficult to justify development or deployment based on a single application, but have tremendous potential over the longer term to enable future initiatives. An example would be communications infrastructure such as the installation of a fibre optic cable to transmit video images to a control centre. Initially the cost of such infrastructure may be prohibitive, but over the longer term, the potential use of this infrastructure may be of significant value to other initiatives.

Within this task, we will draw upon the best practices review conducted in Task 2.2 as well consider such factors as cost (both capital and operating), compatibility with legacy systems, availability of standards, maturity, risk, etc. to identify what will be considered as the enabling technologies for ITS in the Highway 2 corridor. These enabling technologies will then become a key consideration in the development of the implementation program for the project (Task 2.7) as well as provide a focus for Phase 3 of the study.

Task 2.4 – Institutional / Policy Analysis

In this task each of the initiatives identified in Phase 1 and their related operational aspects will be reviewed from an institutional perspective to identify any potential issues or concerns related to roles, responsibilities, policies, procedures, responsibilities, jurisdictional boundaries, staffing, skill requirements, labour issues and funding. Potential problems will be identified and recommendations formulated.

This task will involve discussions (via telephone and personal meetings) with the various stakeholders and/or potential partners to present the initiatives, discuss how it may affect their daily operations and receive input on how the initiative can be improved or where changes are required in order to better meet their needs, legacy systems or operational policies and procedures. This stakeholder contact will be limited to major stakeholders including:

- City of Edmonton, City of Red Deer and City of Calgary;
- RCMP;
- Alberta Transportation's Operations Managers and MCI's (focusing on the Highway 2 corridor between Edmonton and Calgary);
- Alberta Motor Association;
- Alberta Environment;
- Alberta Agriculture; and
- Environment Canada.

This task will include an assessment of the need for marketing, public information and driver education strategies.

A key issue that will arise in this task is the need and role of a control centre and the how this ITS component and its operation is best addressed within the existing institutional framework and the agencies involved.

Task 2.5 – Develop Physical Architecture

Based on the input received in Task 2.4, each of the initiatives and their concept of operations will be refined. A physical architecture will then be developed based on the ITS Architecture for Canada.

A physical architecture identifies the various subsystems that make up an intelligent transportation system, their location and what external systems are required to interface with the ITS system. It defines the flow of data between the various subsystems (including legacy systems), identifies the communications requirements and type of medium and the interface standards that are required to implement an integrated system. It also identifies the different agencies or stakeholders involved and the associated interfaces with external systems.

An architecture framework supporting the processes involved in each of the initiatives identified in Phase 1 will be prepared. Four classes of physical entities will be defined in these architecture frameworks:

- Subsystems that perform transportation functions;
- Users who interact with the architecture implementation;
- Other external systems that will likely interact with the subsystems through interfaces; and
- Environment in which the various subsystems are located.

Each architecture framework will be specific to the project requirements and developed utilizing the ITS Architecture for Canada.

Task 2.6 - Establish Performance Criteria

In this task performance criteria for each of the initiatives will be identified. Both quantitative and qualitative criteria will be identified to objectively evaluate the effectiveness of individual initiatives. Specific quantitative criteria will depend on the particular initiative and the availability of existing data and may include such considerations as air quality considerations, reduction of accidents, reduction in average incident duration, percent of system users, reduction of congestion, life cycle costs, changes in travel time, stops, fuel consumption, pollutants and other standard measures of effectiveness. Qualitative criteria will include institutional considerations, risk evaluation, user attitudes, development cycle of key components of the system, contribution to economic development (job creation, export and investment opportunities generated) and improvements to the quality of life.

A working paper will be developed as part of this task identifying the performance criteria (quantitative and qualitative) proposed for each of the initiatives. This working paper will then form the basis for the benefit/cost analysis in Task 2.8.

Task 2.7 – Define Implementation Program

In this task, each of the initiatives identified in Phase 1 will be broken down into a series of strategic projects that will support a staged implementation program. In developing these strategic projects, we will take into account the following considerations:

- Relative priority of each of the needs and opportunities (Priority criteria will be identified and agreed upon with the Steering Committee prior to their application);
- The need to deploy “early winner” projects early in the program to address immediate needs and demonstrate the benefits of the program;
- Ability to expand systems geographically and functionally as funds become available;
- Recognition of technology risk, maturity, compatibilities and costs on a life cycle basis, and development / deployment of select enabling technologies to stimulate future development of the program;
- Recognition of multi-agency interaction, institutional issues and barriers, and development of a plan that encourages cooperation;
- Trends in technology, and the need to encourage migration of ITS in a compatible direction; and
- The need to provide opportunities for public/private and public/public partnerships.

The implementation program will be divided into three time frames: immediate (0 to 2 years), short (3 to 5 years) and long (up to 10 years) terms. For the immediate and short terms, considerable detail will be provided identifying projects to be implemented, their inter-relationships, types of technologies to be implemented (enabling technologies), pilot projects, research projects and institutional strengthening requirements (e.g., training, professional activities, skill sets required, etc.) for both the public and private sectors. For the long term, the program will be considerably less detailed and will provide direction only in terms of projects to be implemented on a broad basis, their direction and objectives with little detail on the technologies to be implemented.

In this task, the first workshop will be conducted. The objective is to demonstrate to the stakeholders how their input has assisted in defining the ITS Program for Highway 2, outline the preliminary findings and recommendations of the study and obtain input on opportunities and barriers associated with the plan and how these may be addressed. One workshop (located at Alberta Transportation’s offices in Red Deer) is proposed. All input received will be taken into consideration in finalizing the implementation program.

“Early winner” projects will be selected for the immediate term on the basis of priority of need, ease of implementation, maturity of the technology involved and the potential benefit to stakeholders including the ability to demonstrate benefits through measured performance criteria. Successful implementation of the “early winners” will be critical to the future success of the project and the ability to gain continued support for future deployment of ITS projects.

Task 2.8 – Benefit / Cost & Risk Analysis

Benefit / cost and risk analysis are interrelated tasks that will be conducted concurrently. The benefit / cost analysis will provide an indication of the potential worth of each of the proposed initiatives. The risk analyses will identify the likelihood of the costs and benefits not being as expected.

The benefit/cost analysis will be a high level analysis conducted following finalization of the implementation program. Order of magnitude cost estimates for the “strategic projects” will be used to develop budgetary figures for capital expenditures. These cost estimates will be developed only for the projects that have been identified for the

immediate and short terms. The budgetary forecasts will then be compared to estimated available funds and adjustments made to ensure the deployment program is realistic. Benefits will be based on experience in other jurisdictions with similar traffic characteristics and ITS deployments and quantified for the immediate and short terms. Benefit/cost ratios will then be calculated for each initiative over the 5 year program to determine its economic worth. Non-quantifiable benefits will also be considered in this analysis.

A risk analysis will also be conducted of the proposed implementation program focussing on technology, financial and institutional issues and identifying their impact on the implementation program and ways to mitigate or manage them.

Task 2.9 – Preliminary ITS Blueprint Report

In this task a final report documenting the findings and recommendations of Phase 2 will be prepared. A draft will be submitted to the Steering Committee and reviewed with the committee to receive their input and comments. Following receipt of all comments, the report will be revised and a final report will be prepared.

An executive summary of the final report will be prepared with the intent of making this report a standalone document available for distribution to a wider audience. This executive summary will serve as a document that can be released to the project stakeholders and general public in hardcopy as well through the project website.

Phase 3 - Final Blueprint Report

In this portion of the final stage of the project, components that were identified as enabling technologies in Task 2.3 and the related potential technologies are investigated in greater detail to develop technical specifications, interface standards, communications requirements and commissioning tests. Potential suppliers of the equipment and recommended procurement strategies will also be provided.

Within this phase, four components will be investigated in detail including the development of technical specifications.

- Changeable Message Signs (Portable and permanent);
- RWIS;
- CCTV Cameras: and
- Internet site and Related Database.

Within each of the functional plans developed in Task 3.3, a number of hardware and software components will be identified. Within this phase of the project, a number of these components will be selected for investigation at a higher level, providing functional requirements for the related equipment, potential suppliers and recommended procurement strategies. The components that are recommended for consideration for the development of functional requirements are listed below.

- Over height detectors and warning system;
- Call centre software (automation of recording of incident information, receipt of calls, generation of messages, etc.);
- Work zone control (e.g. speed detection, auto generation of messages, etc.);
- Communications system; and

- CMS response plan selection software.

The list of components identified above for development of technical specifications and functional requirements is intended as a preliminary list based on the findings of the study to date. The list will be reviewed at the completion of Phase 2 to ensure it meets the requirements of the project and any necessary modifications made.

Task 3.1 – Technology Evaluation

In this task the potential technologies identified in Task 2.3 for each of the six components will be examined in greater detail to determine the recommended technology type. This evaluation will include consideration of such factors as application needs and requirements, communications requirements, compatibility with legacy systems, reliability, cost (capital and recurring), maturity, local support, trends in the industry and compatibility with other initiatives and technologies.

It is possible that for several components more than one technology will be identified as being applicable for deployment within the Highway 2. In this case various technologies will be identified with selection of the technology left to the tendering process and the specifications or functional requirements developed will incorporate the necessary measures to ensure compatibility of the technology types selected within the various systems.

Task 3.2 – Development of Technical Specifications/Functional Requirements

Technical specifications and functional requirements for each of the selected components will be developed in this task based on the results of the technology evaluation. The specifications or functional requirements will address such aspects as:

- Need and purpose of the component;
- Functional features and/or requirements;
- Recommended technology;
- Performance specifications of the equipment and software;
- Enclosure requirements;
- Communications requirements;
- Remote access requirements;
- Control and monitoring software;
- Commissioning tests;
- Maintenance and test equipment; and
- Applicable standards and interface requirements.

The format of the specifications will be based on standard Alberta Transportation specifications and will refer to existing equipment specifications (e.g. roadside enclosures) whenever they are considered to be relevant.

The functional requirements developed will provide less detail than the specifications and serve as a basis from which detailed technical specifications can be developed.

Task 3.3 – Preparation of Functional Plans

In this task functional plans for each of the following initiatives will be developed.

- Incident Management System for Highway 2;
- Road Condition and Traffic Information for Highway 2;

- RWIS Network for Alberta's National Highway System;
- Traffic Control and Management for Deerfoot Trail;
- Traffic Control and Management for Anthony Henday Drive; and
- Smart Work Zone for Highway 2.

The functional plans will be based on the concepts and staged implementation program developed in Phase 2. These plans will include the following:

- Plans showing approximate location of field equipment;
- Recommended locations for portable CMS under various incident scenarios and identification of alternate routes;
- Recommended message sets for CMS;
- Operations recommendations including:
 - Flow of command and information;
 - Role and responsibilities of stakeholders;
 - Recommended procedures;
 - Need for and location of control centre(s);
- Role and links to other initiatives; and
- Requirements to incorporate legacy systems including identification of any upgrades or retrofits required.

For the RWIS initiative, the plan and specifications developed within this phase of the study will include the preparation of tender documents.

This task will also include a review of the costs developed in Task 2.8 and an update of the benefit cost ratio as required.

In this task, the final stakeholder workshop will be conducted. The objective is to present to the stakeholders the final recommendations of the study and how they fit into the overall program. One workshop (located at Alberta Transportation's offices in Red Deer) is proposed. All input received will be taken into consideration in finalizing the study recommendations.

Task 3.4 - Preparation of Final Report

In this task a final report documenting the findings and recommendations of Phase 3 will be prepared. A draft will be submitted to the Steering Committee and reviewed with the committee to receive their input and comments. Following receipt of all comments, the report will be revised and a final report will be prepared.

An executive summary of the final report will be prepared with the intent of making this report a standalone document available for distribution to a wider audience. This executive summary will serve as a document that can be released to the project stakeholders and general public in hardcopy as well through the project website.