

OHIO DEPARTMENT OF TRANSPORTATION OFFICE OF GEOTECHNICAL ENGINEERING RESEARCH IMPLEMENTATION PLAN



Title: GUE-70-14.10 Mine Research Project, Guernsey County, Ohio

State Job Number: 45041

PID Number:

Research Agency: BBC&M Engineering, Inc.

Researcher(s): Timothy Van Echo

Technical Liaison(s): Rick Ruegsegger,

Research Manager: Karen Pannell

Sponsor(s): Tim McDonald, Gene Geiger

Study Start Date: 8/15/1999

Study Completion Date: 6/30/2003

Study Duration: 47 months

Study Cost: \$1,446,975.00

Study Funding Type: 80 Federal / 20 State, ODOT SPR (2)

STATEMENT OF NEED:

This project fulfilled a statewide need, as well as a local need. The statewide need was to generally determine what geophysical, geotechnical and groundwater investigations could be used singly, or in conjunction with one another, to detect the presence or ongoing formation of subsurface mine voids related to abandoned underground mines. The local (District 5) need was to perform a post-construction investigation of the GUE-70-14.10 Emergency Mine Remediation Project to determine if subsurface conditions beneath the roadway were remaining stable throughout the 1995 project area.

RESEARCH OBJECTIVES:

- detect the presence and ongoing formation of voids or anomalies beneath the roadway pavement using various geophysical, geotechnical, and groundwater investigative methods.
- field test and evaluate investigative methods to determine their suitability for statewide use on other similar projects.

RESEARCH TASKS:

Phase I

- evaluate the effectiveness of various investigative methods on a 200-foot-long segment of the eastbound IR 70 lanes.

Phase II

- apply the most effective investigative methods, as determined by Phase I of the work, to the evaluation of the entire GUE-70-14.10 project area.

Phase III

- provide a technology transfer document summarizing knowledge gained during Phases I and II, and providing guidance for its practical application in roadway settings.

RESEARCH DELIVERABLES:

Phase I report detailing:

- the equipment and methods utilized for testing of a broad range of geophysical, geotechnical and groundwater testing in a small test section.
- comparative analysis of the combined results of all of the investigative forms of testing.
- recommendations for a reduced number of successful forms of testing to be utilized in the larger, entire project area during Phase II.
- Sub-section for each investigative method.

Phase II report providing:

- the testing results of a selected group of geophysical, geotechnical and groundwater methods over the entire GUE-70-14.10 project area.
- comparative analysis of the combined results of all of the investigative forms of testing.
- recommendations for a reduced number of successful Phase forms of testing for testing of the larger project area during Phase II.
- a report sub-section for each investigative method.
- comments on the effectiveness of the previous remediation work (underground mine drilling and grouting) constructed in 1995.
- conclusions and recommendations regarding the need for future GUE-70-14.10 site investigations and/or remedial construction work.
- conclusions and recommendations regarding the potential statewide applications of the various forms of testing.

Phase III technology transfer document detailing:

- the successful methods of investigation used on the Phase I and Phase II areas.
- discussion of the limitations and benefits of the methods to the investigation of similar soils, groundwater, and abandoned underground mine conditions.
- guidance on the applicability of the methods used to the investigation of sites with dis-similar subsurface conditions.

RESEARCH RECOMMENDATIONS:

- surface ground penetrating radar (GPR) should be used to try to detect any features that might be located directly beneath the roadbed.
- seismic reflection e used to detect fracturing in the bedrock.

PROJECT PANEL COMMENTS:

This project provided a wealth of information, particularly with regarded to the use of geophysical testing techniques to detect mine-related subsurface voids.

IMPLEMENTATION STEPS & TIME FRAME:

The implementation plan for this successful research project includes:

- an ongoing effort to encourage District staff to consider the use of the studied forms of geotechnical, geophysical and groundwater methods as a part of subsurface investigations.
- distribution of the Phase III Technology Transfer Report to all District AUMIRA Coordinators (completed in Summer 2003.).
- distribution of the Phase III Technology Transfer Report to all state, federal and Canadian transportation officials who are members of the FHWA-sponsored Interstate Technical Group on Abandoned Underground Mines (completed in Summer 2003.).

EXPECTED BENEFITS:

- Knowledge of testing techniques which can detect subsurface voids and thus can be a tool for forewarning ODOT of impending related surface collapse which would reduce public safety

EXPECTED RISKS, OBSTACLES, & STRATEGIES TO OVERCOME THEM:

The primary obstacle will be to convince District staff to invest time and money in the various forms of testing when they have had little, or no, previous experience with this form of subsurface testing. .

OTHER ODOT OFFICES AFFECTED BY THE CHANGE:

Other possible ODOT applications for this successful research would be for locating buried drainage structures and/or determining the location and extent of buried structural foundations

PROGRESS REPORTING & TIME FRAME

Please refer to the descriptive information provided under the above heading of Implementation Steps and Time Frame for more information.

TECHNOLOGY TRANSFER METHODS TO BE USED:

The main thrust of this research was to develop information identifying effective techniques to detect and analyze subsurface voids related to abandoned underground mine voids. The purpose for this research was to create a resource to be shared by everyone working for ODOT. Therefore, the main statewide focus of the earlier described implementation plan is one of technology transfer. It is for this reason, that Phase III of the research project was the production of a technology transfer report for broad distribution. Please refer to the descriptive information provided under the above heading of Implementation Steps and Time Frame for more information.

IMPLEMENTATION COST & SOURCE OF FUNDING:

None cost beyond the cost of the project..

Approved By: (attached additional sheets if necessary)

Office Administrator(s):

Signature: Gene Geiger Office: OGE Date: 9/21/2005

Division Deputy Director(s):

Signature: Tim McDonald Division: PM Date: 9/22/2005