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SANDIA REPORT

SAND94–2340 • UC–600
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Printed April 1995

Off Site Demonstrations for MWLID Technologies

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Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550
for the United States Department of Energy
under Contract DE-AC04-94AL85000

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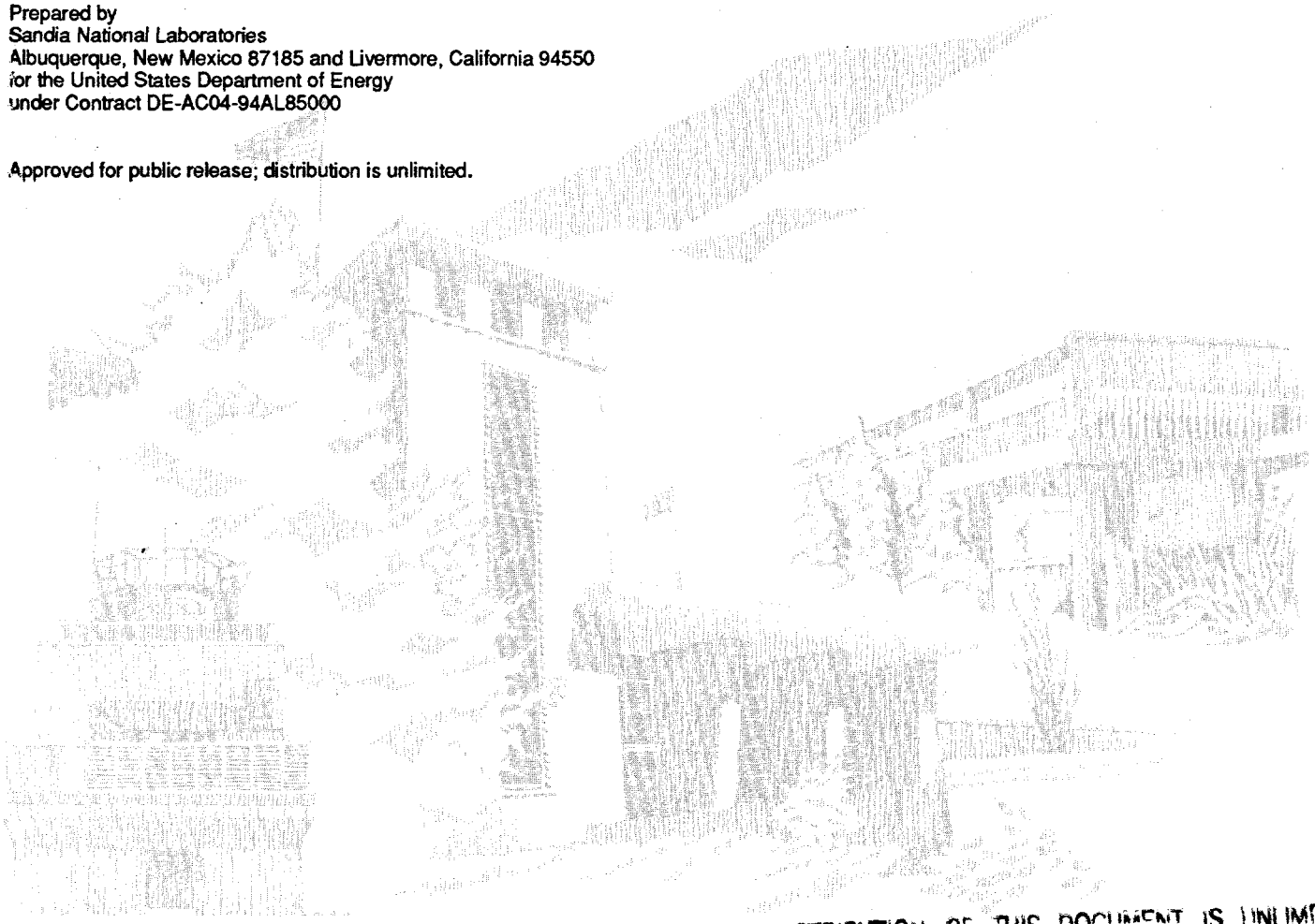

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Microfiche copy: A01

SAND94-2340
Unlimited Release
Printed April 1995

Distribution
Category UC-600

Off Site Demonstrations for MWLID Technologies

TTP# AL2-2-11-10

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ABSTRACT

The Off Site Demonstration Project for the Mixed Waste Landfill Integrated Demonstation (MWLID) was established to design off site demonstrations of MWLID-developed environmental restoration technologies that will facilitate the transfer, commercialization, and use of these technologies to the public and private sector. To meet these goals, the project focused on identifying the environmental restoration needs of hazardous waste and/or mixed waste landfill owners (Native American and municipal) and documenting potential demonstration sites and the contaminants present at each site. The project also assessed the environmental regulations that would effect MWLID technology demonstration activities at identified sites and developed preliminary off site demonstration program outlines for primary candidate sites.

ACKNOWLEDGEMENTS

The Off Site Demonstration Project for the Mixed Waste Landfill Integrated Demonstration (MWLID) was funded by the Office of Technology Development (OTD) under Department of Energy (DOE) contract number DE-AC04-94AL85000.

The authors thank Skip Chamberlain of the Environmental Management Office (EM-551) for his technical guidance and support.

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EXECUTIVE SUMMARY

Open demonstrations of technologies developed by the Office of Technology Development's (OTD's) Mixed Waste Landfill Integrated Demonstration (MWLID) should facilitate regulatory acceptance and speed the transfer and commercialization of these technologies. The purpose of the present project is to identify the environmental restoration needs of hazardous waste and/or mixed waste landfill owners within a 25-mile radius of Sandia National Laboratories (SNL). Most municipal landfills that operated prior to the mid-1980s accepted household/commercial hazardous waste and medical waste that included low-level radioactive waste.

The locations of hazardous and/or mixed waste landfills within the State of New Mexico were identified using federal, state, municipal and Native American tribal environmental records. The records reviewed included the U.S. Environmental Protection Agency (EPA) Superfund Program CERCLIS Event/Site listing (which includes tribal records), the New Mexico Environment Department (NMED), Solid Waste Bureau mixed waste landfill database, and the City of Albuquerque Environmental Health Department landfill database. Tribal environmental records are controlled by each tribal government, so each tribal environmental officer and governor was contacted to obtain release of specific site data beyond what is available in the CERCLIS listings.

A total of 249 municipal/private solid waste facilities controlled by 123 different owners were identified in the state of New Mexico. Of these 249 facilities, 134 are identified as either open or closed landfills. Twenty-two additional landfills located on Native American land were identified through a review of the CERCLIS list and contact with Native American Pueblo officials. The total number of landfills identified in New Mexico, excluding unreported sites located on Native American land and closed Department of Energy (DOE) and Department of Defense (DOD) sites, is 156.

Thirty-one municipal/private landfill sites were identified within a geographic region that includes the city of Albuquerque, NM and extends in all directions for 25 miles from SNL. Of the 31 sites, 17 are located within the Albuquerque city limits, eight are located on Native American land, two are located on Kirtland Air Force Base, and four are located in communities surrounding Albuquerque. Sixteen of these 31 landfills are closed. Portions of two other Pueblos, Zia and San Felipe, lie within our 25 mile radius; however, the "open dumps" recorded on the CERCLIS listing are not located within the radius of interest and have not been reviewed. Eighteen of the sites are on the CERCLIS Site/Event Listing for the state of New Mexico and are considered potential sites for the MWLID demonstrations.

The CERCLIS files on municipal and tribal landfills were reviewed for information pertaining to site contaminants and current site status. Contaminants identified at the various sites include volatile organic compounds, heavy metals, petroleum hydrocarbons, pesticides, PCBs, acids, and chlorinated solvents.

From the sites reviewed, five were recommended as potential sites for MWLID off site demonstrations. The five recommended sites were selected based on location, contaminants applicable to MWLID technologies, current site development, site visibility for promoting MWLID technologies, and size. Of the five sites selected, three are City of Albuquerque municipal landfills (Coronado, Los Angeles, and Eubank) and two are unnamed sites

(designated sites 3 and 4) located on Isleta Pueblo. Contaminants at these sites include chromium, commercial hazardous waste, petroleum products, halogenated volatile organics, tetrachloroethene, methane gas, and PCBs.

Preliminary off site demonstration program outlines were designed for two of the five sites, one on Native American land and one on municipal land. Applicable MWLID technologies for these sites include

- SitePlanner™/PLUME,
- Magnetometer Towed Array,
- Hybrid Directional Drilling,
- Cross Borehole Electromagnetic Imaging,
- X-Ray Fluorescence Spectroscopy,
- Stripping Analysis, and
- SEAMIST™/Vadose Zone Monitoring System.

Nomenclature

AMAFCA	Albuquerque Metropolitan Area Flood Control Authority
BBC	background benchmark concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information System
DOD	Department of Defence
DOE	Department of Energy
DS	Site Discovery (CERCLIS event type)
EPA	Environmental Protection Agency
HUD	Housing and Urban Development
LAL	Los Angeles Landfill
LCMS	Landfill Characterization and Monitoring System
IPS	Isleta Pueblo site
MCL	maximum contaminant level
MWLID	Mixed Waste Landfill Integrated Demonstration
NMED	New Mexico Environment Department
OTD	Office of Technology Development
PA	Preliminary Assessment (CERCLIS event type)
PCB	Polychlorinated Biphenyls
PI	principal investigator
ppb	parts per billion
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SEA	Science and Engineering Associates, Inc.
SI	Site Inspection (CERLCIS event type)
SNL	Sandia National Laboratories
TAL	targeted analite list
TCL	targeted compound list
VOC	volatile organic compound
XRF	X-Ray Fluorescence Spectroscopy

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INTRODUCTION

The Office of Technology Development (OTD) was established by the US Department of Energy (DOE) to develop and demonstrate new environmental restoration technologies. The OTD organized the Mixed Waste Landfill Integrated Demonstration (MWLID) to conduct demonstrations of these innovative technologies at contaminated sites.

The goal of the Off Site Demonstrations Project is to facilitate the transfer, use, and commercial application of MWLID/OTD-developed technologies. The present project was designed to identify the environmental restoration needs of mixed and/or hazardous waste landfill owners (Native American and municipal) and to document potential sites for the demonstration of MWLID technologies within 25 miles of Sandia National Laboratories (SNL) in Albuquerque, New Mexico.

Federal, state, municipal and available tribal environmental records were accessed to identify the locations of municipal landfills within New Mexico. The information sources are assembled in Appendix A.

This project identified solid waste facilities within the state, specifically those within a 25-mile radius of SNL. Records were researched to determine relevent statistics and regulator concerns regarding the landfill sites. From this list, five sites were selected as potential sites suitable for demonstration of MWLID technologies, and preliminary demonstration plans were designed for two of the sites.

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IDENTIFICATION OF LANDFILLS

State-Wide Landfill Statistics

A total of 249 solid waste facilities controlled by 123 different owners were identified using the databases of the New Mexico Environment Department, (NMED) Solid Waste Bureau and the City of Albuquerque Environmental Health Department. Of these 249 facilities—which include open and closed landfills, recycling sites, transfer stations, and incinerators—134 are identified as either open or closed landfills. Twenty-two additional landfills located on Native American land were identified through a review of the Comprehensive Environmental Response, Compensation, and Liability Act Information System Listing (CERCLIS) and contact with Native American officials. The total number of landfills identified in New Mexico, excluding unreported sites on Native American land and closed DOE and Department of Defense (DOD) sites, is 156. This number will increase as additional closed DOE, DOD, and tribal landfill sites are identified. An evaluation of sites within the confines of Kirtland Air Force Base identified an additional 42 closed landfill sites (See Appendix B).

Landfill Locations Within 25 Miles of Sandia National Laboratories - Albuquerque, NM

Thirty-one municipal or private landfill sites have been identified within a geographic region that includes the city of Albuquerque, NM and extends in all directions for 25 miles from SNL. This geographic area includes most of Bernalillo County and portions of Sandoval, Santa Fe, Torrence, and Valencia counties (Figure 1). Of the 31 sites (Table 1), 17 are located within the Albuquerque city limits, eight are located on Native American land, two are located on Kirtland Air Force Base, and four are located in counties surrounding Bernalillo County. Sixteen of the 31 identified landfills are closed.

Identified Landfills on the CERCLIS Site/Event Listing

A review of the CERCLIS Site/Event Listing for the state of New Mexico identified 18 sites with assigned Environmental Protection Agency (EPA) identification numbers. Eight of these sites, which are listed as "open dumps," are located on Native American land at Isleta Pueblo south of Albuquerque. The remaining ten are located on private or municipal land. A listing of the landfill owner, facility name, CERCLIS event type, and EPA identification number for each of the 18 sites is given in Table 2. Seventeen of the 18 sites are located outside the confines of DOE facilities and are considered to be potential MWLID technology demonstration sites.

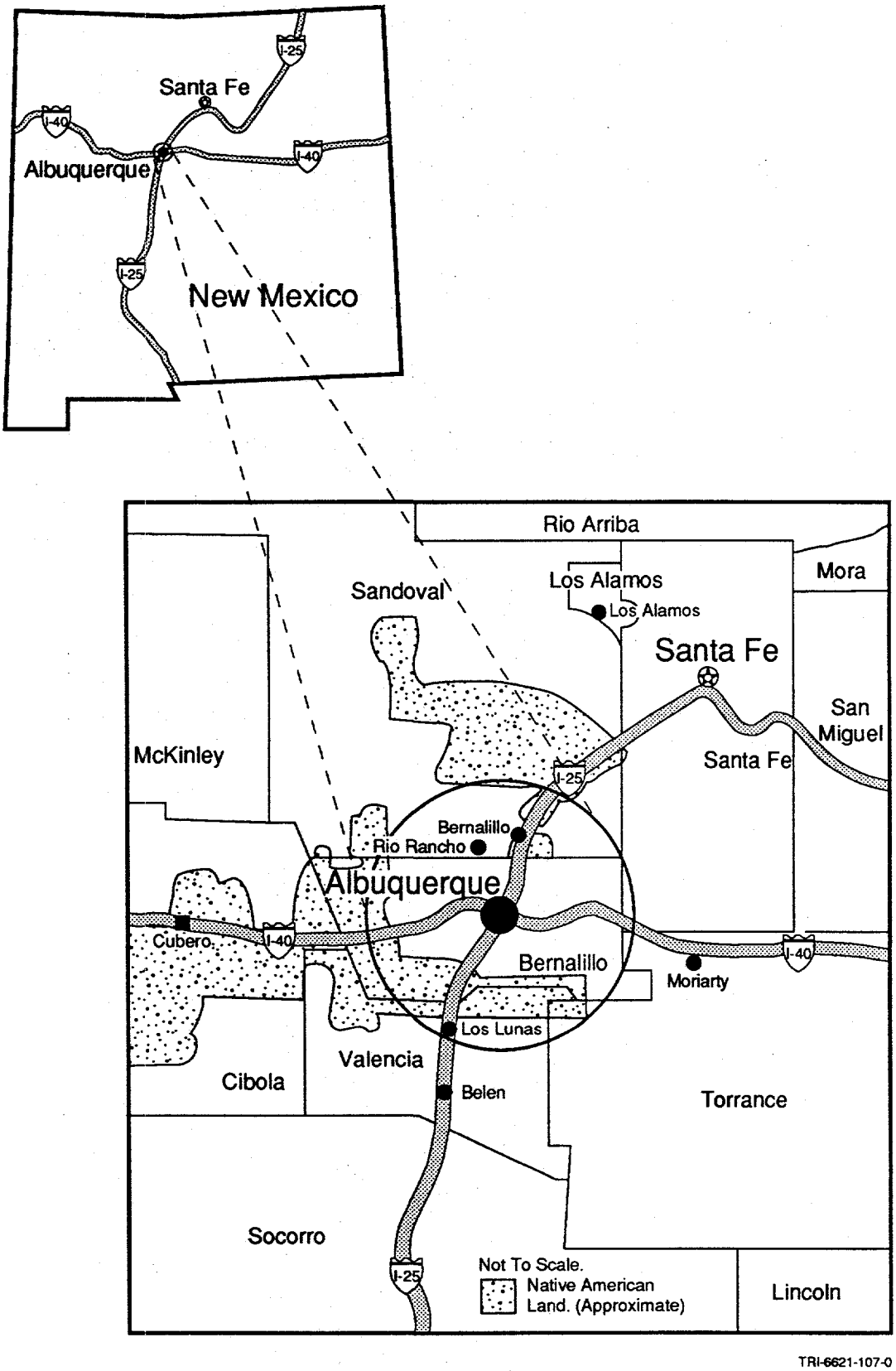

Figure 1. Geographic area for landfill indentification within 25 miles of Sandia National Laboratories - Albuquerque, NM.

Table 1. Landfills Within 25 Miles of Sandia National Laboratories

This table combines information from the New Mexico Environment Department state-wide solid waste landfill listing (2/9/94) and the New CERCLIS site/event listing (2/1/94).
(New listings are available from the New Mexico Environment Department every three months.)

Description for general abbreviations

F.FAC. - Federal Facility
EPA - U.S. Environmental Protection Agency
N/A - Not available
NOCL - Not on CERCLIS list

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	REGULATORY LEAD
	Municipal				
1	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Atrisco Landfill 99999 Corregidor Abq., NM 87105	Closed	A - Serving Population > 3000	EPA EPA EPA
2	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Coronado Landfill 9201 Pan American Abq., NM 87103	Closed	A - Serving Population > 3000	EPA EPA EPA State
3	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Los Angeles Landfill 4201 Paseo Del Norte Abq., NM 87113	Closed	A - Serving Population > 3000	EPA State State
4	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	South Yale Santiary Landfill 2920 Yale Blvd. Abq., NM 87114	Closed	A - Serving Population > 3000	EPA EPA EPA
5	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	South Broadway Landfill 6099 Sanitary Landfill Abq., NM 87103	Closed	A - Serving Population > 3000	EPA EPA EPA
6	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Eubank Sanitary Landfill Abq., NM 87123	Closed	A - Serving Population > 3000	EPA EPA EPA
7	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Sacremento Landfill Abq., NM 87113	Closed	A - Serving Population > 3000	EPA EPA EPA EPA

Table 1. Landfills Within 25 Miles of Sandia National Laboratories

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	REGULATORY LEAD
8	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Nazareth Landfill 99999 San Mateo Abq., NM 87113	Closed	A - Serving Population > 3000	EPA EPA EPA
9	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Cerro Colorado Landfill 10 Miles West of Albuquerque on I-40 Abq., NM	Open	A - Serving Population > 3000	NOCL
10	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Mesa Del Sol Landfill South Broadway Abq., NM	Closed	A - Serving Population > 3000	NOCL
11	Delphi Research, Inc. Ernest Montoya 701 Haines NW Abq., NM 87102	Delphi Research, Inc 701 Haines NW Abq., NM 87102	Closed	Research	NOCL
12	Kirtland Air Force Base Walter S. Darr III 542D CTW/EM KAFB, NM 87117	Kirtland AFB Landfill KAFB, NM 87117	Open	A - Serving Population > 3000	NOCL
13	City of Los Lunas Betty Behrend P.O. Box 1209 Los Lunas, NM 87031	Los Lunas Landfill 3.4 Miles West of Los Lunas, NM	Open	A - Serving Population > 3000	EPA EPA
14	Mountain Refuse Paul McComb 114 State Hwy 217 Tijeras, NM 87059	Mountain Refuse Tijeras, NM	Closed	A - Serving Population > 3000	NOCL
15	Riverside Construction George Sena Sr. 2503 Coors Blvd. SW Abq., NM	Riverside General Construction Abq., NM	Closed	C - Receives Only Construction and Demolition Debris	NOCL
16	Sandia National Laboratories Kathleen A. Carlson P.O. Box 5400 Abq., NM	Sandia National Laboratories Tech Area III KAFB, NM	Open	D - Industrial On-site Disposal Operation (Does Not Include Farms & Ranches)	EPA F. FAC.
17	Sandoval County Ron Abouseleman P.O. Box 40 Bernalillo, NM	Southern Sandoval County Landfill 1 Mile West of Hwy. 528 Rio Rancho, NM	Open	A - Serving Population > 3000	NOCL

Table 1. Landfills Within 25 Miles of Sandia National Laboratories

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	REGULATORY LEAD
18	Seay Brothers, Inc. Mike Seay P.O. Box 80750 Abq., NM 87198	Seay Brothers 2 Miles N. of Rio Bravo on Coors Abq., NM	Open	C - Receives Only Constructionand Demolition Debris	NOCL
19	Southwest Landfill Raphael Valdepana 5816 Pajarito Road SW Abq., NM	Southwest Landfill on West Mesa Abq., NM	Withdrawn	C - Receives Only Construction and Demolition Debris	NOCL
20	Santucci P.O. Box 15700 Rio Rancho, NM 87174	Rio Rancho Landfill Rio Rancho, NM	Open	A - Serving Population > 3000	NOCL
21	Russ Pitney Earthmoving Abq., NM	South of Tramway Near I-25 Abq., NM	Open	C - Receives Only Construction and Demolition Debris	NOCL
22	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Nine Mile Hill Landfill North of I- 40 At Nine Mile Hill Abq., NM	Closed	A - Serving Population > 3000	NOCL
23	Historical Landfill No Ownership or Dates of Use Given	Old City River Landfill Woodward and Second St. SW Abq., NM	Closed	A - Serving Population > 3000	NOCL
	NATIVE AMERICAN LANDS				
24	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Isleta Open Dumps (Wall-Colmony Machine Works) Isleta Pueblo, NM 87022	Closed	Unclassified	Tribal
25	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 1 - N/2,NW/4, Sec.3 and NE/4,NE/4 of Sec. 4-T8N-R2E. West of Coors Rd. and Los Padillas Cemetary	Closed	Unclassified	Tribal
26	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 2 - NE/4 of Sec.28-T8N-R2E West of U.S. Interstate 25	Closed	Unclassified	Tribal
27	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 3 - NW/4,SW/4 Sec.23-T8N-R2E and N/2,SE/4 Sec. 22-T8N-R2E, south of S.R.45 between U.S. Interstate 25 and Coors Rd.	Closed	Unclassified	Tribal

Table 1. Landfills Within 25 Miles of Sandia National Laboratories

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	REGULATORY LEAD
28	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 4 - E/2,NE/4 Sec. 27-T8N-R2E near intersection of AT&T and Santa Fe Railroad and El *Camino Real.*	Closed	Unclassified	Tribal
29	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 5 - SE/4,NE/4 Sec.24-T8N-R2E and SW/4,NW/4 Sec.19-T8N-R3E on both sides of the light duty road going east from Isleta Pueblo	Closed	Unclassified	Tribal
30	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 6 - SE/4 Sec.9-T7N-R2E and NE/4 Sec16-T7N-R2E along both sides of the Belen Highline Canal and the Belen Ditch	Closed	Unclassified	Tribal
31	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 7 - SE/4,SE/4 Sec. 31-T8N-R3E and NE/4,NE/4 Sec.6-T7N-R3E south of Canyon Wash and east of Chical	Closed	Unclassified	Tribal

Table 2. Landfills Within 25 Miles of Sandia National Laboratories that are on the CERCLIS Listing

This table combines information from the New Mexico Environment Department state-wide solid waste landfill listing (2/9/94) and the New CERCLIS site event listing (2/1/94).
(New listings are available from the New Mexico Environment Department every three months.)

Description for the CERCLIS event type abbreviations

DS1 - Site Discovery
ES1 - Expanded Site Inspection
HR1 - Preparation for Hazardous Ranking Documentation
NF1 - Finalized on National Priority List
NP1 - Proposed for National Priority List
PA1 - Preliminary Assessment
RV1 - Removal Action
SI1 - Site Inspection
SI2 - Additional Site Inspection
NO FRAP - No Further Remedial Action Planned
L. Prior - Lower Priority
H. Prior - Higher Priority

Description for general abbreviations

F. FAC. - Federal Facility
EPA - U.S. Environmental Protection Agency
N/A - Not available
NOCL - Not on CERCLIS list

Table 2. Landfills Within 25 Miles of Sandia National Laboratories that are on the CERCLIS Listing

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	CERCLIS EVENT TYPE	EVENT START DATE	EVENT COMPLETION DATE	REG. LEAD	EPA ID#	CONTAMINANT DESCRIPTION
	Municipal									
1	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Atrisco Landfill 99999 Corregidor Abq., NM 87105	Closed	A - Serving Population > 3000	DS1 PA1 - NO FRAP SI1 - NO FRAP	N/A 6/1/82 9/21/92	4/1/82 6/1/82 9/21/92	EPA EPA EPA	NMD980622674	No contamination data in file. Listed on CERCLIS because of potential contamination from disposal of solvents etc. when the site was open. Estimated 9% of waste disposed of in landfill was hazardous waste.
2	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Coronado Landfill 9201 Pan American Abq., NM 87103	Closed	A - Serving Population > 3000	DS1 PA1 - NO FRAP SI1 - L. Prior SI2 - NO FRAP	N/A 7/1/82 9/21/92 N/A	4/1/82 7/1/82 9/21/92 4/26/93	EPA EPA EPA State	NMD980622708	Site is now owned by Philips (Signetics) and falls under RCRA regulations. Trichloroethelene detected in ground water. Methane detected in methane monitoring system.
3	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Los Angeles Landfill 4201 Paseo Del Norte Abq., NM 87113	Closed	A - Serving Population > 3000	DS1 PA1 - NO FRAP SI1 - L. Prior	N/A 4/1/80 4/1/86	2/1/80 4/1/80 4/1/86	EPA State State	NMD980864219	Chlorinated solvents (Causing groundwater contamination - NMED)
4	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	South Yale Santiary Landfill 2920 Yale Blvd. Abq., NM 87114	Closed	A - Serving Population > 3000	DS1 PA1 - L. Prior SI1 - H. Prior	N/A 7/1/82 6/1/82	4/1/82 7/1/82 6/1/82	EPA EPA EPA	NMD980622716	Chlorinated solvents (Causing groundwater contamination - NMED)
5	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	South Broadway Landfill 6099 Sanitary Landfill Abq., NM 87103	Closed	A - Serving Population > 3000	DS1 PA1 - NO FRAP SI1 - L. Prior	N/A N/A 7/1/82	1/1/80 9/1/81 7/1/82	EPA EPA EPA	NMD980622690	Phenols detected. Other concerns (but not detected in groundwater) include organic solvents, heavy metals, Toluene, benzene, cyanides, and acids.

Table 2. Landfills Within 25 Miles of Sandia National Laboratories that are on the CERCLIS Listing

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	CERCLIS EVENT TYPE	EVENT START DATE	EVENT COMPLETION DATE	REG. LEAD	EPA ID#	CONTAMINANT DESCRIPTION
6	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Eubank Sanitary Landfill Abq., NM 87123	Closed	A - Serving Population > 3000	DS1 PA1 - NO FRAP SI1 - L. Prior	N/A N/A 6/1/82	4/1/82 7/1/82 6/1/82	EPA EPA EPA	NMD980622666	Listed on CERCLIS because of potential contamination from disposal of solvents and chlorides, etc. when the site was open. Estimated 9% of waste disposed of in landfill was hazardous waste. No solvents or chlorides have been detected in ground water.
7	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Sacremento Landfill Abq., NM 87113	Closed	A - Serving Population > 3000	DS1 PA1 - NO FRAP SI1 - L. Prior SI2 - NO FRAP	N/A 7/1/82 9/23/92 N/A	4/1/82 7/1/82 9/23/92 6/28/93	EPA EPA EPA EPA	NMD980864227	Lead detected in ground water. Pesticides/PCB's detected in soil/sediment samples.
8	City of Albuquerque Dr. Gene Romo P.O. Box 1293 Abq., NM 87103	Nazareth Landfill 99999 San Mateo Abq., NM 87113	Closed	A - Serving Population > 3000	DS1 PA1 - L. Prior SI1 - NO FRAP	N/A 7/1/82 9/28/92	4/1/82 7/1/82 9/28/92	EPA EPA EPA	NMD980622682	Manganese, zink, di-n-butylphthalate, and aroclor-1248 in concentrations > 3X background concentrations in groundwater.
9	City of Los Lunas Betty Behrend P.O. Box 1209 Los Lunas, NM 87031	Los Lunas Landfill 3.4 Miles West of Los Lunas, NM	Open	A - Serving Population > 3000	DS1 PA1 - NO FRAP	N/A 8/1/81	9/1/81 8/1/81	EPA EPA	NMD980750103	Suspected pesticide disposal. No data in file.
10	Sandia National Laboratories Kathleen A. Carlson P.O. Box 5400 Abq., NM	Sandia National Laboratories Tech Area III KAFB, NM	Open	D - Industrial On-site Disposal Operation (Does Not Include Farms & Ranches)	DS1 PA1 - L. Prior.	N/A N/A	1/1/83 2/1/90	EPA F. FAC.	NM5890110518	No file available through NMED.

Table 2. Landfills Within 25 Miles of Sandia National Laboratories that are on the CERCLIS Listing

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	CERCLIS EVENT TYPE	EVENT START DATE	EVENT COMPLETION DATE	REG. LEAD	EPA ID#	CONTAMINANT DESCRIPTION
	NATIVE AMERICAN LANDS									
11	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Isleta Open Dumps (Wall-Colmony Machine Works) Isleta Pueblo, NM 87022	Closed	Unclassified	DS1 RV1	N/A N/A	3/3/92 1994	Tribal	NM0000016626	Chromium from Wall-Colmony Machine Works. Currently in final phase of remediation.
12	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 1 - N/2,NW/4, Sec.3 and NE/4,NE/4 of Sec. 4-T8N-R2E. West of Coors Rd. and Los Padillas Cemetary	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products
13	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 2 - NE/4 of Sec.28-T8N-R2E West of U.S. Interstate 25	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products
14	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 3 - NW/4,SW/4 Sec.23-T8N-R2E and N/2,SE/4 Sec. 22- T8N-R2E, south of S.R.45 between U.S. Interstate 25 and Coors Rd.	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products, potentially chromium waste from Wall-Colmony Machine works (on CERCLIS list) in last stages of contaminated soil removal. (Landfill may have been open during the machine works' early years.)

Table 2. Landfills Within 25 Miles of Sandia National Laboratories that are on the CERCLIS Listing

#	OWNER	FACILITY NAME AND ADDRESS	STATUS	LANDFILL CLASSIFICATION	CERCLIS EVENT TYPE	EVENT START DATE	EVENT COMPLETION DATE	REG. LEAD	EPA ID#	CONTAMINANT DESCRIPTION
15	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 4 - E/2,NE/4 Sec. 27-T8N-R2E near intersection of AT&T and Santa Fe Railroad and El Camino Real.	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products, suspect chromium waste from Wall-Colmony Machine works.
16	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 5 - SE/4,NE/4 Sec.24-T8N-R2E and SW/4,NW/4 Sec.19-T8N-R3E on both sides of the light duty road going east from Isleta Pueblo	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products
17	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 6 - SE/4 Sec.9-T7N-R2E and NE/4 Sec16-T7N-R2E along both sides of the Belen Highline Canal and the Belen Ditch	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products
18	Isleta Pueblo Box 1270 Isleta Pueblo, NM 87022	Site 7 - SE/4,SE/4 Sec. 31-T8N-R3E and NE/4,NE/4 Sec.6 T7N-R3E south of Canyon Wash and east of Chical	Closed	Unclassified	DS1	N/A	3/3/92	Tribal	NM0000016626	Household, commercial hazardous waste, petroleum products

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SITE REGULATORY ASSESSMENT

Isleta Pueblo Landfill Sites

The sites located within the Isleta Pueblo Reservation are under the jurisdiction of the Isleta Pueblo Tribal Council. As stated in Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Indian tribal governments are granted the same status as state governments. The regulatory driving agency is the EPA, and regulations governing site assessment and remediation operations include:

- CERCLA,
- Resource Conservation and Recovery Act (RCRA),
- Safe Drinking Water Act, (SDWA)
- Clean Water Act,
- Clean Air Act, and
- Tribal environmental regulations, which have the option of being more stringent than federal regulations.

Discussions with the primary tribal environmental contact and environmental protection specialist indicate that Isleta Pueblo follows federal environmental regulations, with the exception of the Clean Water Act. Tribal water-quality standards are more stringent than those outlined in the Clean Water Act.

Any proposed site assessment and/or remediation activities will have to be approved by the Tribal Council.

City of Albuquerque Landfill Sites

The regulatory driving agency for the City of Albuquerque is the EPA, adnministered through the NMED. Regulations governing site assessment and remediation activities include:

- CERCLA,
- RCRA,
- SDWA
- Clean Water Act,
- Clean Air Act,
- New Mexico Solid Waste Management Regulations (based on RCRA), and
- City of Albuquerque Solid Waste Regulations.

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POTENTIAL SITES SELECTED FOR OFFSITE DEMONSTRATION

Five of the 31 identified landfill sites were selected as potential demonstration sites. Site selection was based upon location and presence or suspected presence of heavy metals and volatile organic compounds. (VOCs) Two of these sites are located on Native American land. Three sites are City of Albuquerque municipal landfills, one of which is no longer owned by the City of Albuquerque. A brief site description and map of each potential demonstration site follows.

Isleta Pueblo Site No. 3

Site Description

Isleta Pueblo Site No. 3 (IPS No. 3) is approximately 115 acres in size. It is located 0.5 miles west-southwest of the town of Isleta and approximately one mile west of the Rio Grande (Figure 2). The site is bound on the north by New Mexico State Road (NMSR) 45 and on the east by Coors Road/El Camino Real. The south and west sides of the site are bound by undeveloped acreage. Access to the site is by numerous streets that also provide access to residences and to the Wall-Colmony Machine Works adjacent to and east of the site. Terrain slopes to the east and southeast. On site vegetation consists of native grasses and some trees. Depth to groundwater at the site is estimated to be approximately 100 feet. The site is currently developed with Housing and Urban Development (HUD) housing and associated infrastructure along NMSR 45.

Site Specific Regulatory Events

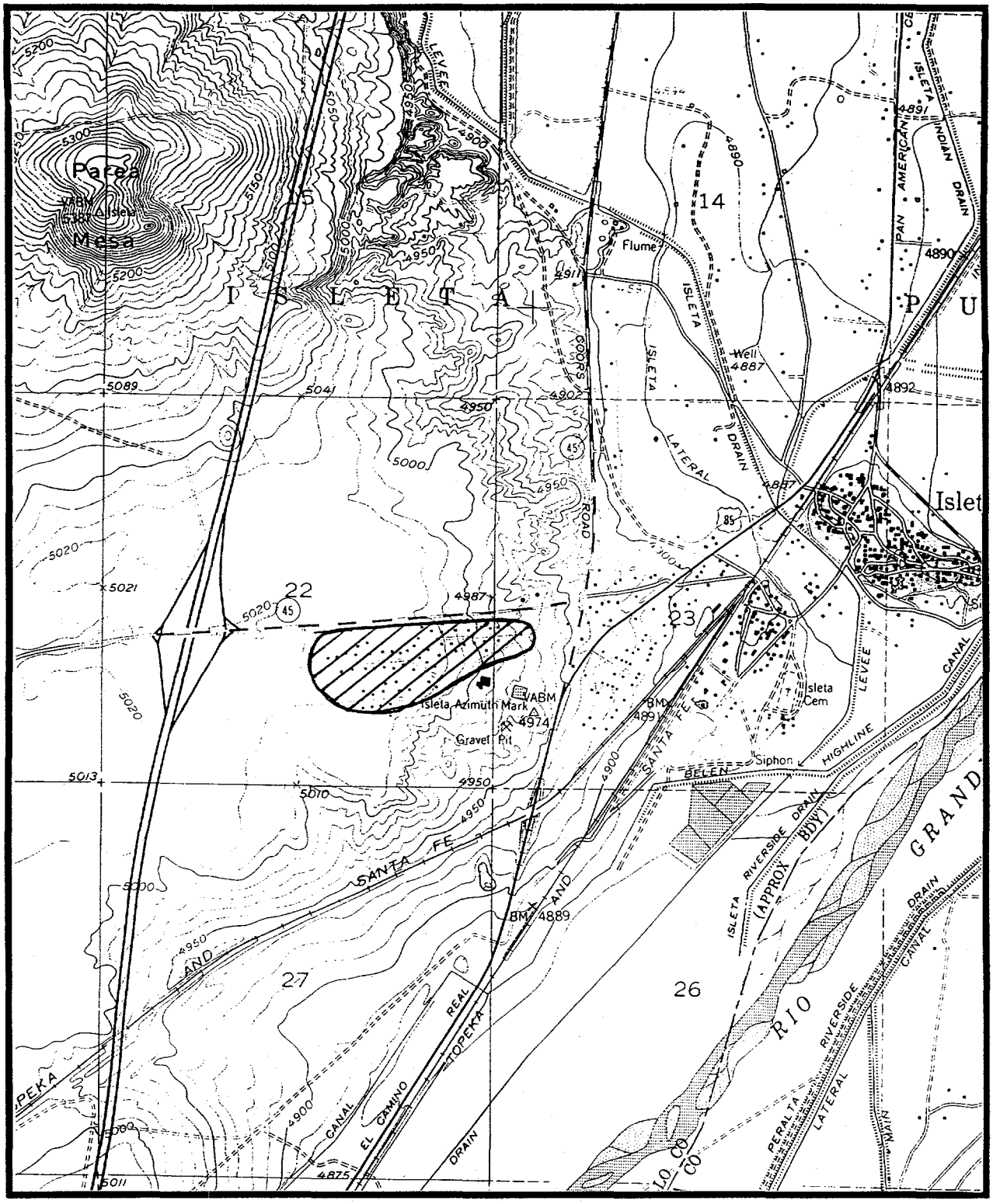
Site Discovery (DS1) completed on 3/31/92.

Contaminants Present

This landfill is the Pueblo's oldest dumpsite. The site's opening date is unrecorded. It was utilized by Pueblo residents until closure in 1974. The dump may contain chromium waste from the adjacent Wall-Colmony Machine Works, which initiated operations at approximately the same time that the dump was closed. Other suspected contaminants, based on 1983 estimates of materials placed in City of Albuquerque landfills (Appendix C), include household and commercial hazardous waste and petroleum products.

Applicable Assessment Technologies for Off Site Demonstration

- SitePlanner™/PLUME
- Magnetometer Towed Array
- Hybrid Directional Drilling



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Approximate area of landfill site.

Figure 2. Site location map Isleta Pueblo Site #3.

- Cross Borehole Electromagnetic Imaging
- X-Ray Fluorescence Spectroscopy
- Stripping Analysis

These technologies are described later in the report.

Stakeholder Issues

IPS No. 3 is a source of major concern to the Pueblo Council because it was developed with residential housing after closure. The development of the area also restricts site access for some of the technologies and prevents maintaining limited access to the site during assessment.

Because tribal water-quality standards are more stringent than those outlined in the Clean Water Act, water quality is a primary stakeholder issue.

Because of the multilateral nature of the tribal government, the principal investigator (PI) may be required to interface with different tribal officials during the course of a demonstration. In addition, work slowdowns or schedule delays are probable if residents decide to re-evalute their participation in the project or if ceremonial events conflict with demonstration schedules.

Isleta Pueblo Site No. 4

Site Description

Isleta Pueblo Site No. 4 (IPS No. 4) is approximately 25 acres in size. It is located one mile southwest of the town of Isleta and approximately 0.75 miles west of the Rio Grande, near the intersection of the AT and SF Railroad and El Camino Real, in the northwest quarter of section 26-T8N-R2E (Figure 3). The site is accessible from the east by El Camino Real. Terrain is irregular and slopes slightly to the south. On site vegetation consists of native grasses and sage. Depth to groundwater at the site is estimated at approximately 25 feet. The dump site trenches are now closed, and there is no commercial or residential development on site.

Site Specific Regulatory Events

Site Discovery (DS1) completed on 3/3/92.

Contaminants Present

This dump site was utilized during the mid-1970s for an unrecorded period of time. No source records exist for the materials disposed at this site. It is assumed that the majority of the disposed materials originated from within the Pueblo; however, it is probable that materials from commercial operations off the Pueblo were also disposed at this site. The primary suspected contaminant is chromium waste from the Wall-Colmony Machine Works, which was operational during the 1970s and is located approximately 0.25 miles north of the site. Other suspected contaminants, based on 1983 estimates of materials placed in City of Albuquerque landfills, include household and commercial hazardous waste and petroleum products.

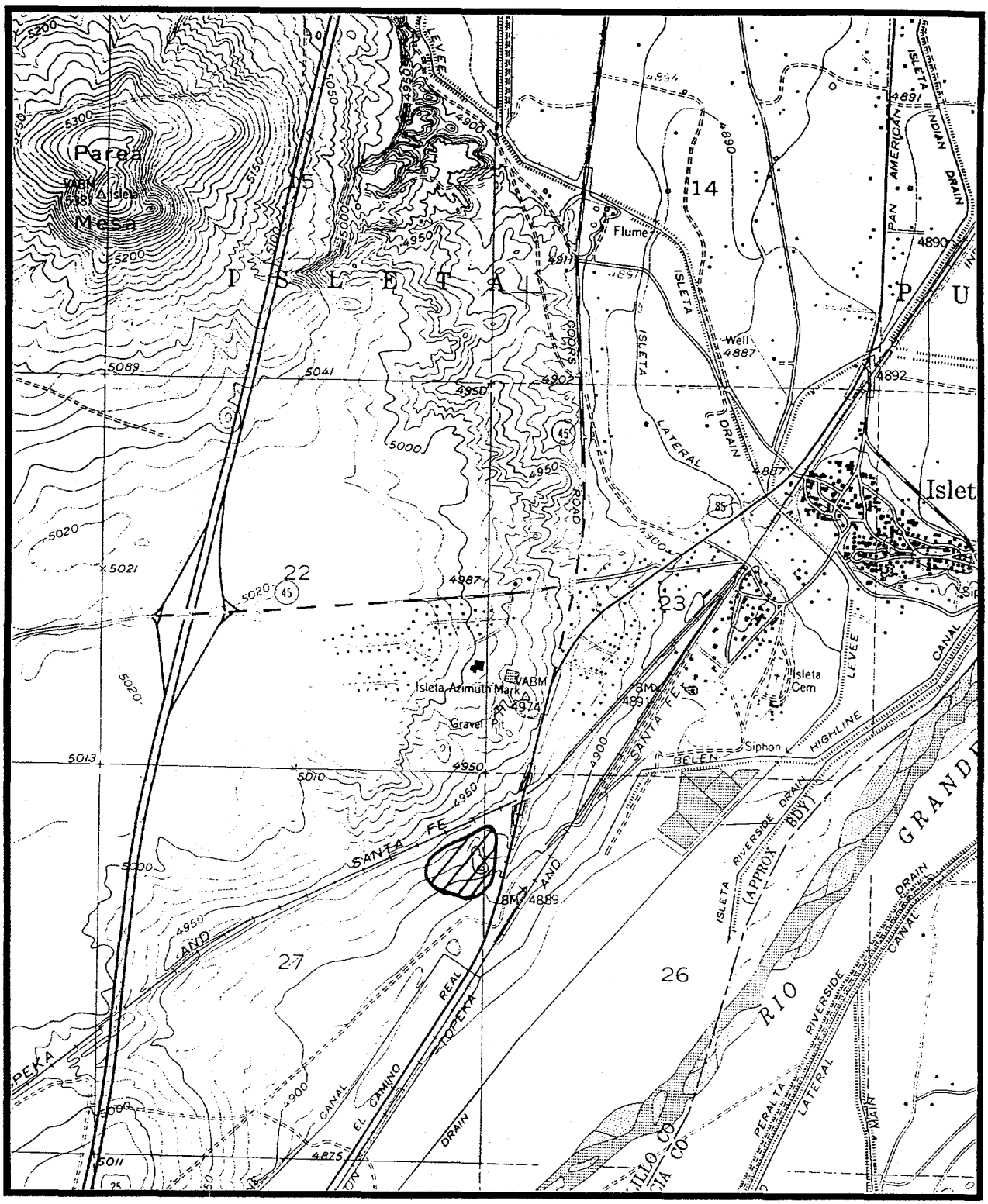


Figure 3. Site location map Isleta Pueblo Site #4.

Applicable Assessment Technologies for Off Site Demonstration

- SitePlanner™/PLUME
- Magnetometer Towed Array
- Hybrid Directional Drilling
- Cross Borehole Electromagnetic Imaging
- X-Ray Fluorescence Spectroscopy
- Stripping Analysis

Stakeholder Issues

Because tribal water-quality standards are more stringent than those outlined in the Clean Water Act, water quality is a primary stakeholder issue.

The nature of the tribal government is such that during the course of a demonstration, the PI may be required to interface with different tribal officials. In addition, work slowdowns or schedule delays are probable if residents decide to re-evalute their participation in the project or if ceremonial events conflict with demonstration schedules.

City of Albuquerque Eubank Landfill

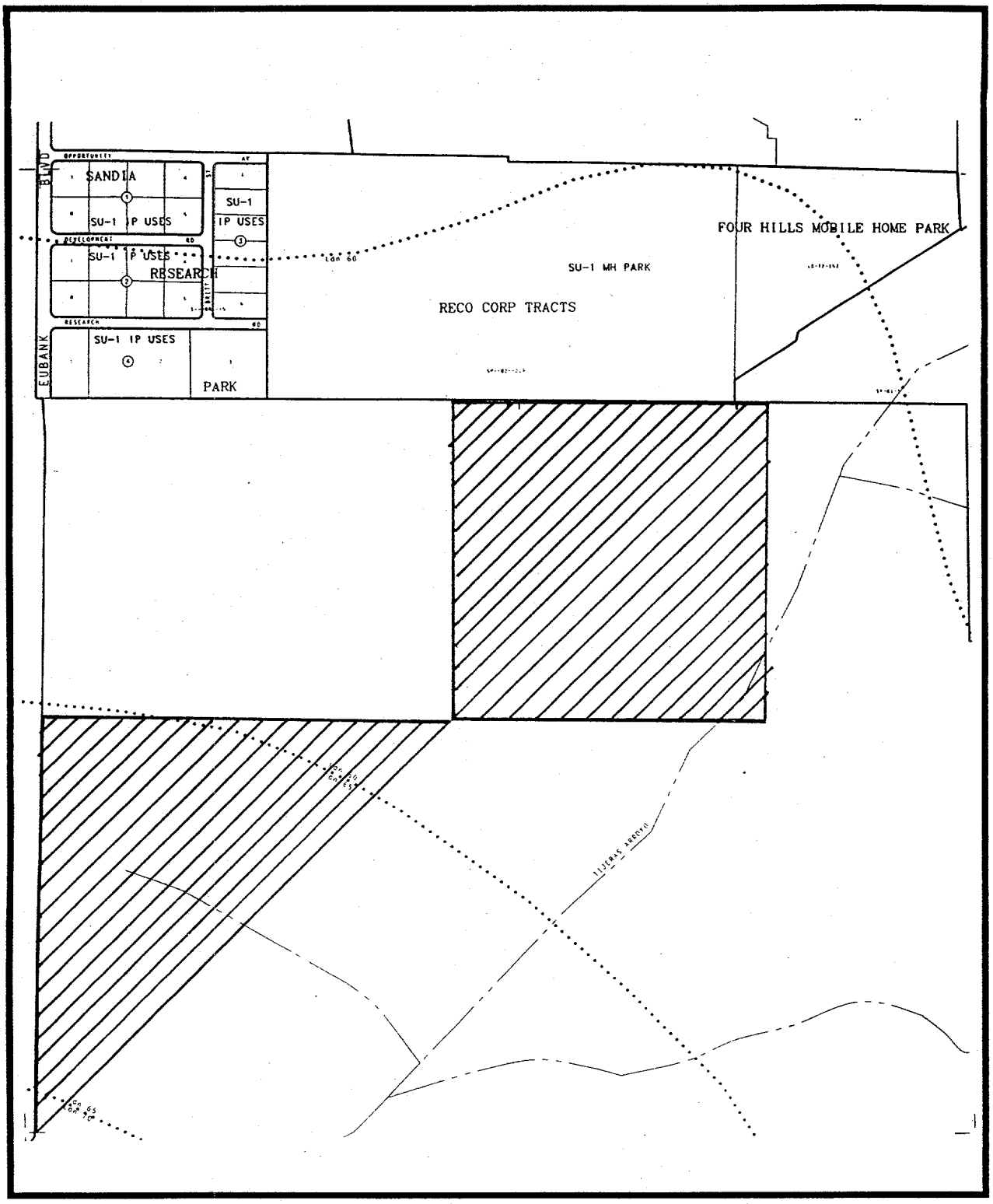
Site Description

The Eubank Landfill is located in the southeast quadrant of Albuquerque (grid M-21-Z of the Albuquerque Zone Atlas) as shown in Figure 4. The landfill encompasses approximately 100 acres and was utilized for disposal of household and commercial refuse from 1967 until closure in 1978. The site is bound to the north by the Four Hills Mobile Home Park, some undeveloped land, an electric power station, and the Sandia Research Park. To the west, south, and east the site is bound by Kirtland Air Force Base. The site is accessible from the south end of Eubank Boulevard and from Kirtland Air Force Base. Tijeras Arroyo runs in a northeast to southwest orientation adjacent to the southeast border of the site. The site is nearly flat with a slight slope to the south and southeast. On site vegetation consists of native grasses, weeds, sage, and several medium-size trees. Groundwater at the site is approximately 400 feet below the surface and flows in a south and southwest direction (SI1). Currently the surface of the site is undeveloped.

Site Specific Regulatory Events

The Eubank Landfill is owned by the City of Albuquerque and is currently listed as a low-priority CERCLA site (ED # NMD 980622606). CERCLIS event types listed to date include:

- Site Discovery (DS1) completed on 4/1/82,
- Site Inspection (SI1) completed on 6/1/82, and
- Preliminary Assessment (PA1) completed on 7/1/82.



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Approximate area of landfill site.

Figure 4. Site location map city of Albuquerque Eubank Landfill.

Contaminants Present

The preliminary site assessment completed in 1982 identified liquid solvents, possibly methelyne chloride, chemical wastes, commercial wastes, and residential waste. There is no leachate collection system at this landfill (SI1).

Applicable Assessment Technologies for Off Site Demonstration

- SitePlanner™/PLUME
- Magnetometer Towed Array
- Hybrid Directional Drilling
- Cross Borehole Electromagnetic Imaging
- SEAMIST™/Vadose Zone Monitoring System

Stakeholder Issues

The following stakeholder issues have been identified:

- A subdivision, Willow Wood, is being developed to the north and northeast of the site.
- Kirtland Air Force Base has water supply wells in the down hydraulic-gradient direction from the site. Well #8 , 0.5 miles southwest of the landfill, and well #11, 1 mile southeast of the landfill, were sampled in 1982 and 1981 respectively. No significant levels of contamination were found in either well. At the time of the site inspection, it was recommended that the EPA advise Kirtland Air Force Base to sample its water wells located down gradient from the landfill annually to determine whether any groundwater contamination is occurring.
- The City of Albuquerque has expressed an interest in having this site assessed.

City of Albuquerque Los Angeles Landfill

Site Description

The Los Angeles Landfill is located in northern Albuquerque and is situated approximately one mile west of U.S. Interstate 25 between Alameda Boulevard (on the north) and Paseo del Norte (on the south) as shown in Figure 5. The 77-acre site is bound to the west by the Albuquerque Metropolitan Area Flood Control Authority (AMAFCA) North Diversion Channel and to the east by the Washington Business Park. Depth to groundwater at the landfill ranges from 95 to 125 ft. Groundwater flow is recorded (SI1) as being to the southeast. The site is currently known and utilized as the Albuquerque Balloon Fiesta Park.

Site Specific Regulatory Events

The Los Angeles Landfill is owned by the City of Albuquerque and is currently listed as a low priority CERCLA site (EPA ID# NMD980864219). CERCLIS event types listed to date include:

- Site Discovery (DS1) completed on 2/1/80
- Preliminary Assessment (PA1) completed on 4/1/80, and
- Site Inspection (SI1) completed on 4/1/86.

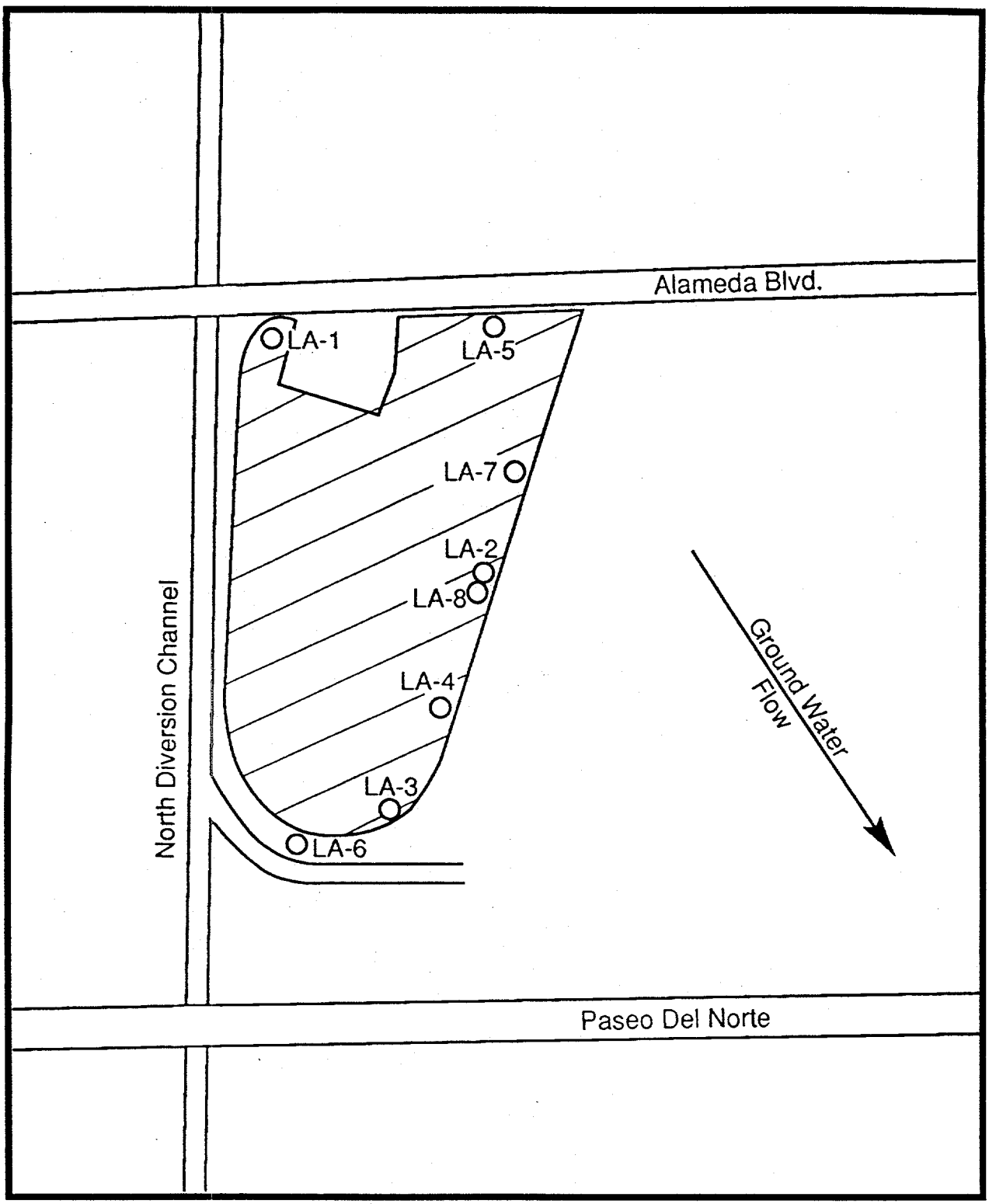

Figure 5. Site location map for Los Angeles Landfill showing monitor well locations and ground water flow direction.

Contaminants Present

The site inspection report (1986) listed PCBs, lindane, trichloroethylene, toluene, and napthalene as substances of major concern. Eight leachate and eight ground water monitoring wells are located on site. The leachate monitoring wells have never yielded fluids. The landfill has on site gas vents to vent methane gas. Analysis of water samples collected from monitoring well 2 (LA2) and analyzed for organic chemical constituents during 1987 and 1988 indicated the presence of the contaminants listed in Table 3.

Table 3. Contaminants Present in Groundwater Samples Collected from LA2

Contaminant	1987-1988 Concentrations (ppb)	1994 Concentrations (ppb)	SDWA MCLs (ppb)
Benzene	3	0	5
Xylenes (Total)	2	0	10
p-xylene	1	0	
m-xylene	1	0	
Toluene	trace	0	1000
1,1 Dichloroethane	1.5	6	*
1,1,1 Trichloroethane	1	0	200
Trichloroethene (TCE)	2	4.3	5
Tetrachloroethene	2.7	11	*
1,1 Dichloroethene	2	0	7
1,1,1 Trichloroethene	1.4	NT	200
Chloromethane	1	0	*
Dichloromethane	trace to 2	0	5
Trichlorofluoromethane	5.3	0	*
Freon type compound	1	NT	5
1,1,2 Trichloroethene	trace	NT	*
1,1 Dichloroethene	23	0	7
Chloroethane	2	0	*
Methylene Chloride	NT	2.7	*
1,2 Dichloropropane	NT	1.2	5

NT - Indicates no Analytic testing
* - Indicates no US EPA Maximum Contaminant Level (MCL)

The five water wells located within a 0.5-mile radius of the site have not shown (as of 1986) the presence of the above listed contaminants.

Applicable Assessment Technologies for Off Site Demonstration

- SitePlanner™/PLUME
- Magnetometer Towed Array
- Hybrid Directional Drilling

- Cross Borehole Electromagnetic Imaging
- SEAMIST™/Vadose Zone Monitoring System

Stakeholder Issues

The following stakeholde issues have been identified:

- Drinking water contamination.
- Site used during October as the Balloon Fiesta Park.
- Site used for fireworks displays in July.

City of Albuquerque Coronado Landfill

Site Description

The Coronado Landfill site is located in north Albuquerque at 9201 Pan American Freeway, N.E. The site is approximately 60 acres in size and is bound to the east by the Pan American Freeway and to the south by Alameda Avenue. To the west and north the site is bound by San Mateo Boulevard and San Diego Avenue respectively (Figure 6). Landfill materials are estimated to be confined to the northwest portion of the site and the filled arroyo channel. This channel crosses the southern half of the site and runs adjacent to the south side of the Signetics, Inc. building. Depth to groundwater at this site is approximately 250 feet.

Site Specific Regulatory Events

The Coronado Landfill was purchased (during 1978 -1979) from the City of Albuquerque by Signetics, Inc., a subsidiary of the North American Philips Company. The site was used for the construction of a microchip manufacuring facility. At the time of purchase, Signetics was not aware that the site had previously been part of a landfill. The site is currently listed as a CERCLA site. CERCLIS event types listed to date include:

- Site Discovery (DS1) completed on 4/1/82
- Preliminary Assessment (PA1) completed on 7/1/82,
- Site Inspection (SI1) completed on 9/21/92, and
- Additional Site Inspection (SI2) completed on 4/26/93.

No further remedial action is planned for the Coronado Landfill under CERCLA (EPA ID #NMD980864219). This site will be further investigated under RCRA

Contaminants Present

Signetics has conducted quarterly groundwater sampling at the site since 1990. The groundwater is analyzed for total Kjeldahl Nitrogen and Halogenated Volatile Organics. Tetrachloroethene has been detected in several of the quarterly sampling events. Signetics also performs monthly monitoring of the 35 methane gas vents. Methane as high as 500,000 ppm has been detected.

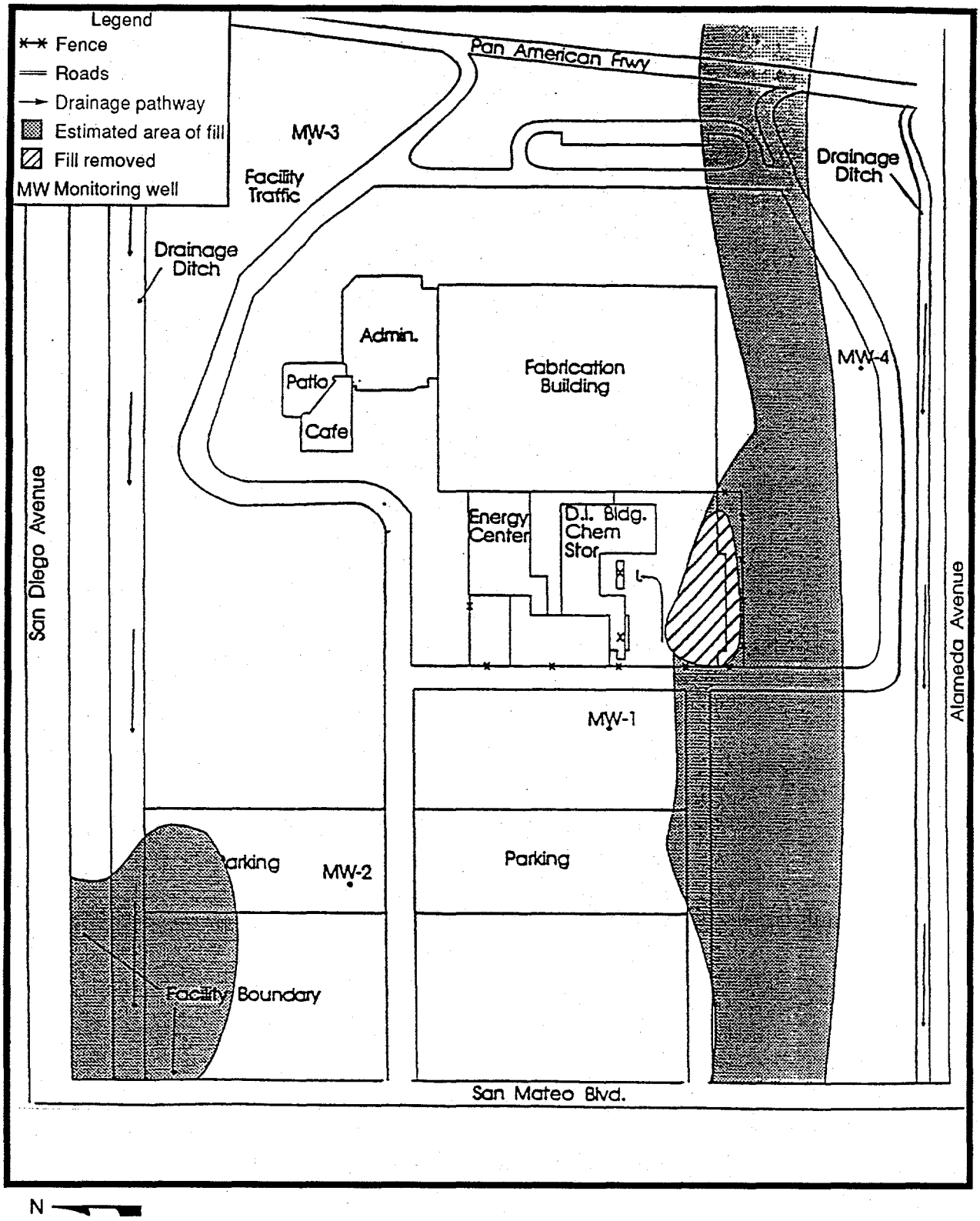

Figure 6. Site location map city of Albuquerque Coronado Landfill (from Signetics RCRA part 8 permit).

During the last site investigation, groundwater samples and soil samples (6-8" depth) were collected and analyzed for target compound list (TCL) organics and target analite list (TAL) metals (Appendices D and E). Comparisons were made with the Background Benchmark Concentration (BBC), which is three times the natural background concentration. Groundwater samples showed concentrations of the contaminants listed in Table 4.

Table 4. Contaminants Present in Groundwater Samples Collected at Coronado Landfill Site

Contaminant	Concentration (ppb)	SDWA MCLs (ppb)
Lead	2.2	0
Selenium	20.2	50
Zink	28.9	5000
Tetrachloroethene	14	5
Bis(2-ethylhexyl)Phthalak	18	*

* – Indicates no USEPA Maximum Contaminant Level (MCL)

Surface Soil Samples showed concentrations of the following contaminants:

- chromium, lead, and mercury above the BBC
- dibenzofuran
- high levels of polyaromatic hydrocarbons (acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo (a) anthracene, chrysene, benzo (b) fluroanthene, benzo (k) fluroanthene, benzo (a) pyrene, indeno (1,2,3-cd) pyrene, dibenzo (a,h, anthracene, benzo (g,h,i) perylene). Benzo Pyrene is the most toxic of these compounds and was found in concentrations up to 88,000 ppb
- pesticides detected above the BBC (heptachlor, dieldrin, aldrin, heptachlor epoxide, and endrine ketone)

Applicable Assessment Technologies for Off Site Demonstration

- SitePlanner™/PLUME
- Magnetometer Towed Array
- Hybrid Directional Drilling
- Cross Borehole Electromagnetic Imaging
- X-Ray Fluorescence Spectroscopy
- Stripping Analysis
- SEAMIST™/Vadose Zone Monitoring System

Stakeholder Issues

Signetics worker safety is a primary stakeholder issue that will need to be addressed. Assessment activities may have to be planned around Signetics' work schedule.

Sandia National Laboratories
Unique Capabilities

A unique capability of the SNL MWLID program is its expertise in evaluating and demonstrating innovative environmental technologies such as those proposed for this project. SNL has several years of experience as a sponsor of technology demonstrations at mixed waste and chemical waste landfill sites for the DOE and the DOD. Valuable information and experience has been gained by the MWLID staff through these demonstrations, including extensive knowledge of the performance of various environmental technologies in arid environments, experience with government environmental regulators, and expertise in commercialization of technologies and technology transfer to the private sector.

The SNL MWLID program has an outstanding record for the transfer of innovative environmental technologies to the domestic martket. The program can claim 15 technology transfer/commercialization successes with another seven pending. A search of current literature and contacts with other professionals involved with the assessment and remediation of mixed waste and chemical waste landfill sites has determined that the unique, innovative environmental technologies being demonstrated are available on a limited basis in the domestic private or public sector. It is the objective of this project for the technologies demonstrated to be made available to the domestic private and public sector for commercial applications through technology transfer.

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Potential MWLID Technologies For Off site Demonstration

Preliminary demonstration programs have been developed for two of the five portential demonstration sites: Isleta Pueblo Site No. 3 (on Native American land) and the City of Albuquerque Los Angeles Landfill (on municipal land).

The assessment techniques that may be used at both Isleta Pueblo Site No. 3 (IPS No. 3) and the Los Angeles Landfill (LAL) site include SitePlanner™/PLUME, Magnetometer Towed Array, Hybrid Directional Drilling, and Cross Borehole Electromagnetic Imaging. Assessment techniques for possible use at only the IPS No. 3 include X-Ray Fluorescence Spectroscopy and Stripping Analysis. Assessment techniques that may be used at the LAL site only include the SEAMIST™/Vadose Zone Monitoring System. A brief description of each of these technologies follows.

SitePlanner™/PLUME

SitePlanner™/PLUME is a computerized sampling tool that uses geostatistics to optimize the use of historical and non-intrusive field data to aid in the formulation of a sampling strategy. SitePlanner™ and PLUME combine data visualization, data management, and geostatistics to optimize the number and placement of drilling and sampling locations needed to assess a hazardous waste site. The system can be used in the field during collection of data, such as geologic and on site chemical analytical information, to support real-time decision making during a site assessment process. Using this methodology to optimize the number and location of borings, wells, and samples can result in significant time and cost savings for site assessment. This sampling strategy provides guidance for siting vertical and directionally-drilled boreholes and sampling locations along the boreholes for contaminant delineation.

Magnetometer Towed Array

The Magnetometer Towed Array employs an array of seven magnetometers mounted on a trailer towed by an off-road vehicle to rapidly survey a site. The vehicle and sensor platform have been designed to exhibit a low magnetic signature to minimize interference with the magnetometers. An on-board computer accepts magnetic data simultaneously with precise positioning data and outputs positions for every magnetic data point. The magnetic map of the surveyed area is displayed on a video monitor and provides a user interface to semi-automated target analysis. A magnetic anomaly can be selected for iterative least-squares model matching to determine the best fit of the magnetic moment and depth to the anomaly.

Hybrid Directional Drilling

Directional drilling (drilling at an angle) and horizontal boring have been demonstrated to eliminate the problem of drilling-induced contaminant migration and contaminated drilling by-products at a landfill. Worker safety is enhanced because the drilling equipment can often be located at the periphery of the landfill. This drilling technology minimizes the environmental impact of the drilling process and provides a low cost but high quality alternative to more costly, conventional directional drilling methods at shallow depths and vertical peripheral drilling.

Cross-Borehole Electromagnetic Imaging

Cross-borehole Electromagnetic Imaging is used to map the subsurface of a site by measuring the attenuation and phase shift of radio frequency signals propagated between boreholes. Because electrical properties such as resistivity or electrical conductivity are directly related to the chemical composition of the fluid passing through the geologic medium, VOC contaminant source and plume detection are possible.

X-Ray Fluorescence Spectroscopy

Using a lined borehole, X-Ray Fluorescence Spectroscopy (XRF) detects and quantifies metal contaminants in real time using two XRF techniques. Depending on site-specific objectives and constraints, the XRF probe can use either a radio-isotope source or an x-ray generating tube to detect metal contamination in the subsurface. Downhole detection and quantification of metal contamination minimizes the number of samples that must be collected and subsequently analyzed on site or shipped off site to a laboratory. In-situ analysis can greatly speed the assessment process and support near real-time decision making in the field, leading to time and cost savings .

Stripping Analysis

Stripping Analysis is a rapid field screening method that can be used for the detection of heavy metals in soil samples retrieved through drilling or other sampling techniques. This method can analyze four metals simultaneously at parts-per-billion (ppb) levels within several hours of collection. Results are as good or better than comparable laboratory techniques. Significant cost savings can be achieved using stripping analysis to support field assessment and remediation activities. This technique provides results in the field in a near-real-time fashion and can be used (1) as a screening method for site worker safety, (2) to direct field activities quickly and efficiently, and (3) to minimize the number of samples that must be sent to a laboratory for confirmation analyses.

SEAMIST™/Vadose Zone Monitoring System

The SEAMIST™ membrane liner, developed by Science Engineering Associates (SEA) and demonstrated at the MWLID, is a promising technology that can replace the rigid casing found in most boreholes for many applications. SEAMIST™ can be used for sample collection, in-situ measurements, and sensor transport downhole without allowing contact between the instruments and the contaminated soils. Sensors that operate downhole to detect contamination or measure soil properties reduce the number of soil samples that have to be obtained and sent off site for analysis.

An integrated pressure and gas sampling system using the SEAMIST™ borehole liner has been built by SNL and SEA. This system is a stand-alone field system that performs real-time measurement at up to 64 sampling ports in either a single well or multiple wells. The wells used can range from one- to two-inch-diameter test holes created by a hydraulic "punch" to existing full size boreholes eight inches in diameter. The sampling system utilizes a Bruel and Kjaer gas analyzer, a barometric pressure sensor, a differential pressure sensor (to determine the pressure difference between the surface and sampling point), and a solenoid valve system to sequentially connect each sampling port to a sensor. Also, temperature sensors and thermocouple psychrometers that measure soil water potential are located in selected wells. The Vadose Zone Monitoring System can be used to assess and monitor contaminant transport in areas with deep vadose zones.

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Preliminary MWLID Off Site Demonstration Program

Isleta Pueblo Site No. 3

Site Description and Project Considerations

Isleta Pueblo Site No.3 (IPS No. 3) is located 0.5 miles west-southwest of the town of Isleta and approximately 1 mile west of the Rio Grande on the Isleta Pueblo Reservation (Figure 2). The site is bound on the north by New Mexico State Road (NMSR) 45 and on the east by Coors Road/El Camino Real. The south and west sides of the site are bound by undeveloped acreage. Access to the site is facilitated by numerous streets that provide access to residences and to the Wall-Colmony Machine Works, now inactive, which is located adjacent to and east of the site.

IPS No. 3 is located in alluvial deposits of silts, sands, gravel, and cobbles. The terrain slopes to the east and southeast. Depth to groundwater is estimated to be approximately 100 feet. There are no groundwater monitoring wells installed on site to determine direction of flow; however, the Pueblo's water tanks and associated supply well are located adjacent to and north of NMSR 45 in a northeasterly direction from the site. Site vegetation includes mainly native grasses and some trees.

The site is approximately 115 acres in size and is the Pueblo's oldest dumpsite, which was used until closure in 1974. The site's opening date is unrecorded. The contaminant of concern is chromium waste presumed to have originated from the adjacent Wall-Colmony Machine Works, which initiated operations at approximately the same time that the dump closed. The machine works continued operation until early 1991 and underwent remediation for chromium contamination during 1994. Other suspected contaminants at the landfill site include household and commercial hazardous waste and petroleum products. The suspected contaminant list is based upon 1983 estimates of materials placed in the City of Albuquerque landfills (Appendix C).

The site is under the jurisdiction of the Isleta Pueblo Tribal Council. Because tribal governments have been granted state government status under CERCLA, the EPA is the governing agency. The site is a source of major concern to the Pueblo Council because it has been developed as a residential area with HUD housing and related infrastructure.

This site assessment demonstration will address stakeholder issues that must be resolved in a mutually beneficial manner. Additionally, all tribal and federal regulations governing site assessment will be reviewed and followed. A written agreement including a statement of work, regulatory requirements, and stakeholder issues will be signed with the Isleta Pueblo Tribal Council prior to starting the demonstration. The written agreement will constitute the Isleta Pueblo Tribal Council approval of the demonstration.

MWLID technologies applicable to site assessment have been integrated into the site assessment program. These technologies include the SitePlanner™/PLUME, Magnetometer Towed Array, Hybrid Directional Drilling, Cross Borehole Electromagnetic Imaging, X-Ray Fluorescence Spectroscopy, and Stripping Analysis.

Site Demonstration Approach

The site assessment demonstration at IPS No. 3 will be conducted using the Landfill Characterization and Monitoring System (LCMS) approach. The LCMS is an integrated systems approach for assessing and monitoring contaminants in and beneath landfills. The system uses the best of emerging and existing technologies that are compatible and complementary. The emphasis of the system is on minimally intrusive technologies and downhole sensors that require minimal development work. The synergy of this approach can produce superior results in a safe fashion while reducing the costs and time for field investigation as much as 80% to 90%. This particular demonstration will focus on techniques used to identify heavy metal contamination (chromium waste), as this is potentially a critical problem.

Site Demonstration Program

The site assessment team will completed the following tasks:

Regulatory Requirements

1) Meet with Isleta Pueblo tribal regulators and confirm/identify all tribal regulations that will govern assessment of the site. As stated in CERCLA, tribal governments are granted the same status as state governments. The regulatory driving agency is the EPA.

2) Secure an agreement with the Isleta Pueblo Tribal Council that allows SNL to assess the landfill site. Secure all permits needed for site assessment. This process will require numerous stakeholder meetings with both the tribal council and the residents currently living on the landfill site.

3) Working with the Isleta Pueblo tribal regulators and the EPA, confirm all tribal and federal regulations governing site assessment on tribal lands. The regulatory review should include:

   - the CERCLA site assessment reporting and regulatory requirements;
   - RCRA handling of any hazardous waste generated by site assessment activities;
   - Clean Water Act compliance, should any waste stream discharges occur on site; and
   - Clean Air Act compliance.

4) Insure that all regulations are and will be followed and all necessary permits are secured.

Stakeholder Issues

1) Conduct preliminary demonstration meeting.

2) Present preliminary site assessment plan to Isleta Tribal Council for review and suggestions.

3) Hold stakeholder meetings to describe the program and address stakeholder concerns.

Agreement

Draw up an agreement with the Isleta Pueblo Tribal Council to conduct the demonstration. The agreement should address:

1) finalized site assessment plan
2) regulatory requirements
3) stakeholder issues

Site Assessment Plan

The site assessment program will be conducted in the following three phases:

Phase I: Historical
Phase II: Non-intrusive
Phase III: Minimally Intrusive

A description of these phases follow.

Phase I: Historical

SitePlanner™/PLUME

SitePlanner™ will use historical and non-intrusive field data to aid in the formulation of a sampling strategy. Site information integrated into SitePlanner™ will include a site map of the landfill and immediately surrounding area. Initially the site boundaries will be delineated through analysis of aerial photographs and available landfill-operations information. Additional information for site assessment will include tribal site records, analytical results obtained from assessment activities, and site geographic, hydrologic, geologic, and contaminant distribution data. Two specific tasks are necessary:

1) Input all current and historical site information into SitePlanner™/PLUME to develop a site plan map to be used as a geographic basis for laying out the site assessment surveys. Secure historical and recent aerial photographs of the landfill site and surrounding area and delineate

   - the approximate boundaries of the site, and
   - areas of dumping that may indicate concentrated hazardous waste disposal (i.e., concentrations of 55-gallon drums, sludge pits, abandoned storage tanks, etc.).

2) Based on information gathered and input into SitePlanner™/PLUME, determine an appropriate Magnetometer Towed Array and hand-held magnatometer survey grid for locating concentrations of buried ferris metal objects (55-gallon drums, abandoned tanks, etc.).

Phase II: Non intrusive

During Phase II the site assessment team will:

1) Conduct Magnetometer Towed Array and hand held magnetometer survey (in densely developed areas) and input survey information into SitePlanner™/PLUME database for further site analysis.

2) Utilize SitePlanner™/PLUME to analyze existing data and determine where additional data is needed for further site assessment. Lay out drilling and sampling pattern based on distribution of contaminant plume presence and highly suspect areas of chromium contamination.

Phase III: Minimally Intrusive

During Phase III the site assessment team will:

1) Drill vertical boreholes as dictated by SitePlanner™/PLUME siteplan.

2) Utilize Hybrid Directional and horizontal drilling to drill holes under the landfill. While drilling, collect soil samples for stripping analysis. Input sample location information into SitePlanner™/PLUME database.

3) Utilize Cross Borehole or Surface-to-Borehole Electromagnetic Imaging as a reconnaissance tool to identify any VOC contaminant plumes. Input information into SitePlanner™/PLUME database for further site analysis.

4) Conduct downhole X-Ray Fluorescence Spectroscopy survey to determine heavy metal contamination.

5) Utilize Stripping Analysis as a field screening tool to determine the presence and concentration of heavy metal contaminants. Compare to X-Ray Fluorescence Spectroscopy survey. Submit selected samples to EPA-approved analytic laboratory for contaminant analysis after screening by Stripping Analysis. Input information into SitePlanner™/PLUME database for further site analysis.

Conduct Demonstration

To conduct the results of the site assessment demonstration, the assessment team will:

1) Select time.
2) Set up logistics.
3) Run demonstration.

Reporting

To report the results of the site assessment demonstration, the assessment team will:

1) Utilize the capabilities of SitePlanner™/PLUME to generate the site assessment report, supporting contaminant distribution maps, and 3-D subsurface projections.

2) Submit site assessment report to the appropriate regulatory agency with site primacy.

City of Albuquerque Los Angeles Landfill

Site Description and Project Considerations

The LAL is located in northern Albuquerque, approximately 1 mile west of U.S. Interstate 25 between Alameda Boulevard (north) and Paseo del Norte (south) (Figure 5). The site is bounded to the west by the AMAFCA North Diversion Channel and to the east by the Washington Business Park. The site is known and currently utilized as the Albuquerque Balloon Fiesta Park.

This landfill is located in alluvial deposits of silt, sand, gravel, and cobbles. The terrain slopes slightly to the south and west. Depth to groundwater at the landfill ranges from 95-125 feet with flow recorded during the assessment (SI1) as being to the southeast.

Originally, the landfill monitoring system contained eight leachate and eight groundwater monitoring wells. Five additional wells were installed in 1988. There are also on site methane gas vents. The 1986 Site Inspection Report listed PCBs, lindane, trichlorethylene, toluene, and napthalene as substances of major concern. Analysis of water samples collected from monitoring well 2 (LA2) in 1987 and 1988 indicated the presence of Benzene (3ppb), p-xylene (1ppb), m-xylene (1ppb), Toluene (trace), 1,1 Dichloroethane (1.5ppb), 1,1,1 Trichloroethane (1ppb), Trichloroethene (2ppb), Tetrachloroethene (2.7ppb), 1,1 Dichloroethene (2ppb), 1,1,1 Trichloroethene (1.4ppb), Chloromethane (1ppb), Dichloromethane (trace to 2ppb), Trichlorofluoromethane (5.3ppb), Freon type compound (1ppb), 1,1,2 Trichloroethene (trace), 1,1 Dichloroethene (23ppb), and Chloroethane (2ppb).

The leachate monitoring wells have never yielded fluids. Five water wells located within a 0.5-mile radius of the site have not shown the presence of the above contaminants as of 1986 (most recent data).

The LAL site is owned by the City of Albuquerque and is commonly known as the Albuquerque Balloon Fiesta Park. The site is used annually for the Albuquerque International Balloon Fiesta in October and for the Independence Day fireworks display in July.

A site assessment demonstration at this site must consider the scheduling of events at the site. Early stakeholder introductions will be important. Additionally, all city, state, and federal regulations governing the site must be followed. A written agreement including a statement of work, regulatory requirements, and stakeholder issues will be signed with the City of Albuquerque Health and Environment Department and the NMED. The written agreement will constitute approval for the demonstration.

MWLID technologies applicable to site assessment have been integrated into the site assessment program. These technologies include the SitePlanner™/PLUME, Magnetometer Towed Array, Hybrid Directional Drilling, Cross Borehole Electromagnetic Imaging, and SEAMIST™/Vadose Zone Monitoring System.

Site Demonstration Approach

The site assessment demonstration at LAL will be conducted using the LCMS approach, which is an integrated systems approach for characterizing and monitoring contaminants in and beneath landfills. The system uses the best of emerging and existing technologies that are compatible and complementary. The emphasis of the system is on minimally intrusive technologies and downhole sensors that require minimal development work. The synergy of this approach can produce superior results in a safe fashion while reducing the costs and time for

field investigation as much as 80% to 90%. Because the contaminants of concern are volatile organic compounds, the demonstration will focus on techniques to identify these.

Site Demonstration Program

Regulatory Requirements

The site assessment team will complete the following tasks:

1) Meet with City of Albuquerque regulators and confirm/identify all municipal regulations that will govern assessment of the site.

2) Secure an agreement with the City of Albuquerque that allows SNL to assess the landfill site. Secure all permits needed for site assessment. This process will require numerous stakeholder meetings with the City of Albuquerque and the residents that are currently living around the landfill site.

3) Meet with NMED regulators and confirm

   - the CERCLA site assessment reporting and regulatory requirements;
   - RCRA handling of any hazardous waste generated by site assessment activities;
   - Clean Water Act compliance, should any waste stream discharges occur on site; and
   - Clean Air Act compliance.

4) Secure all permits needed for site assessment

Stakeholder Issues

1) Conduct preliminary demonstration meeting.

2) Present preliminary site assessment plan to City of Albuquerque, NMED, and EPA for review and suggestions.

3) Hold stakeholder meetings to describe the program and address stakeholder concerns.

Agreement

1) Draw up an agreement with the City of Albuquerque to conduct the demonstration. The agreement should address:

   1. finalized site assessment plan
   2. regulatory requirements
   3. stakeholder issues

Site Assessment Plan

The Site assessment program will be conducted in three phases:

Phase I: Historical
Phase II: Non intrusive
Phase III: Minimally Intrusive

A description of these phases follows.

Phase I: Historical

SitePlanner™/PLUME

Using historical and non-intrusive field data, SitePlanner™/PLUME will aid in the formulation of a sampling strategy. Site information integrated into SitePlanner™ will include a site map of the landfill and immediately surrounding area. Initially the site boundaries will be delineated through analysis of aerial photographs and any available landfill-operations information such as closure reports. Additional information for site assessment will include City of Albuquerque, NMED, and EPA site records; analytical results obtained from assessment activities; and site geographic, hydrologic, geologic, and contaminant distribution data.

1) Input all accessible current and historical site information into SitePlanner™/PLUME to develop a site plan map to be used as a geographic basis for laying out the site assessment surveys. Secure historical and recent aerial photographs of the landfill site and surrounding area and delineate

   - the approximate boundaries of the site, and
   - areas of dumping that may indicate concentrated hazardous waste disposal (i.e., concentrations of 55-gallon drums, sludge pits, abandoned storage tanks, etc.).

2) Based on information gathered and input into SitePlanner™/PLUME, determine an appropriate Magnetometer Towed Array survey grid for locating concentrations of buried ferris metal objects (55 -gallon drums, abandoned tanks, etc.).

Phase II: Non intrusive

During Phase II the assessment team will:

1) Conduct Magnetometer Towed Array survey and input information into the SitePlanner™/PLUME database for further site analysis.

2) Utilize SitePlanner™/PLUME to analyze existing data and determine where additional data are needed for further site assessment. Lay out drilling and sampling program based on distribution of contaminant plume presence and any areas of VOC contamination. Input information into SitePlanner™/PLUME database for further site analysis.

Phase III: Minimally Intrusive

During Phase III the assessment team will:

1) Drill vertical boreholes as dictated by SitePlanner™/PLUME site plan.

2) Utilize Hybrid Directional Drilling to collect soil samples for analysis to determine the concentrations of contaminants present. Submit samples to EPA approved analytic laboratory for contaminant analysis. Input sample location information into SitePlanner™/PLUME database.

3) Utilize Cross Borehole or Surface-to-Borehole Electromagnetic Imaging as a reconnaissance tool to identify VOC contaminant plumes. Input information into SitePlanner™/PLUME database for further site analysis.

4) Install SEAMIST™ Vadose Zone Monitoring System wells to monitor movement of the contaminant plume(s) within the vadose zone.

Conduct Demonstration

To conduct the demonstration, the assessment team will meet with state and city authorities to plan and execute these tasks:

1) Select time
2) Set up logistics
3) Run demonstration

Reporting

To report the results of the demonstration, the assessment team will:

1) Utilize the capabilities of SitePlanner™/PLUME to generate the site assessment report, supporting contaminant distribution maps, and 3-D subsurface projections.

2) Submit site assessment report to the appropriate regulatory agency with site primacy.

Future Project Activity

Future activity of the Off-Site Demonstrations for MWLID technologies project will focus on performing an environmental site assessment of one of the recommended sites utilizing MWLID-developed technology. The actual start date for the off site demonstration of these technologies will dependent on the availability of DOE funding.

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Appendix A

SOURCES OF INFORMATION

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Federal Information

New Mexico-specific federal information was secured from the NMED Ground Water Protection and Remediation Bureau in the form of the U.S. Environmental Protection Agency (EPA) Superfund Program CERCLIS Event/Site listing. This listing provided information for identifying landfill sites (currently or formerly under evaluation) with hazardous waste contamination. This listing includes sites on federal, state, municipal, and tribal properties.

Information related to closed Department of Energy (DOE) and Department of Defense (DOD) sites located on Kirtland Air Force Base, New Mexico was secured through SNL's environmental restoration program.

State of New Mexico Information

State of New Mexico mixed waste landfill information was secured from the NMED, Solid Waste Bureau. This information listing included data on each mixed waste landfill location within the state, with the exception of sites located on Native American land. The information listing includes:

- owner's name and address,
- facility name and location,
- current landfill status (open/closed),
- landfill classification based on population served, and
- type of landfill (i.e. mixed waste, construction debris, industrial, or research).

Albuquerque Municipal Information

Municipal information for Albuquerque was secured from the City of Albuquerque Environmental Health Department. This information was obtained for cross-reference checks with the state-provided information to ensure the identification of not only recent landfills but also historical landfills that may not have been recorded in the state listing.

Tribal Information

Tribal environmental records on Native American land are controlled by each tribal government. Conversations with the environmental representative of the All Indian Pueblo Council—Pueblo Office of Environmental Protection revealed no official Pueblo Council listing for landfill sites on Native American land. Therefore, the best source for identifying contaminated sites would be the CERCLIS listing. For information concerning additional landfill site locations, it is necessary to contact tribal governors and/or their environmental officers. Native American land located within 25 miles of Sandia National Laboratories/Albuquerque, NM (SNL) includes the following Indian Reservations:

Isleta Indian Reservation*
Laguna Indian Reservation (extreme eastern portion)
Sandia Indian Reservation
San Felipe Indian Reservation* (extreme southern portion)
Santa Ana Indian Reservation (extreme southern portion)
Zia Indian Reservation* (extreme southeast portion)

Only three reservations (marked with an asterisk) have sites listed on the CERCLIS list. These reservations are the Isleta, San Felipe, and Zia Indian Reservations. The major

population centers/"open dumps" for the San Felipe and Zia Indian Reservations are beyond the 25 mile radius of SNL/NM.

Publications

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Fluor Daniel ARCS Team, August 6, 1992. *Copies of Access Letters Sent to Site Owners in the Albuquerque, NM Area, Site Inspection WA# 25-6JZZ.* Fluor Daniel, Inc.

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Fluor Daniel ARCS Team, May 5, 1993. *Site Inspection Report (Part A, Addendum) Sacramento Landfill Site, NMD980864227WA# 25-6JZZ.* Fluor Daniel, Inc.

New Mexico Health and Environment Department, Environmental Improvement Division, 1980. *Chemical Quality of New Mexico Community Water Supplies: A Compilation of Chemical and Physical Data.*

New Mexico Health and Environment Department, Environmental Improvement Division, date unknown. *Listing Site Inspection Report, South Yale Landfill, Albuquerque, New Mexico.*

Solid Waste Bureau of the New Mexico Environment Department, December 31, 1991. *New Mexico Solid Waste Management Regulations.* Santa Fe, NM.

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APPENDIX B

Summary of Closed DOE and DOD Landfill Sites on, Kirtland Air Force Base, New Mexico (Secured from SNL Environmental Restoration Program)

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Summary of Closed DOE and DoD Landfill Sites at Kirtland AFB, New Mexico

#	Site Name	Operable Unit	Contaminants of Concern
1	Radioactive Waste Landfill (TA-2)	Tech Area 2	Plutonium, Uranium, Tritium, Solvents, Metals
2	Classified Waste Landfill (TA-2)	Tech Area 2	PCBs, Solvents, Semi-volatiles, High Explosives, Tritium, Uranium, Metals
3	Chemical Disposal Pit (TA-2)	Tech Area 2	High Explosives, Metals, Solvents, Tritium
4	Gas Cylinder Disposal Pit (Building 9966)	Southwest Tech Area	Unknown
5	Open Dump (Coyote Canyon Blast Area)	Foothills Test Area	Depleted Uranium, High Explosives, Lead, Beryllium
6	Burial Site/Open Dump (Schoolhouse Mesa)	Central Coyote Test Area	Depleted Uranium, Beryllium, Lead, High Explosives, Solid Waste
7	Burial Mounds (Bunker Area North of Pendulum Site)	Canyons Test Area	Depleted Uranium, Radioactive Tracers, Beryllium, Lead, High Explosives
8	Radioactive/Explosive Burial Mounds	Central Coyote Test Area	Depleted Uranium, Beryllium, Lead, High Explosives, Solid Waste
9	Burial Site/Open Dump (Lurance Canyon) (Active)	Canyons Test Area	Depleted Uranium, Beryllium, Lead, High Explosives, Trichloroethene
10	Burial Site (Building 9920) (Active)	Southwest Test Area	Depleted Uranium, Zirconium, Iron, Molybedum, Mercury
11	Trash Pits (Frustration Site)	Foothills Test Area	Unknowns, Potentially Depleted Uranium, Beryllium, Lead, High Explosives
12	Open Dumps (Arroyo del Coyote)	Tijeras Arroyo	Depleted Uranium, Petroleum Hydrocarbons, High Explosives
13	Scrap Yards/Open Dump (Thunder Range)	Southwest Test Area	Lead, Beryllium, Depleted Uranium, Asbestos, PCBs, Petroleum, Hydrocarbons, Solvents, Mercury
14	Landfill and Open Dump (Tijeras Arroyo)	Responsibility of Others	Responsibility of Kirtland Air Force Base
15	Burial Site (South of TA-1)	Tech Area 1	High Explosives, Contaminated Building Debris
16	Burial Site (West of TA-3)	Tech Area 3 & 5	Radionuclides, Heavy Metals, Depleted Uranium, Unknowns

Summary of Closed DOE and DoD Landfill Sites at Kirtland AFB, New Mexico

#	Site Name	Operable Unit	Contaminants of concern
17	Building 9820 - Animal Disposal Pit (Coyote Springs)	Foothills Test Area	None Expected
18	Old KAFB Landfills (~ 20 sites)	Responsibility of Others	Responsibility of Kirtland Air Force Base
19	Chemical Waste Landfill	Chemical Waste Landfill	Organics: Trichloroethene; Dichloromethane; Tetrachloroethene; 1,1-dichloroethene; Carbon Tetrachloride; 1,1,1-trichloroethane; Vinyl chloride. Inorganics: Chromium VI, Beryllium
20	Mixed Waste Landfill (TA-3)	Mixed Waste Landfill	Tritium
21	Gas Cylinder Disposal Pit (TA-3)	Tech Areas 3 & 5	Shock-sensitive Explosive Compounds, Various Gases, Liquids
22	Gas Cylinder Disposal Pit (Thunder Range) (See Archives)	Archival	None
23	New Aerial Cable Site/Burial Site/Dump/Test Area (Active)	Canyons Test Area	Lead, Beryllium, Depleted Uranium, Rocket Propellant

APPENDIX C

City of Albuquerque Residential Hazardous/Toxic Waste Survey January 1983

(Secured from City of Albuquerque Landfill CERCLIS Files)

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CITY OF ALBUQUERQUE
RESIDENTIAL HAZARDOUS/TOXIC WASTE SURVEY
JANUARY 1983

Estimated Annual Amounts of Hazardous/Toxic Materials
Disposed of by 96,320 Households in the Albuquerque City Limits

	City Refuse Service	Empty Down Drain	Hauled to Landfill	On or Off Premeses[1]	Total
Pesticides	16,647	125	520	1,040	18,332
Poisons	1,040	520	0	0	1,560
Household Cleaners	4,682	1,040	0	0	5,722
Household Polishes	520	0	0	0	520
Drain Openers	520	520	0	520	1,560
Motor Oil	337,094	33,293	165,426	359,984	895,797
Recycled Oil	0	0	0	0	161,264
Antifreeze	68,667	58,263	21,849	158,143	306,922
Paints	131,092	4,162	31,212	2,081	168,547
Weed Killers	1,040	520	3,122	0	4,682
Fertilizers	5,202	520	5,202	12,485	24,970
Solvents or Thinners	6,763	520	5,202	12,485	24,970
Total	573,267	99,483	229,932	534,253	1,598,199
	36%	6%	14%	34%	90%[2]

All amounts are in pounds.

[1]Driveway, bury in backyard, dump on mesa, etc.

[2]Does not include recycled oil, which accounts for 10%.

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APPENDIX D

Target Compound List - Organic Results
Albuquerque Coronado Landfill

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SUMMARY OF ORGANIC COMPOUND RESULTS, SURFACE SOIL SAMPLES
Albuquerque Coronado Landfill
September 22–23, 1993

Station Location:	SS09	SS09	SS06	SS07	SS07	SS08	SS08
CLP Sample Number:	FX904	FX904	FX905	FX908	FX908D	FX909	FX909D
Comments:	Background	Benchmark Concentration	Surface Soils	Surface Soils	Surface Soils	Duplicate SS07	Duplicate SS07
Analyte Qualifier	(ug/kg) Q	(ug/kg) Q	(ug/kg) Q	(ug/kg) Q	(ug/kg) Q	(ug/kg) Q	(ug/kg) Q
VOC							
None Detected							
Acid/Base Neutral							
2-Methylphenol	350 U	350 U	350 U	350 U	35000 U	69 J	17000 U
4-Methylphenol	350 U	350 U	350 U	130 J	35000 U	94 J	17000 U
2,4-Dimethylphenol	350 U	350 U	350 U	40 J	35000 U	350 U	17000 U
Naphthalene	350 U	350 U	350 U	470 *	35000 U	430 *	17000 U
2-Methylnaphthalene	350 U	350 U	350 U	240 J	35000 U	180 J	17000 U
Acenaphthylene	350 U	350 U	350 U	2000 *	35000 U	1600 *	17000 U
Acenaphthene	350 U	350 U	350 U	3000 E*	2800 DJ*	1900 *	17000 U
Dibenzofuran	350 U	350 U	350 U	2200 *	370 U	360 U	370 U
Fluorene	350 U	350 U	350 U	4900 E*	370 U	360 U	370 U
Phenanthrene	350 U	350 U	120 J	56000 E*	370 U	360 U	370 U
Anthracene	350 U	350 U	350 U	7700 E*	370 U	360 U	370 U
Carbazole	350 U	350 U	23 J	29000 E*	370 U	360 U	370 U
Di-n-Butylphthalate	350 U	350 U	350 U	350 U	370 U	360 U	79 J
Fluoranthene	350 U	350 U	260 J	84000 E*	370 U	360 U	370 U
Pyrene	350 U	350 U	220 J	130000 E*	170000 D*	82000 E*	100000 D*
Benzo(a)Anthracene	350 U	350 U	92 J	410 U	370 U	360 U	370 U
Chrysene	350 U	350 U	170 J	410 U	370 U	360 U	370 U
Benzo(b)Fluoranthene	350 U	350 U	210 J	75000 EJ*	110000 D*	6000 EJ*	6200 D*
Benzo(k)Fluoranthene	350 U	350 U	220 J	350 UJ*	65000 DJ*	350 UJ	75000 DJ*
Benzo(a)pyrene	350 U	350 U	83 J	30000 EJ*	88000 D*	17000 EJ*	58000 D*
Indeno(1,2,3-cd) Pyrene	350 U	350 U	130 J	32000 EJ*	55000 D*	18000 EJ*	35000 D*
Dibenzo(a,h) Anthracene	350 U	350 U	350 U	13000 EJ*	28000 DJ*	5500 EJ*	18000 D*
Benzo(g,h,i) Perylene	350 U	350 U	120 J	32000 EJ*	55000 D*	14000 EJ*	33000 D*
Pesticide							
Heptachlor	1.8 U	1.8 U	1.8 U	1.8 U	150 DJP*	1.8 U	150 DJP*
Aldrin	1.8 U	1.8 U	1.8 U	15 JP*	180 U	14 JP*	180 U
Hepachlor Epoxide	1.8 U	1.8 U	3.3 JP*	8.5 JP*	180 U	8.3 JP*	180 U
Dieldrin	21 X	21 X	3.0 JP	3.5 UJ	310 DPJ*	3.5 UJ	62 DPJ*
Endrine Ketone	3.5 U	3.5 U	3.5 U	3.5 UJ	280 DJP*	3.5 UJ	190 DPJ*
alpha-Chlordane	2.5 P	7.5 P	6.2	5.9 JP	180 U	5.5 JP	180 U
gamma-Chlordane	2.4 P	7.2 P	5.2	1.8 U	180 U	1.8 U	180 U

J – The associated value is an estimated quantity.
U – The material was analyzed for but was not detected above the level of the associated value.
P – Greater than 25% difference between two GC columns for the detected concentration.
X – Results are considered suspect because retention time windows fall within the range belonging to Aroclors.
E – Exceeds instrument range.
D – Diluted Sample result.
* – Compound was greater than three times background concentration or greater than quantitation limit.

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APPENDIX E

Target Compound List - Analyte Results
Albuquerque Coronado Landfill

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SUMMARY OF INORGANIC ANALYTE RESULTS, SURFACE SOIL SAMPLES
Albuquerque Coronado Landfill
Sampling Event: September 22–23, 1992

Station Location	Compound or Element	Concentration (mg/kg)	Qualifier	CLP Sample Number	Comments
	SURFACE SOIL BACKGROUND SAMPLE (Depth: 0–10 inches)				
SS09	Aluminum	9350		MFW405	Background
SS09	Arsenic	2.7		MFW405	Background
SS09	Chromium	6.2		MFW405	Background
SS09	Iron	12800		MFW405	Background
SS09	Lead	10.1		MFW405	Background
SS09	Nickel	9.6		MFW405	Background
SS09	Mercury	0.05	U	MFW405	Background
SS09	Vanadium	22.2		MFW405	Background
SS09	Zinc	52.4	J	MFW405	Background
	BACKGROUND BENCHMARK CONCENTRATIONS				
SS09	Aluminum	28050		MFW405	3 X Background
SS09	Arsenic	8.1		MFW405	3 X Background
SS09	Chromium	18.6		MFW405	3 X Background
SS09	Iron	38400		MFW405	3 X Background
SS09	Lead	30.3		MFW405	3 X Background
SS09	Nickel	28.8		MFW405	3 X Background
SS09	Mercury	0.05		MFW405	Quantitation Limit
SS09	Vanadium	66.6		MFW405	3 X Background
SS09	Zinc	157.2		MFW405	3 X Background
	SURFACE SOIL SOURCE SAMPLES (Depth: 0–6 inches)				
SS06	Aluminum	4290		MFW406	Surface Soils
SS06	Arsenic	1.3	B	MFW406	Surface Soils
SS06	Chromium	3.4		MFW406	Surface Soils
SS06	Iron	6320		MFW406	Surface Soils
SS06	Lead	8.9		MFW406	Surface Soils
SS06	Nickel	6.1	U	MFW406	Surface Soils
SS06	Mercury	0.05	U	MFW406	Surface Soils
SS06	Vanadium	9.3	B	MFW406	Surface Soils
SS06	Zinc	35.8	J	MFW406	Surface Soils
SS07	Aluminum	4310		MFW407	Surface Soils
SS07	Arsenic	2.3		MFW407	Surface Soils
SS07	Chromium	20.9 *		MFW407	Surface Soils
SS07	Iron	7920		MFW407	Surface Soils
SS07	Lead	72.4 *		MFW407	Surface Soils
SS07	Nickel	7.5	B	MFW407	Surface Soils
SS07	Mercury	0.09 *	B	MFW407	Surface Soils
SS07	Vanadium	14.1		MFW407	Surface Soils
SS07	Zinc	114	J	MFW407	Surface Soils
SS08	Aluminum	4150		MFW408	Duplicate of SS07
SS08	Arsenic	1.9	B	MFW408	Duplicate of SS07
SS08	Chromium	9.3		MFW408	Duplicate of SS07
SS08	Iron	7850		MFW408	Duplicate of SS07
SS08	Lead	62.5 *		MFW408	Duplicate of SS07
SS08	Nickel	8.7		MFW408	Duplicate of SS07
SS08	Mercury	0.09 *	B	MFW408	Duplicate of SS07
SS08	Vanadium	12.0		MFW408	Duplicate of SS07
SS08	Zinc	101	J	MFW408	Duplicate of SS07

B – Analyte was detected above the Instrument Detection Limit but below the Contract Required Detection Limit.
J – The associated value is an estimated quantity.
U – The material was analyzed for but was not detected above the level of the asscciated value.
UJ – The material was analyzed for but was not detected. The asscciated value is an estimate and may be inaccurate.
* – Analyte is greater than three times background concentration or greater than quantitation limit.

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Distribution

Federal Agencies

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US DOE
9800 S. Cass Ave.
Argonne, IL 60439

State Agencies

1 NM Environment Department
Secretary of the Environment
Attn: Judith Espinoza
1190 St. Francis Drive
Santa Fe, NM 87503-0968

Tribal Agencies

2 Isleta Tribe
Attn: Lt. Governor Joseph R. Olguin
Blane M. Sanchez
P.O. Box 39
Isleta, NM 87022

Municipal Agencies

1 City of Albuquerque
Attn: Dr. Gene Romo
P.O. Box 1293
Albuquerque, NM 87103

Corporations

3 Tech Reps, Inc.
Attn: Ralph Gruebel
5000 Marble NE, Suite 222
Albuquerque, NM 87110

Libraries

1 Thomas Branigan Library
Attn: D. Dresp
106 W. Hadley St.
Las Cruces, NM 88003

1 Government Publications
Zimmerman Library
University of New Mexico
Albuquerque, NM 87131

Internal

	MS	Org	
1	0719	6621	6621Library
6	0719	6621	C.V. Williams
1	0756	6607	G. Allen
5	0899	13414	Technical Library
1	0619	12615	Print Media
2	0100	7613-2	Document Processing for DOE/OSTI
1	9018	8523-2	Central Technical Files