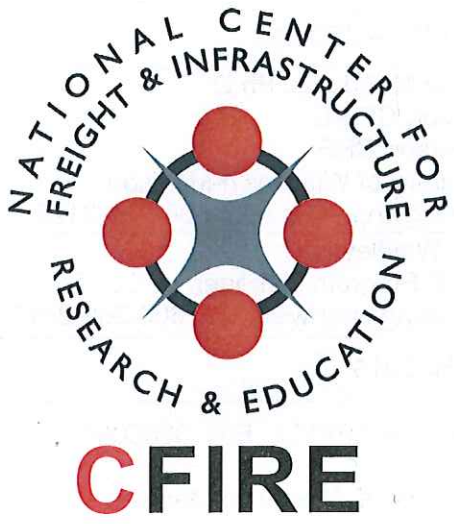

Program Progress Performance Report (PPPR): July 1, 2014 to December 31, 2014

April 2015

National Center for Freight & Infrastructure Research & Education
Department of Civil and Environmental Engineering
College of Engineering
University of Wisconsin–Madison

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Federal agency submitting to:	RITA, USDOT
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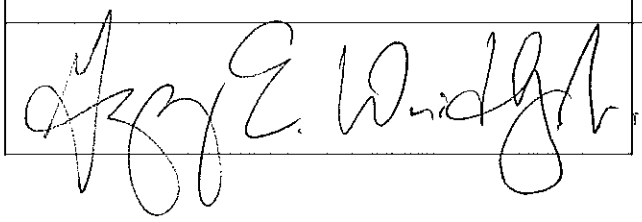	

This report covers CFIRE's efforts to collaboratively address research, education, workforce development, and technology transfer under DTRT12- G-UTC19 during the reporting period of July 1, 2014 to December 31, 2014.

1. Accomplishments
   A. CFIRE's Goals
      i. **Research**: Through the strategic planning process, CFIRE is continuing its efforts with eight research initiatives that support the USDOT Strategic Goals and advance the state of practice in freight and freight infrastructure systems.
      ii. **Education and Workforce Development**: The partner institutions of CFIRE are actively engaged in education and workforce development at the local, state, and national levels. CFIRE has built upon established successful programs and continues support new collaborative initiatives. Our proposed education and workforce activities for university students and practicing professionals will develop skills and knowledge in multimodal freight transportation systems that reinforce our Center's theme.
      iii. **Technology Transfer**: Technology transfer is the process of transferring discoveries or innovations derived from university research into products and services that benefit the profession. CFIRE will engage the freight community in a cross-section of technology transfer initiatives. These will include both traditional and innovative approaches to disseminating information.
      iv. **Collaboration**: The CFIRE team has taken advantage of regional expertise by establishing both northern and southern hubs to help coordinate proposed education, training, and technology transfer efforts. The CFIRE team brings a wealth of experience and a history of collaborative work. We will leverage these assets to further develop relationships across a spectrum of initiatives that include both state and national-level collaborations.

   B. Accomplishments under CFIRE's goals
      i. Research Initiatives:
         - **RI-1: A Multi-Modal Freight Safety, Security, and Environmental Routing Tool**
           USDOT Priorities: Safety/Sustainability
           Performing Institutions: University of Wisconsin – Milwaukee, University of Wisconsin - Superior, University of Alabama - Huntsville, and University of Southern Mississippi.
           Start Date: July 1, 2012 End Date: June 30, 2015
           - Major activities:
             - applied quality control procedures to assist with data validation and verification
             - ran test routes to identify bug fixes and made corrections, as appropriate
             - made improvements to web user interface
           - Specific objectives
             - The research will produce a GIS framework to identify and categorize safety, security, and environmental risk along multimodal transportation networks
           - Significant results:
             - once available, multiple freight transportation stakeholders will have access to a tool that allows for making more informed routing decisions taking into consideration impacts associated with efficiency, safety, security and environmental protection
           - Key outcomes or other achievements
             - increasing confidence that a comprehensive and practical decision-support tool can be implemented
           - Changes
             - Emphasis of research changed to entire continental US rather than just CFIRE states
               - Some of the data has required a higher degree of quality control
               - Network connectivity between freight origins/destinations missing that has required additional effort to achieve a routable network
               - As a result, the project schedule has been set back by a few months

- **RI-2: Making Freight-Centric Communities More Livable: Measuring the Impact of Advanced Technologies**
  USDOT Priorities: Livability/Economic Competitiveness
  Performing Institutions: University of Memphis, University of Wisconsin-Madison, and University of Toledo.
  Start Date: July 1, 2012 End Date: June 30, 2015
  - Major activities:
    - More detailed air quality assessment and a pilot effort for quantifying livability and comparing to data obtained from residential surveys was completed.
    - The UW-Madison team worked on components of a visualization that incorporates the survey results from Memphis against a freight intensity factor derived from employment and truck data. A literature review was conducted on freight intensity. A truck route shapefile was produced and analysis of the survey results conducted in R. The results will be housed in an ESRI Story Map Journal and will be finalized in January 2015.
  - Specific objectives:
    - Identify technologies used in the field and their benefits
    - Determine priorities for livability from freight stakeholders' perspectives
    - Determine environmental impacts in the areas of safety and noise
    - Determine if residential stakeholders priorities are in line with the government priorities
    - Demonstrate the relationship of actual freight intensity and the residents' perception of livability
    - Identify a set of best practices that promote livability, which can be used in freight-centric areas across the US
  - Significant results:
    - Several thesis reports were completed based on this project. See "publications" under "products."

- **RI-3: Non-Destructive Technologies for Monitoring and Condition Assessment to Support Safety, Maintenance Programming, and Cost Allocation**
  USDOT Priorities: State of Good Repair
  Performing Institutions: University of Wisconsin-Madison; University of Wisconsin - Milwaukee
  Start Date: July 1, 2012 End Date: June 30, 2015
  - Major activities:
    - Software is designed now so that we can save and handle the information collected from the users to make up a database of past user cases.
    - Currently working on layout sheet and domain framework working. Connecting the Knowledge Center to the Logicnet (web-based db) through the cause node.
  - Specific objectives:
    - The results of this investigation will provide local, state, and federal agencies with information sources and non-destructive tools for structural health monitoring, developing risk management systems, upgrading design standards, and assessing and allocating costs associated with deterioration and structural damage.
  - Significant results:
    - Software development and modification
    - Development of non-destructive technologies database
  - Key outcomes:
    - Presentation (referenced later in document)

- **RI-4: Mining Automatic Identification Systems (AIS) Data for Improved Vessel Trip Analysis Capabilities**
  USDOT Priorities: Economic Competitiveness
  Performing Institutions: Vanderbilt, University of Toledo, and University of Wisconsin-Superior.
  Start Date: July 1, 2012 End Date: June 30, 2015
  - Major activities:
    - Algorithm for data thinning continued testing with great lakes AIS data.
  - Specific objectives:
    - Review literature on use of AIS for Great Lakes, Oceans and Inland routes
    - Prepare write up on why AIS was developed and original intended uses
    - Prepare case studies of current uses of AIS
    - Conduct exploratory analysis of AIS data to find key attributes needed for developing algorithms to reduce AIS data record counts
  - Significant results:
    - Acquiring ancillary data (e.g. Vessel data) to rectify errors in AIS data prior to thinning the raw AIS data. Key attributes such as MMSI, speed, lat, long, and heading were identified and is used to develop and code the data thinning algorithm. The algorithm when implemented resulted in a near 98% reduction in the raw AIS data with all important and pertinent information intact.
  - Key Outcomes:
    - Nothing to Report

- **RI-5: Estimating the Effects of Extreme Weather on Transportation Infrastructure**
  USDOT Priorities: Sustainability
  Performing Institutions: Vanderbilt University and University of Wisconsin-Madison.
  Start Date: July 1, 2012 End Date: June 30, 2015
  - Major activities:
    - Identified key freight corridors/locations in the CFIRE region of interest using FAF07 data. Key freight areas were determined as having FAF07 values greater than 10,000.
    - Continued evaluation of the impacts associated with the May 2010 flood event that occurred in the Nashville, TN area using Hazus, data from local agencies (including new data on roadway surface repairs from Metro Nashville Public Works), and analysis of the Nashville post-flood household survey results.
    - Queried both the North American Regional Reanalysis (NARR) archive and North American Regional Climate Change Assessment Program (NARCCAP) models to identify "hot spots" for extreme precipitation events in the Eastern U.S. both historically and in the years between 2041 and 2070 (from NARCCAP) using a threshold of 2" average daily precipitation.
    - Continued development of a preliminary risk index that would link precipitation extremities to highway infrastructure damages and delays.
  - Specific objectives:
    - Develop and pilot test a methodology for identifying highway infrastructure which is threatened by flooding events.
    - Estimate the actual damage due to flooding to the highway infrastructure itself and related indirect effects (e.g., delays in shipments, increased travel times and fuel costs).
    - Define a risk index based on extreme weather threat and consequential impact on transportation infrastructure and operations.
  - Significant Results:

        - Hazus estimates a significantly greater amount of economic damage due to flooding than has traditionally been reported, and still fails to consider all negative impacts to infrastructure and mobility
        - Road closures do not appear to be an effective proxy measure for representing damage to highway infrastructure due to major precipitation events
        - Hazus is best used as a screening-level tool to identify highly vulnerable areas and then a more refined hydrologic model is better suited to evaluate depth and extent of flooding in areas of specific transportation assets.
        - NARCCAP model outputs are not easily integrated into GIS due to differing coordinate systems of the six main models used and coordinate system/projection anomalies. Additionally, NARCCAP data uses an unusual longitude convention (i.e., from 0 - 360 degrees East). NARR uses -180 West to 180 degrees East longitude.
        - Using our criterion for "key precipitation events", tropical areas had 24-hour daily precipitation averages of over 30".
    - Key outcomes:
        - Nothing to report

- **RI-6: Realigning Multimodal Freight Networks in Response to International Capacity Expansion**

  USDOT Priorities: Economic Competitiveness
  Performing Institutions: University of Southern Mississippi, University of Alabama - Huntsville, University of Memphis, University of Illinois - Chicago, and University of Wisconsin - Superior.
  Start Date: July 1, 2012 End Date: June 30, 2015
    - Major activities:
        - Writing final report.
    - Specific objectives:
        - Develop transportation networks
        - Include new subject port – Gulfport, MS.
        - Develop network models for all scenarios
        - Develop a set of 60 + maps
        - Conduct economic development feasibility analysis
    - Significant results:
        - Optimized distribution models from three coastal ports to CFIRE regions.
        - What-if scenario analysis models for freight flows among 13 US ports and two major markets (Chicago & Memphis).
        - Models were developed for FAF regions and whole US.
        - Port Level Scenarios – 9 maps.
        - US Interior Optimized Scenarios – 36 maps.
        - Sensitivity Analysis Scenarios – 12 maps.
        - GIS models were developed for all network models and potential intermodal locations were identified.
        - Imported containerized freight shipment flows through the port, Gulfport, MS, to its vicinities were observed.
        - Even though the observed little flow from Houston, TX may not describe current status, overall flows from each coast to states are believed to be easily interpretable with total flow numbers at coasts.
    - Key outcomes:
        - Final report will be completed in next reporting period.

- **RI-7: Enhancing Rail Connectivity to Underserved Rural Communities**

  USDOT Priorities: Livability/Economic Competitiveness
  Performing Institutions: University of Memphis, University of Wisconsin-Superior and

Madison, University of Alabama in Huntsville, and University of Southern Mississippi.
Start Date: July 1, 2012 End Date: June 30, 2015

- Major activities:
  - Final project report was mostly assembled.
- Specific objectives:
  - This research will identify the actions, practices, and policies needed to continue or expand adequate short line or Class 1 and regional rail service to rural communities.
- Significant results:
  - Based on the results of the surveys, 10-15 locations were selected for further study geographically distributed in Mississippi, Alabama, Tennessee, and Wisconsin. These stakeholders were surveyed either by phone or email on the various perspectives on the nature of the problem, the views on the community efforts, programs, policies and investments that are necessary to attract, retain or improve operations for rail access.
- Key outcomes:
  - Final report will be available next reporting period.
- Changes:
  - Case studies where not feasible to be performed due to limited participation from the industry
  - The policy manual will be based on the survey results

- **CFIRE 08-01: Laboratory Study of High Performance Curing Compounds for Concrete Pavement, Phase II**

  Performing Institution: University of Wisconsin-Madison
  Start Date: September 1, 2012 End Date: March 31, 2015

  - Major Activities:
    - The impact of the time of application of membrane forming curing compounds was evaluated in a series of laboratory experiments.
  - Specific Objectives:
    - The primary goal of this research was to evaluate the influence of MFCC application time on the freeze-thaw scaling damage resistance of concrete made with materials common to Wisconsin paving.
  - Significant Results:
    - This research shows that when using curing compounds, scaling resistance was influenced by two factors: the choice of compound used and application time matched to the particular mix characteristics and environmental conditions of the concrete.
  - Key Outcomes:
    - Nothing to Report

- **CFIRE 08-03 Wisconsin Study on the Impact of OSOW Vehicles on Complex Bridges**

  Performing Institution: University of Wisconsin-Madison
  Start Date: August 8, 2013 End Date: October 7, 2015

  - Major Activities:
    - Three Wisconsin “complex” highway bridges were load tested during this period.
  - Specific Objectives:
    - The proposed work will focus on the development of accurate bridge analysis models for a set of identified complex bridges. Vehicles over 400kips in total weight will be considered as the main load types considered but the analysis will also include response to the standard AASHTO LRFD Design Truck as a basis for comparison of effects.
  - Significant Results:

        - The initial bridge analytical models were accurate but there were some unexplained differences between measured bridge response during load tests and predicted response.
    - Key Outcomes:
        - Nothing to Report

- **CFIRE 08-06 Comparison of Fresh Concrete Air Content Methods & Analysis of Hardened Air Content in Wisconsin Pavements**
  Performing Institution**:** University of Wisconsin-Madison
  Start Date: October 17, 2013 End Date: October 16, 2015
    - Major Activities:
        - Field testing and sampling have been completed at a total of twelve (12) WisDOT paving project sites with the outstanding cooperation of all parties
    - Specific Objectives:
        - The primary objective of this study is, by employing ASTM C457 linear traverse procedure, to gain a thorough and valid definition of the air void systems of Wisconsin pavement concrete associated with the use of synthetic air entraining agents (AEA).
    - Significant Results:
        - Differences in air content between pressure meter and C457 cylinders are within ±2% air. This is comparable to literature (Whiting and Nagi, 1998)
        - Differences in air content between volumetric meter and C457 cylinders are mostly within ±2% air.
        - In most cases, cores have higher hardened air content than both front and back cylinders
        - Core – front cylinder = -2.1 to 4.6% (mean = +1.1%)
        - Core – back cylinder = -0.7 to 4.3% (mean = +1.6%)
        - The relatively large difference between the air content in cores and cylinders behind the paver is troubling. These values should be essentially the same. These differences have been observed by others and require resolution.
    - Key Outcomes:
        - Nothing to Report

- **CFIRE 09-01 Compass 2013 Data Analysis and Reporting**
  Performing Institution: University of Wisconsin-Madison
  Start Date: January 1, 2014 End Date: December 31, 2014
    - Major Activities:
        - Review of Compass Statistical Process
        - Assembly of the 2013 Compass Annual Report
        - Preparation of the Compass 2104 Field Review Report
        - Preparation of the Compass 2013 Report on Pavement
    - Specific Objectives:
        - Same as activities
    - Significant Results:
        - The major result from Part 1 of the Statistical Review was that the accuracy of some performance measures was inadequate. Based on this result, alternative sampling designs and analysis techniques were investigated.
    - Key Outcomes:
        - The primary analysis and reporting tasks for the Compass project were completed as expected and these processes will continue in the future.

- **CFIRE 09-02 Wisconsin Commercial Ports Development Initiative**
  Performing Institution: University of Wisconsin-Madison
  Start Date: October 1, 2013 End Date: December 31, 2014
    - Major Activities:

        - Assessed Wisconsin's commercial port infrastructure, markets, and related freight and maritime policies. With input and direction from the state's port leadership, industries, agencies and the logistics sector, the assessments and stakeholder input were used to create a strategic action plan.
    - Specific Objectives:
        - To create a strategic plan and development initiatives that will help increase commercial development of Wisconsin's ports and support local and statewide economic development.
    - Key Outcomes:
        - Communities and the state anticipate increased employment, economic development, and focus on logistics at Wisconsin ports.

- **CFIRE 09-03 Compilation of Existing State Truck Size and Weight Limit Laws**
  Performing Institution: University of Wisconsin-Madison as a sub to Olsson & Assoc.
  Start Date: March 11, 2014 End Date: August 5, 2014
    - Major Activities:
        - Complete review and verification of regulatory interpretation and applicability of prepared summary of truck size and weight limit laws.
        - Assist project members with compilation of the final report.
    - Specific Objectives:
        - Verification of regulatory interpretation and applicability.
    - Significant Results:
        - Overall, we received quality input from most states (46/50) regarding the interpretation of their truck size and weight limit laws. A comprehensive knowledge of state truck size and weight policy was acquired for the project and incorporated into the final draft report.
    - Key Outcomes:
        - Completion of final report for submittal to AASHTO and FHWA for review.
- **CFIRE 09-04 A Guidebook for Freight Transportation Planning Using Truck GPS Data**
  Performing Institution: University of Memphis
  Start Date: September 1, 2013 End Date: December 31, 2014
    - Major Activities:
        - Estimating freight PMs for transportation facilities.
        - Design of an O-D algorithm for computing the number of trips
        - Development of an ArcGIS too for processing truck data
    - Specific Objectives:
        - The proposed research is designed as a one year project and will develop a guidebook of how data from the FPMWeb tool can be utilized in long term transportation planning and operational transportation strategies in the State of TN.
    - Significant Results:
        - It was found that the majority of trips were originated/destined near large metropolitan areas of TN (i.e., Memphis, Nashville, Knoxville, Chattanooga, etc.). A substantial number of origins and destinations were observed along the major freight corridors (I-40, I-24, I-65, I-75, and I-81).
    - Key Outcomes:
        - Development of procedures for estimating facility FPMs, including truck turn times, facility occupancy, and truck entry/exit volumes.
- **CFIRE 09-05 Effect of Primary and Secondary Crashes: Identification, Visualization, and Prediction**
  Performing Institution: University of Memphis
  Start Date: September 1, 2014 End Date: August 31, 2015
    - Major Activities:

        - Crashes occurring in Shelby county, TN within the time period of January 1, 2010 to December 31, 2012 were analyzed.
    - Specific Objectives:
        - To clearly define primary and secondary crashes, understand and analyze the occurrence and nature of such crashes, and develop tools that can comprehensively analyze primary and secondary crashes on major truck routes at the planning and operational levels.
    - Key Outcomes:
        - A transportation agency will be able to identify hazardous locations of secondary crash occurrence, determine the potential factors involved in occurrence of such crashes, and predict their occurrences given traffic exposure, highway geometry, and environmental conditions.

- **CFIRE 09-06 A Guidebook for Best Practices on Integrated Land Use and Travel Demand Modeling**
  Performing Institution: University of Memphis
  Start Date: September 1, 2014 End Date: August 31, 2015
    - Major Activities:
        - Experimented with and analyzed the results of various analytical tools to express the impacts of land use and transportation planning.
    - Specific Objectives
        - This project will seek to develop a guidebook that will assist practitioners as they integrate both their land use and transportation models.
    - Significant Results:
        - A synthetic case study was used for demonstrating modeling and forecasting capabilities of land use models.
    - Key Outcomes:
        - Nothing to Report
- **CFIRE 09-07 Understanding Time-of-Day Variation in Truck Transport and General Traffic Emissions: Guidance for Strategic Urban Air Quality Investments**
  Performing Institution: UW-Madison and Texas A&M Transportation Institute
  Start Date: August 1, 2014 End Date: October 31, 2015
    - Major Activities:
        - Refine traffic information for air quality and trucking analysis.
        - Calculate time-of-day air pollution emissions.
    - Specific Objectives:
        - We intend to greatly improve the understanding of how the timing of truck and mixed-vehicle transport affects urban air quality and public health.
    - Significant Results:
        - Nothing to Report
    - Key Outcomes:
        - Nothing to Report
- **CFIRE 09-08 Effects of Heavy Vehicles on Dynamic Traffic Features**
  Performing Institution: University of Wisconsin-Madison
  Start Date: September 1, 2014 End Date: August 31, 2015
    - Major Activities:
        - defined the heavy vehicle
        - processed the NGSIM (Next Generation Simulation) trajectory datasets and identified a sample of 138 HVs
        - selected six car-following models from the literature for their performance in reproducing HV behavior
        - empirical analysis of HVs based on the Asymmetric Behavioral (AB) model
    - Specific objectives:

        - To investigate the effect of HV on bottleneck capacity drop and stop-and-go traffic oscillations.
    - Significant Results:
        - From the NGSIM datasets, we have analyzed 87 vehicle pairs (45 car-following truck, 36 truck-following-car, and 6 truck-following-truck).
        - In summary, the characteristics of cars and trucks differ significantly, both in the spacing level maintained and the reaction pattern in response to stop-and-go waves.
    - Key Outcomes:
        - Our empirical analysis has uncovered the basic characteristics for trucks in traffic streams, which differ significantly from cars. The results are being used in the model calibration and impact evaluation.

- **CFIRE 09-10 Evaluating the Use of Operational Management Techniques for Capacity Improvements on Shared-use Rail Corridors**
  Performing Institution: Michigan Technological University
  Start Date: September 1, 2014 End Date: August 31, 2015
    - Major Activities:
        - Investigation of capacity concepts and review of different tools and methodologies related to the operational management technique
        - Obtaining information and data related to the proposed case studies
    - Specific Objectives:
        - Improving understanding of the concept of capacity and similarities and difference between the U.S. and European rail systems.
        - Identifying respective methodologies, techniques and tools applied in the U.S. and Europe for capacity evaluation/improvement and the relationship between system characteristics and tools used for analysis
    - Significant Results:
        - There is no single definition of railroad capacity which can be used by all rail agencies and companies in different regions and countries.
        - There are several differences between the U.S. and European rail systems that affect the approaches, tools and outcomes of rail capacity analysis.
        - There are several different tools and simulation packages available in both European and the U.S. rail industry, but due to the significant differences between operational philosophy and network characteristics of these two rail systems, European studies tend to use timetable-based simulation tools while the non-timetable based tools are commonly used in the U.S.
    - Key Outcomes:
        - Nothing to Report
- **CFIRE 09-13 The Potential for Mode Conversion to Rail Service in Wisconsin**
  Performing Institution: University of Wisconsin-Madison
  Start Date: September 1, 2014 End Date: November 30, 2015
    - Major Activities:
        - Digitization of Wisconsin shippers from the WEDC's Driver report
        - Digitization of Wisconsin's rail lines
        - Literature Review and identification of shippers to interview
    - Specific Objectives:
        - Identification of freight rail access in the state of Wisconsin, and its influence on the new economic geography of freight.
    - Significant Results and Key Outcomes:
        - Nothing to Report
- **CFIRE 09-14 Field Validation of Polyurethane Technology in Remediating Rail Substructure and Enhancing Rail Freight Capacity**

Performing Institution: University of Wisconsin-Madison
Start Date: July 1, 2014 End Date: December 31, 2015

- Major Activities:
  - Assess the feasibility of polyurethane-stabilized layers within a rail ballast and substructure to mitigate ballast fouling impact.
- Specific Objectives:
  - Identify a suitable field site
  - Determine the track structure and substructure conditions and materials
  - Field injection of polyurethane into the substructure to remediate fouling effect.
  - Instrument the location for dynamic and long term monitoring
  - Conduct and Life Cycle Analysis (LCA)
- Significant Results:
  - Three possible field sites were identified and investigated. The field site chosen for the investigation has a significant ballast and substructure deficiency causing frequent maintenance. A geotechnical and geophysical investigation was conducted. Soil profiles were developed as well as their in situ strength.
- Key Outcomes:
  - A full geophysical and geotechnical report of the selected field site
  - Fully designed polyurethane injection location and pattern
  - Verification of selected instrumentation in a laboratory setting

- **CFIRE 09-15 The Impact of Fracking on Freight Distribution Patterns**

Performing Institution: Vanderbilt University
Start Date: August 1, 2014 End Date: December 31, 2105

- Major Activities:
  - Began literature review and contacted industry stakeholders
  - Researched various shale plays in terms of prior fracturing activities and future growth potential.
- Specific Objectives:
  - Develop a tool that any county can use to estimate the impact of hydraulic fracturing in their jurisdiction on transportation risks, costs and benefits.
- Significant Results:
  - Data sources are available from which a wealth of information is available to aid with tool development.
- Key Outcomes:
  - Wilkinson County, Mississippi has been identified as a promising candidate from which to pilot test the tool as a “proof of concept”.

- **CFIRE 09-16 Reshoring and its impact on Transportation Infrastructure & US Economy**

Performing Institution: University of Southern Mississippi
Start Date: August 15, 2014 End Date: December 31, 2015

- Major Activities:
  - First draft of literature review was done and shared with the team
  - Two webinars were conducted by Harry Moser to share Reshoring Initiative’s library of database and tutorial of his tool called “Total Ownership Cost”
  - An abstract has been submitted to the Industrial & Systems Engineering Annual Conference, 2015.
- Specific Objectives:
  - Develop a reshorability index and manufacturing location quotients within CFIRE region that will help US manufacturers to evaluate their reshoring strategy.
  - Develop tools and techniques to assess the impact of potential reshoring on transportation infrastructure.

- Significant Results and Key Outcomes:
  - Nothing to Report

- **CFIRE 09-17 Nationwide Best Practices to implement Freight Transportation Careers**
  Performing Institution: University of Alabama-Huntsville
  Start Date: September 1, 2014 End Date: December 31, 2015
  - Major Activities:
    - Begin to identify educational units with transportation programs
  - Specific Objectives:
    - To examine freight transportation careers and examine the educational paths that lead to specific careers. The goal is to develop a guidebook for educators to lead more individuals into freight transportation careers.
  - Key Outcomes:
    - Developed a preliminary list of transportation programs at all levels and begin to collect data about these programs.
- **CFIRE 09-18 Addressing MAP-21 Freight Objectives using GPS Data**
  Performing Institution: University of Memphis
  Start Date: July 1, 2014 End Date: December 31, 2015
  - Major Activities:
    - Literature review
  - Specific Objectives:
    - To: (a) provide a set of comprehensive FPMs that can provide insight into functioning of the multifaceted freight transportation network, and (b) examine the CFIRE freight network and compute FPMs using truck GPS data to address MAP-21 objectives.
  - Significant Results:
    - It was found that the 53% of studies used GPS data to estimate LTT and roughly 34% of studies analyzed vehicle trip patterns and tour characteristics.
- **CFIRE 09-19 Freight Economic Vulnerabilities Due to Flooding Events**
  Performing Institution: Vanderbilt University
  Start Date: July 1, 2014 End Date: June 30, 2015
  - Major Activities:
    - Develop freight transport economic risk data
    - Define and evaluate future flood scenarios
    - Identify vulnerable freight transportation infrastructure warranting adaptation consideration
  - Specific Objectives:
    - To further develop the relationship between flooding events and consequential effects on freight transportation infrastructure and operations involving highway, rail and barge transport. More specifically, it will estimate the direct and indirect economic impacts of various flooding scenarios on truck, rail and barge transportation by developing economic loss/damage functions based on the extent and level of flood inundation.
  - Significant Results and Key Outcomes:
    - Nothing to Report
- **CFIRE 09-20 Estimating the Future Agriculture Freight Transportation Network Needs due to Climate Change using Remote Sensing and Regional Climate Models**
  Performing Institution: Vanderbilt University
  Start Date: July 1, 2014 End Date: September 30, 2015
  - Major Activities:
    - Evaluation of crop data for TN from the National Agricultural Statistics Service
    - Identified “extreme” weather events that may impact crops from the National Weather Service data repository

- Specific Objectives:
  - The objective of this project is to utilize recent historical trends in agriculture growth and yield patterns in the U.S. Midwest using remote sensing techniques and then extrapolate to future growth using regional climate forecasting
- Significant Results and Key Outcomes:
  - Nothing to Report
- Changes:
  - Shifted focus to Tennessee where data is more readily available and we have experience with recent historical extreme weather event that may have impacted agriculture and freight.

ii. Education and Workforce Development- The following progress has been made on CFIRE's commitments to education and workforce initiatives.

- University of Memphis:
  - The primary goal of the Girls Experiencing Engineering (GEE) and Transportation Engineering Careers (TREC) programs is to increase the number of students pursuing careers in transportation engineering by offering high school students an opportunity to increase their awareness and interest levels regarding existing and potential opportunities in the field. Secondarily, the program seeks to create a broader impact by providing high school science and math teachers with new pedagogical methods and tools for use in their classrooms and by providing undergraduate students with leadership training and practice opportunities through peer mentoring.
    - 86.5% of students indicate the GEE/TREC program made them feel more confident in math and science.
    - 100% of students reported having a better understanding of how STEM is used in the real world.
    - 95.5% believe they have the ability to succeed in a STEM or Transportation Engineering career.
  - Impact on the development of the principal discipline?
    - Increased number of students who know about the curriculum in transportation engineering
    - We also held two parent workshops to help communicate the opportunity for students who receive a degree in transportation engineering.
  - Impact on society beyond science and technology?
    - The hope is that we increase the number of minorities and females seeking a career in transportation.
- University of Southern Mississippi:
  - Attended the Strengthening Skills Training and Career Pathways Across the Transportation Industry Forum at the U.S. Department of Transportation in Washington D.C.
  - The forum focused on future workforce demands and related skills training needs across the transportation industry. Groups broke out into various sessions to determine the training needs of career paths of each mode of the transportation industry. Future partnerships may develop.
  - Attended Educational Week at Ingalls Shipbuilding at Pascagoula, Mississippi to share LTT educational opportunities with attendees on October 23, 2014
  - Met high school students at HS Career Fair event, MS Coast Coliseum on November 3, 2014
  - Organized a lunch & Learn event at Ingalls Shipbuilding at Pascagoula, Mississippi to share LTT educational opportunities with attendees on November3, 2014
  - Partnered with National Strategic Planning & Analysis Research Center (nSPARC) at Mississippi State University, University of Alabama, Auburn University, University of

Kentucky and University of Tennessee at Knoxville to perform and Economic Impact Study of the Tennessee-Tombigbee Waterway for the Tennessee-Tombigbee Waterway.

- University of Wisconsin – Madison:
  - UW Transportation Management and Policy Program - Conducted fall colloquium on the topic of Sustainable Transportation.
  - Sponsored CFIRE's Outstanding Student of the Year for 2014 – Andre Anderson, University of Wisconsin-Superior.
  - Began work on new grant from FHWA – Midwest Transportation Workforce Center.
- University of Wisconsin – Superior:
  - Continue to teach and host the Certification in Transportation & Logistics program.
  - To encourage students to participate in activities in preparation for professional and academic life beyond graduation. Thirty one students attended seven professional society meetings, symposiums and national conferences.
  - Brought five Transportation and Logistics (CTL) students to ISM - Lake Superior Chapter General Meeting, November, 2014.
  - Richard Stewart conducted a tour of Wisconsin DOT Headquarters in Madison, WI and the WALMART Distribution Center in Tomah, WI with 13 Transportation and Logistics (CTL) students of the University of Wisconsin-Superior.
- Vanderbilt University
  - Conducted workshops on GPS, Online Mapping, and Google Earth for high school teachers and students.

iii. Technology Transfer - The following progress has been made on CFIRE's commitments to T2:

- University of Memphis:
  - IFTI hosted the 8th Annual Freight Intermodal Conference on October 7, 2014 at the FedEx Institute of Technology on the University of Memphis campus. The conference is the annual Tech Transfer activity for the Southern Hub. Over 150 practitioners from the public and private sector gather to hear from researchers, politicians and industry professionals on the state of the industry. TDOT has become a significant partner in the conference. The TDOT commissioner has made a presentation each of the past three years and has mentioned that he intends to make this an annual appearance as his schedule allows.
- The University of Southern Mississippi:
  - Is arranging and participating in the 2015 MDOT Peer-Exchange.
- Vanderbilt University:
  - Hosted and participated in meetings of the Middle Tennessee Freight Advisory Committee and the Executive Committee of the Tennessee Freight Advisory Committee
- University of Wisconsin-Madison:
  - The Department of Engineering Professional Development continues to provide railroad engineering short courses to practicing professionals. CFIRE provides funding in the form of scholarships. Courses offered during the fall of 2014 included:
    - Highway-Rail Grade Crossing Safety (November 2014 in Madison, WI)
    - Maintaining and Inspecting Railroad Track (October 2014 in Chicago, IL)
  - In August 2014, UW-Madison in conjunction with Wisconsin DOT, hosted the 2014 MidContinent Transportation Research Symposium in Madison, WI. The Symposium included close to 200 attendees from about 15 states, 70 of which were Wisconsin DOT employees. The agenda featured close to 80 presentations in the areas of infrastructure, planning, traffic and safety, and freight.
- University of Wisconsin-Superior
  - Successfully provided industry seminars for the sixth consecutive year.
  - Richard Stewart was a Panel Moderator and Presenter at the Wisconsin Governor's Freight Summit, August 13, 2014.

- University of Toledo
  - Sponsor and partner for the 2014 Ohio Conference on Freight: Driving Change in Global Logistics. Two hundred and sixty nine attendees from private and public sectors within the US and Canada were in attendance. http://www.ohiofreight.org/OCF_agenda_2014.pdf

C. Next Reporting Period

i. Research Initiatives: In the upcoming reporting period, most research initiatives are scheduled to be completed and will be presented at the 2015 MidContinent Transportation Research Symposium.

ii. Education and Workforce Development:

- UW-Madison:
  i. Sponsoring of Railroad Engineering Short Courses
  ii. Milwaukee Regional Future City Competition in January
  iii. Stakeholder Meeting for Midwest Transportation Workforce Center
- MTU:
  i. Will host TRAC workshop in March.
  ii. Will take leadership role in a Transportation Workshop Series in Detroit, MI in the spring.
- University of Memphis:
  i. Freight Transportation Leadership Academy in February
  ii. Stakeholder Meeting of Southeast Transportation Workforce Center
- University of Toledo:
  i. Will support the Maritime Academy of Toledo.

iii. Technology Transfer:

- All partners: will be attending TRB's 94th Annual Meeting in January.

- Products

A. Publications and conference papers:

Publications:

I. Mersereau, James Lewis. MS. The University of Memphis. November 2014. A COMPARISON OF EMISSIONS-REDUCTION STRATEGIES TO IMPROVE LIVABILITY IN FREIGHT-CENTRIC COMMUNITIES THROUGH MODELING. Major Professor: Stephanie Ivey, PhD

II. Ford, Kelsey Elizabeth. M.S. Civil Engineering. The University of Memphis. December 2014. A Quantitative Assessment of Livability Principles for Neighborhood-Level Analysis. Major Professor: Stephanie Ivey, PhD

III. Pouryousef, H, Lautala, P., White, T.; "Railroad Capacity Tools and Methodologies in the U.S. and Europe"; Journal of Modern Transportation- Springer, USA

IV. Nilsson, I. and O. Smirnov (2014). Industrial Cluster Differentiation: An Empirical Approach, Working Paper, University of Toledo (61st Annual North American Meetings of the Regional Science Association International, Washington, D.C, November 12-15, 2014).

V. Pourabdollahi, Z., Karimi, B., Mohammadian, A., and Kawamura, K.[2014] Shipping Chain Choices in Long Distance Supply Chains: Descriptive Analysis and a Decision Tree Model. Transportation Research Records 2410. Washington D.C. 58-66.

VI. K. Kawamura, P.S. Sriraj, H. R. Surat, and M. Menninger. "Analysis of Factors Affecting Truck Parking Violation Frequency in Urban Areas". Forthcoming in Transportation Research Records: Journal of the Transportation Research Board, Washington D.C.

VII. Lin, J. Q. Chen, K. Kawamura. "Sustainability SI: Logistics Cost and Environmental Impact Analyses of Urban Delivery Consolidation Strategies". Forthcoming in Networks and Spatial Economics [on-line first]

VIII. Ma, W., Liao, D., Liu, Y., and Lo, H-K, 2014. “Optimization of pedestrian phase patterns and signal timings for isolated intersection,” Transportation Research Part C; doi:10.1016/j.trc.2014.08.023.

IX. An, J., Liu, Y., and Yang, X., 2014. “Measuring Bus Service Reliability from Passenger’s Perspective: Methodology and Case Study from China,” Transportation Research Record; 2415: 48-58.

X. Pan, S., Yu, J., Yang, X., Liu, Y., and Zou, N., 2014. “Designing a Flexible Feeder Transit System Serving Irregularly Shaped and Gated Communities: Determining Service Area and Feeder Route Planning,” ASCE Journal of Urban Planning and Development; doi: http://dx.doi.org/10.1061.

XI. Zhao, J., Liu, Y., and Yang, X., 2014. "Operation of signalized diamond interchanges with frontage roads using dynamic reversible lane control," Transportation Research Part C; 51: 196-209.

XII. Zhao, J., Ma, W., Liu, Y., and Yang, X., 2014. “Integrated design and operation of urban arterials with reversible lanes,” Transportmetrica B: Transport Dynamics; 2(2): 130-150.

XIII. Yu, J., Pan, S., and Liu, Y., 2014. “Locating Urban Transit Transfer Centers: A Service Zoning Based Approach,” Journal of Transportation Systems Engineering and Information Technology; 14(4): 113-119.

XIV. Pan, S., Yu, J., and Liu, Y., 2014. “Integrated optimization model of pedestrian-public transit emergency evacuation,” Journal of Traffic and Transportation Engineering; 14(3): 79-86.

XV. Luo, Z. and Liu, Y., 2014. “Operational Characteristics of Mixed Traffic Flow under Bi-direction Environment Using Cellular Automaton,” Journal of Traffic and Transportation Engineering; 1(6): 383-392.

XVI. Ma, W., Liu, Y., and Head, L., 2014. “Optimization of Pedestrian Phase Patterns at Signalized Intersections: A Multi-objective Approach,” Journal of Advanced Transportation; 48: 1138-1152.

XVII. Titi, H. H., Coley, N., Latifi, V. and Matar, M. (2014). “Characterization of Overweight Permitted Truck Routes and Loads in Wisconsin,” Journal of the Transportation Research Board, National Research Council, Washington, D.C., No. 2411 / Freight Systems 2014, Vol. 2: Urban Freight, Hazardous Materials, and Trucking, pp. 72-81.

XVIII. “Port Management, Chapter 2”, Stewart, Richard, The Business of Transportation, Volume 2, edited by Darren Prokop, Praeger, 2014.

XIX. Mei Cao, “Effect of Supply Chain Cultural Orientation on Product Quality: Mediating Roles of Goal and Communication”, Proceedings of 2014 DSI Annual Meeting, Tampa, FL, November 22-25, 2014.

XX. Banks, J., J. Camp and M. Abkowitz. Adaptation Planning for Floods: A Review of Available Tools, Natural Hazards, Vol. 70, No. 2, 2014.

XXI. Banks, J., J. Camp and M. Abkowitz. Scale and Resolution Considerations in the Application of HAZUS-MH 2.1 to Flood Risk Assessments, Natural Hazards Review, 2014.

XXII. Pallme, Dan, Bruce Lambert, Chad Miller, and Martin Lipinski (2014) A Review of Public and Private Intermodal Railroad Development in the Memphis Region Research in Transportation Business & Management.

XXIII. Miller, Chad and Bruce Lambert (2014). “Seventy-Five Years of Transportation Administration Becoming Public Administration,” Public Works Management & Policy 19(4): 310-315.

XXIV. Sarder, MD. (2014). Customer Service in Logistics Operations. Some Practical Concepts of Industrial Engineering. LAP Lambert Academic Publishing, Saarbrücken, Germany: OmniScriptum GmbH & Co. KG, (ISBN 978-3-659-62709-5).

XXV. Ozelkan, E., Sarder, MD., & Ali, A., (2014). Back to Fundamentals for a Successful Lean Six Sigma Enterprise Transformation: An Introduction to JET Special Issue, Journal of Enterprise Transformation special issue on Lean Transformation, Vol. 4, Issue 2.

Presentations:

I. “A Multi-Modal Freight Safety, Security and Environmental Routing Tool”, Mid-Continent Transportation Research Symposium, Madison, WI, August 2014.

II. Ivey and Hart presented ‘Making Freight-Centric Communities More Livable: Examining Residential Perceptions and Priorities for Livable Communities’ at the 2014 Mid-Continent Transportation Research Symposium.

III. Dhar, Samir K. and A. Mokashi. 2014. Mining AIS Data within the Great Lakes, Mid Continent Transportation Research Symposium, August, 2014, Madison, Wisconsin.

IV. Helgeson, S. and Cramer, S. Study of High Performance Curing Compounds for Concrete Pavements in Wisconsin, Presentation at the Wisconsin Concrete Pavement Association 2015 Workshop, Oshkosh, Wisconsin on February 12, 2105.

V. Helgeson, S. and Cramer, S. Evaluation of Curing Compound Application Time on the Surface Durability of Concrete, Final Report to the Wisconsin Dept. of Transportation for Study 0092-11-05, 127 pgs, March 2015.

VI. Sarker, A., Naimi, A., Mishra, S., Golias, M. M., and Freeze, B. (2015) Identification of Secondary Crashes in Large Scale Highway Networks. In proceedings of the 94th Annual Meeting of Transportation Research Board.

VII. T. Sakai, K. Kawamura, and T. Hyodo. Location Dynamics and Efficiency of Logistics Facilities: Evidences from Tokyo. Presented at 54th Association of Collegiate Schools of Planning Annual Meeting, Philadelphia. October 30, 2014.

VIII. T. Sakai, K. Kawamura, and T. Hyodo. "Large-Scale Metropolitan Freight Surveys: Challenges and What Data Say about Them" Presented at Mid-Continent Transportation Research Symposium, Madison, WI. August 2014.

IX. Coley, Nicholas J. "Overweight Permit Route and Load Analyses." Presented at the 2014 Mid-Continent Transportation Research Symposium, Madison, WI. Session 4-B, Planning: Freight Modeling, August 22, 2014.

X. Latifi, Valbon. "Truck Traffic on Pavement Performance using MEPDG." Presented at the 2014 Mid-Continent Transportation Research Symposium, Madison, WI. Session 1-D, Infrastructure: Design and Construction, August 21, 2014.

XI. Richard Stewart; "Port Planning Benchmarking Study", Presentation at the Wisconsin Commercial Ports Association Annual Meeting, August 21, 2014, Green Bay, WI.

XII. Richard Stewart, "Climate Change Impacts on the Great Lakes Shipping Industry" 4 Congress Canadian Marine Pilots Association Niagara Falls, Ontario September 11, 2014.

XIII. Richard Stewart, "The Development of a Liquefied Natural Gas (LNG) Supply Chain in the Great Lakes Region", 3rd Annual World Congress of Ocean Dalian, Peoples Republic of China October 18, 2014.

XIV. Mei Cao, "Effect of Long-Term Oriented Culture on Communication and Process Efficiency in Supply Chain", the Joint 19th Asia-Pacific Decision Sciences Institute Conference (APDSI 2014) and the 8th International Conference on Operations and Supply Chain Management (ICOSCM 2014), Yokohama, Japan, July 18-22, 2014.

XV. Mei Cao, "Role of Communication in a Collaborative Supply Chain: An Empirical Analysis", INFORMS Annual Meeting, San Francisco, CA, November 9-12, 2014.

XVI. "Estimating the Effects of Climate Change on Highway Infrastructure Flood Damage", Annual Meeting of the Society for Risk Analysis, Denver, CO, December 2014.

XVII. "Assessing the Vulnerability of Tennessee Transportation Assets to Extreme Weather", 8th Annual Intermodal Conference, Memphis, TN, October 2014.

XVIII. "A Multi-Modal Freight Safety, Security and Environmental Routing Tool", Mid-Continent Transportation Research Symposium, Madison, WI, August 2014.

XIX. "Estimating the Effects of Extreme Weather on Transportation Infrastructure", Mid-Continent Transportation Research Symposium, Madison, WI, August 2014.

XX. Sarder, MD., Miller, C. & Adnan, Z. (2014). Understanding the Reshoring Decision-Making Process Using AHP Approach, Proceeding of the Annual Industrial & Systems Engineering Research Conference (ISERC), Montreal, Canada.

XXI. Sarder, MD., Rahman, M., & Eksioglu B. (2014). Risk Based HazMat Routing in a Supply Chain Network, Proceeding of the Annual Industrial & Systems Engineering Research Conference (ISERC), Montreal, Canada.

XXII. Nakka, R. & Sarder, MD. (2014). Transforming Business Strategies of Manufacturing Industries through Reshoring, Proceeding of the Annual Industrial & Systems Engineering Research Conference (ISERC), Montreal, Canada.

B. Websites (does not include the academic partner institution websites reported in the Fall 2012 PPPR):

i. UW CFIRE (http://www.wistrans.org/cfire/) will highlight transportation education programs for K-12 students, and transportation lessons, professional development, and resource materials for teachers.
ii. A video was created by a teacher/media specialist attending the Maritime Transportation & Ship-Building Teacher Institute and is posted on YouTube for public viewing where it will raise awareness of maritime and transportation careers: http://www.youtube.com/watch?v=XGGYCmzphdY&feature=youtu.be
iii. Beneficial Use Summit (RI-8): Includes a project summary, list of the steering committee members, draft Summit details and the current draft version of the Summit agenda http://www.wistrans.org/cfire/events/dredging/
iv. CLTT "Special Studies and Applied Research" webpage is a repository for freight transportation research. http://www.usm.edu/logistics-trade-transportation/special-studies-applied-research
v. "Certified in Transportation and Logistics Online Program", in collaboration with the American Society of Transportation and Logistics. www.uwsuper.edu/ctl CFIRE provided matching support for the beta testing of two modules
vi. 2013 Mid-America Freight Coalition Annual Meeting (http://midamericafreight.org/events/2013am/) contains an archive of the agenda, presentations, and other materials from this event. Disseminated via the CFIRE and MAFC blogs, as well as multiple social media channels (mass email, Twitter, Facebook, etc.).
vii. Summit on the Beneficial Use of Dredged Materials (http://www.wistrans.org/cfire/events/dredging/) contains an archive of the agenda, presentations, and other materials from this event. Disseminated via the CFIRE blog, as well as multiple social media channels (mass email, Twitter, Facebook, etc.)
viii. CFIRE Scholarships for EPD Rail Short Courses are listed on the CFIRE website (http://www.wistrans.org/cfire/education/epd-rail/). Applicants apply for these scholarships via a webform, when scholarships for upcoming courses are available. Notifications of availability are disseminated via the CFIRE blog, as well as multiple social media channels (mass email, Twitter, Facebook, etc.).
ix. University of Memphis, TREC Website
- http://www.memphis.edu/herff/trec/trec_about.php

x. University of Memphis - IFTI hosted the 7th Annual Freight Intermodal Conference
- http://www.memphis.edu/ifti/events_pages/intermodal_conference.php

xi. RI-6 dynamic web page:
- https://www.usm.edu/logistics-trade-transportation/ri-6-run-scenarios

xii. "Real-time Inland Marine Transportation Information." http://transp40.vuse.vanderbilt.edu/slapps/realtimeinlandinfo/
- Username: aisuser; Password/Ingram
- This site contains the AIS data from Paducah and Reserve, real-time weather data, lock performance data and means to query all data layers. Note that since Dr. Dobbins is leaving Vanderbilt, the data feed from Reserve and Paducah has been cut off.

xiii. RI-2 visualization website
- http://www.wistrans.org/livability/MemphisLamarAve.htm

C. Newsletters:
i. The USM CLTT produces a monthly e-newsletter for over 5000 subscribers
- http://www.usm.edu/logistics-trade-transportation/news-and-events

D. Technologies/Inventions/Other Products:
i. UW-Milwaukee: Database of OSOW single permitted trucks in Wisconsin from 2007 to 2013 is available.
ii. University of Toledo: The MidWest FreightView DataViewer runs on a Citrix server on the GISAG lab at the University of Toledo. Interested parties can obtain a unique login to gain access.

Another piece of software was developed – "PathWorld." During the PathWorld project, specialized methods were used to create efficient navigation software on very large network datasets. It is envisioned that this software will be commercialized for use by intermodal shippers once it is in its final phase.

iii. GTAC public opinion survey data, graphs, and analysis publicly disseminated through regional mass media, including The Capital Times, Duluth News Tribune, Ashland Daily Press, Wisconsin Public Radio, UWS website, etc.

iv. Richard Stewart moderated a panel on "Boosting Economic Growth: Addressing Risks to Ports, Trade, and Supply Chains," June 6, 2013 for the Capitol Hill Ocean Week in Washington, DC.

- Collaboration - The following progress has been made on CFIRE's commitments to collaboration.
  A. UW-Madison Course IES/CEE 970 Colloquium in Transportation Management and Policy. Thematic area for Spring 2013 semester was Transportation and Economic Competitiveness. A partial list of the speakers included Dennis Leong of WisDOT, Kathy Heady of the Wisconsin Economic Development Corporation, Max Pietsch of Schneider National, Tom Rave of Gateway to Milwaukee, Ken Lucht of the Wisconsin and Southern Railroad, and Curt Heaslet of FedEx.
  B. Collaborating Organizations
     i. Ace Marine
     ii. American Association of State Highway and Transportation Officials; DC; in-kind support
     iii. American Society of Transportation and Logistics; Warrenton, VA; contributed to project
     iv. American Transportation Research Institute; Atlanta, GA; in-kind support
     v. AMTRAK
     vi. Ashland Daily Press – in-kind support
     vii. Bay Ship Building Company
     viii. Brown County, WI
     ix. Bülent Ecevit University; Zonguldak, Turkey; collaborative research
     x. Burlington Northern Santa Fe; Fort Worth, TX; in-kind, facilities
     xi. Canadian National Railway; Memphis, TN; financial, in-kind support, facilities
     xii. Center for Science & Environmental Outreach, Michigan Technological University; Houghton, MI; in-kind support, facilities, personnel exchange
     xiii. Center for Transportation Studies – University of Minnesota; personnel exchanges
     xiv. City of Chicago; Chicago, IL; in-kind support
     xv. Council of Supply Chain Management Professionals (Twin Cities and Northeast Wisconsin Roundtable) - in-kind support, presentations
     xvi. Door County Maritime Museum
     xvii. Duluth Seaway Port Authority; personnel exchanges
     xviii. Duluth Superior Transportation Association; Duluth, MN: in-kind
     xix. Enbridge; Calgary, Alberta; in-kind support, facilities
     xx. Experience Aviation, Inc,; Miami, FL; in-kind support
     xxi. Federal Emergency Management Agency; Washington, DC; in-kind
     xxii. Federal Highway Administration Kentucky Division Office; Frankfort, KY; partner
     xxiii. FedEx, Curt Heaslet; Memphis, TN; colloquium speaker
     xxiv. Frac Focus
     xxv. Fraser Shipyard; Superior, WI; in-kind, facilities
     xxvi. Frito-Lay, Inc.
     xxvii. Great Lakes Commission, Ann Arbor, MI; in-kind support
     xxviii. Great Lake Fleet; Superior, WI; in-kind, facilities
     xxix. Great Lakes and Seaway Shipping Online, Inc.; Port Huron, MI; in-kind support
     xxx. Great Lakes Maritime Research Institute; Superior, WI; collaborative research
     xxxi. Halvor Trucking; Superior, WI; in-kind, facilities
     xxxii. Illinois Department of Transportation; Springfield, IL; in-kind support
     xxxiii. Indiana Department of Transportation; Indianapolis, IN; conference partner

xxxiv. Ingram Barge Company; Nashville, TN; financial, in-kind
xxxv. Institute for Trade and Transportation Studies; New Orleans, LA; in-kind support
xxxvi. Institute for Transportation, Iowa State University; Ames, IA; Donation
xxxvii. Intermodal Association of North America (IANA) – financial, in kind
xxxviii. Intermodal Transportation Institute, University of Toledo; Toledo, OH; in-kind
xxxix. International Maritime University of Panama; Panama City, Panama; collaborative research
xl. Kentuckiana Regional Planning and Development Agency; Louisville, KY; in-kind
xli. Kentucky Transportation Cabinet; Frankfort, KY; conference partner
xlii. Lake Carriers Association, Rocky River, OH; in-kind support, collaborative research
xliii. Lake Superior Railroad Museum, Superior, WI; in-kind support, facilities
xliv. Livable Memphis
xlv. LogicNets, Inc.; Washington, DC; consulting services
xlvi. Marinette Marine
xlvii. Marquis Yachts
xlviii. Marten Transport; Mondovi, WI; in-kind support, facilities
xlix. Mead & Hunt, Inc., Dawn Johnston; Madison, WI; colloquium speaker
l. Memphis City Schools; Memphis, TN; facilities, research, personnel
li. Menards; Eau Claire, WI; Facilities and research support
lii. Metro Nashville Government; Nashville, TN; in-kind
liii. Metropolitan Interstate Council; Superior, WI; in-kind, research support
liv. Metropolitan Nashville- Davidson County Government; Nashville, TN; In-kind
lv. Metropolitan Transportation Support Initiative at the Urban Transportation Center, University of Illinois – Chicago; Chicago, IL; in-kind support, personnel exchange
lvi. Michigan Department of Transportation; Lansing, MI; in- kind
lvii. Michigan Tech Rail Program; Houghton, MI; personnel exchange
lviii. Middle Tennessee State University
lix. Midwest Terminals; Maumee, OH; in-kind support
lx. Milwaukee Port Authority; Milwaukee, WI; in-kind support
lxi. Mississippi Department of Transportation; Jackson, MS; in-kind support
lxii. Mississippi Oil and Gas Board
lxiii. Missouri Department of Transportation; Jefferson City, MO; Conference partner
lxiv. National Association of Purchasing Managers (Lake Superior Chapter) - in kind, facilities
lxv. National Great Lakes Maritime Museum; Vermilion, OH; in-kind support
lxvi. National Oceanic and Atmospheric Administration (NOAA); Washington, DC; in-kind
lxvii. Neel-Schaffer, Inc.; Jackson, MS; conference partner
lxviii. Norfolk Southern Railroad
lxix. North American Regional Climate change Assessment Program; Boulder, CO; in-kind
lxx. North Carolina A&T State University; Greensboro, NC; memorandum of understanding
lxxi. North Coast Training Center – facilities; in-kind support
lxxii. North Coast Marine Manufacturing Alliance
lxxiii. North Shore Scenic Railway; Duluth, MN; in-kind, facilities
lxxiv. Northeast Wisconsin Technical College: in-kind support
lxxv. Office of Naval Research; Arlington, VA; in-kind support
lxxvi. Omni-Trax & Illinois Railway
lxxvii. Port of Green Bay
lxxviii. Port of Toledo; Toledo, OH; in-kind support
lxxix. Prime Focus, LLC
lxxx. Schneider National, Max Peitsch; Green Bay, WI; colloquium speaker
lxxxi. Schools (8)/School Districts (7) in Wisconsin
lxxxii. St. Lawrence Seaway Development Corporation; Messena, NY; in-kind support
lxxxiii. Temple, Inc.; Decatur, AL; conference partner
lxxxiv. Tennessee Department of Transportation; Nashville, TN; financial support

lxxxv. The Gateway to Wisconsin, Tom Rave; Milwaukee, WI; colloquium speaker
lxxxvi. The Maritime Academy of Toledo; Toledo, OH; in-kind support
lxxxvii. Tokyo University of Marine Science and Technology – supplied Tokyo Freight Survey data
lxxxviii. Transportation Development Association of Wisconsin
lxxxix. Twin Cities Transportation Club; Minneapolis, MN; in-kind support
xc. University of Southern Alabama; Mobile, AL; research support
xci. University of Minnesota – Duluth; Duluth, MN; personnel exchanges
xcii. URETEK USA & URETEK ICR
xciii. US Army Corps of Engineers; St. Paul, MN; in-kind support
xciv. US Coast Guard; Cleveland OH; in-kind support
xcv. US Commercial Service; Washington, DC; conference partner
xcvi. US Energy Information Administration
xcvii. US Environmental Protection Agency; Chicago, IL; in-kind support
xcviii. US Maritime Administration; Chicago, IL; in-kind support
xcix. US Office of Naval Research
c. UW-Madison Sea Grant Institute; Superior, WI; in-kind support
ci. Wayne State University, Department of Civil and Environmental Engineering; Detroit, MI; in-kind support
cii. Wisconsin Coastal Management Program (WCMP)
ciii. Wisconsin Commercial Ports Association (WCPA)
civ. Wisconsin Economic Development Corporation, Kathy Heady; Madison, WI; speaker
cv. Wisconsin Department of National Resources; in-kind support
cvi. Wisconsin Department of Transportation; Madison, WI; financial support, in-kind
cvii. Wisconsin Maritime Museum
cviii. Wisconsin & Southern Railroad, Ken Lucht; Milwaukee, WI; colloquium speaker
cix. Women's Foundation for a Greater Memphis
cx. Wooddale High School, Memphis, TN.
cxi. Wuzi University Beijing China - in kind, facilities