COUTTS/SWEETGRASS AUTOMATED BORDER CROSSING

PHASE I

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1 INTRODUCTION

National initiatives, such as the Canada-United States Free Trade Agreement (CFTA), the General Agreement of Tariffs and Trade (GATT), and the North American Free Trade Agreement (NAFTA) are encouraging increased trade activities and efficiencies between Canada, the United States and Mexico. Although it is the expressed policy of all three countries to facilitate the growth of this trade, limited resources and staffing levels for all regulatory and enforcement agencies involved with border crossing activities challenge their ability to encourage increased trade activity. Because a dramatic increase in the amount of regulatory and enforcement resources and staff is unlikely, the use of advanced computer and communication technologies (i.e. Intelligent Transportation Systems) to improve the efficiency of existing border crossing activities may be the most suitable solution.

Typical international border crossing activities consist of:

- driver/vehicle/carrier checks for compliance and safety,
- customs clearance, and
- immigration and naturalization clearance.

Using ITS technologies, many of the regulatory and enforcement activities can be performed automatically through electronic means rather than current manual or visual methods. Benefits of automating border crossing activities include:

- quicker clearance of compliant vehicles and drivers,
- improved targeting of non-compliant vehicles and drivers, and
- reduced costs to both government and industry.

Ultimately, “seamless” border crossings may be attained where compliant commercial vehicle traffic is unimpeded by inspection and information gathering.

For an automated border crossing system to work effectively, close cooperation is needed between the various agencies involved with border crossing activities (i.e., transportation, customs, immigration and naturalization and other agencies) on both sides of the border.

Ultimately, the *Coutts/Sweetgrass Automated Border Crossing Project* was intended to result in a fully automated international border crossing facility that addressed the regulatory and enforcement needs of the Montana Department of Transportation, Alberta Transportation and Utilities, U.S. and Canadian Customs, and U.S. and Canadian Immigration and Naturalization, while improving the operational efficiency of the commercial vehicle industry utilizing this crossing. Phase I of this project, as documented in this report, was intended to result in the implementation of weigh-in-motion (WIM) and potentially automatic vehicle identification (AVI) systems to enhance compliant commercial vehicle movement through the joint vehicle inspection station near the Coutts/Sweetgrass international border crossing. With the successful completion of Phase I, Phases II and III would have addressed customs and immigration requirements, respectively. However, as documented in this report, institutional issues prevented the successful completion of Phase I and precluded the continuation of efforts into subsequent project phases.

1.1 BACKGROUND

This section describes the general (1) site characteristics, (2) trade and traffic characteristics, (3) current border crossing operations and (4) key stakeholders for the *Coutts/Sweetgrass Automated Border Crossing Project*.

1.1.1 Site Description

The Coutts/Sweetgrass international border crossing is located on the U.S./Canadian border in the open-plains country east of the Rocky Mountains (see Figure 1). Rural and sparse, the resident population is estimated at 500. Significant populations in the area are:

- Lethbridge, Alberta that is located 65 miles north of the U.S./Canadian border with 60,000 residents;

- Shelby, Montana that is located 35 miles south of the U.S./Canadian border with a population of 2,700; and
- Great Falls, Montana that is located 120 miles south of the U.S./Canadian border with 58,000 residents.

The Coutts/Sweetgrass international border crossing, at the northern terminus of U.S. Interstate 15 and the southern terminus of Canadian Route 4, represents a vital link between the Canadian trade markets and those of the United States and Mexico. Canadian Route 4 is a high quality two-lane facility that connects the Coutts/Sweetgrass international border crossing to Lethbridge, Alberta and the major Alberta cities of Calgary and Edmonton to the north. Lethbridge, Alberta also lies on the major east-west Canadian Route 3, while Shelby, Montana is situated on the east-west routes of U.S. Highway 2 and the Burlington Northern Railroad (Western Transportation Institute 1995).

1.1.2 Trade and Traffic Characteristics

At a national level, trade markets are in a tremendous state of flux. Focus is shifting from domestic markets to global markets. In addition, traditional east-west markets are now reorienting north-south. Once having the advantage for international trade, coastal areas must now compete with inland areas as U.S. trade activities increase with Canada and Mexico (Smith 1997). Driving this increase in north-south trade activity are national initiatives, such as the Canada-United States Free Trade Agreement (CFTA), the General Agreement of Tariffs and Trade (GATT), and the North American Free Trade Agreement (NAFTA). These initiatives have helped to lessen the constraints on international trade between Canada, the U.S. and Mexico by reducing or eliminating certain tariffs and permits.

Historically, Canada and the United States both favored east-west trading routes, thereby bypassing north-south routes. As a result, many goods manufactured or produced in the west often traveled east before reaching markets in the north or south (*Arizona Trade Corridor Study* 1997). Further development of the CANAMEX Corridor, which facilitates north–south trade movement directly between Canada and Mexico, will directly affect commercial vehicle demand at the Coutts/Sweetgrass international border crossing.

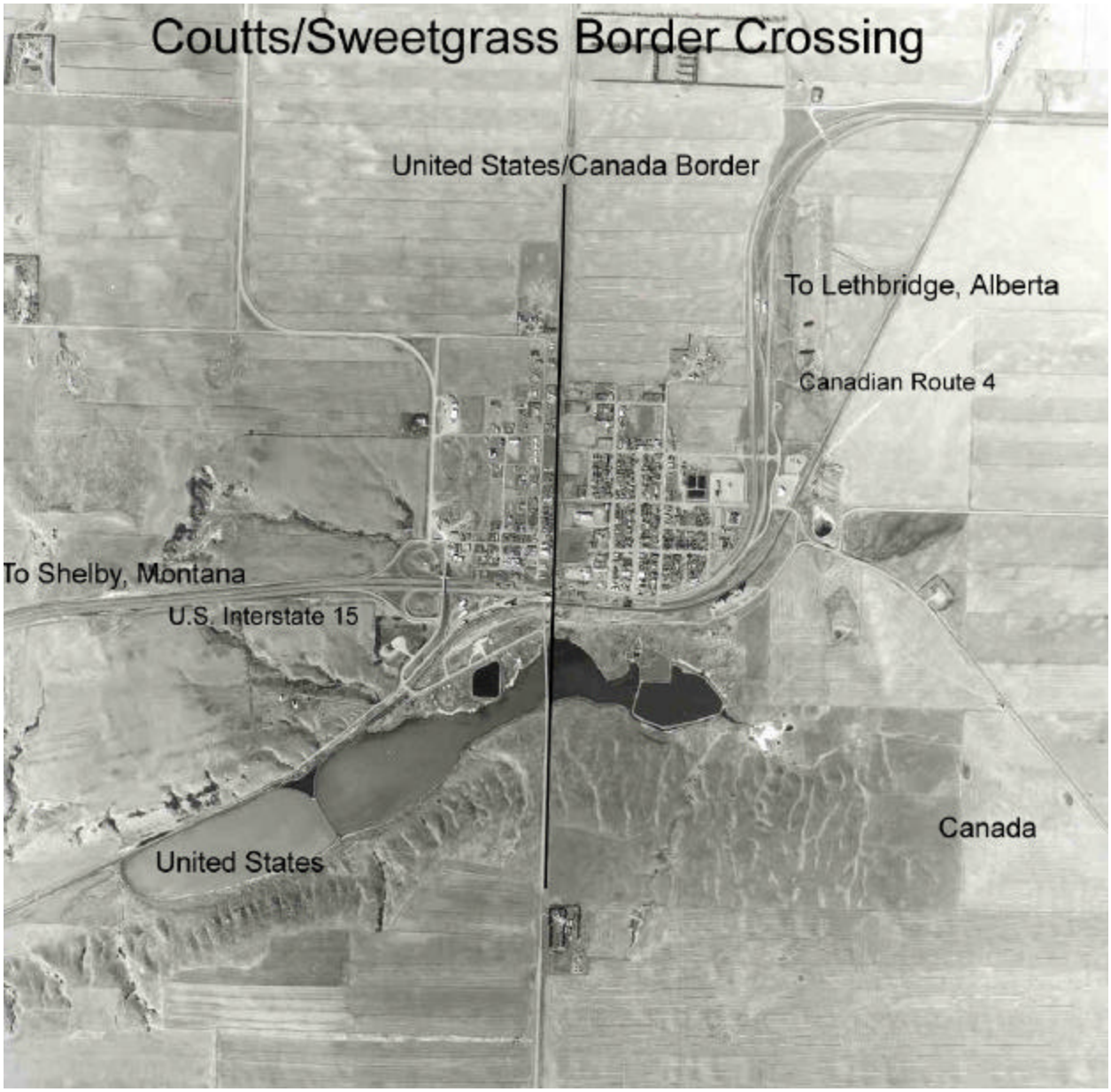

Figure 1. Greater Coutts, Alberta/Sweetgrass, Montana Area

To date, trade flows through the CANAMEX Corridor have been relatively small, although significant growth is occurring. As an example of this growth, note in Figure 2 that Montana's agricultural exports nearly doubled between 1995 and 1996. Agricultural crop and livestock exports are Montana's 7th and 8th largest exports to Canada, respectively (see Figure 3). Other large exports to Canada from Montana in 1996 are summarized in Table 1 (Massachusetts Institute for Social and Economic Research 1997).

Economic prosperity in the United States, especially Montana, is strongly linked to the volume of exports that are moved between state and international borders. The state of Montana exported $1.2 billion in products in 1996 to foreign destinations. Agricultural products accounted for the majority at $850.2 million - $379.6 million more than 1995. Wheat and wheat products are Montana's leading export, making up 88 percent of the State's agricultural exports. Exports of wheat and wheat products accounted for the largest increase during 1996 with $349.8 million more than 1995. Manufactured products accounted for the next largest share of exports at $309.1 million. Mineral, forestry and miscellaneous product export accounted for the remaining $84.2 million 1 (Massachusetts Institute for Social and Economic Research 1997).

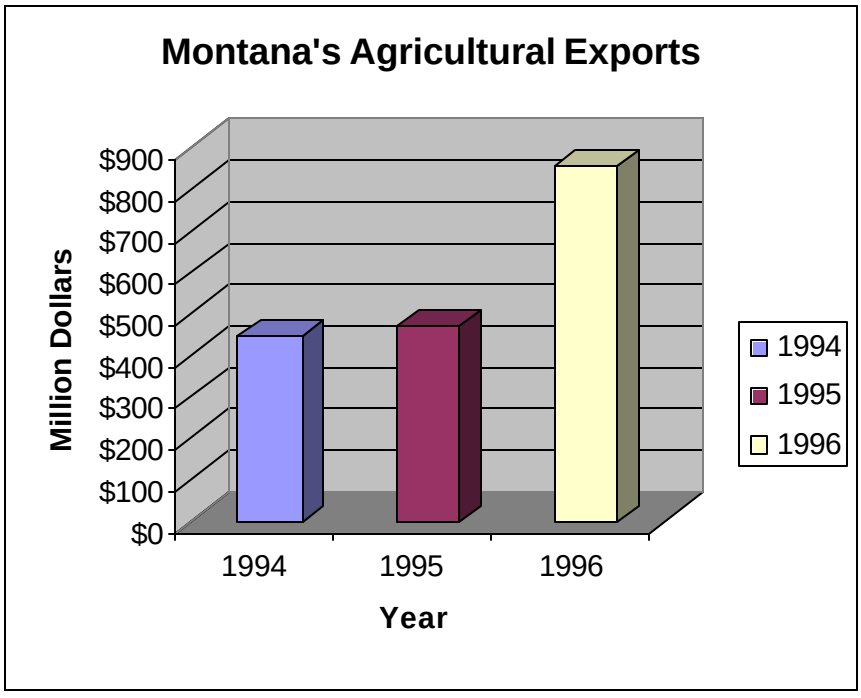

Figure 2. Montana's Agricultural Exports

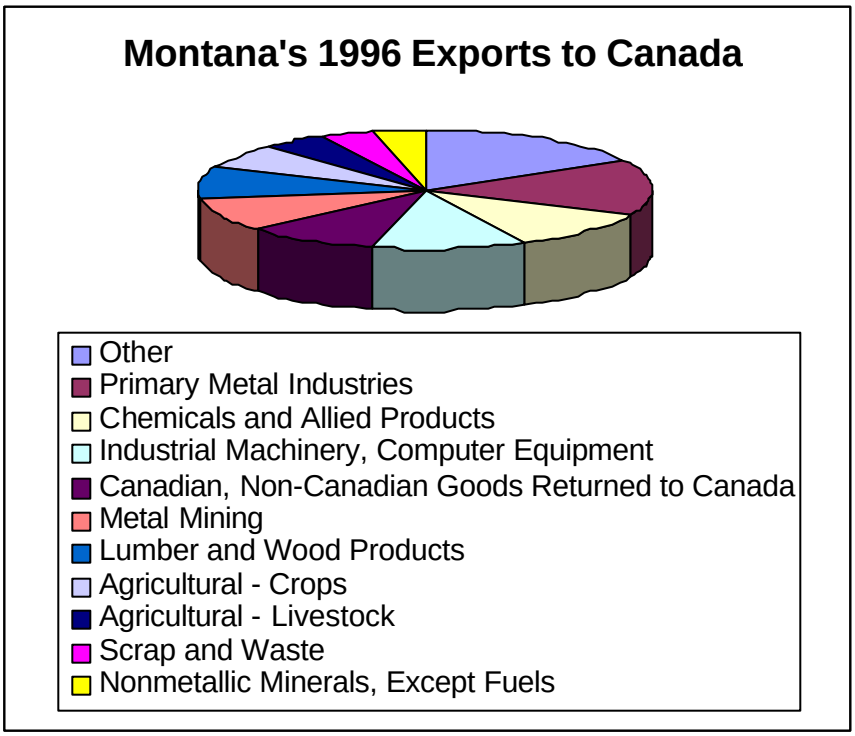

Figure 3. Montana's 1996 Exports to Canada

Table 1. Montana's 1996 Exports to Canada

	Total	To Canada
Primary Metal Industries	$88.4 million	$29.8 million
Chemicals and Allied Products	$57.2 million	$21.9 million
Industrial Machinery And Computer Equipment	$76.2 million	$21.2 million
Canadian and Non-Canadian Goods Returned to Canada	$19.1 million	$19.1 million
Metal Mining	$32.3 million	$18.9 million
Lumber and Wood Products	$27.7 million	$17.3 million
Scrap and Waste	$7.7 million	$7.7 million
Nonmetallic Minerals Except Fuels	$17.3 million	$7.4 million

In 1996, Montana's top market for manufactured products was Canada; $119.3 million or 38.6 percent of the $309.1 million total (see Figure 4). This was a 28.3 percent increase from the previous year and an annual percent change from 1987 to 1996 of +8.5 percent. Japan was a distant second at $35.6 million and Mexico at $33 million. Shipments of mineral products were similar; Canada at $26.5 million followed by Japan with $8.1 million (Massachusetts Institute for Social and Economic Research 1997).

Given the volume and economic value of trade activity between the U.S. and Canada, transportation investments at the state and provincial level are being encouraged to accommodate increased trade flows. More specifically, the volume and economic value of trade between Montana and Alberta, as well as the noted increasing trend in trade activity between these two jurisdictions, warrant investment in border crossing facilities and the infrastructure leading to and from.

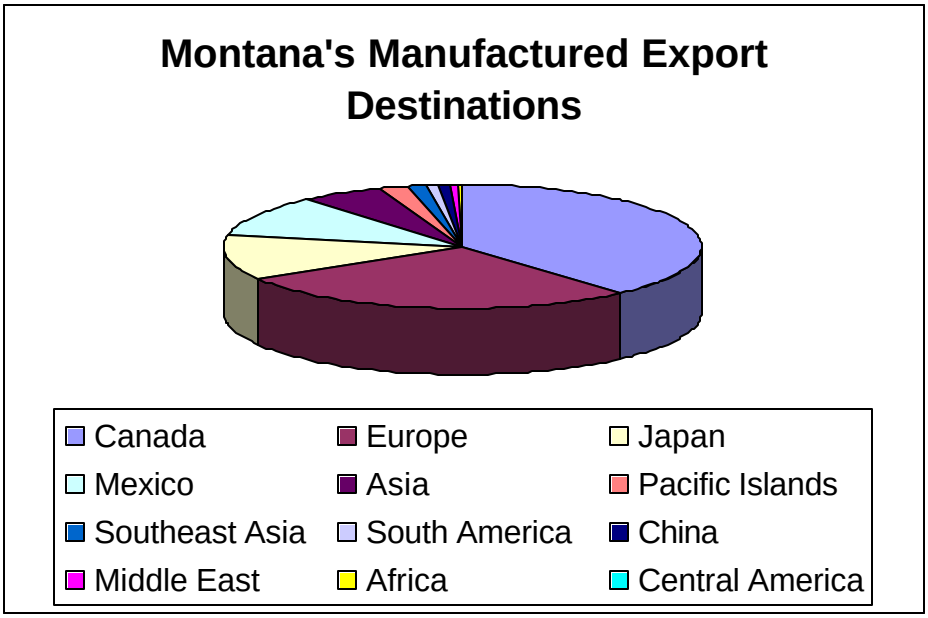

Figure 4. Montana's Manufactured Export Destinations

1.1.3 Current Border Crossing Operations

Investment in the physical infrastructure leading to and from the international border crossing and within the border crossing facility itself will fall short in accommodating trade traffic demand without supplementally considering operational improvements. Current regulatory and enforcement efforts cannot completely assure either safety on the nation's roadways or compliance of motor carriers with weight and credential regulations. Safety assurance activities are not targeted consistently on those carriers, drivers and vehicles that pose the greatest risk. Roadside regulatory and enforcement personnel often lack timely information on a carrier's safety record. Congestion and delays at national and international weigh stations and ports of entry penalize compliant carriers unnecessarily because current procedures require that all vehicles stop for inspection. Increased trade activity will only exacerbate these problems.

In general, border crossing operations consists of the following steps (see Figure 5).

- A shipper, needing to move a commodity from an origin to a destination, hires a carrier to transport the product.
- The shipper may complete the necessary border crossing exit/entry documentation or may hire a licensed customs broker to complete the necessary documentation.
- When the carrier approaches the border, outbound customs reviews the export documentation provided either by the carrier or the broker.
- If documentation is in order, the carrier proceeds to the inbound customs/immigration and naturalization facility for a primary inspection. During this inspection, entry documentation is reviewed and customs/immigration and naturalization agents verify persons, cargo and vehicles using various sources. The U.S. Department of Agriculture (USDA), Federal Drug Administration (FDA) or other agency may be involved during the primary inspection. Following the primary inspection, the carrier is either deemed "low risk" with respect to non-compliance and released for entry into the country (following a safety inspection) or asked to proceed to a secondary inspection station. Commodities such as agricultural products require a secondary inspection.

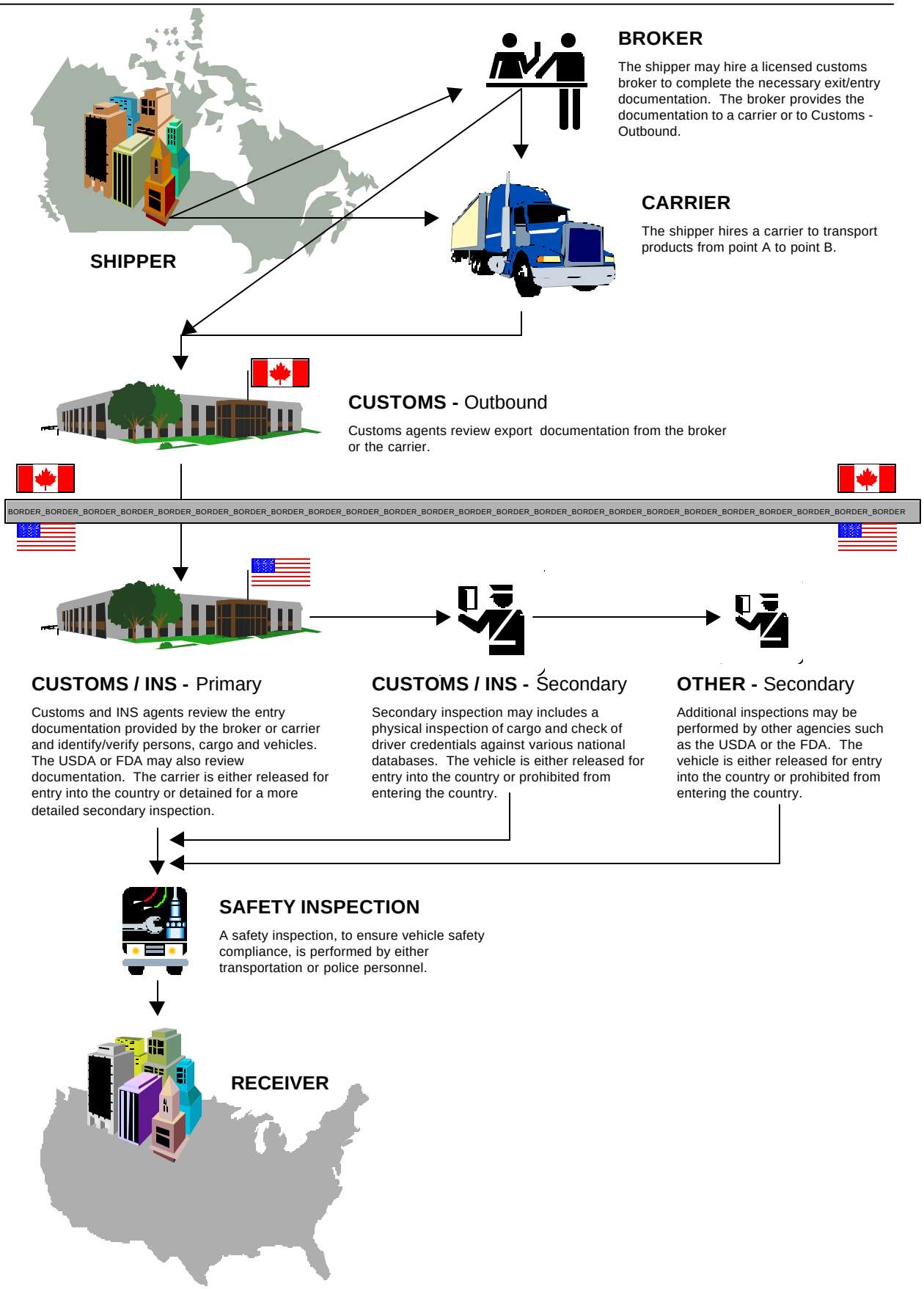

Figure 5. General Border Crossing Process

- During the secondary inspection, the cargo may be physically inspected and a more detailed review of driver credentials using national databases may take place. Following the secondary inspection the vehicle is either (1) released for entry into the country (following a safety inspection), (2) subject to additional inspections by agencies other than customs and immigration and naturalization (i.e., USDA, FDA) or (3) prohibited from entering the country.

- A vehicle safety inspection may occur as a final inspection before the carrier is allowed to enter the country. The vehicle safety inspection is performed either by transportation or police personnel depending on the border location and local arrangements. Vehicle weight may be checked at the border or at a facility some distance downstream or upstream of the border crossing.

- The commodity is then transported to the receiver either directly by the carrier or following various cargo transfers.

A similar process is followed at the Coutts/Sweetgrass international border crossing. Unfortunately, systemic, bureaucratic, political and regulatory barriers sometimes impede the movement of commercial vehicles between the United States and Canada. Commercial vehicle movement between Canada and the United States has been characterized by:

- goods that are loaded and unloaded several times before arriving at their destination to ensure the loads conform to the regulations of each jurisdiction;

- trucks having to stop for inspection by both state and provincial personnel to ensure conformity with each jurisdiction's regulations; and

- a highway transportation system where the complexity and diversity of regulations, weights, dimensions and so on, severely handicap efficiency and effectiveness with no significant gains in safety or operation (Western Transportation Institute 1995)

Joint agreements between the two countries have helped to break down some of the barriers to inter-jurisdictional commercial vehicle travel, although improvements in coordination are still possible.

1.1.4 Stakeholders

To encourage inter-jurisdictional coordination, one must have a clear understanding of the stakeholders involved with commercial vehicle operations and their respective roles. Numerous regulatory and enforcement agencies can be involved in international border crossing activities.

Involvement from transportation, customs and immigration, and other agencies occurs to differing degrees. Industry is also a major stakeholder with respect to international border activities. General roles of each group are described below.

Transportation Agencies. Transportation agencies typically assume a regulatory and enforcement role in commercial vehicle operations. In general, transportation personnel ensure that a vehicle and its cargo meet safety and weight standards and that all related licensing and permitting requirements have been met. Transportation personnel also ensure that the operator of each vehicle is legally authorized to drive that commercial vehicle. For the Coutts/Sweetgrass international border crossing, the primary transportation agencies involved include the Montana Department of Transportation and Alberta Transportation and Utilities.

Customs and Immigration Agencies. Similar to transportation agencies, customs and immigration agencies assume a regulatory and enforcement role in commercial vehicle operations. The role of the customs agency is to recognize misrepresentation in documentation, prevent contraband, and identify non-compliant cargo. To accomplish this, customs agents will check bills of lading, invoices or other documentation stating the contents of the shipment. If questionable, operators may be required to unload or uncrate their cargo at the expense of the shipper for inspection. Customs agencies may also act as an agent for drug enforcement agencies.

The role of the immigration agency is focused more on the vehicle driver rather than the cargo. Immigration agents confirm personal identity, citizenship, and the right to enter the country to prevent unlawful entry into either the U.S. or Canada. As part of this process, immigration agents may check driver credentials against various databases to identify citizenship and possible criminal history.

At the Coutts/Sweetgrass international border crossing, the U.S. Customs Service (USCS), the U.S. Immigration and Naturalization Service, Canadian Customs and Canadian Immigration all have a presence and a role.

Industry. With increased trade competition, motor carriers are facing pressures to reduce costs and focus more on delivery time and customer service. A key variable in determining the

efficiency of freight movement is travel time. For the trucking industry, shorter travel times mean the movement of more freight in less time. Improved travel time to and through intra-national and international ports of entry ultimately improve competitiveness in both domestic and international markets. Consequences of an inefficient freight transportation system are cumulative:

- longer travel times mean more expensive shipping costs for products;
- higher shipping costs result in higher manufacturing costs;
- higher manufacturing costs result in a loss of sales to foreign competitors in a global marketplace; and
- a loss of sales diminishes U.S. industries' inability to operate at or near capacity, further reducing trade competitiveness (Western Transportation Institute 1995).

Industry stakeholders affected by the inefficiencies at the Coutts/Sweetgrass international border crossing include customs brokers and freight forwarders, shippers, and motor carriers. Oftentimes, the opinions of the various motor carriers are expressed uniformly through various representative organizations such as the Montana Motor Carriers Association, Inc. and the Alberta Trucking Association.

Other. Numerous other agencies or entities have a lesser role in commercial vehicle operations at international border crossings. These lesser-involved agencies may relate to the following:

- revenue-monitoring,
- agriculture,
- food and drugs,
- fish and wildlife,
- drug enforcement,
- environmental protection,
- police and public safety, and
- emergency response.

To encourage inter-jurisdictional coordination and provide Montana and Alberta with a broad-based perspective on the *Coutts/Sweetgrass Automated Border Crossing Project*, an Oversight Committee was formed in 1995. The Oversight Committee was comprised of representatives from U.S. and Canadian customs, immigration, transportation agencies and trucking industry representatives. Table 2 summarizes the specific representatives comprising the *Coutts/Sweetgrass Automated Border Crossing Project* Oversight Committee.

1.2 REPORT PURPOSE AND CONTENTS

Recall that the original intent of the *Coutts/Sweetgrass Automated Border Crossing Project* was to develop a fully automated international border crossing facility that addressed the regulatory and enforcement needs of the Montana Department of Transportation, Alberta Transportation and Utilities, U.S. and Canadian Customs, and U.S. and Canadian Immigration and Naturalization, while improving the operational efficiency of the commercial vehicle industry utilizing this crossing. This was to be accomplished in three phases:

(1) Phase I - implement weigh-in-motion (WIM) and potentially automatic vehicle identification (AVI) systems to enhance compliant commercial vehicle movement through the joint vehicle inspection station near the Coutts/Sweetgrass international border crossing;

(2) Phase II – incorporate customs regulatory and enforcement requirements; and

(3) Phase III - incorporate immigration regulatory and enforcement requirements.

This report was to document the full Phase I implementation process. However, challenges of an institutional nature prevented the successful completion of Phase I and precluded the continuation of efforts into subsequent project phases. Therefore, this report includes only the following information:

- a description of the proposed project methodology,
- a summary of national initiatives and site-specific efforts affecting international border crossing operations as discovered through a literature and national review, and
- a description of the institutional challenges specific to this effort.

Conclusions and recommendations are provided at the end of this report.

Table 2. *Coutts/Sweetgrass Automated Border Crossing Project* Oversight Committee

CANADA	CANADA (continued)	UNITED STATES
Roger Clarke, Director Carrier Services Motor Transport Board/ Motor Transport Services Alberta Transportation and Utilities Red Deer, Alberta	Robert Lisowski Livingston International Coutts, Alberta	Mark Cole Dick Irvin Trucking, Inc. Shelby, Montana
Verl Fyfe H.H. Smith, Ltd. Coutts, Alberta	Melanie McCallum, Director U.S. Relations Dept. of Federal & Intergovernmental Affairs Edmonton, Alberta	Mary Ann Comstock, President W.Y. Moberly Inc. Sweetgrass, Montana
Fai Gan, Assistant Director Utilities & Engineering Branch Alberta Transportation & Utilities Edmonton, Alberta	Carl Procuik, Chairman Motor Transport Board/ Motor Transport Services Alberta Transportation Utilities Edmonton, Alberta	Curt Laingen Montana Motor Carriers Association, Inc. Helena, Montana
Rob J. Henderson, Acting Manager Southern Alberta District Customs Border Services, Canadian Customs Coutts, Alberta	Norm Sharpe Communications Manager Public Communications Alberta Transportation and Utilities Edmonton, Alberta	Jay Lanius, Vice President W.Y. Moberly Inc. Sweetgrass, Montana
Al Johnson, Chief Coutts Operation-East Customs and Excise, Revenue Canada Coutts, Alberta	William Sokil Sokil Express Lines, Ltd. Edmonton, Alberta	Dave Galt, Administrator Motor Carrier Services Division Montana Department of Transportation Helena, Montana
Peter Wallace Revenue Canada Ottawa, Ontario	Paul Thielen, Manager Coutts Immigration Center Canada Immigration Coutts, Alberta	Drew Livesay Motor Carrier Services Division Montana Department of Transportation Helena, Montana
		Jon Weigum U.S. Immigration Service Sweetgrass, Montana

2 METHODOLOGY

The *Coutts/Sweetgrass Automated Border Crossing Project* - Phase I methodology is outlined in Figure 6. Note that there were three primary "tracks" for achieving the desired end results. These actions, in themselves, were to provide useful insight into the automation of an international border crossing but also were intended to lay the foundation for future coordination efforts involving customs and immigration agencies planned as part of Phases II and III.

This Chapter documents the full proposed methodology for Phase I although the project was discontinued early in the methodology. The intent for including this information here is to support future related international border crossing improvement efforts.

2.1 DEFINE PHASE I GOALS AND OBJECTIVES

The objectives of *Coutts/Sweetgrass Automated Border Crossing Project* – Phase I were initially diverse but would have ultimately led to the implementation of a comprehensive, efficient automated international border crossing system that simultaneously benefited regulatory and enforcement agencies and the trucking industry. The general goal of the Phase I effort was to lay a solid foundation for future endeavors in Phases II and III. Specific Phase I objectives included the following:

2.1.1 Track A

- reach agreement related to bypass criteria (i.e., the minimum credential standards that would allow a driver and vehicle to drive through or past the border crossing facility without stopping for verification) between Alberta and Montana;
- document program marketing strategies and the participant database development process;
- document baseline conditions for future operational evaluations;

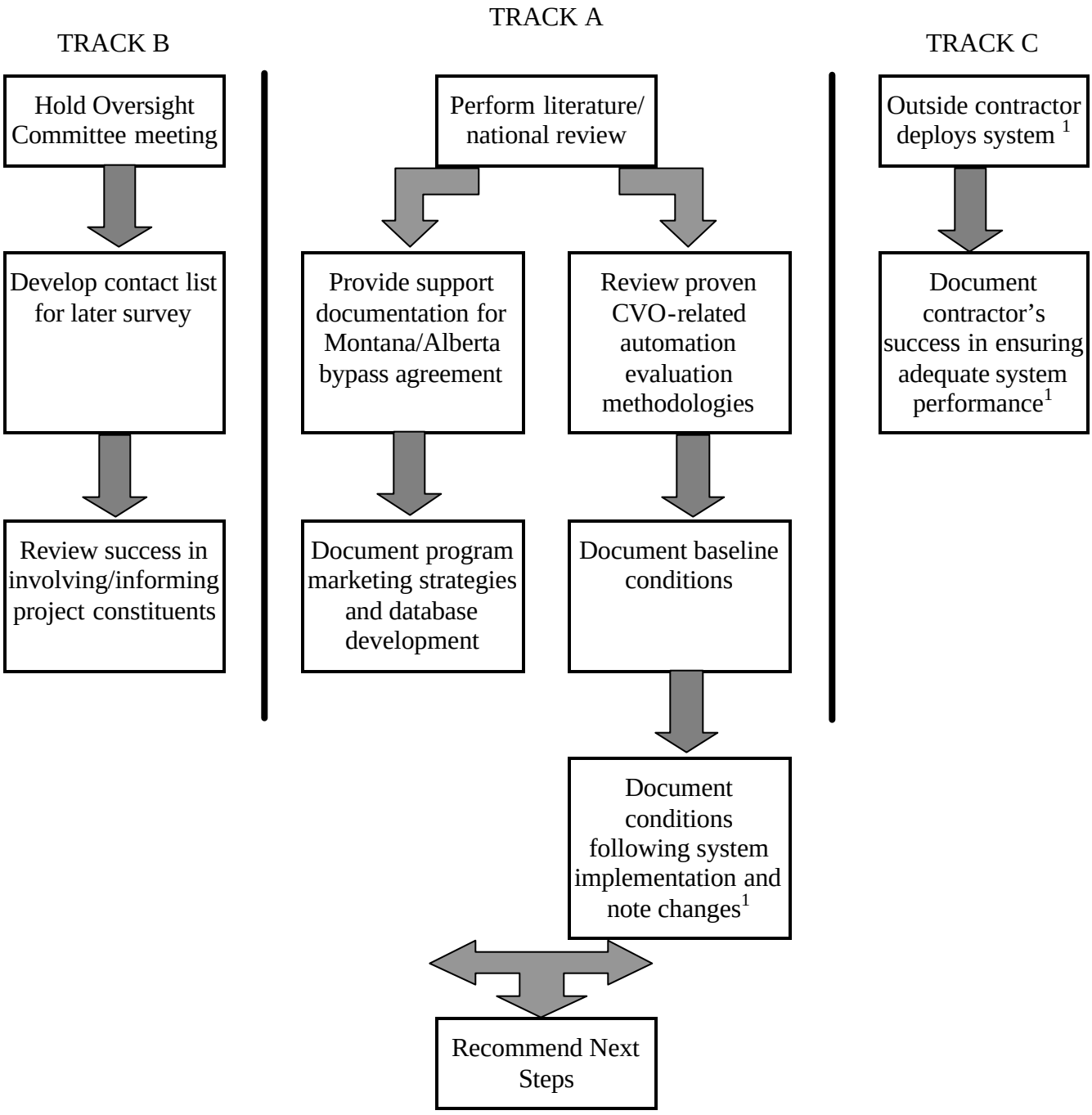

Figure 6. Phase I Methodology

[1] System may be limited to weigh-in-motion or may include automatic vehicle identification.

2.1.2 Track B

- investigate MDT and WTI's "success" in informing and involving project constituents (i.e., customs, immigration, and transportation agencies and the trucking industry);

2.1.3 Track C

- implement an operable system consisting of weigh-in-motion and possibly automatic vehicle identification as a first step to bypass operation; and

2.1.4 Tracks A, B, and C Combined

- recommend the "next steps" for Phases II and III.

Each of the various project tasks that would have led to the accomplishment of these objectives is described below.

2.2 TRACK A

2.2.1 Perform Literature/National Review

The intent of a literature/national review for the *Coutts/Sweetgrass Automated Border Crossing Project* was twofold. In the short term, information related to other international border crossing automation efforts was sought to provide negotiation or resolution strategies that were particularly successful in reaching compromise between two neighboring countries. Literature specific to the U.S./Canadian border was favored over literature relating to southern U.S. borders. However, *The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project*, focusing on the U.S./Mexican border, and similar documents were reviewed despite differences between the border climates of Mexico and Canada. When reviewing documents related to the U.S./Mexican border, researchers focused more on the opportunities for transferable evaluation methodologies rather than border-specific issues.

In the long term, information related to the evaluation of other commercial vehicle operations automation efforts including both equipment performance and facility operations, provided WTI researchers with sound and proven evaluation methodologies. The early identification of future

evaluation needs would have ensured that the appropriate baseline data was collected in the near-term.

In addition to reviewing formal literature, WTI researchers polled various organizations involved in international border crossing efforts for related information. Such groups included:

- the International Border Clearance Planning and Development Committee,
- the Task Force on Border Infrastructure and Facilitation, and
- the Southwest Border Transportation Alliance.

2.2.2 Document Program Marketing Strategies and Database Development

Depending on the nature of the automated border crossing system and the arrangements made for system management, an outside service provider is often responsible for marketing and participant database development.

Had agreement been reached on the bypass criteria and initial automation accomplished (i.e., the installation of weigh-in-motion), the program would have been marketed to potential trucking industry representatives. Because marketing would have taken place prior to full automation, it would have been necessary to emphasize to the trucking industry that the movement toward full automation could be a lengthy process. Near-term benefits, while providing improvement over fully manual methods, may fall short of long-term benefits. Bypass methods in the near-term would have likely consisted of truckers visibly displaying a "participation decal" on their truck. When visibly confirmed by the facility attendant, participating trucks would have been allowed to drive through the facility without stopping to produce credentials for verification - their credentials would have been verified off-site when they joined the bypass program and periodically throughout their participation. If an automatic vehicle identification system were implemented as part of Phase I, the level of automation and resulting benefits for the trucking industry may have been much higher. It would have been necessary to emphasize that participation in the program does not preclude enforcement or regulatory officials from performing random checks for safety and other credentials. Some trucking industry representatives may have been willing to participate early on if they frequently cross the border;

any improvement over existing fully manual operations may have saved them time or money. Others may have been more reluctant to join.

Again, because of the nature of the automated border crossing system and the arrangements made for system operations and maintenance; efforts expended for database development would have been either minimal or complex depending on the responsible party. WTI would have documented both the program marketing or promotional efforts and the development of a participant database.

2.2.3 Select Measures of Effectiveness

The measures of effectiveness defined through this task would have not only defined the information needs to draw conclusions about Phase I progress but also to consider potential future operational analyses if more advanced stages of facility automation were possible.

Because the planned level of facility automation at the completion of Phase I was limited (consisting only of weigh-in-motion), the proposed measures of effectiveness for Phase I were more qualitative than quantitative. Proposed measures of effectiveness for Phase I related to the:

- success of the bypass criteria resolution process, and
- contractor's success in meeting system performance criteria,
- success of constituency involvement and support throughout Phase I of the project.

Measures of effectiveness for more fully automated facilities (i.e., consisting of automatic vehicle identification systems) would have been more quantitative. These may have included the following:

- procedural efficiency (i.e., the number and nature of steps and procedures involved in commercial vehicle processing);
- vehicle processing time;
- administrative processing time;

- travel time or vehicle delay through border crossing vicinity;
- queue length;
- air pollution emissions;
- percent of trucks weighed; and
- violations captured.

It is important to emphasize that while the use of measures of effectiveness would have been limited in the evaluation performed as part of Phase I (because of limited facility automation), it was important to identify potential measures of effectiveness early on so that sufficient baseline data would have been collected for later analyses.

2.2.4 Document Baseline Conditions

Following the definition of appropriate measures of effectiveness, field data would have been gathered. Such data would have mimicked the previously defined measures of effectiveness (i.e., the number and nature of steps and procedures involved in commercial vehicle processing, vehicle processing time, administrative processing time, travel time or vehicle delay through border crossing vicinity, etc.)

Researchers would have determined appropriate data collection methods and durations that produced sufficient data for later analysis while remaining within the project budget. Care would have been taken to consider outside factors or activities that could confound the measurable benefits of the weigh-in-motion or other automation efforts. Potentially confounding factors may have included changes in roadway alignment or changes in operation by U.S. or Canadian Customs and Immigration to improve the efficiency of the facility outside of the effects of this effort's automation.

2.2.5 Document Conditions Following System Implementation and Note Changes

The level of automation attained in Phase I would have directly affected the scope and depth of the facility operation evaluation. For limited automation (i.e., only weigh-in-motion), the researchers' ability to capture measurable benefits would have been challenged. Automation

coupled with manual methods (i.e., visually noting participant decal and waving the truck through) would have predictably reduced the truck processing time and resulted in regulatory/enforcement personnel savings. However, the magnitude of time savings may have been sufficiently minor to limit trucker participation. Nonetheless, researchers would have made every effort to quantify benefits resulting from this first step toward full automation.

The implementation of an automatic vehicle identification system would have allowed for a much more thorough and meaningful facility operation evaluation to be performed. It is likely that a greater proportion of truckers would have been willing to participate because of the higher level of automation and higher potential time-savings benefits. In addition, bypass would have occurred automatically without manual intervention. Data collection following system implementation would have occurred at several levels of market penetration (i.e., 2 percent, 5 percent, 10 percent, etc.) to determine the relative operational improvements given increased participation.

In each case, the same data elements collected when documenting baseline conditions would have been consistently captured again. Statistically sound methods would have been used to determine the significance of operational changes before and after system implementation.

2.3 TRACK B

2.3.1 Develop and Administer Constituent Survey

WTI would have arranged, coordinated and scheduled periodic Oversight Committee meetings, contacting each Committee representative by mail and by phone to communicate meeting agenda, goals and other pertinent information. WTI would have prepared and distributed meeting minutes resulting from each meeting to all Oversight Committee meeting attendees and other parties as requested by MDT and FHWA.

Following each Oversight Committee meeting, WTI would have contacted, via mail or other medium, members of the Oversight Committee to survey their knowledge and understanding of the *Coutts/Sweetgrass Automated Border Crossing Project*. These survey results would not have been statistically analyzed because of the small sample and potential bias resulting from such a

targeted sample. However, these survey results would have provided MDT and WTI useful insight as to their agencies' effectiveness in involving project constituents.

2.4 TRACK C

2.4.1 Document Contractor's Success in Ensuring Adequate System Performance

The Montana Department of Transportation (MDT) contracted with an outside contractor, WHM, to perform the preliminary site inventory and analysis for the Coutts/Sweetgrass international border crossing. Information related to existing systems, infrastructure and topography were collected.

Had the implementation of the weigh-in-motion system moved forward, WTI would have documented the contractor's success in ensuring adequate performance of the system from an equipment-related rather than an operational perspective. Proven methodologies would have guided this effort to ensure an accurate performance evaluation. Both the American Society for Testing and Materials (ASTM) and the National Cooperative Highway Research Program (NCHRP) provide specifications/guidelines for evaluating the performance of weigh-in-motion systems (i.e., ASTM E 1318-94 and NCHRP Project 3-39, respectively). The accuracy of weigh-in-motion when recording various factors such as wheel load, axle load, axle-group load, gross vehicle weight, vehicle speed, and axle-spacing would have been investigated and documented. WTI researchers would have similarly documented the contractor's success in attaining adequate system performance from the automatic vehicle identification system.

While the objectives and subsequent work tasks for the *Coutts/Sweetgrass Automated Border Crossing Project* were somewhat varied and unrelated in Phase I, the inability to reach agreement on bypass criteria between Montana and Alberta was more critical in that it resulted in the discontinuance of the project as a whole.

3 LITERATURE/NATIONAL REVIEW

Two types of information emerged from the literature and national review conducted as part of the *Coutts/Sweetgrass Automated Border Crossing Project*: (1) national trade or transportation initiatives potentially affecting the scope and direction of this study and (2) site-specific border crossing efforts that could be looked to for lessons learned. This information was made available both as formally published literature as well as through informal discussions with various organizations involved in international border crossing efforts.

3.1 NATIONAL INITIATIVES

National initiatives relating to trade activities or transportation improvements may have affected the outcome or direction of this study. Hence, a clear understanding of national activities was thought to be beneficial. National initiatives are categorized below as (1) international trade, (2) Intelligent Transportation Systems/Commercial Vehicle Operations, (3) border crossing activities.

3.1.1 International Trade

Over the past seven years, the U.S. government has been involved in negotiations that have resulted in one bilateral and two multilateral trade agreements: (1) the bilateral Canada-United States Free Trade Agreement (CFTA), (2) the multilateral General Agreement on Tariffs and Trade (GATT), and (3) the multilateral North American Free Trade Agreement (NAFTA). Each of these trade-related policies is discussed in more detail below.

Canadian-U.S. Free Trade Agreement. The Canada-U.S. Free Trade Agreement (CFTA) established a liberal free-trade environment between the U.S. and Canada. The final agreement came into effect on January 1, 1989. Both the U.S. and Canada agreed that neither party should increase any customs duty or introduce any customs duty on any goods originating in the territory of another party except as otherwise provided in the agreement. The agreement also

included provisions for the reduction of existing tariffs, and for the reduction and removal of other impediments to trade such as import quotas and import licensing requirements. As a result, by 1994, more than 70 percent of trade in goods between the U.S. and Canada entered duty free (Smith 1997). In contrast, before the CFTA, Canada's average tariff on goods imported to the U.S. (weighted by trade) was about 9.9 percent while the U.S. average tariff on goods imported from Canada was about 3.3 percent (Smith 1997).

General Agreement On Tariffs And Trade. The recent 1994 General Agreement On Tariffs And Trade (GATT) is intended to encourage and expand the free flow of trade in goods and services among the 128 participating countries. GATT provides for liberal trade in agriculture, textiles and apparel, general tariffs, and government procurement. The 1994 GATT addressed three new areas: (1) trade in services, (2) investment and (3) intellectual property rights. Finally, the agreement dealt with several institutional issues including the creation of the World Trade Organization (WTO), dispute settlement procedures, and trade policy review mechanisms.

North American Free Trade Agreement. The North American Free Trade Agreement (NAFTA) among Canada, Mexico, and the U.S. is intended specifically to create a free-trade area among Canada, Mexico and the U.S. through the elimination of tariffs and other barriers to trade over the 15-year period from 1994 to 2009. The agreement covers five general areas (1) tariff reductions, (2) the removal of non-tariff trade barriers, (3) financial investment, (3) trade rules including dispute settlement procedures, and (5) environmental issues.

These three trade-related agreements, while healthy for the economy, pose a serious challenge for each countries' trade supporting infrastructure (i.e., roadways, intra-national and international border crossing facilities, etc.). Generally, this attention has centered on congested eastern border locations (Smith 1997). By contrast, there has been little recognition that increased international trade is also impacting rural, western crossings. The *Coutts/Sweetgrass Automated Border Crossing Project* offered a unique rural environment within which the goals of the CFTA, GATT and NAFTA could have been accomplished.

3.1.2 Intelligent Transportation Systems/COmmercial Vehicle Operations

In an effort to accommodate or plan for increasing trade traffic, the Federal Highway Administration (FHWA) has instituted a national program for the application of Intelligent Transportation Systems (ITS) to commercial vehicle operations (CVO). The goals of the national ITS/CVO program are to:

- improve highway safety,
- streamline credentials and tax administration,
- reduce congestion for motor carriers, and
- ensure regulatory compliance and equitable treatment (National ITS/CVO Program 1998).

Resultant benefits of ITS/CVO implementation include:

- reduced administrative costs for regulatory agencies and motor carriers,
- reduced frequency and severity of commercial vehicle accidents,
- reduced congestion and improve efficiency at weigh stations and international border crossings, and
- improved economic competitiveness through reduced the cost of motor carrier transportation and regulation (National ITS/CVO Program 1998).

The national ITS/CVO program comprises four focus areas:

- safety assurance,
- credentials administration,
- electronic screening, and
- carrier operations.

Two initiatives in the national ITS/CVO program will support technology deployment in these four focus areas: (1) the Commercial Vehicle Information Systems and Networks (CVISN) initiative and (2) the Mainstreaming initiative. CVISN will provide the technical infrastructure to link these projects and information systems, including common standards and electronic

communication among participating agencies and carriers. The Mainstreaming initiative will provide the organizational infrastructure to support ITS/CVO deployment including state and regional ITS/CVO forums and business plans (see Figure 7). Each of the national ITS/CVO program aspects are discussed briefly below.

Safety Assurance. The ITS/CVO safety assurance program will enable safety inspectors to target their resources on the carrier, drivers and vehicles that are at the highest risk. Potential technologies include automated roadside safety inspections and carrier reviews, safety information systems, and on-board safety monitoring.

Safety assurance projects underway nationally include the following.

Roadside Safety Inspections and Carrier Reviews

- The Safety and Fitness Electronic Records (SAFER) system will provide access from fixed and mobile inspection sites to the data residing within the federal and state motor carrier safety information systems.

Safety Information Systems

- The Safety Status Measurement System (SAFESTAT) will measure safety "fitness" by assessing a carrier in four broad areas: (1) accidents, (2) driver, (3) vehicle management and (4) safety management.
- Operational tests in Idaho, Minnesota and Wisconsin are developing on-site and off-site (through carrier self-certification) methods to verify compliance with out-of-state orders issued following driver and vehicle safety inspections

On-board Safety Monitoring

- The FHWA and National Highway Traffic Safety Administration (NHTSA) are sponsoring a series of projects to develop brake testing devices and emissions testing devices that reduce time and effort required for roadside safety inspections. Other research projects are developing on-board systems to monitor performance of the driver, the brakes, and other vehicle components (National ITS/CVO Program 1998).

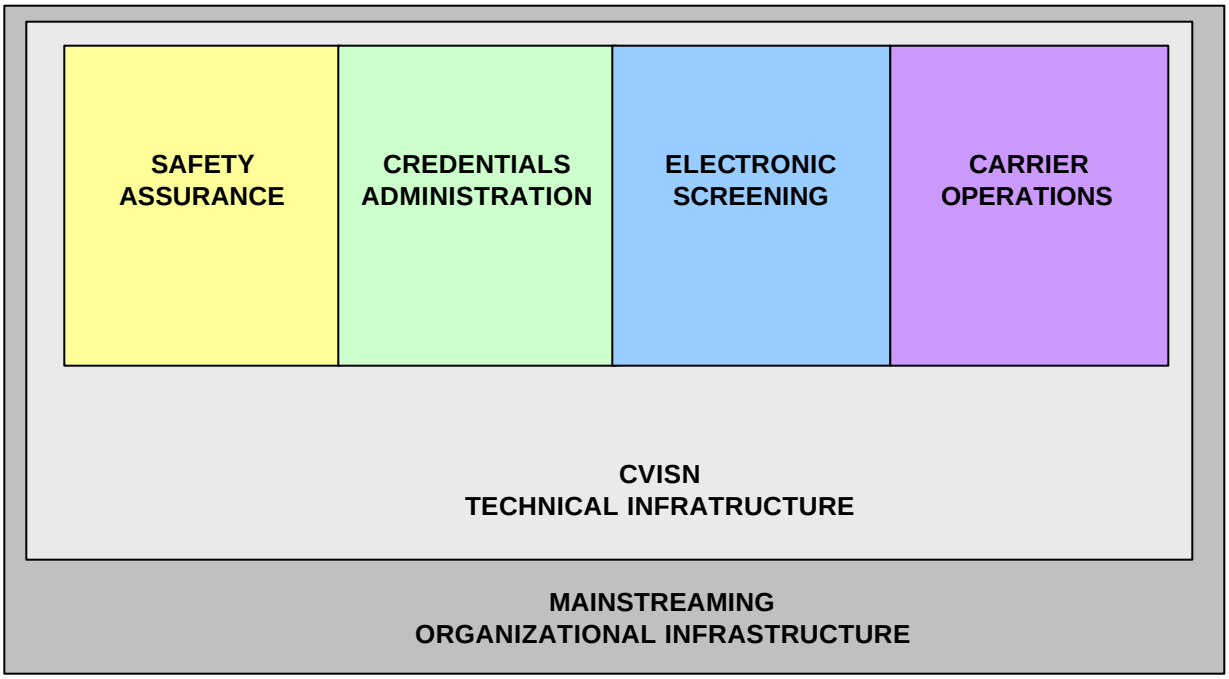

Figure 7. National ITS/CVO Program (1998)

Credentials Administration. The objective of the ITS/CVO credentials administration program is to streamline credentials and tax procedures. The expected benefits include reduced operating costs and administrative effort for both agencies and carriers, as well as improved regulatory compliance by carriers. Technology development focuses on electronic application, purchasing, and issuance of credentials as well as automated tax reporting and filing.

National efforts related to credentials administration include the following:

- Operational tests of electronic "one-stop shopping" systems are underway in three regions: the Midwest, the Southwest, and the Far West, under the direction of HELP, Inc.
- Multi-state clearinghouses are under development to manage the exchange of data and fees for the International Registration Plan (IRP) and the International Fuel Tax Agreement (IFTA).

- The I-95 Corridor Coalition representing 12 Northeast states, is developing a regional electronic registration system that will enable motor carriers to register electronically with state motor vehicle agencies, either directly or through third-party service providers.

- Eleven states in the Southeast, six states in the West, and five states in New England have developed regional oversize/overweight permitting programs. A broad program covering all 12 Northeast states is under development.

- Under the auspices of the Alliance for Uniform Hazardous Materials Transportation Procedures, four states are participating in a pilot test of a proposed base-state program for hazardous materials registration and permitting.

- The Automated Mileage and State-line Crossing Operational Test (AMASCOT), completed in late 1995, demonstrated and evaluated the technology to automate the collection and filing of motor carrier mileage and fuel reports (National ITS/CVO Program 1998).

Electronic Screening. The objective of the ITS/CVO electronic screening program is to improve the verification of size, weight, and credentials information by roadside enforcement operations. The primary benefit of these projects will be reduced delays for compliant motor carriers, which will improve freight mobility and reduce delivery costs. In addition, the decrease in the use of weigh stations will reduce the number of accidents resulting from traffic queues outside stations or from vehicles exiting and re-entering the mainline highway.

National efforts related to electronic screening include the following:

- The PrePass program, offered by HELP, Inc., allows trucks to be weighed at highway speeds and have their credentials verified without stopping. Numerous states currently participate in the PrePass program.

- The Advantage CVO Partnership is developing a Mainline Automated Clearance System (MACS) along the Interstate 75 corridor from Ontario to Florida. Six states and Ontario are participating an operational test of the system.

- Building on Oregon's experience with the Green Light operational test, four Northwest states are developing the Multi-jurisdictional Automated Pre-clearance System (MAPS). The MAPS system will be interoperable with HELP and MACS technology.

- The capability for international electronic border clearance is being developed through operational tests at major crossings in New York, Michigan, Washington, Texas, New Mexico, Arizona, and California. The systems will address customs, immigration, administrative, and safety requirements (National ITS/CVO Program 1998).

Carrier Operations. The ITS/CVO carrier operations program will increase the flow of information about carrier operations and roadway conditions among carriers, state agencies, and emergency responders. Benefits of this program include reduced congestion and better managed commercial vehicle traffic. Potential technologies include fleet and vehicle management technologies, travel advisory services and hazardous materials incident response services.

National efforts related to carrier operations include the following:

Travel Advisory Services

- The I-95 Corridor Coalition will establish a public/private organization known as TruckDesk to collate, package, and disseminate information on highway travel conditions to motor carrier dispatchers and drivers.

Hazardous Materials Incident Response Services

- Operation Respond is developing a format for information exchange and computer linkages between railroads, intermodal motor carriers, and first responders to speed the flow of information and the notification about hazardous materials incidents. Operational tests are underway in California, Georgia, Louisiana, Michigan, New York, and Texas.

- The National Institute for Environmental Renewal (NIER) is developing a pilot program for a Hazardous Materials Fleet Management and Monitoring System that will establish and operate information systems to identify the contents of hazardous materials transported by motor carriers. An operational test is underway along Interstate 81 in Pennsylvania, to be followed by additional work in Los Angeles (National ITS/CVO Program 1998).

Commercial Vehicle Information Systems and Networks. The ITS/CVO Commercial Vehicle Information Systems and Networks (CVISN) program is investing in the development of the technical infrastructure that will support the widespread deployment of ITS/CVO services. Through CVISN, the ITS/CVO program is developing the following:

- standards, protocols, and unique identifiers to facilitate the electronic data interchange and vehicle-to-roadside communication capabilities that enable most ITS/CVO services;
- interstate clearinghouses for vehicle registration, fuel tax administration, hazardous materials permits, and other credentials; and
- the SAFER system to provide a much-needed link between existing and planned motor carrier safety information systems (National ITS/CVO Program 1998).

A primary CVISN goal is to ensure that the vast majority of CVO business transactions are handled electronically by the year 2005. To achieve this primary goal, the CVISN Model Deployment initiative is underway to move the CVISN architecture from the concept stage into operation.

Mainstreaming. The organization and management of the ITS/CVO program are critical to the overall progress in deployment. The FHWA's mainstreaming initiative will organize and manage ITS/CVO deployment. The objectives of the mainstreaming program are to:

- incorporate ITS/CVO more fully into state and metropolitan transportation planning;
- coordinate ITS/CVO activities among agencies and among states; and
- explain the ITS/CVO program to key decision makers in the public and private sectors.

The ITS/CVO program will develop policies, plans, projects, and forums at three levels:

- the state level, because the states have the first-line responsibility for motor carrier safety regulations;
- the regional level, because many truck trips occur in more than one state; and
- the national level, because of the need to ensure uniformity of state services for carriers operating in more than one region (National ITS/CVO Program 1998).

Thirty-three states, including Montana are participating in the ITS/CVO mainstreaming initiative. The state ITS/CVO mainstreaming program will emphasize planning for and deployment of specific ITS/CVO technologies and services, with a particular emphasis on the deployment of the CVISN infrastructure. The development of a national ITS/CVO program will

not change the fundamental allocation of responsibility between the states and the Federal government, but will improve coordination and communication both within and among states. In most states, the primary need is for the integration and coordination of the work of existing agencies to ensure smooth planning.

3.1.3 Border Crossing Activities

In addition to the all-encompassing national ITS/CVO program that considers all aspects of commercial vehicle movement, there are two large-scale efforts aimed specifically at improving border crossing operations: (1) the International Border Clearance Program and (2) the North American Trade Automation Prototype. Each of these is briefly described below.

International Border Clearance Program. The International Border Clearance Program (IBC) is a federally sponsored program that provides a focused effort to implement ITS/CVO technologies at international borders. Specifically, objectives of the IBC program are to:

- streamline border clearance regulatory and enforcement processes,
- reduce the information burden on private industry,
- deploy ITS technologies that are interoperable between IBC functions and transportation functions,
- achieve repeatable and predictable IBC operations, and
- realize cost effective solutions that easily integrate with existing public and private infrastructure and minimize investment by the various stakeholders (Booz-Allen & Hamilton 1997).

North American Trade Automation Prototype. The North American Trade Automation Prototype (NATAP) is a national program that brings together Customs border crossing regulatory and enforcement activities at a national level. NATAP attempts to standardize the processes that occur when a vehicle enters or exits the U.S. from a Customs perspective. It is a model for how customs will be processed in the future. NATAP efforts are focusing initially on six international border crossing sites:

(1) Buffalo, New York;

(2) Detroit, Michigan;

(3) El Paso, Texas;

(4) Laredo, Texas;

(5) Nogales, Arizona; and

(6) Otay Mesa, California.

Had the *Coutts/Sweetgrass Automated Border Crossing Project* advanced to Phase II, NATAP automation activities at each of these sites would have provided useful lessons learned for future border crossing automation efforts at other locations.

3.2 SITE-SPECIFIC EFFORTS

The large-scale border crossing activities described in the previous section are concentrated at only a handful of sites although there are 131 border crossings in the United States that lead into Canada to the north and Mexico to the south. The literature and national review performed as part of the *Coutts/Sweetgrass Automated Border Crossing Project* uncovered detailed information related to the following international border crossing sites:

- Detroit, Michigan;
- Port Huron, Michigan;
- Buffalo, New York;
- Blaine, Washington;
- Otay Mesa/San Ysidro, California;
- El Paso, Texas; and
- Laredo, Texas.

This section describes some of the similarities and differences at these select northern and southern border crossings with respect to:

- traffic characteristics,
- infrastructure characteristics,
- operational characteristics,
- safety and weight inspections,
- border technologies,
- tolls,
- border restrictions, and
- border efficiency.

3.2.1 Traffic Characteristics

The commercial vehicle demand and the related economic trade values at each of the various northern and southern international border crossings varies significantly (see Table 3). Note that annual commercial vehicle volumes range from 150,800 in Blaine, Washington to 580,350 in El Paso, Texas. One commonality among nearly all sites is that an increasing trend in the commercial vehicle volumes has been historically noted and is anticipated to continue (Brown, et al. 1995). If comparable growth occurs, the Coutts/Sweetgrass international border crossing should anticipate an 11 to 17.5 percent growth in commercial vehicle volumes.

3.2.2 Infrastructure Characteristics

Directly related to commercial vehicle demand is the infrastructure characteristics at each of the various international border crossing sites. Table 4 describes the number of available lanes, the number of primary and secondary inspection booths and recent and planned improvements to the various international border crossing facilities. Depending on the age of the facility and recent rehabilitation efforts, the degree to which the facilities are able to accommodate the growing commercial vehicle demand will vary (Brown, et al. 1995).

Table 3

Table 4

Table 4 (Continued)

3.2.3 Operational Characteristics

Depending on the cargo being transported, different methods for processing commercial vehicles are undertaken. These various methods include:

- 3461 Entry (specifies who the shipper is by code, tariff classifications, cargo value, quantity, port of exportation, and port of importation);
- Line Release Entry (used for low risk, high volume shipments using established carriers, brokers, and shippers);
- Border Cargo Selectivity (uses the Automated Commercial System (ACS) and the Automated Broker Interface (ABI) system to obtain information about shipper/manufacturer name, consignee, harmonized number, country of origin, and importer of record);
- Border Release System (BREL) (requires manual processing and occurs when a truck shows up at the border without any pre-filed paperwork);
- Pre-file (requires that the broker enters data into the Automated Commercial System (ACS) through the Automated Broker Interface (ABI) system. Customs enters the entry number found on the manifest and determines whether a secondary inspection is required.
- Despacho Previo (used by Mexican Customs to pre-clear southbound railcars);
- Form 7512 (allows trucks carrying cargo from Canada to Mexico to continue through the U.S. without delivering cargo);
- Monthly Master Manifest;
- In-Bond Movements;
- Empties; and
- APTA/In transit.

Table 5 describes the processing methods used at each of the international border crossing sites. When available, the percent of commercial vehicle traffic processed using a particular method is specified. Note that the most common processing methods include line release and border crossing selectivity, respectively. Also included in Table 5 is an indication of facility hours of

Table 5

Table 5 (continued)

operation and staffing levels for the various sites. Most sites offer 24-hour a day processing (Brown, et al. 1995)

3.2.4 Safety and Weight Inspections

Facilities for performing weight and safety inspections are often not in the immediate border crossing facility. Table 6 describes the location of safety and weight enforcement facilities in relation to the international border crossing for each of the various sites. Table 6 also summarizes the credentials checked during these inspections, the frequency with which a safety inspection is performed and the agency responsible for enforcing weight and safety. In each case, police agencies and transportation agencies were responsible for ensuring safety and weight compliance, respectively (Brown, et al. 1995).

3.2.5 Border Technologies

Border technologies can be categorized by (1) information systems, (2) weight and size monitoring technologies, (3) cargo monitoring technologies and (4) vehicle identification and processing technologies. Table 7 summarizes the various technologies used at each of the various international border crossing sites. Note the consistency in use with respect to many of the information systems (i.e., National Crime Information Center, National Law Enforcement Telecommunications, Center Index System, National Automated Immigrant Information Lookout System). Use of the various weight/size/cargo monitoring and vehicle identification and processing technologies are more sporadic among the various sites (Brown, et al. 1995).

3.2.6 Tolls

Each of the sites with the exception of Blaine, Washington and Otay Mesa/San Ysidro, California charge some type of toll for crossing the international border (see Table 8). The toll amount is typically related to either the number of axles on a commercial vehicle or to the weight of the commercial vehicle. Other miscellaneous fees exist as well, including a wide load and escort fee of $10.00 in Port Huron, Michigan and various processing fees in Laredo, Texas. Detroit, Michigan offers discounted toll rates to frequent users of the international border crossing (Brown, et al. 1995).

Table 6

Table 7

Table 8

3.2.7 Border Restrictions

At many of the border crossing sites, particularly at older facilities, the physical infrastructure limits the size and weight of commercial vehicles crossing the international border (see Table 9). Tunnel structures are limited by allowable commercial vehicle size while bridge structures are limited by allowable commercial vehicle weight. Rehabilitation efforts at many of the sites are correcting for these size and weight limitations whenever possible.

In addition to size and weight restrictions, commodity restrictions exist as well. Hazardous materials are restricted at many of the international border crossing locations. Certain crossings restrict hazardous materials transport all together while other crossing restrict the type and quantity of hazardous materials moved (Brown, et al. 1995).

3.2.8 Border Efficiency

Border efficiency is primarily the cumulative result of the traffic characteristics, the infrastructure characteristics and the operational characteristics of the site. Primary inspection times are fairly consistent between the sites depending on the level of paperwork completion (see Table 10). Primary inspections generally take less than 5 minutes if all required paperwork is in order. Secondary inspection times range from 5 minutes up to several days depending on the type of secondary inspection required. The wait times at each of the sites indicate that perhaps either the infrastructure characteristics or the operational protocol are insufficient with respect to the ever-increasing commercial vehicle demand. The effects of these wait times with respect to both delay costs and emissions reported for Buffalo, New York; Blaine, Washington and El Paso, Texas are significant (Brown, et al. 1995).

Had the *Coutts/Sweetgrass Automated Border Crossing Project* continued, the national and site-specific information contained in this Chapter would have (1) guided project direction to align with national initiatives, (2) supported baseline documentation efforts by assisting researchers in identifying potentially confounding factors (i.e., physical characteristics or operational protocol that would have potentially limited improvements in border crossing efficiency regardless of automation efforts) and (3) provided numerous venues for lessons learned.

Table 9

Table 10

Table 10

4 INSTITUTIONAL CHALLENGES

Montana and Alberta have a history of partnership and cooperation. The commonality is that similar agencies are responsible for the safe and legal entry and exit of goods, vehicles and people into and out of each respective jurisdiction. Differences in neighboring country's policies have led, in this case, to challenges when implementing ITS/CVO technologies for improved border efficiency. These challenges were in fact so severe that they prevented completion of the Phase I effort and continuation into subsequent project phases.

This Chapter briefly overviews common institutional challenges associated with ITS deployment in commercial vehicle operations. Following this general overview, those institutional challenges affecting automation progress at the Coutts/Sweetgrass international border crossing are described in detail.

4.1 OVERVIEW OF INSTITUTIONAL CHALLENGES

Institutional challenges associated with ITS deployment in commercial vehicle operations have been well documented in previous literature (Hallenbeck, Koehne and Scheibe 1993; Kavalaris and Sinha 1994; Keng, Govind and Walton 1995). As such, only a general overview is provided here to familiarize the reader. Those desiring more detail should refer to the previous literature cited.

In general, ITS/CVO institutional challenges relate to the following:

- differing perspectives and philosophies;
- legislative, regulatory and organizational limitations;
- lack of motivation and leadership;
- communications;
- funding and resource limitations;

- automation constraints; and
- standards.

Each of these is described briefly below.

4.1.1 Differing Philosophies and Perspectives

Differing perspectives and philosophies can exist between (1) multiple jurisdictions, (2) regulatory and enforcement agencies and the trucking industry and (3) divisions within a single agency or industry. If not addressed appropriately, these differences can result in animosity and distrust and lead to a resistance to change.

Jurisdictions often have very different perspectives concerning their role in trucking regulation and the role of ITS technologies. For example, one jurisdiction may want to pursue ITS/CVO technologies to more effectively monitor weight distance tax payments, while another jurisdiction may be primarily interested in performing more effective safety checks. Differing perspectives of regulatory and enforcement agencies and industry groups also exist. For example, a system designed to speed truck flow through a port of entry may be viewed by a trucking firm as a way to reduce operating expenses. Enforcement personnel, however, may view the system as a hindrance to the effectiveness of visual inspections. Similarly, the creation of a system that increases a state's ability to verify a truck's credentials may be viewed by a trucking firm as a method for increasing its tax exposure. Even within a single agency, what may be viewed by one division as a means to streamline the regulatory process may be viewed by another division as an attempt to reduce control over its portion of the regulatory process (Koehne, Hallenbeck and Scheibe 1993).

Most jurisdictions, agencies and divisions are territorial about the functions they normally perform. The presence and severity of turf problems differ significantly depending on the existing level of interaction between the participants, the existing organizational structure, the level of interaction already occurring, and the individuals involved. Confounding this territorial issue is an underlying resistance to change. This resistance to change is often found at the lower levels of organizations (i.e., the field personnel). However, when these attitudes exist at the

upper levels of organizations, significant implementation delays can occur especially if the people with those attitudes are in decision making positions.

4.1.2 Legislative, Regulatory and Organizational Limitations

There are two types of legislative and regulatory challenges: those that are part of state/provincial and federal statutes, and those that are part of administrative codes or policies adopted by specific agencies. For the most part, administrative codes or policies can be changed without significant delay or problem, as long as there is a convincing argument justifying those changes. However, regulatory changes that require action by a state/provincial legislature can be expected to take both time and effort.

At an organizational level, agencies are commonly asked to compromise their differences to accommodate the differences among jurisdictional procedures and systems. The more complex the organizational structure, and the larger the number of decision makers that need to agree to a system or plan, the longer it takes to reach agreement on that system or plan. This is further complicated by the fact that there is often duplication of regulatory functions among several agencies.

4.1.3 Lack of Motivation and Leadership

The motivation or incentive sufficient to do something perceived as different, risky, and expensive often challenges the implementation of ITS/CVO. Compelling arguments in favor of the various ITS/CVO technologies and processes have not, until recently, been well developed and documented.

Limited leadership at the national level with respect to ITS/CVO implementation exacerbates the lack of motivation. States and provinces may be lacking sufficient information on the specific benefits to be obtained from ITS/CVO technologies or the most promising technologies that should be implemented.

4.1.4 Communications

The monitoring, regulation, and enforcement of the trucking industry is extremely complex involving numerous agencies, divisions within agencies and levels of government. The number of individuals and entities that are involved makes it extremely difficult to include all of the appropriate persons in the communications process. Effective communication is further hampered by the continual changing of personnel into and out of decision making positions. Communication failures often occur either *vertically* or *horizontally.* A vertical communication failure means that information is not being passed effectively through the vertical components of an agency, or state or provincial organizational structure. A horizontal communications failure means that information is not being transferred effectively within one organizational level of one or several similar agencies (Koehne, Hallenbeck and Scheibe 1993). The international nature of the Coutts/Sweetgrass border crossing magnifies horizontal communication challenges due to different governmental and organizational structures between Canada and the U.S.

4.1.5 Funding and Resource Limitations

ITS/CVO implementation can be a costly process. Aside from the obvious in-field equipment-related costs, implementation usually includes, at a minimum, the following:

- the cost of creating or revising existing computer systems;
- the cost of in-vehicle/on-vehicle devices;
- the cost of peripheral system equipment (i.e., computers at field sites and central offices, and communications between those points); and
- infrastructure modifications to accommodate the system (i.e., resurfacing, widening, etc.).

Training costs for personnel, management costs for setting up new procedures, and maintenance costs associated with operating the new systems also add to the total cost of ITS/CVO systems. Training and maintenance are important early considerations; existing staff are not likely to possess the electronic component and computer software maintenance skills that may be required after ITS/CVO implementation. Because regulatory and enforcement agencies are always faced

with more funding needs than available resources, ITS/CVO activities must compete with these other funding requirements.

4.1.6 Automation Constraints

Different levels of automation exist among the various agencies and jurisdictions involved in commercial vehicle regulation and enforcement. Many regulatory and enforcement functions are performed manually. Also, agencies that have historically experienced problems as a result of trying to automate (i.e., delays in obtaining software, inadequate software performance once it has been obtained, poor system design and inappropriate equipment selection) may not be as willing to accept ITS/CVO technologies, particularly when those new technologies are not well proven elsewhere in the country.

4.1.7 Standards

ITS/CVO implementation has been prevented or significantly delayed by the lack of standards for a wide range of subjects:

- in-vehicle/on-vehicle devices,
- communications protocols (both between vehicles and the roadside and between different jurisdiction computers),
- data formats,
- forms and procedures,
- information collection and data transfer, and
- penalties for non-compliance.

Minor differences, such as the number of digits provided for a carrier's name in a database, or the coding used to indicate a particular type of infraction, can cause significant difficulties in the design of computer systems required to exchange information (Koehne, Hallenbeck and Scheibe 1993).

Major differences also can exist in the computer hardware used to store, manipulate, and transfer the data. Because each jurisdiction performs its own equipment procurement and has different

sets of priorities, levels of funding, and organizational structures, equipment types vary. State or provincial agencies often use computers with different proprietary operating systems. At the same time, jurisdictions may use different brands of equipment at field sites and different methods of communications between the field and central offices.

4.2 INSTITUTIONAL CHALLENGES AFFECTING THE COUTTS/SWEETGRASS INTERNATIONAL BORDER

While it was anticipated that the *Coutts/Sweetgrass Automated Border Crossing Project* would face many of the general institutional challenges described above to some degree, those involved with the project did not foresee such an early and insurmountable impasse related to commercial vehicle safety criteria for bypassing the border crossing facility.

Both the trucking industry and state agencies have a strong interest in the safety of their trucks and the effectiveness of safety programs. Trucking firms are concerned about the safety of their drivers, the safety of the public, and the costs associated with unsafe operations (liability, insurance, damage claims, etc.). States and provinces are charged with ensuring the safe operation of the transportation facilities. While truck accidents are a small proportion of all accidents each year, truck accidents tend to be more costly, more visible, and more likely to cause serious injury or death. Therefore, states/provinces are very interested in ensuring that the trucks using the highways are in good working order, have been properly maintained, and are operated safely (Koehne, Hallenbeck and Scheibe 1993).

Both Alberta and Montana have commercial vehicle safety programs in place. In Alberta, the Partners in Compliance (PIC) program seeks to reward extraordinary trucking industry members through a voluntary motor carrier self-monitoring process. Approved carriers must install a specialized license plate on each of their vehicles denoting them as "PIC-compliant." This identification plate allows the vehicle to pass through the weigh stations, port-of-entry or border crossing facilities without stopping. However, as a non-automated system, the vehicle must still travel through the weigh station/port-of-entry/border crossing facility to allow for visual bypass approval by the regulatory or enforcement personnel (the facility personnel view the PIC-compliant plate and wave the truck through without stopping it).

The bypass criteria defined for PIC, on the basis of "benchmarks," provide considerably higher standards than the average compliance presently achieved by the trucking industry in Alberta, Canada. Further, the PIC program has a more involved, stringent compliance process than existing pre-clearance programs in Montana and the rest of the U.S.

In Montana, regulatory and enforcement officials use the Safety Status Measurement System (SAFESTAT) which measures safety "fitness" by assessing a motor carrier in four broad areas: (1) accident, (2) driver, (3) vehicle and (4) safety management. SAFESTAT scores a motor carrier's safety performance, weighting recent and severe accidents more heavily. SAFESTAT supports related motor carrier registration suspension or revocation due to unsatisfactory safety performance.

Both the Partners in Compliance (PIC) program and the Safety Status Measuring System (SAFESTAT) have a similar overall intent - to improve highway safety and preserve the roadway infrastructure. However, when looking at the details of each safety program, strong philosophical differences exist between Montana and Alberta regulatory and enforcement officials.

Ideally, with respect to commercial vehicle operations, one would like to optimize both safety levels and operational efficiencies. It is assumed that at early stages of development, investment in safety and operational improvements would have a sizable impact. The impact of continued investment in safety and operational improvements is thought to gradually lessen resulting in only minor incremental improvements (see Figure 8). It was this "optimal level" on which Montana and Alberta regulatory and enforcement officials could not reach agreement.

To gain improvements in safety, motor carriers must be held to strict standards of operation and vehicle maintenance. To improve operational efficiency at an international border crossing facility, regulatory and enforcement officials must target non-compliant carriers while allowing compliant carriers to bypass the facility.

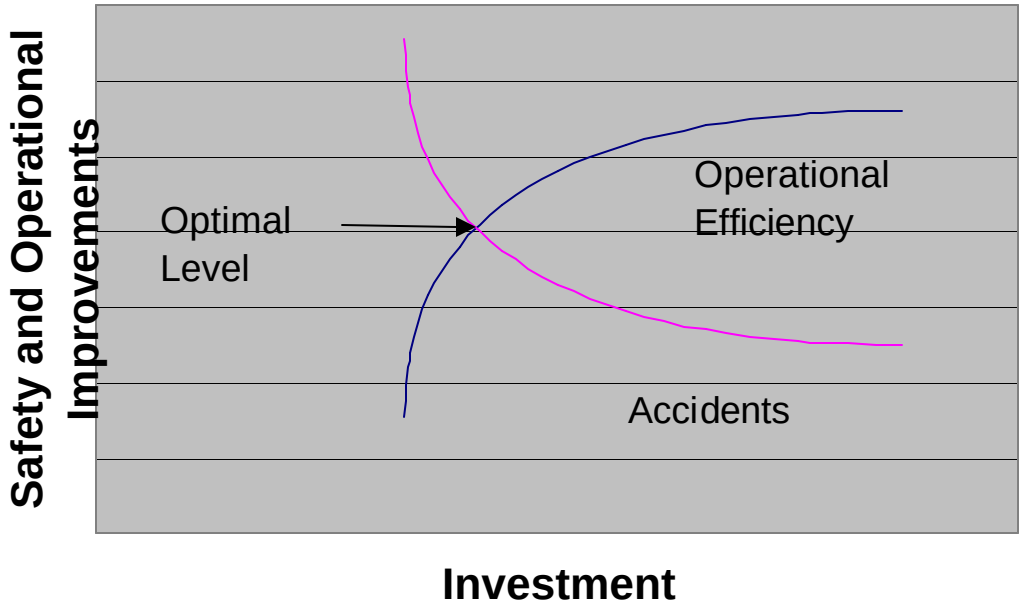

Figure 8. Investment vs. Safety and Operational Improvements

In the PIC program, safety standards are set very high and the processes required for a motor carrier to achieve bypass standing are rigorous. As such, voluntary participation in the program is low, representing only motor carriers that have "extraordinary" safety performance. While high motor carrier safety standards may have a significant effect on roadway safety levels, bypassing such a low percent of the carriers has little to no effect on the operational efficiency of the international border crossing.

Montana officials propose allowing motor carriers with "demonstrated" safety compliance bypass the Coutts/Sweetgrass international border facility rather than just the "extraordinary" carriers. Safety standards would not necessarily be compromised but the level of detail reported to prove safety compliance would be greatly reduced. Predictably, this would increase voluntary participation in the bypass program. This philosophy more closely approaches the safety level/operational efficiency optimization depicted in Figure 8. Benefits to safety would not be optimized in isolation as PIC attempts to do. Instead, more modest safety gains would be realized but in addition, significant operational improvements could be gained.

Given the nature of these two differing philosophies – Alberta officials desiring to optimize safety levels through rigorous standards in the PIC program and Montana officials desiring to

optimize both safety levels and operational efficiencies at the Coutts/Sweetgrass international border crossing – project progress was at an impasse until resolution was reached.

Numerous discussions took place between high level officials from both the Montana Department of Transportation and the Alberta Transportation and Utilities in writing, by telephone and in-person. In one exchange, Alberta transportation officials expressed, in their opinion, the potential for compromised safety should PIC program standards be adjusted to align with U.S. and Montana SAFESTAT standards through a comparative analysis of PIC and SAFESTAT criteria. A subsequent comparison was performed by Montana transportation officials. The results of this exchange are summarized in Table 11.

The effectiveness of either the PIC or SAFESTAT program in improving motor carrier safety and preserving the infrastructure is indeterminable at this point. Without historical safety data that can be isolated with respect to the effects of each safety program, speculation as to the effectiveness of either program cannot be substantiated.

Both jurisdictions hold each other's respective programs in high regard and agree with the overall intent of each program (i.e., to improve highway safety and preserve infrastructure). Disagreement exists when determining whether to optimize safety levels or to optimize safety levels and operational efficiencies in combination. This root philosophical difference manifested itself in at-odds discussions related to specific safety-related bypass criteria.

In November 1998, resolution regarding how to proceed with the Coutts/Sweetgrass Automated Border Crossing Project was reached. A meeting involving the Federal Highway Administration (FHWA), the Montana Department of Transportation and the Western Transportation Institute was held. It was agreed to by all parties that the *Coutts/Sweetgrass Automated Border Crossing Project* was at an impasse and that no further delay or effort should be expended.

Table 11. Comparative PIC/SAFESTAT Exchange Between Alberta and Montana

PIC CRITERIA	SAFESTAT CRITERIA	
	ALBERTA	MONTANA
1.0 DRIVER QUALIFICATIONS		
• requires all drivers to take PIC Test	yes	yes
• requires driver score of 75% on PIC Test	no	U.S. drivers are tested prior to receiving a CDL
• maintains driver files	yes	yes
• written safety program/disciplinary policy	no	USCFSR recommends
• written safety training and orientation	no	no
• written policy on reporting violations	yes	yes
• written policy on driving prohibitions	yes	yes
• regulations	yes	yes
• designated safety personnel	no	no
• written hiring procedures	no	no
• safety personnel provide input to hiring	no	no
• reports statistics monthly	no	no
2.0 REPORTABLE COLLISION		
• written reportable collision program	no	no
• detailed reportable collision files	no	USCFSR 390.15 requires detailed files kept for one year
• detailed collision reporting procedures	no	no
• collision definitions	no	no
• $4500 property damage	no	Disabling damage must be reported for company files
• death	yes	yes
• injury	yes	yes
• non-urban, 0.3/1.6 m km	no	no
• driver training on legal obligations	no	no
• statistics reported monthly	no	no
• document retention 3 years	yes	yes
3.0 EQUIPMENT INSPECTION		
• written maintenance program	no	USCFSR requires written carrier maintenance program
• detailed maintenance files	yes	yes
• written pre- and post inspections	yes	yes
• retains CVSA forms/repair confirmation	yes	yes
• requires CVSA out-of-service criteria familiarity	no	USCFSR require driver familiarity with all regulations, not just out-of-service criteria
• CVSA out-of-service < 5%	no	no
• requires minimum annual CVSA inspections	no	USCFSR requires annual, comprehensive inspection by trained personnel
• responsible for lease/contract vehicles	yes	yes
• reports statistics monthly	no	no
4.0 DRIVER HOURS OF SERVICE		
• < 5% fatigue related violations	no	no
• drivers/dispatchers/internal auditors understanding of regulations	yes	yes
• form, manner and duty violations review on all logs and with drivers	no	USCFSR requires carriers to ensure driver's logs meet regulations
• sample records inspection monthly to determine fatigue-related violations	no	no

Table 11. Comparative PIC/SAFESTAT Exchange Between Alberta and Montana (Continued)

PIC CRITERIA	SAFESTAT CRITERIA	
	ALBERTA	MONTANA
4.0 DRIVER HOURS OF SERVICE (Continued)		
• carrier responsibility for all lease and contract operator records	yes	yes
• time record documentation	yes	yes
• statistics reported monthly	no	no
5.0 DANGEROUS GOODS		
• < 10% documentation errors	no	no
• < 0.2 occurrences/ 1.6 m km	no	Unintentional release reported to USDOT's RSPA
• driver tra ining in handling	yes	yes
• load security/compatibility, etc.	yes	yes
• driver inspection of cargo tanks	no	Daily inspections of equipment by driver's required including cargo tanks with strict testing requirements
• policy on cargo tank trip inspections	no	no
• understanding of appropriate permits	no	no
• internal emergency procedures	yes	yes
• display of safety marks	yes	yes
• statistics reported monthly	no	no
• document retention 2 years	yes	yes
6.0 WEIGHTS & DIMENS IONS		
• equipment statistics maintained	no	no
• cargo and shipping statistics maintained	no	no
• training in weight/over-dimension management and permit conditions	no	no
• load/commodity dispatches statistics (either actual or sample)	no	no
• weights on bill of lading recorded	no	no
• internal over-length review and prevention	no	no
• have all proper permits	no	no
• identify over-dimension loads/violations	no	no
• identify all over-length hauled	no	no
• maintain over-length/dimension standards	no	no
• statistics reported monthly	no	no
7.0 IFTA		
• 100% compliance	yes	yes
• filing returns	yes	yes
• complete and accurate trip records	yes	yes
• maintain monthly/quarterly summary	yes	yes
• document retention for 4 years	yes	yes
8.0 PRORATE/IRP		
• 85% accuracy	no	no
• complete and accurate trip records	yes	yes
• report statistic s monthly	no	no
• maintain monthly/quarterly summary	yes	yes
• maintain records for 4 years	yes	yes

5 CONCLUSIONS AND RECOMMENDATIONS

Commercial vehicle regulatory and enforcement personnel in Canada, the United States and Mexico are challenged by increased international trade activities encouraged through national initiatives, such as the Canada-United States Free Trade Agreement (CFTA), the General Agreement of Tariffs and Trade (GATT), and the North American Free Trade Agreement (NAFTA). The volume and economic value of trade between Montana and Alberta, as well as the noted increasing trend in trade activity between these two jurisdictions, warrant investment in border crossing facilities and the infrastructure leading to and from. Because a dramatic increase in the amount of regulatory and enforcement resources and staff is unlikely, the use of advanced computer and communication technologies (i.e. Intelligent Transportation Systems) to improve the efficiency of existing border crossing activities may be the most suitable solution.

The *Coutts/Sweetgrass Automated Border Crossing Project* was intended to improve operational efficiency of this rural border crossing facility using ITS applications. Phase I of the *Coutts/Sweetgrass Automated Border Crossing Project* was intended to result in semi-automated international border crossing facility that addressed the regulatory and enforcement needs of the Montana Department of Transportation and the Alberta Transportation and Utilities, while improving the operational efficiency of the commercial vehicle industry utilizing this crossing. With the successful completion of Phase I, Phases II and III would have addressed customs and immigration requirements, respectively. However, as documented in this report, institutional challenges prevented the successful completion of Phase I and precluded the continuation of efforts into subsequent project phases.

Institutional challenges associated with ITS deployment in commercial vehicle operations have been well documented in previous literature and include challenges related to:

- differing perspectives and philosophies;
- legislative, regulatory and organizational limitations;
- lack of motivation and leadership;

- communications;
- funding and resource limitations;
- automation constraints; and
- standards.

Progress on the *Coutts/Sweetgrass Automated Border Crossing Project* was impeded early on by differing perspectives and philosophies among Montana and Alberta transportation officials related to safety bypass criteria. Ideally, with respect to commercial vehicle operations, one would like to optimize both safety levels and operational efficiencies. To gain improvements in safety, motor carriers must be held to strict standards op operation and vehicle maintenance. To improve operational efficiency at an international border crossing facility, regulatory and enforcement officials must target non-compliant carriers and allow compliant carriers to bypass the facility.

Given the nature of these two differing philosophies – Alberta officials desiring to optimize safety levels through rigorous standards in the PIC program and Montana officials desiring to optimize both safety levels and operational efficiencies at the Coutts/Sweetgrass international border crossing – project progress was at an impasse until resolution was reached. In November 1998, resolution was determined to be hopeless. All involved parties agreed that no further delay or effort should be expended on the *Coutts/Sweetgrass Automated Border Crossing Project*.

Future ITS/CVO deployment and border crossing automation efforts at the Coutts/Sweetgrass international border crossing are unlikely unless any one or a combination of the following conditions occur:

- the PIC or SAFESTAT program evolve in such a way to better align with respect to safety standards,
- a comprehensive study substantiates safety improvements or compromises related to either the PIC or SAFESTAT program, or
- through personnel rotation, existing Montana or Alberta regulatory and enforcement officials are replaced with individuals possessing more aligned perspectives and philosophies related to ITS/CVO.

Until such time, no further, large-scale ITS/CVO efforts are recommended.

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