

Traffic Management Centers in a Connected Vehicle Environment

Project Plan

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Introduction:

Kimley-Horn and Associates, Inc. (KHA) has teamed with Noblis, DGD Enterprises, and Bernie Wagenblast to identify how a connected vehicle environment will shape the role and function of Transportation Management Centers (TMCs). This project is examining operational, technical and policy impacts of a future TMC environment and will inform the Pooled Fund Study (PFS) members about priority connected vehicle opportunities, needs and gaps and that would need to be addressed in future TMCs.

To date, the emerging connected vehicle capabilities have not yet had a significant impact on TMCs largely because many connected vehicle activities are still in the development and testing stages. TMCs, like many operating units of state department of transportations (DOTs) and transportation management agencies, have seen an increase in responsibilities and operational expectations, with minimal or nominal increase in staffing capabilities or skill sets to do so. In some cases, TMC staffing has been reduced or streamlined. At the same time, expanded traffic management and operations infrastructure, newer communications technologies and networks, and increasing focus on integrating system capabilities have expanded the technical skill requirements of operations and Information Technology (IT) staff that support or are integral to overall TMC operations.

The members of the Cooperative Transportation Study (CTS) PFS recognize that the role of the TMC and TMC operations may be impacted or influenced in a future connected vehicle environment. To better prepare for these potential impacts, operational activities, infrastructure, resource and system needs, the PFS initiated this project to identify how a connected vehicle environment will shape the role and function of TMCs. This study is examining operational, infrastructure, technical, and policy impacts of a new TMC environment, to inform the CTS PFS members about priority needs and gaps that would need to be addressed relative to TMCs in a future connected vehicle environment.

The PFS seeks information about current connected vehicle activities and which activities may have the most impact on TMCs, what TMC functions or activities could most

benefit from integrating with connected vehicle activities and initiatives, and the overall “readiness” of TMCs to adapt to a connected vehicle environment. This study is factoring in the diversity in TMCs throughout the country (urban TMCs, rural/statewide TMCs, multi-agency TMCs, arterial-focused TMCs, and TMCs that cover multiple regions). Through this effort, our team also will develop a concept for a future TMC within a connected vehicle environment, which will help to identify the required partnerships, policies, process changes or new processes, resource needs, technical skill set needs, and other important factors that will shape the TMC of the future.

The objectives of this project are to:

- Identify current connected vehicle activities that have the potential to have the highest impact on TMCs;
- Identify what TMC functions or activities could most benefit from integrating connected vehicle data and capabilities;
- Assess overall “readiness” of TMCs to adapt to a connected vehicle environment and identify challenges, constraints and potential timeframe considerations; and
- Develop a concept for a future TMC within a connected vehicle environment to be able to proactively plan for future TMC operations, partnerships, and capabilities.

Deliverables:

- Task 1: Connected Vehicle Program Activities in Relation to TMC Operations
Technical Working Paper, 4/10/2013
- Task 2: Expected Changes in TMCs Concepts Paper and Summary, 6/24/2013
- Task 3: Operational Concept for Future of TMCs in a Connected Vehicle
Environment, 8/26/2013
- Task 4: Final Recommendations, 10/28/2013

Task 1: Review of Connected Vehicle Program Activities in Relation to Traffic Management Center Operations

In this task, a summary of current (and anticipated future) efforts within TMCs will provide a baseline for assessing potential impacts and operational issues or readiness for a connected vehicle environment. To obtain this information, an electronic survey instrument will be developed to distribute to a select list of TMCs (up to 30 for an anticipated response number of 25) that provide a broad geographic representation of TMCs across the United States. This includes TMCs that operate the transportation network in urban areas, rural areas, and entire states. Information will be used to develop a short-list of TMCs for more detailed interviews as part of Task 2.

Deliverable: Technical Working Paper Summarizing Task 1

Task 1.1: Feedback Form

The electronic feedback form will provide a straightforward mechanism for respondents to provide information on specific questions as well as free-form questions. Questions

focus on current capabilities, operating environment, planned system and operational enhancements, as well as questions on anticipated benefits, challenges, or constraints with introducing new forms of data to support TMC operations. Questions will also seek to identify current gaps in data or operational capabilities that could potentially be addressed by connected vehicle data.

Task 1.2: Technical Working Paper

The feedback collected from the form will be summarized and included as part of a technical working paper that documents current operational environments, anticipated future environments that would need to interact with connected vehicle data, and anticipated challenges or constraints expressed by TMC managers and operations supervisors through the feedback form. The draft working paper will be reviewed via Webinar briefing.

Task 2: Investigation of Expected Changes in TMCs

This task investigates the expected changes a TMC may undertake in a connected vehicle environment. The task builds upon the activities in Task 1, review of the TMC PFS “Impacts of Technology Advancements on Transportation Management Center Operations”, the “Data Use and Analysis and Processing” project of the Michigan DOT, and the information received from the outreach to TMCs.

Deliverable: Final Concepts Paper and Summary of Expected Changes in TMCs

Task 2.1: Develop Connected Vehicle TMC Concepts

In investigating the potential changes undertaken in a connected vehicle environment, special consideration will be given to the type of connected vehicle data that may be available to TMCs, how these data will be used to enhance TMC operations, the role of third-party data providers in providing these data, the types of connected vehicle applications that may be implemented by TMCs, and how roadside equipment (RSE) units and on-board equipment (OBE) units can be incorporated into TMC operations.

A document will be developed that identifies the impacts to TMC operations once connected vehicle technologies are more widely deployed. At a minimum, the concepts will address the following questions:

- Given that the connected vehicle environment will be established in a phased manner, how will TMCs phase in connected vehicle technologies with existing ITS technologies?
- How can connected vehicle data be used to enhance current TMC operations? How will a connected vehicle environment impact standard operating procedures at the TMC?
- What, if any, changes in agency roles and responsibilities may result from a TMC operating in a connected vehicle environment?
- What is the role of third-party data providers in providing connected vehicle data to TMCs?

- How will connected vehicle infrastructure (e.g., RSE units and OBE units) be incorporated into TMCs?
- What impact will connected vehicle data have on data retention requirements?
- What are the expected impacts to TMC operations and maintenance budget in a connected vehicle environment?
- What are the staffing impacts to TMCs in a connected vehicle environment? Are there needs for specialized training of staff to operate and maintain infrastructure at a TMC?

The purpose of the concepts document is to create a vision of a TMC in a connected vehicle environment. Because there are several policy issues surrounding a national deployment of connected vehicle technologies, the concepts paper will identify different scenarios. An important consideration for these concepts will be the availability of data, potential constraints on usage of data generated by connected vehicles, and in a broader sense, mobile applications. Since connected vehicle data is a driving factor behind the changes a TMC may anticipate, the concepts paper will also discuss the various types of data that may be available in a connected vehicle environment for use in a TMC. These concepts are expected to be used for discussion purposes for more detailed interviews. Following the interviews described in Task 2.3, a final Concepts Paper will be prepared and submitted to PFS members for review.

Task 2.2: Determine Sites/Stakeholder to Interview

The purpose of these interviews is to gain additional input, and to help fill in the gaps identified in writing the concept paper. Site/stakeholder selection will focus on identifying a representative sample of early adopters of connected vehicle capabilities to be able to ask detailed technical and operational questions about potential benefits, impacts, challenges and considerations. Feedback from the survey form and PFS members will be used to develop a short list and final selection for interviews.

Task 2.3: Conduct Interviews with Sites/Stakeholders

Detailed questions will be developed and provided to the interview sites in advance of the discussions. An Interview Summary document will be prepared for each of the interviews. The Interview Summary for each interview will include an overview of the interview, the context of the interview, and a set of summary observations gained during the interview. A list of stakeholders participating in the interview and their roles will also be included. PFS members will be briefed on the interview outcomes via a Webinar. Following comments from the draft summary provided to PFS members for review, a final Summary of Expected Changes in TMCs will be submitted.

Task 3: Document the Future of TMCs in a Connected Vehicle Environment

This task will bring together outcomes from Task 1 and Task 2 to develop a vision for a future TMC in a connected vehicle environment to serve as a high-level Operational Concept as well as present potential operational scenarios of a TMC operating

environment integrating information sources and capabilities from connected vehicle platforms and systems.

This vision is envisioned to present:

- Types of information that are anticipated to be available to TMCs through connected vehicle platforms;
- How that data could be integrated into TMC operations and systems;
- Potential benefits; and
- Potential changes to TMC operating environments, such as enhanced decision support, more responsive strategy implementation, and broader coverage of real-time conditions.

The team will develop a summary graphic that would capture key data flows, system interactions, and potential outputs from a TMC with connected vehicle data and capabilities. This vision would be developed considering the needs, gaps, and readiness outcomes from Task 1, along with the envisioned connected vehicle capabilities to support TMC operations from Task 2. Stakeholder input will be critical to developing a vision that represents a realistic and desirable end state. The Operational Concept will be developed and a Webinar briefing will be conducted for PFS members for review.

Deliverable: Operational Concept Documenting the Future of TMCs in a Connected Vehicle Environment

Task 4: Preparation of Recommendations

This task will summarize the findings across the three prior tasks to prepare a succinct summary of key recommendations, including action items and important next steps to advance the readiness of state and local TMCs to integrate data and other aspects of a future connected vehicle environment.

There are likely to be several modifications to the National ITS Architecture required as a result of connected vehicles, including updates to service packages (and associated data flows), standards, equipment packages, and potentially other components of the architecture. For this effort, the focus will remain on those aspects that interact and impact TMC operations and functions and the team will coordinate with the contractor that is responsible for updating the National ITS Architecture to discuss potential scenarios and how that may influence future National ITS Architecture updates.

Recommendations will be summarized into a draft deliverable and a Webinar briefing will be provided to PFS members for review. A final Recommendations document will be prepared incorporating comments from the draft deliverable.

Deliverable: Final Recommendations Report