TA-35

Department of Energy
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

MAR 2 2 1989

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

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HAZARDOUS WASTE SECTION

Mr. John Gould
Hazardous Waste Section
Environmental Improvement Division
1190 St. Francis Drive
Harold Runnels Building
Santa Fe, New Mexico 87503

Dear Mr. Gould:

Reference is made to response to Environmental Improvement Division (EID) letter dated March 7, 1989.

Enclosed is the supporting documentation for the Ground Water Monitoring Waivers at Technical Area (TA) 35 TSL-85 and TSL-125 Surface Impoundments. The signed certification for this demonstration is located in the front of Volume 1. These waivers, along with the supporting documentation, were requested by Mr. Boyd Hamilton in his March 7, 1989, letter. Pursuant to Section 74-4-4.3 of the New Mexico Hazardous Waste Act, the Department of Energy is submitting these waivers to the EID within 10 days of receipt of the request.

If you have any questions, please call Donna Lacombe of my staff at 667-5288.

Sincerely,

Harold E. Valencia
Area Manager

5 Enclosures

Enclosures are located in LANL Bookcase

5047

Supporting Documentation for the

GROUND-WATER MONITORING WAIVERS AT THE TA-35 TSL-85 AND TSL-125 SURFACE IMPOUNDMENTS

REFERENCES CITED

VOLUME 1 OF 4

Environmental Surveillance Group (HSE-8)
Los Alamos National Laboratory
Los Alamos, New Mexico
RCRA Number NM-0890010515

REFERENCES CITED

The following references are contained in Volume 1 of 4:

Abeele, W.V., M.L. Wheeler, and B.W. Burton, 1981, Geohydrology of the Bandelier Tuff; Los Alamos National Laboratory, Report No. LA-8962-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

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BEF, 1986a, Vadose zone characterization of Technical Area 54, Waste Disposal Areas G and L, Los Alamos National Laboratory, New Mexico: Report 3, Preliminary assessment of the hydrologic system; Bendix Field Engineering Corporation report to Los Alamos National Laboratory, Los Alamos, New Mexico.

Supporting Documentation for the

GROUND-WATER MONITORING WAIVERS AT THE TA-35 TSL-85 AND TSL-125 SURFACE IMPOUNDMENTS

hand delivered by Donna Lacombe DOE, Albuquerque Operations Los Alamos Area Office

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MAR 22 1989
HAZARDOUS WASTE SECTION

prepared for

New Mexico Health and Environment Department

Environmental Improvement Division - Hazardous Waste Section

by the

Environmental Surveillance Group (HSE-8)

Los Alamos National Laboratory

Los Alamos, New Mexico

RCRA Number NM-0890010515

INTRODUCTION

During the summer of 1988, individual surface impoundments located at Technical Area (TA) 35, TSL-85 and TSL-125, were sampled for potential hazardous wastes and hazardous waste constituents. Contaminant indicator parameters for each impoundment included volatile (VOA) and semi-volatile (SVOA) organic compound analyses that are included on the U.S. Environmental Protection Agency's (EPA) Contract Laboratory Program (CLP) list, wastes exhibiting the characteristics of Extraction Procedure (EP) toxicity, PCB's, and radiological constituents. Analytical results from these sampling efforts have been summarized in each respective closure plan document (IT, Inc., 1988a and 1988b). However only certain VOA analyses from the EPA's CLP list at each impoundment were identified as being above detection limits. These compounds were the basis for declaring the surface impoundments as regulated units under the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. All other indicator parameters were either below detection limits, or were below regulated concentration levels.

These surface impoundments were declared as RCRA regulated units in October 1988, by Los Alamos National Laboratory's (LANL) Environmental Surveillance Group (HSE-8) following completion of sample analyses. At that time separate interim status closure plans (IT, Inc., 1988a and 1988b) were submitted to the New Mexico Environmental Improvement Division (NMEID) by the U.S. Department of Energy (DOE) for final clean closure under New Mexico Hazardous Waste Management Regulations (NMHWMR-4) 206.C.2.a through 206.C.2.k [40 CFR 265.110 through 120], and NMHWMR-4 206.C.6.f (40 CFR 265.228). As RCRA regulated units, these impoundments are required to have ground-water monitoring plans under NMHWMR-4 206.C.1.a through e (40 CFR 265.90 through 94), unless it can be demonstrated under NMHWMR-4 206.C.1.a(3) [40 CFR 265.90(c)] that there is a low potential for migration of hazardous waste constituents from the facility via the uppermost aquifer to water supply wells or to surface water.

This document is a demonstration in support of ground-water monitoring waivers at the TA-35 TSL-85 and TSL-125 surface impoundments. A single waiver demonstration in support of two separate facilities is justified because they are in close proximity to one another, and because the hydrogeological conditions below each impoundment are nearly identical. This document will be maintained on file at the LANL HSE-8 office. It has been certified by William D. Purtymun, a qualified geologist, and by Stephen G. McLin, a qualified ground-water hydrologist and geotechnical engineer. Both of these individuals are staff members with HSE-8.

REQUIREMENTS FOR AN INTERIM STATUS GROUND-WATER MONITORING WAIVER

All or part of the ground-water monitoring requirements of NMHWMR-4 206.C.1 may be waived if the owner or operator can demonstrate that there is low potential for migration of hazardous waste or hazardous waste constituents from the facility via the uppermost aquifer to water supply wells or to surface water. This demonstration must be in writing, and must be kept at the facility. This demonstration must be certified by a qualified geologist or geotechnical engineer and must establish the following:

1. The potential for migration of hazardous waste or hazardous waste constituents from the facility to the uppermost aquifer by an evaluation of:

   a. A water balance of precipitation, evapotranspiration, runoff, and infiltration; and

   b. Unsaturated zone characteristics, including geologic materials, physical properties, and depth to ground-water; and

2. The potential for hazardous waste or hazardous waste constituents which enter the uppermost aquifer to migrate to a water supply well or surface water by an evaluation of:

   a. Saturated zone characteristics, including geologic materials, physical properties, and rate of ground-water flow; and

   b. The proximity of the facility to water supply wells or surface water.

This demonstration has been organized into several sections that follow. The "Summary of Background Information" section is presented in a logical order to correspond with the numbered regulatory requirements for a monitoring waiver given above. Thus all information related to potential contaminant migration from the surface impoundments through the unsaturated zone and to the main aquifer is summarized first. Then all information related to the potential contaminant migration in the main aquifer to water supply wells or to surface water is summarized. A "Conclusions" section is then presented; these conclusions are ordered so as to correspond to the waiver requirements presented above. Finally a "References Cited" section lists all published and unpublished reports used by us in arriving at our stated conclusions.

SUMMARY OF BACKGROUND INFORMATION

Migration Potential Through the Unsaturated Zone

The water balance equation, which includes components for precipitation, evapotranspiration, runoff, and deep infiltration, indicates that there is no recharge to the uppermost aquifer (Purtymun, 1962; Abrahams et al., 1963; Cushman, 1965; Purtymun and Kennedy, 1966; Lane, 1981; and NMEID, 1984). The uppermost aquifer beneath Pajarito Plateau (TA-35) is recharged from precipitation in the intermontane basin west of Los Alamos (Cushman, 1965; and Purtymun, 1984). Recent studies of the tuff recovered below the TA-54 area indicate a combination of low unsaturated hydraulic transmitting characteristics, the occurrence of extremely low moisture contents, and very low vertical fluid flux potentials. This indicates that aqueous transport of contaminants through the Bandelier Tuff is not a viable mechanism for contaminant migration (Purtymun, et al., 1978a; BEF, 1985a, 1985b, 1986a, 1986b; and IT Inc. 1987).

The geologic section of the Bandelier Tuff at TA-35 is very similar to the physical and hydrologic characteristics of the tuff at TA-54, Areas G and L (Purtymun and Abrahams, 1967; Purtymun and Kennedy, 1970; Purtymun, et al., 1978b; and IT Inc., 1987). However, the thickness of the unsaturated tuff and sediments at TA-35 is greater than at TA-54, as indicated in the table shown below.

Geologic Section at TA-35	Thickness (ft)	Depth (ft)
BANDELIER TUFF		
Tshierege Member		
Unit 3	100	100
Unit 2b	40	140
Unit 2a	80	220
Unit 1b	25	245
Unit 1a	70	315
Otowi Member	385	700
Guaje Member	50	750
PUYE CONGLOMERATE		
Fanglomerate with interbedded basalts	790	1,540
TESUQUE FORMATION		
Siltstones, sandstone, with occasional conglomerate, and interbedded basalts	+1,500	+3,040

The water table surface of the uppermost aquifer is at a depth of about 1,250 ft at TA-35. Of that, the upper 750 ft consists of unsaturated Bandelier Tuff, while the underlying 500 ft consists of unsaturated volcanic sediments and interbedded basalts. There is no perched water beneath the surface of the mesa and the top of the uppermost aquifer.

The unsaturated tuff below TA-35 consists of an ash matrix containing quartz and sanidine crystals, crystal rock fragments of latite and rhyolite, and pumice. The hydrologic transmitting characteristics and low volumetric moisture contents indicate no appreciable amounts of atmospheric recharge to the uppermost aquifer. Furthermore, physical rock properties, such as porosity intrinsic permeability, and specific retention, further support this conclusion. Rock matrix openings related to porosity are capillary in size (i.e., less than 1 mm); however many of these are dead-end pore spaces. The hydrologic and physical characteristics of the unsaturated tuff above the uppermost aquifer are discussed by Abrahams (1963); Baltz, et al. (1963); Purtymun and Koopman (1966); Purtymun (1967 and 1973); Keller (1968); Purtymun, et al. (1978b and 1980); Abeele, et al. (1981); IT Corp.(1987); Brown, et al. (1988); and Stephens (1988).

Migration Potential in the Saturated Zone

The geology and hydrology of the uppermost aquifer, and the development of water supply is documented in Theis and Conover (1962); Griggs and Hem (1964); Cushman (1965); Purtymun and Cooper (1969); Purtymun and Johansen (1974); Purtymun (1975); Purtymun and Adams (1980); Purtymun, et al. (1974, 1980, 1983, and 1984); and John, et al. (1966). The closest water supply well to TA-35 is well number PM-5, located approximately 2,000 ft to the southeast on the mesa between Mortandad and Ten Site Canyons (Purtymun, 1984). Locations of other municipal water supply wells in Los Alamos County are to the north, east, and south of TA-35 (Purtymun, 1984).

PM-5 was completed as a municipal supply well in 1982; routine water quality sampling has shown no indication of contamination (HSE-8, 1988). The well was completed to a depth of 3,093 ft into the Puye Conglomerate and Tesuque Formation. It penetrated a saturated thickness of about 1,885 ft. Aquifer tests indicated a transmissivity of approximately 10,000 gpd/ft; the storage coefficient is estimated to be 0.01.

The ground-water flow rate near PM-5 is to the east at approximately 95 ft/yr, while to the north ground-water flow rates may be as high as 250 ft/yr. South of PM-5, ground-water flow is toward the southeast at approximately 345 ft/yr.

The nearest surface water body to the TA-35 impoundments is the Rio Grande, located some 7.1 miles to the east (Purtymun, 1984). This distance was measured along a streamline drawn perpendicular to the piezometric contours constructed for the uppermost aquifer.

Hypothetical computer simulations (Javandel, et al., 1984) indicate that even if the entire maximum liquid volume at both surface impoundments (i.e., 8,000 gal at TSL-125, and 12,500 gal at TSL-85; see IT, Inc., 1988a and 1988b) leaked directly into the main aquifer (i.e., there was no 1,250 ft of unsaturated tuff between the impoundment bottoms and the main aquifer) over a one year period (i.e., a hypothetical constant impoundment leakage rate of 0.039 gpm), there would be no detectable contamination at PM-5. These simulations assume the contaminant of interest would be a conservative tracer with no porous matrix adsorption or contaminant degradation effects. However volatile organic compounds typically exhibit a strong tendency toward both matrix adsorption and biodegradation, in addition to dispersive mixing in saturated flow. Hence these hypothetical simulations are extremely conservative.

The hypothetical simulations of Javandel, et al. (1984) are presented in dimensionless form so that they are applicable to a wide variety of aquifer configurations; furthermore, they assume steady hydraulic conditions in the main aquifer. For the uppermost aquifer at TA-35, we have a transmissivity of 10,000 gpd/ft, a storage coefficient of 0.01, a dispersion coefficient of about 1.0 sq ft/day, a mean ground-water flow rate of about 150 ft/yr oriented approximately due east, and a hypothetical constant input contaminant concentration level of 10.0 mg/l. The influence of pumping at well PM-5 was directly taken into consideration in computing the mean ground-water flow rate. With these aquifer and contaminant input parameters, the dimensionless concentrations of Javandel, et al. (1984) can be translated into predicted contaminant concentration levels at PM-5 by specifying a time of contaminant transport. Using this procedure, the hypothetical simulations for TA-35 indicate that no detectable contaminant concentration levels would ever be detected at well PM-5.

Since the nearest surface water body to either of the surface impoundments addressed in this document is the Rio Grande, located some 7.1 miles away, no additional hypothetical simulations were done. It is obvious that if the hypothetical simulations described above would not affect well PM-5, then there would be no effect on the Rio Grande either.

CONCLUSIONS

After reviewing the documents referenced herein, and from direct and extensive field observations at Los Alamos National Laboratory, we have reached the following conclusions with regard to the surface impoundments at TA-35 TSL-85 and TSL-125:

(1) The potential for migration of hazardous wastes or hazardous waste constituents from the surface impoundments located at TA-35 TSL-85 and TSL-125 to the uppermost aquifer is extremely low to non-existent.

(2) In the highly unlikely event that hazardous wastes or hazardous waste constituents were to enter the uppermost aquifer from these surface impoundments, then there exists an extremely low to non-existent potential for such constituents to migrate from this uppermost aquifer to water supply wells or to surface waters in concentration levels above minimum detection limits.

(3) These conclusions are based on direct field observations made by us, on physical evidence obtained from published and unpublished reports, and on hypothetical computer simulations designed to model subsurface contaminant transport. All of the information used by us in arriving at these conclusions are cited below, and are intended to be part of this demonstration.

CERTIFICATION

GROUND-WATER MONITORING WAIVERS AT THE

TA-35 TSL-85 AND TSL-125 SURFACE IMPOUNDMENTS

We the undersigned do hereby certify that this demonstration in support of separate ground-water monitoring waivers for the above mentioned facilities are correct and accurate, and that all supporting documentation in the reference section of the attached report has been reviewed by us, both individually and collectively. The opinions reached by us, and expressed herein, are based on direct field observations at Los Alamos National Laboratory, and the published and unpublished reports cited in this document. This demonstration consists of five separate sections; they are: (1) Introduction; (2) Requirements for an Interim Status Ground-Water Monitoring Waiver; (3) Summary of Background Information; (4) Conclusions; and (5) References Cited. Copies of the references cited in this demonstration have been included in four separately bound volumes.

William D Purtymun

William D. Purtymun
Geohydrologist

Stephen G. McLin

Stephen G. McLin, Ph.D., P.E.
Ground-Water Hydrologist and Geotechnical Engineer

REFERENCES CITED

The following references are contained in Volume 1 of 4:

Abeele, W.V., M.L. Wheeler, and B.W. Burton, 1981, Geohydrology of the Bandelier Tuff; Los Alamos National Laboratory, Report No. LA-8962-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Abrahams, J.H., J.E. Weir, and W.D. Purtymun, 1963, Distribution of moisture in soil and near-surface tuff on the Pajarito Plateau, Los Alamos County, New Mexico; U.S. Geological Survey, Short Articles in the Geologic and Hydrologic Sciences, Article No. 339, Washington, D.C.

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Baltz, E.H., J.H. Abrahams, and W.D. Purtymun, 1963, Preliminary report on the geology and hydrology of Mortandad Canyon near Los Alamos, New Mexico, with special reference to disposal of liquid low-level radioactive wastes; U.S. Geological Survey, open file report, Albuquerque, New Mexico.

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BEF, 1986a, Vadose zone characterization of Technical Area 54, Waste Disposal Areas G and L, Los Alamos National Laboratory, New Mexico: Report 3, Preliminary assessment of the hydrologic system; Bendix Field Engineering Corporation report to Los Alamos National Laboratory, Los Alamos, New Mexico.

The following references are contained in Volume 2 of 4:

BEF, 1986b, Vadose zone characterization of Technical Area 54, Waste Disposal Areas G and L, Los Alamos National Laboratory, New Mexico: Report 4, Preliminary assessment of the hydrologic system through fiscal year 1986; Bendix Field Engineering Corporation report to Los Alamos National Laboratory, Los Alamos, New Mexico.

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