El Paso Regional Ports of Entry Operations Plan

Volume I
Project Summary Report

prepared for

Texas Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

HNTB, Inc.
KPMG, LLC
Harris Interactive Service Bureau
University of Texas El Paso

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1.0 Introduction and Background

The El Paso/Juárez region's international border crossings are a system of regional, statewide, and national significance. This system provides a critical link between maquiladora factories, primarily located in Ciudad Juárez, and distribution centers and consumer markets located in metropolitan El Paso, Texas and New Mexico, and beyond. All told, more than $69.4 billion in U.S.-Mexico trade crossed through the region's ports of entry in 2010, a 47 percent increase from 2009.[1] This represents nearly 18 percent of total trade between the United States and Mexico – making the El Paso gateway the second-busiest land port of entry in the United States by total trade value.

In addition to facilitating trade, this system also provides access to schools and businesses and contributes to a shared regional culture and lifestyle. In 2010, over 60,000 passenger cars and nearly 22,000 pedestrians used these crossings each day.[2] Overall, border-dependent businesses and travelers contributed over $1 billion to the regional economy and supported nearly 700,000 jobs on both sides of the border.[3] Clearly, this system is a key contributor to the overall health and competitiveness of the El Paso, Juárez, and Texas economies, linking the two communities, fostering international trade, and creating and supporting high-paying, attractive jobs for the region's residents.

However, this vital system is being stressed by continued growth in traffic, trade, and pedestrian volumes, driven by the growing populations and economies of Texas, in general, and the El Paso/Juárez region, in particular. Even though traffic and pedestrian volumes declined in the midst of the 2007-2009 global recession and security crisis in Northern Mexico, these volumes already are growing from their 2009 lows and are expected to grow significantly between now and 2035, driven by expected growth (to $3.4 million) of the regional population.[4] These growth patterns will exacerbate existing wait times at the border – which already have increased more than 60 percent over the last six years – and cause congestion along critical access routes. Trip times and costs for travelers will increase, service reliability for freight shippers and carriers will decrease, and the ability of the system to recover from emergencies and service disruptions will become severely taxed. Layered on top of these concerns is the increasing

[1] U.S. Customs and Border Protection.

[2] Ibid.

[3] Cambridge Systematics analysis based on REMI simulation.

[4] UTEP, Borderplex Long-Term Economic Trends to 2029, April 2010 with Cambridge Systematics extrapolation from 2029-2035.

challenge of balancing mobility needs with social, financial, environmental, and security concerns; rapidly rising infrastructure investment and maintenance costs; and recognition that neither the public nor private sectors – acting independently – have the necessary resources to fully address rising system demands. Individually or collectively, these issues may erode the efficiency and productivity of the El Paso border crossing system, leading to economic implications that will reverberate locally, regionally, nationally, and internationally.

Although many regional stakeholders, agencies, and entities have examined these and other border issues – and in many cases have brought forward their own ideas about how they should be addressed – until now there has been no systemwide examination of the region's border crossings as an integrated whole. There also has not been an assessment of operational strategies that could be employed to make the existing system of crossings more efficient. A systemwide, operationally focused approach is critical, because without a clear understanding of how existing capacity and systems can be maximized, it will be very difficult to build regional political, financial, or institutional support and momentum for new capacity investments, if needed.

Completion of the Ports of Entry Operations Plan presents a new approach focused on identifying and implementing operational strategies (i.e., staffing, system management, technological, and policy improvements) to:

- Maximize the use of the El Paso's existing system of border crossings;
- Recognize and integrate the various needs, perspectives, and sensitivities of all the different users of the crossings as well as the agencies and entities that are responsible for planning, managing, and securing it; and
- Provide the region with the information needed to work with statewide, national, and international transportation and security policy-makers, the private sector freight and manufacturing communities, and local, regional, and national partners to more effectively and comprehensively plan for the future.

1.1 OUR CHARGE

We were charged with assessing the current and future operations of the region's six international border crossings, from Santa Teresa, New Mexico, to the planned Tornillo-Guadalupe port of entry. Our focus was on identifying operational improvements to improve the current performance of this existing system and determining whether or not these improvements would allow it to absorb future demand.

We were guided in our work by a set of principles, described below, that we used as a touchstone to ensure that our approach, analysis, and final recommendations met the most important transportation, industry, economic, and quality-of-life needs and issues identified by regional stakeholders and interest groups.

El Paso Regional Ports of Entry Plan Guiding Principles	
• Focus on strategies that optimize the use of existing infrastructure. • Focus on strategies that reduce crossing times without sacrificing security and enforcement or creating bottlenecks elsewhere on the system. • Consider logical combinations of operational, policy, and traffic engineering solutions, leveraging technology where feasible.	• Ensure that final potential solutions minimize impacts to the health, safety, function, and character of surrounding neighborhoods. • Include a mix of immediate, short-, mid-, and long-term solutions. • Ensure solutions provide economic, environmental, and/or trade facilitation benefits on a regional scale.

1.2 STRUCTURE OF THIS REPORT

The Final Operations Plan, which describes the current conditions at the region's existing ports of entry, the issues and challenges that are impacting their condition and performance, and a series of operational and policy recommendations for regional stakeholders and leadership to consider, was adopted by our Advisory Committee in May 2011.[5]

This Project Summary Report serves a different purpose. This report is the technical companion to the Final Operations Plan, and provides comprehensive documentation of all the technical and outreach activities conducted to support the Operations Plan's conclusions. Although the Operations Plan and this Project Summary Report are designed to be used in combination, this report is targeted toward a more technical audience.

The remaining sections of this Project Summary Report include:

- An overview of our **work plan**, which describes all the technical steps required to complete our analysis.
- A summary of the **public and stakeholder involvement process** that we used to guide the development of our work, vet our findings, and refine our recommendations.
- An overview of our **technical analysis approaches and key findings** in several important areas impacting border crossing demand and operations, including commodity flow and socioeconomic trends, economic impacts of regional border crossings, an assessment of available technology applications to support border crossing operations, and a summary of potential alternative bridge management strategies.
- A detailed description of the **project screening and scenario development process** that we used to evaluate potential operational projects, strategies,

[5] The Final Operations Plan can be found on the project web site, http://www.elpasoborderplan.org/.

and initiatives within the suite of operational models we developed for this project.

- A summary of the **model development and validation activities** that we undertook to build, test, and apply the operational models used in project evaluation.
- A description of the **financing options** we considered as a way for regional leadership to implement our recommendations.
- A description of the **economic benefits and economic impacts** assessments we conducted on the final set of improvement scenarios.
- **Technical appendices**, which provide lists of individual stakeholders and stakeholder groups interviewed and briefed during plan development, detailed summaries of public and stakeholder meetings, and further details on our technical analysis activities.

2.0 El Paso Regional Ports of Entry Operations Plan Work Plan

2.1 INTRODUCTION

As described earlier, the overall purpose of the Operations Plan was to review all existing ports of entries (POE) within the El Paso region, analyze how the ports currently function, and develop recommendations to improve cross-border mobility in the region. The study region encompassed the entire El Paso region, from Santa Teresa, New Mexico to the Tornillo/Guadalupe POE. The study team was led by Cambridge Systematics, Inc. (CS) and supported by KPMG, HNTB, the Harris Interactive Service Bureau, and the University of Texas at El Paso (UTEP).

Our technical work consisted of five phases:

- Phase I, Project Management and Outreach Activities;
- Phase II, Existing and Forecast Conditions;
- Phase III, Scenario Development and Testing;
- Phase IV, Financial Evaluation; and
- Phase V, Recommendations and Implementation.

The specific work steps within each of these phases are described below.

2.2 WORK STEPS

Phase I – Project Management and Outreach Activities

This phase consisted of four individual tasks, described below.

Task I.1 – Project Management Activities

Objective. The objective of this task was to provide coordination and management of project work tasks, outreach, deliverables, and other critical path activities that must be completed to maintain project schedule and ensure successful project completion.

Approach. We prepared a project management plan (PMP) within one week of notice-to-proceed (NTP) to identify coordination and communication procedures, team and Advisory Committee meeting dates and locations, document

format, and other important operational information pertaining to team activities. Specific details addressed in the PMP included:

- Detailed communication plan to ensure efficient coordination and communication among the project team, TxDOT, the study Advisory Committee, partner agencies, local governments, and other regional efforts;
- Project schedule depicting milestones, Advisory Committee review, and comment periods and meetings;
- Templates and procedures for monthly progress reporting requirements; and
- Quality control and assurance (QA/QC) process.

Work Steps

- Develop project management plan and schedule to meet project reporting and management objectives.
- Develop templates and schedule to meet TxDOT progress reporting and invoicing requirements.
- Develop and implement QA/QC program.

Deliverables. Deliverables for this task included a final PMP that guided all subsequent work.

Task I.2 – Develop and Implement Public Involvement Plan (PIP)

Objective. The objective of this task was to develop and implement an ongoing and inclusive public involvement plan (PIP) to ensure that all interested groups in the El Paso region, including both sides of the U.S.-Mexico border and Southeastern New Mexico, were actively engaged in the planning, development, and implementation of the Operations Plan.

Approach. The PIP described our approach for collecting input from all interested groups in the planning and development of the Operations Plan, as well as how the results and findings of our outreach efforts were used to guide subsequent tasks within this work plan.

Our public involvement approach occurred in three phases (described below): an **initial phase**, to understand public attitudes and perceptions of border crossing needs, issues, and potential solutions; an **intermediate phase**, to hone in on a more specific set of potential solutions that best meet the neighborhood and regional mobility issues; and a **final phase**, to assist in fine-tuning the final recommendations for and roll-out of the Plan. Our PIP included recommendations for a variety of ongoing communications, such as newsletters, project web site (linked to TxDOT, the El Paso MPO, the City of El Paso, Camino Real Regional Mobility Authority (RMA), and others as appropriate), mailing list, and public participation database, to ensure wide dissemination of project materials and information.

Work Steps

- Design and implement the initial outreach events to coincide with the work being conducted in Phase II – Existing and Forecasting Conditions and be completed before the technical work begins in Phase III – Scenario Development and Testing. We developed and conducted a three-tiered initial public involvement in order to define critical issues and impacts, evaluation criteria, and a comprehensive set of project solutions for subsequent screening:
  - **Public Polling** included a broad, random sample (1,000 completed surveys) of public attitudes about a new border crossing, targeting respondents on both sides of the U.S.-Mexico border and Southeastern New Mexico. We worked with TxDOT to design a (up to) 10-minute on-line or telephone survey (in both Spanish and English) to understand the public's attitudes and issues concerning regional border crossings and to gauge attitudes about general types of strategies or solutions that could mitigate these issues. We designed the survey working with TxDOT and use Harris Interactive Service Bureau (HISB) to implement the survey (public polling questions and results are included in Appendix B).
  - **Focus Groups** were structured and implemented to solicit input from a mix of neighborhood and regional interest groups. The Public Polling process was used to help identify the mix of attendees, structure the format of the facilitated discussions, identify the critical neighborhood issues, and begin to identify the evaluation criteria and types of solutions that could best address the public's concerns. We conducted several Focus Groups throughout the region (focus group summaries are included in Appendix B).
  - **Public Meetings** were implemented to broaden the discussion of potential border crossing project solutions. The results of the Focus Groups drove the format of each public meeting. Each public meeting consisted of a presentation describing the specific issues impacting various neighborhoods throughout the region and a facilitated and an open-ended discussion of potential strategies and evaluation criteria and methods used to address the critical issues. Attendees were encouraged to recommend solutions that would potentially address the needs of their neighborhood, and suggest policy changes that would potentially improve mobility and enhance economic competitiveness within the region. We conducted several public meetings across the region (dates and locations of the public meetings are included in Appendix B).
- Document the results and findings of this initial three-tiered approach by identifying critical neighborhood and local issues, defining likely project solutions, and defining the evaluation criteria used to assess the impact of these project solutions.

- Design and implement a series of intermediate outreach events to coincide with the work to be conducted in Phase III – Scenario Development and Testing. The following intermediate events were used to identify a smaller, screened set of solutions (operational, pricing, infrastructure, and others identified in the initial outreach efforts) that best meet the neighborhood and regional issues for the detailed analysis in Phase III:
  - **Focus Groups,** including the same mix of neighborhood and regional interest groups conducted initially, were implemented to solicit feedback on the screening process and the draft list of screened projects that best address the critical regional issues. We conducted several Focus Groups throughout the region.
  - **Solutions Forums**, at different locations throughout the region than the initial Issues Forums, were implemented to present the list of screened projects and to identify those projects that best address the public's regional issues. The results of the intermediate Focus Groups, including the revision of the draft list of potential solutions, drove the format of each forum. Each forum consisted of a presentation describing the screening process, the project solutions that best meet the region's needs, and an overview of the detailed evaluation process that will take place in Phase III. We conducted several Issues Forums across the region.
- Document the findings and results from these intermediate events by identifying project screening criteria and identifying the preferred set of potential solutions for more detailed analysis in later phases.
- Design and implement the **final outreach events** to coincide with the work to be conducted in Phase V – Recommendations and Implementation to assist in fine-tuning the final recommendations for the Plan.
  - **Public Meetings**, were implemented to present the public with the draft recommended/preferred border crossing solutions. The format for these forums included facilitated discussions that described the process and how the set of recommended border crossing solutions were identified through a detailed evaluation. While not a formal Open House, we provided stations that describe the process and results. We conducted several public meetings across the region (dates and locations are provided in Appendix B).
- Document the final outreach results by identifying the recommend and preferred set of projects and any revisions to these projects defined as a result of the Plan Forums.
- Develop and implement **ongoing outreach events** to complement and support each of the PIP phases. Communication plan elements included:
  - **Database and Mailing List of Interested Groups and Individuals.** Through available and new sources, a database of interested groups and individuals was compiled and maintained to support the project.

Available sources of interested groups (standing steering and public committees, participants of previous public outreach efforts, existing neighborhood and regional groups and associations) was compiled and used as our starting point. We expanded this database through the ongoing development of the project's PIP phases. This database was as comprehensive as possible and used to distribute both newsletters and public notices to keep the public informed of the project as it proceeds.

- **Web Page.** A project web page (www.elpasoborderplan.org) was implemented to provide the public with on-line access to understand the project's agency sponsors and participants, and view the final documents, status of key milestones, and listing of upcoming events.
- **Newsletters.** Coinciding with each of the project phases, we prepared five newsletters to announce upcoming public events, describe the milestones of project, and present other relevant information to the public. Newsletters were posted on the web page and also sent to the contacts contained in the database of interested groups and individuals. Newsletters were prepared and distributed by e-mail using the database and on-line through the project web page. The timing of newsletter preparation and distribution coincided with the start and end of Phase II – Existing and Forecast Conditions; end of Phase III – Scenario Development and Testing; and start and end of Phase V – Recommendations and Implementation (Project newsletters are included in Appendix B).
- **Public Notices.** We worked with the TxDOT El Paso District Public Information Officer (PIO) to prepare the content and schedule of print media public notices using TxDOT's, the MPO's, and the City's protocols and requirements. Notices also were posted to the web page and distributed using the project database to identify the key timing of public meetings and review of project reports and milestones.
- **Other Potential Media Elements.** We worked with TxDOT to define other media strategies designed to provide the public with information about the project and to solicit public input into the planning process. Other media events may include television spots, videos to support the PIP events, among others to be determined by TxDOT and its partners.

- We prepared draft and final reports that summarize the design and implementation of this communications plan for agency review, comment, and finalization.

Deliverables. Deliverables for this task included:

- Final PIP (described in Section 3.0).
- Initial, Intermediate, and Final outreach reports (complete at end of Phase II, end of Phase II, and end of Phase V, respectively).

- Five project newsletters, complete at beginning of Phase I, beginning of Phase II, end of Phase II, end of Phase III, and end of Phase V, respectively (included in Appendix B).
- Public notices, media briefing packets, and other materials as required (Appendix B).
- Public participation database (complete at end of project).

Task I.3 – Develop Model/Analysis Tool Framework Design

Objective. The objective of this task as to develop a modeling and analysis framework for the project to ensure compatibility and consistency with current regional and border analysis tools and to ensure the tools developed can provide the decision-makers with the appropriate information.

Approach. We worked with the El Paso MPO and UTEP to understand in detail what the capabilities and current state of each of the analysis tools developed and maintained by each organization. The tools were then compared with the objectives of the study and the desired analysis and information needed for the study. We then assessed each tool through the FHWA Traffic Analysis Tool Selection process (FHWA Traffic Analysis Tool Primer) and developed a recommended Framework to integrate the macro-, meso-, micro-level simulation models. The Framework was presented to the technical members of the stake-holder team for approval.

Work Steps

- Review existing models and analysis tools.
- Conduct tool selection process.
- Develop model framework.

Deliverable. The deliverable for this task was a Technical Memorandum describing the Model/Analysis Tool(s) Framework and Design (included in Appendix I).

Task I.4 – Develop and Implement Data Collection and Interview Plan

Objective. The objective of this task was to review existing planning activities, literature, models, and data sets in the region, assess the degree to which data available within these efforts meet the technical needs of this study, and identify additional data collection activities to support subsequent tasks**.**

Approach. In a desire to utilize existing data whenever possible, we reviewed existing data sets and tools to determine the degree to what other critical inputs/ data collection activities are required. Of particular concern were the data and calibration/validation criteria used in regional model development in order to identify gaps data where more detailed data may be needed for:

- Factoring 24-hour demands from the El Paso MPO TransBorder Model to hourly assignments;
- Developing detailed microsimulation of border operations based on vehicle transactions times under the various inspection functions at the border stations;
- Integrating travel time data from major origin/destination (O/D) pairs crossing through the stations; and
- Updating commercial vehicle data for both regional estimation and microsimulation.

To fill gaps, we developed new primary data collection activities, such as traffic counts, O/D surveys, and face-to-face interviews with stakeholders. Most of the data required for the microsimulation level were obtained from the Customs and Border Protection (CBP) Transaction Recording System and we worked closely with TxDOT, UTEP, CBP, and other stakeholders to get access to this important information.

Any new data collection efforts were designed to build upon, rather than to duplicate, the available data that was identified as part of the data collection plan. We summarized our data collection recommendations within a technical memorandum for review by TxDOT and, following approval, undertook data collection activities.

Work Steps

- Collect, review, and analyze existing reports, studies, data sets, and model data inputs and calibration to assess available data.
- Identify data gaps and recommend additional data collection efforts within a Data Collection and Interview Plan for review and approval by TxDOT.
- Obtain transaction data from CBP for all regional crossings.
- Implement data collection and interview activities upon TxDOT approval.

Deliverables. Deliverables for this task include a draft and final Data Collection and Interview Plan to guide subsequent tasks.

Phase II – Existing and Forecast Conditions

This phase consists of six individual tasks, described below.

Task II.1 – Infrastructure Profile

Objective. The objective of this task was to develop a current and forecast inventory and assessment of the transportation infrastructure in the El Paso region and to conduct a market valuation of regional transportation assets.

Approach. We identified and described the physical location and existing condition of the existing regional transportation system, including all POEs,

including those in Southeastern New Mexico. We also identified and described future infrastructure projects/investments, such as the proposed Oregon Street Light Rail project and the Airway Boulevard extension (from North Loop Road/Trowbridge Drive to Border Highway (Loop 375)), that might impact the future condition and performance of the regional transportation system.

Work Steps

- Describe the regional transportation infrastructure using existing data, information, and maps (under a separate work authorization).
- Conduct engineering assessment of the condition of existing regional transportation infrastructure, identifying potential using GIS maps (under a separate work authorization).
- Summarize findings and results within a technical memorandum (under a separate work authorization).

Deliverables. The deliverable for this task is an Infrastructure Summary technical memorandum (included in Section 4.0 and Appendix C).

Task II.2 – Demographic and Commodity Flow Profile

Objective. The objective of this task was to describe current and future demographic and commodity flow characteristics within the El Paso region.

Approach. We collected data and information to describe population growth patterns in the region (both base year and to 2035), as well as other key economic and demographic indicators, such as gross-regional product and per-capita income, both of which are indicators of a region's economic vitality. The economic trends analysis conducted by UTEP's Border Region Modeling Project was used to guide this effort. We then described how these socioeconomic and demographic trends and issues will translate into additional travel demand in the region.

We also examined current and future demand for freight transportation in the region, particularly cross-border movements, and developed both base year and forecast (2035) demand estimates. We developed the 2035 forecast by combining these data with data available from UTEP, as well as information gleaned from interviews with shippers using the El Paso POEs**.**

Deliverables. We documented our approach, key findings, and conclusions of this analysis within a technical memorandum for review and approval by TxDOT (included in Appendix D).

Task II.3 – Existing Traffic Conditions and Model Calibration

Objective. The objective of this task was to establish the existing traffic/ transportation conditions at the regional border crossings and including the adjacent local street network(s); and to calibrate the Framework Model to those conditions.

Approach. We collected and analyze existing traffic and transportation data (using our data collection plan as a guide) to determine historic trends and to isolate three periods for existing conditions model calibration:

- **Typical Day Scenario –** This is considered a typical day at the crossing;
- **High Passenger Day –** This is considered a day when both the passenger vehicle traffic is high while commercial vehicle traffic is normal;
- **High Commercial Day –** This is considered a day when commercial traffic is high and passenger traffic is normal; and
- **High Demand Day –** This is considered a day when all traffic is high.

The importance of establishing these days was to analyze and determine the existing conditions that lead to the breakdown of operations at the stations. Each day can have specific circumstances that cause either the commercial traffic or the passenger traffic to back up and affect all traffic streams approaching the facility.

We then examined traffic and transportation data from the transportation networks adjacent to each facility and develop the traffic conditions for each of the existing conditions scenarios above to be incorporated into the models.

Simultaneously, we integrated the various travel demand and simulation models for the Zaragosa, Bridge of the Americas (BOTA), Stanton Street, Paso del Norte, and Santa Teresa POEs, and prepare to calibrate the integrated model for existing conditions. Prior to calibration and/or validation, we worked with the study team to identify calibration criteria and targets. For the roadway networks leading to and adjacent to the stations, we used accepted FHWA criteria for *Calibration of Microscopic Simulation Models*. For the POE stations, we recommended a set of calibration criteria based on our experience at other border crossings and worked with TxDOT and other stakeholders to come to consensus on the final set of calibration criteria.

Work Steps

- Compile, reduce, and analyze data.
- Revise Macro/Meso/Micro networks.
- Develop model calibration targets.
- Calibrate model for existing conditions.

Deliverables. Deliverables for this task included a technical memorandum on Existing Conditions Border Station Operations and a technical memorandum on the approach and results of the model calibration (included in Section 6.0 and Appendix I).

Task II.4 – Border Wait Times and Economic Analysis

Objective. The objective of this task was to provide information to be used in the public outreach program as well as input into the screening of recommendations.

Approach. We documented the economic role of the border crossings in the regional economy as well as the economic impact of border wait times at the regional, state, and national levels.

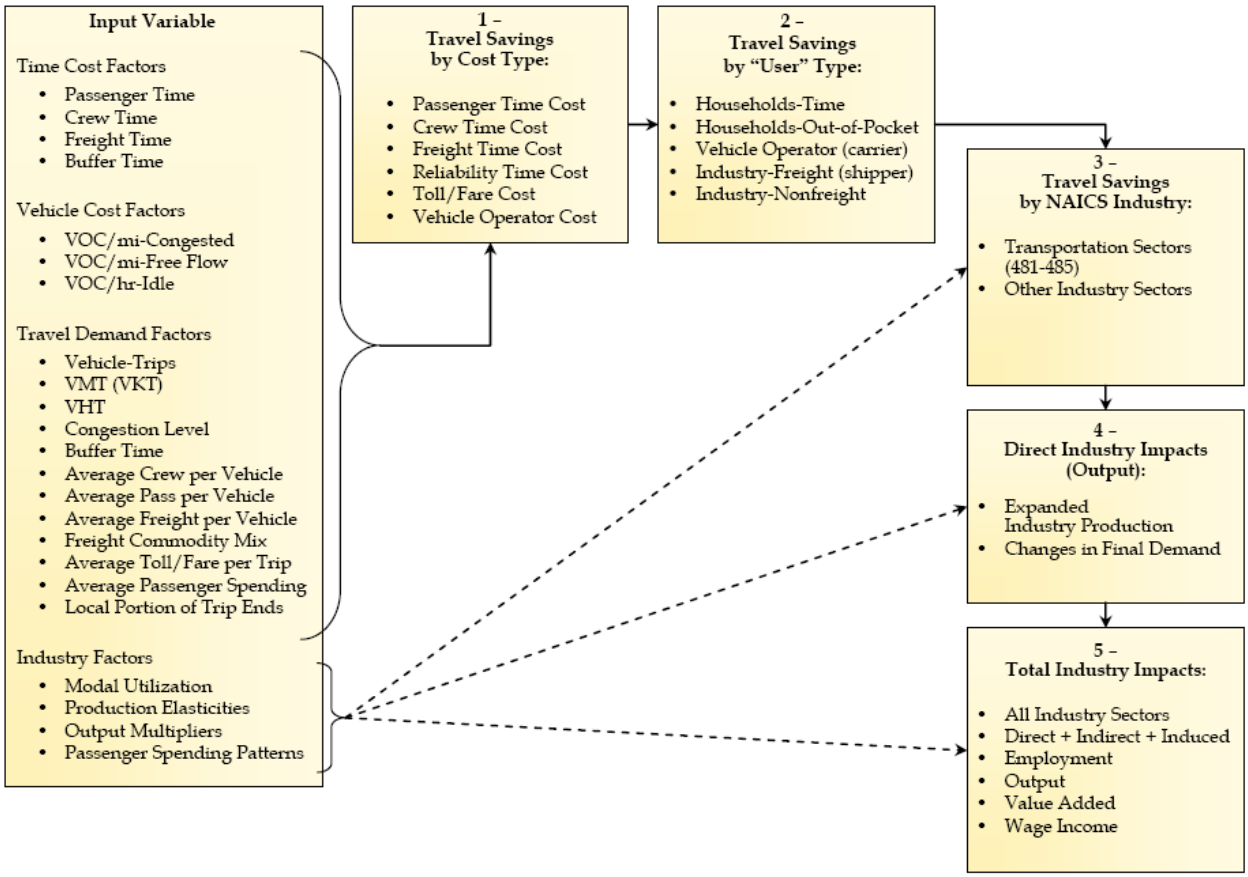
Using the results of the commodity flow profile (Task II.2), we documented the economic role of U.S.-Mexico trade in terms of jobs, income, and state and local tax base and translate our findings into economic impacts. The Regional Economic Modeling, Inc. (REMI) regional economic model and supporting data were used to convert the trade volumes (both goods and services) into data regarding jobs and income supported by the border crossing activity. In turn, this was translated into fiscal variables, including local and state tax revenue collections.

The output of the economic impact analysis was used to develop/refine communication material for outreach with elected officials, decision-makers and the general public. In addition, it served as input to quantify the economic impact of border wait times at the regional, state, and national levels. We documented the wait times at all POEs in the region and estimate the resulting economic impacts on the regional, state, and national economies. An overview of the proposed methodology is shown in Figure 2.1. In addition to the input variables, the methodology required four distinct computational steps:

1. The computation of travel cost savings by "Cost Type;"
2. The computation of travel cost savings by "User Type;"
3. The computation of savings by industry (NAICS) type; and
4. The estimation of direct industry impacts, including industry adjustments to changes in travel costs.

Once these modules were executed, the computation of total impacts, as well as of indirect and induced impacts, was computed using the REMI model.

Figure 2.1 Methodology for Estimating the Economic Impacts of Border Delay



In addition, we identified those bridges along U.S. international boundaries that are presently publicly owned but privately managed. Where this arrangement exists, we described how long has the arrangement been in place and estimate the overall economic impact to the community, the operations, customer service, and other relevant factors. In situations where bridges are privately owned and operated, we described the community relationship in terms of franchises/ leases. We included this summary as part of the technical memorandum developed at the conclusion of this task (Section 4.0).

Work Steps

- Convert border crossing trade volumes (both goods and services) into economic impacts.
- Collect information on border wait times.
- Estimate economic impacts of border delays, using UTEP binational border region economic model.

Deliverable. The deliverable for this task was a technical memorandum describing the economic impacts of the POEs in the region as well as the economic impacts of border crossing delays (included in Appendix E).

Task II.5: Model Refinement

Objective. The objective of this task was to refine the current model networks and model inputs to reflect no-build conditions for the future.

Approach. We refined the regional demand model inputs, including networks and model inputs to reflect future years of 2025 and 2035. We ran the 2025 and 2035 conditions through the Model Framework and analyzed the future operations. Simultaneously, we prepared the Model Network to analyze future scenarios developed as part of Task III.2.

Work Steps

- Develop Future Year No-Build Models for 2025 and 2035.
- Integrate and connect the current capacity and forecasted demand at POEs with existing and proposed transportation facilities (integrate planning for ports of entry with planning for corresponding transportation infrastructure projects).

Deliverables. Deliverables for this task included the following data for use in subsequent tasks:

- 2025 and 2035 No-Build Models and Analysis;
- 2025 and 2035 Scenario Analysis; and
- 2025 and 2035 Tolling Analysis.

Task II.6 – Existing and Expected Future Needs and Issues

Objective. The objective of this task was to use the results of previous tasks to describe the both existing and expected future needs and issues impacting the efficiency of the region's cross-border transportation system.

Approach. In addition to identifying existing system needs and deficiencies, we also identified the expected future transportation system conditions without any improvements (i.e., "no-build"). Using both the existing and future modeling datasets and the results of previous tasks, we identified the locations and severity of regional transportation bottlenecks related to regional POEs, and described how they relate to each other, allowing us to identify existing as well as future system-level needs and deficiencies. Needs and deficiencies were identified in three key areas: 1) Physical, which are related to the condition or capacity of the transportation infrastructure; 2) Operational, which relate to how the transportation system is being utilized; and 3) Institutional, which relate to the policy and regulatory environment that governs the management and enhancement of the system.

Needs and deficiencies were examined in conjunction with the neighborhood and regional issues and associated evaluation criteria defined through public involvement. The final set of needs and issues developed was vetted using the public involvement process described earlier. Completion of this task laid the groundwork for developing solution packages and screening activities in future tasks.

Work Steps

- Identify physical, operational, regulatory, multijurisdictional, and other issues most significantly impacting cross-border movements in the El Paso region for both existing and expected future conditions.
- Develop tables, maps, charts, and graphs to display locations of critical bottlenecks and issues for both existing and future years.

Deliverables. The deliverable for this task was a technical memorandum for review by TxDOT. The Final Operations Plan summarizes the physical, operational, regulatory, multijurisdictional, and other issues that impact cross-border mobility in the region.

Phase III – Scenario Development and Testing

This phase consists of two individual tasks, described below.

Task III.1 – Screen Projects, Identify Evaluation Factors, and Develop Scenarios

Objective. The objective of this task was to screen future project solutions and to develop potential solution packages for more detailed evaluations that address the needs and issues identified in the previous phase.

Approach. This was one of the most critical tasks in the Plan, because it will define, at a systems level, a comprehensive set of scenarios for improving the performance and reducing the negative impact of the regional transportation system. As described earlier, we used our public involvement plan to help guide the development of potential improvement scenarios and evaluation factors.

A comprehensive list of potential solutions were developed through the public involvement process. We prepared an evaluation matrix to screen the feasibility of these projects as well as the packages of solutions defined later in this task. Again, the evaluation factors used in this matrix were derived from the public outreach activities described earlier. This process ensured that all project suggestions from the public are evaluated consistently and transparently. A set of project solutions that best address the regional transportation system needs and deficiencies were carried forward for scenario testing.

Using the screened projects, we developed short- and long-term scenarios for addressing critical needs and issues while mitigating potential impacts. These scenarios combined infrastructure, operational, and policy-level recommendations to address critical needs and community concerns. Recommendations were

provided in the short (0 to 5 years), medium (5 to 10 years), and long terms (10 to 25 years). Potential scenarios included:

- Operational policies, strategies and infrastructure development projects to redistribute international traffic from port to port, existing and proposed POEs;
- System operational strategies and functions, such as:
  - Expanding or restricting the use to FAST or SENTRI lanes;
  - Allowing only FAST commercial crossers on one port;
  - Determine the possibility of changing international traffic flow from two-way to one-way at appropriate ports;
  - Utilize intelligent transportation systems (ITS) to plan and direct traffic;
  - Utilize ITS to expedite crossing and to reduce vehicle miles traveled;
  - Charging tolls at the Bridge of the Americas (BOTA);
  - Increased use of cross-border rail infrastructure for freight or passengers movements;
  - Use of 'green' technology applications to improve cross-border freight efficiency and operations; and
  - Implementation of congestion pricing strategies at all POEs.

Using the models developed in previous tasks, we screened the feasibility of these scenarios in subsequent tasks. Again, the evaluation factors identified in this task were derived from the public outreach activities described earlier. Using public input, we developed a multi-stakeholder, multi-attribute screening approach that will allow us to identify and test the full range of benefits and impacts to all affected stakeholder groups. This helped us describe potential tradeoffs to community members, stakeholder groups, and decision-makers, allowing them to make more informed investment choices.

Work Steps

- Develop evaluation matrix to screen comprehensive list of project solutions defined by the public;
- Identify screened list of projects;
- Develop potential scenarios (of screened projects) for consideration in public outreach activities; and
- Develop potential multi-stakeholder, multi-attribute evaluation factors for use in screening process.

Deliverables. The deliverable for this task was a technical memorandum that describes the final set of eight scenarios (for screening in subsequent tasks) and the final set of multi-stakeholder, multi-attribute evaluation factors to guide the screening process (included in Section 5.0).

Task III.2 – Scenario Evaluation

Objective. The objective of this task was to perform systemwide analysis on the final set of improvement scenarios developed in the previous task.

Approach. We developed, coded, and tested the final set of scenarios developed as part of Task III.1, using the multi-stakeholder, multi-attribute evaluation factors as a guide. We worked with TxDOT and the Advisory Committee to develop assumptions for each scenario prior to testing the recommended scenario.

Work Steps

- Recommended Scenario Coding and Testing.
- Refined Preferred-Scenario Coding and Testing.

Deliverables. The deliverable for this task was a technical memorandum describing the results of each scenario test (included in Section 5.0).

Phase IV – Financial Evaluation

This phase consisted of two individual tasks, described below.

Task IV.1 – Develop Funding and Financing Strategies

Objective. The objective of this task was to develop funding and financing strategies for inclusion in the Final POE Operations Plan.

Approach. We worked closely with KPMG to develop finance plans and financial analysis for each of the final scenarios, based on appropriate mixtures of revenue sources and consideration of project costs and phasing. The financial analysis will use the project costs based on construction and operational requirements that address interrelationships and dependencies between projects. We included a project phasing approach, taking into consideration likely future revenue streams, including project-generated cash flows.

We evaluated and recommend funding and financial strategies in an overall financing plan for implementing the refined regional transportation system, including all recommended projects, strategies, and potential environmental mitigations. As part of this task, we identified potential new sources of revenue, such as impact fees, assessment fees, or project-specific revenues (i.e., user fees) that could be utilized.

Work Steps

- Develop phasing sequence for improvement scenarios.
- Evaluate and recommend funding and financial strategies in an overall financing plan.

- Identify potential new sources of revenue.
- Develop a financing plan for the regional projects and environmental mitigations.

Deliverables. Deliverables for this task included financing strategies for each improvement scenario for inclusion in the Final Operations Plan.

Task IV.2 – System Valuation

Objective. The objective of this task was to develop a high-level valuation of the regional transportation system under two different scenarios: current ownership characteristics (i.e., publicly owned crossings); and alternative ownership (to support a potential public-private partnership (PPP)).

Approach. KPMG developed sketch-level valuations of the regional transportation system under two scenarios: 1) current ownership characteristics (i.e., publicly owned crossings) and 2) alternative ownership (to support a potential public-private partnership (PPP)). The results of this task were used to guide the development of the implementation plan within Phase V.

Work Steps

- Conduct a market valuation studies (under a separate work authorization).

Deliverables. Deliverables for this task included a technical memorandum describing the results of the market valuation process (included in Section 7.0).

Phase V – Recommendations and Implementation

This Phase consisted of three individual tasks, described below.

Task V.1 – Finalize Recommendations

Objective. The objective of this task was to finalize and document the operational, infrastructure, and institutional recommendations tested in Phase III and develop implementation guidance for the region.

Approach. Our recommendations were prioritized into short-term (0 to 5 years), medium-term (5 to 10 years), and long-term (more than 10 years) implementation time horizons. A critical component of this task was the inclusion of implementation strategies to help ensure that all the recommended strategies outlined in the final POE Operations Plan are acted upon and delivered. For each recommended strategy, we outlined key implementation guidance, which helped define:

- **Roles and responsibilities**, i.e., who is the lead agency for the project and what other agencies need to be involved?
- **Barriers and obstacles**, i.e., what are the critical institutional, operational, or other issues that must be resolved before the strategy can move forward?

- **Phasing and dependent projects**, i.e., what other projects or strategies need to be accomplished before, after, or concurrent with the proposed strategy and what are the implications if they are not?
- **Definition of success**, i.e., what constitutes "successful" implementation and what clear benchmarks are expected along the way?

Work Steps

- Finalize and document recommendations with TxDOT and Advisory Committee.
- Develop implementation guidance.

Deliverables. The deliverable for this task was a summary of recommendations and implementation guidance for use in subsequent tasks. These recommendations are included in the Final Operations Plan.

Task V.2 – Documentation and Presentation

Objective. The objective of this task was to summarize the results of our analysis within a final POE Operations Plan and supporting presentation materials for delivery and presentation to TxDOT, the project Advisory Committee, neighborhood and community groups, and other stakeholders.

Approach. All project documentation developed during the study – particularly the technical memoranda that are the deliverables for many tasks – served as the raw material for the final documents, and was developed by team members with that ultimate objective in mind. We worked very closely with TxDOT, the project Advisory Committee, and other stakeholders, as appropriate, in developing the draft and final Operations Plan.

In order to finalize the plan, we provided stakeholders and the general public a final round of workshops, as described in Phase I. Following the last round of workshops, we worked with TxDOT to finalize the Operations Plan. In addition to the final report, we developed a communication strategy for disseminating the findings and communicating the Plan to the stakeholders, elected officials, local planners, and the public. Items included presentations to TxDOT and our project Advisory Committee, the MPO Policy Board, local governments, area chambers of commerce, and others.

Work Steps

- Develop draft and final plan documents and supporting materials.
- Develop presentations for use by TxDOT, the El Paso MPO, the Camino Real RMA, and other regional stakeholders.

Deliverables. The deliverables of this task included:

- Final Operations Plan, including sufficient technical detail on study findings and recommendations; and
- Technical data and information (including data, GIS files, interview notes, and other supporting information) from each of the technical tasks.

3.0 Public Involvement Summary

Stakeholder and public involvement was the cornerstone of the Operations Plan and regional stakeholders and leadership were engaged throughout the process, from the identification of border crossing issues, to the development and testing of potential solutions, and through the vetting of final recommendations. Our stakeholder involvement plan helped ensure that all interested groups in the El Paso region, including both sides of the U.S.-Mexico border and Southeastern New Mexico, were actively engaged in the planning, development, and implementation of the Operations Plan.

Our public involvement plan detailed our methodology for collecting input from all interested groups early on and throughout the study process, as well as how the results and findings of our public involvement efforts would be used to provide input into technical work and guide subsequent tasks. As described in Section 2.0, our outreach approach was three-tiered and occurred in three rounds of extensive involvement. It focused first on defining critical issues and potential impacts, then on selecting evaluation criteria to guide development and screening of project solutions, and finally on packaging comprehensive sets of project solutions that could be modeled and analyzed. The results and findings from this three-tiered approach were supplemented by identification of critical neighborhood and local issues. This input on local concerns also helped define the likely project solutions and the evaluation criteria used to assess the impact of these potential solutions.

The three phases of our public involvement outreach were as follows:

5. **Spring 2010 –** An initial phase to understand public attitudes and perceptions of border crossing issues and discerning potential solutions that best meet the neighborhood and regional mobility issues;
6. **Fall 2010 –** An intermediate phase to communicate project status and allow for stakeholder and public feedback; and
7. **Spring 2011 –** A final phase to assist in fine-tuning the final recommendations for and roll-out of the Operations Plan.

Our public involvement approach included ongoing communications, such as fact sheets/newsletters, project web site (linked to TxDOT, the El Paso MPO, the City of El Paso, and Camino Real Regional Mobility Authority), e-mail distribution list, and use of social media (Facebook, Twitter).

A summary of the public involvement process is presented below.

3.1 INITIAL OUTREACH EVENTS

Our initial outreach was foundational and set the stage for our understanding of public attitudes and perceptions about the region's border crossing needs.

Public Polling was a first step. The survey included a broad, random sample (1,000 completed surveys) of public attitudes about a new border crossing, targeting respondents on both sides of the U.S.-Mexico border and Southeastern New Mexico. We designed of a 10-minute on-line or telephone survey (in both Spanish and English) to understand public attitudes and issues concerning regional border crossings and to gauge attitudes about general types of strategies or solutions that could mitigate these issues. As described earlier, Harris Interactive Service Bureau (HISB) implemented the survey. The survey instrument and a summary of the survey findings are included in Appendix B. **Focus Groups and Public Meetings** were structured and implemented to solicit input from a mix of neighborhood and regional interest groups. Focus groups were conducted for local businesses and the local shipper/carrier/receiver industry that use the ports of entry. A total of 10 public meetings were conducted across the region, including Downtown, the Lower Valley, South, East, and West El Paso, Fabens, and Sunland Park, New Mexico. Special attention was paid to location diversity and both day/evening scheduled times.

The public polling process was used to help identify the mix of focus group participants, structure the format of facilitated focus group discussions, and identify critical neighborhood issues. Results and feedback from the focus groups influenced the format of the public meetings.

All focus groups and public meetings consisted of a presentation describing the specific operational issues impacting the region and a facilitated discussion of potential strategies and evaluation criteria and methods used to address the critical issues associated with the region's ports of entry. Attendees were encouraged to recommend solutions that would address the needs of their neighborhood and suggest policy changes that would potentially improve mobility and enhance economic competitiveness within the region.

3.2 INTERMEDIATE OUTREACH EVENTS

As the project team worked to build models that could evaluate potential solutions, the public was kept informed via the project web site and ongoing briefings. The feedback from these briefings helped to refine and validate development of a smaller, screened set of solutions (operational, pricing, infrastructure, and others identified in the initial outreach efforts) that could advance to the modeling and analysis phase of the project.

Interim Status Briefings to update interested stakeholders on the study were conducted on an ongoing basis and available to interested stakeholder groups by request. During status briefings, stakeholders were presented the draft list of screened scenarios and asked to identify those scenarios that best address the public's regional issues. Interim briefings resulted in revisions of the draft list of potential solutions. A total of 30 stakeholder groups were briefed during this outreach phase, including, but not limited to, El Paso City Council representatives, City of El Paso departments, El Paso MPO, U.S. Customs and Border Protection, Mexican Aduana, Mexican Consulate, local school districts, regional economic development organizations, regional chambers of commerce, and Texas and New Mexico elected officials (a complete list of stakeholder briefings is provided in Appendix B).

The input received at these intermediate outreach events was used by the project team to assist with identifying project screening criteria and identifying the preferred set of potential solutions for more detailed analysis in later project phases.

3.3 COLORING CONTEST

The Operations Plan sponsored a coloring contest called *Connecting People: The Bridges of El Paso*. The bridges coloring contest was open to all El Paso-area elementary students (from Kindergarten to 5th Grade). Students were asked to color one of two images related to the ports of entry and creativity was encouraged. Contestants were divided into three categories by grade level: K-1, 2-3, 4-5. First place winners were selected in each category, and an honorable mention winner also was awarded based on the decision of the judges.

The contest was used to promote awareness of the project among teachers, students, and parents. Over 200 entries were received from Ysleta and El Paso Independent School Districts. Winners were selected and announced on the project web site. They were presented with certificates and gift baskets in a ceremony with TxDOT officials in early 2011. The winning art also was used on posters to announce the project's final round of public meetings. Posters were

displayed on the bridges, in public offices and storefronts, on the international bridges web site and in print media. A subsequent coloring book was prepared for distribution at the final round of public meetings.

3.4 FINAL OUTREACH EVENTS

During the final public involvement phase, preliminary results from the study were presented to stakeholder groups and members of the public to obtain input on project findings from the simulation modeling and respond to questions and concerns. Implementation of the final outreach events assisted in fine-tuning the final recommendations for the Operations Plan. Final outreach events included Stakeholder Briefings and Public Meetings.

Stakeholder Briefings were implemented to present the final recommended border crossing solutions. Forty stakeholder meetings were conducted, including, but not limited to: El Paso City Council representatives, City of El Paso departments, El Paso MPO, Camino Real Regional Mobility Authority, U.S. Customs and Border Protection, Mexican Aduana, Mexican and U.S. Consulate officers and staff, local school districts, regional economic development organizations, regional chambers of commerce, and Texas and New Mexico elected officials (a complete list of stakeholder briefings and dates is included in Appendix B). The meetings were facilitated discussions where the study process and how methodology for identifying recommended solutions was presented, detailed evaluation findings were discussed, and stakeholder issues and findings were documented.

Public Meetings took place at locations throughout the region, including Downtown, the Lower Valley, East, Northeast and West El Paso, and Sunland Park, New Mexico. Special attention was paid to location diversity and both day/evening scheduled times. Seven meetings were conducted using an open house style, with information stations set up around each venue, followed by a presentation and a question and answer session.

3.5 ONGOING OUTREACH EVENTS

Throughout the study, a variety of public information techniques were employed to complement and support each of the outreach phases. Communication plan elements included:

- **Database and Mailing List of Interested Groups and Individuals.** A database of 850 interested groups and individuals was compiled and maintained to support the project. Various stakeholder groups provided their e-mail

stakeholder information to build the database of interested parties. Available sources of interested groups (standing steering and public committees, participants of previous public outreach efforts, existing neighborhood and regional groups and associations) were included. The stakeholder database was expanded through the ongoing development of the project's public involvement phases. This comprehensive database was used to distribute fact sheets, meeting invitations, and public notices to keep the public informed of the project as it proceeded and aware of public involvement opportunities.

- **Web Site.** A project web site (www.elpasoborderplan.org) was developed to provide the public with on-line access to ports of entry information, key agency partners, the project documents and Coloring Contest competition, status of project milestones, and listing of upcoming events. Web site content, available in both English and Spanish, was defined in consultation with TxDOT and its partners. The public also was able to submit inquiries and comments via a mailbox associated with the web site. Responses were prepared and replies were sent when comments and questions were received.
- **Fact Sheets.** Coinciding with each of the project phases, fact sheets were prepared to announce upcoming public events, describe the milestones of project, and present other relevant information to the public. The fact sheets served as brief informational sources about the project. Five fact sheets were posted on the web site, Facebook, Twitter, distributed at public meetings, and e-mailed to contacts in the database of interested groups and individuals. As with the web site, TxDOT and its partners assisted with development of content for each newsletter. These and other public involvement materials can be found in Appendix B.
- **Public Notices.** The TxDOT El Paso District Public Information Officer (PIO) directed content preparation and placement of public notices about upcoming meetings and project events. All print media were prepared using TxDOT, MPO, and City protocols and requirements. Notices also were distributed via the project web site, partners' web sites, and via e-mail using the project database.
- **Media Elements.** TxDOT directed efforts to utilize media sources, such as radio and television, and these opportunities were designed to provide the public with information about the project and to invite public input into the planning process. Media elements included media advisories, press releases, and calendar announcements with El Paso Times and El Diario. Radio and television stations covered several public meetings and interviewed the PIO and project manager about the Operations Plan and public outreach. The El Paso Times and El Diario reported several articles about the Operations Plan and public meetings, and op-ed articles also were printed at key milestones.
- **Advertising.** Over 150 posters advertising the public meetings were displayed across the region at locations identified by TxDOT and its partners,

including ports of entry, businesses adjacent to ports, businesses downtown, city and county office buildings, schools, and other popular restaurants and businesses. DMS signs and paid advertising in the El Paso Times and El Diario also were used to communicate public meeting information.

4.0 Technical Reports and Methods

We developed a number of technical reports to provide background information, data, and context to support our modeling development and calibration activities, the development and testing of improvement scenarios, and the development of the final recommendations included within the Operations Plan. These technical reports included:

- Infrastructure Profile Summary;
- Commodity Flow and Socioeconomic Profile Summary;
- Economic Role of the El Paso Border Crossings Summary;
- Technology Assessment Summary; and
- Port of Entry Management Strategies Summary.

Each of these reports is briefly summarized below and is included in the Appendices of this report.

4.1 INFRASTRUCTURE PROFILE SUMMARY

We developed profiles of the region's six existing crossings, focusing specifically on the number of existing inspection booths, hours of operation, toll rates, current travel volumes, staffing levels, and future plans for expansion, as summarized in Tables 4.1 through 4.6. This information was used to support our model development efforts and shape the Operations Plan recommendations. More detailed information related to each bridge is provided in Appendix C.

Table 4.1 Santa Teresa Port of Entry Characteristics

	Northbound	Southbound
Hours of Operation	Passenger: 6:00 a.m. to 12:00 a.m. Commercial: 8:00 a.m. to 8:00 p.m. M-F 9:00 a.m. to 2:00 p.m. Sat	Passenger: Commercial: 8:00 a.m. to 8:00 p.m.
Operator	New Mexico Border Authority	
Toll	Free	
Type and Number of NB Booths Available	POV (2), Commercial (1), FAST (1)	
2010 Total Count	3,000 (two-way, all vehicles)	
2010 Percent Trucks (of Counts)	17%	
2010 Peak Delay	33 minutes (POV), 7 minutes (Commercial), 2 minutes (FAST)	

Table 4.2 Good Neighbor (Stanton Street) Bridge Characteristics

	Northbound	Southbound
Hours of Operation	6:00 a.m. to 12:00 a.m. M-F 10:00 a.m. to 12:00 a.m. Sat and Sun	24 hours per day
Operator	CAPUFE	City of El Paso
Structure(s)	Three-lane bridge primarily for southbound noncommercial traffic; dedicated northbound commuter lane	
Length	880 feet	
Toll	Noncommercial southbound access only; $2.50 vehicle, $0.50 pedestrian	
Type and Number of NB Booths Available	SENTRI (3)	
2010 Total Count	4,400 (two-way, all vehicles)	
2010 Percent Trucks (of Counts)	0%	
2010 Peak Delay	Negligible	

Table 4.3 Paso del Norte Bridge Characteristics

Hours of Operation	24 hours per day
Operator	Northbound: CAPUFE Southbound: City of El Paso
Structure(s)	Four-lane bridge primarily for northbound noncommercial traffic; 1 southbound toll booth for pedestrians
Length	982 feet
Toll	$2.25 vehicle, $0.50 pedestrians
Type and Number of NB Booths Available	POV (11)
2010 Total Count	6,500 (two-way, all vehicles)
2010 Percent Trucks (of Counts)	0%
2010 Peak Delay	41 minutes (POV)

Table 4.4 Bridge of the Americas (BOTA) Characteristics

	Northbound	Southbound
Hours of Operation	Passenger: 24 hours per day Commercial: 8:00 a.m. to 6:00 p.m. M-F 6:00 a.m. to 2:00 p.m. Sat	Passenger: 24 hours per day Commercial: 8:00 a.m. to 8:00 p.m. cargo 8:00 a.m. to 11:00 p.m. empties
Operator	International Boundary and Water Commission (IBWC)	
Structure(s)	Four structures: Two two-lane commercial and two four-lane noncommercial	
Length	506 feet	
Toll	Free	
Type and Number of NB Booths Available	POV (14), Commercial (4), FAST (2)	
2010 Total Count	28,400 (two-way, all vehicles)	
2010 Percent Trucks (of Counts)	10%	
2010 Peak Delay	40 minutes (POV), 26 minutes (Commercial), 14 minutes (FAST)	

Table 4.5 Ysleta-Zaragoza Bridge Characteristics

	Northbound	Southbound
Hours of Operation	Passenger: 24 hours per day Commercial: 6:00 a.m. to 12:00 a.m. M-F 8:00 a.m. to 4:00 p.m. Sat	Passenger: 24 hours per day Commercial: 6:00 a.m. to 11:00 p.m.
Operator	Promofront (private Mexican concessionaire)	City of El Paso
Structure(s)	Two structures; four-lane commercial bridge and five-lane noncommercial bridge	
Length	804 feet	
Toll	Fare for all southbound and northbound traffic; POV $2.50, Commercial vehicle $3.50 per axle, Pedestrians $0.50.	
Type and Number of NB Booths Available	POV (10), Commercial (6), FAST (2), SENTRI (2) Southbound empty trucks are not allowed.	
2010 Total Count	17,200 (two-way, all vehicles)	
2010 Percent Trucks (of Counts)	15%	
2010 Peak Delay	41 minutes (POV), 12 minutes (Commercial), 8 minutes (FAST), <1 minute (SENTRI)	

Table 4.6 Fabens-Caseta Bridge Characteristics

Hours of Operation	6:00 a.m. to 10:00 p.m. M-Sun
Operator	International Boundary and Water Commission
Structure(s)	Two-lane bridge for northbound and southbound POV and light truck traffic
Length	510 feet
Toll	Free
Type and Number of NB Booths Available	POV (2)
2010 Total Count	1,500 (two-way, all vehicles)
2010 Percent Trucks (of Counts)	0%
2010 Peak Delay	6:00 a.m. to 10:00 p.m. M-Sun

4.2 COMMODITY FLOW AND SOCIOECONOMIC SUMMARY

Understanding current and future population levels, industry trends, and commodity flows in the region is a critical first step in developing informed policy decisions to improve cross-border transportation, promote economic development, and enhance regional quality of life.

The Commodity Flow and Socioeconomic Profile, included in Appendix D, provides a high-level overview of border operational characteristics, freight activity in the El Paso region, and socioeconomic, industry, and other trends impacting

the ports of entry in the future. This summary was developed in parallel with other technical reports which describe the economic impact of the ports of entry and freight technology trends. Taken together, these reports provide stakeholders with a comprehensive understanding of current and future conditions in the region as they relate to POE operations.

The Commodity Flow and Socioeconomic Profile describes:

- **Operational Characteristics,** including an overview of freight operations along the border, a summary of the maquiladora industry, and cross-border trucking characteristics;
- **Existing Socioeconomic, Population, and Industry Characteristics,** including population, per capita income, and industry output/employment, all of which have an impact on cross-border travel demand;
- **Existing Cross-Border Travel Flows,** i.e., current passenger, pedestrian, and freight demand at the region's POEs;
- **Trends Driving Cross-Border Travel Demand in the Region,** i.e., key socioeconomic, industry, transportation, and security trends that will impact POE demand in the future; and
- **Future Cross-Border Travel Flows,** including passenger, pedestrian, and freight demand.

While Appendix D includes the full technical memorandum describing the region's industry composition, commodity flows, and socioeconomic profile, key findings include:

- Collectively, the region's six ports of entry handle the second-largest volumes of trucks and passenger vehicles along the entire southern U.S. border. These bridges also handle a significant number of pedestrians – approximately 7.5 million in 2009[6] – making the region the second busiest pedestrian crossing along the southern U.S. border
- Cross-border trucks in the region account for approximately 16 percent of total U.S.-Mexico trade.
- Population in El Paso County and Ciudad Juárez has been growing steadily for the past several decades. The population of this border region grew from approximately 785,000 in 1970 to 2.1 million in 2009, representing a 175 percent increase. The intensive development of the maquiladora industry in Ciudad Juárez began in the 1970s and has since attracted a steady flow of domestic migrants from the central and southern regions of Mexico to take advantage of the jobs and income opportunities provided by the maquiladoras.

[6] U.S. Bureau of Transportation Statistics.

- All told, nearly 3.4 million people (about the size of present-day Minneapolis-St. Paul) will reside in the El Paso-Juárez region within the next two decades. The population of El Paso is forecast to expand by 1.4 percent annually on average, reaching nearly one million people by 2035.[7] Driven by its attractiveness as a gateway to the United States and the economic opportunities afforded by the maquiladora industry, Ciudad Juárez is forecast to grow at a more robust 2 percent annual rate, and is expected to reach about 2.1 million by 2035.
- Strong regional population growth in El Paso-Juárez will translate into a significantly larger consuming market in the coming years. This, in turn, will generate an increase in freight demand to supply that market with consumer goods, energy, and construction materials and will stimulate additional cross-border trips for shopping, education, recreational activities, and other services.

4.3 ECONOMIC ROLE OF THE EL PASO BORDER CROSSINGS SUMMARY

Understanding the economic importance of the U.S.-Mexico border to the El Paso region is important in honing policy decisions to improve cross-border mobility, promote economic development, and enhance regional quality of life. This report, provided in Appendix E, documents the economic significance of the region's existing border crossings and analyzes the total economic impact of a reduction in border dependent business activity. Key findings are presented below.

- The region's manufacturing, service, and retail sectors are closely linked and contribute significantly to the economic vitality of the region. Juarez-based maquiladora factories demand distribution facilities, administrative offices and legal, accounting, and financial services. In addition, hotels and restaurants cater to off-site maquiladora management and other visitors. This linkage stimulates a broad range of employment sectors and provides employment for area residents.
- For the 10 largest maquiladora industries in Juárez, almost all of the top 20 suppliers are located in El Paso. Businesses on both sides of the border depend on the crossings to efficiently link these firms.
- Per capita retail sales tax income in El Paso is five times higher than the state average, due in large part to Mexican nationals crossing the border into El Paso to shop.

[7] University of Texas at El Paso, *Borderplex Long-term Economic Trends to 2029*, April 2010 with Cambridge Systematics extrapolation from 2029-2035.

- Border dependent businesses account for nearly 115,000 direct jobs in El Paso County, 559,000 direct jobs in Chihuahua, and 19,000 direct jobs in Dona Ana County.
- The transportation and warehousing sector in El Paso is resilient, growing even in the midst of national and global economic recessions in the early 2000s and today. Between 2001 and 2008, employment in transportation and warehousing sector averaged nearly 17,000 and total output was estimated to be $6.7 billion, almost all of which is dependent on the region's border crossings.
- Decreases in employment at border dependent business – regardless of the cause – would have devastating effects on the regional economy. A 50 percent decrease in direct employment at border dependent businesses would result in a total loss of nearly 450,000 jobs for the binational region. An 80 percent decline in direct employment at border dependent businesses would result in a total loss of nearly 808,000 jobs (see Table 4.7). This includes direct, indirect, and induced jobs.

Table 4.7 Total Employment Impact of Losing Border Dependent Businesses

	Decrease in Border Dependent Business Employment			
	50 Percent		80 Percent	
Region	Direct	Total	Direct	Total
El Paso	57,331	83,100	91,729	137,955
Dona Ana	9,352	12,135	14,963	20,710
Chihuahua	279,340	392,807	446,943	649,120
Total	356,022	448,042	553,636	807,970

Source: Cambridge Systematics analysis using REMI model.

4.4 TECHNOLOGY ASSESSMENT SUMMARY

The technology assessment technical summary outlines an approach to use existing and emerging technologies to improve border operations (without compromising security) in the El Paso/Juarez region. A particular focus is paid to the application of intelligent transportation systems (ITS) and other technologies to reduce congestion – and thereby making cross-border travel more efficient and "green." This report, provided in its entirety in Appendix F, includes the following elements:

1. A description of the existing trade process, policies, programs, and procedures at the U.S.-Mexico border crossings and the current use of technologies at the three El Paso international border commercial crossings.

2. A survey of the relevant new and emerging freight border crossing technologies that can help improve border crossing operations.
3. Identification of preliminary technology services alternatives for consideration. These potential operational concepts are described in terms of regional context, functions, benefits and costs, relationship to the existing ITS infrastructure of the region, and potential deployment phasing.
4. Presentation of a realistic, near-term, and achievable border freight mobility technology implementation plan for the El Paso region – centering on a *Border Traveler and Cargo Information System* that can be designed, tested, and deployed within the next two to four years.

The following provides some highlights of the some of the key findings contained in this planning document.

Border Crossing Technologies

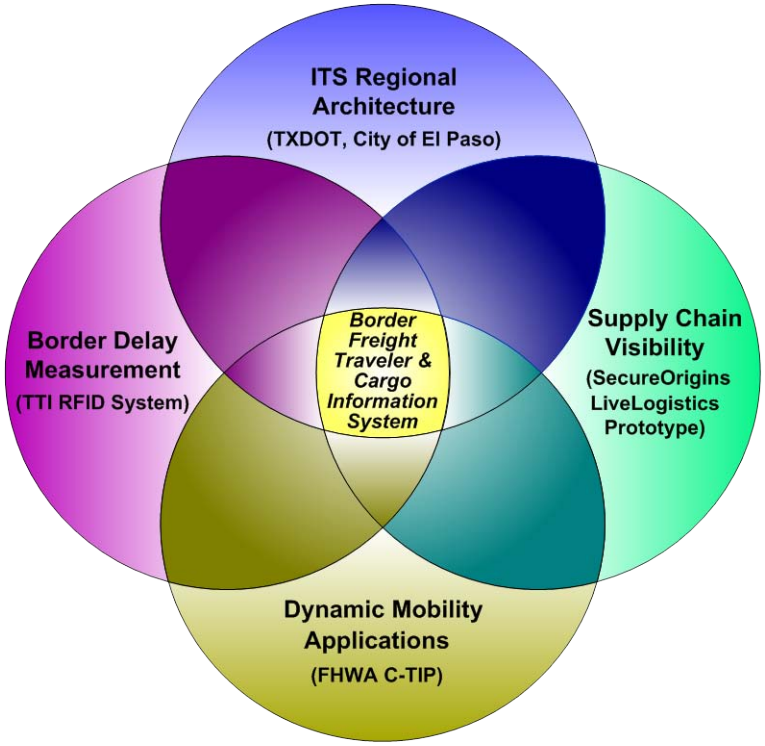
Several technologies are under development that could improve cross-border operations and facilitate efficiencies at border crossings. These include:

- **Virtual screening technologies**, which replace current "manual" screening and inspection process at border crossings with one that is automated and data-driven;
- **Vehicle positioning technologies**, which help measure and distribute wait time information; and
- **Other applications**, such as SecureOrigins, an El Paso-based technology services company which is focused on improving cross-border security and supply chain visibility through innovation.

Potential Technology Solution

Based on the results of an extensive comparative analysis, encompassing factors such as system architecture, technical maturity, institutional complexity, benefits and costs and applicability to the El Paso region, an overall concept for a Border Traveler and Cargo Information System, shown in Figure 4.1, was developed. This concept integrates four program/technology elements to develop a near-term system, which would be focused on providing information to cross-border travelers, commercial vehicles, fleet managers, manufacturers, maquiladoras, and others. Key functions and components of these programs would be integrated to form a "system of systems" approach for achieving a near-term capability for the El Paso region to support reductions in passenger and commercial vehicle travel time, and improved supply chain efficiency for cross-border freight transportation logistics.

Figure 4.1 Concept for the Border Traveler and Cargo Information System



The primary expected benefits of this "Border Traveler and Cargo Information System" would be three-fold:

1. Travel time reductions through improved information available well upstream of key driver decision points;
2. Further improvement of travel time reductions through the implementation of dynamic mobility applications (DMA) technologies, which allow for real-time rerouting of trips for drivers based on real-time congestion information; and
3. Greater supply chain efficiency in terms of cross-border freight movements for maquiladoras and others.

4.5 PORT OF ENTRY MANAGEMENT STRATEGIES SUMMARY

The Port of Entry Management Strategies Summary provides an overview of the range of strategies employed to manage border crossing transportation facilities at the U.S./Canadian border and at the U.S./Mexican border. The experience of other states described in this report as well as the overall Texas experience is intended to inform potential opportunities for public-private partnerships or

private sector involvement at border crossings owned by the City of El Paso. It describes some of the advantages and disadvantages of varying arrangements and highlights key considerations concerning the governance structure of border crossing facilities.

This scan, provided in its entirety in Appendix G, provides brief descriptions of existing border crossing facilities, including details of various governance structures and divisions of operational and managerial responsibilities. For a range of management strategies, we sought to determine the allocation of responsibility for the following management and operations activities:

- Managing traffic operations (e.g., reducing congestion, incident management) with nearby facilities and with Federal partner agencies;
- Collecting tolls and setting toll rates;
- Performing maintenance activities;
- Managing the roadway approach networks;
- Determining when capacity expansions or other safety enhancements are necessary; and
- Coordinating with Customs and Border Protection (CBP), General Services Administration (GSA), and other Federal agencies as well as Canadian and Mexican partners.

Where available, we obtained this information for existing border crossings from publically available resources and from interviews with representatives of these facilities. Key findings are presented below.

Key Findings

- There are numerous examples in Texas and elsewhere of border crossings that are publicly owned and operated, either by the owning agency or a quasi-governmental management authority.
- There are a handful of international crossings that are privately owned and operated, but remarkably few examples that are publicly owned and privately operated, either through short-term operations and maintenance agreements or long-term lease concessions.
- All of the U.S./Mexico border states, with the exception of New Mexico, have enabling legislation in some capacity that grant agencies statutory permission to enter into public-private partnership (PPP) agreements that potentially could be applied for privatizing operations at an international crossing. Only two states on the northern border, Washington and Minnesota, have PPP enabling legislation.
- Given the unique security and coordination issues involved with border crossings and the limited experience of implementing PPPs in these

situations, the apparent knowledge gap could expose public sector facility owners to risk when privatizing operations at these facilities.

- As the City of El Paso considers the possibility of releasing a request for information (RFI) related to privatizing some or all of their border crossings, it may prove beneficial to assemble a core team of transportation finance experts to assist the City in drafting the RFI language in order to minimize potential risk and help ensure a competitive response.

5.0 Project Screening and Scenario Development

We developed and implemented a project screening and scenario development methodology to take the list of potential solutions developed through our stakeholder involvement process into the final package of policy and operational scenarios for evaluation in our suite of operational models. These scenarios defined, at a system level, the comprehensive set of projects, strategies, and initiatives for improving the performance of the cross-border transportation system. The individual components of these scenarios were derived from the universe of potential solutions identified as part of our initial public and stakeholder outreach activities (focus groups, public meetings, and stakeholder interviews), recommendations from other ongoing border mobility improvement initiatives, and other recent studies.

A summary of our approach is provided below. The Screening Criteria and Scenario Development Technical Memorandum and the Final Scenarios for Model Evaluation Technical Memorandum – including all detailed rating tables and schematics – are provided in Appendix H.

5.1 SCENARIO DEVELOPMENT AND FINAL SCENARIO TECHNICAL MEMORANDUMS

The Scenario Development and Final Scenario technical memorandums together outline our approach for screening potential solutions for inclusion within (or exclusion from) the scenarios to be tested within our operational model.

Identification of Potential Solutions

One primary outcome of our initial public and stakeholder outreach activities (focus groups, public meetings, and stakeholder interviews) conducted early in the Operations Plan development process was to establish a comprehensive set of project solutions and evaluation criteria for subsequent screening. We compiled all of the ideas identified by stakeholders and the public throughout this process, as well as recommendations from other ongoing border mobility improvement initiatives and other recent studies, to develop a "master list" of potential solutions. A summary of our public involvement activities, including

the identification and discussion of potential solutions, is provided in Appendix B.[8]

The master list included more than 100 unique solutions, ranging from projects affecting the physical condition or capacity of the transportation infrastructure, to operational strategies that could improve how the transportation system is utilized, to potential policy changes that would address how the crossings are managed. The complete master list of solutions is provided in Appendix H. Organized by port of entry, Appendix H includes a description of each potential solution as well as some additional background and contextual information. It also classifies each solution as short-term (0 to 5 years), medium-term (5 to 10 years), or long-term (greater than 10 years) based on high-level implementation timeline assumptions.

Overview of Screening and Scenario Development Approach

As described in our Analysis, Modeling, and Simulation (AMS) Framework (included in Appendix I), we developed and applied simulation tools using available regional transportation and socioeconomic data to analyze various POE optimization strategies.[9] As discussed in our AMS Framework, the overall modeling/simulation effort had to take place within the budget and schedule of the Operations Plan and, as such, it was not possible to model all of the potential solutions.

As a result, one of the most critical tasks of the Operations Plan involved screening project solutions and developing potential solution packages for more detailed evaluation in our suite of operational models. This screening process, described in more detail below, helped us identify the types of strategies that are most promising in addressing regional issues while staying within the budget and schedule constraints of the overall effort.

Guiding Principles for Scenario Development

To steer the scenario development process, we defined "guiding principles" for screening and grouping potential solutions. These guiding principles were our touchstone to help us ensure that the final set of solution scenarios meet the most important transportation, industry, economic, and quality-of-life needs and issues identified by regional stakeholders and interest groups.

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[8] Port of Entry Operations Plan, *Phase I Public Involvement Summary Report*, provided to the Advisory Committee members, August 2010.

[9] Port of Entry Operations Plan, *Analysis, Modeling, and Simulation (AMS) Framework*, Provided to Advisory Committee members, August 2010.

To capture the intent and objectives of the Operations Plan, a scenario must:

- Comprise logical groupings of operational, infrastructure, and policy-level solutions, leveraging technology where feasible;
- Include a mix of immediate, short-, mid-, and long-term solutions;
- Be realistic, implementable, and cost-effective;
- Facilitate trade and reduce the cost of doing business;
- Reduce crossing times and alleviate bottlenecks without sacrificing security and enforcement;
- Optimize the use of existing infrastructure;
- Provide economic, environmental, and quality-of-life benefits on a regional scale; and
- Minimize impacts to the health, safety, function, and character of surrounding neighborhoods.

These guiding principles helped to ensure that the set of project solutions that best addresses the regional transportation system needs and deficiencies were carried forward for scenario testing.

Screening Approach

Using the principles listed above as a guide, we defined a process and criteria for screening the "master list" of solutions in Appendix H. This process ensured that all project suggestions from the stakeholders and public were evaluated consistently and transparently, using a mixture of qualitative and quantitative methods, and supported by guiding principles and stakeholder feedback. The process is shown in Figure 5.1 and described in more detail below.

1. **Relevance Screen**. As described above, our solutions development process acted as a "clearinghouse" for a range of potential solutions from a range of different agencies, entities, and stakeholders, not all of which were appropriate for analysis within the Operations Plan or the analysis tools we developed to support it. Some potential solutions, like changes to city bus routes, would require a markedly different type of analysis than was accommodated by our modeling effort. Rather than ignoring these potentially good ideas, we flagged them and assigned responsibility to the appropriate agency/organization for further consideration.
2. **Initial Criteria Screen**. Next, we conducted an initial screen of the remaining solutions by assigning a qualitative rating (high, medium, low) to each based on its ability to satisfy five key criteria. These criteria, described below, were derived from our stakeholder outreach efforts as well as the Guiding Principles described earlier:

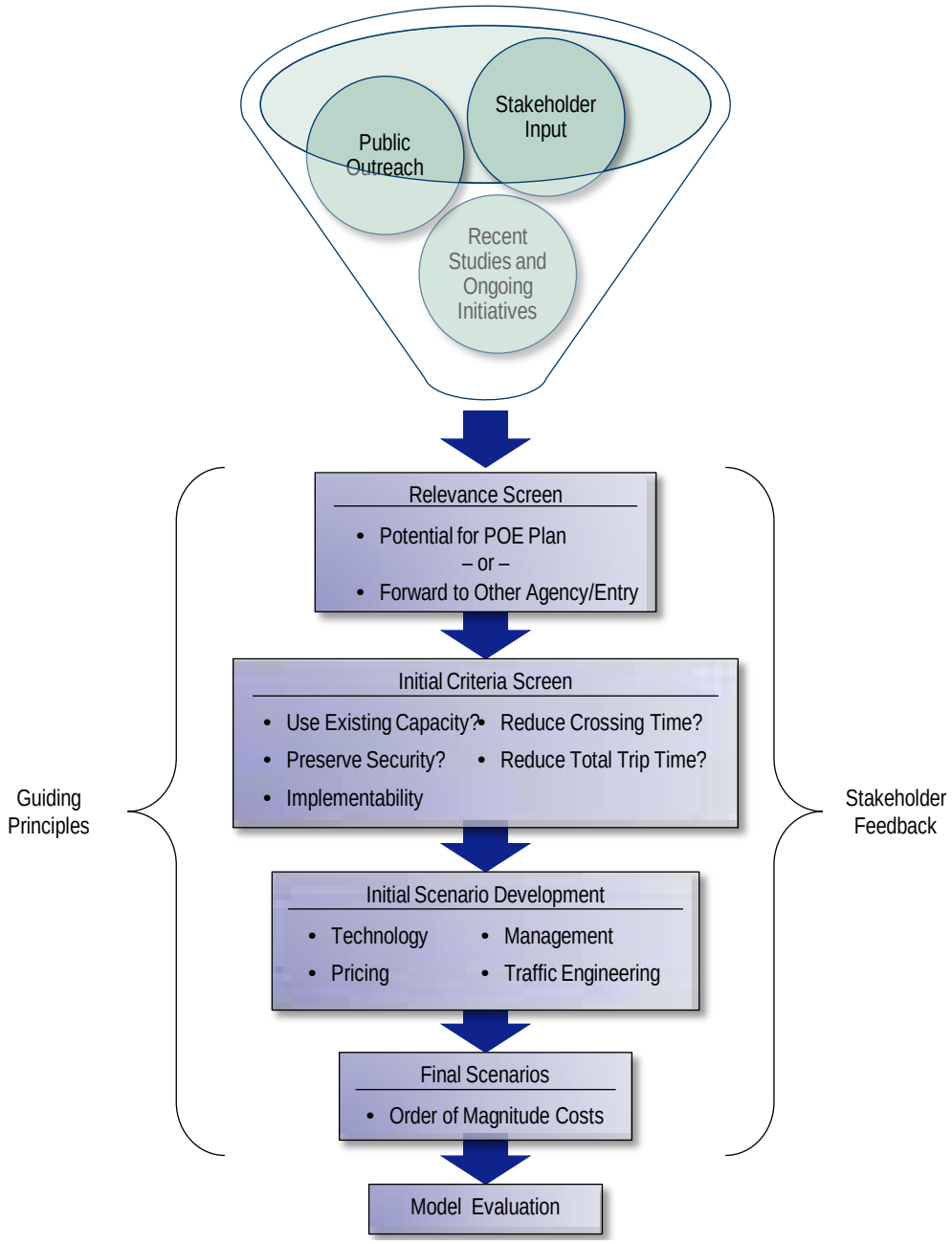
- Extent to which the solution **optimizes the use of existing capacity** or **streamlines existing processes**;
- Extent to which the solution **preserves security**;
- Solution's potential to **reduce crossing times** at the border;
- Solution's potential to **reduce total end-to-end travel time** (excluding wait/inspection times at the border); and
- Extent to which the solution is **implementable**, based on anticipated cost, associated policy changes, or stakeholder pushback.

3. **Initial Scenario Development**. The most promising projects, solutions, and strategies were grouped into four initial scenarios:
   - **Staffing and Management –** Solutions that address the institutional, policy, or regulatory environment that governs the management of the region's cross-border network, including Customs and Border Protection (CBP) staffing levels and bridge hours of operation;
   - **Pricing –** Solutions that would modify existing toll rates, propose tolls on bridges that currently are free, or implement pricing strategies based on time of day or congestion levels;
   - **Technology –** Solutions that leverage existing technology or implement new technology applications to improve the efficiency of cross-border movements, inspections, or information available to passengers, carriers, or shippers; and
   - **Traffic Engineering and Infrastructure –** Solutions that relate to the condition or physical capacity of the port of entry infrastructure or approach network, as well as operational solutions that relate to how the system is being utilized.

   Projects, solutions, and strategies not included within these initial scenarios were retained within the process as "supporting activities" that were considered as part of implementation recommendations.

4. **Final Scenario Development and Testing**. Based on feedback from regional stakeholders (described below), the initial scenarios were refined and finalized. Order of magnitude cost estimates were completed prior to analysis within the operational model. These initial scenarios were coded and tested in the model. Based on the findings of the initial model runs, the scenarios were refined by mixing solutions from all four typologies as appropriate, and clustering solutions based on low, medium, and high relative-cost thresholds. We coded and tested these additional scenarios in our suite of operational models, the results of which were used to develop operational, infrastructure, and institutional recommendations for the region.

Figure 5.1 Screening Approach Summary



Stakeholder Feedback

A critical component in the development of both initial and final scenarios was the collection of feedback from key regional stakeholders, including potential implementers of the solutions, heavy users of the crossings, and other beneficiaries or affected parties. Prior to finalizing the list of scenarios for testing within

the operational model, we solicited feedback from regional stakeholders asking them to:

- **Identify errors in or omissions from the master list of solutions**, to ensure we captured the full suite of potential solutions that would improve the performance of the region's crossings and approach networks.
- **Provide additional detail on proposed solutions**, as appropriate, to ensure we had adequate information on which to evaluate the feasibility. As can be seen in Appendix H, some project descriptions (e.g., "extend operating hours") did not provide enough detail to support screening or model evaluation at this time. However, with additional detail, these and other projects were considered worthy of further consideration and evaluation.
- **Assess the validity of the screening process and criteria**, to ensure that they were consistent with the Guiding Principles and resulted in a set of project solutions that best addresses the regional transportation system needs and deficiencies.

The following sections summarize the results of the Steps 1 through 4 of this process.

Relevance Screen Results

The Operations Plan covers a broad scope, geographically (i.e., Santa Teresa to Tornillo), programmatically (i.e., passenger cars, freight vehicles, and pedestrians), and in terms of the number and type of stakeholders (i.e., binational transportation, security, business development interests). As a result, the Operation Plan's public and stakeholder outreach activities solicited input from a wide range of perspectives to ensure that all interested groups in the region, on both sides of the U.S.-Mexico border, were actively engaged in the development of the Plan. The master list of proposed solutions (Appendix H) also includes numerous recommendations from other recent or ongoing initiatives, such as the Paso Del Norte Group's Model Border Port Committee,[10] the Texas Department of Transportation's (TxDOT) *Border Crossing Travel Time Study* completed in 2008,[11] and other recent studies.

As discussed earlier, while the universe of potential solutions documented in the master list is diverse and wide-ranging, not all were appropriate for analysis within the Operations Plan or the analysis tools developed to support it. In addition, some solutions were only tangentially related to border crossing

[10] The Paso del Norte Group, *Vision for the Paso del Norte Region*, Model Port Brief, August 2010.

[11] RJ RIVERA Associates, Inc., *Border Crossing Travel Time Study Final Study Report Volume I*, prepared for the Texas Department of Transportation El Paso District, June 2008.

operations and were not appropriate for consideration within our analyses. Rather than ignoring these potentially good ideas, we identified which solutions on the master list fall within the purview of the Operations Plan and which were more appropriate for consideration by other agencies, entities, or stakeholders, as shown in Figure 5.2.

For example, although a feasibility study of international light rail service (Table H.1.1, General Port of Entry Improvements), Bus Route Option I (Table H.1.4), Bridge of the Americas Port of Entry Improvements, and other similar strategies may contribute to improved cross-border mobility in the region, full analysis of these solutions would be more appropriately evaluated by other agencies/organizations rather than included within the Operation Plan's approach. Figure 5.2 lists the solutions from the master list that are most appropriately handled by other agencies, entities, or stakeholders.

Figure 5.2 Relevance Screen for Proposed Solutions

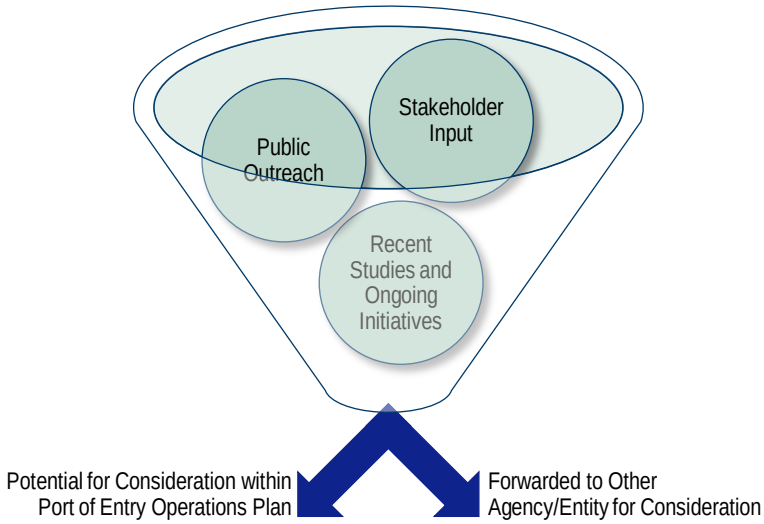


Table 5.1 Proposed Solutions More Appropriately Evaluated by Other Agencies, Entities, or Stakeholders

Potential Solution	Responsibility	Rationale
Improve customer service signage at land ports of entry	U.S. Customs and Border Protection	Customer service improvement, limited impact on mobility
Add Ombudsman to Establish Customer Service and Professionalism Training Standards and Metrics	U.S. Customs and Border Protection	Customer service improvement, limited impact on mobility
Consolidate entry/export documents for commercial shippers	U.S. Customs and Border Protection, Mexican Aduanas	Difficult to assess impacts in model
Improve access to and training of immigration subject matter experts at the ports of entry	U.S. Customs and Border Protection	Customer service improvement, limited impact on mobility
Improve C-TPAT program self-reporting and readmission guidelines	U.S. Customs and Border Protection	Difficult to assess impacts in model
Improve transparency of SENTRI admission and revocation guidelines	U.S. Customs and Border Protection	Difficult to assess impacts in model
Create incentives for personnel to facilitate trade, in addition to such incentives that exist for interdiction	U.S. Customs and Border Protection	Difficult to assess impacts in model
Increase the number of ATF (Bureau of Alcohol, Tobacco, Firearms and Explosives) personnel in the region	Bureau of Alcohol, Tobacco, Firearms and Explosives	Difficult to assess impacts in model
Streamline immigrant visa admission process	U.S. Customs and Border Protection	Difficult to assess impacts in model
Implement pilot tracking project to include intelligent devices (GPS, RFID) for monitored crossings	El Paso Metropolitan Planning Organization	Difficult to assess impacts in model
Automate I-94 processing	U.S. Customs and Border Protection	Difficult to assess impacts in model
Automate and improve process for return of I-94 upon departure at land ports of entry	U.S. Customs and Border Protection	Difficult to assess impacts in model
Improve immigration-related information available on-line	U.S. Customs and Border Protection	Customer service improvement, limited impact on mobility
Design new Tornillo port of entry as a Model Border Port	Paso Del Norte Group, U.S. Customs and Border Protection	Facility design consideration, limited impact on mobility
Privatize the region's ports of entry	City of El Paso	Significant analysis required to assess impacts
Pursue feasibility study to encourage passenger light rail across port of entry	Sun Metro, City of El Paso	Significant analysis required to assess impacts
Develop strategic development plan for the area surrounding Santa Teresa	City of Santa Teresa	Significant analysis required to assess impacts
Bus route options I-IV	Sun Metro, City of El Paso	Significant analysis required to assess impacts

Initial Criteria Screen Results

As described earlier, we evaluated and rated each solution based on its ability to satisfy five criteria:

1. Extent to which the solution **optimizes the use of existing capacity** or **streamlines existing processes**;
2. Extent to which the solution **preserves security**;
3. Solution's potential to **reduce crossing times** at the border;
4. Solution's potential to **reduce total end-to-end travel time** (excluding wait/inspection times at the border); and
5. Extent to which the solution is **implementable**, based on anticipated cost, associated policy changes, or stakeholder pushback.

These initial screening criteria represent the subset of guiding principles that reflect the most important priorities of the stakeholders we talked with during our outreach efforts. Using an evaluation matrix, each solution was assigned a "high," "medium," and "low" ranking for each criterion, as well as an overall rating. The following sections provide additional explanation of these criteria, including examples of "high," "medium," and "low"-rated solutions for each.

Criteria 1: Optimize Use of Existing Capacity/Streamline Existing Processes

Overall, the public outreach process revealed strong support throughout the region to invest in operational improvements to make the existing border crossings more efficient prior to investing in new capacity.[12] Popular operational improvement ideas included making use of all existing inspection booths during peak travel periods and using advanced technology to provide real-time traffic information. As illustrated by the examples in Table 5.2, a solution would make more efficient use of available capacity and/or existing infrastructure or streamline existing processes by removing redundancies receives a high-qualitative rating. Solutions that would require investment in new infrastructure, such as the construction of a new port of entry, receive a low rating for this criteria.

[12] *Phase I Public Involvement Summary Report*, provided to the Advisory Committee members, August 2010.

El Paso Port of Entry Operations Plan, *Public Opinion Survey Results Executive Summary*, available at www.elpasoborderplan.org.

Table 5.2 Criteria 1: Optimize Use of Existing Capacity
Rating Examples and Rationale

Rating	Example Solution	Rationale
High	Allow 24-hour commercial operations	Extending commercial operating hours may help to disperse demand throughout the day.
	Design secure dual-inspection point pilot program to streamline commercial inspections	Working with Mexican Aduanas, CBP would examine cargo upon arrival in Mexico, rather than subjecting shipments to duplicate inspections, one upon exit from the United States and another upon arrival in Mexico.
Medium	Designate a port of entry for the exclusive use of commercial vehicles	While separating commercial and noncommercial traffic may improve operational efficiency, converting a port of entry for the exclusive use of commercial vehicles would require some amount of infrastructure reconfiguration.
Low	Construct a new port of entry in the region	This solution would require investment in new infrastructure.

Criteria 2: Preserve Security

Safety and security are clear priorities for the region and the public indicated that improvements to port of entry efficiency should not come at the expense of national security. Project solutions that have the potential to improve security, such as expanding enrollment in trusted traveler programs (SENTRI and FAST) to concentrate more resources on potentially high-risk travelers and goods or implementing technology to increase inspection rates or reduce subjectivity, receive high ratings for security preservation (Table 5.3). While none were suggested, any solution that would compromise security in any way would have received a low rating.

Table 5.3 Criteria 2: Preserve Security
Rating Examples and Rationale

Rating	Example Solution	Rationale
High	Expand SENTRI enrollment to 50,000	Increased SENTRI enrollment will facilitate the movement of low-risk travelers and allow CBP to focus limited resources on illegal travel or other security risks.
Medium	Conduct southbound inspections at the point of debarkation (unloading) rather than at the border	Moving southbound inspections away from the border, potentially several miles into Mexico, requires the use of jersey barriers or other devices to keep the commercial vehicles secure prior to screening.
Low	None	None of the proposed solutions intentionally compromise existing security – this would be a fatal flaw.

Criteria 3: Reduce Crossing Times

Crossing times encompass both the wait times leading up to the inspection point, as well as the duration of the inspection itself. Stakeholders in the region clearly indicated that a reduction in crossing times would help facilitate trade, reduce the cost of doing business, and improve the economic competitiveness of the region. Many of the proposed solutions sought to reduce crossing times by either increasing the rate of movement and pace of inspections at the border to improve throughput or by dispersing demand across available capacity throughout the day and/or among the ports of entry in the region. Table 5.4 provides examples of solutions for each rating.

Table 5.4 Criteria 3: Reduce Crossing Times
Rating Examples and Rationale

Rating	Example Solution	Rationale
High	Implement contra-flow lanes during peak periods	The use of contra-flow lanes during peak periods would provide additional capacity to improve throughput in the peak direction.
	Evaluate tolling/pricing solutions	Implementing higher tolls during the peak period may help to reduce wait times by encouraging off-peak travel.
Medium	Pilot an empty truck fee program	Charging a fee for empty trucks would discourage empty truck movements during peak periods; however, encouraging trucks to be value-added in both directions may counteract any wait time reductions.
Low	None	None of the proposed solutions were deemed to adversely impact crossing times.

Criteria 4: Reduce End-to-End Travel Times

Not all issues affecting cross-border mobility occur at the border. Several potential solutions addressed broader transportation system issues, such as traffic flow/lane configurations on the approaches to the ports of entry, system connectivity, or advanced travel information. These solutions, in combination with those that address crossing times at the ports of entry themselves, may help to reduce end-to-end travel times.

Table 5.5 Criteria 4: Reduce End-to-End Travel Times
Rating Examples and Rationale

Rating	Example Solution	Rationale
High	Use Intelligent Transportation Systems (ITS) and/or dynamic message signs (DMS) on the bridges and approaches to alert drivers of lane closures, crossing times, and lane assignments	Providing real-time, mobile alerts on congestion conditions and lane openings/closures provide drivers with information on which to base routing and departure decisions, which may help to disperse demand across available capacity throughout the day and/or among the ports of entry in the region.
	Construct a connector ramp from BOTA to access Cesar Chavez Border Highway West	At present, drivers leaving BOTA cannot go west; therefore, this solution would fill a critical gap in system connectivity.
Medium	Reuse the old Border Safety Inspection Facility (BSIF) location near the Zaragoza port of entry for commercial vehicle staging and queuing	This solution would prevent trucks from queuing onto the frontage roads of LP 375, which may help to keep local traffic flowing more smoothly near the port of entry but may not affect the end-to-end travel time of the commercial vehicles themselves.
Low	Improve signage to/from the Fabens port of entry and I-10	While additional signage may help to guide traffic traveling between these two points, traditional signage may have a negligible impact on end-to-end travel times.

Criteria 5: Implementability

Any of the proposed solutions would require some level of coordinated effort to implement. However, while some of the proposed solutions remain largely within local control, others will require Federal and/or international planning or funding action. As a result, this last key criterion considered the degree of difficulty required for implementation.

As shown in Table 5.6, a potential solution rates "high" if it was relatively inexpensive and the full decision-making authority lies within local control. A "medium"-rated solution may have been implemented elsewhere in the region or nation, but would require a more significant amount of additional state or local involvement prior to implementation. Any solution that would require planning and/or funding action at the Federal or international level would receive a "low" rating to acknowledge the additional hurdles that would be required to implement a solution of this nature.

Table 5.6 Criteria 5: Implementability
Rating Examples and Rationale

Rating	Example Solution	Rationale
High	Provide a pedestrian mall along El Paso Street to address the issue of the heavy pedestrian traffic at the Paso del Norte Crossing	Implementing a pedestrian mall and restricting access to cross street traffic are two inexpensive solutions that fall completely within local jurisdiction.
Medium	Expand C-TPAT and SENTRI enrollment	While CBP involvement would be required to assist enrollment processing, this solution could be championed by local stakeholders to boost participation in the existing programs through a variety of strategies.
Low	Implement a toll at the Bridge of the Americas (BOTA)	Charging a toll would require an amendment to the Chamizal Treaty, necessitating a new agreement between the U.S. Congress and the Mexican Federal government.
	Prioritize adequate staffing at the ports of entry	Funding required to hire and train the additional front line officers needed to fully staff the existing booths would require a Federal allocation.

Summary of Initial Screening Results

The qualitative ratings for each of the potential solutions are provided in Appendix H, tabulated by port of entry (Tables H.2.1 through H.2.6). This section summarizes the initial screening results by grouping the most promising projects, solutions, and strategies into four initial scenarios:

1. **Staffing and Management –** Solutions that address the institutional, policy, or regulatory environment that governs the management of the region's cross-border network, including Customs and Border Protection (CBP) staffing levels and bridge hours of operation (Table 5.7);
2. **Pricing –** Solutions that would modify existing toll rates, propose tolls on bridges that currently are free, or implement pricing strategies based on time of day or congestion levels (Table 5.8);
3. **Technology –** Solutions that leverage existing technology or implement new technology applications to improve the efficiency of cross-border movements, inspections, or information available to passengers, carriers, or shippers (Table 5.9); and
4. **Traffic Engineering and Infrastructure –** Solutions that relate to the condition or physical capacity of the port of entry infrastructure or approach network, as well as operational solutions that relate to how the system is being utilized (Table 5.10).

While some of the potential solutions listed in the following tables can be combined within the same scenario, others are mutually exclusive and must be modeled separately to evaluate impact. For example, a scenario that would create 24-hour commercial operations at all commercial ports of entry would have to be modeled separately from scenario that tests 24-hour commercial

operations at just one port of entry. Where these solution variations are listed in the tables that follow, we worked with stakeholders to identify the most appropriate variation(s) to evaluate within a manageable number of total scenarios.

Table 5.7 Initial Staffing and Management Scenario Options

Potential Solution	Overall Rating
Implement 24-hour commercial operations: 1. All commercial POEs 24 hours 2. Zaragoza only 3. Santa Teresa only 4. BOTA only 5. Tornillo only 6. Santa Teresa and Zaragosa 7. BOTA and Zaragosa 8. Santa Teresa and Tornillo	●
Fully staff front line officers during periods of high demand: 1. At all existing booths at all crossings 2. Zaragosa only (3 pedestrian, 12 POV, 9 commercial) 3. BOTA only (4 pedestrian, 14 POV, 6 commercial) 4. Paso Del Norte only (4 pedestrian, 11 POV) 5. BOTA and PDN 6. BOTA and Zaragosa	●
Streamline inspection processes: 1. Design secure dual-inspection point pilot program to streamline commercial inspections (CBP and Mexican Aduanas) 2. Support legislative change for state DPS inspections to serve Federal FMCSA requirements 3. Allow Mexican Aduanas staff to inspect in-bond vehicles on U.S. soil	◒

Note: ● Rates well against initial screening criteria, ◒ Partially meets the initial screening criteria, ○ Does not meet the initial screening criteria.

Table 5.8 Pricing Scenario Options

Potential Solution	Overall Rating
Toll BOTA at same rate as Paso Del Norte and Ysleta-Zaragoza	◒
Increase tolls during peak periods	◒
Dynamically increase tolls up to some specified maximum based on real-time traffic flows	◒
Pilot an empty truck fee program	◒

Note: ● Rates well against initial screening criteria, ◒ Partially meets the initial screening criteria, ○ Does not meet the initial screening criteria.

Table 5.9 Technology Scenario Options

Potential Solution	Overall Rating
Install ITS devices on bridges and approaches to alert drivers of lane openings/closures, crossing times, and lane assignments	●
Implement queue monitoring technology	●
Implement noninvasive inspection technology for cargo	●
Implement a pilot program using an RFID-based system to measure truck crossing times and a mobile device signal detection technology (Bluetooth) to measure POV crossing times	◒
Implement interoperable technology for license plate recognition and FAST/SENTRI tags that could be used at all of the region's POEs	○

Note: ● Rates well against initial screening criteria, ◒ Partially meets the initial screening criteria, ○ Does not meet the initial screening criteria.

Table 5.10 Traffic Engineering and Infrastructure Scenario Options

Potential Solution	Overall Rating
Expand use of designated inspection lanes for certain passengers and pedestrians: 1. Provide FAST/designated commuter lanes (DCL) at all ports of entry 2. Increase the number of FAST/DCL lanes at existing ports of entry 3. Provide variable FAST/DCL lanes during peak periods 4. Pilot a dedicated empty truck lane at Zaragoza or BOTA	●
Implement bridge specialization: 1. Convert bridges to one-way pairs (e.g., BOTA southbound/Zaragosa northbound) 2. Implement contra-flow lanes during peak periods 3. Limit commercial vehicles at BOTA to empties southbound and FAST northbound 4. Establish Ysleta-Zaragoza as a commercial-only port of entry 5. Route all oversize/overweight trucks through Santa Teresa	◒
Improve connectivity and accessibility to the ports of entry: 1. Construct grade-separations/between Santa Teresa POE and I-10 (Artcraft Road) 2. Improve loop road to directly connect the Border Highway and Paisano Drive (BOTA) 3. Construct a connector ramp from BOTA to access Cesar Chavez Border Highway West. 4. Provide an eastbound exit ramp from the main lanes of LP 375 (Ysleta-Zaragoza POE) 5. Add an additional left-turn lane on the LP 375 westbound frontage road (Ysleta-Zaragoza POE)	◒
Reconfigure lane assignments/traffic circulation patterns on BOTA approach: 1. Eastbound Paisano 2. Westbound Paisano 3. Southbound U.S. 54 4. Southbound IH-110	●
Expand capacity within existing footprint: 1. BOTA bridge infill between the northbound and southbound spans to add two travel lanes in each direction 2. Expand the number of inspection booths at BOTA and Zaragoza	◒

Note: ● Rates well against initial screening criteria, ◒ Partially meets the initial screening criteria, ○ Does not meet the initial screening criteria.

Finalizing Scenarios for Evaluation

The process outlined above defined the set of *initial* scenarios for evaluation, which were based on qualitative ratings reflecting the professional judgment of the project team. As described previously, however, additional input from key stakeholders, defined as the primary implementers of the solutions (U.S. Customs and Border Protection, City of El Paso, Texas Department of Transportation, U.S. General Services Administration, etc.), the heavy users of the crossings (maquiladoras), and other beneficiaries or affected parties, was critical to finalize the list of scenarios for testing within the suite of operational models. During a series of stakeholder meetings, the project team solicited feedback on the initial screening results from the region's stakeholders. We received feedback from potential implementers of the solutions, heavy users of the crossings, governmental entities, and other beneficiaries or affected parties (listed in Appendix A). This process allowed us to achieve four primary outcomes:

- **Identify errors in or omissions from the master list of solutions**, to ensure we captured the full suite of potential solutions that would improve the performance of the region's crossings and approach networks;
- **Understand the relationship of the initial scenarios to other ongoing efforts**, to avoid testing solutions that currently are being evaluated or pilot-tested by other entities;
- **Group scenarios and gather additional detail required for modeling**, as appropriate, to ensure we had adequate information on which to evaluate the feasibility of each solution; and
- **Identify potential implementation issues**, that would be important to address as part of the Operations Plan recommendations.

Below is a summary of the information we collected in these four areas that facilitated the development of final scenarios for testing.

Errors and Omissions among the List of Potential Solutions

Stakeholders brought our attention to a couple errors or suggested changes in the initial scenarios, to which we made the appropriate adjustments. Unlike Bridge of the Americas (BOTA) and Zaragoza, state and Federal Motor Carrier Safety Administration (FMCSA) inspectors already are collocated at Santa Teresa's state facility, with each agency respecting the other agency's inspections. As a result, maximum benefit from the scenario to streamline State Department of Public Safety (DPS) and Federal FMCSA inspection processes would be realized at the BOTA and Zaragoza ports of entry where the two inspections are located at different facilities.

Many stakeholders, particularly those to which the change would most apply, noted that 24-hour commercial operations are not necessary. They favored expanding commercial hours beyond their current windows (suggesting 5:00 a.m. to 1:00 a.m.), but suggested that demand during the late night/early

morning hours would not justify the resources required to operate a 24-hour schedule at the crossings.

Relationships to Ongoing Efforts

There was some overlap between our initial scenarios and other recent or ongoing initiatives in the region to improve border operations. Inventorying these activities provided information to help us narrow the list of scenarios to test in the suite of operational models. Ongoing initiatives included:

- **Paso del Norte's Model Border Port Recommendations –** In an August 2010 Model Port Brief, the Paso del Norte Group identified a list of prioritized recommendations to streamline trade and reduce the total cost of doing business for the private sector.[13] These recommendations were included in our master list of potential solutions, but also are being reviewed currently by CBP.
- **RFID/Bluetooth Pilot Programs at BOTA and Zaragoza –** FHWA-funded research has demonstrated that RFID is one of the most cost-effective and practical ways of measuring commercial vehicle border crossing time. As a result, FHWA and TxDOT are deploying RFID-based systems at BOTA. Bluetooth also has proven to provide equally effective measurement for passenger vehicles and has been in use for several years border crossings along the U.S.-Canada border. The Texas Transportation Institute (TTI) conducted a successful test of the technology two years ago, and currently has an ongoing pilot at the Zaragoza port of entry that has been successful as well. The results of these initiatives will inform decisions regarding use of these technologies in the future.
- **"Ready Lane" Pilot Program –** Beginning December 19, 2010, CBP will initiate a 90-day "ready lane" pilot program at Zaragoza. Travelers entering the United States with approved Western Hemisphere Travel Initiative (WHTI)-compliant, RFID-enabled travel documents (such as a U.S. passport card, enhanced driver's license, or SENTRI/FAST card) may use the dedicated inspection lane. The pilot program will help CBP determine the efficiency and effectiveness of a dedicated RFID lane for those travelers.
- **Secure Origins Technology –** Secure Origins is a technology services company based in El Paso providing real-time monitoring of cargo traffic. The company recently received FHWA funding under "Secure Border Trade" to equip 30 trucks with this technology. The "supply chain" service uses Intelligent Software Agents (ISA) that are able to collaborate, experiment, and act without a human operator, monitoring shipments through the supply chain from origin to destination. This technology has the ability to inform a shipper if their truck is opened, if a driver goes off of a specified route or out

[13] The Paso del Norte Group, *Vision for the Paso del Norte Region*, Model Port Brief, August 2010.

of a route envelope, if a driver opens his or her door or leaves the trucks, in addition to monitoring conditions such as temperature, radiation, and leakages with sensors. Webcams are located at loading points, where tracking begins. ISAs work in combination to monitor, interpret, analyze, and evaluate an appropriate course of action for customers and integrate with GIS, Relational Database Management Systems (RDBMS), GPS, web-cams, RFID systems, and sensors creating a shared platform ensuring the interoperability of all applied systems.

- **Improvements at Santa Teresa –** In July 2010, the Santa Teresa Port of Entry was awarded $10 million from the American Recovery and Reinvestment Act. Among other improvements, the funding will be used to expand passenger vehicle lanes from two lanes to five (one of which will be designated as a SENTRI lane), add another commercial inspection lane (for a total of three), expand passenger and commercial vehicle queuing, and expand pedestrian inspection areas.

Grouping Scenarios and Additional Detail Required for Modeling

Relying on stakeholder feedback and additional research and analysis, we further narrowed the number of scenarios by grouping complementary scenarios from the initial list. We also gathered additional detail where needed to support the modeling analysis. The following is a summary of details affecting the list of final scenarios:

- **Evaluate the effects of fully staffing all booths, all crossings –** Rather than testing combinations of increased staffing at just one or two ports of entry, the staffing scenario investigated the system impacts of staffing all existing booths at all crossings (as demand requires).
- **Clarify empty truck fee scenario –** Under this pricing scenario, we clarified it to mean testing the effect of tolling empty trucks at BOTA.
- **Group queue monitoring technology with traveler-based ITS information systems –** Collectively, the technology scenario tested queue-monitoring technology applications used to inform inspection officers of fluctuating staffing needs as well as applications used by travelers to receive pre-trip information about lane openings/closures and crossing times. These technology applications are detailed in Appendix F).
- **Clarify one-way pair bridge specialization –** Under this scenario, the one-way paired movements would apply to commercial vehicles using BOTA and Zaragoza. The BOTA redesign (schematic provided in Appendix H) would accommodate southbound commercial vehicles. Northbound commercial vehicles would use Zaragoza. A second scenario would test the reverse bridge specialization – northbound commercial vehicles would use BOTA, while southbound commercial vehicles would use Zaragoza.

- **Feasibility of infrastructure improvements –** Upon further research, two of the proposed infrastructure improvements were determined to be infeasible and were removed from the list of final scenarios. Due to limited right-of-way and the presence of existing infrastructure, the site of the proposed connector ramp from BOTA to Loop 375 Border Highway West would not work geometrically. Similarly, an earlier study found that the geometrically feasible location for the proposed exit ramp from Loop 375 near the Yaragoza POE would require the removal of an existing entrance ramp.[14] Upon analysis of traffic data, however, the entrance ramp is heavily utilized by commercial trucks accessing the eastbound Loop 375 mainlines. More detailed information on the remaining traffic engineering and infrastructure scenarios is included in Section H.3.
- **Routing of oversize/overweight trucks –** Stakeholders did not identify the routing of oversize/overweight trucks as a primary problem requiring attention. When dimensions restrict the use of the region's other crossings, oversize/overweight trucks already use the Santa Teresa port of entry.

Potential Implementation Issues

We also received feedback from stakeholders related to their level of support (or lack of support) for some of the initial scenarios and how implementable they felt certain projects would be. While we used our operational model to evaluate the potential system benefits of the final scenarios, stakeholder feedback helped to flag potential implementation challenges that will have to be addressed with the Operations Plan.

- **Tolling and Pricing –** Many stakeholders were leery of the tolling and pricing scenarios, emphasizing the need instead to reduce travel costs. A private sector survey addressing the impact of proposed tolling at BOTA showed that a majority of the respondents would change their transportation patterns in some way, such as consolidating shipments or using an alternate port of entry. While tolling and pricing scenarios were evaluated in the operational model, there are several implementation hurdles that would have to be addressed. In addition to prevalent stakeholder opposition, charging a toll on BOTA would require an amendment to the Chamizal Treaty, which stipulates that it operate as a toll-free facility.
- **Bridge Specialization –** Bridge specialization, particularly for commercial vehicles, was not supported by several industry groups in the region, citing the need for shippers to have flexibility and redundancy in the system.

[14] RJ RIVERA Associates, Inc., *Border Crossing Travel Time Study*, prepared for the Texas Department of Transportation El Paso District, June 2008.

- **Funding for Additional Staffing –** Funding realities continue to limit CBP's ability to hire and train the front line officers needed to fully staff the inspection booths during periods of high demand.
- **U.S.-Mexico Reciprocity –** A proposed solution to streamline commercial inspection procedures by establishing a dual-inspection pilot program between CBP and Mexican Aduana and/or allowing Mexican Aduana to inspect in-bond vehicles on U.S. soil involves a legislative issue. At the time of these meetings (fall 2010), there was no reciprocity between the countries granting the authority to station staff abroad.

Final Scenarios for Model Evaluation

This section summarizes the final scenarios selected for testing in our suite of operational models. The final scenarios were grouped into four categories:

1. **Staffing and Management –** Solutions that address the institutional, policy, or regulatory environment that governs the management of the region's cross-border network, including Customs and Border Protection (CBP) staffing levels and bridge hours of operation (Table 5.11);
2. **Pricing –** Solutions that would modify existing toll rates, propose tolls on bridges that currently are free, or implement pricing strategies based on time of day or congestion levels (Table 5.12);
3. **Technology –** Solutions that leverage existing technology or implement new technology applications to improve the efficiency of cross-border movements, inspections, or information available to passengers, carriers, or shippers (Table 5.13); and
4. **Traffic Engineering and Infrastructure –** Solutions that relate to the condition or physical capacity of the port of entry infrastructure or approach network, as well as operational solutions that relate to how the system is being utilized (Table 5.14).

Table 5.11 Final Staffing and Management Scenarios

Potential Solution
Extend commercial hours of operation: 1. Extend all commercial ports of entry to 20-hour operations (5:00 a.m. to 1:00 a.m.) 2. Extend Zaragoza only (5:00 a.m. to 1:00 a.m.) 3. Extend Santa Teresa only (5:00 a.m. to 1:00 a.m.) 4. Extend BOTA only (5:00 a.m. to 1:00 a.m.)
Fully staff front line officers at all existing booths at all crossings during periods of high demand
Streamline inspection processes by supporting legislative change for state DPS inspections to serve Federal FMCSA requirements at BOTA and Zaragoza (already in place at Santa Teresa)

Table 5.12 Final Pricing Scenarios

Potential Solution
Toll BOTA at same rate as Paso Del Norte and Ysleta-Zaragoza ($3.50 per axle)
Increase tolls during peak periods at PDN, Stanton, and Zaragoza
Dynamically increase tolls up to some specified maximum based on real-time traffic flows at PDN, Stanton, and Zaragoza
Toll empty trucks at BOTA

Table 5.13 Final Technology Scenario

Potential Solution
Install ITS devices, including queue monitoring technology, on bridges and approaches for the purposes of informing inspection officers of fluctuating staffing needs and alerting travelers of lane openings/closures, crossing times, and lane assignments.

Table 5.14 Final Traffic Engineering and Infrastructure Scenarios

Potential Solution
Expand use of designated inspection lanes within each crossing's existing footprint: 1. Provide designated commuter lanes (DCL) at all ports of entry 2. Increase the number of FAST lanes at commercial ports of entry
Implement bridge specialization: 1. Limit commercial vehicles at BOTA to empties southbound and FAST northbound 2. Route all southbound commercial traffic through BOTA and northbound commercial traffic through Zaragoza 3. Establish Ysleta-Zaragoza as a commercial-only port of entry and allow southbound empty trucks 4. Route all northbound commercial traffic through BOTA and southbound commercial traffic through Zaragoza
Improve connectivity and accessibility to the ports of entry: 5. Construct grade-separations/between Santa Teresa POE and I-10 (Artcraft Road) 6. Improve loop road that connects Stanton/PDN, BOTA, and Ysleta-Zaragoza POEs 7. Add an additional left-turn lane on the LP 375 westbound frontage road (Ysleta-Zaragoza POE) 8. Reconfigure southbound lane assignments/traffic circulation patterns on BOTA approach (Paisano, U.S. 54, and IH-10).
Complete BOTA bridge infill between the northbound and southbound spans to add two travel lanes in each direction.

6.0 Model Development and Validation

6.1 INTRODUCTION

As discussed earlier, we developed a suite of operational models to evaluate the transportation impacts of the 22 staffing/management, technology, pricing, and traffic engineering scenarios described in the previous section. Two types of tools were developed: simulation tools, which used the VISSIM software; and a spreadsheet-based queuing tool. Collectively, these tools allowed us to evaluate impacts at both the individual crossing level and across the entire system of crossings. The following summarize the development, validation, and calibration of these tools.

6.2 SIMULATION TOOLS

Overview

VISSIM simulation models were developed to evaluate the impact of different proposed improvements for the BOTA and Ysleta POEs. The simulation models for both BOTA and Ysleta POEs were developed using the PTV VISSIM simulation software (version 5.2).

Measures of Effectiveness (MOE)

The measures of effectiveness (MOE) which were used to evaluate simulation models in this study are listed in Table 6.1.

Table 6.1 Measures of Effectiveness

MOEs	Descriptions	Units
Average Delay	Hourly average delay per vehicle before vehicles arrive at the border inspection facilities.	Minutes/Vehicle
Total Delay	Total delay by all vehicles in the study area for the 12-hour study period (8:00 a.m. to 8:00 p.m.).	Vehicle-Hours
Q Ratio	Calculated as total vehicle-miles traveled (VMT) divided by total vehicle-miles traveled (VHT), which is a measure of the quality of travel. This measure is a proxy for the average travel speed, in mph.	MPH
Queue Length	The length of queues counted from the border inspection facilities.	Feet

6.3 CALIBRATION

This section presents the data collected for model development and calibration, followed by the traffic demand estimation, calibration criteria, and calibration results.

Data

The data required as the model input was either collected by the project team in 2010 or obtained from CBP. Since the inbound and outbound traffic use different inspection facilities, the data are grouped into two major categories, i.e., inbound and outbound. Since autos may use separate facilities than trucks, the data are further grouped into two subcategories, i.e., autos and trucks.

Inbound Autos

Inbound autos need to pass through the inspection plaza on the U.S. side. Those that fail the main inspections need to pull over into a parking lot for secondary inspections. Inbound autos use separate routes than the inbound trucks.

Three-day[15] average auto volumes at the inspection plaza provided by CBP were used as the throughput for traffic demand estimation. The primary processing times were extracted from CBP data. Not all the available booths are open in each of the operating hours. Thus, the average number of booths open during each of operating hours was calculated based on the staffing plan provided by CBP.

Hourly waiting times on these three days were provided by CBP and were averaged to calculate average delay. Then, the hourly inbound auto demand was estimated using the throughput and the delay based on the queuing theory. Further adjustments were conducted during the calibration process to better match volumes and delay at the inspection plazas.

The percentage of autos sent to secondary inspections and the average processing time for primary and secondary inspections also were extracted from data that CBP provided.

For Ysleta, besides the regular autos, there is another type of autos, i.e., SENTRI, which provides expedited CBP processing for preapproved, low-risk travelers. The SENTRI volumes and primary processing times also were provided by CBP.

Inbound Trucks

There are two types of inbound trucks, regular and FAST (Free and Secure Trade). Drivers with valid FAST cards can enter the United States by land or sea with expedited service between the United States and Canada or to the United States from Mexico.

[15] March 24, April 21, and April 29, 2010.

Both types of trucks need to pass through the primary truck inspection facility on the U.S. side. The regular trucks that fail the primary inspection are subject to secondary inspection which is in a separate facility. The secondary inspection has several different types, including the Vehicle and Cargo Inspection System (VACIS), pylon-mounted x-rays, and gantry systems for scanning trucks and containers. Those trucks (both regular and FAST) that fail the secondary inspections need to pass through the dock inspection. Inbound trucks use separate routes than the inbound autos.

Three-day[16] average truck volumes at the primary inspection facility provided by CBP were used as the throughput for traffic demand estimation. The primary processing times were extracted from CBP data. Again, not all the available booths are open in each of the operating hours. Thus, the average number of booths open during each of operating hours was calculated based on the staffing plan provided by CBP.

Hourly waiting times for each truck types on these three days were provided by CBP and were averaged to calculate delay. Then the hourly inbound truck demand was estimated using the throughput and the delay based on the queuing theory. Further adjustments were conducted during the calibration process to better match volumes and delay at the inspection plazas.

The percentage of trucks that fail the primary inspection was obtained from the data provided by CBP. Since different secondary inspection facilities were used for those trucks that failed the primary inspection, regular and FAST trucks were further divided into different subtypes to replicate different truck types that were subject to different secondary inspections. The percentage of trucks for secondary inspections and the processing times for each of the secondary inspections were calculated based on the data collected by the project team.

Outbound

Outbound autos need to pass through the in-lane inspection stations on the U.S. side and the inspection plaza on the Mexico side. The hourly throughputs at BOTA were only available for 10:00 a.m. to 12:00 p.m. and 4:00 p.m. to 6:00 p.m. Since the outbound hourly throughputs at Ysleta were not available during all the study times (8:00 a.m. to 8:00 p.m.), similar hourly distribution factors at Ysleta were applied to BOTA.

No waiting time information was available for the outbound autos and trucks, thus the maximum queues observed on the U.S. side were used for the demand estimation based on the queuing theory. The inspection processing time on the Mexico side was first assumed to be same as that of the inbound primary inspection. It was adjusted accordingly to match the throughput at the POEs.

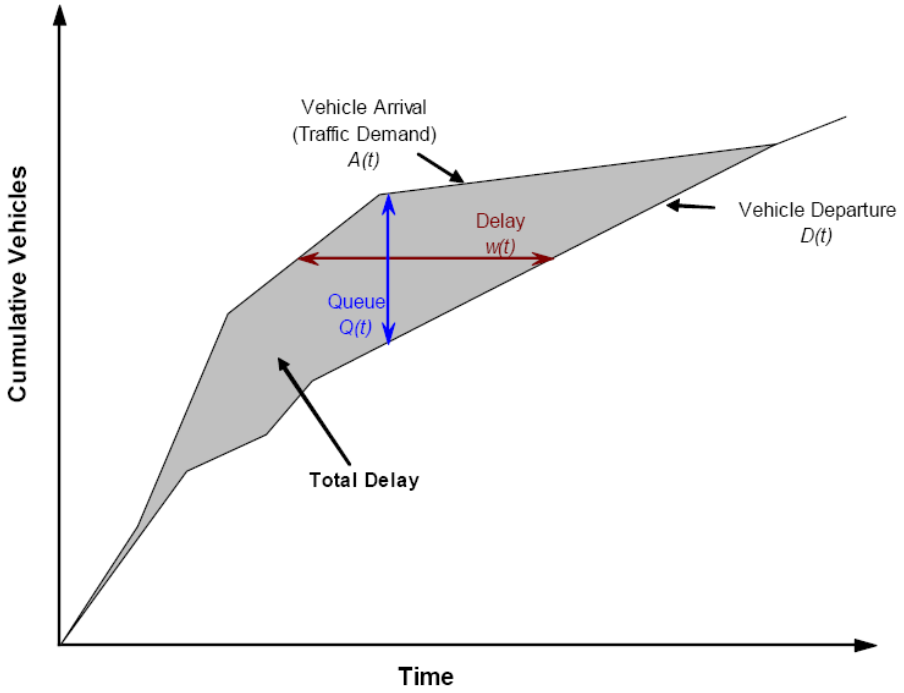
[16] March 24, April 21, and April 29, 2010.

Traffic Demand Estimation

The existing volumes provided by CBP are hourly traffic counts at the border inspection facilities, which reflects the system throughput (vehicle departure) but not the demand. In this section, we developed traffic demand utilizing average hourly delay, queue lengths, and volumes.

Average delay per vehicle by hour, along with hourly counts at the border inspection facilities, were used for the estimation of traffic demand. The basic principle of queuing theory is utilized in this estimation process, which are illustrated in Figure 6.1. The x-axis in this figure represents time, and the y-axis represents cumulative vehicles. When vehicle arrival (traffic demand) A(t), exceeds vehicle departure, D(t), delay occurs. As shown in Figure 6.1, the vertical distance between A(t) and D(t) at any time represents the number of vehicles in queue at that time; the horizontal distance between A(t) and D(t) at any time represents the delay, w(t), to vehicles arriving at time t; the area between A(t) and D(t), shown shaded on the diagram, represents the total delay, or summation of delay experienced by all vehicles. For this analysis, the hourly volumes at the inspection facilities represent vehicle departure. Together with average hourly delay, traffic demand can be estimated, as illustrated in Figure 6.1.

Figure 6.1 Queuing Diagram Features



Calibration Criteria

Every simulation software program includes a set of adjustable parameters. The practitioner calibrates the model by refining some or all of these parameters until the model matches local conditions. These adjustments are necessary to account for the impact of "unordered," site-specific factors. This process requires:

- Establishing criteria for the target results that the model should match;
- Adjusting the system parameters to match observed conditions; and
- Running the model to ensure the model's outputs match the corridor measurements.

The calibration targets for microsimulation by the Federal Highway Administration (FHWA) are detailed in Table 6.2.

Table 6.2 FHWA Calibration Criteria and Measures

Criteria and Measures	Calibration and Acceptance Targets
Hourly Flows, Model versus Observed	
Individual Link Flows	
Within 15%, for 700 < Flow < 2,700 veh/h	> 85% of cases
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases
Within 400 veh/h, for Flow > 2,700 veh/h	> 85% of cases
Sum of All Link Flows	Within 5% of sum of all link counts
GEH Statistics < 5 for Individual Link Flows	> 85% of cases
GEH Statistics for Sum of All Link Flows	GEH < 4 for sum of all link counts
Travel Times, Model Versus Observed	
Journey Times, Network	
Within 15% (or one minute, if higher)	> 85% of cases
Visual Audits	
Individual Link Speeds	
Visually Acceptable Speed-Flow Relationship	To analyst's satisfaction
Bottlenecks	
Visually Acceptable Queuing	To analyst's satisfaction

The simulation models constructed for this border crossing mobility study were not typical microsimulation models and, therefore, the criteria were modified slightly, as shown in Table 6.3.

Table 6.3 Adopted Calibration Criteria and Measures

Criteria and Measures	Calibration and Acceptance Targets
Hourly Flows, Model versus Observed	
Individual Hourly Flows	
Within 100 veh/hr for Cars	> 85% of cases
Within 25 veh/hr for Trucks	
GEH Statistics < 5 for Individual Hours	> 85% of cases
GEH Statistics for Sum of All Hours	GEH < 4 for sum of all link counts
Travel Times, Model Versus Observed	
Hourly Wait Times	
Within Five Minutes	> 85% of cases
Visual Audits	
Bottlenecks	
Visually Acceptable Queuing	To analyst's satisfaction

The calibration process was iterative and required checking the model performance against available data that had been collected from different sources. Calibration MOEs include traffic volume, delay, and queue length. Professional judgment also was employed in determining the reasonableness of the calibration results.

Calibration Results

BOTA

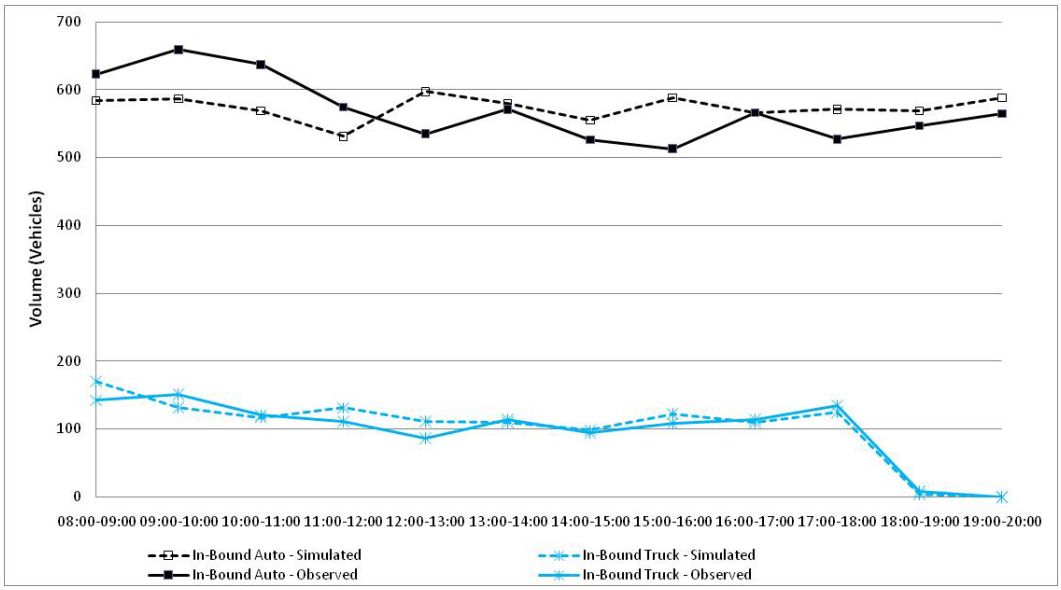
Traffic Volume Calibration

The model was calibrated against the throughput measured at the U.S. points of entry by CBP. All hours fell within the calibration criteria of 100 cars and 25 trucks except for the truck volumes within the first hour. GEH statistics were all within five for all hours, and the overall GEH statistics were 0.5 and 1.4 for cars and trucks, respectively, which is well below the calibration target (GEH<4). As shown in following tables and figures, overall the crossing traffic volumes were well calibrated.

Table 6.4 Inbound Traffic Volume Calibration (BOTA)

Inbound	Volume Type	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	Total
Autos	Observed	623	659	637	574	535	571	526	513	566	527	547	565	6,843
	Simulated	584	587	569	531	597	580	555	588	566	571	569	588	6,885
	Diff.	-39	-72	-68	-43	62	9	29	75	0	44	22	23	42
	GEH	1.6	2.9	2.8	1.8	2.6	0.4	1.2	3.2	0.0	1.9	0.9	1.0	0.5
Trucks	Observed	142	151	120	111	86	114	94	108	114	135	8	0	1,183
	Simulated	170	132	117	131	111	110	98	122	109	125	0	0	1,225
	Diff.	28	-19	-3	20	25	-4	4	14	-5	-10	0	0	50
	GEH	2.2	1.6	0.3	1.8	2.5	0.4	0.4	1.3	0.5	0.9	1.6	N/A	1.4

Figure 6.2 Inbound Traffic Volume Calibration (BOTA)



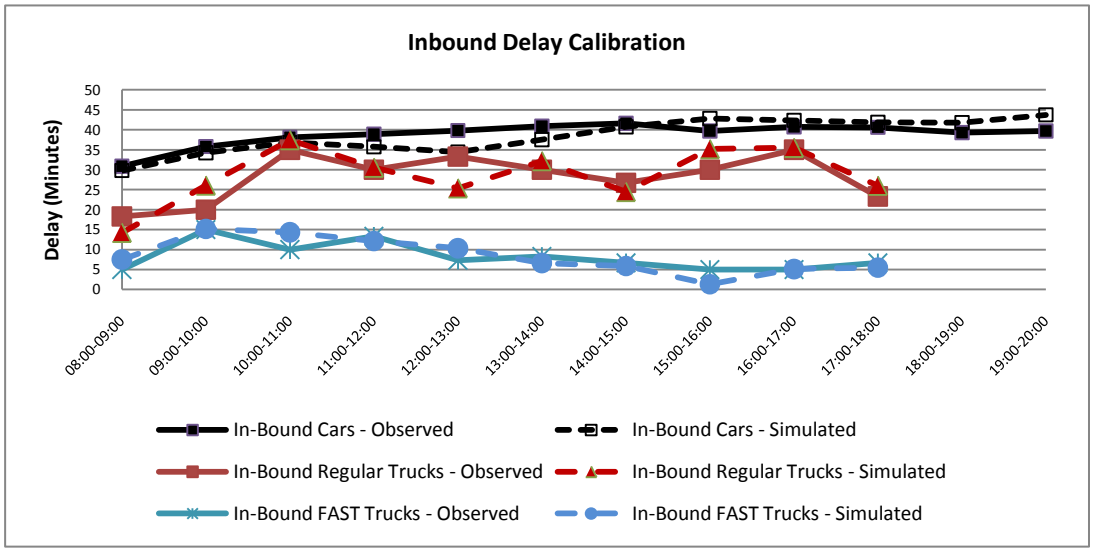
Delay Calibration

The model was calibrated against the CBP reported wait times for inbound cars and trucks. All but four hours fell within the calibration criteria of five minutes. Overall, the wait times were calibrated to within the 85 percent calibration criteria.

Table 6.5 Inbound Delay Calibration (BOTA)

Vehicle Types	Delay (Minutes)	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	Average
Autos	Observed	30.9	35.8	38.1	38.9	39.8	40.9	41.6	39.7	40.7	40.6	39.3	39.7	38.8
	Simulated	29.8	34.2	36.8	35.7	34.4	37.5	40.7	42.8	42.4	41.9	41.8	43.7	38.5
	Difference	-1.1	-1.6	-1.3	-3.2	-5.4	-3.4	-0.9	3.1	1.7	1.3	2.5	4.0	-0.4
Regular Trucks	Observed	18.3	20.0	35.0	30.0	33.3	30.0	26.7	30.0	35.0	23.3	0.0	0.0	28.2
	Simulated	14.2	26.0	37.4	30.5	25.4	32.2	24.4	35.2	35.5	26.0	0.0	0.0	28.7
	Difference	-4.1	6.0	2.4	0.5	-7.9	2.2	-2.3	5.2	0.5	2.7	0.0	0.0	0.5
FAST Trucks	Observed	5.0	15.0	10.0	13.3	7.3	8.3	6.7	5.0	5.0	6.7	0.0	0.0	8.2
	Simulated	7.5	15.2	14.3	12.1	10.3	6.6	5.9	1.3	5.1	5.5	0.0	0.0	8.4
	Difference	2.5	0.2	4.3	-1.2	3.0	-1.7	-0.8	-3.7	0.1	-1.2	0.0	0.0	0.2

Figure 6.3 Inbound Delay Calibration (BOTA)



Queue Length Calibration

The model was calibrated against queue diagrams drawn by project team members. The queue observed in the model was calibrated to the modeling team's satisfaction.

Table 6.6 Maximum Queue Length Calibration (BOTA)

Direction	Approach	Maximum Queue Length in a Typical Day (Feet)	
		Observed	Simulated
In-Bound	Mexico 45 NB	3,200	2,700
	Truck Lane	1,000	900
Out-Bound	U.S. 62 EB	3,000	3,500
	U.S. 62 WB	3,600	4,000
	SB U.S. 54	2,500	2,000
	I-10 EB	3,300	3,500
	I-10 WB	3,300	3,500

Ysleta-Zaragoza

Traffic Volume Calibration

The model was calibrated against the throughput measured at the U.S. points of entry by CBP and the toll plaza by the City of El Paso staff. All hours except one in the inbound and one in the outbound fell within the calibration criteria of 100 cars and 25 trucks. GEH statistics are all within five for all hours, and the overall GEH statistics were 1.3 and 1.5 for cars and trucks, respectively, well below the calibration target (GEH<4). As shown in the following tables and figures, Overall, the crossing traffic volumes were well calibrated.

Table 6.7 Inbound Traffic Volume Calibration (Ysleta)

Inbound	Volume Type	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	Total
Autos	Observed	442	537	437	425	423	402	391	430	458	403	462	535	5,345
	Simulated	479	520	439	414	426	404	397	445	483	467	440	529	5,443
	Diff.	37	-17	2	-11	3	2	6	15	25	64	-22	-6	98
	GEH	1.7	0.7	0.1	0.5	0.1	0.1	0.3	0.7	1.2	3.1	1.0	0.3	1.3
Trucks	Observed	78	78	90	102	80	76	89	85	97	110	104	92	1,081
	Simulated	81	76	98	98	99	106	90	93	97	102	99	91	1,129
	Diff.	3	-2	8	-4	19	30	1	8	0	-8	-5	-1	48
	GEH	0.3	0.2	0.8	0.4	2.0	3.1	0.1	0.8	0.0	0.8	0.5	0.1	1.5

Figure 6.4 Inbound Traffic Volume Calibration (Ysleta)

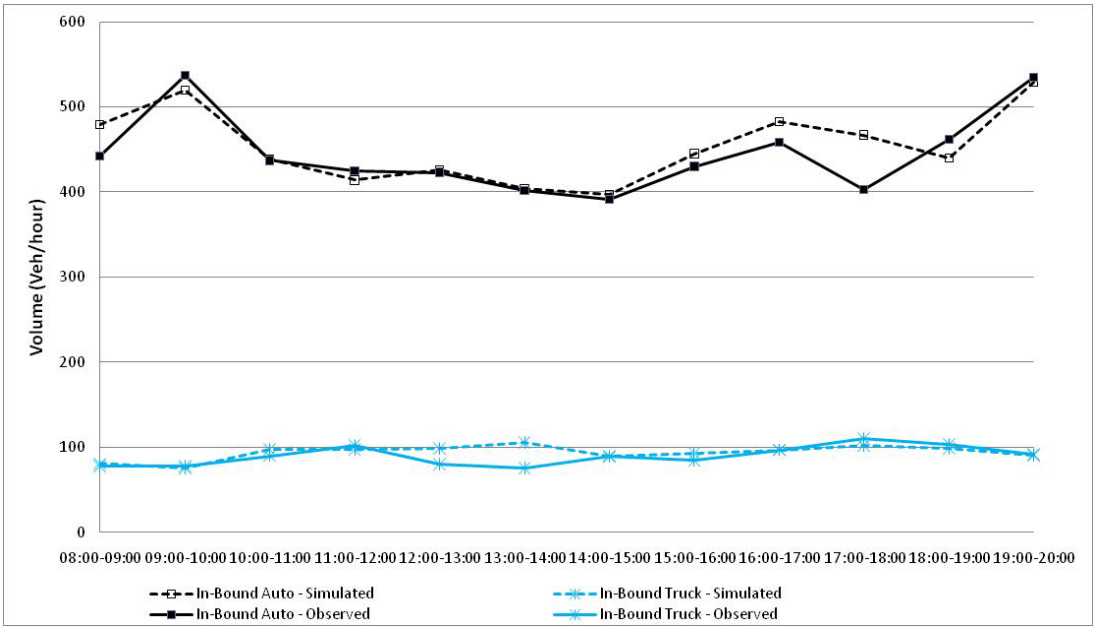
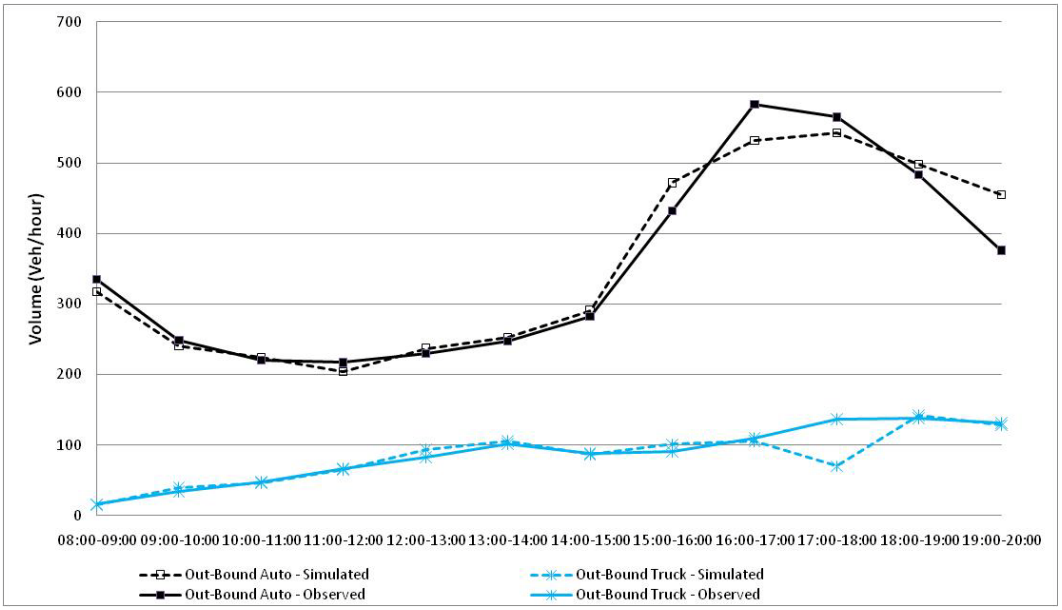


Table 6.8 Outbound Traffic Volume Calibration (Ysleta)

Outbound	Volume Type	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	Total
Autos	Observed	335	249	220	217	230	247	282	432	583	565	483	376	4,219
	Simulated	317	241	224	204	237	253	291	472	532	543	498	455	4,267
	Diff.	-18	-8	4	-13	7	6	9	40	-51	-22	15	79	48
	GEH	1.0	0.5	0.3	0.9	0.5	0.4	0.5	1.9	2.2	0.9	0.7	3.9	0.7
Trucks	Observed	16	34	47	67	83	102	88	91	110	137	138	132	1,044
	Simulated	15	40	46	65	93	106	87	101	106	70	142	128	999
	Diff.	-1	6	-1	-2	10	4	-1	10	-4	-67	4	-4	-45
	GEH	0.3	1.0	0.2	0.2	1.1	0.4	0.1	1.0	0.4	6.6	0.3	0.3	1.4

Figure 6.5 Outbound Traffic Volume Calibration (Ysleta)



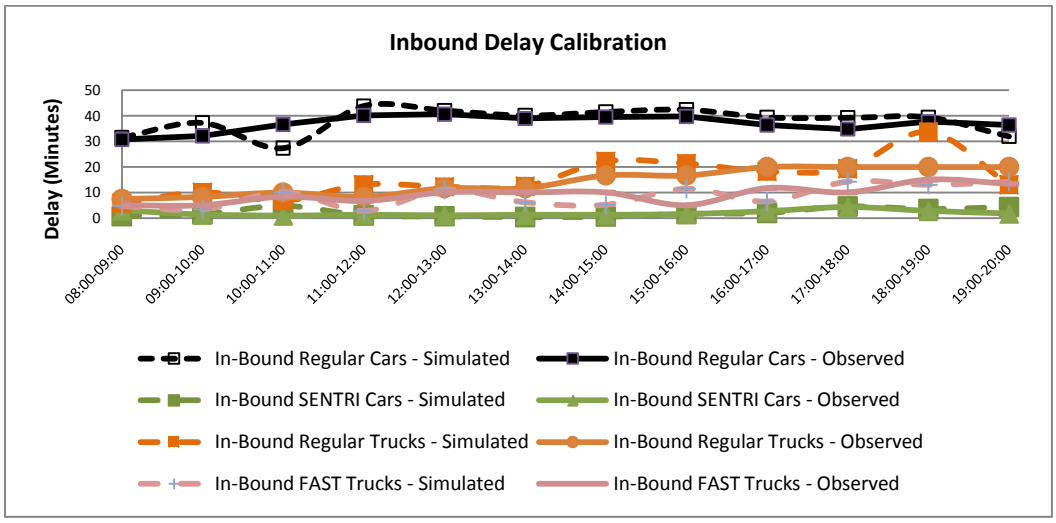
Delay Calibration

The model was calibrated against the CBP reported wait times for inbound cars and trucks. All but six cells fell within the calibration criteria of five minutes. Overall the wait times were calibrated to within the 85 percent calibration criteria.

Table 6.9 Inbound Delay Calibration (Ysleta)

Vehicle Types	Delay (Minutes)	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	Average
Regular Cars	Observed	30.8	32.1	36.7	40.1	40.7	39.0	39.5	39.8	36.4	34.8	37.7	36.4	37.0
	Simulated	31.5	37.3	27.4	43.9	42.1	40.1	41.5	42.4	39.4	39.2	39.4	32.0	38.0
	Difference	0.7	5.1	-9.3	3.7	1.4	1.2	2.0	2.6	3.0	4.4	1.7	-4.4	1.0
SENTRI Cars	Observed	3.0	1.4	1.0	1.3	1.1	1.3	1.3	1.6	2.7	4.3	2.8	1.8	2.0
	Simulated	0.7	1.5	4.8	1.0	0.7	0.4	0.5	1.6	2.0	4.6	3.5	4.4	2.1
	Difference	-2.3	0.1	3.8	-0.3	-0.4	-0.9	-0.8	0.0	-0.7	0.3	0.7	2.6	0.2
Regular Trucks	Observed	7.5	8.3	10.0	8.3	11.7	11.7	16.7	16.7	20.0	20.0	20.0	20.0	14.2
	Simulated	5.7	10.1	6.8	13.1	12.3	12.4	22.2	21.3	18.2	19.3	33.7	13.0	15.7
	Difference	-1.8	1.8	-3.2	4.8	0.6	0.7	5.5	4.6	-1.8	-0.7	13.7	-7.0	1.4
FAST Trucks	Observed	5.0	5.0	8.3	6.7	10.0	10.0	10.0	5.0	11.7	10.0	15.0	13.3	9.2
	Simulated	4.7	3.3	10.1	2.8	11.1	6.1	5.2	11.4	6.5	14.2	13.0	14.1	8.5
	Difference	-0.3	-1.7	1.8	-3.9	1.1	-3.9	-4.8	6.4	-5.2	4.2	-2.0	0.8	-0.6

Figure 6.6 Inbound Delay Calibration (Ysleta)



Queue Length Calibration

The model was calibrated against queue diagrams drawn by project team members. The queue observed in the model was calibrated to the modeling team's satisfaction.

Table 6.10 Maximum Queue Length Calibration (Ysleta)

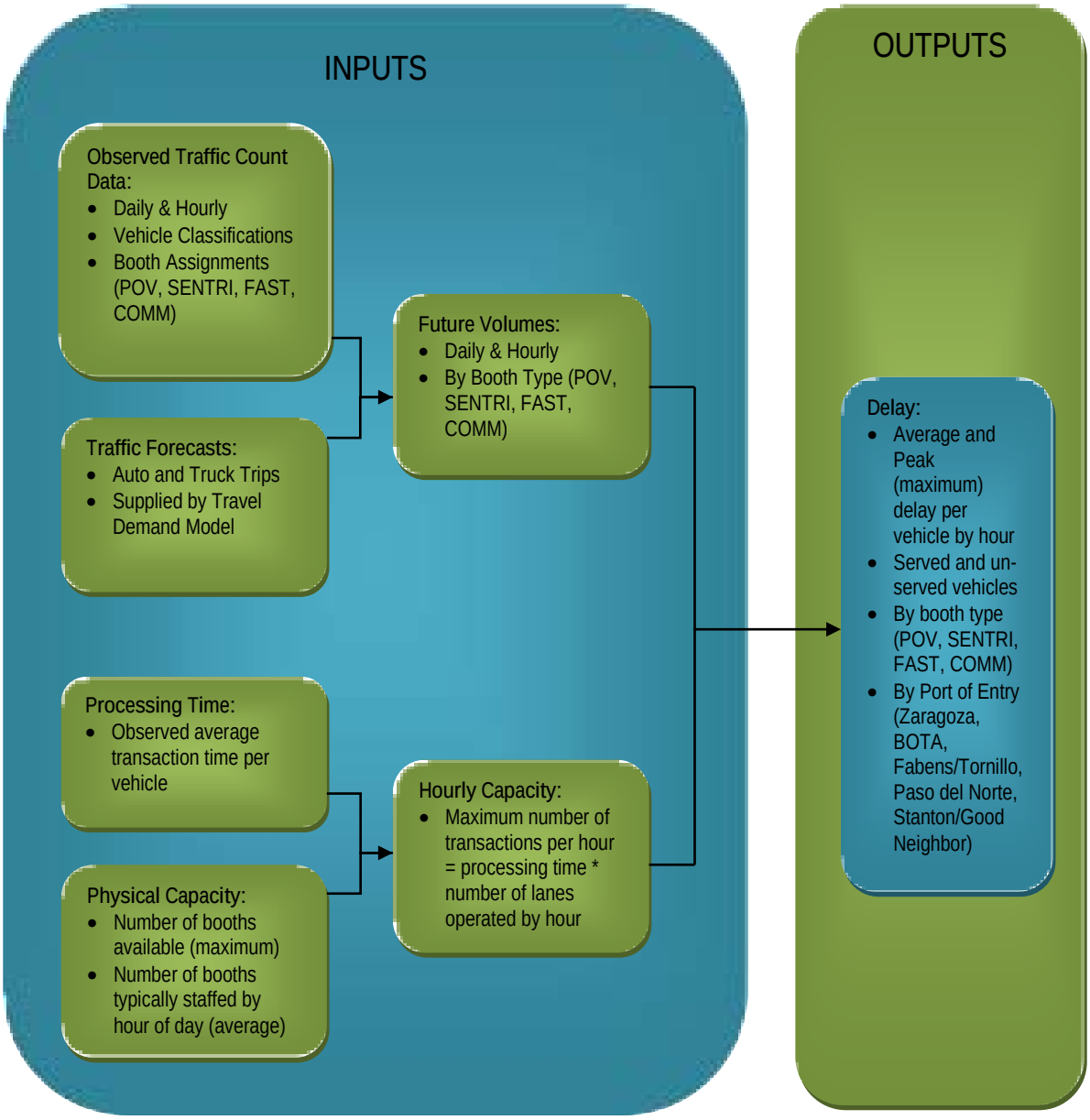
Direction	Approach	End of the Maximum Queue in a Typical Day (Feet)	
		Observed	Simulated
In-Bound	Waterfill EB (Mexican Side)	3,500	3,100
Out-Bound	Border Highway (SR 375) EB	1,300	1,300
	Zaragoza Road SB	1,200	1,700
	Border Highway (SR 375) WB	3,000	3,050

6.4 QUEUING TOOL

We developed an Excel-based sketch-planning queuing tool for the purpose of evaluating the impacts of different scenarios being tested as part of the El Paso Ports of Entry Operations Plan. This sketch-level queuing tool is a first-in/first-out model, laid out in tabular format, which steps through the day in hourly increments and calculates average and peak (i.e., maximum) delays per vehicle per lane type at each port of entry (POE). The maximum delays were then used to determine the year in which each lane type at each POE is expected to reach "operational capacity." This tool was developed for all six POEs and was used to supplement the simulation models developed for the BOTA and Zaragoza POEs (described in the previous section).

Figure 6.7 illustrates the inputs and outputs of the queuing tool. Further detail on the four key inputs used to develop the queuing tool is provided below.

Figure 6.7 Input and Output Variables in Queuing Tool



Observed Traffic Counts and Traffic Forecasts

The queuing tool used observed northbound data to convert daily auto and truck volume forecasts from the El Paso MPO regional travel demand model (Transborder Model) into hourly volumes by lane type (POV, SENTRI, Commercial, or FAST). Observed northbound count data by vehicle class for each hour of the day were used to disaggregate the daily auto and truck trips output from the travel demand model into hourly forecasts in both the south-bound and northbound directions, as observed southbound data were not available.

Processing Time and Physical Capacity

There also are two profiles provided for the number of booths operating at any given time and the vehicle processing times for different types of crossings. Average processing times per vehicle for each POE were assumed not to change between the existing and future years, however, they did vary somewhat between crossings based on observed processing time data provided by Customs and Border Protection (CBP). Two profiles were developed within the queuing tool to represent the number of open booths by hour of day and lane type for each POE. The number of booths open may vary from day to day based on how CBP operates the facilities and as such, typical conditions were included in the booth profiles. The two profiles included:

1. A "**normal operations**" profile, which was based on the average number of booths open during any given hour. This configuration tends to overestimate existing delays.
2. A "**high-capacity operations**" profile, which was developed using the maximum number of booths operated during a given hour; as expected, this tends to underestimate delay.

Between the two profiles, a reasonable estimate for future operations can be blended together.

We reviewed the results from the low- and high-capacity scenarios for each lane type in comparison to observed delays (provided by CBP). As a result of this review, we determined that unless otherwise determined for a specific scenario, the high-capacity operations results (i.e., the maximum number of booths staffed during a given hour which does not mean all booths are staffed all day) would be used to calculate delays for POV and SENTRI lanes, while the low-capacity operations results (i.e., average number of booths open during a given hour) would be used to calculate delays for Commercial and FAST lanes.

Scenarios

Scenarios Tested in the Queuing Tool

In addition to the No-Build and Preferred Scenarios, 24 additional scenarios, or variations of scenarios, were evaluated using the queuing tool. These scenarios are described in Table 6.11 below (and are described in more detail in Section 5.0).

Table 6.11 Scenarios Evaluated in Queuing Tool

	Staffing and Management Scenario Options
	Potential Solution
	Extend commercial hours of operation:
1.	• Extend all commercial ports of entry to 20-hour operations (5:00 a.m. to 1:00 a.m.)
2.	• Extend Zaragoza only (5:00 a.m. to 1:00 a.m.)
3.	• Extend Santa Teresa only (5:00 a.m. to 1:00 a.m.)
4.	• Extend BOTA only (5:00 a.m. to 1:00 a.m.)
5.	Fully staff front line officers at all existing booths at all crossings during periods of high demand

	Pricing Scenario Options
	Potential Solution
7.	Toll BOTA at same rate as Paso Del Norte and Ysleta-Zaragoza ($3.50 per axle)
8.	Increase tolls during peak periods at PDN, Stanton, and Zaragoza
10.	Toll empty trucks at BOTA
	Traffic Engineering and Infrastructure Scenario Options
	Potential Solution
	Expand use of designated inspection lanes within each crossing's existing footprint:
12.	• Provide designated commuter lanes (DCL) at all ports of entry
13.	• Increase the number of FAST lanes at commercial ports of entry
	Implement bridge specialization:
14.	• Limit commercial vehicles at BOTA to empties southbound and FAST northbound
15.	• Route all southbound commercial traffic through BOTA and northbound commercial traffic through Zaragoza
16.	• Establish Ysleta-Zaragoza as a commercial-only port of entry and allow southbound empty trucks
17.	• Route all northbound commercial traffic through BOTA and southbound commercial traffic through Zaragoza
	Improve connectivity and accessibility to the ports of entry:
18.	• Construct grade-separations/between Santa Teresa POE and I-10 (Artcraft Road)
19.	• Improve loop road that connects Stanton/PDN, BOTA, and Ysleta-Zaragoza POEs
22.	Complete BOTA bridge infill between the northbound and southbound spans to add two travel lanes in each direction.
16D[a]	Establish Zaragoza as a "commercially preferred" crossing.

[a] Scenario 16 was modified from its original description which evaluated Ysleta-Zaragoza as a "commercial-only" port of entry. Revised as a "commercially focused" port of entry, modified Scenario 16D retains all existing passenger vehicle service at Ysleta-Zaragoza, while enhancing commercial/FAST capacity.

We also tested a "combined scenario," which included the following improvements:

- Extend commercial hours of operation at BOTA and Santa Teresa (5:00 a.m. to 1:00 a.m.) (combines Scenarios 3 and 4);
- Fully staff front line officers at all existing booths at all crossings during period of high demand (Scenario 5);
- Work with Texas Congressional delegation, DPS, and other stakeholders to combine/co-locate FMCSA and Texas DPS inspection processes (Scenario 6);
- Implement the Border Traveler and Cargo Information System (technology scenario, Scenario 11);
- Reconfigure southbound lane assignments at BOTA approach (Paisano, U.S. 54, IH-110) to separate cars and trucks (Scenario 21); and
- Implement system improvements to enhance commercial operations at Zaragoza:
  - Add left-turn lane on the LP 375 westbound frontage road (Scenario 20); and
  - Add northbound inspection capacity (Scenario 16D).

Scenario Assumptions

The following assumptions were included as part of the No-Build Scenario:

- *Current 2010 Conditions* – Traffic volumes (by car and truck) and average staffing levels, transaction times, and northbound vehicle delay (by type of lane) were identified for each POE using observed northbound data from the U.S. Customs and Border Protection (CBP). This information was used to represent current 2010 conditions for each POE. As noted earlier, no southbound data were available. As a result, for the purpose of calculating delay and approximating the year in which the crossing reaches "operational capacity," the same operating conditions and characteristics as those in the northbound direction were assumed for the southbound direction, with the exception of the Stanton POE.
- *Estimated 2015 Conditions* – It was assumed that the new Tornillo POE would replace the Fabens-Caseta POE by the year 2015. The Tornillo POE is expected to service commercial vehicles (where Fabens-Caseta did not). It also was assumed that the American Recovery and Reinvestment Act (ARRA) improvements planned for the Santa Teresa POE also will be in place by the year 2015. These improvements include additional POV and commercial booths.
- *Estimated Future Year No-Build Conditions* – Future year (2015, 2025, and 2035) traffic volumes were estimated for each POE using the El Paso Metropolitan Planning Organization regional travel demand model and CBP forecasts. It was assumed that future year infrastructure, operations, and CBP staffing levels for each POE would be identical to what they were in 2010, with the exception of those identified above, for the No-Build Scenario. Future year delay at each facility and lane type was calculated using current average transaction times.

In addition, the following assumptions were common for all scenarios to develop future year forecasts:

- Demographic forecasts based on U.S. data from the El Paso MPO Model for model years 2007, 2015, 2025, and 2035 and Mexican data from IMIP for model years 1997, 2005, 2015, and 2025;
- Cross border growth projections based on UTEP demographic and economic forecasts; and
- Value of time is $16.81/hour for passenger vehicles and $50.43/hour for trucks.

Tables 6.12 to 6.14 document our modeling and queuing tool assumptions and the source of the information for each assumption (if applicable) for each of the individual scenarios.

Table 6.12 Key Staffing and Management Scenario Modeling Assumptions

No.	Scenario	Key Assumptions	Source
	Extend commercial hours of operation:		
1.	Extend all commercial ports of entry to 20-hour operations (5:00 a.m. to 1:00 a.m.)	Total volumes remain the same, but commercial vehicle arrivals are redistributed to a 20-hour day.	
2.	Extend Zaragoza only (5:00 a.m. to 1:00 a.m.)	Total volumes remain the same, but commercial vehicle arrivals are redistributed to a 20-hour day.	
3.	Extend Santa Teresa only (5:00 a.m. to 1:00 a.m.)	Total volumes remain the same, but commercial vehicle arrivals are redistributed to a 20-hour day.	
4.	Extend BOTA only (5:00 a.m. to 1:00 a.m.)	Total volumes remain the same, but commercial vehicle arrivals are redistributed to a 20-hour day.	
5.	Fully staff front line officers at all existing booths at all crossings during periods of high demand	Southbound inspection times are the same as northbound Average inspection times in future years remain the same as 2010 Peak demand hours defined as follows: Santa Teresa: 10:00 a.m. to 1:00 p.m. (commercial); 12:00 to 6:00 p.m. POV); Stanton: 8:00 a.m. to 6:00 p.m.; PDN: 8:00 a.m. to 6:00 p.m.; BOTA: 9:00 a.m. to 4:00 p.m. (commercial), 9:00 to 11:00 a.m. (FAST); 7:00 a.m. to 9:00 p.m. (POV); Zaragoza: 12:00 to 4:00 p.m. (commercial), 9:00 a.m. to 9:00 p.m. (passenger); Fabens/Tornillo: 6:00 to 7:00 a.m. (passenger)	Passenger primary northbound Inspection transaction times provided by RTR Technologies, LLC Peak demand hours based on 2010 delay by hour at each POE

Table 6.13 Key Pricing Scenario Modeling Assumptions

No.	Scenario	Key Assumptions	Source
7.	Toll BOTA at same rate as Paso Del Norte and Ysleta-Zaragoza ($3.50 per axle)	Auto Toll Rate = $2.50 Truck Toll Rate = $14	City of El Paso Toll Rates
8.	Increase tolls during peak periods at PDN, Stanton, and Zaragoza	Premium Period Toll Rate = $5 auto, $21 truck Premium Toll Period from 9:00 a.m. to 9:00 p.m.	
10.	Toll empty trucks at BOTA	Empty Trucks at BOTA = 65% of total trucks Empty Trucks tolled at $14	Historical laden versus empty commercial data provided by CBP

Table 6.14 Key Traffic Engineering and Infrastructure Scenario Modeling Assumptions

No.	Scenario	Key Assumptions	Source
	Expand use of designated inspection lanes within each crossing's existing footprint:		
12.	Provide designated commuter lanes (DCL) at all ports of entry	At POEs with no existing DCL lanes (BOTA, Fabens/Tornillo, Santa Teresa, PDN), add one DCL lane per direction by removing/repurposing one general POV lane. Assumed maximum lanes open for POV and SENTRI lanes. Assumed SENTRI volumes would increase to 30 percent of all POV traffic at BOTA/Stanton/PDN/Zaragoza and 10 percent of all POV traffic at Santa Teresa & Fabens/Tornillo. Treated Stanton and PDN as a one-way pair by converting the NB DCL at Stanton to a SB DCL and then added a NB DCL to PDN as it was assumed that Stanton did not have enough room for both a southbound and northbound DCL.	
13.	Increase the number of FAST lanes at commercial ports of entry	Repurposed one general truck lane to FAST lane at Santa Teresa, BOTA, and Zaragoza. Assumed no change to POV operations.	
	Implement bridge specialization:		
14.	Limit commercial vehicles at BOTA to empties southbound and FAST northbound	Applied existing distributions of bridge choice data on FAST/Empties to future trips.	Historical laden versus empty, FAST versus regular commercial data provided by CBP.
15.	Route all southbound commercial traffic through BOTA and northbound commercial traffic through Zaragoza	Refer to Figure B.1 of the Final Scenarios for Model Evaluation TM for a schematic of the reconfiguration at BOTA. Disallow NB trucks at BOTA and repurpose NB commercial inspection facilities to accommodate six additional POV inspection booths. Relocate the SB commercial vehicle ingress, and assume four general truck inspection booths and two FAST lanes.	
16.	Establish Ysleta-Zaragoza as a commercial-only port of entry and allow southbound empty trucks	No change to NB or SB operations at BOTA (POV and commercial). At Zaragoza, disallow all POV traffic (all traffic rediverts to the other ports of entry). Northbound commercial inspection facility at Zaragoza remains unchanged, while the southbound POV facility is repurposed to accommodate southbound commercial inspections (assume six general truck inspection booths and two FAST lanes).	
17.	Route all northbound commercial traffic through BOTA and southbound commercial traffic through Zaragoza	At BOTA, assume no change to POVs and trucks in the NB direction. All SB lanes will be available to POVs only. At Zaragoza, assume no change to POVs in both the north and southbound directions. To accommodate southbound trucks, repurpose the existing NB commercial inspection area for SB truck inspections (providing six general truck inspection booths and two FAST lanes).	
	Improve connectivity and accessibility to the ports of entry:		
18.	Construct grade-separations/between Santa Teresa POE and I-10 (Artcraft Road)	Roadway improvements modeled by increasing the theoretical speed and capacity of Artcraft Road between the Santa Teresa POE and I-10. All other operations at the Santa Teresa POE remain unchanged from existing conditions.	Conceptual diagrams of Artcraft Road grade separations developed for the Upper Valley Traffic Study, Walter P Moore, December 2008.
19.	Improve loop road that connects Stanton/PDN, BOTA, and Ysleta-Zaragoza POEs	Roadway improvements modeled by increasing the theoretical speed and capacity of Loop 375 between PDN and Zaragoza. All other operations at the ports of entry remain unchanged from existing conditions.	Loop 375 design schematics developed by HNTB, November 2010.
22.	Complete BOTA bridge infill between the northbound and southbound spans to add two travel lanes in each direction.	Refer to Figure B.8 of Final Scenarios for Model Evaluation TM for conceptual schematic of bridge infill. Bridge infill provides two additional travel lanes (i.e., not inspection booth capacity) for additional storage capacity on span. In northbound direction, covert 2 POV lanes to 2 DCL (SENTRI) lanes. All booth capacity to remain within existing footprint. No change to commercial operations.	Bridge infill schematic developed by El Paso MPO, April 2010.

No.	Scenario	Key Assumptions	Source
Combined	Couple Scenario 16 with fully staffing the POV booths at the other crossings (Scenario 5), extending commercial hours of operation at Zaragoza (Scenario 2), and adding more FAST lanes at Zaragoza (Scenario 13).	No change to NB or SB operations at BOTA (POV and commercial). At Zaragoza, disallow all POV traffic (all traffic rediverts to the other ports of entry). Northbound commercial inspection facility at Zaragoza remains unchanged, while the southbound POV facility is repurposed to accommodate southbound commercial inspections (assume six general truck inspection booths and two FAST lanes). Total volumes remain the same at Zaragoza, but commercial vehicle arrivals are redistributed to a 20-hour day. Southbound inspection times are the same as northbound; Average inspection times in future years remain the same as 2010. Peak demand hours defined as follows: Santa Teresa: 10:00 a.m. to 1:00 p.m. (commercial); 12:00 to 6:00 p.m. POV); Stanton: 8:00 a.m. to 6:00 p.m.; PDN: 8:00 a.m. to 6:00 p.m.; BOTA: 9:00 a.m. to 4:00 p.m. (commercial), 9:00 to 11:00 a.m. (FAST); 7:00 a.m. to 9:00 p.m. (POV); Zaragoza: 12:00 to 4:00 p.m. (commercial), 9:00 a.m. to 9:00 p.m. (passenger); Fabens/Tornillo: 6:00 to 7:00 a.m. (passenger). Repurposed one general truck lane to FAST lane at Zaragoza and assumed no change to POV operations.	
16D	Establish Zaragoza as a "commercially preferred" crossing.	No change to NB/SB passenger vehicle facilities; No change to SB truck facility inside the POE. Add left turn lane to LP 375 (aka Scenario 20). Add additional NB truck booths (and fully staff) as space allows. Assume ITS solutions are in place to communicate relative wait times at BOTA and Zaragoza so that some NB truck traffic will redistribute to Zaragoza. Assume no change to hours of operation at BOTA (i.e., not closed from 2:00 to 8:00 p.m.).	

Scenario Results

The maximum delays output from the queuing tool were used to estimate the year in which each lane type at each POE would reach operational capacity. An estimate of the future operational capacity year for each POE was estimated if delays surpassed ***one hour for commercial and FAST vehicle lanes and two hours for all other lanes***. This delay threshold was based on a combination of best practices review and stakeholder input.

Figures 6.8 through 6.15 illustrate the anticipated operational capacity years by lane type in the northbound and southbound directions when comparing the Combined Scenario to the No-Build Scenario. As illustrated in the figures, in all cases, the years in which the Preferred Scenario reaches operational capacity are either the same or better (i.e., later) than the No-Build Scenario.

Figure 6.8 Anticipated Operational Capacity Year of Northbound POV Lanes
No-Build versus Combined Scenario

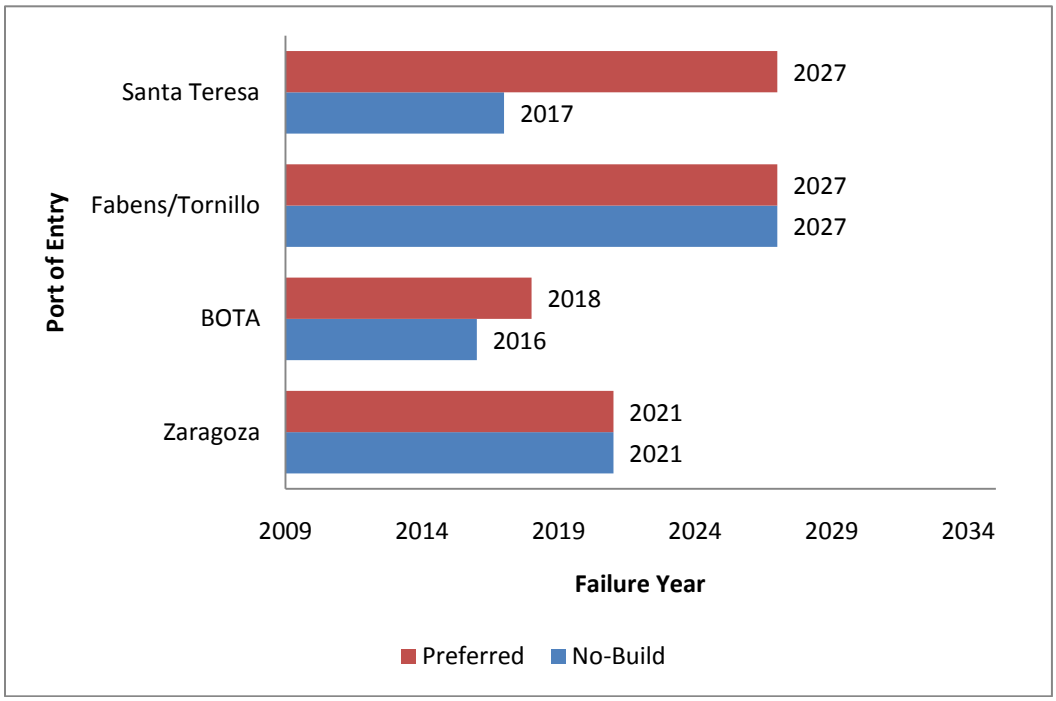


Figure 6.9 Anticipated Operational Capacity Year of Northbound SENTRI Lanes
No-Build versus Combined Scenario

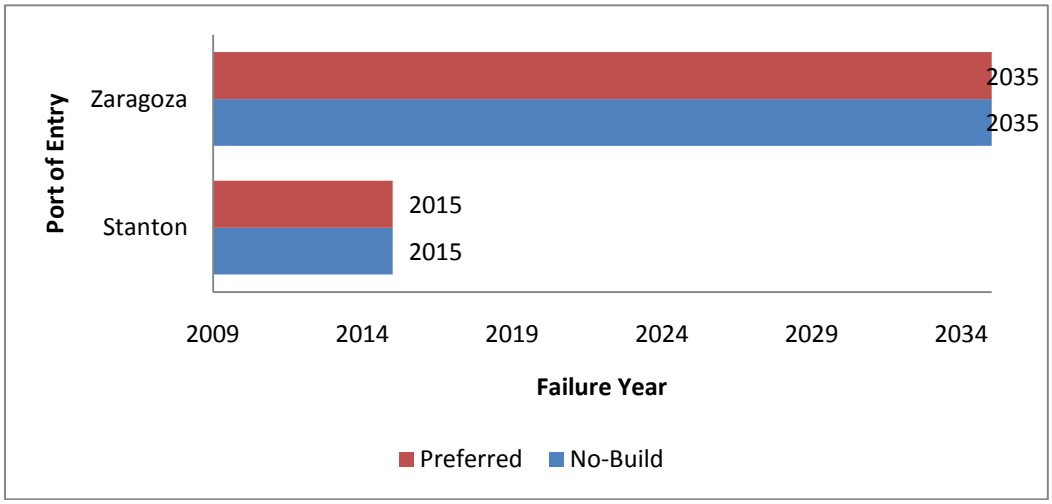


Figure 6.10 Anticipated Operational Capacity Year of Northbound Commercial Lanes
No-Build versus Combined Scenario

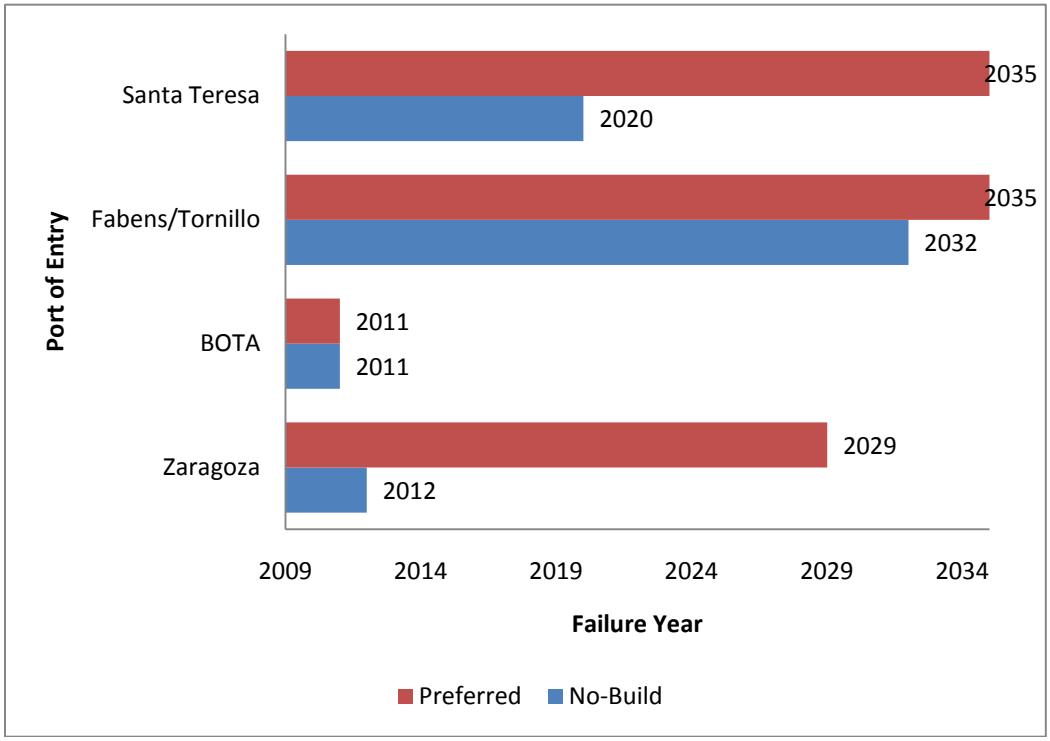


Figure 6.11 Anticipated Operational Capacity Year of Northbound FAST Lanes
No-Build versus Combined Scenario

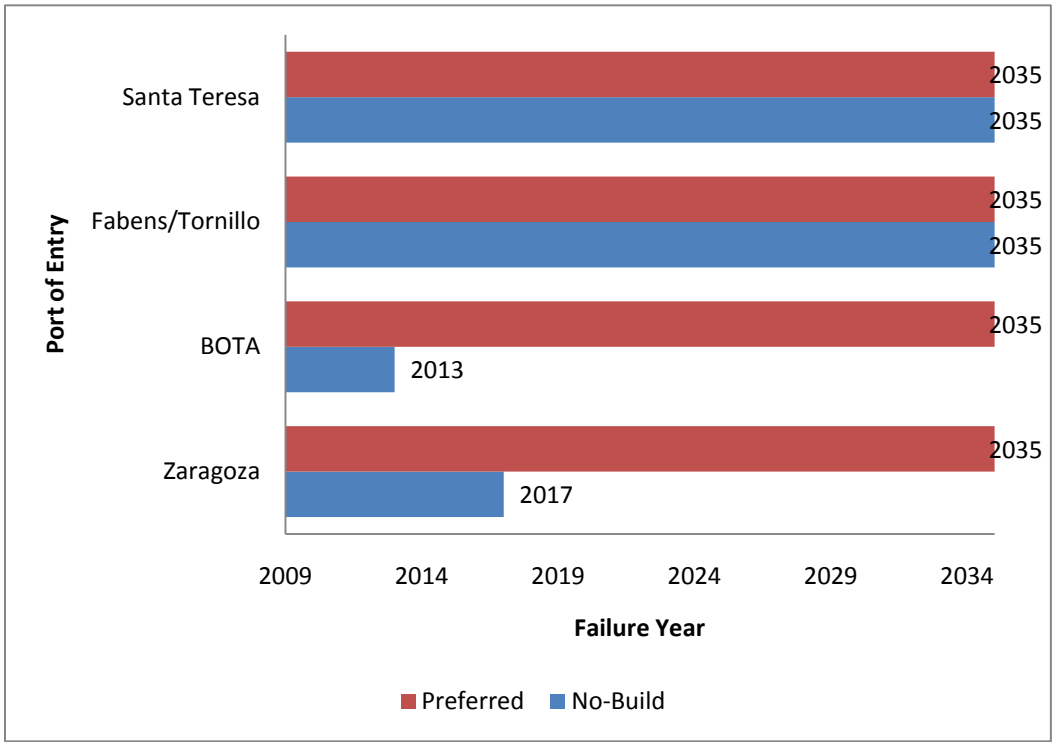


Figure 6.12 Anticipated Operational Capacity Year of Southbound POV Lanes
No-Build versus Combined Scenario

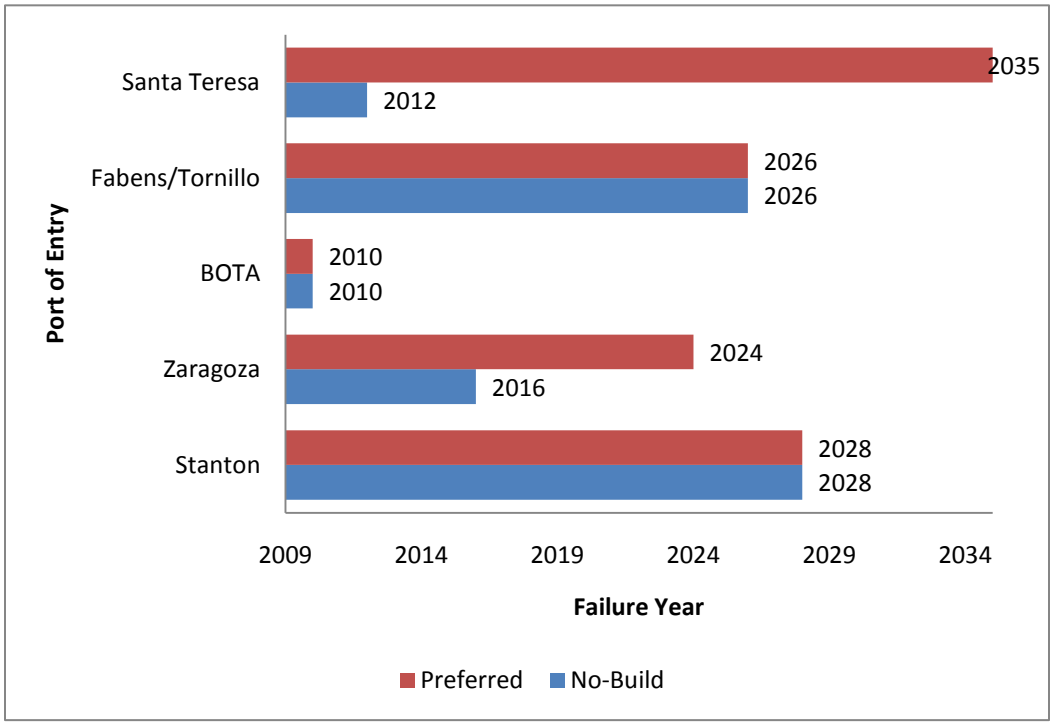


Figure 6.13 Anticipated Operational Capacity Year of Southbound SENTRI Lanes
No-Build versus Combined Scenario

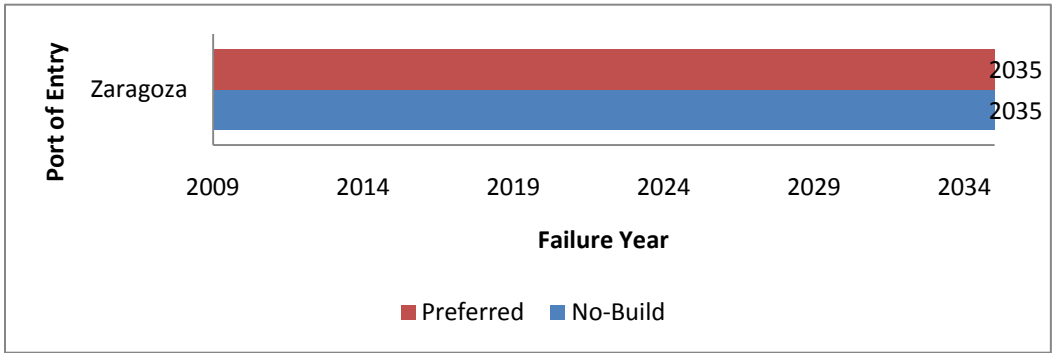


Figure 6.14 Anticipated Operational Capacity Year of Southbound Commercial Lanes
No-Build versus Combined Scenario

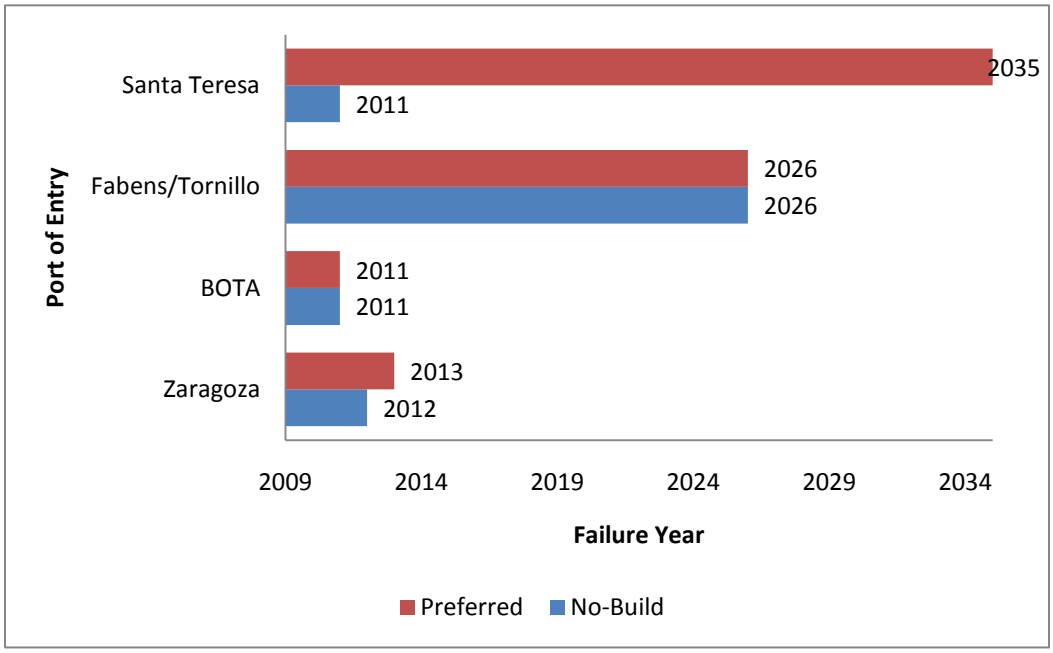
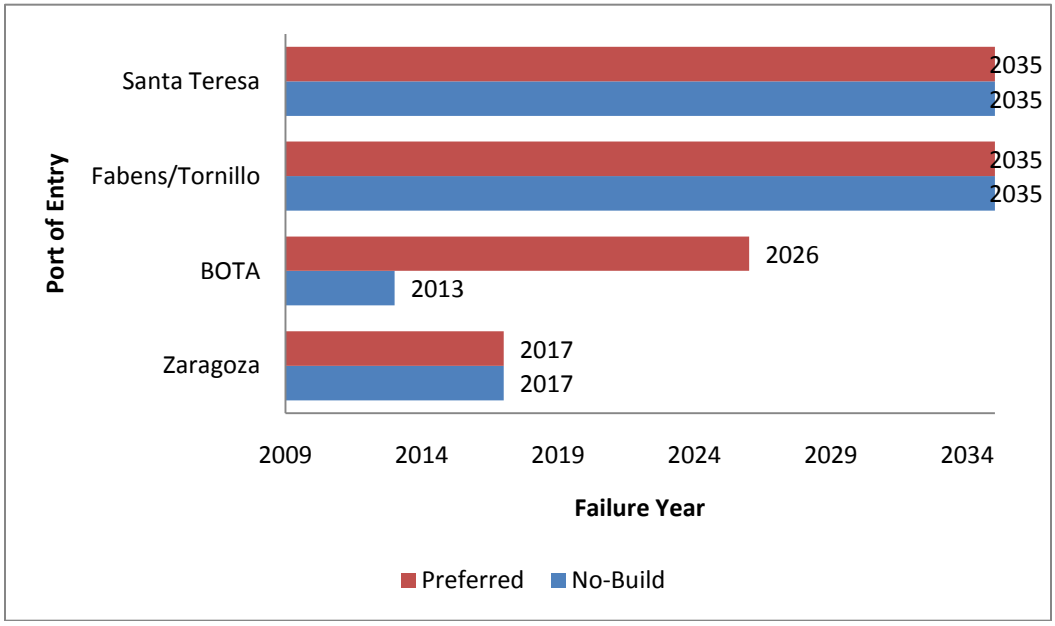


Figure 6.15 Anticipated Operational Capacity Year of Southbound FAST Lanes
No-Build versus Combined Scenario



7.0 Financing Options

7.1 INTRODUCTION

The project team, lead by KPMG LLP (KPMG) developed a sketch-level valuation of the City of El Paso's bridge system under two different models:

1. Current ownership characteristics (i.e., publicly owned crossings); and
2. Alternative ownership (i.e., a public-private partnership).

As discussed earlier, the region's six crossings are owned and operated by a number of different entities, including the City of El Paso (Stanton, Paso del Norte, and Zaragoza), El Paso County (Tornillo), the International Boundary and Water Commission (BOTA), and the New Mexico Border Authority (San Teresa). This analysis focused specifically on the City-owned crossings.

The City currently operates and manages southbound traffic at three of the six border crossings (or ports of entry) that connect El Paso to Ciudad Juarez, Mexico in the El Paso MPO region. The International Bridges Department is responsible for collecting bridge toll revenues for the City on all southbound pedestrian, passenger vehicle, and commercial traffic at the Paso del Norte, Stanton Street and Ysleta-Zaragoza crossings. These three crossings generate positive cash flows for the City and are significant economic engines for the region.

Our analysis evaluated a variety of traffic and revenue scenarios and configurations. Each scenario analyzed the value to the City of the projected future cash flows generated by the City-owned bridge system over the next 50 years. The public ownership scenarios estimated the cash flows generated at the City-owned crossings under the current ownership structure.

While the use of the term "alternative ownership" implies a transfer of ownership, this scenario contemplates a long-term lease under a public-private partnership model (PPP) rather than an asset sale or transfer of ownership. These scenarios contemplate a concession model in which the City would receive an upfront payment from a private sector partner for the right to operate and maintain the bridge system. This partnership would take the form of a long-term operating lease and the City would retain ownership of the assets. For the purposes of this section, the alternative ownership scenarios were referred to as the "PPP scenarios."

A number of the scenarios consider the BOTA as part of the City-owned bridge system. BOTA is the largest crossing in the region and handles more than half of all international crossing traffic (passenger vehicle and commercial). The crossing currently is not tolled and is operated by the Federal government.

Assumptions used in the analysis have been developed through consultation with the City of El Paso and members of the project team. All assumptions and the basis for using each have been outlined in Section 7.3.

7.2 SYSTEM VALUATION OVERVIEW

Our analyses relied primarily on the cash flows generated at the City-owned crossings (Paso del Norte, Stanton, and Zaragoza) under the current ownership structure. The PPP scenario also was undertaken on a cash flow basis, with revenues from the City-owned crossings adjusted to reflect a more aggressive view on tolled throughput. This analysis evaluated a variety of traffic and revenue scenarios and configurations as outlined in the Valuation Scenarios section.

Some of the key attributes of the current situation are highlighted below, followed by an overview of PPPs and some of the issues the City may face under a PPP scenario.

Publicly Owned Crossings

The City of El Paso, through the International Bridges Department, currently is responsible for the operations and overall management of all southbound traffic at the Paso del Norte, Stanton, and Zaragoza crossings. The majority of the operating revenues received by the City come from tolls charged on passenger vehicles and commercial traffic. They also receive revenues from pedestrian tolls and parking meters.

Since the City does not receive any Federal or state funding for day-to-day operations of these bridges, these revenues are used to pay for all of the operating expenses associated with toll collection and the tolling stations. In addition to covering operating expenses, bridge revenues also are used for funding minor capital expenditures (e.g., vehicle purchases) and paying any current debt service obligations. Excess revenues are transferred to the City's General Fund for use in other areas.

In the past, the City has used State Infrastructure Bank (SIB) loans to finance improvements such as upgrades to the tolling system, periodic maintenance and rehabilitation, and major capital enhancements. There currently are four loans outstanding related to bridge expenditures, with the final loan being fully repaid by 2021. The City has indicated that if they continue to retain responsibility for major capital or rehabilitation expenditures in the future under the current ownership scenario, tax-exempt toll revenue bonds issued by the City would be the preferred financing tool.

The analysis of the public ownership model assumed that all of the risks associated with the ongoing operation and maintenance of the crossings would be retained by the City. Risks associated with the operation of the facility may include, among other items:

- Traffic and revenue risk (use of competing facilities or lower than projected growth in the region surrounding the City);
- Insurance costs (costs to insure or repair the facility) in response to uncontrollable events;
- Inflation risk (risk of inflation rates trending above those assumed in the analysis); and
- Broad market risks (supplier insolvency, etc.).

Section 7.4 provides a more detailed discussion of how these risks have been accounted for in the analysis.

PPP Scenario

Under a PPP scenario, the City would contract with a private sector partner for the long-term operation and maintenance of the City-owned crossings with the City retaining ownership of the crossings.

What is a Public-Private Partnership?

A PPP is an alternative model for delivering public services and funding infrastructure created through a cooperative venture between the public and private sectors. In this context, the term "partnership" is not intended to imply a legal partnership, but rather a symbiotic relationship of two or more entities to achieve a common goal. The arrangement is designed to leverage the expertise of all parties in meeting a public need by appropriately allocating risks, resources, rewards, and responsibilities.

The private sector's incentive to generate a return means that they are constantly looking for ways to improve the services offered to customers and are more likely to come up with innovative ideas that provide better value to users. A PPP allows the public sector to take advantage of the innovation and refined processes that may be implemented by the private sector to deliver a level of service prescribed and enforced by the public sector. In doing so, the public sector improves their value for money by receiving a premium public service while staying within their available resources. Globally, PPPs have helped deliver a broad range of modern assets and services that include high-quality service and maintenance activities to ensure that investments retain their value and that services meet public demand over the long term.

Within the realm of PPPs, there are two general classes of projects: greenfield and brownfield. A greenfield project is a new build; essentially the construction of new infrastructure without any constraints posed by prior work. A brownfield is typically the monetization of an existing asset; a transfer of rights and responsibilities of an existing government asset for a specified price. In both cases, the asset is leased to the private sector to generate cash flows/revenues; however, the government retains ownership of the asset.

How Can This be Applied to El Paso?

As the City's bridges are fully operational, they would be considered a brownfield asset. Since there is a revenue component associated with the bridges (user tolls), the most likely structure under this scenario would be a full concession arrangement in which the private party would make a lump-sum payment (upfront) to the City for the right to maintain and operate the bridges for a specified period of time. Payment details are discussed further in Section 7.2.

A benefit of brownfield assets that have been operational for an extended period of time is that they provide bidders with reliable traffic forecasts. This is not only helpful in projecting future revenues of the asset, but it also provides bidders with a greater ability to get financing at reasonable rates. Similarly, brownfield assets allow bidders to assess the current operational performance of the asset to determine whether they can leverage past experience and proprietary technology to generate greater throughput (i.e., more traffic). In the City's circumstances, there is potential for increasing profit by improving throughput and not just reducing costs.

The system of bridges currently owned and operated by the City generates significant positive cash flows for the City with the majority of these revenues being transferred to the City's General Fund for other purposes. By entering into a public-private partnership for the operations and maintenance (O&M) of the City-owned crossings, El Paso can transfer the risk of revenues, cost overruns and missed or deferred maintenance schedules to the private sector. Additionally, a PPP would allow the City to transfer the risks associated with any future upgrades or renovations of the existing infrastructure to the private sector.

Determining the appropriate delivery model to use under a PPP arrangement can have considerable implications on the value of the bids received by the City from the private sector. Given that the bridges do not require substantial rehabilitation or expansion at this time and are brownfield assets, the most appropriate delivery model would be a long-term O&M contract under which a private consortium would collect revenues, operate and retain responsibility for the general upkeep of the assets. This type of brownfield opportunity typically draws interest from investment banks and other funds with equity to invest. The level of civil contractor/developer interest in the bridge system also may be dependent upon the amount of capital construction and capital maintenance anticipated during the life of the concession as their business model is dependent on achieving returns on investment as a result of construction activities. By structuring a transaction to generate the greatest amount of competition the City will realize the greatest value for its taxpayers.

The following table outlines some of the key motivators and concerns of each type of private partner (i.e., contractors/developers, providers/operators, investment banks and pension funds) and identifies examples of each.

Representative Sponsors				
	Civil Contractors/Developers	**Providers/Operators**	**Investment Funds**	**Pension Funds**
Examples	■ Acciona ■ ACS Dragados ■ Balfour Beatty ■ Bouygues ■ Cintra/Ferrovial ■ FCC ■ Flatiron ■ Flour ■ Global Via ■ Hochtief/Turner ■ Kiewitt ■ Odebrecht ■ OHL ■ Skanska ■ Zachry	■ Abertis ■ Bombardier ■ Brisa ■ Iridium ■ Itinere ■ Siemens ■ Transurban ■ Virgin	■ Alinda ■ Borealis ■ Carlyle ■ Citi Infrastructure ■ Goldman Sachs ■ JP Morgan ■ Macquarie ■ Morgan Stanley	■ Caisse de Depot ■ CalPERS ■ CalSTRS ■ CPPIB ■ Dallas Police and Fire ■ Ontario Teachers ■ Regional U.S. public pension funds
Motivators	■ Construction period profitability ■ Construction contract size ■ Long term returns on strategic equity ■ Project visibility	■ Post-development period profitability ■ O&M margins ■ Long term returns	■ Project visibility ■ Near term profitability ■ Ability to refinance ■ Capital appreciation	■ Stability/predictability of long term cash flows ■ Moderate long term risk ■ Proven track record ■ Dividend income
Concerns	■ Approval processes ■ Development restrictions ■ HAZMAT/Site conditions ■ Competition ■ Environment risks ■ Political considerations ■ Long stop date ■ Ramp-up period	■ Development term ■ Ramp-up period ■ Risk allocation ■ Performance requirements ■ Long term political considerations	■ Project delivery risks ■ Approval processes ■ Risk allocation ■ Political considerations ■ Uncertain demand forecasts and other revenue risks	■ Permits and third party approvals ■ Long term risk allocation ■ Future competing facilities ■ User preference predictability ■ Labor considerations

The success of several recent TxDOT projects shows that there is an appetite for PPP projects within the state and that a PPP scenario for the system of bridges in El Paso could draw significant interest from private sector developers and banks.

Advantages and Disadvantages of a PPP Arrangement

Experience has shown in the PPP landscape that the private sector can develop and/or operate a facility more cost-effectively than the public sector. The private sector's incentive to maximize profits means that they will be more willing to hold down costs and capitalize on efficiencies wherever they can. For example, the private sector may look to have more market flexibility in their labor force or continuously reallocate resources to optimize their performance. The same can be applied to areas such as technology and management; the private sector is always incentivized to find the most cost-effective way of operating a facility, whether it is through technical expertise or proprietary technology.

The table below highlights some of the potential benefits and drawbacks to a public sector entity of a PPP.

Advantages and Disadvantages of PPPs	
Potential Benefits to Public Sponsor	**Potential Drawbacks**
✓ Innovation leading to more cost effective delivery and long term operations ✓ Flexibility through private financing and funding regimes; can free up traditional municipal capital for additional or critical projects ✓ Budget certainty over the 'whole life' of an asset ✓ Defined cost / rehabilitation schedules ✓ Service standards are enforceable – private sector cannot defer maintenance of the asset ✓ Competition, accountability, and transparency ✓ Leverage under-performing infrastructure, such as parking assets, toll facilities, etc. ✓ Stimulate job growth and economic development ✓ Risk transfer to the private sector ✓ Off balance sheet financing	✓ Political/stakeholder sensitivity ✓ Potential for higher user fees if the proper mechanisms are not in place ✓ Shared control with the private sector / reduction in public control ✓ Potential higher cost of financing ✓ Motives of the private partner could conflict with public policy objectives

Payment Options for El Paso

There are two methods by which the City can be paid under a PPP arrangement. The first is an upfront concession fee paid to the City. The concession fee would constitute a lump sum payment from the private sector partner to the City at the start of the contract to compensate the City for the present value of expected future cash flows and any residual value the assets may have at the time of executing the agreement. This option would maximize the current transfer to the City's general fund; however, it also would be the only payment received from the private sector for the term of the contract.

The second option would involve establishing a schedule of annual payments, based on a dollar cap or a percentage of revenues that the City would receive from the private party. The annual payments would basically function as a deferral of an upfront concession fee, to ensure the City is receiving positive annual cash flows rather than a single upfront payment amount. This option is similar to the current operating scenario except for the fact that the City would be able to transfer the operating risks to the private sector.

Under both of these payment options, the City is passing the revenue risk to the private sector; however, in doing so, there is the potential that the City could be "leaving money on the table" if revenues turn out to be higher than forecasted. To help protect the City from missing out on these revenues, the agreement can include a revenue sharing structure that would allow the City to receive a portion of revenues collected above a preestablished limit. This limit can be determined using gross revenues, a maximum return on the private sector investment or some other agreed upon metric.

Similarly, the City also can build provisions into the agreement that would allow the City to share in any refinancing gains that may be realized by the private sector party. These amounts would most likely be negotiated with the private sector party closer to the execution of the contract.

Policy Considerations

Government has a fundamental role in delivering PPPs in that they are responsible for defining the project's objectives and setting and monitoring the safety, quality and performance standards for the services, all while ensuring that public interests are safeguarded.

Operational Standards

Service and performance output requirements are an important aspect of PPP contracts and the City can establish what they consider to be satisfactory levels of service and enforce these performance standards through the concession agreement. The most common way to ensure that service and performance requirements are met is to implement financial damages when standards are breached.

The use of liquidated damages to ensure the quality of service also will draw the attention of the private partner's lenders as the lenders' debt is at risk; not only revenue risk but also the private sector's performance. This will incentivize lenders to monitor the private partner's performance more closely and provide additional incentive for the private partner to meet the output requirements.

Hand-Back Requirements

Service and quality standards are not only important during the term of the contract, but also at the end of the contract. The City should outline the "hand-back" requirements of the assets in the agreement. These requirements specify the condition the assets should be in upon being transferred back to the City. By doing this, the City avoids receiving assets in need of rehabilitation at the end of the contract.

Toll Rate Policy

The City can maintain control over toll rate setting by establishing clear policy guidelines and contractual limitations that must be followed by the private sector. Such limitations may include overall toll rate caps, frequency of toll rate increases and the rate at which rates may be increased. It is important for tolling policy to be fair for both the operator of the facility and the public. While initial toll rates on the bridges may be the same for both the City and a private operator, toll rates are more likely to be adjusted on a regular basis under a PPP structure as a private operator is not subject to the same political influences as the public sector and is motivated to optimize revenues. Regularly scheduled toll rate increases within City established policy limits will help to maximize the value the City will receive for the bridges.

Term of Concession

PPP concession length is another important policy issue which has both costs and benefits. Typically, longer concession lengths are beneficial to the private sector as they have favorable tax treatments. If the concession length exceeds the crossings remaining design life, then the private sector concessionaire can typically be treated as owner of the assets for tax purposes. The concessionaire can

then benefit from accelerated tax depreciation for its share of the upfront concession payment. For the purposes of this analysis, the PPP analysis conservatively assumes that the upfront concession payment is depreciated over the life of the concession term. Additional diligence will be needed to determine the tax implications of concession length when further assessing the feasibility of a PPP arrangement.

Brownfield Asset Considerations

It also is important for the City to consider some of the key commercial risk items associated with brownfield assets. An example of a key commercial risk in this case would be that of latent defects pertaining to the existing bridge system. Prior to entering into an agreement, the private sector will want to review an asset condition report that outlines:

- The standards to which the original facility was constructed;
- The standards to which the asset has been maintained since initial construction; and
- The maintenance standards expected from the private partner going forward.

These factors will play an important role in the allocation of risk related to latent defects of the existing assets as the private sector will not necessarily want to replace an asset if its useful life falls within the term of the agreement.

Other Key Commercial Terms

The City also should consider the following issues prior to entering into an agreement with a private partner:

- Willingness to place various restrictions on the construction of competing facilities in the region;
- Ensuring consistency in tolling technology used at the crossings and connecting highways; and
- Impact to personnel currently employed on the City-owned bridges.

The City and the private partner may have differing viewpoints on these key commercial risk items, but each one should be negotiated prior to entering into a contract to avoid running into any significant problems during the concession term.

Valuation Scenarios

In developing the valuations, a number of different traffic and revenue configurations were considered for both the public ownership scenario and the PPP scenario and a base case was developed in order to evaluate the impact of each of the different configurations.

The five configurations used to value the bridge system under the public ownership scenario include:

1. The base case;
2. A premium period tolling scenario;
3. Tolling BOTA as part of the bridge system;
4. Tolling empty trucks at BOTA as part of the bridge system; and
5. Tolling BOTA as a standalone facility.

These scenarios are described in further detail below. For each scenario, cash flow projections for the next 50 years were analyzed. The results of the public ownership analysis are presented in Section 7.4.

The analysis of the PPP scenarios considered the value of the bridge system under the base case and tolling BOTA as part of the bridge system. Using these two traffic and revenue configurations, the analysis was performed assuming a 50-year contract term. The results of this analysis are presented in Section 7.5.

As currently is the case, there are several risk factors that could affect future cash flows over the next 50 years. One of the bigger risks is the uncertainty of long-term traffic volumes. The escalating violence in Ciudad Juarez could have a negative effect on recreational cross-border traffic as could the construction of a competing facility.

Under the public ownership model, the City will retain these risks as described above. In a PPP scenario, the upfront concession fee paid to the City by the private sector is essentially a risk-free amount because the private sector would be assuming the majority of these risks for the term of the contract. Ultimately, there is a tradeoff between the City retaining all risks for the chance to receive a potentially larger cash inflow (public ownership) and receiving a guaranteed payment with minimal future risk exposure (PPP scenario).

Base Case

The base case scenario was based on the current operating procedures employed at the three City-owned crossings (Paso del Norte, Stanton, and Zaragoza). For the PPP scenario, more aggressive toll escalation assumptions were applied.

Premium Period Tolling

The project team analyzed the traffic flow at all bridges in order to identify any patterns or trends in the daily traffic volume at the crossings. We observed that there were no real "peak" periods during the day at the City-owned crossings in which traffic volumes were considerably higher during a one- or two-hour period. Instead, they noted a "premium" period wherein volumes were elevated and remained at that level for an extended period of time. This premium period occurred daily between 9:00 a.m. and 9:00 p.m.

The premium period tolling scenario valued the City-owned crossings assuming an increase in passenger vehicle and commercial truck tolls during the premium period. The scenario assumed that passenger vehicle tolls are doubled during

the premium period while commercial truck tolls are increased by 50 percent. As a result of the increased tolls, there is an estimated 15 percent diversion from the City-owned crossings during the premium period.

Tolling BOTA (Part of the Bridge System)

This scenario assessed the value of the bridge system if BOTA were to be included with the three City-owned crossings as a single project. This scenario looked strictly at the estimated costs and cash flows generated at BOTA over the term of the valuation period and ignored any issues related to the ownership of the crossing, the authority to toll BOTA or any other policy concerns surrounding the presidential treaty that currently governs the operations at BOTA.

With the introduction of tolling on BOTA it was reasonable to assume that traffic volumes would decline at this border crossing; the majority of the traffic is diverted to Zaragoza. As Zaragoza is part of the bridge system, the impact on revenues would be minimized. In this scenario, because there are no non-tolled border crossing options, the project team forecasts that traffic levels on the entire bridge system would remain constant.

This configuration is utilized in both the public ownership and PPP scenarios. Similar to the base case, the PPP scenario applies more aggressive toll escalation assumptions than the public ownership scenario at both BOTA and the City-owned crossings.

Tolling Empty Trucks at BOTA (Part of the Bridge System)

This scenario was similar to the preceding scenario in that it includes both BOTA and the City-owned crossings in the valuation of the bridge system; however, it only contemplated tolling empty trucks at BOTA rather than all trucks, passenger vehicles and pedestrians. Approximately 65 percent of all southbound trucks currently are empty. This configuration serves to discourage empty trucks from using the crossings and helps reduce wait times at the border. This configuration should encourage shippers to be more efficient in managing their routing more effectively.

Tolling BOTA (Standalone)

This scenario analyzed BOTA as a standalone facility (separate from the City-owned bridge system). It values the potential cash flows that could be generated at BOTA over the next 50 years if tolls were charged on all pedestrians, passenger vehicles, and commercial traffic.

7.3 DOCUMENTATION OF ASSUMPTIONS

The sections below outline the assumptions used in the valuation of the bridge system under both the public and PPP scenarios. The assumptions were

developed through consultation with the City of El Paso and members of the project team. The basis for using each assumption is provided below. Revenues and costs are assumed to grow at the same rate under both the public ownership and PPP scenarios, unless stated otherwise.

It should be noted that this analysis did not contemplate the implementation of any operational improvements that may be recommended as part of the Operations Plan. For the purposes of this analysis, the current operating structure and costs were assumed to continue. If changes are made to operational procedures at the crossings, it could lead to results that are materially different than the current analysis.

Traffic and Revenue

Passenger vehicle and commercial truck traffic and revenue assumptions used in the analysis were developed by Cambridge Systematics for each crossing. The pedestrian traffic for 2011 reflected the actual pedestrian traffic at the crossings for 2010. All pedestrian, passenger vehicle and commercial traffic was assumed to grow at the following rates:

- Two percent per year from 2011 through 2020;
- One percent per year from 2021 through 2030; and
- One-half percent per year from 2031 through 2060.

Base toll rates for passenger vehicles and commercial traffic were assumed to equal the current toll rates adjusted annually for inflation. All trucks were assumed to have four axles, thus generating a base toll rate of $14 per transaction (4 x $3.50 per axle) in 2011.

Pedestrian toll rates were not assumed to increase with inflation and will remain at $0.50 per transaction for the first 10 years of the analysis. Tolls charged to pedestrians were assumed to increase by $0.25 every 10 years starting in 2020. Under the Tolling Empty Trucks at BOTA scenario, only 65 percent of the commercial traffic is tolled. All other commercial, pedestrian, and passenger vehicle traffic on BOTA is toll free. Assumptions related to traffic growth were the same as stated above.

Under the Premium Period Tolling scenario, passenger vehicle toll rates were assumed to start at $5 per vehicle (during the premium period) adjusted annually for inflation. Similarly, toll rates charged on trucks were assumed to be $21 ($5.25 per axle) during the premium period adjusted annually for inflation. The 15 percent diversion rate from the City-owned crossings during the premium period was reflected in the annual revenue projections. The premium period toll rates charged to pedestrians were assumed to remain the same as the base pedestrian toll rates noted above.

The traffic forecast models described in previous sections were constrained for capacity at each of the crossings meaning that the projected traffic at each of the crossings is feasible based on current operating procedures.

Current hours of operation were assumed to continue at each of the crossings.

The main difference in the traffic and revenue forecast for the PPP scenario was that the analysis assumes two separate toll rate increases to reflect a more aggressive pricing regime that could potentially be employed by the private sector. While toll rates also can be increased under the public ownership scenario, PPPs provide a mechanism for increasing tolls that minimizes the political scrutiny of such an increase. This mechanism would prescribe limits on the annual toll rate escalation assumed by the private sector and allows the City to lock in the value of future increases today (realized through an increased concession payment).

Our assumption for the PPP scenario was that passenger vehicle and commercial toll rates would be increased by 50 percent in 2013 (year three of the forecast) and then another 50 percent in 2016 (year six of the forecast) under the PPP scenario. It was assumed that each increase in the toll rate will create a diversion of traffic to BOTA of 15 percent and 5 percent, respectively. Pedestrian toll rates were assumed to remain the same as the public ownership model.

Macroeconomic Assumptions

All scenarios analyzed assumed an inflation rate of 2.50 percent. This proxy for inflation was determined by looking at the average rates for three economic indicators over the last 10 years:

- The Consumer Price Index (PI);
- The United States Gross Domestic Product (GDP); and
- The Employment Cost Index (ECI) for the South U.S. Census Region.

The analysis also assumed that interest is earned on all cash balances at a rate of 1.50 percent. This percentage was a proxy for the three-year U.S. Treasury yield and was only used in the PPP scenarios.

Operating Expenses

Salaries, wages, and benefits and other expenses (including materials and supplies, operating and nonoperating expenditures) were assumed to increase at the following real growth rates (coinciding with the assumed growth in traffic):

- Two percent per year from 2012 through 2020;
- One percent per year from 2021 through 2030; and
- One-half percent per year from 2031 through 2060.

The initial costs assumed for 2011 were based on the City's projected cost estimates for that year. These costs were assumed to increase with inflation on an annual basis. Any diversion of traffic would result in a corresponding decrease in operating expenses of equal magnitude (i.e., a 15 percent diversion of traffic will result in a 15 percent decrease in operating expenses).

Contractual services costs were primarily attributable to security (unrelated to customs officials) and janitorial services. The initial costs assumed for 2011 were based on the City's projected cost estimate for the year. The City also projects an increase in these costs of $200,000 for 2012. Contracts for these services are typically entered into by the City for a duration of three years. Starting in 2013, the City will enter into a three-year contract for these services and will have no annual increases during the term of the contract. It was assumed that a series of three-year contracts will be in place throughout the term of the analysis. The costs for these services were assumed to increase by the following amounts each time a new contract is executed:

- Four percent for contracts negotiated between 2013 and 2024; and
- Three percent for contracts negotiated between 2025 and 2060.

All operating expenses for BOTA under the Tolling BOTA scenarios were assumed to be proportionate to the traffic levels anticipated at BOTA when compared to the City-owned crossings (approximately 76 percent).

Periodic Maintenance and Rehabilitation

We used input from the Director of the International Bridges Department to develop a reasonable periodic maintenance and life-cycle schedule for the bridge crossings over the next 50 years. These assumptions were based on the City's historical life-cycle and rehabilitation efforts and their best estimate for future expenditures. (Note: All values quoted in this section are in USD 2010.)

The analysis assumed a $2.1 million structural rehabilitation expense every 10 years starting in 2014. This amount covers general refurbishment of the buildings at the crossings and any minor rehabilitation of the roadways and bridges. These periodic amounts are subject to inflation (2.50 percent).

For upgrades to the toll collection system, the analysis assumed a $1.5 million expense every six years. The City anticipates that the tolling system technology employed at the crossings will need to be continuously upgraded in order to ensure they remain consistent with the other systems utilized throughout the State. The first toll collection system upgrade expense is incurred in 2011 and is allocated across the bridge system. These periodic expenditures are subject to inflation (2.50 percent).

The City anticipates major bridge enhancements of approximately $6.25 million at each crossing every 15 years. Major enhancements were made to the Stanton and Paso del Norte crossings in 2010. As such, the analysis assumed that the first major bridge expenditures at these two crossings will occur in 2025. The City also has identified a need for an extension of the roadway and other bridge enhancements at Zaragoza which are assumed to occur in 2013. The costs for major bridge enhancements are subject to inflation (2.50 percent).

Finally, the analysis also assumed an annual routine maintenance expense of $180,000 for the entire bridge system. Routine maintenance includes general upkeep of the buildings and roadways and is subject to inflation.

Under the toll BOTA scenarios, there is a one-time tolling system implementation cost of $2 million in 2011. All other periodic maintenance and rehabilitation expenses assumed for BOTA are equal to 76 percent of the total costs for the three City-owned crossings.

A well-structured PPP contract should have well-established hand-back requirements that outline the condition the assets should be in at the expiration of the agreement. This transfers the cost of those rehabilitation efforts to the private sector and ensures that the public sector receives their asset in fair condition. With this in mind, there are higher maintenance and rehabilitation expenditures assumed in the final years of the PPP scenarios when compared to the public ownership scenarios.

Future Capital Expenditures and Upgrades

The analysis assumed that there will be no additional crossings constructed in the region during the term of the analysis, other than the replacement of the Fabens-Caseta crossing with the new Tornillo-Guadalupe POE. Similarly, there are no major upgrades planned for any of the crossings that would significantly impact the capacity of the bridge system. It is important to note that the bridge assets are likely to have additional replacement costs during the 50-year term of the analysis. As the costs for this level of capital improvement is unknown, no assumptions were made for these costs. To the extent such costs are incurred, the results of the analyses would be reduced accordingly.

Financing Assumptions

This section outlines the financing assumptions used in the analysis of the public ownership scenarios.

As mentioned in Section 7.2, in the past the City has used SIB loans to finance any periodic maintenance and rehabilitation or major enhancements at the crossings. There currently are four outstanding loans with varying repayment dates. The final SIB loan will be fully paid off by the end of 2021. The City has provided a repayment schedule (principal and interest) for the four loans which has been directly integrated into the analysis. We assumed that the City will continue to make these scheduled payments until the loans are fully repaid.

For all future major bridge enhancements, we assumed that the City will use revenue bonds with the following characteristics:

- A credit rating in the A-category;
- A term of 10 years;
- An interest rate of 5.00 percent; and

- Level principal and interest payments.

The analysis assumed separate bond issuances in the next 50 years coinciding with major capital expenditures outlined in Section 7.3. The following table provides the year of each bond issuance, as well as the approximate nominal amount of each issuance under the public ownership scenarios.

Year of Issuance	Bond Proceeds – City-Owned Scenarios	Bond Proceeds – Including BOTA
2013	$6.7 million	$6.7 million
2020	N/A	$18.2 million
2025	$18.1 million	$18.1 million
2027	$9.5 million	$9.5 million
2035	N/A	$26.3 million
2040	$26.2 million	$26.2 million
2042	$13.8 million	$13.8 million
2050	N/A	$38.1 million

For the purposes of this analysis, BOTA was assumed to have no debt outstanding. In the scenarios that combine BOTA with the City-owned bridge system, we assumed that financing is required for major bridge enhancements on all bridges and that the Federal government would no longer be providing funding for upgrades or maintenance to BOTA.

Under the analysis of the PPP scenario, we assumed that the private party would finance the concession payment using 70 percent debt and 30 percent equity. The initial debt financing would come from a mini perm bank debt facility with a term of 10 years which would be refinanced in 2020 using a 30-year bond. The mini perm facility has an assumed all-in interest rate of 7.50 percent. Interest-only payments would be made during the term of the facility with the full principal amount being repaid at the time of the refinancing. The mini perm carries an arrangement fee of 1.50 percent and a minimum debt service coverage ratio (DSCR) of 1.30x.

The bond used to refinance the full amount of the mini perm facility also carries an interest rate of 7.50 percent. The private partner would make level principal and interest payments throughout the term of the facility. An arrangement fee of 1.50 percent and a minimum DSCR of 1.30x also were assumed for the bond debt.

The analysis assumed a debt service reserve account requirement of 100 percent of the following year's debt service.

Other Assumptions

The public ownership analyses examined the value of the cash flows being generated by the City-owned bridge system over a 50-year period starting January 1, 2011.

A range of discount rates were used to calculate the Net Present Value (NPV) of the cash flows in order to reflect a range of views on the cost of the City retaining all risks associated with the ownership and operation of the bridges, as discussed further in Section 7.4. All NPVs discussed in this section are presented as of January 1, 2011.

The PPP analysis assumed the use of a maintenance reserve account (MRA) with the following requirements (where "n" equals the year in which the expenditure occurs):

Period	MRA Requirement
n-1	100%
n-2	75%
n-3	50%
n-4	25%

Interest is earned on the outstanding balance in the MRA at a rate of 1.50 percent (proxy for the three-year U.S. Treasury yield).

A corporate tax rate of 35 percent and a state income tax rate of 0.7 percent are charged to the private sector under the PPP scenario. Equity is assumed to require an internal rate of return (IRR) of 14 percent.

7.4 RESULTS OF PUBLIC OWNERSHIP SCENARIOS

The public ownership scenarios analyzed the value to the City of the projected future cash flows generated by the City-owned bridge system, both as it currently stands and with the addition of BOTA as a tolled crossing. The results of each scenario and the methodology used in the analysis are provided in the sections below.

Overview of Public Ownership Analysis

As noted earlier, traffic and revenue projections and future cost estimates for each of the crossings were developed by a working group of members from the City, Cambridge Systematics, Inc., and KPMG.

Results for each of the scenarios are presented below and represent the total net cash flow of the assets to the City over the 50-year term of the analysis in both nominal and NPV terms. All NPV amounts are presented as at January 1, 2011.

The analysis estimated the hypothetical risk-adjusted value of the crossings to the City under a public ownership structure. This hypothetical value was used to compare the estimated value of the crossings to the City under the public ownership scenario to the estimated value of the concession fee under the PPP scenario for the long-term operation and maintenance of the bridge system.

Surplus cash remaining from the toll revenues generated by the crossings were assumed to flow to the City through the General Fund. To assess the value of the surplus cash flows expected over the next 50 years, these cash flows should be discounted at a rate that reflects the time value of money and the risks associated with the ultimate realization and collection of these cash flows.

The analysis used a range of discount rates (5 percent, 8 percent, and 10.5 percent) to assess the value of the estimated future cash flows of the City-owned crossings. The range of discount rates used in the analysis represents the following:

- The City's approximate cost of capital (5 percent);
- A rate based on an approximation of the Capital Asset Pricing Model (CAPM), excluding any adjustments for project-specific risks (8 percent); and
- A rate based on market comparables (10.5 percent).

A range of discount rates was used for the analysis rather than a specific value to account for the high-level estimate of future costs and rehabilitation and different views on risk. The five percent discount rate did not account for any risks and is only a proxy for the City's cost of capital.

The eight percent discount rate calculated under the CAPM-based approach used the concept that investors in a project/security must be compensated in two ways; the time value of money and risk. The CAPM-based approach relies on market data and statistics to help quantify how investors should be compensated for the risk they are accepting. To this end, surplus cash flows from the crossings can be considered analogous to dividends that are paid to equity investors of publicly traded securities, as they carry the greatest amount of risk. This would suggest that projected surplus cash flows should be valued using an equity cost of capital that effectively prices the risk associated with the ultimate collection and realization of those cash flows. Therefore, the cost of equity capital is equal to an investor's risk-free rate of return, plus the product of a beta coefficient (measure of volatility of a given equity security relative to the overall market, where 1.0 is assumed to equal the beta coefficient of the market) and the risk premium of the market as a whole. This analysis excluded any adjustments to the discount rate for project-specific risks.

The 10.5 percent discount rate was based on market comparables. This approach involved an assessment of publicly disclosed brownfield transactions and their associated market rates of return in order to estimate the return expectations that should be applied to the City's bridge assets. The use of market comparable returns provides objective support for the market perception of the risks

associated with the transaction, including an assessment of how those risks should be priced and ultimately reflected in the value of the project. It is recognized that the financing structure assumed in the public ownership model would be considered more conservative than the capital structures used in private sector concession projects. Due to the leveraged nature of the comparable projects, a further adjustment was required to provide allowance for the unleveraged nature of the public financing. Such an adjustment reflected the change in risk profile that a private sector entity could accept over a public sector entity.

The results shown in the following section are indicative only. If the City requires a more detailed analysis, the City may wish to consider contracting with technical advisors to develop more precise cost schedules for both the public ownership and PPP models.

Public Ownership Analysis Results

The results of the public ownership analysis are presented in the following table. The NPV as at January 1, 2011 using the three discount rates outlined above are provided for each of the five scenarios, in addition to the total nominal amount of the transfers to the City's General Fund.

Public Ownership Summary Results - Transfer to General Fund

	As of 01-January-2011			
$ millions	NPV @ 5.0%	NPV @ 8.0%	NPV @ 10.5%	Nominal
Base Case	427	245	172	1,587
Premium Period Tolling	701	408	289	2,561
Tolling BOTA (part of the Bridge System)	890	519	368	3,255
Tolling Empty Trucks at BOTA (part of the Bridge System)	450	258	181	1,686
Tolling BOTA (stand-alone)	359	212	152	1,295

It is worth noting that under the public ownership model the City would receive revenues on an annual basis over the next 50 years rather than the upfront payment that would be received in a PPP arrangement. The NPVs of the future cash flows have been provided only to allow the public ownership results to be compared to the PPP results.

As BOTA accounts for more than half of all cross-border traffic in the region, it can be expected that toll revenues and transfers to the General Fund increase significantly when BOTA is tolled and added to the system. Similarly, the increase in toll rates under the premium period tolling scenario more than offset the estimated 15 percent diversion of traffic leading to a substantially higher transfer to the General Fund when compared to the base case.

It also should be noted that this analysis does not consider any administrative costs that may be associated with adding BOTA to the City's bridge system.

7.5 RESULTS OF PPP SCENARIOS

The PPP analysis looked at a project term of 50 years and estimated the value of the upfront concession fee that may be paid to the City. The results of the PPP scenarios are provided below along with the methodology used for valuing the system of assets.

Overview of PPP Analysis

The purpose of the PPP analysis was to determine the upfront amount (concession fee) that a private sector entity would be willing to pay the City of El Paso for the right to operate the bridge system for a set period of time. As mentioned earlier, one of the key benefits to the City of entering into a PPP arrangement with a private sector consortium is the ability to maximize the current financial benefit to the City.

This analysis estimates the amount of the concession fee by projecting the total costs that would be incurred by the private sector throughout the project term, including the cost of financing the upfront concession payment.

In contrast to the public ownership scenario, it is important to note that the projected cash flows to the City under the PPP scenario are effectively guaranteed. In each of the scenarios, the concession fee represents a guaranteed upfront payment to the City, regardless of the actual revenues generated by the bridge system over the term of the agreement. By entering into a PPP, the City is able to transfer the majority of the revenue and operational risks to the private partner.

The results presented in the following sections are indicative only. If the City requires a more detailed analysis, the City may wish to consider contracting with technical advisors to develop more precise cost schedules for both the public ownership and PPP models. The marketability of the capital structure assumed in this analysis will be dependent on future market conditions.

PPP Scenario Results

The results of the PPP scenarios are provided in the table below. For each scenario, the total estimated upfront concession fee paid to the City by the private partner is presented.

PPP Summary Results - Concession Fee	
$ millions	Upfront Payment *As at 01-January-2011*
City owned crossings - 50 years	256
City owned crossings + BOTA - 50 years	478

Much like the results of the public ownership analysis, the addition of BOTA to the bridge system significantly increases the value of the City-owned assets. This kind of increase over the base case can be expected considering the revenue potential of BOTA.

The concession fee amounts provided above may vary considerably as forecast data and commercial risk transfer items are further refined.

7.6 SUMMARY

The valuation of the regional transportation system under both the public ownership scenario and the PPP scenario showed that the bridge system can provide a significant economic benefit, even without the benefit of improved operations. The three City-owned crossings generate positive annual cash flows for the City and the addition of BOTA to the City-owned bridge system only increases the value of the system to the City. The table below provides a summary of the estimated transfers to the General Fund in NPV and nominal terms for all five public ownership scenarios.

Public Ownership Summary Results - Transfer to General Fund				
	As of 01-January-2011			
$ millions	NPV @ 5.0%	NPV @ 8.0%	NPV @ 10.5%	Nominal
Base Case	427	245	172	1,587
Premium Period Tolling	701	408	289	2,561
Tolling BOTA (part of the Bridge System)	890	519	368	3,255
Tolling Empty Trucks at BOTA (part of the Bridge System)	450	258	181	1,686
Tolling BOTA (stand-alone)	359	212	152	1,295

These results show the positive impact of including BOTA in the bridge system with the total cash flow generated being more than double the base case result. There are several hurdles that would need to be cleared before BOTA could actually become part of the City's system, but the benefits of such an addition could be significant.

The bridge system also is potentially attractive to private partners under a PPP scenario. The City could pass the majority of the risks associated with the operations and maintenance of the bridge system on to a private partner for a significant upfront concession fee, essentially monetizing the assets. Since these

brownfield assets have a history of strong financial performance, private sector partners will be able to develop reliable traffic forecasts and as a result be more aggressive with their financial offers to the City. The following table provides the estimated concession fee amount that could be paid to the City under each of the PPP scenarios. Once again, the upfront concession fee paid to the City is essentially a risk-free amount because the private sector would be assuming the majority of these risks.

PPP Summary Results - Concession Fee	
	Upfront Payment
$ millions	*As at 01-January-2011*
City owned crossings - 50 years	256
City owned crossings + BOTA - 50 years	478

Ultimately, the City will need to make a decision as to whether they want to pass on the operating risks associated with the bridge system to a private partner for an upfront fee or continue with current operations while retaining all risks. The tradeoff between a guaranteed payment with minimal future risk exposure and retaining all risks for the chance to receive a potentially larger cash inflow should be carefully considered and the City should ensure that any resolution protects public interests first and foremost.

8.0 Economic Impact Analysis

This section describes the economic analysis of the region's border crossings that we conducted as part of the Operations Plan. This economic analysis provided a range of information to decision-makers and the general public about possible projects and feasibility, impacts of alternatives, and return on investment. The economic analysis consisted of three components:

1. Economic role of the border crossing (discussed in Section 4.0);
2. Economic impact of border crossing delay; and
3. Economic benefits of the recommended operational improvement scenarios.

This section describes the economic impact of border delays, both existing and future, on the regional economy and the potential impact of the recommended operational improvement scenarios.

8.1 METHODOLOGY

Our methodology was designed to capture, in as detailed a manner as possible, costs arising from border delay due to congestion and then to estimate the total economic impacts (referred to as "no-build" scenario). Border costs are explicitly estimated by mode and trip purpose based on characteristics of demand at the border. The total impacts were estimated based on changes in incremental travel costs.

Analytical Framework for Estimating Economic Impact of Border Wait Time at El Paso

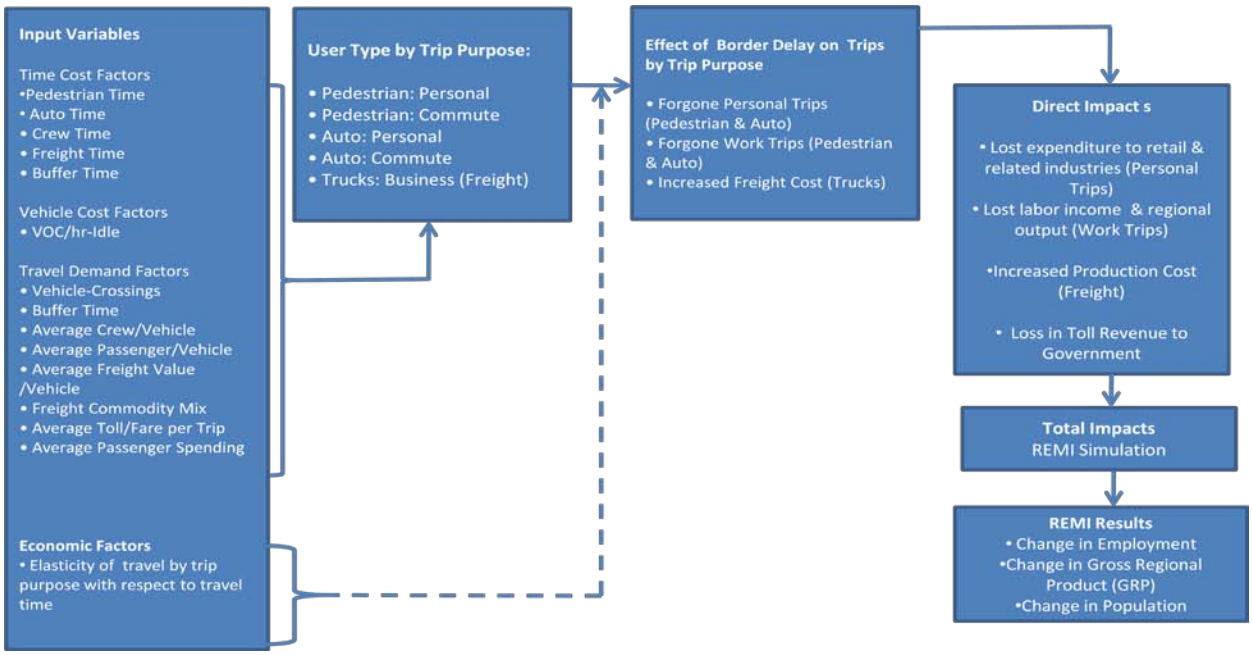
From Figure 8.1, input variables for analysis were broken down into four categories relating to time costs, vehicle costs, travel demand, and economic characteristics. Time costs were drawn from extensive literature on the valuation of travel time, utilizing data sources such as Bureau of Labor Statistics. Vehicle operating costs were estimated based on unit costs expressed in literature. Travel demand characteristics were estimated using travel demand, observation data, interviews, microsimulation, and queuing analyses models. Travel demand characteristics vary by mode and trip purpose. These cost factors allow for different costs (and cost responses) for a variety of modes and trip purposes.

Border crossings and associated delays were generated from the suite of operational models (described in Section 6.0), for three benchmark years: 2015, 2025, and 2035. The forecast traffic data were based on field observation data collected in 2010. To estimate border crossings for the intermittent years, estimated border crossing for the benchmark years were interpolated based on the following equation:

$$BC_t = BC_{baseyear} + \frac{(BC_{forecast\ year} - BC_{base\ year}) * (t - base\ year)}{(forecast\ year - base\ year)} \qquad base\ year \le t \le forecast\ year$$

A similar approach was utilized to estimate delay at the border. Delay was estimated as the difference in travel time at any time of the day (from arrival at the border, including queuing to exit from the border) and the expected travel time when there was no vehicular queue.

Figure 8.1 Analytical Framework for Estimation of Economic Impact of Border Delay at El Paso POE



From Figure 8.1, user type (mode) by trip purpose identified each category of border-crossing and the purpose for the trips. There are three modes of crossings: pedestrian, personal vehicle, and commercial vehicles (trucks). Each of these modes varies by trip purpose: personal, commute, and business. Due to different trip purposes, each traveler faces different trip incentives relative to travel time. Therefore, as delay increases (which in turn increases travel time) travelers make travel decisions at the margin. Decision at the margin is premised on the elasticity of trip purpose with respect to travel time. Elasticity measures the percent change in trips by trip purpose arising from 1 percent change in travel time. For example, 1 percent increase in travel time for commuters reduces commute trips by 0.96 percent (Table 8.1) and vice versa. The negative sign attached to the elasticity indicate risk aversion of travelers with respect to increasing travel time. Therefore, as the delay increases, fewer crossings are expected at each border.

Table 8.1 Travel Data by Trip Purpose and Elasticity

Trip Purpose	Elasticity
Personal	-0.83
Commute (Work Trips)	-0.96
Business	-0.12

Source: Transportation Elasticities, Victoria Transport Policy Institute.

Forgone trips by trip purpose were monetized, annualized, and mapped to the affected or impacted industries (direct impacts). For example, lost or forgone personal trips were monetized and annualized based on the average daily expenditure and mapped to wholesale and retail trades industry as lost consumer expenditure in El Paso. Also, forgone trips impact toll revenues generated by government. Therefore, estimated change in toll revenue arising from the forgone trips was mapped to government as reduction in revenue or expenditure.

Delay cost associated with commercial vehicle comprises additional costs arising from increased travel time, idling vehicle operating, and carrying buffer stocks (excess inventory). Idle vehicle operating cost is the running cost incurred while waiting in queue at the border. These include fuel and nonfuel costs. Hourly fuel consumption and maintenance cost for trucks are 0.8 gallons[17] and $0.14,[18] respectively. Based on average diesel cost of $3.03 per gallon, hourly fuel cost was estimated to be $2.42.

Cross-border delay also affects timely delivery of input materials to production facilities as well as finished goods to consumer markets. To avert any short of either input materials or finished goods on consumer markets, firms invest in buffer stock (excess inventory). It was assumed that the carrying cost of buffer stocks was equivalent to freight delay cost. In addition to predictable border crossing, excessive or unexpected border crossing delays could cause unreliability in freight delivery. This requires additional investment in buffer stocks and it poses an enormous risk to delivery of input materials. As a result, unrecoverable production time will be lost. This has major consequences on just-in-time (JIT) production facilities. Alternatively, freight scheduled for multimodal transportation to consumer markets may not be delivered due to a break in the transport chain. These occurrences increase production cost of businesses.

[17] Report by State of Oregon Department of Environmental Quality titled, "Improving Truck Efficiency and Reducing Idling," October 10, 2010.

[18] Ibid.

General Assumptions Underpinning the Framework

- Annual change in border crossing by trip purpose is linear. Therefore, border crossing data for base and forecast years have been interpolated to estimated data for the intermittent years.
- Congestion cost is equivalent to increased crew and inventory cost.
- Vehicle operating costs stem mainly from idle running cost (fuel and nonfuel) during the wait time.
- All incremental crew and vehicle operating costs directly borne by private carriers are wholly passed on to shippers.

Valuation of Economic Impact of Delay

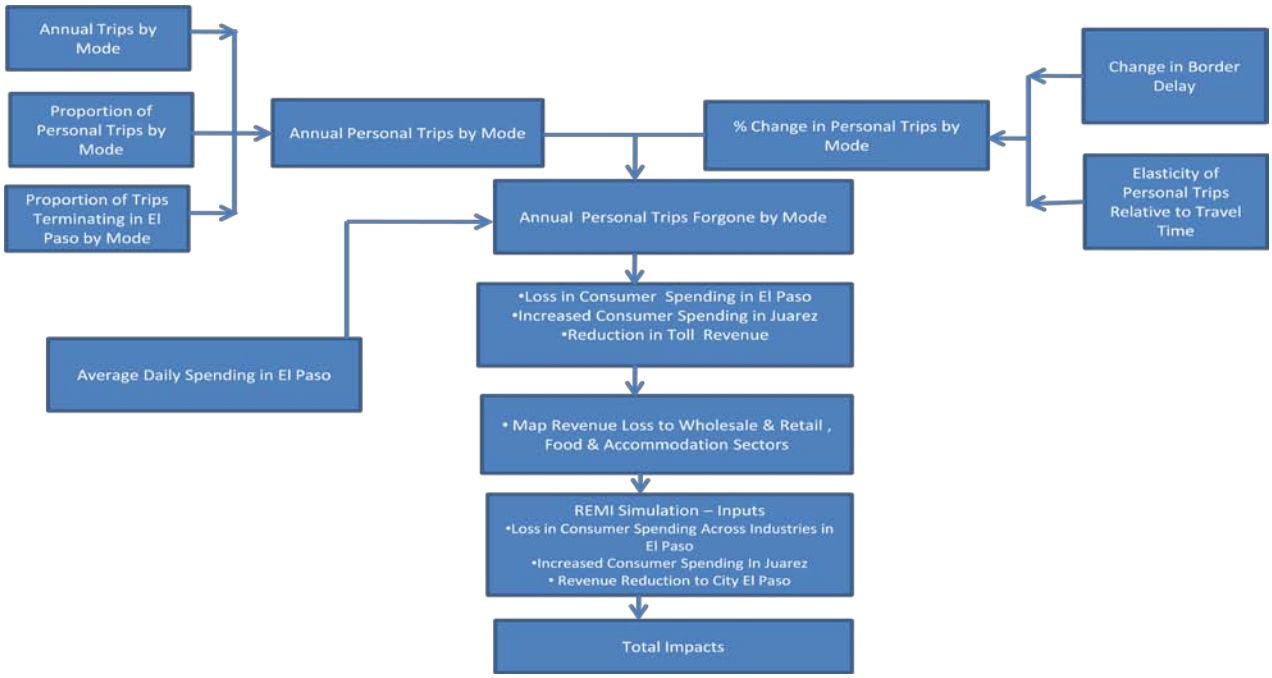
This section discusses the methodology employed to estimate the economic impacts of passenger vehicles and truck crossings. Personal vehicle crossings impact the regional economy through the following channels:

- Forgone personal trips: shopping, vacation, and recreation, etc.;
- Forgone work trips (commute);
- Reduction in productivity and regional output; and
- Reduction in toll revenue.

Valuation of Forgone Personal Trips (Shopping, Vacation, and Recreation)

Travelers' sensitivity to travel time varies with trip purpose. The sensitivity increases as the value of trip purpose diminishes. For example, a traveler from Ciudad Juárez will be willing to wait at the border for three hours to commute to work at El Paso, but that same traveler may not do the same for shopping or leisure trips. As border delay increases, forgone trips associated with shopping, vacation and recreation between the base and forecast years (from the suite of operational models), frequency of visit to the United States (annually), average duration of stay during each visit, and average daily spending were used to estimate lost income in El Paso.

Figure 8.2 Detailed Approach to Estimate Economic Impact of Forgone Personal Trips



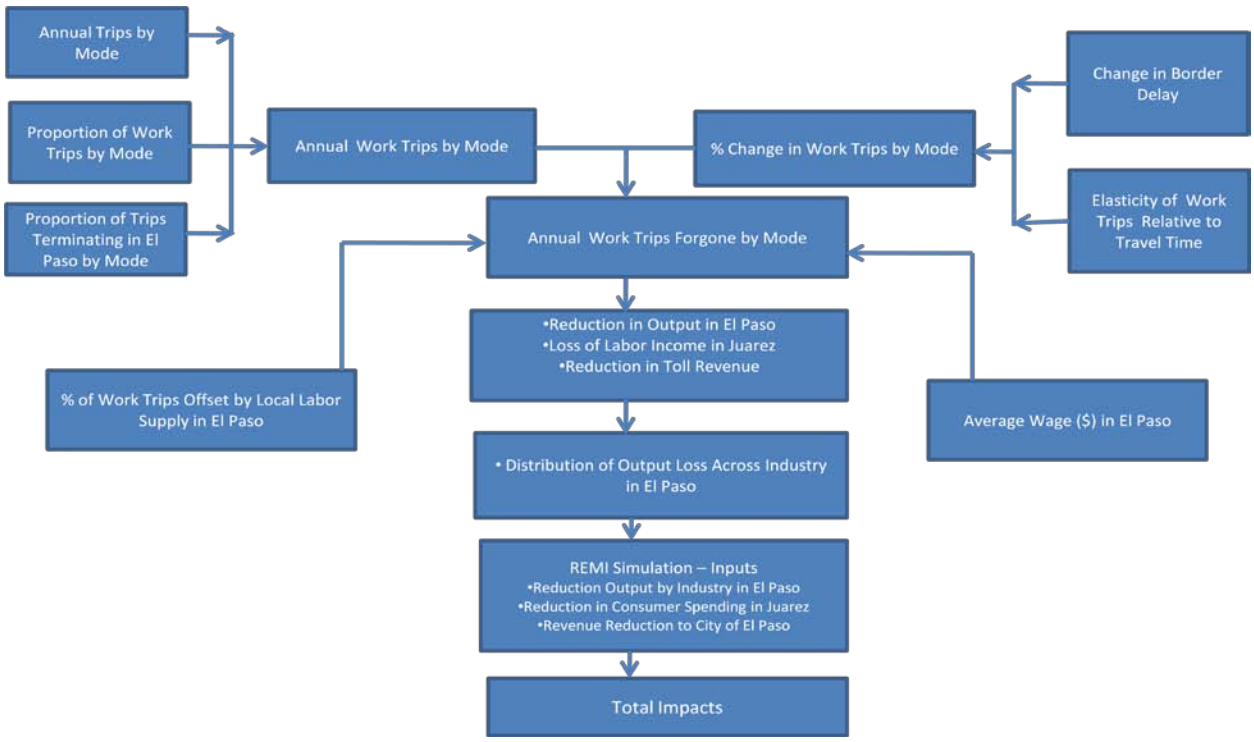
Detailed Steps for Estimation of Direct and Total Impacts

- Annual Personal Trips = Annual Pedestrian/Auto Crossings x Proportion of Personal-Related x Proportion of Trips Terminating in El Paso.
- Percent Change in Annual Personal Trips = Change in Delay x Elasticity of Personal Trips Relative to Travel Time.
- Forgone or Lost Personal Trips = Number of Personal Trips x Percent Change in Annual Personal Trips.
- Revenue Loss to El Paso = Forgone or Lost Trips x Average Spending in El Paso.
- Increased consumer expenditure in Juárez = Revenue Loss to El Paso.
- Reduction in Toll Revenue = Forgone Personal Trips x Toll per Crossing.
- Distribution of revenue loss across wholesale and retail trades, food and accommodation, arts, entertainment and recreation, and medical care.
- Map and input revenue loss to El Paso across industries, increased consumer spending in Juárez, and reduction in toll revenue to City of El Paso Government into REMI model.

Valuation of Forgone Work Trips

Similar to leisure, work trips will be forgone as border delay increases. Below is the overview of estimation of the associated economic impact.

Figure 8.3 Detailed Approach to Estimate Economic Impact of Forgone Work Trips



Detailed Steps for Estimation of Direct and Total Impacts

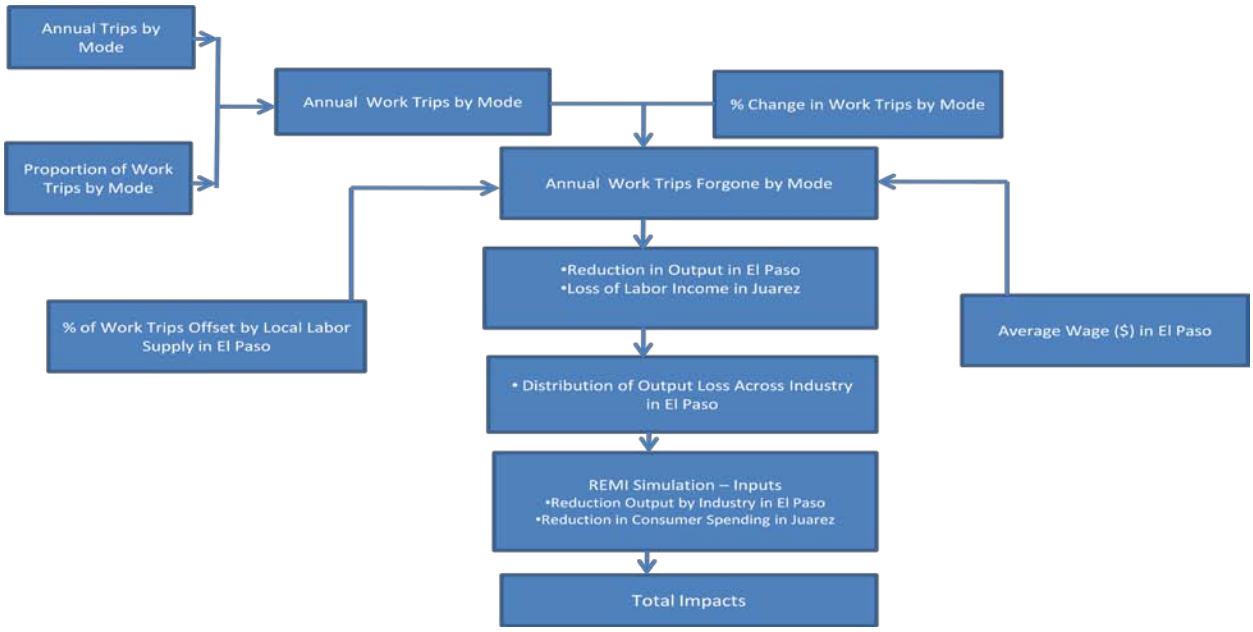
- Annual Work Trips = Annual Pedestrian/Auto Crossings x Proportion of Work Trips x Proportion of Trips Terminating in El Paso.
- Percent Change in Annual Work Trips = Change in Delay x Elasticity of Commute Trips Relative to Travel Time.
- Forgone or Lost Work Trips = Number of Work Trips x Percent Change in Annual Work Trips.
- Total Output Reduction (Loss) to El Paso = Forgone or Lost Works Trips x Average Wage x Percent of Lost Work Trips Offset by Local Demand.
- Total Output Reduction in El Paso = Loss in Labor Income in Juárez/Chihuahua.
- Reduction in toll revenue = lost work trips x toll per crossing.

- Distribution Output Reduction across Industries in El Paso is based on relative output in 2008.
- Map and input output reduction across industries in El Paso, reduced labor consumer spending in Juárez, and reduction in toll revenue to City of El Paso Government into REMI model.

Valuation of Lost Cross-Border Productivity

This section estimates lost working hours arising from delay at the border crossings and associated impact on regional output. For example, when a worker is delayed at the border crossings, such that the worker works for only six hours instead of the normal eight hours, there is lost work of two working hours and the associated productivity. In the event that the worker still works for eight hours, the delay at the border is valued as user cost. Also, as border crossing delay increases, commuting between Ciudad Juárez and El Paso will no longer be attractive for workers. Based on the aforementioned elasticity of work trip respect to travel time, the change or forgone work trips were estimated. Associated loss in productivity was estimated as the product of forgone work trips and average hourly wage, as shown below:

Figure 8.4 Detailed Approach to Estimate Economic Impact of Lost Productivity/Output



Detailed Steps for Estimation of Direct and Total Impacts

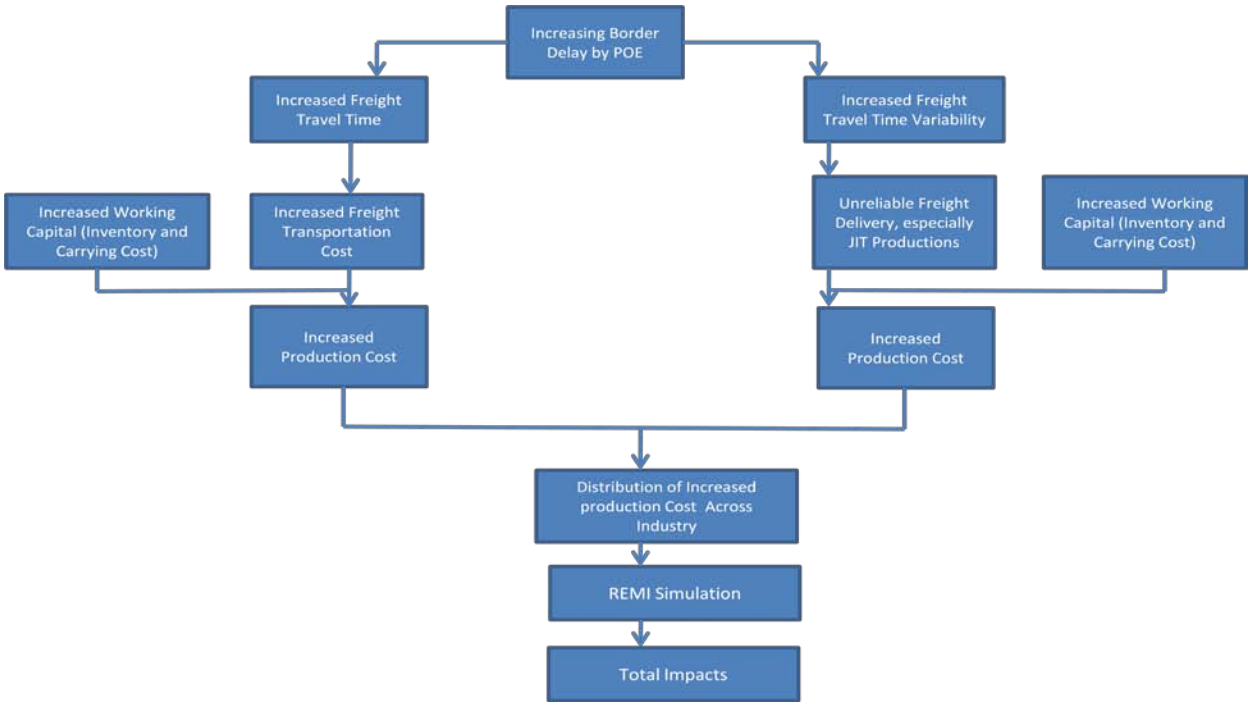
- Annual Work Trips = Annual Pedestrian/Auto Crossings x Proportion of Work Trips.
- Work Trips with Shorter Days = Annual Works Trips x Percent of Delayed Work Trips.
- Total Output Reduction (Loss) to El Paso/U.S. = Percent of Work Trips Offset by Local Demand x Average Wage.
- Total Output Reduction in El Paso = Loss in Labor Income in Juárez/Chihuahua.
- Distribution Output Reduction across Industries in El Paso based on relative output in 2008.
- Input Loss in Labor Income in Juárez/Chihuahua in REMI Model.

Valuation of Economic Impact of Freight Transportation

Economic impacts of freight transportation were analyzed based on changes in the following:

- Delay Cost;
- Vehicle Operating Costs; and
- Carrying cost of buffer stocks (excess inventory).

Figure 8.5 Detailed Approach to Estimate Economic Impact of Delay on Production



Detailed Steps for Estimation of Direct and Total Impacts

- Increased freight transportation cost = Border delay x (hourly crew cost + hourly vehicle operating cost).
- Average Freight Value per Truck = Annual Cross-Border Freight Value/ Annual Truck Crossings.
- Average Freight Value Delayed = Average Freight Value per Truck x Hourly Truck Crossings x Border Delay.
- Buffer Stocks = Average Freight value Delayed.
- Carrying Cost = 10% x Buffer Stocks.[19]
- Total Delay Cost = Increased Freight Transportation Cost + Carrying Cost.
- Increased Production Cost = Total Delay Cost.
- Distribution of increased production cost across industries based on relative output in 2008.
- Input increased production cost across industry into REMI Model.

[19]REM Associates.

8.2 ESTIMATION OF ECONOMIC IMPACTS

Economic impact is measured as changes in economic activity in a given region, arising from a project or a change in policy. It can be expressed in various economic variables, including sales (output), employment, and personal income (earnings). Reduction in U.S. and Mexico trade arising from border delays affect output of firms (especially export-oriented manufacturing industries) and so reduces demand for key factors of production, including labor, materials, equipment, and supporting downstream activities which are supplied by other local and nonlocal firms. This chain of activities leads to local economic contraction through lower employment, personal income, and business profits. Generally, total assessment of economic impacts comprises estimation of three impact types, namely direct, indirect, and induced.

Direct Impacts

Direct impacts associated with cross-border economic activities are the direct effects of changes in output (sales) or production cost, and spending in key economic industries, including wholesale and retail trades, manufacturing, and transportation and logistics. For instance, the direct effect of foregone shopping trips (due to border delays) is the incremental revenue loss to the cross-border retail industry.

Indirect Impacts

As business sale increases, demand for key input materials also increases in tandem, and vice versa. Therefore, the indirect impact associated with increased business sale (output) is estimated or referred to as increase in demand (purchases) for key input materials by local firms who are the direct suppliers to these businesses. For example, increased construction activities increase the demand (purchases) for steel, concrete, timber, fuel, etc. Consequently, spending on factors of production stimulate expansion of businesses downstream of the production chain. Accordingly, changes in output, employment, and income arising from these expansions are considered to be indirect impacts.

Induced Impacts

Direct and indirect impacts are the sources of induced impacts, and it normally constitutes the largest portion of total impacts. Changes in output, employment, and income, stemming from household consumption of goods and services are induced impacts. Similar to indirect impacts, increase or decrease in personal consumption also lead to increase or decrease in business sales (output). This chain of activities also translates into changes in employment, and income.

Economic Impact of Delay Associated with Personal Vehicles (POV)

Border delay increases travel time. Also, increasing travel time induces behavioral changes to travel decisions at the margin. At the current level of CBP

staffing and infrastructure capacity, border delay is expected to increase in tandem with projected volume of crossings. This will induce changes to travel decisions by trip purpose, since travelers face different trip incentives. For example, an hour increase in border delay may affect 30 percent of leisure-related trip, but not business-related trip. Also, additional one-hour increase (total of two hours) may affect 50 percent of leisure-related trips and 10 percent of business-related trips.

Economic impact of border delay arising from POVs is expected to affect the regional economy in the future. Currently, delay experienced by POVs vary by POE and range between 0.1 to 0.8 hour. This delay compares favorably with a threshold (maximum delay) of 2 hours indicated by stakeholders at various stakeholders meetings. Consequently, travels decision remain unchanged. Based on current border conditions and forecast of future traffic flow, border delay is estimated to increase in tandem with the projected increase in traffic to reach about 15 hours by 2035.

Economic Impact of Forgone Personal Trips (Shopping and Recreation) Trips Due to Cross-Border Delay

Personal trips are expected to be forgone due to projected increase in travel time by 2035. The rate of change in trips will be based on elasticity of trip purpose with respect to travel time. By 2035, 18.1 million personal vehicles (auto) trips were estimated to be forgone. The forgone trips would directly impact expenditure on consumer products and services in El Paso in the amount of $1.0 billion. Of this amount, $0.6 billion (60 percent) is associated with lost expenditure on clothing. Distribution of lost expenditure by product or service is shown in Table 8.2.

Table 8.2 Direct Impact of Forgone Shopping and Recreation on El Paso
Billions of Dollars

Items	Expenditure – 2035
Food and Beverages	0.2
Clothing	0.6
Consumer Durables	0.1
Medical Care	0.1
Total	1.0

Source: Cambridge Systematics Analysis.

The direct impacts served as inputs into REMI simulation model to estimate the total impacts. In estimating the total impact of forgone personal trips, we assumed that the lost expenditure on consumer products in El Paso by Juárez/Chihuahua residents will be spent locally (in Juárez/Chihuahua).

Total impacts of forgone personal trips showed mixed results on the regional economy, and are detailed in Table 8.3. While the regional economy showed a

0.03 percent (1,585 jobs) growth in total employment, gross regional product (GRP) or the value of economic activities in the region showed a decline of 0.03 percent ($0.08 billion) over the same period. This anomaly is explained by the projected increase in real exchange rate between the Mexican Peso and the U.S. dollar.[20] The relatively higher price level (inflation) in Mexico increases the real exchange rate, thus causing depreciation of the Peso. Depreciation of the Peso in turn reduces the value of goods and services expressed in U.S. dollars. Further details of the regional impacts are shown in Table 8.3.

Table 8.3 Regional Economic Impact of Forgone Personal Trips

Region	Economic Variable	2035	Percent Change
El Paso Region	Employment	1,585	0.03%
	GRP (Billions of Dollars)	-0.08	-0.03%
	Population	4,021	0.05%

Source: Cambridge Systematics Analysis, REMI Simulation.

Based on Table 8.4, forgone personal trips are expected to adversely affect El Paso's economy, marginally boost Dona Ana County's economy, and yield mixed results in Juárez/Chihuahua. El Paso's GRP and jobs are expected to decline by 0.1 percent ($0.04 billion) and 346 (0.07 percent), respectively. On the contrary, Dona Ana County's GRP is expected to increase marginally 0.03 percent and also generate 460 jobs over the same period. Although Juárez/Chihuahua is expected to generate 1,548 jobs (0.1 percent) over the same period, the total value of economic activities is expected to decline by 0.07 percent.

[20] Real exchange rate is defined as the nominal exchange rate adjusted by the ratio of the price level of the foreign country to the price level of the domestic country (Kesriyeli and Kipici, 1997).

Table 8.4 Distribution of Economic Impact of Forgone Personal Trips Due to Cross-Border Delay

Region	Economic Variable	2035	Percent Change
El Paso	Employment	-346	-0.07%
	GRP (Billions of Dollars)	-0.04	-0.10%
	Population	-609	-0.06%
Chihuahua	Employment	1,548	0.10%
	GRP (Billions of Dollars)	-0.06	-0.07%
	Population	3,727	0.07%
Dona Ana County	Employment	460	0.04%
	GRP (Billions of Dollars)	0.003	0.03%
	Population	64	0.02%

Source: Cambridge Systematics Analysis, REMI Simulation.

El Paso's wholesale and retail trades industry is mostly affected by the forgone personal trips. From Table 8.5, expected job loss in wholesale and retail trades industry is 3,456, followed by healthcare industry with 1,051 jobs lost by 2035. Over the study period, 1,355 and 1,564 additional jobs will be generated in financial and other services respectively. El Paso's net job loss is estimated to be 1,077 by 2035.

Table 8.5 Job Loss by Industry in El Paso Due to Forgone Personal Trips

Industry	2035
Agriculture, Forestry, and Fishing	72
Utilities	24
Construction	264
Manufacturing	128
Wholesale and Retail Trades	-3,456
Transportation and Warehousing	313
Information	77
Financial Services	1,355
Professional Services	172
Administrative Support	291
Education	389
Healthcare	-1,051
Arts, Entertainment, and Recreation	-139
Accommodation and Food Services	-681
Other Services	1,564
Public Administration	-421
Total	1,077

Source: Cambridge Systematics Analysis, REMI Simulation.

Economic Impact of Forgone Work Trips Due to Border Delay

Similar to personal trips, work trips are expected to be forgone in future, due to excessive border. Although current delay is inadequate to stimulate loss in work trips, it has marginal impact on regional productivity/output, as it causes tardiness to work. Tardiness may lead to workers working for less than the required number of hours, thus leading to loss in labor income as well as regional output. For example, a Juárez/Chihuahua resident working in El Paso may be available to work for six hours instead of the normal eight hours due to hold up at the border. This leads to loss of wage of the Juárez/Chihuahua resident, and output loss by El Paso business. In addition to tardiness, work trips are expected to be lost as delay increases above acceptable levels. Assuming nonavailability of local labor to offset lost work trips, the decline in productivity/output by industry in El Paso (arising from northbound forgone work trips) is estimated as direct impacts, and shown in Table 8.6. Similarly, southbound forgone work trips directly impact the manufacturing industry in Juárez/Chihuahua to the tune of $13.8 million.

Table 8.6 Direct Impact of Lost Work Trips by Industry Output in El Paso
Millions of Dollars

Industry	2035
Manufacturing	130
Wholesale and Retail Trades	640
Truck Transportation	150
Warehousing and Storage	10
Arts, Entertainment, and Recreation	40
Accommodation and Food Services	300

Source: Cambridge Systematics Analysis.

Delay in work-related trips is expected to have significant impact on the regional economy by 2035. REMI simulation reveals that in 2010, tardiness to work caused a loss of 0.01 percent in regional economic activities (GRP) and 0.01 percent (1,835) job loss (see Table 8.7). By 2035, tardiness in addition to lost work trips is expected to result in 0.55 percent decline in regional economic activities. This translates into loss of 27,396 jobs (0.55 percent). Additionally, the gradual decline in regional economic activities and associated job losses are expected to cause migration from the region in search for brighter economic opportunities in other regions. Consequently, a loss of 146 residents from the region in 2010 is estimated to increase to 44,346 (0.36 percent of residents) by 2035. Distribution of impacts among the subregions (El Paso, Juárez/Chihuahua, and Dona Ana County) is detailed in Table 8.8.

Table 8.7 Regional Economic Impact of Forgone Work Trips Due to Cross-Border Delay

		Year			
Region	Economic Variable	2010	Percent Change	2035	Percent Change
All Regions	Employment	466	0.01%	27,396	0.56%
	GRP (Billions of Dollars)	0.02	0.01%	1.38	0.55%
	Population	146	0.00%	44,346	0.36%

Source: Cambridge Systematics Analysis, REMI Simulation.

Table 8.8 Distribution of Economic Impact of Forgone Work Trips Due to Cross-Border Delay

		Year			
Region	Economic Variable	2010	Percent Change	2035	Percent Change
El Paso	Employment	95	0.03%	14,941	3.11%
	GRP (Billions of Dollars)	0.01	0.03%	0.94	2.55%
	Population	20	0.01%	17,179	1.8%
Chihuahua	Employment	361	0.32%	12,110	0.76%
	GRP (Billions of Dollars)	0.01	0.29%	0.42	0.5%
	Population	438	0.04%	25,961	0.66%
Dona Ana County	Employment	3	0.01%	216	0.17%
	GRP (Billions of Dollars)	0.001	0.01%	0.02	0.22%
	Population	1	0%	712	0.22%

Source: Cambridge Systematics Analysis, REMI Simulation.

Based on impacts distribution, El Paso's economy is the largest beneficiary of work trips in the region. Consequently, El Paso's economy is mostly impacted from forgone work trips (see Table 8.8). By 2035, projected value of total economic activities is estimated to decline by 2.55 percent ($0.94 billion) and associated jobs loss of 14,941 (3.11 percent). This represents 68 percent of the region's economic decline and 55 percent of regional job loss. Also, in the wake of the economic decline, 17,179 or 1.8 percent of residents are expected to migrate from El Paso. El Paso's migration constitutes 39 percent of total migration from the region. Over 50 percent of the migrants fall within the critical working-age group (age 20-44) in El Paso.

Although relatively less impacted (compared to El Paso), Juárez/Chihuahua's economy also is expected to contract due to forgone work trips. Chihuahua's regional economic activity is expected to decline by 0.5 percent of its projected value and associated loss of 12,110 jobs (0.76 percent). This represents 30 percent of regional economic decline and 44 percent of regional job loss resulting from forgone work trips. As a result of the economic contraction, 0.7 percent of

residents (equivalent of 59 percent of regional migration) are expected to migrate from Juárez/Chihuahua.

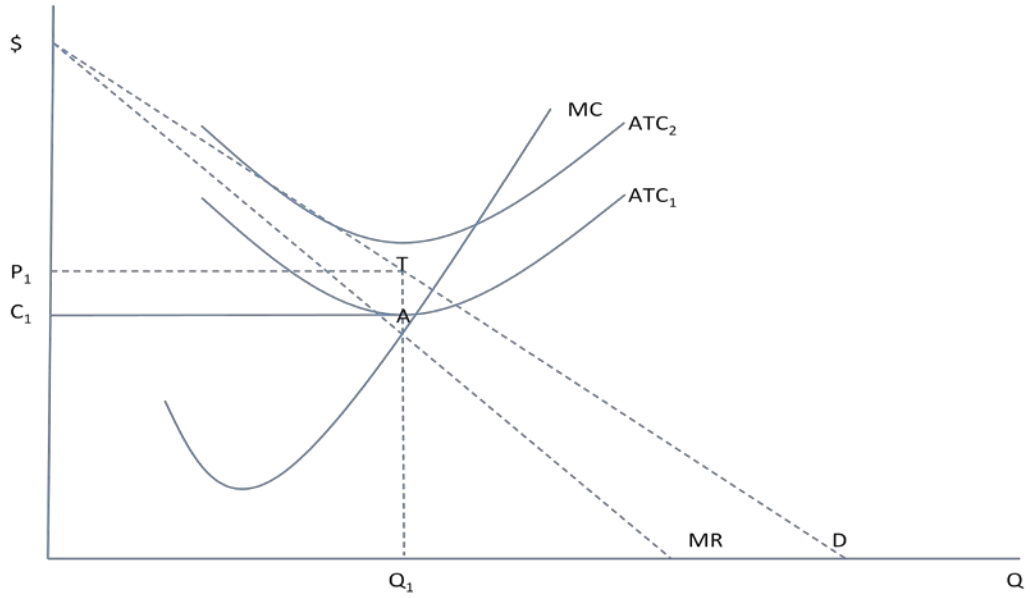
Dona Ana County's economy is the least impacted by forgone work trips in the region. Gross regional product (or value of economic activity) is expected to decline marginally by 0.2 percent and a marginal job loss of 0.17 percent in 2035. Dona Ana County's economic contraction is equivalent to 1.4 percent of regional economic contraction and 0.8 percent of job regional job loss.

8.3 ECONOMIC IMPACT OF DELAY ATTRIBUTED TO FREIGHT MOVEMENTS

Cross-border truck movements in the region are primarily freight transportation. Southbound freight movements (El Paso-Juárez/Chihuahua) consist of input material destined to production facilities in Juárez/Chihuahua, the maquiladoras, while northbound freight movements (Juárez-El Paso) consist of finished and intermediate goods destined to U.S. and international consumer markets and production facilities. Cross-border delays increase freight travel time as well as delay freight delivery, thus posing risk of input materials and finished goods shortage at the production facilities and consumer markets respectively. To avert shortage of input materials or finished goods, businesses invest in buffer stocks (excess inventory). Increased travel cost and investment in buffer stocks also increase production cost of goods-producing industries. In a competitive market, increased production cost reduces business competitiveness and profitability, especially just-in-time (JIT) industries that rely on low-inventory levels as a strategy to enhance profitability. Rising business cost may lead to economic contraction in the region as explained below.

Figure 8.6 shows the structure of a firm operating in a monopolistically competitive (imperfect competition) market. Given availability of similar products or substitutes on the market (from competitors), a monopolistically competitive firm's profit-maximizing output occurs where marginal revenue equals marginal cost (MR = MC or point B). Given demand (D), the profit-maximizing output and associated price are Q_1 and P_1, respectively. Average total cost of production at the profit-maximizing output is C_1 (read-off point A on ATC_1 curve). Therefore, profit per unit of output is determined as $P_1 - C_1$ and total profit is determined as (P1 – C1) x Q_1 or the area under the rectangle P_1TAC_1.

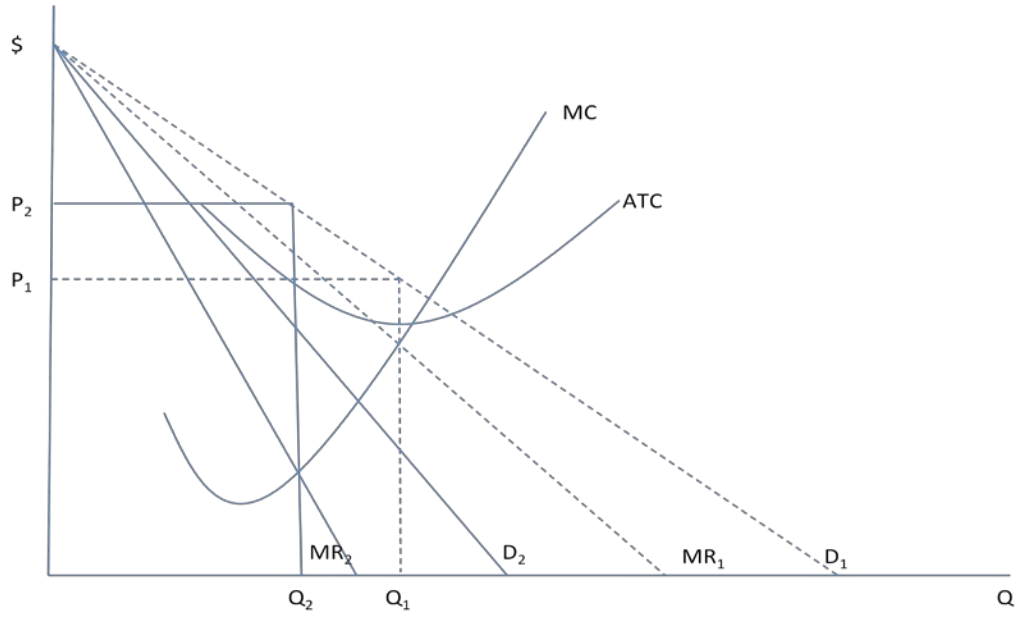
Figure 8.6 Market Structure of a Firm in Monopolistically Competitive Market (Highly Elastic Product)



Total cost comprises fixed cost plus variable cost. While fixed cost does not change, variable cost (mainly labor and input material costs) changes with level of output. Increasing variable costs, in turn, increases the total cost of production. In a highly competitive market, products are elastic so market prices are sticky or relatively stable. Therefore, for a given output level, increased variable cost (for instance, production materials or freight) leads to increased average variable cost and average total cost, thus shifting the curve ATC_1 upward (in the direction of ATC_2). The upward shift of ATC_1 reduces profit per unit output and total profit of the firm. As costs increases, the firm's optimum point of operation occurs when price equals average variable cost (P = AVC). Marginal increase in AVC (AVC > P) will lead to firm shutdown since revenue will be inadequate to cover labor and material costs.

For low-medium elastic products, increase in average total cost leads to output reduction (Figure 8.7). In this market, individual firms pass-on all or a fraction of additional costs to consumers. This increases the market price of products from P_1 to P_2. Consumers' response to the increased price reduces the demand for the firm's product (from D_1 to D_2) and consequently results in reduction in profit-maximizing output (from Q_1 to Q_2). Since the product is elastic, the additional revenue generated from increased price is inadequate of offset revenue loss associated with change in quantity demanded, thus lowering total revenue and profit. Also, reduction in output translates to job loss.

Figure 8.7 Market Structure of a Firm in Monopolistically Competitive Market (Low-Medium Elastic Product)



Based on global competitive markets and widespread JIT industries (maquiladoras), Juárez/Chihuahua and El Paso are both at risk of facing severe/harsh economic contraction arising from projected increase in cross-border delay of freight movements. The maquiladoras, located in Cuidad Juárez, State of Chihuahua, are the major good-producers and employers in the region and are just-in-time (JIT) industries. Operations and profitability of JIT industries are characterized by carrying low-inventory levels. Consequently, the increased transportation and buffer stock costs are affecting the competitiveness and profitability of maquiladoras and other businesses in the region. As delay increases over the study period, businesses will face conditions that will make shutdown eminent. However, to maximize shareholders wealth, firms will consider relocation to more competitive environments as a better option. This view already has been expressed by stakeholders in the region.

Business shutdown or relocation from Cuidad Juárez, Chihuahua will tremendously affect El Paso's economy. Approximately 14-18 top 20 input suppliers to the maquiladoras in Juárez are located in El Paso, indicating the interdependency of the good-producing sectors of both economies. Therefore, decline in goods production in Juárez will affect demand for input supplies and related services (transportation, financial services, retail, real estate, etc.) from El Paso. In the event that firms relocate from Juárez, related industries in El Paso may be virtually wiped-out. Also, significant retail expenditures in association with Juárez residents will be lost due to labor income loss in Juárez.

Direct Impact of Freight on Regional Economy

Northbound cross-border congestion has effect on timely freight delivery in the region. Although southbound (El Paso-Juárez/Chihuahua) freight movements hardly experience obstructions at the border, northbound freight movements (Juárez-El Paso) were observed to experience delay of less than 1 hour during peak periods in 2010. Northbound cross-border congestion is due to real-time demand for freight, increasing freight volume, and efficiency of U.S. Customs and Border Protection (CBP) services (thorough freight inspections). Based on the aforementioned reasons for the delay, cross-border delay is expected to increase in tandem with cross-border freight volume to estimated peak delay of 11 hours in 2035.

From the Commodity Flow and Socioeconomic Profile Technical Memorandum (provided in Appendix D), total value of northbound (Juárez-El Paso) goods movements in 2010 was $66.85 billion. Also, there were 1,040,289 northbound truck crossings in 2010. Therefore, average of value of northbound freight per truck was estimated to be $64,261. Similarly, average southbound freight value per truck was estimated as $62,834. Based on 13 percent inventory carrying cost, total freight transportation delay cost (crew, vehicle operating, and inventory carrying costs) or increase business cost for 2010 was estimated to be $0.14 billion (direct impact), as shown in Table 8.9.

Table 8.9 Direct Impact by Industry of Attributed to Cross-Border Delay of Freight Transportation
Billions of Dollars

Industry	2010	2035
Agriculture and Forestry	0.35	150
Mining (except Oil and Gas)	3.95	1,713
Supporting Activities for Mining	0.83	358
Manufacturing		
Food	7.94	3,440
Beverage and Tobacco	6.52	2,882
Textile	1.11	484
Apparel	2.63	1,140
Leather and Allied Products	0.30	131
Wood Products	2.90	1,259
Paper	3.81	1,649
Printing	0.96	418
Plastics and Rubber Products	5.18	2,242
Nonmetallic Mineral Products6	5.17	2,240
Primary Metal Manufacturing	4.44	1,925
Fabricated Metal Products	2.26	977
Machinery	2.36	1,021

Industry	2010	2035
Computer and Electronic Products	45.30	19,614
Electrical Equipment	25.89	11,208
Transportation Equipment	14.24	6,164
Total	136.18	58,956

Source: Cambridge Systematics Analysis.

From Table 8.10, delay in freight movements is expected to contract the regional economy by $54 billion (and 0.86 million job losses) between 2010 and 2035. In 2010, the region lost $0.1 billion (or 0.07 percent) in economic activities. This translated into loss of 2,551 jobs (or 0.07 percent). As volume of cross-border crossings increases, associated border delay is expected to cause further economic contraction to $54.4 billion (21.8 percent) and 0.86 million (17.5 percent) job losses in 2035. As the regional economy contracts and economic opportunities diminish, approximately 1.8 million residents are likely to migrate from the region over the same period. Distribution of the impacts across the region is indicated in Table 8.11.

Table 8.10 Total Regional Economic Impacts Attributed to Delay of Cross-Border Freight Movements

	Economic Variables	2010	Percent Change	2035	Percent Change
All Regions	Employment	2,551	0.07%	856,668	17.54%
	GRP (Billions of Dollars)	0.09	0.07%	54.40	21.86%
	Population	1,139	0.01%	1,824,826	14.65%

Source: Cambridge Systematics Analysis, REMI Simulation.

Table 8.11 Distribution of Regional Economic Impacts Attributed to Delay of Cross-Border Freight Movements

	Economic Variables	2010	Percent Change	2035	Percent Change
El Paso	Employment	371	0.11%	144,617	30.11%
	GRP (Billions of Dollars)	0.02	0.10%	12.38	33.70%
	Population	124	0.02%	218,064	22.80%
Juárez/Chihuahua	Employment	2,013	0.17%	666,205	41.64%
	GRP (Billions of Dollars)	0.06	0.16%	39.80	46.95%
	Population	933	0.03%	1,470,421	37.95%
Dona Ana County	Employment	31	0.03%	12,801	9.81%
	GRP (Billions of Dollars)	0.001	0.03%	1.06	11.98%
	Population	12	0.01%	29,940	9.27%

Source: Cambridge Systematics Analysis, REMI Simulation.

Economic Impact of Freight Movements on Juárez/Chihuahua

From Table 8.11, Juárez/Chihuahua's economy is the largest beneficiary of cross-border freight movements in the region. As a result, bottlenecks in cross-border freight movement mostly affect Juárez/Chihuahua compared to other sub-regions. Cross-border freight delays are expected to cause economic contraction valued at approximately $40 billion in Juárez/Chihuahua over the study period. In 2010, Juárez/Chihuahua's economy contracted by $0.06 billion or 0.16 percent of expected economic activity, equivalent to 67 percent of the regional contraction 2010. By 2035, further economic contraction of $39.8 billion, approximately 47 percent of projected economic activities in Juárez/Chihuahua and 73 percent of projected regional economic contraction, is expected due to increasing cross-border delay.

Juárez/Chihuahua's economic contraction is expected to result in a net loss of 664,192 jobs over the study period. In 2010, Juárez/Chihuahua lost a total of 2,013 jobs, representing approximately 0.17 percent jobs in Juárez/Chihuahua and 79 percent of total regional job loss in 2010. Further economic contraction is expected to increase job loss to about 0.67 million by 2035. This represents 42 percent loss in estimated jobs in Chihuahua and 77.7 percent of job loss in the region. In Juárez/Chihuahua, construction and manufacturing industries are mostly affected by the economic contraction with 168,369 and 210,400 job losses respectively, as detailed on Table 8.12.

Table 8.12 Job Loss by Industry in Juárez/Chihuahua Due to Cross-Border Delay in Freight Movements

Industry	2010	2035
Agriculture, Forestry, and Fishing	79	27,251
Mining	9	10,856
Utilities	12	3,031
Construction	539	168,639
Manufacturing	684	210,400
Wholesale and Retail Trades	235	63,205
Transportation and Warehousing	103	33,810
Information	19	3,631
Financial Services	10	3,047
Professional Services	21	9,110
Administrative Support	66	28,102
Education	39	23,397
Healthcare	29	12,317

Industry	2010	2035
Arts, Entertainment, and Recreation	4	1,251
Accommodation and Food Services	35	11,036
Other Services	122	47,985
Public Administration	9	9,137
Total	2,013	666,205

Source: Cambridge Systematics Analysis, REMI Simulation.

Over the study period, about 1.47 million or 38 percent of population are expected to migrate from Juárez/Chihuahua, representing 80 percent of total migration in the region. The expected migration will affect the labor strength of Juárez/Chihuahua, as approximately 51 percent of migrants are in the critical working-age group (age 20-44 cohorts) and critical working-age group and their families constitute over 70 percent of the migrants (Table 8.13).

Table 8.13 Migration by Age Cohort from Juárez/Chihuahua Due to Economic Impact of Freight Movements

Age Cohorts	2010	2035
0-4	119	152,276
5-9	80	148,146
10-14	121	139,742
15-19	195	141,367
20-24	165	152,574
25-29	102	166,831
30-34	60	171,733
35-39	36	147,605
40-44	22	101,814
45-49	15	61,895
50-54	9	36,825
55-59	5	22,127
60-64	4	13,401
65-69		7,750
70-74		3,988
75-79		1,752
80-84		539
85+		55
Total	3,217	1,470,421

Source: Cambridge Systematics Analysis, REMI Simulation.

Economic Impact of Freight Movement on El Paso

As home to major input suppliers to the manufacturing industry in Juárez/Chihuahua, El Paso's economy is severely affected by cross-border delay in freight movements. Over the study period, El Paso's economy is expected to contract by $12.3 billion. In 2010, El Paso's economy contracted by $0.02 billion and it is expected to contract further to $12.4 billion or 33.7 percent of projected value of economic activities in 2035. This represents 33.7percent decline in El Paso's economic activity and 23 percent of total regional economic contraction.

El Paso's economic contraction is expected to translate into loss of 144,246 jobs over the study period. In 2010, El Paso lost 371 jobs (or 0.11 percent of total jobs). As border congestion exacerbates, job loss is expected to increase to 144,617 by 2035, equivalent to 30 percent decline in projected jobs in El Paso and 17 percent of total regional job loss. From Table 8.14, construction and wholesale and retail trades are the private-sector industries mostly affected by job loss arising from the economic contraction.

Table 8.14 Job Loss by Industry in El Paso Due to Delay in Cross-Border Freight Movements

Industry	2010	2035
Agriculture, Forestry, and Fishing	3	778
Mining	0	18
Utilities	1	343
Construction	60	18,710
Manufacturing	20	9,473
Wholesale and Retail trades	73	19,562
Transportation and Warehousing	13	4,361
Information	5	1,112
Financial Services	35	11,638
Professional Services	15	6,813
Administrative Support	35	14,752
Education	4	2,412
Healthcare	27	12,026
Arts, Entertainment, and Recreation	5	1,657
Accommodation and Food Services	25	9,555
Other Services	27	11,073
Public Administration	19	20,333
Total	371	144,617

Source: Cambridge Systematics Analysis, REMI Simulation.

In response to the regional economic downturn, around 218,064 El Paso residents are expected to migrate to other parts of the United States to seek better economic opportunities. El Paso lost 124 residents or 0.02 percent of its residents in 2010, representing 11 percent of regional migration in 2010. Further contraction of the economy will cause further migration of 218,064 residents, representing 23 percent of projected population and 12 percent of regional migration in 2035. The estimated migration will erode the labor base of El Paso, as about 49 percent of the migrants are in the critical working-age group (age 20-44). Also, critical working-age group and their families constitute over 70 percent of the migrants (Table 8.15).

Table 8.15 Migration by Age Cohort from El Paso Due to Delay in Cross-Border Freight Movements

Age Cohorts	2010	2035
0-4	16	26,923
5-9	11	24,740
10-14	16	22,033
15-19	26	21,452
20-24	22	22,483
25-29	14	23,729
30-34	8	23,470
35-39	5	19,726
40-44	3	13,552
45-49	2	8,277
50-54	1	4,957
55-59	1	2,994
60-64		1,826
65-69		1,050
70-74		533
75-79		234
80-84		76
85+		9
Total	-8,910	218,064

Source: Cambridge Systematics Analysis, REMI Simulation.

Economic Impact of Freight Movement on Dona Ana County

Dona Ana County's economy is the least beneficiary of cross-border freight, hence the least impacted by cross-border freight delays in the region. Dona Ana County's economy is expected to contract by $1.06 billion, equivalent to a 12

percent decline in Dona Ana County's economic activity and 2 percent of regional economic contraction over the study period.

Net job loss in Dona Ana County is estimated to be 12,771 jobs or 9.8 percent of estimated jobs in the County and 1.5 percent of total regional job loss. From Table 8.16, construction (jobs) and manufacturing (jobs) industries are the private sector industries most affected by the job loss. Financial services follow with 1,349 jobs.

Table 8.16 Job Loss by Industry in Dona Ana County Due to Delay in Cross-Border Freight Movements

Industry	2010	2035
Agriculture, Forestry, and Fishing	4	870
Utilities	0	25
Construction	5	1,699
Manufacturing	1	429
Wholesale and Retail Trades	5	1,286
Transportation and Warehousing	0	271
Information	0	74
Financial Services	2	883
Professional Services	2	872
Administrative Support	2	699
Education	0	214
Healthcare	3	1,606
Arts, Entertainment, and Recreation	1	354
Accommodation and Food Services	2	645
Other Services	1	740
Public Administration	2	2,135
Total	31	12,801

Source: Cambridge Systematics Analysis, REMI Simulation

Due to the economic contraction, 29,928 (9.2 percent) residents or 1.6 percent of total regional residents are expected to migrate from Dona Ana County between 2010 and 2035. Of this total, the critical working-age group and their family constitute over 72 percent of the migrants (Table 8.17). This will erode the labor strength of the County and the long-term recovery of the relatively slow-growth economy.

Table 8.17 Migration by Age Cohort from Dona Ana County Due to Delay in Cross-Border Freight Movements

Age Cohorts	2010	2035
0-4	2	3,254
5-9	1	3,056
10-14	2	2,832
15-19	3	3,031
20-24	2	3,422
25-29	1	3,611
30-34	1	3,423
35-39		2,751
40-44		1,846
45-49		1,124
50-54		676
55-59		409
60-64		249
65-69		143
70-74		72
75-79		31
80-84		9
85+		1
Total	43	29,940

Source: Cambridge Systematics Analysis, REMI Simulation.

8.4 ECONOMIC IMPACT OF RELIABILITY OF FREIGHT MOVEMENTS

Unreliability in freight delivery poses additional cost to businesses. In addition to average delay, commercial vehicles intermittently experience unexpected delays at the POE. Computer glitches, thorough freight inspection, and severe congestion are some of the reasons for unexpected delays. These lead to interruption in freight flow to either consumer markets or production facilities. Consequently, businesses risk shortage of finished goods on the market or input materials at the production facilities. The impact of unreliability of freight delivery is severe on production facilities, especially JIT industries, since shortage of input materials could lead to production shutdown. In response to increasing unreliability in freight delivery, businesses will further increase investment in buffer stocks. This additional investment further increases production cost and affects competitiveness and profitability of businesses in the region. To illustrate

the effect of production loss on businesses, Delphi Corporation has been selected for the analysis.

Case Study – Delphi

Delphi Corporation is a leading global supplier of automotive parts and components headquartered in Troy, Michigan. The company maintains facilities in 30 countries and employs nearly 150,000 people worldwide, with 42,000 in Mexico alone. Delphi has a significant presence in Juárez with its Mexico Technical Center, eight manufacturing sites, and a total of 12,000 employees. Delphi makes extensive use of El Paso's Ports of Entry to support these operations. Currently, about 700 northbound trucks cross the El Paso/Juárez bridges each week, amounting to around 35,000 trucks per year.

Delphi is 11 percent the size of transportation equipment manufacturing industry in Juárez/Chihuahua. Assuming similar technology and productivity across industry, Delphi's value-added services in 2010 is estimated to be $0.66 billion. For eight-hour daily operations, Delphi's hourly value-added service is estimated to be $320,000. This means that an hour of production shutdown or interruption will cost $320,000 in wages, income, and other forms of compensation. To regain lost production time, Delphi will have to extend operations by an hour and also pay 50 percent premium on wage, etc. (overtime). This raises the total cost of an hour of production shutdown to approximately $475,000. By 2035, an hour of production shutdown is estimated to cost $943,000, an increase of 98.5 percent.

8.5 PROPOSED INTERVENTIONS TO REDUCE CROSS-BORDER WAIT TIMES

It is evident from the previous section that the increasing border wait time will have a long-term adverse impact on the regional economy. As a result, the project team developed and evaluated the operational impacts of the 22 scenarios listed in Section 5.0. After initial screening, the following seven scenarios demonstrated the most promise for reducing wait times at the ports of entry and improving system operations:

- Scenario 1 – Extend hours of operation at all commercial crossings;
- Scenario 3 – Extend commercial hours of operation at Santa Teresa only;
- Scenario 4 – Extend commercial hours of operation at BOTA only;
- Scenario 5 – Fully staff front line officers at all existing booths at all crossings during period of high demand;
- Scenario 11 – Implement the Border Traveler and Cargo Information system;

- Scenario 16D – Establish Zaragoza as a "commercially preferred" crossing; and
- Combination of all scenarios above.

As described in the following sections, we estimated the potential economic impacts of these individual scenarios.

8.6 EVALUATION METHODOLOGY

We used an economic impact analysis (utilized to assess the economic impact of the "no-build" scenario) to evaluate the most promising improvement scenarios. Based on this approach, the scenario with the least estimated adverse economic impact is viewed as the "best" scenario.

Our economic analysis used estimated delays (described in Section 8.1) to estimate direct impacts across industry and input into REMI Model for simulation.

8.7 RANKING OF SCENARIOS BASED ON ECONOMIC IMPACTS ON REGIONAL ECONOMY

Using the REMI simulation model, we tested each of the recommended scenarios individually to determine the economic impact of the operational improvements. We then combined all of the scenarios together to determine their collective impacts on the regional economy. The relative rankings of these scenarios are shown in Table 8.18. REMI simulations of direct impacts indicate that the "combined" scenario has the least adverse impact on the regional economy and is ranked as the most attractive improvement alternative.

Table 8.18 Ranking of Proposed Interventions Based on Economic Impacts

Scenario	Rank
Combined Combination of all recommended scenarios	1
16D – Establish Zaragoza as a "commercially preferred" crossing	2
5 – Fully staff front line officers at all existing booths at all crossings during period of high demand	3
4 – Extend commercial hours of operation at BOTA only	4
1 – Extend hours of operation at all commercial crossings	5
3 – Extend commercial hours of operation at Santa Teresa only	6
11 – Implement the Border Traveler and Cargo Information system	7

Source: Cambridge Systematics Analysis.

Summary of economic impacts for individual scenarios are shown in Tables 8.19 to 8.25.

Table 8.19 Economic Impact of Scenario 1
Extend Hours of Operation at All Commercial Crossings

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	1,572	0.04%	758,266	15.33%
GRP (Billions of Dollars)	0.05	0.04%	47.75	19.20%
Population	729	0.01%	1,558,343	12.50%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Table 8.20 Economic Impact of Scenario 3
Extend Commercial Hours of Operation at Santa Teresa Only

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	841	0.02%	759,676	15.56%
GRP (Billions of Dollars)	0.03	0.02%	47.9%	19.25%
Population	325	0.01%	1,568,543	12.59%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Table 8.21 Economic Impact of Scenario 4
Extend Commercial Hours of Operation at BOTA Only

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	2,718	0.07%	749,562	15.35%
GRP (Billions of Dollars)	0.1	0.08%	46.95	18.86%
Population	1,213	0.01%	1,514,758	12.16%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Table 8.22 Economic Impact of Scenario 5
Fully Staff Front Line Officers at All Existing Booths at All Crossings during Period of High Demand

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	841	0.02%	742,631	15.21%
GRP (Billions of Dollars)	0.03	0.02%	46.55	18.70%
Population	325	0.01%	1,502,463	12.06%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Table 8.23 Economic Impact of Scenario 11
Implement the Border Traveler and Cargo Information System

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	1,572	0.04%	843,791	17.28%
GRP (Billions of Dollars)	0.05	0.04%	53.55	21.51%
Population	729	0.01%	1,789,262	14.37%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Table 8.24 Economic Impact of Scenario 16D
Establish Zaragoza as a "Commercially Preferred" Crossing

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	4,751	0.13%	672,627	13.77%
GRP (Billions of Dollars)	0.17	0.13%	41.85	16.81%
Population	2,028	0.02%	1,311,879	10.53%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Table 8.25 Economic Impact of All Scenarios Combined

Economic Variables	2010	Percent Change	2035	Percent Change
Employment	1,304	0.03%	629,128	12.88%
GRP (Billions of Dollars)	0.05	0.03%	38.50	15.47%
Population	568	0.01%	1,151,428	9.24%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

8.8 COMPARISON OF COMBINED AND NO-BUILD SCENARIOS

Although the combined scenario is viewed as the best improvement scenario, it does not provide a significant recovery of the regional economy. Relative to economic impact of "no-build" scenario, implementation of the combined scenario is expected to recover regional economic activity by $16 billion (or 6.4 percent) in 2035 (Table 8.26). Economic analysis of the "no-build" scenario indicates that $54 billion in economic activity will be lost by 2035. However, investment in combined scenario is expected to lower the economic loss to $38.5 billion. About 73 percent ($11.5 billion) of the recovered regional economic activity is expected to accrue to Juárez/Chihuahua, Mexico, while 23 percent accrues to El Paso (Table 8.27). Consistent with earlier findings, Juárez/Chihuahua is the most beneficiary of benefits associated with this investment.

Table 8.26 Economic Impacts Comparison
No-Build and Combined Scenario

	No-Build		Combined Scenario		Change (No-Build – Combined Scenario)	
Economic Variables	2035	Percent Change	2035	Percent Change	2035	Percent Change
Employment	856,668	17.54%	629,128	12.88%	227,540	4.66%
GRP (Billions of Dollars)	54.40	21.86%	38.50	15.47%	15.90	6.39%
Population	1,824,826	14.65%	1,151,428	9.24%	673,398	5.41%

Source: Cambridge Systematics Analysis, REMI Simulation Results.

Similarly, the combined scenario is expected to recover 4.7 percent of jobs (227,540 jobs) relative to the "no-build" scenario in the region by 2035. Regional job loss associated with the combined scenario in 2035 is estimated to be 629,128 (or 12.88 percent), down from 856,668 (or 17.5 percent) job loss in the case of "no-build" scenario. About 76 percent (172,251 jobs) of total jobs recovered accrues to Juárez/Chihuahua. El Paso accounts for about 19 percent (42,223 jobs) and the remainder accrues to Dona Ana County.

Table 8.27 Regional Distribution of Economic Impacts

		No-Build		Combined Scenario		Change (No-Build – Combined Scenario)	
	Economic Variables	Number	Percent Change	2035	Percent Change	Number	Percent Change
El Paso	Employment	144,617	30.11%	102,594	21.36%	42,223	8.75%
	GRP (Billions of Dollars)	12.38	33.70%	8.71	23.73%	3.67	9.97%
	Population	218,064	22.80%	134,366	14.05%	83,698	8.75%
Juárez/Chihuahua	Employment	666,205	41.64%	493,954	30.88%	172,251	10.76%
	GRP (Billions of Dollars)	39.80	46.95%	28.26	33.33%	11.54	13.62%
	Population	1,470,421	37.95%	935,579	23.88%	534,842	14.07%
Dona Ana County	Employment	12,801	9.81%	8,704	6.67%	4,097	3.14%
	GRP (Billions of Dollars)	1.06	11.98%	0.70	7.93%	0.36	4.05%
	Population	29,940	9.27%	17,825	5.52%	12,115	3.75%

Source: Cambridge Systematics Analysis, REMI Simulation.