Kentucky Research Consortium for Energy and Environment

A collaboration of Kentucky Universities administered by the University of Kentucky

www.uky.edu/KRCEE
KRCEE Mission

• To support DOE’s efforts to obtain an expeditious and economically viable environmental remediation of the Paducah Gaseous Diffusion Plant, WKMWA, and surrounding areas.

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KRCEE Objectives

- Application of technical expertise to assess, and accelerate the implementation of cost effective technologies and methodologies that will result in accelerated clean-up and risk reduction.
- Establishment of problem-specific Project Teams drawn from disciplines of expertise at participating universities that will work with and through DOE and its contractors to accelerate the implementation of project concepts and plans. Project Team focus will be on risk prioritization and accelerated implementation of cost-effective remedial activities to minimize impacts on public health and the environment.
- Technical review of proposed remediation plans and any non-consensus technical issues associated with their implementation.
- Utilization of Project Teams to interface directly through DOE with DOE national laboratories, EPA, and state regulatory agencies to help forge consensus solutions to technical problems related to the clean-up and ongoing operations of the PGDP site.
- Accomplishment of targeted long-term and short-term projects & tasks designed to support an accelerated clean-up of the PDGP.
KRCEE Projects Completed

- Phase I KRCEE Grant Funding
  - 21 Projects Undertaken, 18 completed
  - 3 Projects to be completed by July 1, 2009

- Completed Projects Include:
  - PGDP Data Warehouse
  - TCE Fate and Transport - Aerobic Biodegradation
  - Lithostratigraphy Project
  - Real Time Field Characterization & Cleanup Demonstration Project
  - Seismic Projects
Seismic Assessment 1, 2, 3

- PIs: Dr. Ed Woolery (UK-GLY) and Dr. Zhenming Wang (UK-KGS)
  - Expansion of Seismic Network in W. Ky and to PGDP Site/Paducah
  - Collection of Seismic Data to provide basis for Seismic Modeling, Seismic Hazard Assessment & Seismic Engineering Design at PGDP & vicinity
  - Collaboration with USGS, SSA, and Professional Engineering Associations to redefine the New Madrid Seismic Zone
  - PGDP Seismic Hazard Assessment

- Impact/Benefit:
  - Impact on USGS seismic policy
  - Reduction in seismic engineering criteria for W. Ky., Paducah, PGDP
  - Decrease in seismic engineering design costs in W. Ky., Paducah, PGDP through application of measured seismic/geotechnical data in facility design (houses thru infrastructure)

- Status:
  - 100% Completed
C-746-U Holocene Displacement (Seismic 4)

- **PIs:** Woolery (UK-GLY) and Hampson (UK-KRCEE)
- **Products:**
  - Detailed field investigation of Holocene Displacement at PGDP
  - Targeted field investigation ABOVE identified seismic profile features
  - Lithostratigraphic characterization that identifies and tracks shallow soil strata at PGDP
  - Final Report undergoes Independent Technical Review by Subject Matter Experts prior to release
- **Impact/Benefit:**
  - Remove Holocene Displacement regulatory obstacle in order to allow permitting of C-746-U Landfill expansion for remedial waste
  - Increased understanding of the occurrence and distribution of paleosoils and upper continental deposits at PGDP
  - Allowed collection and correlation of extensive lateral and vertical data w/o extensive OSHA trench excavation (35’ deep X 90’ wide X 2000’ long)
  - Participation of nationally/internationally recognized subject matter experts to solve site problem(s)
  - Completion of Project at significantly reduced time/cost to DOE
- **Status:**
  - 100% Completed;
Integrated Geophysical Imagining Techniques for Detecting Neotectonic Deformation in the Fluorspar Area Fault Complex Western Kentucky (Seismic 5)

• PI’s: Woolery (UK-Gly); Anderson (UK-Gly); Hampson (KRCEE) Addressed

• Preliminary Question “Is PGDP groundwater flow system related to local fabric of seismic deformation?”

• Acquired, processed, and interpreted over 7.8-km of seismic reflection data and 2-km of electrical resistivity data were.

• Imaged high-angle faults extending into Pleistocene horizons (Regional Gravel Aquifer 60 - 100 ‘bgs)

• Consistent with results from other parts of the FAFC (Nelson et al., 1997, 1999; Langston et al., 1998; Woolery and Street, 2002, etc.).

• Structural features preferentially oriented with groundwater and contaminant migration.

• Additional geophysical/geological data are needed to reduce uncertainty.
Integrated Geophysical Imaging (Seismic 5)

Interpreted Faulting

- Series of high-angle faults striking approximately N30°E to N45°E outlining a series of asymmetric grabens.
- Greater displacements are observed in the bedrock reflector than within overlying sedimentary horizons.
- Early Paleozoic faulting reactivated as recently as the Pleistocene.
KRCEE Phase 2 Grant
Seismic Assessment Projects

KRCEE Phase 2 Grant Funding and Projects
- Started January 2009

Phase 2 Seismic Projects

• Seismic 6 - Continued monitoring of seismic stations at PGDP and in vicinity of Paducah

• Seismic 7 - CUSSO Instrumentation & Data Evaluation

• Seismic 8 - Review/Comment MAE Center “Impacts of Earthquakes on the Central United States”

• Seismic 9 - Further Integrated Geophysical Investigation at Little Bayou Creek Seeps

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Summary of Issues with MAE Center “Impacts” Document and Supporting Information

Science
• Old data
• Incorrect data inputs for math model
• Incorrect Math Formulas (wrongly relate causes and effects)
• Application of Fictitious Faults
• Comparison to areas with known hazard and risk to be greater than that of Western Kentucky (does it make sense?)

Consequences
• Increase cost of all infrastructure projects to address seismic engineering
• Spend money unnecessarily
• Preclude building certain facilities
• Provide funding to prepare for grossly overstated risk not characteristic of likely natural events

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