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INTERNATIONAL
TECHNOLOGY
CORPORATION

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# Interim Status Closure and Post-Closure Care Plan

## Tech Area 16 Surface Impoundment
## Los Alamos National Laboratory
## Los Alamos, New Mexico

*Los Alamos National Laboratory*
*Los Alamos, New Mexico*

14351

**RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT**

INTERNATIONAL TECHNOLOGY CORPORATION

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## 1.0 INTRODUCTION

This Closure and Post-Closure Care Plan is submitted in accordance with the requirements of 40 CFR 265.110 through 120 (NMHWMR 206.C.2.a through 206.C.2.j) and 265.228 (NMHWMR 206.C.6.f). The plan identifies all steps necessary to close the Tech Area 16 (TA-16) surface impoundment under interim status standards.

The Laboratory desires to close the TA-16 surface impoundment in accordance with the requirements of 40 CFR 265.228(a) and (b) [NMHWMR 206.C.6.f(1) and (2)], for "clean closure." To meet the requirements of "clean" closure, the Laboratory proposes to remove standing liquids, wastes, and waste residue from the impoundment; clean the liner; and remove underlying and/or surrounding contaminated soil, if necessary. The liner will be cleaned in-situ, and reinstalled following decontamination verification sampling, such that the surface impoundment can remain in use as a nonhazardous waste treatment facility.

This document is organized as follows. Section 2.0 describes the existing surface impoundment. Section 3.0 presents the waste characteristics. Section 4.0 describes the process which results in waste generation, and Section 5.0 presents the closure and post-closure requirements.

## 2.0 FACILITY DESCRIPTION

The TA-16 surface impoundment is located in a remote area in the eastern section of TA-16 and covers an area of approximately 2,400 square feet. The impoundment is situated just north of a small unnamed canyon (tributary to Valle Canyon) (Figure 2-1). An asphalt pad extends up to the north edge of the impoundment berm. Relatively undisturbed ground occurs to the east and west of the impoundment. A description of the local geology and hydrology is provided in Appendix A.

Surface dimensions of the impoundment are 60 feet long by 40 feet wide and eight feet deep from the top of the berm. The upper four feet of the impoundment sides are sloped at a ratio of two to one while the lower four feet are sloped at one to one. The bottom of the impoundment is 37 feet long and ten feet wide with a slight downward slope to the northeast corner. The structure is equipped with a field-seamed Hypalon liner. Field seams are welded with a minimum six-inch overlap. Construction diagrams for the impoundment are presented in Appendix B.

Inflow to the impoundment occurs at two points, one in the northwest corner of the structure and one in the center of the east side. There is no permanent outfall from the structure.

## 3.0 PROCESS INFORMATION

The TA-16 surface impoundment stores filtrate from treatment of a high explosive (HE) waste stream. Small particles of waste HE collect in the bottoms of sumps in TA-16 buildings 401 and 406, forming sludges. These sludges are periodically removed from the sumps for treatment. Sludge treatment consists of placing sludge in a pressurized particle filter. Warm air is blown through the filter at approximately two pounds per square inch until the sludge has dried. Liquid extracted from the filter process is directed to the TA-16 surface impoundment. This is the only source of material placed into the TA-16 surface impoundment. Periodically, fluids from the impoundment are discharged to permitted National Pollution Discharge Elimination System (NPDES) outfall number NM0028355.

Between discharges to the impoundment, evaporation of water from the impoundment causes contaminant concentrations to gradually increase. Current operating procedures, however, provide for periodic removal of fluids from the impoundment to ensure that contaminant concentrations do not exceed regulatory limits and become hazardous materials.

## 4.0 WASTE DESCRIPTION

As a result of an extended period of accumulation and evaporation between August, 1985 and January, 1986, the barium concentration in the impoundment exceeded limits for EP Toxicity (Table 4-1). Fluids in the impoundment were treated with a flocculant to remove barium. Precipitants and sediments from the one-time treatment were removed from the site and are currently stored in the TA-54, Area L storage area. The barium concentration in fluids stored in the impoundment are now monitored to ensure regulatory limits are not exceeded.

## 5.0 CLOSURE AND POST-CLOSURE REQUIREMENTS

### 5.1 CLOSURE PLAN

This closure plan for the TA-16 surface impoundment is designed to meet the following performance standards:

- Protect human health and the environment
- Prevent the escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters or atmosphere
- Minimize future maintenance

The Laboratory plans final closure for the impoundment in late 1987.

#### 5.1.1 Estimate of Maximum Liquid in Impoundment

Filtrate extracted from the K047 explosive waste treatment vessels is transferred to the surface impoundment for temporary storage and discharge in accordance with the NPDES permit. The maximum filtrate stored in the surface impoundment for treatment at any one time is 70,439 liters (18,610 gallons).

#### 5.1.2 Liquids and Residue Removal Procedures

The procedures discussed below provide for removal of standing liquids, waste, and waste residue to meet the requirements of "clean closure" in accordance with 40 CFR 265.228(a) and (b) [NMHWMR 206.C.6.f(1) and (2))].

##### 5.1.2.1 Liquids Removal

Prior to removal of liquids from the surface impoundment, one representative sample of the liquid will be collected using a composite liquid waste sampler (COLIWASA) to obtain a vertical composite of fluids. The sample will be stored in appropriate containers and preserved as specified in Section 5.1.5. The liquid sample will be analyzed for total metals and the following organic compound groups: volatiles, base/neutral extractables, acid extractables, and nitroaromatics.

Following sampling, fluids will be pumped from the surface impoundment into drums or other containers approved to store hazardous waste. The containers will be stored in the TA-54, Area L storage area until sample results are received and proper treatment/disposal methods are determined. The waste fluid will either be treated at Laboratory facilities or disposed of off-site. All waste shipped off-site will be manifested in accordance with 40 CFR 262 Subpart B (NMHWMR 203). The waste transporter will have an EPA identification number in accordance with 40 CFR 263.11 (NMHWMR 205.B).

5.1.2.2 Residue Removal

Residue remaining in the impoundment after fluid removal will be sampled to determine appropriate treatment/disposal methods. Two samples of the residue will be collected; one from the lowest point (northeast corner) and the other directly beneath an influent location. Samples will be stored in appropriate containers and preserved as specified in Section 5.1.5. Residues will be analyzed for the same constituents as fluid samples (Section 5.1.2.1).

Following sampling, residues will be physically removed from the impoundment by pumping or excavation. The method used will depend on the physical characteristics of the residue after fluid removal. Residues will be stored in drums or containers approved to receive hazardous waste until sample results are received and proper treatment/disposal methods can be determined. The containers will be stored in the TA-54, Area L storage area. Waste residues will be either treated at Laboratory facilities or disposed of off-site. All wastes shipped off-site will be manifested in accordance with 40 CFR 262 Subpart B (NMHWMR 203). The waste transporter will have an EPA identification number in accordance with 40 CFR 263.11 (NMHWMR 205.B).

5.1.2.3 Hazard Protection

Personnel involved with sampling, removing liquids and residues from the impoundment, and liner cleaning will use proper protective clothing. The Laboratory's safety group (HSE-5) will be responsible for assessing hazards and determining protective clothing requirements.

5.1.2.4 Equipment Decontamination

All equipment used in sampling and removal of liquids and residue will be scraped and brushed to remove residue and the residue collected will be placed in drums for treatment or disposal as specified in Section 5.1.2.2. The equipment will be decontaminated by washing with surfactants such as alconox and steam cleaning. Rinsate will be collected and handled as fluid from the surface impoundment. Protective clothing will be disposed of on- or off-site as hazardous waste.

5.1.3 Liner Decontamination Procedures

The Laboratory desires to remove contaminants, if present, from the surface impoundment liner and continue use of the facility to treat and store non-hazardous materials. To accomplish this, the liner will be cleaned to meet the standards of 40 CFR 265.228(b) [NMHWMR 206.C.6.f(2)].

The liner will be pre-washed using pressurized hot water to remove remaining residue. Rinsate will be collected and handled in the same manner as residue from the surface impoundment. Following the pre-wash, the liner will be scrubbed using a surfactant such as alconox and rinsed with pressurized hot water. Steam will not be used as it may damage the liner. Rinsate from the second wash will be collected and handled in the same manner as impoundment fluids.

A representative sample of the rinsate will be collected and preserved in accordance with procedures presented in Section 5.1.5. The sample will be analyzed for total metals and the following organic compound groups: volatiles, base/neutral extractables, acid extractables, and nitroaromatics. Methods for treatment and/or disposal of the rinsate will depend on results of sampling. It is expected that rinsate from the second wash will not be hazardous waste as defined in 40 CFR 261.3 (NMHWMR 201.A.3). A determination that the rinsate from the second wash is not a hazardous waste will indicate that the liner does not contain hazardous constituents which are leachable in quantities sufficient for the liner to be determined a hazardous waste; thus, meeting the requirements of 40 CFR 265.228 (NMHWMR 206.C.6.f). The washing procedures will be repeated, as necessary, utilizing appropriate surfactant solutions until the rinsate is no longer a hazardous waste.

5.1.4 Soil Sampling and Ground-Water Investigation Plans

Soil and ground water (if present) will be sampled and investigated to determine whether fluids from the surface impoundment have contaminated the underlying and surrounding soil and ground water. The following sections present plans for determining the number and the location of samples to be collected and the procedures to be used for collection, storage, and preservation of samples.

5.1.4.1 Soil Boring and Sampling Plan

Soil samples will be collected from the area immediately underlying the liner by drilling two boreholes, one in each half of the surface impoundment. A total of three soil samples will be collected in each borehole at intervals of 0-1 foot, 5-6 feet, and 9-10 feet (below the bottom of the impoundment). Sample intervals will be adjusted, if necessary, depending on the depth bedrock is encountered. These soil samples will be collected to determine if contaminants from the impoundment have migrated beneath the liner.

Two background composite soil samples will be collected; one to the east and one to the west of the surface impoundment at a distance greater than 500 feet from the surface impoundment berms (Figure 5-1). The exact location and depths for background samples will be field selected based on similar topographic and geologic characteristics to the surface impoundment site.

All soil samples will be collected, stored, and preserved in accordance with protocols described in Section 5.1.5. Analyses to be performed depend on analytical results of surface impoundment fluid and residue samples. If no organic constituents are detected in the surface impoundment samples, soil samples will be analyzed only for metals by using the EP toxicity method. If organic constituents are present in the surface impoundment, soil samples will be analyzed for the organic constituents present in the surface impoundment.

Should statistical analysis of soil-chemistry data indicate the presence of contamination (5.1.6), the Laboratory will further investigate the extent of contamination. Appropriate remedial actions will be determined and undertaken after contamination investigations have been conducted. Appropriate actions may include soil removal or treatment. Statistical comparisons of leachable metals data from soil samples should be analyzed with caution because weathering processes on differing parent material may yield significantly different metal concentrations in the resulting soils.

5.1.4.2 Ground-Water Investigation Plan

Three boreholes will be drilled to a depth of approximately 120 feet to determine the likelihood of recovery of a representative volume of perched ground water. A soil sample will be collected at the bottom of each of the boreholes and analyzed for those constituents tested for beneath the impoundment. The boreholes will be located adjacent to the surface impoundment as shown on Figure 5-2. Based on hydrogeologic conditions in nearby areas (Appendix A), the top of the main aquifer lies at a depth of approximately 1,200 feet below the surface impoundment.

The Laboratory anticipates that no measurable volumes of ground water will be encountered in the soil borings. However, should measurable volumes of ground water be found, the soil borings will be completed as monitoring wells meeting requirements of EPA's RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (September 1986). The proposed ground-water monitoring plan is provided in Appendix C.

5.1.5 Sampling and Analysis Procedures

The following sections define procedures and methods for sampling, analysis and documentation applicable to this closure plan. While the procedures and methods are specific, any applicable procedure or method defined in Test Methods for Evaluating Solid Wastes, U.S. EPA SW-846, most current edition (SW-846) may be used if conditions or experience shows the alternate method to be more appropriate.

The sample collection personnel will be instructed to heed the following precautions:

- Do not smoke, eat, or handle any objects not necessary for sampling while performing sampling procedures.
- Do not sample downwind of any potential volatile organics sources such as car exhausts, open fuel tanks, etc. These could result in contamination of the sample. If any such sources are unavoidable, make a note of them in the field logbook.

- Leave caps on the sample containers until just before filling.
- Avoid handling the teflon bottle cap liners. Do not use any liner which falls out of the cap and onto the ground.
- Gloves should be worn when taking samples and when handling bottles, especially those with added preservative.

5.1.5.1 Waste Liquid and Rinsate Sampling

A COLIWASA sampler or similar device will be used to sample liquids in the surface impoundment and rinsate from the liner and equipment cleaning. The recommended model of the COLIWASA is shown in Figure 5-2, the main parts consisting of the sampling tube, the closure-locking mechanism, and the closure system. As an alternative to the Coliwasa, glass tubes may be used to sample liquids. The primary advantage in utilizing a glass tube is that the tube will be disposed of as hazardous waste after each sample is collected, thus eliminating the potential for cross-contamination.

Sampler Preparation

The COLIWASA sampler must be clean before use. The sampler must be washed with a warm detergent solution (Liquinox or Alconox), rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. A necessary piece of equipment for cleaning the tube of the COLIWASA is a bottle brush that fits tightly inside the diameter of the tube. The brush is connected to a rod of sufficient length to reach the entire length of the sampler tube. Using this ramrod and fiber-reinforced paper towels, the COLIWASA tube may be quickly cleaned. Clean COLIWASA samplers will be stored until use in polyethylene plastic tubes or bags in a clean and protected area.

Sampling Procedures

- Assemble the clean glass COLIWASA sampler and check to make sure the sampler is functioning properly. Adjust the locking mechanism, if necessary, to make sure the neoprene rubber stopper provides a tight closure.

- Wear necessary protective clothing and gear and observe required sampling precautions.
- Put the sampler in the open position and slowly lower the COLIWASA sampler into the liquid at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same.
- When the sampler stopper hits the bottom of the liquid container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler and slowly withdraw the sampler from the container with one hand while wiping the sampler tube with a disposable cloth with the other hand.
- Carefully discharge the sample into a glass container by slowly opening the sampler.
- Cap the glass container, attach a label and seal record in the field log book, and complete the sample analysis request sheet and chain-of-custody record (Section 5.1.5.3).

5.1.5.2 Soil Sampling

The sampling procedures outlined below will be used to determine the amount of hazardous material deposited as residue in the impoundment or in the soil underlying the surface impoundment. Adequate preparation ensures that proper sampling is accomplished. A checklist of items required for field sampling is given in Table 5-1.

Surface soil samples will be collected with a trowel or scoop. To sample below eight cm (three in.), samples will be collected using a drilling rig with continuous flight hollow stem augers and Shelby samplers. All samples will be collected in EPA-approved containers and preserved in accordance with EPA methods (Table 5-2).

Sampling Procedures

Trowel or Scoop

- Take small, equal portions of sample from the surface or near the surface of the material to be sampled.
- Composite the samples in a glass container.

- Cap the container, attach a label and seal, record in field log book, and complete the sample analysis request sheet and chain-of-custody record (Section 5.1.5.3).

Shelby Sampler

- Assemble the clean Shelby sampler to the drill rod.
- Drive the Shelby sampler one to two feet ahead of the auger string.
- Withdraw the drill rod from the auger string and retrieve the Shelby sampler.
- Store the core sample in an appropriate sample container and packed in an insulated container with ice.
- Label the sample, affix the seals, record in the field log book, complete sample analysis request sheet and chain-of-custody record, and deliver the samples to the laboratory for analysis (Section 5.1.5.3).

Cleaning of Downhole Drilling Tools

All downhole drilling tools (augers, drive rods, etc.) will be steam-cleaned or pressure-washed after completion of each boring. All Shelby samplers will be cleaned after each location or depth interval is sampled. Wash fluids will be collected and analyzed to determine a proper disposal protocol.

5.1.5.3 Sample Handling and Documentation

Sample containers will be sealed with a gummed paper seal attached to the container in such a way that the seal must be broken in order to open the container. The seal and sample tag will be completed with a waterproof pen. An example of a sample seal is shown in Figure 5-4.

The sample label is necessary to prevent misidentification of samples and shall include, if applicable, the grid number referenced to positions staked on the site perimeter. The "field information" in the case of soil sampling, shall include observations such as the soil texture and surface appearance, ambient temperature and cloud cover at time of sampling, and precipitation conditions 24 hours before sampling. An example of a sample label is shown in Figure 5-5.

The chain-of-custody form is necessary to trace sample possession from the time of collection and must accompany every sample. This is a two-page record with the original accompanying shipment and the "copy" retained by the Laboratory. An example of this form is shown in Figure 5-6.

A separate closure sampling field log book will be kept and will contain all information pertinent to field surveys and sampling. The log book shall have bound and consecutively numbered pages in 8-1/2 by 11-inch format. Minimum entries include:

a. Purpose of sample (routine sampling, special sampling)

b. Location of sampling (coordinates referenced to staked field points, if soil sample)

c. Name and address of person making log entry

d. Type of process producing waste

e. Number and volume of sample taken

f. Description of each sampling location, sampling methodology, equipment used, etc.

g. Date and time of sample collection

h. Sample destination and transporter's name (name of laboratory, UPS, etc.)

i. Map or photograph of the sampling site, if any

j. Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc.)

k. Field measurements, if any (pH, flammability, explosivity, specific conductance, etc.)

l. Collector's sample identification number(s)

m. Signature of person responsible for the log entry

n. Analytical parameters requested.

Sampling situations vary widely. No general rule can be given as to the extent of information that must be entered in the log book. A good rule, however, is to record sufficient information so that someone can reconstruct the sampling situation without relying on the collector's memory.

The sample shipment and chain-of-custody record will be accompanied by a sample analysis request sheet (Figure 5-6). The request sheet has two parts: field and laboratory. The field portion of this form will be completed by the person collecting the sample and include most of the pertinent information noted in the log book. The laboratory portion is intended to be completed by the laboratory personnel when the sample is received.

5.1.5.4 Sample Analysis

All analyses, quality assurance and quality control will follow methods defined in SW-846. The analytical methods expected to be employed for analysis of samples collected during closure activities are denoted in Table 5-3.

5.1.6 Statistical Determination

The closure regulation 40 CFR 265.114 (NMHWMR 206.C.2.e) requires that all facility equipment and structures be disposed of or decontaminated by removing all hazardous waste and residues. These regulations address decontamination of equipment. The term residue is not defined. 40 CFR 261.3(c)(2)(i) [NMHWMR 201.A.2.c.(2)] states that any solid waste generated from the treatment of solid waste is a hazardous waste except as provided in 40 CFR 261.3(d)(1) [NMHWMR 201.A.2.c.(3)], which states that solid waste described in 40 CFR 261.3(c)(2)(i) [NMHWMR 201.A.2.c.(2)] is not a hazardous waste if, in the case of any solid waste, it does not exhibit any of the characteristics of a hazardous waste identified in 40 CFR 261 Subpart C (NMHWMR 201.B). Those characteristics include ignitability, corrosivity, reactivity, and EP Toxicity. The intent of these closure regulations is to guarantee that a closed area possesses no risk to human health or the environment.

The definition of what constitutes contamination of the TA-16 surface impoundment, based on the above-cited regulations, is not clear. Barium is the regulated constituent that is most likely to be found at the site. According to 40 CFR 261.3(d)(1) [NMHWMR 201.A.2.c.(3)], the residue would not be a regulated waste for barium or other metals unless the concentration exceeded the EP Toxicity limit. There are no limiting concentrations in the regulations for hazardous constituents other than those listed as EP Toxic.

On completion of the sampling survey described in Section 5.1.4, the Laboratory will prepare a risk assessment for constituents showing a one standard deviation increase over the maximum background concentration. The risk assessment will determine the threshold concentration for each constituent that represents a significant risk to human health and the environment and will take into account all possible pathways. Soils containing regulated constituent levels above the threshold concentration will be considered contaminated.

A copy of the completed risk assessment, along with pertinent backup data, will be provided to the NMEID for review and approval of the threshold values. Should NMEID find the threshold contamination levels inadequate, the Laboratory will negotiate threshold values agreeable to both parties.

### 5.1.7 Decontamination

The approach to decontamination depends on the extent of contamination, as determined by the sampling survey. If the sampling survey indicates that there are no contaminated areas at the surface impoundment, no further action will be taken at the site.

Should removal of contaminated soil be necessary, the Laboratory will contract with a permitted transporter and disposal site contractor who will provide sealed gondola trucks and provide for decontamination of those trucks at the disposal site. Small equipment used to pick up soil will be scraped and brushed clean, and the accumulated dust will be placed in drums for transport to Area L. The equipment will be decontaminated as outlined in Section 5.1.2.4.

Personnel involved in sampling and decontamination will wear rubber gloves, safety glasses, and coveralls. Personnel involved in dust-generating activities, such as digging and filling drums, will wear dust masks to prevent inhalation of contaminated dust. The Laboratory's Industrial Hygiene Group, HSE-5, will review the site survey analytical data and recommend additional protective clothing.

The Laboratory recognizes that if extensive contamination has occurred, the closure plan presented here may be impractical. If the surface impoundment sampling survey proves this to be true, the Laboratory will provide the survey data to the Director of NMEID within 30 days of the completion of the analytical work. Within 60 days of submission of the survey data, the Laboratory will provide an amended closure plan. The plan may also be amended under other circumstances as per 40 CFR 265.112(b) [NMHWMR 206.C.2.c(2)].

5.1.8 Decontamination Verification

If soil removal is deemed necessary, decontamination of the surface impoundment will be demonstrated by additional sampling. Because removal of contaminated soil will leave an exposed surface, the disturbed surface will be resampled in the same locations. Analysis and the determination of contamination is as previously discussed, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

5.1.9 Closure Schedule

The Laboratory plans to initiate closure of the TA-16 Surface Impoundment on the date this closure plan receives final regulatory approval. It is anticipated final closure will be initiated in 1987 and be complete in late 1987 or early 1988. The following events will be completed on or before the time indicated below:

| TIME (day) | ACTIVITY |
|---|---|
| 0 | Regulatory approval of closure plan |
| +15 | Closure initiated |
| +15 | Sample fluids in impoundment, remove fluids and residue from impoundment, and decontaminate liner |
| +75 | Collection of soil samples and advancement of boreholes |
| +135 | Removal of contaminated soil if necessary |
| +180 | Certification completed. |

If the soil surrounding the surface impoundment is contaminated and if extensive sampling and analysis is required, the removal or other remedial actions may take longer than 180 days. If this situation occurs, a demonstration will be made to the appropriate regulatory authority to explain the need to extend the 180 days closure time.

#### 5.1.10 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed in accordance with this plan. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE offices and one copy maintained by the HSE-8 Regulatory Compliance Section.

### 5.2 POST-CLOSURE PLAN

A Post-Closure Plan is not required for storage and treatment facilities.

### 5.3 NOTIFICATION IN DEED TO PROPERTY

The Laboratory will submit notice to local land authorities in accordance with 40 CFR 265.119 (NMHWMR 206.C.2.g) and a notation of deed in accordance with 265.120 (NMHWMR 206.C.2.j).

### 5.4 CLOSURE COST ESTIMATE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 265.140(c) [NMHWMR 206.C.3.a(3)].

### 5.5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 265.140(c) [NMHWMR 206.C.3.a(3)].

### 5.6 POST-CLOSURE COST ESTIMATE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 265.140(c) [NMHWMR 206.C.3.z(3)].

### 5.7 FINANCIAL ASSURANCE MECHANISM FOR POST-CLOSURE CARE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 265.140(c) [NMHWMR 206.C.3.a(3)].

## 5.8 LIABILITY REQUIREMENTS

This section is not applicable because federal facilities are exempt from this section per 40 CFR 265.140(c) [NMHWMR 206.C.3.a(3)].

## TABLE 4-1
## BARIUM CONCENTRATIONS IN THE SURFACE IMPOUNDMENT FLUIDS

| DATE | ANALYSIS | BARIUM CONCENTRATION |
|---|---|---|
| August 14, 1985 | EP-TOX | 36.0 mg/ℓ |
| January 30, 1986 | EP-TOX | 115.1 mg/ℓ |
| February 9, 1986 | Barium (Total) | 171.0 mg/ℓ |
| April 1, 1986 | Barium (Total) | 0.14 mg/ℓ |
| May 20, 1986 | Barium (Total) | 22.0 mg/ℓ |
| July 7, 1986 | Barium (Total) | 15.0 mg/ℓ |
| September 9, 1986 | Barium (Total) | 30.0 mg/ℓ |

TABLE 5-1

CHECKLIST OF SUGGESTED ITEMS FOR FIELD SAMPLING

| Quantity | Item | Use | Supplier |
|---|---|---|---|
| 1 | Field log book | To keep sample records | Office supply stores |
| 1 | Disposable towels or rags | To clean sampling equipment | Terry towels or equivalent; available at chemical supply houses |
| 6 | Large polyethylene bags | To store waste papers, rags, etc. | Plastic supply houses |
| 12 | Polyethylene bags | To store sample containers | Plastic supply houses |
| 4 | Waterproof pens | To complete records and labels | Stationery stores |
| 1 | Apron, oil and acid proof | Protective garment | McMaster-Carr Co.<br>P. O. Box 4355<br>Chicago, IL |
| 1 | Face mask | Protective garment | MSA<br>400 Penn Center Boulevard<br>Pittsburgh, PA 15235 |
| 1 | Liquinox or Alconox Detergent | Used to clean sampler | |

TABLE 5-2

SOIL SAMPLE COLLECTION METHODS

| CONSTITUENT | CONTAINER TYPE | CONTAINER SIZE | PRESERVATIVE[a] TYPE | PRESERVATIVE[a] AMOUNT |
|---|---|---|---|---|
| Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver, Nickel | Glass, silica/teflon septa | 250 mℓ | --- | --- |
| Volatile Organics | Glass, silica/teflon septa | (2) 40 mℓ | --- | --- |
| Base/Neutral Extractables | Glass, silica/teflon septa | 250 mℓ | --- | --- |
| Acid Extractables | Glass, silica/teflon septa | 250 mℓ | --- | --- |
| Nitroaromatics | Glass, silica/teflon septa | 250 mℓ | --- | --- |

(a)All samples will be cooled to 4°C upon collection.

TABLE 5-3

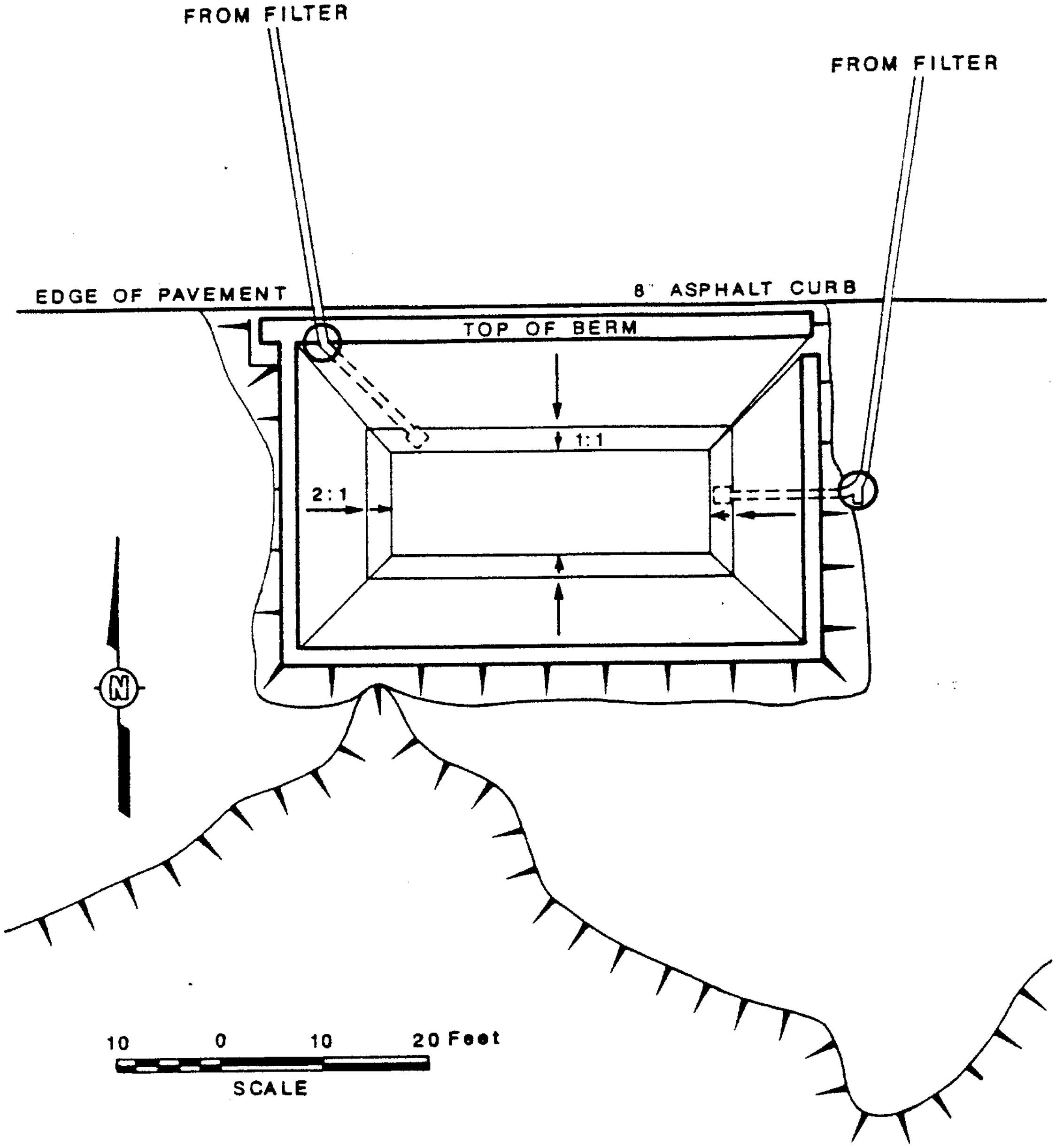
ANALYTICAL PARAMETERS AND METHODS FOR SOIL SAMPLES COLLECTED AT THE TA-16 SURFACE IMPOUNDMENT

| EPA Hazardous Waste Number | Metals | EP Toxic Regulated Concentrations | EPA Analytical Method[1] |
|---|---|---|---|
| D004 | Arsenic | 5.0 mg/ℓ | 6010 |
| D005 | Barium | 100.00 | 6010 |
| D006 | Cadmium | 1.0 | 6010 |
| D007 | Chromium | 5.0 | 6010 |
| D008 | Lead | 5.0 | 6010 |
| D009 | Mercury | 0.2 | 7470 or 7471 |
| D010 | Selenium | 1.0 | 6010 |
| D011 | Silver | 5.0 | 6010 |
| -- | Nickel | - | 6010 |

Organic Scan

| | |
|---|---|
| GC/MS for volatiles | 8240 |
| GC/MS for base/neutral extractables | 8270 |
| GC/MS for acid extractables | 8270 |
| GC or GC/MS for nitroaromatics | 8090 or 8270 |

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.




DRAWN BY 11/4/86 | CHECKED BY | APPROVED BY 11/4/86 | DRAWING NUMBER 301017 A15

FIGURE 2-1

TA-16
SURFACE IMPOUNDMENT

PREPARED FOR

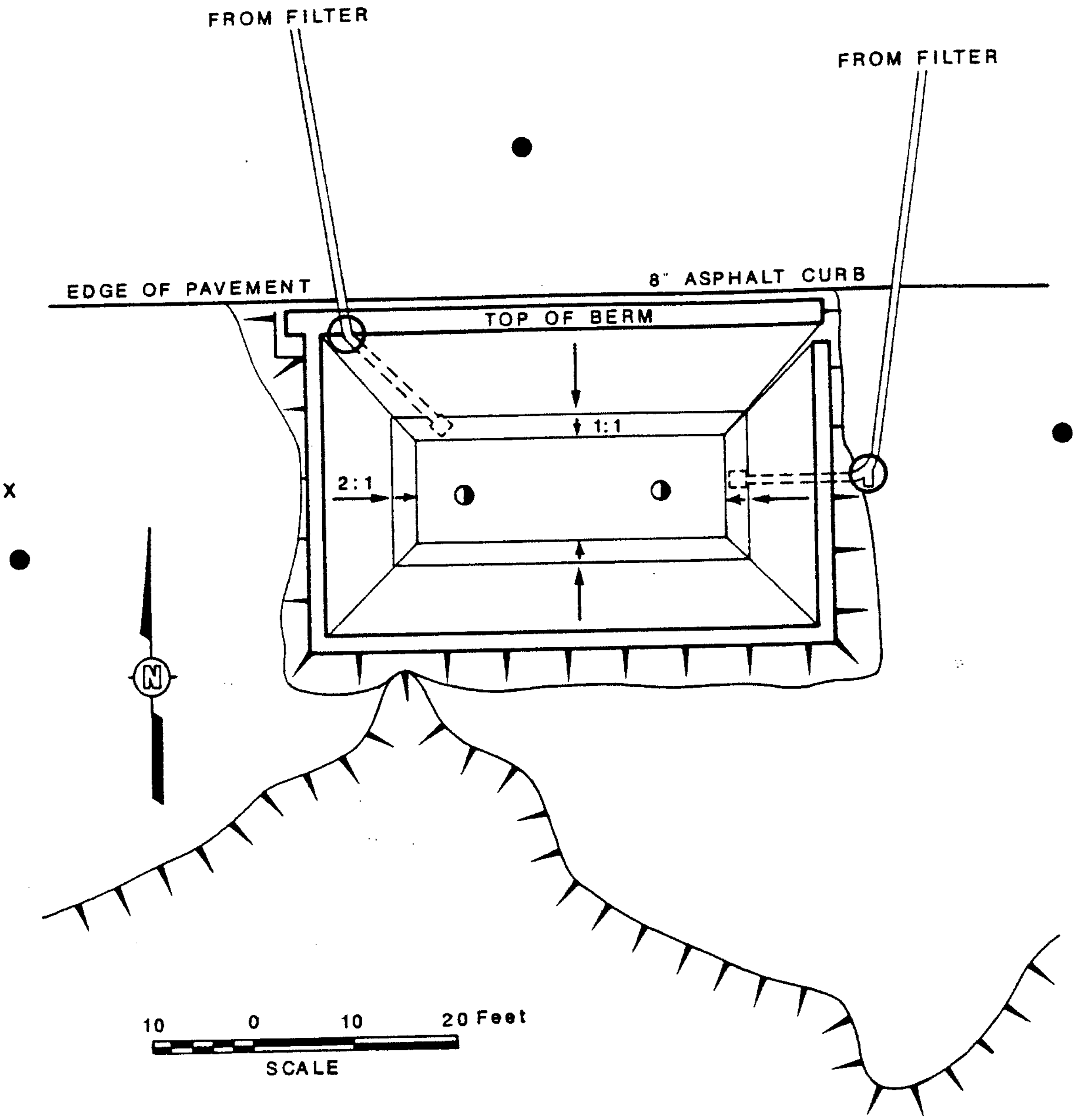
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT ... Creating a Safer Tomorrow



Do Not Scale This Drawing

65360




DRAWING NUMBER 301017 A14

DRAWN BY | 11/3/86 | CHECKED BY | APPROVED BY | 11/4/86

LEGEND

X Composite Soil Sample

◑ 10 Foot Soil Boring

● Deep Borehole

FIGURE 5-1

PROPOSED SOIL SAMPLE AND BOREHOLE LOCATIONS

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT ...Creating a Safer Tomorrow



"Do Not Scale This Drawing"

65360

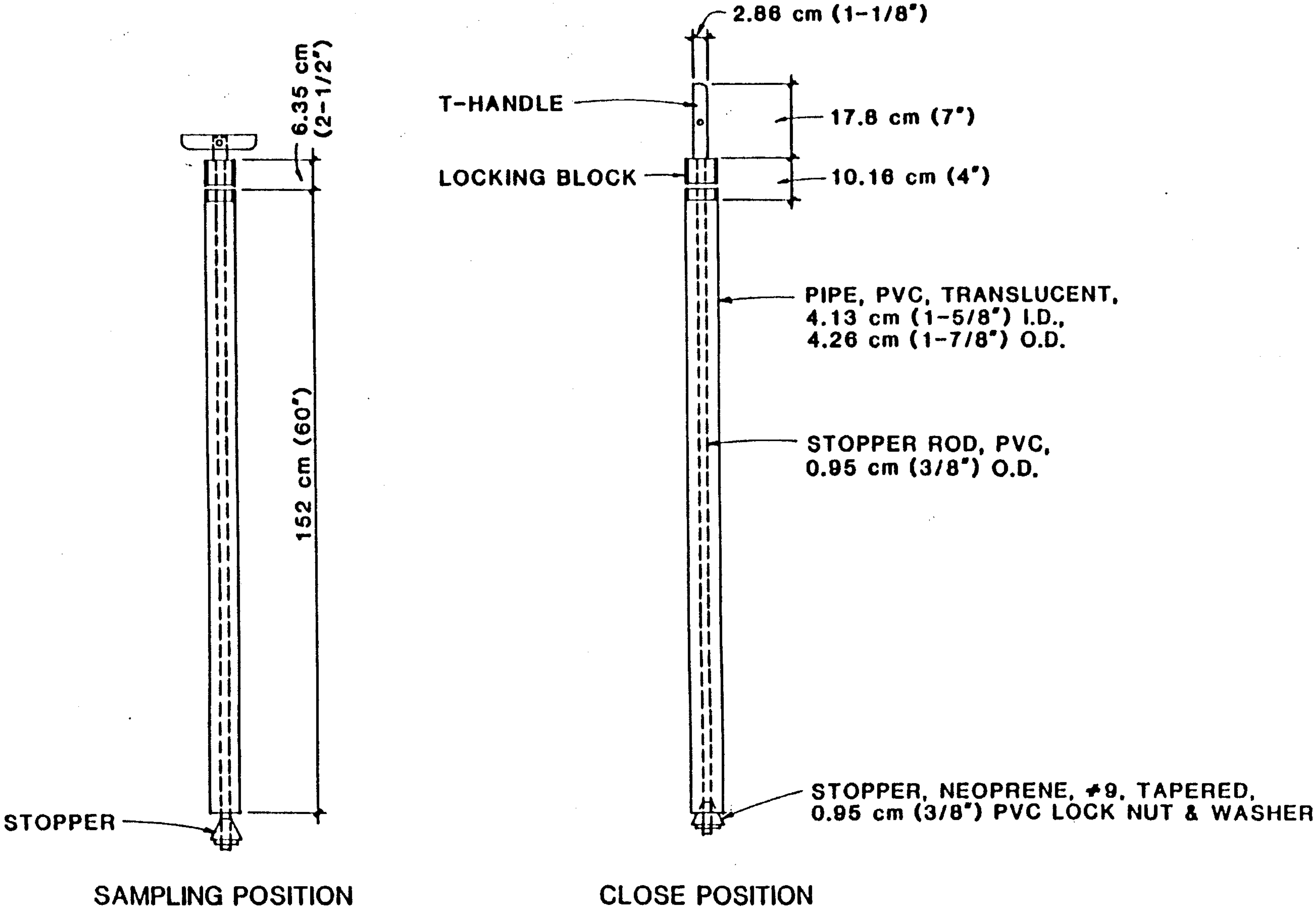



FIGURE 5-2 COMPOSITE LIQUID WASTE SAMPLER (COLIWASA)

3011 A16

## FIGURE 5-3
## EXAMPLE OF SAMPLE SEAL

OFFICIAL SAMPLE SEAL

Collected by ____________ Collector's Sample No. ________
(Signature)

Date Collected ____________ Time Collected ____________

Place Collected ________________________________

________________________________________

________________________________________

## FIGURE 5-4
## EXAMPLE OF SAMPLE LABEL

---

**OFFICIAL SAMPLE LABEL**

Collector____________________Collector's Sample No.________

Place. of Collection______________________________________

__________________________________________________________

Date Sampled________________Time Sampled__________________

Field Information_________________________________________

__________________________________________________________

__________________________________________________________

# FIGURE 5-5
# CHAIN OF CUSTORY RECORD

Hazardous Materials
Collector's Sample No.___

Location of Sampling: __Producer __Hauler
__Disposal Site
__Other: ____________________

________________________________________

Company's Name ____________________ Telephone (___) ____________

Address ________________________________________
number street city state zip

Collector's Name ____________________ Telephone (___) ____________
signature

Date Sampled ____________________ Time Sampled ____________ hours

Type of Process Producing Waste ____________________

Waste Type Code _____ Other ____________________

Field Information ____________________

________________________________________

________________________________________

Sample Allocation:

1. ________________________________________
name of organization

2. ________________________________________
name of organization

3. ________________________________________
name of organization

Chain of Possession:

1. ____________________ ____________ ____________
signature title inclusive dates

2. ____________________ ____________ ____________
signature title inclusive dates

3. ____________________ ____________ ____________
signature title inclusive dates

# FIGURE 5-6
# HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

**PART I: FIELD SECTION**

Collector________________ Date Sampled______ Time_____ hours

Location of Sampling______________________________
name of company, disposal site, etc.

Address___________________________________________
number street city state zip

Telephone (____)_________ Company Contact________________

| HML NO.. (Lab only) | COLLECTOR'S SAMPLE NO. | TYPE OF SAMPLE* | FIELD INFORMATION |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Analysis Requested________________________________
__________________________________________________

Special Handling and/or Storage___________________
__________________________________________________

**PART II: LABORATORY SECTION**

Received by ____________ Title____________ Date____________
Sample Allocation: ___HML ___LBL ___SRL Date____________
Analysis Required_________________________________
__________________________________________________

*Indicate whether sample is sludge, soil, etc.:**Use back of page for additional information.

# APPENDIX A

# GEOLOGY AND HYDROLOGY OF AREA P NEAR S-SITE

# GEOLOGY AND HYDROLOGY OF AREA P NEAR S-SITE

by

William D. Purtymun

## I. INTRODUCTION

Area P (Landfill) is located on the western margin of the Pajarito Plateau within the boundaries of Los Alamos National Laboratory. The Pajarito Plateau, formed by a series of ashflows and ashfall tuffs, forms an apron around the east flank of the Sierra de los Valles (Fig. 1). The surface of the plateau slopes gently eastward and terminates along the Puye Escarpment and White Rock Canyon above the Rio Grande. The surface of the mesa has been dissected into a number of narrow mesas by southeast trending streams.

This report was requested by the Regulatory Compliance Section of the Environmental Surveillance Group (HSE-8). It was prepared from published reports and reconnaissance of the area.

## II. GENERAL GEOLOGY

The Pajarito Plateau is structurally a part of the Rio Grande depression--a complex series of faulted troughs or basins that extend from southern Colorado along the Rio Grande to northern Mexico (Kelley 1952). The basement rock has been down faulted in the depression to as much as 10,000 to 15,000 feet below sea level (Fig. 2). The depression is filled with sediment and volcanic rocks.

The rocks that outcrop along the edges of and form the surface of the Pajarito Plateau are from oldest to youngest:

the Tesuque Formation, Puye Conglomerate, Basaltic Rocks of Chino Mesa, Tschicoma Formation, and Bandelier Tuff (Fig. 2). For a detailed description of these rock units, see Griggs (1964). The most important rock unit at Area P is the Bandelier Tuff.

The Bandelier Tuff forms the upper surface of the Pajarito Plateau. It is composed of a series of ashfalls and ashflows of rhyolite tuff. The three members of the Bandelier Tuff in ascending order are Guaje member, a lump pumice; the Otowi Member, a massive nonwelded ashflow; and the Tshirege Member, a series of moderately welded to welded ashflows (Purtymun and Koopman 1965). The Tshirege Member forms the surface of the mesa at Area P.

The most prominent structural feature of the Pajarito Plateau is the Pajarito Fault Zone, which tends northward along the western edge of the plateau (Fig. 3). The fault is downthrown to the east and displaces rocks of the Bandelier Tuff, Puye Conglomerate and Tschicoma Formation (Fig. 2). The displacement is estimated at about 400 ft (Budding 1976). Two smaller faults occur north and east of the Fault Zone (Fig. 3). They are the Los Alamos Fault (displacement 20 ft) and the Guaje Mountain Fault (displacement 10 to 50 ft). The Water Canyon Fault is the most important fault in this study as it occurs near Area P (see section III).

## III. LOCAL GEOLOGY

Area P (Landfill) lies near the western margin of the Pajarito Plateau in a saddle of a short eastern trending narrow mesa. A scarp due to the Water Canyon fault lies to the west of the landfill. To the north, the Canon de Valle has cut through the scarp and drains an area to the west on the flanks of the Sierra de los Valles. A small canyon has cut into the edge of the scarp to the south of the saddle. This south edge of the saddle slopes gently to the south. The explosive burning facility occupies the saddle and gently sloping part of the saddle to the south.

Area P (Landfill) occupies the northern part of the saddle that slopes gently to the north for about 400 feet and then becomes very steep as Canon de Valle has cut a deep canyon into the Bandelier Tuff. To the east of Area P the saddle rises gently to the top of the narrow mesa that terminates about a mile to the east as Canon de Valle turns abruptly to the south (Fig. 4).

The Bandelier Tuff (Tshirege Member) forms the saddle and underlies the Explosive Burning Facility and part of the landfill. About 50 feet of tuff in the saddle appear to be a moderately welded tuff, while about 80 feet of welded tuff is exposed beneath the moderately welded tuff in the south wall of Canon de Valle (Fig. 5).

The following geologic section is estimated from logs of Test Hole DT-5A and PM-2 and log of supply Well PM-2 (Purtymun 1968):

| Geologic Unit | Thickness (ft) | Average Depth Below Land Surface to Top of Unit (ft) |
|---|---|---|
| Bandelier Tuff | 800 | 0 |
| Puye Conglomerate | 500 | 800 |
| Tschicoma Formation | 1000 | 1300 |
| Tesuque Formation and Earlier Volcanics and Sediments | 2000 | 2300 |
| Precambrian Rocks | -- | 4300 |

The Water Canyon fault lies about 2 miles east of the Pajarito Fault Zone (Fig. 3). It is a normal fault with a displacement of about 30 ft as measured between marker beds in the Bandelier tuff. The fault is downthrown to the east and is abut 2.5 to 3 miles long (Budding 1976).

The scarp formed west of Area P appears to be an erosional scarp. The Water Canyon fault lies east (Fig. 4). The outcrop of the upper units of the Bandelier Tuff on the north wall of Canon de Valle shows no breaks (bed dip to the west) northwest, north, and northeast of Area P. Several hundred yards east of Area P these beds are broken by the Water Canyon fault. The fault zones of broken tuff weather rapidly with the formation of silt and clay. These zones tend to restrict the movement of water rather than promote the movement. East of fault the beds dip gently to the east.

The elevation of the saddle is about 7460 ft above sea level. The main aquifer (aquifer capable of municipal and industrial supply) lies at an elevation of about 6230 feet above sea level, or 1230 feet below the saddle in the Puye Conglomerate.

IV. LOCAL HYDROLOGY

Surface runoff from Area P is into Canon de Valle. Canon de Valle heads on the flanks of the Sierra de los Valles to the west and is tributary to a major intermittent stream in Water Canyon about 2 miles to the southeast. Water Canyon is tributary to the Rio Grande about 6 miles to the east in White Rock Canyon.

The stream in Canon de Valle below Area P is probably intermittent due to small drainage areas on the flanks of the mountain. It contains some water used in cooling machining processes from facilities to the west. This water forms base flow of the stream.

Canon de Valle is over 100 feet deep at the saddle near Area P. The canyon in this area of the plateau contains only a thin section of alluvium (probably less than 10 feet thick), which could contain water from the stream perched on the underlying tuff. This is a common occurrence with water in major stream channels that cross the plateau. In Water Canyon, about 2.5 miles to the southeast, water in a shallow observation well fluctuates with the amount of runoff in the intermittent stream. It is dry most of the time. In this area, a 200-foot deep/2-foot diameter well cased through the alluvium to shut out the water is completed in the tuff. This well has contained no water for the past 25 years.

Based on other test holes and supply wells on the plateau (Frijoles Mesa, Supply Wells PM-2, 3, 4, and 5), there is no known perched water beneath the alluvium in the stream channel and the top of the main aquifer.

The top of the main aquifer lies at a depth of about 1230 feet below the surface in rocks of the Puye Conglomerate at Area P. The main aquifer is recharged from precipitation in the mountains to the west, deep canyons cut into the mountains, and from ground water in the Valles Caldera west of the Sierra de los Valles. The movement of water is from the recharge area eastward toward the Rio Grande where part of the water is discharged into the river through seeps and springs. The movement of water in the upper 500-feet of aquifer at Frijoles Mesa to the southwest has been calculated at about 345 feet per year, while to the east the movement in the upper 1740 feet of supply well is much less at 95 feet per year (Purtymun 1984). The movement of the water in the main aquifer is probably near an average of the two rates at about 200 feet per year in the upper 1000 ft of the aquifer. A thick section of Tschicoma Formation lying within the main aquifer has a low permeability and tends to restrict the movement of water.

## V. AREA P

The landfill at Area P is located on the south wall of Canon de Valles. The elevation is about 7400 ft. The south wall of the canyon contains a thick growth of live oak, pine, and wild rose.

The Bandelier Tuff that forms the Pajarito Plateau consists of a series of ashflow and ash falls that are described as nonwelded, moderately welded, and welded. The tuff at the landfill overlies a welded tuff and laps on to a moderately welded tuff (Fig. 5). The hydrologic characteristics of the tuff depend on degree of welding; the denser the welding, the lower porosity and hydraulic conductivity. The porosity of a moderately welded tuff will range from 30 to 55 percent by volume, while that of a welded tuff will range from 15 to 40% by volume. The saturated hydraulic conductivity for a moderately welded tuff ranges from 0.1 to 1.7 ft/day, while the welded tuff ranges from 0.009 to 0.26 ft/day. The tuff at Area P is not saturated.

The tuff is dry with natural moisture contents ranging from one to six percent by volume. Soil development on the tuff and north facing slopes has restricted most, if not all, infiltration from precipitation into the underlying tuff.

The landfill is an on-sloping bench of moderately welded tuff underlain by a welded tuff (Fig. 5). The landfill was built from west to east. To the west the surface of the landfill has been capped with soil and tuff. There is no indication of water or leachate leaving the toe of the older part of the landfill.

To the west, on the recently used part of the landfill, there is a considerable erosion, subsidence and evidence of water entering the landfill. At the toe of the landfill in this area the water appears (at time of precipitation, not continuous flow) as surface flow on the top of the welded tuff.

The toe of the dump in the older part extends over the welded tuff, to the canyon bottom; however, the main part of the landfill is well above flood stage of Canon de Valle. There are some cans and other debris scattered below the main toe of the dump.

The landfill may not be located in the best possible area; however, there are some positive geologic and hydrologic conditions at the present location.

(1) The landfill is underlain by a welded tuff, which has a low porosity and a low hydraulic conductivity.

(2) The landfill is above the maximum flood level of Canon de Valle with exception of minor amounts of material that is scattered below the main toe of the landfill.

(3) It is in an area where all runoff water can be diverted from the landfill.

(4) About 1200 ft of unsaturated volcanics and sediments lie between the landfill and main aquifer of the Los Alamos Area.

(5) The Water Canyon Fault zone lies about 400 ft east of the landfill.

The depth to the top of the main aquifer, combined with the underlying relatively impermeable welded tuff, indicates that the present location of the landfill could be ideal with stabilization and runon and runoff control.

REFERENCES

Budding, A. J. and Purtymun, W. D., "Seismicity of the Los Alamos Area Based on Geologic Data," Los Alamos Scientific Laboratory report LA-6278-MS (1976).

Griggs, R. L., "Geology and Ground-Water Resources of the Los Alamos Area, New Mexico," U.S. Geol. Survey Water Supply Paper 1753 (1964).

Kelley, V. C., "Tectonics of the Rio Grande Depression of Central New Mexico," in The Rio Grande Country, NM Geol. Soc Guidebook, 3rd Field Conference (1952).

Purtymun, W. D. and Koopman, F. C., "Physical Characteristics of the Tshirege member of the Bandelier Tuff with Reference to Use as a Building and Ornamental Stone," U.S. Geol. Survey Open-File report (1965).

Purtymun, W. D., "Geology of the Microseismograph Station at S-Site, Los Alamos County, New Mexico," U.S. Geol. Survey Admin report (1968).

Purtymun, W. D., "Hydrologic Characteristics of the Main Aquifer in the Los Alamos Area: Development of Water Supplies," Los Alamos National Laboratory report LA-9957-MS (1984).

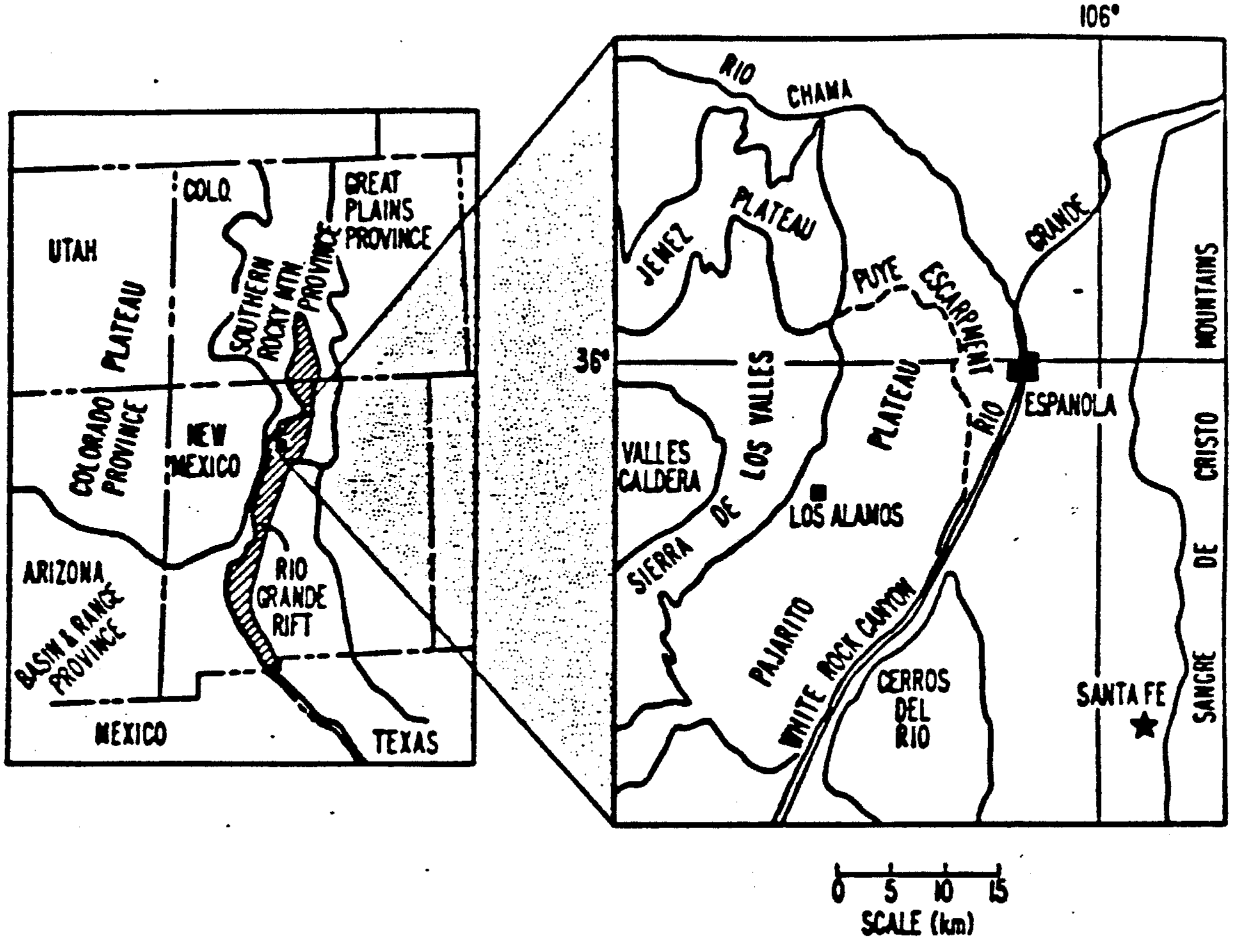



Fig. 1. Physiographic features of the Los Alamos Area.

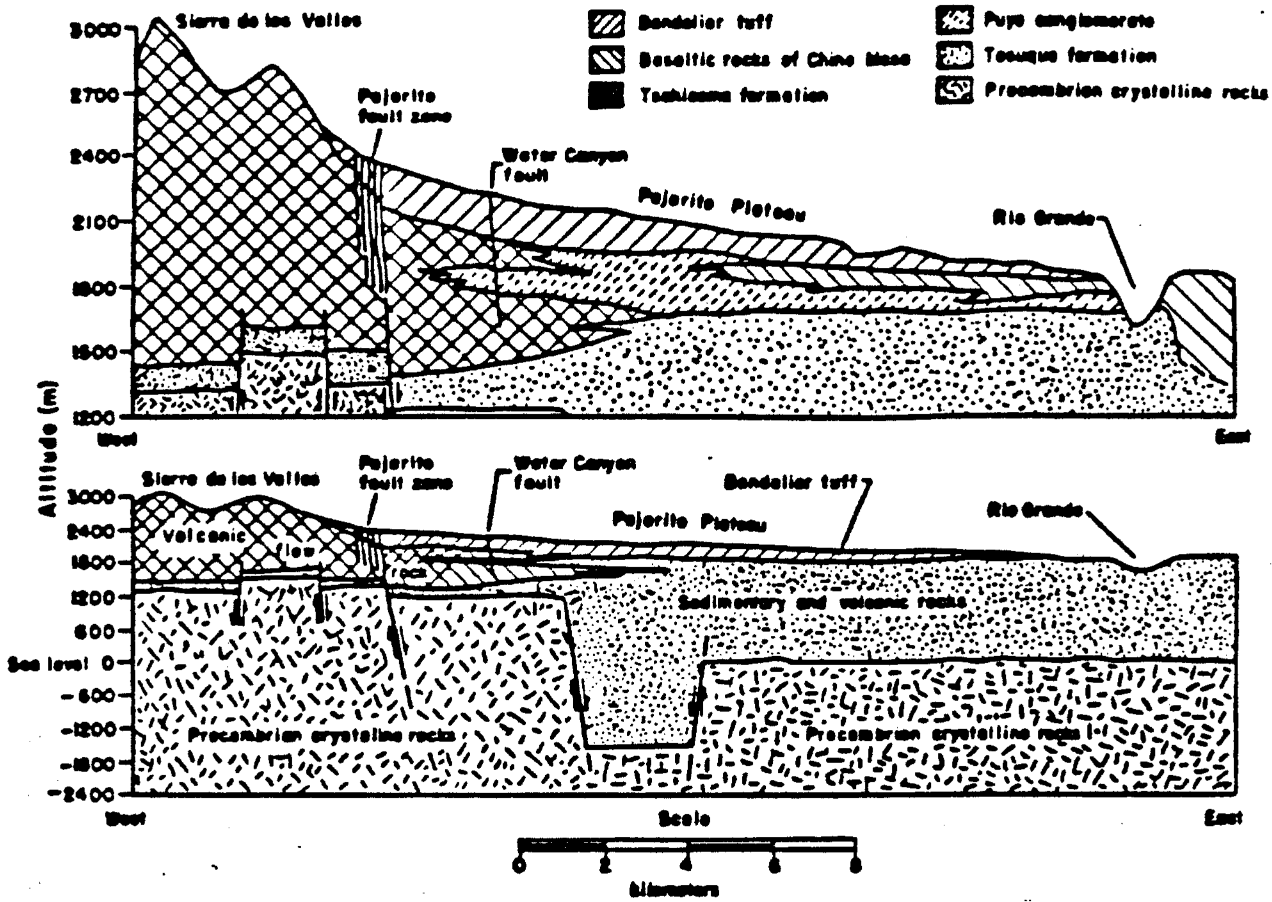



Fig. 2. Geologic section showing stratigraphic relationship of geologic unit.

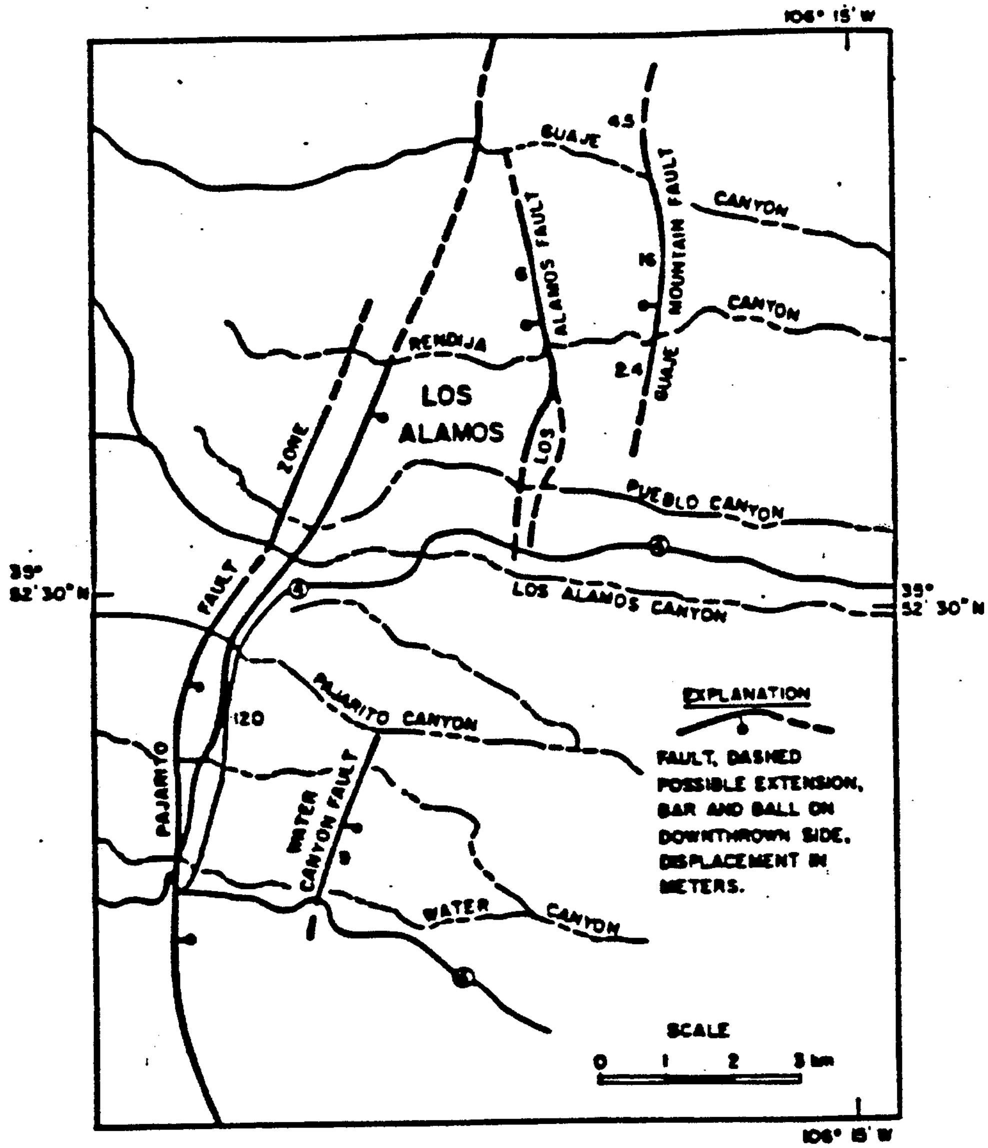



Fig. 3. Map showing faults in the Los Alamos Area.

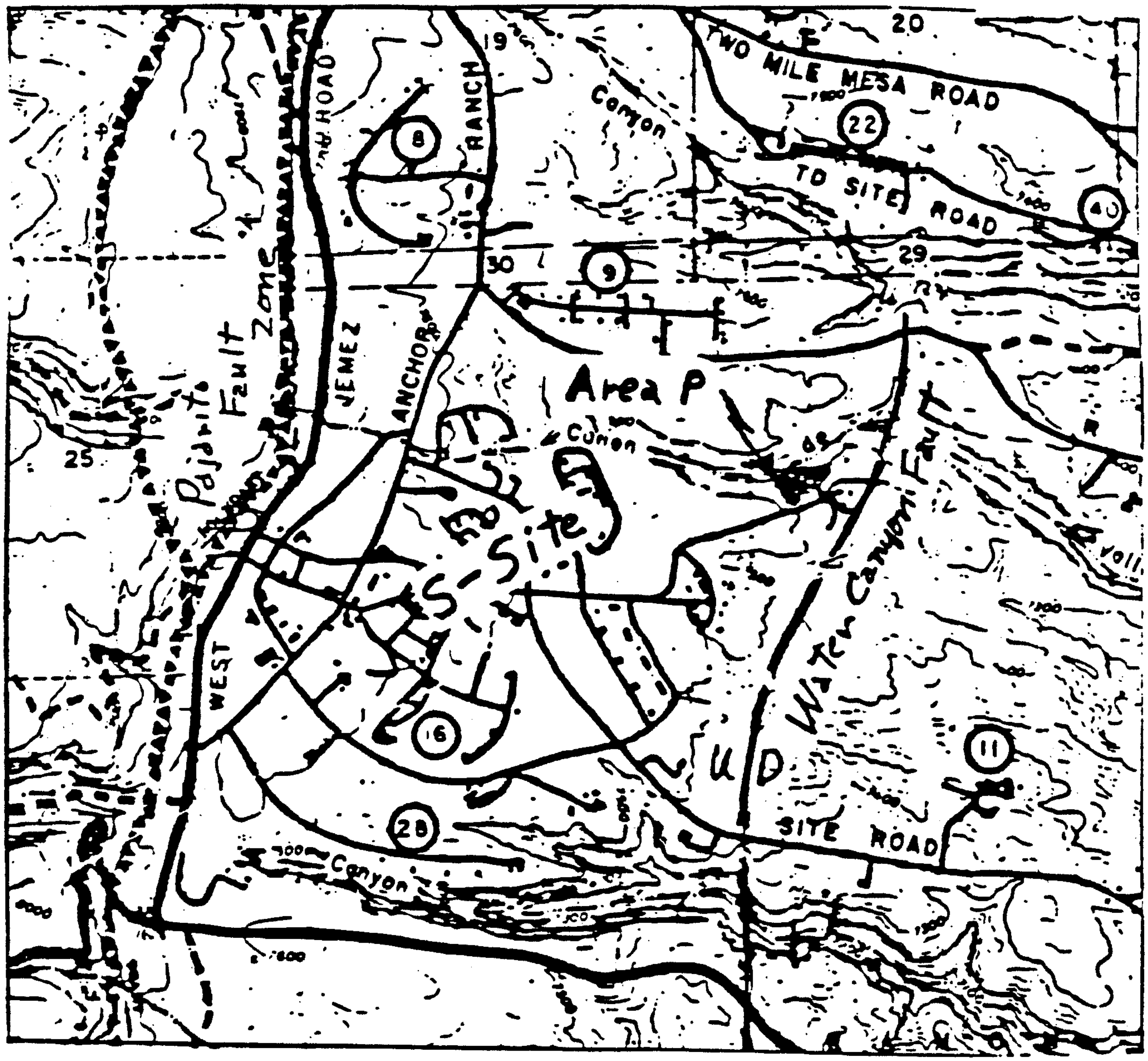
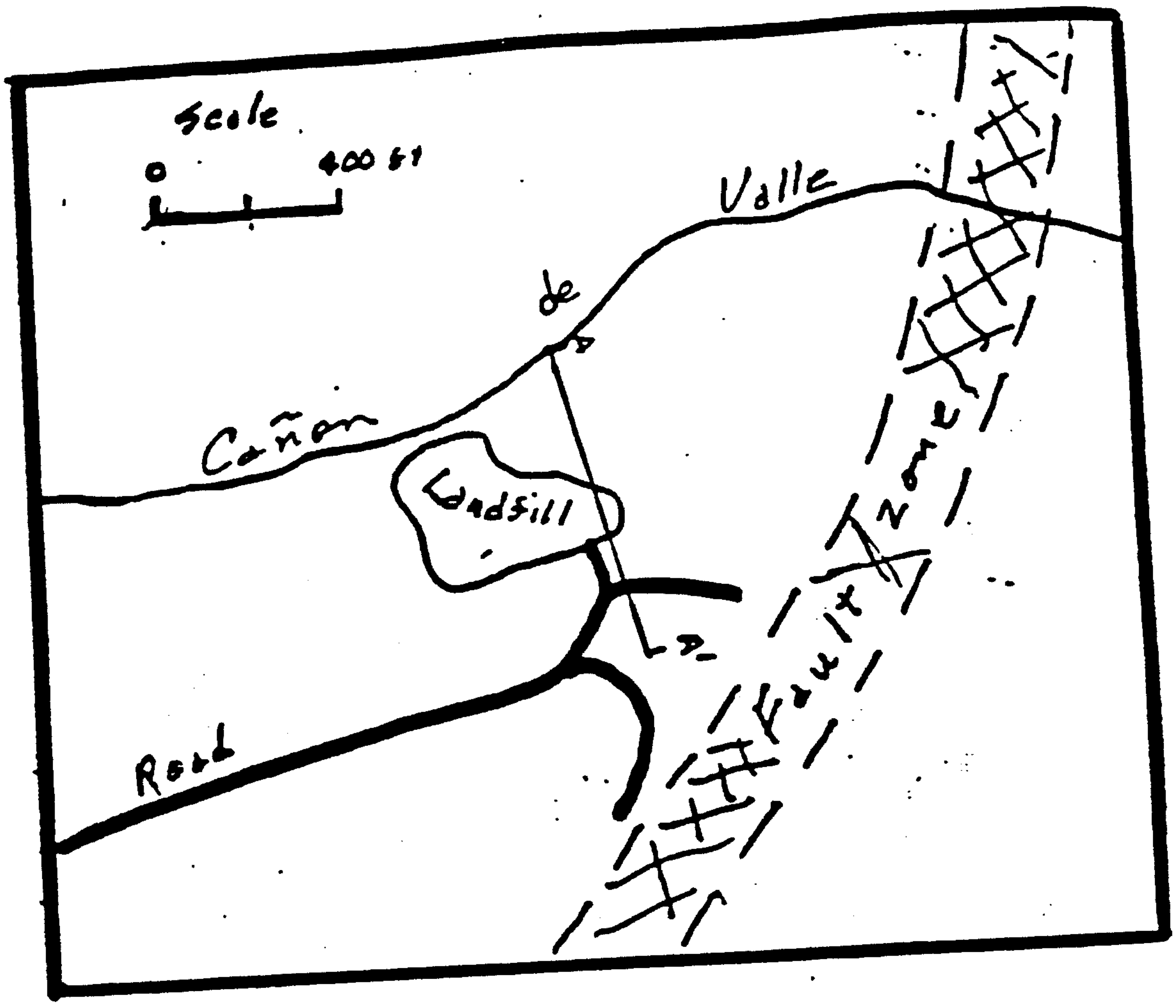



Fig. 4. Map showing S-Site, Area P and nearby faults.



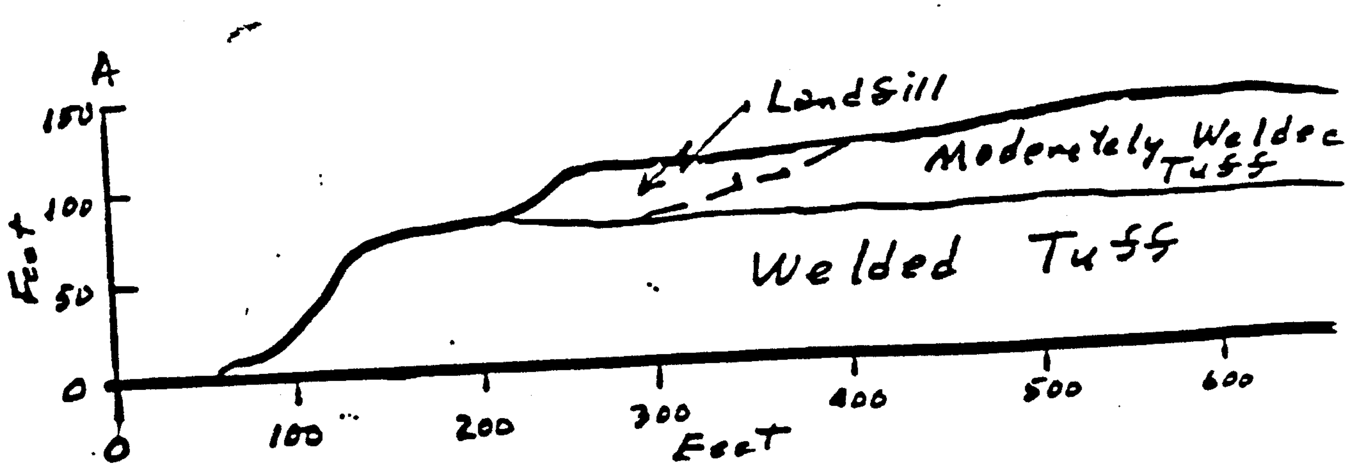




Fig. 5. Map showing landfill at Area P and generalized geologic section.

# APPENDIX B

## TA-16 SURFACE IMPOUNDMENT CONSTRUCTION DIAGRAMS

# EFFLUENT FLOW CONTAINMENT POND
# STRUCTURES 401 & 402 TA-16

## INDEX

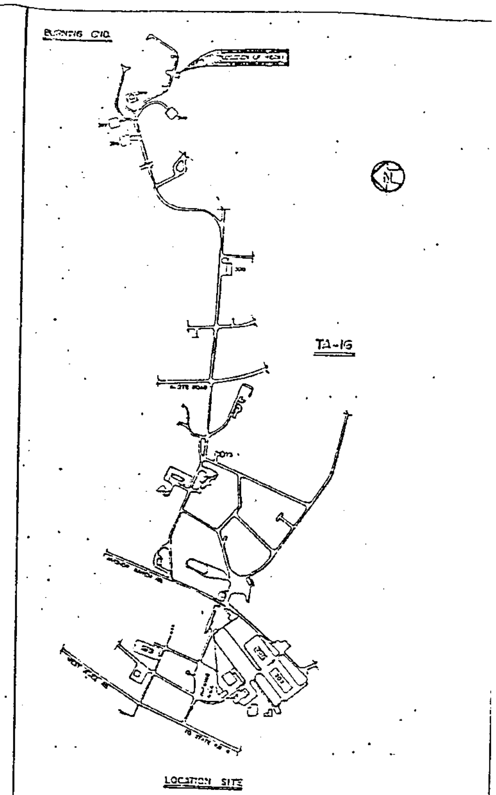
| SHEET | DWG. | | TITLE |
|---|---|---|---|
| T1 | 1 OF 4 | | TITLE, INDEX, LEGEND & LOCATION SITE |
| C1 | 2 OF 4 | | SITE PLAN, SLOPE, GEN. NOTES & SECTION |
| C2 | 3 OF 4 | | GRADING PLAN & DETAILS |
| C3 | 4 OF 4 | | DETAIL SHEET |

## LEGEND

EXIST. CONTOURS

NEW CONTOURS

EXIST. TO BE REMOVED




THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY

THE ZIA CO. FACILITIES ENGINEERING DEPARTMENT

EFFLUENT FLOW CONTAINMENT POND

TITLE, INDEX, LEGEND & LOCATION SITE

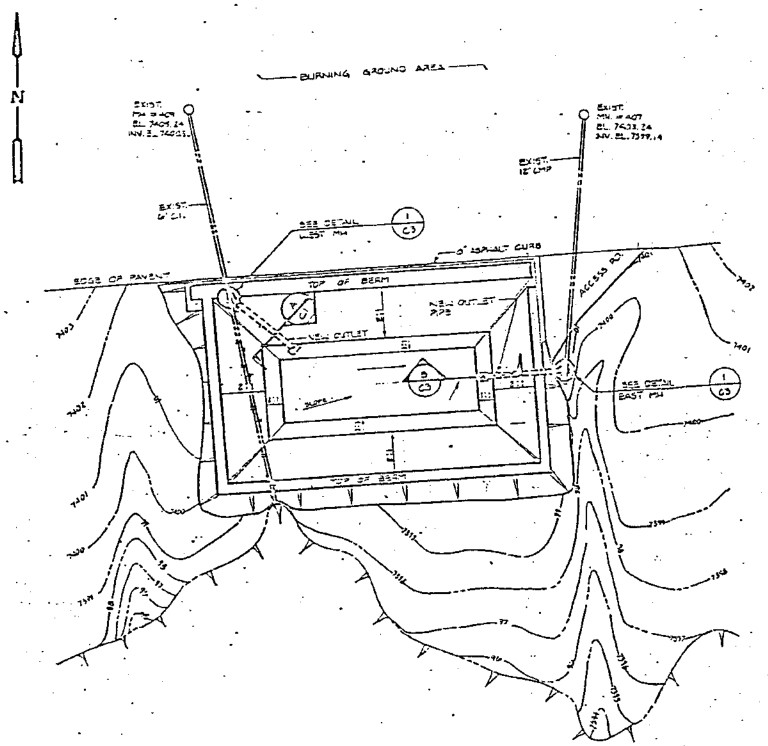
STRUCTURES 401 & 402 TA-16

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

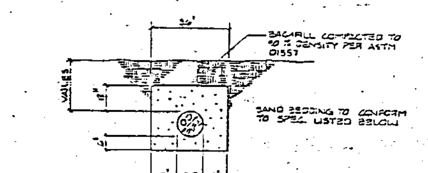
SHEET T1

7035-16

ENG-C 44462




CONTAINMENT POND - SITE PLAN
SCALE: 1" = 10'-0"




SAND BEDDING SHALL BE CLEAN & SHALL CONFORM TO THE FOLLOWING

| SIEVE SIZE | % PASSING |
|---|---|
| 3/8" | 100 % |
| NO 200 | 0 - 20 % |

SAND BEDDING SHALL BE COMPACTED TO A PERCENT DENSITY PER ASTM D1557 AS DETERMINED BY THE QUALITY ASSURANCE SECTION OF THE ENGINEERING SERVICES DEPARTMENT OF THE ZIA COMPANY

SECTION
SCALE: 1/2" = 1'-0" CMP TRENCH

## SCOPE OF WORK

EXCAVATE APPROXIMATELY 203 CU. YDS. SOUTH OF THE TA-16 SAND FILTERS TO FORM A CONTAINMENT POND AS PER DRAWINGS. THE POND WILL BE COVERED BY A HYPALON LINER SO AS NOT TO ALLOW LEAKAGE INTO THE GROUND. INSTALL APPROXIMATELY 80' OF 3" HIGH ASPHALT CURB AT LOCATION SHOWN ON DRAWING. INSTALL TWO 48" Ø CMPS MANHOLES OVER EXISTING EFFLUENT LINES AND INSTALL A 6" & 12" CLASS 50 DUCTILE IRON PIPE TO TERMINATE AT THE POND. THE EXISTING CMPS NOT BEING USED SHALL BE REMOVED IN AN APPROVED MANNER.

## GENERAL NOTES

1. EXISTING PIPING CANNOT BE CUT WITH A TORCH. IT MUST BE SEPARATED AT THE NEAREST JOINT.
2. ANY EXISTING PIPING TO BE REMOVED SHALL BE DISPOSED OF IN A MANNER APPROVED BY WX-12 OF THE LOS ALAMOS NATIONAL LABORATORY. CALL VERDIE RAPER OR BILL MC CORMACK AT 7-9374 FOR A PROCEDURE ON REMOVING PIPE.
3. GENERAL INSTRUCTIONS FOR JOB SITE PREPARATION
   - A. THE EARTH UPON WHICH THE LINER WILL BE PLACED MUST BE SMOOTH AND FREE FROM SHARP ROCKS, ROOTS, VEGETATION, AND OTHER FOREIGN MATERIAL. A COMPACTED SUBSTRATE IS ADVISABLE TO PREVENT SETTLING. COMPACTION AROUND PIPES AND STRUCTURES IS ESPECIALLY IMPORTANT.
   - B. CHECK MEASUREMENTS AND GRADES PRIOR TO START OF LINER INSTALLATION. SURVEYOR CONTROL STAKES SHOULD BE LEFT IN PLACE TO ASSIST IN PLACING THE LINING PANELS.
   - C. DIG THE ANCHOR TRENCH AS SHOWN ON THE SHOP DRAWING OR THE ENGINEERING DRAWINGS. ALWAYS THROW EARTH FROM TRENCH AWAY FROM SIDE SLOPE.
   - D. CREW SIZE WILL DEPEND ON THE PROJECT SIZE. A MINIMUM OF 6 MEN IS REQUIRED; MOST PROJECTS NEED AT LEAST 10 MEN TO SPREAD PANELS.
   - E. SAND BAGS WILL BE NEEDED TO KEEP THE MATERIAL IN POSITION DURING WINDY CONDITIONS. NORMALLY 20 SAND BAGS PER PANEL ARE REQUIRED.
   - F. TOOLS AND EQUIPMENT NOT SUPPLIED BY MANUFACTURER INCLUDE: WIPING RAGS, PAINT BRUSHES FOR ADHESIVE, RAKES AND SHOVELS. LINER PANELS MAY WEIGH AS MUCH AS 4000#. A LARGE FRONT END LOADER OR FORKLIFT WILL BE REQUIRED TO ASSIST IN THE SPREADING OF THE LINING MATERIAL.
   - G. CEMENTS AND ADHESIVES SHALL BE KEPT FROM EXTREME HEAT AND COLD.
   - H. DRIVING ON THE LINER IS PERMITTED ONLY WHEN THE LINER IS FIRST COVERED WITH 12" OF EARTH. IF AN AREA IS TO HAVE SUSTAINED TRAFFIC 24" OF COVER IS ADVISED. DAMAGE TO THE LINER MUST BE REPAIRED AS IT IS DISCOVERED.
   - I. STRUCTURES INCLUDING PIPES AND OUTLETS SHOULD BE PRIMED PRIOR TO PLACEMENT OF THE LINER TO STRUCTURES.
   - J. [illegible] ADHESIVE TO BE HYPALON [illegible] BY [illegible] CAT. NO. [illegible] 400
4. SURVEY AND QUALITY CONTROL SHALL BE PROVIDED BY ZIA ENGINEERING SERVICES AND QUALITY ASSURANCE DEPARTMENTS.
5. HYPALON INSTALLATION SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.
6. CORRUGATED METAL PIPING SHALL BE 16 GAGE 0.064" THICK WITH 2" X 1/2" CORRUGATIONS.
7. EXCESS FILL FROM THE EXCAVATION SHALL BE TAKEN TO A LOCATION DESIGNATED BY WX-12.

| NO. | DATE | CLASS REV. | REVISIONS | DWN | DES | CHKD | REQ GRP | REQ G.O. | ENG GRP | ENG C.D. |
|---|---|---|---|---|---|---|---|---|---|---|

THE ZIA CO. FACILITIES ENGINEERING DEPARTMENT

EFFLUENT FLOW CONTAINMENT POND

SITE PLAN, SCOPE, GENERAL NOTES AND SECTION

STRUCTURES FOR 1400 — TA-16

| | |
|---|---|
| DRAWN | OTA |
| DESIGN | [illegible] |
| CHECKED | MS/MS |
| RELEASED | [signature] |
| DATE | [illegible] |

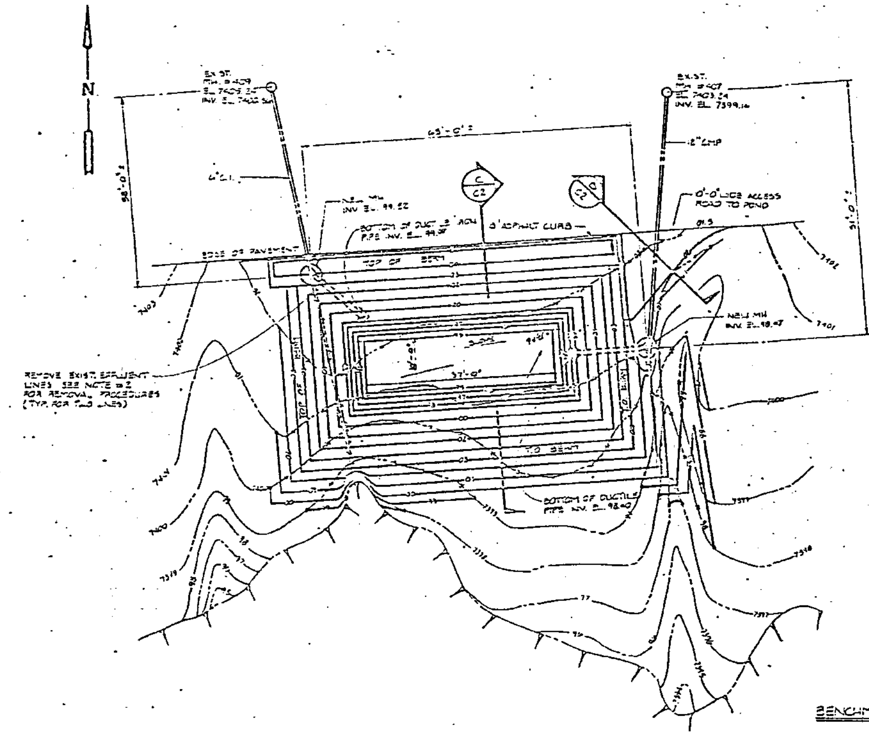
SUBMITTED [signature] RECOMMENDED [signature] APPROVED [signature]

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

SHEET C1 OF [illegible]

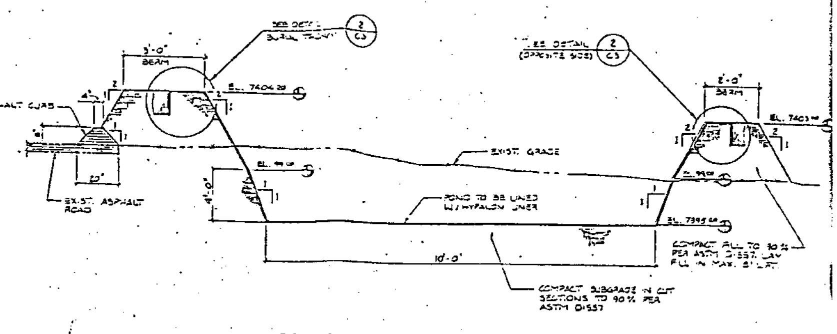
CLASSIFICATION U — REVIEWER [signature] — DATE [illegible]

LAB JOB NO. 7035-16 — DRAWING NO. ENG-C 44462 — REV

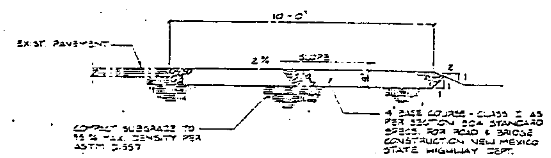



CONTAINMENT POND - GRADING PLAN
SCALE: 1" = 10'-0

BENCHMARK: BRASS CAP #1421
ELEV. 7453.17
LAB COORDINATES S23 + 08.95
W4 + 08.43
BRASS CAP IS LOCATED N.E. OF BURNING GROUND.




SECTION C/C2
N.T.S. CONTAINMENT POND



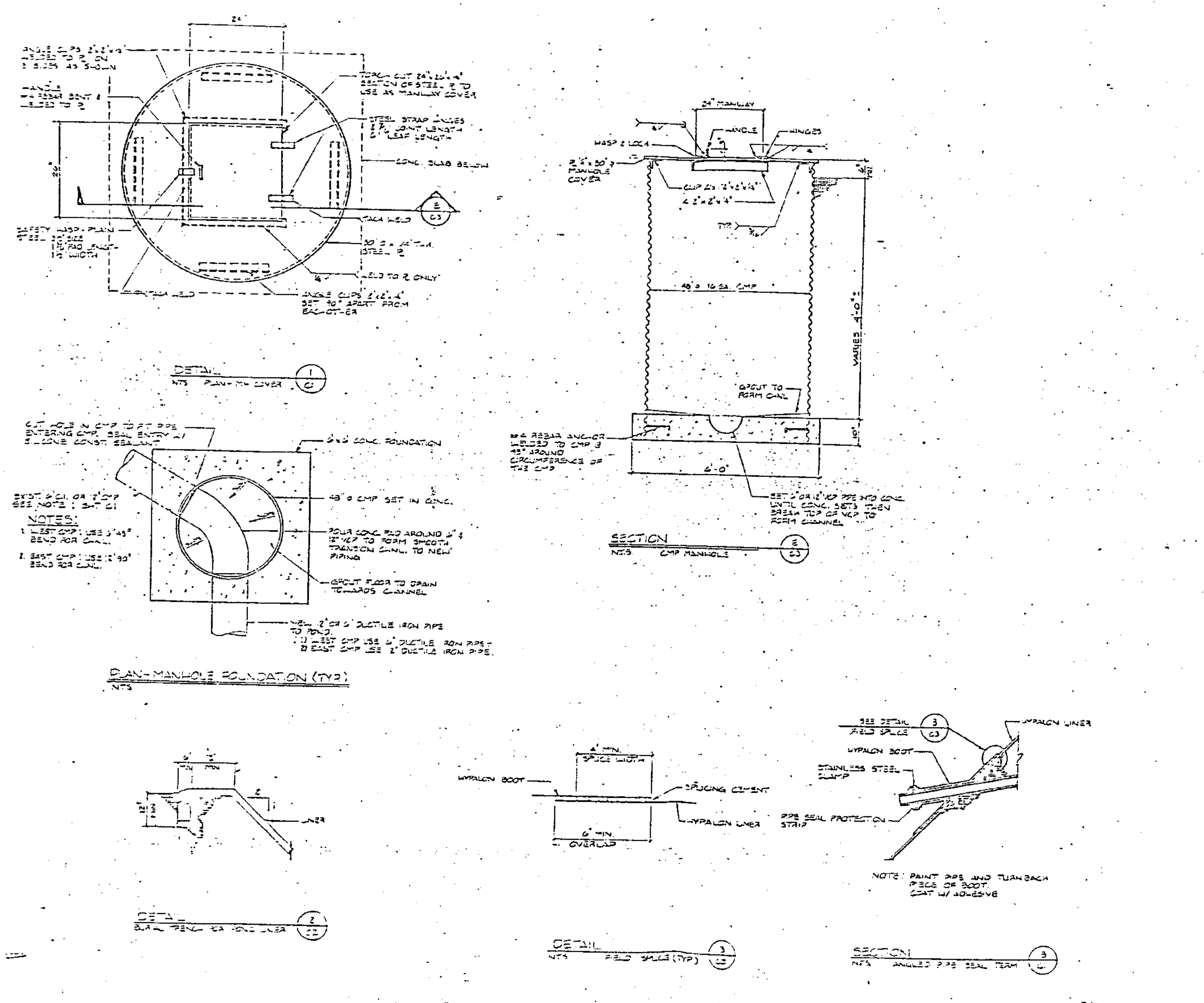

SECTION D/C2
N.T.S. ACCESS ROAD

THE ZIA CO. FACILITIES ENGINEERING DEPARTMENT

EFFLUENT FLOW CONTAINMENT POND
GRADING PLAN & DETAILS
STRUCTURE NO.S 401 & 402

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

SHEET C2
LAB JOB NO. 7035-16
DRAWING NO. ENG-C 44462




THE ZIA CO. FACILITIES ENGINEERING DEPARTMENT

EFFLUENT FLOW CONTAINMENT POND

DETAIL SHEET

STRUCTURE NO.S 401 & 402

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

SHEET C3

7035-16

ENG-C 44462

# APPENDIX C

# TA-16 SURFACE IMPOUNDMENT GROUND-WATER MONITORING PLAN

# TA-16 SURFACE IMPOUNDMENT GROUND-WATER MONITORING PLAN

In the event recoverable volumes of ground water are encountered during the soil boring program, the borings will be completed as ground-water monitoring wells. Drilling logs from borehole advancement will be prepared and submitted to regulatory agencies to supplement existing documentation of geology and hydrology contained in Appendix B. Each well will be surveyed to verify its horizontal and vertical location to 0.01 feet. Depth-to-water measurements will be taken in each of the three wells to the nearest 0.01 feet using a graduated steel tape or equivalent. The elevation of the ground-water surface will be determined using the depth-to-water measurements taken at each of the wells. Using the calculated ground-water surface elevation, a fourth well will be installed hydraulically down gradient.

## Ground-Water Sampling

To ensure that the samples collected are representative of the ground water, monitoring wells will be purged prior to sampling, and the samples will be collected using devices that should not induce sample alteration. Well purging will be conducted according to the borehole volume removal procedure, but a check will also be made on the adequacy of the calculated purging time via measurements of pH, specific conductivity, and temperature. These measurements are taken periodically during the calculated purging time. This extra check will give additional assurance that the stagnant well bore water has been removed from the well and that the samples collected are representative of the ground water.

After the water begins to flow from the purging pump, the well will be pumped for the length of time necessary to purge four to six well volumes and until pH, temperature, and conductivity stabilize. The pH, temperature, and conductivity of the discharged water will be measured at least three times during purging. The pH will be considered stable when two consecutive measurements agree within 0.2 pH units. Temperature will be considered stable when two consecutive measurements agree within 0.2 degrees C. Conductivity will be considered stable when two consecutive measurements agree within ten μmhos.

If the well pumps dry while purging, the pump will be turned off and the well will be allowed to recharge. After sufficient recharge has occurred, samples will be collected with a sampling pump or bailers. All samples will be collected in EPA-approved containers and preserved in accordance with EPA methods (Table C-1).

Sample bottles will be filled slowly to prevent entrapment of any air bubbles. For those bottles requiring no headspace, the bottle will be filled completely such that a meniscus forms. The cap will be replaced immediately and the bottle will be turned upside down, tapped a few times and checked for air bubbles in the sample. If a bubble exists, the sample will be discarded and the sampling procedures repeated until an air-free sample is obtained.

The time, date, and initials of the sampler will be entered on all sample labels. Information regarding pumping, field measurements, etc. will be entered in field logbook as it becomes available. Sample seals will be placed on each container and the container placed on ice in a cooler or ice chest.

Sample shipment and chain-of-custody record will be accompanied by a sample analysis request sheet. The request sheet has two parts: field and laboratory. The field portion of this form will be completed by the person collecting the sample and include most of the pertinent information noted in the log book. The laboratory portion is intended to be completed by the laboratory personnel when the sample is received.

Sample Analysis

All analyses, quality assurance and quality control will follow methods defined in SW-846 (Table C-2). The samples will be analyzed for dissolved metals and the following organic compound groups: volatiles, base/neutral extractables, acid extractables, and nitroaromatics. If ground water does not contain detectable concentrations of organic compounds and if barium concentrations are below 1.0 mg/ℓ, then the impoundment will be "closed clean", and no further ground-water monitoring will be conducted. Should ground-water contamination be indicated, the extent of contamination will be investigated and necessary remediation efforts will be implemented.

**TABLE C-1**

**WATER SAMPLE COLLECTION METHODS**

| CONSTITUENT | CONTAINER TYPE | CONTAINER SIZE | FIELD FILTRATION | PRESERVATIVE[a] TYPE | PRESERVATIVE[a] AMOUNT |
|---|---|---|---|---|---|
| Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver, Nickel | Plastic | 0.5 liter | 0.45 micron | $HNO_3$ to pH <2 | 5 mℓ |
| Volatile Organics | Glass, silica/ teflon septa | (2) 40 mℓ | --- | --- | --- |
| Base/Neutral Extractables | Glass, silica/ teflon septa | 1.0 liter | --- | --- | --- |
| Acid Extractables | Glass, silica/ teflon septa | 1.0 liter | --- | --- | --- |
| Nitroaromatics | Glass, silica/ teflon septa | 1.0 liter | --- | --- | --- |

[a] All samples will be cooled to 4°C upon collection.

TABLE C-2

ANALYTICAL PARAMETERS AND METHODS FOR WATER SAMPLES COLLECTED AT THE TA-16 SURFACE IMPOUNDMENT

| EPA HAZARDOUS WASTE NUMBER | METALS | EPA METHOD |
|---|---|---|
| D004 | Arsenic | 206.3 |
| D005 | Barium | 208.1 |
| D006 | Cadmium | 213.1 |
| D007 | Chromium | 281.1 |
| D008 | Lead | 239.1 |
| D009 | Mercury | 245.1 |
| D010 | Selenium | 270.3 |
| D011 | Silver | 272.1 |

| ORGANIC SCAN | |
|---|---|
| GC/MS for volatiles | 623, 624 |
| GC/MS for base/neutral extractables | 625 |
| GC/MS for acid extractables | 625 |
| GC/MS for nitroaromatics | 625 |