



MEMORANDUM

TO: Dr. Lindell Ormsbee, Associate Director
Kentucky Water Resources Research Institute
University of Kentucky
233 Mining and Minerals Research Building
Lexington, KY 40506-0107

Mr. Steve Hampson, Assistant Director
Kentucky Water Resources Research Institute
University of Kentucky
233 Mining and Minerals Research Building
Lexington, KY 40506-0107

RE: Technical Memorandum for the C-746-U Landfill—Review of Interpretations and Recommendations for Further Investigations

Dr. Ormsbee and Mr. Hampson:

As per your request of 12 April 2004, this memorandum summarizes a critique of the neotectonic fault interpretations in the vicinity of the C-746-U Landfill, Paducah, Kentucky. It is divided into two categories: 1) Review of Interpretations and 2) Recommendations for Further Investigations.

REVIEW OF INTERPRETATIONS

The high-resolution SH-wave profiles reported in the subject document were performed at the state-of-the-art. The profiles are of good quality and have imaged well-defined geologic structure at the site. The following statements reflect discrepancies in the report's interpretation in light of our review and experience:

1. The reported interpretation stated that data show a simple horst and graben structure "...consistent with extensional regional tectonics and faulting observed in the Fluorspar Area Fault Complex..." Conversely, the data suggests a more multifaceted history. Specifically, the well-defined Paleozoic-aged extensional structure appears to have a complex episodic history that includes a later structural inversion. This is supported by the presence of antiformal folding of reflecting horizons in the hanging walls and small-amplitude force folds present in the intra-Quaternary horizons, although the data quality of these very near-surface horizons makes this interpretation less definitive. This latter interpretation would be more consistent with the prevailing scientific consensus.
2. The reported profile interpretations suggest that segments of the deformation cannot be interpreted across the entire seismogram; however, the evidence given in the preceding opinion disqualifies this assessment. This disagreement notwithstanding, no evidence is presented in the report to indicate the age of the latest imaged deformation, nor has evidence been provided as to the near-surface extent of deformation. This is the primary weakness in the report's conclusions.
3. The report describes and shows single planar faults in its interpreted deformation. This is an oversimplification that is rarely seen in unlithified sediment or rock environments; deformation more often occurs across relatively broad zones rather than single planes. The stacked profiles at the C-746-U landfill indicate that latter case is exhibited, and will provide a more robust interpretation.
4. Two significant anomalies were not described.

RECOMMENDATIONS

1. The geophysical investigations have identified anomalies, but have exhausted their potential with regard to determining the age of deformation; therefore, no further geophysical profiling at the site is suggested.
2. Any future activity should begin with a thorough characterization of the age of near-surface sediment. Without a well-defined Holocene-aged horizon present at the site, any crosscutting relationships defined by seismic profiles, drilling, and/or trenching are meaningless.
3. If Holocene-aged sediments are present at the site, then a trenching, geoslicing, or DP sampling of the Holocene material above the anomalies is suggested.
4. If no Holocene-aged sediments are present at the site, then the questionable statements regarding the presence of Holocene deformation at the Barnes Creek site must be resolved. Currently, the only scientifically recognized Holocene deformation outside of the central New Madrid Seismic Zone is along the Commerce Geophysical Lineament, 50+ kilometers west of the C-746-U landfill.

Sincerely,

Edward W. Woolery, Ph.D.
Assistant Professor of Geophysics