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Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

March 26, 2003

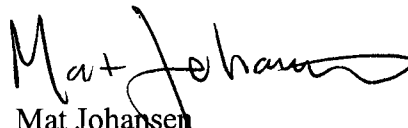
John Young
LANL Corrective Action Project Leader
State of New Mexico
Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303



Subject: Pilot Geophysical Studies in Mortandad Canyon

This letter transmits the report Pilot Geophysical Studies in Mortandad Canyon – Los Alamos National Laboratory, Los Alamos County, NM (enclosed). Note that these pilot studies were voluntarily conducted to evaluate the applicability of geophysical methods at LANL. While the results are promising, there remains uncertainty regarding the interpretation of these results at LANL and therefore we request NMED exercise caution in the interpretation and use of these pilot results. We intend to use the results as one source of information in developing the Groundwater Workplan for Mortandad Canyon scheduled for delivery to NMED this year.

We will contact you to schedule a briefing on the strengths and weaknesses of results and lessons learned from the pilot tests. Please call Tom Whitacre, at 665-5042, or myself, at 665-5046, with any questions or comments.


Mat Johansen
Project Manager

OPM:1MJ-004

Enclosure

cc w/o enclosures:

Tom Whitacre, OPM, LASO
Bob Enz, OPM, LASO
Joe Vozella, OFO, LASO
David Gregory, OPM, LASO
Herman Le-Doux, OPM, LASO
Doug Stavert, RRES-D, LANL, MS-J591
Charlie Nylander, RRES, LANL, MS-J591



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**Pilot Geophysical Studies in Mortandad Canyon -
Los Alamos National Laboratory
Los Alamos County, NM**

Geophex Job No. 1171

Submitted to:

Pacific Western Technologies, Ltd.
8338A Comanche NE
Albuquerque, NM 87110
for
Department of Energy
Office of Los Alamos Site Operations
528 35th Street
Los Alamos, NM 87544

Headquarters:

Geophex, Ltd.
605 Mercury Avenue
Raleigh, NC 27603-2343

Tel: (919) 839-8515
Fax: (919) 839-0096
Website: www.geophex.com
Email: geophex@geophex.com

September 2002

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 ***Geophex, Ltd.***
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Los Alamos County, NM**

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Executive Summary

Geophex was directed by the Department of Energy, through a contract with Pacific Western Technologies, Ltd., to conduct two pilot geophysical studies in Mortandad Canyon at the Los Alamos National Laboratory. Specifically, Geophex was asked to evaluate the applicability of two geophysical methods, DC resistivity and seismic reflection, at the Los Alamos National Laboratory. These studies were carried out during May and June of 2002. Both methods proved to be extremely successful at providing detail geologic information to depth (200 feet for resistivity and 13,000 feet for the seismic reflection) at this site. The detail provided by both methods can be used to refine the stratigraphic and groundwater models for Los Alamos National Laboratory.

Nine DC resistivity profiles were acquired throughout the canyon using a dipole-dipole configuration. Of these nine profiles, one profile (Line 1) was collected continuously for 9,290 ft. Resistivity data provides a method to detect "moist" zones in the alluvium and upper Bandelier Tuff of Mortandad Canyon. In the upper Bandelier Tuff, low resistivity zones are interpreted to be "wet" or clay-rich fracture zones. These fracture zones are supported by the fracture zone interpretations in the CMP reflection section. The largest spatial area of "moist" alluvium and bedrock occur in the vicinity of R-15.

Seismic pilot studies in Mortandad Canyon consisted of Vertical Seismic Profiles (VSPs) in R-15 & R-13 and a two-mile Common Midpoint (CMP) reflection profile along the axis of the canyon. VSP data provided an opportunity to:

- 1) Test surface impact sources to vibratory sources for generating seismic energy at LANL
- 2) Determine in situ velocity structure for the upper 1000 ft. of the stratigraphic section
- 3) Track the exact depth and nature of reflectivity in the stratigraphic section and incorporate it in the interpreted Mortandad Canyon CMP reflection section.

CMP data provide a view of structure along the axis of the canyon. Fracture zones and variations in thickness and elevation are present in the section. CMP data provide the ability to track these horizons more accurately than by simply extrapolating well information alone.

1.0 Introduction

Geophex was contracted by the Department of Energy to conduct two pilot geophysical studies in Mortandad Canyon at the Los Alamos National Laboratory. The purpose of these two studies was to evaluate the applicability of geophysical methods at the Los Alamos National Laboratory, specifically, DC resistivity and seismic reflection. These studies were carried out during May and June of 2002. The locations of all data types collected are shown on Plate 1.

Nine DC resistivity profiles were acquired throughout the canyon using a dipole-dipole configuration. Of these nine profiles, one profile (Line 1) was collected continuously for 9,290 ft. down the canyon starting near MCO-4. The remaining eight profiles (Lines 3-10) transect the canyon and intersect Line 1 at various locations. Profile depths varied based on the total length of line available. In the upper stretches of the canyon, the shortest profile (Line 3) penetrated approximately 20-30 ft. below surface level (bsl). The longest profiles (Line 1 & Line 10) imaged to 200 ft. bsl.

Seismic pilot studies in Mortandad Canyon consisted of Vertical Seismic Profiles (VSPs) in R-15 & R-13 and a two-mile Common Midpoint (CMP) reflection profile along the axis of the canyon.

This report discusses the acquisition parameters, processing steps and results for each of the two geophysical methods evaluated during these studies. This report also has an accompanying binder that contains eight plates (Plate 1, Plate 2, Plate 3, Plate 4, Plate 5A, Plate 5B, Plate 6A and Plate 6B).