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SHRP2 ROUND 7 (PLANWORKS): I-40 IN TENNESSEE- A CORRIDOR OF NATIONAL SIGNIFICANCE IN MOVING FREIGHT AND LINKING MULTISTATE COMMUNITIES

FINAL REPORT

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16. Abstract I-40 corridor in Tennessee can be considered as “America’s Freight Corridor”. Based on information from the Freight Analysis Framework (FAF), I-40 Corridor is one of the five (I-10, I-20, I-40, I-80 and I-70) major east-west freight corridors in the nation. Next to I-80, I-40 carries more volume of freight tonnage than any other east west interstate facility. The corridor connects from the Port of Long Beach in California through Tennessee to North Carolina. Notably, the State of Tennessee has more interstate miles of I-40 (455 miles) than any other state. The round 5 IAP research explores the reliability of the freight corridors, efficient truck parking, and land use integration to freight movement in West Tennessee. Considering I-40 corridor as a freight centric corridor with number of new and emerging initiatives at local, state and national level, a new strategic PlanWorks approach is needed that addresses “Freight Corridor Visioning” to further strengthen freight movement along the I-40 corridor. The proposed Round 7 IAP will help improve stakeholder dialogue and collaboration in the decision-making process in regard to identifying private sector expectations for corridor reliability verses public sector funding realities in the context of I-40 strategic corridor. Public sector stakeholders planning efforts provide visioning over a ten (10) to twenty-five (25) year time frame based on available resources, while the private sector has a much shorter visioning window of three (3) to five (5) years.		
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This research was funded through the State Planning and Research (SPR) Program by the Tennessee Department of Transportation and the Federal Highway Administration under SHRP2 Round 7 IAP, Research Project Title: SHRP2 ROUND 7 (PlanWorks): I-40 in Tennessee- A corridor of national significance in moving freight.

EXECUTIVE SUMMARY

I-40 in Tennessee is a freight centric corridor with number of new and emerging initiatives at local, state and national level. A new strategic PlanWorks approach is needed that addresses "Freight Corridor Visioning" to further strengthen freight movement along the I-40 corridor. The proposed Round 7 IAP will help improve stakeholder dialogue and collaboration in the decision-making process regarding identifying private sector expectations for corridor reliability verses public sector funding realities in the context of I-40 strategic corridor. Public sector stakeholders planning efforts provide visioning over a ten (10) to twenty-five (25) year time frame based on available resources, while the private sector has a much shorter visioning window of three (3) to five (5) years.

The long-range plans of TDOT and Memphis MPO have identified I-40 as a strategic freight centric corridor and several projects along the corridor are included in the next ten (10) year plan as a high priority. I-40 corridor in Tennessee can be considered as "America's Freight Corridor". Based on information from the Freight Analysis Framework (FAF), I-40 Corridor is one of the five (I-10, I-20, I-40, I-80 and I-70) major east-west freight corridors in the nation. Next to I-80, I-40 carries more volume of freight tonnage than any other east west interstate facility. The corridor connects from the Port of Long Beach in California through Tennessee to North Carolina. Notably, the State of Tennessee has more interstate miles of I-40 (455 miles) than any other state. I-40 is strategically crucial to Tennessee whether mobility, efficiency, safety or other factors are being considered. This interstate serves as a major corridor for goods movement within the state and is an integral route for freight movement to and from the state. There are several intermodal facilities throughout West Tennessee that rely on the I-40 corridor to connect with markets on both the east and west coasts. This interstate facility is a key part of the local, state and national economy. Even though I-40 corridor is critical to Tennessee's economy, a 40-mile stretch spanning from the Mississippi River to the end of Memphis metropolitan boundary has been gaining special attention as congestion has worsened in the recent years. Several multi-million-dollar improvement projects have been identified along the I-40 corridor with some under-construction and the rest programmed to be constructed in the next five (5) to ten (10) years. There is a need to improve regional dialogue and collaboration regarding identification of potential financial and reliability impacts on corridor planning decision initiatives to strategically organize the improvements on I-

40 as it involves multiple public and private stakeholders. Without strategic planning and coordination among agencies the capacity improvements of I-40 corridor will remain challenging.

Specific PlanWorks component(s) to be addressed

(1) Use of web-based dash-boards showing planned improvements will facilitate public and private sector engagement and help develop better mutual understanding, (2) Development of a process to integrate corridor management challenges into the Freight Advisory Committee (FAC) recommendations, and (3) Incorporation of data driven recommendations into corridor improvement projects.

Keywords: PlanWorks, I-40 corridor, web-based resource, reliability, strategic planning

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CHAPTER 1: INTRODUCTION

1.1. Background

I-40, one of the major east-west interstate highways, is no doubt a facility of national significance stretching between Barstow, California in west and Wilmington, North Carolina in the east (see Figure 1-1). It is the third longest interstate in the country after I-80 and I-90. This interstate is the lifeline of the country's economy as it carries the second highest volume of freight by tonnage in east west interstate facility after I-80. And, no doubt, it is also the lifeline of Tennessee as the State has the highest coverage of I-40, 455 miles (see Figure 1-2). In this scenario, it is very important to carry out the new capacity as well as the regular maintenance projects to meet the increasing demand of the highway along with the efficient operations. Hence, hundreds of significant projects are carried out by state agencies along this highway within the State of Tennessee. But, these projects are only efficient whenever all the public and private stakeholders stand on the common ground and implement the projects with a proper planning and programming, which is the goal of this project.

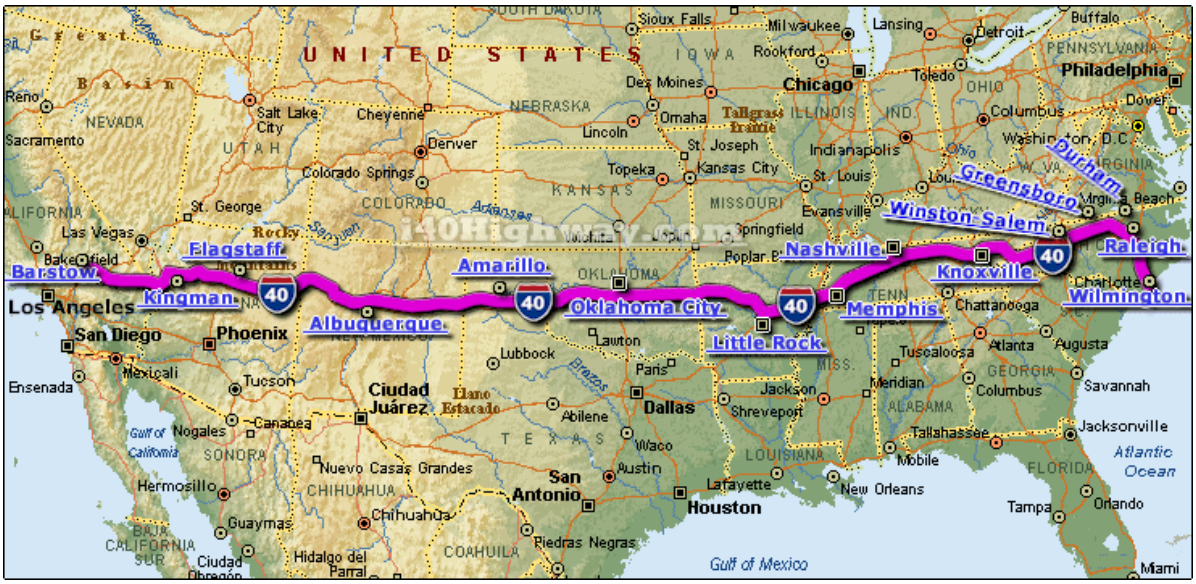

Figure 1-1: I-40 expanding from west, California to east, North Carolina

(Source: https://harrispersonalinjury.com/)

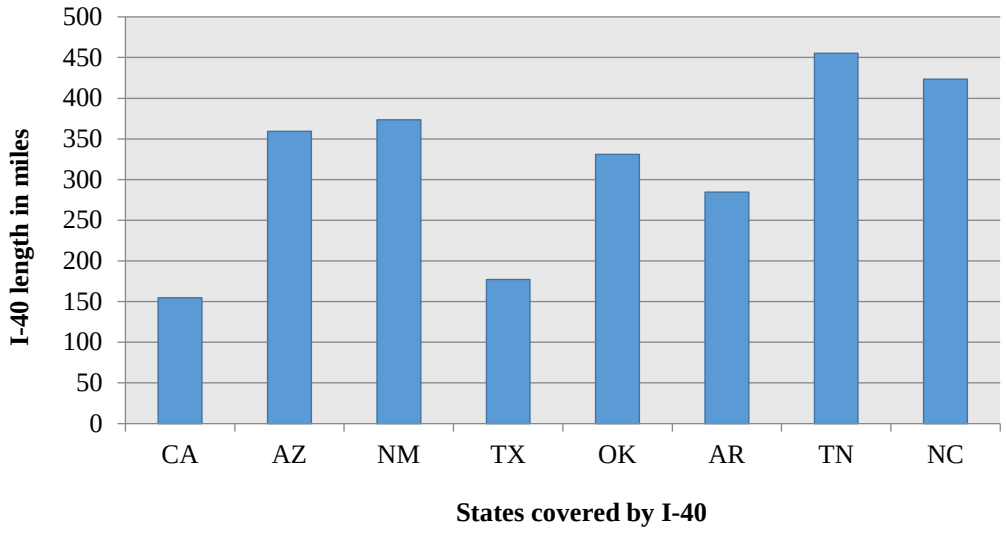

Figure 1-2: I-40 coverage in the States by length

For the corridor planning of I-40, the following measures should be taken:

- Develop a mutual understanding of deficiencies as well as opportunities that exist within the corridor, including transportation, community, and environment
- Adopt the comprehensive set of goals for the corridor
- Determine the data, information, and level of analysis needed for the environmental review, which includes social, cultural, and natural environment
- Define a methodology that includes criteria to enable a comparison and selection of solutions that address the corridor's opportunities and deficiencies and that address the approved goals
- Determine a range of solutions for the identified problems and opportunities that can include transportation, community, and environment goals
- Select a preferred solution set from the full range of solutions
- Identify the evaluation criteria, methods and measures for prioritizing the implementation of the solution set for the corridor
- Make recommendations on phasing and priorities of implementing the solutions for the corridor. As a follow-up action to this step other related plans and programs should be updated to reflect these priorities

1.2. I-40 in Memphis, Tennessee

I-40 stretches around 40 miles within Memphis MPO starting from the Mississippi River Bridge to the intersection of I-40 and the Memphis MPO boundary. Construction of I-40 in Tennessee took a very long time due to multiple challenges along the way. One of the main reason behind the delay was the routing concerns regarding the Overton Park in Memphis (Stammer Jr & Shannon, 2010). That issue continued to 1980s before the Supreme Court decided in favor of the Citizens to preserve the Overton Park[1]. That was the reason why I-40 circled around the Memphis on the northern side. The National Environmental Policy Act of 1969, passed at the time of the Overton Park dispute, played a deciding role in the rerouting of I-40 in Memphis[2]. Now, I-40 of Memphis has been a major freight corridor of the State as well as the nation serving various freight industries and connecting the Lamar Avenue in this region. But with the increasing demand of freight vehicles and establishment of major freight companies like BNSF, FedEx Super hub, Memphis International airport, the congestion has been an issue in this corridor for the recent years. According to TRIMS AADT predicted for 2020, the section between Sam Cooper and Sycamore View Road is among the most traveled segment of I-40 in Tennessee.

Figure 1-3: I-40 right after crossing the Mississippi bridge within the Memphis MPO

(Source- http://www.okroads.com/)

[1] See page no. 86 in http://hdl.handle.net/10267/28400

[2] See page no. 111 in http://hdl.handle.net/10267/28400

The rest of the report is organized as follows. The next chapter presents the broad overview of PlanWorks, the features of the PlanWorks used in the corridor planning along with the process of establishment of steering committee for the vision of I-40 corridor improvement. The third chapter shows the pattern of travel time and travel time reliability measures like Standard deviation (SD) and 95th Percentile along the various segments of the freight corridor within Memphis MPO which is then followed by the presentation of web-portal structure and content of the web-portal/dashboards in the fourth chapter. Chapter five describes the approach for institutionalization of PlanWorks and its strategies to reach out to the private stakeholders for freight corridor management and assessment of effectiveness of the stakeholder engagement. The report concludes with the summary outcomes of the project highlighting the importance of the PlanWorks in the corridor planning along with the scope of future research, in chapter six.

CHAPTER 2: PLANWORKS

2.1 Introduction

PlanWorks is a "Systematic web-based resource that supports collaborative decision-making to deliver projects that meet environmental, community, and mobility needs." PlanWorks focuses on improving the planning process for public works by:

- Gathering community and stakeholder input where stakeholders include economic, environmental, and community partners
- Coordinating projects among various agencies
- Communicating planned projects to stakeholders

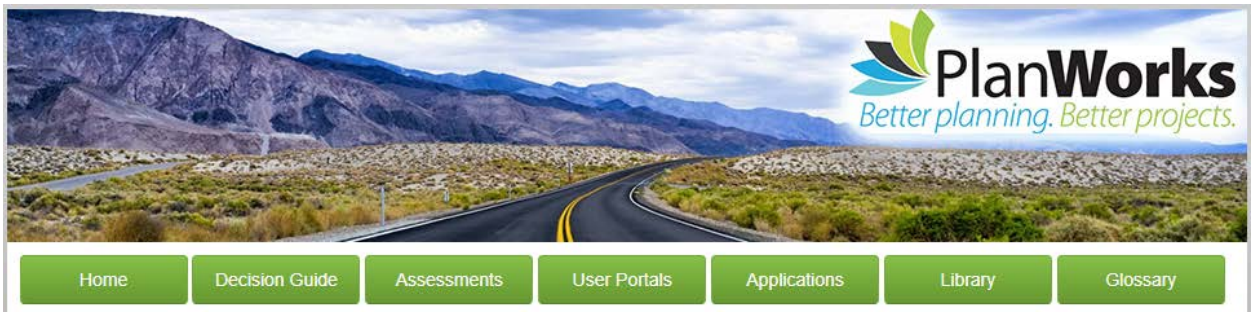

Figure 0-1: Homepage of PlanWorks developed by Federal Highway

(Source- Federal Highway Administration (2015a))

Tennessee Department of Transportation (TDOT) and the Memphis Metropolitan Planning Organization (Memphis MPO) have identified I-40 as a strategic freight corridor and have planned several high-priority improvements projects in the next 10 years. The Memphis section of the I-40 corridor links the intermodal facilities in West Tennessee to markets on both the east and west coasts, and is a key part of the local, state, and national economies. Several multi-million-dollar improvement projects have been identified along the corridor to combat growing congestion. Implementation of these projects will require a tool for improved regional dialogue and collaboration. This tool, PlanWorks, can help to identify challenges in the planning process such as financial and reliability impacts on the corridor, many public and private stakeholders may face.

This project focuses on improvements to the westernmost 40 miles of the I-40 corridor, running from the Mississippi River to the end of the Memphis metropolitan area. It will address four

specific PlanWorks components. A guide for the development of web-based portal will be proposed to show the planned improvements to facilitate public and private sector engagement and to develop a better mutual understanding. After that, we will develop a process to integrate corridor management challenges into the Freight Advisory Committee (FAC) recommendations using stakeholder input. Lastly, we will help to incorporate data-driven recommendations into corridor improvement projects.

In this task, a number of strategies developed by earlier PlanWorks projects will be reviewed, and new ways to improve PlanWorks processes will be developed with specific focus on freight centric corridor management. Novel approaches in engaging private stakeholders will be developed such as, (i) identifying the needs of the private stakeholders and presenting them with scenarios of how their business processes will further improve by engaging in the visioning process of the FAC, and (ii) creating a listserv of private freight stakeholders (e.g., trucking, railroads, barge, distribution centers etc.) and sending them quarterly newsletters with updates on freight planning activities will generate interest in further collaboration with the public sector. As a part of SHRP2 C15 program, several guidelines are available, for instance, (i) When is it best to engage freight stakeholders, (ii) What are the methods to engage freight stakeholders, and (iii) How to increase the efficacy of freight stakeholder outreach. C15 guidelines and community visioning practices will be considered by the project team while developing strategies to reach out to private stakeholders.

2.2 Literature Review

PlanWorks is made accessible as an integrated web-based resource designed primarily for the practitioners that identifies the key decision points in four phases of transportation decision-making: long range transportation planning, corridor planning, programming, and environmental review and permitting (International (Firm) & Corporation, 2014). The decision points provide the organizational structure for the SHRP2 products by calling the user's attention to them at the point or the points in the highway delivery process where the information is required by making it all accessible through a web-based search. The results from the 10 SHRP2 studies were integrated into PlanWorks over a four-year period as each study was completed. The products and outcomes of other SHRP2 research are integrated into this framework to strengthen the basis for the decisions about when, where, and how much capacity is needed along with the assessment of the economic

impacts and the ways to build the capacity that enhance the communities and environment. By pairing the framework with the case studies and tools, PlanWorks makes framework easier to access, understand, and apply to the users' case by comparing their current decision-making with the examples of the successful collaboration elsewhere like (Transportation Research Board, 2010a, 2011b, 2011a) thereby identifying where changes may be the most beneficial. The tool also provides the guidelines on how to collaborate the various stakeholders during the planning phase to come out with the feasible solution as in Transportation Research Board (2011b). During the past 15 years, the "public involvement" as a practice, has become as essential element of transportation planning and programming process where input from the public involvement helps to guide the efficient use of funding, resulting in better decision-making along with quality transportation outcomes (Wilbur Smith Associates & S R Kale Consulting LLC, 2010). Having the right people on the table with the right information at the right time will confirm that true collaboration can result in better solutions to the transportation challenges. Before PlanWorks was finalized, SHRP2 pilot tests were exercised to provide the feedbacks on its elements, information, and presentation.

As an example, MnDOT and WSDOT were selected as two of the agencies to pilot test PlanWorks and both were successful in implementing the PlanWorks to achieve their respective goals (Federal Highway Administration, 2015c). The Minnesota project used PlanWorks to guide planning activities that would result in a collaboratively developed Complete Streets plan in the city of Grand Rapids, Minnesota (Minnesota Department of Transportation, 2013). Using the tools and the techniques provided within the PlanWorks, MnDOT team worked collaboratively with various stakeholders (City of Grand Rapids, Itasca County, Minnesota DOT, and FHWA) and hence successfully designed the Complete Streets Plan. Similarly, Washington State Department of Transportation (WSDOT) project team worked collaboratively with the stakeholders using the tools and the techniques provided under the PlanWorks to successfully define the scope of Phase 1 of the SR 509 Corridor Completion Project (Washington State Department of Transportation, 2013). The defined scope was so cost-effective that it reduced the initial project implementation cost by about $400 million while preserving most of the project benefits.

Multiple case studies can be found in the library section of the PlanWorks website (Federal Highway Administration, 2015a). Three major studies related to the corridor planning are listed

on this section. First study is I-710, a heavily congested 28-mile freeway, connecting the Ports of Los Angeles and Long Beach to the east Los Angeles as well as rest of national interstate system (Transportation Research Board, 2011a). This study is an example of a planning effort that encountered major obstacles from the public but was able to resolve it through the support of all stakeholders. Four major stakeholder agencies, Los Angeles County Metropolitan Transportation Authority (Metro), the Southern California Association of Governments (SCAG), Caltrans, and the Gateway Cities Council of Governments (GCCOG), with Metro as the study coordinator initiated the study in 2000. However, a public outcry (citizens expressed alarm at the perceived impacts on their communities through the change in I-710) in 2003, made stakeholders to revise the outreach process (Figure 0-2) by integrating the public involvement process with the decision-making process which was successful in overcoming the public mistrust and achieving the project goals.

Similarly, the Kelly Parkway project is a good example of integrated transportation planning and the use of proactive community involvement for the construction of 8.8 mi limited-access highway in south San Antonio, Texas (Transportation Research Board, 2011b). This project faced the hindrances from the local community, which had a majority of minority (95%) and 34% below the poverty line. The major issues were concerned with quality of life, safety, language, and education levels for sharing the information. Local residents wanted the reassurance that the project was in the best interest of the community than simply KellyUSA (Air Force Base Conversion Agency, Texas Department of Transportation, San Antonio, Tex., & Federal Highway Administration, 2004). To solve these issues, the project team engaged the local neighborhoods and community by establishing a special office for community relations and developing a formal public involvement plan together with hiring of a special sub consultant specializing in Hispanic community relations. Something similar to this also happened in New Jersey while New Jersey Department of Transportation (NJDOT) responded to the congestion along Route 31 passing through the Flemington Borough. The growing concern of the possible negative impacts of the bypass on the local business community and the area's environmental resources led NJDOT embark on the integration of land use and transportation planning (Transportation Research Board, 2010b). The project team conducted one-on-one interviews with the stakeholders such as property owners, developers, interest groups, and local government. In addition, the team also created an advisory

group including the representatives from NJDOT, FHWA, local government, and local business associations. From these approaches, NJDOT was able to overcome the mistrust from the community and NJDOT has institutionalized this planning approach in its Future in Transportation (FIT) program. The other case study with corridor planning and environmental review is I-405 corridor program carried out by Washington State Department of Transportation (WSDOT). This program was a pilot study for an improved transportation decision-making process developed by WSDOT and FHWA called "Reinventing NEPA" attempting to move the National environmental Policy Act (NEPA) decision-making into the early stages of long-range planning (Transportation Research Board, 2011a). WSDOT structured the decision-making process for the I-405 Corridor Program as a circular flow of information, recommendations, and approvals between three committees (the Executive Committee, the Steering Committee, and the Citizen Committee) and the general public as shown in Figure 0-3. The members of the committees represented local jurisdictions, resource agencies, businesses, transit providers, and the general public. Although there are widely varied opinions about the success of the overall process, the public involvement process was very successful at keeping stakeholders informed at each step in the process and helping to build the trust with the public.

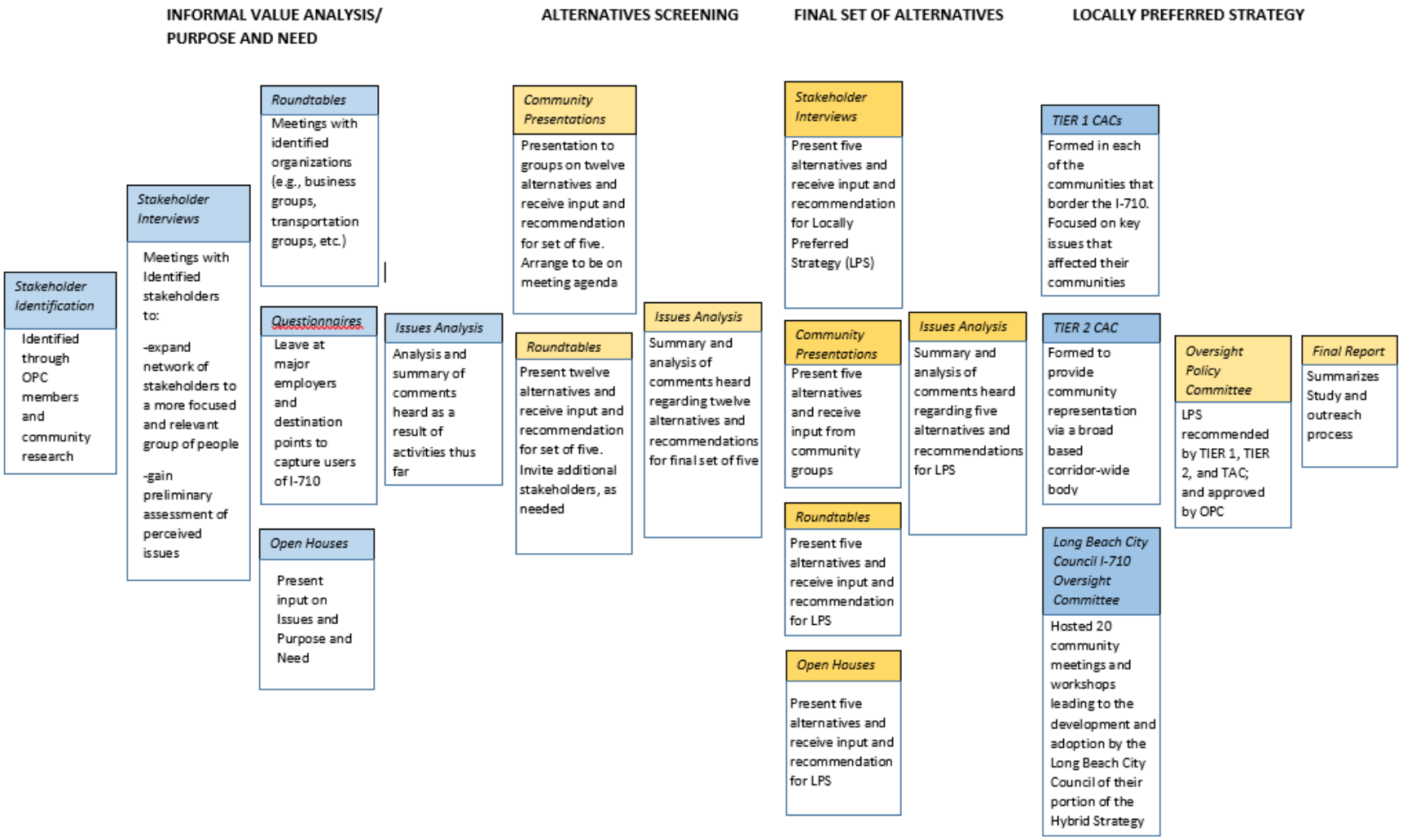

Figure 0-2: I-710 MCS outreach process flowchart

(Source: Los Angeles Metropolitan Transportation Authority, Los Angeles, Calif., (2005))

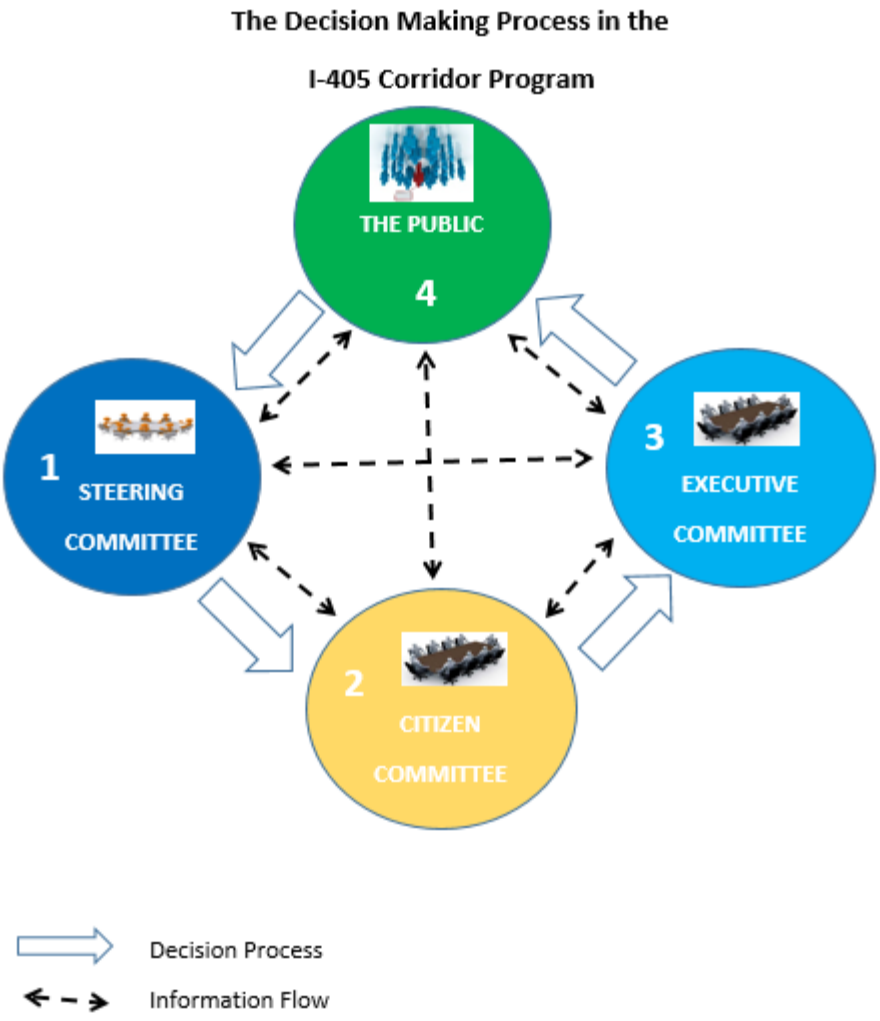

Figure 0-3: Flow of information between the committees and the public

(Source: WSDOT (2002)

Likewise, the US-285 project, expansion of a 14.7-mi segment of mountainous highway southwest of Denver, was a highly successful example of planning and development of additional highway capacity according to the partners and stakeholders including the Colorado Department of Transportation, FHWA, the U.S. Environmental Protection Agency, the Sierra Club, and others (Transportation Research Board, 2010a). Drawing the lessons from the nearby highway projects, outreaching the community interest groups proactively, and broad support for the project, made it an award-winning example of context extensive solutions (CSS) and efficient planning and development. The study related to the stakeholder collaboration are also listed on the PlanWorks library. The construction of bypass on US-64 corridor around Asheboro, North Carolina became essential to resolve the congestion, mitigate the accident rate, and enhance the road's Level of

Service (LOS) and hence 14-mile roadway including seven interchanges was designed to provide improved access to NC Zoo, located on Randolph County (Transportation Research Board, 2011c). NCDOT signed an interagency agreement with the FHWA and the U.S. Army Corps of Engineers (USACE) in May 1997 and as a first step to its application, FHWA, USACE, North Carolina Department of transportation (NCDOT), U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS), NC Wildlife Resources Commission (NCWRC), NC Department of Cultural Resources (NCDCR), and the NC Division of Water Quality (NCDWQ) all participated on the US 64 merger team to provide meaningful and early input on any likely impacts to resources along with participation in issue resolution.

In our case, as "Hub City", the Greater Memphis region plays a critical role in the nation's global supply chain (Memphis Urban Area MPO, 2017). I-40 connects Memphis to the major cities of Tennessee like Knoxville, Nashville, and Jackson in the east and to Little Rock, Oklahoma City, etc. to the west. The Memphis MPO in collaboration with its peer organizations on a local, state, and federal level may be in position for the initiatives with the policies like establishment of framework to analyze the dual effects of I-40/I-55 on the Greater Memphis road networks.

2.3 PlanWorks features adopted for transportation decision-making

PlanWorks is a broad source of information consisting of series of steps applicable for successful implementation of transportation related projects. Based on the nature and the impact of the project, the features of the PlanWorks may vary from project to project. Decision guide, assessments, user portals, and applications are the four major divisions within PlanWorks. Under these major divisions, there exists multiple subdivisions, all of which are developed based on the past case studies. We will be discussing some of the major features/subdivisions of PlanWorks selected for this study taking most of the references from PlanWorks website.

2.3.1 Decision Guide

It is the nucleus of the PlanWorks envisioned under Second Strategic Highway Research Program (SHRP 2). It is based on various case studies, carried out in the past. This tool can be used to solve various issues related to transportation by applying the techniques mentioned in this tool. It is also a useful tool for advancing the state of practice in transportation decision-making. Regarding the nature of our project, the corridor planning has been selected. The key decision steps of corridor planning (see Figure 0-4) are:

i. Approving the scope of corridor plan.
ii. Defining the range of problems and opportunities within the corridor.
iii. Setting the goals (transportation, community, and environmental) for the corridor.
iv. If the environmental review for the corridor is considered, the clear linkage of corridor study to the environmental review is to be defined.
v. Defining the evaluation criteria, method, and performance measures to cross-validate the solutions achieved to the goals set.
vi. Approving the range of solution sets for the corridor.
vii. Selecting the preferred solution set for the corridor plan.
viii. Approving the methodology for prioritizing the individual solutions within the preferred solution set
ix. Implementing the prioritized individual solutions according to their rank.

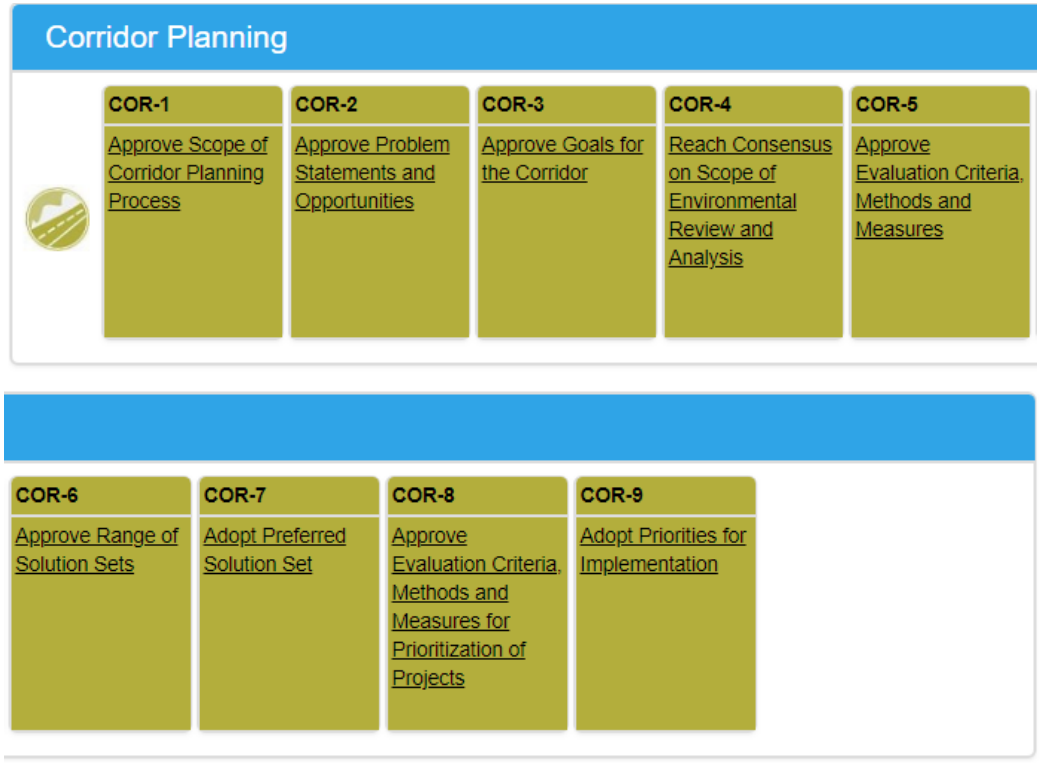

Figure 0-4: Steps of corridor planning for decision-making in transportation

(Source- https://fhwaapps.fhwa.dot.gov/PlanWorks/DecisionGuide)

2.3.2 Assessments

As discussed in the literature review, every project is expected to encounter the hindrances during the implementation of the project. The hindrances can be from the technical side or the community

which is directly affected by the project. To overcome these types of issues in the future, the assessment tool within the PlanWorks stands out leading to the successful project and plan development. Again, several options are available within the assessment depending upon the needs of the project. The web-tool is designed with the question sets within each category of assessment which assigns the score of weak, average, or strong. Hence the tool helps to figure out the important category of the assessment to the respective project.

According to the need of our study, stakeholder collaboration has been selected as there are large number of stakeholders who are concerned about the process and outcome of this important corridor study but at the same time do not have the decision-making authority. This collaboration also ensures that the stakeholders who want to be and need to be at the table, are identified and engaged.

The committee will be comprised of regional and local agencies with jurisdiction along the I-40 corridor and private stakeholders (that rely on the corridor for commerce) in West Tennessee. The committee will include continuing dialogue and collaboration with regional and bi-state partners like the Memphis and West Memphis MPOs, Arkansas State Highway and Transportation Department, and Tennessee DOT. In addition, regional chambers of commerce as well as regional carriers (air, trucking, and rail), distribution centers and shipping representatives will be invited to serve as members on the steering committee. The corridor management steering committee will assume the following roles: (a) Provide corridor management oversight in an effort to resolve any issues that may arise during the process (e.g., feasibility of implementation of proposed ideas/strategies), (b) Approve the delineation of the study corridor, (c) Identify and engage regional freight stakeholders into the process, and (d) Review and comment on all draft work products to the extent possible in FAC meetings.

At the present scenario, the Memphis MPO has already organized several advisory boards, including:

- Freight Advisory Committee (FAC)
- Planning and Land Use Advisory Committee (PLAC)
- Engineering and Technical Committee (ETC)
- Transportation Policy Board (TPB)

To support long-range planning and minimize conflicting goals, the I-40 Corridor Management Steering Committee should include liaisons with each of these boards. To ensure equity, the committee should also include private stakeholders from all modes. This will allow emphasis to be placed on the health of the overall freight transportation system, avoiding the appearance of collusion with any particular organization.

Convincing stakeholders—both public and private—to join the committee will require an act of sales. And as with most sales, stakeholders can be expected to ask, "What's in it for me?" Chapter 3 of the Stakeholder Engagement Guide[3] provides an answer: common ground. The public and private sectors share many of the same goals, and building a forum for discussion will allow for better creation of policies and projects that address these goals. Examples of common ground between the public and private sector include:

- Identifying which businesses rely on a transportation facility for product deliveries or access to customers
- Understanding commodity flows patterns and their importance to regional and state economies
- Establishing the mix of freight and passenger traffic on transportation facilities
- Understanding how to accommodate daily and seasonal freight flows
- Developing zoning and planning standards and criteria that provide buffers between transportation intensive land uses and other types of land
- Identifying high-accident locations involving freight carriers
- Assessing capacity needs for commercial vehicle staging and parking
- Tracking the type and amount of hazardous materials moving on the transportation system
- Developing strategies to reduce problems from hazardous material incidents

2.3.3 User Portals

Within PlanWorks, we can find two major portals, partner and stakeholder portals. Partners are those who can directly involve in the decision-making process and can influence the decisions. However, stakeholders are those who are interested in transportation but do not have the authority to make the decisions. Since the stakeholder's input and views are essential for a successful execution of the project, this report is intended to guide the stakeholders on the decision-making process and hence will be focused on stakeholder portals.

[3] https://www.fhwa.dot.gov/Planning/freight_planning/guidebook/guidebook.pdf

Stakeholder Portals

In this portal, the assessment of the stakeholders on three different categories, communications, understanding, and commitment is available which can track the status of stakeholder collaboration. The general information on Stakeholder Portals is presented under "user portals" in chapter 4 of this report. Based on the current situation of stakeholders and their input to the rubrics (see Figure 0-5), the results and the recommendations are provided within the portal (see Figure 0-6). Figure 0-5 and Figure 0-6 shows the input and the result for stakeholder communications only.

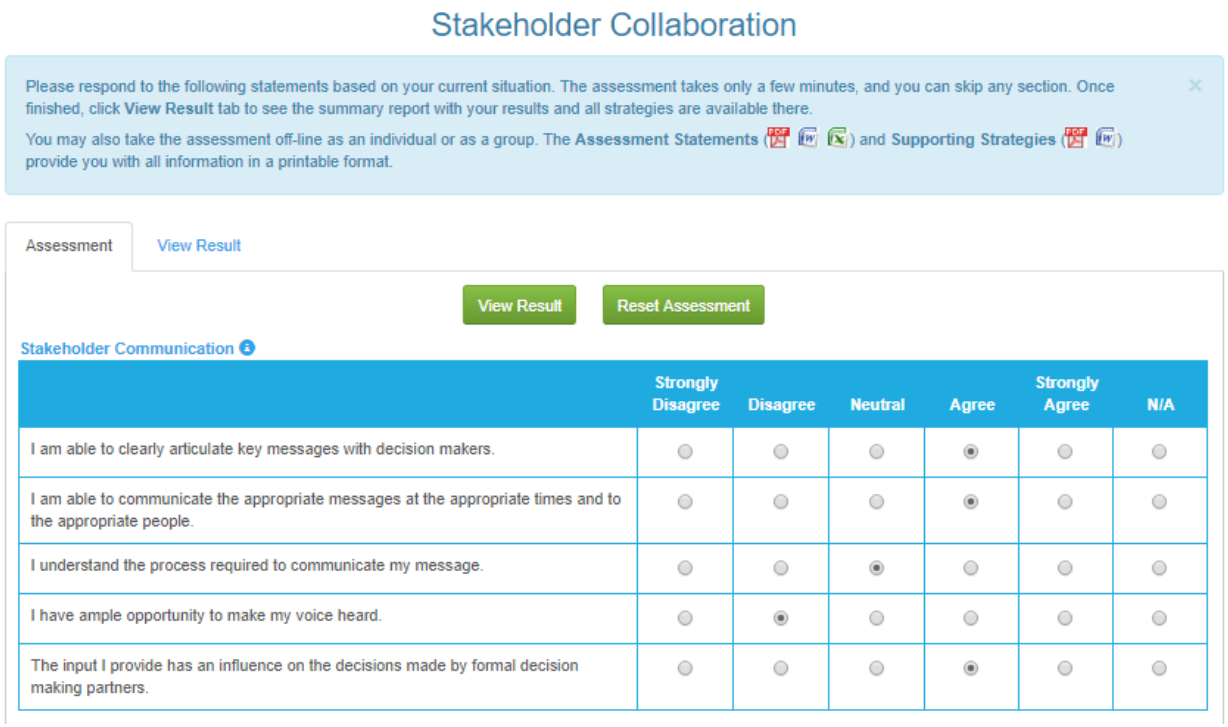

Figure 0-5: Questionnaires and input to the Stakeholder Portal

(Source- https://fhwaapps.fhwa.dot.gov/PlanWorks/Assessment/StakeholderCollaboration)

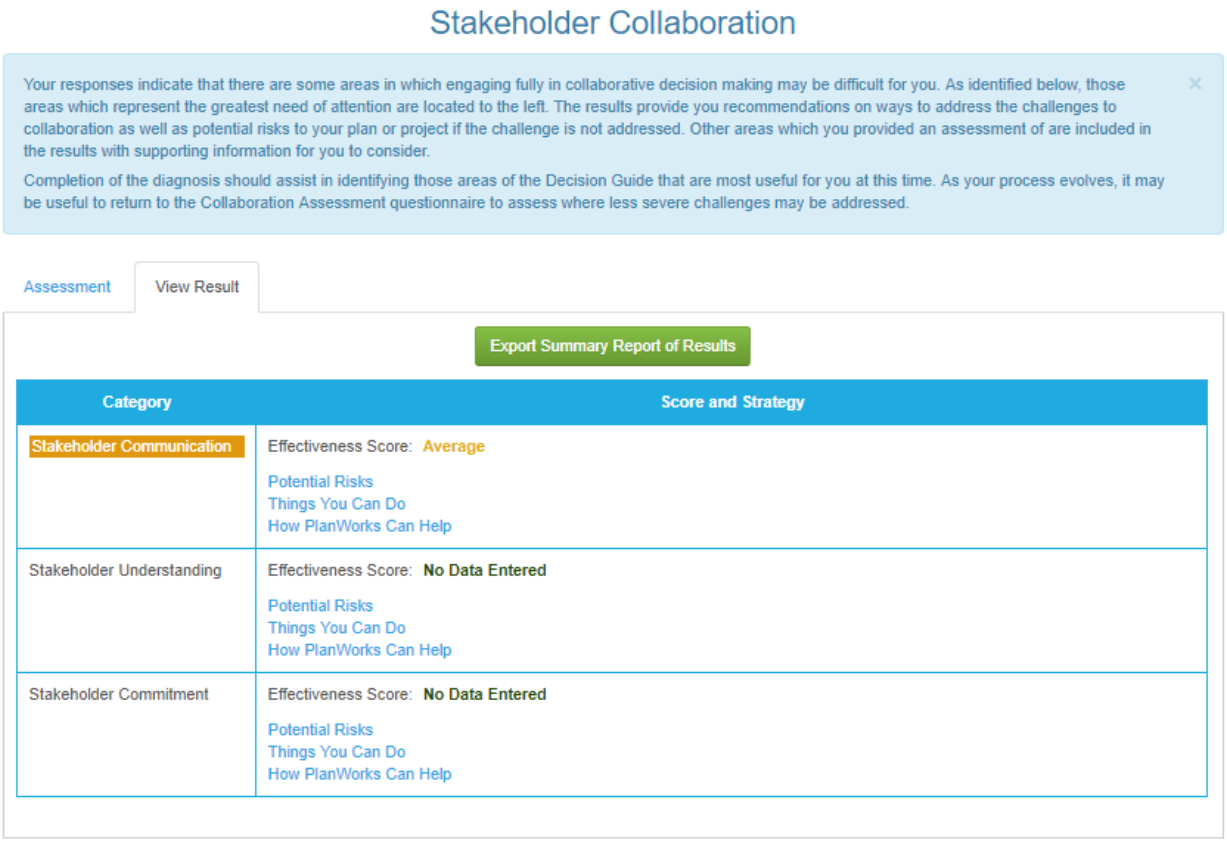

Figure 0-6: Result summary of the stakeholder portal

(Source- https://fhwaapps.fhwa.dot.gov/PlanWorks/Assessment/StakeholderCollaboration)

2.3.4 Applications

The PlanWorks tool can be applied in a vast range of transportation, community, and environment related projects. One of the applications of it in this study is freight. By providing the resources, PlanWorks helps transportation practitioners to better engage the freight industry and incorporate various freight specific information in the decision-making. The inputs from the freight stakeholders through the various key steps of decision guide (corridor planning) help the state DOTs and MPOs to implement the plans and projects effectively to address the freight needs. Except steps 4, 8, and 9 mentioned in the decision guide above, all other key decision steps are directly related to freight and hence freight sector can be enhanced by a balanced participation of freight stakeholder in the planning.

There exists couple of examples from past practices in which the participation of the freight stakeholders in the planning phases have boosted the transportation system and the economy overall. One of the examples related to the corridor planning is the San Diego Association of

Governments (SANDAG) working for the SR-905 corridor improvement was assisted by the trucking firm, railroads, and maquiladoras of this region to better understand the freight operations and hence plan accordingly. In addition, the participation of freight stakeholders also provides an opportunity to the freight community to better understand the transportation planning process and minimizes the project opposition.

Another application of the PlanWorks in this study is the Visioning and Transportation. It assists the transportation visionaries and practitioners to enhance the level of visioning in transportation decision-making (Federal Highway Administration, 2015f). In the present scenario, the Memphis MPO draft freight plan (Memphis Urban Area MPO, 2017) prioritizes the following project categories:

- Improving arterial roadway-to-interstate traffic flows
- Providing a greater definition and coordination of freight movement on the region's railroad networks
- Identifying and continuously improving on a "Smart" real time traffic management and wayfinding system

To implement these projects on I-40 corridor, the vision developed should be consistent with the goals of TDOT and the Memphis MPO. With regards to the freight transportation system, the Statewide Multimodal Freight Plan stresses the importance of the goals and their objectives as shown in Figure 0-7. With these broad goals in mind, the steering committee can begin developing a vision using the guide shown in Figure 0-8. The guide walks users through the following illustration.

In preparation for the first meeting, the meeting coordinator should visit the PlanWorks site and select the "Visioning and the Decision Guide" from panel on the left side of the page. Then, the "Corridor Planning" list can be isolated from the dropdown menu. This page can be furnished to meeting attendees to help direct the conversation. The first three boxes of the guide in Figure 0-8 are already complete and can be used to facilitate discussion on the remaining boxes. Discussing these three points should lay sufficient groundwork for the members of the committee to develop a vision for the corridor.

1. "Why are we doing this?"
   - Common ground, as previously discussed
2. "What has been done?"

- The meeting coordinator should have a good grasp on current and pending projects, and how stakeholder feedback has been taken in the past

3. "What is important?"
   - Refer to the MPO and State plans, as shown above

2.4 Chapter Summary

In this chapter, the brief overview of PlanWorks is presented. The features of PlanWorks along with its importance as well as applications in the corridor planning and environmental review are discussed with abundant literature. The formation of PlanWorks, various planning organizations adopting the PlanWorks in their project, and the success of the project due to PlanWorks are highlighted in the literature review. The four major PlanWorks features implemented in our study of corridor planning are discussed with some backgrounds. As a part of the PlanWorks, the procedure for the formation of steering committee and the development of vision for the I-40 corridor improvement in Memphis are also presented in this chapter which can be utilized by any planning organization, working for the betterment of the freight corridor.

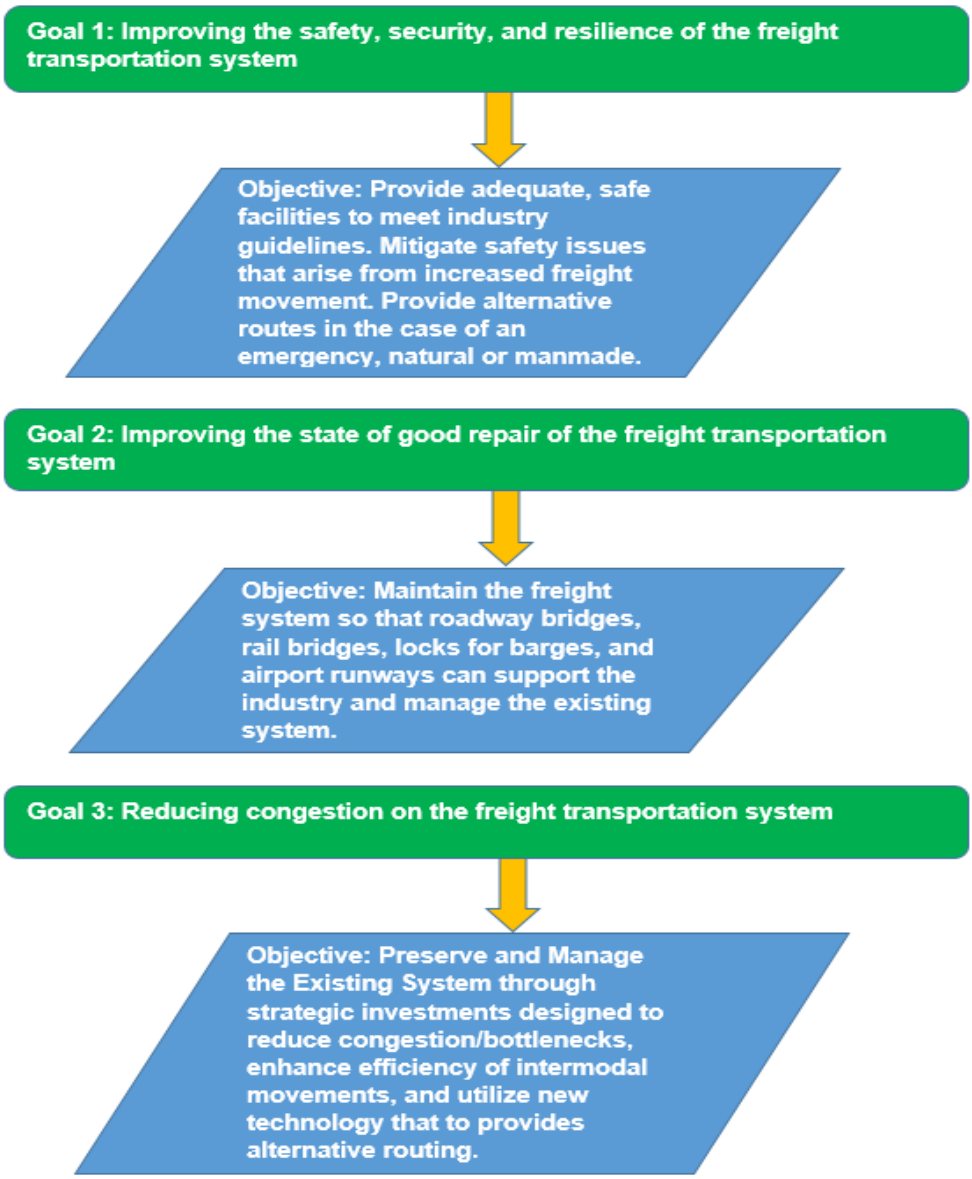

Figure 0-7: Visioning of freight transportation system

(Source: Wilbur Smith Associates & S R Kale Consulting LLC, (2010))

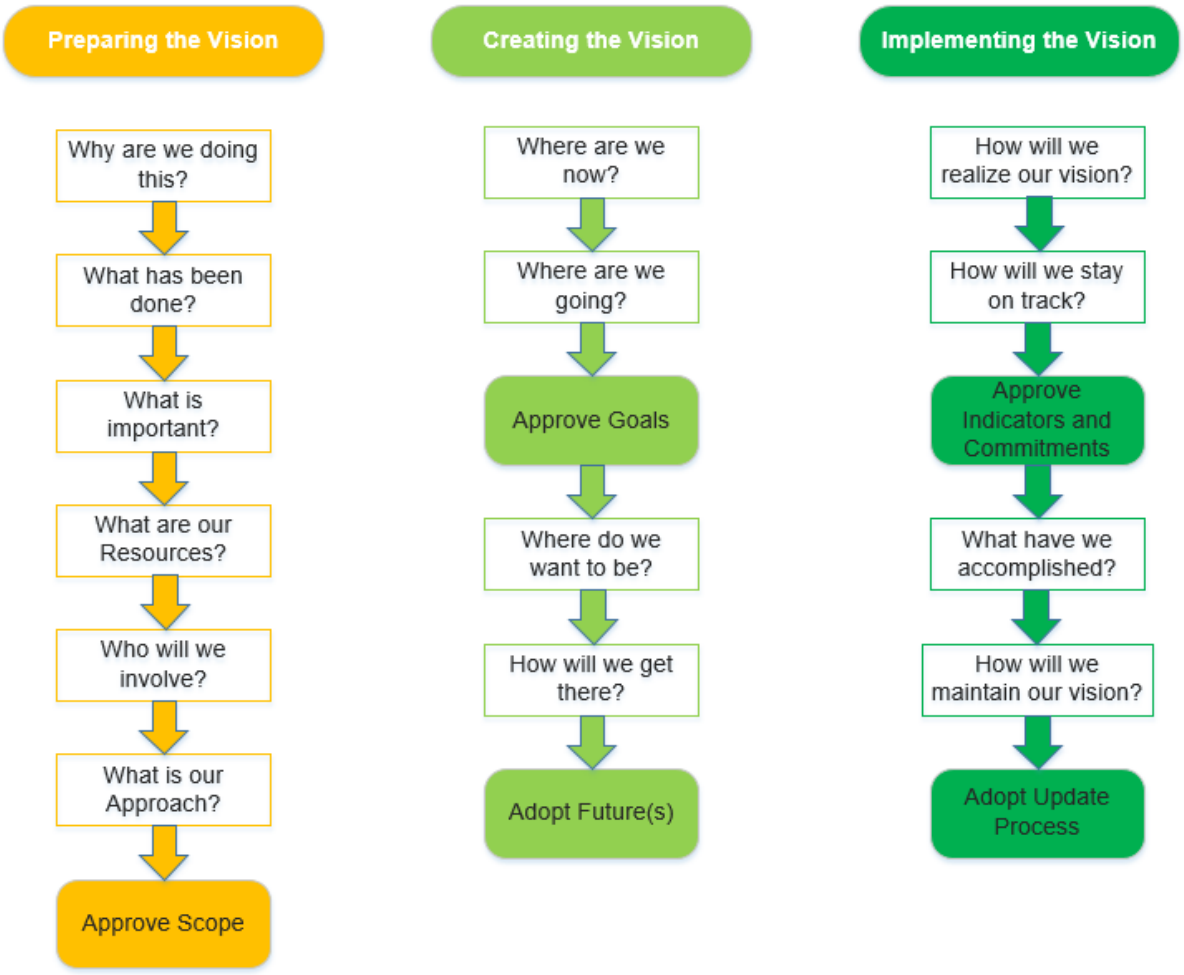

Figure 0-8: Project Overview

(Source- https://fhwaapps.fhwa.dot.gov/PlanWorks/Application/Show/6)

CHAPTER 3: USE OF PERFORMANCE MEASURES

3.1 Introduction

Like we discussed about one of the applications of the PlanWorks, freight, in the previous chapter, this chapter is focused on another application, performance measures. Performance measures are the integrated tool within the transportation decision-making that helps to build the consistency, transparency, and accountability into the planning process. These measures can be used to evaluate the major highway capacity projects and can also be used after the completion of the plan to monitor the effectiveness of the implemented solutions. Although these measures can be broadly organized around five major areas of concern- transportation, environment, economic, community, and cost, this chapter is intended to cover the transportation only. Within the transportation, four major performance measures can be used to assess the transportation system performance- mobility, reliability, accessibility, and safety. Due to limited resources, this report will address the mobility and reliability supported by a case study. However, detail information on the performance measures covering all the areas of the project together with the diagnostic tool is already available in the PlanWorks website.

TDOT maintains several real-time data sources which will be used to calculate the performance measures such as delay, travel time, travel time reliability, traffic crash, and incidents. TDOT and its partners have experience in developing freight performance measures[4]. These results can then be summarized and provided to the private stakeholders and users of I-40 corridor. A website can be developed to disseminate this information.

- Two performance measures: Expected travel time and Travel time reliability (Standard deviation, 95th percentile of expected travel time)
  - By path
  - By vehicle class (autos, ***trucks***)
  - By time of day
  - By incident type
  - By number of vehicles involved etc.
- Archive (from ATRI/NPMRDS/E-TRIMS)

[4] http://www.ce.memphis.edu/smishra/PDFs/Projects/FPM-finalDraft.pdf

- Real time (if TDOT has subscriptions to WAZE or others.)

For each origin-destination (OD) pair, we will select the set of the shortest paths from origin to destination.

- Number of shortest paths for a given OD pair is defined
- OD pairs are defined as centroids of census tracts within the study area
- Paths are considered unique if any link is not common to both paths

This will allow a selection of primary and alternate routes, in case of congestion, construction, or unsuitable infrastructure (such as low clearance) for special loads. Each path will be evaluated according to several performance measures to allow users to make more informed routing decisions.

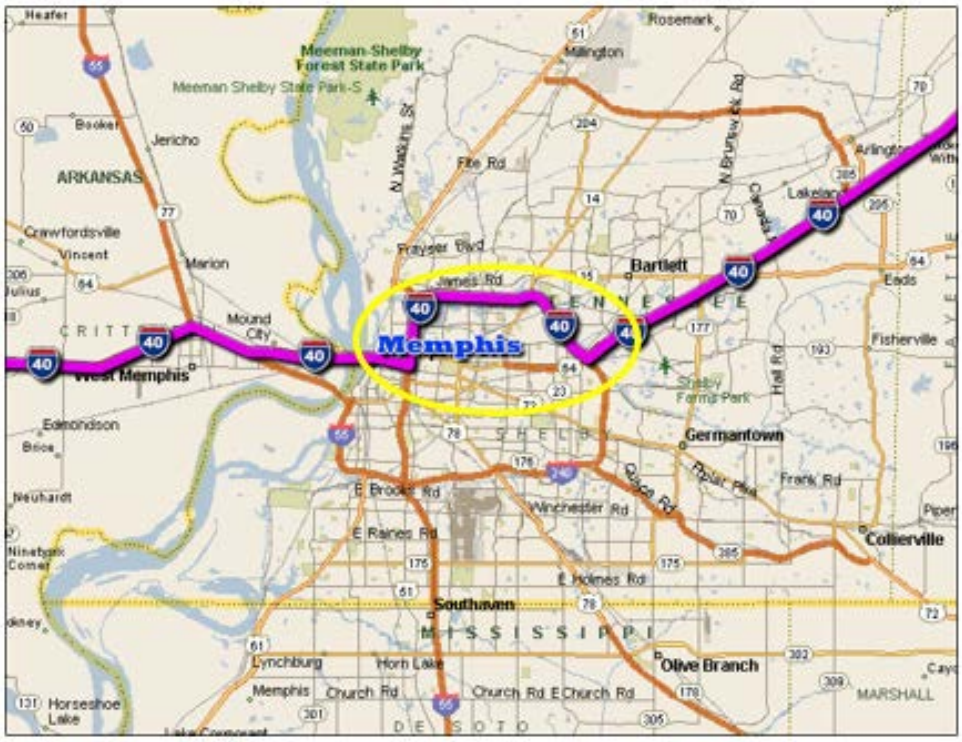

Figure 0-1: Scope of work

(Source- http://www.i40memphis.com/)

3.2 Methodology

Figure 0-2 shows the schematic framework for the determination of the shortest paths within the O-D pair, for a given area. First a definite area (county, MPO, State) is selected and the main corridor within this area is laid out. To establish the origin and destination, the smaller areas (census tracts, census blocks) within the definite area is classified. The representing point of these smaller areas like centroid are found and then connected to the network through centroid

connector. Once the network with these connectors is established, the shortest path algorithms like Dijkstra's algorithm can be employed to come up with the number of shortest paths for a given O-D within an area. The user can set different constraints depending upon the resources available and the purpose of the study.

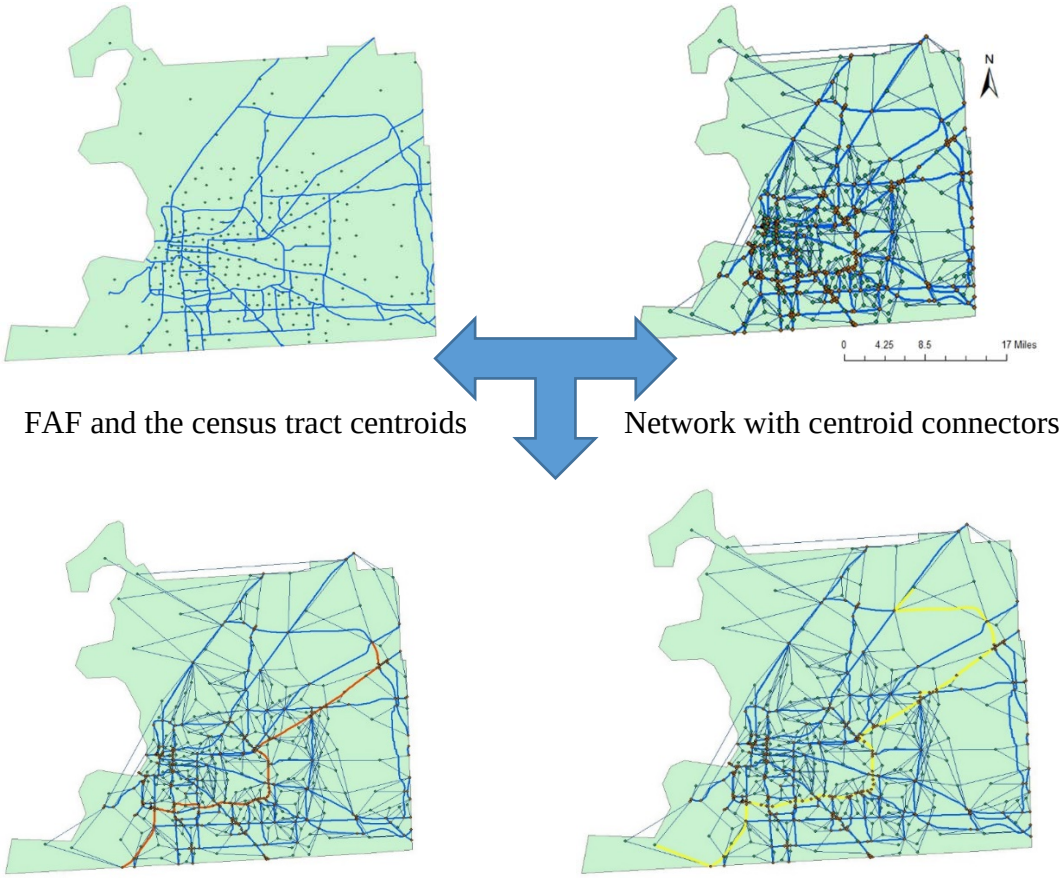

Figure 0-2: Proof of concept for determining k-shortest paths

Similarly, Figure 0-3 shows the methodological framework for the shortest path study. The truck GPS data for a region (in this case, a Shelby County within Tennessee) is derived from the ATRI. The 4-years dataset (2011-2014) for three particular months (March, June, and October) and two weeks within each month is extracted for the region. Also, the GPS dataset was aggregated for each hour of a day. As explained in previous paragraph, the freight network is created within the County. Since there are 231 census tracts within this region, the free flow travel times (based on off-peak hour) for the 231*230 paths are found. Based on this free flow time for each path, the

shortest paths can be derived. Figure 0-4 shows a typical example of the 10 shortest paths (based on travel time) for an OD pair of 2-473 for a particular hour of the day. The figure also shows the details (links) of the shortest paths. Although the travel time measure has been regarded as the best approach for the derivation of the shortest path as the users keep travel time as their important measure, a different approach with distance can also be used to come out with the shortest paths. As shown in Figure 0-5, the 10 shortest paths for a given O-D pair have been derived using the measure as the distance of the path.

Although this study has aggregated the days of the week based on their similarity (weekend, weekdays), the analysis can be performed for the disaggregated dataset as well but with more time components. This work can be replicated for any OD pair in the network, and for any time // day combination. This result can be uploaded to a web-portal, where users can select the time//day of interest and receive route choices for their trip.

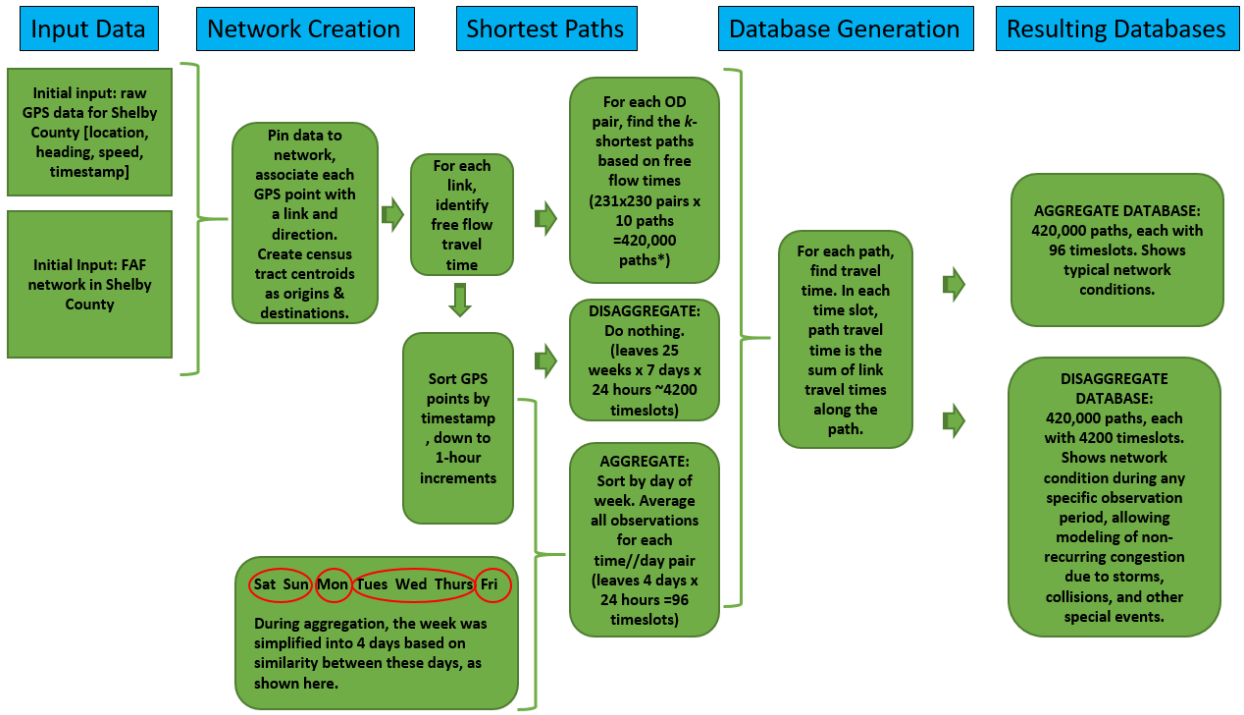

Figure 0-3: Methodological framework for the determination of 10 shortest paths using truck GPS data

Origin	Destination	Path Rank	Time	Link-Path Incidence Matrix														
2	473	1	0.805987	2	7	10	48	52	53	59	96	106	116	119	121	120	135	2
2	473	2	0.805987	2	7	10	48	52	53	59	96	106	116	119	121	120	135	2
2	473	3	0.807437	2	7	10	48	52	53	59	96	106	116	150	194	209	227	2
2	473	4	0.807437	2	7	10	48	52	53	59	96	106	116	150	194	209	227	2
2	473	5	0.850563	2	7	10	48	52	53	59	96	106	116	119	121	120	118	1
2	473	6	0.850563	2	7	10	48	52	53	59	96	106	116	119	121	120	118	1
2	473	7	0.852557	2	7	10	48	52	53	59	96	106	116	119	121	120	135	2
2	473	8	0.852557	2	7	10	48	52	53	59	96	106	116	119	121	120	135	2
2	473	9	0.854007	2	7	10	48	52	53	59	96	106	116	150	194	209	227	2
2	473	10	0.854007	2	7	10	48	52	53	59	96	106	116	150	194	209	227	2

Figure 0-4: Link-path incidence matrix for k=10 paths for OD pair, 2-473

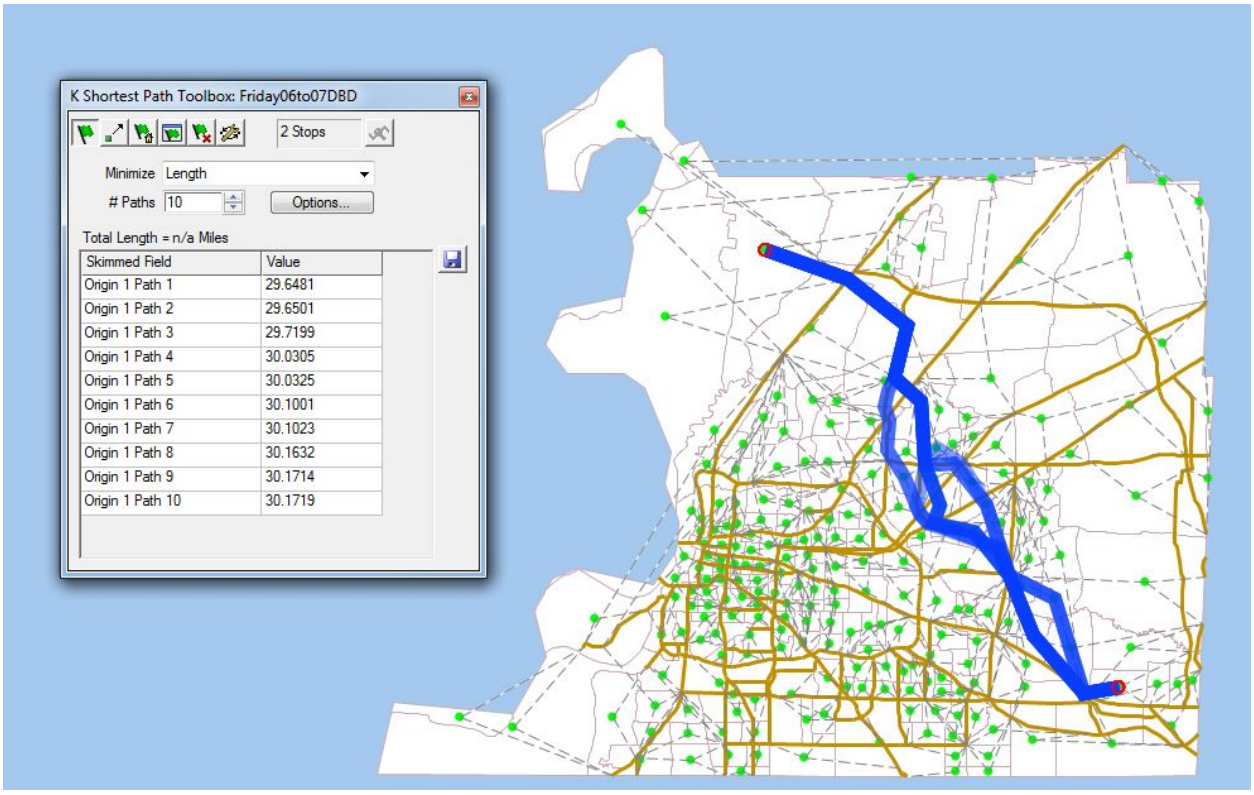

Figure 0-5: Ten shortest paths for a particular origin and a destination, in ascending order of path distance

3.3 Case Study

Various links of the important and widely used freight segments within Shelby County/Memphis MPO (I-40, Lamar) are studied to observe the travel time and its reliability measures. All these measures are expected to indicate the effect of congestion during the peak hours of the day which highlights the fact that these segments should be prioritized in the transportation plan.

3.3.1 1st case (NPMRDS)

The first example is the 1.5 miles (westbound) and 1.61 miles (eastbound) segment of I-40 corridor between exit 12 and exit 14 of Tennessee, as shown in Figure 3 6. This link is next to one of the most travelled segment of I-40 in Tennessee region. The truck speed has been limited to 55 mph and a serious congestion can be observed in this link, at the peak hours of the day.

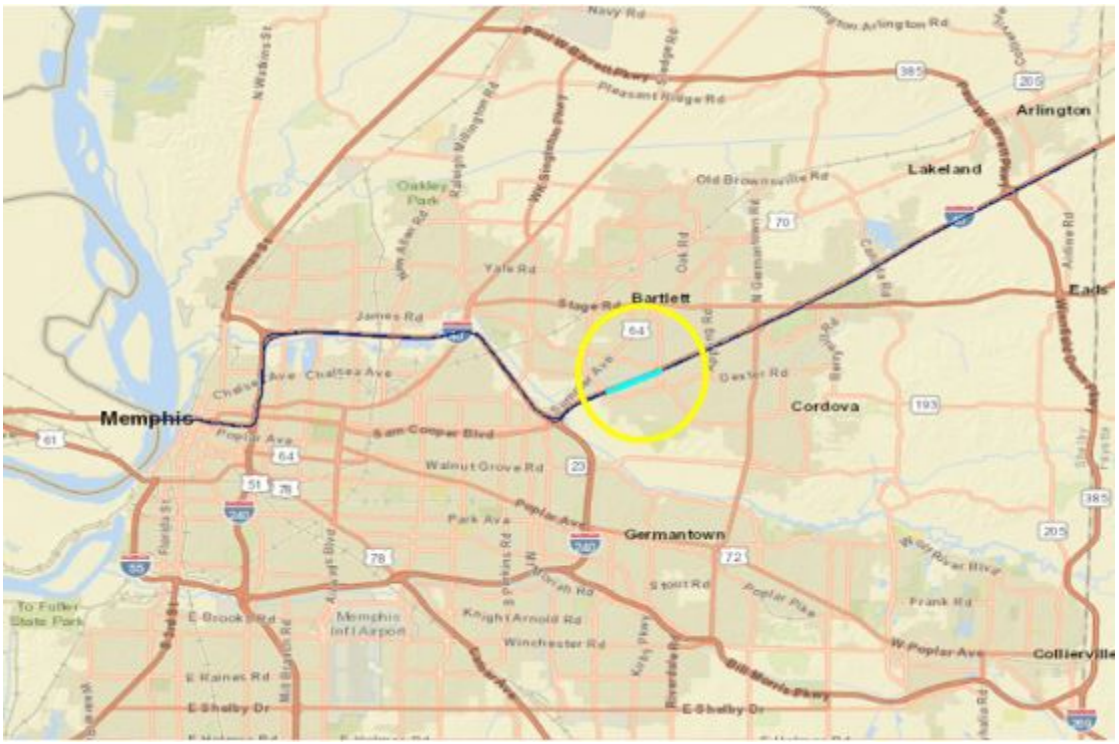

Figure 0-6: Section of I-40 between Exit 12 (Sycamore View Road) and Exit 14 (Whitten Road)

Figure 0-6 shows the important link of I-40 corridor right after the Sam Cooper Boulevard. Using NPMRDS dataset, both directions of the link are observed for the travel patterns within a day and a week. Figure 0-7 and Figure 0-8 shows the eastbound and westbound travel pattern for the link respectively. Although we can observe a distinct AM peaks in most of the weekdays in case of eastbound, there lacks a regular two peaks for AM and PM. However, in case of westbound, the AM peak (5:30 – 9:30) and PM peak (3:00 – 6:30) are present. The free flow time is observed as 1.69 minutes which makes AM and PM peak 8 and 4 times of free flow time respectively. The reason behind the absence of distinct peaks in eastbound may be:

1. Trucks leave from Memphis throughout the day
2. New interchange built on I40-I240 interchange helped truck travel times to reduce significantly

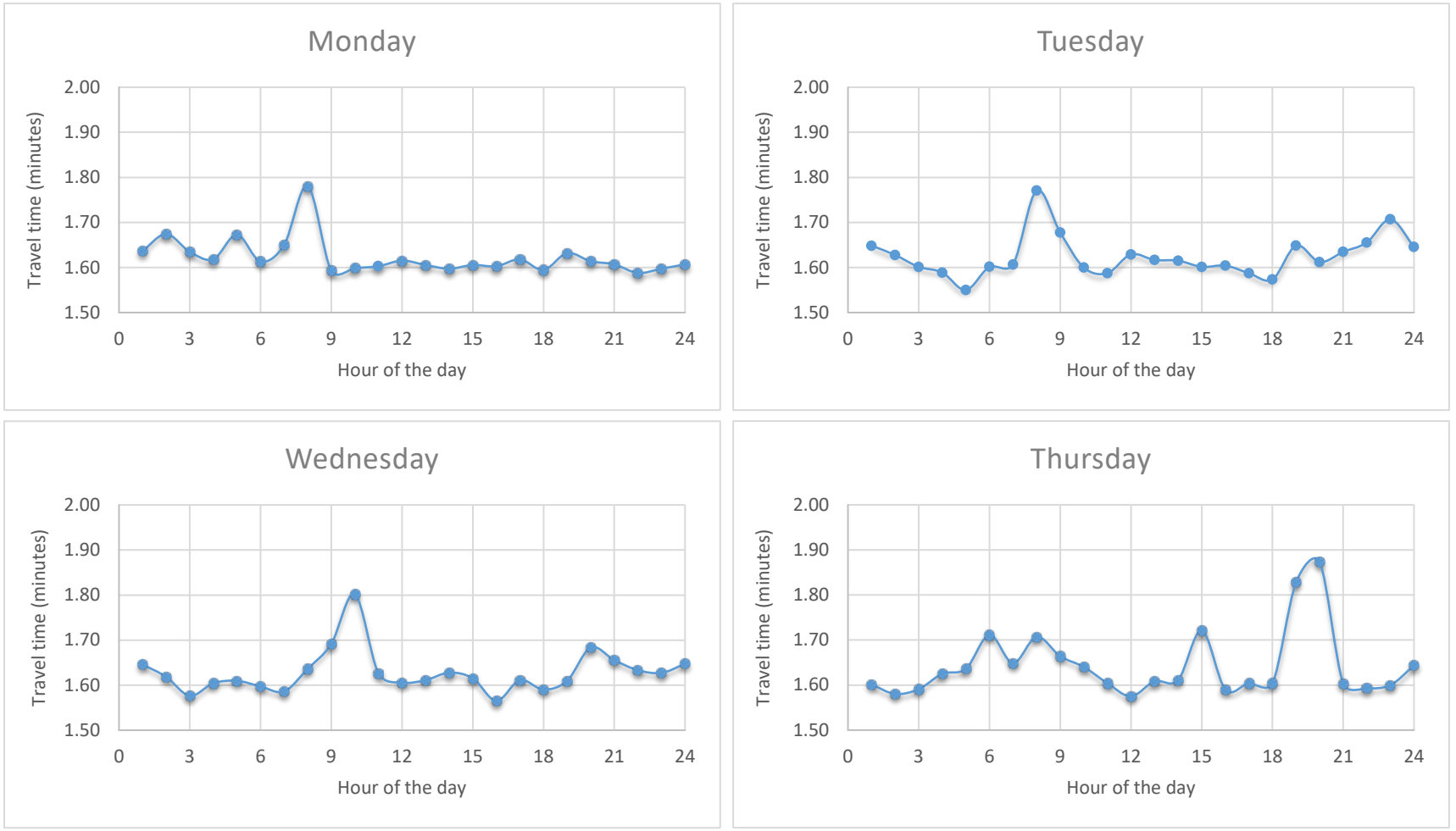

Figure 0-7: Travel time within a day and typical weekdays of I-40 between exit 12 and 14 (eastbound)

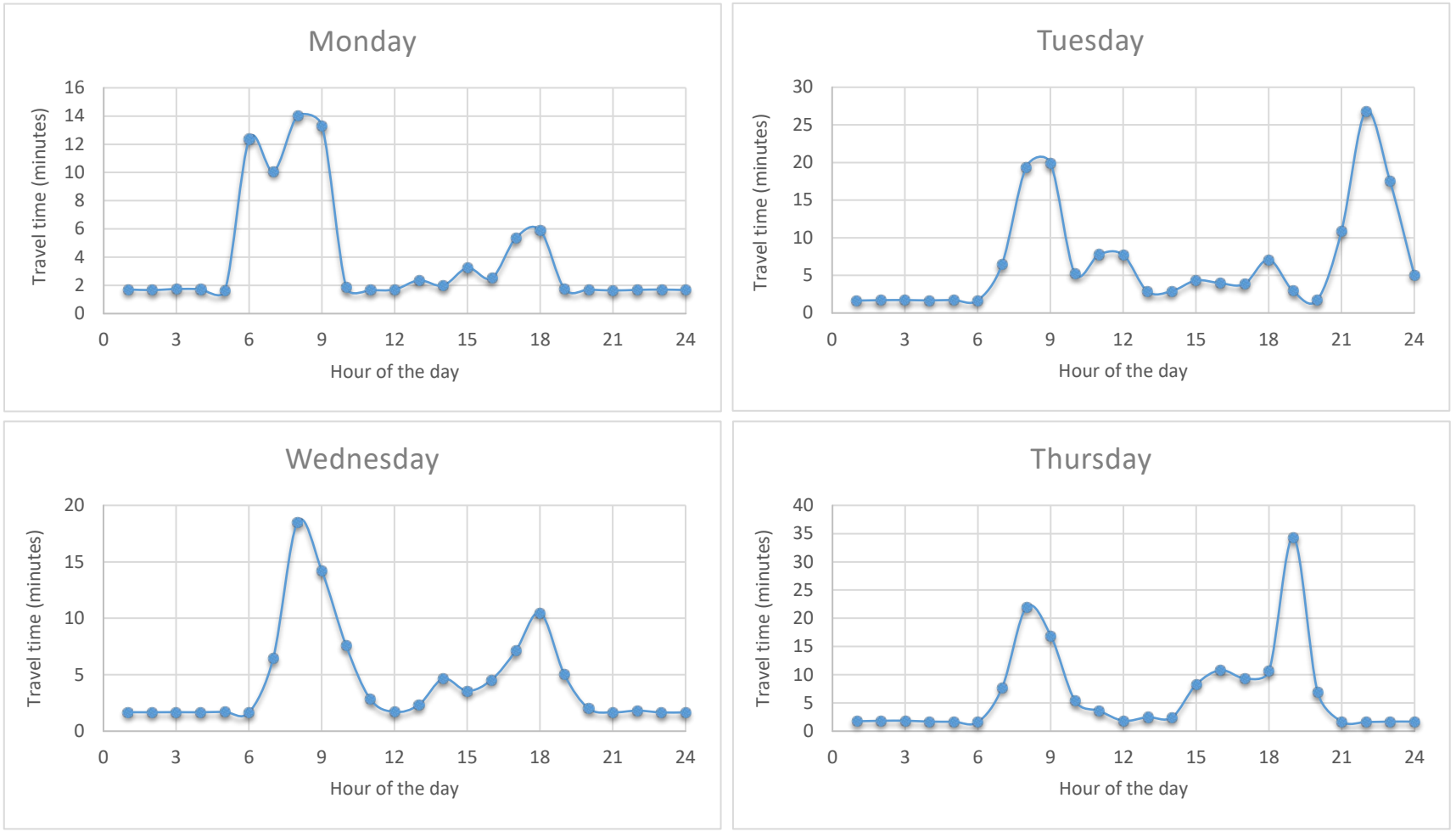

Figure 0-8: Travel Time within a day and weekends of I-40 between exit 12 and 14 (westbound)

3.3.2 2nd case (Google Maps)

The second example is the 3.9 miles southbound segment of Lamar Avenue between Winchester and East Holmes road. Three major establishments, Memphis International Airport, BNSF Railway, and Intermodal Cartage Group (ICG) are by the side of this important segment (see Figure 0-9). Using the Google maps, out of two shortest paths, the travel time patterns for the one covering only the Lamar Avenue (shown in blue) is analyzed.

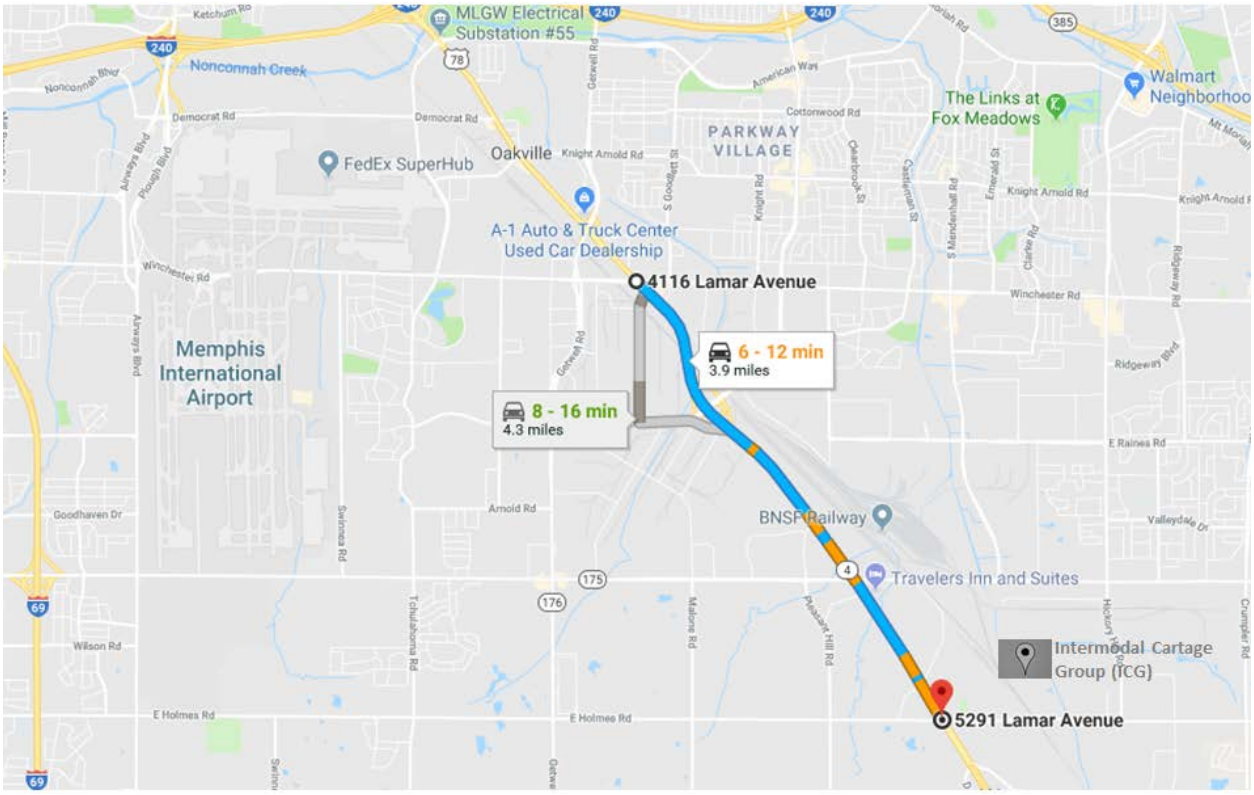

Figure 0-9: An important 3.9 miles stretch of the major freight corridor of the nation (Lamar Avenue) showcasing origin-destination, multiple shortest paths, and three major establishments

Figure 0-10 and Figure 0-11 shows the travel time information within a day for typical weekdays and weekends respectively. The free flow time for this segment is 6.5 minutes. The AM and PM peak are found to be 1.5 and 2.5 times the free flow time respectively. Unlike the weekdays, the travel time over the weekends seemed to be consistently higher in the hours other than off peak hours. Hence the definite pattern of AM and PM peaks is missing over the weekends conveying the information that the trucks travel throughout the day rather than a defined peak period, in the weekends.

Similarly, two reliability measures of travel time, Standard deviation (SD) and 95th percentile, for the same segment are computed for the typical weekdays (see Figure 0-12). Unlike the actual travel time, SD shows the variation of travel time within an hour and 95th percentile travel time gives the likely travel time in which we can make the trip successful 95% of the time. These measures help to predict the consistency of the travel time and the measure of extra time we need to allocate while traveling to make the trip on time. The patterns of these reliability measures are almost similar to the mean travel time we calculated above, again highlighting the fact that the travel time is inconsistent and higher for the peak hours of the day.

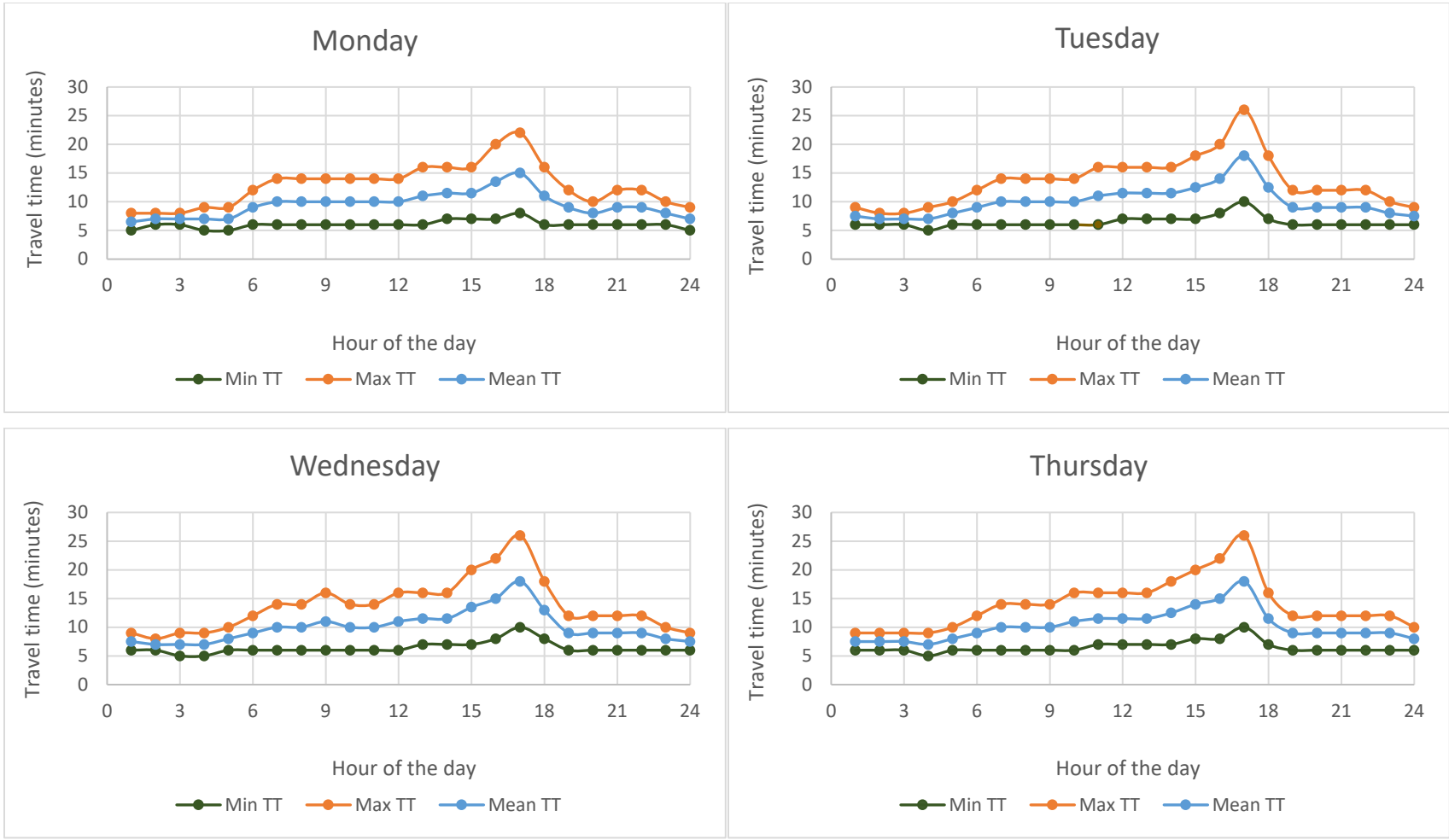

Figure 0-10: Minimum, maximum, and mean travel time within a day and typical weekdays for a segment of Lamar Avenue between Winchester and East Holmes road (southbound)

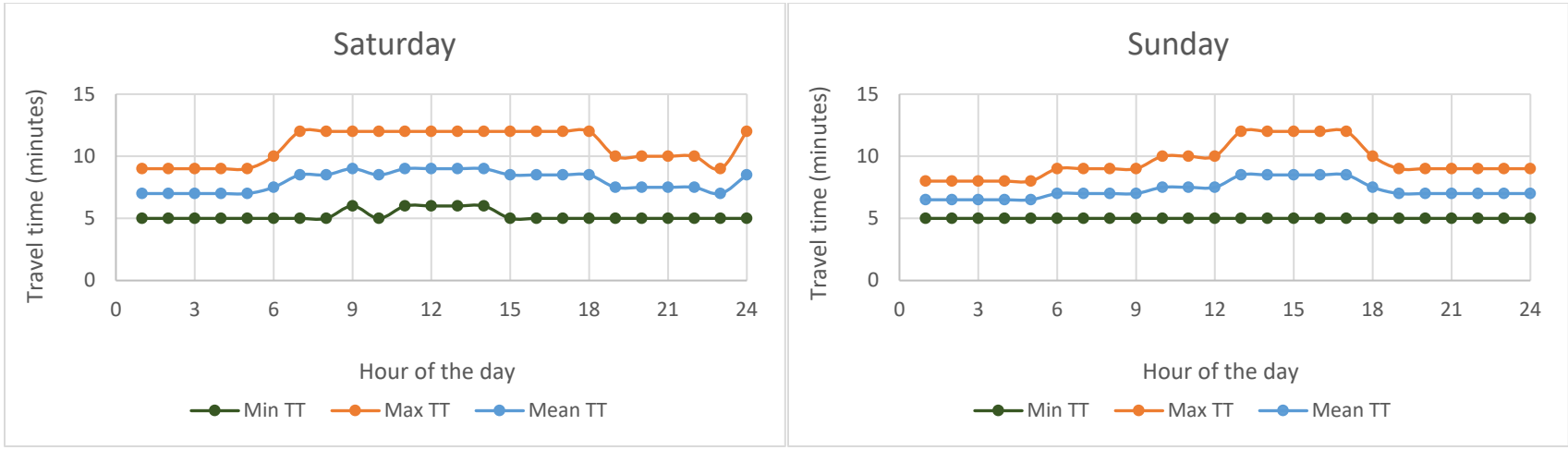

Figure 0-11: Minimum, maximum, and mean travel time within a day and weekends for a segment of Lamar Avenue between Winchester and East Holmes road (southbound)

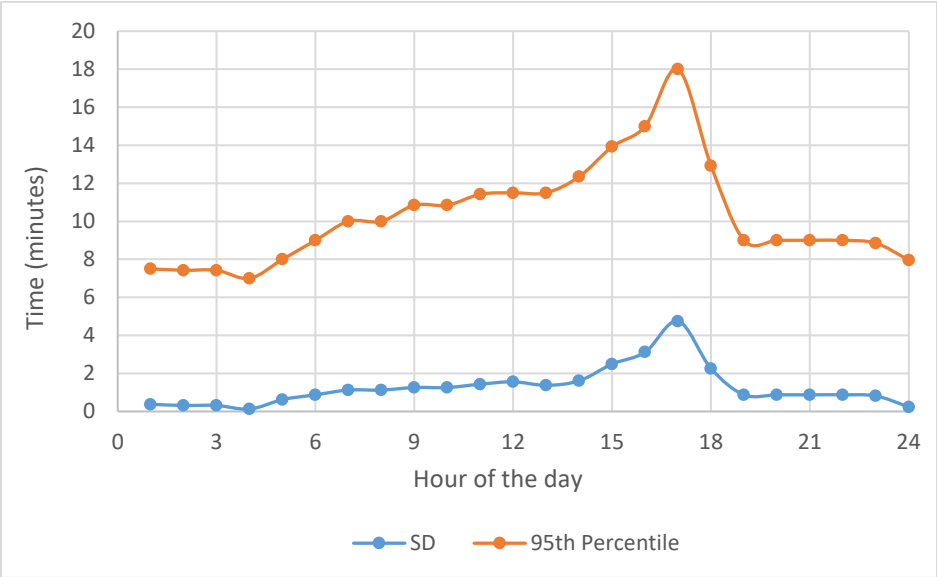

Figure 0-12: Reliability measures, Standard deviation (SD) and 95th Percentile travel time, within a day of typical weekdays for a segment of Lamar Avenue between Winchester and East Holmes road (southbound)

3.4 Chapter Summary

In this chapter, the importance of the performance measures in the corridor planning has been highlighted. In an attempt to calculate the expected travel time, the methodology for the computation of the shortest paths for a given OD pair within the given area is described. Due to limited resources, the case study has been restricted to the best shortest path. Two important performance measures, travel time and its reliability measures (Standard deviation and 95th Percentile) over the various hours of a day and different days of a week are shown on some of the major segments of freight corridor within the Shelby County of Tennessee. The result shows that the AM and PM peaks on the major freight corridor are really congested and hence the improvement projects to mitigate this problem should be prioritized in these corridors in order to keep the freight moving in efficient and economical way.

CHAPTER 4: WEB-BASED PORTALS/ DASHBOARDS

4.1 Introduction

This report so far has been focused on using the already available resources in an attempt to plan the capacity related projects successfully. These resources are available in the PlanWorks website[5] as a portal primarily to engage public and private stakeholders. The web-based portal contains key decision points of the freight centric corridor management, role and responsibilities of stakeholders, performance measures of the corridor, and outcomes of all stakeholder meetings. This portal is directed towards FAC, MPOs, and other stakeholders. A number of key elements of PlanWorks web portal (Federal Highway Administration, 2015a) will be considered such as a high level overview of the project on the front page and more detailed information as the user clicks on specific hyperlinks. Other than the PlanWorks, an example of the web-based portal is the Interstate-65 study recently conducted by TDOT (Tennessee Department of Transportation, 2017).

This section also provides a layout for the development of the web-based portal which can be similar to the various existing web portal, developed as a part of some projects by state and federal agencies. It can be based primarily on the two sources mentioned in the research proposal: the PlanWorks guide for partner and stakeholder portals (Federal Highway Administration, 2015e), and the existing TDOT "studies" pages (Tennessee Department of Transportation, 2017). The web portal can have three main functions. First, it acts as an information station for the general public and allows citizens to provide feedback on current conditions. Second, the portal allows partners and stakeholders to review their roles in ongoing projects and review corridor planning meetings. Third, the portal displays the various performance measures like the one presented in chapter 3 of this report.

4.2 Landing Page Layout

The layout of the landing page can be similar to the layout of TDOT developed page shown in

Figure 0-1 but with one key difference: it should also serve as the connection portal for the controlled-access parts of the site. In addition, the studied corridor can be spatially shown in the map on the landing page with the help of the software like Esri. By this, the stakeholders can access

[5] https://fhwaapps.fhwa.dot.gov/PlanWorks/Home

the information on multiple links within the corridor and its surrounding areas simply by zoom in and zoom out function as shown in Figure 0-2.

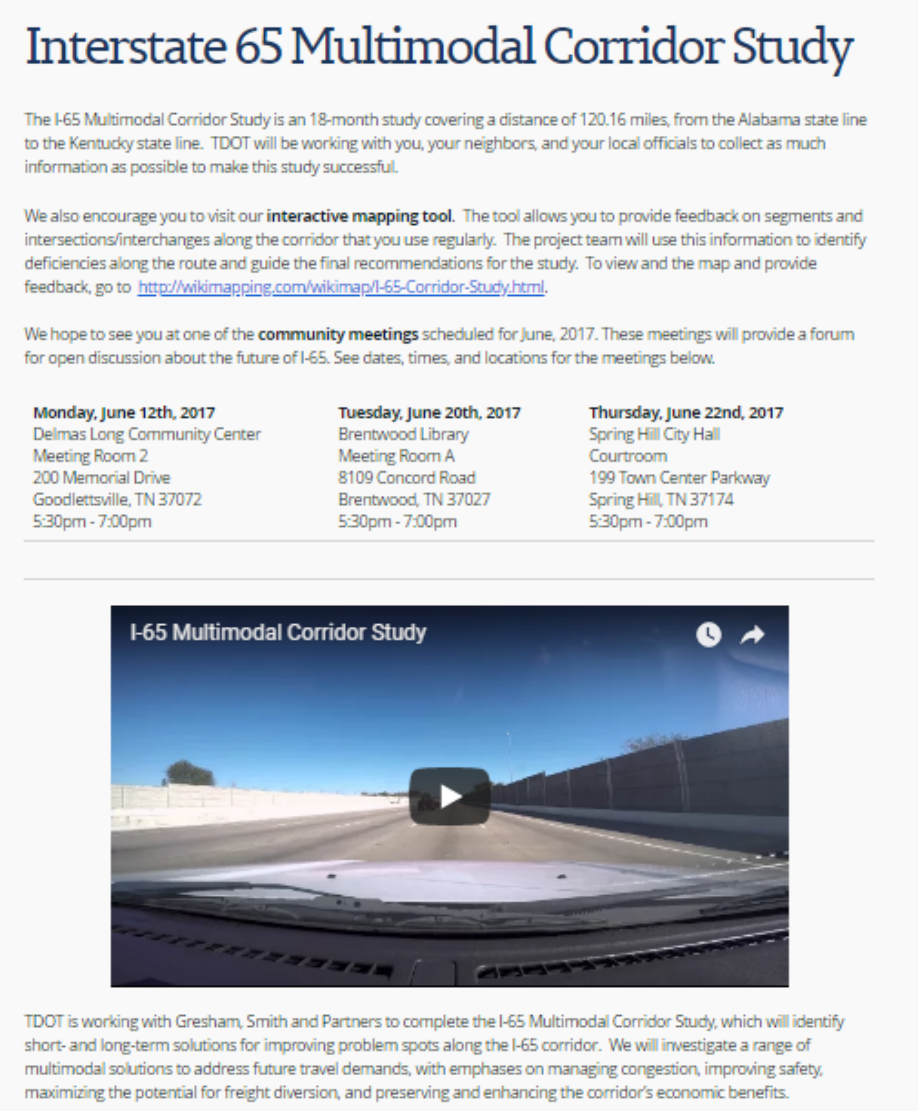

Figure 0-1: I-65 Corridor Study Page

(Source: Tennessee Department of Transportation (2017))

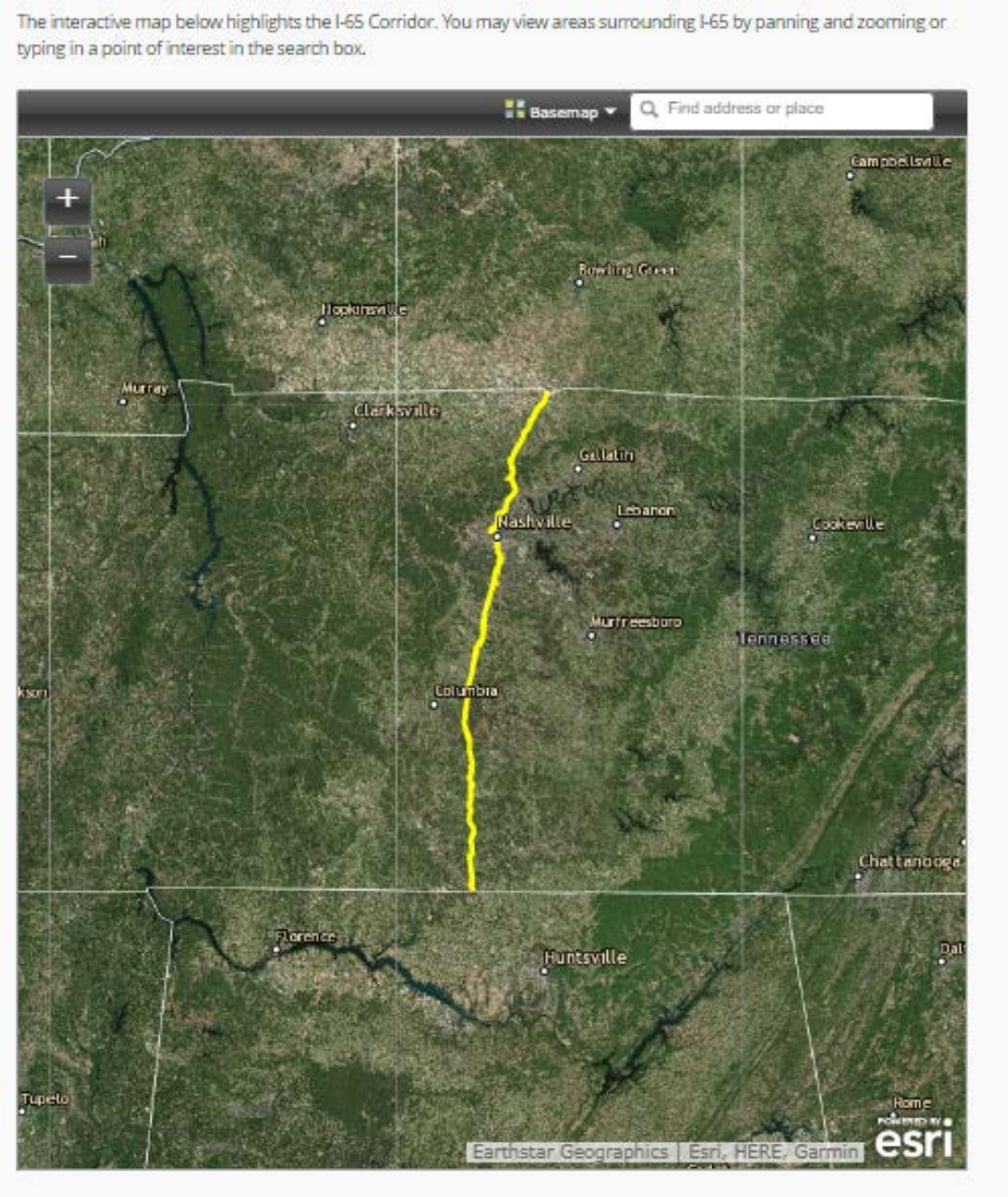

Figure 0-2: Spatial representation of I-65 corridor in the landing page of I-65

(Source: Tennessee Department of Transportation (2017))

A mockup of the site's proposed layout is given in Figure 0-3, and shows which information should be included in each location. Figure 0-3 also indicates that the schedule of upcoming public forums should be dynamic and tied to an external calendar.

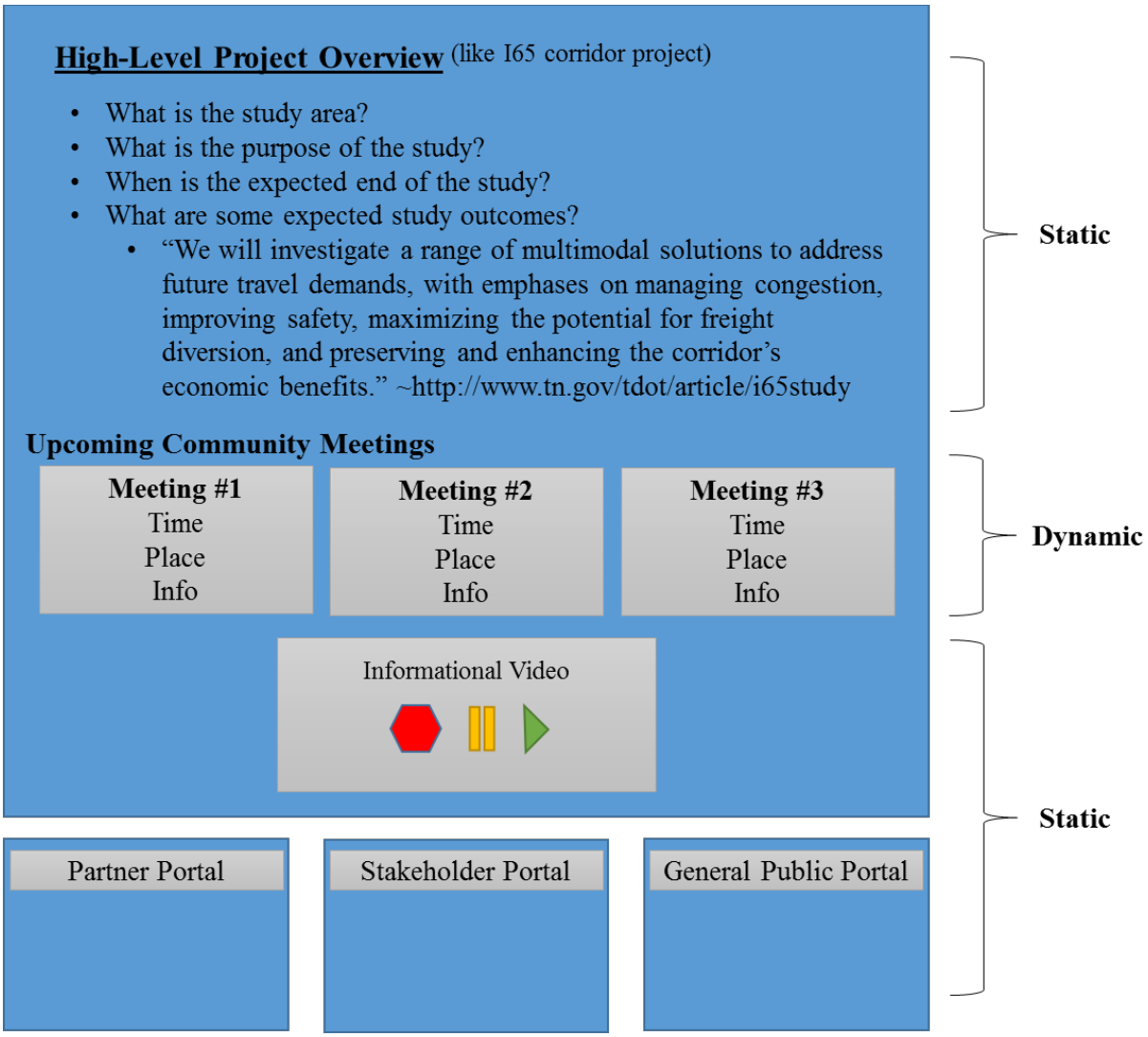

Figure 0-3: Proposed Landing Page Layout

Further information about the partner and stakeholder portals can be found under the "User Portals" tab on the PlanWorks website. The following sections summarize the content proposed within each portal.

4.2.1 General Public Portal

The General Public Portal is an open-access interface designed for concerned citizens or anyone else without access to the Stakeholder or Partner portals. Within the General Public Portal, users can access the vision for the corridor (once prepared, as outlined in the chapter 2 of the report for this project). As corridor improvement projects become available, they should be linked in this section, with basic information on expected start and end dates, project motivation, and the changes

expected at the end of the project. Finally, this section of the site will host a forum for user feedback, allowing users to post comments on the sections of the corridor they most often use, and the issues they most often encounter.

In short, the General Public Portal serves as the first point of contact between the Corridor Management Steering Committee and the rest of the world. It allows the public to become better informed not only about projects underway in the area, but about the purpose of those projects and how they fit into a larger vision for the corridor. It also formalizes a channel for the public to provide information about how they experience the corridor. This channel serves as the basis for free crowdsourced data collection while making corridor users feel heard.

4.2.2 Stakeholder Portal

The Stakeholder Portal is an area of the site with access restricted to Corridor Management Steering Committee members without the authority to make decisions. The portal provides midlevel access: users can access all the information and options available through the General Public Portal, as well as a schedule of upcoming Corridor Management Steering Committee meetings and notes from previous meetings, facilitating communication for committee members.

The Stakeholder Portal houses a list of active committee members, their roles, and their responsibilities. It also provides a deeper level of information on ongoing corridor improvement projects. It may offer plan drawings, information on the engineers and contractors in charge of each project, or other information at the discretion of the committee. Finally, this portal contains an interactive tool showing the performance measures developed in the chapter 3 of this report. Users will be able to select a “Time of Day” and “Day of Week” from dropdown boxes, and then select the census tract centroid nearest to their desired origin and destination, as shown in Figure 0-4. The tool will then provide the performance measures relevant to the user’s specifications. Note that Figure 0-4 is only a sketch of the interactive tool, and is not intended to show the final product.

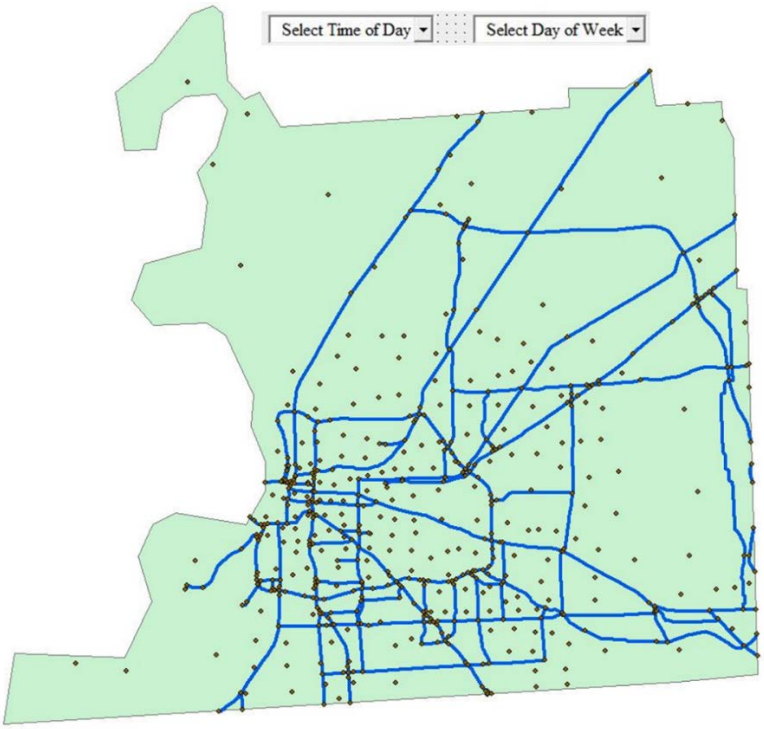

Figure 0-4: Sketch of Interactive tool to view the performance measures

4.2.3 Partner Portal

The Partner Portal is the most restricted area of the site, allowing access only to Corridor Management Committee members granted the authority to make decisions. Users at the Partner level can access all information and options available through the Stakeholder and General Public portals and can see high-level information on ongoing corridor improvement projects. In addition to information on projects and meetings, Partners can also view the Partner Interests and Partner Roles for each phase of each planned project[6]. While Figure 0-5 shows potential interests of some partners, Figure 0-6 shows the roles these partners may have.

[6] As outlined in https://fhwaapps.fhwa.dot.gov/PlanWorks/UserPortal/PartnerPortal

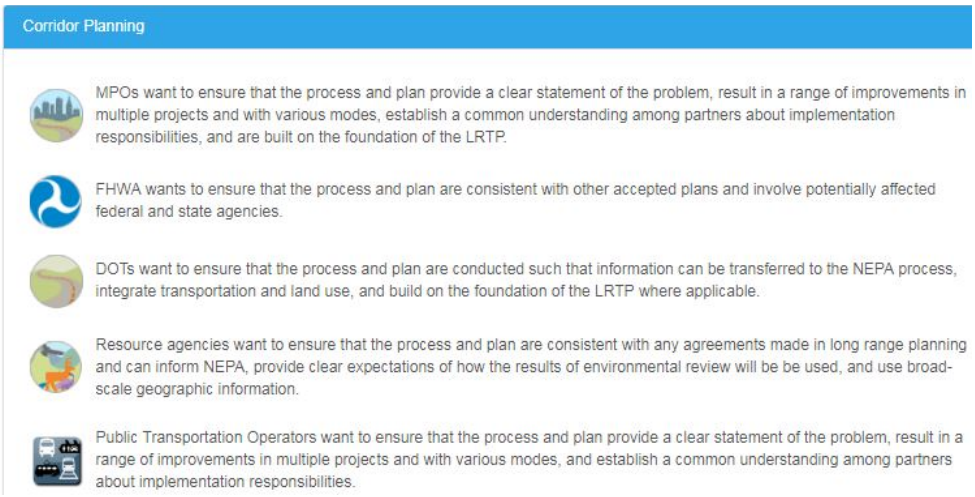

Figure 0-5: Potential Partner Interests

(Source: Federal Highway Administration (2015b)

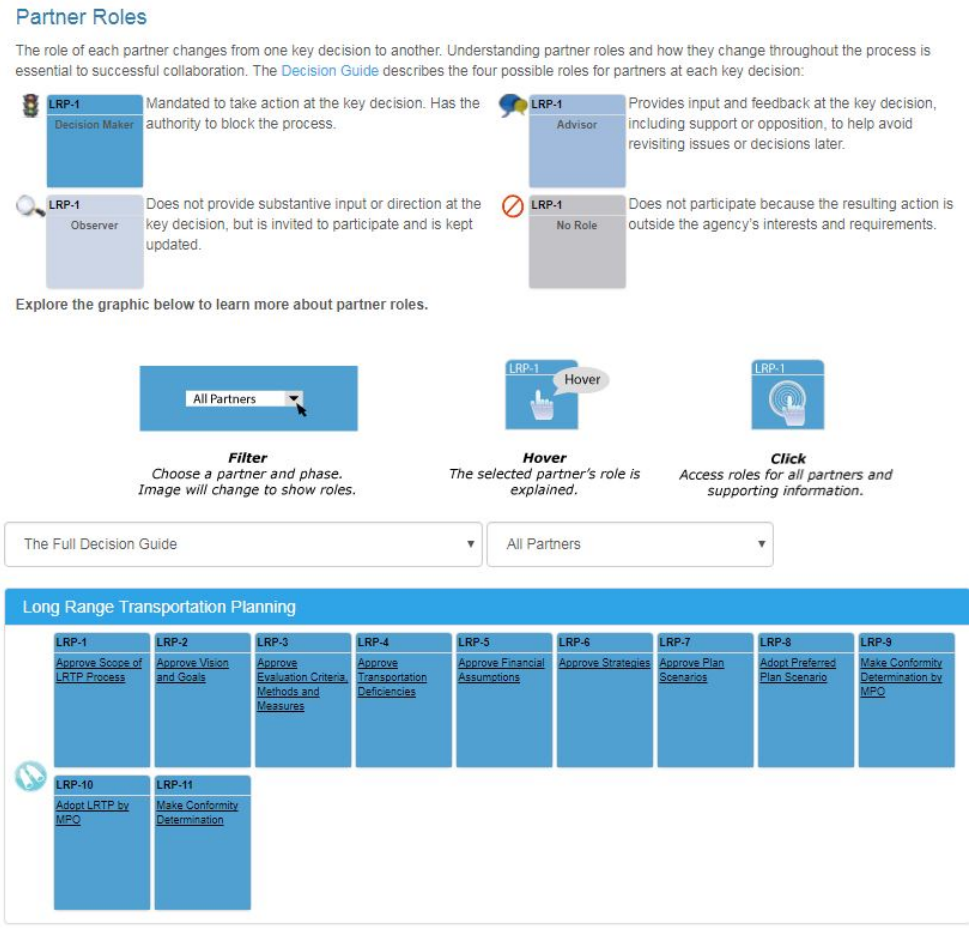

Figure 0-6: Potential Partner Roles

(Source: Federal Highway Administration (2015b)

4.3 TDOT Interactive Map

Another pertinent example taken as a reference for the development of web-based portal is the interactive map, developed by TDOT. Figure 0-7 shows the location and the status of the projects (as a part of various projects) carried out within the State of Tennessee. The information like this can be very helpful to track the status of investment and its outcome within the regions and sub regions.

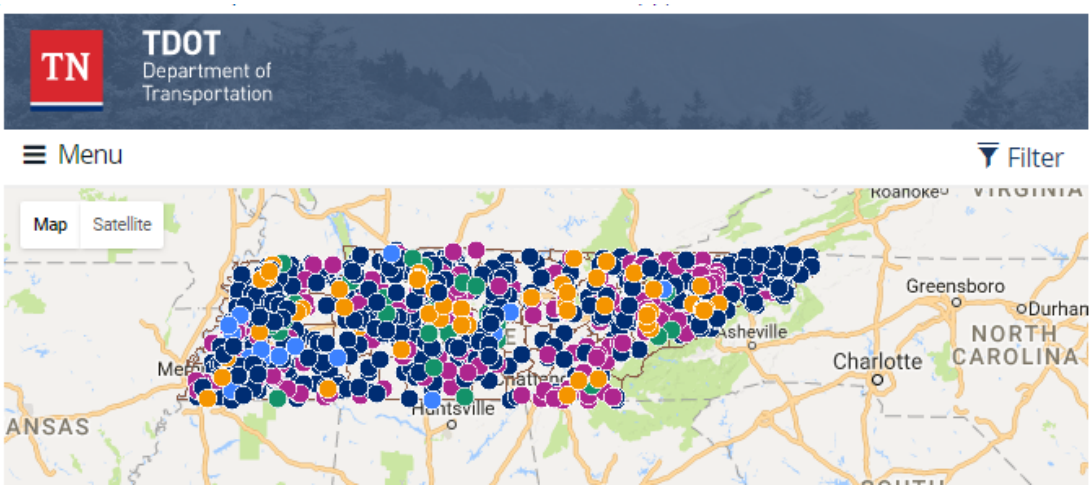

Figure 0-7: Web portal tracking the projects by their status of progress

(Source- https://www.tdot.tn.gov/ProjectNeeds/Spot#/)

Figure 0-8 shows the filtration features within the portal to select the projects based on user queries. The selection queries are in the form of counties, region, political structure, and project status. Either single or multiple selection features can be used to collect the information required within a limited space. These selection features are very essential to serve a people of the specific region within larger space. As seen in Figure 0-9, the projects can be sorted out for the interested programs. At the end, a small example of the use of these selection features within the web portal can be selection of the projects within our study area. Figure 0-10 shows the location of projects at I-40 within the Memphis MPO region.

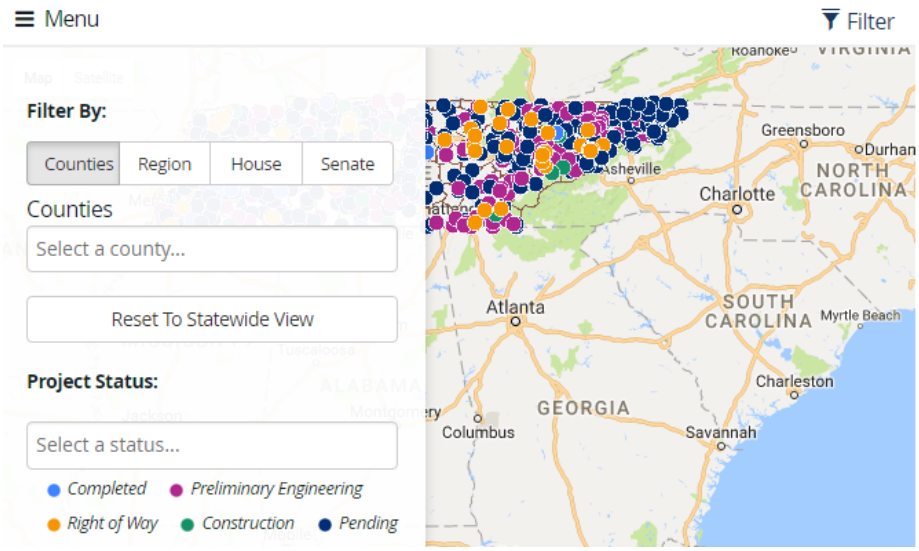

Figure 0-8: Filtration of projects by multiple features within the portal

(source- https://www.tdot.tn.gov/ProjectNeeds/Spot#/)

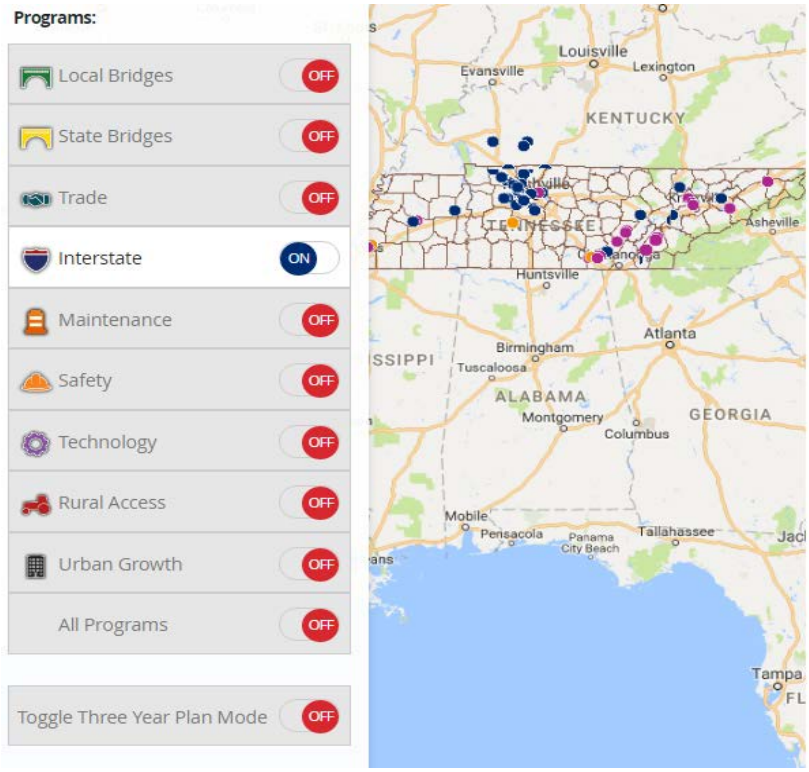

Figure 0-9: Projects under different programs

(Source- https://www.tdot.tn.gov/ProjectNeeds/Spot#/)

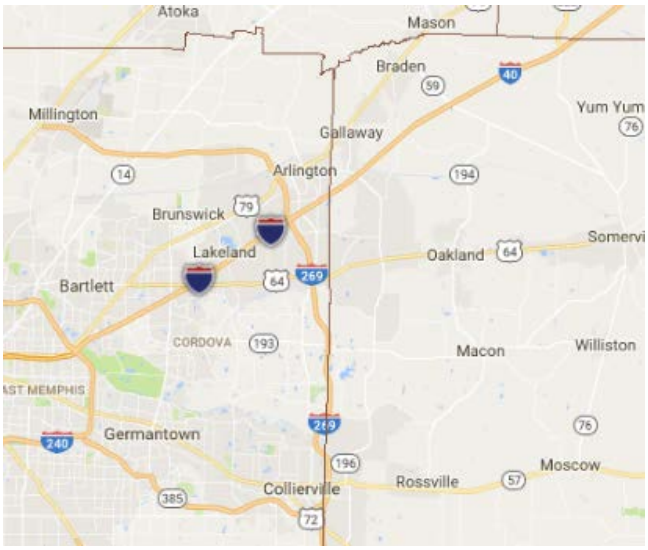

Figure 0-10: Projects located at I-40 (indicated by dark blue interstate symbol) within Memphis MPO

(Source- https://www.tdot.tn.gov/ProjectNeeds/Spot#/)

4.4 Chapter Summary

This chapter discusses on the various web-based portals highlighting the PlanWorks portal which has already been developed to inform the users on the planning process, by effectively engaging the public and private stakeholders. These types of portals can be developed as the end-product of the project by digitizing all the information collected during the project phases and then uploading to the internet so that the people will be highly benefitted with this information in the future. Similar other examples including the web-based portal of the I-65 projects carried out by TDOT and the interactive map of TDOT itself to access the information on the status of the projects over the state of Tennessee are also discussed. These resources have been and will continue to be a valuable product in the transportation sector established for the welfare of the transportation community.

CHAPTER 5: INSTITUTIONALIZATION OF PLANWORKS

In this chapter, we propose to evaluate the effectiveness of potential improvement strategies in engaging private and public stakeholders**.** Effective strategies to further engage private stakeholders will also be proposed in this task. Assessment will be a key to measure success of the stakeholder engagement process. Examples of assessment include number of private and public agency participation in FAC and their inputs to various key questions related to visioning of I-40 corridor. In addition, guidelines provided by PlanWorks will be considered to assign scores such as weak, average, strong to stakeholder communication, understanding, and commitment (Federal Highway Administration, 2015d). Also, we will ensure that the process developed in this project is straightforward and potential users could easily adopt the PlanWorks platform to analyze corridor improvement projects. In addition, we will showcase benefits and illustrate how PlanWorks can be incorporated into current planning processes of various agencies (MPOs, RPOs, TPOs, TDOT) in the state of Tennessee.

5.1 Establishment of PlanWorks steps on a bigger stage

Different agencies have established the features of PlanWorks in their long-term planning based on their past success of the adoption of the PlanWorks steps. After the success of the Route 31 project and other integrated planning efforts, NJDOT has institutionalized “integrated land use and transportation plans” in its Future in Transportation- FIT program (Transportation Research Board, 2010b). Similarly, in 2013, TDOT established the statewide Freight Advisory Committee (FAC) including members from public, private, and academia representing different freight modes within Tennessee (TDOT, 2013). This Statewide FAC forms from three regional level FACs representing three regions, east, west, and middle of Tennessee. These FACs meet regularly to discuss and resolve the freight issues within the State.

The adoption of PlanWorks trend can also be noticed in associations. Southern Association of State Highway and Transportation Officials (SASHTO) is formed to encourage the balanced transportation system within the member States of southern US; to study the various materials, methods of construction and maintenance and to discuss common problems experienced with transportation facilities; to exchange ideas and evaluate programs within the aviation, highway, rail, transit and water modes of transportation; to cooperate in every way possible with the U.S. Department of Transportation, the Federal Highway Administration, the Federal Aviation

Administration, the Federal Railroad Administration and the Federal Transit Administration in the consideration of transportation problems; and to support legislation for the purpose of protecting capital investments in current transportation systems and for improving transportation programs (SASHTO, 2003). Likewise, Association of MPOs (AMPO) is another example of engaging the stakeholders (member MPOs) and discussing the transportation planning process. Since MPOs govern the large regions of the US by driving the economy through the major transportation infrastructure, AMPO is focused on improving the quality of these infrastructures and keep the American economic competitiveness alive (AMPO, 1994). Within the Tennessee MPO as well, the responsibilities are governed by executive and technical board. While the executive board formed from locally elected officials and governor of Tennessee provides the policy direction, the technical committee comprised of professional planners and engineers from local government and transportation agencies provides the technical expertise for transportation related projects (OCT, 2013).

5.2 Establishment of PlanWorks steps on a smaller stage

Memphis MPO consisting of 24 elected officials, Memphis Area Transit Authority (MATA), Memphis-Shelby County Airport Authority (MSCAA), Memphis-Shelby County Port Commission (MSCPC), and representatives from the TDOT and Mississippi Department of Transportation (MDOT) develops and implements the short and long-term plans that meet the community objectives (Memphis MPO, 1977). The Memphis MPO's Public Participation Plan (PPP) encourages the entire community and community leaders to participate in developing the feasible alternatives and support the regional transportation network respectively (PPP, 2014). The PPP guides on how the MPO conducts most of its projects interacting with the public, also thereby increasing the public awareness of transportation services and programs as shown in Figure 0-1.

5.3 Strategies for stakeholder engagement

This section extends the application (explained in subsection 2.3.4) of various PlanWorks strategies adopted by different agencies in the past which can be embraced by TDOT for a specific freight corridor like I-40 management. For the corridor management where there has not been any engagement of stakeholders, formation of the committee like Freight Advisory Committee (FAC) consisting of public and private freight stakeholders (e.g., logisticians, motor carriers, industrial real estate developers, railroads, barge, distribution centers, etc.) would be a good start. For

example, Delaware Valley Regional Planning Commissions (DVRPC) and Philadelphia Goods Movement Task Force have set a very good example for freight stakeholder engagement advising the partner agency from the freight point of view (SHRP2, 2013).

Figure 0-1: Various approaches of public participation under Memphis MPO's Public Participation Plan (PPP)

For those corridors where a committee has already been formed but lacking the effectiveness of the committee or stakeholder engagement, following outreach approaches can be adopted depending upon the type and complexity of the projects (SHRP2, 2013):

i. Organizing the freight stakeholder meetings in which the agency can make a presentation on plan, project, or program, including the projects detail, study area, time frame for completion and the expected results
ii. Workshops working through some issues using visual displays of information together with the formal and informal felicitation techniques to elicit the comment and ultimately reach consensus

iii. The approaches like sending the members of the committee quarterly newsletter with updates and request for the comment on the freight planning activities will generate the further interests on the project

iv. Regular update of the websites and providing the repository of documents and other resources

v. Various types of interviews of the stakeholders such as in-person, telephone or using survey tools

vi. Seeking the fresh perspective continually from the stakeholder. Sometimes the novel input may reenergize the existing stakeholders and remove the hindrances on the project's progress

5.4 Assessment of the strategies' effectiveness for Stakeholder engagement

Once the stakeholders are engaged using various approaches defined in section **Error! Reference source not found.**, it is essential to keep track of the engagement process on a timely basis in order to make the engagement more effective. To ease this process, user portal of the PlanWorks website has some features/tools developed as described in the subsection 2.3.3. The stakeholder needs to provide some input to the rubric and then the tool will assign the scores such as weak, average, strong to stakeholder communication, understanding, and commitment. The tool will also provide some feedbacks and help materials that can be used to assess the future risks, ways to minimize this risk, and the PlanWorks tool that can be used to have the better understanding of the project by improving the level of engagement.

In addition to this, SHRP2 C15 guidebook also provides some material to assess the effectiveness of the outreach methods, by freight stakeholder type. Table 0-1 shows the anticipated level of success for different strategies under two broad headings, "focused outreach" and "ongoing dialogue" for almost all types of possible freight stakeholders directly associated with I-40 corridor. While the cells with the open circle indicates the general interest of stakeholders in participation, the solid circle indicates the likely success in collaboration with the corresponding stakeholder. The empty cell indicates that the particular outreach method is likely to generate a little useful information from the participation with the corresponding stakeholder. Hence, this useful guide can be utilized by TDOT to assess the effectiveness of stakeholder engagement for its future projects on the freight corridor like I-40.

Table 0-1: Key freight stakeholders and most effective outreach methods (SHRP2, 2013)

Key Freight Stakeholders	**Focused Outreach**				**Ongoing Dialogue**	
	Freight Meetings	Workshops or Focus Groups	Telephone and In-person Interviews	Surveys (e.g., online)	Freight Committee	One-on-One Meetings
Beneficial Cargo Owners (BCOs)	○	○	●		○	○
Logisticians	○		○			○
Motor Carriers	●	●	○		●	○
Railroads	○	●	●	○	●	●
Commercial Real Estate	○	●	●		○	●
Chambers of Commerce and Business Groups	●	●	●	●	●	●
Economic Development Agencies	●	●	●	●	●	●
Port Authorities and Marine Terminal Operators	●	●	●	●	●	●
Local Governments	○	○	●		●	●
Transportation Agencies	●	●	●	○	●	●
Local Governments	○	○	●	○	●	●
Other Stakeholders	○	○	○	○	●	

Legend:

● - High likelihood of success in effective collaboration with freight stakeholder

○ - General interest by the stakeholder in participating

EMPTY - likely to yield little useful information if employed for that kind of stakeholder

CHAPTER 6: SUMMARY AND CONCLUSIONS

This report highlights the PlanWorks steps that can be used in transportation decision-making, specifically the corridor planning. The abundant resources available in the PlanWorks webpage can be efficiently used according to the interest of the users. An example of corridor planning for the I-40 within the Shelby County of Tennessee is presented as a case study for this report using some PlanWorks features in a specific order to enhance the capacity of the corridor. The nationwide case studies have been presented in the literature review section of chapter two which highlights the use of PlanWorks and the story of success by integrating PlanWorks in the planning process.

The use of performance measures during the planning process can be really helpful to evaluate the project success and the worth of investment. Two performance measures, travel time and travel time reliability are shown for the nationally important freight corridors in Memphis, Tennessee. The pattern of travel time within the hour of the day and the day of week are shown highlighting the effect of traffic in a peak period. Two approaches within the travel time reliability, standard deviation (SD) and 95^{th} percentile, are also shown to underline the inconsistency of travel time during the AM and PM peak periods and the necessity of the capacity enhancement projects on these corridors.

The guidelines and the examples for the development of the web-based portals are explained in the chapter four of the report. A layout of the newly developed web-based portal has been presented which can be utilized in the future to develop the portals for the corridor planning task. The usefulness of the web portal of PlanWorks itself, the I-65 project, and interactive map of TDOT are also emphasized, basically on the participation of public and private stakeholders. At the end, in chapter five, the establishment of the adoption of PlanWorks and its steps in any transportation related planning process are marked out, supported by some successful projects in the past. In addition, various PlanWorks strategies together with some C15 guidelines for the successful stakeholder engagement as well as the assessment criteria used to assess the effectiveness of the stakeholder engagement or outreach methods, are highlighted.

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