INTERSTATE 10 MOBILE RIVER BRIDGE AND BAYWAY WIDENING: A PROJECT OF NATIONAL AND REGIONAL SIGNIFICANCE
Survey Response Report

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November 12, 2014

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Survey Response Report

This document supplements the survey response information provided by the Alabama Department of Transportation (ALDOT) in the requested electronic submittal. The information in this document provides greater detail and substantiation to those responses. This report's detail is meant to assist the Federal Highway Administration (FHWA) and the Office of Freight Management and Operations in preparing their comprehensive response for Congress. It is imperative that national investments such as Projects of National and Regional Significance (PNRS) continue to be made to meet the challenges of the 21st century. The following discussion of the Interstate 10 (I-10) Mobile River Bridge and Bayway Widening project demonstrates the nexus between national investments and meeting 21st century challenges.

1. National Strategic Investments

Strategic investments consider multiple interdependent relationships to provide numerous effects across a range of outcome objectives. The PNRS initiative identifies these strategic objectives and, as this report demonstrates, the I-10 Mobile Bridge and Bayway Widening investment will capitalize on multiple interdependent relationships in achieving these objectives. This report provides a primary, quantitative analysis of these benefits and costs then reports them in a comprehensive benefit/cost analysis. These benefit/cost results are further linked to additional discussions of the interdependent relationships between PNRS objectives that are less readily quantifiable yet strategically significant. This assessment is accomplished using secondary information such as transportation and business research, market analysis, and technology scans. Taken together, the primary and secondary levels of analysis in this report demonstrate this project's capacity to meet the strategic objectives of the PNRS initiative.

2. Performance Improvement to the Federal-Aid Highway System

Transportation investments in the 21st century must be targeted to provide improved performance for the Federal-Aid Highway System (the System) and transportation overall. The System represents a significant investment that U.S. citizens have made to support prosperity and

resilience for future generations. Maintaining and enhancing these transportation systems is an imperative mission. The PNRS initiative specifically targets these types of transportation investments. By making strategically targeted investments in large projects, the FHWA can leverage these initiatives to improve system performance thus benefiting an entire region and the nation as a whole. The following discussion demonstrates in detail how a national investment in this I-10 Mobile River Bridge and Bayway Widening project will improve performance of the System for the region and nation as a whole. Appendix A provides backup for the calculations.

2.1 Improved Travel Speeds

Currently the bottleneck at the George C. Wallace Tunnel reduces corridor peak period travel speeds substantially below the 55 mph speed limit. In the eastbound direction, the primary PM peak period direction, there were 420 hours in 2013 in which average traffic speeds through the tunnel were less than 40 mph. Of these hours, less than half were during weekdays (207 hours) leaving weekends with a disproportionate amount of severe delay. Also in 2013, there were 1,483 hours in which the eastbound speeds were less than 50 mph. Of these hours, 1,004 hours or two thirds were during weekdays.

The tunnel is not, however, the lowest speed portion of the route. The reduction of I-10 to four lanes to go through the tunnel creates an eastbound bottleneck just before the tunnel entrance, where a combination of merging traffic and a sharp curve combine to create even lower speeds, which were measured at 11.6 mph during incident-free weekday peak periods (3:00–6:00 p.m.) in 2011.[1] As the photograph in Figure 1 illustrates, the resulting queue can extend back from the tunnel to past Virginia Street, the interchange depicted in the figure that is located 1.24 miles west of the tunnel entrance. Figure 2 shows a similar queue at 6:00 p.m. on Wednesday October 29, 2014, as recorded by ALDOT's website.[2] On days with more severe congestion, the eastbound queue can reach Michigan Street, 3.6 miles west of the tunnel entrance and over half a mile west of the proposed project limits at Duval Street.

[1] From expanded view of Figure 6 – 2011 Average Section Travel Speeds from *2011 Draft Congestion Management Process for the Urban Area of Mobile, AL*. Original report and expanded figure from South Alabama Regional Planning Commission, October 21, 2014.
[2] Alabama Department of Transportation, Traffic Information and Cameras, http://alitsweb2.dot.state.al.us/its/, 6:00 p.m. CDT, October 29, 2014.

Figure 1: I-10 George C. Wallace Tunnel constraints limit both travel speeds and reliability, with the eastbound queue extending west of Virginia Street in this photograph.

With rapid predicted corridor traffic growth, future conditions will quickly become worse. Traffic approaching the tunnel has grown from an annual average daily traffic (AADT) of 61,210 vehicles per day in 2008 to 75,180 vehicles per day in 2013, a growth of 23% or 4.2% per year. AADT growth between 2010 and 2030 is expected to be 64% or 2.5% per year. Over one fourth of that growth has already occurred in the 3 years between 2010 and 2013. Eastbound PM peak-period delays per vehicle crossing Mobile Bay from Duval/Broad Street to US 90 are roughly 3 to 7 minutes in 2014, depending on queue speeds. Delay is defined as the time difference from traveling at congested speeds compared with a free flow speed of 55 mph over the 11.2 miles. This definition is conservative for delay because higher free flow speeds are possible on the crossing, especially if the proposed project is constructed. Due to expected traffic growth, delay will grow to 30 to 60 minutes over the next 10 years because of the bottleneck caused by the tunnel and its approach conditions. By the time that the proposed project would open in 2027, all eastbound PM peak period traffic would be experiencing an hour of delay crossing Mobile Bay.

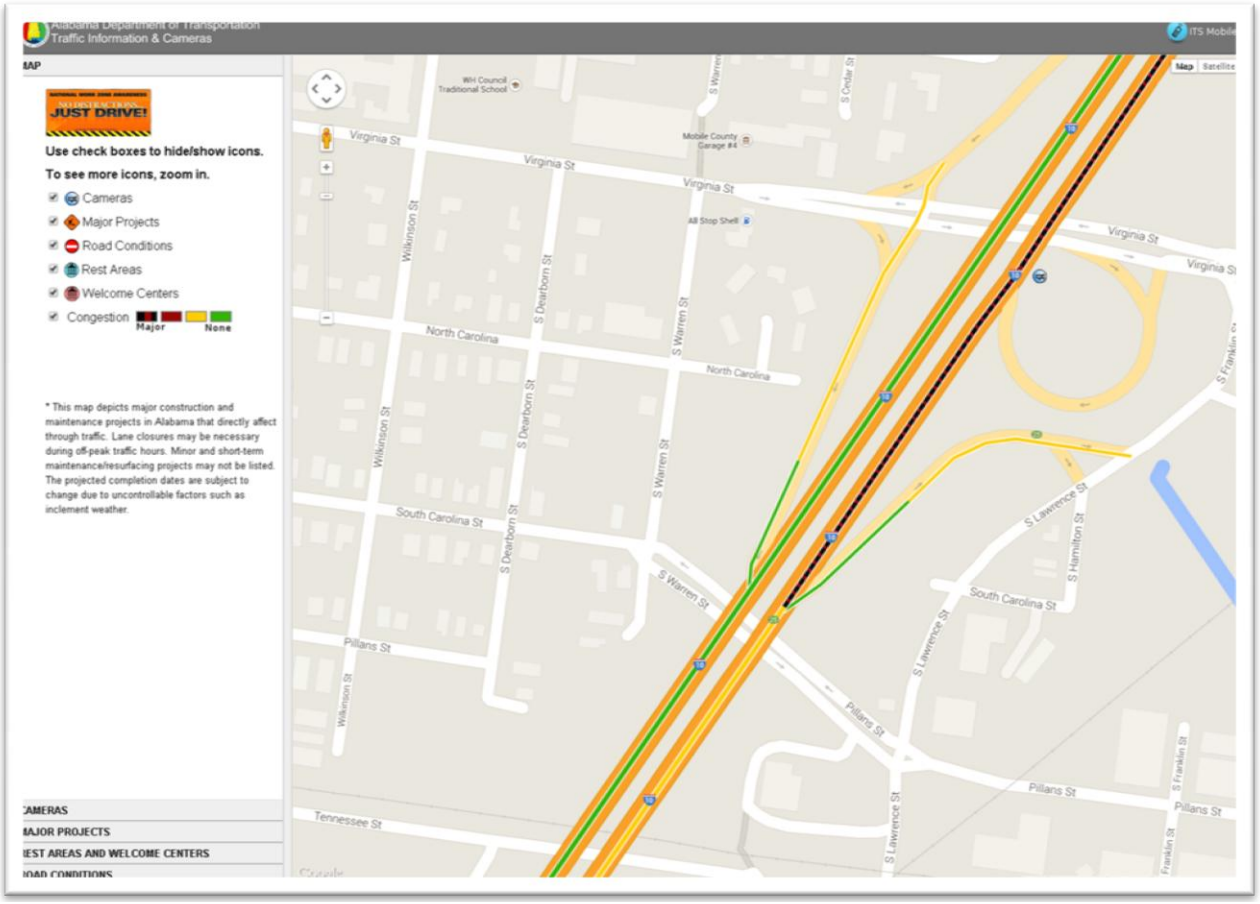

Figure 2: Real-Time Peak Hour for I-10 at 6:00 p.m., October 29, 2014, with eastbound queue extending west of Virginia Street.[3]

Because queue lengths and speeds vary daily, the analysis for this PNRS grant conservatively assumed that the average traffic speed through the queue was 30 mph in 2014, which corresponds to about 3 minutes of delay in the eastbound crossing between 3:00 p.m. and 6:00 p.m. However, expected rapid traffic growth renders the future delay results relatively insensitive to this assumption because future speeds will be dramatically lower in any case. Even with more modest growth rates of 1.5% to 1% that were assumed after 2030, delay from the bottleneck would continue to grow rapidly. To reflect local sensibilities about delay, this PNRS analysis assumed that corridor travelers would avoid traveling in the corridor during the 3:00–6:00 p.m. period once crossing delay reached 1 hour, at which point queue speeds would be less than 5 mph. This report does not consider the travel time costs implied by capping delay, e.g., a

[3] http://alitsweb2.dot.state.al.us/its/. 6:00 p.m. CDT, October 29, 2014.

longer peak period, travel moving to other corridors, or deferred travel, which would increase project benefits substantially if considered.

Although the eastbound PM peak period delay is currently the primary source of corridor delay, Figure 3 shows that the westbound AM peak period traffic also experiences congestion while approaching the tunnel. Currently westbound AM peak period queues extend halfway to the Mid-Bay Interchange, about 1.4 miles from the tunnel entrance. Assuming average westbound queue speeds of 30 mph in 2014, the current westbound delay is estimated to be about 1 minute per vehicle during the AM peak period, which is primarily confined to 7:30 to 9:00 a.m. Although the amount of delay is minimal today, the traffic queue (Figure 3) shows that the tunnel entrance is over capacity. This means that all future traffic growth will make the westbound queue longer and speeds slower, somewhat like plugging the drain of a bathtub while continuing to pour water into it. Although the expected traffic growth rate of 2.5% per year may not seem high, delays will increase exponentially. That is, traffic will increase by 28% over 10 years, but the corresponding speeds through the westbound queue would drop from an estimated 30 mph in 2014 to less than 5 mph in 2024 because of the bottleneck conditions. Similarly to the eastbound direction, this rapid traffic growth will escalate the westbound delays to over 20 minutes within 10 years and will reach the maximum hourly crossing delay cap within 15 years. The AM peak period is estimated to spread from 1.5 hours currently to 3 hours within 10 years.

These future delay estimates would be matched by a rise in annual tunnel hours with speeds less than 50 mph from 1,483 hours eastbound and 668 hours westbound to many times this number. Hours with severe congestion on the tunnel approaches would rise correspondingly and would affect interstate commerce, corridor travelers, and the local and regional economy.

The proposed project is projected to reduce these existing and projected delays by over 6 million vehicle hours annually when it opens in 2027 and over 10 million hours by the 2056 analysis horizon year. Queue speeds in 2027 would rise from less than 5 mph to 55 to 60 mph. The 2027 average corridor speeds would increase from less than 10 mph eastbound and 12 mph westbound to 55 to 60 mph. Based on the traffic growth assumptions, the I-10 corridor across Mobile Bay is projected to maintain speeds at 55 mph or above throughout the 30-year analysis period to 2056.

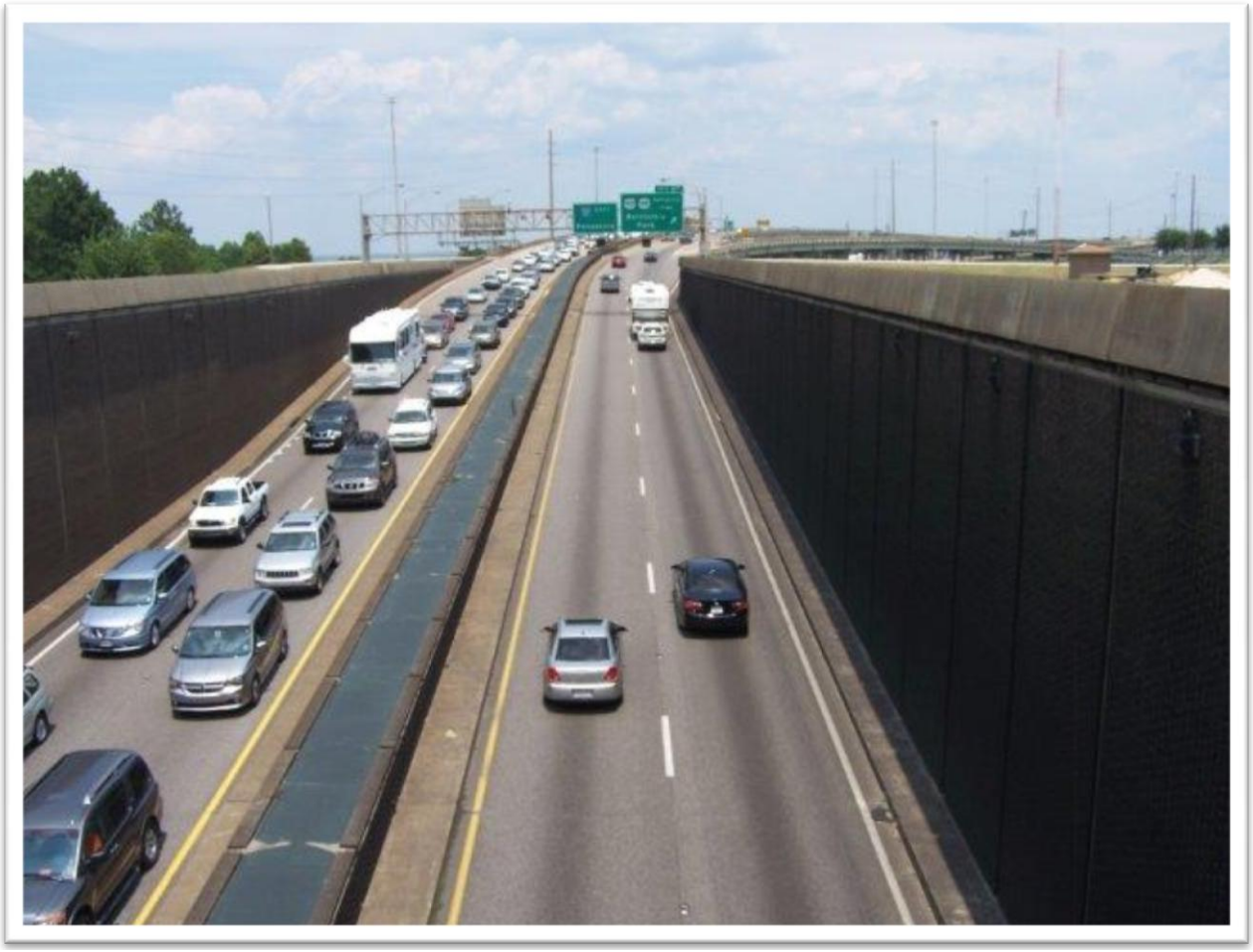

Figure 3: Back-up queues also form westbound during the AM peak period due to a bottleneck approaching the tunnel entrance.

2.2 Reduced Long-Term Congestion

Current annual traffic delay during the peak periods on I-10 from Duval Street to US 90/98 is estimated to be about 160,000 vehicle hours per year under the assumptions discussed in the previous section. Delay is defined as the time difference from traveling at congested speeds compared with a free flow speed of 55 mph over the 11.2 miles. In 10 years, corridor traffic delay is projected to increase exponentially to over 3 million vehicle hours per year. By the end of the 30-year analysis period in 2056, corridor traffic delay is projected to surpass 10 million vehicle hours per year even with capping the maximum crossing time to 1 hour. The corridor delay is based on assuming that I-10 peak period traffic grows from a 2013 tunnel peak period traffic of about 2,740 veh/hour in the PM eastbound peak and 2,810 veh/hour

in the AM westbound peak.[4] The assumed growth is 2.5% per year from 2013 to 2030, 1.5% per year from 2030 to 2040, and 1% per year after 2040. The post 2030 traffic growth rates were estimated from comparing existing local population and traffic growth rates with projected local population growth rates through 2040 and national population growth rates through 2050. While higher design hour volumes from forecasted AADT could have been used in the analysis, the referenced daily volumes were selected to give a more conservative delay analysis. A conventional speed curve is used to estimate future speeds as a function of volume/capacity and free flow speed.[5]

These delay figures do not include the secondary delay that would be incurred from the extra traffic using other highway routes across Mobile River or Mobile Bay to avoid I-10 delays or from delays experienced by traffic attempting to get on I-10 during the peak periods. Anecdotally these secondary delays are considerable, but there is no definitive estimate of them. Another delay category not considered above is non-recurrent delay, i.e., delay caused by highway crashes and other incidents. On congested corridors, non-recurrent delay can equal 50% or more of the delay caused by regularly recurring congestion. While the proposed project would not eliminate the primary causes of non-recurrent delay, its construction would substantially reduce crashes and provide a more redundant highway network for avoiding or mitigating incidents in general. For the purpose of acknowledging the contribution that the proposed project would likely make to reduce these secondary and non-recurrent delays, an additional delay reduction of 15% of the calculated delay savings is assumed. Although it doesn't affect the general conclusions of the benefit/cost analysis, this assumption provides the basis for a sensitivity analysis discussed below.

2.3 Improved Trip Reliability

Trip reliability continues to emerge as the more informative metric for the performance of the transportation system. Discussions on how to characterize reliability continue. For example, is reliability best conceived from the driver's perspective or the system performance perspective [7]? One trip reliability measure is the buffer index, which is simply the additional

[4] Based on hourly volumes over a 24-hour period on June 28, 2013 with an ADT of 82,600 veh/day; South Alabama Regional Planning Commission, October 22, 2014.
[5] The actual BPR-type formula is speed = free flow speed/(1 + 0.2 (volume/capacity)^{10}), where free flow speed varies from 55 mph to 60 mph, depending upon the highway section.

time required to make the trip compared with uncongested conditions. For an eastbound PM peak trip crossing Mobile Bay in 2027, the assumed opening year of the proposed project, the buffer index would be 57 minutes for what would normally be less than a 12-minute trip. The AM westbound buffer index would be 45 minutes for the same length trip. Given that crashes and incidents can add to these times, these "buffers" indicate a high degree of future trip unreliability. With the proposed project, the average future speeds on the bridge and tunnel route are estimated to be 55 mph or greater over the 30-year analysis period. The buffer index would be zero, indicating substantially improved reliability.

2.4 Increased Access to People and Freight Movement

The transportation network provides for commerce in the form of people and freight movement among other functions. These were in essence seminal arguments made for building the United States Interstate Highway network. The I-10 corridor was conceived to provide this commercial functionality for people and freight movement from the Atlantic to the Pacific Ocean. This corridor connects regional, national, and international trade nodes and exemplifies the emerging understanding of logistics for the 21st century. The I-10 corridor through Mobile, Alabama, plays an integral role in these complex logistics [5, 12].

Much of the economic activity in Mobile, Alabama, evolved around the connections between land and water commerce. This includes the movement of people and freight. The local elements of people movement reflect the typical dynamics of modern cities with commute patterns reflecting the full spectrum of business activities. More importantly, though, are the people and freight movement reflecting the dynamics of being the 12th largest port in the United States. This project targets enhancement to each of these situations. Traffic operations professionals will be able to develop improved strategies for handling the movement of people and freight throughout metro Mobile. Further, working in conjunction with the Port of Mobile and the full range of freight and logistics stakeholders along the Gulf Coast, these traffic operations professionals will be able to develop strategies to assist logistics professionals by actively supporting regional, national, and international trade [1].

2.5 Identified Benefits and Costs Associated with Performance Improvement

System performance improvements with this project demonstrate the value of national investment in the PNRS program. As the full benefits of the ongoing investment in the nation's

Interstate system unfold in the 21st century, there will be an increasing need for more intimate coordination with other elements of the nation's interests. These are embedded in the objectives of the PNRS program and detailed for this project in discussions following this summary of performance improvement benefits and costs.

Parameters for identifying benefits and costs for analysis include a 30-year time period and both 7% and 3% discount rates. The 30-year time period provides a reasonable analysis period for a bridge facility that will last a minimum of 75 years. Further, there is a substantial residual value in 2057 to account for the remaining life of the bridge. The use of 7% and 3% discount rates follows Transportation Investment Generating Economic Recovery (TIGER) guidance and provides a more robust perspective of the historic and emerging perspective for the time value of money. Ultimately, improved performance benefits are rooted in time and speed savings that account for 86% of total benefit. Beginning in 2027 there is a gain of $147 million from time savings which increases to $228 million in 2056. This accounts for 77% of the benefits through travel time savings. Fuel savings go from about $18 million in 2027 to $27 million in 2056 providing another 9% in benefits from improved fuel economy at more optimal speeds. The time savings include costs (disbenefits) for the project of $1.7 to $2.8 million per year during construction due to construction related delays, based on assuming a 10% free flow time penalty during construction.

3. National Economic Benefits

As the complexity of regional, national, and international economic activity increases in the 21st century, investments in the transportation system must continue to meet these complex situations. For example, the port of Mobile has recently made investments to increase their container cargo capacities by 1,000%. Further, the Panama Canal continues to undergo modernization to accommodate international container cargo freight trade expansions. Gaining the full benefit of these economic dynamics requires investments that ensure their potential is not limited. The following discussion details how the requested investment in the I-10 Mobile River Bridge and Bayway Widening project benefits the nation's economic activities in the 21st century and beyond.

A central economic dynamic of the 21st century lies in the emergence of multifaceted manufacturing utilizing emerging techniques and supply chain dynamics in the Southeastern

U.S. There are many elements related to this continuing manufacturing emergence, and multimodal transportation is a pivotal element. These manufacturing dynamics are often linked to the civilian aircraft manufacturing, among other manufacturing prominent in the Southeastern states [12]. Further, transportation infrastructures that support economic activity in one place also support economic activity elsewhere by providing the reliability in service for logistical planning. This is why transportation planning has a regional component, sometimes so broad as to include the entire nation" [12, p. 41]. This reality is reflected in the Draft Primary Freight Network designation for I-10 through Alabama, Mississippi, and Louisiana. The I-10 system, coupled with railroad and maritime activities throughout the Gulf Coast, provides efficient maritime interface infrastructure to support a healthy regional economy. The economic potential of the region may be hampered with other issues similar to the constrained tunnel in Mobile, Alabama. As the following discussion highlights, national investments in transportation associated with multimodal operations will be critical for 21st century economic competitiveness.

3.1 Increased Access to Jobs

Investments in transportation continue the long demonstrated capacity to act as a multiplier for the economy. A principal part of this multiplier effect lies in providing increased access to jobs and corresponding diversification of the economy which provides the foundation for economic resilience. The challenge continues to be in accounting for the increased access to jobs based on enhancements to the transportation network infrastructure. This accounting must accommodate the interplay of complex physical and social dynamics. Integrating agent-based travel demand models with traffic micro-simulation models appears promising in connecting network dynamics to human behavior [6, 12, 16]. Local jurisdictions have accomplished similar objectives in their ongoing collaborative planning process, "Human Services Coordinated Transportation Plan for the Alabama Counties of Mobile, Baldwin and Escambia" [17]. While the behavioral dynamics of this report focus on special needs citizens, they may tentatively be associated with the network dynamics identified in "Origin Destination Study for Mobile County – SARPC", which is based on AirSage real-time cellular data [18]. Taken together, these two pieces of regional data indicate enhanced access to jobs between Mobile and Baldwin Counties and points beyond. The ability to demonstrate increased access to jobs relies on integrating information about transportation network dynamics with human behavior, which both of these reports accomplish.

3.2 Enhanced National Energy Security

Energy security continues as a national initiative of strategic importance for maintaining a global economic advantage and geopolitical stability [2]. Transportation plays an integral role in strategies for obtaining energy security [8]. This I-10 Mobile River Bridge and Bayway Widening project would enhance national energy security in significant ways. Estimated annual fuel savings range from 5.7 million gallons in 2027, the assumed opening year of the proposed project, to 8.7 million gallons in 2056. These fuel savings range from 57% to 60% of the fuel consumed in the project corridor analysis. The corresponding savings in emissions range from about 65,000 (short) tons per year in 2027 to 99,000 (short) tons in 2056. These energy savings estimates reflect the significance of considering transportation investments in terms of energy efficiency and national security [2, 8].

3.3 Improved Intermodal Freight and Logistics Options Including Hazardous Freight

The changing dynamics of national and international freight operations and technology are apparent with the Port of Mobile and all other Gulf ports. Maintaining the U.S.'s competitive edge through efficiency is a national imperative [5, p. 19]. Further,

> "The majority of the Nation's bulk commodities and containerized goods are shipped through ports. Ports serve as points of entry for imported goods and egress for exports. After entering harbors, ships move to specific marine terminals that are often specialized to handle the type of ship and cargo being transported. These marine terminals often serve as end points of highway and rail freight movements and must be maintained and improved to support efficient and cost-effective trade." [5].

The I-10 corridor is nationally recognized as an integral component of the freight and logistics dynamics for the nation. The corridor is at the center of the Gulf's Primary Freight Network and integral to freight and logistics operations once the expanded Panama Canal begins operations. In essence,

> "On the Gulf Coast, Houston, Texas, is currently dredging to allow for post-Panamax sized ships. Of concern in the global shipping community is the continued support of key shipping hubs and connectivity to and from the rest of the United States. It is critical that the hub ports have adequate connections to distribution points throughout the country. Of

> equal concern is the ability at these ports to break down the loads from the mega-container ships and transfer container cargo to feeder vessels that can access and support smaller harbors along the East, West, and Gulf Coasts, and in the future, the Great Lakes, via short sea shipping." [5].

While information exists that sheds light on how freight and logistics potentially capitalize on the expanded Panama Canal, the global strategic nature of this situation introduces challenges for detailed analysis. Essentially, this information is seen as providing a competitive advantage for national and international business operations. However, currently available information indicates that removing the known system constraints at the George C. Wallace Tunnel would allow public and private parties to fully utilize the enhanced, more reliable, and direct routing provided by the I-10 Mobile River Bridge and Bayway Widening.

3.4 Identified Benefits and Costs Associated with National Economy

The objective of enhancing the national economy with investments in the PNRS program demonstrates the intimate relationship between transportation infrastructure and the overall economy. For example, in addition to serving regional traffic, I-10 is the primary access route for Gulf communities to travel to and from beach resorts and other ocean based venues. There are currently disproportionate I-10 traffic delays on the weekends related to this recreational traffic. Removing these delays and providing travel time reliability will improve the economic viability for the tourism industry.

Other economic benefits include the travel savings accrued to freight in the I-10 corridor. Currently, over 4 million trucks per year or 15% of AADT are estimated to use the George C. Wallace Tunnel for a trip on I-10 through Mobile. Enhanced truck operator's preferences for the new bridge, including hazardous materials, are estimated to increase truck percentages from 15% of to 19% of AADT. Further, research indicates highway routes that serve import/export freight have a direct effect on the national economy: when congested, they degrade it; when improved, they help it. The percentage of trucks in the George C. Wallace Tunnel that are associated with import/export freight is estimated to be between 50% and 80% of the total trucks or 2.0 to 3.3 million trucks in 2014. By 2027, the number of trucks associated with import/export freight would rise to 2.8 to 4.5 million trucks per year; these trucks would be subjected to delays

approaching one hour. Construction of the project would eliminate these delays, with commensurate benefits for import/export trade and the national economy.

4. Improved Transportation Safety, Homeland Security, and Disaster Preparedness

Safety and security are ongoing 21st century concerns. National investments must specifically work to address these concerns and improve safety and security. Investing in this I-10 Mobile River Bridge and Bayway Widening project will accomplish just that. The following discussion details the situational sensitivity of the relationship between crash frequency and injury severity in light of enhanced operational conditions; more specifically, this project addresses the balancing trade-offs between increased speeds and the likelihood of increased injury severity crashes. Additionally, experiences in the 21st century indicate national investments must address homeland security, which is highlighted in the following discussions as well.

The I-10 Mobile River Bridge and Bayway Widening project will incorporate improved route signage based on better route geometry, optimal horizontal and vertical geometry, intelligent transportation systems, and enhanced traffic incident management response strategies. Each of these works to reduce crash frequency in conjunction with reducing injury severity. An additional element to these criteria is the bridge's capacity to improve hurricane response and recovery. This vital connection will allow hurricane response to better balance evacuation activities directed at moving people further inland. This vital link will be integral in hurricane evacuation and recovery [9, 13].

4.1 Reduced Transportation Crash Frequency

Great advances in understanding and technology for transportation safety have been made over the last half-century. The construction of the I-10 Mobile River Bridge and Bayway Widening to support a six-lane and eight-lane interstate facility with modern interstate geometry will provide a facility with all these safety and security advances, such as roadside clearances, ITS monitoring, and driver information. Without accounting for ongoing advances in traffic safety, the total crash value including frequency and severity is estimated to be reduced by 36–40% from the 2027 opening year to the 2056 horizon year. This represents 9% of total benefits for improving the safety of the interstate facility. Overall crashes are estimated to be reduced by

53% in the opening year when traffic is lower and by 50% in the horizon year when traffic is higher.

The crash reduction estimates come from comparing the existing crash rates for the I-10 corridor with those estimated from Highway Safety Manual (HSM) methodology for the new six-lane bridge and widened eight-lane Bayway. The remaining portions of the project corridor were analyzed at their previous accident rates, the most conservative assumption, although the segments of the I-10 route related only to the tunnel were assumed to have only one third of the total AADT per the previous projections from the EIS. Note that for consistency, all analyses for the "build" condition were conducted for both the new I-10 route and the bypassed segments using the tunnel. The severity breakdown for new six-lane and eight-lane I-10 segments were based on a sampling of mainline crashes for six-lane and eight-lane freeways in Alabama. These HSM multivehicle and single vehicle crash equations for six-lane and eight-lane freeways were calibrated using a sampling of crashes on similar freeway sections in Alabama. In all cases, the HSM SPF underestimated the number of crashes, so the calibration factors are greater than 1. The calibration factors are based on a limited data set because of data and time limitations, which introduces variability in the calculation. For example, for a six-lane section, multivehicle, the equation could overestimate or underestimate by as much as 50%, and for a six-lane section, single vehicle, the equation could overestimate or underestimate by as much as 75%. Because crash savings make up only 9% of the total benefits, this potential variability does not compromise the overall economic conclusions, although the estimated crash reduction percentages could be influenced by the potential variability.

4.2 Injury Severity

Conventional thinking in transportation safety is injury severity increases as speeds increase. While this line of thinking generally holds, this project presents conditions suggesting this conventional thinking may be ameliorated with this project. Because of high injury rates on the existing facility through the George C. Wallace Tunnel, the new six-lane bridge combined with lower tunnel route traffic is estimated to reduce fatal crashes by about 30% and injury crashes by about 46%. These reduced percentages are the result of relatively high fatal and injury crash rates on the existing I-10 route under Mobile River and across Mobile Bay compared with those typically experienced on six- and eight-lane freeways in Alabama. The project is projected

to avoid 32 fatal crashes and about 1,700 injury crashes over the 30-year analysis period. As discussed above, the potential variability introduced into the estimates by limited calibration data could affect these injury severity conclusions.

4.3 Homeland Security and Disaster Preparedness

Homeland security continues to be engrained in infrastructure development, redevelopment, and operations. Further, events like Hurricane Katrina continue providing invaluable experiences and data for coping with future uncertainties. Each of these uncertainties requires consideration when contemplating PNRS. Post-Hurricane Katrina economic analysis demonstrated the imperative nature of infrastructure to support disaster recovery. Econometric analysis of post-Katrina year-to-year spatially organized economic data indicated economic activity in the core of the disaster area shifted to other locations [9, 15]. The identified constraints to recovery included inadequate transportation infrastructure to provide for comprehensive disaster relief and recovery. This I-10 Mobile River Bridge and Bayway Widening project provides the type of resilient transportation infrastructure necessary for security and preparedness professionals to continue their success in ensuring community safety [15]. Ultimately, what is currently express as homeland security is the pragmatic notion of what Mobile and surrounding communities have historically used to cope: diligence. As Figure 4 demonstrates, diligence and homeland security are generationally engrained in how business is conducted in this region and with the I-10 Mobile River Bridge and Bayway Widening project.

Figure 4: The secure fabrication of the George C. Wallace Tunnel during the 1970s provides an example of Mobile, Alabama's, long tradition of coping with homeland security-related concerns.

4.4 Identified Benefits and Costs Associated with Transportation Safety and Security

The benefits valued in dollars are based on fatality and injury values recommend by TIGER guidance and property damage (PDO) costs developed in a current state study with Virginia. In 2014 dollars, the values are $9.3 million per fatality, $171,000 per injury, and $9,000 per PDO crash. The monetized value of crashes over the 30-year analysis period would total about $1.5 billion without the proposed project. The proposed project would save over $0.5 billion of this value over 30 years, for an estimated 38% savings.

5. Benefit/Cost Analysis

This analysis of benefit/cost for the I-10 Mobile River Bridge and Bayway Widening initiative remains rooted in well-reasoned economic theory and practice and follows the relevant 2014 TIGER guidelines. While this report identifies numerous benefits based on the objectives of the PNRS program and emerging insights into the nature of the 21st century global economy, only well understood transportation benefits are used. This reasonableness should be extended to the consideration of the appropriate discount rate. Specifically, investment in a public facility would not reduce investment in private production because the economy does not have enough demand for its current level of products. Combined with the current cost of money, this suggests that 3% is the reasonable discount rate with which to evaluate this initiative. Regardless, benefit/cost ratios are 2.7 for a 7% discount rate and 5.3 for a 3% discount rate. Note the 3% rate is currently higher than the cost of money to the federal government.

Quantified benefits and their contribution to the overall benefits include travel time savings contributing 77%, fuel savings contributing 9%, accident savings contributing 9%, and remaining life of bridge after 30 years contributing 5%. As discussed above, the estimates of time savings are based on comparisons of no-build and build speeds computed by speed curves for the several segments of the route, with details provided in Appendix A. These speed curves estimate the current delay from available traffic and speed data and projects future delay from estimated growth rates.

Value of time data were drawn from 2014 TIGER guidance (TIGER BCA Resource Guide 2014.pdf and USDOT VOT Guidance 2014.pdf). Updated to 2014 dollars using the CPI (all urban – unadjusted), the hourly person values for all trip purposes are $13.20 per person hour for local travel, $19.23 per person hour for intercity travel, and $26.20 per person hour for truck drivers. The local and intercity person values were combined into a weighted average of $14.61 per person hour using distributions of travel by trip purpose on various modes from annual person-miles of travel (PMT) derived from Table 5 of Summary of Travel Trends: 2009 National Household Travel Survey (using 2001 values).[6] Using the auto occupancy rate of 1.25 and a truck percentage of 15% gave a composite value of time of $19.25 per vehicle hour.

[6] http://nhts.ornl.gov/publications.shtml, March 12, 2014.

Even with substantial crash reduction, as discussed previously, the values of crash savings and fuel savings were about equal at 9% of benefits. Fuel savings were based on gasoline and diesel fuel consumption by speed from the California Air Resources Board for 2011 and 2031 fleet averages. Fuel costs were based on Gulf Coast fuel costs for the week of October 13, 2014, as posted by the Energy Information Agency.[7]

The other major component of a benefit/cost analysis is the capital cost. Capital costs are $791,804,534 in 2014 dollars, converted from $989,495,777 Year of Expenditure (YOE) dollars. The future expenditures were deescalated to 2014 by removing 4% per year escalation, while about $12 million for protective right-of-way purchases in 2012 were escalated to 2014 dollars using the Consumer Price Index. In YOE dollars, the capital costs break down into approximately 5% right-of-way, 9% engineering, < 1% utility adjustments, and 86% construction. Appendix A gives cost and other analysis details in both pdf tables and Excel spreadsheets.

As summarized in Appendix A, bridge maintenance costs were based on existing maintenance costs in the Mobile area, with minor cost savings assumed in the first 30 years of the widened Bayway. Highway maintenance costs were based on national estimates and approximately equaled the Bayway no-build maintenance cost at $5,000 per lane mile. Because of the expansion of lane miles and the relatively minor nature of maintenance costs compared with the capital costs, maintenance cost savings were a negative benefit of 0.1%.

Appendix A presents the cash flow spreadsheets for the 7% and 3% discount rates along with all analyses. The net present value of discounted benefits minus discounted costs is $3.4 billion in 2014 dollars at a 3% discount rate. The project would pay for itself in public benefits within 5 years (payback period). The undiscounted benefits range from $177 million in the 2027 opening year to $260 million in the 2056 horizon year. All dollar amounts are 2014 dollars.

As discussed previously, 15% of the direct I-10 corridor time savings were added to the total benefits as a token measure of the secondary or indirect area wide time savings. The secondary savings make up 10% of the total benefits. If the indirect or secondary time savings

[7] http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp.

were as large as the direct time savings or 100%, as seems possible given the gridlock that major tunnel delays cause today and will increasingly cause in the future, the net present value of discounted benefits minus discounted costs would rise to $5.3 billion with a benefit/cost ratio of 8.3 for a 3% discount rate.

6. Resources

The I-10 Mobile River Bridge and Bayway Widening initiative represents the need for the PNRS program. By joining the resources of the nation with those of the Mobile region, all stakeholders are able to realize benefits. Achieving these mutual benefits begins with a 50/50 partnership between the FHWA and ALDOT. Together we can set the course for achieving the promise of the 21st century.

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Projects of National and Regional Significance Survey Responses

Are you submitting a new project or is this a resubmittal of a project that was previously submitted?

New project

1. **In order to respond to this survey, you must have the authority to respond on behalf of your agency. Please check with the appropriate agency personnel to determine if you may respond to this survey. Do you have the authority to respond on behalf of your agency?**

   Yes

2. **What type of agency do you represent? Respondent types are based on eligible applicants as defined in SAFETEA-LU Section 1301 as amended by MAP-21 Section 1120.**

   State Department of Transportation

3. **Please list the name, city, and state of the agency you represent.**

   Alabama Department of Transportation
   Montgomery, Alabama

4. **In what state(s) or U.S. territory is the project located? (Select all that apply in the case of multistate or multijurisdictional projects.)**

   Alabama

4a. In what county(s) is the project located?

Mobile and Baldwin

5. **Based on your knowledge of the project and the following definition, is the project being submitted an eligible project? (Answering "No" to this question will result in your project being placed in TIER 3.)**

   Eligible project means any surface transportation project or set of integrated surface transportation projects closely related in the function they perform, eligible for Federal assistance under title 23, United States Code. Projects may include: public or private rail facilities providing benefits to highway users; surface transportation infrastructure modifications to facilitate intermodal interchange, transfer, and access into and out of ports; and other activities eligible under such title.

   Yes

6. **Project Title**

   Interstate 10 Mobile River Bridge and Bayway Widening

7. Project Description (limited to 1,500 characters including spaces)

This project will design and construct a six-lane, cable-stayed bridge to carry I-10 over the Mobile River in Mobile, Alabama. This will provide a more direct and higher speed alignment for I-10. Currently, I-10 utilizes the George C. Wallace Tunnel under the Mobile River. While a state of the art design in 1972, this tunnel crossing configuration requires attention based on what has been learned since then. A detailed National Environmental Protection Act process has identified a preferred alternative articulated in the approved Draft Environmental Impact Statement in July 2014. The cable stayed bridge will realign I-10 on the west side of the Mobile River with a bridge abutment high enough to accommodate maritime freight activities beneath the bridge. The eastern abutment will connect directly with the existing Bayway structure which will be widened to accommodate enhanced performance needs. The project includes reconfiguring system to system and system to surface interchanges on both the western and eastern approaches. Providing optimal merging and diverging distances, horizontal and vertical alignments, intelligent transportation systems, and enhanced traffic incident management will provide reliable, uncongested, free flow operations for 21st century economic dynamics of the Southeastern U.S. and the nation.

For the following questions, you must describe the project's national or regional significance. (limited to 1,500 characters including spaces)

Please provide information in all relevant areas and if available, provide quantifiable information such as that obtained through preliminary engineering, benefit and cost analysis, etc. To be classified as a TIER 1 PNRS, information must be provided for Questions 8–14. Respondents will be given the opportunity to upload supporting documentation at the end the survey.

8. Briefly describe how the project will significantly improve performance of the Federal-aid highway system nationally, or regionally. (limited to 1,500 characters including spaces)

The Primary Freight Network (PFN) expresses the national benefits for this project with the I-10 corridor's designation as part of the 27,000 miles of strategic Interstates. While Mobile itself has the 12th busiest port in the United States based on tonnage, I-10 connects the Port of Mobile with the other top 20 Gulf Coast ports of Port of South Louisiana (1), Houston (2), New Orleans (4), Beaumont (5), Corpus Christi (7), Baton Rouge (9), Port of Plaquemines (10), Texas City (11), and Lake Charles (13) (Bureau of Transportation Statistics, 2014). The Panama Canal enhancements are 80% complete and slated to open in 2015. The long-term logistical dynamics of national and international trade require the highest functioning facilities possible. The George C. Wallace Tunnel in Mobile, Alabama, constrains this activity. This project will remove this constraint providing for increased international trade activity. Specifically, this project will reduce existing and projected delays by over 6 million vehicle hours annually when it opens in 2027; over 10 million hours by the 2056 horizon year. Queue speeds in 2027 would rise from less than 5 mph to 55 to 60 mph. The 2027 average corridor speeds over the 11.2-mile project corridor increase from less than 10 mph eastbound and 12 mph westbound to 55 to 60 mph. Based on the traffic growth assumptions, the I-10 corridor across Mobile Bay is projected to maintain speeds at 55 mph or above throughout the 30-year analysis period to 2056.

9. Briefly describe how the project will generate national economic benefits that reasonably exceed the costs of the project, including increased access to jobs, labor, and other critical economic inputs. (limited to 1,500 characters including spaces)

The Gulf Coast states continue to expand their role in manufacturing for national and international consumption. The Interstate system coupled with railroad and maritime activities throughout the Gulf provide efficient interface infrastructure to support this enterprise. The benefit/cost analysis demonstrates this project pays for itself with direct benefits. The net present value of discounted benefits minus discounted costs is $3.4 billion in 2014 dollars at a 3% discount rate ($1.3 billion at a 7% discount rate). The project would pay for itself in public benefits within 5 years (payback period). The undiscounted benefits range from $177 million in the 2027 opening year to $260 million in the 2056 horizon year. All dollar amounts are 2014 dollars. Benefit/cost ratios are estimated to be 2.7 at a 7% discount rate and 5.3 at a 3% discount rate. By 2027, the opening year of the project, the project would avoid delays approaching one hour for an estimated 2.8 to 4.5 million trucks per year carrying import/export freight. The import/export freight carried by I-10 through Mobile has a direct effect on the national economy; failure to improve the crossing over Mobile Bay would increasingly degrade the national economy whereas improvement would enhance the national economy. The I-10 corridor through the Gulf of Mexico facilitates the full spectrum of intermodal activities central to national interests in the 21st century.

10. Briefly describe how the project will reduce long-term congestion, including impacts in the State, region, and the United States, and increase speed, reliability, and accessibility of the movement of people or freight. (limited to 1,500 characters including spaces)

Currently the bottleneck at the George C. Wallace Tunnel reduces corridor peak period travel speeds substantially below the 55 mph speed limit. In the eastbound direction, the primary PM peak period direction, there were 420 hours in 2013 in which average traffic speeds through the tunnel were less than 40 mph. Half (207 hours) were during weekdays leaving a disproportionate amount of severe delay on the weekends. Also in 2013, there were 1,483 hours in which the eastbound speeds were less than 50 mph. Queuing at the tunnel entrances further reduces 2014 I-10 peak period speeds over the 11.2 mile project corridor through Mobile to 45 mph eastbound and 50 mph westbound. Within 10 years, these speeds will drop to 15 mph eastbound and 20 mph westbound. By 2027, the proposed opening year of the project, average peak period corridor speeds would be less than 10 mph eastbound and 12 mph westbound, with further reductions likely due to traffic growth. Construction of the proposed project would increase average speeds through the project corridor to 55 to 60 mph throughout the 30-year analysis period. The project would avoid substantial delay ranging from over 6 million vehicle hours per year in 2027 to over 10 million vehicle hours per year in 2056, with 15% of those delay hours accruing to freight. Ultimately, 50% to 80% of corridor freight is estimated to be import/export freight directly impacting national and international economic activity.

11. Briefly describe how the project will improve transportation safety, including reducing transportation accidents, and serious injuries and fatalities. (limited to 1,500 characters including spaces)

The construction of the I-10 Mobile River Bridge and Bayway Widening will incorporate all the advances in transportation safety developed over the last half-century. It will incorporate improved route signage based on better route geometry, optimal horizontal and vertical geometry, intelligent transportation systems, and enhanced traffic incident management response strategies. Each of these works to reduce crash frequency in conjunction with reducing injury severity. Because of high injury rates on the existing facility through the George C. Wallace Tunnel, the new six-lane bridge combined with lower tunnel route traffic is estimated to reduce fatal crashes by about 30% and injury crashes by about 46%. These reduced percentages are the result of relatively high fatal and injury crash rates on the existing I-10 route under Mobile River and across Mobile Bay compared with those typically experienced on six- and eight-lane freeways in Alabama. The project is projected to avoid 32 fatal crashes and about 1,700 injury crashes over the 30-year analysis period. The monetized value of total crash savings is projected to exceed $0.6 billion over the same 30-year period. Additionally, hurricane response and recovery is improved with balanced evacuation activities moving people further inland and post hurricane recovery expedited with a durable connection between communities.

12. What percentage of this project will be funded by non-Federal funds? (please only enter a number, DO NOT enter the percent sign)

50

13. Please describe the level of non-Federal funding sources to construct, maintain, and operate the infrastructure facility. Include a description of key stakeholders you anticipate providing financial support for this project. (limited to 1,500 characters including spaces)

The Alabama Department of Transportation (ALDOT) plans to use bonds to pay for the non-Federal funding to construct the project. ALDOT will be the only source of non-Federal funding. ALDOT will pay for the maintenance and operation of the project using the traditional 90/10 split of Federal/State funding.

14. What is the estimated total project cost? (Please only enter a number, DO NOT enter a dollar sign)

To be considered a PNRS-eligible project, the total project cost must be at least $500M or 50 percent of the amount of Federal highway assistance funds apportioned to the State in which the project is located. See PNRS Table for a listing of the amount of Federal highway assistance funds per state.

$791,804,534 in 2014 dollars and $989,495,777 in Year of Expenditure (YOE) dollars.

15. Please provide your contact information.

William Couch
Alabama Department of Transportation
334.242.6439
couchw@dot.state.al.us

16. Please upload any information that would help to support your survey response. If you have multiple files please combine them into one zip file. All common file types (i.e., PDF, Word, Excel, PPT) are accepted. The maximum file size that can be uploaded is 16Mb.