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IN REPLY  
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February 10, 1977

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Gentlemen:

Attached is the January, 1977 report on three programs being pursued at LASL dealing primarily with shallow land burial of radioactively-contaminated solid waste materials. A section is included reporting on special program-related activities on which we have invested some effort this reporting period.

Sincerely,



Lamar J. Johnson  
Group Leader  
H-8 Environmental Studies

LJJ:kr (A414, A415, A420)  
Attachment: Report a/s  
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February 1977

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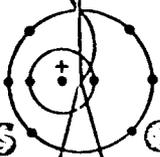
*Handwritten notes:*  
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MONTHLY PROGRESS REPORT

JANUARY 1977

- LS-14-1-8A  
EVALUATION OF TRU-CONTAMINATED WASTE BURIAL SITES
- LS-15-1-8A  
LASL RADIOACTIVE SOLID WASTE DISPOSAL SITE STUDIES
- LS-20-1-8A  
RADIOACTIVE WASTE BURIAL TECHNOLOGY
- RELATED ACTIVITIES

LOS ALAMOS SCIENTIFIC LABORATORY  
ENVIRONMENTAL STUDIES GROUP H-8



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LOS ALAMOS, NEW MEXICO 87544

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WORK PERFORMED FOR  
DIVISION OF WASTE MANAGEMENT,  
PRODUCTION, AND REPROCESSING  
U.S. ENERGY RESEARCH  
AND DEVELOPMENT ADMINISTRATION

UNITED STATES  
ENERGY RESEARCH AND  
DEVELOPMENT ADMINISTRATION  
CONTRACT W-7405-ENG. 36

## EVALUATION OF TRU-CONTAMINATED WASTE BURIAL SITES, LS-14-1-7A

Biological transport model documentation efforts continued through January. Testing of the information in the user's manual was started the last week of the month. The testing will identify errors in the instructions, and will serve to check that all of the available options operate properly. The computer code documentation will begin in February with the labeling of subroutines and the adding of explanatory information for the user.

The ground work was laid during January for the final evaluation of all LASL TRU-contaminated waste burial sites. Of first interest will be developing techniques for assessing the impact of burrowing animals on shallow land burial sites. Particular interest lies in parameters such as the depth of burrows, the quantity of soil excavated, the population density, and the average useful life span of a burrow. On the basis of the information developed in the preliminary evaluation of LASL burial sites, waste excavation by burrowing animals may prove to be an important short-time-frame release mechanism.

## LASL RADIOACTIVE SOLID WASTE DISPOSAL SITE STUDIES, LS-15-1-8A

A number of projects are underway at the current LASL waste disposal site, Area G, TA-54, and at some of the older, closed burial grounds.

### Area G Studies

Core from all five horizontal monitoring holes beneath Waste Disposal Pit #3 was screened for radioactivity with a NaI detector. The electronics package is calibrated to have an energy window of approximately 12-40 keV. This window will be sensitive to  $^{90}\text{Sr}$ , uranium, thorium, plutonium, americium, and  $^{137}\text{Cs}$ . For specific isotopes, this window can be changed for optimum sensitivity. Soil samples placed in petri dishes (sample mass  $\sim 70$  g) and held flush with the detector face yield the following sensitivities:

1.  $^{239}\text{Pu}$ --9.3 pCi/cpm; detectability ( $3\sigma$  level, 10 min count)  
= 100 pCi/g

2.  $^{90}\text{Sr}$ --3.6 pCi/cpm; detectability ( $3\sigma$  level, 10 min count)  
= 50 pCi/g

Note--for soil core samples, these values will be modified somewhat. Also, the detection limits will improve with the addition of detector shielding.

The count time used during the screening was much less than 10 min, reducing the detectability to a few nanocuries per gram. No radioactivity above the sensitivity level was detected. Of the samples collected, every other one was submitted for gross-alpha, -beta, and -gamma, and  $^{137}\text{Cs}$  analyses. Core from the three other horizontal holes will be sampled and submitted in February. Two photographs taken during the coring operation are included with this report. The first photo, Fig. 1, depicts the air-operated core rig used to drill the monitoring holes. Core, as shown in the second photo, Fig. 2, was collected in runs of 5, 10 or 20 feet depending on drilling conditions. The core was then boxed and marked as to hole and depth.

The lower level of the meteorological tower at Area G was wired for two windspeed channels and one temperature channel. A considerable amount of this month's effort involved grounding the tower to prevent damage from lightning strikes.

#### Studies at Other Areas

Half of the surface soil samples from closed waste disposal sites C and F were prepared for gross-alpha, gross-beta,  $^{137}\text{Cs}$ , and  $^3\text{H}$  analyses. (There are a total of 208 surface soil and 187 vegetation samples from the two areas). Moisture in the soils was distilled for  $^3\text{H}$  analysis. Approximately 500 g of soil were dried at  $100^\circ\text{C}$  for 24 hrs before being counted for  $^{137}\text{Cs}$  in a scintillation detector. The remainder of the soil samples will be prepared and submitted in February. The immediate purpose of the project is to define any surface contamination at Area C and to establish whether Area F was ever used for radioactive waste disposal. This project will also aid in establishing monitoring techniques for closed waste disposal sites. A records search for information on closed radioactive waste disposal sites was made.

### Related Studies

LASL Group G-6, Geosciences, has initiated a geologic study of the Bandelier Tuff, the rock type on which the Laboratory is situated. The purpose of the study is to determine the distinguishing geologic and geochemical characteristics of the different units of the tuff, which are necessary for defining the hydrologic and engineering parameters of the units. This information is vital to radionuclide migration studies. Review of existing geologic data will be done in February in preparation for field studies starting in March.

Progress was made on development of other instrumentation for radionuclide detection. The field Phoswich has undergone further evaluation this month and additions/modifications to the one existing instrument are planned. Besides changing the collimation of the detector (making it adjustable), an internal timer/scaler to allow long quantitative counts in the field will be added. This will also improve field detectability. In addition, we will add "smart" logic of either a type developed by LASL Group R-2, or one based on micro processors. Such logic will enhance the field search capability of the instrument by alarming only when the signal reaches a given preset level.

### RADIOACTIVE WASTE BURIAL TECHNOLOGY, LS-20-1-8A

One element of this program includes examination of the present distribution of radionuclides adjacent to existing LASL disposal sites, and use of the data to understand the processes causing the distribution. Analytical data on the  $^{239}\text{Pu}$  and  $^{241}\text{Am}$  distribution beneath an abandoned liquid waste disposal trench was obtained during the month. The distributions, shown in Fig. 3, indicate a strong relationship between the two nuclides. However the original waste solutions contained isotopes  $^{238}\text{Pu}$ ,  $^{239}\text{Pu}$ ,  $^{240}\text{Pu}$  and  $^{241}\text{Pu}$  in unknown proportions. A substantial portion of the  $^{241}\text{Am}$  observed in the core was derived from decay of  $^{241}\text{Pu}$  (half-life of 13.2 yrs) since the time of disposal (approximately 25 yrs). Inquiry into techniques for analysis of the present  $^{241}\text{Pu}$  content of the core indicates that only mass spectrometry would

provide the analytical sensitivity required. That technique requires a much larger sample (more than 10 kg) than is available from the core. Thus, no direct determination is possible of the relative mobilities of  $^{241}\text{Am}$  and  $^{239}\text{Pu}$ . Inspection of the ratios of the two nuclides indicates that  $^{241}\text{Am}$  appears more mobile, but much more data is required to confirm or refute this point.

#### RELATED ACTIVITIES

The outline for the Shallow-Land Disposal Section of the GBIS was finalized during the month. A three day visit with BPNL in Richland identified those areas where further LASL inputs are required. Work was begun on developing those inputs, and the writing of the final text was initiated. That work is presently targeted for completion by February 15.

The writing of replies to comments on NUREG 0116 was completed and forwarded to the NRC. Two days were spent in Bethesda, Maryland, with NRC staff developing an appendix to NUREG 0116 which will answer the majority of those comments.

Contact was made with F. Scott Keys from the Denver office of the USGS. LASL is designated as technical advisor to the ERDA sponsored USGS program to improve down-hole logging capabilities for monitoring waste disposal sites. Initial work at LASL will involve calibration of probes for measurement of specific radio-nuclides.

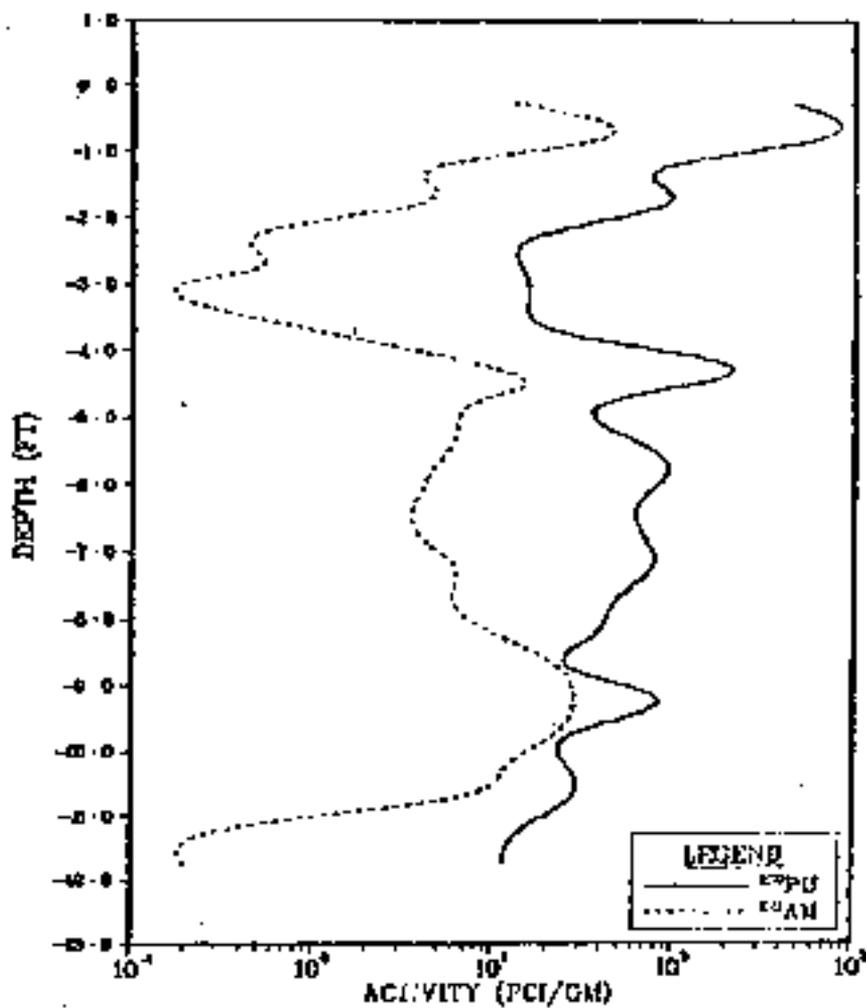


Fig. 3. Radionuclide Distribution  
Beneath Absorption Bed No. 4, Area T,  
TA-1.