Project Investigator	Project Name	Department
Clinton Wood	Rapid and Continuous Assessment of Soil Conditions along Highway Alignments	Civil Engineering
Sarah Nurre	The Dependence of Infrastructure Restoration on Transportation Net-works	Industrial Engineering
Sarah Hernandez	The Effects of Weather Events on Truck Traffic Using Fixed and Mobile Traffic Sensors	Civil Engineering

Rapid and Continuous Assessment of Soil Conditions along Highway Alignments
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For new highways built in the United States geotechnical investigations are often conducted using drilling and sampling techniques. These investigations provide design values for pavement design. However, the drilling and sampling is only conducted at discrete locations along the highway alignment often thousands of feet apart. The drilling and sampling will provide design data and will detect large and board changes in the materials and stratigraphy under the new highway alignments. However, it can miss small, but very problematic areas between the discrete investigation locations, such as sinkholes, uknown landfills, unmarked graves, localized changes in soil, etc. These can cause moderate to high cost I creases if detected during the construction phase, but can cause significant increases in maintenance costs and/or the need to rehabilitate the pavement system if not detected until after construction. To be able to detect these problematic areas, highway departments and engineers need rapid and continuous techniques that provide an uninterrupted profile of the subsurface. These techniques need to be relatively easy to use, rapidly conducted, and be able to detect these problematic areas. The most promising geophysical methods to supplement the drilling and sampling are electrical resistivity methods. These methods are considered the least expensive and do not require specialty training to collect the field data or interpret the data (Sree Devi et al. 2001). In addition, these methods provide data that can be directly correlated to data collected during the drilling and sampling operations.

The Dependence of Infrastructure Restoration on Transportation Networks

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Critical infrastructure systems enable society to function [1]; therefore their quick and efficient recovery is vital following extreme events. The complicating factor of efficient restoration is that interdependencies exist among infrastructure systems, specifically the transportation network is fundamental for carrying out restoration activities. Thus, the purpose of this research effort is to devise efficient restoration plans over time for the transportation network and one other interdependent infrastructure network. Our use of the term 'restoration plan over time' includes operational aspects including what components are selected for repair immediately following the event, who performs the repair, at what time the repair is conducted, and how and when work crews efficiently and feasibly move – using the transportation network – from one restoration task to the next. Thus, with these decisions we directly model the interdependencies between the restoration activities completed and in process on the transportation network and the ability to complete restoration activities in another infrastructure network. To solve these problems, we will explore exact and heuristic solution methods. By utilizing a heuristic solution method, we are able to develop restoration plans in real-time (e.g., seconds rather than days or hours). Success of this research proposal goes beyond just the benefit of developing efficient restoration plans which capture infrastructure interdependencies. Through the developed model, we are able to quantify the impact of transportation restoration efforts or lack there of on other infrastructure restoration efforts. With this quantification, we can better inform policy makers on how to allocate restoration resources and funds following an extreme event in the Southern plains region or any geographic area prone to damage from extreme events.

The Effects of Weather Events on Truck Traffic Using Fixed and Mobile Traffic Sensors

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Trucking is the dominate mode of transport for freight commodities accounting for 68% of the market by weight and 65% of the market by value (FHWA, 2015a). With freight tonnage expected to grow by 43% over the next 25 years, it is increasingly important to direct resources towards efficient maintenance and operation of the freight transportation system (FHWA, 2015b). Considering that I-30 and I-40 in Arkansas have been designated as part of the national Primary Freight Network (PFN) under MAP-21 legislation (FHWA, 2015c), a better understanding of current and future freight truck travel patterns on these highways will facilitate informed, data-driven decision making at the national level. In the Southern Plains region, severe weather conditions such as cold temperatures, wind, ice, and snowfall, can have major effects on traffic volumes along the PFN and surrounding roadways (Schwartz et al., 2014). For each of these application areas, knowledge of the relationship between weather events and design parameters such as Annual Average Daily Truck Traffic (AADTT) and design hour volume can allow for more robust short and long range decision-making and facility planning by transportation agencies. The proposed research will investigate the use of fixed and mobile traffic sensor systems to model temporal and spatial variations in freight truck movements as a result weather events. The proposed research concentrates on the following objectives: (1) to develop a spatial regression model to explain and predict the impact of weather events on truck traffic volumes and travel patterns and (2) to fuse fixed truck traffic sensor measurements (e.g. WIM data) with mobile sensor data (e.g. GPS) to produce estimates of population level VMT and VHT impacts resulting from weather events.