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APPENDIX E

USGS AND LASL GUIDELINES FOR PIT CONSTRUCTION

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Ground Water Branch
P.O. Box 4217
Albuquerque, New Mexico
June 30, 1965

Mr. Salvatore E. Russo
Chief, Engineering 3
Los Alamos Scientific Laboratory
Los Alamos, New Mexico

Dear Sir:

The following guidelines are proposed for the construction of pits for the disposal of solid radioactive wastes on Mesita del Buey, Los Alamos County, New Mexico. These guidelines were formed during a meeting held at Los Alamos on June 23, 1965 with the following people in attendance.

Salvatore Russo, Eng. 3; Ben Williams, Eng. 3; Dean Meyers, H-1; William Kennedy, H-6; and C. W. Christenson, H-7 of the Los Alamos Scientific Laboratory; and Dr. C. V. Theis, F. C. Koopman and William D. Purtymun of the U.S. Geological Survey.

Construction

1) Pits constructed with a minimum distance of 50 feet from canyon rim.
2) Pits constructed no deeper than adjacent canyon floor.
3) Pits constructed with long dimension parallel (as near as possible) to surface topographic contours.
4) Large open joints filled with seal material (tuff removed from pit during construction).
5) Drainage should be maintained on open pits so that runoff from precipitation on the mesa does not enter the pit while it is being filled.
6) Size and shape of pit are not important.
7) Bottom of the pit does not need to be level.

Burial of wastes

1) Burial of wastes in layers (ie. layer of waste and a layer of tuff) should be continued.
2) Wastes are to be buried in the confines of the natural tuff. If the soil zone is exceptionally thick this would be an unusual condition and would show instability in that immediate area. The wastes should be buried below the soil zone within the tuff.

Surface seal of pits

1) Pits can be filled with wastes to within 2 feet of the land surface.
2) Seal material (tuff) overlying the wastes should range in thickness from 6 to 8 feet.
3) The surface of the seal material over the pit should be slightly rounded.
4) Adequate drainage provided to remove runoff from precipitation on the mesa.
5) Drainage ways are to be located so that they do not cross the surface of a sealed pit.
6) Consideration should be given to the planting of native vegetation on the surface of sealed pits.

As an additional thought - A suggestion by Dr. Theis not discussed at the meeting.

It may be necessary to have periodic inspections of the sealed and finished pits to determine any unusual settling or gullying. It is thought that the times of inspection for instability and indications of adjustment of the surface to a natural condition will be shortly after the season of the highest rainfall. It may be necessary to have biannual inspections.

The above information is intended for a guide only. It is hoped that it is specific enough for the continued safe-storage of waste program but general enough to permit future changes that may have to be made.

Sincerely yours,

F. C. Koopman
Acting District Chief

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544

OFFICE MEMORANDUM

TO : *Distribution* DATE: *April 24, 1975*

FROM : *LaMar J. Johnson, H-8 Group Leader*

SUBJECT : *SOLID RADIOACTIVE WASTE DISPOSAL GUIDELINES*

SYMBOL : *H8-WM-461*

MAIL STOP: *490*

Attached is a copy of solid radioactive waste disposal guidelines presently in use by the LASL for the construction and use of solid radioactive waste disposal facilities at the Laboratory. The guidelines were arrived at through consideration of previous recommendations, as well as current thinking on requirements for safe and effective disposal of radioactive waste.

It is recognized that in some instances previous practice did not conform with these guidelines. Programs have been initiated to conform with these guidelines in matters relating to the appearance or condition of the burial site. Questions related to the location or burial mode of previously disposed waste are presently incorporated within a research program of the Waste Management Section which will evaluate the short and long term adequacy of the burial sites.

These guidelines are considered to be in final form. Should you feel that any significant considerations have not been included, please contact us.

LJJ:TKK:mar
Attachment as stated.
Distribution:

D. Davis, ALO
W. Hale, USGS, Albuq.
K. R. Braziel, LAAO
G. L. Voelz, M.D., H-DO
L. P. Reinig, ENG-DO
J. W. Healy, H-DO
H. S. Jordan, H-DO
W. J. Maraman, CMB-11
R. J. Bard, CMB-8
M. M. Thorpe, A-1
D. R. Smith, P-5
V. J. Stephens, ENG-DO
C. W. Dagget, ENG-4
J. G. Parsons, ENG-4
T. K. Keenan, H-8
J. L. Warren, H-8
W. C. Hanson, H-8
W. D. Purtymun, H-8
M. A. Rogers, H-8
M. L. Wheeler, H-8

GUIDELINES FOR CONSTRUCTION AND USE

OF SOLID WASTE DISPOSAL FACILITIES

I. Administration

It shall be the responsibility of the individual in charge of the Solid Waste Management Operations to insure compliance of the following recommendations and procedures in the guidelines for construction and use of solid waste disposal facilities.

II. Site Selection Critera (General)

A. The geohydrology of the site will require evaluation in order to design the site in a manner to minimize the impact on surface and ground water (U.S.G.S. Water Supply Paper 1753, LA-4660-MS, LA-5286-MS).

B. Locations containing archaeological sites will require investigations. Evaluation of Federal land containing archeological sites is required by four Congressional Acts and a Presidential Order. A report has been prepared describing all archaeological sites on LASL property. This includes maps and archaeological evaluation of sites.

C. The ecology of the area will be considered in site selection. Consideration shall be given to leaving strips of natural vegetation between pits as windbreaks to reduce wind erosion of the disturbed surfaces and to make rehabilitation more realistic. Plant and animal communities that are classified as rare or endangered will be preserved and protected as specified in "The Endangered Species Act of 1973" (50 CFR-Part 17).

III. Pit Locations and Layout

A. Topographic contour maps shall be prepared or available at contour intervals of five feet or less, which describe the topography prior to ground breaking or clearing of area.

B. The layout of the pits shall be with the long dimension more or less parallel to the topographic contours to obtain maximum utilization.

C. The location of the "spill point" (the lowest elevation of the rock surface along the edge of the pit) shall be a minimum of 50 feet from the canyon rim (break in topographic slope). This is illustrated in Fig. 1. The canyon "rim" will be identified on the area topographic map. Disposal shafts shall be located no closer than 50 feet from the adjacent canyon rim.

D. Access roads to pit sites shall be carefully laid out to avoid traversing archeological sites and maintain adequate drainage.

E. Vegetation and topsoil in areas between pit edges and mesa rims, and on one side of each pit shall be left in the natural state as nearly as possible. (See Fig. 2.)

F. If archaeological sites are in a potential disposal site location, construction must be proceeded by the following:

1. Evaluation of the site for antiquity value by a qualified archaeologist.

2. Archaeological salvage of the site under supervision of a qualified archaeologist.

3. A report of the findings and deposition of the artifacts in a suitable repository.

IV. Construction

A. Pits and shafts shall be constructed no deeper than adjacent canyon floors that contain or may contain saturated zones.

B. Horizontal dimensions and shape of pits and shafts are not restricted.

C. The floors of the pits do not need to be horizontal.

D. The slope on pit walls shall be approximately 1 to 4.

E. Minimum distance between pits shall be 15 ft at land surface.

F. Crushed tuff 0.5 to 1 ft deep shall be compacted on floor of the pit before emplacement of wastes.

G. Open joints and fractures in pit walls, access ramps, and floors that are open two inches or more shall be filled with sealing material. (Example: mixture of bentonite (dry) and crushed tuff or cement (dry) and crushed tuff).

H. Appropriate measures shall be taken to insure containment of material within disposal shafts, for example, an asphalt coating on the walls of tritium disposal shafts. Prior to its use, a shaft shall be inspected to insure absence of significant open joints or fractures. If any are present they shall be sealed to the best degree possible with appropriate material, similar to that recommended for the purpose in pits.

I. Drainage shall be constructed and maintained so that surface runoff does not enter the pits or shafts.

J. Topsoil shall be stockpiled for use in rehabilitation of the pit seal. Topsoil shall be stockpiled in such a manner as to minimize erosion.

K. Tuff removed during construction of the pits shall be separately stockpiled in the same manner as the topsoil. It shall not be stockpiled on top of rehabilitated or undisturbed areas.

L. Roads shall be planned so that vehicles or equipment do not transverse rehabilitated areas. Dust control shall be employed to minimize resuspension.

M. Prior to excavation of a pit or shaft, notification shall be provided to a LASL geologist responsible for waste site monitoring. At the discretion of the geologist, material samples may be collected during construction. Following excavation of a pit or shaft, it shall be surveyed and recorded on a map of the waste disposal area. In addition, for pits, an engineering drawing showing lengthwise profiles, i.e. the walls and centerline, and crosswise profiles at significant breaks in bottom slope and at every 100 foot length, will be prepared. At the time of the survey the location of the first and last reference posts (for waste disposal record purposes) shall be established and recorded on the engineering drawing of the pit profiles.

N. Before a pit is placed in use, a qualified geologist from LASL shall inspect and approve its use. The geologist shall prepare a description of the pit, including such things as location and orientation of fractures, position of flow boundaries in the tuff, plant root locations, etc.

V. Burial of Wastes

A. The wastes buried in pits shall be placed in layers and covered with an approximate 0.5 ft layer of compacted crushed tuff.

B. Combustible and wind dispersable wastes shall be covered by the end of the day of delivery.

C. Pits and shafts shall be filled with wastes to a minimum depth of 3 feet below the "spill point" (lowest point on pit rim, Fig. 1).

D. Documentation shall be made of origin of shipment, type, identity and amount of radionuclides in wastes placed in the pit and shafts. Records shall include location within the pit of each shipment of waste received.

VI. Final Cover of the Wastes

A. The final cover of a pit shall be crushed tuff overlain by topsoil.

B. The final cover of a pit shall be a minimum of 2 ft above the original land-surface at the edge of the pit and will extend beyond the edges of the pit at least 3 ft.

C. The final cover of a shaft shall be non-contaminated cement, a minimum of 3 ft thick, slightly rounded, and extending about 0.5 ft above land surface.

D. The surface of the final pit or shaft cover shall be slightly rounded to allow surface drainage without excessive erosion.

E. Provisions shall be made to control runoff in the disposal area to minimize infiltration and erosion of the final cover of pits or shafts.

F. Bench marks shall be placed at the corners of each pit and in the final pour of seal cement in the shafts. The bench marks (at least 12 inches in diameter) shall be set into the bed rock and extend through the final cover at the corners of each pit. The bench mark will be a single pour of cement with a standard brass cap which will contain Engineering data (cap number, LASL Coordinates, and elevation and Disposal Data (Radioactive Waste Pit numbers and location; e.g. Radioactive Waste Pit 24 SW Corner, or Radioactive Waste Shaft number). These bench marks are to be tied into the disposal and engineering records so that if materials are to be retrieved, they can be found with a minimum of effort and disturbance to the final cover.

VII. Rehabilitation and Revegetation

A. As noted in Section V E, native vegetation will be left in areas between pits.

B. Turf-forming grasses and bunch grasses will be planted in the final cover to prevent wind and sheet wash erosion.

VIII. Monitoring Systems

A. Established "green belts" adjacent to pits and shafts as well as grasses of the final cover will be monitored to determine if uptake of radionuclides occur.

B. Background data to determine radionuclide concentration in and adjacent to pits should be collected prior to disposal of wastes.

C. Monitoring holes and access casing should be operational prior to placing of wastes in pits.

D. The area shall be inspected on an annual basis to determine the condition of final cover. Significant changes in the cover due to settling or erosion shall be corrected.

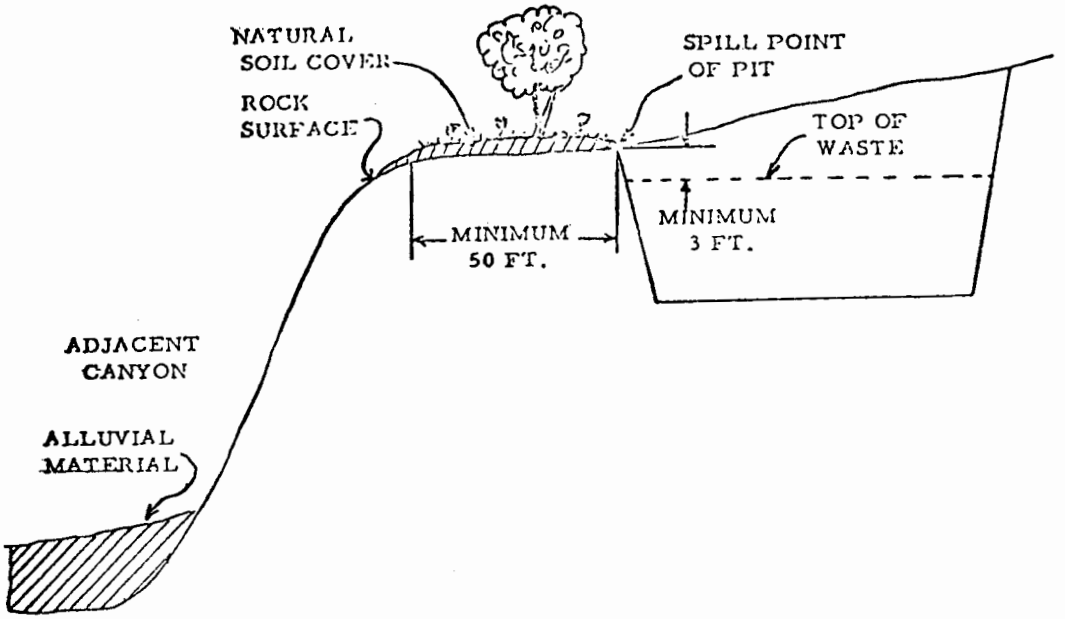

Figure 1. Cross-section showing details of pit location and placement of wastes

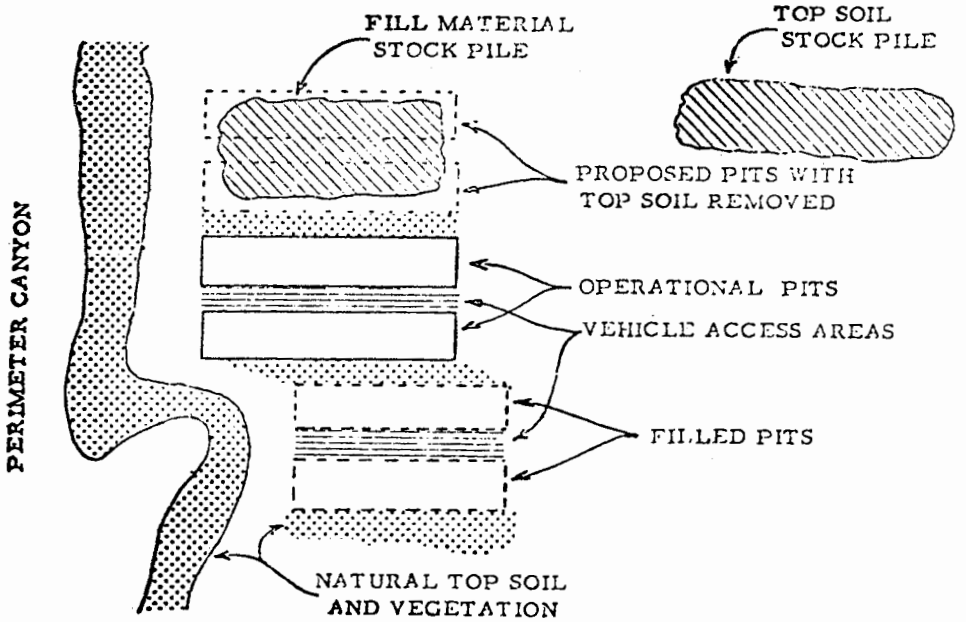

Figure 2. Suggested layout of disposal pits, stockpile areas and biotic sanctuaries.