VERMONT
AGENCY OF TRANSPORTATION

FACT SHEET

2017 Research Symposium

& STIC Annual Meeting

High Speed Ground Penetrating Radar for Road Pavement and Bridge Structural Inspection and Maintenance

RESEARCH PROJECT TITLE
High Speed Ground Penetrating Radar for Road Pavement and Bridge Structural Inspection and Maintenance

STUDY TIMELINE
05/2014– 06/2016

PRINCIPAL INVESTIGATOR
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MORE INFORMATION
Final research report is on Vtrans website: _final report_

This fact sheet was prepared for the 2017 VTrans Research Symposium & STIC Annual Meeting held **on September 28, 2017** at National Life in Montpelier, VT. 8:00 am– 12:00 pm.

Fact sheets can be found for additional projects featured at the 2017 Symposium at http://vtrans.vermont.gov/planning/research/2017symposium

Additional information about the **VTrans Research Program** can be found at http://vtrans.vermont.gov/planning/research

Additional information about the **VTrans STIC Program** can be found at http://vtrans.vermont.gov/boards-councils/stic

What was the Problem?

➢ Vermont has 14,436 public road miles. 45% of them are in poor or mediocre condition. Among 2,727 Vermont bridges, 288 or 10.6% are considered structurally deficient, and 643 or 23.6% are considered functionally obsolete.

➢ Early and accurate detection, localization and assessment of damages or defect in pavement and bridge deck are important for 1). scheduling maintenance and rehabilitation activities; 2). significantly reducing the damage progression and maintenance costs.

➢ Traditional inspection methods, i.e. core sampling, chain drag, half cell potentials and chloride measurement are either destructive or lowly efficient, costly, disturbing to the traffic.
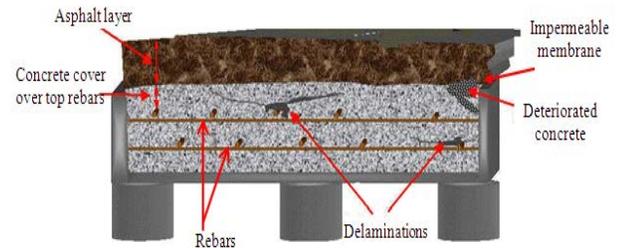

Methodology or What was done?

Develop a systematic methodology of employing ground penetrating radar (GPR), including dual band GPR instruments, subsequent data processing and interpretation methods that can be regularly used as part of a roadway pavement and bridge evaluation program. Field tests are conducted for system performance validations. Three-step GPR signal processing:

Step 1: Remove static interference and noise to increase the signal to noise ratio (SNR).
Step 2: Hilbert Transform to extract signal phase and power envelop parameters .
Step 3: Identify structure layers and buried objects.
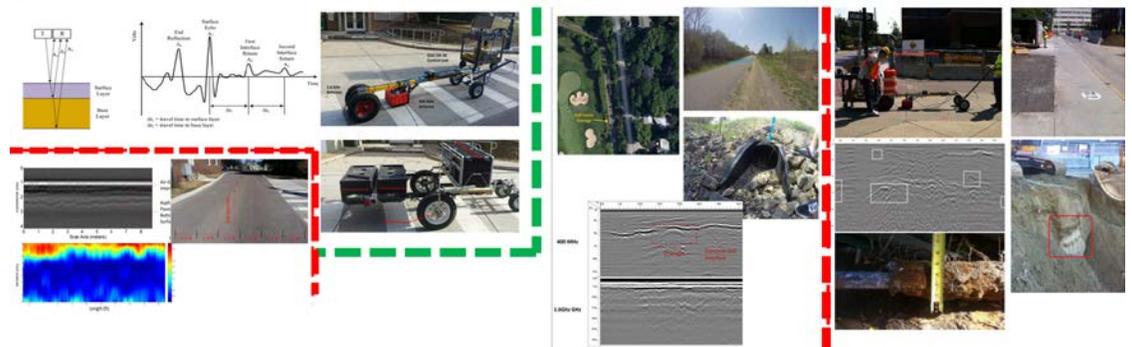
Conclusion or What are the next steps?

GPR is effective for roadway subsurface structure examination. Dual band GPR configuration and signal processing can achieve accurate and comprehensive inspection results. In the next step, we can further explore GPR for bridge and railroad survey.

What are potential impacts? What is the benefit to VTrans?

GPR survey data can be utilized to assist VTrans decision making for transportation infrastructure maintenance, reconstruction and other asset management. Possible inspection

• Evaluate asphalt pavement thickness, bridge deck, railroad foundation, etc.
• Detect and locate underground utility, i.e. water pipes, electrical cables, natural gas pipes, before the construction project.
• Evaluate harsh weather impact on transportation infrastructure, i.e. usage of deicing salt, etc.