# Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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RECEIVED
MAY 6 1996

*Date:* May 2, 1996
*Refer to:* EM/ER:96-229

Mr. Benito Garcia
NMED-HRMB
P.O. Box 26100
Santa Fe, NM 87502

RFI Report

**SUBJECT: RESPONSE TO THE NOTICE OF DEFICIENCY (NOD) FOR TECHNICAL AREA (TA) 33, MATERIAL DISPOSAL AREA (MDA) K**

Dear Mr. Garcia:

Enclosed is the Los Alamos National Laboratory's response to the Environmental Protection Agency's NOD concerning TA-33, MDA K. A certification form signed by the appropriate officials is also enclosed. The enclosed response repeats each comment from the NOD for convenience in reviewing.

NOD comments numbered 1, 2, 4, 5, and 6 concern the radionuclide tritium, which is not regulated by the New Mexico Environment Department as tritium is not a Resource Conservation and Recovery Act-regulated constituent. The Laboratory has responded to those comments, but recognizes that the Department of Energy has final regulatory authority over decisions concerning this constituent.

Please contact Roy Michelotti at (505) 665-7444 or Joe Mose at (505) 667-5808, if you have any questions about this response to the NOD.

Sincerely,

Jorg Jansen, Program Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/bp

Enclosures: Response to NOD
Certification

4735

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# CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Response To The Notice Of Deficiency For Technical Area 33, Material Disposal Area K

Name: _____ Date: 5-2-96

Jorg Jansen, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: _____ Date: 5/2/96

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

# Field Unit 3
# Response to the List of Deficiencies
# RFI REPORT FOR MDA-K, PRSs 33-002 (a,b,c,d,e)
# Los Alamos National Laboratory

**1. 4.1.2.2 Results of Field Screening:**

Paragraph states that tritium "sniffers" were set up in work areas and that no tritium was detected during drilling. The risk analysis indicates that a possible credible exposure pathway is inhalation resulting from tritium flux from the soil. **[a]** Paragraph 4.1.2.2 should disclose the sensitivity and type of instrument used to monitor for tritium and **[b]** discuss wind direction and instrument location on the day(s) monitoring/drilling occurred. This should be reported regardless of the DOE allowable effective dose equivalent.

**Response:** Sniffer readings do not represent ambient conditions at Material Disposal Area (MDA) K and do not represent the exposure a casual site visitor would receive. The sniffer was used for health and safety purposes only. It was set up inside the core logging trailer whenever personnel were present. Readings were also taken directly at borehole openings during drilling. All boreholes were subsequently capped. Readings above the detection limit for tritium came from air in the trailer or from an outgassing, open borehole. No sniffer data were used to make characterization decisions at MDA K.

The sentence should have read, "...no tritium was detected above health and safety action levels during drilling operations." Readings were often above 2 $\mu Ci/m^3$, but always below the health and safety action level of 5 $\mu Ci/m^3$ (ICF-Kaiser 1994, 02-095).

[a] The tritium sniffer belongs to the LANL Health Physics Measurements Group (ESH-4) and was calibrated by ESH-4 personnel prior to use in the field.

- Manufacturer: Overhoff, Model: 394-C
- Detection limit: approximately 2 $\mu Ci/m3$ tritium

[b] In the autumn when the drilling took place, the wind direction is typically from the southwest (LANL 1995, 1164).

**2. 4.1.3.1.2. Surface Tritium Results:**

LANL should include a discussion on how the conclusion was reached that airborne stack releases from the tritium facility were the source of tritium on the surface of MDA-K. **[a]** Does the aerial concentration distribution pattern match the prevailing wind direction? **[b]** Could the distribution down-slope be due to mechanical soil transport which is continuing today toward existing drainages?

**Response: [a]** Tritium distribution at Main Site is discussed in Section 3.2.2.2 (page 40) of the January 1995 RFI report, LA-UR-95-882 (LANL 1995, 1212). The following is the relevant excerpt from that report:

> "Tritium, measured in pCi/ml or nCi/L (equivalent units) is uniformly high on the TA-33 grid, with a median value of 13.7 pCi/ml, higher than the surveillance maximum of 13 pCi/ml. The grid maximum is 872 pCi/ml. By contrast the field blanks, all below 3.6 pCi/ml, are within the surveillance background range. The elevated values on the grid show a spatial pattern highest in the direction of the prevailing daytime winds, that is, northeast of the former tritium production facility (TA-33-86). The values fall off in all directions with distance from this facility. Figure 3-5 shows the distribution of grid samples containing tritium and an indication of the tritium concentrations."

Figure 1 of this NOD response is a copy of the Fig. 3-5 bubble plot of surface tritium distribution from the January 1995 TA-33 RFI report (LANL 1995, 1212).

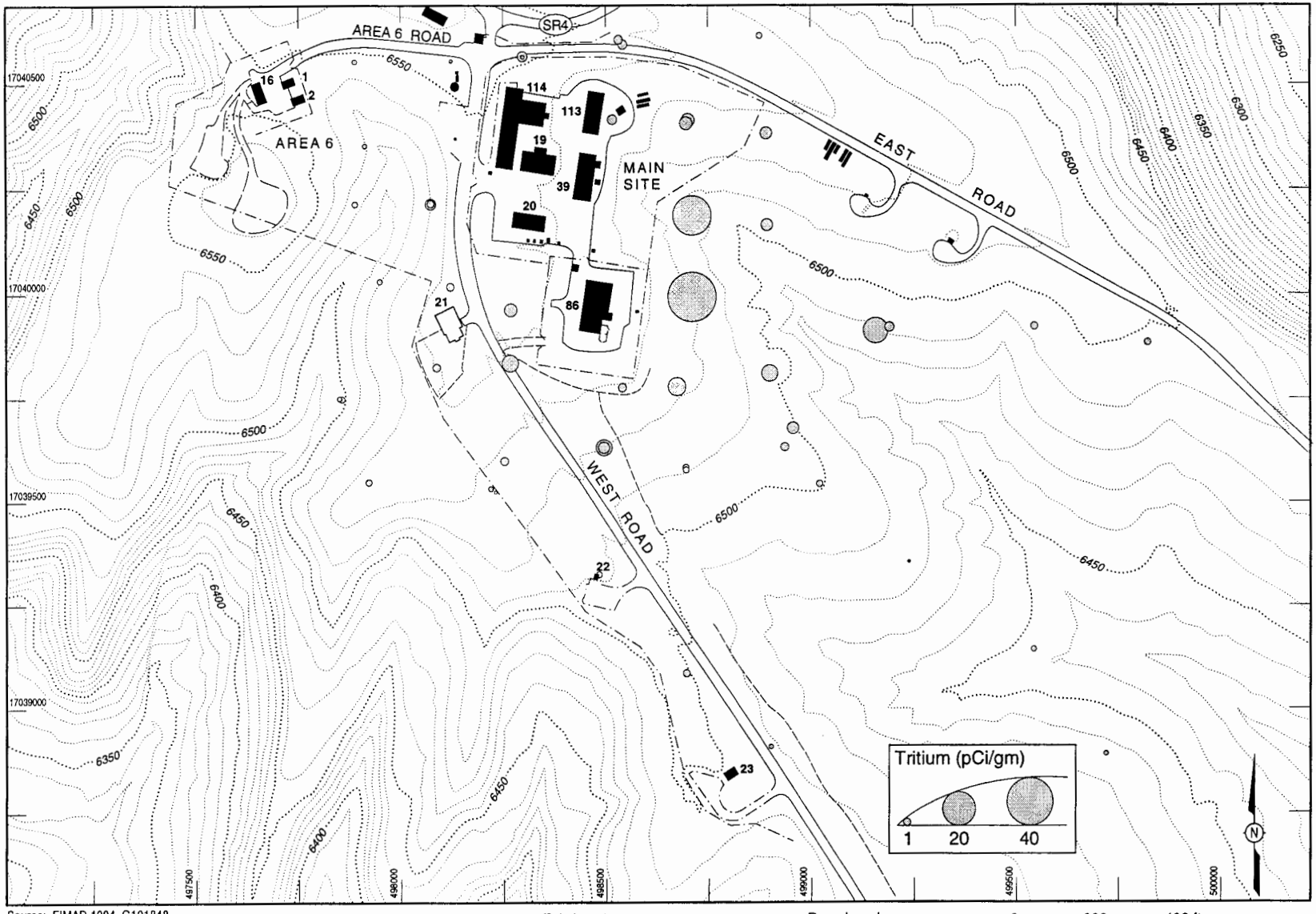
Wind directions at the eastern edge of LANL are discussed in the Installation Work Plan (IWP) for the Environmental Restoration (ER) Project as, "...a moderately southwesterly up-valley [Rio Grande Valley] wind during the day and either a light northeasterly to northerly drainage wind or moderate southwesterly wind at night" (LANL 1995, 1164). TA-33 is at the southeastern corner of LANL. Figure 1 indicates elevated tritium concentrations east and somewhat north of TA-33-86, as is consistent with this description and the windrose data in Subsection 2.5.3 of the IWP.

**Response: [b]** Concerning mechanical soil transport of tritium, the most likely transport mechanism is as tritiated water mixed with rain or snow runoff. (Tritium, a form of hydrogen, is analyzed in the water extracted from soil samples.) It is assumed that the bulk of water in the soil was deposited during the last storm or snowmelt event to occur before the samples were taken. Such moisture either evaporates or moves as runoff in a dynamic, ever-shifting manner. Data presented in Figure 1 imply that tritiated water either evaporates or is diluted during natural runoff events as it moves downslope into the drainages.

3. **4.1.3.1.3. Deep Borehole Results:**

Paragraph 4.1.3.1.3 indicates that analytical results from deep borehole sampling were compared to background values determined from surface sampling. LANL shall revise the report to integrate background values from subsurface sampling if such information is available. If subsurface background data is not available, a discussion should be included to indicate why it is appropriate/inappropriate to use surface values in place of subsurface values.

**Response:** At the time the report was written, only surface background data were available for comparison purposes. Subsurface background data have since been published (Longmire et al. 1995, 1266). Table 1 below is revised Table 4-5 of the MDA K RFI report (Environmental Restoration Project 1995, 1263). The stratigraphic unit for each sample depth and the appropriate upper tolerance limit (UTL) are included as the last two columns of the table. The new UTLs reaffirm the conclusion that inorganics are not a concern at MDA K.




Source: FIMAD 1994, G101848
Modified by: cARTography by A. Kron 1/7/95

Existing structure
Former structure
Paved road
Unimproved road/trail
Fence

0 200 400 ft
Contour interval = 10 ft

**Fig. 1. Tritium distribution at Main Site.**

## TABLE 1

### ANALYTE CONCENTRATIONS, EXCLUDING TRITIUM, ABOVE LANL UTLS FOR BOREHOLES AT MDA K

| ANALYTE | BOREHOLE ID | SAMPLE ID | CONCEN-TRATION (mg/kg) | LANL SOIL UTL [a] (mg/kg) | SAL [b] (mg/kg) | DEPTH (ft) | STRATI-GRAPHIC UNIT [c] | LANL UTL [d] (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Antimony | 33-1230 | AAA3292 | 23 | 2.5 | 32 | 127 | QBT1v | 0.3 |
| Cadmium | 33-1231 | AAA3321 | 4.2 | 2.7 | 80 | 314 | QTb | ND [e] |
| | 33-1230 | AAA3884 | 3.6 | 2.7 | 80 | 0-1 | B Horizon [f] | 2.7 |
| Chromium | 33-1230 | AAA3884 | 57 | 34.2 | 400 | 0-1 | B Horizon | 19.0 |
| Lead | 33-1230 | AAA3884 | 48 | 39 | 400 | 0-1 | B Horizon | 22.3 |
| Nickel | 33-1231 | AAA3321 | 103 | 26.7 | 1 600 | 314 | QTb | ND |
| Uranium | 33-1230 | AAA3884 | 8.09 | 2.82 | 95 | 0-1 | B Horizon | 5.34 |
| | 33-1230 | AAA3889 | 5.16 | 2.82 | 95 | 30 | QBT2 | 7.12 |
| **ANALYTE** | **BOREHOLE ID** | **SAMPLE ID** | **ACTIVITY (pCi/g)** | **LANL SOIL UTL** | **SAL (pCi/g)** | **DEPTH (ft)** | **STRATI-GRAPHIC UNIT** | **LANL UTL (pCi/g)** |
| Plutonium-238 | 33-1230 | AAA3281 | 0.145 | 0.01 | 27 | 10 | QBT3 | NA[g] |
| | 33-1230 | AAA3283 | 0.040 | 0.01 | 27 | 10 | QBT3 | NA |
| Plutonium-239 | 33-1231 | AAA3321 | 0.113 | 0.025 | 24 | 314 | QTb | ND |

[a] UTL = LANL (99%, 0.95) upper tolerance limit. used in the MDA K RFI Report. (Environmental Restoration Project 1995, 1263).
[b] SAL = Screening action level.
[c] See Fig. 4-7 of the MDA K RFI Report for the appropriate lithologic units at sample depth. (Environmental Restoration Project 1995, 1263).
[d] LANL (95%, 0.95) UTLs for appropriate horizon (Longmire et al. 1995, 1266).
[e] ND = Not determined. QTb (Cerros del Rio basalts) were not included in the subsurface background studies.
[f] The B soil horizon is most appropriate for surface sampling because topsoil was scraped off during historic activities.
[g] NA = Not analyzed. Plutonium was not analyzed in subsurface background samples.

**4. 4.1.3.2.1. Borehole observations – Chaquehui Anomaly:**

**a.** This discussion should be expanded to explain **[a]** why subsurface groundwater flow to the springs in Chaquehui Canyon is the source of the tritium anomaly. **[b]** The geochemical mechanisms for tritium to be transported in solution from the tritium facility and precipitated in sediments near springs should be documented. **[c]** Assuming groundwater is the medium of transport, can a time relationship be established between the emplacement of the 100 foot tritium spike, records of precipitation or facility outfall, and the Chaquehui Canyon sediment anomaly? If not, other potential sources of tritium should be investigated.

**Response:** [a] The fact that local springs did not show elevated tritium levels led to the conclusion that subsurface groundwater flow is not the source of the observed anomaly in sediments. If groundwater were the source, spring samples (direct samples of discharging groundwater) would have higher tritium levels than the sediment samples. Water in the sediments represents some unknown mixture of groundwater, surface water, and potential local sources. The background tritium concentrations in the springs suggest that groundwater flow is not a viable explanation. See also question 5 of this NOD response.

[b] Because the data suggest that groundwater is not a transport path, LANL does not propose a geochemical mechanism for groundwater transport, nor for tritium "precipitation." Tritium is most likely present as tritiated water and is contained in the moisture present in the sediment samples, not some precipitated solid phase.

[c] Because a groundwater pathway is not implicated, it is not appropriate to attempt to assess a groundwater travel time.

LANL acknowledges that there is no suitable explanation for the Chaquehui tritium anomaly. The measured concentrations do not pose any significant risk (results are orders of magnitude below SALs), and the additional data gathered from lower Chaquehui groundwater (springs) and sediments do not suggest widespread tritium contamination. LANL recommends continued monitoring, as detailed in the last paragraph of Section 4.1.4.2 of the MDA K RFI report (Environmental Restoration Project 1995, 1263). Both LANL and the New Mexico Environment Department continue to monitor springs and sediments in the area.

**b.** Table 4-7: An explanation should be provided for the unusually wide variation in the tritium activities (pCi/L) measured from October 1991 to August 1994, from samples collected from approximately the same locations.

**Response:** The wide variation is entirely consistent with the hypothesis outlined in our response to 4a above; that the observed data represent a mixture of different water sources, with the exact mixing ratio varying with time. Prior to the August 1994 ER sampling episode, samples were collected by the LANL Environmental Surveillance personnel without detailed site descriptions, and it is impossible to accurately recover exact sampling locations.

**5. 4.1.3.2.2 Borehole Interpretations:**

**a.** As stated in 4.1.3.9.2 "active discharges from the building continue. "Paragraph 4.1 states that no personnel are stationed in the building and all equipment has been removed. **[a]** An explanation should be included as to the source and reason for current discharge from the building, and **[b]** if these current discharges are significant enough to cause migration of sub-surface tritium.

**Response: [a]** The building is empty, but because water and electricity are still supplied to TA-33-86, LANL facilities managers do not consider it inactive. The sanitary facilities in TA-33-86 are not in use. Facilities in the adjacent guard shack are used instead. The exhaust stack still operates to ventilate the building. At this time effluent from the following equipment discharges to septic system TA-33-93 (Michelotti 1995, 02-113).

| EQUIPMENT | DISCHARGE TO SEPTIC SYSTEM |
|---|---|
| Cooling jacket | Less than 1 gal/day |
| Cooling tower blowdown | 100 gal/week |
| Guard shack sanitary facilities | Permitted for 20 gal/day. Used intermittently. |

**Response: [b]** Recommendations on discharges to MDA K are discussed in Section 4.1.4.2 of the RFI report. Data discussed in Section 4.1.3.2.1 of the RFI report for MDA K imply that modest discharges to the system did not caused significant migration of subsurface tritium between 1989 and 1994.

**b.** Chaquehui Anomaly

The explanation for the Chaquehui Anomaly in 4.1.3.2.2 does not agree with the explanation cited in 4.1.3.2.1.

Sections 4.1.3.2.2 and 4.1.3.2.1 were meant to convey the same information. Sampling and drilling data suggest that subsurface groundwater flow is <u>not</u> a reasonable pathway for tritium found in sediments at the mouth of Chaquehui Canyon. Please also note the response to question 4 a of this NOD. LANL has no explanation for the source and pathway of the anomaly at this time. Both LANL and the New Mexico Environment Department continue to monitor springs and sediments in the area.

***6.* 4.1.3.3. Risk Assessment:**

The Rio Grande River should be reconsidered as a possible exposure pathway due to the presence of tritium in sediment samples collected from near the confluence of Chaquehui Canyon and the Rio Grande. As indicated by the report, the origin of tritium at this location is unknown and the variation in activity is unusually great.

LANL disagrees that the Rio Grande should be considered as a possible exposure pathway in the risk-based decision making process for the PRSs associated with MDA K. The reasons for this position are as follows:

- The origin of the tritium detected in the sediment samples near the confluence of Chaquehui Canyon and the Rio Grande in 1991 (Chaquehui anomaly) is not understood. However, tritium concentrations in area sediments seem to be generally decreasing, as indicated in Table 4-7 of the RFI report for MDA K (Environmental Restoration Project 1995, 1263). This drop, if real, suggests a one-time spike in deposition, possibly associated with operational activities at the Laboratory, rather than ongoing contaminant migration from a source of tritium at MDA K or some other remote location.

- The Rio Grande is not technically considered a viable exposure pathway for decision making at this site due to the distance from MDA K to the river. This distance is important as it relates to the potential for hydraulic contaminant transport and the results of the RFI sampling mentioned above. Hydraulic driving forces previously in place at MDA K during site operations, i.e., cooling water and septic tank discharges, have been greatly diminished, thereby reducing the potential for contaminant transport from MDA K.

- Dilution in the river is also a major consideration when evaluating the river as a viable pathway. Dilution results in even lower risk levels.

7. **4.2 SWMU 33-002(b) Sump TA-33-134:**

**[a]** The description of the sump should provide an estimated date for when the sump was last used to dispose of significant amounts of waste. **[b]** The rubble fill should be described in terms of particle size to determine the likelihood of waste migration from the sump. **[c]** Any indication of sump overflow should be noted.

**Response:** [a] Waste discharge volumes at TA-33-86 were never recorded. A reasonable estimate for the last discharge of any kind to the sump is September 1991 when LANL Director's Policy DP104, prohibiting discharges to the environment, went into effect. In accordance with DP104 and LANL Administrative Requirements 9, Section 6, industrial wastewater (e.g., mop water) from TA-33-86 was carried to the LANL radioactive liquid waste treatment facility at TA-50 (Michelotti 1995, 02-113).

**Response:** [b] From surface indications, the rubble fill varies from sand-like particles to irregular 1-2 ft tuff boulders. Field notes from sampling describe the fill at 4 ft as 50% 0.25 in. aggregate and 50% fines. The fill at 5 ft depth was aggregate rock ranging from 0.25 to 1 in. (ICF-Kaiser 1994, 02-095).

**Response:** [c] There is no indication of overflow at this sump. The sump forms a surface depression approximately 18 in. deep in very loose, dry, pumice soil.

8. **4.2.2 Field Investigation:**

The unspecified drilling method and sampling adjacent to the sump was inadequate as indicated by a penetration depth of only 30 inches.

**Response:** Hand augering was the drilling method for collecting samples. The unlined sump was sampled at a depth of 5 ft, as explained in Section 4.2.2 of the MDA K RFI report (Environmental Restoration Project 1995, 1263). (A borehole drilled adjacent to the sump was sampled at the soil/tuff interface, at 30 in.)

Because LANL also believes sampling was inadequate, sumps TA-33-133 and TA-33-134 will be resampled. Please see the Phase II sampling and analysis plan for the sumps in Sections

2.2 and 3.2 of Appendix B of the MDA K RFI report. The plan specifies drilling to a depth of 15 ft in the center of each unlined sump using a hollow-stem auger drill rig. Samples will be collected at depths of 5 ft, at 8 ft or soil/tuff interface, and at 15 ft.

**9. 4.3 SWMU 33-002(c) Sump TA-33-133:**

Same comments as for Sump 33-002(b), Sump TA-33-134.

**Response:** After 1959 there was no pathway for waste to reach the sump. In 1959 the drainpipe leading into sump TA-33-133 was extended through the sump and routed approximately 75 ft downslope to daylight. Between 1959 and 1990, the drainpipe was used for once-through cooling water blowdown. There is no indication that cooling water entered the sump.

**Response:** From surface indications, the rubble fill varies from sand-like particles to irregular 2–3 ft tuff boulders. Sampling field notes describe the fill as "loose material with pieces of gravel and tuff" (ICF-Kaiser 1994, 02-095).

**Response:** There is no indication of overflow at this sump. During sampling the sump location was difficult to find. This sump will be resampled; see response to question 8 above.

## REFERENCES

Environmental Restoration Project, September 29, 1995. "RFI Report for MDA K, PRSs 33-002 (a,b,c,d,e), Field Unit 3," Los Alamos National Laboratory Report LA-UR-95-3624, Los Alamos, New Mexico. **(Environmental Restoration Project 1995, 1263)**

ICF-Kaiser, February 17, 1994. "Summary of 1993 Survey and Sampling Activities at TA-33 (Main Site and Area 6)," ICF-Kaiser Engineers, Inc., Contract 9-XS2-X5348-1, Los Alamos, New Mexico. **(ICF-Kaiser 1994, 02-095)**

LANL (Los Alamos National Laboratory), January 1995. "RFI Report for TA-33," Los Alamos National Laboratory Report LA-UR-95-882, Los Alamos, New Mexico. (LANL 1995, 1212)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 4, Los Alamos National Laboratory Report LA-UR-95-740, Los Alamos, New Mexico. **(LANL 1995, 1164)**

Longmire, P. A., D. E. Broxton, and S. L Reneau (Eds.), October 1995. " Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments, and Bandelier Tuff, Los Alamos, New Mexico, Los Alamos National Laboratory Report LA-UR-95-3486, Los Alamos, New Mexico. **(Longmire et al. 1995, 1266)**.

Michelotti, R. August 29, 1995. Telephone conversation: Roy Michelotti (CST-18) and Steve Diamond (Santa Fe Engineering) recorded in Michelotti notebook, Los Alamos National Laboratory, Los Alamos, New Mexico. **(Michelotti 1995, 02-113)**