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## TIP Project Brief – 080046/9H9012

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### Civil Infrastructure

#### VOTERS: Versatile Onboard Traffic Embedded Roaming Sensors

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*Develop a novel system based on instrument packages that can be installed on a wide variety of private and public vehicles to assess the conditions of bridges and roadways through several different and complimenting methods at regular driving speeds during the course of ordinary use of the vehicles.*

#### Sponsor: Northeastern University

360 Huntington Avenue  
405 Lake Hall  
Boston, MA 02115-5000

- Project Performance Period: 3/1/2009 - 3/24/2014
- Total project (est.): \$18,802 K
- Requested TIP funds: \$9,000 K

A research team headed by Northeastern University (Boston, Mass.) and including the University of Massachusetts at Lowell, the University of Vermont and State Agricultural College (Burlington, Vt.) and Witten Technologies, Inc., (Somerville, Mass.) plans to eliminate the need for setting up hazardous and congestion-prone highway work zones to conduct roadway inspections with an automated “drive-by” inspection system that uses ordinary vehicles in the course of their regular driving. The VOTERS (Versatile Onboard Traffic Embedded Roaming Sensors) project proposes to gather accurate, up-to-date condition information on roadways and bridges using compact instrument packages that would be installed in cars and trucks. The packages will include several novel and sophisticated sensor developments, including an acoustic system that listens to the noise made by the vehicle’s tires on the roadbed and from that determines possible defects such as cracks or poor bonding between the concrete roadbed and asphalt overlay; a small, high-frequency ground-penetrating radar array to detect delamination, trapped moisture, rebar corrosion and similar faults that would be invisible from the surface; and an advanced millimeter-wave radar to determine the surface condition of the roadway including the detection of potholes, embedded moisture, and thin ice layers. An onboard computer will control the instruments, check its location using GPS, and report data back to base stations using the cellular phone system—all without involving the vehicle’s driver, who just needs to follow his or her regular driving routine. Installed in a diverse fleet of vehicles, VOTERS will provide a constant stream of information on road and bridge deck conditions gathered under real, daily driving conditions at operational speeds that will not congest traffic. The information will allow planners to schedule needed repairs at the right place and at the right time. The project involves several significant research challenges requiring TIP support, in particular the development of inexpensive, non-contact sensors able to gather the needed data at regular driving speeds.

#### For project information:

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#### Active Project Members

- Earth Science Systems LLC (WheatRidge, CO)  
*[New JV Member since original JV was formed]*
- Northeastern University (Boston, MA)  
*[Original, Active JV Member]*
- Trillion Quality Systems, LLC (Plymouth Meeting, PA)  
*[New JV Member since original JV was formed]*
- University of Massachusetts Lowell (Lowell, MA)  
*[Original, Active JV Member]*
- University of Vermont and State Agricultural College (Burlington, VT)  
*[Original, Active JV Member]*