Draft A 10/16/06

Pre-Proposal

Acquire High Resolution Reflection Seismic Data for Deep Vadose Geologic Conceptual Model in the 200 Areas

G.D. Cummins

Statement of the Problem

Significant stakeholder and regulator concerns have been raised regarding the migration of contaminants in the Hanford Site 200 Areas into the deep vadose zone and to groundwater and eventual transport of contaminants to the Columbia River either through a northward or eastward pathway.

Disposal of process and condensate waste in cribs, trenches, and ponds from B-Plant and PUREX operations in the 200 East Area, have resulted in the movement of contaminants from source areas into the deep vadose zone and aquifer. There is need to refine the geological conceptual model to reduce uncertainty in both contaminant inventories and predicted contaminant pathways from the 200 East Area to the Columbia River. Uncertainty in the basalt bedrock surface elevation makes it difficult to predict whether future flow will be to the north or east.

The Hanford Site operational setting is in a windy, arid, high desert climate with asphalt, gravel, and dirt road conditions. The general geologic setting in the 200 East Area includes basalt bedrock approximately 600-700 ft below ground surface (bgs) in the south to 60 ft bgs in the north. The basalt is overlain by gravel, sand, and clay deposits of the Ringold formation and those deposits are overlain by thick (100- 400 ft) heterogeneous glacial fluvial gravel, cobble, and sand deposits of the Hanford formation. The water levels range from 330 ft bgs in the south to 215 ft. bgs in the north. This setting has resulted in challenging data acquisition efforts in the past with variable success.

Emerging high resolution seismic data acquisition and processing technologies, developed in the last five to ten years, can provide additional subsurface data, especially beneath and between boreholes, for refining the geologic conceptual model and for determining preferred contaminant flow paths, particularly with regard to paleochannel deposits and faulting.

Current Tri-Party Agreement (TPA) milestones require accelerated remedial investigations and feasibility studies and integration of vadose and groundwater investigations as part of the Hanford Site Accelerated Cleanup effort. Refining the existing geological conceptual model is needed to respond to public and stakeholders expectations. Stakeholders have expressed concerns that borehole data alone is inadequate for sufficient characterization of the subsurface and have requested the use of emerging geophysical methods to better characterize the deep vadose zone and top of basalt surface at the Hanford Site.

Proposed Approach

Geophysical characterization of the 200 Areas will be performed using high resolution reflection seismic survey data acquisition to provide FH with the potential to better understand the subsurface stratigraphy and to evaluate the potential for preferred vertical and horizontal pathways for mobile contaminants in the deep vadose and groundwater intervals.

This proposal is for a pilot study to acquire, process and interpret shallow high resolution reflection seismic profiles over the 200 East Area to determine its usefulness in the identification of preferential flow paths to the river and the visualization of the spatial variability of subsurface strata for support the refining of the site geologic model. The proposed program design is provided in Figure 1.

Data will acquired and processed at a resolution depth of 75-1000 ft. These results will be evaluated by FH and an assessment will be made on the feasibility of further characterization by this geophysical method. If FH determines the approach to be feasible, approximately an additional 100 line miles of data may be initiated in a separate Phase II SOW.

Testing of various sampling arrays will be necessary to produce the best results. The contractor shall conduct field testing as needed to determine optimum data acquisition parameters. The Contractor shall provide Global Positioning System (GPS) surveyed locations of each line and associated data reference points for EM survey data recovery for site Geographic Information System (GIS) mapping and interpretation software applications.

Anticipated Results

Surface geophysics is a cost-effective method of obtaining subsurface lithological and structural detail not currently available beneath and between boreholes over a large area These data will provide detail to the existing geologic conceptual model for the 200 East Area including the identification of preferred flow paths and a better understanding of the potential for northward flow under future water table conditions. As a result, the following determinations might be made

(1) points of compliance to accelerate remedial decisions
(2) areas for focused remedy selection
(3) optimal monitoring and investigation well locations.

Schedule

Step 1. Data Acquisition Planning and Pilot Study Documentation - 3 months

Step 2. Phase I Pilot Study - Acquisition, Processing, and Interpretation – 6 months

Step 3. Phase II Expand Data Acquisition Area – To be determined in a separate proposal.

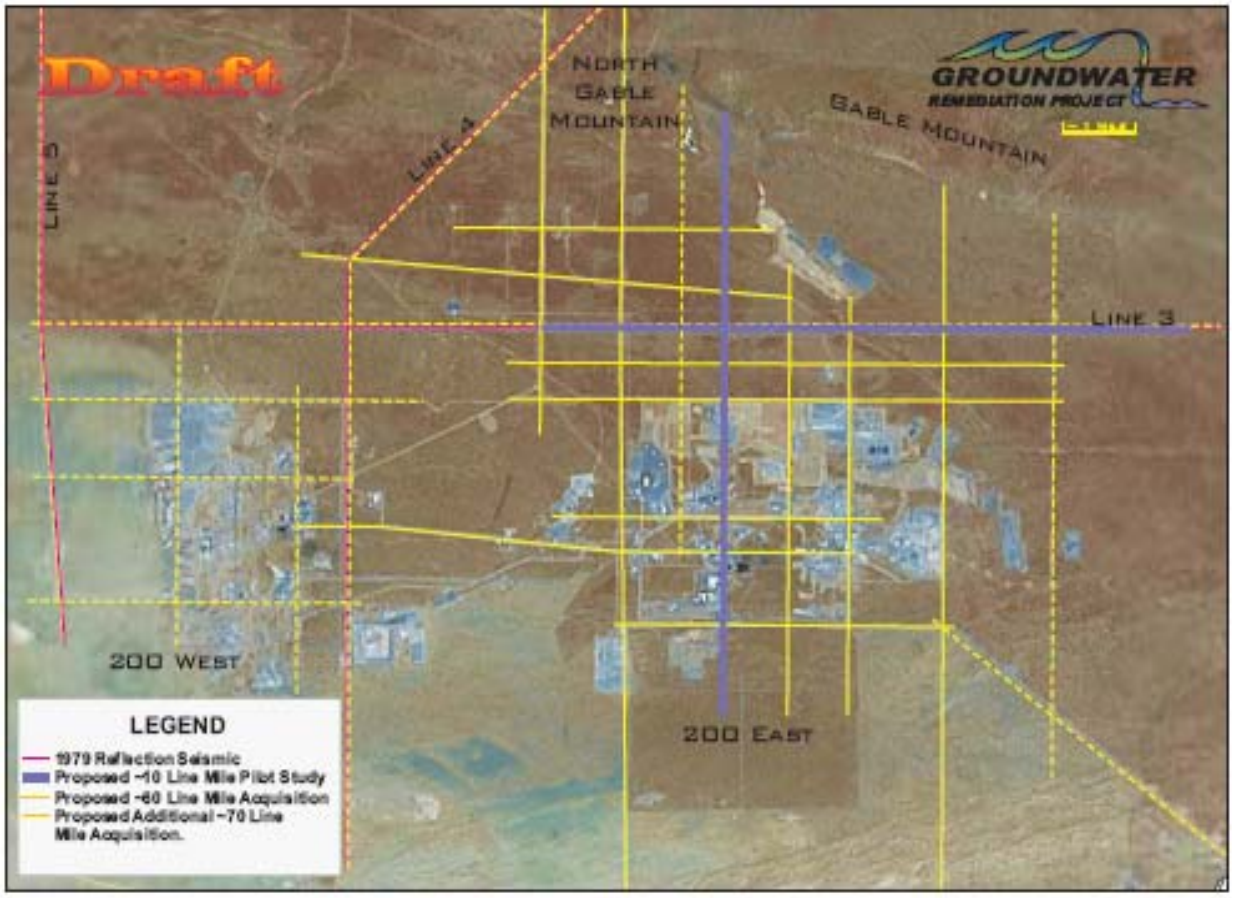

Figure 1 – Seismic Study Design Program – Pilot Study Lines in Blue

Budget

Step 1. Planning Documentation -$40,000

Step 2. Acquire, process and interpret 10 line miles of seismic data in 200 East and Gable Mtn. Gap Area at $30K per line mile = $300,000

Step 3. Expand Data Acquisition Area –TBD

Total Budget: $340K

Deliverables

1 – Acquisition, processing and interpretation of 10 line miles of shallow (75 ft.-1000 ft. below ground surface) high resolution seismic data.

2 – Data Summary Report