HSWA LANL 1/1104/21
21-029

ENVIRONMENTAL RESTORATION PROJECT
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Date: December 13, 2001
Refer to: ER2001-1023

2001 RECEIVED

Mr. John Young, Corrective Action Project Leader
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF RESPONSE TO THE SUPPLEMENTAL INFORMATION REQUEST FOR PHASE II RFI REPORT FOR POTENTIAL RELEASE SITE (PRS) 21-029, DP TANK FARM

Dear Mr. Young:

This letter and enclosures comprise the Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project's response to the Request for Supplemental Information (RSI) for the Phase II Resource Conservation and Recovery Act Facility Investigation (RFI) Report for Potential Release Site (PRS) 21-029, DP Tank Farm (HWB-LANL-01-016). The ER Project Office received the RSI from the New Mexico Environment Department's Hazardous Waste Bureau (NMED-HWB) on November 14, 2001. Our response consists of answers to each NMED-HWB comment, and where applicable, replacement pages for the Phase II RFI Report for PRS 21-029. LANL would like to thank Ms. Maranville for taking the time to meet with ER Project staff to discuss NMED-HWB's comments and our responses. We believe that because of these meetings, LANL is able to concisely provide the additional information requested by NMED-HWB.

If you have any questions, please contact John Hopkins at (505) 667-9551 or Woody Woodworth at (505) 667-5820

Sincerely,

Julie A. Canepa, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

Sincerely,

Mat Johansen, Project Manager
Department of Energy
Los Alamos Area Office

10621

JC/MJ/PB/vn

Enclosure: 1) LANL ER Project RSI Response
2) Corresponding Replacement Pages for the Phase II RFI Report

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S-7, MS F674
E/ER File, MS M992
IM-5, MS A150
RPF, MS 707

Response to
Request for Supplemental Information for the Phase II RFI Report for Potential Release Site 21-029, DP Tank Farm. Los Alamos National Laboratory, EPA ID#NM0890010515, Task Number HWB-LANL-01-016

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. The comments are divided into general and specific categories as presented in the letter. Los Alamos National Laboratory's (LANL's) responses follow each NMED comment.

GENERAL COMMENTS

NMED Comment

1. *LANL may submit revised test and tables to NMED for insertion into the administrative record or attach as an addendum to the Phase II RFI Report.*

LANL Response

1. LANL will provide replacement pages to insert into the Phase II Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) report. Replacement pages are attached and are identified in responses below.

NMED Comment

2. ***Detection of lead in soil and sediment samples.*** *The detection of lead in soil and sediment samples collected during the 2000 and 2001 investigation activities are discussed in great detail throughout the Phase II RFI Report. Although it is important to point out that lead was detected in some soil samples; it was only detected at low levels in a few samples and eliminated as a contaminant of concern during the risk screening process. LANL should insert a paragraph in Section 6.0 (page 77) regarding lead, indicating that although lead was detected in soil and sediment samples, based on the risk screening process, lead does not appear to pose a risk to humans or the environment.*

LANL Response

2. LANL agrees. Section 5.0, Conclusions and Recommendations, has been revised to indicate that although lead was detected in soil and sediment samples, lead does not pose an unacceptable risk to human health or the environment, based on the risk screening process. Pages 78 through 82 are provided for replacement in the report.

SPECIFIC COMMENTS

NMED Comment

1. ***Executive Summary, page iii***
   Section 1.1 Background, page 1
   Section 3.4.1 Summary, page 13

   "The tank farm and two related petroleum hydrocarbon seep areas (western and eastern) in DP Canyon are being addressed under RCRA corrective action and New Mexico Environment Department (NMED) underground storage tank (UST) standards." AND

   "In addition, because DP Tank Farm operated as an underground storage tank (UST) facility, characterization and cleanup activities will meet NMED UST standards (Environmental Restoration Project 1999, 64829)." AND

   "The tank farm and two related petroleum hydrocarbon seep areas (western and eastern) in DP Canyon are being addressed under RCRA corrective action and NMED UST standards."

   Point of clarification. In accordance with page 18 of the approved RSI response (G4), PRS 21-029 will be characterized and remediated (if required) in accordance with RCRA corrective action regulations and cleanup will meet UST standards.

LANL Response

1. LANL agrees. The RFI of Potential Release Site (PRS) 21-029, DP Tank Farm, was conducted in accordance with RCRA corrective action regulations. RFI results indicate that the nature and extent of contamination at DP Tank Farm has been defined and that only residual subsurface petroleum hydrocarbon contamination remains. Maximum detected concentrations of organic and inorganic chemicals were compared with human health screening action levels for the most protective exposure scenarios and with the most protective ecological screening levels. The results showed no unacceptable risk to human health or the environment, and therefore, no cleanup was required. The RFI report text has been revised, and replacement pages iii, 1, and 13 are attached.

NMED Comment

2. ***Executive Summary, page iv, final bullet, page iv*** *"The primary observation of inspections of the hydrocarbon seep areas in DP Canyon is that there is little physical evidence of hydrocarbon contamination in DP Canyon, particularly in the last year. Therefore, there is no need to continue the regular inspections of the seeps in DP Canyon."*

   NMED disagrees with the above statement. The eastern seep was not discovered until March 2000. NMED will consider a reduction of inspection frequency to quarterly for both the western and eastern seep locations; however, this will follow eight (8) consecutive quarters of inspection at which time LANL may request a reduction in frequency (if appropriate). At this time, NMED will not approve LANL to discontinue monitoring of both seeps.

LANL Response

2. LANL has removed the last sentence of the final bullet on page iv of the executive summary and the last sentence of the third paragraph on page 78. After receiving NMED approval of the Phase II RFI

report for PRS 21-029, LANL will propose reducing the frequency of the eastern and western seep area inspections to quarterly intervals. Additionally, LANL will propose that the seep area inspections be conducted by Canyon Focus Area personnel and integrated into the ongoing Canyons Focus Area investigation of DP Canyon. Inspection results will be reported in quarterly reports and incorporated into the forthcoming Canyons Focus Area surface aggregate report. Replacement pages iv and 78 are attached.

NMED Comment

3. ***Section 3.4.1 Summary, page 15*** *"No QC samples were collected during the 2000 fieldwork." Since all samples collected during the 2000 fieldwork were not recollected during the 2001 fieldwork how can the regulatory agency determine if the results are valid. Please provide a clear, concise rationale for using data from 2000 fieldwork.*

LANL Response

3. Because of field documentation deficiencies and because no QC duplicate samples were collected during the Fiscal Year (FY) 2000 field investigation, some of the FY 2000 sample locations required resampling during FY 2001. The FY 2001 resample locations were placed as close to the FY 2000 locations as possible; differences in distances ranged between 1.81 ft and 4.67 ft. To determine the quality of the analytical results for the FY 2000 samples, those results were compared with the FY 2001 results (Table 1). Only the results for samples at the same depths were compared.

   The relative percent difference (RPD) is used to assess the precision between a parent sample result and the associated duplicate result. The RPD is calculated as follows:

   $$RPD = \text{absolute value } (S-D)/(S+D/2)*100$$

   where RPD = relative percent difference
   S = parent sample result
   D = duplicate sample result

   The LANL Environmental Restoration (ER) Project criterion for the RPD is less than 35% for soil samples, when the sample concentrations are greater than or equal to five times the method detection limit.

   Table 1 shows the results and RPDs for the 108 analytes. Ninety-seven analytes were not detected in both the FY 2000 and the FY 2001 samples. For seven analytes, the RPDs for the FY 2000 and the FY 2001 sample pairs were less than 35%. Therefore, even though the FY 2000/FY 2001 sample pairs were collected one year apart and not at the exact, same sample locations, 104 of the 108 sample pairs (96%) were in agreement, based on ER Project quality control guidelines.

   Only four of the 108 FY 2000/FY 2001 sample pairs had RPDs that exceeded 35% (RPDs ranged between 41% and 161%). Of these four sample pairs, three were separated by 4.67 ft, and the other was separated by 2 ft. The three sample pairs separated by 4.67 ft are associated with the boreholes northeast of the location of former tank 9 (borehole 21-11149 drilled during FY 2000 and borehole 21-11245 drilled during FY 2001). Site topography and surface disturbance from the advancement of borehole 21-11149 caused the 4.67-ft distance between these boreholes. The RPD criteria (<35%) for ER Project samples is for samples collected at the same location on the same day. The extra variability (RPDs >35%) for these four sample pair is expected because the sample locations were not in exactly the same place, and the samples were collected over one year apart. Further, for two of

the sample pairs, the FY 2001 lead results were qualified as estimated and biased high, based on routine validation of the data. These two FY 2001 lead results were higher than the corresponding FY 2000 results, which caused the RPDs for these sample pairs to be greater than 35%.

In summary, 96% of the results for the FY 2000/FY 2001 sample pairs agreed. The other four sample pairs were less precise in their agreement but make sense based on slight differences in locations and analytical method variability (the samples were analyzed more than one year apart and analyzed in different batches).

Table 1
DP Tank Farm 2000/2001 Data Comparison

Analyte	FY 2000 Sample ID	FY 2000 Result (mg/kg)	FY 2000 Qualifier	FY 2001 Sample ID	FY 2001 Result (mg/kg)	FY 2001 Qualifier	RPD	Location Difference (ft)	Depth (ft)
Benzene	MD21-00-0039	0.0054	U	MD21-01-0074	0.0059	U	Both ND[a]	1.81	0–0.5
Ethylbenzene	MD21-00-0039	0.0054	U	MD21-01-0074	0.0059	U	Both ND	1.81	0–0.5
Toluene	MD21-00-0039	0.0054	U	MD21-01-0074	0.0059	U	Both ND	1.81	0–0.5
Xylene (Total)	MD21-00-0039	0.0054	U	MD21-01-0074	0.0059	U	Both ND	1.81	0–0.5
Xylene[1,2-]	MD21-00-0039	0.0054	U	MD21-01-0074	0.003	U	Both ND	1.81	0–0.5
Diesel	MD21-00-0068	11	U	MD21-01-0117	27	U	Both ND	3.82	39–40
Gasoline	MD21-00-0068	0.04	U	MD21-01-0117	0.11	U	Both ND	3.82	39–40
Acenaphthene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Anthracene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Benzo(a)anthracene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Benzo(a)pyrene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Benzo(b)fluoranthene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Benzo(k)fluoranthene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Chrysene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Dibenz(a,h)anthracene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Fluoranthene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Fluorene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Methylnaphthalene[2-]	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Naphthalene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Phenanthrene	MD21-00-0068	0.35	U	MD21-01-0117	0.35	U	Both ND	3.82	39–40
Pyrene	MD21-00-0068	0.35	U	MD21-01-0117	1.7	U	Both ND	3.82	39–40
Lead	MD21-00-0068	9.2	—[b]	MD21-01-0117	8.6	—	6.74	3.82	39–40
Benzene	MD21-00-0068	0.006	U	MD21-01-0117	0.0065	U	Both ND	3.82	39–40
Ethylbenzene	MD21-00-0068	0.006	U	MD21-01-0117	0.0065	U	Both ND	3.82	39–40
Toluene	MD21-00-0068	0.006	U	MD21-01-0117	0.0065	U	Both ND	3.82	39–40

Table 1 (continued)

Analyte	FY 2000 Sample ID	FY 2000 Result (mg/kg)	FY 2000 Qualifier	FY 2001 Sample ID	FY 2001 Result (mg/kg)	FY 2001 Qualifier	RPD	Location Difference (ft)	Depth (ft)
Xylene (Total)	MD21-00-0068	0.006	U	MD21-01-0117	0.0065	U	Both ND	3.82	39–40
Diesel	MD21-00-0072	10	U	MD21-01-0125	52	U	Both ND	1.9	39–40
Diesel	MD21-00-0072	10	U	MD21-01-0125	26	U	Both ND	1.9	39–40
Gasoline	MD21-00-0072	0.04	U	MD21-01-0125	0.1	U	Both ND	1.9	39–40
Acenaphthene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Anthracene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Benz(a)anthracene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Benzo(a)pyrene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Benzo(b)fluoranthene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Benzo(k)fluoranthene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Chrysene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Dibenz(a,h)anthracene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Fluoranthene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Fluorene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Methylnaphthalene[2-]	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Naphthalene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Phenanthrene	MD21-00-0072	0.34	U	MD21-01-0125	0.34	U	Both ND	1.9	39–40
Pyrene	MD21-00-0072	0.34	U	MD21-01-0125	1.7	U	Both ND	1.9	39–40
Lead	MD21-00-0072	4.3	—	MD21-01-0125	5.2	J+	18.95	1.9	39–40
Benzene	MD21-00-0072	0.006	U	MD21-01-0125	0.0058	U	Both ND	1.9	39–40
Ethylbenzene	MD21-00-0072	0.006	U	MD21-01-0125	0.0058	U	Both ND	1.9	39–40
Toluene	MD21-00-0072	0.006	U	MD21-01-0125	0.0058	U	Both ND	1.9	39–40
Xylene (Total)	MD21-00-0072	0.006	U	MD21-01-0125	0.0058	U	Both ND	1.9	39–40
Diesel	MD21-00-0077	40	—	MD21-01-0074	33	U	19.18	1.81	0–0.5
Gasoline	MD21-00-0077	0.55	U	MD21-01-0074	0.13	U	Both ND	1.81	0–0.5
Acenaphthene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Anthracene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Benz(a)anthracene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Benzo(a)pyrene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Benzo(b)fluoranthene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Benzo(k)fluoranthene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Chrysene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Dibenz(a,h)anthracene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Fluoranthene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5

Table 1 (continued)

Analyte	FY 2000 Sample ID	FY 2000 Result (mg/kg)	FY 2000 Qualifier	FY 2001 Sample ID	FY 2001 Result (mg/kg)	FY 2001 Qualifier	RPD	Location Difference (ft)	Depth (ft)
Fluorene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Methylnaphthalene[2-]	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Naphthalene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Phenanthrene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Pyrene	MD21-00-0077	3.7	U	MD21-01-0074	0.44	U	Both ND	1.81	0–0.5
Lead	MD21-00-0077	9.4	—	MD21-01-0074	11.3	J-	18.36	1.81	0–0.5
Diesel	MD21-00-0099	31	—	MD21-01-0134	20	J	43.14	4.67	89–90
Gasoline	MD21-00-0099	1.3	—	MD21-01-0134	1	U	26.09	4.67	89–90
Acenaphthene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Anthracene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Benz(a)anthracene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Benzo(a)pyrene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Benzo(b)fluoranthene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Benzo(k)fluoranthene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Chrysene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Dibenz(a,h)anthracene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Fluoranthene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Fluorene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Methylnaphthalene[2-]	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Naphthalene	MD21-00-0099	0.35	U	MD21-01-0134	0.34	U	Both ND	4.67	89–90
Phenanthrene	MD21-00-0099	0.037	J	MD21-01-0134	0.34	U	160.74	4.67	89–90
Pyrene	MD21-00-0099	0.35	U	MD21-01-0134	1.7	U	Both ND	4.67	89–90
Lead	MD21-00-0099	5	—	MD21-01-0134	7.6	J+	41.27	4.67	89–90
Benzene	MD21-00-0099	0.006	U	MD21-01-0134	0.0062	U	Both ND	4.67	89–90
Ethylbenzene	MD21-00-0099	0.006	U	MD21-01-0134	0.0062	U	Both ND	4.67	89–90
Toluene	MD21-00-0099	0.006	U	MD21-01-0134	0.0062	U	Both ND	4.67	89–90
Xylene (Total)	MD21-00-0099	0.006	U	MD21-01-0134	0.0062	U	Both ND	4.67	89–90
Diesel	MD21-00-0137	23	J	MD21-01-0105	28	UR	19.61	2	34–35
Diesel	MD21-00-0137	23	J	MD21-01-0105	29	U	23.08	2	34–35
Gasoline	MD21-00-0137	0.044	U	MD21-01-0105	0.11	U	Both ND	2	34–35
Acenaphthene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Anthracene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Benz(a)anthracene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Benzo(a)pyrene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35

Table 1 (continued)

Analyte	FY 2000 Sample ID	FY 2000 Result (mg/kg)	FY 2000 Qualifier	FY 2001 Sample ID	FY 2001 Result (mg/kg)	FY 2001 Qualifier	RPD	Location Difference (ft)	Depth (ft)
Benzo(b)fluoranthene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Benzo(k)fluoranthene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Chrysene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Dibenz(a,h)anthracene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Fluoranthene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Fluorene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Methylnaphthalene[2-]	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Naphthalene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Phenanthrene	MD21-00-0137	0.36	U	MD21-01-0105	0.37	U	Both ND	2	34–35
Pyrene	MD21-00-0137	0.36	U	MD21-01-0105	1.8	U	Both ND	2	34–35
Lead	MD21-00-0137	6.4	—	MD21-01-0105	12.5	J+	64.55	2	34–35
Benzene	MD21-00-0137	0.006	U	MD21-01-0105	0.0051	U	Both ND	2	34–35
Ethylbenzene	MD21-00-0137	0.006	U	MD21-01-0105	0.0051	U	Both ND	2	34–35
Toluene	MD21-00-0137	0.006	U	MD21-01-0105	0.0051	U	Both ND	2	34–35
Xylene (Total)	MD21-00-0137	0.006	U	MD21-01-0105	0.0051	U	Both ND	2	34–35

[a] ND = not detected.

[b] A dash indicates that there is no data qualifier.

NMED Comment

4. ***Table 4.2-1 and 4.2-2 Screening Evaluation of Noncarcinogenic COPCs in Mesa Top Soil, page 66.*** *Please clarify Table 4.2-1 as it is not clear. The Table lists two columns of SALs but does not indicate concentration units or type of SAL (residential or 1/10th SAL). An additional column indicating the Hazard Index should also be included for the noncarcinogens. Table 4.2-2 should also reflect applicable changes required for Table 4.2-1.*

LANL Response

4. Tables 4.2-1 and 4.2-2 have been revised, and replacement pages 66 and 67 are attached. Concentrations of carcinogenic chemicals of potential concern (COPCs) were compared to the corresponding cancer risk and not to a hazard quotient. Therefore, a cancer risk column has been added to Table 4.2-2.

EXECUTIVE SUMMARY

This report describes Phase II Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) activities conducted during 2000 and 2001 at Potential Release Site (PRS) 21-029 (DP Tank Farm) and in DP Canyon. This investigation was conducted in accordance with the Phase II RFI work plan and the response to the request for supplemental information (RSI). PRS 21-029 was characterized in accordance with RCRA.

PRS 21-029 is located at the western edge of Technical Area (TA) 21. TA-21 is located on the northern boundary of the Los Alamos National Laboratory (the Laboratory). The TA is on DP Mesa, immediately east-southeast of the Los Alamos town site. In 1945, the operations for establishing the chemical and metallurgical properties of nuclear material that were necessary to achieve and sustain the required nuclear fission reaction were transferred to the TA-21 facilities.

From January 1946 to February 1985, DP Tank Farm was the primary fueling station supporting Laboratory operations. Structures included fuel tanks, fill ports, valve boxes, and the East and West Fill Stations, and site access roads all bounded by an earthen berm along the rim of DP Canyon on the north end of the site.

DP Tank Farm is currently inactive and owned by Department of Energy (DOE). The site is a part of TA-21, which is subject to Public Law 105-109; the public law directs DOE to transfer lands that are not critical to the mission of the Laboratory to either Los Alamos County or the Department of the Interior in trust for San Ildefonso Pueblo by November 26, 2007. DP Mesa is slated for transfer to Los Alamos County. The county has advised DOE that the intended use for this property is commercial.

The objectives of this Phase II RFI were to

- identify the nature and extent of subsurface petroleum hydrocarbon contamination associated with PRS 21-029 (the mesa top),
- identify the source or sources of petroleum hydrocarbons associated with the two localized hydrocarbon seep areas in DP Canyon;
- identify the migration pathway or pathways by which petroleum-related products have moved from the source(s) to the areas of the two hydrocarbon seeps in DP Canyon and determine if these pathways are still active,
- revise the conceptual model for contaminant fate and transfer,
- perform screening assessments of New Mexico Environment Department (NMED) underground storage tank (UST) related chemicals for potential present-day risks posed to human and ecological receptors located on the mesa top (PRS 21-029), and
- determine if there is a need for remedial action based on risk evaluation.

The Laboratory Environmental Restoration Project conducted the Phase II RFI at PRS 21-029 and in DP Canyon north of the PRS from April 2000 to July 2001. Pursuant to the Phase II RFI work plan and subsequent RSI response, sediment samples, hand-auger samples, and core samples were collected to characterize the area of PRS 21-029 and the two hydrocarbon seep areas in DP Canyon. A total of 179 samples were submitted to an off-site contract laboratory for analysis. The analytical suite included total petroleum hydrocarbons; semivolatile organic compounds; total lead; and benzene, toluene, ethylbenzene, and xylene. Additionally, one sample was collected at depth from the bottom of the borehole located at the West Fill Station and analyzed for americium-241, cobalt-60, cesium-134, cesium-137, tritium, and uranium-235.

The Phase II RFI focused on determining the source of the petroleum hydrocarbon contamination in DP Canyon, determining the nature and extent of the contamination, and developing/revising the conceptual

model for fate and transport. Weathered diesel and gasoline petroleum hydrocarbons were identified as the chemicals of potential concern (COPCs) at this site, based on fingerprint results comparing chemical characteristics of analytical data from the two petroleum hydrocarbon seep areas. To determine the source of the contamination, field investigation activities were started in DP Canyon and worked back toward the source area. To identify COPCs and the extent of contamination, data of sufficient quality were compared with applicable thresholds (i.e., background values for lead, background values for radionuclides, and UST Bureau cleanup levels for organic chemicals). If sample data were above background or fallout concentrations for inorganic chemicals and radionuclides or related to a release for organic chemicals, the analytes were retained as COPCs and evaluated further.

Human health and ecological assessments were performed for only PRS 21-029. The PRS includes the fenced area on the mesa top. Assessments of the Western Seep Investigation Area and Eastern Seep Investigation Area are deferred to the ongoing Canyons Focus Area investigation of DP Canyon and will be documented in a the surface aggregate report. All data collected from outside the PRS 21-029 boundary will be provided to the Canyons Focus Area for integration into the Los Alamos/Pueblo Canyon surface aggregate report.

The maximum analytical concentrations for 11 organic and inorganic chemicals were screened against the human health screening action levels (SALs) for the most protective exposure scenarios and the most protective ecological screening levels. Each analyte was eliminated from the human health screening process because the maximum concentrations were below levels that cause concern for receptors. All analytes were also eliminated from the ecological screening assessment because of negligible risk to plants and animals on the mesa-top area. No human health or ecological risk assessments were completed because no analytes were retained from the screening assessments at the mesa-top area.

A summary of the results of the PRS 21-029 RFI indicates the following:

- The vertical and horizontal extent of mesa-top (PRS 21-029) contamination has been defined in accordance with project requirements, and no further sampling for extent is required.
- The analytical results support the preliminary conceptual model hypothesis that no bulk sources of contamination remain at the site.
- The most probable contaminant sources at PRS 21-029 are the East Fill Station, the West Fill Station, and tanks 9 and/or 10.
- The source for the western and eastern seeps is DP Tank Farm, and the transport mechanism for contamination movement has been refined to include flow in and along fractures, movement along a clay-altered horizon, and hydrocarbon flow along the Guaje Mountain Fault offset.
- Investigation results allowed for a much clearer understanding of the two seeps.
- Using archived information and investigation results, the revised site conceptual model was refined to indicate that subsurface petroleum-related hydrocarbons in the unsaturated zone are immobile.
- As a result of the screening assessments, PRS 21-029 is recommended for no further action because concentrations of UST-related chemicals are less than NMED risk levels and SALs.
- The primary observation of inspections of the hydrocarbon seep areas in DP Canyon is that there is little physical evidence of hydrocarbon contamination in DP Canyon, particularly in the last year.

The primary conclusion of the Phase II RFI is that the overall investigation objective to improve the understanding of nature and extent of contamination and refine the conceptual model for PRS 21-029 and the two seeps has been met. Also, as a result of the screening assessments, PRS 21-029 is recommended for no further action because concentrations of UST-related chemicals are less than NMED risk levels and SALs.

1.0 INTRODUCTION

1.1 Background

Los Alamos National Laboratory (the Laboratory) is a multidisciplinary research facility owned by the Department of Energy (DOE) and managed by the University of California. The Laboratory is located in north-central New Mexico approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe. The Laboratory site covers 43 square miles of the Pajarito Plateau, which consists of a series of finger-like mesas that are separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation between approximately 6200 ft and 7800 ft. The eastern portion of the plateau stands 300 ft to 900 ft above the Rio Grande.

The Laboratory's Environmental Restoration (ER) Project is involved in a national effort by the DOE to clean up sites and facilities that were formerly involved in weapons research and production. The goal of the ER Project is to ensure that DOE's past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve that goal, the ER Project is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are either solid waste management units (SWMUs) or areas of concern (AOCs). In the ER Project, SWMUs and AOCs are collectively referred to as potential release sites (PRSs).

Depending on the type of contaminant(s) and the history of a PRS, the New Mexico Environment Department (NMED) or the DOE has administrative authority over work performed by the ER Project. NMED, under the auspices of the State of New Mexico, has authority over cleanup of sites with hazardous waste or hazardous constituents, including the hazardous waste portion of mixed waste (i.e., waste contaminated with both radioactive and hazardous constituents). Hazardous constituents are regulated under the Resource Conservation and Recovery Act (RCRA). The DOE has authority over cleanup of sites with radioactive contamination; radionuclides are regulated under DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE Order 435.1, "Radioactive Waste Management." The PRS in this report contains petroleum hydrocarbons, which include hazardous constituents.

NMED enforces the Hazardous and Solid Waste Amendments (HSWA) Module VIII of the Laboratory's Hazardous Waste Facility Permit, hereafter referred to as the HSWA Module (EPA 1990, 1585). The HSWA Module specifies conditions and requirements for performing ER activities. The Environmental Protection Agency (EPA) issued the HSWA Module on May 23, 1990, and revised it on May 19, 1994; the permit is currently under revision by NMED. PRS 21-029 (DP Tank Farm) is a SWMU listed in the HSWA Module. PRS 21-029 was characterized in accordance with RCRA (Environmental Restoration Project 1990, 64829).

In accordance with the HSWA Module, appropriate corrective actions are determined through the RCRA facility investigation (RFI) process. The purposes of an RFI are to

- identify site information and collect environmental data, as necessary;
- characterize the nature and extent of any contaminant release(s) to air, groundwater, surface water, bedrock, and soil;
- evaluate the potential risk to human health and the environment; and
- support corrective measures proposals, if appropriate, for the site.

This report is organized according to the RFI annotated outline (LANL 1998, 58605) and the revised RFI report outline for DP Tank Farm approved by NMED (Bertino 2001, 70120). The Phase II RFI work plan (Environmental Restoration Project 1998, 59976) and the response to the request for supplemental information (RSI) (Environmental Restoration Project 1999, 64829) thoroughly address DP Tank Farm historic operating information and investigation activities. Therefore, only summary information necessary to evaluate and interpret results is included in this report (Bertino 2001, 70120).

This report describes the results of the Phase II RFI of PRS 21-029 at Technical Area (TA) 21 at the Laboratory. Sections 1 through 5 include an abbreviated site history, environmental setting, data collection and analysis, risk assessments, and conclusions/recommendations. Appendix A includes a list of acronyms and defines terms used in this report. Appendix B gives details of the operational and environmental setting, including site fracture information. Appendix C describes the results of the quality control (QC)/quality assurance process. Appendix D includes the analytical suites and results. Appendix E describes the statistical analyses; Appendix F includes the ecological scoping checklist. Appendix G lists the relevant regulatory documents. Appendix H includes borehole logs, and Appendix I includes hand-auger borehole logs. Appendix J contains photographs. Appendix K presents sample location numbers and all field-screening results, describes the samples, and states the purpose of collecting the samples from the locations. Appendix L presents the geologic cross sections for the site.

1.2 Technical Area 21

TA 21 is located on the northern boundary of the Laboratory (Figure 1.2-1). It is centrally located on the Pajarito Plateau, approximately midway between the flanks of the Jemez Mountains on the west and the Rio Grande to the east. TA-21 is located on DP Mesa, immediately east-southeast of the Los Alamos town site (Figure 1.2-2). In 1945, the operations for establishing the chemical and metallurgical properties of nuclear material that were necessary to achieve and sustain the required nuclear fission reaction were transferred to the TA-21 facilities in the areas of DP West and DP East. DP Tank Farm, PRS 21-029, is located at the western edge of TA-21. DP Tank Farm is the former location of 2 fill stations and 15 underground storage tanks (USTs) that contained petroleum hydrocarbon products; the stations and tanks were decommissioned in 1988.

1.3 Objectives and Scope

This report describes Phase II RFI activities conducted during 2000 and 2001 at PRS 21-029 and in DP Canyon. This investigation was conducted in accordance with the Phase II RFI work plan (Environmental Restoration Project 1998, 59976) and the RSI response (Environmental Restoration Project 1999, 64829). The objectives of the Phase II RFI were to

- identify the nature and extent of subsurface petroleum hydrocarbon contamination associated with PRS 21-029 (the mesa top),
- identify the source or sources of petroleum hydrocarbons associated with the two localized hydrocarbon seep areas in DP Canyon;
- identify the migration pathway or pathways by which petroleum-related products have moved from the source(s) to the areas of the two hydrocarbon seeps in DP Canyon and determine if these pathways are still active,
- revise the conceptual model for contaminant fate and transfer,
- perform screening assessments of NMED UST-related chemicals for potential present-day risks posed to human and ecological receptors located on the mesa top (PRS 21-029), and
- determine if there is a need for remedial action based on risk evaluation.

Subsurface migration of free petroleum product was considered to be the most likely mechanism by which petroleum-related products could have been introduced in bulk into DP Canyon. Fractures in the tuff beneath the former location of the tank farm show a predominant northwest to northeast strike and a northward dip. A surface or near-surface petroleum-related product release infiltrating the tuff would likely migrate to the north along fractures toward the drainage at the bottom of DP Canyon.

The predominant nature of the contamination at PRS 21-029 and in DP Canyon in the area of the two seeps was petroleum related. Contaminants in sediment and tuff samples collected from auger holes in the hydrocarbon seep areas were classified as weathered diesel (in contrast to the 1998 canyon sediment samples from reach DP-1 that contained heavy fuel or lubricating oil). The chromatograms of samples from the fill stations clearly identified diesel as the primary petroleum-related hydrocarbon present at these locations.

Before the Phase II RFI, the full extent of contamination was not well established at PRS 21-029 (DP Tank Farm) or in DP Canyon. Previous sampling was limited to PRS 21-029 and the western seep area in DP Canyon. Additional information was required to describe how DP Tank Farm and the hydrocarbon seep areas in DP Canyon interact. The extent of subsurface petroleum hydrocarbon contamination associated with the two seep areas in DP Canyon required additional characterization. Data gaps also needed to be addressed to define the extent of petroleum hydrocarbon and inorganic chemical contamination in surface and subsurface media at potentially affected, but previously unsampled, locations at PRS 21-029.

3.4 Field Investigation and Data Review

3.4.1 Summary

From January 1946 to February 1985, DP Tank Farm was the primary fueling station supporting Laboratory operations. Structures included fuel tanks, fill ports, valve boxes, and the East and West Fill Stations, and site access roads all bounded by an earthen berm along the rim of DP Canyon on the north end of the site. DP Tank Farm and two related petroleum hydrocarbon seep areas (western and eastern) in DP Canyon were characterized in accordance with RCRA (Environmental Restoration Project 1999, 64829).

The data collected during the Phase II RFI at PRS 21-029 were used to

- fill data gaps remaining after the Phase I RFI, UST investigation, and VCA conducted at the site;
- confirm that no bulk sources of contamination or subsurface structures remain at the site;
- determine the source and transport mechanism for the western and eastern petroleum hydrocarbon seeps; and
- ensure that the residual hydrocarbon contamination in the subsurface beneath the mesa top poses no unacceptable risk to human health or the environment.

The Laboratory ER Project conducted the Phase II RFI at PRS 21-029 and in DP Canyon north of the PRS from April 2000 to July 2001. Pursuant to the Phase II RFI work plan and subsequent RSI response (Environmental Restoration Project 1998, 59976; Environmental Restoration Project 1999, 64829), 27 sediment samples, 121 hand-auger samples, and 351 core samples were collected to characterize the area of PRS 21-029 and the two hydrocarbon seep areas in DP Canyon. All Phase II RFI sample locations are presented in Figure 3.4-1. A total of 179 samples were submitted to an off-site contract laboratory for analysis. The total of the numbers above includes all samples that were field screened by immunoassay field testing. The analytical suite included TPHs; semivolatile organic compounds (SVOCs); total lead; and BTEX. Additionally, the sample collected at depth from the bottom of the borehole located

at the West Fill Station was analyzed for americium-241, cobalt-60, cesium-134, cesium-137, tritium, and uranium-235.

The Phase II RFI focused on determining the source of the petroleum hydrocarbon contamination in DP Canyon, determining the nature and extent of the contamination, and developing/revising the conceptual model for fate and transport. Weathered diesel and gasoline petroleum hydrocarbons were identified as the COPCs at this site, based on fingerprint results comparing chemical characteristics of analytical data from the two petroleum hydrocarbon seep areas (Environmental Restoration Project 1998, 59976; Environmental Restoration Project 1999, 64829). To determine the source of the contamination, field investigation activities were started in DP Canyon and worked back towards the source area. To identify COPCs and the extent of contamination, data of sufficient quality were compared with applicable thresholds (i.e., background values for lead, background values for radionuclides, and UST Bureau cleanup levels for organic chemicals). If sample data were above background or fallout concentrations for inorganic chemicals and radionuclides or related to a release for organic chemicals, the analytes were retained as COPCs and evaluated further.

Review of data from the field investigations indicate that the data were of sufficient quality and quantity to support the following statements:

- Previous findings, which identified weathered diesel as the primary classification of the petroleum hydrocarbon contamination present in the mesa-top subsurface and at the Western and Eastern Seep Investigation Areas, were confirmed. GROs were primarily detected in sediment/tuff samples from the eastern seep area.
- Lead was identified above its background values within all three investigation areas.
- No bulk sources of contamination or subsurface structures remain at the site.
- DP Tank Farm is the source of the western and eastern petroleum hydrocarbon seeps.
- Residual hydrocarbon contamination in the subsurface beneath the mesa top poses no unacceptable risk to human health or the environment.

This Phase II RFI report focuses on the potential present-day risks posed to human and ecological receptors located at PRS 21-029. The cumulative risk from all potential sources of contamination in DP Canyon will be evaluated in a future watershed report for the upper DP Canyon aggregate, as identified in the approved installation work plan (LANL 1998, 62060; Bertino 2001, 70120).

3.4.2 Deviations from and Augmentation to the Phase II RFI Work Plan and the RSI Response

There were numerous deviations and omissions from the approved Phase II RFI work plan and the RSI response during the Phase II RFI fieldwork conducted during the summer and fall of 2000. A detailed description of the deviations was provided to NMED in a letter (LANL 2001, 64952) dated February 1, 2001, and at a subsequent meeting on April 11, 2001. As a result of these deviations, it was necessary to repeat a significant portion of the field investigation work during the spring and summer of 2001 (Bearzi 2001, 69919; Bearzi 2001, 70768). Resampling was required at 6 sediment sample locations, 18 auger-hole locations, and 8 borehole locations. In addition, two sediment samples were collected (downgradient of the previous sample locations) in the drainage channels from the westernmost and middle storm drain pipes in the western seep area. The sample summary table in Appendix K distinguishes between and cross-references sample locations from the Phase II RFI 2000 fieldwork and those from the 2001 fieldwork. The following is a summary of deviations that occurred during the 2000 field activities.

All UST-related COPCs were eliminated based on this screening process. Detected radionuclides on the mesa top were also below screening benchmarks.

4.2 Screening Assessments

Because the site is a SWMU, as identified in the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 1585), the site is evaluated according to the Laboratory's RCRA-based guidance for human health and ecological risks. However, because PRS contamination results from UST releases, the assessments only involve chemicals characteristic of petroleum hydrocarbon fuels. The UST-related chemicals[1] identified in the NMED's guidance for USTs include VOCs, SVOCs, and lead. The decision to assess only UST-related chemicals is documented in the record of communication (Bertino 2001, 70120). The approved RSI response and record of communication (Environmental Restoration Project 1999, 64829; Bertino 2001, 70120) also indicate that the radionuclide results from the single borehole sample collected from the bottom of the borehole adjacent to the West Fill Station would not be evaluated for potential human health and ecological risk because human or ecological exposure is improbable at this depth in solid tuff. The radionuclide results are discussed below in the uncertainty analyses.

4.2.1 Human Health Screening Assessment

(a) Scoping

Chainlink fencing restricts public access to the site, and no permanent structures exist there. The area is scheduled for transfer to Los Alamos County. Neighboring properties on DP Road are mainly commercial or industrial. Consideration of impacted media is limited to soil and tuff because the depth to groundwater is estimated to be 1200 ft bgs. On the basis of previous investigations (Environmental Restoration Project 1996, 52270), the NMED recognized that the site does not pose a threat to groundwater (McInroy and Koch 1996, 55172). Although alluvium and alluvial groundwater exists downstream in DP Canyon, the area immediately north of the mesa top is close to the head of DP Canyon and consists of bedrock tuff with no alluvium. Hence, alluvial groundwater is not present within the PRS (Environmental Restoration Project 1998, 59976)

Although access to the site is currently restricted, a residential scenario was used to evaluate potential risks. Because this property is proposed for transfer to Los Alamos County, future land use will likely include construction activities as permanent structures are developed. These activities will necessarily entail subsurface soil excavation. NMED guidance for UST sites specifies consideration of the subsurface to a depth of 15 ft to evaluate exposure experienced by construction workers. Consequently, analytical data, spanning 0 ft to 15 ft below the ground surface, served as the basis of the human health screening assessment. Considering that the site will likely be developed commercially, employing a residential scenario to evaluate exposure to COPCs up to 15 ft bgs in the human health screening assessment is an appropriate approach to assessing potential human health risks.

For human health to be adversely affected, people must come into contact with a COPC through a complete exposure pathway. For a pathway to be complete there must be (1) a source of contaminant, (2) a mechanism by which the contaminant is released, (3) a medium through which a contaminant travels from the point of release to the receptor location, and (4) a route of exposure by which the

[1] Broad categories for petroleum hydrocarbons (e.g., DROs) are considered with regard to individual hydrocarbon constituents. And while methyl-tert-butyl-ether (MTBE) is a UST-related constituent, it was not analyzed in media from DP Tank Farm because fuels stored there predate the use of MTBE in petroleum products.

receptor takes in the contaminant that causes or threatens adverse health effects (EPA 1989, 8021). Potential exposure pathways from soils include ingestion, inhalation of vapors and soil particulates, and dermal contact.

Eight samples collected from the surface to 15 ft bgs are used to represent the UST-related chemicals on the mesa top. These samples are composed of fill (5) and tuff (3). Large areas within the assessment boundary in the mesa-top area (PRS 21-029) are represented by fill material. Considering the intent of the recent (2000 and 2001) sampling campaigns to identify the nature and extent of contamination, sampling focused on fill areas among the former tank locations. Fill material best represents past surface releases from DP Tank Farm operations. In all cases, the detected UST-related chemicals are represented by the maximum concentration in fill/tuff in the numerical comparison to SALs.

(b) Screening Evaluation

This human health screening assessment is performed according to guidance provided by NMED's risk-based decision tree (NMED 1998, 57761), EPA Region 6 (EPA 2000, 68410), and the Laboratory ER Project (LANL 1998, 62060). The SALs were calculated based on the methodology in Appendix C of the IWP (LANL 1998, 62060) or provided in guidance from NMED (2000, 68554). The parameters used include the most current values available as presented in EPA Region 6 and/or NMED guidance (EPA 2000, 68410; NMED 2000, 68554). The SALs reflect a residential exposure scenario where exposure is based on 24 hours per day and 350 days per year. The SALs are used to ensure a representative evaluation of potential risk at this site. The comparison to SALs is conducted separately for noncarcinogens and carcinogens. The SALs are equivalent to a 10^{-6} cancer risk for carcinogens and a hazard quotient (HQ) of 1.0 for noncarcinogens. The maximum detected concentrations of each COPC from 0 ft to 15 ft bgs were compared to the SAL for carcinogens and 0.1 SAL for noncarcinogens because more than one noncarcinogenic COPC was identified. The COPCs detected at depths greater than 15 ft are not evaluated because no pathways are present that might result in exposure to a receptor.

Ten COPCs were retained for evaluation of potential human health risk for the mesa-top area. The results of the screening assessment are presented in Tables 4.2-1 and 4.2-2.

Table 4.2-1
Screening Evaluation of Noncarcinogenic COPCs in Mesa Top Soil

UST-Related Chemical	Maximum Concentration (0–15 ft) (mg/kg)	SAL[a] (mg/kg)	0.1 SAL (mg/kg)	HQ[b]
Toluene	0.003	180	18	0.00002
Fluoranthene	0.21	2300	230	0.00009
Phenanthrene	0.056	1800	180	0.00003
Pyrene	0.17	1800	180	0.00009
Lead	43.5	400	40	0.1
			Hazard Index	0.1

[a] The SAL represents a residential exposure.

[b] The hazard quotient is the ratio of the maximum detected concentration to the SAL.

Table 4.2-2
Screening Evaluation for Carcinogenic COPCs in Mesa Top Soil

UST-Related Chemical	Maximum Concentration (0–15 ft) (mg/kg)	SAL (mg/kg)	Cancer Risk
Benz(a)anthracene	0.11	0.62	2×10^{-7}
Benzo(a)pyrene	0.14	0.062	2×10^{-6}
Benzo(b)fluoranthene	0.13	0.62	2×10^{-7}
Benzo(k)fluoranthene	0.14	6.2	2×10^{-8}
Chrysene	0.13	61	2×10^{-9}
		Total cancer risk	2×10^{-6}

Table 4.2-1 shows that noncarcinogenic organic COPCs had maximum concentrations several orders of magnitude less than their respective soil SALs. These COPCs are eliminated from further assessment. Lead had a maximum concentration greater than 0.1 SAL. However, lead is nearly an order of magnitude below its SAL; this concentration of lead along with the concentrations of the other noncarcinogenic COPCs results in a hazard index (HI) (sum of the ratios of the concentration to the SAL) below NMED's target level of 1.0 (NMED 2000, 68554).

Table 4.2-2 shows that the maximum concentrations of carcinogenic COPCs other than benzo(a)pyrene are less than their SALs. These COPCs can be eliminated from further assessment. Benzo(a)pyrene had a maximum concentration greater than its respective SAL, which represents a cancer risk of approximately 2×10^{-6}. The total excess cancer risk from the carcinogenic COPCs is less than NMED's target risk level of 10^{-5} (NMED 2000, 68554).

(c) Uncertainty Analysis

An uncertainty in this assessment is whether mesa-top data characterize the nature of contamination in near-surface soils and fill. It is important to note that all near-surface soil samples were screened in the field for TPHs by immunoassay test kits and organic vapors during 2000 and 2001. Intervals from each borehole were screened for hydrocarbon contamination using an immunoassay test for weathered diesel to determine which samples would be sent to an off-site analytical laboratory (Appendix K). The mesa-top material was screened for weathered diesel because this is expected to be a primary indicator of contamination by UST-related chemicals. Samples that tested positive by the immunoassay and/or other screening procedures, and those deemed important for defining the spatial extent of hydrocarbon-impacted media were analyzed for UST-related chemicals (Table 3.4-4).

Two hundred and eleven samples over all depths were screened with the immunoassay test on the mesa top. Of these samples, 8 tested positive for up to 40 ppm diesel, and one tested positive for up to 160 ppm diesel (Appendix K). This is a detection frequency of 9/211 or about 4%. For the samples collected from shallower depths (0 ft–15 ft) for which human exposure is more likely, few detects of TPHs by this technique were also found. Specifically, of 43 samples screened at 15 ft bgs or less, only 2 samples tested positive for the low-range of diesel contamination (detection frequency of about 5%). Using this approach, the immunoassay results show that the vast majority of samples have no indication of contamination by UST-related chemicals and that the mesa-top area (PRS 21-029) is not heavily contaminated.

Considering the specific UST-related chemicals detected in laboratory analyses, an additional uncertainty in this assessment is whether maximum concentrations were captured by the mesa-top sampling

conducted during 2000 and 2001. The fill material, upon which the numerical screening comparisons are based, was collected in the area that had surrounded the tanks in the western portion of the mesa top. The historical releases from the tanks should represent a worst-case exposure estimate based on fill material. Because of the subsurface nature of contamination and the revised conceptual model for this site, all UST-related chemicals will ultimately migrate downward from the source. If contamination resulted from facility operations, it would likely be captured at depth considering the extensive time interval (up to 50 years) for contaminant migration. An evaluation of maximum concentrations with depths down to 100 ft or more shows that, of the 32 tuff samples collected (Table 3.4-1), no UST-related chemicals have higher maximum concentrations at depth relative to the fill samples, i.e., the sample data used in the screening assessment represents the maximum concentrations of contaminants on the mesa top.

The drainage samples are also used to assess whether the nature of contamination was adequately defined. These areas collect suspended soil and fill material draining off the mesa top from stormwater and snowmelt events. The investigation into the nature of PRS contamination (Section 3.4.4.4.1) shows that samples collected from the drainage off the mesa top have somewhat higher concentrations (2 to 3 times the mesa-top concentrations) for some detected COPCs. The assessment of mesa-top fill data was augmented by samples (maximum depth of 1.5 ft) from the drainages off the mesa top, located just outside the northern perimeter of the fence line (Figure 3.4-4). Although these additional samples are outside of the site boundary, they integrate surface runoff from the site and are representative of contamination that may be transported off the mesa top.

The consideration of the drainage samples provides additional spatial coverage for additional near-surface soils. Table 4.2-3 presents a comparison of maximum concentrations of contaminants in mesa-top fill to maximum concentrations in drainage samples. The data for drainage samples demonstrate a pattern similar to the mesa top with regard to the soil analytical profile. The correspondence in analyte concentration trends for drainage and mesa-top samples offers evidence that mesa-top fill samples are reflective of soils in the area and that the nature of contamination has been adequately described. Because the maximum drainage sample concentrations are slightly higher than mesa-top concentrations, it is appropriate to assess the potential risk related to exposure to these concentrations.

Table 4.2-3
Analytical Profile of UST-Related Chemicals in Mesa-Top Fill Relative to Storm Drainage Samples

Analytical Suite	UST-Related Chemical	Mesa Top Maximum Concentrations (mg/kg)	Drainage Maximum Concentrations (mg/kg)
VOC	Toluene	0.003	0.016
SVOC	Benz(a)anthracene	0.11	0.43
SVOC	Benzo(a)pyrene	0.14	0.46
SVOC	Benzo(b)fluoranthene	0.13	0.47
SVOC	Benzo(k)fluoranthene	0.14	0.43
SVOC	Chrysene	0.13	0.46
SVOC	Fluoranthene	0.21	0.64
SVOC	Phenanthrene	0.056	0.26
SVOC	Pyrene	0.17	0.72
Inorganic	Lead	43.5	72

will include recommendations on the need for corrective action or continued monitoring within the watershed.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The objectives of the Phase II RFI were to

- identify the nature and extent of subsurface petroleum hydrocarbon contamination associated with PRS 21-029 (the mesa top),
- identify the source or sources of petroleum hydrocarbons associated with the two localized hydrocarbon seep areas in DP Canyon;
- identify the migration pathway or pathways by which petroleum-related products have moved from the source(s) to the areas of the two hydrocarbon seeps in DP Canyon and determine if these pathways are still active,
- revise the conceptual model for contaminant fate and transfer,
- perform screening assessments of NMED UST-related chemicals for potential present-day risks posed to human and ecological receptors located on the mesa top (PRS 21-029), and
- determine if there is a need for remedial action based on risk evaluation.

PRS 21-029, Mesa-Top Area

The vertical and horizontal extent of mesa-top contamination has been defined in accordance with project requirements, and no further sampling for extent is required. According to the Phase II RFI work plan, the extent of contamination is defined relative to whole, competent tuff. It was not expected, or required, that extent be defined relative to contamination that may exist in fractures within the tuff (Environmental Restoration Project 1998, 59976). The analytical results also support the preliminary conceptual model hypothesis that no bulk sources of contamination remain at the site; only subsurface residual contamination remains.

The revised site conceptual model presented in Section 3.4.4.4 identifies the most probable contaminant sources at PRS 21-029 as the East Fill Station, the West Fill Station, and Tanks 9 and/or 10. The surface and subsurface samples from the three investigation areas of this Phase II RFI were fingerprinted for petroleum type and were characterized as weathered diesel and gasoline. These characterization results are important because they can be compared to, and differentiated from, samples collected from DP Canyon subreaches DP-1 West and DP-1 Central, which were characterized as motor oil. The motor oil contamination in DP Canyon is currently assumed to be from town site runoff (Environmental Restoration Project 1999, 63915).

Using archived information and investigation results, the revised site conceptual model was refined to indicate that subsurface migration of petroleum-related hydrocarbons in the unsaturated zone ceased.

As presented in Section 4.0, the maximum analytical concentrations for 11 organic and inorganic chemicals were screened against the human health SALs for the most protective exposure scenarios and the most protective ESLs. Each analyte was eliminated from the human health screening process because the maximum concentrations were below levels that cause concern for receptors. All analytes were also eliminated from the ecological screening assessment because of negligible risk to plants and animals on the mesa-top area. No human health or ecological risk assessments were completed because no analytes were retained from the screening assessments at the mesa-top area.

Lead was detected in several samples (5 of 37) above its soil or tuff background values of 22.3 mg/kg and 11.2 mg/kg, respectively. The concentrations of lead above the soil background value ranged between 22.6 mg/kg and 43.5 mg/kg, and concentrations above the tuff background value ranged between 13.8 mg/kg and 15.4 mg/kg. Based on these data, lead is not a widespread contaminant nor is it present at highly elevated concentrations at this PRS. The screening assessments found that the maximum detected concentration (43.5 mg/kg) was below the human health SAL (400 mg/kg) and the minimum ESL (76 mg/kg). As a result, lead concentrations represent hazard quotients of 0.1 for human health risk and 0.3 for ecological risk. Therefore, although lead is present as a result of site operations at DP Tank Farm, it does not exceed NMED's target hazard quotient of 1.0 and does not pose a potential unacceptable risk to human health or the environment.

Western Seep Investigation Area

The source for the western seep is DP Tank Farm, and the transport mechanism for contamination movement has been refined to include flow in and along fractures, movement along a clay-altered horizon, and hydrocarbon flow along the Guaje Mountain Fault offset. Additionally, investigation results allowed for a much clearer understanding of the two seeps.

Eastern Seep Investigation Area

The source for the eastern seep is DP Tank Farm, and the transport mechanism for contamination movement includes hydrocarbon migration in tuff, flow in and along fractures, and movement along a clay-altered horizon. All data collected from outside the PRS 21-029 boundary will be provided to the Canyons Focus Area for integration into the Los Alamos/Pueblo Canyon surface aggregate report.

Regular inspections of the hydrocarbon seep areas in DP Canyon have been conducted for nearly two years. The purpose of these inspections is to document any changes in the seeps in relation to seasonal changes and recent precipitation. The results of these inspections have shown there is some seasonal variability in the presence of hydrocarbons in the canyon, and this information has been used to refine the site conceptual model. However, the primary observation of these inspections is that there is little physical evidence of hydrocarbon contamination in DP Canyon, particularly in the last year.

The overall investigation objective to improve the understanding of nature and extent of contamination and refine the conceptual model for PRS 21-029 and the two seeps have been met. Also, as a result of the screening assessments, PRS 21-029 is recommended for no further action because concentrations of UST-related chemicals are less than NMED risk levels and SALs.

6.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Laboratory's ER Project to track records associated with the Project. These numbers can be used to locate copies of the actual documents at the ER Project's Records Processing Facility and, where applicable, with the ER Project reference library titled "Reference Set for Material Disposal Areas, Technical Area 21."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Area Office; United States EPA, Region 6; and the ER Project Material Disposal Areas Focus Area. This library is a living collection of documents that was developed to ensure that the administrative

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