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Radioactive Liquid Waste Lines Removal Project at Los Alamos (1981–1986)

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TABLES

FIGURES

RADIOACTIVE LIQUID WASTE LINES REMOVAL PROJECT AT LOS ALAMOS (1981-1986)

by

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ABSTRACT

This report describes the abandoned liquid waste lines removal operations conducted at Los Alamos in the period 1981-1986. Particular emphasis has been placed on as-left conditions, that is, on the location of sections of waste lines or contaminated soil which were left in place on the basis of ALARA decisions. Contaminated items were left when interfering utilities, roads, structures, or great depth made complete removal not cost effective or not safe. Left items were either not highly contaminated or they were not near the surface.

Total cost of the project was $4.2 million. Approximately 5800 m^3 of contaminated waste was placed in the Solid Waste Management Site at TA-54 Area G. The project accomplished the removal of approximately 34,500 ft (6.5 miles) of abandoned waste lines under carefully controlled conditions.

Procedures for excavation, waste disposal, personnel protection, and radiation monitoring are described. Environmental monitoring criteria and methods for determining acceptable levels of contamination in soils and on surfaces are discussed.

I. INTRODUCTION

A. Purpose of the Project

Over the 43 years of national defense activities at Los Alamos, some 39,000 ft (7.4 miles) of underground contaminated liquid waste line and associated structures and equipment items were installed, used, and subsequently removed or abandoned when their useful purpose had ended. These items had been abandoned under generally controlled conditions; however, much of the liquid waste line was outside of fenced or secured technical areas (TAs). In a few instances, short lengths of contaminated lines

had been left under Los Alamos townsite street crossings at the end of an inital phase of decontamination and decommissioning (D & D) at TA-1 in 1965-1967 (Ahlquist 1977). The relatively unrestricted access (by excavation) to these lines made their removal an important consideration in Department of Energy (DOE) remedial action activities. Further benefit could be gained by removal of lines and structures within Laboratory technical areas by making more space available for beneficial uses.

The primary routes of these lines connected the Laboratory areas at TA-1, TA-3, TA-35, TA-43, and TA-48 to the liquid waste treatment plant at TA-45 and later at TA-50. A brief history of the liquid waste system is provided in Section I.B.

In 1975, the DOE and Los Alamos National Laboratory determined the need for major remedial action regarding the abandoned underground liquid waste lines. Although no reportable occurrences involving the lines had taken place, the many excavations which occur in the course of normal Laboratory construction and maintenance raise the risk of accidental intrusion into contaminated waste lines. It was decided to initiate a coordinated program in which a trained team of D & D workers would remove the lines from the areas most likely to receive future development. Of particular importance was the removal of all lines from the Los Alamos townsite. A project plan was prepared by the Laboratory and approved by DOE (Garde 1981). The sponsoring DOE agency was the Office of Military Application (Weapons Research, Development, and Testing). The total cost of the project, the total volume of waste resulting from operations, and the manpower utilized in the two phases of the project are summarized in Table I. The Phase I and Phase II categories define the work done in 1981 (Phase I) and in 1984-86 (Phase II). A special project at the Diamond-West Jemez intersection (SM-700) was accomplished in 1982; another special project on Line 18 near the Diamond-Eniwetok intersection in 1983. Cost information for Phase II is provided in greater detail in Appendix A.

Table I

SUMMARY OF LIQUID WASTE LINES REMOVAL PROJECT

	Phase I	Phase II	Total
Total Cost ($M)	0.96	3.04	4.23
Total Waste Volume (m^3)	2400	3400	5800
Manpower Utilized (man-months)			
Zia Company	40	320	360
Laboratory	29	240	269

Funding was provided from a larger line item construction project entitled "Radioactive Liquid Waste Collection System Improvements". This improvement project provided new pipe-in-pipe plastic or fiberglass lines which are monitored for plugging or leakage at appropriate locations. Its arrangement eliminated the need for extensive use of pressure lines. Most locations are served by gravity drain to TA-50. At a few locations, existing lines were utilized in the new system. A more complete description of the new liquid waste collection system has been published (Emelity 1984).

The line removal D & D project was conducted in a manner that emphasized worker safety, maintained good public relations, and minimized adverse effects on the environment and on Laboratory operations. Residual radioactive material was reduced to as low as reasonably achievable (ALARA) levels and excavated areas were backfilled, contoured, and revegetated or resurfaced.

The D & D crews consisted typically of 6-8 laborers, an equipment operator, a truck driver, and a foreman. As many as three crews were in the field at one time.

B. History of the Radioactive Liquid Waste (RLW) System

A simplified map of the Los Alamos area (Figure 1) shows the major branches of the abandoned liquid waste system. Research

and development operations at Los Alamos have generated radioactively contaminated liquid industrial wastes since 1943. The untreated wastes from TA-1 were initially discharged into Pueblo Canyon. A treatment plant (TA-45) utilizing precipitation/flocculation operations was placed in service in 1952 to process wastes from TA-1. By late 1953 wastes from the newer laboratory complex (TA-3) south of Los Alamos Canyon and the Health Research Laboratory (TA-43) were also piped to TA-45. In 1958, wastes from TA-48, a newly constructed radiochemistry site south of Los Alamos Canyon, entered the system.

Wastes from TA-3 and TA-48 flowed first to a waste neutralization/storage station designated TA-3-700, which was equipped with a motorized, remotely controlled discharge valve. A plant operator at TA-45 controlled the flow from TA-3 and TA-48 with the valve at TA-3-700. Discharge from TA-3-700 flowed through an inverted siphon (depressed sewer) across Los Alamos Canyon to the intersection of Diamond Drive and Canyon Road, then east along Canyon Road to TA-45. Near the Trinity Drive and Diamond Drive intersection, a branch line serving TA-43 entered the system. The first wastes from TA-3 were discharged in June 1953 and from TA-43 in September 1953. TA-3 waste was very dilute in 1953 and a practice was adopted of monitoring the waste stored at TA-3-700. If the radioactivity would cause the 2-week effluent average at TA-45 to exceed the maximum permissible concentration for the release of gross-alpha activity to the environment, the waste was routed through a diversion manhole for treatment at TA-45. If this level was not exceeded, the waste was diverted directly to Pueblo Canyon. In July 1953, approximately 3% of the TA-3 waste was diverted to the plant; by the end of December 1953, 70% of the waste was being diverted. This waste was a composite of discharges from TA-1, TA-3, and TA-43.

The TA-3, TA-43, and TA-48 connections to TA-45 remained in service until mid-1963. Because small quantities of very dilute waste were released from TA-43, TA-43 waste lines were disconnected from the system and reconnected within the building to the sanitary system.

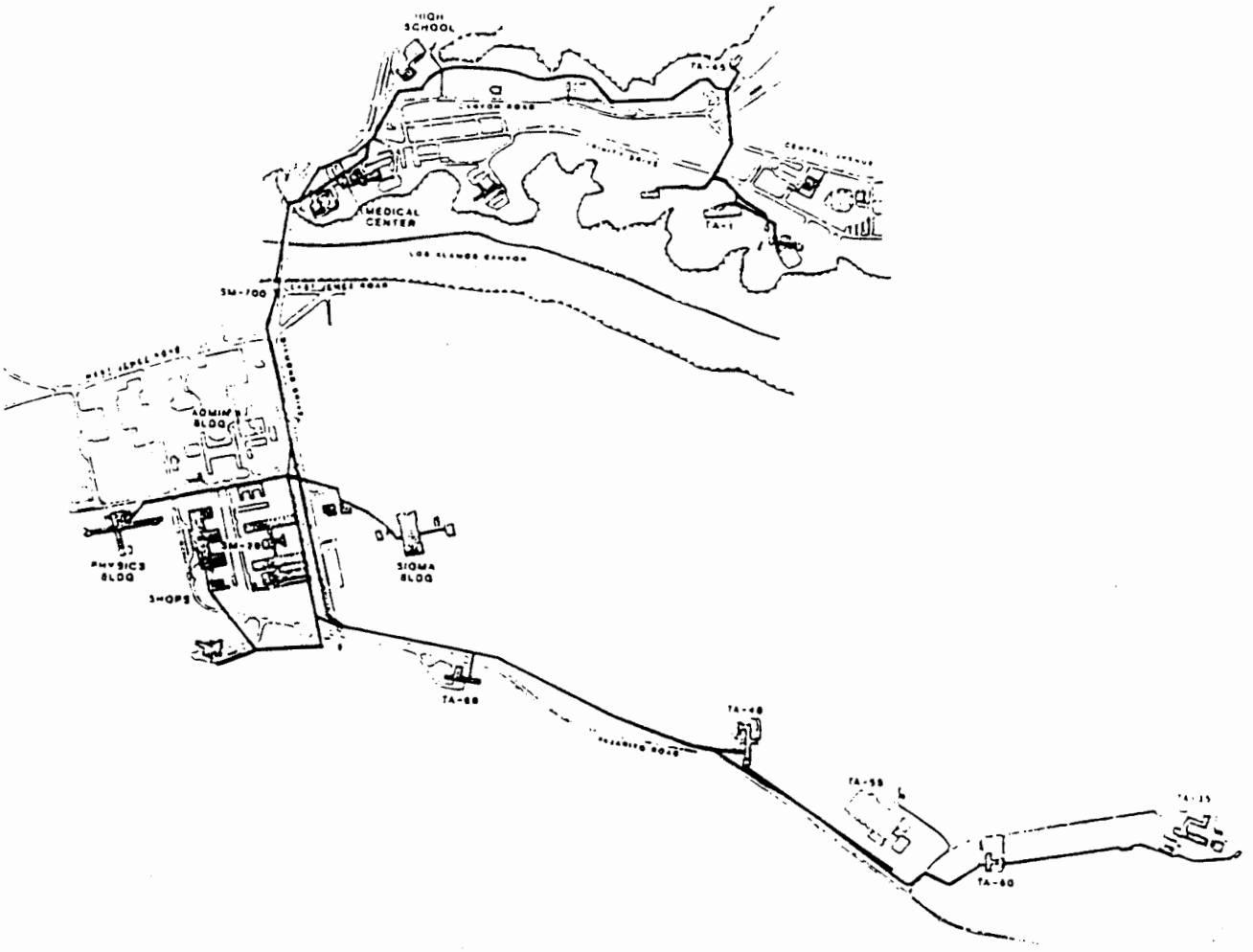


Fig. 1. Simplified map of Los Alamos area showing original routes of abandoned contaminated liquid waste lines.

On July 27, 1963, the system between TA-3-700 and TA-45 was abandoned and a new pumping station that had been added to SM-700 was placed in operation to redirect the wastes to the new treatment plant at TA-50. TA-45 continued to treat waste from TA-1 until May 26, 1964, after which it was decommissioned, along with much of the liquid waste system in the townsite, during the period 1965-1967.

Abandoned waste line removal activity in the period 1967-1976 was limited to construction locations such as TA-55 where abandoned waste lines were removed as part of site preparation. In 1977 removal of waste lines was coordinated with a planned improvement of the Trinity Drive-Diamond Drive intersection by the County of Los Alamos (Gunderson 1979). Waste line removal work was not started again until 1981 when the activities described in this report were initiated. Removal of the remaining sections of the system in the townsite and in technical areas south of Los Alamos Canyon is the topic of this report.

II. OPERATIONAL METHODS

A. Radiological Survey Methods

1. Soil Cleanup Guidelines. Guidelines for residual radioactivity concentrations in soil after removal of waste lines and structures were based on the general principle of as low as reasonably achievable (ALARA). Under this principle, the primary guidance was to keep any future exposure of the general public to remaining radioactivity to as low a level as technically and economically reasonable. To expedite decision making concerning this principle, de minimus levels of soil contamination and upper-limit concentration guides were used. De minimus levels are those below which no environmental or physical effect is expected. These levels were recommended by the Laboratory's Environmental Surveillance Group (HSE-8). Establishing de minimus levels addressed the use of unreasonably long sample counting times in quest of continually lower detection limits. The upper limit concen-

tration guides, also recommended by HSE-8, were selected to ensure conformance to the secondary requirement that no member of the public receive a dose, as a result of exposure to residual contamination, exceeding 500 mrem/yr to any organ of the body. These latter limits were derived by calculations of potential dose equivalents associated with important radionuclides transported by various possible pathways. Appendix B describes the derivation of these limits.

The initial step in the application of these guidelines was excavation of soil in the trenches until no above-background readings were obtained using phoswich and beta-gamma survey meters and alpha survey meters or until it was impractical to proceed further (i.e., depth greater than backhoe reach or interference from obstacles).

Soil samples were obtained at appropriate intervals from representative locations along the bottom and walls of the trench or from the location where the excavated soil was placed. The number of soil sampling locations was dependent on relative radionuclide levels.

Soil samples were analyzed for various constituents such as gross alpha, gross beta, tritium, or gamma spectrum, depending upon Laboratory records of what radionuclides were discharged into a particular line. Previous sample results were also observed. Sample analysis results were compared to the de minimus guidelines shown in Table II.

If the soil sample results were below the levels given in the table, the area was considered acceptably free of contamination. If soil sample results exceeded the guidelines, additional cleanup was requested and the monitoring and sampling procedures were repeated until the guidelines were met or it was determined that further cleanup to the guides was impractical due to safety, economics, or other reasons.

Administrative procedures by which ALARA decisions were made are provided in Appendix C.

TABLE II

SOIL CONCENTRATION GUIDELINES (ABOVE BACKGROUND) CONFORMING TO DE MINIMUS LEVELS

	Surface Soil[a]	Subsurface Soil[b]
Gross Alpha	Nondetectable[c]	75 pCi/g
Gross Beta	25 pCi/g	75 pCi/g
External Gamma[d]	5 μR/h	20 μR/h
Tritium	100 pCi/ml	250 pCi/ml

[a]Surface soil is defined as soil located within 5 ft (1.5 m) from the surface.

[b]Subsurface soil is located at any depth greater than 5 ft (1.5 m).

[c]Detector background plus 3 sigma counting error (see Appendix B for details.)

[d]If ^{137}Cs is present.

If the de minimus guidelines could not be reasonably met, the measured levels were compared to those in Table III, which gives the upper limit concentration guidelines based on the 500 mrem/yr dose limit. The concentrations in Table III are based upon the scenarios presented in Appendix B and as such were not construed as absolute limits. Conservative assumptions made in the scenarios might be very different from the field situation encountered. Thus, flexibility was used in applying the guidelines and consideration was given on a case-by-case basis to factors such as the extent, depth, and location of the contamination zone, the radionuclides present and their concentrations, the nature of the contaminated soil, and the safety, economic, and operational impact of further decontamination. Taking these factors into account

and using Table III guidelines as reference points, decisions were made as to whether the contamination would result in a 500 mrem/yr dose to any organ of any member of the public. Decontamination continued until it was felt that the occurrence of the 500 mrem/yr dose was very improbable.

TABLE III

SOIL CONCENTRATION GUIDELINES (pCi/g ABOVE BACKGROUND)
BASED ON 500 mrem/yr ORGAN LIMIT

Radionuclide	Surface Soil[a]	Subsurface Soil[a]
^{241}Am	50	600
^{241}Pu[b]	1 670	20 400
$^{239-240}Pu$	200	1 900
^{238}Pu	350	3 200
^{238}U	80	960
^{235}U	80	960
^{234}U	80	960
^{137}Cs	80	960
^{90}Sr	100	1 200
^{3}H[c]	8 870	120 000

[a] See definition in notes a and b, Table II.

[b] ^{241}Pu limit derived from the ^{241}Am concentration.

[c] In pCi/ml of soil moisture.

In all cases, the residual radioactivity levels were recorded in the HSE-8 project log book and on soil drawings (ENG-C-43943S series) provided as permanent record of the project.

2. Surveying During Operations. A trained Radiation Protection Group (HSE-1) health protection technician provided continuous surveillance of excavation, waste removal, and backfilling work. For detection of radioactivity in soil, the technician was equipped with a portable phoswich detector,

Harshaw Model 301. Operating instructions for the phoswich were provided in HSE-1 D & D Section Instructions I-3, I-3A, and I-3B (Cox 1981). The phoswich detector, shown in operation in Figure 2, provided relatively high sensitivity in a rugged package for detecting low-energy gamma or x-ray photons (Umbarger 1978). Because alpha particle measurement directly from soil is difficult in the field, the low-energy photons emitted from alpha emitters such as ^{238}Pu, ^{239}Pu, and ^{241}Am were used to provide a rough indication of the quantity of these radionuclides present in the soils. The phoswich detector was chosen to provide greater sensitivity for photons while also reducing detector response to high-energy photons contributed by natural back-ground. Background reduction was accomplished by anti-coincidence gating of pulses produced in the two phosphor crystals and by pulse shaping. The level of detectability above natural background by the phoswich in field search mode was approximately 100 pCi/g of soil. Soil samples taken for laboratory analysis by HSE-8 provided quantitative gross-alpha data, as discussed in the next section. A calibration check of the phoswich detector was performed daily using a ^{241}Am source. The check required that a 50-s count fall within the 95% confidence interval of a standardized count.

Monitoring of equipment surfaces and personnel was accomplished by thin-window Geiger-Mueller (GM) detectors for beta/gamma radiation and air proportional counters for alpha radiation. These instruments received normal servicing and calibration checks through the HSE-1 instrumentation section.

3. Sampling for Record Purposes. HSE-8 obtained soil samples at intervals selected to provide representative samples from the bottom and walls of the trench or from excavated soil. Soil samples were more numerous in locations where radionuclide activity had been found or was expected.

Soil samples were analyzed for various constituents such as gross alpha, gross beta, tritium, or gamma spectrum. The analysis method could be tailored somewhat, based on what radionuclides were known to have been discharged to the line or on what radionuclides had been seen in earlier samples.

Quality control procedures for soil sampling included the following:

- radiochemical analysis of selected soil samples,

Fig. 2. A monitoring operation using a phoswich detector.

- duplicate and split samples consisting of approximately 10% of the total number of samples, and

- daily calibration checks of gross alpha and gross beta counting instruments with soil samples spiked with ^{239}Pu and ^{90}Sr-^{90}Y, respectively.

The primary laboratory alpha and beta/gamma counting instruments were 10-cm diameter ZnS scintillation detectors equipped with single-channel analyzer. Soil samples were placed in plastic bags and manually worked to break up soil chunks. Approximately 75 g of soil was placed in 88-mm diameter x 13-mm deep plastic petri dishes. The samples were dried in a microwave oven, allowed to cool, and counted for 5 minutes. This procedure allowed detection above background of approximately 25 pCi/g alpha activity and 8 pCi/g beta/gamma activity. Background and calibration counts were performed daily.

Tritium analysis was performed by radiochemical analysis of soil samples. Soil moisture was distilled from approximately 200 g of soil. A 5-ml aliquot of the distillate was mixed with liquid scintillation gel. This cocktail was counted in liquid scintillation counters with a detection limit of approximately 0.5 pCi/ml above background. Only a few samples suspected of tritium contamination actually were positive. These were observed at the Sigma area while excavating Line 18 near manhole SM-710 at 10-ft depth in 1984. None of these samples exceeded the 250 pCi/ml of soil guideline for subsurface soil; the maximum tritium sample was 67 pCi/ml of soil.

HSE-8 also obtained and analyzed weekly samples of airborne activity during excavation. These were high volume samples collected over approximately 30 hr operating time at 400 scfm/hr. Background activity level for this analysis was 1-5

fCi/m^3 for beta activity. None of these weekly samples exceeded occupational exposure limits in DOE Order 5480.1A Chapter 11.

B. Removal Methods

1. Excavation. A drawing search and walkthrough by all involved parties preceded excavation. The construction engineer prepared a work order which described the scope of work, location, cost estimate, manpower and equipment needed, and special safety requirements of the job. Personnel safety requirements are discussed in Section II.C. The work order received approval from representatives of the Laboratory, DOE, and the Zia Company.

A policy was followed that the subject pipe and known underground utility lines near the pipe be exposed by hand digging before machine excavation started. Despite this, a few utility lines were cut during removal operations. Consequences of these accidental cuts were not reportable occurrences under DOE guidelines.

Excavation was typically performed by one of two hydraulically operated excavators:

- Liebherr excavator - 1.3 yd^3 bucket with 25-ft reach.
- John Deere backhoe - 0.25 yd^3 bucket with 16-ft reach.

Pipes at depth greater than 25 ft were usually left in place. As a trench was being dug, soil samples were field checked by phoswich detectors down to a level approximately 3 ft above the pipe. From this level down to and including locations beneath each pipe joint and break point, soil samples were taken and checked in the laboratory for contamination in addition to field checks. The pipe was approached gradually to minimize mixing contaminated soil with uncontaminated soil.

Dust control was provided by water spray. Airborne contamination was monitored and shown to be minimal, as discussed in Section II.C.

Excavated soil determined to be clean was stockpiled alongside the trench line at least 2 ft from the edge for reuse as backfill material. Contaminated soil was loaded directly onto plastic-lined, tarpaulin-covered dump trucks or into appropriate storage containers for transporting to the TA-54 Solid Waste Management Site.

The trench was backfilled with its own excavated material when practicable. Compaction at depths below 5 ft were accomplished hydraulically, by tamping with the backhoe bucket, or by a combination of methods depending on backfill material. From the 5-ft depth to the surface, compaction was by hand tamper, trench roller, or front end loader depending on the area in which the trench is located. Under paved areas, the top 3 ft of backfill was selected material such as tuff, base course, or good soil.

Pipe removal procedures were dictated somewhat by the type of pipe being removed. Vitrified clay pipe (VCP) could be broken by the backhoe bucket and removed directly with soil. This was usually the case in deep trenches. Plastic or steel pipe was usually removed by hoisting a length out of the trench, cutting the pipe into appropriate lengths, taping both ends, and loading each section onto a truck. This operation did not require entry of personnel into the trench. Pipe cutting was accomplished by hydraulic cutter, portable (saber) saw, or circular pipe cutters. Figure 3 shows a pipe cutting operation in progress.

Contaminated soil or pipe below the 100 nCi/g retrievable transuranium (TRU) limit was transported to TA-54 in plastic-lined, tarpaulin-covered dump trucks. Contaminated materials

above the 100 nCi/g limit (retrievable TRU waste) were not found in the waste line project.

Manholes were usually removed as they were encountered and lifted as a single piece onto a lowboy trailer for transport to TA-54 (see Figure 4). Many manholes were found filled with concrete from earlier decommissioning operations. All manholes were inspected for radioactive liquids or sludge, which was removed before the manhole was removed. Wall penetrations were sealed with grout, surfaces were sealed with asphalt as needed to achieve contamination control during removal and disposal. The manhole was freed on at least three sides down to the bottom of the manhole. Each manhole was lifted from the excavation, wrapped in plastic, and loaded onto a plastic-lined truck bed and wrapped, as needed, for transporting to TA-54. The bottom of the excavation was checked for contamination and unacceptable radioactive contaminated soil was removed prior to backfilling.

2. Contamination Control. Occasions with highest potential for spread of contamination occurred when pipes were cut, when pipes and soil were lifted from the trench, or when soil and other material was transported by truck. Contamination control during waste line removal operations involved wrapping and sealing contaminated materials, controlling airborne contamination by water spray, draining or soaking up of contaminated liquids, and the like. Previous experience at Los Alamos and elsewhere provided useful methods by which contamination was retained in the desired location. Plastic bags and trays were used to contain any liquid from a pipe as it was being cut. Both ends of cut sections of pipe were bagged and taped before transport. This was not the case with VCP, which was broken by the backhoe and removed with the soil and base course under it.

Fig. 3. Pipe cutting operation (plastic pipe and portable circular saw).

Fig. 4. Typical manhole removal operation.

Water spray was used to suppress dust generation during excavation, depending on soil conditions and the level of contamination. Fixing of loose contamination to surfaces by application of asphaltic material was useful on several occasions (Nelson 1980; Harper 1981). Although high alpha count rates were routinely found inside waste pipes, very little activity was spread either to air or soil during breaking or cutting operations. Therefore, the use of coating materials was seldom necessary.

Decontamination of equipment such as the backhoes or dump trucks was rarely necessary. Backhoes were monitored before moving away from the work site to avoid tracking or spreading. Dump trucks were monitored before departing TA-54.

3. Waste Disposal. The contaminated material removed by the waste line project was transported to the TA-54 Solid Waste Management Site by dump trucks with plastic-lined and covered beds. The loads were routinely 5 m^3 volume. A summary of total load volumes is included in Appendix A. These data were summarized from Radioactive Solid Waste Disposal records (RSWD load tickets) which accompanied every load and described the waste in the load. An estimate of activity in the loads of soil and pipe was made. An estimate of activity in soil was made from phoswich readings (Cox 1981) and confirmed by HSE-8 samples. Activity within a length of pipe was estimated by taking several readings with a detector probe, converting average count rate to activity under the probe and multiplying by appropriate probe-to-pipe surface area ratios for the length and diameter of the pipe. The method assumed uniform deposition along the length of the pipe.

The waste with activity concentration below 100 nCi/g was deposited in trenches at TA-54 Area G. Waste management operations at Area G are described in the Waste Management

Group (HSE-7) Standard Operating Procedures and Operating Instructions. Retrievable waste (> 100 nCi/g), had the waste lines project encountered any, would have been packaged for storage in sealed shafts.

4. Left Lines. Some portions of lines were left in place for a variety of reasons, such as overlying structures and utility lines, paving, encasement in concrete with other lines, depth too great, and the like. Left items are discussed individually in Section III with more detailed documentation in ALARA memos (Attachment 1) and on the appropriate sheet of engineering drawing ENG-C-43943. A list of reference drawings is provided as Attachment 2.

A monument, sign, or other marker was not usually installed at the site of a left item. The few exceptions are described in Section III. Left items were generally left in a location not likely to be disturbed or in a condition not likely to cause a detectable hazard if disturbed.

Each section of left line was sealed at both ends with a plug of special concrete (Tigercrete). Tigercrete is a quick-setting, hard-curing formulation of concrete with an adhesive additive. If the pipe were directly accessible, the seal was applied by hand and allowed to harden before backfilling. If the pipe were in a deep trench, a concrete seal was made by pouring 1-2 yd^3 around the end of the pipe.

Each short section of left line was at least partially decontaminated by manual methods before sealing, if it were accessible. Longer lengths which could not be decontaminated were sealed as described above.

C. Personnel Safety

1. Health Physics Monitoring. Group HSE-1 provided continuous surveillance of excavating and waste removal operations by a

trained health protection technician. Special requirements for radiation protection of workers were specified under the Laboratory practice of issuing Special Work Permit for Radiation Work (see RWP, Health and Safety Manual, Administrative Requirements 1-3 and 3-1). The RWP was initiated by the project technical manager and completed by HSE-1 personnel, once expected conditions had been reviewed. Anti-contamination clothing, respiratory protection, and air sampling were provided as necessary. Experience with typical excavation and pipe removal work showed very little measurable contamination was made airborne nor was it likely that significant soil contamination would be encountered without early detection by field instrumentation. In no instance was activity overlooked by field sampling and later detected in samples sent for laboratory analysis.

Personnel monitoring included the normal monthly radiation badge dosimetry plus bioassay analysis of urine specimens on an annual basis. Air sampling in the work area was conducted daily to establish an experience record. After normal activity levels were shown to be well below guide-lines, air sampling was performed continously in areas where past line leakage had raised contamination measurably above background. Air samples were sent to the Health Physics Analysis Lab (HSE-1) for analysis of gross alpha and gross beta/gamma activity. Respiratory protection was required (full-face respirators) whenever high soil activity was encountered. Respirators were fitted to each worker by the Industrial Hygiene Group (HSE-5) and then field tested at the beginning of the operation.

Nasal smears were taken on a daily basis following dusty operations and checked for alpha and beta/gamma activity. None of the smears approached the action levels of 500 dpm alpha or 5000 dpm beta/gamma at which an occurrence report is required.

2. Safety Methods. Lost time accidents were very low in the project. One serious lost time accident occurred at TA-35 when a worker was struck by a pump motor housing which failed during lifting. The accident injured his back and ribs leading to a loss time of approximately 6 months. This accident was not related to the special features of the project, which are discussed below.

a. Excavating Safety. Most of the excavating in the project was done in previously excavated soil with indeterminate grades of backfill and compaction. The possibility of cave-in in some of the deeper trenches required issue of special work permits and the following safety practices to allow personnel entry:

- o shoring rules were followed in accordance with OSHA regulations (OSHA 1979);
- o approved shoring or trench wall sloping methods were applied whenever personnel access to trenches deeper than 5 ft was needed.

Pipes were lifted out of the trench, where possible, to eliminate the need for personnel entry into the trench. Figure 3 showed a typical operation in which the backhoe lifts plastic pipe out of the trench for cutting.

Several canyon-side locations were steep enough to require safety harness and lines on workers. Workers and line tenders were trained in the use of this equipment and performed the work in a safe manner. Figure 5 shows typical canyon-side operations.

b. Industrial Hygiene. A few occasions required personnel entry into manhole structures or other confined spaces. HSE-5 or the Zia Safety Office provided monitoring for

Fig. 5. Removal operations on a steep canyon-side.

safely breathable atmosphere. Safety lines were utilized where appropriate.

Hazardous chemicals were not encountered in any of the removal operations nor were decontaminating agents used which presented a toxic hazard to workers. The solvents used in decontaminating work were common commercial products.

c. Traffic Control and Public Access. The project involved many road crossings, some of which were in the townsite. Excavations across parking lots and sidewalks were also quite common. These operations required planning and prior contact with Los Alamos County officials, responsible Los Alamos National Laboratory groups, and other interested parties. Traffic control plans were implemented, complete with barricades, signs, and flagmen to control vehicle and pedestrian traffic. Off-hour control in the townsite was accomplished by backfilling, covering trenches, temporary fencing, or a watchman. Many crossings in the TA-3 area were worked on weekends to reduce disruption of public and commuter traffic. No incidents involving traffic or other accidents involving the public were reported.

3. Administrative Procedures. Prior to excavation and removal of waste lines or structures as part of the project, a series of steps was followed to insure that all involved parties had provided needed input. The following administrative procedures were set up:

- o prepare a project plan and obtain concurrence within the DOE - Laboratory - Zia organizations;
- o obtain authorization from DOE through the Albuquerque Operations Office and the Los Alamos Area Office to remove the lines and structures included in the project;

- initiate work orders as needed to inform and obtain approvals from operating groups affected by the project and coordinate efforts of the participating groups (HSE-1, HSE-7, HSE-8, ENG-1, and the Zia Company);

- schedule personnel and equipment to allow one or more locations to be in progress;

- provide preliminary surveys and research to avoid interference with existing utilities or operations to the greatest extent possible;

- provide complete documentation of operations such as manpower use, length removed, location of left items, waste volumes, and the like;

- reach informed supportable ALARA decisions regarding items which are unusually difficult to remove;

- provide complete documentation at the end of project, particularly as-left conditions.

The key administrative procedural items are summarized as follows:

- Safety policies, guidelines, and instructions in the Los Alamos Health and Safety Manual were applied to all the activities. These govern health physics monitoring, industrial safety, and environmental monitoring matters.

- Authorization to perform the line removal operations was obtained in advance through DOE, Laboratory, and Zia Company channels.

- o The removal operations were conducted in a manner consistent with the ALARA principle viewed from the aspect of the worker and also the environment (left items or soil contamination).

- o Preliminary work was expended to avoid disruption of normal Laboratory operations or possible hazard to workers (example: drawing searches to locate line crossings and hand digging to verify them).

III. RESULTS OF OPERATIONS

A. TA-50 Lines (Work Package I.1 and Part of II.3)

1. Description of Work. Four contaminated waste lines approaching TA-50 from the east were removed during the period July, 1981, to August, 1981, to enable the TA-50 upgrading project to begin. Five other lines were removed in 1984 from the area between the Pecos Road crossing and TA-50. The TA-50 lines and their major features are summarized in Table IV. Original routings of these lines are shown in simplified form in Figure 6 and on drawing ENG-C-43943, sheets 1A, 2, 3, 4, 5, 51, 72, and 73. Soil sampling locations and as-left condition of soil in the TA-50 lines work are shown in drawing ENG-C-43943, sheet S-1.

   An outfall area east of TA-50 received waste from Lines 55 and 67 and is discussed in 3. below. The contaminants encountered in this work package were primarily ^{239}Pu, ^{106}Ru, ^{137}Cs, ^{89}Sr, ^{90}Sr, and ^{90}Y. Maximum alpha activity level was 16,000 dpm/50 cm^2 measured inside pipe from Line 67. Maximum beta/gamma dose rate encountered at the pipe surface were less than 0.5 mR/h.

2. As-Left Conditions. Lines 44, 45, 45A, 47, 48, 48A, 54, 55, and 67 were completely removed. A 6-ft section of Line 46 was left in place west of Building WM-1 because of a storm drain above the line (see drawing ENG-C-43943, Sheet 72). A

TABLE IV

TA-50 LINES SUMMARY

LINE NO.	DESCRIPTION[a]	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[b]	AS-LEFT CONDITION
44	Line from Line 45 to Line 46 at MH-WM-6.	28	6	5-7	VCP	Completely removed in 1984. MH-WM-6 also removed.
45	Line from Line 43 at Pecos Dr to Line 44 at TA-50.	588	5	5-7	PVC	Completely removed in 1984. MH-WM-6 also removed; contaminated soil left (see Special Topics).
45A	Line from new MH-WM-73 to MH-WM-56 via MH-WM-55	67	5	7	PVC	Completely removed in 1984. MH-WM-55 and MH-WM-56 were also removed.
46	Line from MH-WM-6 to Bldg WM-1.	41	6	12-16	CIP	Partially removed in 1984. A 6-ft section left west of WM-1 (see As-Left Conditions section).
47	Line from MH-WM-6 to Bldg WM-1 (Soils Lab).	14	4	11	CIP	Completely removed in 1984 except for short length included in new system.
48	Line from Tank WM-3 to MH-WM-6 via MH-WM-7	95	6	5-9	CIP	Completely removed in 1984. MH-WM-7 was retained; holes for Line 48 were capped.
48A	Line from MH-WM-6 to MH-WM-78.	44	3	9	SS	Completely removed in 1984. MH-WM-78 was retained.
49	Pressure line from TA-35 to Tank WM-3	305	3		CIP	Partially removed in 1981. Capped line at gate valve on WM-3 tank. More removed in 1984 (see TA-35, Section III.B.).
54	Branch between Line 49 and Bldg WM-2.	65	3	---	CIP	Completely removed in 1981. End of Line 54 bypassed into overflow tank at WM-2.
55	Line from Bldg WM-1 retaining wall to Bldg WM-2, from WM-2 to MH-WM-8, and from WM-8 to headwall east of TA-50 fence.	300	6	---	[c]	Completely removed line and MH-WM-8 in 1981. Contaminated soil at outfall east of TA-50 partially removed (see Special Topics).
67	Overflow drain line from Bldg WM-2 to headwall east of TA-50 fence.	280	6	---	[d]	Completely removed in 1981. Contaminated soil at outfall east of TA-50 partially removed (see Special Topics).

[a] WM (Waste Management) is a more recent designation of structures at TA-50 originally designated LD (Liquid Disposal).

[b] Type symbols: BI black iron, BS black steel, CIP cast iron, DI duriron, GS galvanized steel, PVC polyvinyl chloride, SS stainless steel, VCP vitrified clay.

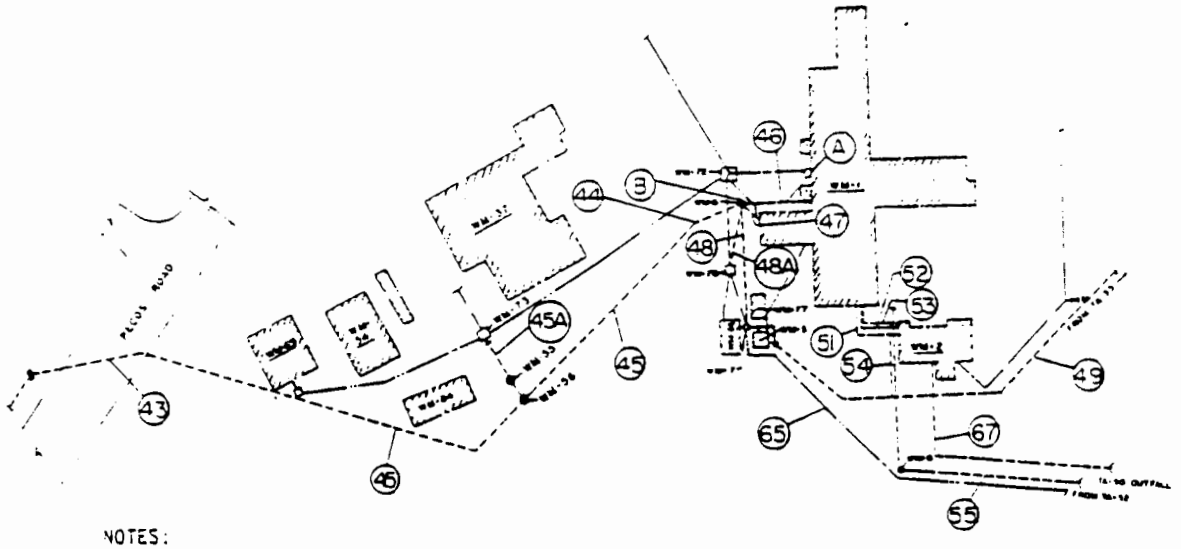
[c] 244 ft CIP, 165 ft VCP.

[d] 26 ft of 6-in CIP, 250 ft of 6-in VCP.

2100-ft section of Line 49 was left; see the discussion in Section III.B, TA-35. No contamination exceeding the established guidelines was left in the excavated trenches. The outfall area east of TA-50 was not decontaminated due to funding limitations and minimal environmental impact (see Special Topics discussion).

3. Special Topics. A 25-ft section of Line 67 was found filled with a yellow porous sludge containing 25 nCi/g of weapons grade plutonium, which was not retrievable.

The outfall area east of TA-50 was partially decontaminated in 1981 by removal of soil (70 m^3 total). Maximum surface contamination levels left at that time were 400 pCi/g of gross alpha activity and 40 pCi/g of gross beta activity. Temporary signs and tape indicate the contaminated area.



NOTES:

A. Line 46 - 6 ft left at ~ 15 ft deep.

B. Manhole WM-6 removed; contaminated soil left at ~ 19 ft deep.

Fig. 6. Simplified diagram of TA-50 lines.

Several manholes were removed from TA-50. Manhole WM-8 was removed in 1981; manhole WM-6, in 1984. Manholes WM-55 and WM-56 were removed with Lines 45 and 45A in 1984. Contaminated soil up to 3800 pCi/g alpha activity was left in the excavation of MH-WM-6 approximately 19 ft below grade (see Attachment 1, memo Cox to Garde, November 19, 1984).

B. TA-35 Lines and Tanks (Work Packages I.2 and II.5)

1. Description of Work. Twenty contaminated waste lines and several structures were removed from the TA-35 vicinity in 1981 and in a 1984-85 work period. The lines and their major features are summarized in Table V. The structure removal work is described under Special Topics. Line routings and structure locations are shown in simplified form in Figure 7 and on drawing ENG-C-43943, sheets 5B and 6-14. Final soil activity concentrations are shown on drawing ENG-C-43943, sheet S-2. The primary contaminants found in this work package were ^{137}Cs and ^{90}Sr-^{90}Y.

Radioactive waste, primarily soil, pipe, and concrete chunks, was transported to TA-54 for disposal.

2. As-Left Conditions. Lines 69, 72, 73-89, 90A, 90B, 93, 94, 95, 96, 97, 98, and 99 were completely removed. Sections of other lines were left in place as described below.

Line 49. Line 49 was partially removed in the 1984-85 work period (see Attachment 1, memo Cox to Valentine, March 19, 1985). As shown in Figure 8, a 145-ft section near TA-50 and a 330-ft section near TA-35 were removed, along with several cleanouts and short sections of pipe at points between TA-50 and TA-35. Approximately 2100 ft of Line 49 remain in areas covered by a concrete-covered berm, asphalt roadways and parking lots, numerous existing utilities, uncontaminated storm drains, and transportable buildings.

TABLE V

TA-35 LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
-9	TA-35 to TA-50	508	3	5-8	CIP, VCP	A 305-ft section was removed with TA-50 package in 1981; an additional 508 ft was removed in 1984-85. 2100 ft remains of 2900-ft original length (see As-Left Conditions).
68	Line from TA-35-29, a test pit, to TA-35-41.	24	3	3-5	SS	Partially removed in 1985; 126 ft left (see As-Left Conditions).
69	TA-35-31 to TA-35-41.	17	4	4	SS	Completely removed in 1984. TA-35-31 and TA-35-41 removed in 1984.
70	TA-35-26 to TA-35-41.	268	4	2-4	SS	Left 35 ft in place (see As-Left Conditions).
71	Line from connection with Line 70 to canyon outfall.	48	4	3	BS	Partially removed in 1985. 150 ft left in place (see As-Left Conditions).
72	TA-35-31 to TA-35-9.	125	4	4-5	BS	Completely removed in 1984. TA-35-9 removed in 1984.
73-89	Seventeen short lines between TA-35-9 and TA-35-10.	289	1-3	2-4	SS	Completely removed in 1984. TA-35-10 removed in 1985; contaminated soil left (see Special Topics).
90	Line from TA-35-3 to TA-35-8, a pump pit.	138	2	3	SS	Partially removed in 1985 (120 ft left, see As-Left Conditions). TA-35-8 removed in 1984.
90A	Line from TA-35-7 via MH 35-12 to Line 90.	50	3	4-6	SS	Also called YY. Completely removed in 1984. MH-35-12 also removed. Activity remains under MH-35-12 location (until TSL-7 is removed).
90B	Line parallel to Line 90 from TA-35-7 to TA-35-8, a pump pit.	140	1	15	BS	Also called XX. Completely removed in 1985.
91	Line from TA-35-7 to TA-35-8, a pump pit.	139	3	8-15	BS	Partially removed in 1985 (71 ft left). Soil removal to 20-ft depth; some contamination left (see As-left Conditions).
92	Line from TA-35-7 to TA-35-8, a pump pit.	137	2	8-16	BS	Partially removed in 1985 (73 ft left). Soil removal to 20-ft depth; some contamination left (see As-left Conditions).
93	Line from TA-35-7 to TA-35-9.	100(?)	1 1/4	---	GS	Completely removed in 1981.

TA-35 LINES SUMMARY

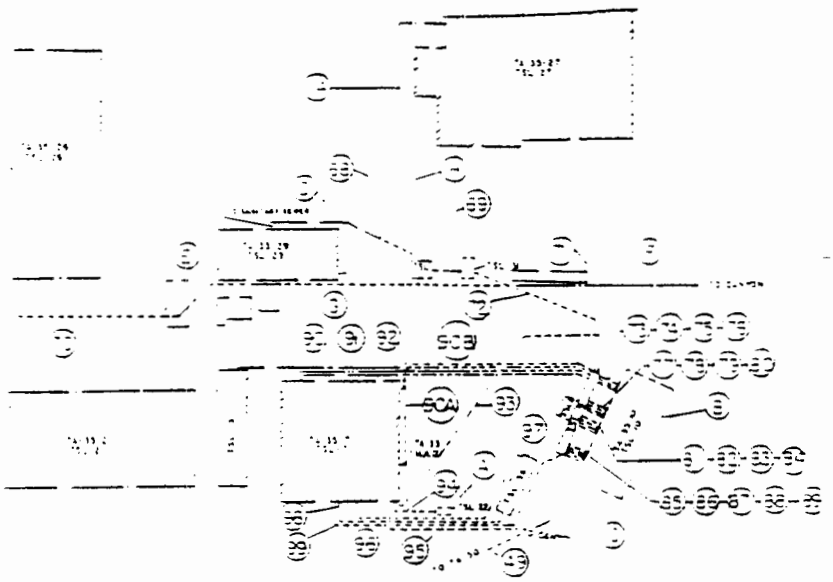
LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
[illegible]	Line from TA-35-[illegible] to TA-35-[illegible].	35	2	---	DS	Completely removed in 1981. TA-35-22 (concrete sludge tank) also removed (see Special Topics).
[illegible]	Line from TA-35-[illegible] to [illegible].	82	2	---	DI	Completely removed in 1981.
[illegible]	Line from TA-35-[illegible] to drainage connection with Line [illegible].	12	3	---	SS	Completely removed in 1981? May have been considered part of Line 97, which was removed in 1981.
[illegible]	Line from Line 96 to TA-35-[illegible], a storage tank.	144	3	---	SS	Completely removed in 1981. TA-35-36 (storage tank) also removed (see Special Topics).
[illegible]	Line from TA-35-[illegible] to TA-35-[illegible].	150	2	---	SS	Completely removed in 1981.
[illegible]	Line from TA-35-[illegible] to TA-35-[illegible], a pipe trench.	150	2	---	SS	Completely removed in 1981.
[illegible]	Line from TA-35-[illegible] to TA-35-[illegible], the core test building.	17	3	3	SS	Partially removed in 1985. 168 ft of uncontaminated lines left in place at TA-35-27 to be used as waste water sewer line.

[a]Type symbols are defined in Table IV.

Line 68. Line 68 was partially removed in 1985. A total of 126 ft of Line 68 was sealed and left in place; a 24-ft section (nearest TA-35-41) was removed (see memo Cox to Valentine, February 12, 1985). No contamination was detected in the pipe.

Line 70. Line 70 was partially removed in 1985. A total of 35 ft was sealed and left in place (see memo Cox to Valentine, March 6, 1985). An 18-ft contaminated section was left under the foundation of a transformer oil storage tank. A 17-ft contaminated section was left under two concrete-encased water mains. Both ends of these sections were properly sealed with concrete.

Line 71. Line 71 was partially removed in 1985. Approximately 150 ft were left in place at a depth of approximately 30 ft under the berm south of substation TSL-53 (see memo Cox to Valentine, March 4, 1985). No contamination was detected in the pipe.



NOTES:

A. TSL-22, soil contamination left at 10-ft depth.

B. TSL-10, soil contamination left at 18-20 ft depth.

C. Line 49, see next figure for left sections.

D. Line 68, 126 ft left at 3-5 ft depth (connected to sanitary sewer).

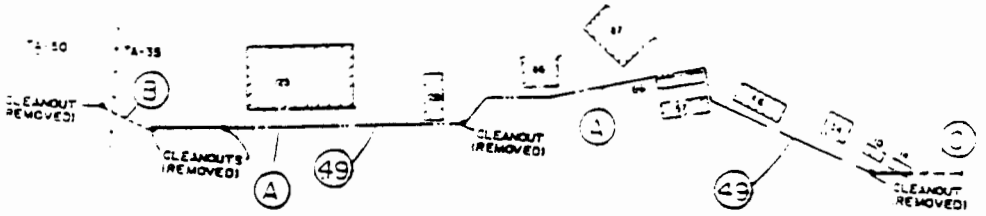
E. Line 70, 18 ft left, 17 ft left at 3-ft depth.

F. Line 71, 150 ft left at 20-ft depth.

G. Line 90, 91, 92 - section left at 20-ft depth.

H. Line 114, 168 ft left at 3-ft depth as waste water sewer.

Fig. 7. Simplified diagram of TA-35 lines and tanks.



NOTES:

A. Line 49 - part of 2100-ft section left under berm, parking lots, and buildings.

B. Line 49 - 145 ft removed.

C. Line 49 - 330 ft removed.

Fig. 8. Line 49 details.

Lines 90, 91, and 92. Lines 90, 91, and 92 were partially removed in 1985; approximately 120 ft of Line 90, 71 ft of Line 91, and 73 ft of Line 92 were left in place because of interfering utilities (see memo Cox to Valentine, April 10, 1985). Some contaminated soil was also left at the excavations for Line 90, 90B, 91, and 92 (see memo Cox to Valentine, January 28, 1985). Continued removal of soil below 9-ft depth was considered a threat to the structural integrity of Building TA-35-7.

Line 114. Line 114 was only partially removed (17-ft section). A 168-ft section was left in place under 13.2 KV power lines, various other utilities, and a parking lot (see memo Cox to Valentine, February 12, 1985). No contamination was found in this line.

3. Special Topics. The TA-35 work removed several structures as part of the waste line project. These were mostly concrete components related to the air scrubber system removed from Building TA-35-7 in 1979-80 (see LA-9058-MS, November 1981). Building TA-35-7 itself has not been removed* nor were related components in Building TA-35-3 removed. Removed structures are discussed individually below.

TA-35-8, A Pump Pit. Miscellaneous piping and equipment were removed in advance and hand digging around the structure was required to prepare it for removal by crane. This structure was removed to TA-54 as one 30-ton load.

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*A concrete abutment at the SE corner of TA-35-7 was removed as part of the TA-35-22 removal operation. Also, high levels of direct radiation remain along the east side of the TA-35-7 foundation where Lines 90A and TA-35-12 (a manhole) were removed. The contact dose rate was approximately 50 mR/hr at a 15 x 15-in utility tunnel exiting the east wall at 9-ft depth. The area was backfilled and signs placed for radiation protection until TA-35-7 is removed.

TA-35-8, A Pipe Trench. This structure was removed by the same procedure used at TA-35-8, except it required three loads of 20-, 10-, and 18-ton sections.

TA-35-10, A Contaminated Liquid Waste Tank. This large concrete tank contained four sections and was covered by a sheet metal roof. Major excavation was required to expose the walls to demolition by wrecking ball and Liebherr excavator. Figure 9 shows this operation in progress. Contaminated soil up to 350 pCi/g gross beta activity was left at depths of 18-20 ft (see memo Cox to Valentine, February 26, 1985, and memo Romero to Valentine, February 19, 1985).

TA-35-12, A Manhole. This small manhole in Line 90A (also YY) was found filled with foam from the TA-35-7 decontamination project. The manhole was removed. Contaminated soil was found to 9 ft (2 ft into tuff*) and removed.

TA-35-22, A Sludge Tank. This concrete tank was excavated and removed in one load. Contaminated soil was left at 10 ft deep in solid tuff in this excavation (see memo McAtee to File, August 28, 1981).

TA-35-31, A Concrete Holding Tank. This small tank was excavated and removed in one load.

TA-35-36, A Liquid Waste Collection Tank. This 25,000 gallon tank was excavated and removed in one load.

TA-35-41, A Caustic Treatment Building. This building contained stainless steel tanks which were removed separately to TA-54. The building was excavated to 13 ft and was completely removed.

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*Tuff is rock composed of compacted volcanic ash and dust.

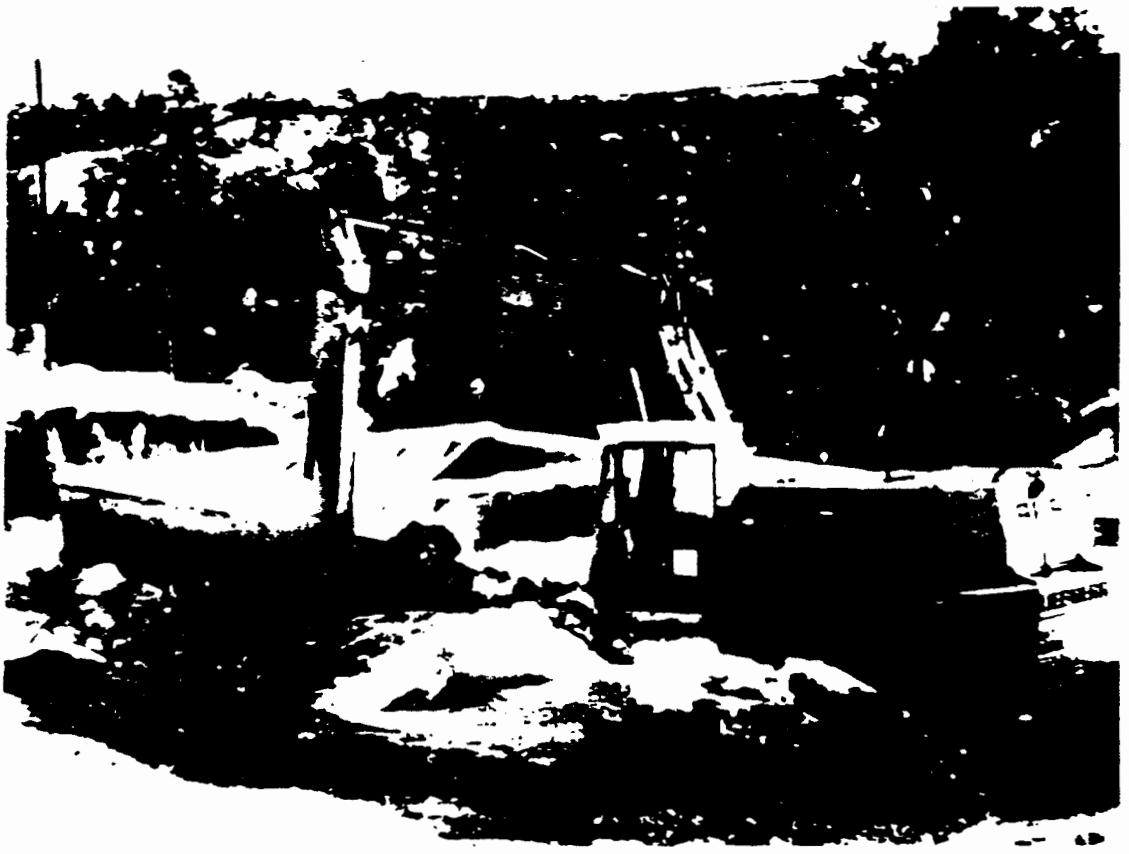

Fig. 9. Operations during the removal of structure TA-35-10, a contaminated liquid waste tank.

C. Pajarito Road (Work Packages I.3 and II.1)

1. Description of Work. Contaminated waste lines were removed from an area along the north side of Pajarito Road from the Diamond Drive intersection to TA-48. This work also included Line 28 from the Occupational Health Lab (Bldg OH-1, TA-59) to its interconnection with Line 31. A small building used to hold liquid waste (TA-59-08) was also removed. This work was performed in 1981, 1983, and 1984. A spill area originating from a break in 1974 was decontaminated again in 1984.

The Pajarito Road lines and their major features are summarized in Table VI. Line routings and the location of the spill area are shown in Figure 10 and on drawing ENG-C-43943, sheets 15 through 22. Final soil activity concentrations are shown on drawing ENG-C-43943, sheets S-3 through S-5 and S-19 through S-21. The primary contaminants found in the lines and the spill area were ^{238}Pu and ^{239}Pu. Radioactive waste, primarily soil and pipe, was transported to TA-54.

2. As-Left Conditions. Lines 24, 24A, 26, 27, 28, and 31 were completely removed with the Pajarito Road work.

3. Special Topics. A concrete block structure (TA-59-08, formerly TA-3-412) containing a holding tank and associated pumps and piping was removed with Line 28 operations. Line removal operations on the north side of Pajarito Road near TA-59 encountered contaminated soil left earlier after clean-up of a major spill from a break in Line 26. This spill was discovered July 9, 1974, and was followed by extensive clean-up. The area of contamination extended northward toward Mortandad Canyon from a cleanout at station 51 + 81 (see LA-6731-MS, March 1977).

Samples showing soil contamination were noted during removal of Line 26 in 1981 (see sheet S-4 of drawing ENG-C-43943) and again during removal of Line 31 during December 1983, prompting a trenching effort in 1984 to find and remove contaminated soil (see sheet S-20). A follow-up effort involved digging of exploratory trenches (all 6-8 ft deep, two 100 ft long and two others 60 ft long) in the suspect area. All samples were free of contamination above guidelines. The spill area is now considered to meet ALARA guidelines.

TABLE VI

PAJARITO ROAD LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
24	Line from cleanout (station 70 + 78) corner of Diamond-Pajarito intersection to MH-ULR-149 located west of TA-48.	3475	3	2-14	CIP	Completely removed (3225 ft removed in 1981; remainder removed in 1984). MH-ULR-149 removed in 1981 as part of TA-48 work.
24-A	Line from MH-727 across Diamond Drive to cleanout (station 70 + 78).	160	3	11-13	CIP	Completely removed in 1984.
26	Line from cleanout (station 70 + 78) at NE corner Diamond-Pajarito intersection to cleanout (station 55 + 30) NE of TA-59, OH-1.	1600	6	4-5	VCP	All but 75 ft removed in 1981; remainder removed in 1983.
27	Line from cleanout (station 55 + 30) to MH-ULR-149 west of TA-48.	2825	8	10	VCP	Completely removed in 1981.
28	Line from Occ. Health Lab, OH-1 (TA-59) to Line 31.	420	6	4-6	b	Line completely removed in 1984-85. Bldg 59-08 also removed.
31	Line from Diamond Drive to junction with Line 33 near TA-48 (station 31 + 66).	3776	5	3-11	PVC	Completely removed in 1983-84.

[a]Type symbols are defined in Table IV.

[b]Composite pipe (3-in PVC fed through 6-in VCP). The removed length shown is the sum of both pipes.

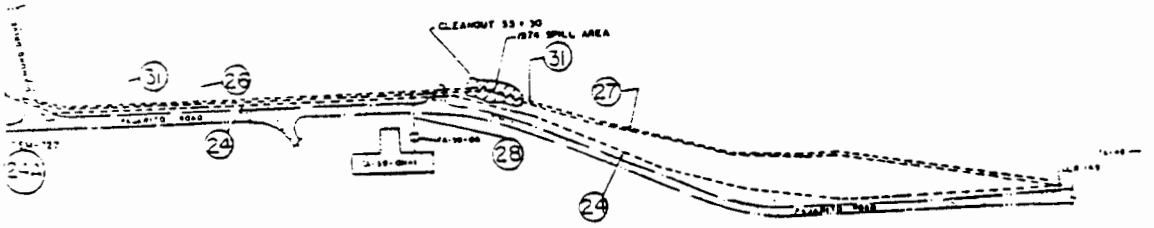

Fig. 10. Simplified diagram of Pajarito Road lines.

D. Townsite (Work Package I.4)

1. Description of Work. Four road crossings, the siphon (Line 167) in Los Alamos Canyon, and one manhole were removed from the townsite during a four-year period from 1981-1985. The lines and their major features are summarized in Table VII. Their routings and locations are shown in simplified form in Figure 11 and on drawing ENG-C-43943, sheets 30 through 33. Short sections of Line 167 were left in concrete anchors on Los Alamos Canyon walls and are discussed in more detail under As-Left Conditions.

2. As-Left Conditions. Lines 172, 173A, 173B, and 173C were completely removed with the Townsite work. Short (3 ft) sections of Line 167 were left in place in concrete anchors on the walls of Los Alamos Canyon (see memo Cox to Garde, July 3, 1984, and memo Montoya to Valentine, November 25, 1985). Anchors No. 2, 3, 4, and 5 were left on the north side of Los Alamos Canyon and No. 1, 2, 3, 4, and 5 on the south side. The pipe in each anchor was decontaminated to less than 400 dpm/100 cm^2 and both ends were sealed with concrete.

Lines 170 and 171 are discussed here because they are the only sections of the abandoned waste systems known to be left in the townsite. Other than two short sections of waste line outside the fence at TA-21, these are the only known lines left north of Los Alamos Canyon. Their removal was not part of the project described in this report. As described in the report of an earlier project (DOE/EV-0005/14, 1979), these lines and an associated manhole (MH-ULR-61) were left in place in the Health Research Laboratory - Los Alamos Medical Center area because they were difficult to remove and were also believed to be uncontaminated.

3. Special Topics. Manhole ULR-33 was removed from the bottom of Los Alamos Canyon in 1981 as part of the Townsite work.

TABLE VII

TOWNSITE LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
167	Siphon line under Los Alamos Canyon Bridge.	1003	3	2-15	DIP	Completely removed except for 9 concrete anchors left during 1981-1985 work period (see As-Left Conditions).
170	Line from Health Research Lab (HRL-1, TA-43) to MH-ULR-61.	---	---		---	For record only. A 225-ft section of uncontaminated pipe and MH-ULR-61 left east of HRL-1, TA-43 under parking lot after removal operations in 1977 (see DOE/EV-0005/14).
171	Continuation of Line 170 from MH-ULR-61 to MH-ULR-60.	---	---		---	For record only. A 355-ft section of uncontaminated pipe left under LAMC north wing and under parking lot after removal operations in 1977 (see DOE/EV-0005/14). MH-ULR-60 was removed in 1977.
172	Canyon Road crossing near Canyon-Diamond intersection.	60	4	7	DIP	Road crossing left after removal operations in 1984 was completely removed in 1986, except for an uncontaminated 12-in diam steel casing.
173A	Canyon Road crossing near Canyon-Central intersection.	67	8	4-6	VCP	Road crossing left after removal operations in 1984 was completely removed in 1985.
173B	Rose Street crossing near Central-Rose intersection.	43	8	4-5	VCP	Road crossing left after removal operations in 1984 was completely removed in 1985.
173C	Central Avenue crossing between Rose and Oppenheimer intersections.	78	8	7-8	VCP	Road crossing left after removal operations in 1984 was completely removed in 1985.

[a]Type symbols are defined in Table IV.

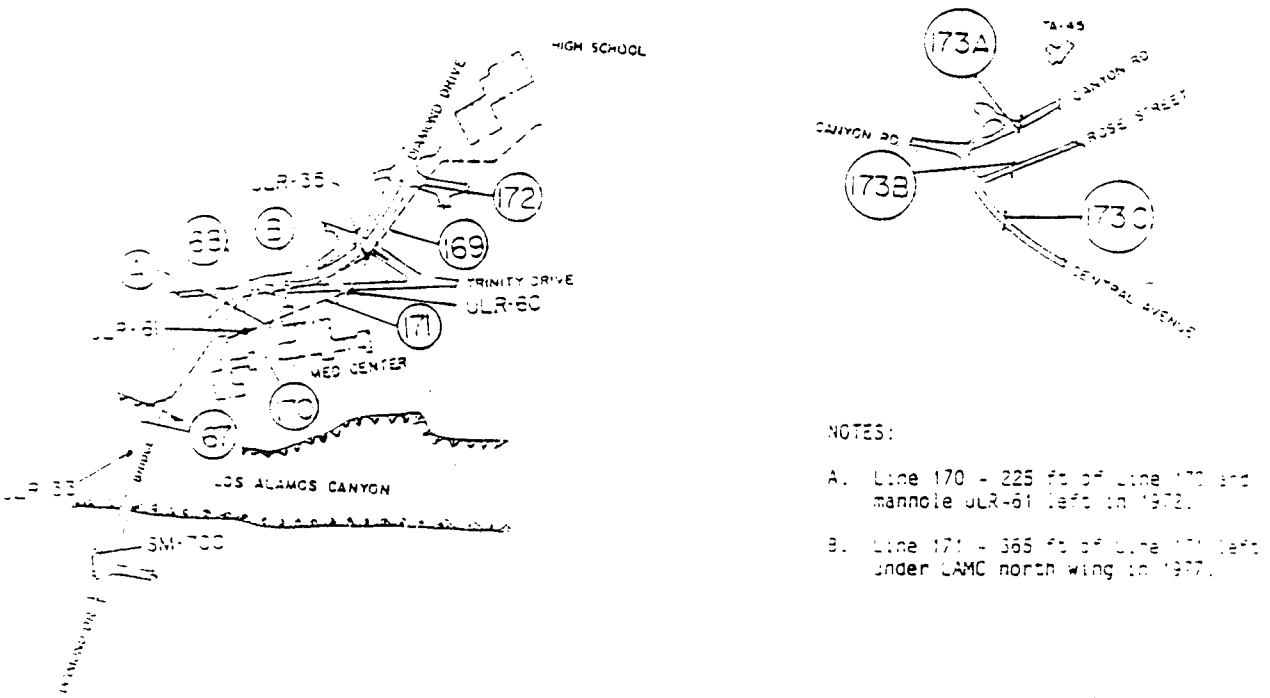

Fig. 11. Simplified diagram of Townsite lines.

E. TA-48/55 (Work Packages I.5 and II.3, and Line 34)

1. Description of Work. Contaminated waste lines were removed from the vicinity of TA-48 and TA-55 in 1981 and 1984. The lines and their major features are summarized in Table VIII. Line routings are shown in simplified form in Figure 12 and on drawing ENG-C-43943, sheets 23 through 28, 54.

2. As-Left Conditions. Lines 32, 35, 37, 39, and 41 were completely removed with the TA-48 work in 1981. Lines 33 and 40 were removed in 1984. The removal of Line 43 in the TA-55 area was begun in August of 1984 and finished in April of 1985. Approximately 100 ft of Line 34, 330 ft of Line 36, and 50 ft of Line 38 were left inside the security fence at TA-48. These lines ran under roadways, the guard station, sidewalks, and existing utilities (see memo Cox to Valentine, April 25, 1985). A 4-ft section of Line 43 was left in place

TABLE VIII

TA-48/55 LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
31	Line from MH-ULR-149 to its termination approximately 335 ft to the east (earlier connection with Line 33).	335	6		VCP	Completely removed in 1981. Removed MH-ULR-149 (see Special Topics).
33	Line from Line 31 junction near TA-48 (Station 31 + 66) to junction with Line 40 at MH-RC-10 (Station 28 + 75).	290	6	7	VCP, CIP	Completely removed in 1984.
34	Line from TA-48 (RC Bldg) to junction with Line 33 (Station 31 + 66).	200	3	3-7	CIP	Partially removed in 1984. Remaining 100 ft was left inside the security fence at TA-48 (see As-Left Conditions).
35	Line from MH-ULR-149 west of TA-48 to its termination approximately 150 ft to the east.	150	3		CIP	Completely removed in 1981.
36	Line from north wing of RC Building to Line 34.	0	3		CIP	A 330-ft section was left inside the security fence (see As-Left Conditions).
37	Line from north end of TA-48 northward to canyon outfall.	56	2		CIP	Completely removed in 1981.
38	Line from TA-48 (RC Building) to MH-RC-10.	6	3	7	CIP	A 50-ft section left in place (see As-Left Conditions).
39	Line from a vertical culvert at the former location of MH-RC-10 to MH-ULR-1016.	505	3		VCP	Completely removed in 1981.
40	Line parallel to Line 39 from MH-RC-10 to MH-ULR-1016.	459	6	6	PVC	Completely removed in 1984.
41	Line from south side of TA-48 to termination approximately 630 ft to the southeast.	630	1-1/2		SS	Completely removed in 1981.
42	Line from TA-48 to TA-50 (old line).	---	---	---	---	For record only. Completely removed with TA-55 construction project (see Special Topics).
43	Line from MH-ULR-1016 west of TA-55 to east side of Pecos Drive.	1762	6-8	3-4	CIP	A 4-ft section left in place south of TA-55 (see As-Left Conditions).

[a] Type symbols are defined in Table IV.

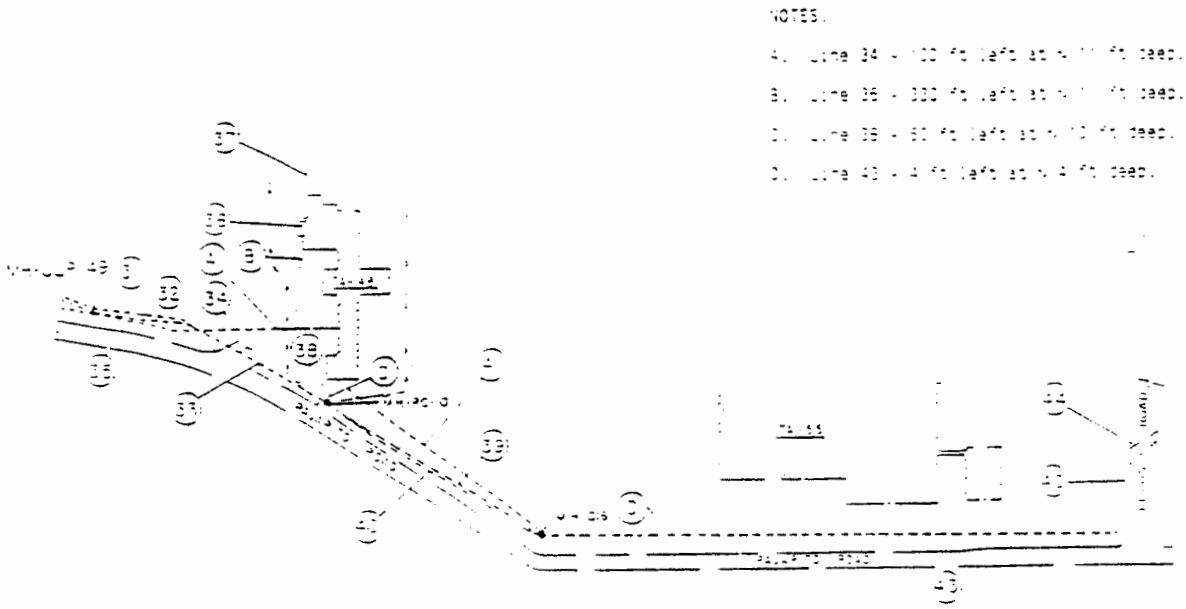

Fig. 12. Simplified diagram of TA-48/55 lines.

at station 2 + 80 (under Pecos Road) because it passed over a water main and under a gas main encased in concrete (see memo Cox to Garde August 28, 1984). The line was decontaminated by hand and both ends were sealed with concrete.

3. Special Topics. Manhole ULR-149 west of TA-48 was removed in 1981. Manhole ULR-1016 between TA-48 and Pecos Road was removed in 1984. A section of Line 42 originally believed to be in place under Pecos Road was searched for by trenching but was not found; it is believed to have been removed along with the rest of Line 42 during TA-55 site preparation.

F. SM-700 and Lines 1 and 23 to Manhole SM-703 (Work Package II.2)

1. Description of Work. SM-700 was the central collection point for contaminated liquid waste from TA-3 (CMR, Sigma, and a few other buildings). Its pumping capacity then transferred the waste by Line 23 to MH-SM-736 near the intersection of

Diamond and Pajarito Road, where gravity feed then took it to TA-50. Portions of two contaminated waste lines, three manholes, a pump station, and a retention tank were removed from the SM-700 area in 1981 and 1982. The lines and their major features are summarized in Table IX. Their routings are shown incidentally in Section III.H (Figure 15) and on drawing ENG-C-43943, sheets 35, 37, 40, and 44. Sections of Lines 1 and 23 and a portion of manhole SM-702 were left under the Diamond-Jemez intersection (see As-Left Conditions). Information on manholes and structures removed by this work is discussed in Special Topics.

2. As-Left Conditions. Lines 1 and 23 have been removed from the SM-700 area except for 150-ft and 100-ft sections, respectively, which remain under West Jemez Road at the intersection of Jemez Road and Diamond Drive. These lines were filled with asphalt emulsion and capped in 1982. Brass monument plates which mark each end of these two lines have subsequently been covered by landscaping (see ENG-C-43943, Sheet 35). The portions of Lines 1 and 23 south of West Jemez Road are discussed in the TA-3 section.

3. Special Topics. Manholes SM-701 and SM-703 were removed in 1982. Contaminated soil under SM-703 was removed to a maximum concentration of 255 pCi/g alpha and 24 pCi/g beta/gamma activity (see memo Harper to File, September 1, 1982). Part of manhole SM-702 remains under the Diamond-Jemez intersection.

The SM-700 structure consisted of a 16 ft x 22 ft x 11 ft concrete block pump house above ground and two 14 ft x 22 ft x 14 ft concrete tanks underground (see Figure 13). The structure was broken into manageable pieces by wrecking ball and transported to TA-54. SM-738 was an 11-ft diameter, 44-ft long steel tank which was half buried in the ground. This tank was removed as a single unit. The tanks apparently did not leak; soil samples underneath were below guideline.

TABLE IX

SM-700 AND LINES TO MH-703 SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
1	Line from SM-700 to monument B (45 ft south of MH-SM-703 location).	250	3	---	VCP	A 150-ft section left under the intersection of Diamond and West Jemez Road. MH-SM-701 and 703 were removed. MH-SM-702 partially left. Structures SM-700 and SM-738 also removed (see As-Left Conditions).
23	Line from SM-700 to monument near MH-SM-703 location.	215	6	---	CIP	A 160-ft section left under the intersection of Diamond and West Jemez Road (see As-Left Conditions).

[a]Type symbols are defined in Table IV.

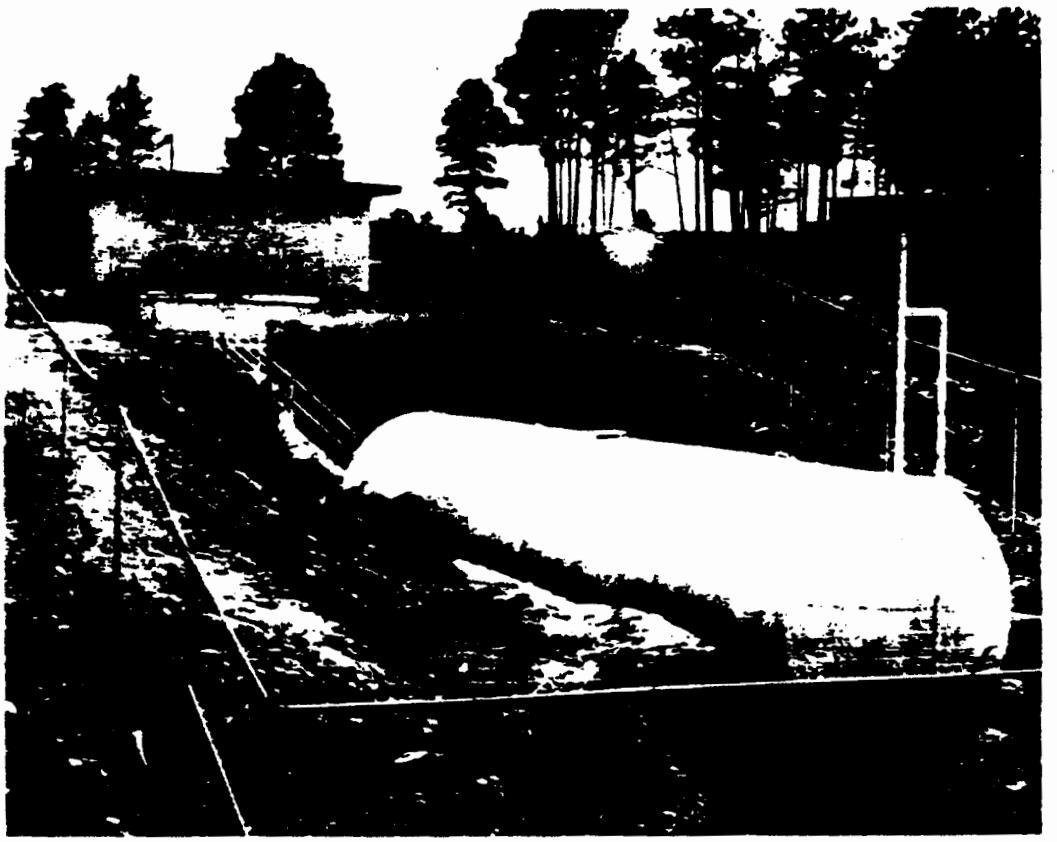

Fig. 13. SM-700 before being demolished.

G. Sigma Lines (Work Package II.4 and Lines 18A and 18B)

1. Description of Work. Nine contaminated waste lines and six manhole structures were removed from the vicinity of Sigma Building (TA-3) in 1983 and 1984. The lines and their major features are summarized in Table X. Their routings are shown in simplified form in Figure 14 and on drawing ENG-C-43943, sheets 45, 55, 56, 57, 58, 59, 62, 63, and 64. Final soil

TABLE X

SIGMA LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
18	Line northwest from TA-3-32 to marker north side of Eniwetok Dr.	204	4	4-10	VCP	Line completely removed in 1984. Manholes SM-710 and -732 both removed.
18A	Line from marker on north side of Eniwetok Dr. to east curb of Diamond Dr.	300	6	---	VCP	Line completely removed as a special package in 1983. Manhole SM-709 removed.
18B	Line from east curb of Diamond Dr. to MH-SM-708 west of Diamond Dr.	0	6	18-20	VCP	A 190-ft section of Line 18 was left under Diamond Dr. (see As-Left Conditions).
19	Line from north side of TA-3-34 to MH-SM-711.	70	4	7	VCP	Completely removed in 1984. Manhole SM-711 removed.
19A	Line connecting MH-SM-711 with MH-SM-710.	150	6	4-7	VCP	Completely removed in 1984.
20	Line from west side of TA-3-66 to MH-SM-732.	617	6	4-8	VCP	27 ft left under trailer SM-1515 and 16 ft under water main, 5 ft deep (see As-Left Conditions). Manhole SM-732 removed.
20A	Line from west side of TA-3-66 to MH-SM-734.	170	6	4	CIP	Completely removed in 1984.
21	Line from the northeast corner of TA-3-35 to MH-SM-734.	103	4	3-4	VCP	Completely removed in 1984. Manhole SM-734 removed.
22	Line from east side of TA-3-66 to TA-3-141.	278	2	4	SS	Completely removed in 1984.

[a] Type symbols are defined in Table IV.

activity concentrations are shown on drawing ENG-C-43943, sheets S-10, S-13, S-14, S-15, S-16, S-17 and S-18.

Most of this work was performed during the period February to April, 1984. A separate project removed another section of Line 18 (designated 18A) in 1983. A third section (designated 18B) was left (see As-Left Conditions). The primary contaminants found in this work package were tritium, ^{235}U, and ^{238}U.

2. As-Left Conditions. Lines 19, 19A, 20A, 21, and 22 were completely removed with the Sigma work. Holes left where lines exited from buildings or manholes were sealed with concrete.

Lines 18 and 18A were removed in two separate operations, as stated in 1. above. A 190-ft section of Line 18 (Line 18B) remains under Diamond Drive and the SM-123/Museum parking lot (see memo Montoya to Valentine, March 10, 1986). This line is called Line 18A in the ALARA memo.

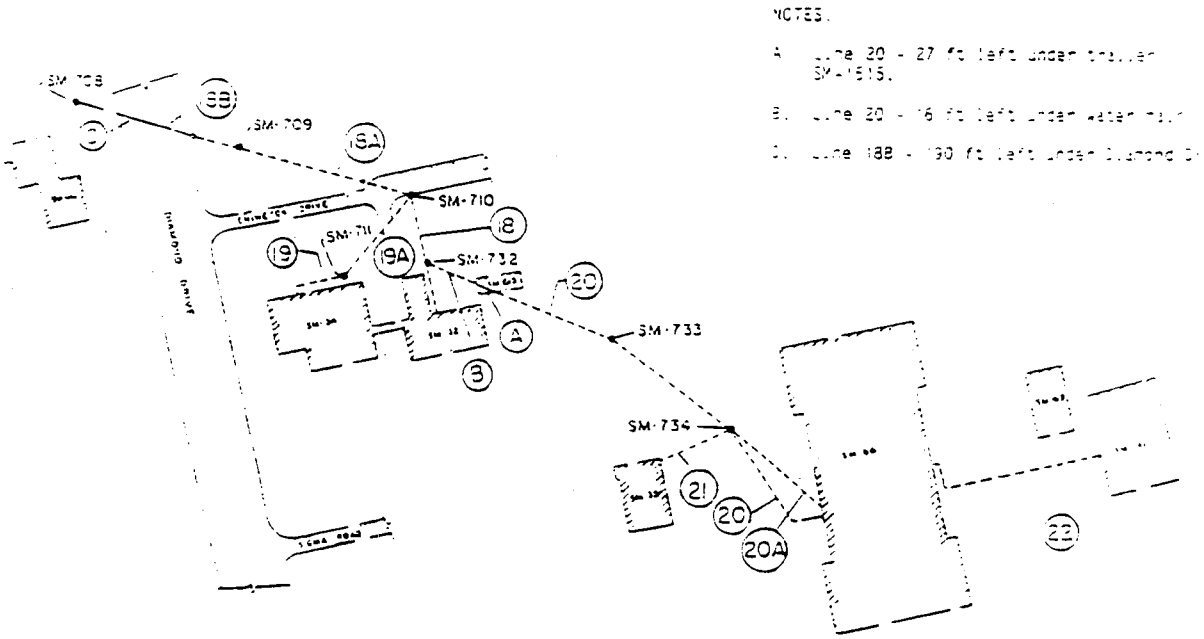

Fig. 14. Simplified diagram of Sigma Building and related lines.

Line 20 was removed except for a 27-ft section left under a trailer (SM-1515, still in place) and a 16-ft section found encased in concrete under a water main. Repeated washing of both sections lowered contamination to background levels. Contamination in soil at the ends of both sections was below guideline level. Decisions to leave these sections were described by memo Cox to Garde, March 2, 1984.

Line 21 had a preexisting break 20 ft east of SM-35. The highest level of soil contamination was 1200 pCi/g. Soil concentration levels were recorded on drawing C-43943, Sheet S-17. Soil was removed to meet the guideline level at this location.

3. Special Topics. Six manhole structures were completely removed from the vicinity of Sigma Building (MH-SM-709, -710, -711, -732, -733, and -734). Manhole 709 was removed in 1983 with Line 18A. Weights of these manholes ranged from 9 to 18 tons. Manholes 710 and 734 were found filled with concrete. Tritium was the primary contaminant in Line 19 serving SM-34; ^{235}U and ^{238}U were the primary contaminants in the lines from SM-35, -66, and -102. Soil removal was required below manhole 734 to meet guideline level.

H. TA-3 (Work Package II.6)

1. Description of Work. Eighteen contaminated waste lines and 18 manholes were removed from the TA-3 vicinity in 1984, 1985, and 1986. The lines and their major features are summarized in Table XI. Their routings are shown in simplified form in Figure 15 and on drawing ENG-C-43943, sheets 66-70 and 75-88. Some sections of the following lines were left and are discussed in more detail in As-Left Conditions: 1, 2, 5, 7, 8, 9, 11, 12, 13, 17, 17C, 17D, 17E, and 30A. The removal of the manholes is discussed in Special Topics.

2. As-Left Conditions. Lines 2A, 3, 9A, 9B, 15, 15A, 23, and 30 were completely removed in 1984 and 1985 with the TA-3 work. Several sections of other lines were left in place, primarily because of interference by many utility lines in the area. Left lines were plugged at each end. The sections left in place are discussed below.

Line 1. A 140-ft section of Line 1 was left in place (see memo Montoya to Valentine, March 10, 1986). This section extends northward from as-left manhole SM-708 (see memo Cox to Valentine, September 12, 1985) toward the original location of manhole SM-707. Its depth ranges from 12 to 20 ft. A separate section of Line 1 was left during the SM-700 work (see Section III.F.).

Several major leaks occurred over the years in Line 1 between manholes SM-706 and SM-707. The contaminated zone was encountered several feet above and to the side of the pipe at these locations. Contaminated soil containing up to 5 nCi/g of alpha activity was removed. The trench was enlarged at times to 12-ft width and 16-ft depth to reach all contaminated soil (see Figure 16). The guidelines were met at all locations.

Line 2. An 8-ft section of Line 2 was left under the nitrogen dewar tank at SM-216 (see memo Cox to Garde, July 27,

TABLE XI

TA-3 LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
1	Line from MH-SM-703 to MH-SM-708.	901	8	7-14	VCP	Partially removed in 1985 and 1986. Left a 140-ft section north from MH-SM-708 (see As-Left Conditions).
2	Line from MH-SM-716 to MH-SM-708.	1111	8	6-7	VCP	Partially removed in 1984. Left several sections (see As-Left Conditions).
2A	Line running alongside Line 2.	116	8	6-11	VCP	Completely removed in 1984.
3	Line from SM-40 to MH-SM-716.	497	6	4-7	VCP	Completely removed in 1984.
5	Line from SM-28 to MH-SM-714.	169	8	3-9	CIP	Partially removed in 1984. Left 12-ft section (see As-Left Conditions).
7	Line from MH-SM-725 to MH-SM-708.	0	8	18-20	VCP	Left 1040-ft section east of SM-29 including mannoles MH-708, -719, -722, and -725 (see As-Left Conditions).
8	Line from SM-29 (Wings 2 and 4) to MH-SM-719.	110	6	19-20	VCP	Left a 471-ft section along the north side of SM-29, Wing 2. Left a 13-ft section entering Wing 4 from the north (see As-Left Conditions).
9	Line from SM-29 (Wings 3 and 5) to MH-SM-722.	245	6	5-20	VCP	Left 390-ft section (including MH-SM-723) along the north side of SM-29, Wing 3 (see As-left Conditions).
9A	Line from SM-29 (Wing 1, north side) to Line 9.	187	6	7	VCP	Completely removed in 1985.
9B	Line from SM-29 (Wing 1, south side) to Line 9.	75	6	5-7	VCP	Completely removed in 1985.
10	Line from MH-SM-726 to MH-SM-725.	NA	6	---	VCP	This line considered part of Lines 17 and 17E. Completely removed.
11	Line from MH-SM-728 to MH-SM-725.	674	8	12	VCP	Partially removed in 1984. Left 4-ft section at south edge of Pajarito Road; left a 23-ft section under SM-177 (see As-Left Conditions).
12	Line from MH-SM-725 to MH-SM-728.	1010	8	5-15	VCP	Partially removed in 1984. Left 63-ft section east of SM-16 (see As-Left Conditions).
13	Line from SM-102 to MH-SM-730.	660	6	13-16	VCP	Partially removed in 1984. Left 5-ft section and 3-ft section south of SM-102 (see As-Left Conditions).

TABLE XI (Continued)

TA-3 LINES SUMMARY

LINE NO.	DESCRIPTION	REMOVED LENGTH (ft)	DIAM. (in)	RANGE OF DEPTH (ft)	TYPE[a]	AS-LEFT CONDITION
14	Line from SM-16 to MH-SM-737.	100	8	---	VCP	Completely removed during new waste system installation.
15	Line from SM-65 to MH-SM-728.	31	4	6	VCP	Completely removed in 1984.
15A	Line from change trailer SM-1502/03 to MH-SM-728.	55	4	2	PVC	Completely removed in 1984.
17	Line from SM-154 to MH-SM-726.	599	6	18-21	VCP	Partially removed in 1985. Left a 2-ft section on south side of SM-29 (see As-Left Conditions).
17A	Line from SM-29 Wing 9 to SM-154.	NA	6	5	CIP	A 177-ft section was retained as part of the new waste system.
17B	Line from SM-29 Wing 9 to SM-154.	NA	4	5	SS	A 190-ft section was retained as part of the new waste system.
17C	Line from SM-29 Wing 9 to Line 17.	0	6	18-21	VCP	A 35-ft section was left on the south side of Wing 9, SM-29 (see As-Left Conditions).
17D	Line from SM-29 Wing 7 to Line 17.	0	6	20	VCP	A 14-ft section was left on on the south side of Wing 7, SM-29 (see As-Left Conditions).
17E	Line from SM-29 Wing 7 to Line 17.	36	6	16-19	SS/ VCP	Partially removed in 1985. A 3-ft SS section was left on south wall of Wing 7 (see As-Left Conditions).
23	Line from MH-SM-703 to MH-SM-736.	2887	6	4-12	CIP	Completely removed in 1985.
25	Line from MH-SM-736 to cleanout (Station 70 + 78).	85	6	4	CI/ VCP	Completely removed in 1984.
30	Line from MH-SM-727 to MH-SM-736.	136	6	4-6	CIP	Completely removed in 1984.
30A	Line from MH-SM-727 to SM-97, an old guard station removed in 1955.	176	8	6-8	VCP	Partially removed in 1984. Left a a 5-ft section 60 ft west of Diamond Drive (see As-Left Conditions).

[a]Type symbols are defined in Table IV.

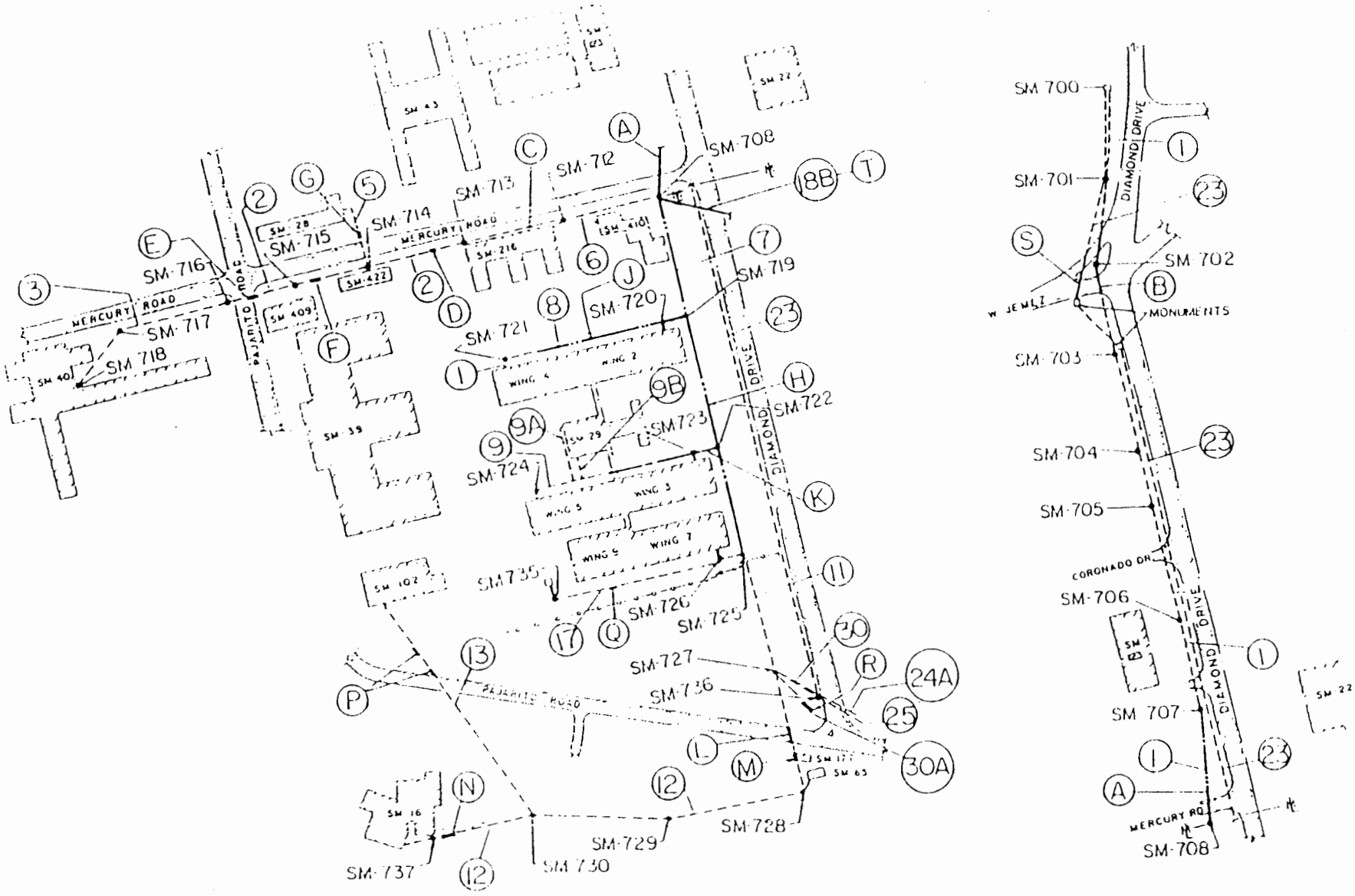

Fig. 15. Simplified diagram of TA-3 and related lines.

Fig. 15 (Continued)

NOTES:

A. Line 1 - 140 ft left under a parking lot and utilities.

B. Line 1 - 250 ft left under West Jemez Road (see SM-700 work).

C. Line 2 - 8 ft left under a nitrogen dewar.

D. Line 2 - 23 ft left under conduits and water main.

E. Line 2 - 40 ft left under Pajarito Road.

F. Line 2 - 7 ft left under conduits.

G. Line 5 - 12 ft left under utilities.

H. Line 7 - 1040 ft and manholes SM-708, -719, -722, and -725 left under utilities.

I. Line 8 - 19 ft left under utilities.

J. Line 8 - 471 ft left under transformer and utilities.

K. Line 9 - 390 ft left.

L. Line 11 - 4 ft left at south edge of Pajarito Road.

M. Line 11 - 23 ft left under Building SM-177.

N. Line 12 - 63 ft left under retaining wall.

P. Line 13 - 5 ft and 3 ft left under utilities.

Q. Lines 17, 17C, 17D, 17E - 12-ft, 5-ft, 35-ft, 14-ft, and 3-ft sections left under obstructions.

R. Line 30A - 5 ft left under conduit.

S. Line 23 - 160 ft left under West Jemez Road (see SM-700 work).

T. Line 18B - 190 ft left under Diamond Drive (see Sigma work).

Fig. 16. Excavation to remove contaminated soil along Line 1.

1984); a 4.5-ft section was left at 6.5-ft depth under Pajarito Road (see memo Cox to Garde, November 13, 1984). A 7-ft section of Line 2 was left at 5-ft depth near Building SM-422 under 16 conduits encased in concrete (see memo Cox to Garde, September 11, 1984). A 40-ft section was left at 5-ft depth under Pajarito Road at Mercury Road (see memo Cox to Valentine, March 20, 1985); this section included the 4.5-ft section above. A 23-ft section of Line 2 was left under 12 conduits and encased water main west of Bldg SM-216 (see memo Cox to Garde, August 13, 1984).

Line 5. A 12-ft section of Line 5 was left at 5-ft depth under water and gas lines encased in concrete at Mercury Road (see memo Cox to Garde, September 28, 1984).

Line 7. Approximately 1040 ft of Line 7 and four manholes (708, 719, 722, and 725) were left at 18- to 20-ft depth east of SM-29. The line lies under numerous utility lines (see memo Cox to Valentine, September 12, 1985).

Line 8. A 19-ft section of Line 8 was left where it enters the northwest corner of SM-29, Wing 4. Utility lines crossed over Line 8 at that point. A 471-ft section of Line 8 was left north of Wing 2, beginning at a transformer and ending at MH-SM-719 (see memo Montoya to Valentine, December 17, 1985). Manhole SM-720 in Line 8 was removed.

Line 9. A 390-ft section of Line 9 was left at a 19-20-ft depth. This section was left under the Wing 1-to-Wings 3/5 corridor and eastward to MH-SM-722 (see memo Montoya to Valentine, December 17, 1985). Utility lines, lawn sprinklers, and trees lay over this section of Line 9, which also includes manhole SM-723.

Line 11. A 4-ft section of Line 11 was left at the south edge of Pajarito Road. Its location under a 16-in water line and a storm sewer and its depth (16 ft) rendered it too difficult to remove (see memo Cox to Garde, July 18, 1984). A 23-ft section of Line 11 was left under Building SM-177 at a depth of 13 ft (see memo Cox to Garde, July 3, 1984).

Line 12. A 63-ft section of Line 12 was left under a retaining wall of the upper parking lot at SM-16 (see memo Cox to Garde, June 27, 1984).

Line 13. A 5-ft section of Line 13 was left at 16-ft depth under a steam and condensate line (see memo Cox to Garde,

June 28, 1984). A 3-ft section of Line 13 was left at 17-ft depth under a sanitary sewer line (see memo Cox to Garde, June 28, 1984). These sections are both south of Building SM-102.

Line 17. A 12-ft section of Line 17 was left at a depth of 21 ft under the new waste line, storm drains, and a concrete encasement south of SM-29 Wing 9 (see memo Cox to Valentine, June 10, 1985). Contaminated soil (up to 400 pCi/g beta activity) was left at two locations along Line 17 south of SM-29 (see memo Cox to Valentine, July 22, 1985). A 5-ft section of Line 17 was left west of manhole-SM-725 (see log 7/11/85). Figure 17 shows the deep trenching required to remove Line 17.

Line 17C. A 35-ft section of Line 17C was left at a depth of 21 ft under the same interferences listed for Line 17 above (see memo Cox to Valentine, June 10, 1985).

Line 17D. A 14-ft section of Line 17D was left under a retaining wall and the floor of SM-29 Wing 7 generator room (see memo Cox to Valentine, July 23, 1985). The section is at 20-ft depth south of Wing 7.

Line 17E. A 3-ft length of Line 17E, a 6-in stainless steel pipe, was plugged and left protruding from the south side of SM-29 Wing 7.

Line 30A. A 5-ft section of Line 30A was left in place west of Diamond Drive at a depth of 5 ft (see memo Cox to Garde, June 21, 1984). This section is encased in concrete under a 13 KV electrical conductor.

Fig. 17. Deep trenching to remove Line 17 south of SM-29.

3. Special Topics. The manholes listed below were removed in 1984, 1985, and 1986 as part of the TA-3 work:

SM-704 (12 tons)	SM-720 (3 tons)
SM-705 (10 tons)	SM-721 (2 tons)
SM-706 (19 tons)	SM-724 (1.5 tons)
SM-707 (10 tons)	SM-726 (1.3 tons)
SM-712 (12 tons)	SM-727 (15 tons)

SM-713 (9 tons)	SM-728 (3.2 tons)
SM-714 (6 tons)	SM-729 (3.4 tons)
SM-715 (7 tons)	SM-730 (3.4 tons)
SM-716 (8 tons)	SM-735 (1.5 tons)
SM-717 (8 tons)	SM-736 (6 tons)
SM-718 (fragmented)	SM-737 (weight unknown)

Manholes SM-708, -719, -722, and -725 were left in place with Line 7 due to overlying utilities, as stated under Line 7 above. Manhole SM-723 was left in place near Wing 3 of Building SM-29 with a section of Line 9 (see memo Montoya to Valentine, December 17, 1985). The cover of each manhole was sealed with silicone adhesive and tack-welded closed.

I. TA-21 (Work Package II.7)

1. Description of Work. This work involved removal of abandoned tanks, piping, and equipment associated with past waste disposal operations at Building TA-21-257. Liquid contaminated with plutonium, uranium, americium, and tritium was delivered to the facility in mobile tanks. There it was neutralized, mixed with cement in a pug mill, and delivered by transfer pipe (later a hose) into forms (24-in diameter corrigated metal pipes 21 ft long). These concrete shapes were stored vertically in the ground in an outdoor storage area a few hundred feet to the northwest of Building 257. Contaminated pipe, scaffolding, tanks, the pug mill, and the walls of the room containing the pug mill were removed in 1986. A transfer pipe filled with concrete which solidified during a transfer breakdown was removed. Also removed was a fiberglass casing through which a transfer hose passed from Building 257 to the outdoor storage area. The concrete shapes containing retrievable amounts of TRU waste will be transferred from TA-21 to TA-54 as a separate project in the near future.

2. As-Left Conditions. The work at TA-21 was limited due to lack of funding under the waste lines project. The Building 257 work was performed because the operating group (HSE-7) indicated it to be the most pressing beneficial work which could be accomplished with the funds remaining in the project. However, extensive waste line work remains to be done at TA-21. Approximately 3000 ft of abandoned waste line exists, two sections of which extend beyond the TA-21 fence north of Building 257. These carried liquid waste to a contaminated outfall area on the wall of DP Canyon. Several thousand additional feet of active waste lines at TA-21 will be subject to removal after completion of waste system upgrade activities.

IV. SUMMARY

Radioactive liquid waste lines removal operations conducted at Los Alamos during the period 1981-1986 have been described. This $4.2 million project has successfully removed 34,500 ft (6.5 miles) of abandoned underground lines and many related structures. Although interfering utilities, roads, and structures necessitated leaving some sections of line in place, the major portion of the old liquid waste system is now removed. This is particularly true of lines in the Los Alamos townsite and in areas outside fenced technical areas.

The removal operations were under the technical management of Los Alamos National Laboratory's Radiation Protection Group (HSE-1) with construction engineering support from the Facilities Engineering Division (Construction Group, ENG-1). The Zia Company provided skilled and unskilled craft personnel, a field engineer, other support personnel, and necessary equipment.

Several major upgrades in the liquid waste management program at Los Alamos led to abandonment of major portions of the old liquid waste system. These occurred in 1963 when a new waste treatment plant (TA-50) started service; in 1964, when the old treatment plant at TA-45 was deactivated; and in 1979, when a major construction project installed new lines between TA-3 and TA-50.

The project was conducted according to the principle that doses to workers or to anyone occupying areas cleaned up by the project would be kept as low as reasonably achievable (ALARA). Soil cleanup guidelines were established and adhered to, usually by total removal of contaminated soil and piping. When interfering utilities or other problems prevented total removal, the decision to leave an item in place was reached after careful consideration of the health risk presented by the item and the cost/benefit of its removal.

The project was monitored by several HSE Division groups to insure it was carried out in an environmentally sound, industrially safe manner. HSE-1 provided continuous personnel monitoring and field monitoring of soil and solid waste; HSE-3 and the Zia Safety Office provided personnel safety coverage; HSE-8 provided environmental soil monitoring and record sample analysis. HSE-7 provided disposal of the large volumes of waste material produced by the project.

Results of operations were described in terms of items left, ALARA decision memoranda, and reference to the as-left engineering drawings. Approximately 46 items were left in place, consisting of a total waste line length of approximately 6000 ft. This quantity indicates approximately 85% of the 39,000-ft total length of abandoned liquid waste lines was effectively removed.

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We also would like to express our appreciation for word processing provided by Sandra Borrego (HSE-1).

APPENDIX A

COST AND WASTE VOLUME SUMMARY

During Phase II of the liquid waste lines project, approximately 24,000 ft of pipe and 1,130 m^3 of manholes and other structures were removed. Available cost and waste volume data for each line are listed in Table A-1. A summary of cost data shows the approximate line removal costs in 1984-85 dollars were:

Type	Depth	Average Cost
Vitrified Clay Pipe,	2 to 8 ft	$102/ft
6 - 8 in diameter	9 to 20 ft	$115/ft
Polyvinyl Chloride (PVC)	5 to 7 ft	$ 59/ft
Metal Pipe, all sizes,	2 to 6 ft	$ 75/ft
	7 to 15 ft	$141/ft
Average Removal Cost		$ 98/ft

Similar data from structure removal operations in Phase II are summarized in Table A-2. Structure removal costs were:

Manholes	$525/$m^3$
Buildings	$290/$m^3$
Average Removal Cost	$408/$m^3$

The above cost includes pipe or structures removal, back fill, removal of contaminated concrete, pipe, or soil to TA-54, and restoration of the area. The cost also includes D & D, monitoring, engineering and environmental support personnel, equipment rental, and expense items.

In the Phase II work, one foot in every eight was left in place due to location of pipe, proximity to active utilities, line depth, and the like. The average contamination inside the pipe was usually less than 40,000 dpm/100 cm^2 and/or 5 mR/hr. The amount of contamination did not have a major effect on the removal cost unless the pipe had developed a leak.

Excluding start-up and shutdown cost, purchase of special capital equipment, and inflation, \$100/ft for pipe and \$400/m^3 for structures may be useful bases for estimates on future projects of this type.

TABLE A-1

LINE COST AND WASTE VOLUME SUMMARY[a]

Line No.	Site[b]	Type[c]	Diam. (in)	Length Removed (ft)	Length Left (ft)	Avg. Depth (ft)	Waste Volume Removed (m^3) pipe	Waste Volume Removed (m^3) soil	Avg. Activity[d] ($dpm/100cm^2$)	Removal Cost[e] ($K)	Cost/ft ($/
1	TA-3	VCP	8	901	140	12	51.5	432	40K	220.4	245
1	SM-700	VCP	8	250	150	-					
2	TA-3	VCP	8	1111	Note f.	6	36	2	Bkg[g]	87.5	77
2A	TA-3	VCP	8	116		6	2	4	Bkg	2.2	19
3	TA-3	VCP	6	497		5.5	11.5	-	Bkg	16.2	33
4	TA-3	-	-	Note h.		-	-	-	-	-	-
5	TA-3	CIP	3	169	12	7	1	-	Bkg	11.9	70
6	TA-3	DI	4	6		4	0.5	-	Bkg		-
7	TA-3	VCP	8	0	1040	19	-	-	4×10^6	-	-
8	TA-3	VCP	6	110	490	20	2	12	36K	3.5	32
9	TA-3	VCP	6	245	390	18	8	16	2×10^6	23.6	96
9A	TA-3	VCP	6	187		7	5	4	Bkg	14.2	76
9B	TA-3	VCP	6	75		6	2	-	Bkg	6.2	83
10[i]	TA-3	-	-	-		-	-	-	-	-	-
11	TA-3	VCP	8	674	27	12	17.5	33.5	Bkg	46.0	68
12	TA-3	VCP	8	1010	63	8	29	41.5	Bkg	45.7	45
13	TA-3	VCP	6	660	8	15	32	86	1600[j]	51.0	77
14	TA-3	VCP	8	100		-	-	-		-	-
15	TA-3	VCP	4	31		6	0.7	-	Bkg	3.1	100
15A	TA-3	PVC	4	55		2	1.8	-	Bkg	2.7	49
16	TA-3	-	-	-		-	-	-	-	-	-
17	TA-3	VCP	6	599	12	18	31	91	400K[k]	93.3	156
17A	TA-3	CIP	6	0	177	5	-	-	-	-	-
17B	TA-3	SS	4	0	190	5	-	-	-	-	-
17C	TA-3	VCP	6	0	35	18	-	-	400K	-	-
17D	TA-3	VCP	6	0	14	20	-	-	400K	-	-
17E	TA-3	SS/VCP	6	36	3	17	1.5	7.5	400K[k]		-
18	Sigma	VCP	4	204		7	4.5	13	1600[l]	17.6	86
18A	Sigma	VCP	6	300		19	-	-	1600[l]		-
18B	Sigma	VCP	6	0	190	19					
19	Sigma	VCP	4	70		7	2	5	1600	12.7	181
19A	Sigma	VCP	6	150		6	4.5	11.5	1600	10.6	71
20	Sigma	VCP	6	617		6	13	37	8000[j]	41.9	68
20A	Sigma	CIP	6	170		4	4.5	4.5	1000[j]	12.5	74
21	Sigma	VCP	4	103		4	3	22	60,000[j]	9.3	90
22	Sigma	SS	2	278		4	2	-	Bkg	13.2	48

TABLE A-1 (Continued)

LINE COST AND WASTE VOLUME SUMMARY[a]

Line No.	Site[b]	Type[c]	Diam. (in)	Length Removed (ft)	Length Left (ft)	Avg. Depth (ft)	Waste Volume Removed (m^3) pipe	soil	Avg. Activity[d] (dpm/100cm^2)	Removal Cost[e] ($K)	Cost/ft ($)
33	SM-700	CIP	8	215	160						
33A	TA-3	CIP	6	2887		5	68	32	12K	119.8	42
34	PR	CIP	3	3475		8					
34A	PR	CIP	3	160		14	4.5	-	324K	16.7	104
35	TA-3	CI/VCP	6	85		4	3.5	-	160K	8.4	99
36	PR	VCP	6	1520							
36A	PR	VCP	6	80		5	3	5	16K	9.4	118
37	PR	VCP	8	2825		10	-	-	-	-	-
38	PR	VCP/PVC		420		6	14	-	Bkg	20.8	50
39	Active	CIP	4	110		-	-	-	-	-	-
40	TA-3	CIP	6	136		5	3.5	-	8K	1.6	12
40A	TA-3	VCP	8	176	5	8	4.5	3.0	Bkg	3.0	17
41	PR	PVC	5	3776		7	56	2	30K	38.9	10
42	TA-48	VCP	6	335		-	-	-	-	-	-
43	PR	VCP/CIP	5	290		7	16	30	40K	8.3	29
44	TA-48	CIP	3	200	100	6	2	5.5	2K	8.5	43
45	TA-48	CIP	3	150		-	-	-	-	-	-
46	TA-48	CIP	3	0	330	-	-	-	-	-	-
47	TA-48	CIP	2	56		-	-	-	-	-	-
48	TA-48	CIP	3	6	50	7	0.5	0.5	2K	0.99	165
49	TA-48	VCP	8	505		-	-	-	-	-	-
50	TA-48	-	5	459		6	11	6.5	Bkg	4.0	9
51	TA-48	SS	1 1/2	630		-	-	-	-	-	-
52	TA-48	SS	1 1/2	40		-	-	-	-	-	-
53	TA-48	CIP	6-8	1762	4	4	54	13	32K	56.1	32
54	TA-50	CIP	6	28		6	1	-	32K	3.1	111
55	TA-50	PVC	5	588		6	7.5	-	32K	14.0	24
55A	TA-50	PVC	5	67		7	1.5	-	Bkg	0.84	13
56	TA-50	CIP	6	41		15	1	8	320K	9.6	229
57	TA-50	CIP	4	14		11	0.5	-	Bkg	3.9	279
58	TA-50	CIP	6	95		6	3.5	-	400K	5.6	58
58A	TA-50	SS/PVC	Note m.	44		9	1	3	320K	7.7	183
59	TA-35	CI/PVC	3	508	2100	6	6.5	-	Bkg	22.9	45
59A	TA-50	CIP	3	305		-					
50-53	ACTIVE	CIP	3								
54	TA-50	CIP	3	65		-	-	-	-	-	-

TABLE A-1 (Continued)

LINE COST AND WASTE VOLUME SUMMARY[a]

Line No.	Site[b]	Type[c]	Diam. (in)	Length Removed (ft)	Length Left (ft)	Avg. Depth (ft)	Waste Volume Removed (m^3) pipe	soil	Avg. Activity[1] (dpm/100cm^2)	Removal Cost[e] ($K)	Cost/ft $
55	TA-50	VCP	6	300		-	-	-	-	-	-
56-66	ACTIVE									-	
67	TA-50	CIP/VCP	6	280		-	-	-	-	-	-
68	TA-35	SS	3	24		3	0.5	-	Bkg	1.3	54
69	TA-35	BS	4	17		4	1		Bkg	0.9	53
70	TA-35	SS/BS	4	268	35	3	7	-	Bkg	35.3	132
71	TA-35	VCP	4	48	150	3	0.5		Bkg	2.7	56
72	TA-35	BS	4	122		4	1.5		Bkg	2.9	23
73-89	TA-35	SS	1-3	289		3	5	-	5mR/hr	3.9	14
90	TA-35	SS	2	138	120	3	1.5	31	3mR/hr	2.3	17
90A	TA-35	SS	3	50		6	1	66	5mR/hr	5.6	112
90B	TA-35	BS	1	140		15	3	157	5mR/hr	12.8	175
90C	ACTIVE	BS	1	22		-	-	-	-	-	-
91	TA-35	BS	3	139	71	15		-	20mR/hr	13.1	94
92	TA-35	BS	2	137	73	15			20mR/hr	13.3	97
93	TA-35	BS	1	100							
94	TA-35	BS	2	35							
95	TA-35	DI	2	82							
96	TA-35	SS	2	12							
97	TA-35	SS	3	144							
98	TA-35	SS	2	150							
99	TA-35	SS	2	150							
100-113	ACTIVE										
114	TA-35	SS	3	17		3	0.5	-	50mR/hr	1.0	59
115-131	Note n.										
132-166	Note o.										
167	TOWN	CIP	3	1003	Note p.	8	12.5	-	12K	83.6	120
168-171	TOWN				Note q.						
172	TOWN	CIP	4	60		7	3	-	12K	10.1	168
173A	TOWN	VCP	8	67		6	2.5	.5	12K	18.3	273
173B	TOWN	VCP	8	43		5	2.5	5	2.4K	9.2	214
173C	TOWN	VCP	8	78		6	2.5	.5	16K	16.1	206
257	TA-21	BS	2	137		3	2	-	200K	-	-

TABLE A-1 (Continued)

NOTES:

a. Costs and waste volume data compiled from Phase II data. Phase I data not complete.

b. Site designations correspond to those used in the body of this report. If blank, the line was not removed as part of this project.

c. Type symbols: BI black iron, BS black steel, CIP cast iron pipe, DI duriron, GS galvanized steel, PVC polyvinyl chloride, SS stainless steel, VCP vitrified clay pipe.

d. Alpha radiation from ^{238}Pu or ^{239}Pu unless otherwise noted. Dose rates in mR/hr are at contact.

e. Removal costs based on craft (Zia) costs only.

f. Several small sections left in place.

g. Bkg is background level $\leq$ 200 dpm/100cm^2 or < 25 pCi/g of soil.

h. Removed during construction of Building SM-422.

i. Renumbered as part of Line 17.

j. ^{235}U and/or ^{238}U was the radioactivity in this line.

k. Up to 5 mR/hr.

l. ^{238}U and suspect tritium.

m. 3-in SS pipe inside 6-in PVC.

n. Lines at TA-2 (not part of this project). Lines 117, 118, 119, and 131 removed in 1985.

o. Lines at TA-21 (not part of this project). Some of these lines are active.

p. Concrete anchors left in place.

q. Lines at HRL and Los Alamos Medical Center (not part of this project). Lines 168 and 169 were removed in 1976. Line 170, 255 ft left; Line 171, 365 ft left (see text).

TABLE A-2

STRUCTURE REMOVAL COST AND WASTE VOLUME[a]

Structure Number	Site[b]	Vol (m^3)	Weight (tons)	Waste Vol (m^3)	Contam. Level[c]	Total Cost ($K)	Cost/m^3 Waste	Comment
MANHOLES								
701	SM-700							
702	SM-700							Base left in place.
703	SM-700	8.5	17					
704	TA-3	5.0	11.5	5.0	64K	2.3	460	
705	TA-3	4.3	10	24.3	400K	4.5	185	
706	TA-3	7.0	19.3	46	Bkg[e]	13.7	297	
707	TA-3	7.0	20	22	120K	10.4	472	Exterior contamination 10K.
708	TA-3							Left in place.
709	Sigma							Removed in 1982.
710	Sigma	5.7	9	7.9	1.6K	3.6	371	^{238}U, possible tritium.
711	Sigma	8	14	9	1.6K	3.6	400	
712	TA-3	5.6	12	5.6	Bkg	4.2	750	
713	TA-3	10	9	10	Bkg	2.8	280	
714	TA-3	4.7	6.5	4.7	Bkg	2.4	510	
715	TA-3	5.5	7.5	5.5	Bkg	3.7	673	
716	TA-3	9.6	8.3	9.6	Bkg	2.5	260	
717	TA-3	3.2	8.5	3.2		1.9	594	
718	TA-3	1.5				3.1	2066	
719	TA-3							Left in place.
720	TA-3	3.3	3	6				
721	TA-3	2.1	1.3	2.1				
722	TA-3							Left in place.
723	TA-3							Left in place.
724	TA-3	3.3	1.5	3.3				
725	TA-3							Left in place.
726	TA-3	2.1	1.0	2.1				
727	TA-3	10	27	10	8K	6.3	624	
728	TA-3	3.2	9	3.2	330	1.5	469	^{238}U
729	TA-3	3.4	9	3.4	Bkg	3.2	941	
730	TA-3	3.4	9	3.4	500	2.0	588	^{238}U
732	Sigma	9	14	9	1.6K	4.1	455	^{238}U, possible tritium.
733	Sigma	5.9	11	5.9	1.6K	3.0	508	^{238}U, possible tritium.
734	Sigma	4.6	9	7.6	1.6K	4.2	552	^{238}U, possible tritium.
735	TA-3	3.3	1.5	3.3				
736	TA-3	3.0	7	3	160K	2.5	833	
737	SM-16	2.0	-	2	Bkg	0.8	400	
1016	TA-48	9	4.8	10	32K	1.3	130	

TABLE A-2 (Continued)

STRUCTURE REMOVAL COST AND WASTE VOLUME[a]

Structure Number	Site[b]	Vol (m^3)	Weight (tons)	Waste Vol (m^3)	Contam. Level[c]	Total Cost ($K)	Cost/m^3 Waste	Comment
MANHOLES								
AM-5	TA-50	3.4		50	1×10^6	13.0	260	Contaminated soil remains.
AM-8	TA-50							
AM-55	TA-50	1.0		1.0	Bkg	0.4	400	
AM-56	TA-50	2.0		2.0	Bkg	0.4	200	
CLR-33	Town							
CLR-149	TA-48							
TSL-12	TA-35	3.5		33.5		5.4	161	^{90}Y, ^{90}Sr contaminated soil remains.
OTHER STRUCTURES								
AM-700	AM-700							
SS-08	TA-59							
TSL-8	TA-35	60	30	122	40[f]	30.3	238	
TSL-9	TA-35	60	50	Note g.	50[f]	Note g.	Note g.	
TSL-10	TA-35	317		643	30[f]	134	208	
TSL-22	TA-35							
TSL-31	TA-35	37		50	Bkg	9.4	186	
TSL-36	TA-35	-	-	-	-	-	-	
TSL-41	TA-35	-	66	72	Bkg	14.	195	

NOTES:

a. Cost and waste volume data compiled from Phase II data. Phase I data not complete.

b. Site designations correspond to those used in the body of this report.

c. Interior alpha radiation in dpm/100 cm^2 from ^{238}Pu or ^{239}Pu, unless otherwise noted.

d. Removal costs based on craft (Z1a) costs only.

e. Bkg is background level $\leq$ 200 dpm/100 cm^2 or <25 pCi/g of soil.

f. mR/hr.

g. Combined with TSL-8.

APPENDIX B

BASIS FOR SOIL CLEANUP GUIDELINES

I. INTRODUCTION

Possible cleanup guidelines for various radionuclides likely to be encountered during the radioactive liquid waste lines removal project were reviewed. This appendix discusses the basis for the cleanup guides presented in Section II.A.1 of this report and the procedures for their implementation. Cleanup operations were based on the following guidance.

- Keep radiation exposure to the general public to as low a level as reasonably achievable (ALARA) (DOE 1981). This guidance implies that all contamination be removed to the extent possible, given existing technical and economic constraints. Removal of contamination to background conditions was considered the ideal objective. However, situations arose in which removal to background levels was not feasible. In these cases contamination was removed as practical.

- Remaining soil contamination, after being minimized in accordance with the ALARA policy, must also comply with the requirement that no member of the public receive a dose, as a result of exposure to the contamination, exceeding specified dose limits of 500 mrem/yr to any organ of the body. Soil radioactivity levels corresponding to this dose limit were estimated for those radionuclides that might be encountered. Incorporation of conservative assumptions made it very unlikely that a member of the public would receive a dose in excess of 500 mrem/yr from soil concentrations below the guidelines.

Flexibility in the application of these guidelines was recommended. This would involve considering each hard-to-decontaminate area individually, taking into account such factors as the extent and depth of the contaminated zone, the radionuclides present and their

concentrations, the nature of the contaminated soil, and the safety, economics, and likely benefit of further decontamination efforts.

II. SURFACE SOIL GUIDELINES

Surface soil guidelines were applied to above-background concentration of radionuclides in soil to a depth of 5 ft (1.5 m). This depth was selected because the root zone of most agricultural plants does not exceed 1.5 m. Guidelines for surface soil were developed not only to be directly applied to existing surface contamination, but also to be indirectly applied to subsurface contamination that may eventually appear on the surface through some physical process, such as excavation or erosion.

Surface soil guidelines for the radionuclides considered here, taken from Healy and Rodgers (Healy 1979A), and Healy, Rodgers, and Wienke (Healy 1979B), were presented in Table III. They result from evaluation of inhalation, ingestion, and external radiation doses over 70 yr of exposure.

The ^{241}Am guide recommended by Healy and Rodgers (Healy 1979A) was changed to correspond to the home gardener ingestion pathway (Healy 1979B). This pathway was considered more appropriate for the waste line case than the scenario in which an individual obtains all his food from the contaminated area.

The uranium soil guideline from Healy (1979B) was calculated for ^{238}U in equilibrium with ^{234}U. This guideline was changed to correspond to the two radionuclides considered individually. Presentation of the uranium soil guides in this form was convenient for the liquid waste line project, since ^{238}U and ^{234}U were found in disequilibrium in some locations.

III. SUBSURFACE SOIL GUIDELINES

Healy and Rodgers (Healy 1979A) investigated a variety of pathways by which buried radioactive material could reach the biosphere and result in a dose to man. The pathways they considered included 1)

erosion of the material and its covering soil and subsequent flow into river systems used for drinking water and irrigation, 2) leaching into groundwater, 3) resuspension of material exposed by erosion, and 4) human habitation and agriculture on exposed material. They found the most limiting pathway for long-lived radionuclides to be living and farming on contaminated soil where soil cover had been eroded away.

For the waste lines removal project, this human habitation pathway would also be among the most restrictive. Three different exposure scenarios were considered to be the more restrictive scenarios applicable to the project. Each involves some type of unintentional human entry into the contaminated zone. Results of the analyses for each scenario are presented in Table B-1. Subsurface soil concentration guides based on these results were presented in Table III.

A. Human Habitation of Eroded Contaminated Area

The first scenario is a direct application of the human habitation pathway (Healy 1979A). Cover soil is eroded by surface flow until subsurface radioactive material is eventually exposed. The radionuclide concentration in this exposed soil is required to be equal to the surface soil guidelines (Table III). Dilution factors are estimated that relate the original subsurface concentrations to the levels expected to be present in the exposed radioactive material. In evaluating the effect of erosion in exposing contaminated soil, Healy (1979A) applied a general dilution factor of 2 to account for mixing with uncontaminated suspended sediment in the water. An additional dilution factor of 6 due to the mixing of the contaminated material with clean soil upon burial was also used. The overall dilution factor is 12 (2 x 6), so that the subsurface soil concentration guides would be equal to the surface guides multiplied by 12. Results are given in the first column of Table B-1.

B. Locating a Home on Excavated Soil

A second potential pathway involved the placement of contaminated soil on the surface. It was assumed that an individual constructed his home across the contaminated area and the excess soil excavated from the basement was spread around his home. The soil was used for gardening and was available for wind resuspension. The basement had dimensions of 60 ft x 30 ft x 10 ft (18 m x 9 m x 3 m), and the contaminated soil that was dug up was conservatively assumed to have dimensions of 60 ft x 6.6 ft x 3.3 ft (18 m x 2 m x 1 m). This described a volume 6.6 ft (2 m) in width and 10 ft (3 m) in depth, running along the length of the basement 5 ft (1.5 m) below the surface of the ground. The dilution factor, calculated from consideration of the volume of the soil excavated, was 13.5. The guidances derived for this scenario are given in the second column of Table B-1.

C. Excavation of Contaminated Soil

A third scenario consisted of an unintentional entry into the contaminated area, such as by workmen digging a basement or installing underground utility lines. This scenario was considered applicable to the frequent construction that occurs along Pajarito Road and Diamond Drive.

Exposure time estimates were based on the time necessary to excavate a basement the size of that described in B above. Estimated times varied greatly according to the type of machinery involved in the excavation. Estimates ranged from 11 h to 22 h. A representative scenario for the maximum exposed individual would include high dust loading and a relatively long exposure time. The maximum exposed individual was assumed to participate in the construction of ten homes in the contaminated area during the course of a year (a total exposure time of 24 h). The dust loading was assumed to be 5 mg/m^3, the existing threshold limit value for nuisance dust in the respirable range. The workman's breathing rate was 43 L/min, corresponding to heavy exertion. The dilution factor of 13.5 derived above was used. Dose con-

version factors from Healy (1979A) were utilized to predict the inhalation dose. Because of the exposure times, the doses calculated were the 70 yr dose commitments rather than the annual dose.

For ^{137}Cs, the most restrictive exposure in this scenario would result from external radiation. Using the value of 0.62(R/hr)/(pCi/g) for a uniformly contaminated soil (Healy 1979B), the exposure for 240 h would be 0.15 mR/(pCi/g). Results of the analysis are given in the third column of Table B-1.

D. Tritium Concentration Guides

Tritium was treated as a special case since it was not included in the referenced reports (Healy 1979A and Healy 1979B). Soil concentration guidelines were derived for tritiated water. The guidelines were given in units of pCi per ml of soil moisture, rather than pCi/g. The three scenarios considered for the subsurface soil guidelines were also analyzed for tritium exposure. These analyses are not described here due to the minor role tritium played in the decontamination effort of the project.

The surface soil moisture guideline was 8870 pCi/ml; subsurface, 120 000 pCi/ml. These values are in Table III.

E. Application of Guidelines

Most contamination occurred below the liquid waste line at depths ranging from 3 ft (0.9 m) to 30 ft (9 m). Surface contamination at or near the surface could appear in areas near the trench where excavated soil was placed, and the surface soil guidelines would apply. An appropriate depth to apply these values was determined to be 5 ft (1.5 m), corresponding to a level bounding the root zones of most agricultural plants with an added margin of safety. Below that level, the subsurface guidelines would apply.

Guidelines given here were derived for area sources. In the field the simplest use of these guidelines would be to apply them to single measurements, such as soil samples. However, flexibility was recommended in cases where a single sample exceeded the limit but, when averaged with other positive samples in its vicinity, the average concentration would be below the guideline. Use of single measurements for comparison with the soil guidelines was considered a conservative procedure not always reasonable to follow in all situations. Whether or not to apply an area average for a particularly difficult area to decontaminate was decided on a case-by-case basis. It was suggested that an area over which averaging would be appropriate would be a 60 ft x 6.6 ft (18 m x 2 m) contaminated area (same as in Section B).

Excavated sections of liquid waste line were cleaned until no above background readings were obtained with survey instruments. When no excess radioactivity was measured, soil samples were taken along the trench bottom and trench walls. The number of soil sampling locations was determined by expected radionuclide levels and their variability. These soil samples would then be dried and counted for gross alpha and gross beta using a ZnS scintillator detection system as described in Section II.A.3. The counting error ($\pm$ 3 std dev) for a 5-min count has been estimated at 26 pCi/g for gross alpha (background count of 30) and 3.75 pCi/g for gross beta (background count of 300). These values are 52% and 5% of the most restrictive surface soil concentration guides and 3% and 0.4% of the most restrictive subsurface soil guides.

TABLE B-1. SUMMARY OF SCENARIO CALCULATIONS FOR THE SUBSURFACE SOIL GUIDELINES (pCi/g)[a]

Radionuclides	Erosion Scenario	Locating a Home on Excavated Soil	Excavation of Contaminated Soil
AM-241	600	675	724
Pu-239,240	2400	2700	1942
Pu-238	4200	4726	3185
U-238	960	1080	5550
U-235	960	1080	5550
U-234	960	1080	5550
Cs-137	960	1080	3360
Sr-90	1200	1350	2.8×10^6
H-3[b]	-	120 000	4.0×10^6

[a] Soil activity concentration above natural background which could result in a dose to any organ of 500 mrem/yr.

[b] pCi/ml of soil moisture.

APPENDIX C

PROCEDURES FOR ALARA DECISIONS

ALARA policy is applied to D & D activities at the Laboratory by way of

- normal efforts to keep exposure of each D & D worker or any other worker ALARA while performing his job,

- limitations on potential exposure of workers from any radiation source left after D & D activities, and

- limitations on potential exposure of any member of the public from any radiation source left after D & D activities.

Implementation of ALARA activities is directed by HSE-1 (Radiation Protection Group). Oversight or enforcement is provided by HSE-8 (Environmental Surveillance Group) when the project or activity could have a potential impact on the environment or has a human/environment interface.

ALARA activities are not directed by committee at Los Alamos. HSE-1 personnel responsible for monitoring operations involving radiation or radioactive material of a particular site advise the operating group on how best to perform the work in a manner that keeps doses ALARA.

ALARA applications have been common in D & D work at Los Alamos. D & D workers have had very low dose acquisition compared to radiation workers. Our experience shows that routine radiation protection practices (radiation monitoring, dosimetry, and airborne contamination sampling) and the relatively low dose rates encountered in D & D operations to date combine to keep dose levels low. An HSE-1 health physics technician is assigned full time to D & D projects.

ALARA decisions related to D & D work at Los Alamos have dealt primarily with left contaminated items or soil. The general procedure followed to arrive at ALARA decisions for left items was as follows:

1. The HSE-1 representative is informed by the construction engineering representative that an item should be left in place for substantive reasons: it is beneath or encased with major utility lines, it is beneath structures or streets, it is at depths too great to reach by normal means. Extra effort to remove the item would exceed cost/benefit guidance.

2. The HSE-1 representative verifies that the quantity of remaining radioactivity is either low enough or its depth is great enough that the item will not pose a hazard to workers or the public anytime in the future. Entombment or placarding or placement of a monument is considered in cases where intrusion by digging into the area could be hazardous.

3. The HSE-8 representative is informed of the need to leave the item in place. He investigates and concurs or asks for further effort.

4. When concurrence is reached, the HSE-1 representative prepares an ALARA memorandum and includes descriptive material as needed to document the location and activity level of the item.

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Healy 1979B: J. W. Healy, J. C. Rodgers, and C. L. Wienke, "Interim Soil Limits for D & D Projects," Los Alamos Scientific Laboratory report LA-UR-79-1865-Rev (September, 1979).

Nelson 1980: D. C. Nelson and J. L. West, "Contamination Control Demonstration for Radioactive Pipeline Decommissioning," Los Alamos document LA-UR-80-1210 (April 1980).

OSHA 1979: "Excavation, Trenching, and Shoring," US Department of Labor, Occupational Safety and Health Administration, Title 29, Code of Federal Regulations, Part 1926.

Umbarger 1978: C. J. Umbarger and M. A. Wolf, "A Battery Operated Portable Phoswich Detector for Field Monitoring of Low Levels of Transuranic Contaminants," Nuclear Instruments and Methods, 155, p. 453-457 (1978).

ATTACHMENT 1

ALARA DECISION MEMORANDA

LOS ALAMOS NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS NEW MEXICO 87545
Telephone Ext

OFFICE MEMORANDUM

TO: Radioactive Liquid Waste Collection System Improvement Project File

DATE: August 28, 1981

THRU: Allen Valentine, Technical Manager

FROM: Lee McAtee, Asst. Technical Manager

SUBJECT: SUB PROJECT B: LINE REMOVAL, WORK PACKAGE I.2.TA35

SYMBOL: H-1-81

MAIL STOP: 401

Between August 14 and 24, 1981, as part of the Acid Waste Line Removal Project, structure TSL-22 at TA-35 shown on the attached figure was excavated and taken to the solid radioactive disposal site for proper burial. TSL-22 was formerly used as a sludge holding tank for a radioactive liquid processing plant at the site. Upon removal it was found that surrounding soil was contaminated to as high as 4.6×10^{4} disintegration per minute per gram of soil (d/m/g) with Sr-90 and Cs-137. This soil was excavated laterally until no further contamination was detectable by established monitoring procedures [3σ error = 3.75 pCi/g gross beta]. The soil was also excavated downward to essentially solid tuff at about four feet below where the bottom of the tank had been located (total depth ten feet below surface). At this depth, activity levels ranging between 180 and 5,000 pCi/g gross beta primarily associated with cracks between solid pieces of tuff were still detectable.

To further decontaminate this area would require large heavy equipment and an inordinate quantity of soil removal. The excavated area is closely adjacent to TA-35, TSL-7 which is within an active Laboratory site. Also comparison of the activity type, levels, and distribution in the pit to hazard evaluation scenarios for Sr-90 indicate a very low probability of significant exposure due to any future intrusion into the contaminated area.

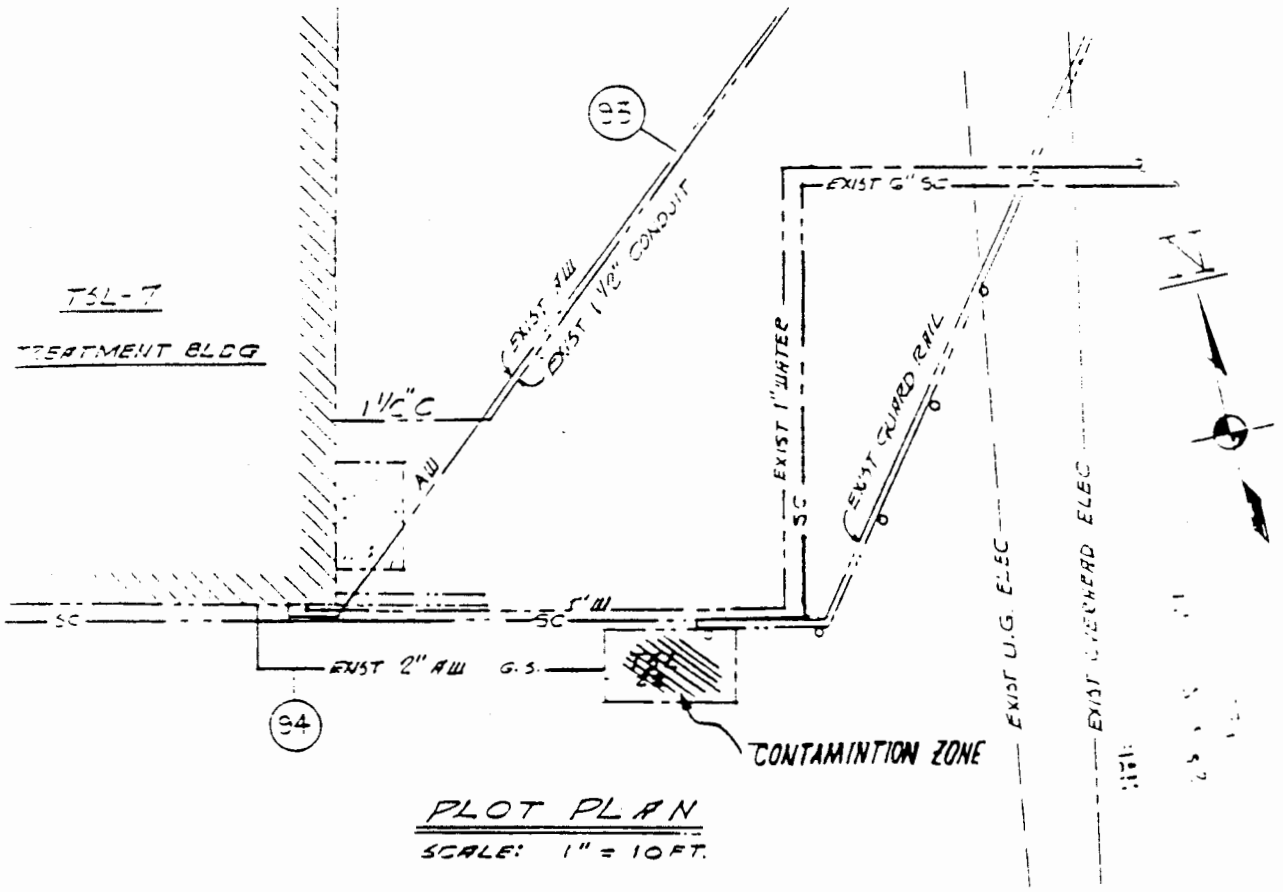
For these reasons, it has been recommended and approved by Line Removal Project Management and DOE officials that there be no further decontamination of the area and that the excavation be backfilled with clean soil. This document verifies that the proper authorities in compliance with established and approved procedures have determined that the area described above has been decontaminated to As Low As Reasonably Achievable levels.

LM:jm

Encl: a/s

Harry S. Jordan
Construction Project Manager
9/1/81
Date

William Crismon
William Crismon
Los Alamos Area Office, DOE
9/3/81
Date



PLOT PLAN
SCALE: 1" = 10 FT.

RADIO ACTIVE LIQUID WASTE COLLECTION SYSTEM - TABS TEN SITE

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: RLWCS Improvement Project: Sub-Project B-Line Removal File
THRU: Ray Garde, Technical Manager
DATE: September 1, 1982
MAIL STOP/TELEPHONE: E517/7-5397

FROM: J. R. Harper, H-7
SYMBOL: H7-82-316

SUBJECT: "ALARA" DECISION AT THE TA-3-SM-703 LOCATION

TA-3-SM-703, a 1.3- x 1.3- x 2.3-meter concrete acid sewer manhole structure, was removed on August 30, 1982, and disposed of at the solid radioactive waste disposal site. Contaminated soil found under the structure was removed such that a 2.7- x 2.7- x 5.3-meter pit was created in the former location of TA-3-SM-703. The average gross alpha contamination found in the bottom of the trench was 140.4 pCi/g of soil. The range of gross alpha contamination levels was from 78.4 pCi/g to 255.1 pCi/g. The average beta-gamma contamination found in the bottom of the trench was 22.8 pCi/g of soil with a range of contamination levels from 19.9 pCi/g to 24.0 pCi/g.

To further decontaminate this area would require large heavy equipment and an inordinate quantity of soil removal with no significant beneficial returns as hazard evaluation scenarios indicate an extremely low probability of significant exposure due to any future intrusion into the bottom of the contaminated pit. The sides of the pit are not contaminated according to established monitoring procedures.

For these reasons, it has been decided by Line Removal Project management and DOE officials that there be no further decontamination in the pit and that the pit location be documented and the pit backfilled with noncontaminated soil. This document verifies that the proper authorities in compliance with established and approved procedures have determined that the area described above has been decontaminated to As Low As Reasonably Achievable Levels (ALARA)

JRH/pb

Harry S. Jordan
Construction Project Manager

William Crismon
Los Alamos Area Office, DOE

To: RLWCS Improvement Project:
Sub-Project B Line Removal File
Ray Garde, H-7, MS E518

September 1, 1982
H7-82-316

Distribution:

H-1 Group Office, MS P229
H-7 Group Office, MS E518
H-8 Group Office, MS K490
W. Crismon, DOE/LAAO, MS A316
H. Jordan, HDO, MS P228
J. Harper, H-7, MS E518

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Ray Garde DATE March 2, 1984

FROM Jim Cox MAIL STOP/TELEPHONE E520/7-5420

SYMBOL HSE-7-84-108

SUBJECT DECONTAMINATION OF TWO SECTIONS OF LINE 20 AT THE SM-32-34 AREA

A total of 43 ft of Line 20, a 6" vitreous clay pipe were decontaminated, surveyed, sealed and left in place on March 1, 1984.

The first section was 27' long located under trailer SM1515. The second section was 16' long encased in concrete located under a water main.

The decontamination effort consisted of swabbing the inside of the pipe with detergents, rinsing and drying. The 16 ft section was washed twice.

Both sections were surveyed for alpha and beta contamination. Direct surveys were made with standard portable instruments. The alpha detector was attached to a ten foot pole and the pipe was surveyed from each end.

Swipes were counted on proportional counters at TA-50.

Direct-alpha survey results were <100 dpm/50 cm^2 (normal background for the instruments) beta readings were $\leq$0.2 mR/hr (background for this area).

Two of the swipes taken on the east end of the 16' section were over 2 x background, the pipe was rewashed and the recount was at background levels. The soil located at the endsof the pipe was below established guide lines.

The exact locations were recorded for the as built drawings.

xc: File

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Ray Garde, Radiation Protection Associate Group Leader
DATE June 21, 1984
FROM Jim Cox, Technical Supervisor
MAIL STOP/TELEPHONE E520/7-5420
SYMBOL HSE-1-84
SUBJECT A SECTION OF LINE 30A LEFT IN PLACE WEST OF DIAMOND DRIVE

A total of 5' of Line 30A, a 8" vitreous clay pipe were left in place on June 19, 1984.

The section of pipe was located under a 13.2KV underground electrical duct encased in concrete at a depth of 5' feet. During the encasement of the electrical duct, the 5' portion of Line 30A was also encased in concrete. It appears that Line 30A was filled with concrete. Since Line 30A has been abandoned, no effort was made to repair the line or remove the concrete.

Direct alpha surveys on each end of the encased section were $\leq$ 200dpm/100cm^2 (normal background of the instrument). Soil samples along this line have been less than 25pc/g.

The exact location were recorded for as-built drawings.

JC:lb

Xc: File
R. Romero, HSE-8 MS K490

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Ray Garde, Radiation Protection Associate Group Leader
DATE June 27, 1984
FROM Jim Cox, Technical Supervisor
MAIL STOP/TELEPHONE E520/7-5420
SYMBOL HSE-1-84
SUBJECT A SECTION OF LINE 12 REMAINING AT THE SM-16 PARKING AREA

A total of 63 feet of Line 12, an 8 inch vitreous clay pipe were surveyed, sealed and left in place on May 23, 1984.

The section of pipe was located under a concrete retaining wall and parking area at a depth of approximately 14 feet.

Direct alpha, beta and gamma surveys of inside the pipe were $\leq$ 200 dpm/100 cm^2 alpha and $\leq$ 0.2 mr/hr beta and gamma. A tritium smear was taken inside the pipe and analyzed by HPAL the results were 220 dpm/100 cm^2. A cloth swipe was pulled through the pipe and surveyed for alpha with a NaI counter, results were $\pm$ 1 dpm/cm^2. The above readings were normal background for the instruments. The tritium smear results is considered insignificant.

Soil samples taken at each end of the remaining section of pipe were < 25 pCi/g. The exact location were recorded for the as-built drawings.

JC:ac

Xc: R. Romero, HSE-8, MS K490
File (TA-50)

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Ray Garde, Radiation Protection Associate Group Leader
FROM Jim Cox, Technical Supervisor
DATE June 28, 1984
MAIL STOP/TELEPHONE E520/7-5420
SYMBOL HSE-1-84
SUBJECT TWO SECTIONS OF LINE 13 REMAINING AT THE OS PARKING AREA

A total of 8 feet of line 13, a 6" vitreous clay pipe were left in place on May 3, and 5, 1984.

The first section was 3 feet long located at a depth of 17 feet under a 10 inch clay sanitary sewer line. The sewer line was 10 feet above Line 13. While attemoting to remove Line 13, a small crack and "sagging" of the sewer line was detected, the line was re-supported and encased in concrete.

The second section was 5 feet long at a depth of 16 feet located under cement encased steam and condensate lines and a 16 inch water main. The removal of Line 13, 10 feet below these lines was felt would jeopardize the integrity of the water main.

Sections of line and soil on both sides of the remaining sections were surveyed by Phoswich and ZnS Counting Systems. No contamination above 25 pc./g was detected.

The exact locations were recorded for the as-built drawings.

JC:lb

Xc: R. Romero, HSE-8, MS K490
File

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO Ray Garde, Radiation Protection Associate Group Leader
FROM Jim Cox, Technical Supervisor
DATE July 3, 1984
MAIL STOP/TELEPHONE E520/7-5420
SYMBOL HSE-1-84
SUBJECT LINE 167: CONCRETE ANCHORS LEFT IN PLACE ON NORTH SIDE OF LOS ALAMOS CANYON

Five concrete anchors (average size 2' x 3' x 6') were used to secure IWL 167, a 3" cast iron pipe, to the north wall of Los Alamos Canyon. For exact locations refer to Engineering Drawing No. C43943, sheet 32. The upper most anchor was removed, but the other four anchors were left in place on June 20, 1984.

The sections of pipe left encased in each of the anchors were approximately 3' long. The sections were decontaminated, the ends were sealed with concrete and the anchors were backfilled to upgrade one foot above the pipe openings.

During the removal of Line 167, soil samples were taken between the anchors, all samples were below established guide lines. Embedded alpha activity inside the pipe was less than 25 pc/g. Beta-Gamma activity were at background levels.

JC:ac

Xc: ALARA File, TA-50, MS E520
R. Romero, HSE-8, MS K490

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Ray Garde, Radiation Protection Associate Group Leader
DATE July 3, 1984
FROM Jim Cox, HSE-1
MAIL STOP/TELEPHONE E520/7-5420
SYMBOL HSE-1-84
SUBJECT A SECTION OF LINE 11 REMAINING AT THE SM-65 AREA

A total of 23 feet of line 11, an 8-inch vitreous clay pipe were surveyed, sealed, and left in place on May 17, 1984.

The section of pipe was located under Building SM-177 at a depth of 13 feet.

Direct alpha surveys of inside the pipe were < [illegible] dpm/100 cm^2 and Beta readings were < 0.2 mr/hr. A cloth swipe was [illegible] through the pipe and surveyed for alpha activity with a NaI co[illegible] results were < 1 dpm/cm. All of the above readings were norma[illegible] background for the instruments.

Soil samples taken at each end of the remaining section of pipe were < 25 pCi/g. The exact locations were recorded for the as-built drawings.

JC:vm

Xc: TA-55
R. Romero, HSE-8, MS K490
File

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Ray Garde, Radiation Protection Associate Group Leader
DATE July 18, 1984
FROM Jim Cox, Radiation Protection Tech. Supervisor
MAIL STOP/TELEPHONE E520/7-5420
SYMBOL HSE-1-84
SUBJECT A SECTION OF LINE 11 LEFT IN PLACE SOUTH OF PAJARITO ROAD

A total of four feet of Line 11, an 8-inch vitreous clay pipe were left in place on July 14, 1984.

The section of pipe was located at a depth of 16 feet under a water main, storm sewer, co-ax and telephone lines. It was felt that the removal of Line 11, 11 to 12 feet below these lines by mechanical means, would prevent jeopardizing of the integrity of the water main. Tunneling at this depth by hand was considered a personnel safety hazard.

Sections of line and soil on both sides of the remaining section were surveyed by Pnoswich and ZnS counting systems. No contamination above 25 pCi/g was detected.

The exact locations were recorded for the as-built drawings.

JC:vm

Xc: R. Romero, HSE-8, MS K490
File, TA-50, MS E520

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Ray Garde, Radiation Protection Associate Group Leader
DATE: July 27, 1984
FROM: Jim Cox, Radiation Protection Technical Supervisor
MAIL STOP/TELEPHONE: E520/7-5420
SYMBOL: HSE-1-84
SUBJECT: A SECTION OF LINE 2 REMAINING NORTH OF BUILDING SM-216

A total of 8 feet of Line 2, an 8-inch vitreous clay pipe was left in place on July 17, 1984. The section of pipe was located at a depth of 6 feet under a Nitrogen Dewar concrete foundation.

No alpha or beta-gamma contamination was detected inside the remaining section of pipe or along the excavated trench line leading to or away from the foundation.

The exact locations were recorded for the as-built drawings.

JC:vm

Xc: R. Romero, HSE-8, MS K490
File

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Ray Garde, HSE-1, MS P229
DATE: 13 August 1984
FROM: Jim Cox, HSE-1
MAIL STOP/TELEPHONE: E520/7-5420
SYMBOL: HSE-1-SS-8
SUBJECT: A SECTION OF LINE 2 REMAINING WEST OF BUILDING SM-216

A total of 23 feet of Line 2, an 8 inch vitreous clay pipe was left in place on August 9, 1984. The section of pipe was located at a depth of 4 to 5 feet under ~~several~~ two 5 in. conduits encased in a 3.5 ft. x 3.5 ft. concrete shield and under a concrete encased water main.

No alpha or beta-gamma contamination was detected inside the remaining section of pipe or along the excavated trench line leading to or away from the section.

The exact location was recorded for the as-built drawings.

JC:cal

Cy: R. Romero, HSE-8, MS K490
File, TA-50, MS E520
File

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Ray Garde, HSE-1, MS P229 — DATE: 28 August 1984

FROM: Jim Cox, HSE-1 — MAIL STOP/TELEPHONE: E520/7-5420

SYMBOL: HSE-1-SS-14

SUBJECT: A SECTION OF LINE 43 REMAINING SOUTH OF BUILDING TA-55

A total of 4 feet of Line 43, an 8 inch cast iron pipe, was left in place on August 24, 1984. The section of pipe was located 4 feet deep at station 2+80, encased in concrete, lying over a water main and under a gas main. It was felt that removing this section of L.43 would jeopardize the integrity of the water main.

The remaining section of L.43 was decontaminated by the HSE-1 Decon Section, and the ends were sealed with concrete. Prior to decontamination alpha surveys indicated contamination levels up to 40,000 dpm/100cm^2 by swipe. After decontamination these levels were reduced to 4,000 dpm/100cm^2 direct, and no detectable by swipe.

JC:cl

Cy: R. Romero, HSE-8, MS [redacted] K490
File, TA-50, MS E520

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: RAY GARDE, HSE-1 — DATE: SEPT. 11, 1984

FROM: JIM COX — MAIL STOP/TELEPHONE: P229/7-8080

SYMBOL: HSE-1-84-SS- 18

SUBJECT: A SECTION OF LINE 2 REMAINING AT SM-422

A total of 7 feet of line 2, an 8 inch Vitreous Clay Pipe was left in place on Sept. 8, 1984. The section of pipe was located at a depth of 5 feet under 16 -- 5 inch conduits encased in a 3.5 ft. X 3.5 ft. concrete shield.

No contamination was detected inside the remaining section of pipe or along the excavated trench line leading to or away from the section.

The exact location was recorded for the as-built drawings.

CY: R. ROMERO, HSE-8, MS K490
FILE, TA-50, MS-E520.

Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Ray Garde, HSE-1, MS P229 DATE: 28 September 1984

FROM: Jim Cox, HSE-1 MAIL STOP/TELEPHONE: E520/7-5420

SYMBOL: HSE-1-SS-23

SUBJECT: A SECTION OF LINE 5 REMAINING AT MERCURY ROAD

A total of 12 feet of Line 5, a 3 inch cast iron pipe was left in place on September 22, 1984.

The section of pipe was located at a depth of 5 feet under concrete encased water and gas lines.

No contamination was detected inside the remaining section of pipe or along the excavated trench leading to or away from the section.

The exact location was recorded for the as-built drawings.

JC:cal

Cy: R. Romero, HSE-8, MS K490
File, TA-50, MS E520

Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Ray Garde, HSE-1, MS P229 DATE: 13 November 1984

FROM: Jim Cox, HSE-1 MAIL STOP/TELEPHONE: E520/7-5420

SYMBOL: HSE-1-SS-27

SUBJECT: A SECTION OF LINE 2 REMAINING AT PAJARITO ROAD

A total of 4.5 feet of Line 2, a 8 inch vitreous clay pipe was left in place on October 30, 1984.

The section of pipe was located at depth of 6.5 feet embedded in a concrete thrust block (water main). No contamination was detected inside the remaining section of pipe or along the excavated trench leading to or away from the section.

The exact location was recorded for the as-built drawings.

JC:cal

Cy: R. Romero, HSE-8, MS K490
File, TA-50, MS E520

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Ray Garde, HSE-1, MS P229 DATE: 19 November 1984

FROM: Jim Cox, HSE-1 SYMBOL: E520/7-5420

SYMBOL: HSE-1-SS-32

SUBJECT: CONTAMINATED SOIL LEFT AT EXCAVATION OF MH-WM-6 NOVEMBER 2, 1984

Contamination up to 25 nCi/g was initially detected in the soil surrounding and below MH-WM-6. The manhole and approximately 20m³ of soil were removed to approximately 19 feet below grade, 7 feet below the bottom surface of MH-WM-6.

Up to 3.8 nCi/g alpha activity remains in the soil. Richard Romero, HSE-8 participated in the ALARA decision. See page 78 LA Notebook #9251 for further information regarding this decision. cc

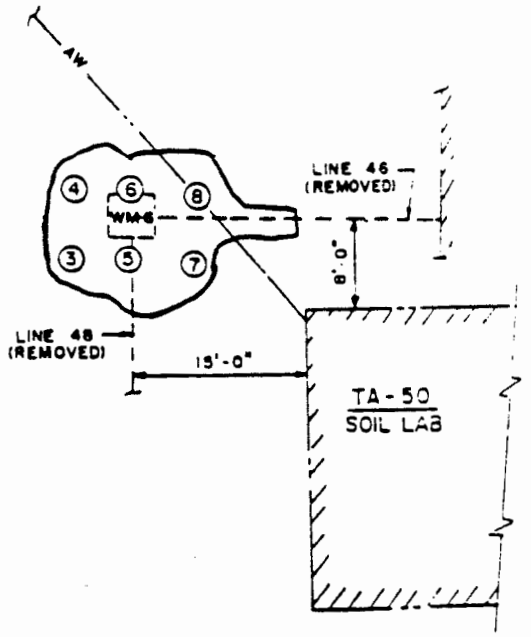
JC:cal

Attach: Plan View: Excavation of MH-WM-6

Cy: R. Romero, HSE-8, MS K490
File, TA-50, MS E520

TEN SOIL SAMPLES WERE COLLECTED ON THE BOTTOM, AND THE SIDES OF THE PIT WALLS, DEPTH OF BOTTOM SURFACE WAS ± 19'-6" AFTER REMOVAL OF OLD ACID MANHOLE WM-6 SAMPLES WERE COLLECTED NOV. 2, 1984

POSITION 1	S.E. WALL	14'	1123	—
POSITION 2	S.W WALL	14'	2064	"
POSITION 3	EXACT BOTTOM	17-1/2'-18'	73	—
POSITION 4	EXACT BOTTOM	17-1/2'-18'	3130	23
POSITION 5	EXACT BOTTOM	19-1/2'	2939	15
POSITION 6	EXACT BOTTOM	19-1/2'	940	—
POSITION 7	EXACT BOTTOM	17-1/2'-18'	3832	10
POSITION 8	EXACT BOTTOM	17-1/2'-18'	1709	—
POSITION 9	NORTH WALL	14'	158	—
POSITION 10	WEST WALL	14'	—	—



PLAN VIEW
SCALE: 1" = 10'-0"

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

DATE: 28 January 1985

TO: Allen Valentine
Radiation Protection Group Leader
Jim Cox, HSE-1

MAIL STOP/TELEPHONE: ES20/7-5420

SYMBOL: HSE-1-SS-5

SUBJECT: CONTAMINATED SOILS AND CONCRETE LEFT OF THE EXCAVATION OF MH-TLS-12 AND LINE 90A, WORK PACKAGE II.5, TA-35

During the removal of MH-TSL-12 and Line 90A up to 50 mr/hr beta-gamma was detected along the face of the concrete foundation of TSL-7. Decontamination attempts on the concrete was minimal due to the rough surface. The loose contamination was removed. MH-TSL-12 and Line 90A lying 4-5 feet east of TSL-7 at a depth of 5-9 feet were removed. Contaminated soil remaining in the trench ranged from 800 pCi/g, gross beta on the east wall to 7 nCi/g gross beta next to TSL-7.

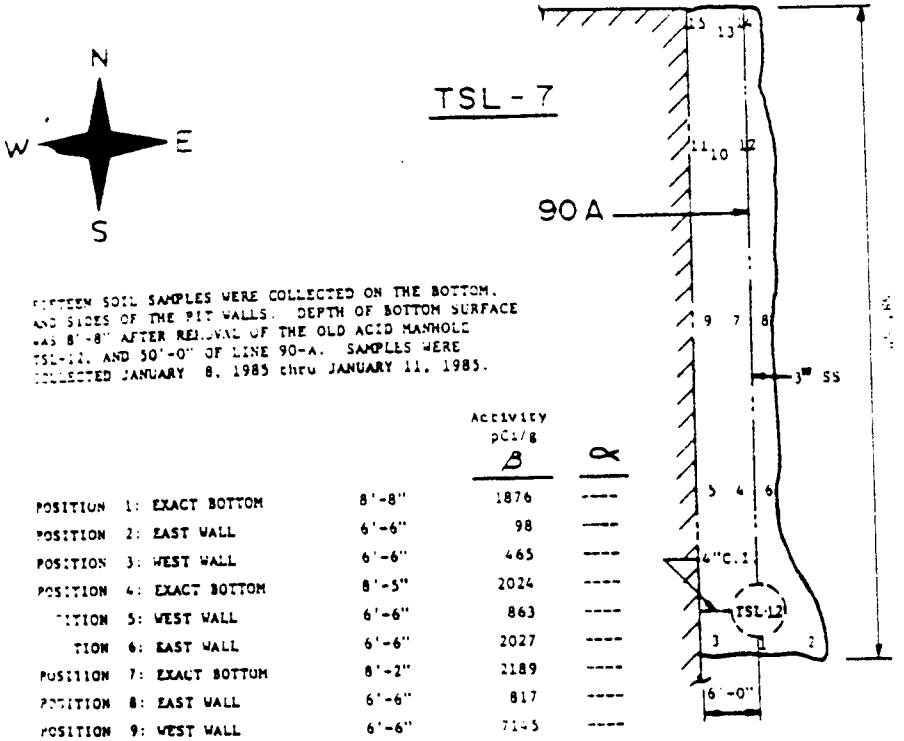
Continued excavation next to TSL-7 was felt would endanger the integrity of the building.

Richard Romero, HSE-8 participated in the ALARA decision.

JC:cal

Attach: Plan View, west elev: Excavation of TSL-12 and Line 90A

Cy: [redacted], MS J490
File, TA-50, MS ES20

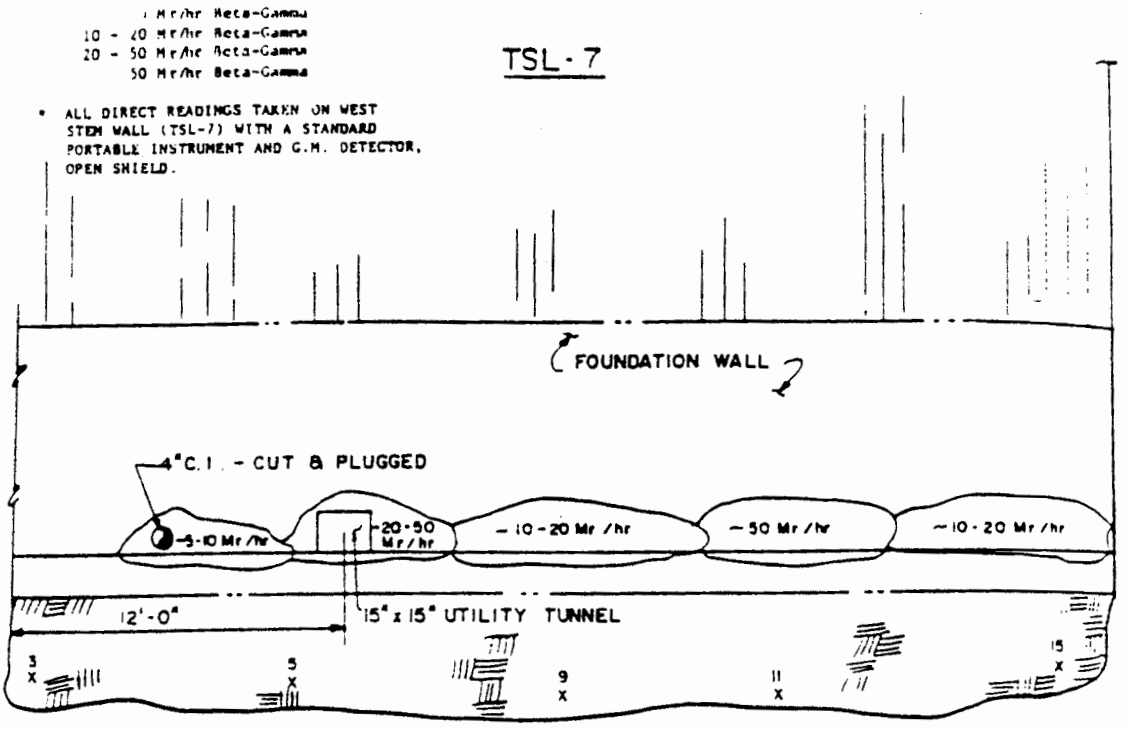


FIFTEEN SOIL SAMPLES WERE COLLECTED ON THE BOTTOM, AND SIDES OF THE PIT WALLS. DEPTH OF BOTTOM SURFACE WAS 8'-8" AFTER REMOVAL OF THE OLD ACID MANHOLE TSL-12, AND 50'-0" OF LINE 90-A. SAMPLES WERE COLLECTED JANUARY 8, 1985 thru JANUARY 11, 1985.

		Activity pCi/g β	Activity pCi/g α
POSITION 1: EXACT BOTTOM	8'-8"	1876	----
POSITION 2: EAST WALL	6'-6"	98	----
POSITION 3: WEST WALL	6'-6"	465	----
POSITION 4: EXACT BOTTOM	8'-5"	2024	----
POSITION 5: WEST WALL	6'-6"	863	----
POSITION 6: EAST WALL	6'-6"	2027	----
POSITION 7: EXACT BOTTOM	8'-2"	2189	----
POSITION 8: EAST WALL	6'-6"	817	----
POSITION 9: WEST WALL	6'-6"	7145	----
POSITION 10: EXACT BOTTOM	8'-0"	1967	----
POSITION 11: WEST WALL	6'-6"	3659	----
POSITION 12: EAST WALL	6'-6"	498	----
POSITION 13: EXACT BOTTOM	8'-0"	1869	----
POSITION 14: EAST WALL	6'-6"	757	----
POSITION 15: WEST WALL	6'-6"	2071	----

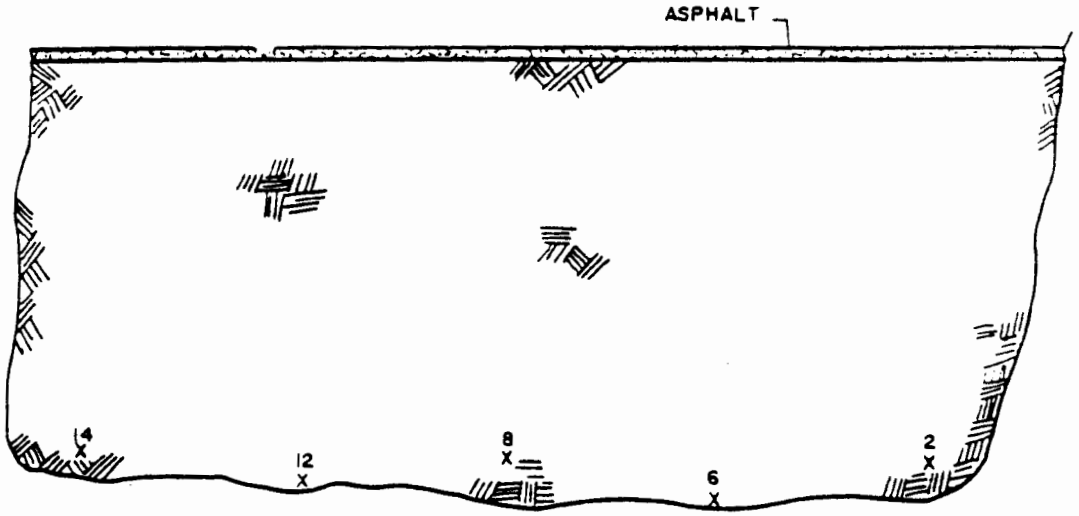
PLAN VIEW

SCALE: 1" = 10'-0"



WEST ELEVATION

NTS



EAST ELEVATION

NTS

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO Allen Valentine
Radiation Protection Group Leader

DATE 12 February 1985

FROM Jim Cox, HSE-1

MAIL STOP/TELEPHONE E520/7-5420

SYMBOL HSE-1-SS-7

SUBJECT A SECTION OF LINE 114 REMAINING AT TSL-27

A total of 168 feet of Line 114, a 3 inch SS pipe were surveyed, sealed, and left in place on January 24, 1985.

Line 114 was installed in 1961 to carry contaminated waste from TSL-27 to TSL-41. The line was never used for contaminated waste.

Starting at TSL-41, 17 feet of Line 114 were removed, to a point where it ran under a concrete incased 13.2KV power lines. The remainder of the line lays under various utility lines and the TLS-27 parking lot. It was decided by HSE-1 and ENG-1 to leave this section in place.

No contamination was detected in the pipe or excavated trench.

Richard Romero, HSE-8 and D. Hohner, ENG-1 participated in this ALARA decision.

JC:cl

Cy: ~~R. Romero, HSE-8, MS K490~~
D. Hohner, ENG-1, MS M713
File (IA-50, MS E520)

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO Allen Valentine
Radiation Protection Group Leader

DATE 12 February 1985

FROM Jim Cox, HSE-1

MAIL STOP/TELEPHONE E520/7-5420

SYMBOL HSE-1-SS-8

SUBJECT A SECTION OF LINE 68 REMAINING AT TSL-29

A total of 126 feet of Line 68, a 3 inch SS pipe were surveyed, sealed and left in place on January 24, 1985.

In 1961 Line 68 was installed to carry contaminated waste from TSL-29 to TSL-41. The line was never used for contaminated waste and was later incorporated into the buildings sewer system. Starting at TSL-41 approx. 28 feet of Line 68 was removed. No contamination was detected in the pipe or excavated trench.

Richard Romero, HSE-8 and D. Hohner, ENG-1 participated in the ALARA decision.

JC:cl

Cy: ~~R. Romero, HSE-8, MS K490~~
D. Hohner, ENG-1, MS M713
File (IA-50, MS E520)

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Allen Valentine, Radiation Protection Group Leader — DATE: February 26, 1985

FROM: Jim Cox, HSE-1 — MAIL STOP/TELEPHONE: E520/7-5420

SYMBOL: HSE-1-SS-14

SUBJECT: CONTAMINATED SOIL LEFT AT EXCAVATION OF TSL-10, WORK PACKAGE II.5, TA-35

TSL-10, four concrete liquid waste collection tanks and approximately 340 m^3 of soil were removed to 18-20 feet below grade.

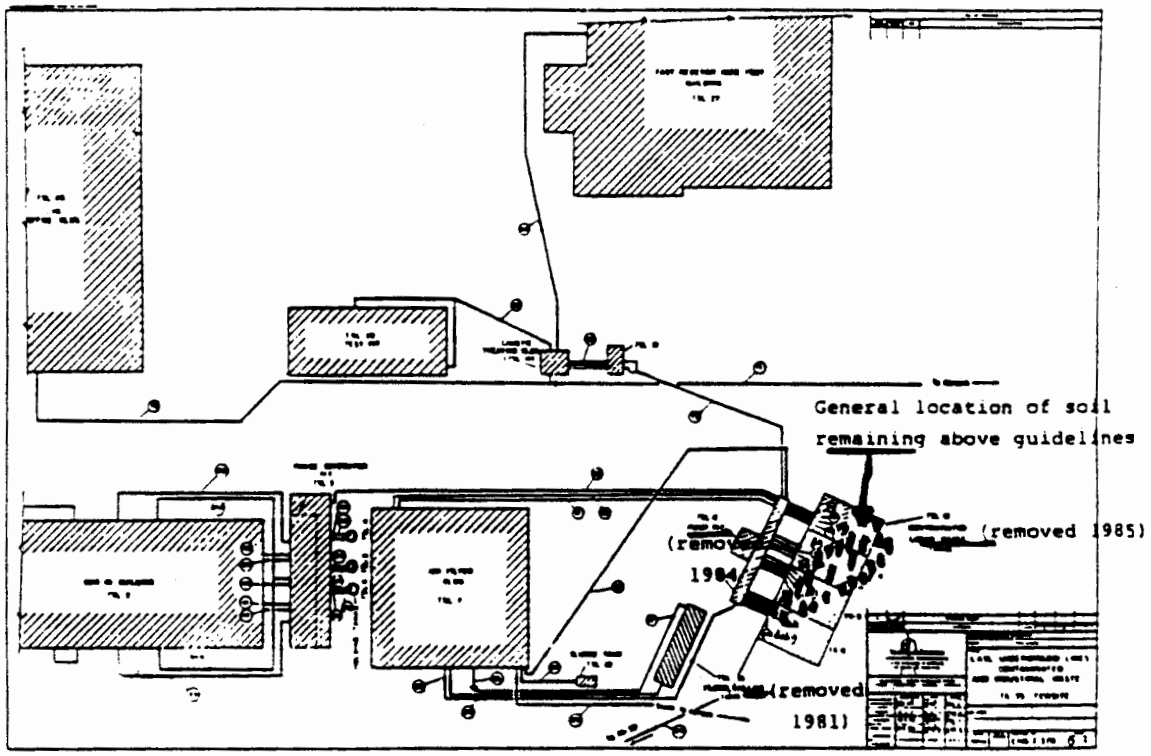
Up to 356 pCi/g gross Beta (SR-90/Y-90) activity remains in the soil at this depth. The area was back filled to grade.

Richard Romero, Jay Wenzel, HSE-8, and D. Hohner, ENG-1, participated in the ALARA decision.

JC:sb

Attachments

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
File, TA-50, MS E520



WORK PKG. 11.5 TA-35

Los Alamos

Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO Allen M. Valentine, Radiation Protection Group Leader — DATE March 4,1985

FROM Jim Cox, HSE-1 Technical Supervisor — MAIL STOP/TELEPHONE E520/7-5420

SYMBOL HSE-1-JC--17-85

SUBJECT A SECTION OF LINE 71 REMAINING SOUTH OF BUILDING TSL-27

Approximately 150 feet of line 71, a 4 inch black steel pipe were surveyed and left in place on February 20, 1985.

The section of pipe was located at a depth of approximately 30 feet under the Dirt-Berm for substation TSL-53.

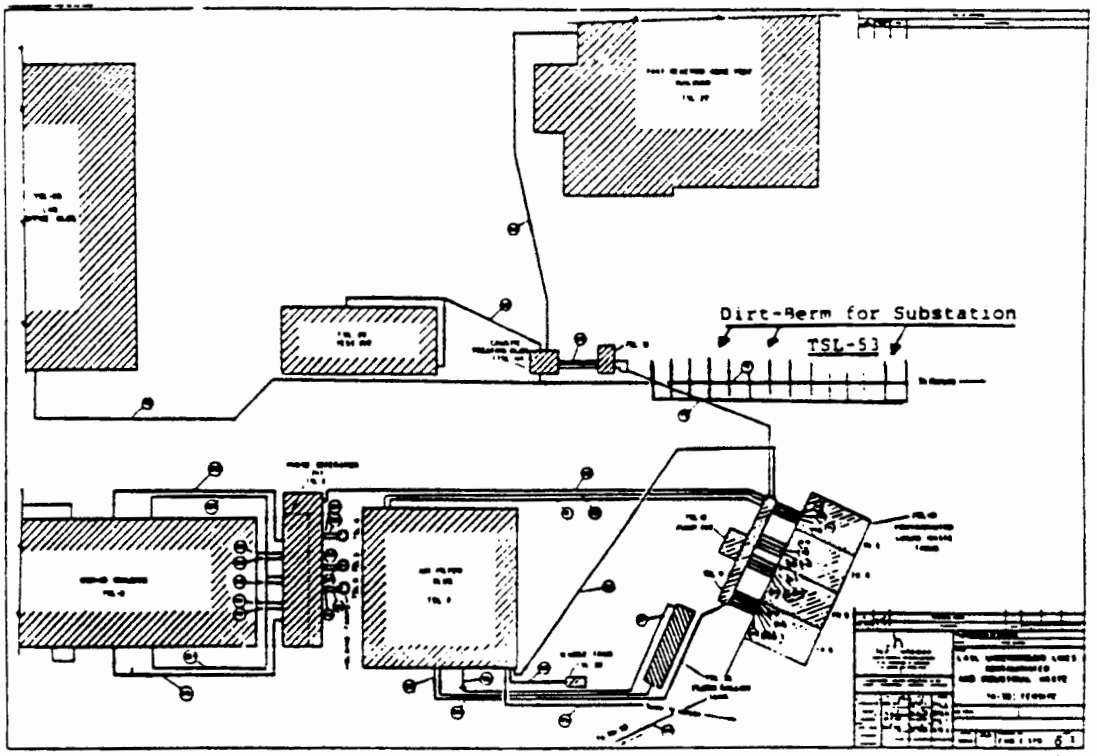
No contamination was detected in the pipe or excavated trench.

Richard Romero, HSE-8, D. Hohner, ENG-1, participated in the ALARA decision.

JC:bv

Attach: Drawing W.P. II.5

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
File (TA-50, MS E520)



WORK DWG. II.5

Los Alamos

Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leader — DATE: March 6, 1985

FROM: Jim Cox, HSE-1 Technical Supervisor — MAIL STOP/TELEPHONE: E520/7-5420

SYMBOL: HSE-1-JC-18-85

SUBJECT: A SECTION OF LINE 70 REMAINING S.W. OF BUILDING TSL-29, TA-35

A total of 35 feet of Line 70, a 4 inch SS pipe were surveyed, sealed and left in place on February 23, 1985.

The first section was 18 feet long located at a depth of 2-3 feet under the foundation of the Transformer Oil Storage Tank. The second section was 17 feet long, 3 feet deep and located under two concrete encased water mains.

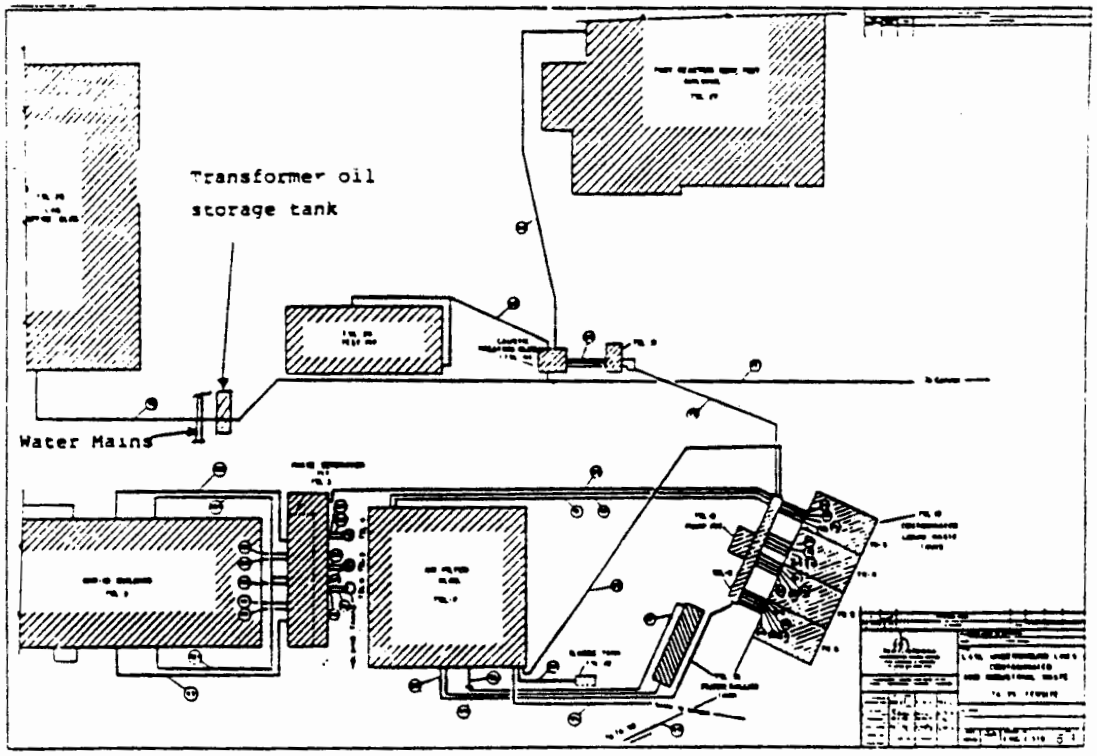
No contamination was detected in either remaining section of pipe, or the excavated trenches.

Richard Romero, HSE-8, D. Honner, ENG-1, participated in the ALARA decision.

JC:bv

Attach: Drawing W.P. 11.5

Xc: R. Romero, HSE-8, MS K490
D. Honner, ENG-1, MS M713
File (TA-50, MS E520)



WORK PKG. 11.5 TA-35

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

To: Allen M. Valentine, Radiation Protection Group Leader — Date: March 19, 1985
From: Jim Cox, Technical Supervisor — Mail Stop/Telephone: ES20/7-5420
Symbol: HSE-1-JC-24
Subject: A SECTION OF LINE 49 LEFT IN PLACE AT TA-35

Approximately 2,100 feet of Line 49 a combination of 3 inch cast iron and plastic pipe were left in place on March 15, 1985.

The pipe is located at a depth of 4 to 30 feet under a dirt berm, gunited with concrete, asphalt roadways, side walks, numerious existing utilities, storm drains, and transportables.

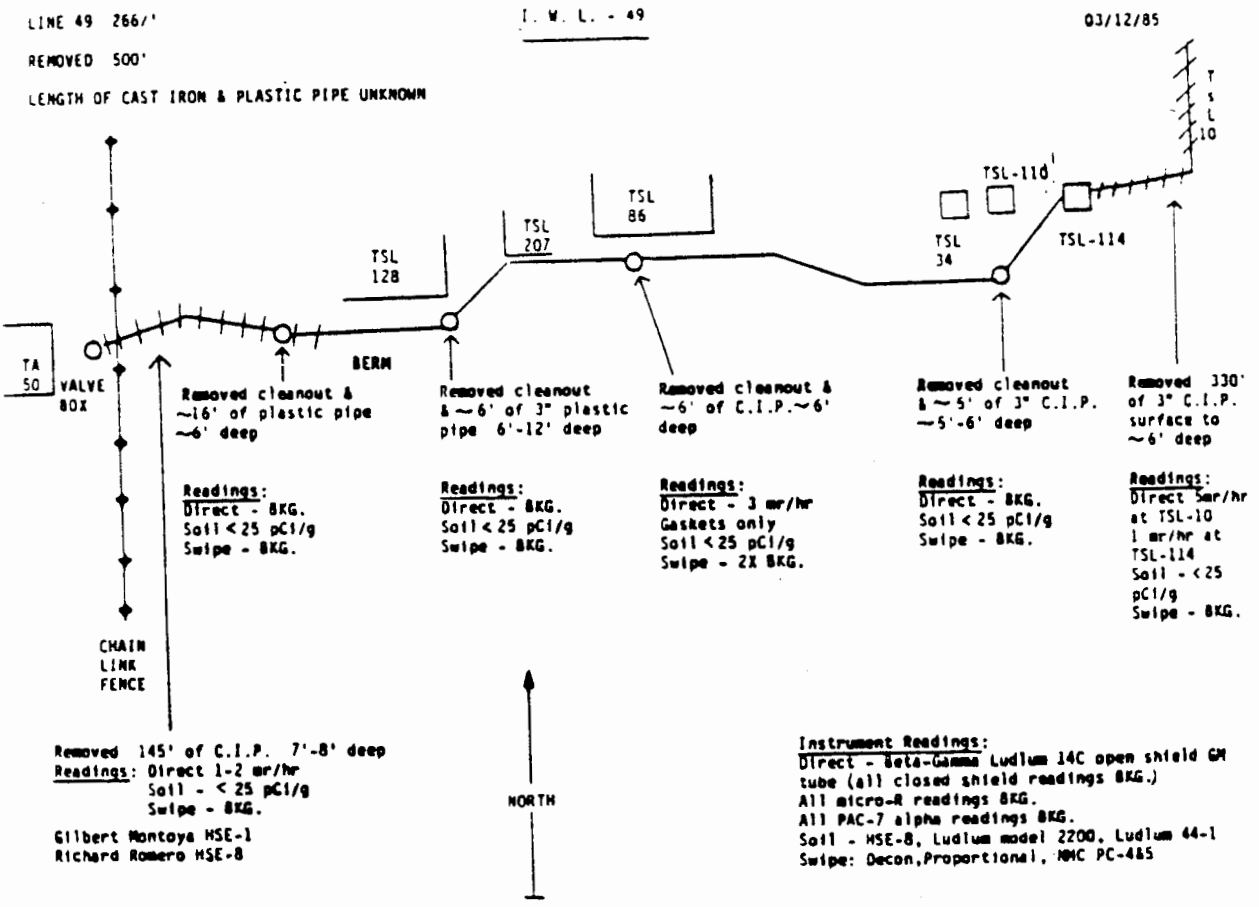
Due to construction projects, Line 49 was relocated several times and the original cast iron pipe was replaced with plastic pipe. No contamination was detected inside the plastic pipe, or excavated trenchs. Contamination inside the cast iron pipe ranged from 1 to 5 mr/hr gross beta (SR-90/Y90), and was detected at the mechanical joints. Swipes readings at these points were negative.

Richard Romero, HSE-8, and D. Honner ENG-1, participated in the ALARA decision.

JC:bv

Attach: Drawing Line 49

Xc: R. Romero, HSE-8, MS K490
D. Honner, ENG-1, MS M713
File (TA-50, MS ES20)



Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leader
DATE: March 20, 1985
FROM: Jim Cox, Technical Supervisor JC
MAIL STOP/TELEPHONE: E520/7-5420
SYMBOL: HSE-1-JC-23
SUBJECT: A SECTION OF LINE 2 REMAINING AT PAJARITO ROAD

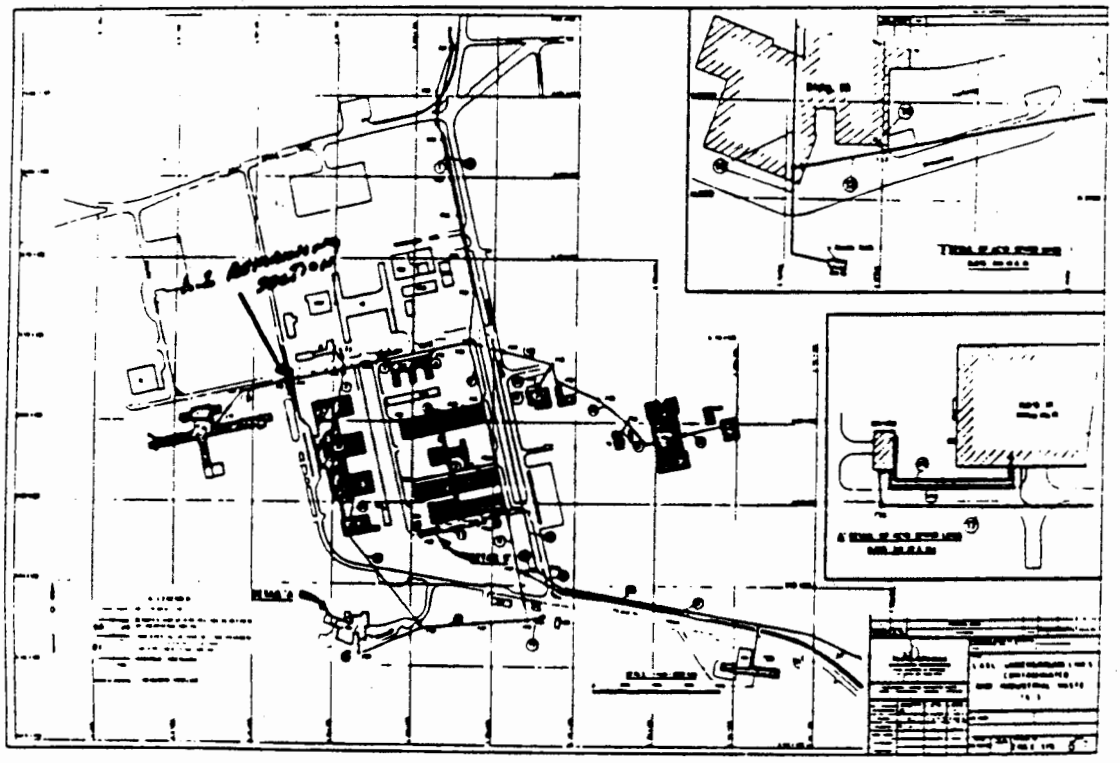
A total of 40 feet of Line 2, an 8 inch vitreous clay pipe was left in place on March 13, 1985. The section of pipe is located under Pajarito Road at the intersection of Mercury Road. The section is 5 feet deep incased in concrete, along with various existing utilities.

No alpha or beta-gamma contamination was detected inside the remaining section of pipe or along the excavated trench line leading to or away from the section.

The exact location was recorded for the as-built drawings.

JC:bv

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
File (TA-50, MS E520)



WP II.6, TA-3

Los Alamos

Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leder
DATE: April 10, 1985

FROM: Jim Cox, Technical Supervisor JC
MAIL STOP/TELEPHONE: E520/7-5420

SYMBOL: HSE-1-JC-26

SUBJECT: SECTIONS OF LINES 90, 91 AND 92 REMAINING AT TA-35

Approximately 120 feet of Line 90, 71 feet of Line 91 and 73 feet of Line 92 were left in place March 28, 1985.

The pipes are located at depth ranging from 8 to 20 feet under the electrical supply lines between Building TSL-7 and Building TSL-2, see Attachment (1). Removal of Lines 90, 91, and 92 would require the relocation of electrical services, and the widening of the area between TSL-7 and the elevated roadway, to allow the use of power equipment.

Contamination levels detected inside the pipes were 3 mr/hr in Line 90, 20 mr/hr in Line 91 and 25 mr/hr in Line 92, gross beta (SR-90/Y90).

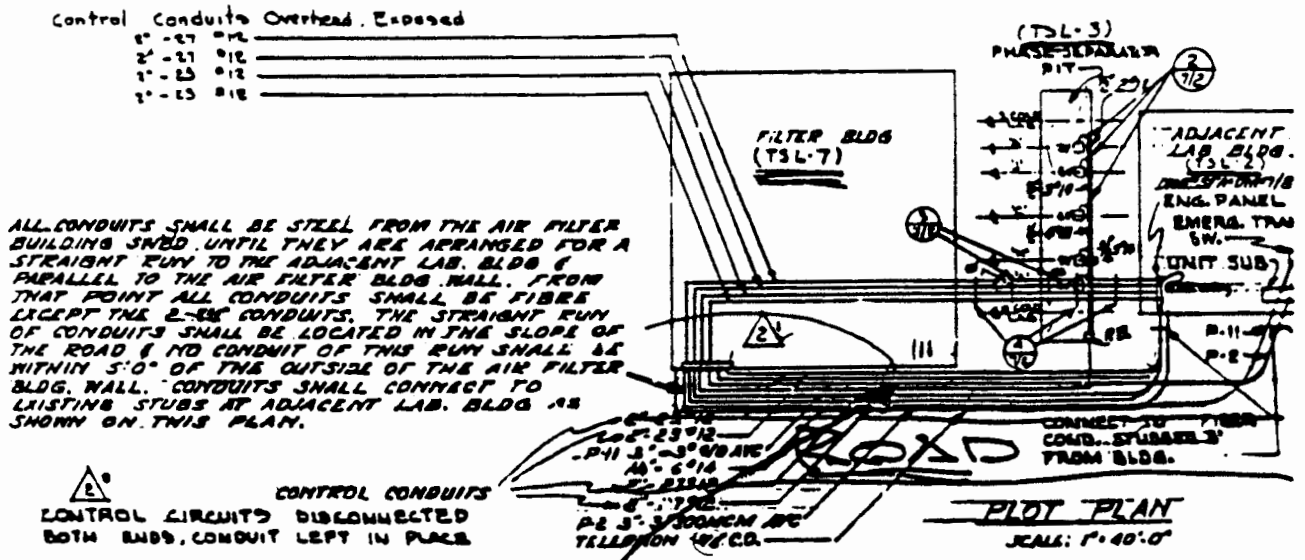
Richard Romero, HSE-8 and D. Hohner, ENG-1, participated in the ALARA decision.

Attachment (1) Location Electrical Services at TSL-7.
(2) Drawing of Lines 90, 91 and 92.

JC:bv

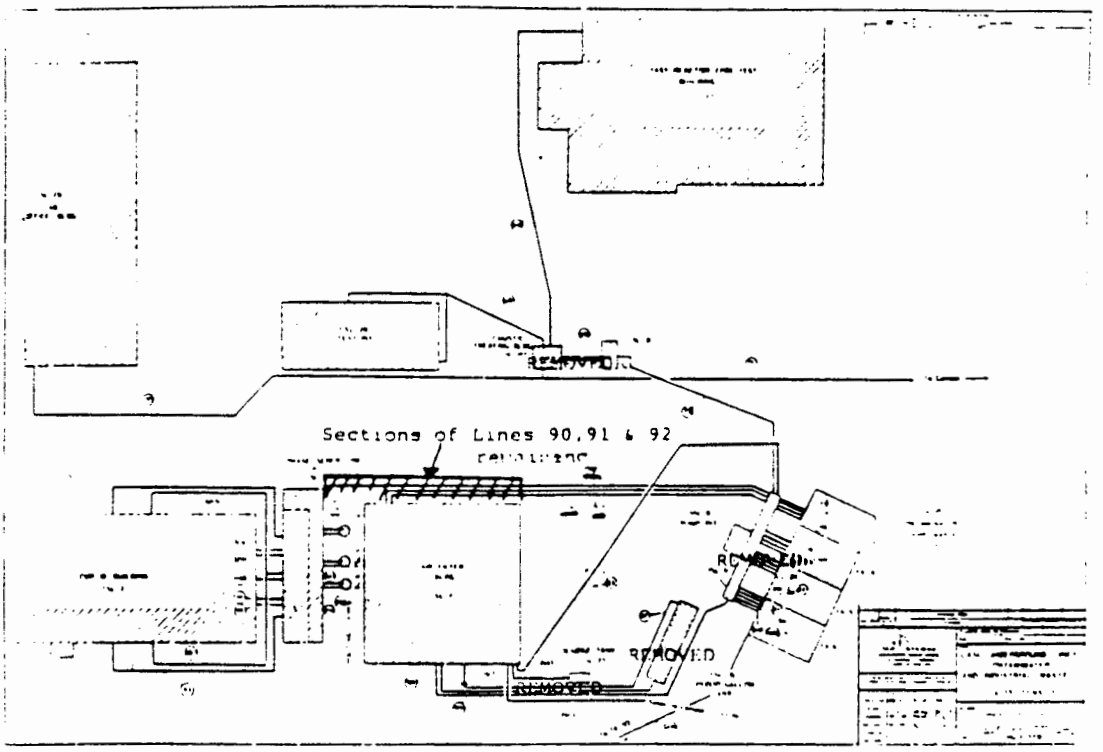
Attach:a/s

Xc: R. Romero, HSE-8, MS K490 w/atta
D. Hohner, ENG-1, MS M713 w/atta
File (TA-50, MS E520) w/atta



LINES 90, 91, & 92

ATT (1) LOCATION ELEC. SERVICES NO. TSL-7 3/85



ATT (2)

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leader
DATE: April 17, 1985
FROM: Jim Cox, Decontamination Technical Supervisor
TELEPHONE: ES20/7-5420
SYMBOL: HSE-1-JC-33

SUBJECT: CONTAMINATED SOIL LEFT AT EXCAVATION OF LINES 90, 90B, 91 AND 92

Lines 90, 90B, 91 and 92 and approximately 230 m^3 of soil were removed to 17 to 20 feet below grade.

Up to 1100 pCi/g gross beta (SR-90/Y90) activity remains in the soil, (see attachment). The area was back filled to grade.

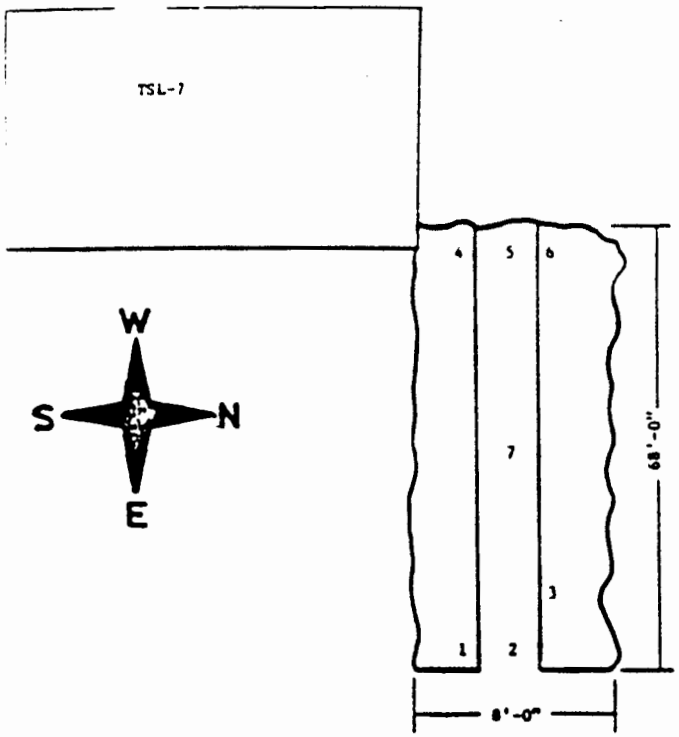
Richard Romero, HSE-8, and D. Hohner, ENG-1, participated in the ALARA decision.

JC:hv

Attachment: I (1)

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
File (TA-50, MS E520)

ATTACHMENT: 1



POSITION 1:	SOUTH WALL	15'-0"	[illegible]	—
POSITION 2:	BOTTOM	20'-0"	167	—
POSITION 3:	NORTH WALL	15'-0"	450	—
POSITION 4:	SOUTH WALL	17'-0"	1100	—
POSITION 5:	BOTTOM	18'-0"	357	—
POSITION 6:	NORTH WALL	17'-0"	650	—
POSITION 7:	BOTTOM	17'-0"	101	—

LINES 90, 90B, 91, 92 (TA-35)

A TOTAL OF FIFTY-FOUR SOIL SAMPLES WERE COLLECTED FROM THIS AREA MARCH 18, 1985 THROUGH APRIL 5, 1985. OF THESE FIFTY-FOUR SAMPLES, EIGHT SAMPLING POSITIONS REMAINED ABOVE I.W.L. ESTABLISHED SOIL CONCENTRATION GUIDELINES. (SUBSURFACE >1.5m ≥ 75 pCi/g).

* HIGHEST β ACTIVITY DETECTED WAS 3243 p Ci/g AT BOTTOM OF TRENCH, POSITION NUMBER FIVE. NO α ACTIVITY DETECTED β ACTIVITY WAS QUANTITATIVELY AND QUALITATIVELY ANALYZED AS 90 Sr - 90 Y BY HSE-8 CHEMISTRY LABORATORY.

CONTAMINATION LEFT WAS BASED UPON ALARA DECISION AGREED UPON BY JIM COX (HSE-1) RICHARD ROMERO (HSE-8) AND DARRELL HOHNER (ENG-1)

* NOTE: POSITION NO. 5 WAS DECONED TO ~ 357 pCi/g

LINE 90 3" S.S.
LINE 90B 3" S.S.
LINE 91 3" S.S.
LINE 92 2" S.S.

GILBERT MONTOYA (HSE-1)
RICHARD ROMERO (HSE-8)

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leader
DATE: April 25, 1985
FROM: Jim Cox, Decontamination Technical Supervisor
MAIL STOP/TELEPHONE: E520/7-5420
SYMBOL: HSE-1-JC-34

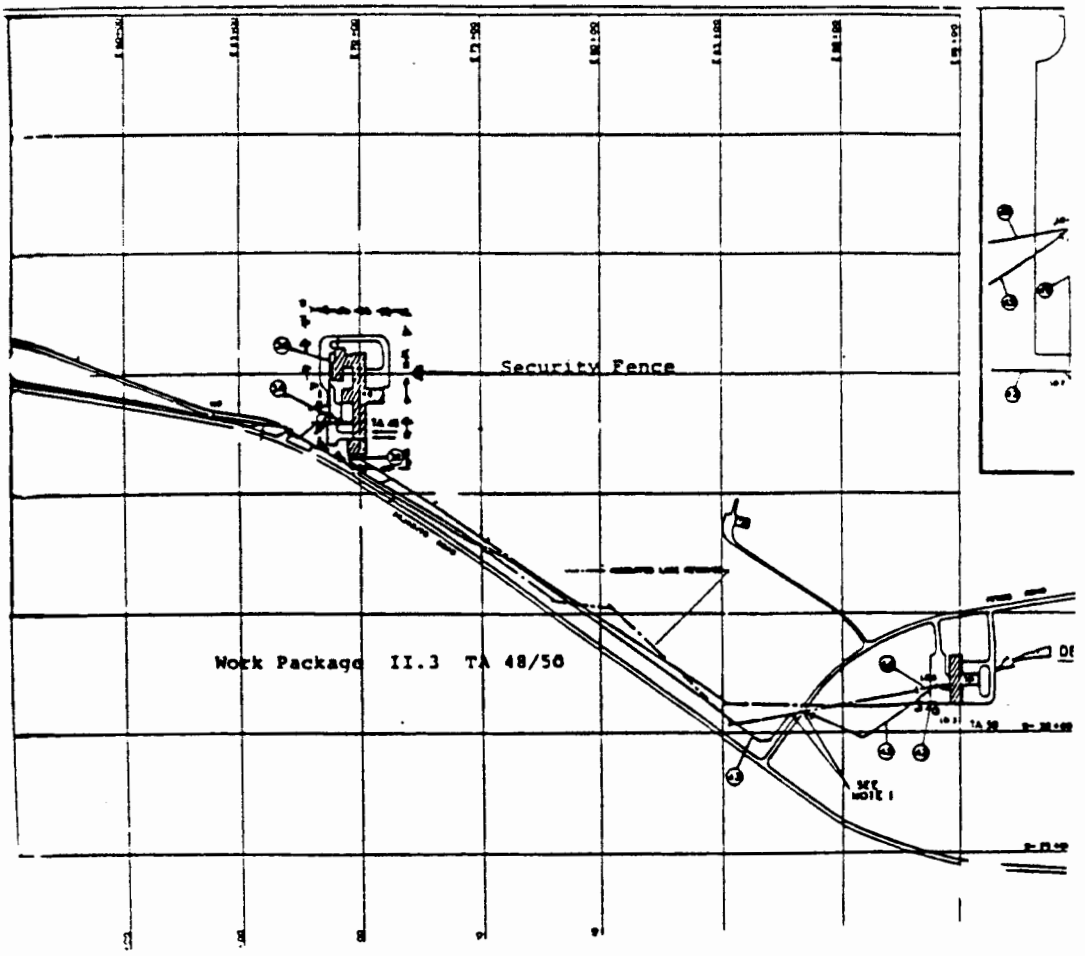
SUBJECT: SECTIONS OF LINES 34, 36, AND 38 REMAINING AT TA-48

Approximately 100 feet of Line 34, 330 feet of Line 36 and 50 feet of Line 38 remain inside the security fence at TA-48. The pipes run under site road ways, guard station, side walk and existing utilities.
During January-February 1984, several lines outside the TA-48 fenced area were removed. This included sections of Lines 34 and 38. Up to 1000 dpm/50cm^2 alpha activity was detected inside Line 34, no detectable activity in Line 36. Line 38 lies entirely inside the closed area and was not analyzed. Due to the location of the pipes and low levels of contamination Mr. James Sattizhn, INC-DO requested that we not remove the pipe within the fenced area. The location of the Lines were recorded for the as-built drawings. Ray Garde, HSE-7 participated in the discussion with Mr. Sattizhn.

JC:bv

Attach: Drawing

Xc: R. Romero, HSE-8, MS K490 w/atta
D. Honner, ENG-1, MS M713 w/atta
File (TA-50, MS E520)



Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leader — DATE: May 10, 1985

FROM: Jim Cox, Decontamination Section Leader — TELEPHONE: E520/7-5420

SYMBOL: HSE-1-JC-43

SUBJECT: CONTAMINATED SOIL LEFT AT EXCAVATION OF LINE 9

Line 9 (West Section) and approximately 4 m^3 of soil were removed to 19-20 feet below grade.

Up to 452 pCi/g (^{238}Pu) activity remains in the soil (see attachment). The area was backfilled to grade.

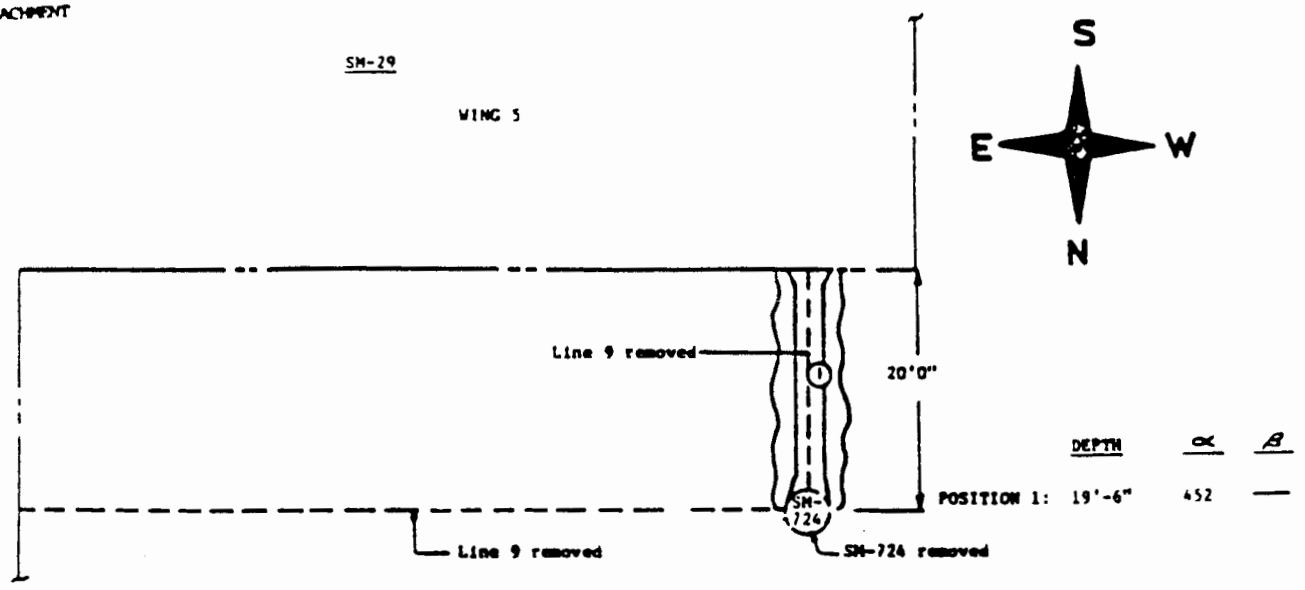
Richard Romero, HSE-8 and D. Hohner, ENG-1 participated in the ALARA decision.

JC:bv

Attachment: a/s

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
File (TA-50, MS E520)

ATTACHMENT



Line 9 6" VCP

A TOTAL OF TWENTY-THREE SOIL SAMPLES WERE COLLECTED FOR THE PERIOD 4/26/85 THRU 5/07/85. OF THESE, ONE SOIL SAMPLE REMAINED ABOVE I.W.L. ESTABLISHED GUIDELINES (SUBSURFACE ≤ 75 pCi/g). INITIAL ACTIVITY WAS FOUND TO BE 491 pCi/g α Pu-238. THIS POSITION WAS DECONED TO 452 pCi/g AND LEFT DUE TO THE DEPTH OF THE TRENCH (19'-6") AND THE NATURE OF THE SUBSTRATE (SOLID TUFF).

RICHARD ROMERO HSE-8
GILBERT MONTOYA HSE-1

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Allen M. Valentine, Radiation Protection Group Leader
DATE: June 10, 1985
FROM: Jim Cox, Decontamination Operations Section Leader
MAIL STOP/TELEPHONE: ES20/7-5420
SYMBOL: HSE-1-JC-51

SUBJECT: SECTIONS OF LINE 17 AND 17C REMAINING AT SM-29

Approximately 12 feet of Line 17 and 35 feet of line 17C were left in place on June 3, 1985.

The two sections of pipe are located at a depth of 21 feet under the new industrial waste line, sensor cables, storm drains and a concrete incasement. (See Attachment 1 and 2). Up to 32,000 dpm/100 cm^2 alpha activity and 5 mr/hr beta-gamma activity were detected inside Line 17. Unable to survey Line 17C, but assume activity is more or less the same as line 17. No contamination above 25 pCi/g was detected in the excavated trench.

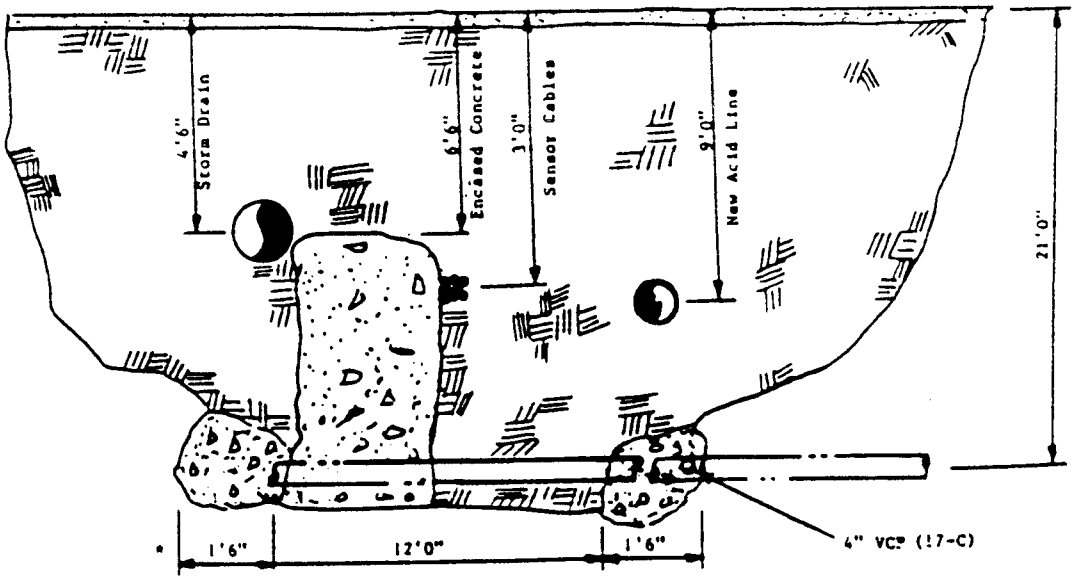
Richard Romero, HSE-8 and D. Hohner, ENG-1, participted in the ALARA decision.

JC:bv

Attach: a/s

Xc: R. Romero, HSE-8, MS K490
D. Honner, ENG-1, MS M713
File (TA-50, MS ES20)

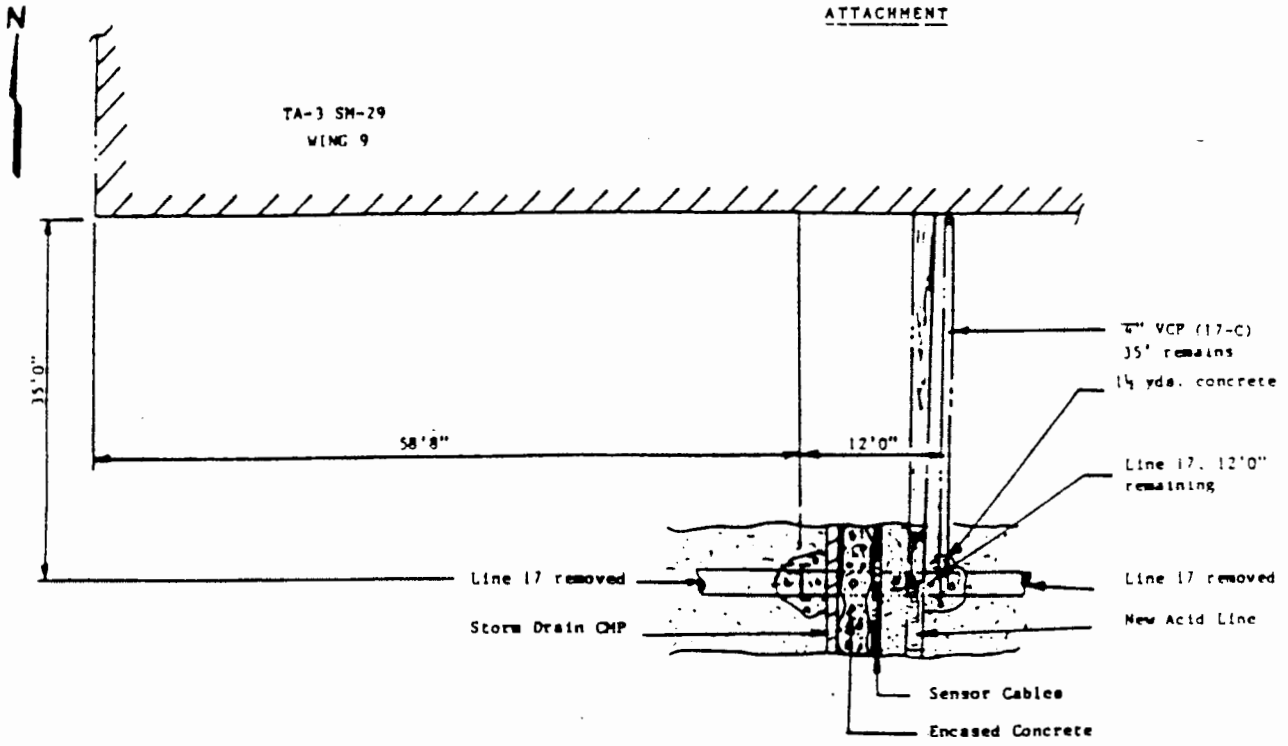
ATTACHMENT



* 1½ yds. of concrete was poured at both ends in order to seal the pipe.

NORTH ELEVATION
NTS

ATTACHMENT



NOTE: Soil samples on the East and West sides of where pipe remains are < 25 pCi/g. Interior of 6" VCP is reading approximately 32,000 dpm/100CM^2, Alpha activity and 5mR/hr Beta and Gamma activity.

Gilbert Montoya HSE-1
Richard Romero HSE-8

PLAN VIEW
NTS

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen Valentine, Radiation Protection Group Leader
DATE: July 22, 1985
FROM: Jim Cox, Decontamination Operations Section Leader
MAIL STOP/TELEPHONE: E520/7-5420
SYMBOL: HSE-1-JC-62

SUBJECT: CONTAMINATED SOIL LEFT AT EXCAVATION OF LINE 17

Line 17 and approximately 18 m^3 of soil were removed to 19-20 feet below grade. Up to 399 pCi/g beta activity remains in the soil (see attachments). Both areas were back filled to grade.

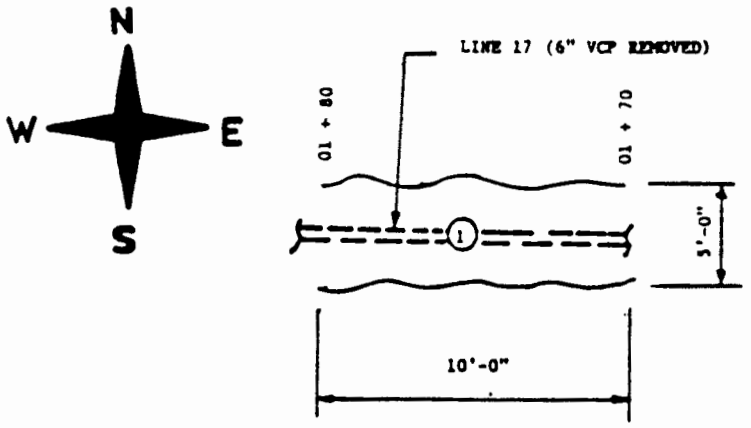
Richard Romero, HSE-8 and Darrell Hohner, ENG-1, participated in ALARA decision.

JC:bv

Attach: a/s

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
File (TA-50, MS E520)

SM-29
WING 9



PLAN VIEW
NTS

SOIL SAMPLE WAS COLLECTED ON WEDNESDAY, JUNE 19, 1985.

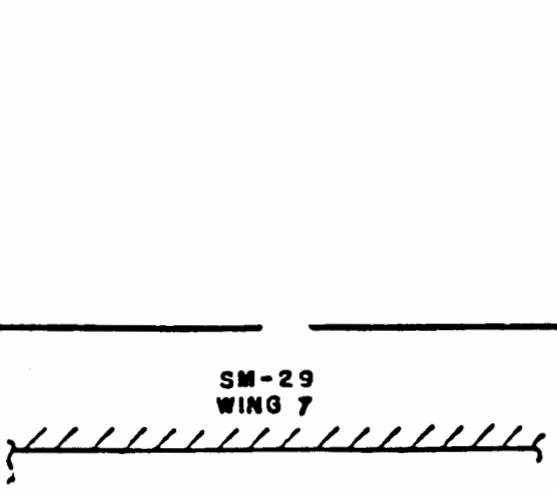
Activity	
β pCi/g	α pCi/g
80.68	———

POSITION 1: EXACT BOTTOM 19'-6"

GILBERT MONTOYA HSE-7
RICHARD ROMERO HSE-8

H. ขนบ

SM-29
WING 7



PLAN VIEW
N.T.S.

SOIL SAMPLE WAS COLLECTED ON JULY 10, 1985.

ACTIVITY

B pCi/g	pCi/g
399	------

GILBERT MONTOYA HSE-1
RICHARD ROMERO HSE-8

POSITION 1: EXACT BOTTOM 19'0"

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO Allen Valentine, Radiation Protection Group Leader — DATE July 23, 1985

FROM Jim Cox, Decontamination Operations, Section Leader — MAIL STOP/TELEPHONE E520/7-5420

SYMBOL HSE-1-JC-64

SUBJECT: SECTION OF LINE 17D REMAINING AT SM-29

Approximately 14 feet of Line 17D were left in place on July 10, 1985.

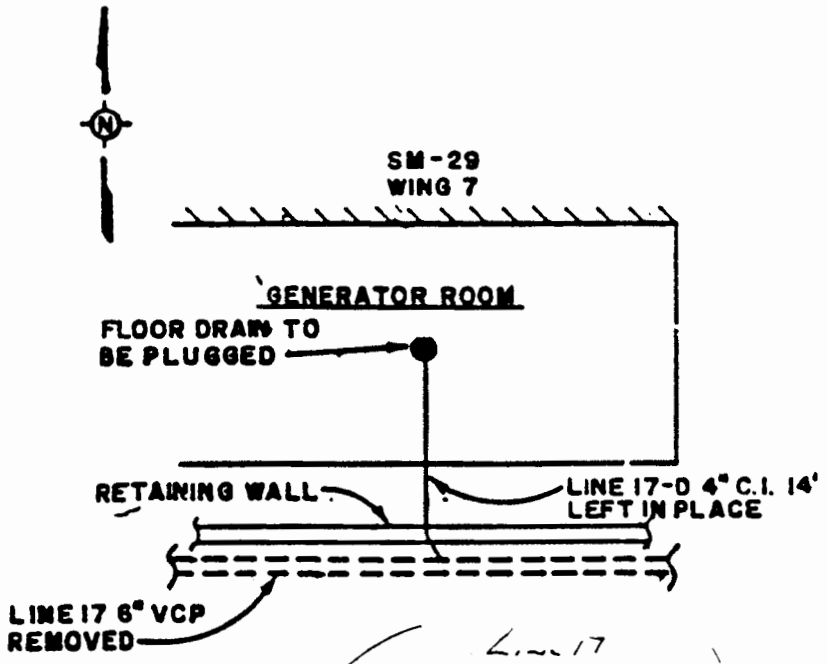
The section of pipe was located at a depth of approximately 20 feet under a retaining wall and the flow of the Wing 7 generator room (see attachment). Unable to survey Line 17D, but assume activity is more or less the same as Line 17. Up to 32,000 dpm/100 cm² alpha activity and 5 mr/hr beta-gamma activity were detected inside Line 17.

Richard Romero, HSE-8 and Darrell Honner, ENG-1 participated in the ALARA decision.

JC:ac

Atta. a/s

Xc: R. Romero, HSE-8, MS K490
D. Honner, ENG-1, MS M713
File (TA-50), MS E520



PARTIAL PLAN VIEW
N.T.S.

GILBERT MONTOYA HSE-1
RICHAR OMERO HSE-8

M.GA TO

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen Valentine, Radiation Protection Group Leader
DATE: September 12, 1985
FROM: Jim Cox, Decontamination Operations Section Leader
MAIL STOP/TELEPHONE: ES20/7-5420
SYMBOL: HSE-1-JC-72

SUBJECT: ACID WASTE LINE NUMBER 7 AND MANHOLES, 708, 719, 722 AND 725 LEFT IN PLACE AT TA-3

Approximately 1,040 feet of Line 7 and 4 manholes were left in place on September 3, 1985, see Attachment 1.

Line 7 is an 8 inch vitreous clay pipe located at a depth of approximately 18-20 feet. It lies under and parallel to water and sanitary sewer mains, natural gas, steam and condensate lines, several electrical service conduits, sprinkler system and storm drains. Numerous other utilities including the new Industrial Waste Line cross over Line 7.

Manholes 708, 719, 722 and 725 are concrete structures, approximately 5.5' x 5.5' x 18-20 feet deep. Manholes 708, 719 and 725 are partially filled with concrete, see Attachment 2. To remove Line 7 and the 4 manholes would require extensive excavation, the re-routing or removal of the above utilities, and considerable street repair.

It is felt that the present budget is not adequate for an operation of this magnitude.

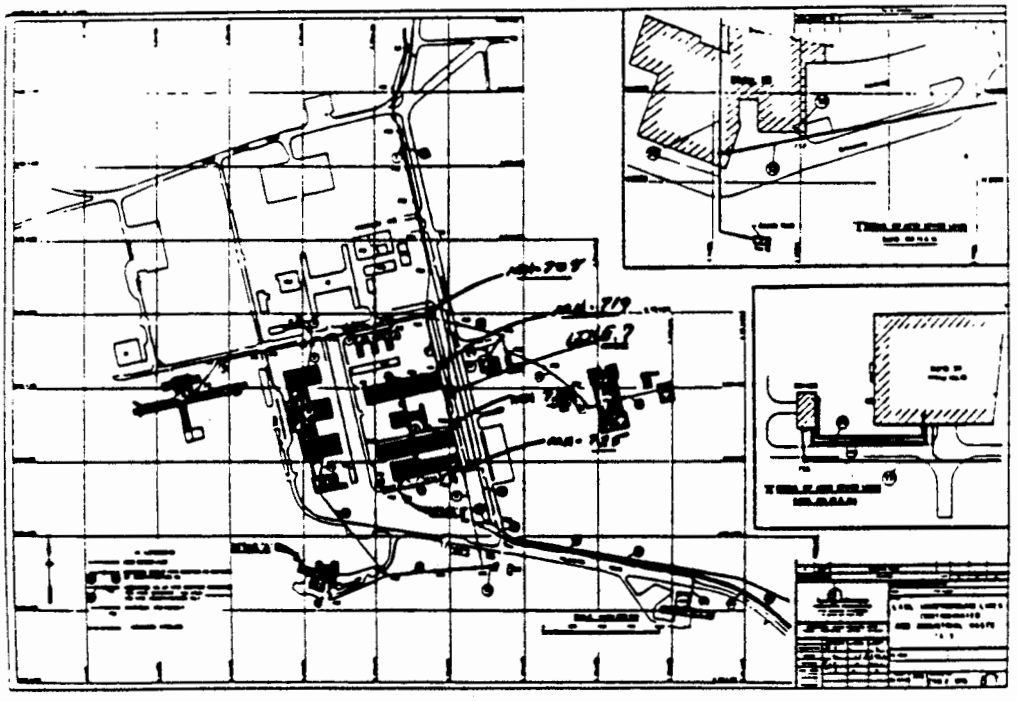
We were unable to survey Line 7 and the bottoms of the manholes, but assuming activity is more or less the same as the connecting Lines 9 and 17. Up to 4 x 10^6 dpm/100 cm^2 alpha activity and 5 mr/hr beta gamma were detected inside Lines 9 and 17.

Richard Romero, HSE-8, and Darrell Hohner, ENG-1, participated in the ALARA decision.

Attachment: a/s

JC:bv

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
J. Elder, HSE-1, MS P229
TA-50 File, MS ES20



W.P. 11.6, TA-3

ATTACHMENT 1

MANHOLE 708

East of SM-410

3' x 3' dimeter entry

5'6" x 5'6" x 17" deep, inside diameter

52" to concrete

No standing water

Direct readings at opening by PAC-7 and HSS1050 Model Three were NDA (no detectable activity)

Swipe taken ∿ 3" from bottom exhibited NDA

*Note: Junction box on north side of manhole with ∿ 3" conduit running in an easterly direction

Lid Sealed

MANHOLE 719

At N.E. corner of TA-3 SM-29 CMR

3' x 3' diameter entry

5'6" x 5'6" x 23' deep, inside diameter

16'11" to top of concrete

15'6" to top of standing water

1'5" of water, water removed by HSE-7

Direct readings at opening by PAC-7 and HSS1050 Model Three were NDA

Swipe taken along walls ∿ 10' down exhibited NDA H_2O sample, negative

Lid Sealed

MANHOLE 723

East side of TA-3, SM-29 CMR

3' x 3' diameter entry

5'6" x 5'6" x 20' deep inside diameter

No concrete

No standing water

Direct readings at opening, by PAC-7 and HSS1050 Model Three were NDA

Swipes taken along walls ∿ 10' down exhibited NDA

Lid Sealed

MANHOLE 725

At S.E. corner of TA-3, SM-29 CMR

3' x 3' diameter entry

5'6" x 5'6" x 16' deep, inside diameter

7' to top of concrete

1' of standing water (water removed by HSE-7)

6' to top of standing water

Direct readings by PAC-7 and HSS1050 Model Three were NDA

No swipe taken

H_2O sample - negative

Lid Sealed

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen Valentine, Radiation Protection Group Leader — DATE: November 25, 1985

THRU: Jim Cox, Decontamination Operations Section Leader — MAIL STOP/TELEPHONE: E520/7-5420

FROM: Gilbert M. Montoya, HSE-1 — SYMBOL: HSE-1-GM-79

SUBJECT: LINE 167: CONCRETE ANCHORS LEFT IN PLACE ON SOUTH SIDE OF LOS ALAMOS CANYON

Five concrete anchors (average size 2' x 3' x 6') were used to secure TWL 167, a 3" cast iron pipe, at the south wall of Los Alamos Canyon. For exact locations refer to Engineering Drawing NO. C43943 sheet 32.

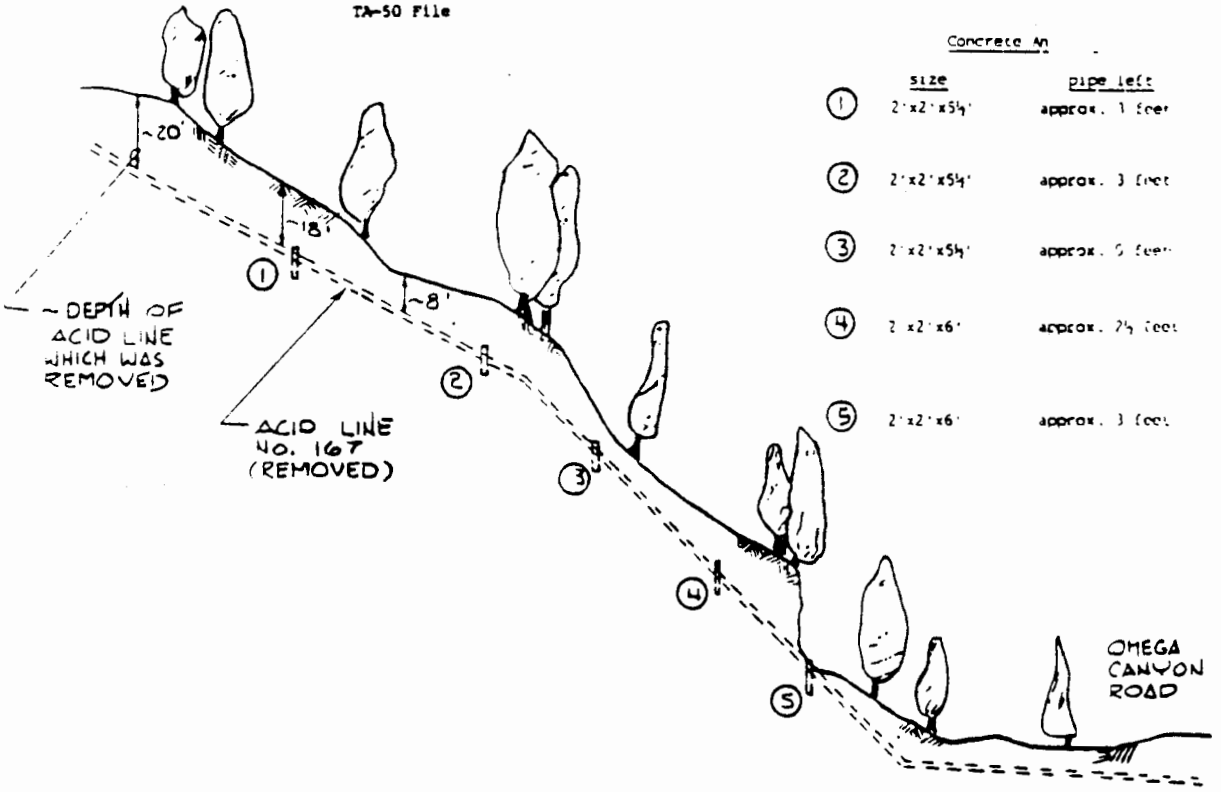
The sections of pipe left encased in each of the concrete anchors were approximately 3' long. The sections were decontaminated, the ends were sealed with concrete and the anchors were backfilled to upgrade one foot above the pipe openings.

During the removal of Line 167, soil samples were collected between the anchors, all soil samples were below established TWL guide lines (< 25 pCi/g). Embedded alpha activity inside the pipe was < 400 DPM/100 cm². Beta-gamma activity were at background levels. Richard Romero, HSE-8 and Darrell Hohner, ENG-1, participated in the ALARA decision.

GM:bv

Att: Drawing

Xc: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
J. Elder, HSE-1, MS P229
TA-50 File



Concrete An

	size	pipe left
1	2'x2'x5½'	approx. 1 feet
2	2'x2'x5½'	approx. 3 feet
3	2'x2'x5½'	approx. 3 feet
4	2'x2'x6'	approx. 2½ feet
5	2'x2'x6'	approx. 3 feet

PROFILE-SOUTH WALL
LOS ALAMOS CANYON
N.T.S.

Gilbert M. Montoya
HSE-1

Los Alamos
Los Alamos National Laboratory
Los Alamos New Mexico 87545

memorandum

TO: Allen Valentine, Radiation Protection Group Leader
Jim Cox, Decontamination Operations Section Leader

DATE: December 17, 1985

TELEPHONE: 5520/7-7800

FROM: Gilbert Montoya, HSE-1

SYMBOL: HSE-1-GM-81

SUBJECT: SECTIONS OF LINE 8 AND 9 AND MANHOLE 723 LEFT IN PLACE AT SM-29

Approximately 490 feet of Line 8, 390 feet of Line 9 and Manhole 723 were left in place in December 1985 - See attachment.

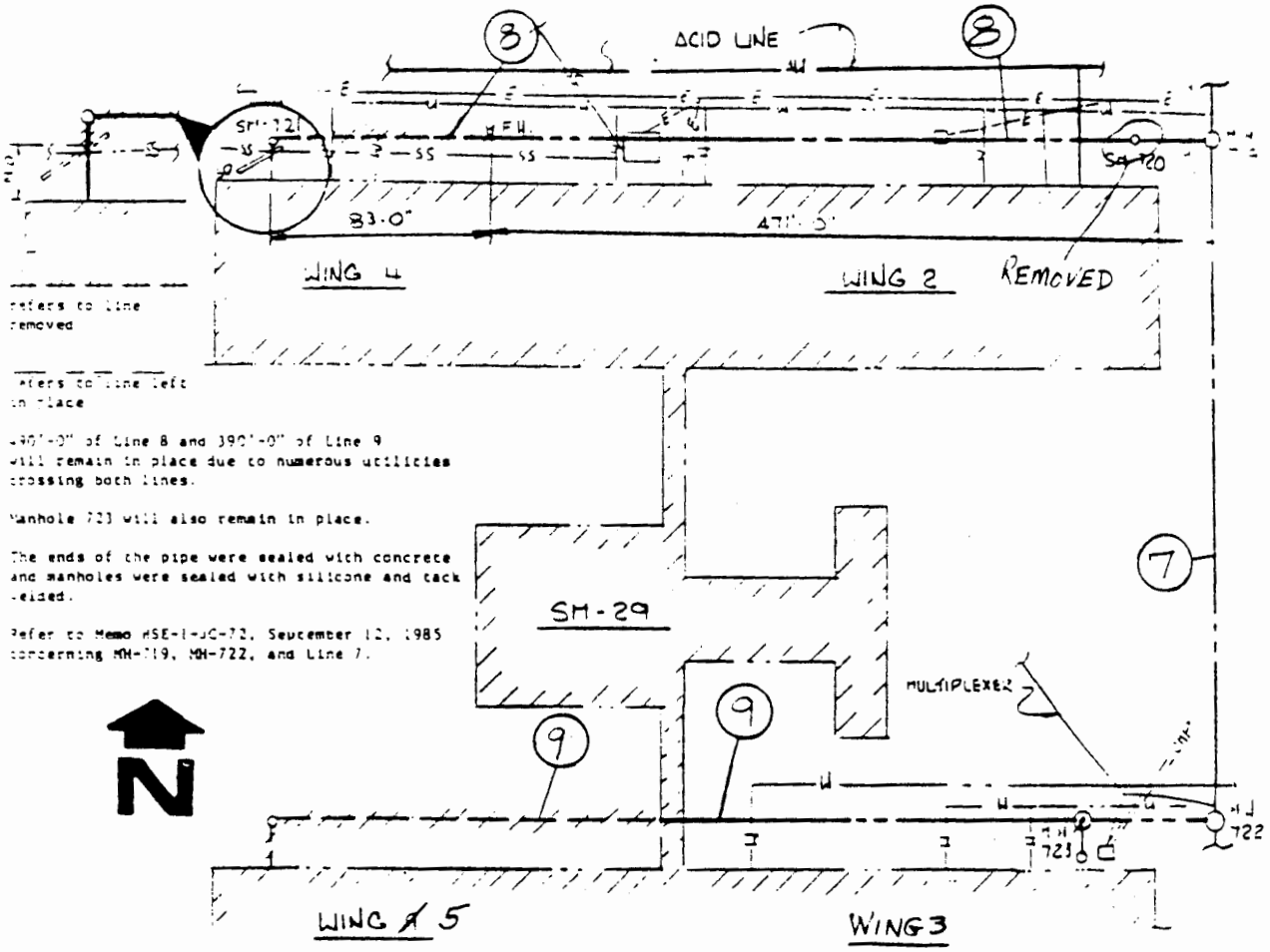
Lines 8 and 9 are six-inch vitrified clay pipes located at a depth of approximately 19-20 feet. The acid lines lie under water lines, sanitary sewers, storm drains, electrical services, sensor lines and a transformer sub-station. Line 9 also lies under a lawn, trees and lawn sprinkler system. Due to the above factors, it was felt that removal of the sections of pipe and manhole at the time was not cost effective.

GM:sb

Attachment a/s

Distribution: R. Romero, HSE-8, MS K490
D. Hohner, ENG-1, MS M713
J. Elder, HSE-1, MS P229

Xc: TA-50 File
File



ATTACHMENT 2

REFERENCE DRAWING LIST

ATTACHMENT 2

REFERENCE DRAWING LIST

Los Alamos Drawing ENG-C-43943
Title: Subproject B - Removal of Existing Lines

Sheet No.	Site	Subtitle
1A	TA-50	TA-50, I 50.2, Line 54
2	TA-50	I 50.4 67
3	TA-50	I 50.3 55
4	TA-50	I 50.1 49
5	TA-50	TA-50, Survey Sheet
5A	Omitted	
5B	TA-35	TA-35, Ten Site
6	↑	TA-35, I 35.4, Line 93
7	|	35.5 94
8	|	35.6 95
9	|	35.7 97
10	|	35.8 98
11	|	35.9 99
12	|	TA-35, Structure TSL-22 Sludge Tank
13	↓	TSL-36
14	TA-35	TSL-36 Section
15	Paj. Rd.	TA-0, Pajarito Lines 24, 26, 27
16	↑	26
17	|	26
18	|	27
19	|	27
20	|	24
21	↓	24
22	Paj. Rd.	24

Sheet No.	Site	Subtitle
23	TA-48/55	TA-48, Lines 41, 39, 35, 32, 37, ULR-149
24	↑	TA-48, Line 41
25	|	39
26	|	35
27	↓	32
28	TA-48/55	37, ULR-149
29	Omitted	
30	Town	Townsite Plot Plan
31	Town	Townsite Line 167, ULR-33 Plan
32	Town	167, ULR-33 Elevation
33	Town	ULR-36, -63, -64, Road Crossings
34	SM-700	SM-700, ULR-33
35	↑	Site Plan
36	|	Line 1, SM-703
37	|	Line 23
38	|	Line 1
39	|	Line 23
40	|	Lines 1 and 23
41	|	(Building Details)
42	|	(Building Details)
43	↓	Sm-738 Tank
44	SM-700	Topographics
45	Sigma	Removal of Line 18 and MH 709
46	Omitted	
47	Omitted	
48	Paj. Rd.	TA-0 Pajarito Line 31
49	Paj. Rd	Lines 31, 33, 34, 40
50	Paj. Rd	Lines 24, 25, 31

Sheet No.	Site	Subtitle
51	TA-50	TA-50 Line 45
52	Omitted	
53	Paj. Rd.	TA-59 Line 28
54	TA-48/55	TA-48 Line 31, 33, 34, 40
55	Sigma	Sigma Lines 18, 19, 19A, 20. 21, 22
56	↑	Line 18
57	|	Line 19
58	|	Line 19A
59	|	Line 20
60	|	Line 21
61	↓	Line 22
62	Sigma	Sigma Line 18 Profile
63	↑	Lines 19, 19A Profile
64	↓	Line 20 Profile
65	Sigma	Line 22 Profile
66	TA-3	TA-3 Lines 12, 13, 14 Parcel I
67	↑	Lines 12, 15, 24, 25, and 11
68	|	Line 2
69	↓	Line 2 Parcel III
70	TA-3	Lines 2, 5, 6, and 3
71	TA-48/55	TA-55 Line 43
72	TA-50	TA-50 Lines 42, 45, 45A, 44, and 46
73	TA-50	Lines 44, 46, 47, 48, 48A
74	TA-3	TA-3 CMR Lines 7, 8, 9, 9A, 9B, 10, 11A, 17, 17A, 17B
75-88	TA-3	SM-29
S-1	TA-50	As-left Soil Concentrations of Radioactivity
S-2	TA-35	As-left Soil Concentrations of Radioactivity
S-3	Paj. Rd.	TA-0, Pajarito, Soils, Lines 24 and 27
S-4	Paj. Rd.	TA-0, Pajarito, Soils, Lines 24 and 26

ATTACHMENT 2 (Continued)

Sheet No.	Site	Subtitle
S-5	Paj. Rd.	TA-0, Pajarito, Soils, Lines 24 and 27
S-6	SM-700	TA-3 Soil Concentration
S-7	SM-700	Soils, Lines 1 and 23
S-8	TA-3	Soils
S-9	TA-3	Soils
S-10	Sigma	Soils Removal of Line 18 and MH-709
S-11	Paj. Rd.	TA-59 Radiological Soils Test Results
S-12	TA-48	TA-48 Plot Plan Soils
S-13	Sigma	Sigma Line 18 Radiological Soils
S-14	↑	TA-3 Radiological Soils Test Results
S-15	|	↑
S-16	|	|
S-17	↓	↓
S-18	Sigma	TA-3 Radiological Soils Test Results, Line 22
S-19	Paj. Rd.	Pajarito, Soils, Lines 24, 26, 31
S-20	Paj. Rd.	Pajarito, Soils, Lines 24, 26, 31
S-21	Paj. Rd.	Pajarito Lines 24, 31, 32, 33, 34