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In reply refer to LS6-80-71  
Mail stop:495

February 29, 1980

Mr. John Peel  
Idaho Operations Office  
550 2nd St.  
Idaho Falls, ID 83404

Dear John:

Enclosed are the January 1980 Monthly Reports on those projects under your low-level waste program.

Sincerely,

James G. Steger  
LS-6 Alternate Group Leader  
Environmental Science Group

JGS:tj

Enc: Monthly Report  
Distribution List



7975

1807 Report

M.A. Roque

MONTHLY PROGRAMS REPORT

January 1980

AL 3.5.1  
Solid Radioactive Waste Disposal Studies

AL 3.5.4  
Shallow Land Burial Technology

AL 3.10.1  
Alternative Systems Study

LOS ALAMOS SCIENTIFIC LABORATORY  
ENVIRONMENTAL SCIENCE GROUP LS-6

Work performed for

DIVISION OF WASTE MANAGEMENT  
US DEPARTMENT OF ENERGY

University of California



LOS ALAMOS SCIENTIFIC LABORATORY

## PROGRAM STATUS REPORT

Title: Solid Radioactive Waste Disposal Studies BR&C NO.: AR-05-15-15

FO/Contractor: AL/LASL WEP NO.: AL 3.5.1

Manager: James G. Steger Annual Budget: \$300k

Principal Investigator: M. A. Rogers Date: February 1980

Month Covered: January 1980

### Task Description:

The purpose of this task is to develop methods for environmental monitoring and surveillance of low-level waste disposal facilities. The approach taken will be to assess the migration of radionuclides from wastes buried during the last 35 years at LASL in order to determine waste/soil interactions and radionuclide movement in a semi-arid environment. Potentially significant pathways will be identified and modeled. A method of monitoring radionuclide movement along these pathways will be developed along with identifying the constraints that must be imposed upon disposal site operating practices and waste forms.

### Highlights and Significant Accomplishments

The field work for the pit location study was started this month. Thermal infrared photographs taken by the Air Force in 1977 were collected. They are small scale and the resolution is rather poor for our purposes. H-8 was having trouble locating the sorption beds at Area V (laundry site) and requested our help. The most recent engineering drawing indicated that some steel acid waste pipes were still in place, so we surveyed the area with a metal detector and a magnetometer. Except for locating some rebar and nails at shallow depths, the metal detector results were negative. The magnetometer survey showed no major anomaly. Either the pipes have been removed or the geometry is wrong (PNL had similar troubles with buried pipes). After the ground dries out from recent snowmelt, we intend to continue with resistivity and seismic refraction measurements.

Some time this month was spent on the verification of the acute release mechanism data in LA-6694-MS. Two informal reports are completed (tornado and meteorite impact), and the third will be finished shortly (earthquake). An analysis of the potential for another volcanic eruption will take some time.

CMB-6 has told us they are waiting for their x-ray diffraction equipment to be set up before proceeding with melting the tuff to form glass samples for the "index of refraction" study. Group P-2 has sent the results on the analyses for the "NURE" elements and Group CMB-1 has sent results on x-ray fluorescence and Si content. There are a total of 32 "NURE" elements, Sc, Cr, Fe, Co, Zn, Rb, Sb, Cs, La, Ce, Sm, Eu, Tb, Yb, Lu, Hf, Ta, Au, Th, Ha, Mg, Al, Cl, K, Ca, Ti, V, Mn, Sr, Ba, Dy, and U. X-ray fluorescence turned up 8 elements whose content in the tuff was above 5 ppm, Bi, Cu, Nb, Pb, Sn, W, As, and Zr. Si content ranged from 32.4 - 35.6%. The chemical analyses will be used to determine what caused the differences we may see in the index of refraction for the glasses. With the Si content showing up so uniform throughout the Bandelier Tuff, the hope of seeing clear differences between glass samples is fading. At any rate we are certainly building up some good background data on the chemistry of the tuff.

Based on data published in Remote Sensing, by Floyd F. Sabins, Jr. (621.3675116 r) p. 125, the thermal conductivity for dry welded tuff was calculated to be  $1.715 \text{ W}^\circ\text{K}^{-1}\text{m}^{-1}$  and the thermal capacity by volume  $337 \text{ Wh}^\circ\text{K}^{-1}\text{m}^{-3}$  out of which thermal diffusivity of  $9.6563 \times 10^{-7} \text{ m}^{-2}\text{s}^{-1}$  is derived. This leads us to the conclusion that the temperature fluctuation depth, defined as the depth at which the fluctuation is reduced to 0.01 of its surface value, is 0.75 m on a daily basis. The interval between the times of arrival of extreme values at soil level and 0.75 m deep will be 63400 s or 17 hr 37 min.

Both the thermal conductivity and the thermal capacity by volume will increase with moisture content. At low moisture content, the rate of increase will be much higher for the thermal conductivity but will taper off at higher moisture content, so that a maximum thermal diffusivity will exist at a moisture

content by volume of 0.15 where it will reach  $4.35 \times 10^{-6} \text{m}^2 \text{s}^{-1}$ . The daily fluctuation depth may then reach 1.60 m and the lag will be around 63600 s, which is roughly the same as for dry tuff.

Budget Variance Analysis

None

Milestone Variance Analysis

None

Problems and Issues

None



# Milestone Schedule

Level	Milestone No.	Milestone	FY. 80												FY. 81			
			O	N	D	J	F	M	A	M	J	J	A	S	10	20	30	40
3	1.1	Summary Report on Source Term					↓											
3	1.2	Field Sampling Completed																
3	2.1A	Summary Report on Hydrology																
3	2.1B	Summary Report on Geology																
3	2.2A	Feasibility of Coupling PNL/LASL Surface Models Determined																
3	2.2B	PNL/LASL Surface Models for TRU Adopted to LLW																

- ⚙️ Level 0 - Department Controlled Milestone
- ⚙️ Level 1 - EIW - Controlled Milestone
- ⚙️ Level 2 - EIW P - Controlled Milestone
- ⚙️ Level 3 - Lead Field Office - Controlled Milestone
- ✓ Level 4 - Other Milestones and/or Intermediate Event

- ◇ Scheduled Deviation for ☆ or △
- Activity Line
- ↓ Time Now

Solid Radioactive Waste Disposal Studies  
 ES&C No. AR-05-15-15  
 WEP No. AT 3 5 1

PROGRAM STATUS REPORT

Title: Shallow Land Burial Technology BR&C NO.: AR-05-15-15  
FO/Contractor: AL/LASL WEP NO.: AL 3.5.4  
Manager: James G. Steger Annual Budget: \$400k  
Principal Investigator: John W. Nyhan Date: February 1980  
Month Covered: January 1980

Task Description:

To improve the technology related to the shallow land burial of radioactive waste by examining radionuclide mobilization and migration mechanisms, by developing monitoring techniques around burial sites, by developing engineering methods to improve waste containment, and by the construction of a waste burial demonstration facility.

Highlights/Significant Accomplishments

We have continued to process a group of 800 tuff samples collected under an old liquid waste disposal pit at LASL in an effort to examine radionuclide mobilization/migration mechanisms. About 260 of these samples are currently ready to be assayed for transuranics and fission products previously added to these pits using ATASS, the automated radionuclide assay system, which we have developed during FY78 and FY79.

Several accomplishments were made in the area of instrumentation development supporting potential monitoring capabilities. The intrinsic germanium detector was sent to the manufacturer for warranty repair due to a vacuum leak in the cryostat system. While the detector was at the factory for two weeks we also had a liquid nitrogen (LN<sub>2</sub>) monitor installed on the dewar, which will shut down electrical power to the detector when the LN<sub>2</sub> levels are low. The ATASS system is currently being recalibrated for radionuclide sensitivity.

Bids from two vendors were received in January for performing downhole Pu mimic studies. At this time we are trying to confirm exact costs and detection limits from one vendor. Bids from the second vendor were quite explicit. The general technique proposed to measure the "mimic" vanadium migration in soils is the same in both quotations, that of neutron activation followed by high energy gamma ray spectroscopy. The vanadium detection limit in situ would be less than 100 ppm on a weight basis. Because additional information on the expected detectability of the technique is being requested from one vendor, it is premature to detail the proposals here and determine the "winning" quotation. In addition, the quotations are proprietary in nature and cannot be released as part of a general distribution progress report especially at this time. We are currently addressing the feasibility of "salting" the tuff test beds with sufficient vanadium to reach concentrations near 100 ppm, i.e., is the anticipated accelerated weathering technique adequate to attain these levels in a reasonable time, such as 1-2 years. If not, then an alternate plan must be devised for the experiment. We estimate funding needs in excess of that currently available on the order of \$90k for FY80 and \$70k for FY81.

A major effort was expended this month in writing a first draft of a potential LASL report describing the ATASS system (Trujillo, G., J. W. Nyhan, and J.M. Crowell, "Radioactive Waste Burial Technology Program: An Automated Transuranic Assay System for Soils"), five contributions to the waste management annual report, and the annual research proposal.

#### Budget Variance Analysis

None

#### Milestone Variance Analysis

None

### Problems and Issues

The method of using vanadium as a radionuclide mimic was suggested by John Umbarger, H-1, as probably the best means of accelerating weathering. He would like to investigate this, and an additional \$90k of FY-80 funds would be of considerable help.



### Milestone Schedule

Level	Milestone No.	Milestone	FY. 80												FY. 81				
			O	N	D	J	F	M	A	M	J	J	A	S	1Q	2Q	3Q	4Q	
	1	Evaluation of manmade barriers.					+												
	3	Literature survey on influence of waste materials & environmental factors on engineered barriers.																	
	6	Analysis of tuff samples collected under a previously-used liquid radioactive waste disposal bed.																	
	7	Technology & modeling of water flow through unsaturated materials.																	
	8	Completion of LASL lab studies on saturated and unsaturated flow of radioactive waste solutions in tuff.																	
	9	Report on NMSU lab studies on stable element solute retention by soils & tuff.																	
	12	Development of neutron activation tracers & field equipment for monitoring tracer migration.																	

Shallow Land Burial Technology

B&C No.: AR-05-15-15  
WEP No.: AL 3.5.4

- ☐ Level 0 - Department Controlled Milestone
- ☐ Level 1 - EIW - Controlled Milestone
- ☐ Level 2 - EIW P - Controlled Milestone
- ☐ Level 3 - Lead Field Office - Controlled Milestone

- ◇ Scheduled Deviation for ☆ or △
- Activity Line
- ↑ Time Now

PROGRAM STATUS REPORT

Title: Alternative Systems Study BR&C NO.: AR-05-15-15  
FO/Contractor: AL/LASL WEP NO.: AL 3.10.1  
Manager: James G. Steger Annual Budget: \$300k  
Principal Investigator: Merlin Wheeler Date: February 1980  
Month Covered: January 1980

Task Description

The overall goals of the proposed work are to gather information pertinent to analyzing Alternative Disposal Methods and to generate a management plan for a program to evaluate selected alternatives to shallow land burial for the disposal of low level radioactive waste. The work will be structured so as to take maximum advantage of all applicable ongoing and proposed work within DOE and other organizations. In particular, close cooperation will be sought between this work and the High Level Waste disposal work coordinated by ONWI.

Highlights/Significant Accomplishments:

Information was collected pertaining to three alternatives; intermediate depth burial, mined cavity, and sea bed disposal. An outline of topical reports on these three alternatives was developed and will include: Conceptual description, Operational phase, Post-Operational phase, Key Technical Issues, Cost and Risk information.

Work began on preparation of an overview document which will include: Waste characteristics, Performance requirements, Environmental Pathway analysis, and Summary descriptions of Alternatives. The overview document will be issued first, followed by a series of topicals on specific alternatives. Finally, a summary document will be issued, by early FY81.

The specific alternatives have been divided into subgeneric levels. This is necessary because the character of a given alternative is strongly dependent on

some determining set of environmental conditions. At a minimum, intermediate depth burial descriptions will distinguish between arid (deep water tables) and humid (shallow water table) conditions. Mined cavity disposal will be distinguished by major rock type. Sea bed disposal will be subdivided on the basis of method of placement.

Budget Variance Analysis

None

Milestone Variance Analysis

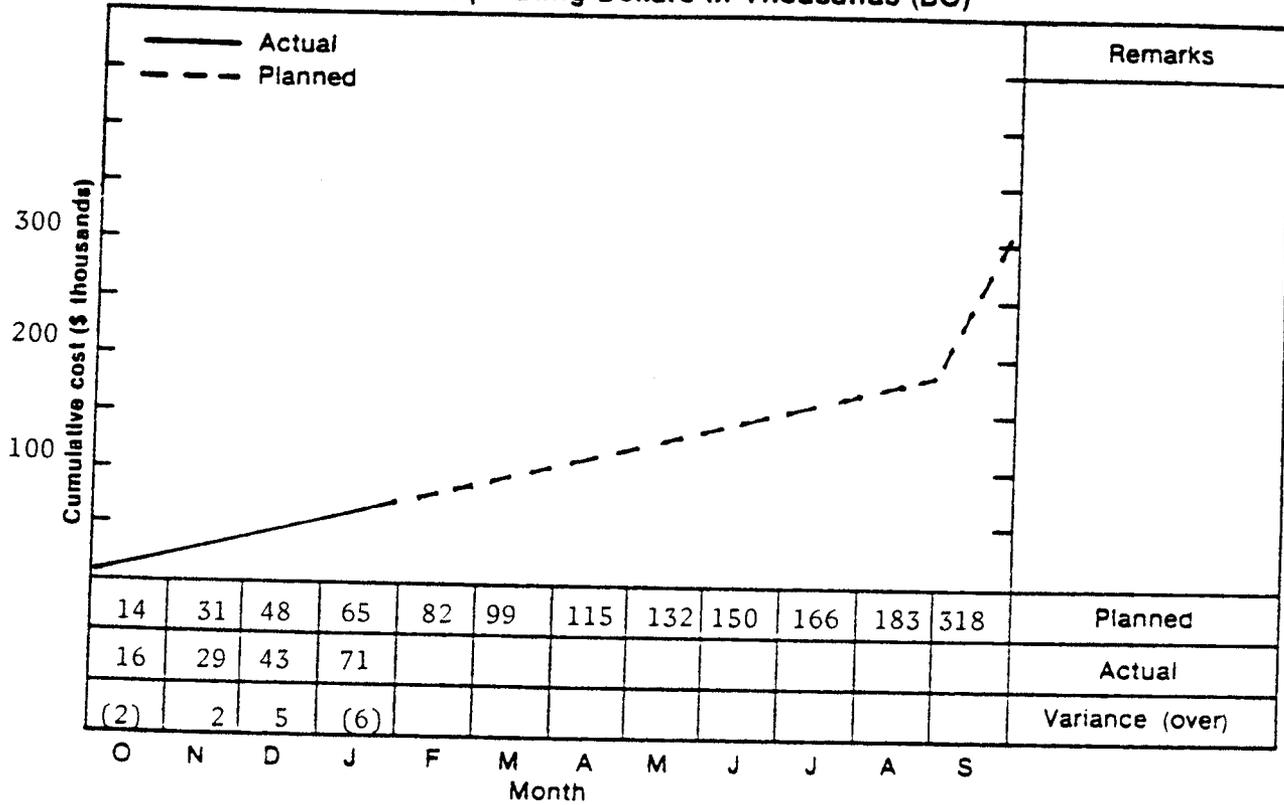
None

Problems and Issues

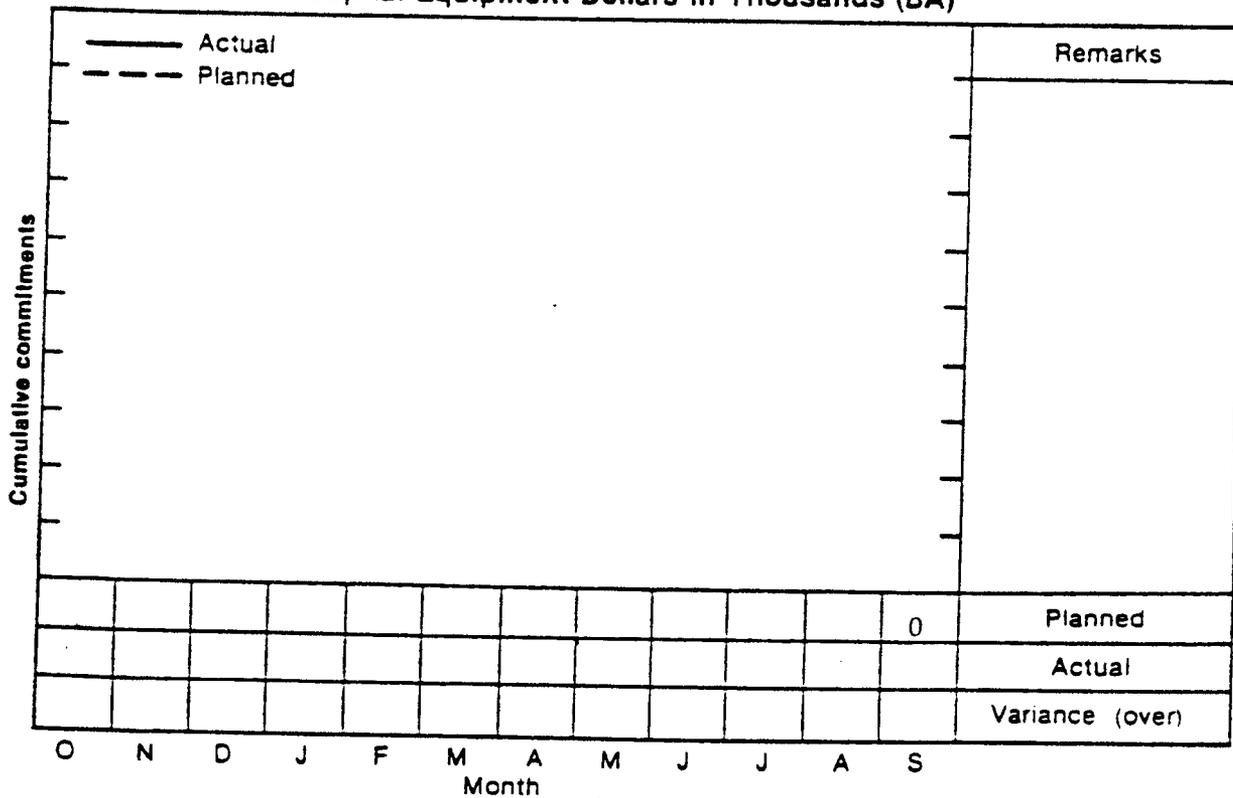
None

Title Alternative Systems Study B&RC No. AR 05-15-15  
 FO/Contractor: AL/LASL FY 80 WEP No. AL 3.10.1

**Operating Dollars in Thousands (BO)**



**Capital Equipment Dollars in Thousands (BA)**



# Milestone Schedule

Level	Milestone No.	Milestone	FY. 80												FY. 81			
			O	N	D	J	F	M	A	M	J	J	A	S	10	20	30	40
3	1.	Input waste characterized					↓		↑									
3	2.	Alternative Options Catalogued								↑								
3	3.	Report on assessment of technical issues											↑					
3	4.	Issue Development Plan															↑	

Activity Alternative Systems Study

ERDC No. AR-05-15-15  
 WEP No. AL 3.10.1

⚙ Level 0 - Department Controlled Milestone  
 ⚙ Level 1 - EIW - Controlled Milestone  
 ⚙ Level 2 - EIW P - Controlled Milestone  
 ⚙ Level 3 - Local Field Office - Controlled Milestone

- - - ⬠ Scheduled Deviation for ☆ or △  
 ——— Activity Line  
 ↑ Time Now

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