UTC Project Information	
Project Title	Connected Vehicle Enabled Freeway Merge Management - Field Test
University	University of Virginia
Principal Investigator	Brian L. Smith
PI Contact Information	Bls2z@virginia.edu
Funding Agencies	CVI-UTC (Tier 1 UTC)
Agency ID or Contract Number	TBD
Project Cost	$150,017.03
Start and End Dates	September 1, 2012 – August 30, 2013
Project Duration	1 year
Brief Description of Research Project	The act of merging (on freeways, roundabouts, etc.) creates vehicular conflicts that frequently result in congestion and crashes. Connected vehicles present a unique opportunity to develop a dynamic assistance system by utilizing the newly available vehicle trajectory data and capability of relaying advisory messages to vehicles in the system. With this background, the research team has previously developed three freeway merge assistance algorithms (lane-level variable speed limit, lane changing advisory, and merge control) for FHWA. This project will build upon the prior work and conduct a field test of these algorithms at the Smart Road of the Connected Vehicle UTC test beds. Results from this field testing will provide real understanding on how these types of merge assistance algorithms can be tested and/or implemented in a real situation. Working under a grant from FHWA's Exploratory Advanced Research Program, the University of Virginia Center for Transportation Studies (UVA CTS) has spent two years developing and simulation testing a set of advanced algorithms to improve freeway merging using the connected vehicle technology. The objectives of these algorithms are to increase utilization of merging capacity in freeways, and also to reduce merging related crashes. All of these algorithms have been evaluated and refined in an enhanced simulation environment considering different market penetration rates of connected vehicle technology with diverse freeway traffic scenarios. In addition, one of the key innovations of this project was that it fully incorporated wireless communication emulation in the

	simulation environment. This resulted in a truly interactive simulation environment that enabled dynamic coupling between the traffic simulator and the network simulator. The purpose of this proposed project is to move a set of the algorithms developed in the FHWA sponsored work from a simulation environment to the Smart Road facility of the Virginia Connected Vehicle UTC test bed. This is an important step needed to refine the algorithms for real-world use, and to help demonstrate connected vehicle benefits to transportation agencies. The Smart Road component of the UTC Virginia test bed presents an excellent opportunity to follow-up on the work sponsored by the EARP program to validate the benefits of the developed algorithms. This will provide the benefits of accelerating implementation of this mobility application, and also helping to refine UVA CTS's connected vehicle simulation environment for use on other algorithm development efforts.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The goal of this project is to field test three freeway merge management algorithms on the Virginia Connected Vehicle UTC Test Bed. Initially the research team will focus on implementing and evaluating dynamic lane control in the Test Bed. Based on the success and evaluation results, the team will pursue further by introducing partial control in the Test Bed. Specific objectives of this study can be summarized as follows: 1. To implement Variable Speed Limit (VSL), Lane Changing Advisory (LCA), and Merge Control Algorithms (MCA) in the Connected Vehicle UTC Test Bed, 2. To evaluate the impact of the VSL, LCA, and MCA in real-world scenarios in improving freeway merging operation, 3. To collect extensive field-level data to improve the connected vehicle simulation environment, 4. To investigate the impacts of communication performance in successfully implementing the different algorithms in the merge assistance system, and 5. To investigate the potential of partial control implementation through merging control algorithm in the merge assistance system.

Impacts/Benefits of Implementation (actual, not anticipated)	This study is still in progress, actual impacts and benefits of implementation will be determined in Summer 2013 when the study is completed. This page will be resubmitted in the next round of reporting to state these actual impacts and benefits.
Web Links • Reports • Project Website	http://www.connectedvehicleinfrastructure-utc.org/?q=node/68 http://rip.trb.org/browse/dproject.asp?n=32363