Los Alamos Environmental Restoration Records Processing Facility

ER Record I.D.# 0015244

DATE RECEIVED: 06/09/93 PROCESSOR: MLB

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LOS ALAMOS NATIONAL LABORATORY

ENVIRONMENTAL RESTORATION
Records Processing Facility
ER Record Index Form
(Side 1 of 2)

Part I: Complete all fields; indicate if not applicable or appropriate; please write legibly.

DOCUMENT TO: Naomi Becker DOCUMENT DATE: 01/13/87

ORIGINATOR NAME: Gerald A. Sandness ORGANIZATION: Battelle - Pacific Northwest Laboratories

SYMBOL: — PAGE COUNT: 2

SUBJECT/TITLE: Review comments on draft report submitted by Roy F. Weston, Inc. regarding ground-penetrating radar (GPR) and magnetic surveys at Site F waste Disposal Area.

RECORD TYPE (Circle relevant type for primary record; type of attachments should be selected on *Keywords List*):

Analytical Data	Excerpt	Map	Plan	Study
Article	FAX	Memo	Procedure	Summary
Chain-of-Custody	Figure	Microform	Purchase Request	Telephone Record
Chart	Form	Notebook	Receipt Acknowledgment	TCC
Computer Output	Interview	Outline	Report	Transcription
Contract	Letter	Personal Notes	Review	Video
Controlled Distribution	List	Photo	SOW	Work Plan
Drawing	Logbook			Other

RECORD CATEGORY: P
(P for Programmatic or R for Reference)

RECORD PACKAGE #: —

RECORD FILMED (Y/N): Y

RECORD LOCATION: —
(Indicate location of record if not filmed.)

Part II: Complete all fields; indicate if not applicable or appropriate; please write legibly. Use *ER Record Index Form Attachment Sheet* if needed.

ATTACHMENTS FILMED (Y/N): —
(Were attachments to this record filmed?)

LOCATION: —
(Indicate location of attachments.)

TECH AREA(S)	ADS NO(S)	WBS NO(S)	STRUCTURE NO(S)/MDA
LIST RELEVANT TECH AREA(S).	LIST RELEVANT ADS NO(S).	LIST RELEVANT WBS NO(S).	LIST RELEVANT STRUCTURE NO(S)/MDA.
6	1111	1.4.2.6.1.14	6-MDA-F

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Part III: Complete all fields; indicate if not applicable or appropriate; please write legibly. Use *ER Record Index Form Attachment Sheet* if needed.

PRS NO(S)	DOCUMENT TO	ORIGINATOR NAMES
LIST RELEVANT PRS NO(S).	*LIST MULTIPLE RECIPIENTS.*	*LIST MULTIPLE ORIGINATORS.*

FILE FOLDER:

CORRECTION (Y/N):
(Is this a correction to a record previously processed?)

CORRECTED #:
(If answer is Yes, please give ER Record # for corrected record.)

CORRECTION DESCRIPTION (Optional):

SUPERCEDE: REPLACE: DELETE: ADD: REVISE:

ATTACHMENT LIST

KEYWORDS: Circle relevant KEYWORDS from the list below for ER Record #: 15244

MISCELLANEOUS (List other indexing criteria as necessary; please write legibly):
OU III, Ground Penetrating Radar (GPR), Magnetic

Abandon
Aboveground Tank
Absorption
Abstract
Accelerator
Access
Accident
Accumulation
Acid
Active
Administrative
ADS (Activity Data Sheet)
Adsorption
AEC (Atomic Energy Commission)
Aerial
Agenda
Agreement
Air
Alpha
Americium
Analysis
Analytical
AOC (Area of Concern)
Approval
Aquifer
ARAR (Applicable, Relevant, or Appropriate Requirements)
Archaeology
Archive
Area
Arsenic
Asbestos
Asphalt
Assessment
Audit

Backfill
Bacteria
Barium
Baseline
BCP (Baseline Change Proposal)
Beds
Bermed Area
Beryllium
Beta
Biology
Blank
Boiler
Boneyard
Bunker
Buried
Burn
Burn Site

Cadmium
Caisson
Calibration
Canyon
Capacitor
Caustic
CEARP (Comprehensive Environmental Assessment and Response Program)
Cement
CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act)
Certification
Cesium
Chain of Custody
Chamber
Change Control
Change Order
Charge
Chart
Checklist
Chemical
Chromium
Cleanup
Clearance
Closure
Clothing
CMI/RA (Corrective Measures Implementation/Remedial Action)
CMS/FS (Corrective Measures Study/ Feasibility Study)
Cobalt
Comment
Committee
Community Relations
Compliance
Compressed Gas
Computer Modeling
Computer Output
Concern
Concrete
Concurrence
Configuration
Construction
Container
Containment
Contaminant
Contract
Control
Controlled Distribution
Core
Corrective Action
Correspondence
Criteria
Cyanide

Data
Deadline
Debris
Decision Analysis
Decommission
Decontamination
Deficiency
Deliverable
Demolition
Description
Detection
Detonation
Development
Discharge
Disposal
Documentation
DOE (Department of Energy)
Dose
DQO (Data Quality Objectives)
Draft
Drainage
Drainline
Drawing
Drilling
Drop Tower
Drum
Dry Well
Dump
Duplicates

Ecology
Effluent
EIS (Environmental Impact Statement)
Emission
Engineering
Environmental
EPA (Environmental Protection Agency)
Equipment
ERDA (Energy Research and Development Administration)
Erosion
Error
ES&H (Environment, Safety, and Health)
Estimate
Evacuation
Evaluation
Evaporator
Excavation
Exclusion
Exhaust
Experiment
Explosive
Exposure
Extension
Extraction

Facility
Fallout
Farm
FAX
Fence
Field
Figure
Filter
FIMAD (Facility for Information Management, Analysis, and Display)
Finding
Fire
Firing Site
Fiscal
Fission
Five-Year Plan
Flow
Flow chart
Fluid
Form
Framework
Free
Fuel
Fume

Gamma
Gas
Generation
Generic
Geochemistry
Geology
Geophysics
Glass Beaker
Glove Box
Graph
Guidance
Gun

Handling
Hazardous
Health
HE (High Explosive)
History
Hole
Home Owner
Hood
HSWA (Hazardous and Solid Waste Amendments)
Hydrology
Hygiene

Impact
Implementation
Implosion
Impoundment
Inactive
Incident
Incinerator
Industrial
Infiltration
Injection Well
Injury
Inorganic
Inspection
Installation
Interim
Interim Action
Internal
Interview
Inventory
Investigation
IRM (Interim Remedial Measure)
Isotope
IWP (Installation Work Plan)

Lab Job
Laboratory
Lagoon
Land
Landfill
Laundry
Leach
Lead
Leak
Legal

Letter
Limit
Lines
Liquid
List
Log
Logbook

Magazine
Management
Manhole
Map
Material
MDA (Material Disposal Area)
Media
Meeting
Memo
Mercury
Metal
Microform
Minimization
Minutes
MIS (Management Information System)
Mixed Waste
MOA (Memo of Agreement)
Model
Modification
Money (Allocation, Appropriation, Budget, Cost, Funding, etc.)
Monitoring
Monthly Report
Mortar Impact Area
MOU (Memo of Understanding)
MSA (Major System Acquisition)

NEPA (National Environmental Policy Act)
NFA (No Further Action)
Nitrate
NMED (New Mexico Environment Department)
NMEID (New Mexico Environmental Improvement Division)
NOD (Notice of Deficiency)
Nonexplosive
Notebook
Notification
NPDES (National Pollutant Discharge Elimination System)
NRC (Nuclear Regulatory Commission)
Nuclear

Observation
Off-gas
Oil
Open
Open Burning
Operation
Order
Organic
Organization
OSHA (Occupational Safety & Health Administration)
OU (Operable Unit)
Outfall
Outline

Pad
PA/RFA (Preliminary Assessment /RCRA Facility Assessment)
PCB (Polychlorinated Biphenyl)
Permit
Personal Notes
Personnel
Personnel Qualification
Photo
Pilot Study
Pipe
Pit
Plan
Plant
Plutonium
Pollution
Polonium
Polaroid
Potential
Presentation
Prevention
Priority
Procedure
Program
Programmatic
Project
Project Leader
Propellant
Property
Proposal
Protection
Protocol
PRS (Potential Release Site)
Public
Pump
Purchase Request

Quality
QA (Quality Assurance)
QP (Quality Procedure)
Quarterly Report

Radioactive
Radiochemistry
Radionuclide
Radium
Rationale
RCRA (Resource, Conservation, and Recovery Act)
Reactor
Receipt
Acknowledgment
Recommendation
Reconnaissance
Records
Recovery
Recycle
Reduction
Reference
Regulation
Release
Remediation
Removal
Report
Request
Requirements
Research
Resin Bed
Resolution
Resource
Respirator
Response
Restoration
Restriction
Results
Review
Revision
RFI/RI (RCRA Facility Investigation/Remedial Investigation)
Risk
RPF (Records-Processing Facility)

Safety
Salamander
Salvage
Sample
Sampling Plan
Sanitary
Satellite
Schedule
Scope

Scrap
Scrap Detonation Site
Screening
Scrubber
Search
Security
Seep
Seminar
Semivolatile
Septic
Sewer
Shaft
Sheet
Shell
Shot
Silver
Site
Sludge
Soil
Solid
Solvent
SOP (Standard Operating Procedure)
SOW (Statement of Scope of Work)
Specific
Spill
Stack
Standard
Statistics
Steamline
Steel
Storage
Strontium
Structure
Study
Subcontractor
Subsurface
Summary
Sump
Support
Surface
Surveillance
Survey
Swipe
SWMU (Solid Waste Management Unit)
System

Table
Tank
Task
TCLP (Toxicity Characteristic Leaching Procedure)
TDD (Technical Document Description)

Technical
Technical Team
Technology
Telephone Record
Test Area
Testing
TLD (Thermoluminescent Dosimeter)
TOC (Table of Contents)
Townsite
Toxic
Tracking
Training
Transcription
Transfer
Transformer
Transport
Treatment
Trench
Trip Report
Tritium
TRU (Transuranic)
TSCA (Toxic Substances Control Act)
Tuballoy
Tuff

Underground
Uranium
Urine
USGS (United States Geological Survey)
UST (Underground Storage Tank)
Utility

Validation
Variance
VE (Value Engineering)
Ventilation
Verification
Video
Volatile
Volume

Warehouse
Waste
Water
WBS (Work Breakdown Structure)
Weapon
Well
Work
Working Group

Zinc

Battelle
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington
Telephone 509 375-3808

(2)

January 13, 1987

Naomi Becker
Environmental Surveillance
HSE-8, MS K490
Los Alamos National Laboratory
Los Alamos NM 87545

Dear Naomi:

As you requested, I have reviewed a draft report submitted by Roy F. Weston, Incorporated.* This report describes ground-penetrating radar (GPR) and magnetic surveys performed at the Site F waste disposal area at the Los Alamos National Laboratory. These surveys were intended to detect and map waste burial trenches and other related subsurface features or objects which are believed to be located within the surveyed area. The draft report listed the geophysical survey instruments used in the surveys, briefly described the procedures used for data collection and analysis, and summarized the results of Weston's interpretation of the data as of mid-July, 1986. The draft report discussed the GPR survey but did not include copies of the GPR data. Consequently, my assessment of the GPR survey is based mainly on our brief examination of the original paper-chart data records during my visit to LANL last fall.

Some of the comments presented in the following paragraphs consist of questions that occurred to me as I read the draft report. Others relate to what seem to be possible problems with the survey procedures or with Weston's interpretation of the data.. Because I have not had an opportunity to study the final version of this report, I don't know whether any of these points are addressed there; however, it is my understanding that the final version does not differ greatly from the draft.

1) The GPR data were collected along parallel survey lines oriented in both the north-south and the east-west directions. The spacing of these lines was 10 ft over most of the site and 5 ft within the fenced areas. Given the fact that GPR data collection was essentially continuous along the survey lines, these parameters were consistent with the objective of

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* Draft letter report from J. A. Williams to Don Diego Gonzalez: Results of the Geophysical Investigation Conducted at Los Alamos Labs Facility, Los Alamos, New Mexico

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locating relatively large deposits of waste materials. On the other hand, the line spacing was too large to permit reliable detection of moderate-sized individual objects. (The detection of individual objects was listed as an objective in the draft report.) It is not clear that a line spacing of less than 5 ft would be feasible at this site due to the presence of numerous trees.

2) Measurements of the magnetic field (vertical component) were made at 25-ft intervals in both the N-S and E-W directions. I believe that this data spacing is too large to be consistent with the objectives of this study. It would be more appropriate for a reconnaissance survey of a large site where large waste deposits are assumed to be present. In this case, it did not provide enough data to reliably detect individual objects or to adequately define the relatively small waste deposits that one would expect to find at this site. A 5-ft data spacing would have been more effective, particularly in adding needed detail to what turned out to be a rather generalized pattern of magnetic anomalies (see the attached map).

3) The effective (usable) depth penetration achieved by the radar unit at this site appears to be no more than two feet. Strong absorption of the radar signal was apparently caused by a high value of ground conductivity. This result was unfortunate given the low resolution and apparent complexity of the magnetic data. Good radar data at this site would be very helpful in defining trench or pit boundaries. Weston was perhaps a bit over-enthusiastic in describing the radar profiles as exhibiting good resolution and clearly defining subsurface features.

4) As you know, our examination of the radar profiles at your facility last fall resulted in the identification of an apparent problem with some of the radar data. Specifically, the reflection patterns obtained in orthogonal traverses of a given piece of ground were markedly different at locations in and around the larger of the two fenced areas. The differences seemed to be much greater than those which could be attributed to, say, the presence of linear reflectors with a consequent polarization-dependent reflectivity. It looked like there might have been a problem with mis-labeling the profiles.

5) The instrument used to perform the magnetic survey was a vertical-field flux gate magnetometer. The use of this type of magnetometer requires that care be taken in the orientation of the instrument in order to avoid erroneous readings. One assumes that care was taken, but no mention was made of the uncertainties associated with the data due to this factor.

6) The contour interval on the magnetic contour map was 100 gammas in the -100 to +100 gamma range and 500 gammas elsewhere. A smaller contour interval in, say, the -200 to +200 gamma range, might help to define the locations of some relatively small magnetic sources. On the other hand, the wide data spacing and uncertainty in the magnitude of the measurement errors lead one to question the significance of apparent low-amplitude anomalies.

7) Five minor (nit-picking?) comments:

i) The use of the term "diamagnetic" is inappropriate when referring to negative magnetic anomalies. The term app[illegible] to materials which exhibit negative values of magnetic suscept[illegible]ty, but not to a negative magnetic anomaly. The latter is [illegible]al part of the dipolar field produced by a permanently mag[illegible]ed object or by the magnetic polarization induced in a paramagnetic or diamagnetic object by an external (or ambient) magnetic field such as that of the earth. Except at the earth's magnetic poles, an induced magnetic dipole field will be tilted and will thus tend to exhibit a measurable negative component.

ii) The zero magnetic contour level does not necessarily define areas of undisturbed ground (no buried materials) as stated on page 5 of the draft report. A zero contour level can occur as a result of the dipolar nature of a magnetic anomaly and as a result of the superposition of positive and negative components of multiple anomalies.

iii) I assume that the "sinkhole" referred to in the report is a result of excavation or the collapse of buried materials rather than a sinkhole in the geological sense.

iv) The linear magnetic anomalies referred to on page 7 do not exist on what I assume is the latest version of the magnetic contour map. (The raw data do not indicate the presence of such anomalies either.)

v) Three of the (measured?) magnetic anomalies listed on page 7 are not shown on the contour map.

8) The magnetic contour map contains large areas where no data are shown. Were these areas inaccessible or otherwise difficult to survey?

9) The results of this study suggest that buried materials (possibly hazardous wastes) may be present outside the limits of the area surveyed so far, particularly on its west and north sides.

10) The fences enclosing the two areas presumed to be known waste disposal areas seemed to cause serious difficulties in both the radar and magnetic surveys. In the radar survey, the fences caused traverse lines to be truncated and repositioned, may have led to confusion in the labeling of certain traverse lines, and may have produced spurious reflections which could mask the desired signals. In the magnetic survey, the fences again caused problems with the traverse lines, but more importantly, produced large magnetic anomalies which may mask weaker anomalies associated with buried materials.

Concluding comments and recommendations:

This study has provided useful information relating to the possible locations of buried materials, some or all of which may be hazardous waste materials. On the other hand, I believe that it should be regarded as only a reconnaissance study because of the low-resolution character of the data and the consequent uncertainties in the identification of waste materials and the locations of those materials. Weston's recommendations for subsequent geophysical work at this site (page 10) are reasonable, but should probably be extended as follows:

i) The magnetic survey should be repeated with a much smaller data spacing. You now have a fast total-field magnetometer and a data recorder capable of rapidly collecting closely spaced magnetic data. This combination of instruments would greatly enhance the interpretability of the data and would eliminate uncertainties due to sensor orientation.

ii) An improved radar survey should be attempted. Better data might be obtained by scheduling the survey at a time when the ground has a minimum moisture content (to minimize absorption of the radar signal) and by utilizing digital data recording and processing techniques to enhance the quality of the data.

iii) Weston's results clearly indicate that the boundaries of the survey area should be extended. The extension should be sufficient to unambiguously enclose the area of possible waste deposition.

iv) The use of a ground conductivity meter such as the Geonics EM31 should be considered. This type of instrument may help to locate trench or pit boundaries.

v) The temporary removal of the fences at this site would substantially facilitate further geophysical measurements and would probably significantly improve the quality and interpretability of the collected data.

I hope that this review will be useful to you. Please feel free to call me if you would like to discuss this matter in greater detail.

Sincerely,

Jerry

Gerald A. Sandness, Ph.D.
Senior Research Scientist
Electro-Optic Systems Section

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