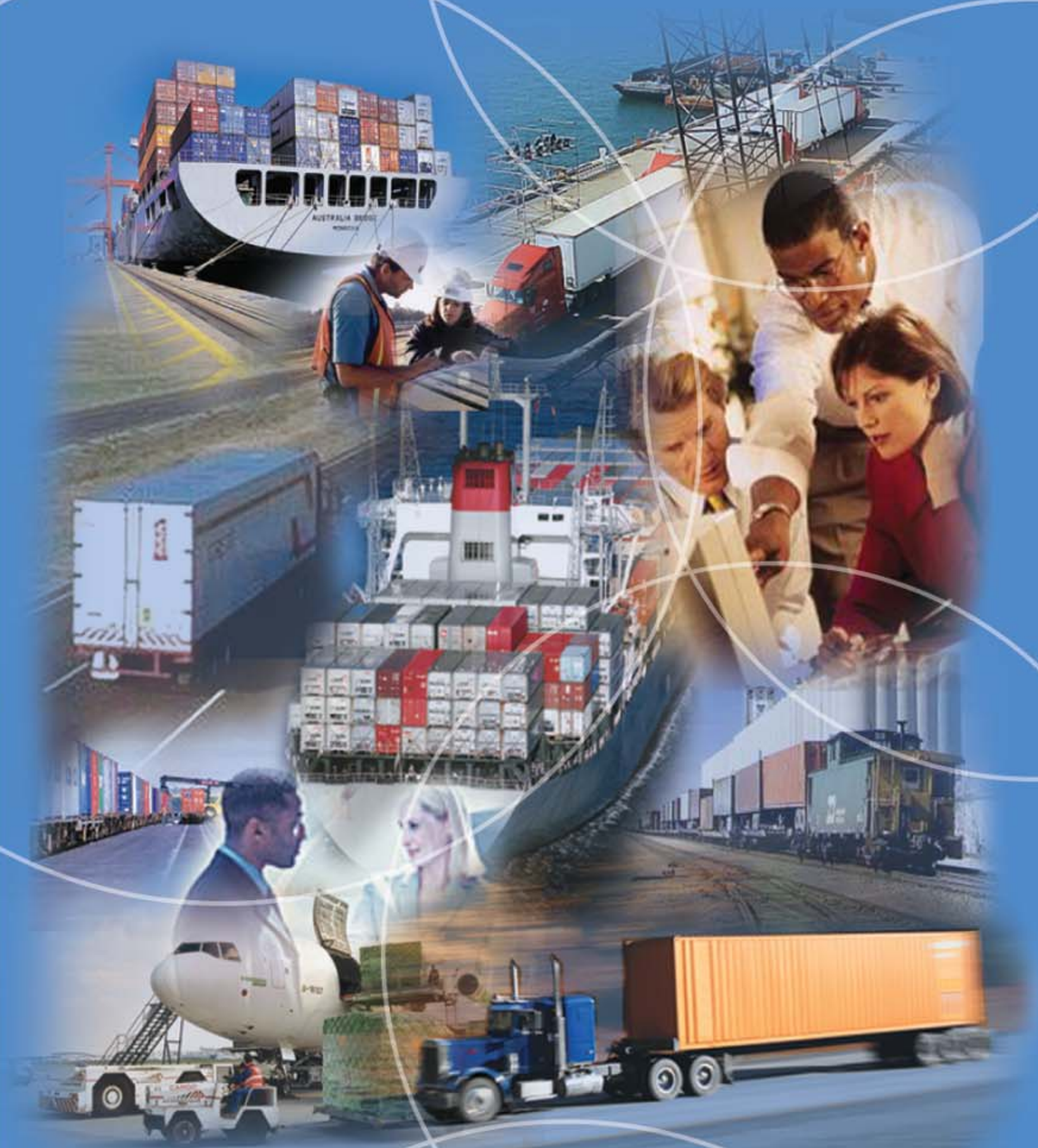
The National I-10 Freight Corridor Study

Summary of Findings, Strategies and Solutions



Final Report

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May 6, 2003

Ms. Dilara Rodriguez
Chair, Technical Advisory Committee
California Department of Transportation
Planning Division
801 S. Grand Avenue - 15th Floor
Los Angeles, CA 90017

RE: National I-10 Freight Corridor
TxDOT Contract No. 50-145P5029

Dear Ms. Rodriguez:

We are pleased to submit this final report, which was prepared for the Technical Advisory Committee in accordance with our contract with the Texas Department of Transportation (TxDOT) for the National I-10 Freight Corridor Study.

This final report, which is the last of seven reports to be prepared for this study, presents the final recommendations for the National I-10 Freight Corridor Study.

Sincerely,

WILBUR SMITH ASSOCIATES

Arnoldus Hart, Vice President
Economics, Freight and Project Finance

FINAL REPORT

Summary of Findings, Strategies and Solutions

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Acknowledgements

We wish to recognize the contributions made by the members of the Steering Committee and the Technical Advisory Committee.

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Project Overview

This study was a joint effort by eight state Departments of Transportation (DOTs) including California, Arizona, New Mexico, Texas, Louisiana, Mississippi, Alabama, and Florida. The objectives of the study were to:

1) Assess the importance of freight moving on Interstate-10 to the economy of the Corridor States and to the rest of the nation;

2) Identify current and future traffic operations and safety problems along the I-10 Corridor which impede freight flow;

3) Identify and evaluate strategies, including intermodal multimodal strategies, needed to facilitate freight flow within the Corridor.

Summary of Study Findings

Freight transportation is central to the performance of the U.S. economy, and a key contributor to U.S. competitiveness in the global marketplace. States are responsible for building, maintaining and operating the highways that carry the bulk of the nation's freight - nearly 80 percent of all domestic tonnage and 60 percent of inter-city ton miles. Continuing investment in highways is fundamental to maintaining the efficiency of nation's freight transportation system.

An analysis of the economic value from trade transported along the I-10 Corridor estimated total impacts in 2000 to be $1.38 trillion, of which $339.4 billion was paid to approximately 10.4 million employees. The results indicated average earnings per job of approximately $32,500.

The continuing trend toward a service economy where reliability is essential, will increase the volume of freight traffic on highways at a projected pace of nearly twice that of automotive traffic by 2025. Worsened highway congestion and capacity constraints impose costs on producers and consumers, and worsen conditions for the traveling public.

Highways are essential to the efficiency of the other freight transportation system elements, including ports, inland waterways and railroads. Investments in high volume transportation corridors must integrate intermodal and multimodal considerations to guarantee an optimal distribution of freight and minimize the burden on highways.

Increasing capacity in high volume corridors is the single best method for lowering highway congestion. Moreover, providing capacity works best when incorporating technologies such as ITS/CVO, as well as innovations in automated truck separation employing mass flow techniques to enhance freight productivity.

Increasing funding is essential to guaranteeing that freight continues moving on highways as efficiently as possible. Separating traffic streams offers an opportunity for increasing funding options. Increased funding requires collaboration between government and business.

Issues related to the demand for freight transportation transcend urban and state jurisdictions. The implementation of solutions, both traditional capacity enhancements as well as innovative technology solutions, will require State/State and/or State/Federal partnerships, as well as partnerships with the private sector.

The decision process for funding improvements should be based, in part, on a system of strategic gateways and corridors that facilitate the movement of freight and people, with recognition of jurisdictions that bridge high volume transportation corridors.

Public Involvement

During the study the consultant team worked with the state partners to identify opportunities for gathering public and stakeholder input. This public participation program included:

- **Web Site** – A web site was developed to provide project information and solicit comments to the project team: http://www.i10freightstudy.org
- **Stakeholder Meetings** – Early in the study, meetings were conducted with elected officials, transportation agencies, freight interests, and others with an interest in the study.
- **Newsletters** – Periodic newsletters updated information to stakeholders and elected officials.
- **Video and Brochure** – A video and brochure providing an overview of freight trends and the Nation I-10 Freight Study were developed.
- **Special Presentations** – Presentations were made to organizations and stakeholder groups on request throughout the course of the study.

Continuing Efforts of the I-10 Partnership

The I-10 Partnership currently presents the best means for coordination between member states, and other outside entities. As a result, the I-10 Partnership will continue efforts to:

- Highlight the role of transportation in economic prosperity and expansion.
- Make the case for increased nationwide investment in transportation across all modes.
- Develop and implement a consensus ITS architecture.
- Help shape the FSHRP (Future Strategic Highway Research Program) agenda by working for the inclusion of strategies to improve truck traffic flows.
- Play a role in coordinating investments along the I-10 Corridor with an increased emphasis on jurisdictions that bridge the Corridor.

Introduction

The purpose of the National I-10 Freight Corridor Study (I-10 Study) is to provide the state DOTs along the Corridor with a clear set of options for accommodating traffic growth, specifically freight related traffic. The Study identified a variety of freight oriented strategies, evaluated their feasibility, and is recommending a menu of the most viable options.

The purpose of this summary report is to outline results from the I-10 Corridor analysis. Details from the analysis are provided in *Technical Memorandum 6,* and appendices. This summary report is presented in three sections. The first section provides base case (existing) conditions along the Corridor, and identifies anticipated transportation needs and issues along I-10 as the result of continued transportation growth. The second section summarizes the study's analysis of a range of traditional and freight specific solutions to capacity problems on the corridor. The first two sections set the stage for the third section outlining strategies for implementing freight specific solutions along high-demand corridors like I-10.

Background

The DOTs in the eight states traversed by I-10 came together as partners to conduct this comprehensive evaluation of the entire corridor system. The study addresses the need to facilitate goods movement along the Corridor, and assesses the feasibility of transportation improvements across a broad range of options. Each of the eight states delegated representatives to an executive level Steering Committee to direct the study, and a Technical Advisory Committee (TAC) oversaw the conduct of the study.

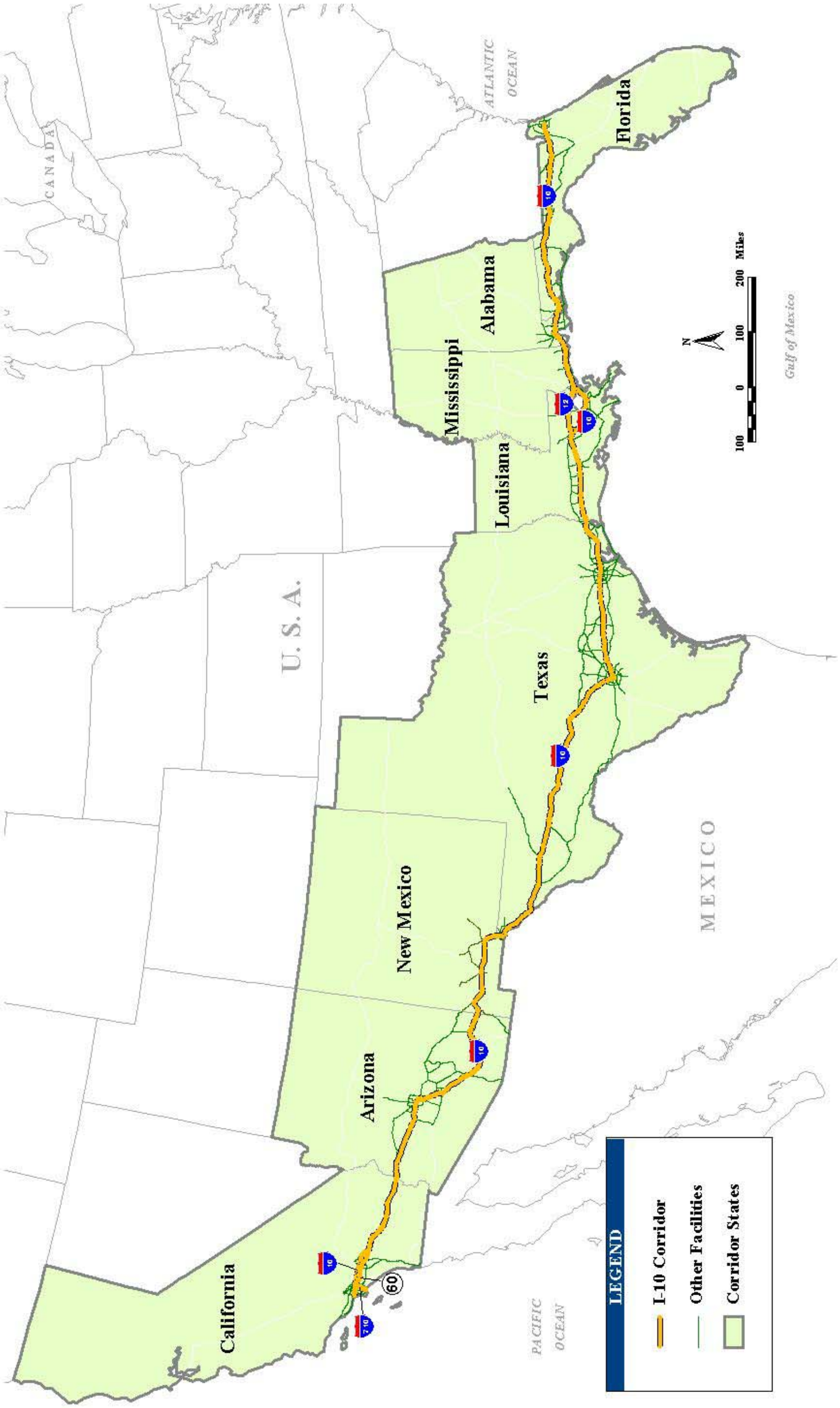
Although the study focused on ways to enhance freight movement speed and reliability, congestion affects all communities and people within the I-10 Corridor. The results of the I-10 Study suggest that the strategies examined be phased-in beginning in 2003 and continued until 2025.

Study Area

The Study Area for the I-10 Corridor includes the following (see map on the following page):

- All 8 states along the Corridor (CA, AZ, NM, TX, LA, MS, AL, FL)
- All 15 major urban areas along the Corridor
- The Interstate-10 facility network, coast-to-coast (including I-710, SR 60 and I-12)
- Relevant portions of major National Highway System (NHS) facilities connecting to I-10
- Relevant portions of urban freeways connecting to the I-10
- All intermodal facilities that influence I-10 (ports, airports, rail, etc.)

Exhibit 1
Study Area



Base Case Conditions Along the Corridor

The base case refers to corridor operating conditions for the years 2000, 2008, 2013 and 2025 given existing characteristics with no future improvements. The base case provides conditions against which improvement scenarios are compared. The reference for defining the base case corridor conditions used for analysis in this study is largely the Highway Performance Monitoring System (HPMS) and the Freight Analytical Framework (FAF), both from the Federal Highway Administration (FHWA).

Traffic along the I-10 Corridor is expected to grow significantly by 2025, with growth in truck travel outpacing automotive travel growth by a factor of nearly 2 to 1. According to the HPMS, **automotive travel along the Corridor is expected to grow by 62%**, while **truck traffic is expected to grow by 118%** along the Corridor, according to domestic and international freight transportation forecasts produced by the FAF.

The base case conditions for the Corridor are described using the following measures:

- Capacity Deficiency - miles at deficient Levels of Service (LOS)
- Truck and car speeds for trips along the I-10 Corridor
- Number of lanes needed to meet acceptable LOS

Measuring Capacity Deficiency

One of the key measures used for this study is the Level of Service (LOS). LOS is defined in the Highway Capacity Manual and uses a scale A (best) through F (worst). For the purposes of this study, the acceptable LOS is D or better in urban areas, and C or better in rural areas. It should be noted that some DOTs along the Corridor may use different standards for minimum tolerable levels of service than the standard used in this study. The I-10 Corridor is more than 2,600 miles long of which approximately 1,900 miles are rural and 721 are urban. According to our analysis, the Corridor currently has approximately 400 miles operating at an unacceptable LOS, with nearly two-thirds of the deficient mileage classified as urban. By 2025, the deficient mileage will reach approximately 1,500 miles, with two-thirds of the deficient mileage now rural miles.

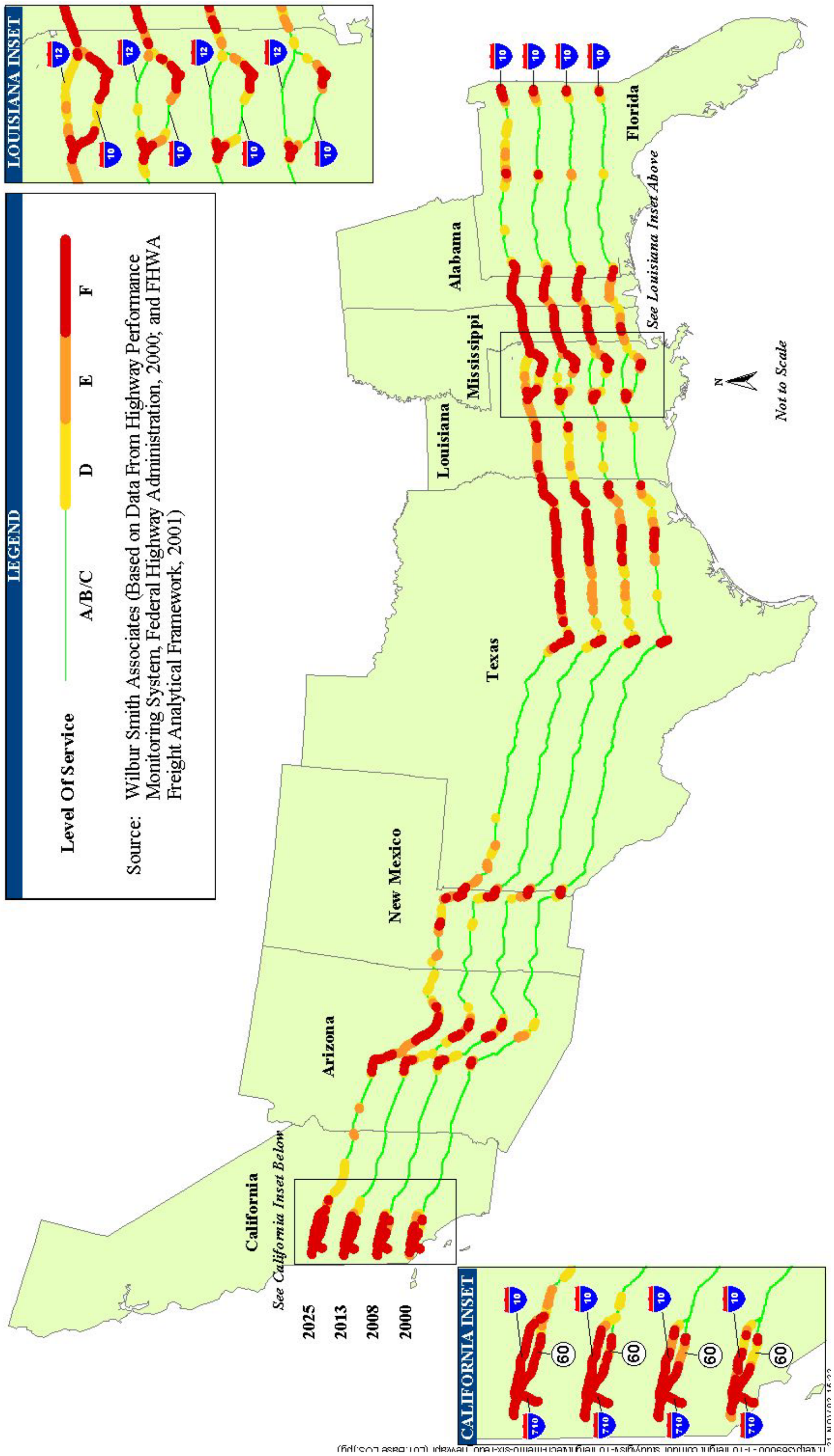
Exhibit 2
Year 2000-2025 Deficient Mileage

State	Length (Miles)	Existing Lane Miles	Deficient Mileage			
Functional Class			2000	2008	2013	2025
Rural Interstate	1,928.8	7,851.3	154.0	283.2	452.1	981.4
Urban Interstate	721.2	4,316.6	244.3	357.8	408.4	538.9
TOTAL	**2,650.0**	**12,167.9**	**398.3**	**641.0**	**860.5**	**1520.3**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

The following map illustrates the geographic distribution of deficient miles along the Corridor.

Exhibit 3 - Level of Service



Estimated Impacts on Speed and Delay

As the LOS along the Corridor declines, the level of congestion increases, and travel speeds decline. Operating speeds along the Corridor are expected to drop significantly over the forecast period, translating into significant delay for freight and passengers. Average truck speeds (average speed over 24 hours) are expected to fall by over 15% by 2025, and as much as 37% during peak hours, resulting in an equivalent of **227.5 million annual truck hours of delay,** an annual cost of **$5.69 billion.**[1] The greatest impact is in urban areas, which will see a 46% drop in speeds for trucks. And while the percentage drop in speeds for cars is expected to be almost the same in terms of percentage drop, **the estimated delay for cars is in excess of 837.9 million annual vehicle hours,** an annual cost of **$14.87 billion.**

Exhibit 4
Year 2000-2025 Truck Speeds

State	2000 Truck Speed (MPH)		2008 Truck Speed (MPH)		2013 Truck Speed (MPH)		2025 Truck Speed (MPH)	
Functional Class	Daily Average	Peak Hour	Daily Average	Peak Hour	Daily Average	Peak Hour	Daily Average	Peak Hour
Rural Interstate	60.9	58.6	60.9	55.2	60.8	52.5	59.9	44.1
Urban Interstate	52.3	26.1	47.4	23.7	43.9	21.9	35.7	18.1
TOTAL	**58.3**	**43.4**	**56.4**	**40.3**	**55.0**	**37.9**	**50.4**	**31.7**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 5
Year 2000-2025 Car Speeds

State	2000 Car Speed (MPH)		2008 Car Speed (MPH)		2013 Car Speed (MPH)		2025 Car Speed (MPH)	
Functional Class	Daily Average	Peak Hour	Daily Average	Peak Hour	Daily Average	Peak Hour	Daily Average	Peak Hour
Rural Interstate	65.4	62.8	65.4	58.8	65.3	55.6	64.2	45.8
Urban Interstate	55.6	27.6	50.4	25.1	46.7	23.2	37.8	19.2
TOTAL	**62.4**	**46.3**	**60.4**	**42.9**	**58.8**	**40.2**	**53.8**	**33.3**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

The Impact of Freight Flows on Congestion

With an increasing focus on freight and intermodal transportation, the I-10 Coalition directed this study to evaluate the feasibility of freight specific strategies for improving transportation along the I-10, and any other major corridor like the I-10 elsewhere in the country. The underlying purpose was to address a basic question: Absent new construction, can a freight specific strategy, or combination of strategies, can help improve congestion along a given corridor?

[1] Note: Estimated truck delay costs presented in this report are conservative, with an average value of approximately $25 per hour utilized. Recent TRB-FHWA studies suggest that carriers on average value savings in transit time at between $144 - $192 per hour. Use of these values would significantly increase the truck delay costs/savings presented herein (by as much as six times or more).

The I-10 Coalition's motivation to look specifically at freight is well founded, and to help make the point the study evaluated the impacts of removing all freight from the I-10 Corridor. The purpose of the exercise was to dramatically demonstrate the impact that freight flows have on congestion levels of the Corridor.

Removing Freight Flows: Impacts on Deficient Mileage - A significant improvement on deficient mileage could be achieved by removing all freight from the Corridor. By the Year 2008, of the projected 641 deficient miles along the I-10, a total 369 miles would improve to acceptable LOS, a 57% improvement from removing freight. By 2025, of the projected 1,520 deficient miles along the Corridor, over 980 miles could be improved to acceptable levels of service, a 65% improvement from removing freight flows from the Corridor.

Exhibit 6 - Year 2000-2025 Deficient Mileage

Functional Class	Base Case 2000	W/O Freight 2000	Base Case 2008	W/O Freight 2008	Base Case 2013	W/O Freight 2013	Base Case 2025	W/O Freight 2025
Rural Interstate	154.0	8.1	283.2	45.9	452.1	69.0	981.4	167.4
Urban Interstate	244.3	145.0	357.8	225.2	408.4	264.8	538.9	369.9
TOTAL	**398.3**	**153.1**	**641.0**	**271.1**	**860.5**	**333.8**	**1520.3**	**537.3**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

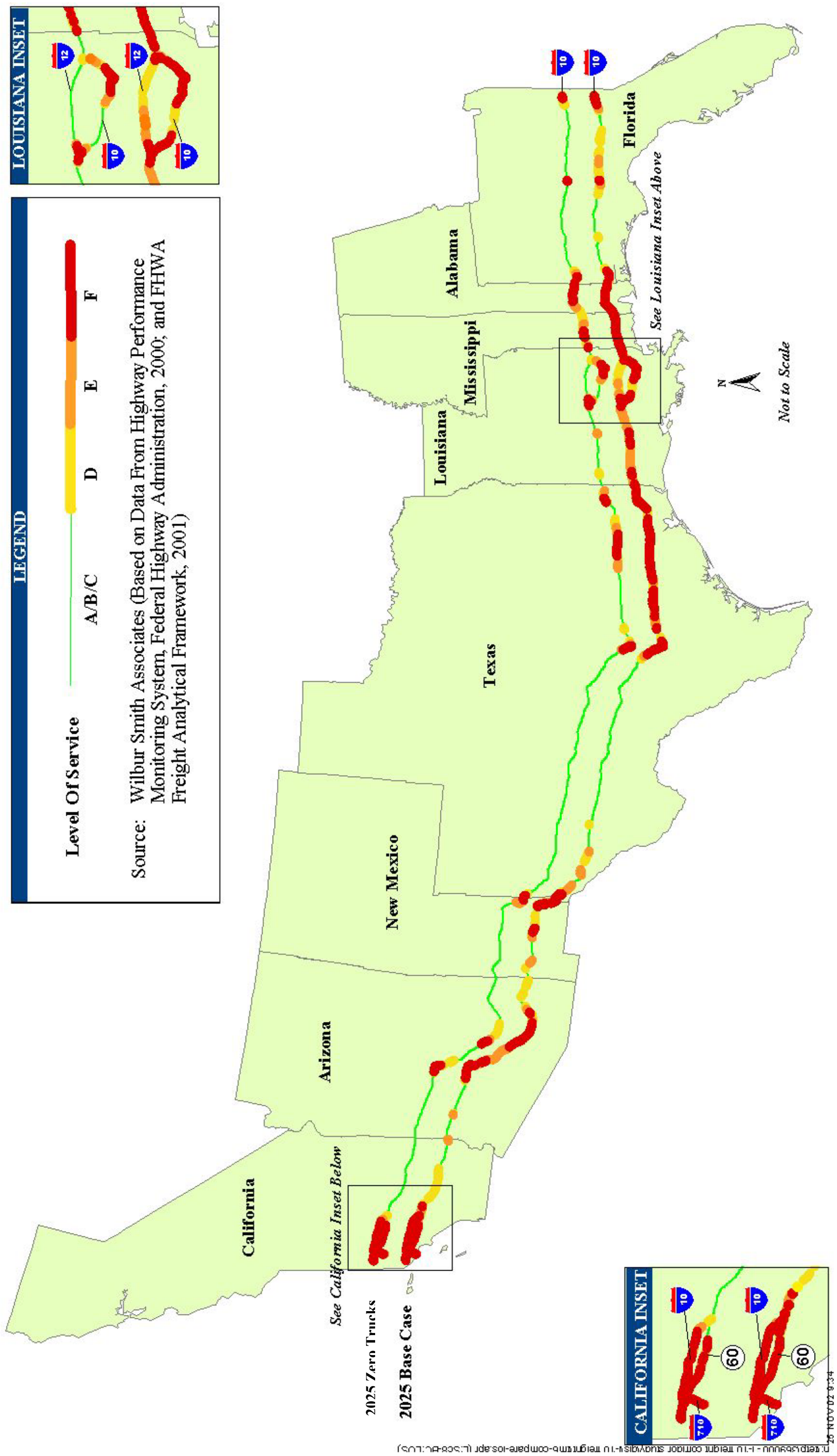
Impact on Speed and Delay - Removing freight flows would increase operating speeds significantly over the forecast period, translating into a significant reduction in delay. The modeling exercise predicted that average car speeds would jump by over 8%, and as much as 32% during peak hours**.**

Exhibit 7 - Car Speeds with Freight Flows Removed from the Corridor

State	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
Functional Class	Base Case		W/O Freight		Base Case		W/O Freight		Base Case		W/O Freight		Base Case		W/O Freight	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	65.4	62.8	65.5	65.3	65.4	58.8	65.4	65.0	65.3	55.6	65.4	64.4	64.2	45.8	65.4	62.2
Urban Interstate	55.6	27.6	58.6	32.0	50.4	25.1	55.3	28.7	46.7	23.2	52.5	27.7	37.8	19.2	45.0	24.7
TOTAL	**62.4**	**46.3**	**63.4**	**50.5**	**60.4**	**42.9**	**62.3**	**47.9**	**58.8**	**40.2**	**61.3**	**47.0**	**53.8**	**33.3**	**58.1**	**43.8**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 8
Year 2025 Level of Service without Freight



Analysis of Freight Oriented Alternatives

The "no freight" exercise demonstrated that alternative means of moving freight in the Corridor, (or reducing the impact that freight has on LOS) can yield substantial benefits. From this premise, the I-10 state partners directed the study analysis to examine seven different approaches, many specific to freight for improving the LOS in the I-10 Corridor:

Scenario 1: Widen I-10 as Much as Needed
Scenario 2: Deploy ITS Technologies along the Corridor
Scenario 3: Separate Truck Traffic from Automotive Traffic
Scenario 4: Rail Intermodal
Scenario 5: Waterway Intermodal
Scenario 6: Urban Truck Bypass
Scenario 7: Truck Productivity
Others: Freight Villages, Time of Facility Operations, etc.

The results presented in this Summary Report were intended to provide the I-10 Corridor partners with information to support the development of an overall policy framework toward accommodating the transportation of freight and people along the Corridor. Based on the results of the analysis summarized here, the I-10 Coalition framed a Comprehensive Freight Congestion Management Approach (CFCMA). The plan is presented in subsequent section of this report.

Scenario 1 – Additional Capacity

The first scenario examined to potentially improve transportation service along the I-10 Corridor is adding the necessary capacity unconstrained by environmental, funding and other obstacles. The average number of lanes needed by 2025 is expected to increase from 6 to 10.1 lanes along urban sections, and from 4.1 lanes to 5.2 lanes along rural sections.

Exhibit 9
Average Number of Lanes

State	Average Number of Lanes				
Functional Class	Base Case	Added Capacity Scenario			
	2000-2025	2000	2008	2013	2025
Rural Interstate	4.1	4.2	4.4	4.6	5.2
Urban Interstate	6.0	7.0	7.7	8.3	10.1
TOTAL	4.6	5.0	5.3	5.6	6.5

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

The impact of adding all the needed miles is a total reduction of all deficient mileage by 2025. The results demonstrate a significant improvement in level of service along the Corridor, where all rural segments are at LOS C or better, and all urban segments are at LOS D or better.

Impact on Speed and Delay - Operating speeds along the Corridor are expected to increase significantly over the forecast period, translating into significant reduction in delay for freight and passengers. Truck delay is expected to improve significantly over the base by 2025; average truck speeds (average speed over 24 hours) are expected to jump by over 18%, and as much as 36% during peak hours, resulting in an equivalent **savings in delay of 95.5 million annual truck hours,** an annual cost savings of **$2.39 billion.** The greatest impact is in urban areas, where truck speeds will increase between 40% (peak hour) and 57% (average daily). Average and peak hour car speeds are expected to jump by approximately 18% and 37% respectively, **saving an estimated 593.3 million annual vehicle hours of delay,** an annual cost savings of **$10.53 billion.**

Exhibit 10
Truck Speeds with Added Capacity

State	2000 Truck Speed (MPH)				2008 Truck Speed (MPH)				2013 Truck Speed (MPH)				2025 Truck Speed (MPH)			
Functional Class	Base Case		Added Capacity Scenario		Base Case		Added Capacity Scenario		Base Case		Added Capacity Scenario		Base Case		Added Capacity Scenario	
	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour
Rural Interstate	60.9	58.6	60.9	60.5	60.9	55.2	60.9	60.2	60.8	52.5	60.9	59.9	59.9	44.1	60.9	59.2
Urban Interstate	52.3	26.1	56.8	30.1	47.4	23.7	56.6	29.1	43.9	21.9	56.4	27.6	35.7	18.1	56.2	25.3
TOTAL	**58.3**	**43.4**	**59.7**	**46.9**	**56.4**	**40.3**	**59.7**	**46.1**	**55.0**	**37.9**	**59.6**	**45.0**	**50.4**	**31.7**	**59.6**	**43.1**

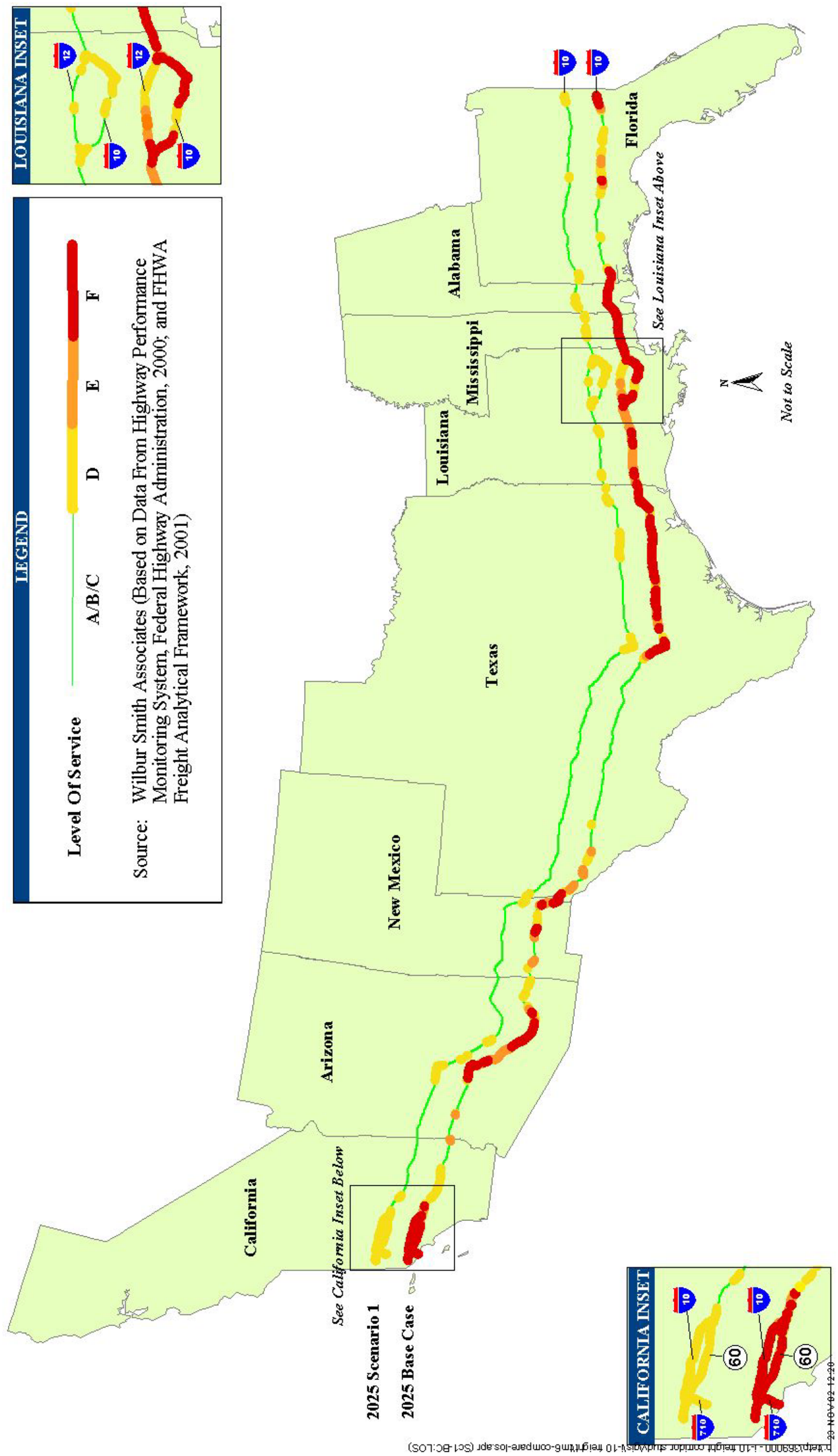
Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 11
Car Speeds with Added Capacity

State	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
Functional Class	Base Case		Added Capacity Scenario		Base Case		Added Capacity Scenario		Base Case		Added Capacity Scenario		Base Case		Added Capacity Scenario	
	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour
Rural Interstate	65.4	62.8	65.4	64.9	65.4	58.8	65.4	64.6	65.3	55.6	65.4	64.3	64.2	45.8	65.4	63.4
Urban Interstate	55.6	27.6	60.5	31.9	50.4	25.1	60.3	30.7	46.7	23.2	60.1	29.2	37.8	19.2	59.9	26.7
TOTAL	**62.4**	**46.3**	**64.0**	**50.0**	**60.4**	**42.9**	**63.9**	**49.1**	**58.8**	**40.2**	**63.9**	**48.0**	**53.8**	**33.3**	**63.8**	**45.8**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 12
Level of Service with Added Capacity



Scenario 2 – Intelligent Transportation Systems

This section summarizes the results of the development and evaluation of Intelligent Transportation System (ITS) deployment scenarios along the I-10 Corridor. The analysis began with a review of existing ITS deployments and a review of operational needs. Based on the current operational context, challenges, and opportunities, a Corridor ITS Vision was established. The Corridor ITS Vision and current operational issues were used to develop Corridor ITS Program Categories and User Services. Specific ITS projects and initiatives that address the desired User Services were then defined.

Consistent with the other corridor Scenarios, the ITS evaluation accounts for changes in demand and field infrastructure over time (2000–2025) and differences between urban and rural ITS applications. In addition, variations that exist among States such as traffic levels, lane capacity, and existing ITS deployments are also reflected in the evaluation. The evaluation utilizes the SCRITS (Screening Tool for ITS) model, developed by FHWA[2].

Deployment Phasing Strategies - This study recommends a general progression of deployments over time for the Corridor.

Exhibit 13
ITS Deployment Progression

Short to Medium Term (by 2008)	Long Term (2009 – 2025)
Advanced Transportation Management Systems (ATMS)	
• Highway Advisory Radio (HAR) • Dynamic Message Signs (DMS) • Close Circuit TV (CCTV) Monitoring and Surveillance at critical locations • Vehicle Detection and Fog Detection Systems • Port information technologies • Road Weather Information Systems (RWIS)	• Additional HAR and DMS at key locations • Research in-vehicle alternatives to traditional HAR and DMS technologies • Additional CCTV Monitoring and Surveillance • Additional Vehicle Detection, Fog Detection Systems and RWIS at critical locations • Speed Warning System at critical locations

Continued next page

[2] SCRITS is an ITS evaluation that computes benefits, such as travel time savings and accident reductions, from 16 different ITS applications. Seven of the 16 ITS applications were not found to be directly applicable to this corridor study. Analysis is performed for the other 9 ITS applications. For ITS applications that have readily measurable effects on travel, the analyses in this scenario will be quantitative. The benefits of some other ITS elements are not as readily measurable, and for these, qualitative assessments are made.

Short to Medium Term (by 2008)	Long Term (2009 – 2025)
Advanced Traveler Information Systems (ATIS)	
• Internet Based Traveler Information and Traveler Information Kiosks • Trailblazer Directional Signs at critical locations • Commercial vehicle specific traveler information at key locations • 511 Traveler Information Phone System	• Continue and expand operation of Internet Based Traveler Information, Traveler Information Kiosks, Trailblazer Directional Signs and commercial vehicle specific traveler information • Research in-vehicle alternatives to traditional Trailblazer Directional Sign technologies • Develop and implement dissemination of commercial vehicle port related and parking availability information • Continue operation of 511 Traveler Information Phone System and support expansion of wireless voice (cellular telephone) networks in rural areas
Maintenance and Construction Operations (MCO)	
• Advance Vehicle Location (AVL) and Computer-Aided Dispatch (CAD) on Maintenance and Construction Operations fleets	• Maintain and upgrade AVL and Computer-Aided Dispatch (CAD) on Maintenance and Construction Operations fleets
Transportation Management Center	
• Establish/Develop Traffic Management Centers (TMC) • Integrate existing TMCs together to enable interoperability • Establish operational guidelines for development and implementation of Rural Traffic Management Centers • Investigate feasibility and acceptance of Virtual TMC and Portable TMC technology for rural traffic management	• Deploy rural TMC technologies at existing urban TMCs • Support additional integration to other existing TMCs • Plan and implement Multimodal Coordination at TMCs • Deploy Virtual TMC technology and Portable TMC technology (if determined to be feasible)
Commercial Vehicle Operations (CVO)	
• Deploy Commercial Vehicle Information Systems and Networks (CVISN) suite of ITS/CVO technologies • Deploy commercial vehicle specific traveler information at key locations • Deploy other ITS/CVO capabilities	• Maintain/expand CVISN suite of ITS/CVO technologies • Continue deployment of commercial vehicle specific traveler information, including parking availability information
Advanced Vehicle Safety Systems (AVSS)	
• Support AVSS research	• Support AVSS field testing and deployments
Emergency Management (EM)	
• Develop Regional Incident Management Plans • Implement technologies and programs that support hurricane evacuation • Implement AVL and Computer-Aided Dispatch (CAD) for Emergency Vehicles • Enable Cellular Phone for Incident Reporting	• Implement, maintain and update Regional Incident Management Plans • Continue implementation of technologies and programs that support hurricane evacuation • Expand implementation of AVL and Computer-Aided Dispatch (CAD) for Emergency Vehicles • Continue operation of Cellular Phone for Incident Reporting • Develop pre-planned Detour Routes • Deploy CCTV at Rest Areas

Short to Medium Term (by 2008)	Long Term (2009 – 2025)
Integration	
• Develop Detailed Regional ITS Architecture • Develop Communications Master Plans • Support expansion of wireless voice and data (cellular telephone) networks in rural areas • Develop and implement ITS Marketing Programs • Incorporation of ITS into Design Activities • Initiate a phased development of a Corridor Archived Data Repository • Intercity Transit Information	• Maintain Regional ITS Architecture and support integration to other existing Traffic Management Centers • Develop and implement an I-10 Corridor Management Plan • Implement phased Communications Master Plans • Deploy ITS Communications Backbone • Plan and implement Multimodal Coordination at Traffic Management Centers • Continue to support expansion of wireless voice and data (cellular telephone) networks in rural areas • Continue implementation of ITS Marketing Programs • Continue to incorporate ITS into Design Activities • Continue the phased implementation of a Corridor Archived Data Repository • Continue dissemination of Intercity Transit Information

Estimated Benefits of I-10 ITS Deployments - The travel time savings from ITS deployment along the I-10 Corridor is estimated at 48.6 million vehicle hours of travel in 2008, 88.1 million VHTs in 2013 and 82.6 million VHTs in 2025. Trucks are estimated to share 8% of the time savings in 2008 and 19% by 2025. The monetary value of these times savings equate to **$445 million in 2008, $744 million in 2013 and $1.58 billion in 2025**.

Capital Costs of Deployment - The total estimated cost[3] for ITS field devices, Traffic Management Center development, and communication infrastructure assumed in the ITS scenario for the I-10 Corridor is $605.5 million.

Exhibits 14
Capital Cost Estimate of Assumed I-10 ITS Infrastructure ($ millions)

	Estimated Cost of Field Devices	Estimated Cost of TMC Development	Est. Cost of Communications Infrastructure
TOTAL	$33.6	$97.0	$474.9

Scenario 2 ITS deployment produces a benefit/cost ratio of 3.0. Note this B/C ratio only includes the benefits from the nine applications evaluated in SCRITS, whereas the TMC and communications costs can be used to support several other applications (emergency management, ramp metering, maintenance and construction operations, commercial vehicle safety applications, etc.) which would provide significant additional benefits.

[3] The costs do not include the total array of ITS technologies recommended for deployment along the I-10 Corridor. The purpose of this cost information is to give a rough, planning level estimation of the level of funding that may be required to deploy the SCRITS modeled ITS applications along the I-10 Corridor for the full build-out, 2025.

Scenario 3 – Truck/Auto Separation

The concept of separated roadways for commercial and passenger vehicle traffic has attracted growing interest from cities and states around the country. It arose in response to congestion, productivity and safety concerns, and while it is not a new class of solution,[4] its level of discussion and some forms of implementation are new. The Chairman of the House Transportation and Infrastructure Committee has cited "economic security"[5] as the potential payoff from all-truck facilities. Physical security also is improved when vehicles are kept moving and free to maneuver.

As congestion between neighboring pairs of cities begins to emerge truck-ways may be especially useful as a response to an inter-urban pattern evident in the long-term forecasts performed for I-10. Separating commercial vehicles and autos allows the use of technologies and vehicles that are far less feasible on mixed-use facilities. There are at least four kinds of separated facilities that can be considered, and a corridor strategy could utilize all four according to local requirements:

- Dedicated Lanes, on the order of HOV lanes for trucks;
- Dedicated Facilities, where the truck lanes stand apart from the passenger road;
- Dedicated Technology, as in mass-flow concepts; and,
- Modal Alternatives, as supplied by an "Expressway" class of intermodal equipment.

For this study, locations for separated truck lane application along the I-10 Corridor were evaluated by considering three principal criteria - daily truck volume, volume/capacity ratios & overall vehicle volume. Secondary consideration was given to two "service sensitivity" factors: numbers of trucks carrying high service freight, and numbers of trucks making deliveries within one hundred miles (typically two to three hours) of the observed point.

Four candidate sections were produced by this method, and then subjected to scenario analysis.

- *Los Angeles to Inland Empire:* Fifty-mile passage from the San Pedro Bay ports on I-710 east to Ontario on SR 60 and ending at the intersection with I-15.
- *Phoenix to Tucson:* 153-mile section of I-10 between the intersection with SR 85 west of Phoenix and Davis Air Force Base south of Tucson.
- *Houston West:* 101 mile passage between San Antonio and Houston, where SR 71 connects from I-10, and ending east of Houston where SR 146 enters I-10 from the Port of Houston.
- *Gulf Coast:* 172 miles from the intersection of I-10 and I-12 in Slidell, LA, along the coast of Mississippi and Alabama to Pensacola, FL[6].

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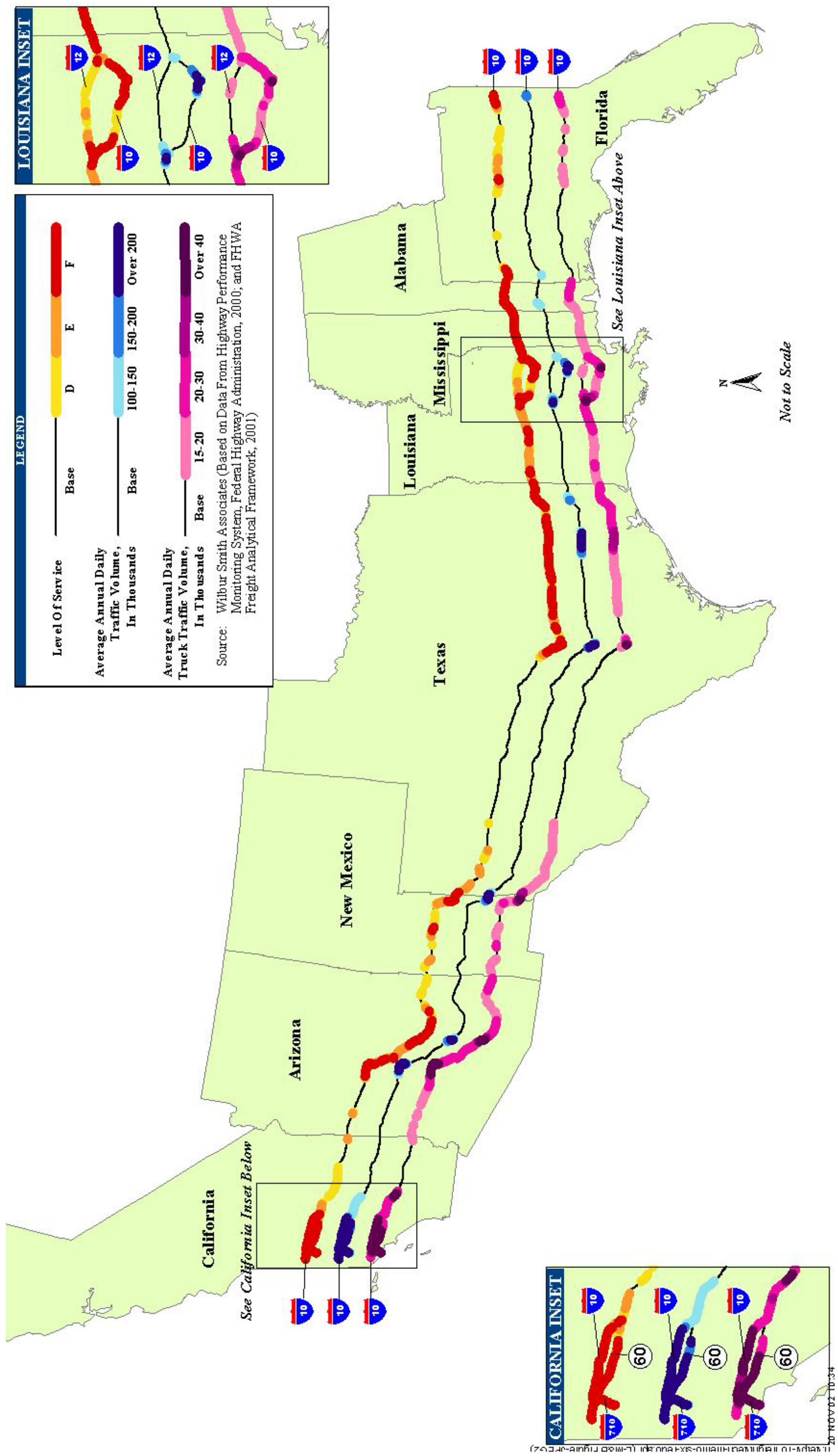
[4] Separation from the passenger vehicle side has been employed for decades, as parkways, divided car-only express lanes, and in a sense, HOV lanes.
[5] Rep. Don Young of Alaska, quoted in Transport Topics, weekly publication of the American Trucking Association, June 10, 2002.
[6] The Gulf Coast passage was not extended further west into Louisiana, chiefly because of the division of I-10 and I-12, making that segment difficult to analyze. Constraints appear at Baton Rouge and New Orleans, but diminish in between.

Exhibit 15
Identification of Candidate Truck Lane Segments
Year 2025 High AADT, AADTT and Poor LOS



Truck/Auto Separation Impacts on Deficient Mileage - The scenario was evaluated by shifting all truck traffic from candidate segments of the Corridor, to a new facility. A significant improvement in LOS results on I-10 with the implementation of this strategy, specifically on those segments where a truckway is implemented. If implementation occurred today (Year 2000), 137 miles would improve to sufficient LOS, out of the total 203 deficient miles - a 67% improvement. By the Year 2008, 174 miles would improve to sufficient LOS, of the total 313 deficient miles along the segments analyzed- a 55% improvement. By 2013, of the total deficient miles, almost 200 miles would improve to an acceptable LOS, a 55% improvement. However, by 2025, the impact drops back to 185 miles at an acceptable LOS - a (41%) improvement[7].

Exhibit 16
Year 2000-2025 Deficient Mileage
(NOTE: Reflects Deficient Miles on Segments Where Separate Truck Facilities are Employed)

Functional Class	Base Case 2000	Truck Separation 2000	Base Case 2008	Truck Separation 2008	Base Case 2013	Truck Separation 2013	Base Case 2025	Truck Separation 2025
Rural Interstate	97.3	8.1	152.3	43.5	181.4	55.9	228.3	107.2
Urban Interstate	105.9	58.5	160.6	95.7	180.5	106.3	222.0	157.7
TOTAL	203.2	66.6	312.9	139.2	361.9	162.2	450.3	264.9

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Impacts on Speed and Delay - Operating speeds along the affected segments of the Corridor are expected to increase significantly over the forecast period, translating into significant reduction in delay for freight and passengers[8]. Average car speeds are expected to jump by over 18%, and as much as 37% during peak hours, resulting in an equivalent **savings in delay of 102.9 million annual vehicle hours,** an annual cost savings of **$1.83 billion.**

Exhibit 17
Car Speeds with Truck/Auto Separation

Functional Class	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
	Base Case		Truck Separation Scenario		Base Case		Truck Separation Scenario		Base Case		Truck Separation Scenario		Base Case		Truck Separation Scenario	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	65.7	51.6	65.8	64.9	65.4	41.6	65.8	63.0	64.8	37.8	65.7	58.8	60.3	29.1	65.4	48.8
Urban Interstate	56.1	25.3	59.8	31.1	50.0	22.9	56.6	26.9	46.0	20.4	53.4	25.8	36.5	17.7	45.2	22.5
TOTAL	**60.2**	**32.9**	**62.6**	**40.3**	**55.9**	**28.9**	**60.6**	**36.2**	**52.9**	**26.1**	**58.5**	**34.6**	**44.3**	**21.9**	**52.3**	**30.1**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

[7] The implication is that by 2025, LOS has deteriorated to a point where a truck separation strategy must be supplemented by additional capacity for general traffic streams along I-10. As is noted, in the earlier years (2008, 2013) LOS is not so far deteriorated so as to offset the gains from the truck only strategy.

[8] Gains in truck speeds were not estimated, because the scenario was modeled as a reduction of commercial vehicle traffic from existing facilities. Trucks traveling in new, dedicated lanes are assumed to increase speeds to a marked degree; the increase would depend on the design features of the roadway.

Scenario 4 - Intermodal Rail

Freight transportation functions as a system, with a marked and growing degree of inter-reliance among modes. Major motor carriers describe themselves as "mode-neutral," because they employ in their operations any form of transportation that can effectively meet the service and cost requirements of their customers. The truck-rail intermodal business is expected to become the number one source of railroad freight revenue by the end of 2003, surpassing even coal.[9]

This scenario examines the potential payoff from the most practical kind of rail option, which is the attraction of over-the-road truck traffic to container-on-flatcar or trailer-on-flatcar (COFC/TOFC) rail intermodal services. In merger proceedings over the past decade, railroads attested to viewing intermodal service as an opportunity for diverting freight from highways. Diversion by conventional carload service is not considered because it has demonstrated only minor potential[10] in these detailed assessments of market opportunity, and is a category of operation in which Class I railroads increasingly do not invest.

The analysis is focused on the principle kinds of highway freight traffic that have shown themselves susceptible to intermodal diversion: goods in dry van trailers, containers moving 500 miles or more, and to a lesser extent, temperature-controlled goods moving similar distances. The market share gains projected by Reebie Associates and published for a series of railroad mergers provided a basis for understanding the realistic extent of highway diversion that improved and competitive intermodal services can attract. Because traffic diversions do not take place unless the competitive status quo is changed, there is an implicit assumption that program investments leading to performance improvements are made by railroads, alone or together with the public sector. These improvements are assumed to be of a magnitude comparable to, but are not predicated upon, a major railroad merger.

The projection of intermodal traffic capture was developed in these steps:

- Truck volume in origin-destination lanes touching the I-10 Corridor was drawn from the Year 2000 TRANSEARCH database.
- Origins and destinations were screened for the existence of intermodal ramp service.
- Traffic was organized in a matrix by distance and lane density.
- Diversions were projected as market share shifts, by applying the merger-based estimates differentially to the traffic matrix.
- Estimates for the years 2008, 2013, and 2025 were established by applying forecast factors.
- Modal shifts were translated directly into reductions of AADTT.

Lanes in the 300-500 mile range received special consideration for the potential application of non-standard intermodal technology. RoadRailer service is one option, but has limited appeal

[9] "The Value of Rail Intermodal to the U.S. Economy", paper by Thomas Brown & Anthony Hatch, September 19, 2002.
[10] Local opportunities for small, focused diversions of bulk traffic may exist, but fall below the scope of a national corridor study.

because of its reliance on bi-modal trailers. "Expressway" or "Iron Highway" equipment is a kind of moving platform that accepts any type of trailer or container, and has had some success in Canada.

Rail Intermodal Impacts on Deficient Mileage - A marginal improvement in terms of the deficient mileage is expected along the affected segments of I-10 with the implementation of the Rail Intermodal scenario[11]. In 2008, of the total 641 deficient miles for the segments of I-10 analyzed, a total of 2 miles will improve to an acceptable LOS, a less than 1% improvement. By 2013, of the total 860 deficient miles, just over 15 miles will improve to an acceptable LOS, a 2% improvement. By 2025, the impact remains insignificant, with 16 miles at an acceptable LOS, a 1% improvement.

Exhibit 18
Year 2000-2025 Deficient Mileage with Rail Intermodal (IMX)
(NOTE: Reflects Deficient Miles for Segments Where Intermodal Service is Implemented)

Functional Class	Base Case 2000	IMX 2000	Base Case 2008	IMX 2008	Base Case 2013	IMX 2013	Base Case 2025	IMX 2025
Rural Interstate	154.0	148.4	283.2	283.2	452.1	438.1	981.4	968.0
Urban Interstate	244.3	244.3	357.8	355.9	408.4	407.2	538.9	536.1
TOTAL	**398.3**	**392.7**	**641.0**	**639.1**	**860.5**	**845.3**	**1520.3**	**1504.1**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Impacts on Speed and Delay - Typically, as the LOS along the Corridor improves, so does the level of congestion. However, the impact of the rail intermodal scenario is not significant enough to make a measurable impact on operating speeds. Operating speeds along the Corridor are expected to increase marginally over the forecast period, translating into a marginal reduction in delay for freight and passengers. Truck speeds are expected to increase by less than 1%, on the average and during peak hours, resulting in an equivalent **savings in hours of delay of 5.6 million annual truck hours** (estimate errs on the high side since it includes reduction in VMT due to diversion), an annual savings of **$139.5 million.** Both average and peak hour car speeds are expected to increase by less than 1%, **saving an estimated 2.2 million annual vehicle hours of delay,** an annual savings of **$38.52 million.**

[11] This implies that by the Year 2025, deterioration in the LOS is so far progressed that an intermodal strategy must be supplemented by the addition of capacity for the general traffic stream along I-10. As is noted, in the earlier years (2008, 2013) LOS is not so far deteriorated so as to offset the gains from this strategy.

Exhibit 19
Truck Speeds with Rail Intermodal (IMX)

State	2000 Truck Speed (MPH)				2008 Truck Speed (MPH)				2013 Truck Speed (MPH)				2025 Truck Speed (MPH)			
Functional Class	Base Case		IMX Scenario		Base Case		IMX Scenario		Base Case		IMX Scenario		Base Case		IMX Scenario	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	60.9	58.6	60.9	58.6	60.9	55.2	60.9	55.4	60.8	52.5	60.8	53.0	59.9	44.1	59.9	44.7
Urban Interstate	52.3	26.1	52.3	26.2	47.4	23.7	47.4	23.7	43.9	21.9	44.0	21.9	35.7	18.1	35.7	18.2
TOTAL	**58.3**	**43.4**	**58.3**	**43.5**	**56.4**	**40.3**	**56.5**	**40.4**	**55.0**	**37.9**	**55.0**	**38.1**	**50.4**	**31.7**	**50.4**	**32.0**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 20
Car Speeds with Rail Intermodal (IMX)

State	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
Functional Class	Base Case		With IMX Scenario		Base Case		With IMX Scenario		Base Case		With IMX Scenario		Base Case		With IMX Scenario	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	65.4	62.8	65.4	62.8	65.4	58.8	65.4	59.0	65.3	55.6	65.3	56.1	64.2	45.8	64.3	46.5
Urban Interstate	55.6	27.6	55.7	27.8	50.4	25.1	50.4	25.1	46.7	23.2	46.7	23.2	37.8	19.2	37.9	19.4
TOTAL	**62.4**	**46.3**	**62.4**	**46.4**	**60.4**	**42.9**	**60.4**	**43.0**	**58.8**	**40.2**	**58.8**	**40.4**	**53.8**	**33.3**	**53.9**	**33.6**

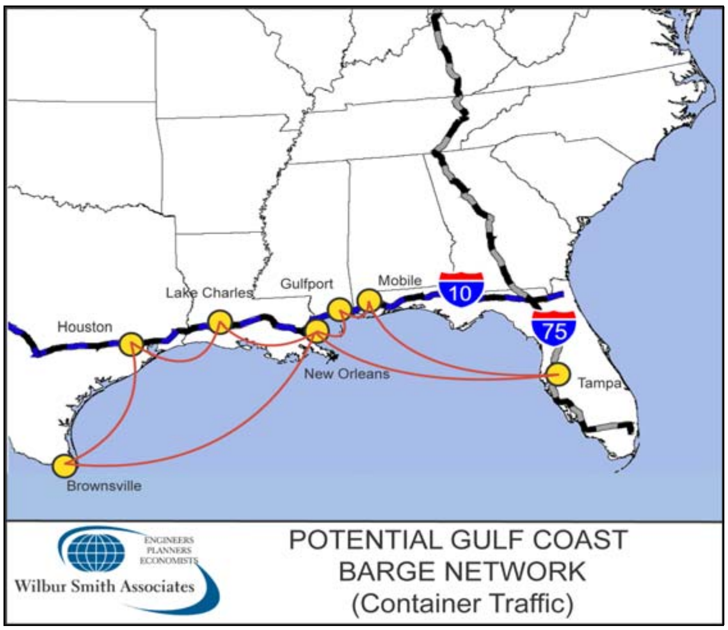
Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Scenario 5 – Maritime Intermodal

Transporting container freight via barge along the Gulf Coast and to inland ports on inter-coastal waterways may be a viable and attractive alternative to truck movements along the I-10 Corridor. Traditionally, commodities transported by barge tend to be low value, bulk goods. However, the use of container barges (flat deck), capable of carrying large numbers of containers and being loaded and unloaded quickly at port, is changing the dynamics of barge transport.

Containerization of barge traffic allows for the transport of higher value commodities typical of interstate truck traffic. Domestic ocean-going and inter-coastal barge freight is no longer limited to traditional bulk commodities such as coal and scrap iron. Container barges, coupled with efficient intermodal port facilities, enable the effective transfer of freight from road to water and back.

There is currently a single operator specializing in the transport of container traffic along the Gulf Coast. For the year ending December 31, 2002, it is estimated that 50,000 containers were be transported between Houston and New Orleans via barge. Additional service from Lake Charles to Houston is also offered - 12,500 containers (or container equivalents) per year.



Growth in Gulf Coast barge traffic will lie in expanding the service offerings to new city pairs and developing an integrated, scheduled network, rather than relying solely on increased volume along existing routes. Adding service to ports along the Gulf has the potential to increase total annual container traffic along the Gulf Coast to 200,000 containers by 2008. After 2008, when the Gulf Coast network is considered fully developed, natural growth rates for the I-10 Corridor commodities were applied for forecast years 2013 and 2025.

Maritime Intermodal Impacts on Deficient Mileage - In order to measure the impact of a multimodal waterway development strategy on transportation capacity along the Corridor, the study analyzed the impact of diverting truck volumes between specific city pairs along the Gulf Coast. The barge container volumes shown in the following table represent potential Gulf Coast barge traffic by major city-pair for 2008, 2013 and 2025.

Exhibit 21
Forecasted Container Volume
Gulf Coast Barge Traffic – Anticipated City Pairs

Barge Segment	Year		
	2008	2013	2025
Brownsville to Houston	50,000	57,244	79,500
Houston to New Orleans	50,000	58,145	83,704
Houston to Gulfport/Biloxi	12,500	14,434	20,424
Houston to Mobile	12,500	14,368	20,104
New Orleans to Tampa	50,000	57,385	79,871
New Orleans to Gulfport/Biloxi	12,500	13,695	17,052
New Orleans to Mobile	12,500	13,879	17,841

A negligible improvement in terms of the deficient mileage is expected on I-10 with the implementation of the Maritime Intermodal Scenario.[12] In Year 2008, of the total 367 deficient miles for the segments of I-10 between the city pairs listed above, a total 2.4 miles will improve to an acceptable LOS, a 1% improvement. By 2013, of the total 480 deficient miles (between the city pairs listed above), over 12 miles will improve to an acceptable LOS, a 12% improvement. By 2025, the impact drops to a 7 mile (1%) improvement in acceptable LOS.

Exhibit 22
Year 2000-2025 Deficient Mileage
(NOTE: Reflects Deficient Miles for Segments Where Barge Service is Implemented)

State	Deficient Mileage							
Functional Class	2000 Base Case (Miles)	2000 Barge (Miles)	2008 Base Case (Miles)	2008 Barge (Miles)	2013 Base Case (Miles)	2013 Barge (Miles)	2025 Base Case (Miles)	2025 Barge (Miles)
Rural Interstate	138.2	138.2	237.4	237.4	327.8	317.5	543.8	539.6
Urban Interstate	83.3	83.3	129.6	127.2	152.2	150.2	231.4	229.3
TOTAL	221.5	221.5	367.0	364.6	480.0	467.7	775.2	768.9

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

[12] The implication is that by 2025, the LOS has deteriorated to a point where a waterway strategy must be supplemented by the addition of capacity for the general traffic stream along I-10. As is noted, in the earlier years (2008, 2013) LOS is not so far deteriorated so as to offset the gains from this strategy.

Impacts on Speed and Delay - Typically, as the LOS along the Corridor improves, so does the level of congestion. However, the impact of the barge scenario is not significant enough to make a measurable impact on operating speeds. Operating speeds along the Corridor are expected to increase marginally over the forecast period, translating into a marginal reduction in delay for freight and passengers. Truck speeds are expected to increase by less than 1%, on the average and during peak hours, resulting in an equivalent **savings in hours of delay of 2.5 million annual truck hours** (estimate errs on the high side since it includes reduction in VMT due to diversion), an annual savings of **$62.0 million.** Both average and peak hour car speeds are expected to increase by less than 1%, **saving an estimated 1.6 million annual vehicle hours of delay,** an annual savings of **$27.51 million.**

Exhibit 23
Truck Speeds with Multimodal Waterway Solution

State	2000 Truck Speed (MPH)				2008 Truck Speed (MPH)				2013 Truck Speed (MPH)				2025 Truck Speed (MPH)			
Functional Class	Base Case		Multimodal Waterway Solution Scenario		Base Case		Multimodal Waterway Solution Scenario		Base Case		Multimodal Waterway Solution Scenario		Base Case		Multimodal Waterway Solution Scenario	
	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour
Rural Interstate	61.5	56.7	61.5	56.7	61.5	50.3	61.5	50.7	61.4	46.3	61.4	47.1	59.9	38.1	60.0	38.4
Urban Interstate	56.4	33.5	56.4	33.5	54.5	28.4	54.5	28.5	52.7	24.2	52.7	24.3	45.0	18.5	45.2	18.6
TOTAL	**60.0**	**47.3**	**60.0**	**47.3**	**59.3**	**41.2**	**59.3**	**41.4**	**58.6**	**36.7**	**58.6**	**37.1**	**54.7**	**29.2**	**54.8**	**29.4**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 24
Car Speeds with Multimodal Waterway Solution

State	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
Functional Class	Base Case		Multimodal Waterway Solution Scenario		Base Case		Multimodal Waterway Solution Scenario		Base Case		Multimodal Waterway Solution Scenario		Base Case		Multimodal Waterway Solution Scenario	
	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour	Daily Avg	Peak Hour
Rural Interstate	64.4	59.0	64.4	59.0	64.3	51.9	64.3	52.4	64.1	47.5	64.1	48.3	62.5	38.6	62.6	38.9
Urban Interstate	59.4	35.5	59.4	35.5	57.4	30.0	57.4	30.1	55.5	25.6	55.5	25.8	47.5	19.7	47.6	19.7
TOTAL	**62.8**	**49.6**	**62.8**	**49.6**	**62.1**	**42.9**	**62.1**	**43.2**	**61.4**	**38.1**	**61.4**	**38.6**	**57.3**	**30.3**	**57.4**	**30.5**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Scenario 6 - Truck Bypasses

Urban truck bypasses are a low key variation of truck separation. There is a clear pattern of increasing congestion across the Corridor, and of rising truck volumes contributing to the overcrowded facility. Congestion begins in the urban areas in the current period. The congestion spreads out from the urban areas and begins to bridge city pairs during the forecast years, yet the most severe constraints remain centered in the urban districts. Local and through vehicles both gain advantage from a bypass around these severely congested districts, the latter by operating on a less obstructed roadway, and the former by volume reduction from the re-routed through traffic. Freight service reliability improves, safety benefits accrue, and diesel emissions become less concentrated geographically. A bypass specifically addresses a local problem of congestion, but it plainly aids non-local traffic as well. A series of these or comparable initiatives, established in sequence across the Corridor, can create an improved through route coast to coast.

Two urban bypasses currently under study by western I-10 states were selected for assessment in this scenario. Each bypass contemplates commercial vehicles as an important and even primary target, but neither has been proposed solely for the sake of this traffic. For scenario analysis, we have narrowed the focus exclusively to through truck volume, and have evaluated benefits on that basis. The two proposed facilities (along with the plans that identified them) are:

- *Northeast Parkway Route Location Study* in El Paso, Texas.
- *SR 85 General Plan Development* in Phoenix, Arizona.

The scenario was evaluated by eliminating through trucks from the affected portions of the Corridor, and diverting them to bypasses. This approach emphasizes benefits for the passenger and commercial traffic remaining on the current facilities, because it is only that remnant that is analyzed. Trucks were not modeled on the new bypass routes, so benefits there are not quantified, although it may be concluded that they are significant. Finally, results are presented just for the sections of the Corridor where bypasses are introduced, so that the specific local impact stands out.

Non-Circuitous Route - The success of a truck Bypass is based on the development of a non-circuitous bypass route. In both the Phoenix and El Paso examples, the bypass cut the corner on the existing I-10, so that the new facility could be expected to be faster and not longer. This allowed us to conclude that the bypass would attract all of the through truck traffic.

Ideal Truck Volumes - The bypasses studied worked where through truck volume was in the range of 4,000-5,000 units per day (or more); through trucks represented 20-40% of total truck volume (or more); and trucks represented 10-20% of total vehicle volume (or more).

Truck Only - The case studies presented herein do not call for a dedicated truck bypass - because the truck volumes by themselves were small for a total vehicle count.

Truck Bypasses Impact on Deficient Mileage - A significant improvement in terms of the deficient mileage is expected on the affected segments of I-10 with the implementation of a Truck Bypass strategy, especially in the later years. In 2008, of the total 46 deficient miles for the affected segments of I-10, a total 17 miles will improve to an acceptable LOS, a 36% improvement. By 2013, of the total 75 deficient miles, over 28 miles will improve to an acceptable LOS, a 38% improvement. By 2025, of the total 205 deficient miles, 72 miles will improve to an acceptable LOS, a 35% improvement.

Exhibit 25
Year 2000-2025 Deficient Mileage
(NOTE: Reflects Deficient Miles for the Affected Segments Only)

Functional Class	Base Case 2000	Truck Bypasses 2000	Base Case 2008	Truck Bypasses 2008	Base Case 2013	Truck Bypasses 2013	Base Case 2025	Truck Bypasses 2025
Rural Interstate	4.1	2.0	16.3	6.8	35.6	16.3	139.5	78.1
Urban Interstate	16.8	14.1	30.1	22.7	39.2	30.2	65.8	55.4
TOTAL	20.9	16.1	46.4	29.5	74.8	46.5	205.3	133.5

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Impact on Speed and Delay - Operating speeds along the affected sections of the Corridor are expected to increase significantly over the forecast period, translating into significant reduction in delay for freight[13] and passengers. Auto delay is expected to improve over the base by 2025; Average car speeds (average speed over 24 hours) are expected to improve marginally by 2.6%, and as much as 16% during peak hours, resulting in an equivalent **savings in delay of 7.8 million annual vehicle hours,** an annual cost savings of **$137.56 million.**

Exhibit 26
Car Speeds with Truck Bypasses
(NOTE: Reflects Car Speeds for the Affected Segments Only)

State	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
Functional Class	Base Case		Truck Bypasses Scenario		Base Case		Truck Bypasses Scenario		Base Case		Truck Bypasses Scenario		Base Case		Truck Bypasses Scenario	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	66.3	64.9	66.3	65.2	66.2	63.5	66.2	64.8	66.0	60.5	66.1	64.0	64.9	46.1	65.5	54.4
Urban Interstate	59.7	30.2	60.2	32.3	55.0	27.7	56.2	28.6	51.2	25.8	53.1	26.8	41.0	20.0	43.5	23.0
TOTAL	**64.6**	**50.6**	**64.7**	**52.2**	**63.0**	**48.3**	**63.4**	**49.5**	**61.6**	**45.5**	**62.4**	**47.7**	**56.8**	**35.0**	**58.3**	**40.8**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

[13] Gains in truck speeds were not estimated. Trucks traveling in new, dedicated lanes may be presumed to pick up speed at peak and on average to a marked degree; the size of the gain would depend on the design features of the roadway.

Scenario 7 - Truck Productivity

A new congressional study on truck productivity by the Transportation Research Board (TRB) urges the federal government to allow practical experimentation to further empirically based regulation of commercial vehicle size and weight. TRB recommendations include pilot studies that could be proposed by states. This scenario examines a Corridor-wide change in one aspect of truck weight policy, which might result from sponsorship of a pilot study by the I-10 states acting in concert. The scenario does not imply that Congress will decide to allow pilot programs, nor that the I-10 states will agree to adopt one. It simply explores the effect on some facets of Corridor productivity if the TRB proposal was followed to its conclusion. Crucial questions like pavement wear, bridge impacts, safety repercussions, and fleet benefits are not adequately assessed - but it is the lack of hard evidence on some of these subjects that motivates the TRB recommendations in the first place.

Combination vehicles hauling tridem (3-axle) trailers at a 97,000 pound gross vehicle weight limit are the configuration considered in this scenario. Trucks at this weight are able to divert portions of carload business from railroads; however, the rail intermodal business is less affected, because the trailers and containers in intermodal service also benefit from the higher load ceiling.

Four tools were applied to the TRANSEARCH modal commodity flow database prepared for the I-10 Corridor. Eight analytic steps were taken to determine the net change in truck volume produced by the introduction of heavy loading tridem trailers. These steps included the estimation of diverted rail traffic which was added back to AADTT.

Truck Productivity Impacts on Deficient Mileage - A marginal improvement in terms of the deficient mileage is expected along the affected segments of I-10 with the implementation of the Productivity Scenario[14]. In 2008, of the total 357 deficient miles for the segments of I-10 analyzed, a total 28 miles will improve to an acceptable LOS, a less than 4.5% improvement. By 2013, of the total 408 deficient miles, over 60 miles will improve to an acceptable LOS, a 7% improvement. By 2025, the impact on LOS is less, a 41 mile (27%) improvement.

[14] The implication is that by 2025, LOS has deteriorated to a point where a productivity strategy must be supplemented by the addition of capacity for the general traffic stream along I-10. As is noted, in the earlier years (2008, 2013) LOS is not so far deteriorated so as to mitigate the gains from this strategy.

Exhibit 27
Year 2000-2025 Deficient Mileage

State / Functional Class	Base Case 2000	Truck Productivity 2000	Base Case 2008	Truck Productivity 2008	Base Case 2013	Truck Productivity 2013	Base Case 2025	Truck Productivity 2025
Rural Interstate	154.0	143.5	283.2	278.7	452.1	409.9	981.4	948.3
Urban Interstate	244.3	237.3	357.8	333.7	408.4	390.5	538.9	530.4
TOTAL	**398.3**	**380.8**	**641.0**	**612.4**	**860.5**	**800.4**	**1520.3**	**1478.7**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Impacts on Speed and Delay - Operating speeds along the Corridor are expected to increase marginally over the forecast period, translating into a marginal reduction in delay for freight and passengers. Truck speeds are expected to increase by 1%, on the average and during peak hours, resulting in an equivalent **savings in hours of delay of 23.9 million annual truck hours** (estimate errs on the high side since it includes reduction in VMT due to diversion), an annual savings of **$596.75 million.** Both average and peak hour car speeds are expected to increase by 0.7% and 2.1% respectively, **saving an estimated 18.0 million annual vehicle hours of delay,** an annual savings of **$319.15 million.**

Exhibit 28
Truck Speeds with Truck Productivity

Functional Class	2000 Truck Speed (MPH)				2008 Truck Speed (MPH)				2013 Truck Speed (MPH)				2025 Truck Speed (MPH)			
	Base Case		Truck Productivity Scenario		Base Case		Truck Productivity Scenario		Base Case		Truck Productivity Scenario		Base Case		Truck Productivity Scenario	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	60.9	58.6	60.9	59.2	60.9	55.2	60.8	55.9	60.8	52.5	60.7	53.3	59.9	44.1	60.0	45.2
Urban Interstate	52.3	26.1	52.4	26.5	47.4	23.7	47.7	23.9	43.9	21.9	44.2	22.2	35.7	18.1	36.2	18.4
TOTAL	**58.3**	**43.4**	**58.3**	**43.9**	**56.4**	**40.3**	**56.5**	**40.8**	**55.0**	**37.9**	**55.0**	**38.5**	**50.4**	**31.7**	**50.7**	**32.3**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Exhibit 29
Car Speeds with Truck Productivity

Functional Class	2000 Car Speed (MPH)				2008 Car Speed (MPH)				2013 Car Speed (MPH)				2025 Car Speed (MPH)			
	Base Case		Truck Productivity Scenario		Base Case		Truck Productivity Scenario		Base Case		Truck Productivity Scenario		Base Case		Truck Productivity Scenario	
	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour	Daily Avg.	Peak Hour
Rural Interstate	65.4	62.8	65.4	63.5	65.4	58.8	65.4	59.6	65.3	55.6	65.3	56.5	64.2	45.8	64.5	47.2
Urban Interstate	55.6	27.6	55.8	28.1	50.4	25.1	50.8	25.4	46.7	23.2	47.0	23.5	37.8	19.2	38.4	19.5
TOTAL	**62.4**	**46.3**	**62.5**	**46.9**	**60.4**	**42.9**	**60.6**	**43.4**	**58.8**	**40.2**	**58.9**	**40.8**	**53.8**	**33.3**	**54.2**	**34.0**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Economic Impact Analysis

Total Economic Impact of Trade Moving Along the I-10 Corridor - As shown in Exhibit 34 the **total estimated impact of freight that relies on the I-10 Corridor is $1.38 trillion**, of which $339.4 billion is paid to some 10.4 million employees. The results indicate average earnings per job of approximately $32,500.

Exhibit 30
Total Economic Impact of I-10 Corridor Freight Flows – 2000

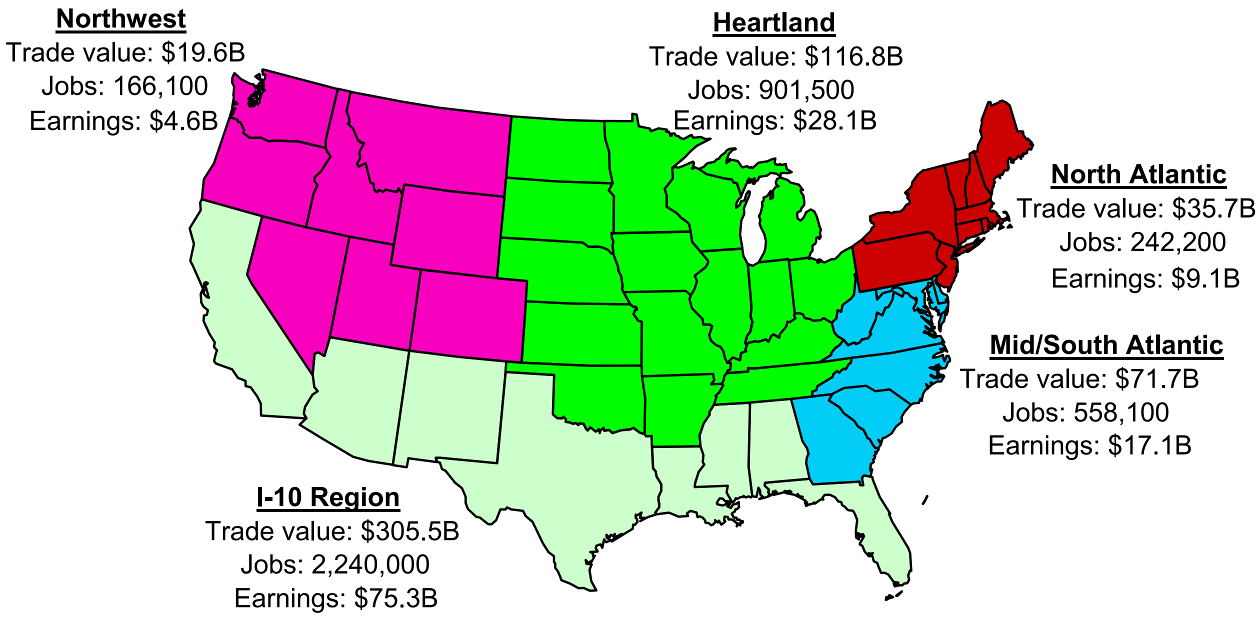
Region	Direct Impact	Multiplier Effect	Economic Activity	Earnings	Jobs
I-10 Region					
Intraregional	$360,746,388,986	$471,709,284,450	$832,455,673,436	$205,103,993,231	6,315,466
Outbound	$117,957,405,248	$154,337,169,222	$272,294,574,470	$66,789,702,172	1,983,772
Inbound	$14,833,065,730	$18,344,349,471	$33,177,415,201	$8,530,006,019	263,923
Total	**$493,536,859,965**	**$644,390,803,142**	**$1,137,927,663,107**	**$280,423,701,421**	**8,563,161**
Rest of the US					
Outbound	$92,411,149,088	$110,837,049,845	$203,248,198,933	$49,222,244,470	1,561,489
Inbound	$19,027,847,790	$21,563,730,116	$40,591,577,906	$9,766,031,082	306,436
Total	**$111,438,996,878**	**$132,400,779,961**	**$243,839,776,839**	**$58,988,275,552**	**1,867,926**
Total Impacts	**$604,975,856,843**	**$776,791,583,103**	**$1,381,767,439,945**	**$339,411,976,973**	**10,431,086**

Freight flows within the I-10 region (intra-regional) account for 60.2 percent of the total economic activity, with the balance occurring with other regions of the United States.

Economic Benefits of I-10 Inter-regional Trade - Inter-regional trade, between the I-10 Corridor region and the rest of the United States, generates significant economic benefits in terms of jobs, earnings, and economic output. Inter-regional trade produced $305.5 billion in spending within the I-10 region (55.6 percent) while $243.8 billion (44.4 percent) occurred in the other regions of the country. Some 2.25 million jobs in the I-10 region and 1.87 million jobs in the rest of the United States are supported by inter-regional freight movements which ply the I-10 Corridor. The jobs supported by I-10 inter-regional trade generated $75.3 million and nearly $59 million in earnings in the I-10 region and rest of the United States respectively.

Exhibit 35 shows the economic impact (trade value, jobs, and earnings) of I-10 Corridor inter-regional trade for major regions of the U.S. for the year 2000.

Exhibit 31
Economic Impact of I-10 Corridor Inter-Regional Trade (2000)



Economic Impact of I-10 Improvement Scenarios

Technical Memorandum 6 – Improvement Scenarios provided the travel time and vehicle operating cost savings data used as inputs to estimate the total economic impact of the I-10 improvement scenarios, using the RIMS-II multipliers.[15] This section presents the estimated total economic impacts of the I-10 improvement scenarios in terms of expenditures, earnings, and jobs. These impacts include the direct and multiplier effects of the incremental savings in travel time between the base case (status quo) and each improvement scenario.

Note that estimated truck delay costs presented in this report are conservative, with an average value of approximately $25 per hour utilized. Recent TRB-FHWA studies suggest that carriers on average value savings in transit time at between $144 - $192 per hour. Use of these values significantly increases the truck delay costs/savings.

Scenario 1 - Additional Capacity – The cumulative economic impact (saving) for Scenario 1 - Additional Capacity is **$410.65 billion** from 2002 to 2025, or **$6.74 million annually per mile** of improvement. Using the latest TRB-FHWA values for transit time savings would result in a cumulative impact of $602.84 billion over the same period.

[15] Note that the benefits of Scenario 2 – Intelligent Transportation Systems were evaluated using different metrics than the other scenarios (see Technical Memorandum 6 – Scenario 2 Appendices).

Scenario 3 – Truck/Auto Separation – The cumulative economic impact (saving) for Scenario 3 – Truck/Auto Separation is **$69.28 billion** from 2002 to 2025, or **$6.25 million annually per mile** of improvement. Truck time savings were not estimated for this scenario[16].

Scenario 4 - Rail Intermodal – The cumulative economic impact (saving) for Scenario 4 - Rail Intermodal is **$12.54 billion** from 2002 to 2025, or **$206,000 annually per mile** of improvement. Using the latest TRB-FHWA values for transit time savings would result in a cumulative impact of $18.41 billion over the same period.

Scenario 5 - Maritime Intermodal – The cumulative economic impact (saving) for Scenario 5 - Maritime Intermodal is **$4.99 billion** from 2002 to 2025, or **$211,000 annually per mile** of improvement. Using the latest TRB-FHWA values for transit time savings would result in a cumulative impact of $7.33 billion over the same period.

Scenario 6 - Truck Bypasses – The cumulative economic impact (saving) for Scenario 6 - Truck Bypasses is **$43.97 billion** from 2002 to 2025, or **$4.98 million annually per mile** of improvement. Using the latest TRB-FHWA values for transit time savings would result in a cumulative impact of $64.55 billion over the same period[17].

Improvement Scenario Economic Impact
2002 to 2025 ($ 000)[a]
Base Assumptions

	Total	Annual	Annual per Mile
Scenario 1 - Additional Capacity	410,654,055	17,854,524	6,738
Scenario 2 - ITS	*Refer to footnote below*		
Scenario 3 - Truck Only Lanes	69,278,303	3,012,100	6,249
Scenario 4 - Multimodal Rail Corridor	12,543,483	545,369	206
Scenario 5 - Multimodal Waterway	4,990,010	216,957	211
Scenario 6 - Truck Bypasses	43,969,897	1,911,735	4,985
Scenario 7 - Truck Productivity	50,187,916	2,182,083	823

With TRB-FHWA Truck Transit Time Rates

	Total	Annual	Annual per Mile
Scenario 1 - Additional Capacity	602,840,153	26,210,441	9,891
Scenario 2 - ITS	*Refer to footnote below*		
Scenario 3 - Truck Only Lanes	69,278,303	3,012,100	6,249
Scenario 4 - Multimodal Rail Corridor	18,413,833	800,601	302
Scenario 5 - Multimodal Waterway	7,325,334	318,493	310
Scenario 6 - Truck Bypasses	64,547,809	2,806,426	7,318
Scenario 7 - Truck Productivity	73,675,861	3,203,298	1,209

[a] Note that the benefits of Scenario 2 – Intelligent Transportation Systems were evaluated using different metrics than the other scenarios (see Technical Memorandum 6 – Scenario 2 Appendices).

Scenario 7 - Truck Productivity – The cumulative economic impact (saving) for Scenario 7 - Truck Productivity is **$50.19 billion** from 2002 to 2025, or **$823,000 annually per mile** of improvement. Using the latest TRB-FHWA values for transit time savings would result in a cumulative impact of $73.68 billion over the same period.

[16] Note that these estimates do not include savings for the trucks using the truck-only lanes, which would be substantial. These estimates are the savings for those vehicles left in the general traffic stream.
[17] Note that these estimates do not include savings for the trucks using the bypass facility, which would be substantial. These estimates are the savings for those vehicles left in the general traffic stream.

A Positive Return on Investment

In order to comment on the potential return on investment of providing additional capacity along the I-10 Corridor, an analysis of the capital and maintenance costs and economic benefits was undertaken. This analysis showed that, assuming all required capacity is added as needed, and is implemented with a five-year delivery period, the cumulative present value[18] benefits from 2000 to 2025 would be $185.28 billion and the costs $18.28 billion[19]. Under these assumptions, the return on investment (B/C ratio) is 10 to 1. It is important to note that this return is higher than returns associated with a project specific Major Investment Study (MIS) corridor analysis, when the project evaluation typically occurs long after the capacity is needed. In the case of this study, the premise being that capacity is added as needed to maintain an acceptable level of service, the benefits are inherently higher. The results make a key point about the reality facing state DOT's: The future is an environment of scarce funding, and longer timelines for planning and environmental review. As a result, returns on highway investments are inevitably lower than what can potentially be achieved.

The following conclusions can be drawn from this analysis:

1. The return on investment is significantly positive (10 to 1 assuming all required capacity is added and is implemented with a five-year delivery period); and

2. The returns will be greatest when states have sufficient resources at hand to invest in capacity as needed.

The Social and Economic Cost of Maintaining the Status Quo (Doing Nothing)

The social and economic implications of maintaining the status quo (i.e., no improvements to capacity and/or other types of options which address congestion) will be broad, severe, and far reaching. The congestion growth as a result of maintaining the status quo on I-10 will impact the viability of the I-10 Region and will negatively impact trade and commerce with the rest of the nation and the world. The quality and frequency of travel options for passengers and freight and the ability for business and industry to grow in the I-10 Region will all be negatively impacted through the degradation of system reliability spurred by congestion growth.

The analysis of improvement scenarios has shown the correlation between congestion (measured through increases in travel time costs and vehicles operating costs) and economic activity. In the base case (status quo) scenario, the cumulative economic costs of congestion from 2002 to 2025 (resulting from increased travel time and vehicle operating costs) are estimated at $2.04 trillion.

Some of the implications of status quo congestion growth on I-10 are outlined following.

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[18] This is the net present value (NPV) of the benefits and costs at a 6 percent discount rate.
[19] The cost estimate includes construction and annual maintenance costs.

- **System Reliability and Access to Suppliers and Markets** – I-10 will experience significant degradation in system reliability or predictability of travel times. This will be most prominent in major cities where bottlenecks will worsen in frequency and duration. Businesses that rely on I-10 freight movement will find it increasingly difficult, due to system unreliability, to access suppliers and markets with the certainty they require. More difficult and time consuming freight movement (including access to ports and intermodal facilities along the I-10 Corridor) could cause the costs of goods to rise.

- **Just-in-Time Manufacturing** – Just-in-time or "continuous flow" manufacturing practices are widely practiced in the United States. This concept requires a consistent predictable supply chain that enables businesses to perform smaller and quicker production runs with a minimum of inventory. These practices leave just-in-time and continuous flow operated businesses vulnerable to severe adverse impacts if their supply chain is interrupted. Variance or unpredictability in freight movement as the result of congestion and system unreliability cause negative local, regional, state, national, and international economic impacts.

- **I-10 Region Competitive Position** – With a decline in system reliability and increase in transportation costs, the I-10 Region could lose some of its competitive edge, both in terms of its existing industrial and commercial base, as well as in terms of expansion and attraction of additional commerce and trade.

- **Employment and Productivity –** The combination of the above factors could have a stagnating effect on the I-10 Region's economy, leading to a decline in employment relative to surrounding economies.

- **Tourism Attraction and Retention** – When tourists experience congestion and lengthy travel times on I-10 they may decide on alternate recreation locations – shifting the economic benefits elsewhere.

- **Workforce Attraction, Retention, and Quality of Life** – Businesses in the I-10 Region need an adequate workforce to locate along the Corridor. The degradation of I-10 travel times and safety will reduce the quality of life and attractiveness of the region as a place to live.

- **National Environmental, Safety, and Security Goals –** I-10 forms an important part of the national transportation system and, as is very clear in this day and age, a part of national security. Status quo congestion growth levels are inconsistent with national environmental, safety, and security goals.

Interpretation of Results

Definition of Feasibility for this Study: This study was conducted by eight State DOT's to determine the feasibility of freight specific strategies to be used by them, as part of their future plans to invest in transportation improvements. While the analysis of this study is specific to a Corridor (Interstate 10), the study is not a traditional MIS corridor study. This study is an analysis of the feasibility of specific methods and policies toward investing in transportation anywhere along a high-use freight corridor such as the I-10. This study is not an analysis of the feasibility of specific projects along the Corridor.

The definition of feasibility is broader than the traditional benefit/cost (B/C) methods used in an MIS category corridor study. MIS category standards such as B/C ratios calculated from the net present value of economic and social benefits versus the net present value of construction, maintenance and operating costs are most suitable for calculating the feasibility of a specific project at a specific location. The findings in this study are at a strategic policy level. Feasibility is based on the impact of a variety of freight specific strategies and policies **aimed toward lowering congestion and reducing deficient mileage**. Once the partner DOTs identify specific projects that meet the strategies outlined in this study, one of the next steps would be to evaluate such projects using MIS level methods, such as B/C calculations. It is important to note that because this study is at a strategic policy level, a finding of feasibility implies ONLY that the respective approach warrants further analysis and design on a project level.

Feasibility of the Scenarios: The results of this Study indicate that the most feasible freight strategies for the State DOTs are those that are directed at the highway system. Analyses of present and future mobility demands, and alternative ways of meeting those demands, clearly indicates the most feasible strategy for the I-10 Partnership to enhance goods movement capacity throughout the I-10 Corridor is to focus on the highway facility. The following is a summary of the feasibility options.

Additional Lanes - The most effective approach is through the addition of lanes. Several segments of the I-10 Corridor are currently under expansion (specifically urban freeways and high-use rural segments between city pairs). Additional segments are also being planned and/or designed for expansion. **Results from the study show that traditional capacity enhancement should continue as a focus for reducing congestion.** However, the results of the analysis also show that **adding all the needed capacity (lanes) is not financially viable without a significant increase in funding.** The feasibility of this scenario is positive for all periods of the study – 2008, 2013 and 2025.

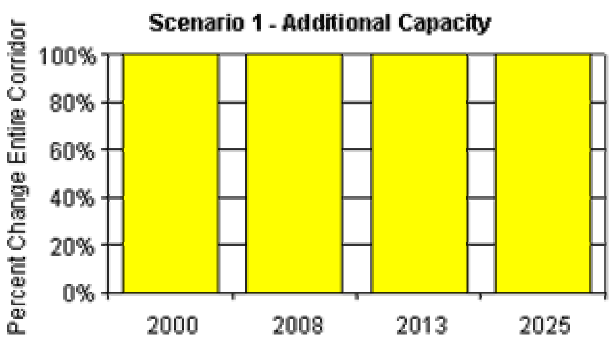
ITS/CVO Technologies – Coordinated corridor wide deployments of ITS/CVO applications **offer returns of up to $3 for every $1 invested.** Furthermore, since these applications are directed at the highway system itself, the benefits directly impact the highway user. However, the total impact on additional capacity is not measurable. Therefore, while ITS/CVO applications do yield high returns based on savings, emissions and safety, they are not feasible as a standalone method for meeting the demand for capacity on the highway system. ITS/CVO investments should continue to be implemented in conjunction with traditional capacity improvements. The use of ITS/CVO applications is positive over all periods of the study – 2008, 2013 and 2025.

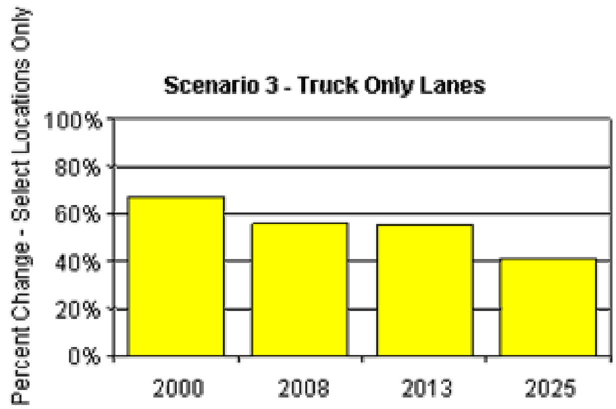
Truck/Auto Separation – Freight densities along some parts of the Corridor offer sufficient critical mass to support the feasibility of truck/auto separation. Although not fully developed anywhere (in practice) along the Corridor, or on any other high-use corridor in the U.S., the concept of separating autos and trucks has been studied nationally and at the State and local levels for a variety of reasons, including safety. The analysis in this Study shows that there are measurable operational benefits under circumstances where the LOS is at an unacceptable level and where truck traffic levels are high (greater than 20,000 vehicles per day). In such circumstances, evaluating the implementation of truck/auto separation should be considered in the process of evaluating alternative methods of adding capacity. **It is important to note that truck/auto separation, while feasible in concept, is in early phases of development from a traffic operations and a design/engineering standpoint and will require further innovation.** This approach appears feasible for several urban areas along the Corridor by 2008. Feasibility increases between several city pairs by 2013. By 2025, whole segments of the Corridor become feasible for consideration of truck/auto separation.

Truck Productivity and Truck Bypass – While these types of approaches offer some operational improvements in capacity, they are **not feasible as stand alone strategies**. However, these two approaches do complement the concept of truck/auto separation. In other words, they offer a sufficiently measurable impact on capacity to warrant evaluation at a project specific level, when considering truck separation.

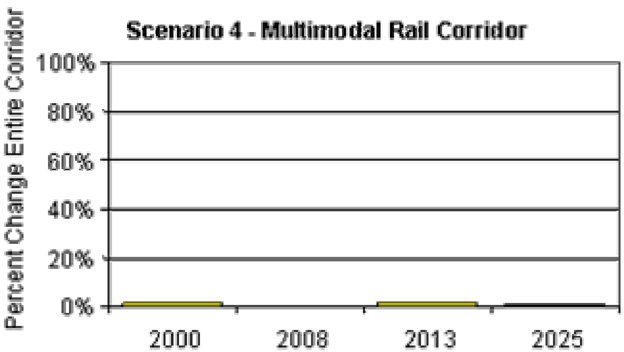
Multimodal Approaches – While investments in other modes such as rail and waterways can succeed in diverting freight traffic from the highway system, **the impact on overall congestion is minimal.** Therefore, multimodal investments, particularly for the I-10 Corridor, are not a feasible method for providing additional capacity to accommodate the expected growth in traffic **on the highway system.** It is important to note that the analysis does show that the rail and marine modes currently transport a significant share of freight throughout the Corridor, but significantly increasing this share will be extremely difficult.

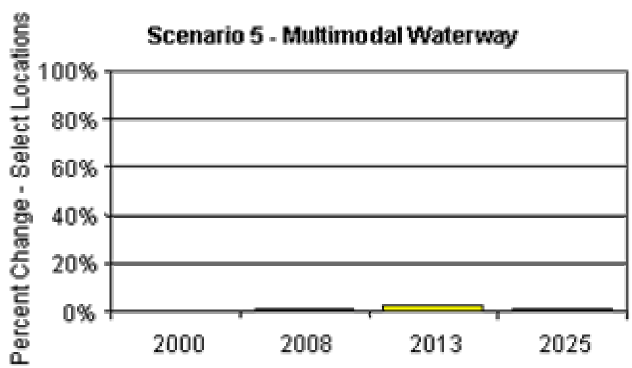
Exhibit 32
Impact of Each Scenario on Deficient Mileage
Reduction in Deficient Mileage

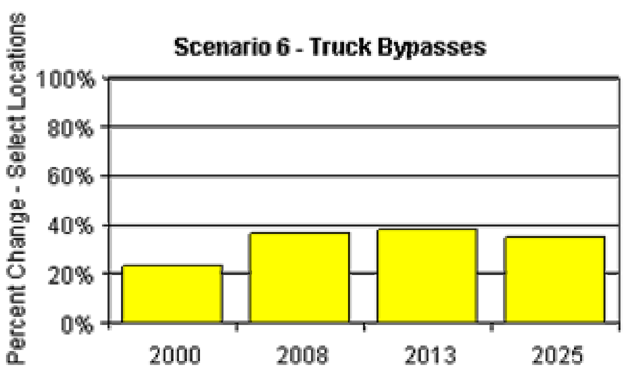


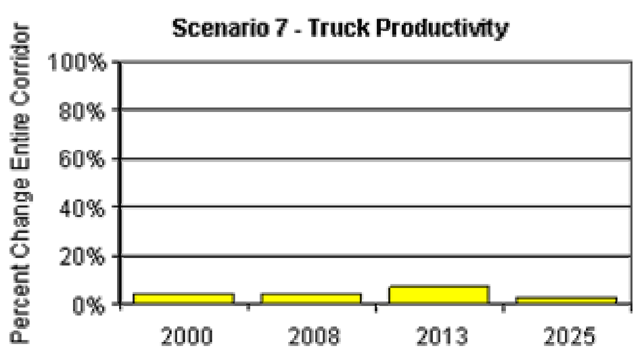


Scenario 2 – Intelligent Transportation Systems (ITS)
The return on ITS investments was an estimated $3 in benefits for every $1 spent. (NOTE: The ITS scenario was evaluated using different metrics that the other scenarios. There is no existing method of estimating ITS impacts on deficient mileage as was done for the other scenarios).









Additional Lane Miles Needed

In order to address the deficiencies outlined above, the study estimated the additional lane miles needed to match increasing travel demand and to maintain an acceptable LOS (at least D in urban areas and C in rural areas).

In order to begin the study with a balance between travel supply and demand, approximately **996 new lane miles should have been open to traffic in 2000**. Based on traffic projections, **an additional 5,064 lane miles would need to be constructed by the year 2025** in order to meet projected demand. This includes approximately 2,100 lane miles in rural areas along I-10, and 2,900 lane miles in urban sections.

Exhibit 33
Year 2000-2025 Additional Lane Miles Needed

State / Functional Class	Length (Miles)	Existing Lane Miles	Needed Lane Miles			
			2000	2008	2013	2025
Rural Interstate	1928.8	7,851.3	307.9	572.3	926.3	2,121.1
Urban Interstate	721.2	4,316.6	687.7	1,247.4	1,642.4	2,942.8
TOTAL	**2,650.0**	**12,167.9**	**995.6**	**1,819.7**	**2568.7**	**5,063.9**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

Capital Costs Associated with Adding Lane Miles

Based on the analysis, the estimated cost to construct the additional capacity along the Corridor is $21.3 billion[20]. The overwhelming majority of cost for additional capacity is needed in urban areas.

Exhibit 34
Year 2000-2025 Cost for Additional Capacity

State / Functional Class	Cost of Additional Capacity ($Millions)			
	2000	2008	2013	2025
Rural Interstate	462.0	913.3	1,725.4	3,876.0
Urban Interstate	4,141.5	7,496.0	9,842.9	17,416.5
TOTAL	**4,603.5**	**8,409.2**	**11,568.3**	**21,292.5**

Source: HPMS, 2000, Federal Highway Administration; Wilbur Smith Associates

[20] Based on Year 2000 dollars; includes complete construction costs, including estimates for ROW, engineering, design, etc.

Existing & Planned Expenditures Through 2003

To account for capital improvements along the Corridor, each of the I-10 Partners provided information from their State Transportation Improvement Plans (STIP) for fiscal years 2000-2003. Based on existing STIPs, it was estimated that approximately $2.3 billion will be spent through 2003, or $575 million per year. It is noted that costs for Interstate maintenance continue to increase and that funding for maintenance comes “off the top” of state highway allocations, making it likely that funds available for capacity enhancements will continue to decline.

Status-Quo Level of Anticipated Expenditures through 2025

FY 2000-2003 expenditures ($287 million annually)[21] were used as the basis for projecting "status quo” level expenditures along the Corridor through 2025. At the status quo level of expenditures it is anticipated that $6.3 billion would be spent on the Corridor. This estimate represents the amount of capacity enhancements along the Corridor given the current balance of expenditures among other funding priorities for the I-10 Coalition.

Exhibit 35
Status-Quo Levels of Anticipated Expenditures on I-10 from 2004-2025 ($000)

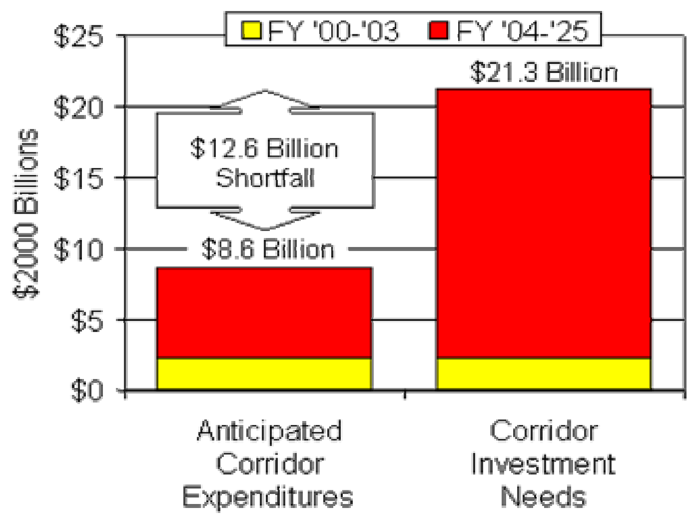
	2004-2008	2009-2013	2014-2025	Total 2004-2025
Corridor Wide	$1,439,082	$1,439,079	$3,453,793	$6,331,954

Estimate of Funding Shortfall Along the I-10 Corridor

The greatest issue facing the I-10 Corridor States is the anticipated shortfall of funding needed to address corridor development. With I-10 Coalition states facing growing statewide needs from both existing maintenance and new growth, funding for improvements along I-10 will become increasingly challenging.

Based on an across-the-board comparison of anticipated expenditures along the Corridor with the projected needs for adding capacity (as estimated by this study); the anticipated funding shortfall is $12.6 billion.

Exhibit 36: Estimate of Funding Shortfall Along the I-10 Corridor



[21] The 2000-2003 annual average estimate of $575 million includes projects for I-10 AND other directly related roadways, including major projects in CA, TX and AZ. Therefore, the annual average is adjusted down 50% ($287 million annually), when estimating future expected expenditures along the corridor.

Strategies Forward: Developing a CFCMA

The analysis for this study set the stage for developing a Comprehensive Freight Congestion Management Approach (CFCMA). The remainder of this report provides a series of strategies in support of such a congestion management approach. Interpretation of the results from the analysis conducted as part of this study provided the basis for developing the strategies.

Strategy #1: Traditional Approaches - Continue Capacity Expansion and ITS

The results of this study clearly show that the most effective method for states to reduce congestion is to direct resources toward adding capacity. However, the increasing cost of maintenance along with the reality that funding for maintenance "comes off the top" of state highway accounts, reduces the funds available for capital improvements.

Newer demand oriented innovations such as ITS/CVO should be viewed as common approaches applied concurrently with adding lanes. Implementation of a standard technology architecture throughout the Corridor will accelerate the impact of technological innovations.

The decision process for making these investments should be driven by the current project programming process conducted at the State and local level. The results from this study show that these types of investments are needed now, and throughout the course of the study period (2008, 2013 and 2025).

Strategy #2: Continue Mode Competitive Policies

Current policy on mode diversion and competitiveness focuses on maximizing the possible amount of diversion away from highways to other modes such as rail and marine. Efforts have focused on ways to make the other modes more competitive in service, specifically for mode neutral commodities/shipments.

This study shows the share of mode competitive traffic along high volume corridors while significant from a market standpoint, are not significant from a capacity enhancement standpoint. In other words, while diverting several unit trains a day of intermodal traffic from highway to rail may represent a measurable market development for the rail industry, removing that amount of traffic from the highway (100-140 truck equivalents per unit train) does not have a significant congestion impact.

Therefore, future modal policies should:

- **Continue Encouraging Modal Shifts** – Continue to focus on diverting freight off highways and avoid policies that would shift freight from other modes to highways.
- **Emphasize the Need to Accommodate Trucks** – Even with successful diversion tactics, the largest share of freight (current and future) relies on the highway/Interstate system.

Therefore freight modal policies should also encourage ways to accommodate trucks safely and efficiently.

Strategy #3: Develop and Apply Innovations to Accommodate Truck Traffic

Truck/Auto separation is an effective method for lowering congestion. Studies like the one recently conducted by the Reason Foundation, show that truck separation can improve safety, both real and perceived. While the costs of constructing truck only facilities is likely comparable to traditional mixed use facilities, separation approaches may offer opportunities for increasing funding options. In addition, there are issues related to traffic operations and design/engineering that must be addressed when considering truck separation, and currently there is no effective policy or strategy at the national or regional level to research and resolve these issues.

Operational Benefits – Truck and cars operate differently. Along high use corridors, this can create a conflict from a safety and from a congestion viewpoint. Separating the trucks and autos along high-use corridors offers significant benefits.

Truck Only Lanes vs. Exclusive/Separate Facilities – Truck separation can be achieved by either developing exclusive lanes (new or existing) along an existing freeway facility, or by developing an separate exclusive facility. The feasibility of either is a function of location (urban versus rural), density of volume (total volume and truck volumes), availability of right of way, and mix of local traffic versus through traffic.

Traffic Engineering Issues – Even in cases where truck separation is applied, there will have to be some degree of car/truck interaction, especially along segments where local traffic merges on/off the freeway system. This presents significant traffic engineering issues (trucks and cars crossing lanes to merge to and from exclusive lanes). Therefore, further research is needed for resolving such issues.

Design/Engineering Issues – Along urban freeways (where conditions for truck separation are most arguable) the options for exclusive lanes are generally limited to the same rights of way as the existing general use freeway or rights of way proximate to the existing freeway. This presents an engineering/design challenge, from a variety of perspectives, including cost, traffic operations and safety. In cases where rights of way are limited, the use of elevated facilities are being studied. In some locations, there is scrutiny of elevated truck facilities from a safety and cost standpoint. Again, there is a need for research in design/engineering innovations to mitigate these concerns.

Truck Bypasses and Truck Productivity Measures – The use of truck Bypasses and truck productivity approaches should be evaluated in conjunction with truck separation.

While the issues related to traffic operations and design/engineering are immediate and real, there currently is no effective policy or strategy, at the national or regional level, to research and resolve these issues. Instead, the issue of truck/auto separation is being addressed at the MIS project evaluation level where traffic operations and design/engineering (among other factors such as environment, safety, etc) are used as criteria. And so when it comes to innovations such as separation, issues regarding traffic operations and design/engineering make little progress beyond the MIS project evaluation level.

By recognizing at the national and regional/corridor levels, that **accommodating trucks** should be central to freight policy and that **truck separation** is a potential freight specific approach at reducing congestion, will likely lead to resources being directed towards driving innovations in truck separation. Once these issues are resolved, the concept of truck separation will be more likely to move beyond the MIS level.

Future Roles for the I-10 Partnership

Issues related to the demand for freight transportation transcend urban and state jurisdictions. Therefore, implementing solutions, both traditional capacity enhancements as well as innovative technologies require State/State and/or State/Federal partnerships. The I-10 Partnership presents the best means for coordination between the member states and other outside entities. The following are specific roles for the I-10 Partnership should pursue:

Highlight the role of Transportation in economic prosperity and expansion - It is especially critical that long-term federal and state transportation policy recognize the important role played by freight transportation in the economy.

Make a Case for Increased Nationwide Investment in Transportation Across All Modes – Congestion and the associated productivity loss are already symptoms of an overstressed transportation system. By the year 2020 domestic freight travel is predicted to grow by 85% and international trade is projected to increase 115%.

Develop and Implement a Consensus ITS Architecture – Technology strategies (e.g. ITS/CVO) show a significant Return on Investment and should be a component of any set of capacity improvements. Implementation of a standard architecture throughout the Corridor will accelerate the impact of technological innovations. The I-10 Partnership provides the ideal forum for coordinating the development and implementation a consensus ITS architecture.

Help Shape Highway Research Programs – The next reauthorization bill will likely contain new highway research programs such as FSHRP (Future Strategic Highway Research Program). The Partnership, in conjunction with AASHTO, can work to ensure that future highway research agendas include the research and innovations needed to accommodate trucks. Increased resources should be directed to research innovative ways of accommodating trucks on the highway system (truck/auto separation, automated truck platoons, etc.).

Coordination of Corridor Investments – The emphasis of multijurisdictional corridors as a decision process for funding improvements based, in part, on a system of strategic gateways and corridors that facilitate the movement of freight and people will likely increase from a Federal policy level. The Partnership should play a role is coordinating investments in corridors that serve major gateways, with a needed emphasis on jurisdictions that bridge the Corridor.

Funding Strategies

The national transportation system's capacity for inter-regional goods movement and travel is vital to the nation's economic health. Analysis of present and future mobility demand, and alternative ways of meeting that demand, clearly indicates the need to increase funding available for maintaining and enhancing goods movement capacity throughout the nation. Increased funding should not be "categorized", so that states can tailor the mix of capacity increasing improvements to those that are feasible and work best in any given area.

The following are six specific funding recommendations:

Recommendation 1: Funding For International Trade, Transportation & Security - given the increased global economy and more open trade policies such as NAFTA, the amount of trade transported on the nation's multimodal transportation system has grown significantly, and the need for investment in the (international trade) transportation system has grown concurrently. However, the amount of funding targeted specifically toward accommodating international trade has not grown proportionately.

The US is an increasingly import oriented nation – we are well-off, we can afford more, and our currency is stronger relative to other nations. As a result, the revenue generated from duties paid on imports is also significant. In Fiscal 2000 revenue from duty, tax and fee revenues generated by Customs was an estimated $22.9 billion[22]. In Fiscal 2000, total operating costs and other costs incurred by Customs was an estimated $2.6 billion. The difference between revenue and costs (approximately $20 billion) were remitted to various General Fund accounts, maintained by Treasury. This is an example of a potential revenue stream that could partially contribute toward transportation and security. At the very least, debates surrounding future funding cycles should consider the use of the incremental share of future growth in trade related revenues be directed toward transportation and security.

Recommendation 2: Greater Obligating Authority - The Byrd Amendment to the STAA of 1982 requires that an amount equal or greater than all current and previous funding obligations, less the amount spent down to date, be held in the Highway Trust Fund. As a result, on a year by year basis, obligating authority for states is typically smaller than what is appropriated. Allowing states to obligate the full amount appropriated through the various Federal programs will provide a net increase in funding for use in transportation by an estimated $15-19billion[23].

Recommendation 3: User Fee Increase - The principle argument in this study is the need for increased funding. Since the Highway Trust Fund (HTF) is a largely user supported fund, it is

[22] This is an estimate, actual amount could vary.
[23] This estimate is based on interviews with Federal officials. The actual amount varies based on funding cycles.

important that any effort that supports the need for increased funding at least look at the existing user based funding mechanism. Are there opportunities for increasing user fees? For example, what is the impact of a relatively lower Gasohol tax (18.4 cents per gallon for gasoline versus 13 cents for Gasohol) on the current revenue streams? What is the feasibility of a user fee on specific users for specific road corridors (for example, a toll for users of truck only lanes)? These are examples of revenue consideration at the Federal and State levels through the next series of annual funding cycles.

Recommendation 4: Increased Funding for Non-Highway Modes of Transportation - The Interstate system's capacity to accommodate future traffic growth is, in part, dependent on the success of the non-highway modes to accommodate their share of traffic. In other words, it is important that the other modes remain competitive so as to avoid diversion to highways. Therefore, there is a need to identify specific funding streams for non-highway modes. For example:

1. The existing **tax on diesel fuel used by the railroads** should be directed towards a specific fund that invests in improving rail corridors.
2. The existing **tax on diesel fuel used for barge transportation** should be invested in improving the competitiveness of the industry and the waterway system.

Recommendation 5: Opportunities to Strengthen Existing Programs - AASHTO has officially adopted a position on funding for freight transportation, much of which is based upon strengthening existing programs. For example, AASHTO states that: "Congress should clarify the eligibility of freight projects for CMAQ funding" and "should increase funding for the Section 130 highway rail grade crossing program, proportionate to the increase in the overall highway program, and increase flexibility within the STP safety set-aside." These are examples of approaches to strengthening existing programs.

Recommendation 6: Innovative Funding Programs - AASHTO has also taken a position on innovative funding programs, particularly in strengthening existing innovative programs for use in freight funding. The AASHTO approach identifies the TIFIA and the SIB programs.

The following is a summary of the AASHTO policy statement on freight funding.

IX-1. The U.S. DOT and AASHTO should jointly sponsor development of a freight planning capacity building process.

IX-2. Congress should enact an increase in FHWA's research and technology program allowing a greater emphasis on freight transportation research and create a Freight Transportation Cooperative Research Program.

IX-3 Congress should encourage the creation of a Freight Advisory Group.
A national freight industry advisory group should be created as a mechanism for communicating with one voice to "One DOT" on freight transportation issues.

IX-4. Congress should support the use of existing innovative finance tools and new financing mechanisms for investments in freight transportation infrastructure.

IX-5 Existing and proposed innovative financing techniques should be tailored to make increased investment in intermodal connectors possible in combination with increases in core TEA-21 programs.

IX-6. Congress, if it continues the Corridors and Borders program, should focus it more tightly on freight corridors and augment funding from the Highway Trust Fund with innovative financing.

IX-7. Congress should clarify the eligibility of freight projects for CMAQ funding

IX-8. Congress should increase funding for the Section 130 highway rail grade crossing program, proportionate to the increase in the overall highway program, and increase flexibility within the STP safety set-aside.

IX-9. Congress should expand and reform the Railroad Rehabilitation and Improvement Financing Program.

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