ER ID 59364

Sampling and Analysis Plan for Subsurface Soil Sampling at DP Tank Farm (21-029)

Field Unit: 1
Technical Area: 21

FY 1995 Field Season

Revision 1

May 1995

Prepared for
Los Alamos National Laboratory
Environmental Restoration Project
Los Alamos, New Mexico

Prepared by
ERM/Golder Los Alamos Project Team
555 Oppenheimer Drive, Suite 100
Los Alamos, New Mexico 87544

1.0 INTRODUCTION

The Sampling and Analysis Plan (SAP) presented below details the field conditions, sampling requirements and procedures for proposed work at Technical Area 21 (TA-21) during the Fiscal Year 1995 (FY95) field season. The scope of work described includes a continuation of the Phase I field investigation started at the DP Tank Farm [Solid Waste Management Unit (SWMU) 21-029] in FY94.

1.1 TA-21 Site Locations and Descriptions

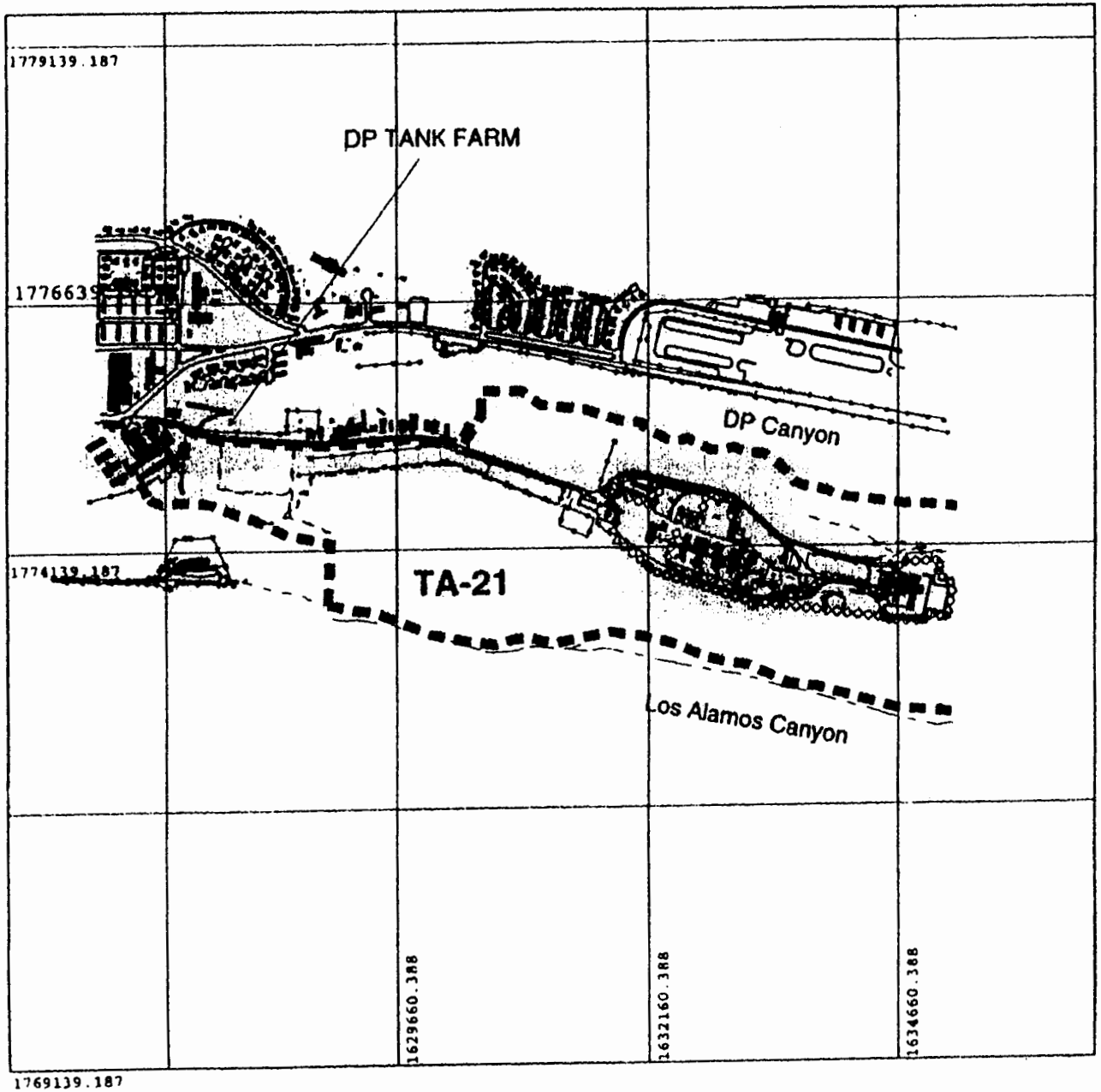
The TA-21 site is located on DP Mesa, east-southeast of the Los Alamos townsite. The site encompasses an area of approximately 311 acres and includes all of TA-21 and the areas extending to the stream channels in the canyons on either side of the mesa—DP Canyon to the north, and Los Alamos Canyon to the south (Figure 1-1). A total of 112 SWMUs have been identified at TA-21. TA-21 was operational from 1945 to 1978 and was used primarily for chemical research and plutonium metal production. Due to the nature of the industrial operations at the site, most of the waste disposal activities were plutonium-related as well. Known contaminants include plutonium, tritium, uranium, volatile organic compounds (VOCs), and PCBs. Current operations at TA-21 involve the LANL Isotope and Structural Chemistry Group (INC-4), the Tritium Science and Technology Group (MST-3), and the LANL operations and maintenance contractor, Johnson Controls, Incorporated. Several other groups conduct varied activities housed within buildings on the TA-21 site.

Field work described within this SAP will be confined to areas within and adjacent to the DP Tank Farm (SWMU 21-029). The site and applicable previous field work is described further in the following paragraphs.

1.1.1 DP Tank Farm Site (SWMU 21-029)

The former DP Tank Farm is located near the western end of DP Mesa on a moderate slope descending from DP Road towards DP Canyon. The site occupies property which is currently bounded by the Knights of Columbus Hall to the west and a Los Alamos County fire station facility on the east. The site is surrounded by a 6-foot chain link fence.

The DP Tank Farm site is the former location of 15 fuel storage tanks and two fill stations (Figure 1-2). The tank farm was operational from January 1946 to February 1985. Reported tank capacities ranged from approximately 2,100 gallons upwards to approximately 51,000 gallons. The tanks appeared to have been used primarily for the storage of petroleum hydrocarbon products (gasoline, diesel, kerosene, and No. 2 fuel oil). The tanks may not have been dedicated to the storage of a single petroleum product and may have contained different substances at different times. One tank was reported to have contained ethanol. There are no known records of any radioactive materials associated with this site. All tanks and structures at the site were decommissioned and removed in 1988. During site decommissioning, only one tank was found to have leaked. The remaining tanks and underground distribution piping were reported to have been in good condition. A 4-foot earthen berm encompassed the northern boundary of the tank farm and a storm drain reportedly discharged surface runoff through the berm at the northeast corner of the property. A recent site inspection revealed two, 24-inch culverts which discharged into DP Canyon at locations almost directly north of each of the fill stations. No associated storm drains have been located. Surface and subsurface soil sampling activities conducted prior to and during decommissioning of the site suggested that there was little potential for significant levels of contamination due to activities at the DP Tank Farm.



LEGEND

- Dirt Roads
- Road, Paved
- Outline for TA-21
- Industrial Fences
- Security Fences
- Buildings

Produced by: Belinda Scheber, 103248

Modified by: Kirsten Oschwald 5/8/95

N

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

Figure 1-1. TA-21, DP Tank Farm Site Location

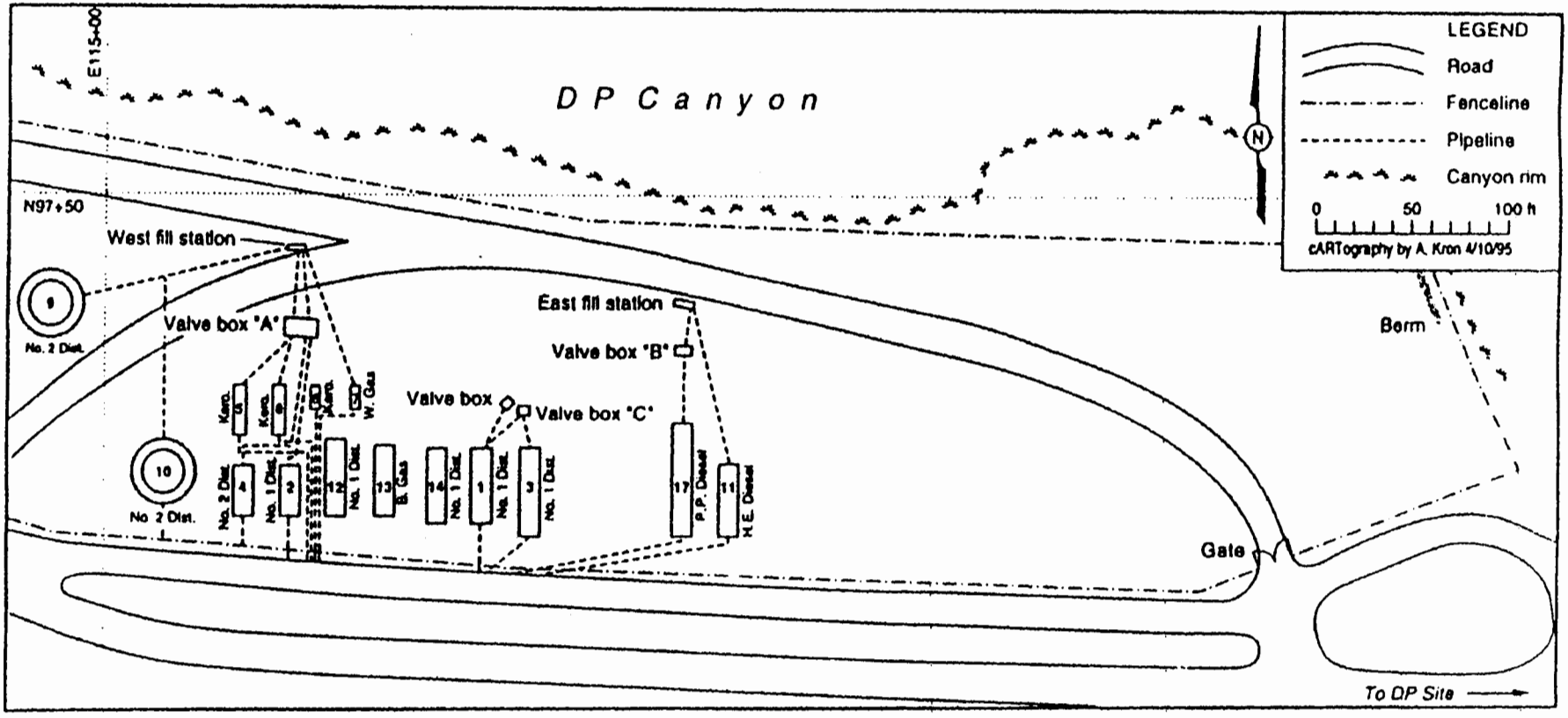


Figure 1-2. DP Tank Farm (SWMU 21-029) showing layout of tanks, pipelines, and fill stations.

During the Phase 1 investigation conducted at the site in September 1994, eleven boreholes were placed at the locations depicted in Figure 1-3. Preliminary data suggested that much of the Tank Farm site contained no detectable levels of potential contaminants in the subsurface soils and tuff. However, significant levels of petroleum hydrocarbons were found in subsurface soils and tuff beneath the area surrounding the two fill stations. The horizontal and vertical extent of the contaminants have not been defined at either of the fill station locations.

At the west fill station, borehole 21-2556 appears to have penetrated the base of contamination, vertically bounding the extent of contamination at the approximate source location. Only one other borehole (21-2557) was drilled and sampled at this site. Thus, the horizontal extent of the contaminants has not been adequately determined. In addition, a possible hydrocarbon seep was discovered by Environmental Restoration (ER) personnel in the upper reaches of DP Canyon directly north of the west fill station. The borehole locations associated with the west fill station and the approximate location of the hydrocarbon seep are shown on Figure 1-3.

Three boreholes were drilled in the vicinity of the east fill station. However, an adequate number of samples to confirm the vertical extent of contamination at the approximate source location (borehole 21-2558) was not collected. Samples collected from borehole 21-2559 contained elevated concentrations of hydrocarbons, but drilling was terminated at a depth of 10 feet below ground surface (bgs). There is no convincing evidence that the zone of contamination has migrated laterally as far as borehole 21-2607, which is located approximately 60 feet northeast of the fill station location. The locations of the boreholes associated with the east fill station are shown on Figure 1-3.

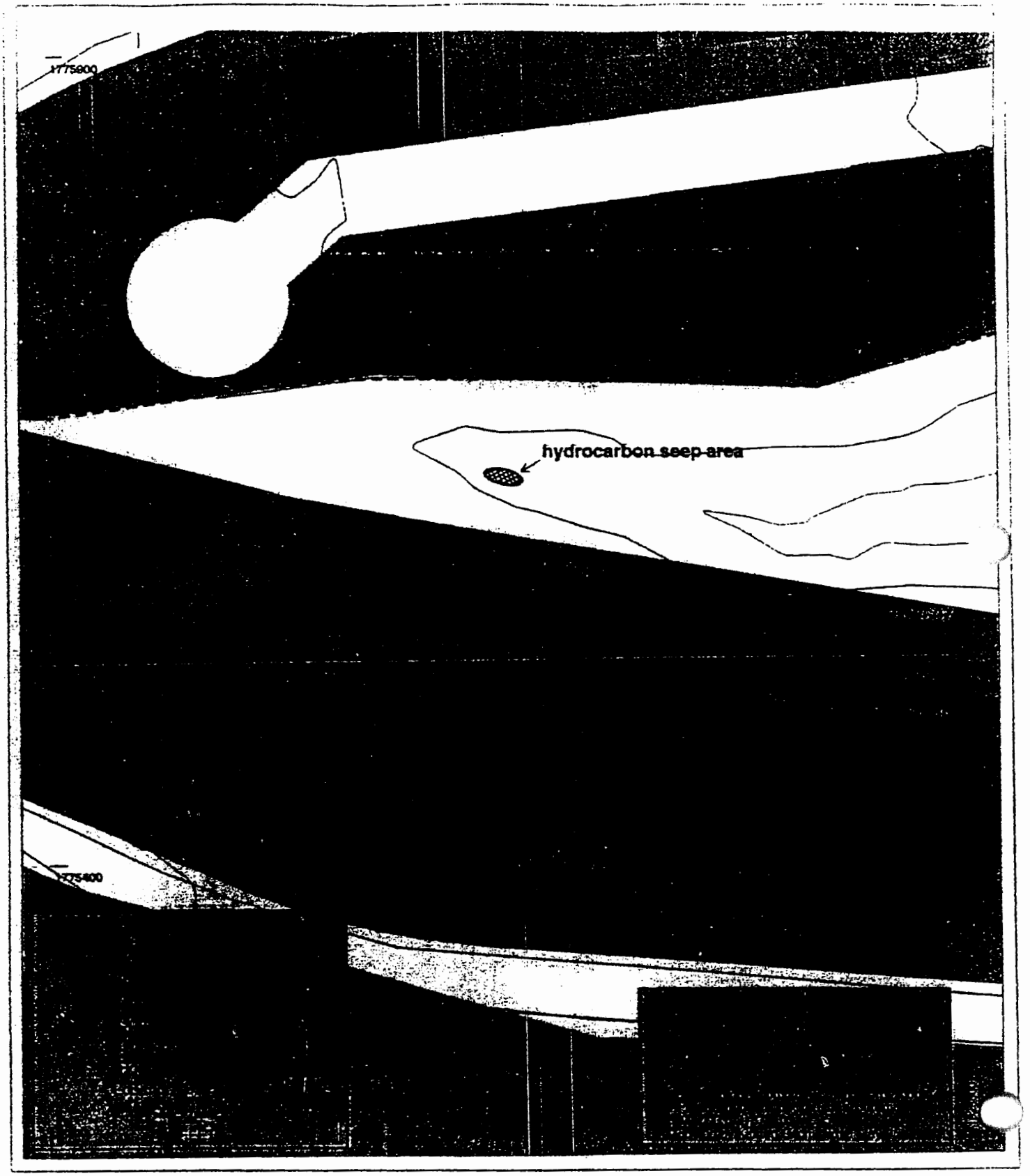


Figure 1-3. Borings Installed at DP Tank Farm During FY94

2.0 NATURE AND EXTENT OF CONTAMINATION AT DP TANK FARM

2.1 Description of Potential Contaminants

The fifteen storage tanks at the former DP Tank Farm are known to have contained a variety of petroleum hydrocarbon products. Number 2 fuel oil, diesel, gasoline, leaded gasoline, ethanol, and their hazardous constituents are considered to be potential contaminants in subsurface soils at the former DP Tank Farm. Analytical results derived from the FY94 investigation have indicated that 2-butanone (MEK) and acetone may also be present. During field investigations conducted in FY94, gasoline and diesel were detected in soils and tuff underlying the former locations of the two fill stations.

2.2 Potential Migration Pathways

Previous sampling results and site investigations have shown that contaminants related to the operation of the former DP Tank Farm have been released to the environment through leaks or spills at the two fill stations. These contaminants appear to have dispersed into the vadose zone beneath the fill stations and may have migrated laterally, perhaps by flow through fractures in the tuff. Contaminants exposed at the hydrocarbon seep could be directly exposed the public through direct contact with soils or liquids, or through vapor phase diffusion. Due to the position of the seep in a drainage, contaminants migrating to the surface may be transported downstream by storm-water runoff. Contaminants remaining in the vadose zone may also migrate upward through vapor phase diffusion and enter the atmosphere.

2.3 Potential Public Health and Environmental Impacts

Based on the potential migration pathways described in the previous paragraph, human exposure to site contaminants could occur through inhalation of vapors, incidental ingestion, or dermal contact with contaminated soils. Contamination of groundwater resources is unlikely based on the depth of the water table in the project area and the nature of the potential contaminants.

2.4 Decisions, Domain, and Approach

The former DP Tank Farm site is located on property controlled by the US Department of Energy, but is currently being considered for release to Los Alamos County. Previous investigations have confirmed the presence of petroleum hydrocarbon products in the vadose zone underlying a portion of property. This investigation is a continuation of the Phase I investigation conducted during FY94 and is designed to collect the information necessary to:

- better characterize the lateral and vertical extent of contaminant migration from the fill station areas in subsurface soil and tuff by sampling with Level III mobile laboratory and/or fixed laboratory analyses, and
- attempt to determine the source of hydrocarbons discharging into DP Canyon through surface soil sampling, chemical fingerprinting, soil gas surveys, or shallow subsurface sampling and analysis, and
- if necessary, based on the findings of the screening evaluation, conduct a preliminary risk assessment of the potential for adverse health effects posed by the site in the absence of further remediation.

Given that the site may soon be released to Los Alamos County, remedial action, if necessary, may be proposed to clean the site to meet human health risk-based cleanup standards for residential, industrial, and/or recreational use.

3.0 INVESTIGATION APPROACH

The basic approach for the investigations at the DP Tank Farm site is briefly outlined below.

3.1 Drilling and Sampling at DP Tank Farm

In order to confirm and further assess the vertical and horizontal extent of petroleum hydrocarbons in the subsurface soil and tuff bedrock underlying the site, several boreholes will be drilled and core samples collected at selected locations adjacent to both the west and east fill stations. It is anticipated that a minimum of nine boreholes will be required to bound the zone of contamination at both of the fill stations. Each borehole will be advanced to a minimum depth of 30 feet. The total anticipated depth is based on extending the borehole 10 feet beyond the deepest confirmed contaminated materials encountered during FY94 field activities. Two angled borings, one at each fill station site, will be drilled in order to evaluate potential fracture migration pathways.

As the boreholes are completed and field laboratory analyses become available, an assessment of the need for additional boreholes to bound the contaminant plumes will be conducted. If the analytical results of the screening-level soil and core samples indicate that the hydrocarbon plume extends laterally beyond the location of the proposed boreholes, then the Field Team Manager (FTM) will inform the Field Project Leader (FPL) and recommend additional boreholes to define the extent of the hydrocarbon plume(s). The number and location of additional boreholes will be chosen by the FPL and FTM. Details of the proposed borehole locations are provided below.

3.1.1 West Fill Station

It is anticipated that four boreholes (21-a to 21-d), placed along the arms of a four-armed array, will be required near the west fill station to bound the vertical and horizontal zone of contamination. One of the boreholes drilled during the FY94 investigations (21-2556) will serve as the center point of the array. The new boreholes will be placed approximately 20 feet from borehole 21-2556 and separated by 90-degree intervals along the four arms of the array. Each borehole will be advanced to a minimum depth of 30 feet, or a minimum of 10 feet beyond the lowermost extent of contamination, based on field screening and analytical results from the Mobile Chemical Analytical Laboratory (MCAL).

One angled boring (21-b) is planned at the west fill station. The boring will be drilled at a 45-degree angle in an east-to-west direction and placed so as to intercept contaminated materials at a depth of approximately 15 feet bgs. This will require that the boring be placed approximately 15 feet east of borehole 21-2556. Angled drilling will continue to a total depth of 30 feet bgs (or 43 feet of angled drilling) and/or 10 feet beyond the lowermost extent of contamination, based on field screening and MCAL data. The approximate locations of the proposed boreholes are shown in Figure 3-1.

3.1.2 East Fill Station

The east fill station investigation will center on the zone of contamination discovered during FY94 field activities. A minimum of five boreholes (four vertical and one angled borehole) will be drilled and sampled. The first borehole (21-e) will be placed adjacent to borehole 21-2558 in order to better define the vertical extent of contamination. A second borehole (21-f) will be located along an orientation line between existing boreholes 21-2558 and 21-2559 and approximately 20 feet from 21-2558. The three remaining boreholes (21-g, h, and i) will be placed at 90-degree intervals from the line between the two initial boreholes and approximately 20 feet from the center of the array. The boreholes will be advanced to a minimum depth of 30 feet, or a minimum of 10 feet deeper than the lowermost extent of contamination, based on field screening and MCAL data. Borehole 21-g will be drilled at a 45-degree angle in an east-to-west direction and placed so as to intercept anticipated

contaminated materials at a depth of approximately 15 feet bgs. This will require that the boring be placed approximately 15 feet east and a few feet north of borehole 21-e. Angled drilling will continue to a total depth of 30 feet bgs (or 43 feet of angled drilling) and/or 10 feet beyond the lowermost extent of contamination, based on field screening and MCAL data. The approximate locations of the proposed boreholes are shown in Figure 3-1.

3.2 Sampling Activities at the Hydrocarbon Seep Area in DP Canyon

3.2.1 Chemical Fingerprint Sampling

Surficial soils or tuff in the vicinity of the hydrocarbon seep will be collected to determine hydrocarbon composition and for possible hydrocarbon "fingerprinting." A minimum of two soil or tuff samples will be collected in the upper six inches of the exposed tuff. Sample locations will be selected based on visual inspection (soil staining, noticeable discharge of hydrocarbon materials) and through screening of geologic materials for organic vapors. Samples will be collected in accordance with LANL-ER-SOP 06.28, R0 "*Chip Sampling of Porous Surfaces*," or LANL-ER-SOP-6.09, R0 "*Spade and Scoop Method for Collection of Soil Samples*," or an applicable alternative method.

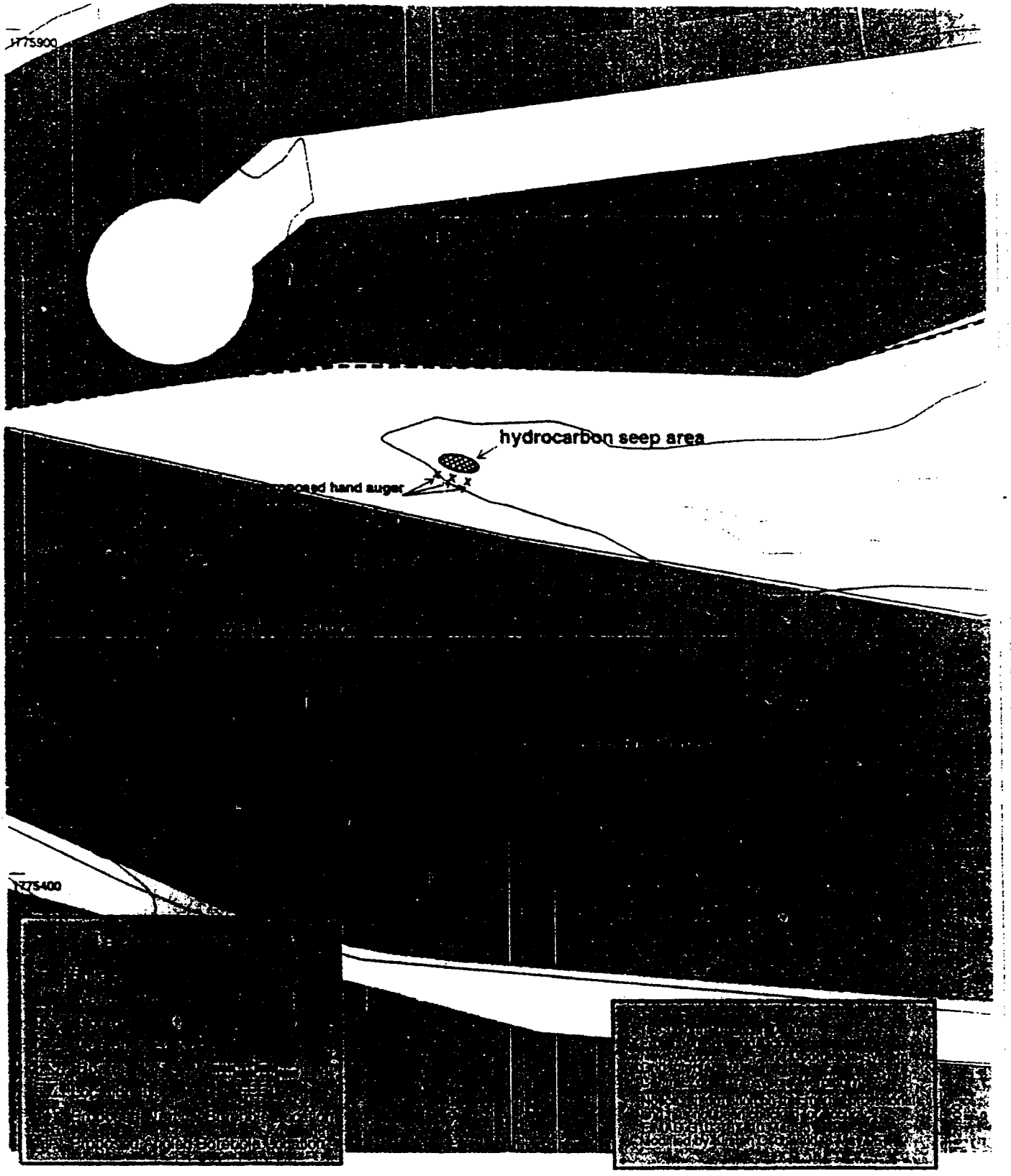
Samples of drill cuttings collected and drummed during FY94 field activities will also be collected to provide a comparison between the hydrocarbons emanating at the seep area and hydrocarbons present in soils underlying the west fill station. Two cuttings samples representative of the 2.5 foot to 10.0 foot depth interval at borehole 21-2556 will be collected from the stored drums. All samples from the seep and cuttings drum will be submitted to CST-3 for analysis of semi-volatile organic compounds (EPA Method 8270) with GC/MS analysis for determination of unknown constituents.

3.2.2 Subsurface Sampling

A minimum of three shallow borings will be drilled into the near-surface tuff upslope from the hydrocarbon seep area. A commercially available manual hand augering system or power post-hole digger will be used to drill the borings. The three initial borings will be placed approximately 5 feet upslope from the seep area on the southern slope of the canyon. The initial boring will be placed above the approximate center of the apparent hydrocarbon discharge area. The other two borings will be placed approximately 5 feet up- and down-canyon, respectively. The approximate locations of the three shallow borings are shown in Figure 3-1.

Samples of the near-surface tuff will be collected at 1-foot intervals. All samples will be collected in accordance with LANL-ER-SOP-06.18, R0, "*Collection of Sand, Packed Powder, or Granule Samples Using the Hand Auger*" or an applicable alternative method. Drilling and sampling will continue until the augers meet refusal or a maximum depth of 5 feet bgs. The samples will be submitted to the MCAL for Level III analysis of VOCs (EPA Method 8020 with determination of gasoline content, MEK, and acetone) and total petroleum hydrocarbons (modified EPA Method 8015).

If hydrocarbons are detected in the hand-augered borings, additional borings will be attempted further upslope.


hydrocarbon seep area

4.0 DRILLING AND SAMPLING PLAN

4.1 Mobilization

All sampling equipment, monitoring equipment, coolers, and sample bottles will be stored at the ERM/Golder offices, located at 600 6th Street in Los Alamos, and transported to the field site each day. All portable monitoring equipment, sampling equipment, and communications equipment will be put on battery charges overnight, as required. All remaining materials will be stored on-site, either inside the field trailer or within other lockable storage areas. Hazardous materials (calibration gases, acids, methanol) will be stored in the ERM/Golder office located at 3250 Trinity Drive in Los Alamos in fire-proof or corrosion-proof storage cabinets, as appropriate. Mobilizing a field office trailer to the site is not anticipated at this time.

The location of the exclusion zones, contaminant reduction zones, and support zone will be established prior to full mobilization to the site in accordance with the Site-Specific Health and Safety Plan (SSHASP). Decontamination areas and waste storage areas will be established prior to mobilization in accordance with the Site-Specific Waste Management Plan.

4.2 Drilling and Subsurface Sample Collection

The subsurface drilling and sampling program at the DP Tank Farm site will be accomplished with a CME 750 (or equivalent) drill rig equipped with standard 8.25-inch outside diameter (OD), 4-inch inside diameter (ID), 5-foot-long auger flights. In order to record lithologic descriptions for the soil boreholes, all hollow-stem auger drilling will be performed in conjunction with continuous core sampling using nominal, 3.125-inch OD, stainless-steel split barrels in 5-foot lengths. Core will be retrieved on a wireline system. Upon retrieval, core samples will be screened initially for health and safety monitoring purposes for organic vapors using a photoionization detector (PID) or flame-ionization detector (FID) and for radioactivity using appropriate meters and probes (refer to the SSHASP). The core samples will be inspected for visual signs of contamination and described in accordance with LANL-ER-SOP-12.01, R0, "*Field Logging, Handling, and Documentation of Borehole Materials.*" The boreholes will be drilled in accordance with LANL-ER-SOP-04.01, R0, "*Drilling Methods and Drill Site Management*" and LANL-ER-SOP-04.04, R0, "*General Borehole Logging.*" Drilling will continue to a minimum depth of 30 feet bgs, or 10 feet beyond the lowermost extent of contamination, based on field screening and MCAL analytical results. A screening level of 100 ppm will be used as the criteria for determining when drilling will be terminated. Field screening methodologies are discussed in Section 4.3.

At a minimum, samples of recovered core will be collected at 5-foot intervals for MCAL analyses and field screening. The samples will be collected from the bottom 1-foot interval of the 5-foot coring interval and submitted to the MCAL for Level III analysis of VOCs (EPA Method 8020 with determination of gasoline content, MEK, and acetone) and total petroleum hydrocarbons (modified EPA Method 8015). Additional samples will be collected at 5-foot intervals for field screening of VOCs by a headspace analysis method. The headspace analysis results will be used as a gross indication the presence of VOCs and will be used in conjunction with the MCAL results to determine when drilling should be terminated. The headspace screening method is briefly described in Section 4.3.

No samples will be collected for radiological van (rad van) analysis, although an approved written justification for the lack of the rad van analysis must accompany each shipment of samples to the MCAL. However, if field screening indicates the presence of radioactive constituents, samples will be collected and submitted to the rad van for gross alpha, gross beta, and gross gamma analyses.

If field screening or visual examination of the core suggests contamination at other depth intervals, additional samples for MCAL analysis will be collected, at the discretion of the site geologist. A total of six to seven sample suites per borehole is anticipated.

4.3 Field Screening Methods

Site health and safety personnel (SSO, RSP, or RCT) will screen each core run interval immediately after the core barrel is retrieved from the borehole and opened. Although no radioactivity is expected to be encountered at the DP Tank Farm, the core will be screened using a GM probe for beta/gamma activity. At this time, no samples for rad van screening are anticipated. However, if the GM probe indicates radioactivity on the core greater than three times that of the local background activity for the Tank Farm area, then the core interval will be screened with an alpha probe, and additional samples for rad van screening (gross alpha, beta, and gamma activity) will be collected

A PID or flame-ionization detector (FID) will be used to screen for VOCs. Due to the nature of the known contamination at the DP Tank Farm, field screening of core samples for VOCs is expected to result in readings above background. Field screening of the core will be used as an indication of gross contamination, to determine sampling intervals, and to determine health and safety precautions to be taken by field personnel.

A headspace analysis technique will be used in the field to provide a quick indication of the concentration of VOCs in soils or tuff encountered during the drilling process. At each 5-foot sampling interval, approximately 500 mg of crushed sample material will be collected and placed in a clean, 1-quart mason jar. After covering the jar opening with aluminum foil (secured in place with a mason jar lid ring or a rubber band), the jar will be placed in a secure location and exposed to sunlight for a minimum of 15 minutes. The heat from the sun will volatilize the hydrocarbons in the sample material. At the end of the required period of time, the tip of a PID will be forced through the aluminum foil and a reading of the VOC concentration trapped in the headspace above the sample material will be recorded.

4.4 Sample Analysis and Quality Control Requirements

The sampling schedule for all TA-21 field work will be coordinated with the Sample Management Office at CST-3 prior to the initiation of sampling and on a daily basis, if necessary, when in the field. Coolers, blue ice, and trip blanks, if necessary, will be obtained daily from CST-3.

Collection and preservation of samples will follow the procedures described in LANL-ER-SOP-01.02, "*Sample Containers and Preservation.*" After collection, the samples will be placed on ice in a cooler and shipped to the MCAL, or to CST-3 if appropriate. Quality control (QC) samples will be collected and submitted to the MCAL or CST-3 following procedures described in LANL-ER-SOP-01.05, "*Field Quality Control Samples.*"

4.5 Borehole Completion and Abandonment

Borehole cuttings from each 5-foot section will be segregated from the others as the borehole is being drilled. After each 5-foot section is drilled, the cuttings will be cleared from the borehole and placed on plastic sheeting. All cuttings will be returned to the borehole in the reverse order unless there is gross visual evidence of petroleum hydrocarbon products in the soil or tuff (refer to the Site-Specific Waste Management Plan). The top 2 feet of the borehole will be sealed with a poured concrete cap.

4.6 Equipment Decontamination

Equipment decontamination procedures are detailed in the Site-Specific Waste Management Plan.

5.0 PLANS AND PROCEDURES

5.1 Plans

Numerous plans and procedures are incorporated into this sampling plan. Some plans have been developed specifically to support this activity, while others are referenced. Plans and procedures that have been identified are noted below.

Site-Specific Health and Safety Plan. This plan was developed to guide all intrusive and non-intrusive site activities, including mobilization, surveying, general site support, drilling and subsurface sampling, surface soil/tuff sampling, and demobilization activities.

Site-Specific Waste Management Plan. This plan was developed to guide the management of all wastes generated at the former DP Tank Farm site. An on-site drum storage area will be established. All drums will be secured within this storage area.

Spill Prevention, Control, and Countermeasures Plan. This plan guides the corrective action required in the event of a spill of any fluids (e.g., gasoline, hydraulic oil, decontamination fluids, etc.).

5.2 Procedures and Training

All training requirements **must be completed prior to mobilization**. Training records will be kept on file at the ERM/Golder main office and copies will be maintained at the work site. If in doubt as to training requirements for individuals, please contact the FTM.

6.0 DAILY AND END-OF-JOB DELIVERABLES

The following documentation shall be completed by the individual (or an approved designee) at the frequency indicated below. Legible copies of items required shall be left with the FTM each night or each week, as appropriate.

Item	Personnel	Frequency
COC/Sample Collection Log	Sampler	Daily (if applicable)
Master Collection Log	Sampler	Daily (if applicable)
Field Team Leader (FTL) Logbook	FTL	Daily
Daily Drilling Summary	Geologist/FTL	Daily
Field Borehole Logs	Geologist	Daily
Final Borehole Logs	Geologist	1 week after demob.
Waste Management Logbook	On-site Waste Mgr.	Daily
Waste Mgmt. Forms (WPF, etc.)	On-site Waste Mgr.	As generated
Waste Drum Status	On-site Waste Mgr.	Weekly
Waste Drum Summary	On-site Waste Mgr.	1 week after demob.
<90-day storage inspection records	On-site Waste Mgr.	Weekly (if needed)
Drill Rig Inspection Form	SSO/Competent Person (CP)	Daily
Safety Inspection Form	SSO or CP	Daily
SSO Logbook	SSO	Daily
Air Monitoring/Calibration Records	SSO	Daily
Rad Monitoring/Performance Check	SSO/HPT	Daily
Exclusion Zone Logbook	SSO/HPT	Daily
SSHASP Acknowledgment	SSO	End of fieldwork
Tailgate Safety Meeting	SSO	Daily

The findings of the FY95 field investigation will be incorporated into the TA-21 FY95 Field Summary Report.