Los Alamos Environmental Restoration Records Processing Facility

ER Record I.D.# 62040

**LOS ALAMOS NATIONAL LABORATORY**
**ENVIRONMENTAL RESTORATION**
**Records Processing Facility**
**ER Records Index Form**

*ER ID NO.* 62040 *Date Received:* 10/16/98 *Processor:* YCA *Page Count:* 7

*Privileged: (Y/N)* N *Record Category:* P *Record Package No:* 0

*FileFolder:* N/A

*Correction: (Y/N)* N *Corrected No.* 0 *Corrected By Number:* 0

*Administrative Record: (Y/N)* Y

*Refilmed: (Y/N)* N *Old ER ID Number:* 0 *New ER ID Number:* 0

*Miscellaneous Comments:*

N/A

4018

*THIS FORM IS SUBJECT TO CHANGE. CONTACT THE RPF FOR LATEST VERSION. (JUNE 1997)*

(7)

62040

Environmental Restoration
*University of California*
Environmental Restoration Project, MS M992
Los Alamos, New Mexico 87545
505-667-0808/FAX 505-665-4747

*U. S. Department of Energy*
Los Alamos Area Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
505-667-7203/FAX 505-665-4504

*Date:* September 10, 1998
*Refer to:* EM/ER:98-336

Mr. Benito Garcia
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

**SUBJECT: RFI FOR THE SP FOR IMPLEMENTING INTERIM MEASURES AND BMPs AT TA-49, PRSs 49-001(b,c,d, and g) (FORMER OU 1144, FU 5)**

Dear Mr. Garcia:

Enclosed is the Los Alamos National Laboratory's response to the New Mexico Environment Department Hazardous and Radioactive Materials Bureau's Request for Supplemental Information (RSI) for the Stabilization Plan for Implementing Interim Measures and Best Management Practices at Technical Area 49, Potential Release Sites 49-001 (b,c,d, and g).

If you have any questions, please contact Dave McInroy at (505) 667-0819 or Joe Mose at (505) 667-5808.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/JW/dm

Enclosure: Response to Request for Supplemental Information on the SP for Implementing Interim Measures and BMPs at TA-49, PRSs 49-001 (b,c,d, and g) (Former OU 1144, FU 5)

Cy (w/ enc.):
D. Daymon, EM/ER, MS M992
D. McInroy, EM/ER, MS M992
J. Mose, LAAO, MS A316
D. Neleigh, EPA, R.6, 6PD-N
J. Newlin, CST-7, MS M992
C. Rodriguez, CIO/ER, MS M992
T. Taylor, LAAO, MS A316
T. Trujillo, DOE-AL, MS A906
J. White, ESH-19, MS K490
S. Dinwiddie, NMED-HRMB
M. Leavitt, NMED-GWQB
J. Parker, NMED-HRMB
G. Saums, NMED-SWQB
S. Yanicak, NMED-AIP, MS J993
EM/ER File (CT# C527), MS M992
RPF, MS M707

Information Only (w/o enc.):
T. Baca, EM, MS J591
D. Boak, TSA-10, MS M992
T. George, EM/ER, MS M992
T. Longo, DOE-HQ, EM-453
J. Plum, LAAO, MS A316
S. Rae, ESH-18, MS K497
G. Rael, AL-ERD, MS A906
J. Vozella, LAAO, MS A316
J. Walterscheid, EM/ER, MS M992
EM/ER File, MS M992

**Response to Request for Supplemental Information
for the Stabilization Plan (SP) for Implementing Interim Measures and
Best Management Practices at PRSs 49-001 (b, c, d, and g)
Los Alamos National Laboratory (LANL) EPA I.D. NM0890010515**

## INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. Los Alamos National Laboratory's (LANL's) responses, which follow each NMED comment, address the general comments on the stabilization plan. Those comments were presented in NMED's Attachment A. NMED's comments on the Storm Water Pollution Prevention (SWPP) Plan, which were presented in NMED's Attachment B, will be incorporated into the SWPP Plan, as required under the National Pollutant Discharge Elimination System Baseline General Permit. These comments will be included as part of the annual site compliance evaluation currently scheduled to be completed in September.

## GENERAL COMMENTS

### NMED Comment

1. *LANL shall submit an as built certification report verifying the work that was completed and what deviations from the approved plan were made.*

### LANL Response

1. LANL will submit two as-built certification reports to NMED, one addressing the best management practices aspects of the stabilization and a second addressing the interim measures aspects. These reports will be prepared during the first quarter of fiscal year 1999, following completion of the respective activities, and each will be certified for accuracy by LANL's Material Disposal Area AB project leader.

### NMED Comment

2. *LANL shall provide a sampling schedule for the moisture content beneath the temporary cover, including fill and clay, to determine if the cover is effective.*

### LANL Response

2. A sampling schedule is provided in the contingency document (Attachment A) requested in NMED's third comment (below). This schedule provides an elaboration of the monitoring program information provided in Section 6.0 of the stabilization plan and calls for a three-part monitoring effort. First, monitoring will be performed in the surface soils and the soil/tuff interface on a monthly basis at

selected locations to determine if an increase in moisture content is occurring. Second, monitoring will be performed on a quarterly basis over the entire length of each monitoring hole in all monitoring wells at the site, as stated in the stabilization plan. Third, additional monitoring may be performed to investigate the effects of selected storm events and rainfall patterns to obtain a better understanding of those climatic events that affect storm water percolation and consequent changes in soil moisture content. The conditions to be studied under this additional monitoring program will be identified by LANL. To facilitate efficient implementation of the monitoring program as well as a rapid response of monitoring personnel to specific storm events, a dedicated neutron probe is planned to be acquired and maintained at Technical Area 49.

**NMED Comment**

3. *LANL shall provide a contingency plan (with schedule) that describes an alternate solution if an increase in moisture content under the temporary cover, including fill and clay, occurs.*

**LANL Response**

3. A contingency document has been prepared as requested (Attachment A).

**NMED Comment**

4. *Attachment 1, Evaluation of Potential Surface Water Concerns. AP 4.5 changes will be initiated by the Surface Water Quality Bureau and the Surface Water Assessment Team (SWAT).*

**LANL Response**

4. No Attachment 1 was included in NMED's comments. The site-specific surface water assessment process (formerly referred to as AP 4.5) is being developed as an Environmental Restoration Project standard operating procedure. Revisions or changes to surface water assessment scores can be initiated by the Surface Water Assessment Team or, if through further review another site visit and assessment are deemed appropriate, by LANL. The Surface Water Quality Bureau will be copied by ESH-18 on all revisions to surface water assessment scores. If there are any questions or concerns, please contact Mike Alexander (665-4752) or Steve Veenis (662-0606).

**ATTACHMENT A**
**CONTINGENCIES FOR REDUCING SOIL MOISTURE CONTENT AT POTENTIAL RELEASE SITES 49-001(b, c, d, and g)**

## 1.0 INTRODUCTION

The contingencies described in this document are supplemental measures that can be taken if needed to control soil moisture content at Los Alamos National Laboratory's (Laboratory's) Potential Release Sites (PRSs) 49-001(b, c, d, and g). These measures can be implemented if future moisture contents are found to progressively increase despite the interim measures that are currently being implemented to reduce moisture levels. PRSs 49-001(b, c, d, and g) are located in the Laboratory's Technical Area (TA) 49 and include Areas 2, 2A, and 2B of Material Disposal Area (MDA) AB. These areas are collectively known as the asphalt pad site, and their locations are shown in Figure 1-1.

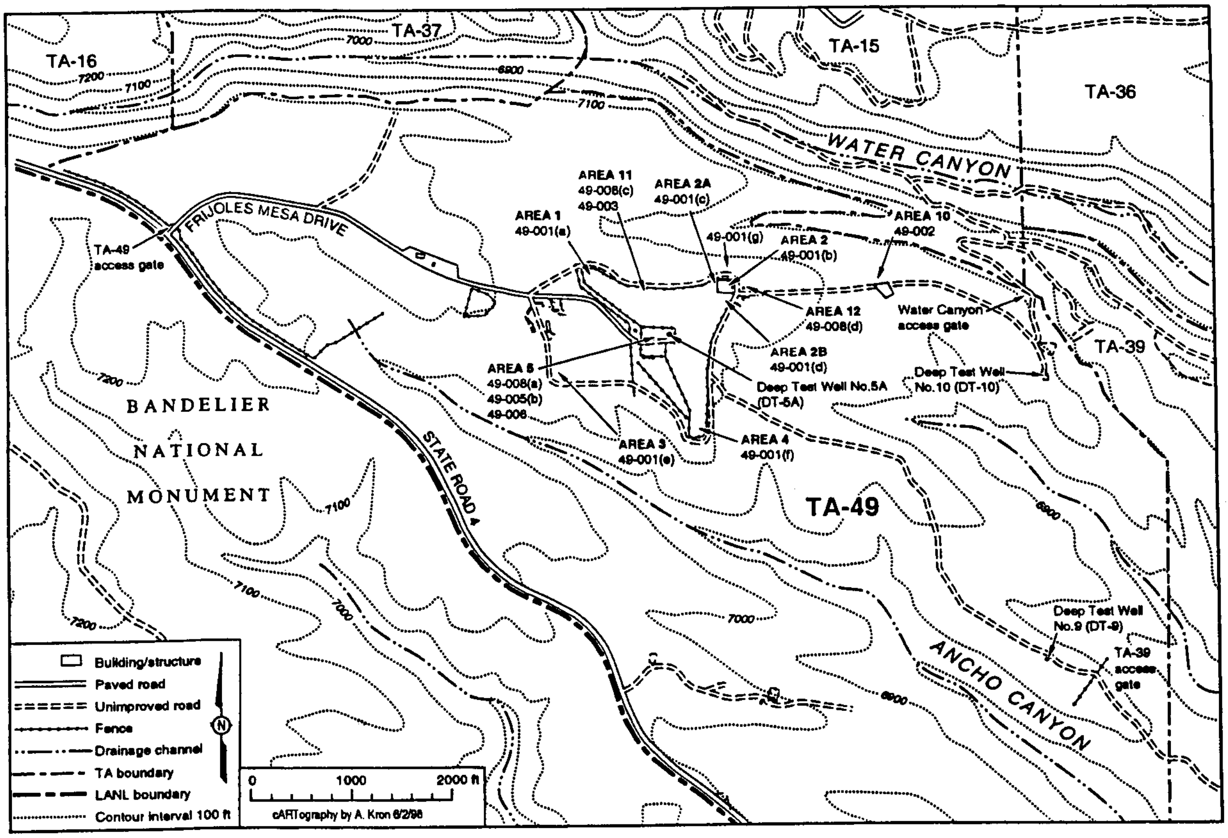

**Figure 1-1. Map of TA-49.**

Stabilization measures intended to induce a long-term reduction in moisture content at the site are currently being implemented and are described in the report, Stabilization Plan for Implementing Interim Measures and Best Management Practices at PRSs 49-001(b, c, d, and g) (LANL, in progress). The stabilization measures include diverting surface water run-on before it reaches the site, removing the asphalt pad to enhance soil moisture evaporation, regrading the site to improve drainage by eliminating surface ponding, and revegetating the site with shallow-rooting grasses to enhance evapotranspiration. The stabilization measures will restore the site to more natural conditions, and over a period of years, the moisture content of the near-surface soil and fill materials is expected to drop. However, in the unlikely event that climatic conditions result in a series of years with high recharge and low evaporation, temporary increases in soil moisture may possibly be observed. The following paragraphs describe the soil moisture monitoring program that will be used to determine the effectiveness of the best management practices, introduce the decision methodology, and provide preliminary action alternatives in the event that a significant, progressive increase in soil moisture content occurs.

This document has been prepared in response to a request by the Hazardous and Radioactive Materials Bureau of the New Mexico Environment Department (NMED).

## 2.0 SOIL MOISTURE MONITORING PROGRAM

The moisture monitoring program described in Section 6.0 of the stabilization plan (LANL, in progress) will be supplemented as described below to obtain the information necessary to determine the need for implementing contingency actions. The current plan calls for quarterly monitoring to total depth of two existing boreholes penetrating the asphalt pad (49-2906 and 49-2907) and eight additional existing holes located off the pad (TH-1 through TH-5 and 2A-O, 2A-Y, and 2B-Y). The supplemental program calls for monthly monitoring to a depth of 3 feet beneath the soil/tuff contact in the two existing boreholes penetrating the asphalt pad (49-2906 and 49-2907), in the two existing off-pad test holes TH-1 and TH-3, and in one additional new hole on the pad. Monthly monitoring will be conducted to nominal depths of about 10 feet beneath the present ground surface for the three boreholes on the pad and to about 7 feet for the two boreholes off the pad. The locations and total depths of these holes are shown in Figure 2-1.

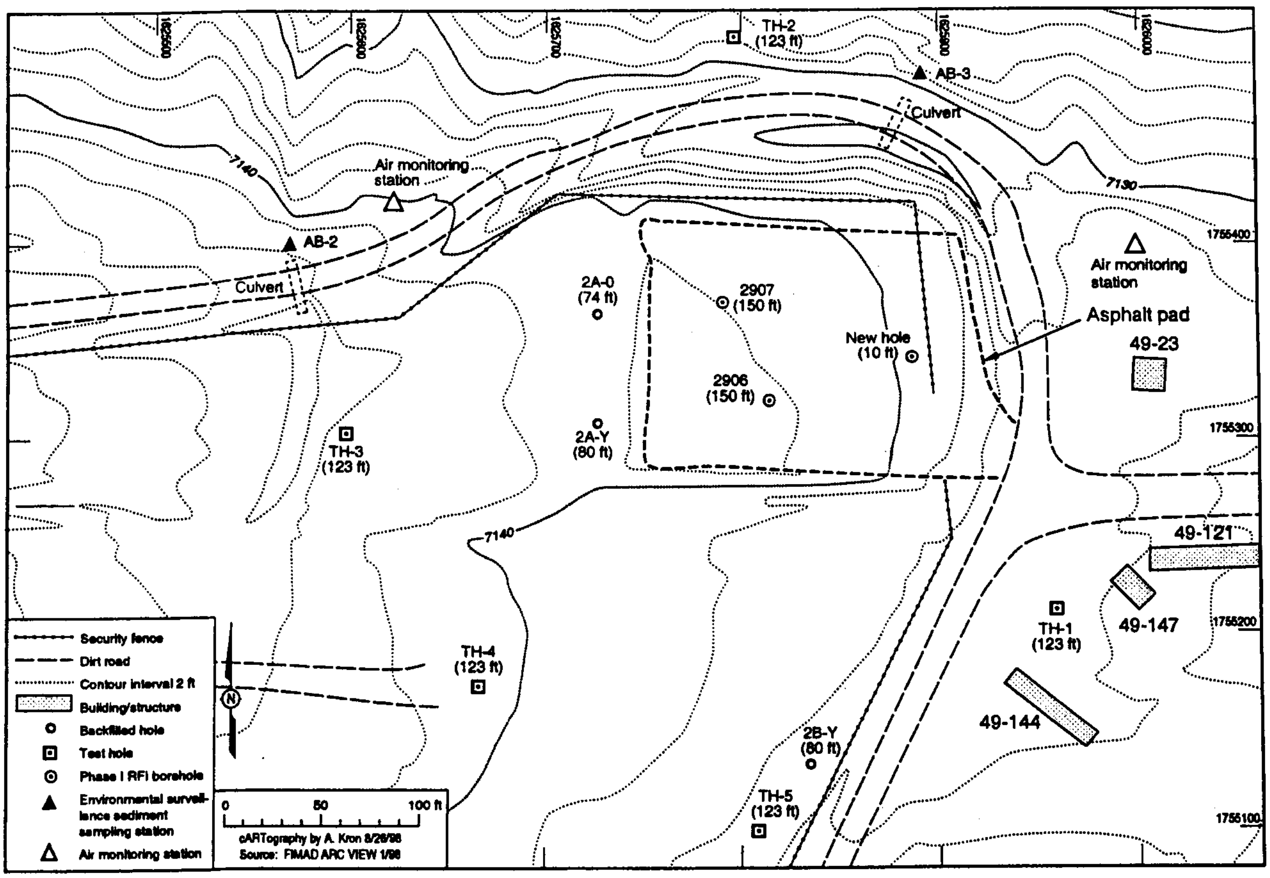


Figure 2-1. Monitoring hole locations at Area 2.

The new hole (designation to be determined) will be located approximately 20 feet east of Shaft 2-O and 10 feet inside the current site fence. It will be installed to a depth of about 4 feet beneath the soil/tuff contact, which is estimated to be about 10 feet beneath the present ground surface. The new hole will be installed at the time the site stabilization measures are implemented. Installation will proceed cautiously and although not expected, if elevated radiation levels are encountered the hole may be moved to another location. The hole will be completed with a sealed PVC casing in tight contact with the borehole wall. This design will provide a durable installation with no annular space for vertical water movement.

Of the three monitoring holes on the pad, hole 49-2907 is located in the northwestern, upgradient part of the pad, hole 49-2906 is located in the south-central part of the pad, and the new hole is located in the east-central, downgradient part of the pad. Holes 49-2906 and 49-2907 are located approximately 25 feet from the nearest shafts where no concrete caps are believed to be present and may therefore be in areas of better vertical drainage where the moisture content of the fill materials beneath the asphalt is lower. The new hole is located downgradient of shaft 2-O where standing water was found above a concrete cap at a depth of 24 inches during RFI sampling in April 1998. The concrete cap may impede vertical drainage, and the new hole may be in an area where the moisture content of the fill materials is higher. These three holes are appropriate for conservatively determining representative average conditions because less than a third of the pad is believed to be underlain by concrete caps. The moisture content of the native soil underlying the fill materials and concrete caps is expected to be elevated throughout the pad.

Because of their geographic spread, their locations relative to known concrete shaft caps, and their upgradient, central, and downgradient sites on the pad, the three monitoring holes on the pad are expected to provide adequate information on the range of moisture conditions in the fill materials, native soils, and soil/tuff contact zone beneath the pad. Monitoring is not planned for holes into test shafts beneath the pad because of the potential for encountering contamination and because moisture measurements in the shaft sand backfill would not provide information typical of the surrounding soils. Monitoring through direct measurement of standing water levels in shallow wells in the fill material above concrete caps is also not planned because the open wells may provide a pathway for enhanced vertical moisture migration, the appropriate well depth in a perched water zone of varying thickness over time would be difficult to determine, and the masking effects of slow flow transients in the clayey fill would be difficult to assess.

The two TH holes that will be monitored are located off the pad in areas where more natural mesa-top moisture conditions prevail. Information from these holes will provide a basis for comparing changes in moisture conditions at the pad with changes in natural soil moisture to help evaluate the effects of the pad fill materials on soil moisture conditions. Hole TH-3 is located upgradient and hole TH-1 is located downgradient of the pad.

The moisture monitoring will be conducted using a calibrated neutron probe. Neutron probes have been extensively studied by the Laboratory and have been found to be effective tools for measuring soil moisture content at Los Alamos (Nyhan et al. 1994, 44015). Radioactive constituents in the fill, soil, and tuff around the existing monitoring holes are within the background range and will not interfere with the probe measurements. Measurements will be taken according to the following specifications.

- Volumetric field moisture measurements of the fill, soil, and tuff material around each borehole will be taken every foot to a depth of three feet beneath the soil/tuff contact.
- Measurements will be made in a manner that allows quantitative comparison to volumetric moisture content data previously obtained from holes at the site.

- Field logs will be maintained documenting each monitoring round.
- An annual monitoring report will be prepared describing the results of each monitoring round, interpreting the results, and documenting any identified trends.

Monitoring to support contingency decisions will be conducted on a monthly basis for at least the first two years following completion of the stabilization measures to provide a comprehensive database that can be analyzed for seasonal trends. A two-year base period has been selected for supporting contingency decisions to defray the potential of reacting to false positives. Limited historical data collected by the Laboratory on percolation of surface runoff into the soil indicates that although climatic conditions may favor substantial percolation in a given year (Wilcox et al. 1997, 57577), the likelihood that such conditions will persist for two years in a row is small. Additionally, the significant 1200-foot depth to groundwater at the site would substantially attenuate short-term pulses in near-surface moisture supply, and minimal incremental risk would be associated with one or two years of high moisture conditions in the fill and underlying soil. Seasonal variations in moisture level are anticipated, such that two full years of data are expected to be necessary to identify differences between seasonal variability and actual long-term changes in moisture content. Although the supplemental monitoring program will be continued until a final corrective measure is completed at the site, after the first two years, the program will be reviewed and modified as appropriate.

In addition to the monthly measurements, additional measurements may be taken to investigate the effects of selected storm events and rainfall patterns to obtain a better understanding of those climatic events that affect storm water percolation and consequent changes in soil moisture content. To facilitate efficient implementation of the monitoring program as well as the rapid response of monitoring personnel to specific storm events, a dedicated neutron probe is planned to be acquired and maintained at TA-49. This would eliminate delays related to transporting the neutron source over public highways.

Moisture measurements have historically been taken in the asphalt pad monitoring holes on an occasional basis and baseline measurements were made in all holes in July 1998 before removing the asphalt. Routine monthly monitoring will start upon completion of the stabilization measures and is expected to begin as early as October 1998.

## 3.0 CRITERIA FOR IMPLEMENTING CONTINGENCY ACTIONS

Contingency actions will be implemented if a progressive, significant increase in moisture content is observed in the fill materials and underlying soil at the pad. A *significant increase* will be determined on the basis of projected risk. Significant moisture content is defined as the amount that would result in a projected human health risk by way of the groundwater pathway above 1 x 10-6 within 1000 years. This determination is nominally expected to be made after two years of monitoring data are collected and is expected to be based on average moisture trends in the three monitored wells on the pad. However, if significant increases in moisture content are observed after the first year of monitoring that are not related to short-term causes such as unusual climatic conditions, the determination to implement contingency actions may be made earlier.

Linking contingency action implementation to health risk provides a rational, quantitative basis for evaluating the significance of any moisture increases that are observed. It would not be appropriate to expend resources on additional site stabilization if an increase in moisture content had only negligible consequences. Because the determination to implement contingency actions involves an analysis of the consequences of increased moisture content, it will necessarily be based on model predictions of contaminant mobilization and transport. The model will be based on site-specific data and will be available for use in the fall of 1999. This schedule will provide timely model availability and the associated implementation trigger values for the consequence analysis when the first year of monitoring data will have been collected.

Because the site information and monitoring database available at the time the consequence analysis would be conducted will be more comprehensive than what is available today, it would be premature to define in detail the methods and approach that would be used in the consequence analysis. In addition, the Laboratory's MDA core document, currently under development, will provide a comprehensive approach to addressing corrective measures at MDAs. It is expected that information on the extent, rate, and significance of contaminant migration in the vadose zone beneath the site will be available from

- monitoring in Phase II RFI slant boreholes planned to be drilled beneath the asphalt pad site in fiscal year 1999 (LANL 1992, 7670, Section 7.6.6),
- modeling studies of the rates of contaminant migration, and
- an assessment of the associated risk.

If the increase in moisture content is found to be significant in terms of the human health risk criterion described above, the next step would be to determine the appropriate contingency actions. If the increase in moisture content is not found to potentially cause this criterion to be exceeded, no contingency action would be required.

## 4.0 ALTERNATIVE CONTINGENCY ACTIONS

Three alternative classes of contingency actions are described in the following subsections. They consist of

- implementing in whole or in part the final corrective measures to be developed for the site through the corrective measures study (CMS) process,
- implementing temporary measures designed to address infiltration from direct precipitation on the site, or
- implementing temporary measures designed to address surface run-on and subsurface interflow entering the site.

The appropriate contingency actions would be implemented if the foregoing consequence analysis indicates that the observed increase in moisture content may significantly reduce the ability of the site to isolate the waste. The actual contingency actions that would be implemented will be selected at the time that the need for such actions is determined. Because knowledge of site conditions and available remedial techniques is expected to increase over the two or more year period before the need for contingency actions is determined, measures designed today would not be expected to be as effective as those designed at a later date.

Selection of the appropriate contingency action will depend on the source of the excess moisture identified at the site. If contingency action is required, analysis of moisture levels will focus on the horizons where moisture peaks have typically been observed beneath the asphalt. As shown in Figure 4-1, these are in the fill materials directly beneath the asphalt and in the native soils underlying those fill materials. The three potential findings are significant increases in moisture levels in the upper horizon, in the lower horizon, or in both horizons.

Because the upper horizon of fill materials is higher than the local ground surface, a finding of significant increases in moisture levels in that horizon could only result from increases in the net infiltration of direct precipitation on the site. One alternative contingency action must therefore address control of direct precipitation. Increases in moisture levels in the lower horizon could result from three principal sources:

- increases in downward migration of moisture from the overlying fill materials,
- increases in surface water run-on originating in the upgradient area between the existing surface water diversion channel and the pad, and
- increases in potential subsurface interflow onto the site beneath the existing surface water diversion channel.

These sources are illustrated in Figures 4-1 and 4-2. Additional alternative contingency actions must therefore address control of potential interflow and supplemental surface run-on.

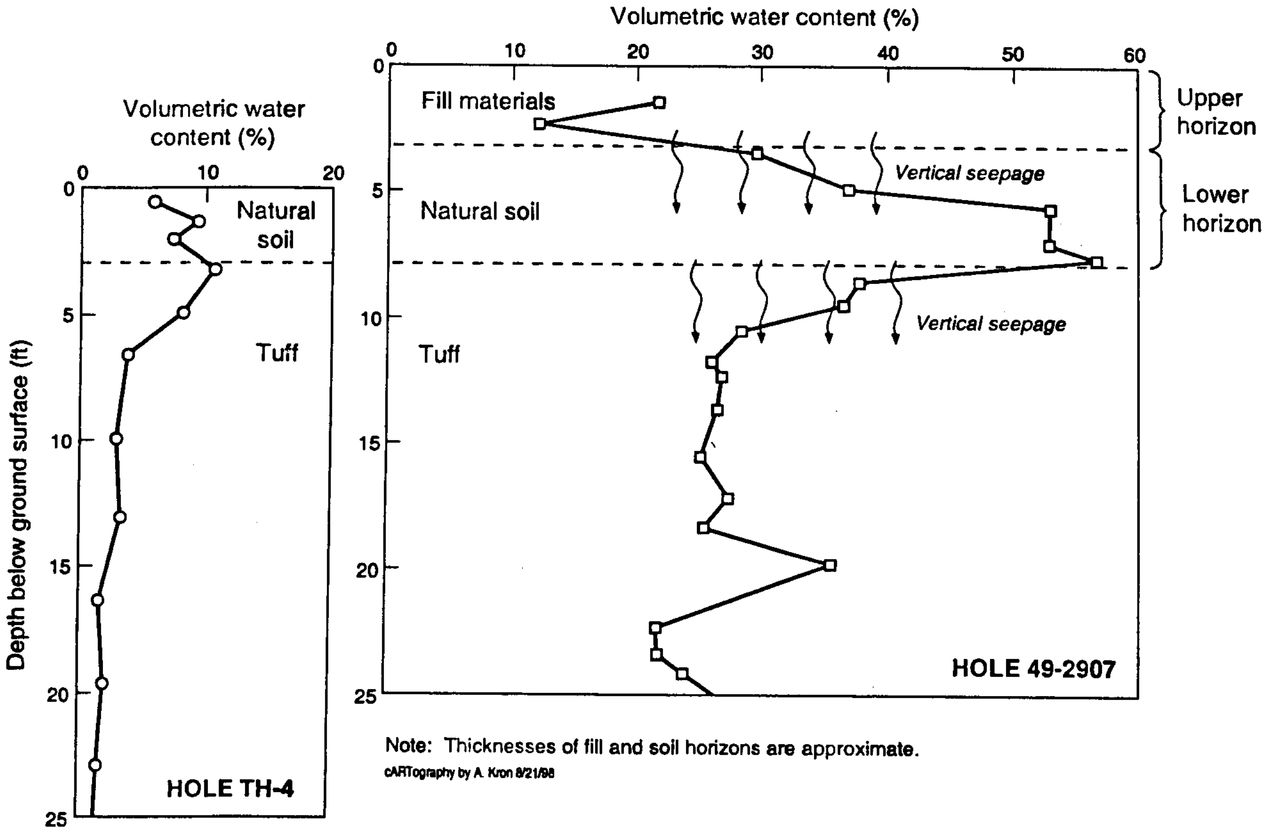


**Figure 4-1. Upper and lower horizons for soil moisture monitoring.**

The following alternative contingency actions are intended to provide examples of effective steps that might be taken but are not necessarily descriptive of the actual contingency actions that would be implemented.

### 4.1 Implement Full Final Corrective Measure

The first alternative contingency action is to implement the full final corrective measure for stabilizing Areas 2, 2A, and 2B. Selection of this alternative would address all additional sources of moisture at the site. It would have the advantage of avoiding additional expenditure of funds on interim stabilization measures but has the disadvantage of likely being more costly and requiring additional design time. Because of the magnitude of the source term and the importance of the site, the final corrective measure would be designed to meet performance criteria developed to help ensure adequate isolation of the source term for the necessary duration of time. It is anticipated that these criteria will be developed by the Laboratory in conjunction with NMED.

A decision to implement the final corrective measure as the contingency action will depend on the timing of the planned corrective measure implementation (CMI), when the need for contingency action is determined, the urgency of the contingency action, and the availability of funding. If implementation of the final corrective measure has been planned for a later date, consideration could be given to expediting completion of the CMS/CMI process. If expediting implementation of the full final corrective measure is not feasible, then staged implementation of the final measure or implementation of a temporary corrective action could be considered.

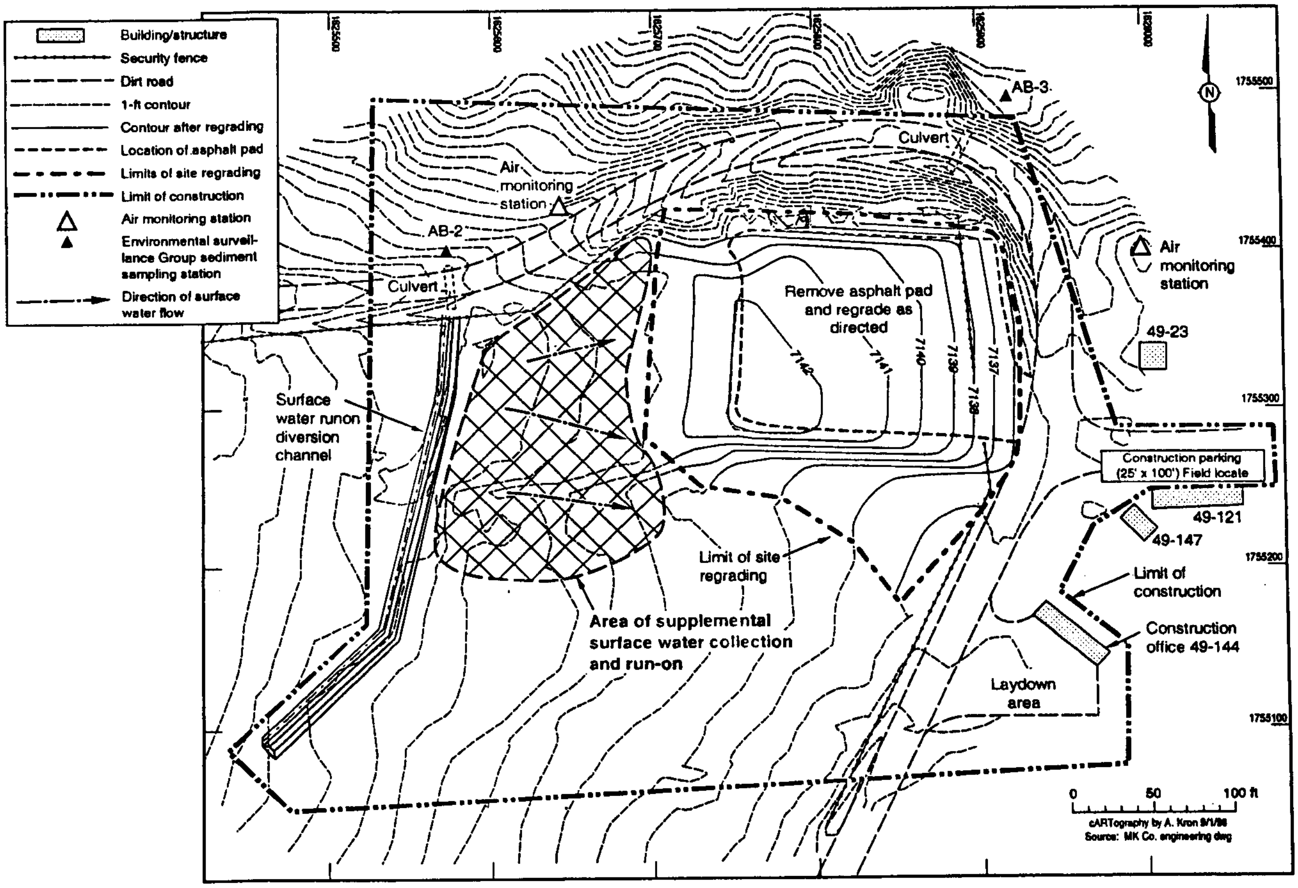


Figure 4-2. Approximate area of supplemental surface water collection and run-on.

## 4.2 Implement Control of Direct Precipitation

Controlling direct precipitation on the site would address moisture increases in the upper horizon as well as increases in vertical seepage from the upper to the lower horizon (Figure 4-1). One method for temporarily controlling direct precipitation on the site would be to construct a structure over the site that would shed all direct precipitation until the final corrective measure is implemented. Alternatively, if the final corrective measure involves an engineered cover, direct precipitation on the site could be controlled by construction of that cover. Either approach could be used and illustrate that effective corrective actions to control direct precipitation, if needed, are feasible and readily available.

### 4.3 Implement Control of Supplemental Run-on

Although most surface water run-on is currently diverted by an upgradient channel, a small but possibly important volume of supplemental storm water run-on could occur from precipitation falling on the upgradient area between the site and the diversion channel. This area is shown in Figure 4-2. Because of differences in elevation, supplemental run-on could only contribute to increases in moisture content in the lower horizon shown in Figure 4-1. Although most of this supplemental run-on will flow around the site as a result of the regrading that will be performed as an interim measure, some will percolate into the ground and could add to any subsurface interflow that originates upgradient of the diversion channel. One method for temporarily diverting the supplemental surface water run-on would be to construct a second, smaller diversion channel near the limit of the regraded area. If needed, seepage from the bottom of both diversion channels and potential accretions to subsurface interflow could be reduced by the addition of low permeability layers in the bottoms of the channels. Although excavation of a second diversion channel may not be the actual remedy selected to control supplemental run-on, it illustrates that effective corrective actions to control supplemental run-on, if needed, are feasible and readily available.

### 4.4 Implement Control of Interflow

Subsurface interflow is the last potentially significant contributor to moisture buildup beneath the site. As with supplemental run-on, because of differences in elevation, interflow could only contribute to increases in moisture content in the lower horizon shown in Figure 4-1. Contributions to interflow could occur from percolation of surface storm water at locations upgradient of either the existing storm water diversion channel or the smaller channel described in Section 4.3. One method for controlling potential interflow would be to construct a trench extending to the soil-tuff interface at an upgradient location that would intercept and divert interflow from the site. The closer this trench is to the site, the more interflow it would potentially intercept. If a temporary trench is needed, it could be colocated with the small diversion channel. Alternatively, potential interflow could be controlled by a low-permeability curtain installed from ground surface to competent tuff around the upgradient perimeter of the site. If an interflow interceptor trench is needed as part of the final corrective measure for the site, interflow could be controlled by constructing that trench. Although the foregoing examples may not include the actual remedy that may be selected to control interflow, these options illustrate that effective corrective actions to control interflow, if needed, are feasible and readily available.

## 5.0 ENHANCED POSTCONTINGENCY MONITORING AND MAINTENANCE

If contingency action is found to be required to address significant increases in moisture contents at the site, the adequacy of the presently planned supplemental monitoring program will be reviewed in light of the observed increases, and the need for modifications will be evaluated. Similarly, the adequacy of the presently planned maintenance program, described in Section 7.0 of the stabilization plan (LANL, in progress), will also be evaluated and modified as needed. An increase in soil moisture content at the site that could potentially result in an unacceptable health risk would be viewed by the Laboratory as a serious issue that would require rapid correction and may also require enhanced site monitoring and maintenance.

## REFERENCES


LANL (Los Alamos National Laboratory), in progress. "Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites 49-001 (b, c, d, and g)," Los Alamos National Laboratory report LA-UR-98-1534, Los Alamos, New Mexico. (LANL, in progress)

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1144," Los Alamos National Laboratory report LA-UR-92-900, Los Alamos, New Mexico. (LANL 1992, ER ID 7670)

Nyhan, J. W., J. L. Martinez, and G. J. Langhorst, October 1994. "Calibration of Neutron Moisture Gauges and their Ability to Spatially Determine Soil Water Content in Environmental Studies.," Los Alamos National Laboratory report LA-12831-MS, Los Alamos, New Mexico. (Nyhan et al. 1994, ER ID 44015)

Wilcox, B. P., B. D. Newman, D. Brandes, D. W. Davenport, and K. Reid, October 1997. "Runoff from a Semiarid Ponderosa Pine Hillslope in New Mexico," *Water Resources Research* **33** (10), pp. 2301–2314. (Wilcox et al. 1997, ER ID 57577)