Department of Energy
Field Office, Albuquerque
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Los Alamos, New Mexico 87544

NOV 23 1993

William Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U.S. Environmental Protection Agency, Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

TA 51, 54, MDA L

Dear Mr. Honker:

Enclosed is the Response to the Notice of Deficiency for the Work Plan for Operable Unit 1148 for the Environmental Restoration Program at the Los Alamos National Laboratory.

If you have questions, please call me at (505) 665-5027, or ask your staff to call Steve Slaten of my staff at (505) 665-5050.

Sincerely,

Joseph C. Vozella, Chief
Environment, Safety and Health Branch

Enclosure

cc w/ enclosure:
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Ver. 1.0; 11/12/93

RESPONSE TO EPA NOTICE OF DEFICIENCY
RFI WORK PLAN OU 1148

Preamble

The work plan for the material disposal areas (MDAs) in OU 1148 follows the conditional remedy guidance presented in the proposed RCRA Subpart S. The criteria for implementation of a conditional remedy include

- protecting human health and the environment,
- achieving media cleanup standards beyond the facility boundary,
- preventing further significant environmental degradation,
- implementing institutional controls,
- continuing monitoring, and
- complying with waste management standards.

Corrective action for the MDAs will include stabilization and post-closure monitoring to insure that contaminants are not being transported beyond controlled site boundaries at concentrations that exceed health risk-based standards or action levels. Remediation of release sites located within the area of institutional control will be based on conditional remedy requirements.

There is also interest by the Laboratory in accelerating the remediation of the subsurface plume of solvents at MDA L. Therefore, extensive revision was done to the Voluntary Corrective Action Plan (VCAP) that was submitted as Appendix A of the work plan. The revised plan was sent to EPA on July 27, 1993 as the "Pilot Extraction Study Plan for the Organic Vapor Plume at MDA L".

General Comments

1. *The work plan repeatedly applies the concept that Phase I will be used to determine whether contaminants of concern (COCs) exceed health risk-based criteria. The actual goal of an RFI work plan is to provide the rationale necessary to determine if a release has occurred to the environment. If a release has occurred, then the rationale necessary to determine the complete horizontal and vertical extent of contamination must be presented.*

   Response: It is apparent that the work plan did not clearly present the overall logic and operational method of the Phase I investigation. This operable unit includes four material disposal areas (MDAs) at which contaminants were deliberately buried as a means of disposal. Therefore, we do not seek to establish whether contaminants have been released to the soil within an MDA. Rather, the investigation is intended to determine if contaminants are (or will be) transported beyond the security fence surrounding each MDA or be transported vertically to the aquifer, in sufficient quantity to generate a risk to human health or to the environment. To detect any potential vertical or horizontal escape of contaminants, the concentrations of contaminants will

be measured near the MDA boundaries and beneath the MDAs. The hydrogeologic properties necessary to model future transport and to develop a plan for long term stabilization will also be measured.

2. *All portions of the work plan which address Phase II sampling will need additional sampling information if Phase II becomes necessary.*

Response: Additional sampling will be done as appropriate. All phase II sampling and analysis plans will be submitted to EPA for approval prior to initiating the sampling.

3. *The RFI work plan does not address monitoring well sampling of wells already installed in the area of OU 1148. LANL shall provide the monitor well sampling schedule and constituents analyzed.*

Response: A list of monitoring wells and sampling ports is presented in Table I, below. Historically, sampling of these wells has been done by the Environmental Surveillance Group at quarterly intervals during the year, usually in the months of March, June, September, and December. In sampling events prior to 1993, a sample of pore gas was pumped through a tube of charcoal at each port of each sampled well. The adsorbed compounds were extracted from the charcoal with carbon disulfide, and analyzed with a gas chromatograph for thirteen constituents presented in Table A-2 of the Pilot Extraction Study Plan (PESP), which is Appendix A to the RFI Work Plan. Some of the historical data are presented in Figs. A-5 through A-9 of the PESP, which show the measured contaminant concentrations vary erratically with time. The erratic behavior may be due to actual variation of the concentrations in the pore gas that are caused by natural subsurface air flows. However, duplicate samples also show erratic behavior, indicating that some of the variation may be due to the sampling method or analytical process. The historical data were adequate to mark the slow progress of the subsurface plume; however, the pilot study now requires higher precision to reveal changes in pore gas concentration caused both by natural phenomena and by applied vapor extraction. Consequently, in January 1993 we began developing a revised sampling method using cartridges containing carbon resin. These are thermally desorbed and analyzed for the 52 cor ituents presented in Table A-3 of the PESP.

During a period of years (1985-1989), the original vapor sampling program grew to include sampling of 27 wells with 173 separate ports. Because of the slow dispersion of the contaminant plume, sampling all of these ports now provides redundant data. Therefore, in 1993, the sampling program was reduced to track 14 selected wells (see Table I wells identified with asterisks).

Spiked air samples and pore gas samples have been analyzed with a photoacoustic infrared gas analyzer that has filters and calibration for TCA, TCE, PCE, total hydrocarbons (methane equivalent), sulfur hexaflouride (a tracer), and water vapor. Experiments on well ports with the analyzer indicate that, at a flow rate of 1 liter/minute, flow must be extracted for about 20 minutes before the TCA content reaches a steady value. The long purge period and the complicated procedure for exposing resin tubes increase the time required to sample each port by about a factor

of fifteen over the previous sampling with charcoal. At this writing, the third quarter sampling is being conducted with the gas analyzer, because at present it is more reliable than either the charcoal tube or resin tube methods. At least one sample is being taken in each well with resin tubes, and occasional comparison samples are taken on charcoal tubes.

We propose to conduct future sampling on the subset of the wells marked by asterisk in Table I, because it is not necessary to sample all wells every quarter to track motion of the plume. Although we will continue experimenting with the sampling methods, we propose to conduct future quarterly sampling as follows.

Concentrations of TCA, TCE, and PCE will be measured with the infrared photoacoustic gas analyzer (Bruel and Kjaer model 1302). Samples will be collected on carbon resin from at least one port of each sampled well, after the analyzer indicates either a steady state or a maximum concentration of TCA during continuous flow from the port.

The sampling will be conducted at three or more ports of a minimum of twelve wells. Nine of the sampled wells will be selected from those marked with an asterisk (*) in Table I, and will include at least two wells located in Area G. The remaining three wells will be selected from any of those listed in Table I. As new wells with instrumented SEAMIST® membranes become available, these may be substituted on a one-for-one basis for other wells located in or near Area L.

This flexibility in selecting wells will permit the application of experience in tracking the plume. It will also permit substitution for a well or port suspected to be faulty.

When the behavior of the subsurface VOC plume is actively under investigation during the pilot extraction study, some ports will be sampled at short intervals to investigate the effects of tides, barometric flows, and/or forced extraction. This sampling will become integrated with the monitoring program. Therefore, all wells of the monitoring program might not be sampled during the same week or month, but twelve wells will be sampled during a quarter.

TABLE I
PORE GAS MONITOR WELLS WITHIN OU 1148

Well number	Install year	Well group/ Const. method	Sample Port Depth (feet from surface)	Location
12*	1985	1	7,27,42	In Area L
14	1985	1	13,31,46,86	"
15	1985	1	18,31,82	"
16	1985	1	7,18,31,82,102	"
01	1986	2	20,40,60,80,100,130,140,160,180,200	Near Area L
02*	1986	2	20,40,60,80,100,120,140,160,180,200	"

TABLE I (cont)
PORE GAS MONITOR WELLS WITHIN OU 1148

Well number	Install year	Well group/ Const. method	Sample Port Depth (feet from surface)	Location
20	1986	3	20,40,60,80,100,130,140,160,180,200	"
21*	1986	3	20,40,60,80,100,120,140,160,180,200	"
22*	1986	2	20,40,60,80,100,120,140,160,180,197	"
23*	1986	3	20,40,60,80,100,120,140,160,180,200	"
24	1986	3	20,40,60,80,100,120,140,160,180,200	"
25	1988	4	20,60,100,160,190	"
26*	1988	4	20,60,100,160,200,215	"
27	1988	4	20,60,100,160,200,220,250	"
28	1988	4	20,60,100,160,200,220,250	"
29*	1988	4	20,60,100,160,200,220,260,288	"
30*	1988	4	20,60,100,160,200,220,243	"
31*	1988	4	20,60,100,160,200,220,260	"
34*	1988	4	60,10,160,200,220,260,300	"
87†	1985		13,31,46,86	In Area L
88†	1985		13,31,46,86	"
89†	1985		13,31,46,86	"
13	1985	3	20,43 63	NW of Area L
09*	1985	1a	37,62,79, 92	In Area G
10*	1985	1a	30,53,95	"
32*	1989	?	20,60,100,130,156	"
33*	1989	?	20,60,100,160,200,220,260,277	"

* Indicates fourteen selected wells discussed in text

† Well identification does not correspond to prior numbering schemes. These three wells were constructed adjacent to well 14 as a test of the completion techniques. Former names were: well 87, "Hole 1 tuff;" well 88, "Hole 2 sand"; well 89, "Hole 3 bentonite."

Notes for Table I.

Group 1 wells are constructed with welded sample ports on a continuous galvanized steel pipe. Sample tubes run inside the pipe from each sample port to the surface. The annulus space for each sample interval is filled with a 5 ft thick graded sand pack with bentonite seals above and below the sand pack. The annulus space between sample intervals is filled with a bentonite/gravel mixture. Group 1 wells are the only wells constructed with the continuous pipe in the borehole.

Group 1a wells are similar to Group 1 wells, except that the records show that the annulus space between sample intervals is filled with gravel, rather than a bentonite/gravel mixture. This may be an error in the drawings.

Group 2, 3, and 4 wells have individual sampling tubes running from sample zones to the surface.

In Group 2 wells individual sample zones consist of 5 ft thick graded sand packs with upper and lower bentonite seals that are 1-3 ft thick. The borehole is filled with crushed tuff between the sample intervals.

In Group 3 wells, individual sample intervals are 20 ft thick and are filled with crushed tuff. Thin (1 ft) bentonite seals separate each interval.

In Group 4 wells sample ports were separated by a distance of 20 ft and the borehole was back-filled with clean sand. No bentonite layers were used to isolate individual sample zones.

Specific Comments

The proposed revision to the text of the work plan is included as attachments with the proposed revision highlighted with underlining.

1. *Table ES-2, Baseline Schedule and Budget for OU 1148 RFI, p. ES-12 - This table indicates that RFI field work will be completed November 13, 1998, and an RFI Final Report will not be completed until October 30, 2000. LANL shall submit a draft final RFI Report within eight months of receipt of analytical data.*

   Response: The draft final RFI Report will be submitted within eight months of receipt of validated analytical data (see attached Table ES-2).

2. *Table 1.4-2, Criteria for a Recommendation of NFA or DA at Decision Point 1, p. 1-32 The table provides very liberal criteria which are used for a no further action (NFA) recommendation. For example:*

a. *Statement #1: "The site was never the location of hazardous-or radioactive-waste generation, treatment, storage or disposal." If the intent of this statement is that a unit did not receive regulated hazardous waste, the NFA is appropriate. If a unit handled solid waste, and there has been a release from the unit, then a RFI is required. The statement should be clarified or deleted.*

   Response: Statement #1 of Table 1.4-2 is modified to state: The site never managed D.O.E. radioactive waste, regulated hazardous waste, or hazardous waste constituents (see attached Table 1.4-2).

b. *Statement #3: "The SWMU was constructed after November 18, 1987 and has operated under a permit." Does the permit contain corrective action provisions? The rationale for this statement must be provided.*

Response: A review of the SWMUs recommended for NFA in the work plan (see specific comments #19 and #20) indicates that the language of statement #3 is inappropriate. The work plan is modified to retract the statement and replace it with a new statement #3 as follows: "The SWMU has engineered release controls and no history or evidence of release" (see attached Table 1.4-2).

c. *Statement #5: "Currently available data indicate that the SWMU has undergone characterization or cleanup, and that COC's are not present in concentrations that exceed health risk-based levels." The extent and maximum concentration of contamination must be determined and all available data supplied with the NFA request.*

Response: All NFA requests will be supported with appropriate data (see attached Table 1.4-2).

3. *1.4.2.8 Decision Point 4 p. 1-35 - The third sentence of the first paragraph reads, "A recommendation of NFA at this point in the decision process will be justified for a SWMU if the mean sample concentration for any listed COC does not exceed the risk-based action level for that COC". The use of a mean sample concentration is not appropriate for a NFA decision. The maximum concentration should be compared with action levels as defined in Subpart S.*

Response: The sentence is revised to state "A recommendation of NFA at this point in the decision process will be justified for a SWMU if the maximum sample concentration for any listed COC does not exceed the screening action level for that COC" (see attached text).

4. *3.9.3.4 Characterizations of Groundwater, p. 3-40 - The work plan states: "The samples will be collected using a method to prevent aeration and will be sealed in an air tight glass bottle". This is not an adequate description for sample collection. The work plan must provide the specific detail necessary to collect groundwater samples. What method will be used to analyze the samples?*

Response: The work plan is revised to reference SOPs for collection of groundwater samples and list methods for analysis of groundwater samples (see attached text).

5. *Table 3.9-2 p. 3-41 - The analytical methods being used should also be listed.*

Response: The work plan is revised to list analytical methods for groundwater samples (see attached Table 3.9-3).

6. *5.1.3.1.1 Source Characterizations, p. 5-11 - The work plan states, "If Phase I sampling indicates contaminants are moving beyond the point of institutional control, additional source characterization may be included as part of the Phase II sampling program". The phrase "Beyond institutional control" must be defined and clarified. If a release has occurred to the environment from a SWMU, then it must be fully characterized.*

   Response: The work plan is modified to state "If Phase I sampling indicates that contaminants are escaping or will escape from a MDA at concentrations that pose a threat to human health and the environment, additional source characterization will be included as part of the Phase II sampling program." At operable Unit 1148, "beyond institutional control" means beyond an area from which the public is physically excluded, and will be physically excluded in perpetuity (see attached text and Table 1.4-1).

7. *Table 5.1-9, p. 5-25 - The QC samples should be specified. The format used in Table 5.1-7 should be used in this Table and other subsequent tables that specify sample collection.*

   Response: The tables that estimate the number of samples for Phase II sampling plans are replaced with new tables in the same format as Phase I tables to specify quality control samples for the potential contaminants of concern. Because of the change in format, underlining is not shown on the replacement tables (see attached tables).

8. *5.1.4.2.5 Sampling Activity, p. 5-28 - Neither this section nor Section 2.0 of Appendix B as indicated in the text, detail the depth of sample collection. This information should be stated either in the text or in Appendix B. In addition, how will the sample location be determined within each random grid chosen (i.e. center of the grid)?*

   Since the purpose of the RFI Phase I sampling is to determine if a release has occurred, LANL shall also use judgmental sampling of catchment areas and collection points in the streambed. This comment also applies to the following sections and, a response is required for each section:

   5.2.4.2.5 Sampling Activity, p. 5-81
   5.3.4.2.5 Sampling Activity, p. 5-141
   5.4.4.2.5 Sampling Activity, p. 5-231

   Response: The text for all Phase I surface sediment sampling activities is revised to specify that the depth of sample collection is from 0 to 6 inches with the actual sample selected from judgment. The random grid sampling strategy will not be used. The number of samples specified in each activity will be distributed along drainage pathways using judgmental sampling to collect samples from the best developed sediment traps (see attached text and figures).

9. *5.1.4.3.5.1 Boreholes at MDA J, p. 5-36 -*

a. *LANL shall add two additional vertical boreholes, similar to the one described in this section (vertical borehole B2), one between pits 2 and 3, and one next to shafts 1 and 2*

Response: The Sampling Plan for MDA J is revised to include two additional vertical boreholes; Borehole B3 is located between pits 2 and 3 at the center of the long axis of the pits; and Borehole B4 is located south of Pit 2 between shaft 1 and 2. The boreholes will each be drilled to a minimum depth of 20 feet below the disposal units, with continuous core collected during drilling. Samples will be submitted for contaminant analysis from each 20 foot depth interval. Sample selection from each interval will be guided by the results of field screening to detect contamination. The total depth for the boreholes shall be determined by field screening but shall not be greater than 200 feet in the Phase I investigation unless field screening indicates drilling should continue (see attached text and figures).

b. *Soil samples should be collected where field screening indicates possible contamination, in addition to a sample being collected every 10 or 20 feet depending on which type of borehole (angled or vertical) is being sampled.*

Response: Sampling will be from each designated 10 or 20 foot interval with the exact zone within that interval established from field screening information as described in the work plan.

10. *5.1.4.4.2 Sampling and Analysis Approach, p. 5-39 - The following comment applies to all the air sampling proposed in this OU: Additional information needs to be provided on the EMFLUX sample cartridges. Passive dosimeters generally do not provide high quality data due to uncertain flow rates of air across or through the dosimeter. We strongly recommend that use of flux chambers or similar techniques to accurately quantify releases of VOCs from the facility.*

Response: The EMFLUX technology does not rely, as dosimeters do, on ambient air-flow rates; the system in effect creates a preferential sink, closed to ambient air, for gas-phase compounds emanating from the surface of the earth. Generally speaking, dosimeters are sensitive in the part-per-million range and are not expected to provide what is normally termed high-quality data. EMFLUX, by contrast, is effective in the low parts-per-billion range, and has been evaluated at EPA's test bed near Las Vegas, NV, where the system's performance relative to ground water contamination earned a correlation coefficient (r) of 0.91. (Please see National Environmental Technology Applications Corporation [NETAC] Report C9-003, "Field Evaluation of the EMFLUX Soil Gas Emanation Flux Survey Technique," June 20, 1989.)

The purpose of the passive air sampling investigations at MDA J and MDA G is to screen the MDAs for the presence of buried wastes that contain VOCs. The measurements at the two MDAs will be compared with passive sampling simultaneously taken at MDA L above a known VOC plume. The text in the work plan is revised to state that the measurements are for screening to define subsurface plumes of VOCs. If in the future a quantitatively accurate flux measurement is required, then a flux chamber will be used that meets EPA approval (see attached text).

11. *Figure 5.1.-7 Passive air sampling locations at MDA L, p. 5-43 - The sampling height above ground level should be included in this figure and in the following figures: Figure 5.3.9 MDA L, Figure 5.4-12, Figure 5.4-13, Figure 5.4-14, and Figure 5.4-15.*

Response: The figures are revised to include a statement that the passive air sample is collected at ground surface (see attached figures).

12. *5.1.4.4.5 Sampling Activity, p. 5-44 - In paragraph three of this section, it is unclear how the periods of maximum vertical gas movement will be determined; therefore, more information needs to be provided.*

Response: The text is revised to state that the periods of maximum vertical gas movement are calculated from a computer model that is based on the influence of periodic change in tidal dilatation of the earth's crust on the vertical migration of soil gas (see attached text).

EPA methods are preferred for all air sampling. An additional reference for use in air sampling is: EPA (U.S. Environmental Protection Agency), June 1988, "A Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air", EPA/600/4-89-017, June, 1988.

Response: See Response to comment #10.

13. *The four boreholes at MDA H shall be drilled next to the shafts. If a fifth borehole can be located within the fence then all the boreholes can be located closer to the shafts. In particular borehole LSH-92-01 should be located next to shafts 3 and 8 and borehole LSH-92-04 should be located closer to shaft 1. Borehole LSH-92-02 should be located within the fence on the east side of shaft 5. Borehole LSA-92-03 should be located close to shafts 3 and 7, but may be outside the fence as close to the shafts as possible.*

Response: Our proposed characterization of MDA H is guided by our reasoning presented above in the preamble and our response to general comment #1. We have revised the work plan with a characterization that is different from that of the draft response to the NOD. At the time the Work Plan was written, the unused shaft locations at MDA H were considered as potential sites for future permitted disposal. We now understand that the Laboratory will not use available land within MDA H for future disposal. Therefore, the boundary of future

institutional control might conceivably be reduced to a smaller perimeter than the existing fence around the existing nine disposal shafts. We can characterize release beyond this possible new boundary of institutional control with boreholes closer to the inactive disposal shafts, as you have requested. To avoid possible damage to the shaft caps by the drilling equipment, we do not want to place the boreholes closer than 25 feet from the shafts. The locations of four proposed boreholes for Phase I characterization are shown on the attached figure (Figure 5.2-6 in the revised work plan). These locations are within 30 feet of the shafts, and are nearly the same as the locations that you suggested above.

- For borehole 92-01, we suggest a location south of the fence, between shafts 4 and 8. You requested a location between shafts 3 and 8; however we prefer a location closer to shaft 4 to explore the tritium release from that shaft.

- Borehole 92-02 is now located east of shaft 5, as requested.

- Borehole 92-03 is now located inside the fence, between shafts 2 and 7. We believe this provides a broader distribution of boreholes than the location you suggested. It will also provide information on the distribution of contaminants toward the north, and avoids unnecessary destruction of trees for access by the drill rig.

- Borehole 92-04 is now located outside the fence, west of shaft 1 as suggested.

Core samples from the four boreholes at MDA H will be analyzed at ten foot intervals to a depth of seventy feet, which is ten feet below the bottom of the disposal shafts. Below a depth of seventy feet to 150 feet, samples will be collected on twenty foot intervals. At depths greater than 150 feet, analyses for most constituents will be on a 50 foot interval. Detailed information on proposed sampling intervals is presented in the attached revised text and table. The minimum depth of each borehole will be 100 feet. The actual depth of each borehole will be determined during drilling by immediate analysis of tritium in core samples and VOCs in gas samples. No borehole will be drilled deeper than the top of the basalt, which is approximately 300 feet below ground level (see attached text, figure, and table).

14. *Please insure response is consistent with information submitted in Pilot Vapor Phase Extraction Method for MDA L.*

Our draft NOD response is consistent with the Pilot Extraction Study Plan. However, for simplicity, we propose to replace this section of the draft NOD response with a reference to the pilot plan, which will constitute Appendix A to the revised Work Plan.

15. *5.4.4.2.4 Rationale for Sampling Activity, p. 5-231 - Are there any additional surface water runoff channels on the north side of Area G which could also be sampled?*

Response: A recently completed study of the north facing slope of Cañada del Buey identified a total of 5 surface water runoff channels on the north side of MDA G. Samples from these channels are included in the revised text and figure (see attachment-specific comment #15).

16. ***EPA comments on 4/23/93***
5.4.4.3.5.1 Boreholes at MDA G, p. 5-142 - Five sample boreholes in an area this large is insufficient to determine if a release has occurred. Additional borings are necessary.

a. *At a minimum the 14 high priority pits should have a boring on each side. Samples should be collected on five-foot intervals down to a depth of ten feet below the bottom of the cells. Below that depth they may be collected on ten-foot intervals. Samples should be analyzed for Appendix VIII constituents. (See response following EPA comments on 9/2/93).*

b. *Additional boreholes shall be located in the shaft fields. Two additional boreholes should be located on the west side of the shaft field containing shafts 1-135. Two boreholes should also be placed next to shafts C1-C13. Samples should be collected on ten-foot intervals down to a depth of ten feet below the bottom of the shafts. Below that depth samples may be collected on twenty-foot intervals. Samples should be analyzed for Appendix VIII constituents. (See response following EPA comments on 9/2/93).*

c. *A better map(s) should be provided showing the numbers for each disposal shaft.*

Response: A map is included to show the location and identification number for each disposal shaft at MDA G (see specific response #16c maps).

EPA comments on 9/2/93

MDA G: The additional boreholes which are added should be drilled to approximately 20 feet below the depth of the adjacent pits, shafts or trenches. LANL should determine if releases are occurring from these units and based on this information later determine the extent of any release by drilling deeper holes. This applies to the proposed perimeter boreholes and interior boreholes. Additional boreholes should be added as follows:

a borehole between pits 2 and 4
a borehole between pits 4 and 5
a borehole south of 5 and located near the north end of pit 1
a perimeter borehole located close to pit 27's southern end
a borehole east of pit 37

Response: The original work plan proposed 5 boreholes at MDA G. The work plan is revised to include 28 boreholes for the Phase I investigation at MDA G. The 28 boreholes address concerns in EPA comments on 4/23/93 and 9/2/93. The proposed locations for the boreholes are shown in figure 5.4-9 in the revised work plan (see attachment). The proposed locations are contingent upon review and issuance of excavation permits by the Laboratory. Therefore, some borehole locations may have to be changed. Each borehole will be drilled vertically to a depth that is a minimum of 20 feet below the adjacent subsurface disposal units. The depths for the boreholes are shown in revised Table 5-4-24 (see attachment). Continuous core will be collected during drilling. All cores will be sampled at 5 foot intervals for gravimetric moisture and tritium. Field screening will be used to select core samples for contaminant analyses from each 10 foot interval to the total depth of the borehole. Samples will be analyzed for the suite of contaminants presented in Section 5.4.4.3.3.3 of the revised work plan (see attachment). Gas samples will not be collected from the Phase I boreholes. After completion of sampling, the boreholes will be sealed following the requirements of LANL-ER-SOP 01.06.RO. Analytical results from the Phase I subsurface characterization will be used to design a Phase II investigation to determine the lateral and vertical extent of contamination. Phase I analytical results will identify a list of contaminants of concern for analysis on core samples collected in Phase II. For planning purposes, it is assumed that Phase II will include 10 additional boreholes drilled to an average depth of 200 feet (see attached text, tables, and figure).

17. *5.4.4.4.5 Sampling Activity, p. 5-247 - Provide more details about how the remaining soil gas samples will be collected from the new boreholes, and the remaining two existing boreholes for which sampling intervals are not included. This should include information as to how a sampling interval will be determined, and are there a minimum number of samples to be collected per borehole.*

Response: The revised Phase I subsurface characterization of MDA G does not include sampling soil gas in the twenty eight new boreholes. The decision to collect soil gas samples in Phase II subsurface characterization and the design of that program will be based on the results of Phase I. The collection of gas samples from the existing monitor wells at OU 1148 (including the four wells at MDA G) is discussed in general response #3. Table 5.4-27 is revised to show sample interval depths for the four monitor wells that are located in MDA G (see attached table).

18. *Annex I - The schedule information does not really provide timeframes for sampling individual MDA's. Did the boreholes for MDA L get drilled in 1992? Provide scheduling information (approximate month/year) for each MDA Phase I sampling.*

Response: The boreholes at MDA L did not get drilled during 1992. Five holes have been drilled in 1993, and three are scheduled to be drilled in November 1993.

The following approximate schedule describes Phase I sampling. This schedule may be renegotiated with EPA in the future as required by technical findings or budgetary constraints. EPA will receive timely notification of any requests to modify the schedule. Drilling occurs at Area L first because it may present the greatest risk. Drilling at Areas J, H, and G is sequenced so that experience and information from one event can be applied to the next event. Drilling at Area G is scheduled last to permit time for development of a new drilling method that generates no waste cuttings, and to provide time for completion of current surface operations that may interfere with the drilling of particular scheduled boreholes.

APPROXIMATE SCHEDULE OF PHASE I SAMPLING EVENTS AFTER FY 93

October 93	Drill "angle" holes in the vapor plume at MDA L.
November 93	Drill three "vertical" holes near disposal units at MDA L.
May-June 94	Sediment sampling in runoff channels.
August 94	Sample for tritium in surface soils at MDA J and MDA G.
September 94	Drill 5 angle holes under pits at MDA L.
April 95-April 96	High-volume air sampling at MDAs G, L, H.
May 95	Drill 4 holes at MDA J.
June 95	Drill 4 holes at MDA H.
August 95	Sample water runoff, MDAs G, H, L, J.
May-September 96	Drill 28 holes, MDA G.
September 96	Sample septic tanks and seepage trench, TA-54 West and TA-51.

19. *No Further Action Units - As part of the ongoing RCRA Facility Assessment (RFA) conducted by LANL, the following Solid Waste Management Units (SWMUs) do not appear to require an RFI; therefore the permit does not need to be modified to include them:*

54-008 septic tanks - These active units did not manage hazardous waste.
54-015(g) Lead casks - the containerized casks were overpacked and returned to MDA G for storage as mixed wastes. They have been removed from MDA L.

54-015(i) Forklift Battery - The battery was containerized before storage at MDA L, and overpacked before storage at MDA G.
54-001(f) Empty drum storage - This drum storage area never handled any hazardous waste or hazardous waste constituents.
54-007(b) Septic Tank - Septic tank for sanitary sewage, scheduled for removal.
54-010 Supply wash water tank - This tank was not part of the waste stream.
54-021 Six empty storage tanks - These tanks have been removed under a RCRA closure plan.
54-002 PCB transformer spill - Cleanup of this site has been implemented.
54-002(a,b) Environmental research caissons - The research caissons never managed hazardous waste or hazardous waste constituents.
AOC C-51-001 Former storage area for clean, drummed soil - This storage area never managed hazardous waste or hazardous waste constituents.

54-016(a) Nondestructive Testing Facility Sump - This waste management unit was constructed after November 18, 1987. No releases have occurred from this unit.
AOC C-51-002 Former location of explosives magazines - The structures have been removed.

Response: We concur and will propose the units for NFA as appropriate.

20. *A Class III permit modification will be required prior to removal of the following units from the HSWA permit:*

54-001(c) Bermed Storage Pad - Never managed any hazardous waste or hazardous waste constituents, and has been removed from MDA L. SWMU no longer exists.
54-013(a) Truck washing pit - This pit was never constructed.
54-015(h) Drum storage area - This is listed as 54-003(b) in the HSWA permit. This waste management unit was constructed after November, 1987. No releases have occurred from this unit.

Response: A class III permit modification will be submitted to remove the units from the HSWA permit.

TABLE ES-2
BASELINE SCHEDULE AND BUDGET FOR OU 1148 RFI[1]

Activity	Schedule Start Date	Schedule Finish Date	Projected Budget Cost (in Thousands of Dollars)
RFI Work Plan	1 Oct 91	30 Sep 92	$ 1,108
RFI	1 Oct 91	13 Nov 98	45,811
RFI Report	15 Jul 93	30 Oct 00[2]	1,816
CMS Plan	7 May 99	30 Oct 00	79
CMS	24 May 00	15 Mar 01	1,168
CMS Report	24 May 00	28 Sep 01	303
ADS Management	1 Oct 91	29 Sep 00	1,863
VCA	1 Oct 92	29 Sep 00	3,340
Subtotal			55,488
Undistributed Escalation (98-02)			1,420
Prior Years			1,736
TOTAL at Completion			58,644

[1] Baseline schedule and budget generated by Management Information System (MIS), EM-13. Baseline data is 3/16/92.

[2] A draft final RFI Report will be submitted to EPA within eight months of receipt of validated analytical data.

TABLE 1.4-2
CRITERIA USED FOR A RECOMMENDATION OF NFA[1] OR DA[2] AT DECISION POINT 1

NFA CRITERIA

#2.a. 1) The site never managed DOE radioactive waste, regulated hazardous waste or hazardous waste constituents.

2) The solid waste management unit (SWMU) was never constructed, installed, or used.

#2.b. 3) The SWMU has engineered release controls and no history or evidence of release.

4) The site has undergone or is scheduled to undergo remediation or voluntary corrective action under the RCRA Operating Permit or Interim Corrective Measures. Corrective measures were or will be subject to approval by the Environmental Protection Agency (EPA).

#2.c. 5) The SWMU has undergone characterization or cleanup, and constituents of concern (COCs) are not present in concentrations that exceed health risk-based action levels. NFA requests will be accompanied by all available data used to determine the extent and maximum concentration of contamination.

DA CRITERIA

1) The SWMU is an active waste management site subject to separate authority, such as HSWA Section 300(a) or TSCA.

[1]NFA: No Further Action
[2] DA: Deferred Action

If a health risk-based action level for a constituent does not presently exist, then the measurement of a concentration above the detection limit and background level will suffice to be considered sufficient confirmation of the COCs presence, and indication that a health risk-based action level should be developed.

The absence of COCs is confirmed if none of the suspected constituents are detected, or no suspected COCs exceed their respective background levels. The ER Program is currently conducting a pilot study on soils and the Bandelier tuff. The study will determine the background concentration range of target analyte list metals and radionuclides. The investigation will also collect data on some physical and chemical parameters that control mobilities of the constituents. Initial results of the study will be presented in the 1992 version of the IWP, and will be available for use in adequate time for data analysis.

1.4.2.8 Decision Point 4:

Do COCs at this SWMU result in a health risk-based impact to receptors?

The purpose of Decision Point 4 is to allow an evaluation of the total set of valid data for each SWMU. Concentrations of COCs at each SWMU will be compared to the action levels for each COC present. A recommendation of NFA at this point in the decision process will be justified for a SWMU if the maximum sample concentration for any listed COC does not exceed the screening action level for that COC.

A CMS (or an alternative response action) is required for SWMUs at which one or more COCs are present at a level that exceeds the risk-based action level specified in 40 CFR 264 Proposed Subpart S or the health risk-based level developed by the Laboratory for that constituent. The ER Program is currently developing baseline risk assessment scenarios and criteria that will be presented in the 1992 version of the IWP. This approach will be developed in adequate time for data analysis. The derivation of action levels for constituents which have no action level under 40 CFR 264 Proposed Subpart S will also be considered in the 1992 IWP. If further site-specific risk assessment indicates that human health and the environment are not at risk, then a recommendation of NFA may be appropriate.

1.4.3 Data Quality Objectives

To ensure that data of appropriate and sufficient type, quantity, and quality are collected during Phase I and Phase II sampling, the Data Quality Objectives (DQO) Process (Neptune 1990 0748, Neptune 1990 0684, Ryti 1990 0714) has been applied to the development of the Phase I and Phase II SAPs.

The seven steps in the DQO Process are as follows:

1) State the problem to be resolved.

3.9.3.4 Characterization of Groundwater

Groundwater from the top of the main aquifer and any perched aquifers that may be encountered (Section 3.9.3.2) will be sampled and analyzed for volatile, organic and inorganic constituents, and for stable and radioactive isotopes. The analytical suite is presented in Table 3.9-3. The groundwater samples will be collected with methods described in ER Program SOPs 06.01,RO Purging of Wells for Representative Sampling of Groundwater; 06.02, RO Field Analytical Measurements of Groundwater Samples; and 06.03, RO Sampling for Volatile Organics. Table 3.9.3 indicates samples that will be analyzed with SW 846 methods. These analyses will confirm the presence or absence of contamination of groundwater in the main aquifer. In addition, the analyses of environmental isotopes will allow absolute ages of the groundwater to be determined and help define the recharge history of the aquifer. The environmental samples will be collected using a method to prevent aeration and will be immediately sealed in an air tight containers.

3.9.3.5 Pore Gas Collection from Open Borehole

Pore gas samples will be collected from the borehole during the in situ air permeability tests. Pore gas samples will be collected approximately every 50 ft, with the testing intervals selected based on results of the geologic description of the core and the interpretation of the suite of the borehole geophysical logs. Zones of basaltic breccia between individual basalt flows will be preferentially sampled because they may have the highest intrinsic permeability and may be the most likely pathway for vapor transport.

The collected gas samples will be analyzed for the following:

- volatile organic constituents,
- relative humidity, and
- SF_6 (a gas introduced during drilling to trace dilution of *in situ* pore gas by drilling air).

Sample collection and laboratory tests will be performed using either appropriate Laboratory ER Program SOPs, or conventional field and laboratory procedures which cover the following area:

- field methodology to collect and preserve pore gas samples collected from discrete intervals in open boreholes, and

- laboratory method to analyze constituents in pore gas samples.

TABLE 3.9-3
ANALYTICAL SUITE FOR GROUNDWATER SAMPLES COLLECTED FROM PERCHED ZONES AND THE MAIN AQUIFER

Major Anions[1]
Carbonate
Chloride
Sulfate
Fluoride
Nitrate
Nitrate and Nitrite
Phasphate

Major Cations[1]
Ammonium
Calcium
Magnesium Potassium
Sodium
Silica

Radionuclides[2]
Gross alpha
Gross beta
Radium-226
Thorium-230

Other Parameters[1]
Total Organic Carbon
Total suspended solids
(<10 micron)

Field Measured Parameters[3]
Temperature
Ph
Eh
Specific Conductance
Alkalinity
Dissolved Oxygen

Minor and Trace Constituents[1]
Aluminum
Arsenic
Barium
Beryllium
Boron
Bromide
Cadmium
Cobalt
Copper
Cyanide
Iron
Lead
Manganese
Mercury
Molybdenum
Nickel
Selenium
Sulfide (as H_2S)
Strontium
Thallium
Uranium
Vanadium
Zinc
VOCs
SVOCs

Environmental Isotopes[2]
Strontium-86/Strontium-87
Hydrogen/Deuterium
Oxygen-16/Oxygen-18
Tritium
Carbon-14

[1] Samples will be analyzed with SW 846 methods.

[2] Samples will be analyzed with contract laboratory methods that are approved by the LANL ER Program.

[3] Samples will be analyzed in accordance with LANL-ER SOP-06.02, RO.

dispersion of contaminants transported by surface water to the alluvium in Cañada del Buey. In addition, perched aquifers are not believed to be present in Cañada del Buey.

5.1.2 Remediation Alternatives and Evaluation Criteria

MDA J has received classified wastes and will remain under institutional control indefinitely, and no releases of hazardous or radioactive contaminants are expected to be identified at MDA J. Therefore, MDA J is recommended for institutional control as a preliminary response action based on current information.

5.1.3 Data Needs and Data Quality Objectives

Based on records of disposal activities at MDA J, only residual amounts of hazardous wastes are expected to have been disposed of in the pits and shafts. There are no records of radioactive waste disposed of in MDA J. However, it is possible that small amounts of radioactive or hazardous wastes were disposed of in the pits and were not recorded. For this reason, a Phase I sampling program will be implemented to determine the presence or absence of contaminants outside the disposal pits and shafts in MDA J.

5.1.3.1 Health and Safety Risks

5.1.3.1.1 Source Characterization

The materials disposed of in the pits and shafts at MDA J are characterized from disposal records as discussed in Section 5.1.1.2.1. Phase I sampling will be performed to determine the presence or absence of contaminants outside the disposal pits and shafts at MDA J. <u>If Phase I sampling indicates that contaminants are escaping or will escape from the MDA at concentrations that pose a threat to human health and the environment, additional source characterization will be included as part of the Phase II sampling program.</u>

The data presented in Table 5.1-3 will provide a better understanding of the information needed for source term characterization.

5.1.3.1.2 Environmental Setting

As discussed in Section 5.1.1.2.2, the migration pathways for contaminants released from MDA J have been modeled conceptually. Phase I investigations will include sampling to determine if contaminants are migrating via several pathways. These pathways are

- vapor phase migration in the subsurface;
- air migration of volatiles released to the atmosphere by evapotranspiration; and
- surface water runoff and sediment transport of contaminants beyond the MDA J area of institutional control.

TABLE 1.4-1
TERM DEFINITIONS

Constituents of Concern: Organic, inorganic, or radioactive solids, liquids, or gases that, due to quantity, concentration, or physical/chemical characteristics, may present a threat to human health or the environment.

Existing Information: Information collected to date from published and unpublished records pertaining to the history or processes of a SWMU. Records can include written communication such as reports, memoranda, letters, notes, or calculations. Verbal communication can be considered as archival data. Archival data generally has unknown data quality.

Human Health or Environment: Pertaining specifically to the health and environment of the general public (exclusive of health concerns for Laboratory employees, which is regulated by OSHA).

Institutional Control: Institutional controls include controlled site access, waste stabilization, and post-closure monitoring done to insure that contaminants are not being transported beyond the controlled site boundaries at concentrations that exceed health risk-based standards or action levels. Remediation of release sites located within the area of institutional control will be based on the proposed RCRA Subpart S conditional remedy requirements.

Phase I: The initial sampling phase of site assessment work to collect adequate information to confirm the presence or absence of contaminants of concern in the environment. Information collected during Phase I sampling and analysis will determine if Phase II sampling is necessary.

Phase II: The second sampling phase of site assessment at SWMUs that have contaminants of concern. Phase II sampling and analysis will provide required data on the physical-chemical characteristics of the site and will delineate the nature and extent of contamination. Data collected will be used for contaminant fate and transport modeling, risk assessment, treatability studies, and corrective measure studies, as required.

Potential Risk: A judgmental determination on the potential release of contaminants of concern to the environment at a SWMU based solely on archival data. A potential risk is based on the likelihood that a release may have occurred at a SWMU and may have entered a potential migration pathway leading to off-site receptors. Active waste management activities conducted under DOE Orders do not represent a risk to off-site receptors. Because specific SWMUs contain retrievable waste managed under DOE Orders until it is certified as TRU waste that will be packaged to meet WIPP waste acceptance criteria, these SWMUs will be recommended for deferred action at Decision Point 1. Criteria for recommending SWMUs for NFA or DA are given in Tables 1.4-2 and 1.4-3.

Site Characterization: Determination of the properties of the site as related to the potential for human health or environmental risk. The properties can include waste location and extent of migration as well as geological and hydrological properties of the site.

Waste Characterization: Determination of the constituents of concern, their amounts, and their physical and chemical forms. The determination can be made using existing records, or actual analytical measurements.

TABLE 5.1-9
PHASE II SURFACE WATER RUNOFF (SOIL) SAMPLING AT MDA J

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	13	4	17	VOCs SVOCs Metals Pesticides PCBs Cyanide Tritium Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.1-11
PHASE II SURFACE SEDIMENT SAMPLING AT MDA J

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	23	8	31	VOCs SVOCs Metals Pesticides PCBs Cyanide Tritium Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Submitted only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.1-14
PHASE II BOREHOLE SAMPLING AT MDA J

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Rock Core	20	10	30	VOCs SVOCs Metals Pesticides PCBs Cyanide Gross Alpha Gross Beta Gamma Spectroscopy
Soil Gas	20	10	30	VOCs

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank (Soil/Rock Core): Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Submitted only when sampling for VOCs.

Trip Blank (Soil Gas): A sealed SUMMA canister or resin tubes are taken to the field during a sampling event and returned with shipment to the analytical laboratory. Canister or resin tubes remain unopened.

Field Blank (Soil/Rock Core): Organic-free water is poured into sample containers at the site of the borehole sampling.

Field Blank (Soil Gas): A SUMMA canister or resin tubes are exposed to the atmosphere near the sampling site. The canister or resin tubes will be left open until 3 liters of air are sampled.

Duplicate Samples (Soil/Rock Core): Collect two separate core samples immediately adjacent to each other by the same sampling technique.

Duplicate Samples (Soil Gas): Obtained by attaching to SUMMA canisters or four resin tubes to the sample line with a Y fitting and filling the canisters or tubes simultaneously.

Equipment (Rinsate) Blanks (Soil/Rock Core): Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

Equipment (Rinsate) Blanks (Soil Gas): A soil gas sample, using a SUMMA canister or resin tubes, is taken to assess the cleanliness of the sample manifold. Clean the sample manifold, fill a 6L Teflon bag with zero-zero air, and attach the bag and canister or resin tubes to the manifold. Collect 3 liters using a flow rate of 500 ml/minute.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.1-17
PHASE II TRITIUM SOIL SAMPLING (VEGETATION) SOILS IN MDA J

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Analysis
Vegetatin	3	2	5	Tritium

[a] Includes Duplicate Sample, and Equipment (Rinsate) Blank.

Duplicate Sample: Split a vegetation sample into two duplicate samples. Fill the sample containers simultaneously from the same sampling area.

Equipment (Rinsate) Blanks: Pour organic-free water over clean, decontaminated sampling equipment. Pour the water over the equipment surface that comes in contact with the sample.

TABLE 5.2-11
PHASE II SURFACE WATER RUNOFF (SURFACE SOIL) SAMPLING AT MDA H

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	9	4	13	VOCs SVOCs Metals Pesticides PCBs Cyanide Tritium Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Split a soil sample into two duplicate samples.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.2-13
PHASE II SURFACE SEDIMENT SAMPLING AT MDA H

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	9	4	13	VOCs SVOCs Metals Pesticides PCBs Cyanide Tritium Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.2-16
PHASE II BOREHOLE SAMPLING AT MDA H

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil/ Rock Core	40	4	44	Tritium
Soil/ Rock Core	24	12	36	VOCs SVOCs Metals Pesticides PCBs Cyanide Gross Alpha Gross Beta Gamma Spectroscopy
Soil Gas	20	14	34	VOCs

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank (Soil/Rock Core): Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Submitted only when sampling for VOCs.

Trip Blank (Soil Gas): A sealed SUMMA canister or resin tubes are taken to the field during a sampling event and returned with shipment to the analytical laboratory. Canister or resin tubes remain unopened.

Field Blank (Soil/Rock Core): Organic-free water is poured into sample containers at the site of the borehole sampling.

Field Blank (Soil Gas): A SUMMA canister or resin tubes are exposed to the atmosphere near the sampling site. The canister or resin tubes will be left open until 3 liters of air are sampled.

Duplicate Samples (Soil/Rock Core): Collect two separate core samples immediately adjacent to each other by the same sampling technique.

Duplicate Samples (Soil Gas): obtained by attaching to SUMMA canisters or four resin tubes to the sample line with a Y fitting and filling the canisters or tubes simultaneously.

Equipment (Rinsate) Blanks (Soil/Rock Core): Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

Equipment (Rinsate) Blanks (Soil Gas): A soil gas sample, using a SUMMA canister or resin tubes, is taken to assess the cleanliness of the sample manifold. Clean the sample manifold, fill a 6L Teflon bag with zero-zero air, and attach the bag and canister or resin tubes to the manifold. Collect 3 liters using a flow rate of 500 ml/minute.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.2-18
PHASE II TRITIUM AIR (VEGETATION AND SOIL) SAMPLING AT MDA H

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Analysis
Soil	9	2	11	Tritium
Vegetation	9	2	11	Tritium

[a] Includes Duplicate Samples, and Equipment (Rinsate) Blank for soil and vegetation samples.

Duplicate Sample (Vegetation): Collect two vegetation samples simultaneously from the same sampling area.

Duplicate Sample (Soil): Collect two separate soil samples simultaneously from the same sampling location.

Equipment (Rinsate) Blank: Pour organic-free water over cleaned, decontaminated sampling equipment. Pour the water over the equipment surface that comes in contact with the sample. Collect the rinsate in a sample container and treat the equipment blank as a water sample.

TABLE 5.3-13
PHASE II SURFACE WATER RUNOFF SAMPLING AT MDA L

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Water	3	4	7	VOCs SVOCs Metals Pesticides PCBs Cyanide Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate water samples simultaneously.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.3-15
PHASE II SURFACE SEDIMENT SAMPLING AT MDA L

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Water	6	4	10	VOCs SVOCs Metals Pesticides PCBs Cyanide Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate surface sediment samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I analytical results.

TABLE 5.3-18
PHASE II BOREHOLE SAMPLING AT MDA L

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Rock Core	126	63	189	VOCs SVOCs Metals Pesticides PCBs Cyanide Gross Alpha Gross Beta Gamma Spectroscopy
Soil Gas (during borehole advancement)	125	65	190	VOCs

(a) Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank (Soil/Rock Core): Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Submitted only when sampling for VOCs.

Trip Blank (Soil Gas): A sealed SUMMA canister or resin tubes are taken to the field during a sampling event and returned with shipment to the analytical laboratory. Canister or resin tubes remain unopened.

Field Blank (Soil/Rock Core): Organic-free water is poured into sample containers at the site of the borehole sampling.

Field Blank (Soil Gas): A SUMMA canister or resin tubes are exposed to the atmosphere near the sampling site. The canister or resin tubes will be left open until 3 liters of air are sampled.

Duplicate Samples (Soil/Rock Core): Collect two separate core samples immediately adjacent to each other by the same sampling technique.

Duplicate Samples (Soil Gas): obtained by attaching to SUMMA canisters or four resin tubes to the sample line with a Y fitting and filling the canisters or tubes simultaneously.

Equipment (Rinsate) Blanks (Soil/Rock Core): Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

Equipment (Rinsate) Blanks (Soil Gas): A soil gas sample, using a SUMMA canister or resin tubes, is taken to assess the cleanliness of the sample manifold. Clean the sample manifold, fill a 6L Teflon bag with zero-zero air, and attach the bag and canister or resin tubes to the manifold. Collect 3 liters using a flow rate of 500 ml/minute.

(b) The actual COCs are determined from Phase I analytical results.

TABLE 5.3-23
PHASE II PASSIVE AIR SAMPLING AT MDA L

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Analysis
Soil Gas	10	3	13	VOCs

[a] Includes Trip Blank, Field Blank, and Duplicate Sample.

Trip Blank: An EMFLUX cartridge that is taken to the field during a sampling event and then shipped back to the analytical contractor along with the field samples. The trip blank will remain unopened both from and to the laboratory.

Field Blank (Ambient or Control Point Sample): A sample taken to assess the ambient conditions at the sampling site. An EMFLUX sampling device is set up on a control point barrier (3 or 4 layers aluminum foil) near a designated sampling point and the cartridge is exposed for the time period required for EMFLUX sampling devices. One control point sample will be taken for every 10 samples.

Duplicate Sample: Collocated soil gas samples obtained by placing two sample cartridges adjacent to each other. Both cartridges will be exposed simultaneously and submitted to the analytical laboratory as consecutive samples.

TABLE 5.3-26
PHASE II HIGH VOLUME AIR (SOIL) SAMPLING AT MDA L

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	3	4	7	SVOCs Metals Pesticides PCBs Gross Alpha Gross Beta Gamma Spectroscopy

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs will be determined from Phase I analytical results.

TABLE 5.4-21
PHASE II SURFACE WATER RUNOFF (SOIL) SAMPLING AT MDA G

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	18	4	22	VOCs SVOCs Metals Pesticides PCBs Cyanide ROCs[c]

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I sampling results.

[c] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

TABLE 5.4-23
PHASE II SURFACE SEDIMENT SAMPLING AT MDA G

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	27	8	35	VOCs SVOCs Metals Pesticides PCBs Cyanide ROCs[c]

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs are determined from Phase I sampling results.

[c] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

TABLE 5.4-26
PHASE II BOREHOLE SAMPLING AT MDA G

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Rock Core	125	62	187	VOCs SVOCs Metals Pesticides PCBs Cyanide ROCs[c]
Soil Gas	125	70	195	VOCs

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank (Soil/Rock Core): Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Submitted only when sampling for VOCs.

Trip Blank (Soil Gas): A sealed SUMMA canister or resin tubes taken to the field during a sampling event and returned with shipment to the analytical laboratory. Canister or resin tubes remain unopened.

Field Blank (Soil/Rock Core): Organic-free water is poured into sample containers at the site of the borehole sampling.

Field Blank (Soil Gas): A SUMMA canister or resin tubes are exposed to the atmosphere near the sampling site. The canister or resin tubes will be left open until 3 liters of air are sampled.

Duplicate Samples (Soil/Rock Core): Collect two separate core samples immediately adjacent to each other by the same sampling technique.

Duplicate Samples (Soil Gas): Obtained by attaching to SUMMA canisters or four resin tubes to the sample line with a Y fitting and filling the canisters or tubes simultaneously.

Equipment (Rinsate) Blanks (Soil/Rock Core): Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

Equipment (Rinsate) Blanks (Soil Gas): A soil gas sample, using a SUMMA canister or resin tubes, is taken to assess the cleanliness of the sample manifold. Clean the sample manifold, fill a 6L Teflon bag with zero-zero air, and attach the bag and canister or resin tubes to the manifold. Collect 3 liters using a flow rate of 500 ml/minute.

[b] The actual COCs are determined from Phase I analytical results.

[c] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

TABLE 5.4-30
PHASE II PASSIVE AIR SAMPLING AT MDA G

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Analysis
Soil Gas	40	8	48	VOCs

[a] Includes Trip Blank, Field Blank, and Duplicate Sample.

Trip Blank: An EMFLUX cartridge that is taken to the field during a sampling event and then shipped back to the analytical contractor along with the field samples. The trip blank will remain unopened both from and to the laboratory.

Field Blank (Ambient or Control Point Sample): A sample taken to assess the ambient conditions at the sampling site. An EMFLUX sampling device is set up on a control point barrier (3 or 4 layers aluminum foil) near a designated sampling point and the cartridge is exposed for the time period required for EMFLUX sampling devices. One control point sample will be taken for every 10 samples.

Duplicate Sample: Collocated soil gas samples obtained by placing two sample cartridges adjacent to each other. Both cartridges will be exposed simultaneously and submitted to the analytical laboratory as consecutive samples.

TABLE 5.4-33
PHASE II HIGH VOLUME AIR (SOIL) SAMPLING AT MDA G

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	9	3	12	SVOCs Metals PCBs Pesticides ROCs[c]

[a] Includes Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate soil samples simultaneously from the same location.

Equipment Blank: A GPS-1 high-volume sampler PUF/XAD filter and cartridge and a high-volume particulate sampler glass-fiber paper filter will be transported to the field during each sampling event and then shipped back to the Sample Coordination Facility with the field samples.

[b] The actual COCs are determined from the analytical results of Phase I sampling.

[c] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

TABLE 5.4-35
PHASE II TRITIUM AIR AND SOIL (VEGETATION) SAMPLING AT MDA G

Media	Estimated # of Samples	# of QC[a] Samples	Total Samples	Analysis
Vegetation	3	2	5	Tritium

[a] Includes Duplicate Sample, and Equipment (Rinsate) Blank.

Duplicate Sample (Air): Collect two vegetation samples from the same sampling area.

Equipment (Rinsate) Blank: Pour organic-free water over cleaned, decontaminated sampling equipment. Pour the water over the equipment surface that comes in contact with the sample.

TABLE 5.5-9
PHASE II SAMPLING AT THE SEPTIC SYSTEM SWMU AGGREGATE

Media	# of Samples	# of QC[a] Samples	Total Samples	Possible COCs[b]
Soil	9	4	13	VOCs SVOCs Metals Pesticides PCBs Cyanide ROCs[c]

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Collected only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two soil samples simultaneously from the same location.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] The actual COCs will be determined from Phase I analytical results.

[c] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

5.1.4.2.5 Sampling Activity

One set of nine surface sediment samples will be collected from the primary runoff area at MDA J during Phase I sampling. The results will be compared to the Laboratory's Environmental Surveillance Program results (Environmental Protection Group 1990, 0497). Table 5.1-10 summarizes the number of grab samples, the number of QC samples, and the analytical requirements for the Phase I surface sediment sampling. Surface sediment sampling procedures are presented in Section 2.0 of Appendix B.

Figure 5.1-5 shows the location of the primary drainage channel to be sampled. Nine sediment samples will be collected at locations along the drainage pathway using geomorphic analysis of the drainage to collect samples from catchment areas and sediment collection points in the streambed. Samples will be collected from a depth of 0 to 6 inches at the center of each of the nine sample locations.

5.1.4.2.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.1-8 and are located in Appendix B of this RFI Work Plan.

5.1.4.2.7 Phase II SAPs

Phase II sampling of surface sediment will be conducted at MDA J to determine the vertical and lateral extent of contamination if Phase I sampling results indicate that concentrations of COCs exceed health risk-based criteria. Composite samples will be collected from a depth of 6-12 in at the nodes where COCs exceeded health risk-based criteria. If Phase II sampling is required, then three additional samples from the talus slope just north of the drainage channel will also be collected. In addition, soil samples will be collected at the passive air sampling locations inside the MDA (11 locations) and analyzed for the COCs that exceeded the health risk-based criteria in the sediment sample (see Section 5.1.4.4 for the passive air sample locations). Table 5.1-11 summarizes the Phase II surface sediment sampling program for MDA J.

5.1.4.2.8 Health and Safety

This SAP will follow the procedures outlined in the Laboratorys Environment, Safety and Health Manual (LANL 1990, 0335) and Annex III of this RFI work plan.

5.1.4.2.9 Schedule

See Annex I.

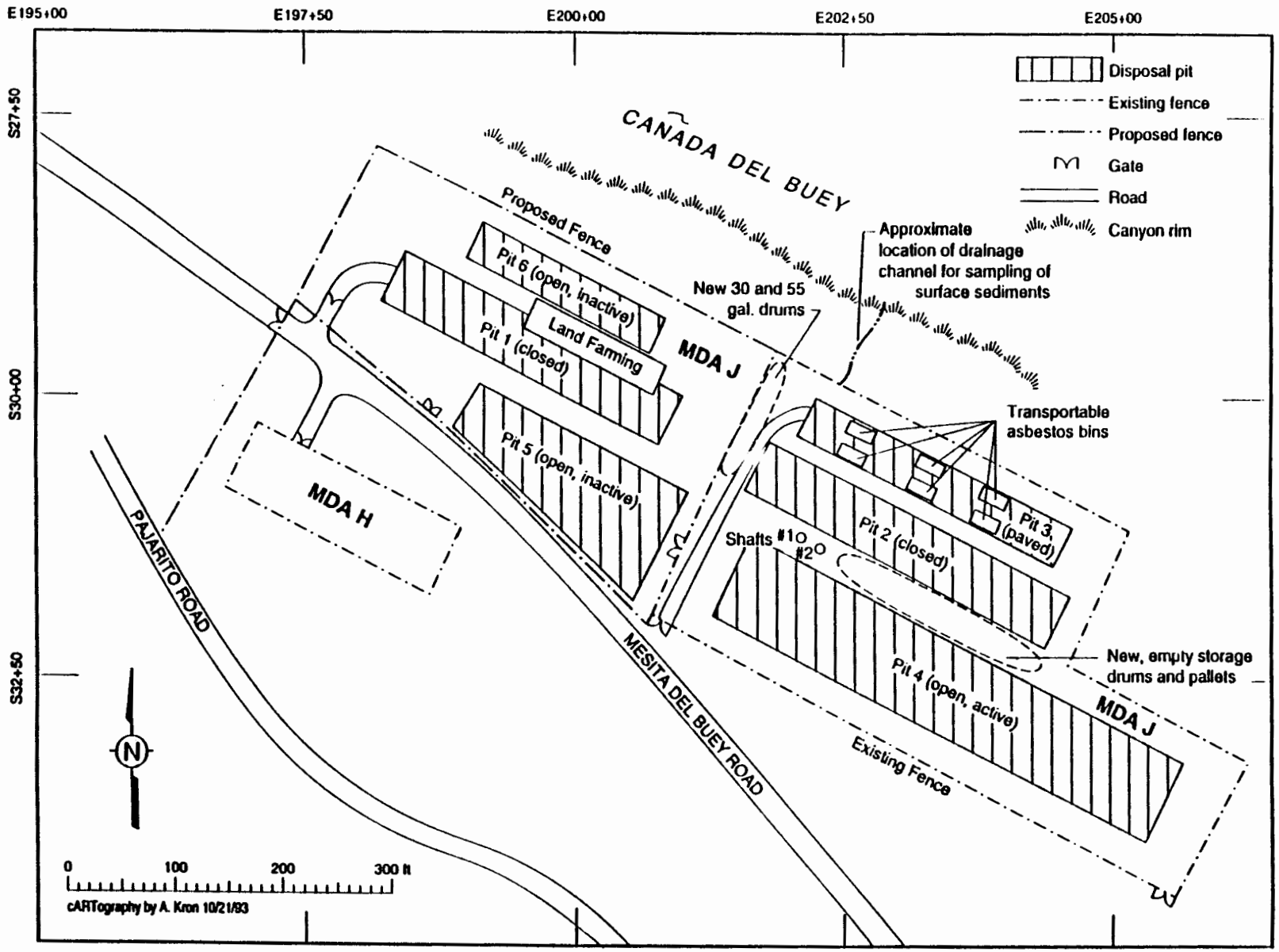

Figure 5.1-5 Surface sediment sampling location at MDA J.

5.2.4.2.3.6 Critical Samples

Samples collected in the drainage channel at MDA H are critical samples because they represent potential transport beyond institutional control.

5.2.4.2.4 Rationale for Sampling Activity

The rationale for surface sediment sampling from the drainage area is to:

- determine if VOCs, SVOCs, metals, pesticides, PCBs, cyanide, tritium, and gross alpha, gross beta, and gamma emitters are being discharged from MDA H;
- further define source terms;
- collect data that can be used to support and supplement existing data for the DQO process; and
- collect data that can be used in a risk assessment.

5.2.4.2.5 Sampling Activity

Figure 5.2-5 shows the location of the primary drainage channel to be sampled. Nine sediment samples will be collected at locations along the drainage pathway using geomorphic analysis of the drainage to collect samples from catchment areas and sediment collection points in the streambed. Samples will be collected from a depth of 0 to 6 inches at the center of each of the nine sample locations.

Table 5.2-12 summarizes the number of grab samples, the number of QC samples, and the analytical requirements for Phase I sampling. Surface sediment sampling procedures are presented in Section 2.0 of Appendix B.

5.2.4.2.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.2-10 and are located in Appendix B of this RFI Work Plan.

5.2.4.2.7 Phase II SAP

Phase II sampling of surface sediment will be conducted at MDA H if Phase I sampling results indicate that COCs exceed health risk-based concentrations. The Phase II sampling will determine the extent of contamination in the drainageway. If Phase II sampling is required, then up to nine composite samples will be collected at the sample nodes where COCs exceeded the health risk-based criteria in Phase I. These samples will be collected from a depth of 6-12 in and analyzed for the COCs present in the corresponding Phase I sediment sample. Table 5.2-13 summarizes the Phase II samples and analytical requirements.

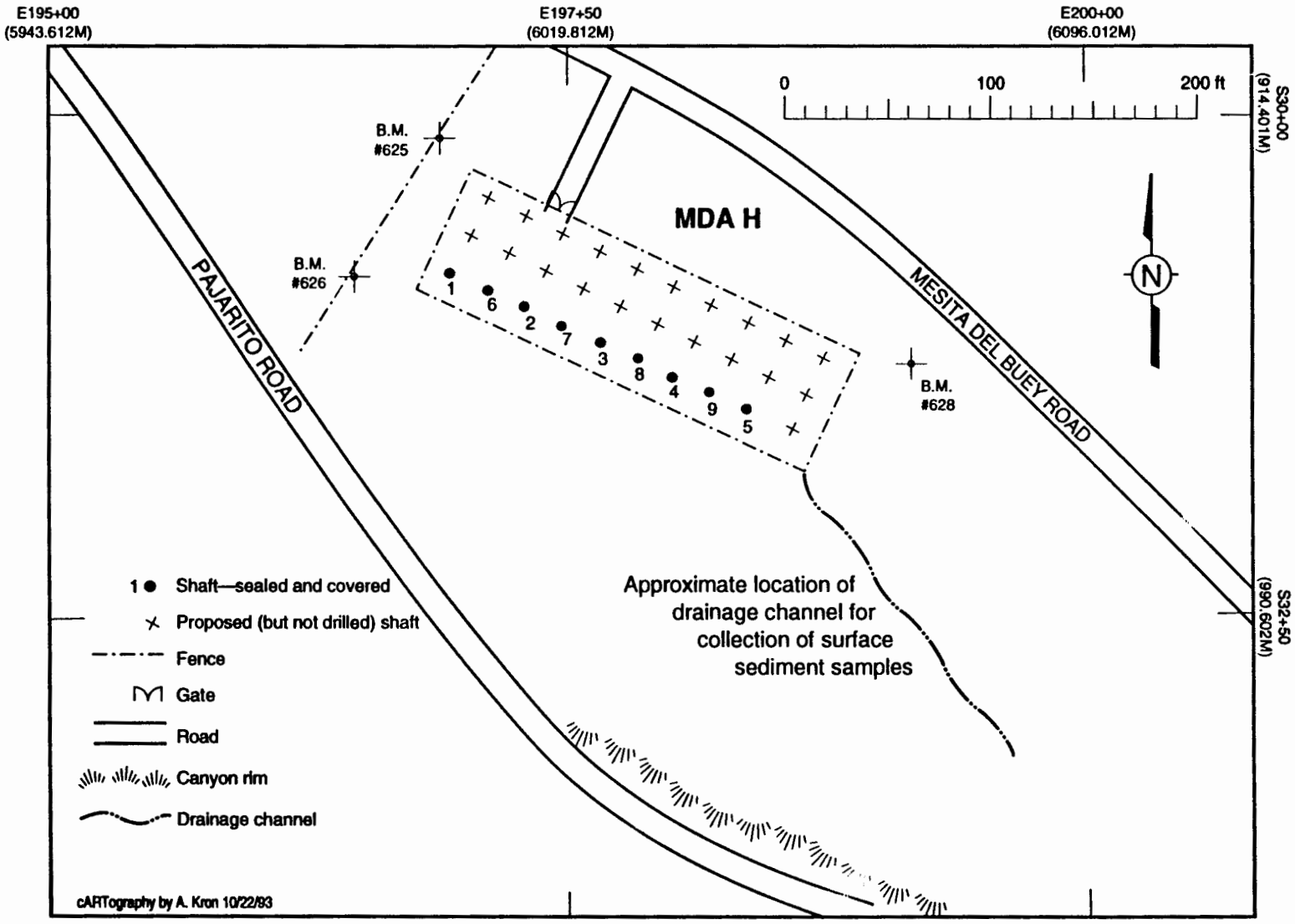

Figure 5.2-5 Surface sediment sampling locations at MDA H.

5.3.4.2.4 Rationale for Sampling Activity

The rationale for surface sediment sampling from the drainage area is to:

- determine if VOCs, SVOCs, metals, pesticides, PCBs, cyanide, tritium, gross alpha, gross beta, and gamma emitters are being discharged from MDA L;
- further define source terms;
- collect data that can be used to support and supplement existing data for the DQO process; and
- collect data that can be used in a risk assessment.

5.3.4.2.5 Sampling Activity

One set of nine surface sediment samples will be collected from the primary drainage channel during Phase I sampling. The results will be compared to the Laboratorys Environmental Surveillance Program results from surface sediment sampling in the adjacent canyons (Environmental Protection Group 1990, 0497). Table 5.3-14 summarizes the number of surface sediment samples, the number of QC samples, and the analytical requirements of the Phase I sampling. Surface sediment sampling procedures are presented in Section 2.0 of Appendix B.

Figure 5.3-6 shows the location of the primary drainage channel to be sampled. Nine sediment samples will be collected at locations along the drainage pathway using geomorphic analysis of the drainage to collect samples from catchment areas and sediment collection points in the streambed. Samples will be collected from a depth of 0 to 6 inches at the center of each of the nine sample locations.

5.3.4.2.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.3-12 and are located in Appendix B of this RFI Work Plan.

5.3.4.2.7 Phase II SAP

Phase II surface sediment sampling will be conducted at MDA L to determine the vertical and lateral extent of any COCs detected during Phase I sampling that exceeded health risk-based criteria. Samples will be collected from 6 to 12 in below the three locations that had the highest concentrations of COCs during Phase I sampling. In addition, samples will be collected from three locations within the talus slope just over the edge of the mesa and downslope from the Phase I sampling locations. Table 5.3-15 summarizes the Phase II sampling program.

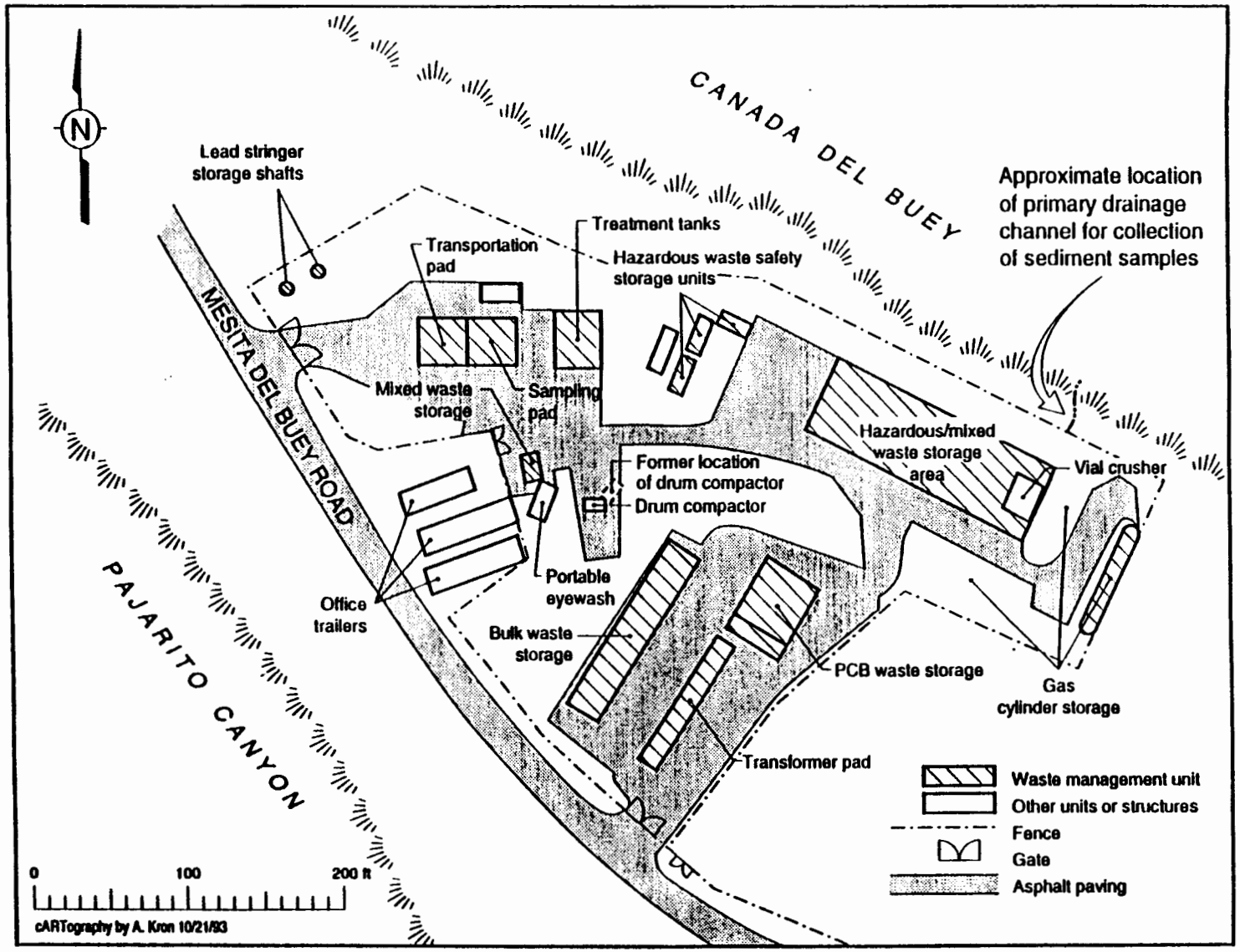

Figure 5.3-6 Surface sediment sampling locations at MDA L (base map modified from Benchmark Environmental Corp. 1990).

5.4.4.2.3.6 Critical Samples

Sediment samples collected in the primary drainage channels leading from MDA G are critical because they represent potential transport beyond institutional control.

5.4.4.2.4 Rationale for Sampling Activity

A total of fourteen surface water runoff channels have been identified at MDA G. Nine of the channels drain into Pajarito Canyon and five of the channels drain into Cañada del Buey.

The rationale for surface sediment sampling from the fourteen drainage areas is to:

- determine if VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and ROCs are being discharged from MDA G;
- further define source terms;
- collect data that can be used to support and supplement existing data for the DQO process; and
- collect data that can be used in a risk assessment.

5.4.4.2.5 Sampling Activity

One set of nine surface sediment samples will be collected from each of the fourteen drainage pathways during Phase I sampling. The results will be compared to the Laboratory's Environmental Surveillance Program results from surface sediment sampling in the adjacent canyons (Environmental Protection Group 1990, 0497). Table 5.4-22 summarizes the number of grab samples, the number of QC samples, and the analytical requirements for the Phase I sampling. Surface sediment sampling procedures are presented in Section 2.0 of Appendix B.

Figure 5.4-7 shows the locations of the fourteen drainage channels for surface sediment sampling. Nine sediment samples will be collected at locations along each channel using geomorphic analysis of the drainage to collect samples from catchment areas and sediment collection points in the streambed. Samples will be collected from a depth of 0-6 inches at the center of each of the nine sample locations.

5.4.4.2.6 Remaining SAP elements

The remaining required elements of the SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.4-20 and are located in Appendix B of this RFI Work Plan.

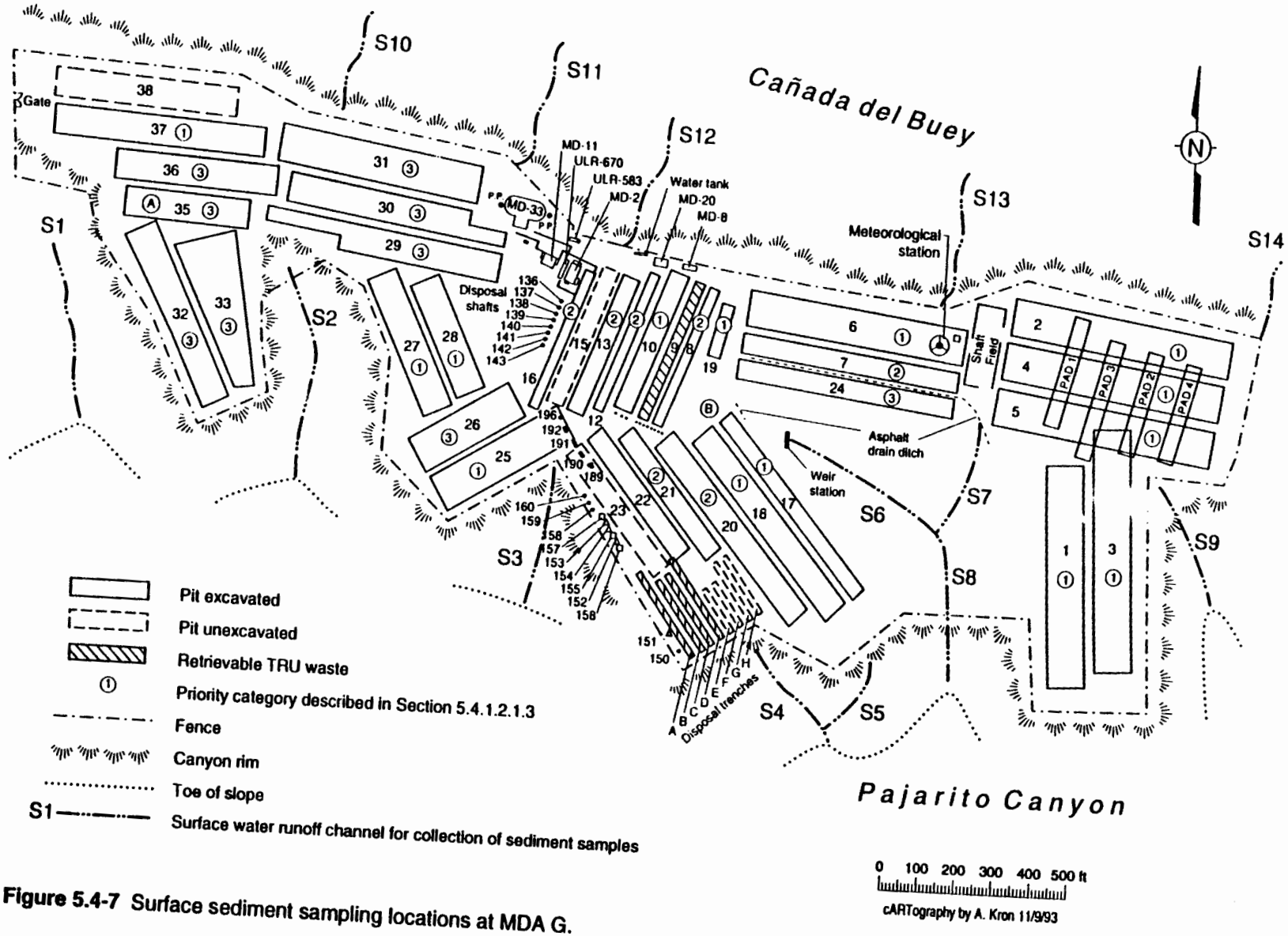

Figure 5.4-7 Surface sediment sampling locations at MDA G.

5.1.4.3.3.5 Required Quantitation Limits

Quantitation limits for laboratory analysis of hazardous substances and radionuclides are presented in Tables V.3 through V.9 of the Laboratorys Generic QAPjP (LANL 1991, 0412).

5.1.4.3.3.6 Critical Samples

Samples collected from the angled borehole east of Pit 1 are critical in determining whether migration has occurred from Pit 1. Samples collected from the vertical boreholes associated with Pit 2, Pit 3, and shafts 1 and 2 are important in determining migration from these subsurface disposal units. Pit 1 and Pit 2 are the oldest pits at MDA J, and the least is known about constituents and constituent volumes which may have been disposed in them. The proposed borehole and soil gas sampling will provide information on surface and subsurface migration from MDA J.

5.1.4.3.4. Rationale for Sampling Activity

The rationale for installing the four boreholes at MDA J is:

- to determine whether there are subsurface contaminant plumes originating from Area J; and

- to provide a preliminary assessment of the nature and extent of contaminant plumes a Area J, if they exist.

This information will be obtained through the following sampling tasks:

Task 1. Borehole Installation

- An angled borehole (B1) will be drilled east of Pit 1 to confirm absence or presence of the migration of target contaminants from this pit area (see Figure 5.1-6 for proposed borehole location).

- Three vertical boreholes will be drilled at the following locations; Borehole B2 immediately east of Pit 2, Borehole B3 between Pits 2 and 3, and Borehole B4 south of Pit 2 between shafts 1 and 2. (See Figure 5.1-6 for proposed borehole locations).

- Core samples will be collected and analyzed for VOCs, SVOCs, metals, pesticides, PCBs, cyanide, tritium, gross alpha, gross beta, and gamma emitters.

- Soil vapors will by screened in the field through the use of a PID and FID.

Task 2. Vapor Sampling

- Vapor sampling to collect soil gas will be conducted within the boreholes as they are advanced. Following collection of the samples, boreholes will be grouted and abandoned.

- Soil gas samples will be collected using resin tubes or SUMMA canisters and analyzed for VOCs using SW-846 protocc 'third edition).

5.1.4.3.5 Sampling Activity

5.1.4.3.5.1 Boreholes at MDA J

Three vertical and one angled borehole will be drilled during the Phase I sampling program. Continuous samples will be collected during drilling. Information obtained from the boreholes will be used to determine if contaminant migration has occurred from MDA J. The vertical boreholes will be drilled to a minimum depth of 20 ft below the adjacent disposal units. Soil gas samples will be collected every 20 ft using down-hole packers within the augers to isolate the sample interval. The angled borehole will be drilled at an incline of 30 degrees from vertical to a borehole length of 80 ft. The advancement of the auger will begin approximately 15 ft from the east side of Pit 1. If the pit is encountered, the boring will be grouted and a new borehole will be advanced at a distance further away from the pit boundary. The actual depth of the boreholes may vary depending on the results of field analysis on cores and soil vapors. The maximum depth for the boreholes shall not be greater than 200 ft in the Phase I investigation unless results from field screening indicate that a borehole should be drilled deeper.

Proposed borehole locations are shown on Figure 5.1-6. Both the vertical and angled boreholes will be advanced by hollow stem auger (HSA) techniques using a Failing Model F-10, or equivalent drill rig. Boreholes will be advanced with 7.625-in outside diameter by 4.25-in inside diameter augers. Soil samples will be collected with a 3.25-in inside diameter, 5-ft-long split barrel continuous sampling tube. A wireline retrieval system will be used to return the sampling tube to the surface. Samples will be submitted from each 20 ft interval for the vertical boreholes, and from each 10 ft interval for the angled borehole. Within a specified depth interval, samples will be collected using re ts from field screening.

Table 5.1-12 is a sampling summary of the vertical and angled boreholes at MDA J. It lists the sampling interval for each media along with the analyses to be performed and the corresponding analytical level. A detailed tabulation of sample intervals and corresponding analyses for each borehole is presented in Table B.3-1 of Appendix B. The ratio for quality control (QC) samples for sample collection activities is presented in Table B.10-1 of Appendix B. Table 5.1-13 summarizes the number of samples, the number of QC samples, and the analytical requirements for Phase I borehole sampling at MDA J, and explains the types of QC samples required.

The procedures for borehole drilling and logging, sample (rock core) collectior from the boreholes, field screening analyses, hydrogeologic measurements, downhole geophysical sur ays, waste disposal, and borehole abandonment are described in Section 3.0 of Appendix B. Soil g s sampling procedures, surveying, and field screening procedures are presented in Appendix B, Section 6.0.

5.1.4.3.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.1-8 and are located in Appendix B of this RFI work plan.

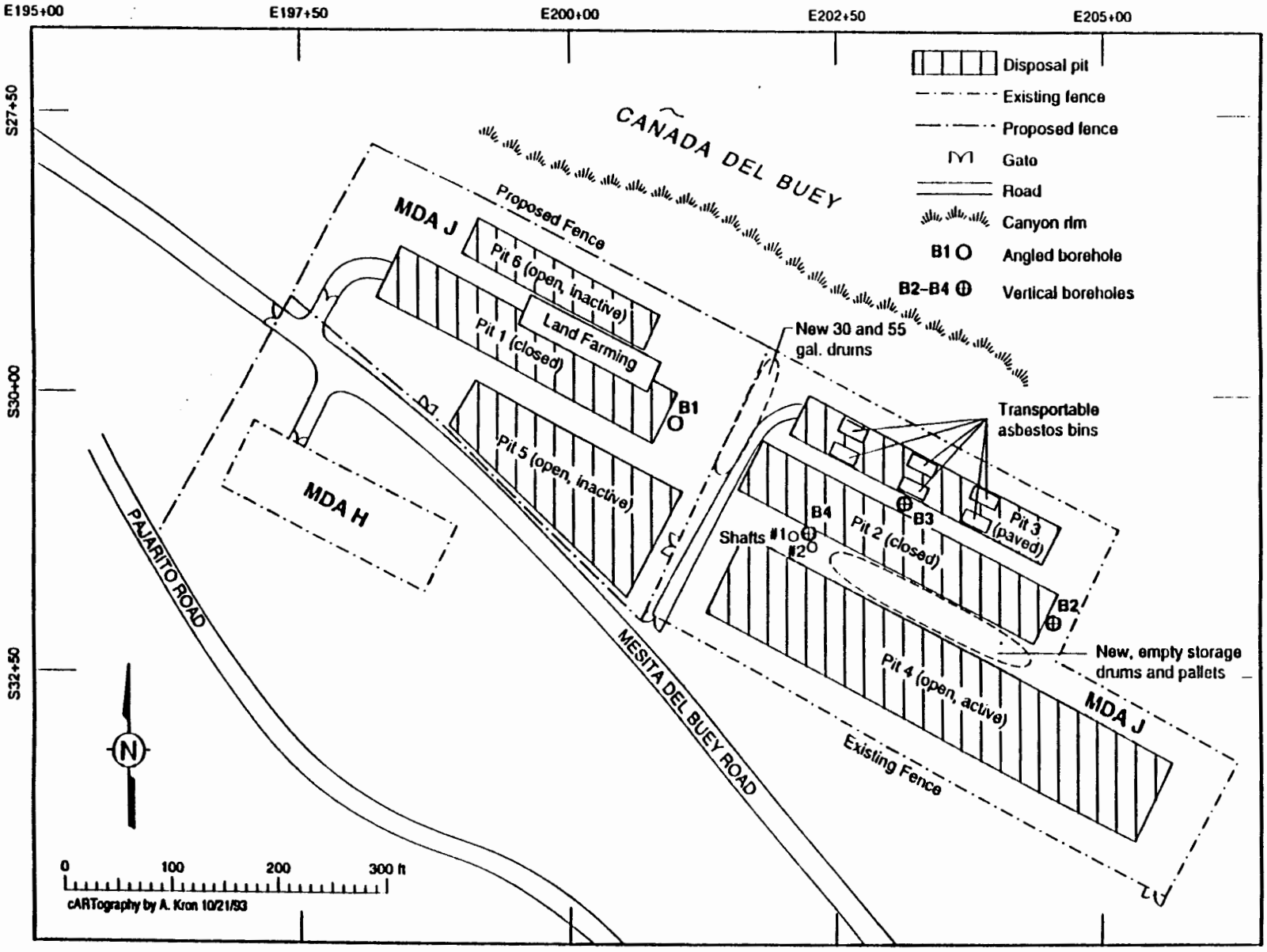

Figure 5.1-6 Angled and vertical borehole locations at MDA J.

5.1.4.3.7 Phase II SAP

No additional angled boreholes will be drilled beneath Pit 1. Two additional vertical borings may be needed to further characterize migration of contaminants away from the MDA if COCs are detected in the subsurface during Phase I sampling. Table 5.1-14 summarizes the Phase II sampling and analytical requirements.

5.1.4.3.8 Health and Safety

This SAP will follow the procedures outlined in the Laboratorys Environment, Safety and Health Manual (LANL 1990, 0335) and Annex III of this RFI work plan.

5.1.4.3.9 Schedule

See Annex I.

5.1.4.4 Passive Air Sampling at MDA J

5.1.4.4.1 Sampling and Analysis Components

The purpose of collecting and analyzing passive air samples at MDA J is to accumulate technically accurate and legally defensible data. The data will be used to characterize the nature, type, and extent of contamination by VOCs at MDA J, if any.

The sampling components will consist of collection of passive air samples at the ground surface using EMFLUX sample cartridges. The analysis component will consist of VOC analysis by Quadrel Services Inc. The data will be validated according to the EPA functional guidelines for organic analysis (EPA 1988, 0293).

5.1.4.4.2 Sampling and Analysis Approach

Soil gas will be sampled using EMFLUX sample cartridges, which are stainless steel mesh and wire cartridges containing approximately 100 mg of selected adsorbent material. The sample cartridges will be placed at surveyed sampling points at predetermined locations. To increase survey sensitivity and accuracy, the EMFLUX system is designed to take maximum advantage of the phenomenon known as earth tides, a geophysical force governing vertical movement of trace gases through the earths crust. Cartridges will be exposed to the soil for a period of 72 hours (the duration of preferred flow due to earth-tides) in order to capture soil gas by passive adsorption.

The EMFLUX technology does not rely, as dosimeters do, on ambient airflow rates; the EMFLUX system in effect creates a preferential sink, closed to ambient air, for gas-phase compounds emanating from the ground surface. The timing and duration of collection (calculated from Quadrel's proprietary earth-tidal-force computer model), as well as subsequent use of related algorithms to eliminate distortions introduced by gravitational effects, are critical to system sensitivity.

Generally speaking, dosimeters are sensitive in the part-per-million range and are not expected to provide what is normally termed high-quality data. EMFLUX, by contrast, is effective in the low parts-per-billion range, and has been evaluated at EPA's test bed near Las Vegas, NV, where the system's performance relative to ground water contamination earned a correlation coefficient (r) of 0.91 (National Environmental Technology Applications Corporation [NETAC] Report C9-003, "Field Evaluation of the EMFLUX Soil Gas Emanation Flux Survey Technique," June 20, 1989.)

The purpose of the passive air sampling investigation at MDA J is to screen the MDA for the presence of buried wastes that contain VOCs. The measurements at the MDA will be calibrated through comparison with passive sampling simultaneously taken at MDA L above a known VOC plume. The measurements are for screening to define subsurface plumes of VOCs.

Variation in barometric pressure is also important to outgassing of soil gas to the atmosphere. Therefore, during the sampling period, a recording barometer will be used to record the barometric pressure on site. Wind speed data will also be collected from the MDA G weather tower.

5.3.4.5 Passive Air Sampling at MDA L

5.3.4.5.1 Sampling and Analysis Components

The purpose of collecting and analyzing passive air samples at MDA L is to accumulate technically accurate and legally defensible data. The data will be used to characterize the nature, type, and extent of contamination by VOCs at MDA L.

The sampling component will consist of collection of passive air samples at the ground surface using EMFLUX sample cartridges. The analysis component will consist of VOC analysis by Quadrel Services Inc. The data will be validated according to EPA functional guidelines for organic analysis (EPA 1988, 0293).

5.3.4.5.2 Sampling and Analysis Approach

Soil gas emanating from the ground will be sampled using EMFLUX sample cartridges, which are stainless steel mesh and wire cartridges containing approximately 100 mg of selected adsorbent material. The sample cartridges will be placed at surveyed sampling points at predetermined locations. To increase survey sensitivity and accuracy, the EMFLUX system is designed to take maximum advantage of the phenomenon known as earth tides, a geophysical force governing vertical movement of trace gases through the earth's crust. Cartridges will be exposed to the soil surface for a period of 72 hours in order to capture soil gas by passive adsorption. See the discussion in section 5.1.4.4.2 for additional information on the EMFLUX technology. In addition, the barometric pressure will be monitored before, during, and after the sampling period. The sampling window will be synchronized with a period of low atmospheric pressure, if possible.

The samples will be sent to the Sample Coordination Facility (SCF), where they will be shipped to Quadrel Services Inc. environmental laboratories for analysis. The analyses to be performed include VOCs, following EPA SW-846 (third edition) protocol, with a ten compound library search and tentatively identified compounds (TICs). Results will be reported in Level III SW-846 packages for subsequent data validation.

5.3.4.5.3 Primary Data Quality Factors

5.3.4.5.3.1 Prioritized Data Uses

The data to be collected are needed for site characterization and as information that will be used to develop a VCAP. Each stage of data collection and use is outlined below.

- Site Characterization - A large data base already exists for MDA L; however, the data do not include all of the regulated VOC compounds.

consist of VOC analysis by Quadrel Services Inc. The data will be validated according to EPA functional guidelines for organic analysis (EPA 1988, 0293).

5.4.4.5.2 Sampling and Analysis Approach

Soil gas will be sampled using EMFLUX sample cartridges, which are stainless steel mesh and wire cartridges containing approximately 100 mg of selected adsorbent material. The sample cartridges will be placed at surveyed predetermined locations. To increase survey sensitivity and accuracy, the EMFLUX system is designed to take maximum advantage of the phenomenon known as earth tides, a geophysical force governing vertical movement of trace gases through the earth's crust. Cartridges will be exposed to the soil for a period of 72 hours (the duration of enhanced air flow). See the discussion in section 5.1.4.4.2 for additional information on the EMFLUX technology. Variation in barometric pressure is also important to outgassing of soil gas to the atmosphere. Therefore, barometric pressure will be monitored before, during, and after the sampling period. The sampling window will be synchronized with a period of low atmospheric pressure, if possible. Wind speed will also be collected from MDA G weather tower.

The samples will be shipped to Quadrel Services Inc. environmental laboratories for analysis. The analysis to be performed include VOCs, following EPA SW-846 (third edition) protocol with ten compound library search and TICs. Results will be reported in Level II SW-846 packages for subsequent data validation.

5.4.4.5.3 Primary Data Quality Factors

5.4.4.5.3.1 Prioritized Data Uses

The data to be collected are needed for site characterization. A data base from four vapor monitoring wells already exists for MDA G; however, the data do not include all of the regulated VOC compounds. Passive air sampling is an inexpensive, nonintrusive means of collecting data in and surrounding MDA G. Passive air sampling will be used to determine the nature and extent of VOCs emanating from the ground to the atmosphere.

The passive air sampling investigation at MDA G will screen the MDA for the presence of buried wastes that contain VOCs. The measurements at the MDA will be calibrated through comparison with passive sampling simultaneously taken at MDA L above a known VOC plume.

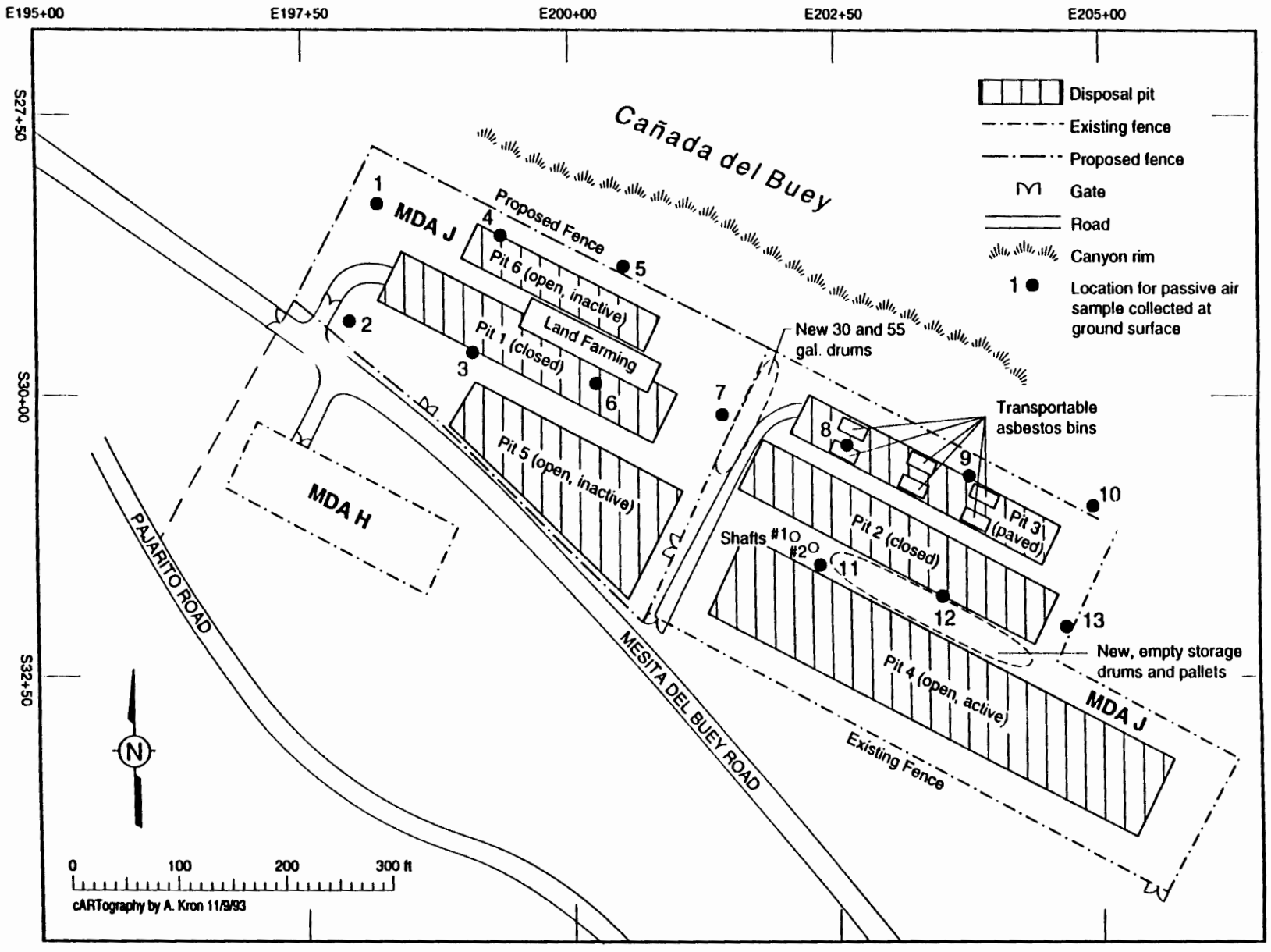

Figure 5.1-7 Passive air sampling locations at MDA J.

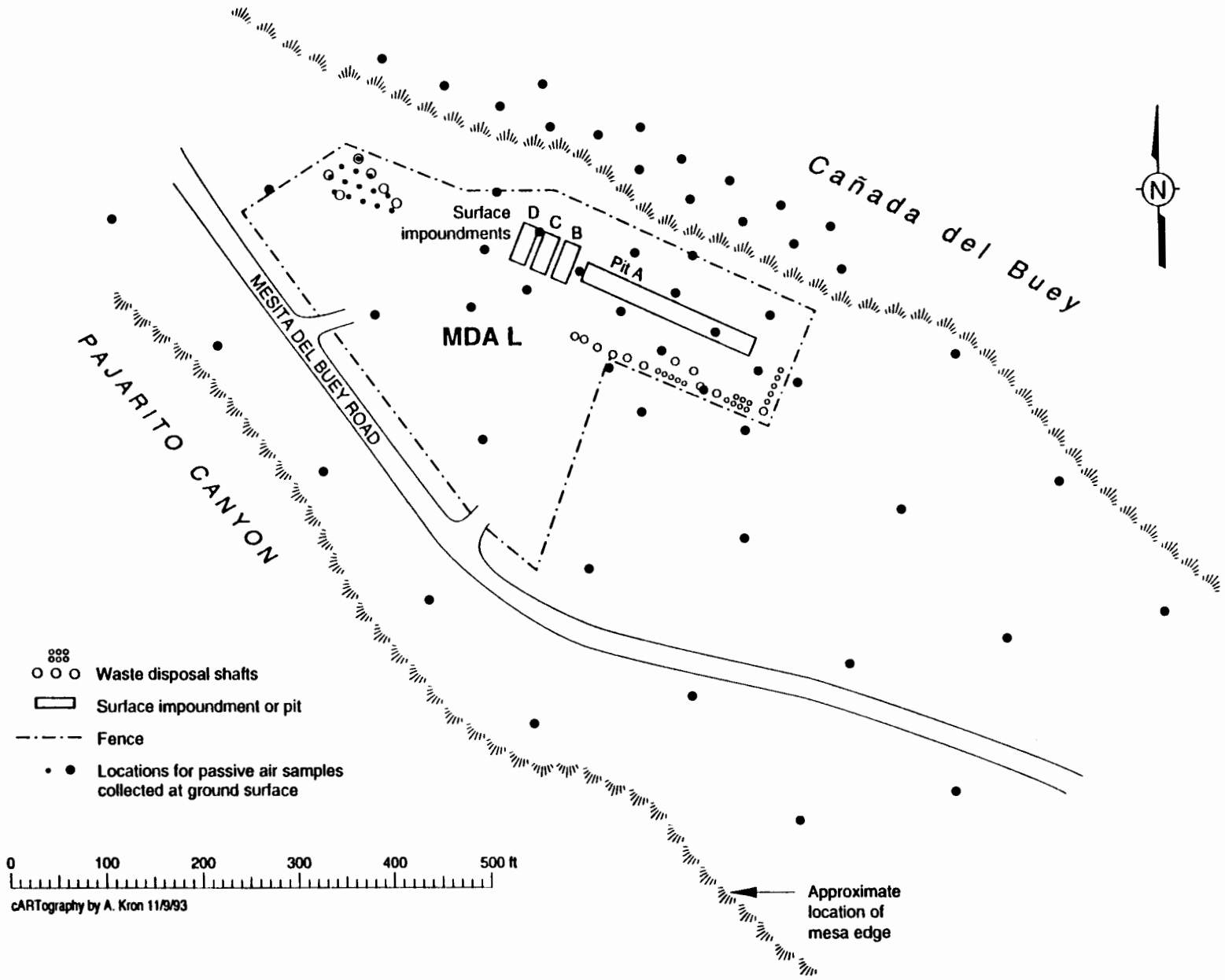

Figure 5.3-9 Passive air sampling locations at MDA L. (Base map modified from IT Corp. 1987 and 1991.)

Specific Response #11

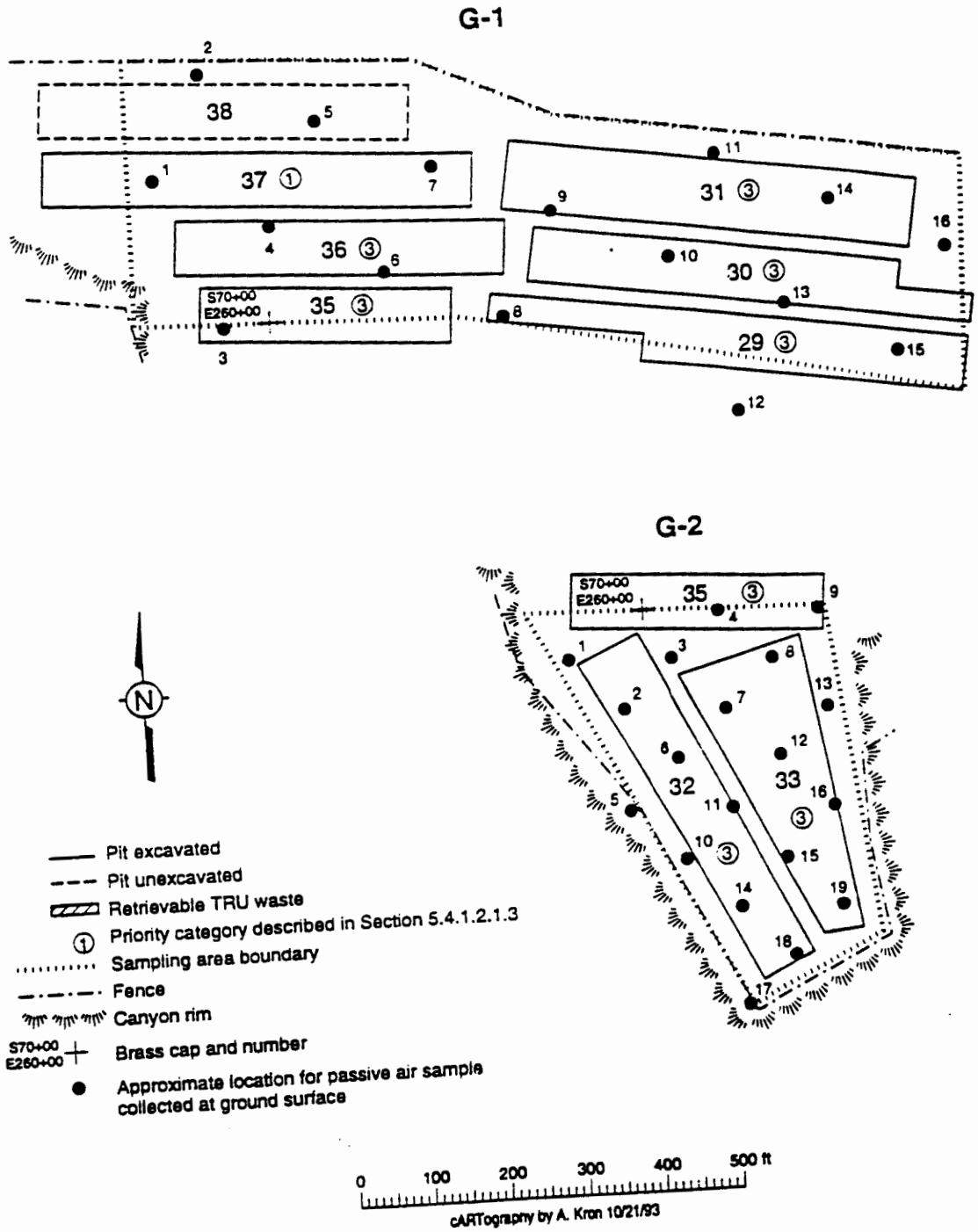

Figure 5.4-12 Location map of passive air samples in grids G-1 and G-2 at MDA G.

Specific Response #11

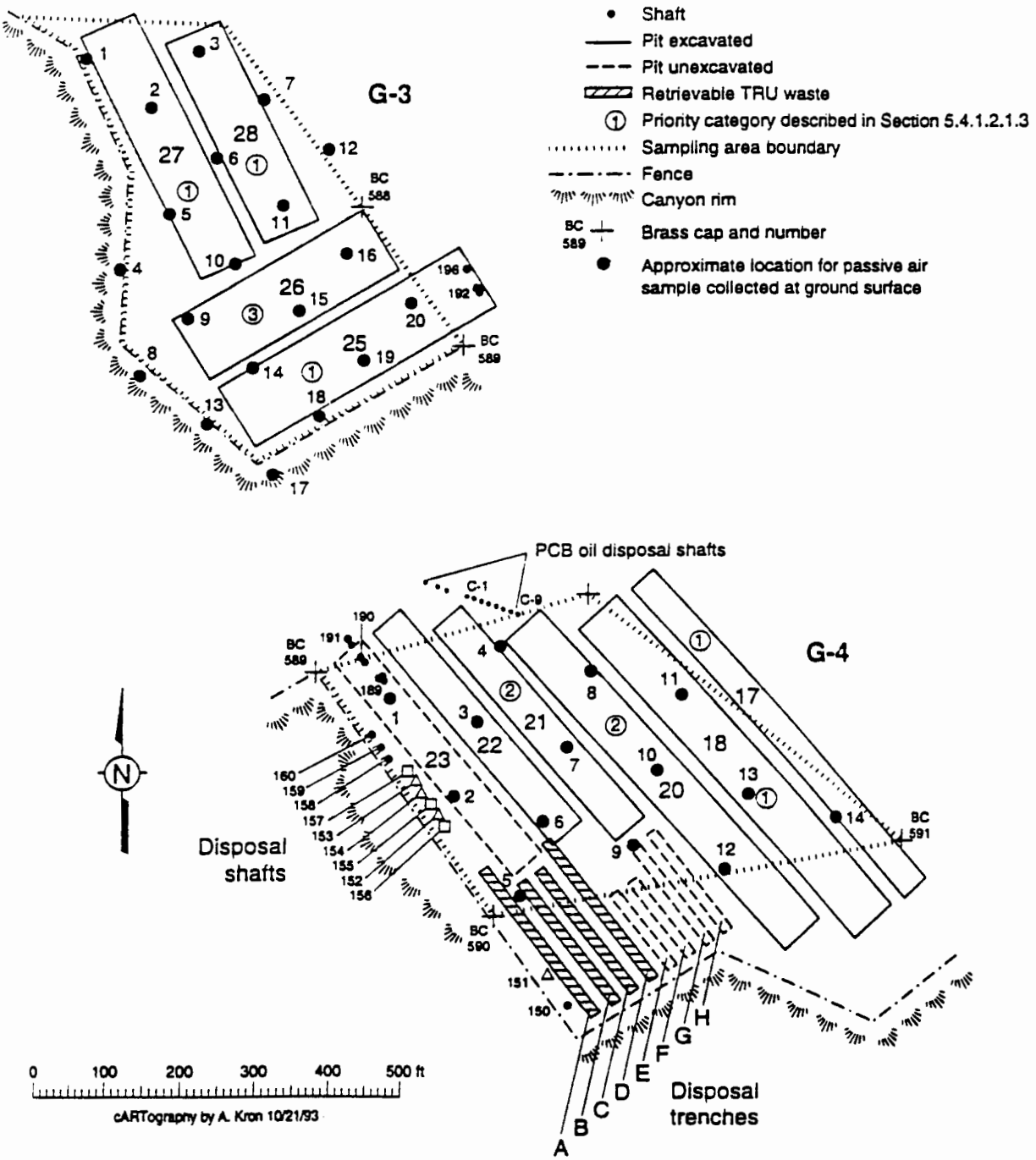

Figure 5.4-13 Location map of passive air samples in grids G-3 and G-4 at MDA G.

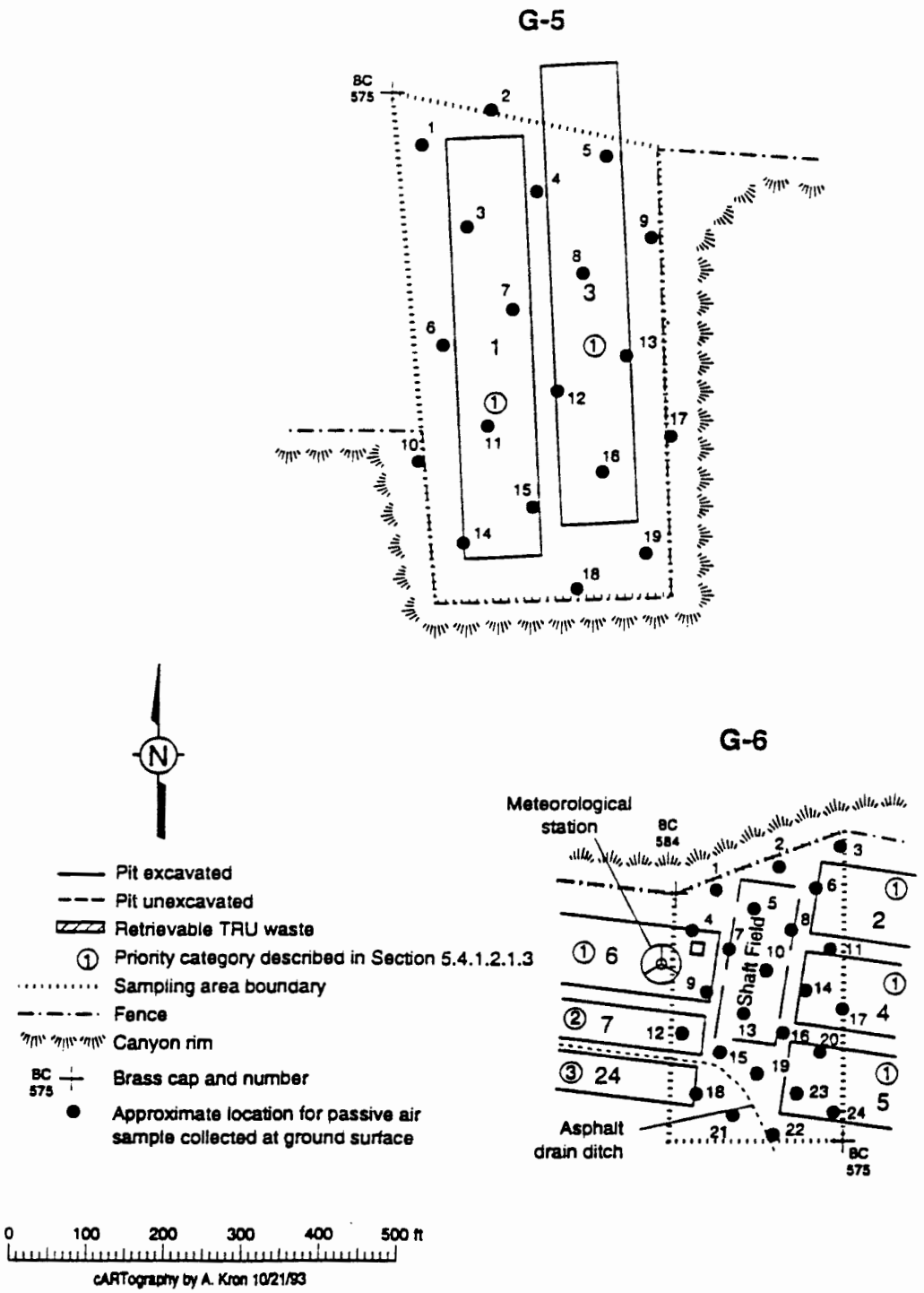

Figure 5.4-14 Location map of passive air samples in grids G-5 and G-6 at MDA G.

Specific Response #11

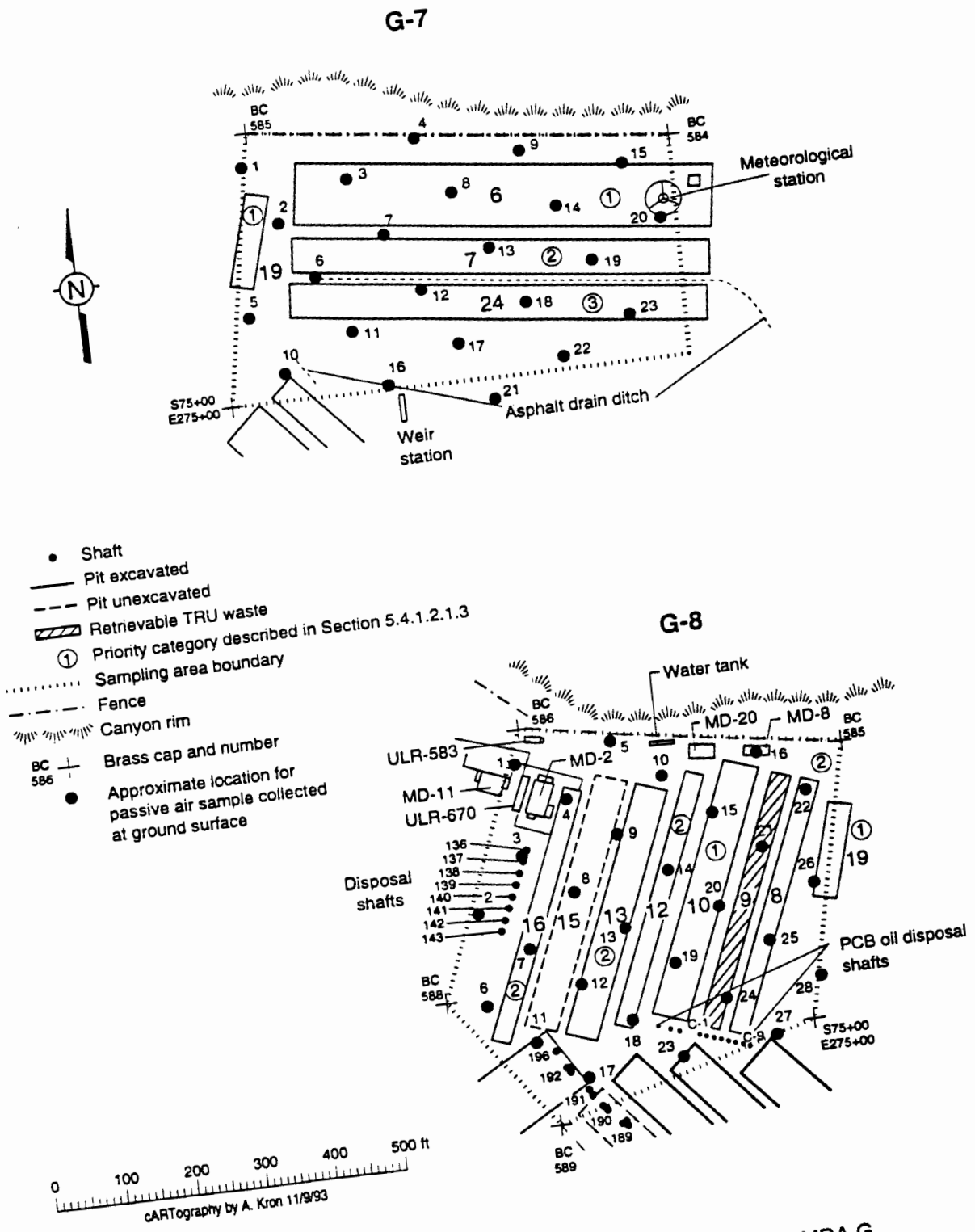

Figure 5.4-15 Location map of passive air samples in grids G-7 and G-8 at MDA G.

Task 3. Data Reduction

All data will be validated according to the EPA functional guidelines for organic analysis (EPA 1988, 0293). This will provide the highest quality data for site characterization.

5.1.4.4.5 Sampling Activity

A total of 26 passive air samples will be collected at MDA J (13 samples x 2 sampling events = 26). The locations of each sampling point are shown on Figure 5.1-7. Table 5.1-15 lists the number of samples, the number of QC samples, and the analytical requirements for the Phase I investigation. It also describes the types of QC samples required.

EMFLUX cartridges will be used to collect passive air samples in MDA J. The Quadrel Services Inc. laboratory, providing the precleaned cartridges, will supply certificates of cleanliness for the cartridges. All sample EMFLUX cartridges will be left on site for a 72 hr period. If adsorption is allowed to continue for longer than 72 hrs, breakthrough may occur.

Sampling events will be based on the time of maximum vertical gas movement and will occur once during a cool season (March, April, or May), and once during the following warm months (June, July, or August). Periods of maximum vertical gas movement are calculated from a computer model that is based on the periodic change in tidal dilatation of the earth's crust on the vertical migration of soil gas (see discussion in Section 5.1.4.4.2 for further information).

The timing of collector deployment and the length of the survey sampling period are critical elements of the EMFLUX system. For each project, and well in advance of anticipated field work, Quadrel will furnish the date and hour by which all collection devices must be in place, using for this determination the companys computerized earth-tide/gas-migration model.

5.1.4.4.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.1-8 and are located in Appendix B of this RFI work plan.

5.1.4.4.7 Phase II SAP

Data collected during the Phase I sampling effort will produce a snapshot in time to provide characterization of the potential VOC flux in MDA J. No Phase II SAP is proposed for passive air sampling at MDA J.

area surrounding Pit A will contain 17 surface sampling locations within a radius of 207 ft. These samples will be collected using the EMFLUX sample cartridges and will be analyzed for EPA SW-846 VOCs (51 compounds) with a ten compound library search.

Task 4. Data Reduction

All data will be validated according to EPA functional guidelines for organic analysis (EPA 1988,0293). This will provide the highest quality data for site characterization.

5.3.4.5.5 Sampling Activity

A total of 136 passive air samples will be collected at MDA L (68 samples x 2 sampling events = 136). The approximate location of each sampling point is shown on Figure 5.3-9. Table 5.3-22 lists the number of samples, the number of QC samples, and the analytical requirements for the Phase I investigation. It also describes the types of QC samples required. Soil gas sampling procedures are presented in Section 6.0 of Appendix B.

EMFLUX cartridges will be used to collect passive air samples in MDA L. The Quadrel Services Inc. laboratory, providing the precleaned cartridges, will supply certificates of cleanliness for the cartridges. All sample EMFLUX cartridges will be left on site for a 72-hr period. If adsorption is allowed to continue for longer than 72 hours, breakthrough may occur.

Sampling events will be based on time of maximum vertical gas movement and will occur once during a cool period (March, April, or May,) and once during the following warm months (June, July, or August). Periods of maximum vertical gas movement are calculated from a computer model that is based on the periodic change in tidal dilatation of the earth's crust on the vertical migration of soil gas (see discussion in Section 5.1.4.4.2 for further information.

The timing of collector deployment and the length of the survey sampling period are critical elements of the EMFLUX system. For each project, and well in advance of anticipated field work, Quadrel will furnish the date and hour by which all collection devices must be in place, using for this determination the company's computerized earth-tide/gas-migration model.

5.3.4.5.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.3-12 and are located in Appendix B of this RFI Work Plan.

5.3.4.5.7 Phase II SAP

Data collected during the proposed Phase I sampling effort will produce a "snapshot in time" to provide characterization of the VOC flux emanating from MDA L. No Phase II sampling using this technique is proposed for the mesa top. However,

5.4.4.5.5 Sampling Activity

The locations of the 162 samples to be collected at MDA G are shown on Figures 5.4-12 through 5.4-15. A total of 324 samples will be collected (162 samples x 2 sampling events=324). Table 5.4-29 lists the number of samples, the number of QC samples, and the analytical requirements for the Phase I investigation. It also describes the types of QC samples required.

EMFLUX cartridges will be used to collect passive air samples in MDA G. The Quadrel Services Inc. laboratory, providing the precleaned cartridges, will supply certificates of cleanliness for the cartridges. All sample EMFLUX cartridges will be left on site for a 72-hour period. If adsorption is allowed to continue for longer than 72 hours, breakthrough may occur.

Sampling events will be based on time of maximum vertical gas movement and will occur once during a cool season (March, April, or May), and once during the following warm months (June, July, or August). Periods of maximum vertical gas movement are calculated from a computer model that is based on the periodic change in tidal dilatation of the earth's crust on the vertical migration of soil gas (see discussion in Section 5.1.4.4.2 for further information).

The timing of collector deployment and the length of the survey sampling period are critical elements of the EMFLUX system (see discussion in section 5.1.4.4.2). For each project, and well in advance of anticipated field work, Quadrel will furnish the date and hour by which all collection devices must be in place, using for this determination the company's computerized earth-tide/gas-migration model.

5.4.4.5.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are presented in Table 5.4-20 and are located in Appendix B of this RFI Work Plan.

5.4.4.5.7 Phase II SAP

Data collected during the proposed Phase I sampling effort will produce a "snapshot in time" to provide characterization of the VOC flux in MDA G. No Phase II sampling using this technique is proposed for the mesa top. However, based upon the results of the Phase I sampling, Phase II passive air sampling along the mesa walls may be conducted in the vicinity of MDA G. Ten locations on both sides of the mesa (20 total) may be sampled. Table 5.4-30 summarizes the Phase II passive air sampling plan for MDA G.

5.4.4.5.8 Health and Safety

This SAP will follow the procedures outline in the Laboratory's Environment, Safety and Health Manual (LANL 1990,0335) and in Annex III of this RFI Work Plan.

5.2.4.3.3.4 Levels of Concern

Appendix F of the IWP (LANL 1991, 0553) and 40 CFR 264, Proposed Subpart S, contain information on constituent levels of concern. Health risk-based determinations of levels of concern will be developed for constituents not listed in Appendix F. The ER Program is currently developing baseline risk assessment scenarios and criteria that will be presented in the 1992 IWP. This approach will be developed in adequate time for data analysis.

5.2.4.3.3.5 Required Quantitation Limits

Quantitation limits for laboratory analysis of hazardous substances and radionuclides are presented in Tables V.3 through V.9 of the Laboratory's Generic QAPjP (LANL 1991, 0412).

5.2.4.3.3.6 Critical Samples

Samples collected from four vertical boreholes located around the perimeter of disposal shafts at MDA H are important in detecting and characterizing contaminant releases to the subsurface.

MDA H is rectangular in shape and contains nine 6-ft-diameter shafts. The boreholes will determine the absence or presence of contamination and the potential for subsurface migration from the site.

5.2.4.3.4 Rationale for Sampling Activity

The reasons for installing the four vertical boreholes are:

- to determine if COCs are present and migrating beyond the point of institutional controls; and
- to characterize permeable geologic features as preferential lateral migration pathways.

Data obtained through implementation of this Phase I SAP will be used for the initial characterization of the nature, extent, and source of any residual soil or rock contamination in the subsurface at MDA H. This information will be obtained through the following sampling task:

Task 1. Borehole Installation

- Four vertical boreholes will be installed to determine the absence or presence of contaminants in the subsurface at the perimeter of MDA H disposal shafts (see Figure 5.2-6 for the proposed borehole locations).
- Core samples will be collected and analyzed for VOCs, SVOCs, metals, pesticides, PCBs, cyanide, tritium, and gross alpha, gross beta, and gamma emitters by EM-9 or by a contract analytical laboratory that is certified to perform SW-846 analyses.
- Soil gas samples will be collected using resin tubes or SUMMA canisters as the boring is advanced, and analyzed for VOCs by EM-9 or by a contract analytical laboratory that is certified to perform SW-846 analyses.

5.2.4.3.5 Sampling Activity

5.2.4.3.5.1 Boreholes at MDA H

Four vertical boreholes will be installed during the Phase I sampling program at locations shown on Figure 5.2-6.

The laboratory will not use available land within MDA H for future disposal. Therefore, the boundary of future institutional control might conceivably be reduced to a smaller perimeter than the existing security fence around the existing nine disposal shafts. The four boreholes are located to investigate releases beyond this possible boundary of institutional control. All borehole locations are within 30 feet of disposal shafts. To avoid possible damage to shaft caps, drilling equipment shall not be located closer than 25 feet from the center of a shaft.

Continuous core samples shall be collected at the four boreholes. Core samples from the four boreholes at MDA H will be analyzed at ten foot intervals to a depth of seventy feet, which is ten feet below the bottom of the disposal shafts. From a depth of seventy feet to 150 feet, samples will be collected on twenty foot intervals. At depths greater than 150 feet, core samples will be collected on a 50 foot interval. The one exception to this sampling schedule is tritium, which will be analyzed on core samples collected on a 10 foot interval over the entire depth of the borehole. The minimum depth of each borehole will be determined during drilling by immediate analysis of tritium in core samples and VOCs in gas samples. No borehole will be drilled deeper than the top of the basalt, which is approximately 300 feet below ground level. A packer system will be used to periodically collect samples for VOC analysis from the bottom of the borehole during drilling. The gas samples shall be collected on a 20 foot sampling interval.

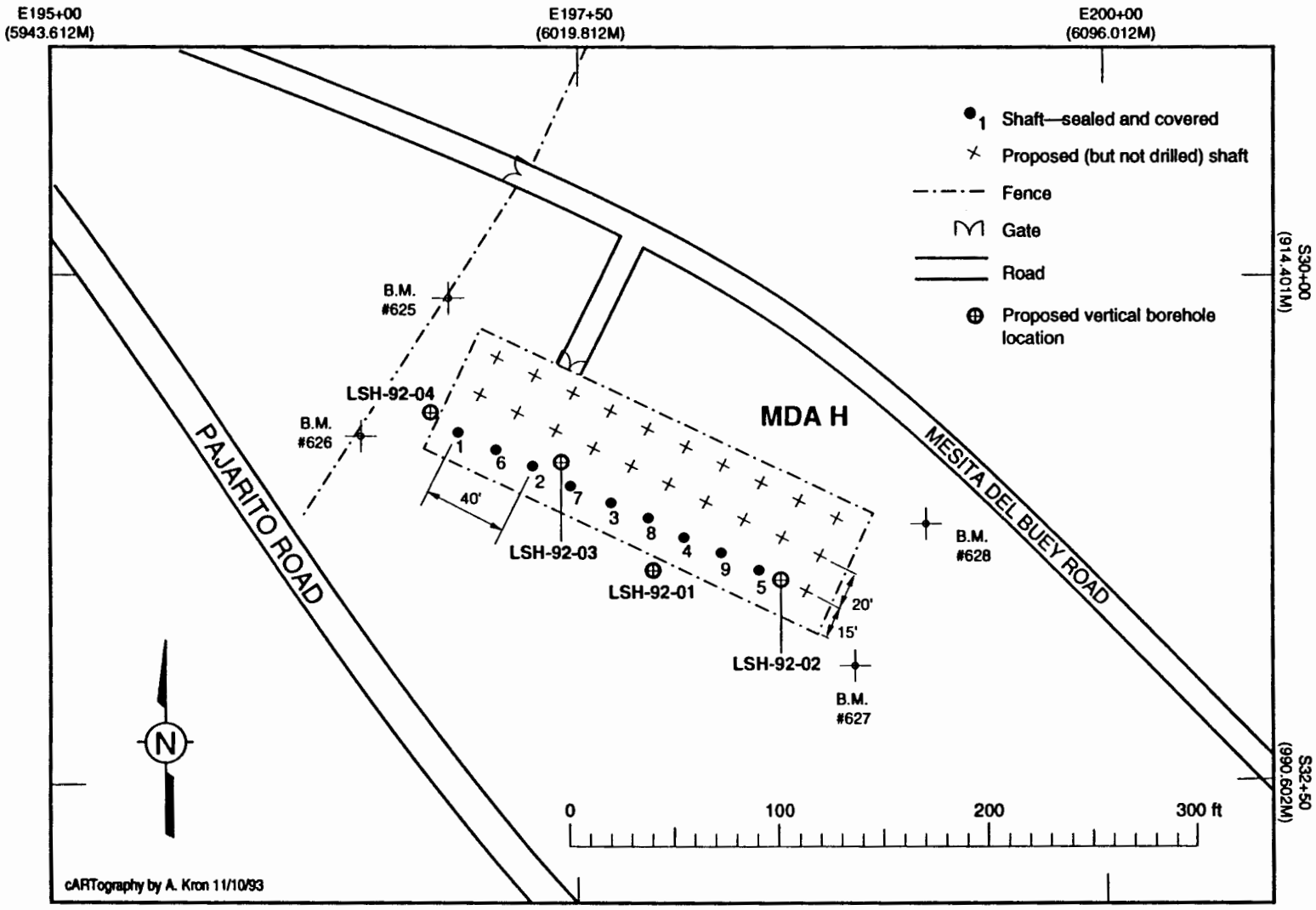

Figure 5.2-6 Location map of proposed vertical boreholes at MDA H.

Table 5.2-14 is a sampling summary of the vertical boreholes at MDA H. It lists the sampling interval for each media along with the analyses to be performed and the corresponding analytical level. A detailed tabulation of environmental and quality control (QC) sample intervals and corresponding analyses for each borehole is presented in Table B.3-2 of Appendix B. The ratio for QC samples for sample collection activities is presented in Table B.10-1 of Appendix B. Table 5.2-15 summarizes the number of environmental and QC samples to be collected at MDA H and explains the types of QC samples.

The procedures for borehole installation and logging, sample collection (rock core) from the vertical boreholes, field screening analysis, hydrogeologic measurements, and waste disposal and borehole abandonment are described in Section 3.0 of Appendix B. Soil gas sample collection procedures, surveying and monitoring, and field screening procedures are presented in Section 6.0 of Appendix B.

5.2.4.3.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.2-10 and are located in Appendix B of this RFI Work Plan.

TABLE 5.2-14
SAMPLING SUMMARY FOR VERTICAL BOREHOLES AT MDA H

Analytical Level	Sampling Interval			Analysis	Medium
Laboratory Analysis[a]	0-70ft	71-150ft	>150 ft		
Level III					
Level III	10ft	20ft	50ft	VOCs	Rock Core
Level III	10ft	20ft	50ft	SVOCs	Rock Core
Level III	10ft	20ft	50ft	Metals	Rock Core
Level III	10ft	20ft	50ft	Pesticides	Rock Core
Level III	10ft	20ft	50ft	PCBs	Rock Core
Level V	10ft	20ft	50ft	Cyanide	Rock Core
	10ft	20ft	50ft	Gross Alpha and Gross Beta, Gamma Spectroscopy	Rock Core
Level III					
Level V	20ft	20ft	20ft	VOCs	Vapor
	10ft	10ft	10ft	Tritium	Rock Core
Field Screening or Analysis					
Level I					
Level I or II	5ft	5ft	5ft	Organic Vapors (PID/FID)	Rock Core
	5ft	5ft	5ft	Alpha, Beta, & Gamma Emissions	Rock core
Level II					
	5ft	5ft	5ft	Gravimetric moisture	Rock Core

[a] A sample will be collected from the designated interval for analyses to confirm the absence or presence of COCs above the health risk-based criteria. The actual depth of the sample will be determined from the field screening and observation.

5.4.4.1.3.3 Primary Contaminants of Concern

The contaminants of concern at MDA G are VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and ROCs. ROCs for OU 1148 are listed in Table 5.4-18.

5.4.4.1.3.4 Levels of Concern

Appendix F of the IWP (LANL 1991, 0553) and 40 CFR 264, Proposed Subpart S, contain information on constituent levels of concern. Health risk-based determinations of levels of concern will be developed for constituents not listed in Appendix F. The ER Program is currently developing baseline risk assessment scenarios and criteria that will be presented in the 1992 IWP. This approach will be developed in adequate time for data analysis.

5.4.4.1.3.5 Required Quantitation Limits

Quantitation limits for laboratory analysis of hazardous and radioactive constituents in water are given in Tables V.3 through V.9 of the Laboratory's Generic Quality Assurance Project Plan (QAPjP) (LANL 1991, 0412). Analytical methods used for surface water runoff samples at MDA G will fall in the range of these quantitation limits. The quantitation limits will follow the current SW-846 protocol for VOCs, SVOCs, pesticides, PCBs, cyanide, and metals. Level V analysis for radionuclides, including tritium, will use the current Laboratory-approved analytical contractor or EM-9.

5.4.4.1.3.6 Critical Samples

The samples collected during a heavy storm are critical samples because they represent potential transport beyond institutional control.

5.4.4.1.4 Rationale for Sampling Activity

Thirteen locations for surface water runoff sampling stations (Figure 5.4-6) have been identified at MDA G. Stations R1-R8 will collect surface water runoff into Pajarito Canyon. Stations R9-R13 will collect surface water runoff into Canada del Buey.

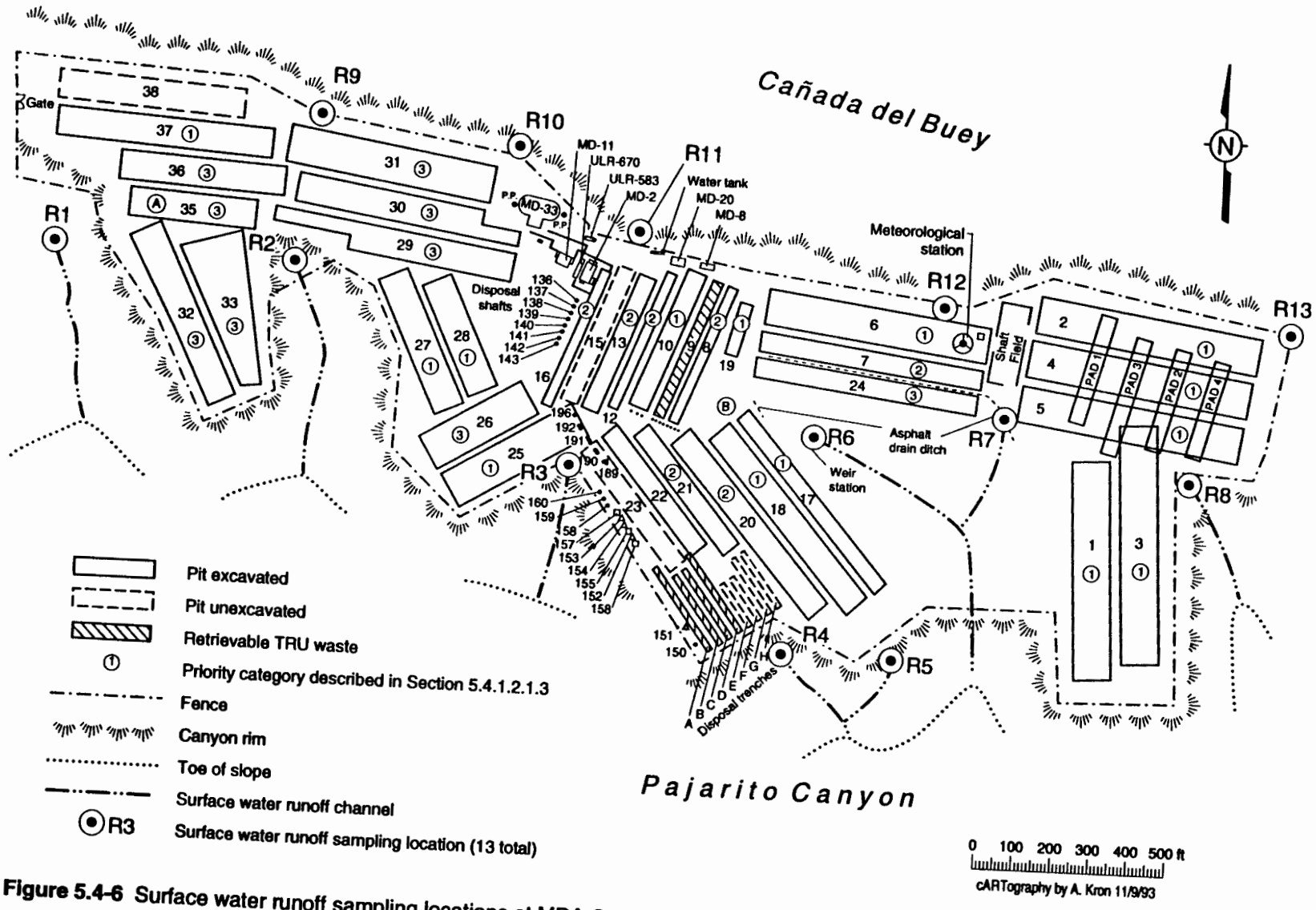

Figure 5.4-6 Surface water runoff sampling locations at MDA G.

The rationale for surface water runoff sampling from the thirteen drainage areas is to:

- determine if VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and ROCs are being discharged from MDA G;
- further define source terms;
- collect data that can be used to support and supplement existing data for the DQO process; and
- collect data that can be used in a risk assessment.

5.4.4.1.5 Sampling Activity

One set of thirteen surface water runoff samples will be collected from the primary runoff pathways at MDA G during Phase I sampling. The analytical results will be compared to the Laboratory's Environmental Surveillance Program results (Environmental Protection Group 1990,0497). The sampling locations are shown on Figure 5.4-6. Table 5.4-19 summarizes the number of samples, the number of QC samples, and the analytical requirements for the Phase I sampling. It also describes the types of required QC samples. Surface water runoff sampling procedures are presented in Section 1.0 of Appendix B.

5.4.4.1.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.4-20 and are located in Appendix B of this RFI Work Plan.

5.4.4.1.7 Phase II SAP

If the results of Phase I surface water runoff sampling indicate that COCs exceed health risk-based criteria, then Phase II sampling will be conducted at MDA G. Surface soil samples will be collected in nine nodes of an MRI grid located in each watershed for the runoff channel(s) where Phase II sampling is required. The samples will be analyzed for the COCs that exceeded the health risk-based criteria in the surface water runoff samples. This Phase II sampling plan is designed to determine the extent of contamination and to provide data to be used in health risk assessments. Table 5.4-21 summarizes the number of samples and analytical requirements for the Phase II sampling activities. The Phase II plan outlined in this table assumes sampling in two watersheds and will be modified, as appropriate, after results of Phase I sampling are reviewed.

5.4.4.1.8 Health and Safety

This SAP will follow the procedures outlined in the Laboratory's Environment, Safety and Health Manual (LANL 1990, 0335) and Annex III of this RFI Work Plan.

TABLE 5.4-19
PHASE I SAMPLING AND ANALYSIS PLAN TABLE FOR SURFACE WATER RUNOFF SAMPLING AT MDA G

Media	# of Samples	# of QC[a] Samples	Total Samples	Analysis
Water	13	8	21	VOCs SVOCs Metals Pesticides PCBs Cyanide ROCs[b]

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank: Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment only when sampling for VOCs.

Field Blank: Organic-free water is poured into sample containers at the sampling site.

Duplicate Sample: Collect two separate water samples simultaneously.

Equipment (Rinsate) Blank: Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

[b] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

5.4.4.2.7 Phase II SAP

Phase II sampling of surface sediment will be conducted at MDA G to determine the vertical and lateral extent of any COCs detected during the Phase I sampling that exceeded health risk-based criteria. Samples will be collected from 6 to 12 inches below the 27 locations that had the highest concentrations of COCs during Phase I sampling. The Phase II sampling will provide data for health risk assessments. Table 5.4-23 summarizes the number of samples and the analytical requirements for the Phase II sampling activities. The Phase II plan outline in this table may be modified, as appropriate, after results of Phase I sampling are reviewed.

5.4.4.2.8 Health and Safety

This SAP will follow the procedures outlined in the Laboratory's Environment, Safety and Health Manual (LANL 1990, 0335) and Annex III of this RFI Work Plan.

5.4.4.2.9 Schedule

See Annex I.

5.4.4.3 Vertical Borehole Sampling at MDA G

5.4.4.3.1 Sampling and Analysis Components

The purpose of collecting and analyzing samples from twenty eight vertical boreholes at MDA G is to collect technically accurate and legally defensible data which can be used to characterize the nature of any contaminant releases at MDA G. The sampling component of the Phase I characterization consists of drilling vertical boreholes to collect continuous rock core samples for chemical and radiological analyses. The analytical component consists of field and laboratory analyses of rock core samples. Rock core samples will be screened in the field for VOCs, tritium, gross alpha, gross beta, and gross gamma ionizing radiation. Analysis at a LANL-contracted analytical laboratory will be conducted on core samples for VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and ROCs (see Table 5.4-24). The data will be validated according to EPA functional guidelines for organic analysis (EPA 1988, 0293) and inorganic analysis (EPA 1988, 0296). Currently, there are no published EPA methods for validating all radionuclide analyses.

TABLE 5.4-24
SAMPLING SUMMARY FOR VERTICAL BOREHOLES AT MDA G[a]

Analytical Level	Sampling Interval	Analysis	Medium
Laboratory Analysis[b]			
Level III	10ft	VOCs	Rock Core
Level III	10ft	SVOCs	Rock Core
Level III	10ft	Metals	Rock Core
Level III	10ft	Pesticides, PCBs, Cyanide	Rock Core
Level V	10ft	ROCs	Rock Core
Field Instrument Screening[c]			
Level I	all core	Organic Vapors (PID)	Rock Core
Level I	all core	Alpha, Beta, & Gamma Emissions	Rock core
Field Laboratory Analysis			
Level I or II	5 ft	Alpha, Beta, & Gamma Emissions	Rock Core
Level II	5 ft	Tritium	Rock Core
Level II	5 ft	Gravimetric moisture	Rock Core

[a] The total depth for each borehole is as follows:

Borehole #	Depth (feet)	Borehole #	Depth (feet)	Borehole #	Depth (feet)
1	70	11	50	21	60
2	70	12	90	22	60
3	50	13	60	23	60
4	50	14	50	24	60
5	70	15	60	25	60
6	50	16	90	26	50
7	90	17	90	27	50
8	90	18	90	28	50
9	90	19	60		
10	60	20	60		

[b] A sample will be collected from a minimum spacing of 10 ft for analysis to confirm the absence or presence of COCs above the health risk-based criteria. The actual depth of the sample will be determined from field screening and observation.

[c] Handheld field instruments are described in Section 5.4.4.3.3.2.

5.4.4.3.2 Sampling Analysis Approach

A phased drilling approach will be used to characterize subsurface contamination at MDA G. Continuous rock core will be collected from the proposed twenty eight Phase I boreholes. Rock core samples will be shipped to a Laboratory-contracted environmental laboratory for analysis. All analyses for hazardous constituents will be performed according to EPA SW-846 (third edition) protocol. Analyses with Tentatively Identified Compounds (TICs) will be reported in Level III SW-846 packages for subsequent data validation. Analysis for radionuclides will be reported in data packages formatted to LANL requirements for the off-site laboratory statement of work.

5.4.4.3.3 Primary Data Quality Factors

- Site characterization- There is a data base for VOCs from four existing wells at MDA G. However, the data do no include all of the regulated volatile organic compounds. Existing data have not been validated in accordance with the EPA functional guidelines. The data base does not include data for SVOCs, metals, pesticides, PCBs, cyanide, or ROCs. Data will be collected to fill existing data gaps and to support the validity and use of the existing data base.

- Risk Assessment - the source term is not fully understood because the exact chemical constituents and quantities that were disposed of in MDA G are unknown. The locations of potential sources of contamination, the rate of organic vapor generation, and the flux emanating from the site are also unknown. Data will be collected to help determine the nature and extent of any residual rock contamination at MDA G, and the potential contribution to environmental transport and exposure pathways.

5.4.4.3.3.2 Appropriate Analytical Levels

Samples collected will be screened in the field and analyzed in a laboratory using SW-846 (third edition) protocol. A PID will be used in the field to screen for organic vapors immediately after samples have been collected.

Radiological screening of samples will be conducted for tritium, gross beta and gamma radioactivity, and gross alpha contamination. Screening for gross beta and gamma radioactivity will be conducted with a hand-held sodium iodide detector (NaID) probe and rate meter, or equivalent system. Screening for gross alpha contamination will be conducted with a hand-held alpha scintillation detector (ASD) and rate meter, or equivalent system. A windowless gas flow proportional (GFP) counter and a liquid scintillation counter in a mobile laboratory will be used to detect for the presence of radionuclides, in addition to screening with the hand-held detectors. The analytical levels include:

Level I	Field Screen: PID Instrument; NaID/ASD Instruments,
Level II	Field Analysis: Windowless GFP Counter; Liquid Scintillation Counter,
Level III	SW-846 Laboratory Methods, and
Level V	Radiological Analysis Laboratory Methods.

5.4.4.3.3.3 Primary Contaminants of Concern

The primary contaminants of concern at MDA G are VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and ROCs (see Table 5.4-18 for a list of the ROCs). Core samples will be analyzed for analytes on the EPA Superfund's Contract Laboratory Program (CLP) target lists for organics and inorganics. The required inorganic analytes and contract required detection limits are as follows:

INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Contract Required Detection Limit [1,2] (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanedium	50
Zinc	20
Cyanide	10

(1) Subject to the restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:

Method in use - ICP
Instrument Detection Limit (IDL) - 40
Sample concentration = 220
Contract Required Detection Limit (CRDL) = 3

The value of 220 may be reported even though the instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibits B and E.

(2) The CRDLs are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

For organics, in addition to the CLP target compound list, CLP procedures will be followed for searching the NIST/EPA/MSDC mass spectral library of approximately 53,000 organic compounds ("Tentatively Identified Compounds") to provide information about additional organic analytes that may be present. A highly skilled mass spectrometrist will interpret the data from the mass spectral search and determine if there is any indication of the presence of organic constituents from the Appendix IX list. The presence and concentration of any of these possible Appendix IX compounds will be confirmed if standards are available.

The required organic analytes and contract required quantitation limits are as follows:

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

		Quantitation Limits*			
Volatiles	CAS Number	Water ug/L	Low Soil ug/kg	Med. Soil ug/kg	on Column (ng)
1. Chloromethane	74-87-3	10	10	1200	(50)
2. Bromomethane	74-83-9	10	10	1200	(50)
3. Vinyl Chloride	75-01-4	10	10	1200	(50)
4. Chloroethane	75-00-3	10	10	1200	(50)
5. Methylene Chloride	75-09-2	10	10	1200	(50)
6. Acetone	67-64-1	10	10	1200	(50)
7. Carbon Disulfide	75-15-0	10	10	1200	(50)
8. 1,1-Dichloroethene	75-35-4	10	10	1200	(50)
9. 1,1-Dichloroethane	75-34-3	10	10	1200	(50)
10. 1,2-Dichloroethene (total)	540-59-0	10	10	1200	(50)
11. Chloroform	67-66-3	10	10	1200	(50)
12. 1,2-Dichloroethane	107-06-2	10	10	1200	(50)
13. 2-Butanone	78-93-3	10	10	1200	(50)
14. 1,1,1-Trichloroethane	71-55-6	10	10	1200	(50)
15. Carbon Tetrachloride	56-23-5	10	10	1200	(50)
16. Bromodichloromethane	75-27-4	10	10	1200	(50)
17. 1,2-dichloropropane	78-87-5	10	10	1200	(50)
18. cis-1,3-Dichloropropene	10061-01-5	10	10	1200	(50)
19. Trichloroethene	79-01-6	10	10	1200	(50)
20. Dibromochloromethane	124-48-1	10	10	1200	(50)
21. 1,1,2-Trichloroethane	79-00-5	10	10	1200	(50)
22. Benzene	71-43-2	10	10	1200	(50)
23. Trans-1,3-Dichloropropene	10061-02-6	10	10	1200	(50)
24. Bromoform	75-25-2	10	10	1200	(50)
25. 4-Methyl-2-pentanone	108-10-1	10	10	1200	(50)
26. 2-Hexanone	591-78-6	10	10	1200	(50)
27. Tetrachloroethene	127-18-4	10	10	1200	(50)
28. Toluene	108-88-3	10	10	1200	(50)
29. 1,1,2,2-Tetrachloroethane	79-34-5	10	10	1200	(50)
30. Chlorobenzene	108-90-7	10	10	1200	(50)
31. Ethyl Benzene	100-41-4	10	10	1200	(50)
32. Styrene	100-42-5	10	10	1200	(50)
33. Xylenes (Total)	1330-20-7	10	10	1200	(50)

*Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

		Quantitation Limits*			
Semivolatiles	CAS Number	Water ug/L	Low Soil ug/kg	Med. Soil ug/kg	on Column (ng)
34. Phenol	108-95-2	10	330	10000	(20)
35. bis(2-Chloroethyl) ether	111-44-4	10	330	10000	(20)
36. 2-Chlorophenol	95-57-8	10	330	10000	(20)
37. 1,3-Dichlorobenzene	541-73-1	10	330	10000	(20)
38. 1,4-Dichlorobenzene	106-46-7	10	330	10000	(20)
39. 1,2-Dichlorobenzene	95-50-1	10	330	10000	(20)
40. 2-Methylphenol	95-48-7	10	330	10000	(20)
41. 2,2'-oxybis (1-Chloropropane)#	108-60-1	10	330	10000	(20)
42. 4-Methylphenol	106-44-5	10	330	10000	(20)
43. N-Nitroso-di-n-propylamine	621-64-7	10	330	10000	(20)
44. Hexachloroethane	67-72-1	10	330	10000	(20)
45. Nitrobenzene	98-95-3	10	330	10000	(20)
46. Isophorone	78-59-1	10	330	10000	(20)
47. 2-Nitrophenol	88-75-5	10	330	10000	(20)
48. 2,4-dimethylphenol	105-67-9	10	330	10000	(20)
49. bis(2-Chloroethoxy) methane	111-91-1	10	330	10000	(20)
50. 2,4-Dichlorophenol	120-83-2	10	330	10000	(20)
51. 1,2,4-Trichlorobenzene	120-82-1	10	330	10000	(20)
52. Nephthalene	91-20-3	10	330	10000	(20)
53. 4-Chloroaniline	106-47-8	10	330	10000	(20)
54. Hexachlorobutadiene	87-68-3	10	330	10000	(20)
55. 4-Chloro-3-methylphenol	59-50-7	10	330	10000	(20)
56. 2-Methylnaphthalene	91-57-6	10	330	10000	(20)
57. Hexachlorocyclopentadiene	77-47-4	10	330	10000	(20)
58. 2,4,6-Trichlorophenol	88-06-2	10	330	10000	(20)
59. 2,4,5-Trichlorophenol	95-95-4	25	800	25000	(50)
60. 2-Chloronaphthalene	91-58-7	10	330	10000	(20)
61. 2-Nitroaniline	88-74-7	25	800	25000	(50)
62. Dimethylphthalate	131-11-3	10	330	10000	(20)
63. Acenaphthylene	208-96-8	10	330	10000	(20)
64. 2,6-Dinitrotoluene	606-20-2	10	330	10000	(20)
65. 3-Nitroaniline	99-09-2	25	800	25000	(50)
66. Acenaphthene	83-32-9	10	330	10000	(20)
67. 2,4-Dinitrophenol	51-28-5	25	800	25000	(50)
68. 4-Nitrophenol	100-02-7	25	800	25000	(50)

* Previously known by the name bis(2-Chloroisopropyl) ether

Semivolatiles (cont)	CAS Number	Quantitation Limits* Water ug/L	Low Soil ug/kg	Med. Soil ug/kg	on Column (ng)
69. Dibenzofuran	132-64-9	10	330	10000	(20)
70. 2,4-Dinitrotoluene	121-14-2	10	330	10000	(20)
71. Diethylphthalate	84-66-2	10	330	10000	(20)
72. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330	10000	(20)
73. Fluorene	86-73-7	10	330	10000	(20)
74. 4-Nitoaniline	100-01-6	25	800	25000	(50)
75. 4,6-Dinitro-2-methyphenol	534-52-1	25	800	25000	(50)
76. N-nitrosodiphenylamine	86-30-6	10	330	10000	(20)
77. 4-Bromophenyl-phenylether	101-55-3	10	330	10000	(20)
78. Hexachlorobenzene	118-74-1	10	330	10000	(20)
79. Pentachlorophenol	87-86-5	25	800	25000	(50)
80. Phenanthrene	85-01-8	10	330	10000	(20)
81. Anthracene	120-12-7	10	330	10000	(20)
82. Carbazole	86-74-8	10	330	10000	(20)
83. Di-n-butylphthalate	84-74-2	10	330	10000	(20)
84. Fluoranthene	206-44-0	10	330	10000	(20)
85. Pyrene	129-00-0	10	330	10000	(20)
86. Butylbenzylphthalate	85-68-7	10	330	10000	(20)
87. 3,3'-Dichlorobenzidine	91-94-1	10	330	10000	(20)
88. Benzo(a)anthracene	56-55-3	10	330	10000	(20)
89. Chrysene	218-01-9	10	330	10000	(20)
90. bis(2-Ethylhexyl)phthalate	117-81-7	10	330	10000	(20)
91. Di-n-octylphthalate	117-84-0	10	330	10000	(20)
92. Benzo (b) fluoranthene	205-99-2	10	330	10000	(20)
93. Benzo (k) fluoranthene	207-08-9	10	330	10000	(20)
94. Benzo (a) pyrene	50-32-8	10	330	10000	(20)
95. Indeno(1,2,3-cd)pyrene	193-39-5	10	330	10000	(20)
96. Dibenz(a,h)anthracene	53-70-3	10	330	10000	(20)
97. Benzo(g,h,i)perylene	191-24-2	10	330	10000	(20)

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

		Quantitation Limits*		
Pesticides/Aroclors	CAS Number	Water ug/L	Soil ug/kg	on Column (pg)
98. alpha-BHC	319-84-9	0.05	1.7	5
99. beta-BHC	319-85-7	0.05	1.7	5
100. delta-BHC	319-86-8	0.05	1.7	5
101. gamma-BHC (Lindane)	58-89-9	0.05	1.7	5
102. Heptachlor	76-44-8	0.05	1.7	5
103. Aldrin	309-00-2	0.05	1.7	5
104. Heptachlor epoxide	1024-57-3	0.05	1.7	5
105. Endosulfan I	959-98-8	0.05	1.7	5
106. Dieldrin	60-57-1	0.10	3.3	10
107. 4,4'DDE	72-55-9	0.10	3.3	10
108. Endrin	72-20-8	0.10	3.3	10
109. Endosulfan II	33213-65-9	0.10	3.3	10
110. 4,4'DDD	72-54-8	0.10	3.3	10
111. Endosulfan Sulfete	1031-07-8	0.10	3.3	10
112. 4,4'-DDT	50-29-3	0.10	3.3	10
113. Methoxychlor	72-43-5	0.50	17.0	50
114. Endrin Ketone	53494-70-5	0.10	3.3	10
115. Endrin aldehyde	7421-36-3	0.10	3.3	10
116. alpha-Chlordane	5103-71-9	0.05	1.7	5
117. gamma-Chlordane	5103-74-2	0.05	1.7	5
118. Toxaphene	8001-35-2	5.0	170.0	500
119. Aroclor-1016	12674-11-2	1.0	33.0	100
120. Aroclor-1221	11104-28-2	2.0	67.0	200
121. Aroclor-1232	11141-16-5	1.0	33.0	100
122. Aroclor-1242	53469-21-9	1.0	33.0	100
123. Aroclor-1248	12672-29-6	1.0	33.0	100
124. Aroclor-1254	11097-69-1	1.0	33.0	100
125. Aroclor-1260	11096-82-5	1.0	33.0	100

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Pesticides/Aroclors.

5.4.4.3.3.4 Levels of Concern

Appendix F of the IWP (LANL 1991, 0553) and 40 CFR 264, Proposed Subpart S, contain information on constituent levels of concern. Health risk-based determination of levels of concern will be developed for constituents not listed in Appendix F. The ER Program is currently developing baseline risk assessment scenarios and criteria that will be presented in the 1992 IWP. This approach will be developed in adequate time for data analysis.

5.4.4.3.3.5 Required Quantitation Limits

Quantitation limits for laboratory analysis of hazardous substances and radionuclides are presented in Tables V.3 through V.9 of the Laboratory's Generic QAPjP (LANL 1991,0412).

5.4.4.3.3.6 Critical Samples

The locations of the 28 proposed vertical boreholes are shown on Figure 5.4-9. Samples collected from the vertical boreholes located at the perimeter of the MDA are important in determining the nature and extent of contamination. Samples collected from boreholes placed in areas of potential or known contamination are important in detecting and characterizing contaminant releases. Samples from the boreholes are critical in the design of Phase II subsurface characterization and future corrective actions.

5.4.4.3.4 Rationale for Sampling Activity

The rationale for installing boreholes is to:

- determine the nature and extent of any residual soil or rock contamination;
- determine the source term for any residual soil or rock contamination; and
- collect data that can be validated according to EPA functional guidelines for data validation and that can be used to support the use of existing data.

Data obtained through implementation of the Phase I SAP will be used for the initial characterization of the nature, extent, and source of any residual soil or rock contamination at MDA G. This information will be obtained through the following sampling tasks:

- Twenty eight boreholes will be installed to determine the nature and extent of any residual soil or rock contamination (see Figure 5.4-9 for the proposed borehole locations).
- Core samples will be collected and analyzed for VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and ROCs by a contract analytical laboratory that is certified to perform SW-846 analyses.

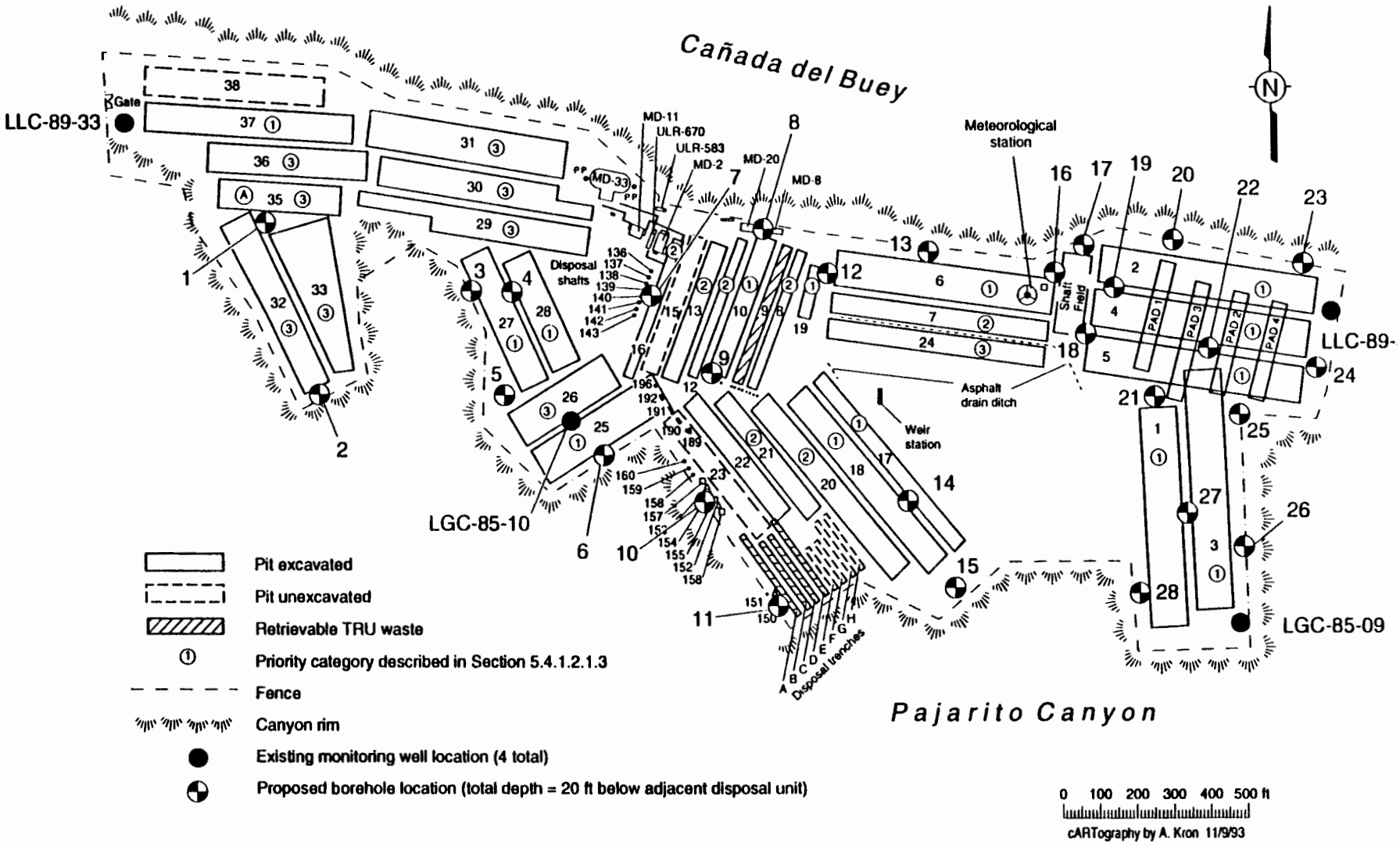

Figure 5.4-9 Location map of proposed boreholes and existing vapor-monitoring wells at MDA G.

5.4.4.3.5 Sampling Activity

5.4.4.3.5.1 Boreholes at MDA G

Twenty eight vertical boreholes will be installed during the Phase I sampling program. Each borehole will be drilled to a depth of at least twenty feet below the adjacent subsurface disposal unit.

The locations of the 28 proposed boreholes are shown on Figure 5.4-9. Table 5.4-24 is a sampling summary of the vertical boreholes at MDA G. It lists the total depth for each borehole, the sampling interval for each media along with the analyses to be performed and the corresponding analytical level. Table 5.4-25 summarizes the number of field samples, the number of QC samples, and the analytical requirements for the Phase I sampling at MDA G, and explains the types of QC samples required.

The procedures for borehole drilling and logging, sample (rock core) collection from the vertical boreholes, field screening analysis, hydrogeologic measurements, downhole geophysical surveys, and waste disposal and borehole abandonment are described in Section 3.0 of Appendix B. Field screening procedures are presented in Section 6.0 of Appendix B.

5.4.4.3.6 Remaining SAP Elements

The remaining required elements of this SAP are common to all of the SAPs prepared for OU 1148. These common elements are listed in Table 5.4-20 and are located in Appendix B of this RFI Work Plan.

5.4.4.3.7 Phase II SAP

It is estimated that ten additional boreholes will be installed during Phase II sampling. These boreholes will be located based on the results of Phase I to determine the vertical and horizontal extent of any contaminant plumes. The Phase II boreholes will be drilled to an estimated depth of approximately 200 feet. Samples will be collected at depth intervals determined from Phase I results, and analyzed for the COCs that exceeded health risk-based criteria during Phase I sampling. Table 5.4-26 summarizes the Phase II sample and analytical requirements.

TABLE 5.4-25
PHASE I SAMPLING AND ANALYSIS PLAN TABLE FOR VERTICAL BOREHOLE SAMPLING AT MDA G

Media	# of Samples	# of QC[a] Samples	Total Samples	Analysis
Rock Core	202	88	290	VOCs SVOCs Metals Pesticides PCBs Cyanide ROCs[b]

[a] Includes Trip Blank, Field Blank, Duplicate Sample, and Equipment (Rinsate) Blank.

Trip Blank (Soil/Rock Core): Two 40 ml VOC sample containers are filled with organic-free water at the Sample Coordination Facility. Filled trip blanks accompany sample bottles to the field, remain unopened throughout the sampling activity, and return with shipment to the analytical laboratory. Submitted only when sampling for VOCs.

Trip Blank (Soil Gas): A sealed SUMMA canister or resin tubes taken to the field during a sampling event and returned with shipment to the analytical laboratory. Canister or resin tubes remain unopened.

Field Blank (Soil/Rock Core): Organic-free water is poured into sample containers at the site of the borehole sampling.

Field Blank (Soil Gas): A SUMMA canister or resin tubes are exposed to the atmosphere near the sampling site. The canister or resin tubes will be left open until 3 liters of air are sampled.

Duplicate Samples (Soil/Rock Core): Collect two separate core samples immediately adjacent to each other by the same sampling technique.

Duplicate Samples (Soil Gas): obtained by attaching to SUMMA canisters or four resin tubes to the sample line with a Y fitting and filling the canisters or tubes simultaneously.

Equipment (Rinsate) Blanks (Soil/Rock Core): Obtained by running organic-free water over cleaned, decontaminated sampling equipment and rinsing the equipment surface that comes into contact with a sample.

Equipment (Rinsate) Blanks (Soil Gas): A soil gas sample, using a SUMMA canister or esin tubes, is taken to assess the cleanliness of the sample manifold. Clean the sample manifold, fill a 6L Teflon bag with zero-zero air, and attach the bag and canister or resin tubes to the manifold. Collect 3 liters using a flow rate of 500 ml/minute.

[b] Radionuclides of Concern (ROCs) for OU 1148 (see Table 5.4-18).

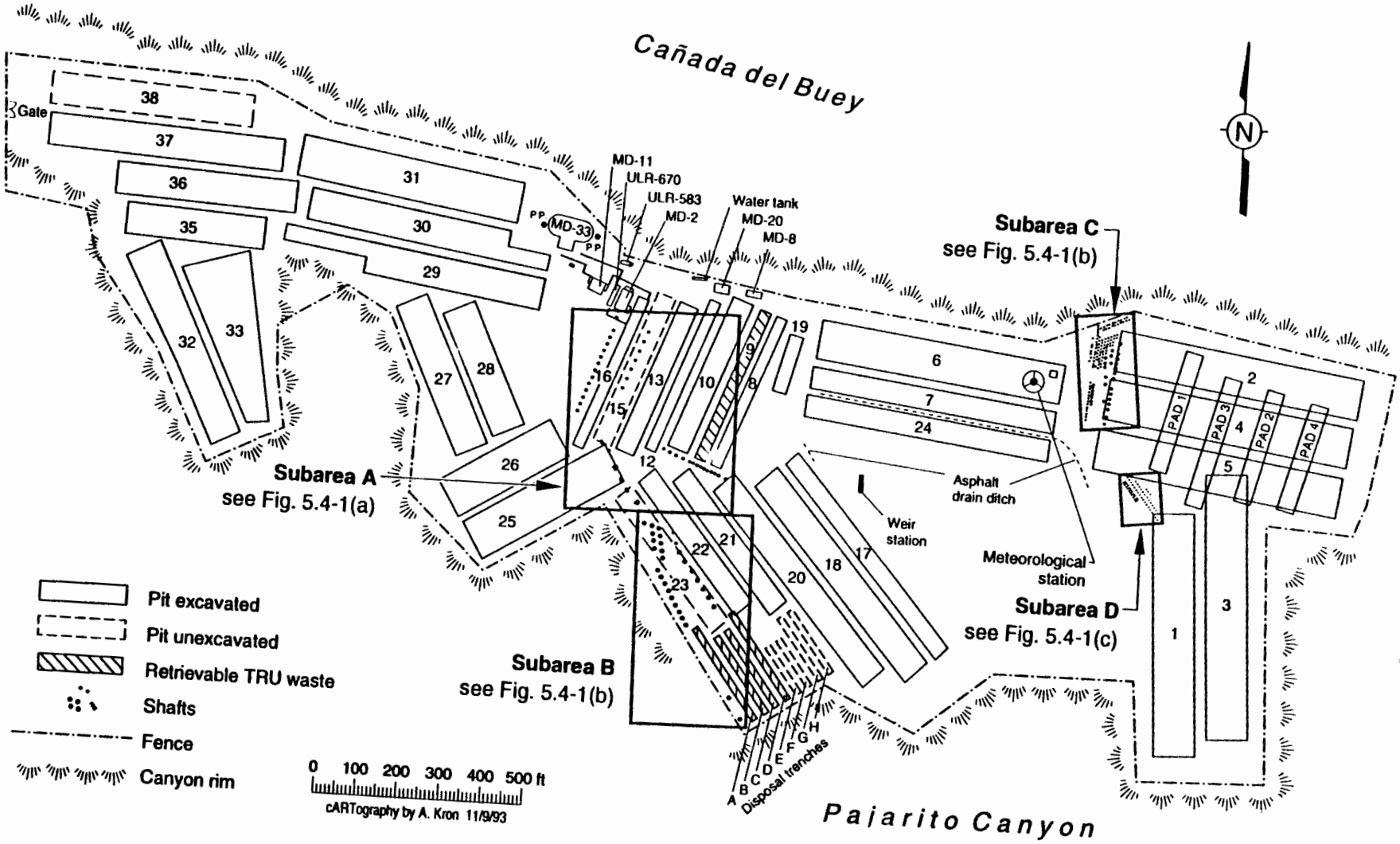

Figure 5.4-1 Location map of shafts, pits, and trenches at MDA G.

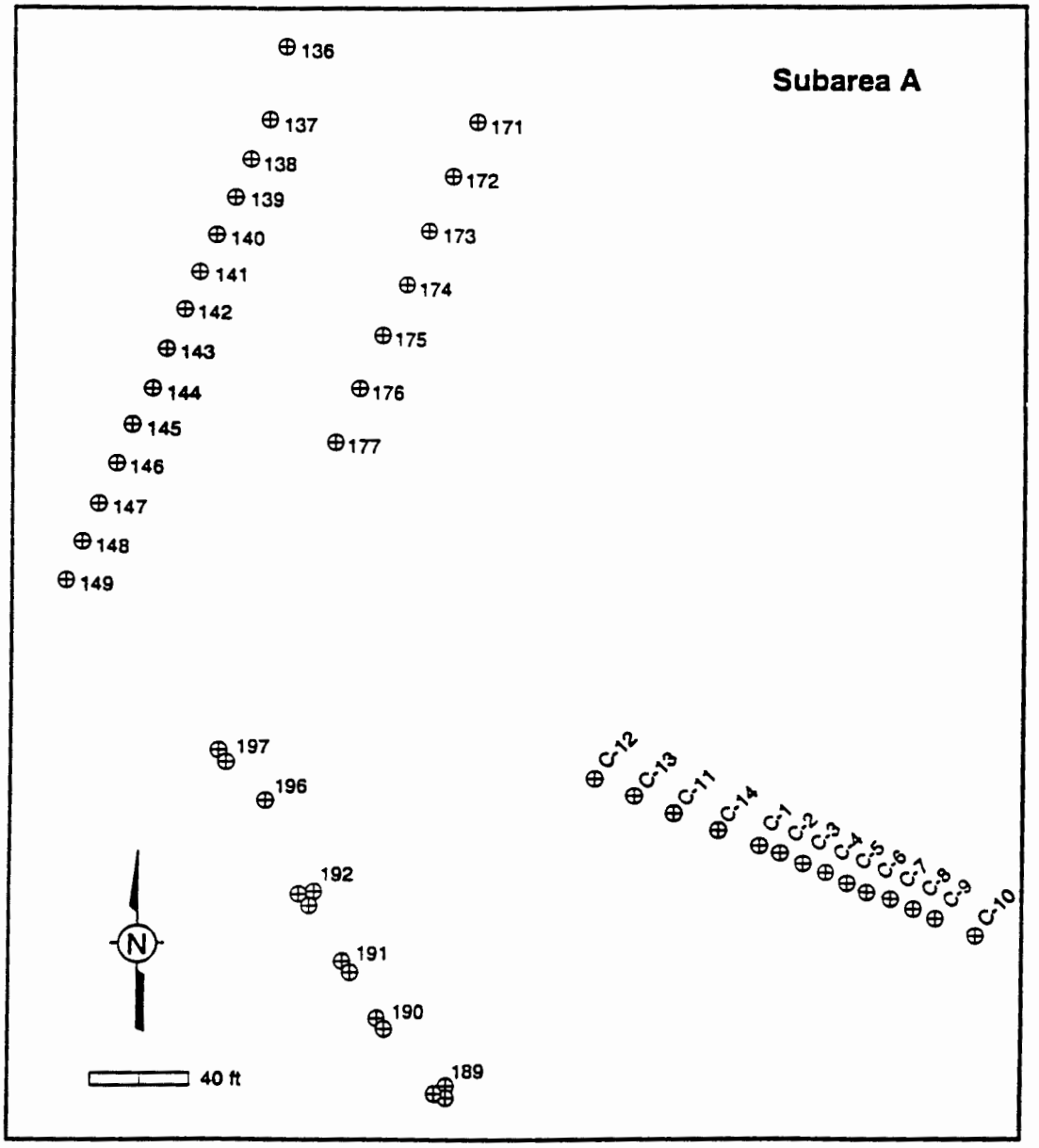

Figure 5.4-1(a) Location of shafts in Subarea A, MDA G (see Fig. 5.4-1 for location of Subarea A).

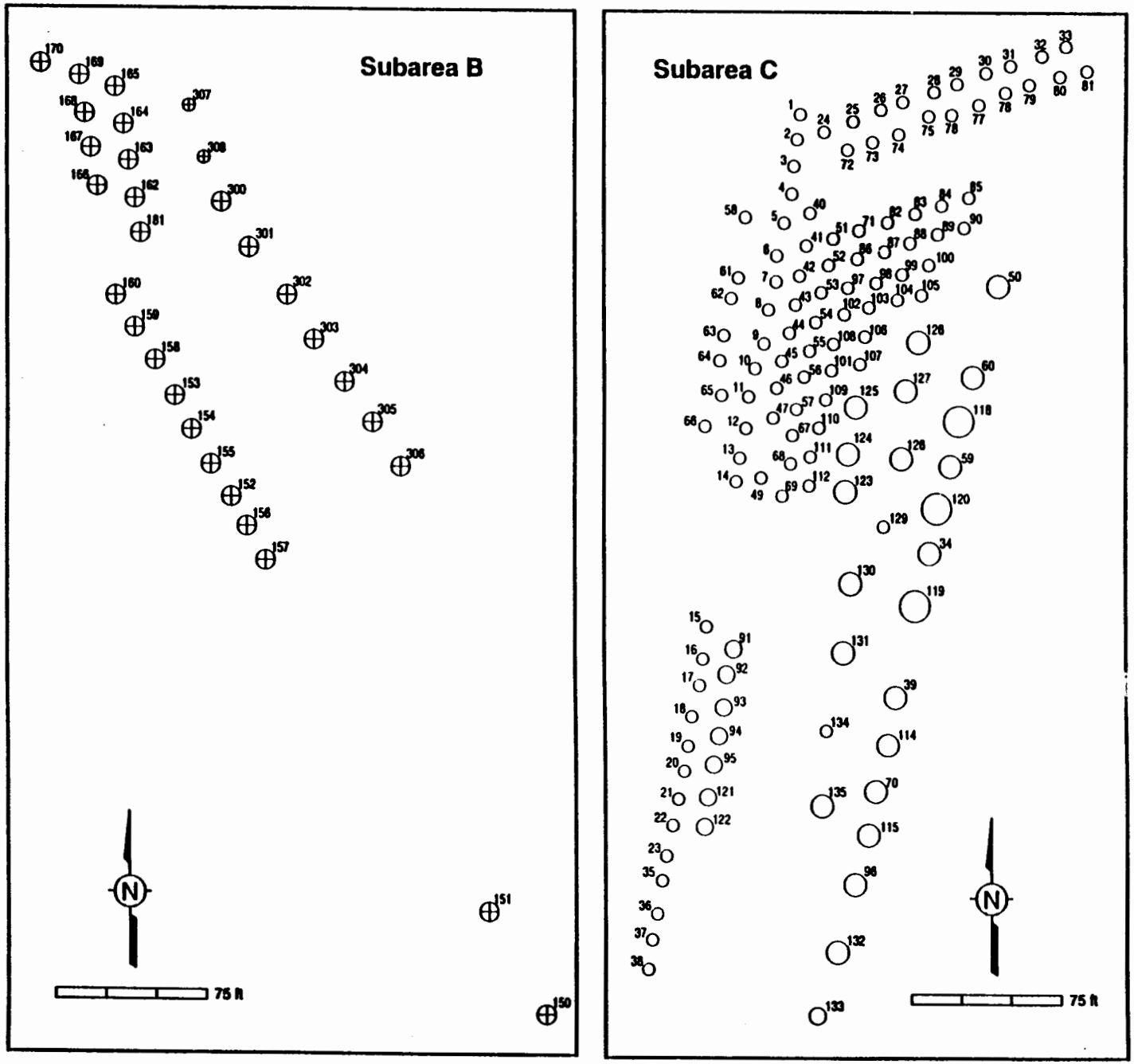

Figure 5.4-1(b) Location of shafts in Subareas B and C, MDA G (see Fig. 5.4-1 for location of Subareas B and C).

Specific Response #16(c)

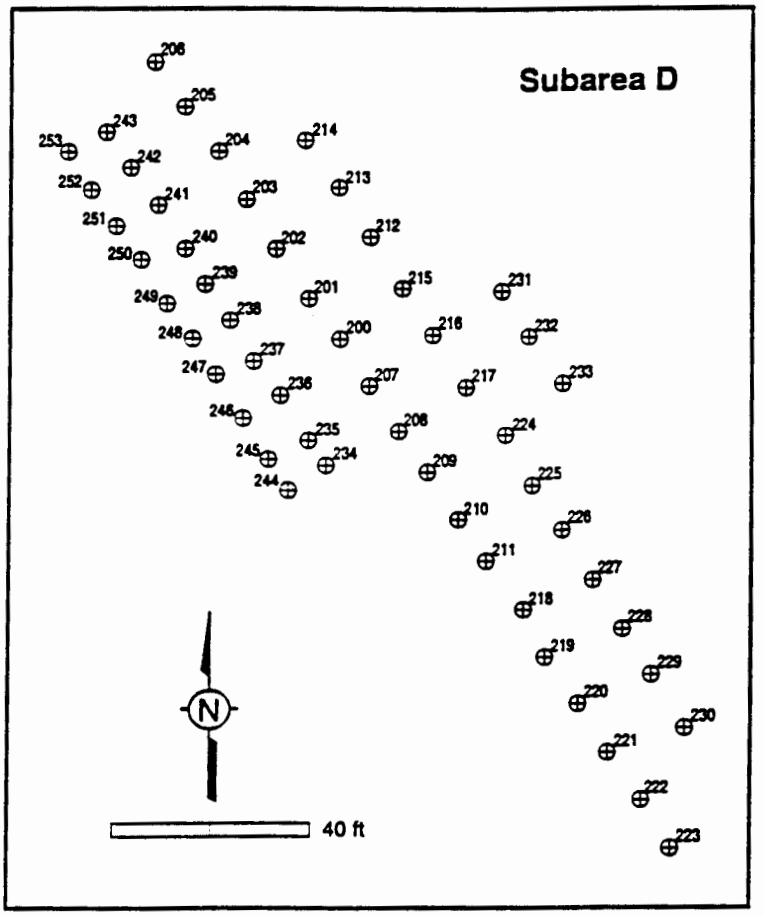

Figure 5.4-1(c) Location of shafts in Subarea D, MDA G (see Fig. 5.4-1 for location of Subarea D).

TABLE 5.4-27
SAMPLE INTERVAL DEPTHS AND PURGE VOLUMES FOR VAPOR MONITORING WELLS AT MDA G

Well Number[a]	Sample Interval Depth (in feet below surface)	Purge Volumes[b] (in ml)
LGC-85-09	37	185
	63	315
	80	400
	93	465
LGC-85-10	30	150
	53	265
	95	475
LLC-89-32	20	
	60	
	100	
	130	
	156	
LLC-89-33	20	
	60	
	100	
	160	
	200	
	220	
	260	
	277	

[a] Well locations are shown on Figure 5.4-10

[b] 1 linear foot = 5 ml; purge volumes are not calculated for wells LLC-89-32 and LLC-89-33.