Freight Shuttle

Connecting El Paso and Ciudad Juarez with a Privately-financeable and Sustainable Cross-border Freight System

Note: This Proposal contains "Confidential Business Information" (CBI)

2013 TIGER Grant

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I. Project Description

The Nation Needs a Game Changer in Transportation

The transportation system in the United States and the policies guiding its future development are at a crossroads. Transportation fiscal solvency, infrastructure preservation, managing environmental impacts, dependence on fossil fuels, intensifying demand, and user-safety issues, have reached critical levels of intensity that have both the public and private sectors searching for solutions. Overhaul of highway system funding is among the most pressing issues with roadway maintenance costs surpassing new construction expenditures in almost every national venue. This is occurring at a time when a rising tide of demand has stressed our aging transportation infrastructure to the breaking point. The problems are real and intractable and pertain to all transportation modes.

Nearshoring Trends and Cross-border Freight

The major landside ports-of-entry (LPOE) to the US, including those along the US/Mexico border, experience truck volumes during peak hours that exceed capacity. The existing border crossing and inspection processes are inefficient; the evolution of infrastructure for truck inspections has not kept pace with traffic volumes. To make this problem worse, a significant amount of pollution is generated from the idling trucks waiting to cross the border decreasing the air quality in the region. Excessive border wait times adversely affect commerce—especially freight transported by trucks.

In the last few years, many global businesses have reassessed their investment in far-away labor markets. With its abundant, increasingly educated and low-cost labor force and in spite of its highly-publicized domestic unrest, Mexico is becoming a more attractive trade partner for businesses in the US. Punctuated by spikes in oil prices in 2007 and more recently in 2011, transportation costs between the Pacific Rim and the US have risen and increasing labor costs, primarily in China, have made these inefficiencies more visible to many supply chain managers. Since the US appetite for imports seems unquenchable, signs points to a shift in global commerce, toward sourcing options closer to or within North America. The numbers bear this out with massive investment by major global players in Mexico, establishing manufacturing operations closer to markets.

This situation has many benefits for US consumers and has geopolitical implications for both Mexico and our balance of trade deficit with China. A critical obstacle to efficient supply chain performance between the US and Mexico is congestion, excessive delay, and artificially elevated costs due to the prevailing security issues at landside ports of entry. This TIGER V project proposes the introduction of a transformational border crossing strategy that both elevates security and accelerates the velocity of trade while lowering the costs of goods movement. It represents a public-private partnership that leverages innovative, environmentally-sound and commercially-sustainable technology and business model to solve a major transportation and security dilemma. This proposal presents a significant new development that encourages private-sector investment in transportation infrastructure and provides US Customs and Border Protection (CBP) with the capability to efficiently scan 100 percent of the cargo entering and leaving US soil. It is the first approach to automated goods-movement that reduces the cost to move goods rather than adding an incremental expense.

Project Overview

The Approach: A Privately-financeable and Sustainable Freight Conveyance

The focus of this proposal is secure, efficient cross-border goods movement. We know that when goods and material flow efficiently, economic growth generally follows. Rising fuel costs, higher labor costs, and congestion are reducing the efficiency of the goods movement industry which now accounts for more than 10 percent of GDP. Given all that we know of the challenges, a new approach to freight transportation in congested freight corridors and ports of entry is desperately needed.

Ideally, the approach should:

- Be financeable with significant private participation and operated as a business in keeping with the commercial nature of goods movement.
- Reduce infrastructure deterioration by providing an alternative to over-the-road trucking;
- Reduce congestion at landside ports of entry and on over-burdened roadways while greatly improving security;
- Enhance economic competitiveness by providing a more efficient goods movement system;
- Reduce dependence on foreign oil and provide for long-term sustainability;
- Enhance community livability by creating far fewer emissions, less noise, and safer highways;
- Help attract new industry and create new and better jobs.

The Solution: Cross-border Freight Shuttle System connecting El Paso/Cuidad Juarez

The Freight Shuttle System (FSS) is a transformational approach that accomplishes all of these goals. The FSS is an automated system of transport vehicles operating on an elevated and secure guideway between specially designed, secure terminals.

The FSS is privately-financeable and, through air-space leasing of existing highway rights-of-way, creates value for the public-sector from underperforming assets. With the trucking industry and short and intermediate distance shippers as its customer base, the FSS will induce thousands of truck trips each day onto a lower-cost, more predictable conveyance. With the ability to operate 24/7 while generating no direct emissions, shipments will be delivered to customers saving fuel, tires, and time. And perhaps most importantly, the all-electric propulsion system will represent the first, large-scale step away from oil in our transportation sector – a strategic national priority.

Figure 1 View of the Freight Shuttle System

This proposal requests funding for preliminary engineering to accelerate the deployment of an 11.7 mile cross-border FSS connecting El Paso, Texas and Cuidad Juarez, Mexico (see Figure 2). The commercial deployment of the FSS is estimated to be a $212.41 million project. The commercial deployment will be an international effort, leveraging grant funds by roughly a 37:1 ratio. Preliminary engineering for a cross-border system was chosen for this grant opportunity for two reasons (1) the relatively short length of the system will, upon completion of the preliminary engineering and permitting, allow rapid deployment, and (2) the inefficiencies existing at our landside ports of entry create serious adverse impacts at both the regional and national level.

The following sections detail the ideas behind the Freight Shuttle and describe why it is among the right approaches for moving goods and for moving the economy forward in the decades ahead. The proposal will make a compelling case for investment in a new technology and in a new form of public-private partnership (PPP), predicated on sound business principles and developed to provide an environmentally-sound and sustainable freight system for the ensuing generations.

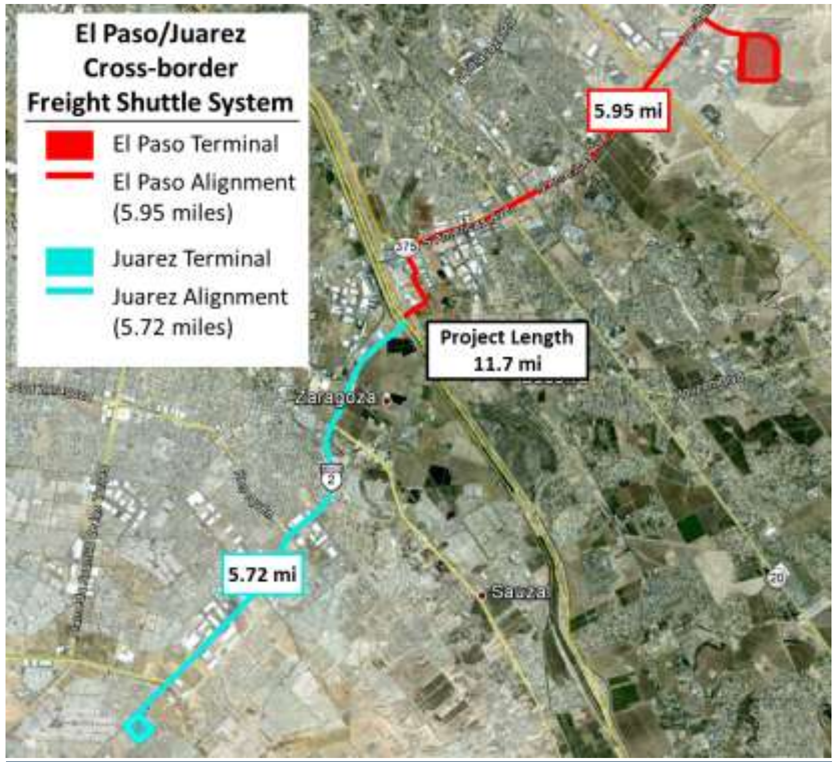

Figure 2 El Paso-Ciudad Juarez Freight Shuttle System Alignment

The Freight Shuttle System Description

Freight Shuttle International (FSI) and its affiliates are commercializing a new, innovative mode of transportation specifically designed for the safe, low-cost, and efficient movement of freight. Developed at the Texas A&M Transportation Institute (TTI), the Freight Shuttle System (FSS) is based on the recognition that the low-cost and time-certain delivery of freight is of paramount importance to the goods movement industry.

The FSS uses single-unit transporters propelled by linear induction motors (LIMs) to move freight on an electrified, elevated guideway built on highway right-of-way (ROW) or other available public or private ROW (Figure 3). Although the FSS's technology seems to be a significant paradigm shift for the transportation industry, similar linear induction systems are used around the world. Well-established people-moving systems operate in Vancouver and New York City. The adaptation of this technology for goods movement is the next logical step for freight transportation seeking efficiency and reliability. Implementation of this system at congested locations, whether in heavily congested freight corridors or at ports of entry, will dramatically improve mobility, reduce pollution, and stimulate economic development.

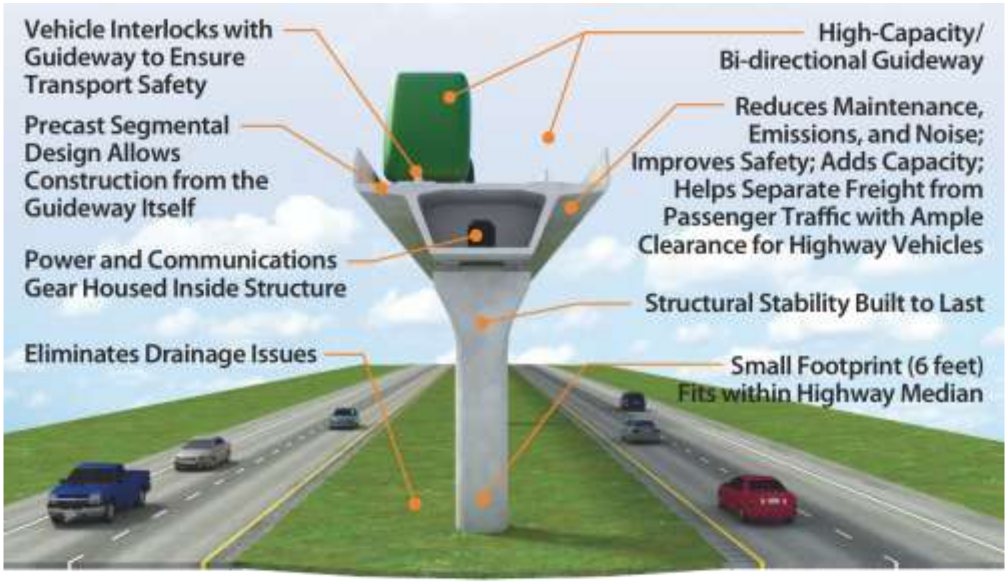

Figure 3 FSS Features

The FSS is the only technology capable of satisfying the wide range of social, environmental, and commercial parameters that a low-emission freight transportation system must meet. In addition, the FSS, backed by an attractive business model, has captured the interest of major commercial shippers and substantial sources of private and institutional investment. This privately financed system will be a powerful new tool for US DOT to enhance quality of life and increase the competitive position of US industry.

System Configuration and Specifications

Summary of Technology

The FSS is specifically designed for the movement of intermodal freight. The hybrid system integrates the best features of trucks and railroads to create a new mode of freight transportation, specializing in short- and intermediate-distance shipments. The FSS moves trailers and containers, via transporters, over segments of up to 500 miles on an emission-free, electric-powered guideway system constructed within existing ROWs. The FSS is composed of three primary components:

- Transporters
- Guideways
- Terminals

These elements are akin to cars, tracks, and stations in the more familiar rail model. The components are linked together by an intelligent communications, command, and control (C3) system. In this system, single-unit, autonomous transporters move cargo to and from terminals via an elevated, electric-powered guideway system. The transporters' steel wheels roll on a steel running surface, without the need for flanges, significantly reducing friction and increasing energy efficiency. Transporters and guideways interlock to prevent derailments and the guideway powers and steers the transporters.

As an automated, driverless conveyance, the FSS reduces two of the most expensive elements of trucking—fuel and driver-related costs—to provide a lower-cost yet more reliable method of shipping in congested corridors. Having no driver also enhances the attractiveness of the FSS in cross-border applications, as the human element is known to be the weak link in border security.

Guideway

Transporters travel along a guideway built in the medians of existing highways or other ROWs—for this proposal, down the median of Loop-375 in El Paso and along International Boulevard in Juarez. The elevated guideway facilitates automation because other modes of travel—cars, pedestrians, and trains—do not interact with the fully grade-separated system. The guideway is a precast, segmental bridge structure, specially adapted to the weights, dimensions, and operational parameters of the FSS.

Span Length

FSI has developed a streamlined solution to the guideway structure that is cost efficient and easily constructible, provides an aesthetically pleasing facility, and provides safe work zones throughout the project. The solution uses typical 160-foot spans with a 7-foot-2-inch-deep precast segmental box girder as shown in Figure 5.

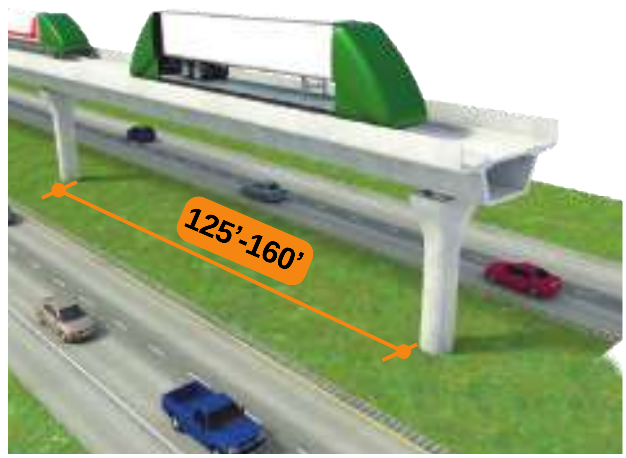

Figure 5 Typical 160-foot span length.

Box Girder

A standard box girder cross section has been optimized for structural performance, material efficiency, and aesthetics (Figure 4). The selected depth of 7 feet 2 inches provides a slender section that will accommodate the required internal tendons and create an efficient use of the concrete thicknesses in the segment. A reduction in the superstructure material quantity translates into reduced column and foundation loads and sizes.

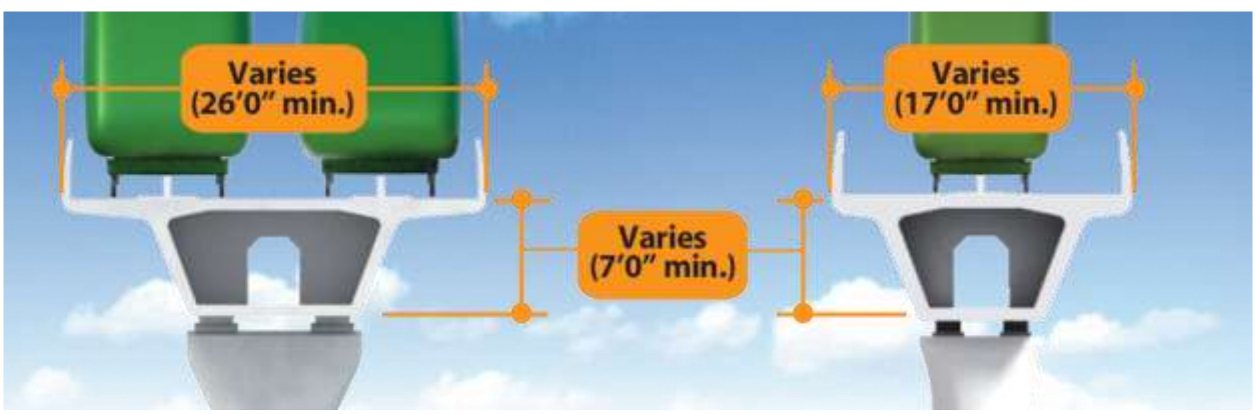

Figure 4 Left: Typical dual-track box girder. Right: Typical single-track box girder.

The same box girder shape used for the typical dual-track guideway will be used for the single-track structures within terminals (Figure 4).

Communications, Command, and Control (C3) System

Multiple, redundant communications elements will ensure that the control system is robust and resistant to communication outages. The FSS employs state-of-the-art information, sensing, and command and control technologies:

- Autonomous vehicles communicate with central control via a broadband, spread-spectrum radio network linked to an Ethernet communications backbone. This system will also allow vehicle-to-vehicle communications and provide forward- and rear-looking radar to provide additional collision avoidance capabilities.
- Vehicle positioning is cross-referenced between guideway-mounted bar-code position markers and onboard global positioning systems, yielding position accuracy to the sub-meter level.
- Onboard health monitoring is accomplished with the latest systems developed to assess the real-time condition of motors, logic systems, wheel bearings, and other vital system elements.
- Switches and vehicles communicate, as do vehicles and terminals, maintaining a constant flow of status, position, and condition data circulating between critical system components.
- Customer interface with the system is automated through a reservation system and shipment tracking on the FSS website.

II. Project Parties

Lead: Texas Department of Transportation (TxDOT)

The Texas Department of Transportation, the project applicant, pursues its mission to work cooperatively to provide safe, effective and efficient movement of people and goods in the State of Texas. As a key proponent of the Freight Shuttle project, TxDOT has collaborated with public and private stakeholders to advance the project.

Freight Shuttle International (FSI)

The foundation of FSI's strength is the substantial breadth and depth of experience of each of our team members. Our core team boasts significant expertise in the fields of freight transportation, large-scale commercial development, finance, law, and business management:

- Dr. Stephen Roop, Founder, Chairman of the Board and Chief Technology Officer: Dr. Roop is the designer of the FSS and oversees all aspects of design, engineering, and systems development. He has over 25 years of experience, is an assistant agency director at TTI, and brings extensive technological expertise, freight transportation experience, and a broad network of contacts in academia, government, and industry to FSI.
- Michael Stewart, Chief Executive Officer: Mr. Stewart provides leadership and, with the board of directors, helps set the strategic direction for the company, as well as develops relationships with licensees, elected officials, government agencies, and other key stakeholders. Mr. Stewart brings extensive company leadership, political strategy, and fund-raising experience from over 35 years of founding and growing a microcomputer manufacturing firm.
- Robert Radovan, Chief Development Officer: Mr. Radovan oversees business development for FSI, focusing on business development and permitting for the company's emerging development projects. He has long-standing relationships with professionals in marketing communications, construction management, and land use planning.

Texas A&M Transportation Institute (TTI)

The FSS has been under development at the Texas A&M Transportation Institute beginning in 2004. Its staff is uniquely suited to support this TIGER V Discretionary Grant by continuing to analyze the myriad requirements associated with deployment of an entirely new approach to freight transportation. The number of topic areas affecting or affected by an innovation of this magnitude is large and TTI's knowledgeable staff will provide assessment, guidance, and strategies for anticipating and effectively dealing with them.

FSS Development Consortium

Our wider FSS development team consists of well-proven and highly respected companies from a variety of industries (Figure). Details on the members of the development team are included in Appendix A.

Figure 8 Locations of FSS development team members. (Map of US, TX blown-up and highlighted with office locations of team members)

III. Grant Funds and Sources/Uses of Project Funds

Tasks	Funding Sources			Budget Amount	Percent of Budget
	TIGER	TxDOT	FSI		
	$ 10,340,639	$ 1,020,000	$ 9,412,981		
PERMITTING					
Environmental Permits	**400,000**	**100,000**	**-**	**500,000**	**2.4%**
Presidential Permit for Border Crossing	**1,800,000**	**200,000**	**-**	**2,000,000**	**9.6%**
			TOTAL PERMITTING	**2,500,000**	**12.0%**
PRELIMINARY DESIGN					
Surveying	**150,000**	**-**	**-**	**150,000**	**0.7%**
Preliminary Geotechnical Investigation	**330,000**	**70,000**	**-**	**400,000**	**1.9%**
Borings	180,000	20,000	-	200,000	1.0%
Preliminary Geotechnical Report	150,000	50,000	-	200,000	1.0%
Subsurface Utility Locations	**80,000**	**20,000**	**-**	**100,000**	**0.5%**
Preliminary Guideway Structure Design	**1,650,000**	**500,000**	**-**	**2,150,000**	**10.3%**
Conceptual Design	650,000	200,000	-	850,000	4.1%
30 % Design & Plans	500,000	150,000	-	650,000	3.1%
60% Design & Plans	500,000	150,000	-	650,000	3.1%
Preliminary Civil Work	**1,108,762**	**30,000**	**-**	**1,138,762**	**5.5%**
Design & Planning	120,000	30,000	-	150,000	0.7%
Site Clearing & Utilities	300,000	-	-	300,000	1.4%
Facility Construction	688,762	-	-	688,762	3.3%
Preliminary Terminal Design	**300,000**	**100,000**	**-**	**400,000**	**1.9%**
Conceptual Design	150,000	50,000	-	200,000	1.0%
30 % Design & Plans	75,000	25,000	-	100,000	0.5%
60% Design & Plans	75,000	25,000	-	100,000	0.5%
Terminal Construction	**2,938,355**	**-**	**-**	**2,938,355**	**14.1%**
Terminal Electrification	**988,522**	**-**	**-**	**988,522**	**4.8%**
Terminal Land Lease Fee	**595,000**	**-**	**-**	**595,000**	**2.9%**
Preliminary Engineering Design	**-**	**-**	**9,412,981**	**9,412,981**	**45.3%**
Engineering Development	-	-	4,865,983	4,865,983	23.4%
Refinement and Structures	-	-	2,571,006	2,571,006	12.4%
Final Design	-	-	1,975,992	1,975,992	9.5%
			TOTAL PRELIMINARY DESIGN	**18,273,620**	**88.0%**
			TOTAL PROJECT	20,773,620	100.0%

Figure 9 Proposed Budget

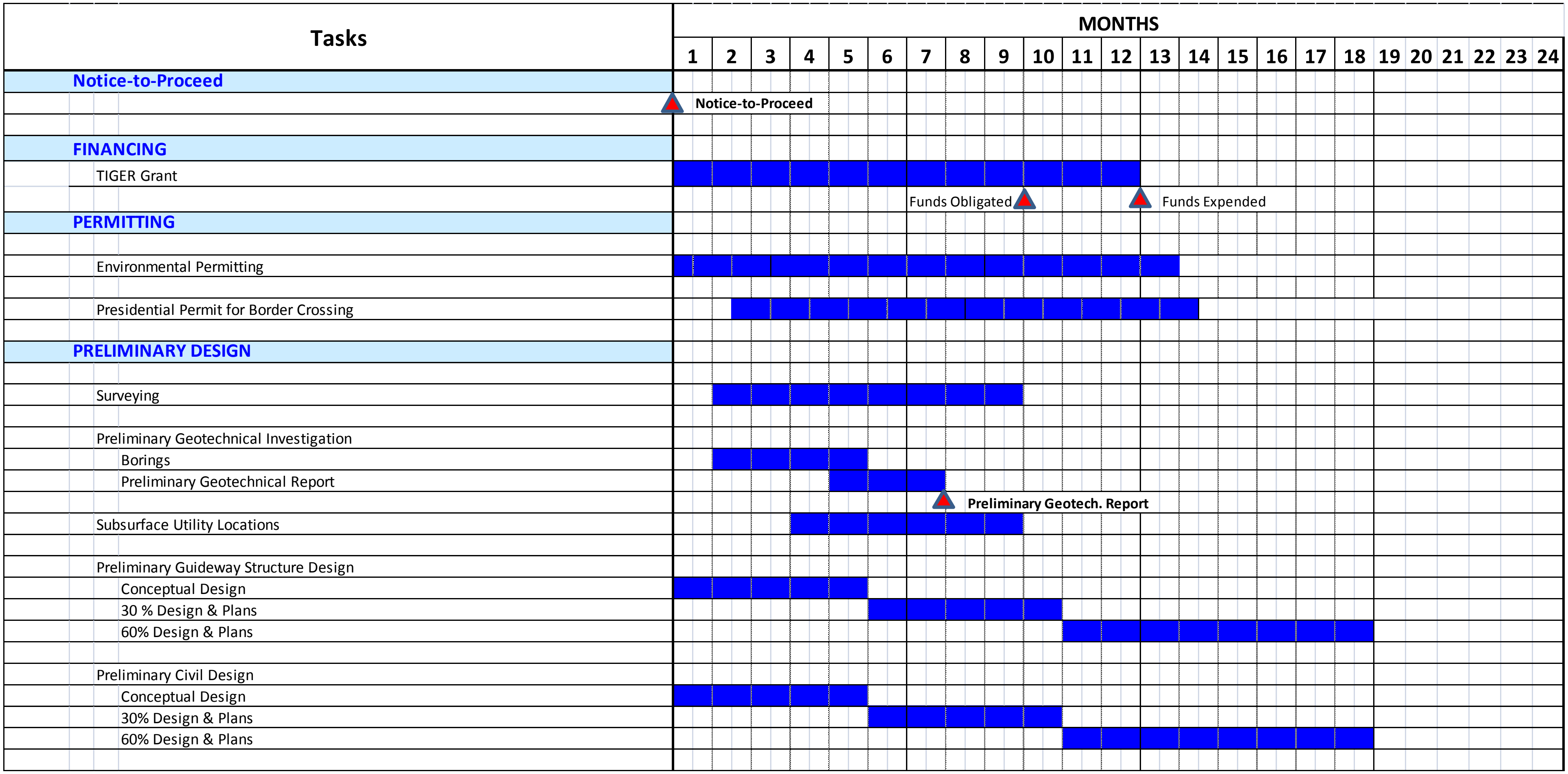

Figure 5 Proposed Schedule

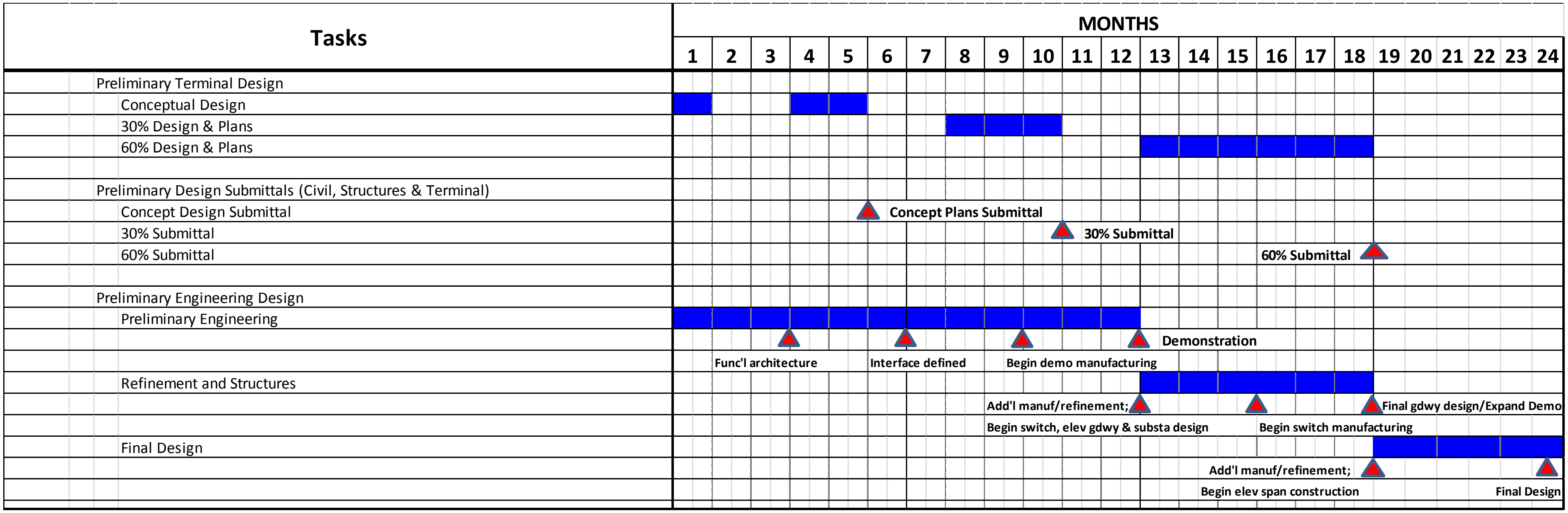

Figure 10 Proposed Schedule (cont.)

IV. Selection Criteria

Long-Term Outcomes

The FSS will help alleviate the adverse impacts associated with cross-border freight transport – LPOE congestion and security, infrastructure damage, air quality, carbon emissions and fossil fuel dependency. It will also help lower the cost of everyday consumer goods by enabling trucking interests, retailers and manufacturers to improve their supply chain efficiency. By automating freight movement, the FSS will greatly improve freight security, lower costs, and reduce the number of trucks at border crossings. In order to show specific benefits, we conducted an economic benefit-cost analysis for the proposed 11.7-mile FSS at El Paso-Juarez. With a 20 percent initial market capture rate, and an increase in market share over the first five years of operation to 50 percent of the market, the assessment showed that the total net present value of evaluated benefits over a 20-year period amounted to almost $64 billon. In addition, TTI estimates that the same 11.7-mile FSS, with initial capture of almost 1,000 shipments a day, can achieve the following public benefits:

- **Improve Cross-border Security:** Reduce efforts to ship contraband on trucks. 100 percent scanning will significantly diminish attempts and allow CBP to speed up the flow of goods between the US and Mexico.
- **Reduce Infrastructure Damage:** Prevent millions of dollars in truck-induced infrastructure damage every year.
- **Reduce LPOE Congestion:** Create additional capacity at our under-funded border crossings by inducing thousands of shipments away from international bridges.
- **Improve Air Quality:** Reduce air pollution and eliminate the known and suspected carcinogens that are byproducts of diesel trucks and will not be present in the FSS.
- **Decrease Greenhouse Gas Emissions:** Cut CO_2 emissions by thousands of tons each year.
- **Decrease Oil Dependency:** Reduce diesel fuel consumption by over 300,000 gallons per year.[1]

In addition to providing the US with a powerful tool to achieve many of its strategic transportation objectives, the FSS will provide significant economic stimulus and add value to existing transportation assets – and accomplish all of this under the umbrella of an effective public-private partnership.

State of Good Repair

Rising freight transportation demand both causes and suffers from the effects of traffic congestion, deteriorating infrastructure, and truck driver shortages. Between 1980 and 2010, truck travel grew by more than 90 percent while lane-miles of public roads increased by only five percent, resulting in a major imbalance between road demand and capacity.[2] The FSS provides solutions to these chronic issues by promoting reduced usage of the highway system. This will be accomplished by providing more secure and time-certain delivery at or below current costs. Reduced LPOE delays and highway congestion will improve motor carrier driver and equipment productivity, reducing idling time and emissions. In addition to the added efficiency for shippers, carriers and LPOE facilities, the avoided infrastructure damage and reduced congestion will significantly reduce life-cycle costs on congested roadways and bridges. TTI estimates that the 11.7-mile FSS project will result in the cumulative reduction of 125.8 million truck vehicle miles traveled (VMT) across the Zaragoza Bridge during the 20 year analysis period (2016-2035).

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[1] Based upon estimated El Paso freight VMT reductions in 2016 due to the FSS. A fuel efficiency of 6.2 mpg was used.

[2] U.S. Department of Transportation. Research and Innovative Technology Administration. Bureau of Transportation Statistics. *Freight in America*, January 2006. Washington, DC: 2006.

Economic Competitiveness

A region's economic health and development is intrinsically tied to the quality of the transportation infrastructure. The FSS will provide significant economic development opportunities for the El Paso-Juarez region it serves by providing new, higher performing infrastructure around which to build new industry. The FSS will reduce the cost of logistics through energy efficiency and automation and facilitate just-in-time manufacturing processes through time-certain delivery. These benefits will provide a distinct competitive advantage to its users and spur new economic development opportunities for a region that today is constrained by border congestion and marginally performing transportation infrastructure. This project will also serve as a model for similar projects across the US.

Livability

The FSS fosters livability for the El Paso community by diverting truck traffic away from crowded international bridges. The El Paso-Juarez communities surrounding the regions' LPOEs are plagued by poor air quality and traffic congestion due to the thousands of trucks that transport cargo to and from the bridges each day. With the FSS, intermodal cargo can be diverted away from urban areas and expressed directly inland to warehousing and distribution centers where trucks can make the last-mile delivery to customers, rail facilities, or, for exports, from inland facilities directly to trading partners in Mexico.

Environmental Sustainability

El Paso Region Air Quality Concerns

The El Paso region has multiple factors that contribute to the air quality. The Joint Advisory Committee for the Improvement of Air Quality Paso Del Norte (JAC) indicates the region known as the Paso del Norte, which includes El Paso, is located between the Franklin Mountains and the Sierras de Juarez in Mexico and is affected by topography, meteorology, economic and population pressures. According to the JAC, U.S. and Mexican health-based air quality standards are frequently exceeded in the Paso del Norte air basin. A report by the Center for Responsible Environmental Strategies (CRES) expands the discussion by indicating that "thermal inversions related to its topography, its desert location, meteorological conditions, and acts of God such as dry weather and high wind, contribute to the status of the air quality on any given day[3]." Additionally, the close proximity to Juarez across the border contributes to El Paso's air quality. The maquiladoras, brick kilns, and other industrial operations on the Mexican side of the border can negatively affect air quality in the region.

Zero Emissions

The FSS's zero-emission, electric propulsion system will be the first large-scale freight conveyance to move away from oil. Power-consumption calculations show that, on a BTU consumption basis, the FSS is 18 times more fuel efficient than the heavy duty diesel (HDD) trucks. Removing thousands of HDD trucks from the road will dramatically reduce emissions and lower the carbon footprint. Although the generation of electricity inherently creates some emissions at the point of production, the net reductions provided by one typical FSS are greater than 95 percent. Power plants emissions were converted from kWh of FSS electric consumption to tons of emissions per one million miles. HDD truck emissions were converted from grams/VMT to lbs/VMT. Based on a twenty year oper-

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[3] **Center for Responsible Environmental Strategies (CRES).** *The Citizens of El Paso Speak on Air Quaility: Summary of Findings.* Austin, TX : s.n., July 11, 2002. Report to Texas House Committee on Environmental Regulation.

ating period, the analysis showed that Carbon Dioxide (CO_2) and Oxides of Nitrogen (NO_x) would be reduced greatly. The discounted value for reducing NO_x and CO_2 during this period amounts to over $2.5 million.

Safety

The FSS has been designed to avoid the danger posed by the at-grade intersection of transportation modes. Highway-rail grade crossings are a prime example. The FSS utilizes an elevated guideway that eliminates all at-grade crossings which, in addition to costing the public sector and railroads millions of dollars annually, were the cause of 1,953 collisions in 2012.[4] Safety is further enhanced by securing transporters to the guideway through a patented vehicle-guideway interlock system that provides "tilt control" and ensures that transporters remain on the guideway. Most importantly, diverting thousands of HDD trucks away from congested highway corridors and bridges each day creates a significant safety benefit to passenger vehicles – one out of nine traffic fatalities in 2010 resulted from a collision involving a large truck[5].

Project Readiness

The FSS has been under development for 8 years and work has been underway in El Paso-Juarez since 2008. Initial project feasibility assessments were made by the Texas A&M Transportation Institute's Center for International Intelligent Transportation Research, followed by a US Department of Energy (DOE) funded study that determined the feasibility of the FSS in the region and provided the basis for the proposed alignment. The FS Development Team is currently prototyping the system.

In 2011 TxDOT issued a request for competing proposals for a "low carbon-emitting freight transportation facility" that has resulted in a "reservation of right-of-way" agreement between FSI and TxDOT for approximately 240 miles of FSS guideway along the freight-intensive I-35 corridor in Texas. This was following in 2012 by the granting of a major corridor within the Mexican State of Nuevo Leon, between the industrial center of Monterrey, Mexico and the Texas border at the Colombia Bridge. Both of these projects represent a solution for freight-induced congestion along a corridor and their scope is, as a result, too large for a demonstration project.

Project Work Plan

The following work plan focuses on the preliminary engineering and design activities necessary to deploy the Freight Shuttle System in commercial – and in the specific case of El Paso-Juarez – international operation. The combination of funds from FSI, TxDOT, and TIGER V will allow preliminary engineering and design along with environmental clearance and permitting to proceed at an accelerated pace. To set the stage for commercial deployment, the FSI development team will immediately initiate the fund-raising process to identify local sources of capital to invest in the system along side of the investors already committed to financing the project (see financing commitment letter in Appendix B).

The work plan contains 4 primary focus areas:

1. Environmental Permitting
2. Presidential Permitting
3. Preliminary Design

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[4] U.S. DOT. Federal Railroad Administration website: www.*FRA.dot.gov*

[5] Insurance Institute for Highway Safety Website: www.iihs.org

4. Preliminary Engineering

Environmental Permitting – Categorical Exclusion

Currently, heavy-duty diesel trucks dominate LPOEs. They are justifiably attractive for freight conveyance due to their inherent travel and scheduling flexibility. Unfortunately, these trucks also create detrimental environmental issues, the effects of which contribute to El Paso's non-attainment ranking in CO_2 emissions.[6]

The FSS is an evolutionary, environmentally sustainable approach to freight transport that will result in the elimination of thousands of trucks idling at international bridge crossings. Removal of these trucks will alleviate some of the prolific environmental issues, like greenhouse gas discharges and air pollution, by lowering the carbon footprint and reducing emissions. These beneficial environmental impacts must be reviewed in accordance with National Environmental Policy Act (NEPA) guidelines for projects with federal involvement (e.g., building in the median of an interstate highway).

NEPA Process – The NEPA process consists of an evaluation of the environmental effects of a federal undertaking, including its alternatives. There are three levels of analysis:

- Categorical exclusion determination.
- Preparation of an environmental assessment (EA) and finding of no significant impact (FONSI).
- Preparation of an environmental impact statement.

Due to FSS's abundance of environmental benefits and minimal anticipated negative impacts the FSS team anticipates that a Categorical Exclusion (CE) would satisfy the level of environmental analysis required for the project.

Preparation of a CE – Preparation of a CE would involve development of:

- **The purpose and need for the project:** The purpose and need, which would be generated in coordination with TxDOT, drives the process for considering alternatives, in-depth analysis, and ultimate selection.
- **Project alternatives:** During preparation of the EA, each alternative is evaluated for environmental constraints using background research, desktop analysis, and field investigations, including noise, air quality, jurisdictional waters and wetlands of the United States, threatened and endangered species, cultural resources, and indirect and cumulative impacts.
- **The environmental impacts of the proposed action and alternatives.**

In accordance with TxDOT guidance, technical reports for those areas of concern that may require technical assistance from the TxDOT Environmental Affairs Division (ENV) would be prepared and submitted for review, with resulting comments incorporated into the CE document. TxDOT has implemented this process to promote quick review of the CE document.

The FSI team proposes creation of a review committee comprised of staff from the TxDOT El Paso district, the Federal Highway Administration (FHWA), and relevant state and federal agencies, with a committee lead from TxDOT ENV. The committee would function as the core review team

6 U.S. Environmental Protection Agency. CO2 Emissions from Fossil Fuel Combustion, 1990–2009. 2009. http://www.epa.gov/statelocalclimate/documents/pdf/CO2FFC_2009.pdf.

for the technical reports and CE, preparing one full set of comments for each submitted document that would represent the interests of each participant. In response, the FSI team would have the ability to efficiently and directly address comments and concerns from all agencies.

Environmental Permitting Timeline – The FSS project is an environmentally beneficial project that we anticipate will proceed through the NEPA review process quickly and efficiently. The FSS team anticipates an accelerated NEPA review timeline for the following reasons:

- Since the project will be located fully within existing ROW, easement acquisition is not necessary, and field investigations could commence without the need to coordinate right of entry with local landowners. Data collection and field work is thus expected to require 3-5 months.
- The review committee proposed above will provide maximum opportunity for informal comment prior to the formal comment and review period.
- Since a main objective of the project is to promote environmental sustainability, negative environmental impacts will be minimized, which will drive a straightforward and uncomplicated review of the CE document. It is expected that the draft CE submittal will be in month 5 of the environmental permitting process, with TxDOT ENV and FHWA review taking place over a 4-6 month timeframe.
- Public hearings will be scheduled for month 11 of the CE process and culminate in month 12.

Presidential Permitting

As an international project, deployment of the FSS will require a Presidential Permit (PP) to pierce the border between the US and Mexico. The Presidential Permitting process is complex and requires the involvement of multiple federal and state agencies. Normally the PP process includes an environmental impact component, but in this case, we have identified the environmental permitting as a separate, parallel process. For the PP, the FSS team will prepare a request-for-qualifications (RFQ) and solicit submissions from qualified firms to assist in the communications, document preparation and reporting required for the PP permitting effort. Fees for this aspect of the project have been estimated and included in the proposed budget.

Preliminary Design

Surveying – Led by TxDOT, the FSS team will survey the identified route between its domestic terminal location and the point of crossing at the US-Mexican border. Much of the alignment will be along TxDOT-maintained roadway and thus, current existing surveys will be available. In those areas where new surveys are required, they will be undertaken to define the alignment, geometry, and footprint for the ensuing FSS facility.

Preliminary Geotechnical Investigation – Borings – In conjunction with FIGG, the FSS team will engage a qualified geotechnical engineer to assess the subsurface conditions associated with the identified facility alignment. The use of highway right-of-way will facilitate this task through the use of existing boring samples available at the El Paso District TxDOT office. For those locations where samples do not exist, the geotechnical engineer will collect data directly by boring. These data will be used by FIGG to establish the foundation requirements for the FSS guideway.

Subsurface Utility Locations – Working with TxDOT, the FSS team will determine the extent and location of subsurface utilities and define the appropriate remedial strategy to be used in advance of foundation installation. It is anticipated that the combination of TxDOT, EL Paso County, and City of El Paso sources will provide a comprehensive inventory of the utilities of interest.

Preliminary Guideway Structure Design – FIGG Bridge Engineers will provide specialized expertise and engineering assistance for preparing the requirements definition, trade-off analyses, subsystem definition and refinement for the elevated guideway. Under this task, FIGG will perform the following:

- Establish elevated guideway design criteria and coordinate with other team members on design requirements:
    - Wells-substations and rectifiers dimensions and weights; electrification conduit sizes, locations and weights.
    - Trinity-third rail, rolling surfaces, shuttle size and weights, and shuttle vertical profile.
    - Curtiss Wright-shuttle performance specifications as it relates to the elevated guideway, third-rail requirements, and switch design parameters.
- Based on the systems engineering information collected, FIGG will prepare drawings for the typical span, and the span housing the electrical substation and rectifier. These will be used to assess the available and required clearances to post-tensioning, access for maintenance of the guideway and rectifiers, and size of the opening required for equipment maintenance and replacement.
    - For the types of spans listed above, FIGG will prepare preliminary 3-D drawings to illustrate the various components and clearances within the box girder spans. It is anticipated that three (3) 3-D drawings will be prepared for each span type.
    - Prepare drawings of the general layout of the elevated guideway against the alignment identified and the foundation design for the typical span.
    - Undertake a span-length optimization study to establish the most economical span length/foundation type for the existing geotechnical conditions.
    - Prepare draft design and construction standards and specifications for the elevated guideway.
    - Develop preliminary construction drawings for the guideway spans at the 30% and 60% design level. These will include drawings showing concrete dimensions, foundation layouts, post-tensioning layouts, and major appurtenances.

Preliminary Civil Design – Civil engineering design and construction services will be directed at the initial build-out of the FS terminal in El Paso. These activities will include site work in preparation for facilities and structures; design and installation of utilities, design and phased construction of facilities, design and phased construction of at-grade guideway, design and installation of perimeter security fencing, and installation of parking for staff.

Preliminary Engineering Design – The Preliminary Engineering task will be directed at the finalization of the technical design of the FSS. Extensive planning and preparation has been directed at this undertaking with each of the development team members' roles clearly defined within a detailed work breakdown structure. The preliminary engineering and integration will focus on the principal FSS subsystems – propulsion system, transporter superstructure, guideway, switches, communications-command-control, electrification, and power delivery. The task is broken into 3 phases:

- Preliminary Engineering /Demo. This phase includes six months of technical refinement, interface design, and systems engineering. The second six months will be used for fabricating components and subsystems in preparation for a significant yet economical demonstration of functionality at the El Paso terminal site.
- Refinement and Structures. This phase expands the scope and capability of the initial demonstration of functionality. During this phase, an at-grade switch mechanism is added,

FIGG finalizes the design for elevated guideway spans, and WELLS finalizes the design for elevated guideway substations.

- Final Design. This phase continues to expand the scope and capability of the demonstration of system functionality. The main goals of this phase are adding three elevated guideway spans which include one span with a substation contained inside it.

Project Risks

Presidential Permitting

This project proposal for a FS CBE System pierces the border between the US and Mexico. Consequently, the deployment of FSS infrastructure over the Rio Grande River will require a Presidential Permit. Obtaining a Presidential Permit (PP) is not a trivial matter. Typically there are multiple stakeholders affected by a PP and the process of applying for and obtaining one reflects the complex issues involved. The process has been known to take several years, often directly reflecting the number of impacts to areas adjacent to proposed border bridges and the degree of alignment between involved federal agencies. Mitigating land impacts and agency alignment are crucial to expedited PPs.

The FSS should overcome both of these issues and granting of the PP should progress smoothly, because (1) the FSS does not materially impact properties at or adjacent to the border, and (2) the federal agencies involved – USDOT, TxDOT, US DHS/CBP and the DOS – are aligned as to the efficacy, desirability, and urgency of the innovation being proposed.

It is our contention that the Presidential Permitting hurdle to deployment will not be viewed as an obstacle, but rather be counted as an additional benefit in the array of benefits resulting from the proposed system and problem-solution strategy.

US CBP and Mexican Aduana

Lack of buy-in from security agencies represents another potential risk for the deployment of the FSS in a cross-border application. The experience with these agencies to date suggests however that they perceive that the FSS offers desirable security and productivity benefits to their organizations. Efforts to refine this effective new tool for use by security agencies at LPOEs will run parallel with the proposed project.

Innovation

The FSS is a completely new mode of freight transportation and as such incorporates several innovative concepts. The FSS has the sole patent (US Patent 7654203) for using LIMs to propel freight in an automated environment. Additional patents have been issued for critical ancillary features of the system (US Patents 8215591, 8113121, 8215238). Although LIMs have been used successfully in other applications, this is an innovative approach for a large-scale freight conveyance. The use of LIMs, which are electrically powered, also allows for regenerative braking which will re-capture energy during deceleration. The automated nature of the FSS enables a 24/7 operating plan that applies differential pricing strategies to encourage off-peak use. The FSS also takes advantage of a public-private partnership (PPP) whereby the public-sector provides underutilized assets, such as the airspace above a highway, and the PPP provides capital for the development of the revenue-generating system.

Partnership

The development and implementation of the FSS presents a robust PPP that is particularly well-suited to the times. With funding shortfalls and rising demand, the public sector is seeking new partnerships that can leverage public-sector assets to deliver the transportation services vital to the economic health of the nation and at the same time provide substantial new revenue to support other transportation needs. The FSS will attract private capital based on a sound business model that maintains the commercial emphasis of the goods movement industry. In partnership with the public sector, the FSS will both alleviate congestion and infrastructure deterioration and, through traffic-based payments, help augment revenue available to the public sector. The formula is simple: Private capital, the FSS, and public participation through ownership and air-space leasing of ROW will result in a green freight transportation alternative that generates revenue for the public sector.

Results of Benefit-Cost Analysis

The formal benefit-cost analysis (BCA) was conducted using best practices in transportation planning and reflecting all TIGER grant application guidelines. To the maximum extent possible given available data, the formal BCA prepared in connection with this TIGER grant application reflects quantifiable economic and social benefits. This BCA covers all of the primary long-term impact areas identified in the TIGER grant application guidelines. The benefits manifest in the following ways:

- Economic Competitiveness: The FSS improves economic competitiveness by significantly improving the freight movement through one of America's largest international land ports. By 2020, almost half of total truck traffic demand in the El Paso Border region will travel via the FSS system, resulting in significant commodity time savings, transportation cost savings, and truck crew value of time benefits. Economic efficiency benefits will be shared by shippers, truckers crossing the existing border crossing Zaragoza Bridge, El Paso residents traveling to and from Mexico7, and ultimately, the American consumer. Furthermore, significant benefits will arise due to the contingent development this project will attract. International companies will choose to invest new capital in the U.S by relocating near the Freight Shuttle System terminal on the U.S. side to take advantage of more efficiently transporting pre-manufactured goods to and from Mexico for assembly. U.S. businesses will be more confident to invest in this region due to increased border security the FSS project will provide them.
- Environmental Sustainability: The Greater El Paso region, as an international trade hub, serves an integral part of the U.S. economy. However, exceptional factors (e.g. topography, economic, population pressures, etc.) also make it one of the unhealthiest areas in America. According to State of the Air 2013, El Paso ranked near the top for 24-hour particle pollution, and current no build projections suggest this region will continue to exceed U.S. federal and Mexican health-based air quality standards.8 By reducing delay on the international border bridge crossings, the linear induction electric motors of the FSS will significantly reduce NOx and CO2 emissions and help meet USDOT environmental sustainability goals.
- Safety: Reduction in truck vehicle miles traveled (VMT) due to the shift of some freight from trucks to the Freight Shuttle will greatly improve the safety of the border region. Fewer fatalities, fewer injuries, reduced crash costs, and fewer hazardous material release incidents will occur because freight will be transported via driverless Freight Shuttle transporters rather than over-the-road trucking. While not quantified in this analysis, as noted elsewhere in this application the FSS project also provides significantly greater security.

[7] The El Paso border region has historically been one of the most economically depressed regions in the nation.
[8] State of the Air 2013. El Paso, TX. Accessed May 29, 2013 http://www.stateoftheair.org/2013/msas/el-paso-tx.html

- Livability: Few projects can accomplish livability goals set forth by USDOT better than the FSS.9 Currently, 72 percent of commercial truck trips are delayed on the Zaragoza international border bridge. The FSS will capture 20 percent of existing truck traffic in 2016 and 49 percent by 2020, resulting in significant time savings for both commercial and passenger vehicle traffic. Consequently, greater accessibility to Juárez (and other areas of the Chihuahua province) facilitates greater economic activity for El Paso neighborhoods. Furthermore, the FSS project aligns federal policies and funding by leveraging international, federal, state, local, and private sources to improve the economic and social well-being of El Paso residents.
- State of Good Repair: The FSS project greatly improves the state of good repair for existing transportation infrastructure. Specifically, the construction of the FSS project will result in the cumulative reduction of 125.8 million truck vehicle miles traveled (VMT) across the Zaragoza Bridge during the 20 year analysis period (2016-2035).

This analysis determined the computed benefit-cost ratio for the Freight Shuttle System (FSS) project to be 86.4 to 1. This BCA compares the capital construction and operation costs needed to maintain the new facility as well as contingent development construction and operation costs to the quantifiable benefits of the project for 20 years following construction.

The quantified benefits are:[10]

1. Commodity time savings, transportation cost savings, environmental benefits, and safety benefits resulting from a reduction in truck delay
2. Value of time savings and value added benefits resulting from added businesses efficiencies

Table 2 below shows a brief overview of benefits examined for the accompanying benefit-cost analysis.

[9] US Department of Transportation, Livability 101: Six Principles of Livability, Accessed May 28, 2013. http://www.dot.gov/livability/101

[10] Because costs were quantified for the United States portion of the project only, the benefits were quantified on the U.S. side only as well consistent with TIGER V guidelines.

Table 1 Project Matrix

Baseline and problems to address	Change to baseline/ alternatives	Type of Impacts	Population Affected by Impacts	Economic Benefits	Summary of Results[11]	Page of reference in BCA
Trucks delayed on the U.S./Mexico Border at the Zaragoza Bridge	FSS reduces delay by taking trucks off bridge border crossings.	Commodity Time Savings, Transportation Cost Savings, Environmental Benefits, Safety Benefits	El Paso residents, shippers, truckers, U.S. Customs and Border Patrol, traveling public, American consumers	Transportation cost savings and commodity time savings as a result of reductions in truck delay on bridge border crossings	$923M in discounted benefits arising from commodity time savings, transportation cost savings, environmental benefits and safety benefits	3-5
No additional facilities will be built in close proximity to the Freight Shuttle Terminal (U.S.)	Additional facilities will be built in close proximity to the Freight Shuttle Terminal (U.S.)	Value Added Benefits	El Paso residents, U.S. Customs and Border Patrol, maquiladora industry, American manufacturers, workforce, and consumers	Value of Time and Value Added benefits that will facilitate more economic activity in close proximity to border crossings.	$63.7B in discounted benefits arising from additional maquiladora facilities located near the border crossings.	6-7

Discount Rates

Federal TIGER guidance recommends that applicants discount future benefits and costs to the year 2013 and present discounted rates of both the stream of benefits and the stream of costs.[12] For this analysis, final streams of benefits and costs are presented at a 7 percent and 3 percent discounted rate. The benefit-cost ratio for the project is 86.4 to 1 at a 7 percent discount rate and a 112.9 to 1 using a 3 percent discount rate.[13]

Cost Benefit Results (Public and Private Sector Costs)

Table 3 summarizes project costs and the quantifiable benefits of the project in terms of net present value. The net present value of all direct project costs are shown as "Construction/M&O Costs" in the table below at $748.6 million discounted at 7 percent. Using the same 7 percent discount rate, the benefits have a net present value of $63 billion over the 20-year period, yielding an 86.4 to 1 benefit-cost ratio.

[11] Numbers presented are for the 7% discount value over the 20 year analysis period.
[12] Department of Transportation Office of the Secretary of Transportation, Docket No. DOT-OST-2012-012; Fed. Register Vol. 77, No. 20, pp.4868.
[13] Most net present value dollar figures presented in this analysis are based on a 7% discount rate.

Table 3: Benefit Cost Analysis Summary

Amounts in 2013 USD dollars, discounted to 2013

Category	Present Value at 7%	Present Value at 3%	Undiscounted
Construction/M&O Costs	$748,626,241	$890,005,985	$1,060,967,251
Total Evaluated Benefits	**$64,687,207,087**	**$100,518,050,576**	**$146,225,987,729**
NPV	$63,938,580,847	$99,628,044,591	$145,165,020,478
B-C RATIO	**86.4**	**112.9**	**137.8**

Cost Benefit Results (Public Sector Costs Only)

Table 4 summarizes project costs and quantifiable benefits of the project for financing from the public sector only in terms of net present value. In other words, Table 2 above reflects all construction and M&O costs (from both public and private sources) while Table 3 reflects only the public funds that are invested. The net present value of all direct project costs from public funds are shown as "Construction/M&O Costs" in the table below at $81.6 million discounted at 7 percent. Using the same 7 percent discount rate, the benefits have a net present value of $64.6 billion over the 20-year period, yielding a 792.2 to 1 benefit-cost ratio. This benefit-cost ratio results when counting only the investment of public funds because of the 9-to-1 ratio of private to public dollars invested in the project.

Table 4: Benefit Cost Analysis Summary for Public Sector Only

Amounts in 2013 USD dollars, discounted to 2013

Category	Present Value at 7%	Present Value at 3%	Undiscounted
Construction/M&O Costs	$81,654,425	$90,547,345	$100,846,319
Total Evaluated Benefits	**$64,687,207,087**	**$100,518,050,576**	**$146,225,987,729**
NPV	$64,605,552,663	$100,427,503,231	$146,125,141,410
B-C RATIO	**792.2**	**1,110.1**	**1,449.9**

Benefit Calculation Assumptions

The benefits of the FSS project are derived by comparing the build conditions to the no build conditions. Under the no build scenario, truck delays to cross U.S./Mexico border at the Zaragoza Bridge continue to grow, causing increased delays. It is estimated that without the FSS, 1.7 million trips per year will be taken by trucks crossing the international border in the El Paso region in 2014 and increase to 3.1 million trips by 2035. As shown in Table 5 below, under the build scenario it is assumed the FSS will capture 20 percent of the original truck market by 2014 and 49 percent by 2019.

Table 5: Estimated Freight Shuttle Truck Market Capture Rate

Year	Freight Shuttle Capture Rate
2014	0%
2015	0%
2016	20%
2017	25%
2018	31%
2019	39%
2020-2035	49%

Under the no build scenario, it is assumed that the full Freight Shuttle System (FSS) concept will not be constructed. The no-build scenario assumes that annual vehicle miles traveled by trucks will increase at a rate of 3.5% which results in increasing delay times and costs for transporting a given commodity. The expected costs from these delays were evaluated and used to create a comparison for the build scenario. Delay and environmental costs will continue to increase as the current scenario continues.

Under the build scenario, a reduction of 125.8 million truck miles will occur. This reduction will allow for more efficient pedestrian and non-commercial travel. Furthermore, the build will result in significant contingent development around the area of the Freight Shuttle System terminal creating economic opportunity and jobs for residents in the area. Finally, the FSS will lead to considerable environmental savings with a total undiscounted benefit of $6 million resulting in reduction of delay by 863,000 hours and less vehicle miles traveled by a FSS capture rate of 49 percent.

The benefits described in detail below reflect the comparison of the costs attributed to continuing to move goods by truck across the border in the El Paso region vs. the costs of transporting the cargo via the FSS system.

Benefit 1: Reduced Truck Delay

The implementation of a Freight Shuttle System will result in a reduction of 125.8 million truck miles across the Zaragoza Bridge over the 20 year analysis period provided. This transfer of traffic from the bridge to the Freight Shuttle will lead to a reduction in congestion and delay that produce quantifiable benefits.

As a result of reduced delay, a savings in commodity shipping time occurs which leads to greater efficiency in commodity transportation. Reduced congestion on the Zaragoza Bridge resulting from the development of the Freight Shuttle will result in more cost effective shipping for those who continue to use the now less-congested bridge. The delay reduction for trucks results in environmental savings by reducing harmful emissions caused by truck idling (creep idling), stop and go traffic, and inefficient travel speeds. Lastly, reducing truck delay times leads and decreasing stop and go traffic helps reduce the number of accidents which, in turn, reduces injuries and fatalities and their associated costs. The monetized values for these benefits are found in Table 6.

Table 6: Savings from Reduced Truck Delay

Amounts in 2013 USD, discounted to 2013

Year	Net Change in Vehicle Costs	Net Change in Crossing Fees	Net Change in Value of Time	Commodity Time Savings	Net Change in Safety Costs	Net Change in Environ-mental Costs	Crossing Fee Revenue	Total (7% Discount Val-ue)
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
2016	$1,974,067	$3,093,120	$6,335,263	$7,418,704	$37,425	$74,450	$17,620,566	$31,927,326
2017	$2,467,584	$3,866,400	$7,919,078	$9,273,380	$46,781	$103,593	$22,025,707	$37,306,873
2018	$3,084,480	$4,833,000	$9,898,848	$11,591,725	$58,477	$131,511	$27,532,134	$43,584,336
2019	$3,990,533	$6,252,674	$12,806,594	$14,996,747	$75,654	$161,900	$35,619,584	$52,692,306
2020	$5,162,749	$8,089,392	$16,568,520	$19,402,029	$97,877	$228,714	$46,082,809	$63,723,700
2021	$5,343,455	$8,372,536	$17,148,451	$20,081,138	$101,303	$239,304	$47,695,796	$61,641,005
2022	$5,530,478	$8,665,578	$17,748,653	$20,783,985	$104,849	$250,275	$49,365,166	$59,626,241
2023	$5,724,045	$8,968,873	$18,369,856	$21,511,424	$108,518	$263,209	$51,092,947	$57,678,121
2024	$5,924,383	$9,282,778	$19,012,788	$22,264,310	$112,316	$276,595	$52,881,167	$55,793,540
2025	$6,131,742	$9,607,684	$19,678,254	$23,043,582	$116,248	$292,125	$54,732,056	$53,971,344
2026	$6,346,349	$9,943,946	$20,366,980	$23,850,092	$120,316	$308,179	$56,647,644	$52,208,483
2027	$6,568,477	$10,291,994	$21,079,843	$24,684,867	$124,527	$326,574	$58,630,363	$50,503,931
2028	$6,798,376	$10,652,217	$21,817,644	$25,548,846	$128,886	$345,571	$60,682,445	$48,854,883
2029	$7,036,318	$11,025,043	$22,581,259	$26,443,053	$133,397	$366,129	$62,806,324	$47,259,888
2030	$7,282,577	$11,410,900	$23,371,563	$27,368,512	$138,066	$389,354	$65,004,432	$45,717,452
2031	$7,537,469	$11,810,286	$24,189,576	$28,326,420	$142,898	$413,306	$67,279,611	$44,225,305
2032	$7,801,292	$12,223,663	$25,036,247	$29,317,886	$147,899	$420,234	$69,634,496	$42,776,513
2033	$8,074,339	$12,651,495	$25,912,522	$30,344,020	$153,076	$447,787	$72,071,723	$41,380,844
2034	$8,356,796	$13,094,070	$26,818,996	$31,405,517	$158,433	$478,497	$74,592,941	$40,030,461
2035	$8,648,983	$13,551,890	$27,756,694	$32,503,577	$163,970	$489,733	$77,201,003	$38,718,376
TOTAL	**$119,784,493**	**$187,687,537**	**$384,417,628**	**$450,159,815**	**$2,270,917**	**$6,007,039**	**$1,069,198,914**	**$969,620,928**

Benefit 2: Contingent Development

The FSS system will facilitate significant contingent development opportunities. This occurs because companies with a cross-border presence will choose to locate near the FSS terminal on the U.S. side of the border to take advantage of the significant enhancements in transportation efficiency made possible by the FSS. These efficiencies accrue in transporting pre-manufactured goods to and from Mexico for assembly as well as finished manufactured goods. As shown in Table 7 below, based on Freight Shuttle capture rates, estimated growth in cross-border trade, and increased economic efficiencies derived from reduced transportation cost resulting from the FSS, it is estimated that the FSS project will add $63.7 billion in value added benefits over the 20 year analysis period.

Table 7: Maquiladora Industry Value Added Benefits

Amounts in 2013 USD dollars, discounted to 2013

Year	Contingent Development Value Added	Total (7% Discount Value)
2014		$0
2015		$0
2016	$4,269,412,695	$3,760,997,720
2017	$4,490,900,086	$3,703,219,078
2018	$4,723,877,737	$3,647,408,045
2019	$4,968,941,738	$3,595,479,092
2020	$5,226,719,100	$3,546,507,328
2021	$5,497,869,363	$3,485,437,732
2022	$5,783,086,283	$3,425,435,111
2023	$6,083,099,607	$3,366,481,257
2024	$6,398,676,937	$3,308,556,431
2025	$6,730,625,699	$3,251,643,129
2026	$7,079,795,206	$3,195,722,224
2027	$7,447,078,831	$3,140,776,886
2028	$7,833,416,291	$3,086,788,777
2029	$8,239,796,058	$3,033,741,172
2030	$8,667,257,880	$2,981,617,564
2031	$9,116,895,447	$2,930,400,924
2032	$9,589,859,184	$2,880,069,808
2033	$10,087,359,202	$2,830,619,722
2034	$10,610,668,385	$2,782,028,804
2035	$11,161,125,655	$2,734,276,284
TOTAL:	**$144,006,461,385**	**$63,717,586,160**

V. Planning Approvals

This proposal contains detailed material on the approvals sought as an integral part of the work plan. The proposal is seeking a Categorical Exemption under NEPA as an addition to already developed highway right-of-way. The work plan also proposes to seek a Presidential Permit to allow the FSS to cross the US-Mexico border. Appendix D contains a resolution passed by the El Paso City Council in support of the FSS project as well as a Memorandum of Understanding between the City El Paso and Juarez, Mexico and Freight Shuttle International, to jointly work together to implement the FSS in the region.

VI. Federal Wage Rate Certification

The Texas Department of Transportation certifies that it will ensure compliance with the requirements of the Subchapter IV of Chapter 31 of Title 40, United States Code (federal wage rate requirements), as required by the FY2012 Appropriations Act for any projects that receive federal funding under the National Infrastructure Program.

John A. Barton, P.E. — 3 June 2013

John Barton
Deputy Executive Director/Chief Engineer
Texas Department of Transportation

Date

Appendix A – Project Team

Figg Bridge Engineers—Guideway Design and Quality Management

FSI's principal designer, Figg Bridge Engineers, is a nationally recognized design firm with responsibility for the overall design of the elevated guideway. Figg is a family of companies exclusively specializing in the design, management, and construction services of bridges. The company pioneered elevated bridges for rail and motorists in existing right-of-way using precast segmental box girders on single piers. With over 24 miles of precast segmental rail bridges in the United States, Figg has built more than all other firms combined. Figg's designs have received 348 awards for quality and innovation, including the highest award for rail—the prestigious Dr. W. W. Hay Award for Excellence from the American Railway Engineering and Maintenance-of-Way Association for the JFK Airport AirTrain project in New York. It has also won two Presidential Awards for bridge design from the National Endowment of the Arts. Figg is recognized as a leader in the design, engineering, and inspection of pre-stressed concrete segmental bridges, and comprises the largest and most experienced concrete segmental bridge team in the United States. The team has studied, designed, or built bridges in 38 states and four nations with construction values over $10 billion and has a major office in Dallas.

Trinity Industries—Transporter Superstructure

Trinity Industries is a multi-faceted company that includes a variety of market-leading businesses that provide products and services to the industrial, energy, transportation, and construction sectors. Several Trinity business segments will be involved in the FSS project, including:

- TrinityRail: Confirmation of Trinity's capability to design and produce intermodal equipment rests in TrinityRail's long history of being a leading supplier of railcars in North America. TrinityRail has the largest market presence in North America with the most complete and diverse product line of any railcar manufacturer. With over 40 years of experience in designing and producing heavy-axle-load railcars, TrinityRail has become the leading supplier of rail equipment in North America, both for direct sale and through lease agreements, TrinityRail's engineering department is recognized as a leader in railcar design and innovation.
- Trinity's Parts and Components: Its businesses include the largest manufacturer of railcar axles in North America and, as a leading U.S. railcar parts manufacturer and distributor, will provide components for the FSS transporter.

Curtiss-Wright Corporation—Vehicle Propulsion System, Guideway Switches

Curtiss-Wright Corporation is a global provider of highly engineered technologies for critical applications. With a long history dating back to the Wright brothers' first flight in 1903, Curtiss-Wright provides an unmatched depth of experience in advanced machine design, integration, applied power electronics, and packaging for demanding utilization. Its experience includes design, development, and test of sophisticated first-of-a-kind machines and power-conditioning systems, as well as successful transition of these designs to repetitive production line manufacture. Capabilities include power and control electronics, motor design and manufacture, motor drives, embedded controls and computing, converters, inverters, power electronics, and modeling/simulation. With over 800,000 square feet of manufacturing space in the Pittsburgh area, Curtiss-Wright has extensive capability to produce high-volume products. Two divisions within Curtiss-Wright will participate in the FSS project:

- Electro-mechanical Division: the electro-mechanical equipment supplier of choice for many commercial and utility customers and the nuclear navy.

- Advanced Products and Systems Division: an acknowledged leader in the development and application of advanced high-performance motors and power electronics products ranging from a few kilowatts to hundreds of megawatts.

Transdyn—Communications, Command, and Control System (C3)

Transdyn has been delivering large infrastructure monitoring and control systems for over 25 years in the transportation, energy, and environmental markets to both U.S. and international customers. Transdyn has over 140 employees with project offices located in Atlanta, San Francisco, Houston, New York, and Washington, D.C. Transdyn's core competency is taking a diverse set of technologies and blending them into a fully integrated system. Its heritage as a leading systems integrator includes building some of the world's largest and most complex control and information management systems. In the transportation market, this includes designing and building information management and control systems that leading transportation agencies use to effectively manage their freeways, bridges, tunnels, and rapid-transit assets. Transdyn has successfully delivered systems for some of the most important transportation facilities including the Boston Central Artery/Tunnel, George Washington Bridge, Cross Israel Highway, and the Hampton Roads Smart Traffic Center.

Powell Industries—Electrification

Powell Industries manufactures electrical equipment and computer systems that monitor the flow of electricity in industrial facilities. Products include switchgear, bus ducts, and process control systems for instrumentation, computer control, communications, and data management. With over 50 years of experience, Powell offers many features that make it the preeminent supplier of power systems and equipment for the transit industry. Powell has successfully provided the power supplies for several major transportation authorities in the United States (New York City, Dallas, Washington, D.C., Baltimore, Los Angeles, Chicago, San Francisco, Seattle, San Diego, Sacramento, Boston, Philadelphia, and St. Louis).

Wells Engineering—Electrification and Substation Design

Wells Engineering is a power-system engineering and consulting firm located in Florence, Kentucky, specializing in the planning and design of power system networks. It is known for its capabilities in the areas of electrical system protection, stability analysis, transmission and distribution design, and substation design. Because the FSS is an all-electric system, the importance of guideway electrification cannot be overstated. Wells Engineering has completed a wide variety of substation designs and installations. It provides both the technical guidance and construction experience necessary to ensure a successful project.

Austin Industries—Construction

Austin Industries is one of the largest and most diversified construction firms in the nation. Operating primarily in the southern half of the United States, the company provides nearly every type of civil, commercial, and industrial construction service. Its financial strength—projects in progress exceed $2 billion in completion value—is a testament to its longstanding, sound financial management.

Appendix C – Freight Shuttle System (FSS) Benefit Cost Analysis Technical Memo

The formal benefit-cost analysis (BCA) was conducted using best practices in transportation planning and reflecting all TIGER grant application guidelines. To the maximum extent possible given available data, the formal BCA prepared in connection with this TIGER grant application reflects quantifiable economic and social benefits.

This BCA covers all five of the primary long-term impact areas identified in the TIGER grant application guidelines. The benefits manifested in the following ways:

- **Economic Competitiveness:** The FSS improves economic competitiveness by significantly improving the freight movement through one of America's largest international land ports. By 2020, almost half of total truck traffic demand in the El Paso Border region will travel via the FSS system, resulting in significant commodity time savings, transportation cost savings, and truck crew value of time benefits. Economic efficiency benefits will be shared by shippers, truckers crossing the existing border crossing Zaragoza Bridge, El Paso residents traveling to and from Mexico[14], and ultimately, the American consumer. Furthermore, significant benefits will arise due to the contingent development this project will attract. International companies will choose to invest new capital in the U.S by relocating near the Freight Shuttle System terminal on the U.S. side to take advantage of more efficiently transporting pre-manufactured goods to and from Mexico for assembly. U.S. businesses will be more confident to invest in this region due to increased border security the FSS project will provide them.
- **Environmental Sustainability:** The Greater El Paso region, as an international trade hub, serves an integral part of the U.S. economy. However, exceptional factors (e.g. topography, economic, population pressures, etc.) also make it one of the unhealthiest areas in America. According to *State of the Air 2013*, El Paso ranked near the top for 24-hour particle pollution, and current no build projections suggest this region will continue to exceed U.S. federal and Mexican health-based air quality standards.[15] .[16] By reducing delay on the international border bridge crossings, the linear induction electric motors of the FSS will significantly reduce NO_x and CO_2 emissions and help meet USDOT environmental sustainability goals.
- **Safety:** Reduction in truck vehicle miles traveled (VMT) due to the shift of some freight from trucks to the freight shuttle will greatly improve the safety of the border region. Fewer fatalities, fewer injuries, reduced crash costs, and fewer hazardous material release incidents will occur because freight will be transported via the driverless shuttle concept rather than over-the-road trucking. While not quantified in this analysis, as noted elsewhere in this application the FSS project also provides significantly greater security.
- **Livability:** Few projects can accomplish livability goals set forth by USDOT better than the FSS.[17] Currently, 72 percent of commercial truck trips are delayed on the Zaragoza international border bridge. The FSS will capture 20 percent of existing truck traffic in 2016

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[14] The El Paso border region has historically been one of the most economically depressed regions in the nation.
[15] State of the Air 2013. El Paso, TX. Accessed May 29, 2013 http://www.stateoftheair.org/2013/msas/el-paso-tx.html
[16] State of the Air 2013. El Paso, TX. Accessed May 29, 2013 http://www.stateoftheair.org/2013/msas/el-paso-tx.html
[17] US Department of Transportation, Livability 101: Six Principles of Livability, Accessed May 28, 2013. http://www.dot.gov/livability/101

and 49 percent by 2020, resulting in significant time savings for both commercial and passenger vehicle traffic. Consequently, greater accessibility to Juárez (and other areas of the Chihuahua province) facilitates greater economic activity for El Paso neighborhoods. Furthermore, the FSS project aligns federal policies and funding by leveraging international, federal, state, local, and private sources to improve the economic and social well-being of El Paso residents. This funding will in turn reduce congestion on existing bridge border crossings and efficiently allocate resources that will significantly improve border security.

- **State of Good Repair:** The FSS project greatly improves the state of good repair for existing transportation infrastructure. Specifically, the construction of the FSS project will result in the cumulative reduction of 125.8 million truck vehicle miles traveled (VMT) across the Zaragoza Bridge during the 20 year analysis period (2016-2035).

This analysis determined the computed benefit-cost ratio for the Freight Shuttle System (FSS) project to be 86.41 to 1. This BCA compares the capital construction and operation costs needed to maintain the new facility as well as contingent development construction and operation costs to the quantifiable benefits of the project for 20 years following construction.

The quantified benefits are:

1. Reduction in truck delay (U.S.)
2. Value Added benefits due to additional businesses efficiencies (U.S.)

Discount Rates

Federal TIGER guidance recommends that applicants discount future benefits and costs to the year 2013 and present discounted rates of both the stream of benefits and the stream of costs.[18] For this analysis, final streams of benefits and costs are presented at a 7 percent and 3 percent discounted rate. The benefit-cost ratio for the project is 86.4 to 1 at a 7 percent discount rate and a 112.9 to 1 using a 3 percent discount rate.[19]

Cost Benefit Results (Public and Private Sector Costs)

Table 1 summarizes project costs and the quantifiable benefits of the project in terms of net present value. The net present value of all direct project costs are shown as "Construction/M&O Costs" in the table below at $748.6 million discounted at 7 percent. Using the same 7 percent discount rate, the benefits have a net present value of $63 billion over the 20-year period, yielding an 86.4 to 1 benefit-cost ratio.

[18] Department of Transportation Office of the Secretary of Transportation, Docket No. DOT-OST-2012-012; Fed. Register Vol. 77, No. 20, pp.4868.

[19] Most net present value dollar figures presented in this analysis are based on a 7% discount rate.

Table 1: Benefit Cost Analysis Summary

Figures in 2013 USD dollars, discounted to 2013

Category	Present Value at 7%	Present Value at 3%	Undiscounted
Construction/M&O Costs	$748,626,241	$890,005,985	$1,060,967,251
Total Evaluated Benefits	**$64,687,207,087**	**$100,518,050,576**	**$146,225,987,729**
NPV	$63,938,580,847	$99,628,044,591	$145,165,020,478
B-C RATIO	**86.4**	**112.9**	**137.8**

Cost Benefit Results (Public Sector Costs Only)

Table 2 summarizes project costs and quantifiable benefits of the project for financing from the public sector only in terms of net present value. The net present value of all direct project costs are shown as "Construction/M&O Costs" in the table below at $81.6 million discounted at 7 percent. Using the same 7 percent discount rate, the benefits have a net present value of $64.6 billion over the 20-year period, yielding a 792.2 to 1 benefit-cost ratio.

Table 2: Benefit Cost Analysis Summary for Public Sector Only

Figures in 2013 USD dollars, discounted to 2013

Category	Present Value at 7%	Present Value at 3%	Undiscounted
Construction/M&O Costs	$81,654,425	$90,547,345	$100,846,319
Total Evaluated Benefits	**$64,687,207,087**	**$100,518,050,576**	**$146,225,987,729**
NPV	$64,605,552,663	$100,427,503,231	$146,125,141,410
B-C RATIO	**792.2**	**1,110.1**	**1,449.9**

Benefit Calculation Assumptions[20]

The benefits of the project are derived by comparing conditions under a "Build" and "No-Build" scenario. These two scenarios are defined as follows:

No Build

Under the no build scenario, it is assumed that the full Freight Shuttle System (FSS) concept will not be constructed. The no-build scenario assumes that annual vehicle miles traveled by trucks will increase at a rate of 3.5% which results in increasing delay times and costs for transporting a given commodity. The expected costs from these delays were evaluated and used to create a comparison for the build scenario. Delay and environmental costs will continue to increase as the current scenario continues. It can also be assumed that development in the area will not occur without the construction of the FSS, or at the rate it would happen with the FSS.

Build

The benefits described in detail below reflect the comparison of the costs attributed to continuing to move goods by truck across the border in the El Paso region to the costs of transporting the cargo via the FSS system. Under the build scenario, a reduction of 125.8 million truck miles will occur. This reduction will allow for more efficient pedestrian and non-commercial travel. The build will

[20] Additional information on sources used can be found in the Appendix.

result in contingent development around the area of the Freight Shuttle System creating economic competitiveness and jobs for residents in the area. In addition, the FSS will lead to considerable environmental savings with a total undiscounted benefit of $6 million, a reduction in delay by 863,000 hours and less vehicle miles traveled by a FSS capture rate of 49%.

Benefit 1: Reduced Truck Delay

The implementation of a Freight Shuttle will result in a reduction of 125.8 million truck miles across the Zaragoza Bridge over the 20 year analysis period provided. This transfer of traffic from the bridge to the Freight Shuttle will lead to a reduction in congestion and delay that has several quantifiable benefits. As a result of reduced delay, a savings in commodity shipping time occurs which leads to greater efficiency of commodity transportation for the region. Reducing congestion on the Zaragoza Bridge through the Freight Shuttle will result in more cost effective shipping by allowing producers to use the shuttle or transport along the now less congested bridge. The delay reduction for trucks results in environmental savings by reducing harmful emissions caused by truck idling and inefficient travel speeds (creep idling and reduced speed areas). Lastly, reducing truck delay times leads to increased safety for vehicles that experience reduced congestion in the form of reduced fatalities resulting from truck accidents. The monetized values for these benefits are found in Table 3.

Table 3: Savings from Reduced Truck Delay

Figures in 2013 USD, discounted to 2013

Year	Net Change in Vehicle Costs	Net Change in Crossing Fees	Net Change in Value of Time	Commodity Time Savings	Net Change in Safety Costs	Net Change in Environmental Costs	Crossing Fee Revenue	Total (7% Discount Value)
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
2016	$1,974,067	$3,093,120	$6,335,263	$7,418,704	$37,425	$74,450	$17,620,566	$31,927,326
2017	$2,467,584	$3,866,400	$7,919,078	$9,273,380	$46,781	$103,593	$22,025,707	$37,306,873
2018	$3,084,480	$4,833,000	$9,898,848	$11,591,725	$58,477	$131,511	$27,532,134	$43,584,336
2019	$3,990,533	$6,252,674	$12,806,594	$14,996,747	$75,654	$161,900	$35,619,584	$52,692,306
2020	$5,162,749	$8,089,392	$16,568,520	$19,402,029	$97,877	$228,714	$46,082,809	$63,723,700
2021	$5,343,455	$8,372,536	$17,148,451	$20,081,138	$101,303	$239,304	$47,695,796	$61,641,005
2022	$5,530,478	$8,665,578	$17,748,653	$20,783,985	$104,849	$250,275	$49,365,166	$59,626,241
2023	$5,724,045	$8,968,873	$18,369,856	$21,511,424	$108,518	$263,209	$51,092,947	$57,678,121
2024	$5,924,383	$9,282,778	$19,012,788	$22,264,310	$112,316	$276,595	$52,881,167	$55,793,540
2025	$6,131,742	$9,607,684	$19,678,254	$23,043,582	$116,248	$292,125	$54,732,056	$53,971,344
2026	$6,346,349	$9,943,946	$20,366,980	$23,850,092	$120,316	$308,179	$56,647,644	$52,208,483
2027	$6,568,477	$10,291,994	$21,079,843	$24,684,867	$124,527	$326,574	$58,630,363	$50,503,931
2028	$6,798,376	$10,652,217	$21,817,644	$25,548,846	$128,886	$345,571	$60,682,445	$48,854,883
2029	$7,036,318	$11,025,043	$22,581,259	$26,443,053	$133,397	$366,129	$62,806,324	$47,259,888
2030	$7,282,577	$11,410,900	$23,371,563	$27,368,512	$138,066	$389,354	$65,004,432	$45,717,452
2031	$7,537,469	$11,810,286	$24,189,576	$28,326,420	$142,898	$413,306	$67,279,611	$44,225,305
2032	$7,801,292	$12,223,663	$25,036,247	$29,317,886	$147,899	$420,234	$69,634,496	$42,776,513
2033	$8,074,339	$12,651,495	$25,912,522	$30,344,020	$153,076	$447,787	$72,071,723	$41,380,844
2034	$8,356,796	$13,094,070	$26,818,996	$31,405,517	$158,433	$478,497	$74,592,941	$40,030,461
2035	$8,648,983	$13,551,890	$27,756,694	$32,503,577	$163,970	$489,733	$77,201,003	$38,718,376
TOTAL:	**$119,784,493**	**$187,687,537**	**$384,417,628**	**$450,159,815**	**$2,270,917**	**$6,007,039**	**$1,069,198,914**	**$969,620,928**

Net change values presented above were calculated by first establishing a status quo value based on a no-build scenario. The no-build scenario for this project assumes that annual vehicle miles traveled by trucks will increase at a rate of 3.5% which results in increasing delay times and costs for transporting a given commodity. The expected costs from these delays were evaluated and used to create a comparison for the build scenario. The values presented in the above table represent improvements over the no-build scenario and can be interpreted as expected societal improvement values over the 20 year analysis period.

In order to calculate the monetized values for each benefit resulting from reduction in truck delays a set of assumptions was outlined. The truck operating cost for a congested area was assumed to be $1.50 per mile and the truck crew time value was set at $26.80 per hour with the assumption that trucks averaged 1.2 crew members per trip. For trucks traveling on the traditional bridge an average truck crossing fee of $17.50 was assumed. For freight moving by Freight Shuttle, the assumed bridge crossing fee is reduced to $8.55 and the average operating cost per trip is set at $3.21. Using these assumptions, along with the Freight Shuttle capture rate's outlined in Table 4, the net change in vehicle costs, crossing fees, and value of time savings were calculated and the total net savings of the project were found by subtracting the total vehicle transport costs (vehicle costs + crossing fees + value of time) in the build scenario from the total vehicle transport costs in the no-build scenario.

Table 4: Estimated Freight Shuttle Truck Market Capture Rate

Year	Freight Shuttle Capture Rate
2014	0%
2015	0%
2016	20%
2017	25%
2018	31%
2019	39%
2020-2035	49%

Commodity time savings were calculated in this analysis by first determining the average number of trips per commodity and the expected growth rate of these trips. Using the value of each commodity a commodity value of time was generated in the form of dollars per hour per ton. The annual commodity cost was found by multiplying the commodity value of time by the number of tons per load for each commodity load and annual hours of delay per commodity for each year in the analysis. The total value of savings was found by subtracting the sum of the annual commodity costs for every commodity and year in the build scenario from the sum of the annual commodity costs for every commodity and year in the no-build scenario.

Safety cost savings were estimated by first assuming a life valuation of $9.1 million and a fatality rate of 0.2 per every 100 million vehicle miles traveled. The total vehicle miles traveled in each analysis year was then divided by 100 million and multiplied by 0.2 to estimate the annual number of fatalities. These fatality estimations are multiplied by the life valuation of $9.1 million to determine the annual safety cost for the build and no-build scenarios. The Freight Shuttle is assumed to have a fatality rate of 0 due to the high safety level associated with its operation, therefore, vehicle miles traveled are calculated in the build scenario by multiplying the expected VMT for that year by 1 minus the expected capture rate for that same year(Build VMT= EVMT(1-Capture rate of FSS). The total expected savings of the project is found by subtracting the sum of expected annual safety costs for the build scenario from the sum of the annual expected safety costs for the no-build scenario.

Environmental cost savings assumes a value of $5,240/short ton of NOx, and a value of $30,649/short ton for SO2, and a variable cost for CO2; with these values being assumed based on recommended TIGER assumptions adjusted to short tons. Total cost calculations are found by multiplying the cost of each emission by the expected emission output in the build and no-build scenario. The no-build scenario calculated estimated emissions based on emission rates for diesel engines and the expected increase in VMT. The build scenario divides VMT between diesel engines and FSS based on the expected FSS capture rate for a given year; following this division, the emission rate for diesel engines is used to calculate emissions based on VMT for diesel engines and emissions for FSS are calculated using weighted emission qualities from the variety of power supplies used to generate electricity for the Freight Shuttle.

Upon completion of the Freight Shuttle, a crossing fee will be charged in order to generate revenue; this fee is assumed to be $50.99 for the U.S. portion of the project. The total revenue from this fee is found by multiplying the fee amount by the expected number of trips for a given year; a sum of these calculations yields the total project revenue for the analysis period. This benefit is compared to a status quo of $0 given the lack of FSS crossing fee in the no-build scenario.

This analysis only takes into account shifts in commercial transport; however, it is important to note the potential benefits to passenger transport that could result from the completion of a Freight Shuttle in the region. Currently, the Zaragoza Bridge is divided into two bridges with one designated for commercial use and one for passenger use. If reduced congestion on the commercial side leads to a blending of users or enables more support to be given to the passenger side during peak hours, then a reduction in congestion could be seen on the passenger side of the bridge as well. This reduction in congestion would lead to benefits in time savings, emission reductions, increased safety, and reduction in vehicle operating cost per trip. These benefits are not quantified in this report; however, if a reduction in truck congestion leads to a reduction in passenger congestion, then these benefits will be realized.

Benefit 2: Enables Maquiladora Industry to Build Additional Facilities

The FSS system will bring about significant contingent development opportunities. This is because international companies will choose to relocate near the Freight Shuttle System terminal on the U.S. side to take advantage of more efficiently transporting pre-manufactured goods to and from Mexico for assembly. As shown in Table 5 below, it is estimated that the FSS project will add $63.7 billion in value added benefits over the life of the project.

Table 5: Maquiladora Industry Value Added Benefits

Figures in 2013 USD dollars, discounted to 2013

Year	Contingent Development Value Added	Total (7% Discount Value)
2014		$0
2015		$0
2016	$4,269,412,695	$3,760,997,720
2017	$4,490,900,086	$3,703,219,078
2018	$4,723,877,737	$3,647,408,045
2019	$4,968,941,738	$3,595,479,092
2020	$5,226,719,100	$3,546,507,328
2021	$5,497,869,363	$3,485,437,732
2022	$5,783,086,283	$3,425,435,111
2023	$6,083,099,607	$3,366,481,257
2024	$6,398,676,937	$3,308,556,431
2025	$6,730,625,699	$3,251,643,129
2026	$7,079,795,206	$3,195,722,224
2027	$7,447,078,831	$3,140,776,886
2028	$7,833,416,291	$3,086,788,777
2029	$8,239,796,058	$3,033,741,172
2030	$8,667,257,880	$2,981,617,564
2031	$9,116,895,447	$2,930,400,924
2032	$9,589,859,184	$2,880,069,808
2033	$10,087,359,202	$2,830,619,722
2034	$10,610,668,385	$2,782,028,804
2035	$11,161,125,655	$2,734,276,284
TOTAL:	**$144,006,461,385**	**$63,717,586,160**

Other Non-Quantifiable Benefits

Annually, approximately 250 million tons of cargo cross our nation's land borders or arrive at our airports and seaports where they are then conveyed across our vast and complex maritime, air, rail, and roadway infrastructures (Information Sharing Environment, 2013). Since the attacks of September 11, 2001, the United States' Custom and Border Protection, along with the Department of Homeland Security have actively sought to not only secure our borders, but to also ensure that trade, a vital part of the American economy, is not adversely hindered or disrupted. However, according to Kevin McAleenan, acting assistant commissioner for field operations at DHS Customs and Border Protection, due to a lack of resources and time, only about 5 percent of cargo containers undergo scanning (Nuclear Threat Initiative , 2012). The Freight Shuttle System can alleviate many of these security concerns due to its unique structure that involves high- tech x-ray and particle scanners, an elevated design, driverless transporters, and a non-divertible and non-stop system design.

The main security functionality of the Freight Shuttle System (FSS) at high-risk locations, such as ports and borders, will be based on special terminals that will allow trained officers to scan 100 percent of containers for illegal substances and materials without disrupting the movement of the freight. Furthermore, the system will have "GPS and wireless communications in conjunction with a fiber-optic backbone which will provide a constant flow of information on status, position and operating conditions, enabling exceptional command and control of the entire system for maximum safety and efficiency." (Freight Shuttle International, 2013) The FSS communication network will be on its own "server" and inaccessible from outside sources or networks. This will help alleviate the ability of hackers or cyber-criminals from accessing or tampering with the network, and enhances the security of the shuttles as they move back-and-forth across the border. In addition, once the container is on the FSS, the removal of the driver and the cab from the equation helps to decrease 2/3 of the vulnerability associated with typical freight transportation. For example, it reduces the ability of the truck drivers from voluntarily transporting (or being coerced into) smuggling goods in their shipment, as well as the use of the cab to smuggle other materials across the border. Furthermore, part of the business model for the FSS is that it will exclude the transportation of HAZMAT chemicals, which will help to ensure that the FSS will not be a primary target of terrorist or criminal networks. All of these security components of the FSS stand to not only improve and increase security at the borders, but it also helps to enhance trade flow.

In a post-9/11 world, the United States' Department of Homeland Security and Customs and Border Protection (CBP) has been tasked with the burden of not only protecting the United States, but also preventing dangerous and illegal materials from crossing back-and-forth among its borders. Currently, these entities are being tasked with enhancing trade flow, while at the same time elevating security. Normally, these two objectives contradict one another, in the sense that elevating security measures often leads to a decrease in trade flow. As such, there has been a movement to find innovative techniques that could accommodate both objectives while at the same time not becoming a burden on the U.S. economic sector. One such initiative has been the proposal to build a Freight Shuttle System (FSS) that can be utilized at the U.S./Mexico border, specifically at the Zaragoza Bridge border crossing that connects El Paso, Texas with Ciudad Juarez, Mexico.

Mexico is a vitally important trade partner with the United States. As a Woodrow Wilson for International Scholars Report points out, Mexico is the second largest destination for U.S. exports and the third largest source of imports. Furthermore, six million U.S. jobs depend on trade with Mexico, denoting that one in every twenty-four workers in the nation depend on U.S.-Mexico trade for their employment. Additionally, "beyond the $393 billion in bilateral merchandise trade each year is another $35 billion in services trade and an accumulated total of $103 billion in foreign direct investment holdings." (Wilson, 2011, p. 1) Therefore, the promotion of trade across the U.S./Mexico border serves as a vital economic interest to the United States.

Additionally, the port of entry from El Paso, Texas into Ciudad Juárez, Mexico conducts "nearly 18 percent of the total trade between the U.S. and Mexico…making the El Paso gateway the second-busiest land port of entry in the U.S. by total trade value. In 2010 alone, more than $69 billion in US.-Mexico trade crossed through the region's ports of entry." (The City of El Paso International Bridges , 2012) In 2011, more than 3.6 million passenger vehicles, 4.2 million pedestrians and 300,000 commercial vehicles crossed from El Paso, Texas into Ciudad Juárez, Mexico. (City of El Paso, Texas, 2013) In 2013, in January through April alone, the Zaragoza Bridge received 754,599 non-commercial vehicles, 121,490 commercial vehicles, and 167,480 pedestrians. (The City of El

Paso, Texas, 2013) With this rate of traffic, the current entry points are at operational capacity, and it is projected that by 2035 that there will be a system-wide failure and unacceptable wait times if no operational improvements are made. (The City of El Paso International Bridges , 2012, p. 2) It is forecasted that "congestion and freight wait times will cause the regional economy to contract by $54 billion and lead to a net migration of 1.8 million residents by 2035, a detriment to the local, state and national economies." (The City of El Paso International Bridges , 2012, p. 2) Typical "peak period" wait times at the Bridge of the Americas (BOTA) already exceed two hours for passenger vehicle traffic and one hour for commercial vehicles during average days. (The City of El Paso International Bridges , 2012, p. 2) As such, there has been movement to find an innovative approach to address these issues, while at the same time increase the security and integrity of the borders.

The FSS will help alleviate many of the issues regarding safety and security. A few examples of how this may be accomplished are listed below.

The scanning stations will allow 100% of containers to be scanned and inspected for human, material, and chemical smuggling. Currently, it is estimated that only 5-10% of freight containers are scanned due to limited resources and time constraints. Most of these scans conducted are based off of a mix of profiling and risk-assessment parameters, which indicates higher degrees of vulnerability. With the FSS, all containers will be subjected to rigorous scans, therefore significantly increasing security.

By design, once the container is on the FSS, the removal of the driver and the cab from the equation helps to decrease 2/3 of the vulnerability associated with typical freight transportation. For example, it reduces the ability of the truck drivers from voluntarily transporting (or being coerced into) smuggling goods in their shipment, as well as the use of the cab to smuggle other materials across the border.

The modality of trucking is the preferred method of smugglers and traffickers to move products and materials across international borders. This is because only 5-10% of current freight cargo is inspected as it crosses the border due to lack of resources and time constraints. With the FSS, 100% of containers will be scanned for a variety of materials and will therefore act as a deterrent to traffickers and smugglers to export/import their materials through these means.

Security will be enhanced not only through scanning and x-ray devices, but also chemical and particle detection. This will prevent the transportation of chemical and hazardous materials. Part of the business model for the FSS is the exclusion of transporting HAZMAT chemicals on the system. This is due to the fact that not only will the system run through cosmopolitan cities, but that the rails will often be parallel to major roadways. By excluding transportation of such materials, this helps to ensure that the FSS will not be a primary target of terrorist or criminal networks.

Furthermore, to prevent corruption among CBP agents, agents will be randomly assigned to inspect containers and they will work in teams, which will serve as a means to keeping detection and reporting honest.

While the project is still in the construction phase, it is predicted that the FSS communication network will be on its own "server" and inaccessible from outside sources or networks. This will help alleviate the ability of hackers or cyber-criminals from accessing or tampering with the network, and enhances the security of the shuttles as they move back-and-forth across the border.

There are some other benefits that can be noted as well. Bob Cook, executive director of the Regional El Paso Economic Development Corp, has estimated that "by 2017, the Freight Shuttle could be able to handle virtually all of the cargo imported by 2,400 trucks a day crossing from Juárez at the Zaragoza and Bridge of the Americas ports of entry." The reduction of trucks and traffic would sharply reduce wait times while vastly increasing the region's import-export capacity. (El Paso Inc. , 2012) Furthermore, by providing an alternative mode of travel for 25 percent of the heavy duty diesel (HDD) trucks traffic, an improvement in overall safety can be expected. The calculation shows that by attracting HDD truck traffic to the Freight Shuttle System (FSS), over $26 million in crash-related costs are avoided. (Texas A&M Transportation Institute , 2010, p. 31)

Overall, the FSS helps to not only improve security but also to enhance trade flow. Its elevated design, driverless carriages, non-divertible carriages, and innovative design structures will help CBP personnel to not only thoroughly inspect all cargo coming across borders, but to also decrease the vulnerabilities we currently have with typical freight transportation.

Summary of Assumptions Used

Table 6 below provides a complete list of assumptions used for this analysis. Complete sources and links for all assumptions used, as well as all calculations are provided in the accompanying BCA spreadsheet.

Table 6: Analysis Assumptions Used

Assumption	Value	Source	Link
Crossing Fee per Trip	$100	Freight Shuttle International	Estimate provided by Dr. Steve Roop
Crossing Fee per Mile	$8.57	Freight Shuttle International	Estimate provided by Dr. Steve Roop
FS Crossing Fee per Trip (US portion)	$8.55	Freight Shuttle International	Estimate provided by Dr. Steve Roop; financial model
Truck Crossing Fee per Axle	$3.50	City of El Paso-International Bridges	Fee for Class 3-6 (Commercial Vehichles) found in chart on City of El Paso-International Bridges website under "Bridge Fees" http://home.elpasotexas.gov/bridges/fares.php
Average Truck Crossing Fee per Trip	$17.50	City of El Paso-International Bridges	Assuming an average of 5 axles per truck (5*Fee per axle of $3.50=$17.50); assumption based on large weights associated with the commodity mix being transported; http://home.elpasotexas.gov/bridges/fares.php
Fatality Rate per 100 M Annual VMT (Large Truck)	0.2	TREDIS	http://www.bts.gov/publications/national_transportation_statistics/html/table_02_18.html; http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/g7_countries_transportation_highlights/pdf/entire.pdf P.32; data adjusted in TREDIS to account for growth rates and other factors
Fatality Cost ($/fatality accident)	$9,100,000	US Department of Transportation - TIGER	Assumption taken from recommendation from the TIGER Benefit-Cost Analysis Resource Guide, p.3.http://www.dot.gov/sites/dot.dev/files/docs/BCA_OnlineSupplement_May2013.pdf
Truck- Crew Time Cost ($/hr per crew member)	$26.80	USDOT-TIGER	http://www.dot.gov/sites/dot.dev/files/docs/BCA_OnlineSupplement_May2013_0.pdf (P.5); Values adjusted for inflation to 2012 dollars using the inflation calculator at http://www.bls.gov/data/inflation_calculator.htm

Assumption	Value	Source	Link
Truck- $/hr per ton	$1.59	Cambridge Systematics/EDR Group	Freight logistics cost is estimated on the basis of values assigned for recurring travel time delay from HEAT documentation, based on literature review and additional research by Cambridge Systematics and EDR Group. These logistics cost values, added to crew cost and vehicle operating cost, yield total freight costs per hour in line with TTI congestion studies.
Truck- Environmental Cost ($/hr) Congested or Idle	$0.21	TREDIS	Environmental costs per VMT can include a wide variety of air pollution, water pollution, noise pollution and land quality/use impacts. However, the default values shown here include only costs associated with air pollutants defined by the Clean Air Act (NOx - nitrogen oxides, SO2 - sulfur dioxide, PM - particulate matter and VOC - volatile organic compounds) plus greenhouse gases. · For the Clean Air Act pollutants, the total cost per VMT is estimated to be 1.1c for cars and 3.9c for large trucks (source: FHWA: 1997 Federal Highway Cost Allocation Study Final Report Addendum, Federal Highway Administration, USDOT, 2000, Table 12. For greenhouse gases, the total cost per VMT is estimated to be 1.7c for cars and 2.4c for trucks based on Littman (Todd Littman: “Climate Change Emission Valuation for Transportation Economic Analysis,” VTPI, 2009 and drawing from Transportation Energy Data Book, Oak Ridge National Laboratory, 2008). Also shown in Table 5.10.7-2 of Littman: Transportation Cost and Benefit Analysis II – Air Pollution Costs, Victoria Transport Policy Institute, updated 2009. Note that there are also some studies that have derived values based on changing market values for emission credits; these sources have been used to derive estimates as high as 5c per VMT for cars and 26c/vmt for trucks.
Nitrogen oxides (Nox) Cost per short ton	$5,240	Tiger- converted to short tons	Original values found in http://www.dot.gov/sites/dot.dev/files/docs/BCA_OnlineSupplement_May2013_0.pdf (P.6-7); Coversion factor found in http://www.eia.gov/cfapps/ipdbproject/docs/unitswithpetro.cfm; Methods can be found in the "Environ Assum" tab
Sulfur dioxide (Sox) Cost per short ton	$30,649	Tiger- converted to short tons	Original values found in http://www.dot.gov/sites/dot.dev/files/docs/BCA_OnlineSupplement_May2013_0.pdf (P.6-7); Coversion factor found in http://www.eia.gov/cfapps/ipdbproject/docs/unitswithpetro.cfm; Methods can be found in the "Environ Assum" tab
Annual Travel Growth Rate	1.90%	TTI	http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-report-2012.pdf
U.S. Travel Distance (miles)	5.95	Google Earth	Used Google Earth to trace path FSS would follow and calculate the distance
Total Travel Distance (miles)	11.67	Google Earth	Used Google Earth to trace path FSS would follow and calculate the distance
Crew/Truck	1.2	TREDIS	Value obtained from the EDR Group through TREDIS; User Resources provides detail on calculation methods used by TREDIS
% of Trips subject to Delay (No-Build)	72%	Dr. Steve Roop, Freight Shuttle International	http://0-www.osti.gov.iii-server.ualr.edu/bridge/servlets/purl/1048877/1048877.pdf (P.107)
Truck Travel Time- Zaragoza Bridge Crossing (hours)	0.57	Dr. Steve Roop, Freight Shuttle International	Travel time is 34.2 minutes http://0-www.osti.gov.iii-server.ualr.edu/bridge/servlets/purl/1048877/1048877.pdf (P. 107)
Average Freight Shuttle operating	$0.54	Dr. Steve Roop, Freight Shuttle	El Paso Financial Modeling

Assumption	Value	Source	Link
cost ($/mile)		International	
Average Freight Shuttle operating cost ($/trip)	$3.21	Dr. Steve Roop, Freight Shuttle International	El Paso Financial Modeling
Vehicle Operating Cost $/mile (Congested) Truck	$1.50	TREDIS	Value obtained from the EDR Group through TREDIS; http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-report-2012.pdf (P.28-31)
Baseline El Paso - Juarez Cross-Border Trade		Texas Center for Border Economic and Enterprise Development	http://texascenter.tamiu.edu/texcen_services/trade_activity.asp; Total trade (import and export) between El Paso and Juarez
Occupany Rate		Real Estate Center at Texas A&M University	http://recenter.tamu.edu/mreports/2011/ElPaso.pdf (P.47)
Occupied Square Feet		Real Estate Center at Texas A&M University	http://recenter.tamu.edu/mreports/2011/ElPaso.pdf (P.47)
Warehouse Space Needed			Assumed 1 additional sqft of warehouse for every $1200 increase in trade based on historical analysis of the growth in cross-border trade vs. the growth in occupied warehouse space in the El Paso market
Cost of Marginal Warehouse Space			Assumed $80/sqft cost of warehouse based on local market conditions and construction cost.

Appendix D – El Paso City Council Resolution and Memorandum of Understanding

11B

CITY CLERK DEPT.
2010 DEC 23 PM 1:52

RESOLUTION

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF EL PASO:

That the City Manager be authorized to sign a Memorandum of Understanding among the City of El Paso, Ciudad Juárez, Chihuahua, México, El Paso Regional Economic Development Corporation (REDCo), and Freight Shuttle Partners, LLC, regarding the feasibility of a Universal Freight Shuttle.

ADOPTED this 6th day of January, 2011.

THE CITY OF EL PASO

John F. Cook
Mayor

ATTEST:

for Richarda Duffy Momsen
City Clerk

APPROVED AS TO FORM:

Josette Flores
Assistant City Attorney

APPROVED AS TO CONTENT:

Kathy Dodson
Director, Economic Development

CITY CLERK DEPT.
2010 DEC 23 PM 12:27

11B

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding ("MOU") is made and entered into by and between the City of El Paso, a Texas Municipal Corporation ("ELP"); Ciudad Juarez, Chihuahua, Mexico ("CDJ"); El Paso Regional Development Corporation ("REDCO"); and Freight Shuttle Partners, LLC ("FSP") and is effective on the date specified below.

WHEREAS, the international land ports of entry located at the U.S./Mexico Border in the El Paso/Juarez metroplex ("POE's") are integral to the financial well being of not only the two cities but the national economies as well;

WHEREAS, the POE's located in the El Paso/Juarez region regularly handle freight valued at about $50 billion (US) annually;

WHEREAS, both cities have acknowledged the need to develop and implement new technologies and modes of operation to increase the efficiency of handling trans-border freight in a safe, secure and reliable manner;

WHEREAS, FSP has developed a method commonly referred to as a Universal Freight Shuttle ("UFS") as a means to move freight across the international border and minimize truck traffic at the POE's;

WHEREAS, the development of the UFS Project requires the cooperation of ELP and CDJ as well as the State and Federal governments of Mexico and the U.S.;

WHEREAS, ELP and CDJ recognize the importance of reducing truck traffic at the POE's and increasing operational efficiencies with regard to the movement of freight and have agreed to assist the private sector partner, FSP, in the development of the UFS Project;

WHEREAS, the City Council of the City of El Paso believes that the public will be served by reducing truck traffic on the POE's thereby reducing the negative environmental impact that arises from the idling truck traffic and by furthering the economic development of the region; and

WHEREAS, REDCO has also agreed to participate in the development of the UFS Project.

NOW, THEREFORE, the parties agree to use best efforts to negotiate and work towards a final agreement as follows:

1. <u>City of El Paso (ELP)</u>. In order to advance the development of the UFS Project, the City of El Paso shall:

   a. Undertake the necessary process to investigate the possibility of securing the necessary right of way at the Zaragoza POE to establish the UFS international crossing on the U.S. side, utilizing the Presidential Permit. ELP will provide a complete report to all parties as to the necessary legal process, associated costs and other pertinent matters to achieve this objective.

b. Work with FSP, Texas Department of Transportation and/or other appropriate entities to identify the appropriate rights of way from the Zaragoza POE to possible sites for the UFS transportation terminal(s) and inspection facilities.

c. If necessary, work with FSP to resolve right of way issues with Union Pacific and/or BNSF in order to create a multi-modal capability at one or more locations.

d. Formulate a plan for an appropriate level of financial incentives to assist in the feasibility of the project and deliver a fair rate of return to the citizens of El Paso and present that plan to the City Council for consideration.

e. Assist in the identification and coordination with other appropriate potential partners such as the Camino Real Regional Mobility Authority.

2. **Ciudad Juarez (CDJ)**. In order to advance the development of the UFS Project, Ciudad Juarez shall:

a. Undertake the necessary process with Mexican federal government and/or concessionaire to validate the possibility of providing the necessary right of way at the Zaragoza POE to establish the UFS international crossing on the Mexican side of the international border. CDJ will provide a complete report to all parties as to the necessary legal process, associated costs and other pertinent matters to achieve this objective.

b. Work with FSP and other entities as necessary to identify the appropriate rights of way from the Zaragoza POE to the selected Juarez site(s) for the UFS transportation terminal(s) and inspection facilities.

c. Consider an appropriate level of financial incentives, including but not limited to municipal bond financing and state and/or federal tax incentives, that will improve the project's cost structure while at same time deliver a fair rate of return to the citizens of Juarez.

3. **El Paso Regional Development Corporation (REDCO)**. In order to advance the development of the UFS Project, REDCO shall:

a. Work with FSP to identify available land site(s) in El Paso that possess the appropriate size, location and other physical characteristics to accommodate inspection facilities, transportation terminals, prototype development and potential vehicle manufacturing.

b. Work with FSP to identify available land site(s) in Juarez that possess the appropriate size, location and physical characteristics to accommodate inspection facilities and transportation terminal.

c. Conduct an in-depth economic impact analysis of the UFS Project which can be used by all parties to accomplish their individual and collective objectives related to the project. All parties will have input into the design of the final deliverable.

d. Use its contacts within the private manufacturing / transportation sector of El Paso and Juarez to open doors for FSP to offer FSP's services.

e. Work with FSP to identify additional sources of private financing if needed.

4. **Freight Shuttle Partners, LLC. (FSP)** Depending on the other parties' progress regarding their commitments to this MOU and any further agreements with the City and other necessary entities, FSP shall consider the possibility of constructing or causing to be constructed a complete UFS System in the El Paso/Juarez area, designed to transport cargo shipments from point to point within the region, and that minimally would have the following characteristics:

a. Minimum investment in excess of $100 million for the system.

b. Terminal facilities in both El Paso and Juarez that would have required security, inspection and other amenities/facilities deemed necessary pursuant to an agreement, as well as those deemed necessary by the federal governments of the US and Mexico.

c. The design and construction of elevated, secure bi-directional guide ways that will link the terminal facilities in both El Paso and Juarez. Guide ways would be expected to require a maximum footprint of no more than five (5) feet on the ground, and be constructed in such a manner as to minimize interference with vehicular traffic flows in El Paso, Juarez, and at the POE.

d. Cargo transport vehicles in the UFS system that would be unmanned and driven by all-electric, linear induction motors.

e. Development of a prototype vehicle for a Border System at the El Paso location.

5. **Joint Activities.** Once the parties sign this MOU, they agree to work together to:

a. Determine a project schedule and timelines for each of the obligations the respective parties have undertaken

b. Develop and implement a process to communicate with the appropriate federal official(s) and/or agencies in both the U.S. and Mexico with the goal of bringing the entire project to a successful conclusion.

c. Develop an implementation plan for the UFS Project including a financial plan, permitting plan and ROW acquisition schedule and plan.

6. **Termination**. Any party may terminate this MOU upon thirty (30) days' written notice to the other parties of the intention to terminate this MOU.

SIGNED and EXECUTED this 11th day of January, 2011.

THE CITY OF EL PASO

By: [signature]
Joyce A. Wilson
City Manager

APPROVED AS TO FORM:

[signature]
Sylvia Borunda Firth
Senior Assistant City Attorney

APPROVED AS TO CONTENT:

[signature]
Kathy Dodson
Director, Economic Development

[SIGNATURES CONTINUE ON THE FOLLOWING PAGE]

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Doc. No.: 59706 v7 (12/23/10 clean)
Doc. Name: Project Development-Freight Shuttle
Doc. Author: SFIR

CIUDAD JUAREZ

By: ____________
Printed Name: EVERARDO MEDINA.
Title: DIRECTOR DE COMUNICACIONES Y OBRAS PUBLICOS DE LA FRONTERA.

EL PASO REGIONAL DEVELOPMENT CORPORATION (REDCO)

By: ____________
Printed Name: Bob Cook
Title: President

FREIGHT SHUTTLE PARTNERS, LLC

By: ____________
Printed Name: ROBERT RADOVAN
Title: CHIEF DEVELOPMENT OFFICER

Doc. No.: 59706 v7 (12/23/10 clean)
Doc. Name: Project Development-Freight Shuttle
Doc. Author: SFIR