



RESEARCH PROJECT CAPSULE [23-2GT]

February 2023

TECHNOLOGY TRANSFER PROGRAM

Field Evaluation of Geophysical Applications for DOTD

JUST THE FACTS:

Start Date:

February 6, 2023

Duration:

24 months

End Date:

February 5, 2025

Funding:

SPR: TT-Fed/TT-Reg – 5

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Sponsored jointly by the Louisiana
Department of Transportation and
Development and Louisiana State
University

POINTS OF INTEREST:

Problem Addressed / Objective of
Research / Methodology Used /
Implementation Potential

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PROBLEM

Current geotechnical exploration practices for the Louisiana Department of Transportation and Development (DOTD) rely on conventional soil borings with the aid of cone penetrometer test (CPT) soundings. The characteristics of these technologies are site-specific by providing discrete profile information. Information between soil borings, CPT, or any other discrete tests are interpretations based on available data.

OBJECTIVE

This research will evaluate the effectiveness of the electrical resistivity, seismic refraction, and cross-hole tomography geophysical methods in Louisiana and provide detailed descriptions of each method, pros and cons, and the cost of each method and required equipment. This research will determine whether the device/test method(s) actually improves confidence above normal operations, and whether the technology should be conducted in-house or not. Consultants may be necessary due to the intricacies of certain geophysical methods or if the equipment purchase and operating costs prove not to be feasible/efficient. The researchers will then develop recommendations and provide an action plan for DOTD to implement and utilize these geophysical methods in various geotechnical applications in Louisiana, such as mapping lithology and foundation integrity studies.

METHODOLOGY

To achieve the objectives of this study, the research team will complete several tasks. First, the team will conduct a literature review and determine which devices will be tested. Next, they will develop an action plan for each test method chosen, followed by the collection of field data. Researchers will analyze the data collected and make recommendations of geophysical methods for Louisiana applications. Last, the team will prepare a final report to be edited and published by the Louisiana Transportation Research Center (LTRC).

IMPLEMENTATION POTENTIAL

This research will benefit the department in several ways. For example, by utilizing geophysical tools in addition to standard geotechnical exploration practices, the department can provide a more detailed pre-construction characterization of the geotechnical conditions at sites. Other potential benefits include improved confidence of material between discrete points, identifying unusual underground conditions or unknown underground piping/objects, improved QA/QC, reducing subsurface risks within the areas between investigations, and ideally reducing overall construction costs.

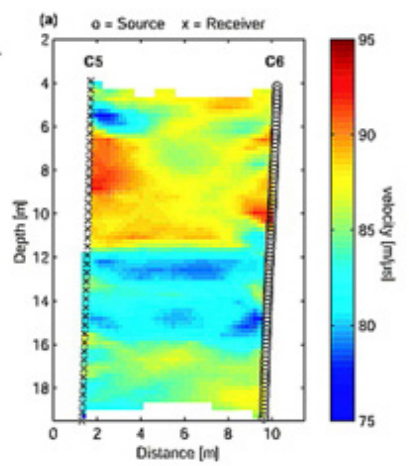
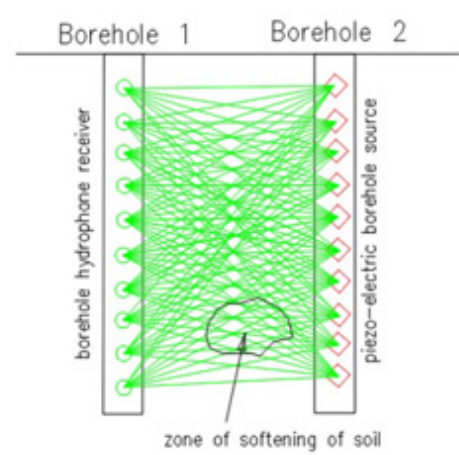
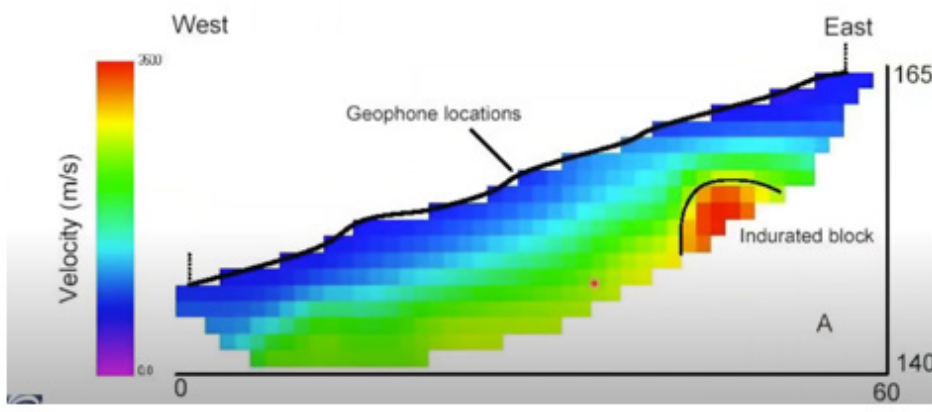
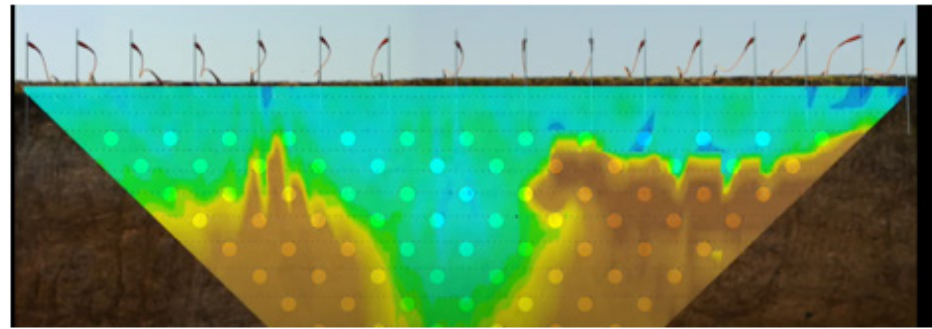


Figure 1. Typical subsurface images/results from each test method (in order from top to bottom: electrical resistivity, seismic refraction, and cross-hole tomography).

Top: <https://www.fhwa.dot.gov/engineering/geotech/agame/>
 Middle: <https://olsonengineering.com/resources/educational-resources/webinars/#geophysics-webinars>
 Bottom: <https://www.mdpi.com/2076-3263/9/9/399>