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Date: JUN 30 1995
Refer to: EM/ER:95-316

SUBJECT: SUBMITTAL OF THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT FOR POTENTIAL RELEASE SITEs (PRSs) IN TECHNICAL AREA (TA) 32

Dear Mr. Honker:

Enclosed are two copies of the Los Alamos National Laboratory's RFI Report concerning PRSs 32-001, 32-002(a,b), 32-003, and 32-004 in TA-32. The report documents the fieldwork performed as detailed in the approved RFI Work Plan for Operable Unit 1079 and the sampling results.

Please ask your office to contact Garry Allen at (505) 667-6080 or Bonnie Koch at (505) 665-7202 if you have any questions.

Sincerely,

Jorg Jansen, Project Manager
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Sincerely,

Robert Simeone

Theodore J. Taylor, Program Manager for
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JJ/TT/bp

Enclosure: RFI Report Concerning PRSs 32-001, 32-002(a,b), 32-003, and 32-004 in TA-32

Environmental Restoration

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RFI Report for
Potential Release Sites

32-001

32-002(a)

32-002(b)

32-003

32-004

Field Unit 1

Environmental

Restoration

Project

June 30, 1995

A Department of Energy

Environmental Cleanup Project

Los Alamos National Laboratory

LA-UR-95-XXX

[redacted]

CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title:

RFI Report Concerning PRSs 32-001, 32-002(a,b), 32-003, and 32-004 in TA-32

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EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation Report describes the Phase I investigation performed at Technical Area (TA) 32. TA-32 is located south of Trinity Drive, behind the present Los Alamos County Roads Division, at the north edge of Los Alamos Canyon. The site served as the medical research and training facility at Los Alamos Scientific Laboratory from 1944 until it was decommissioned in 1954. During this time period, research at TA-32 included work in the areas of organic chemistry, radiobiology, and biochemistry. The Hazardous and Solid Waste Amendments Module VIII of Los Alamos National Laboratory's RCRA Facility Permit (EPA 1990, 0306) identified three solid waste management units (SWMUs) with this site: a former incinerator location (SWMU 32-001), and two former septic tank systems [SWMUs 32-002(a, b)]. As a result of the Phase I investigation, two additional sites were identified as SWMUs: a former transformer location (SWMU 32-003) and a drain line and outfall from building TA-32-3 (SWMU 32-004).

The objectives of the Phase I investigation at TA-32 were to 1) determine if there was residual soil contamination associated with the incinerator, the septic tank systems, and the related outfall areas, 2) determine whether or not contaminants were present along the drainages that run from the mesa top to the toe of the hill slope, which are related to the septic system outfalls; and 3) determine if the septic lines from the former TA-32 laboratory buildings to the former septic tanks remained and, if found, remove them.

All of the SWMUs at TA-32 are recommended for Phase II investigation as described below.

SWMU 32-001. The results of the investigation at SWMU 32-001 indicate the presence of low levels of PCBs at a depth of 11 in. below ground surface. Therefore, a Phase II sampling investigation is recommended at SWMU 32-001 to determine the extent of PCB contamination in the surface and surrounding soils.

SWMU 32-002(a). The investigation intended for SWMU 32-002(a) is now considered to be an investigation of the former transformer location, SWMU 32-003. No samples were collected at the actual location of SWMU 32-002(a). Therefore, it is recommended that sampling at SWMU 32-002(a) be conducted during the Phase II investigation to determine if there is any contamination associated with the septic tank or its outfall, and also to determine if the septic tank or its associated septic lines remain on the mesa top.

SWMU 32-003. The results of the inadvertent investigation of SWMU 32-003, the former transformer location, which was not planned initially, indicate the presence of PCBs. Therefore, it

is recommended that Phase II sampling be conducted in the vicinity of the former transformer to evaluate the extent of PCB contamination. If the extent of PCB contamination is determined to exceed regulatory cleanup levels, and this contamination is determined to be associated with TA-32 operations, a voluntary corrective action will be conducted during the Phase II investigation.

SWMU 32-002(b). The results of the investigation at SWMU 32-002(b) indicate the presence of a septic tank line on the mesa top leading to the former septic tank location. RCRA metals were found in the pipe and in the underlying soils. Reconnaissance sampling in the outfall area downgradient from SWMU 32-002(b) indicated the presence of RCRA metals, the polychlorinated biphenyl Aroclor 1260™, and the possibility of radioactive contamination. A Phase II sampling investigation is recommended to define the nature and extent of contamination at SWMU 32-002(b) in order to support a risk assessment.

Sampling needed

SWMU 32-004. Recent evaluation of engineering drawings revealed the location of a vitrified clay drain line believed to have served a room adjacent to a radiation source room in building TA-32-3. The line leads to an outfall at the edge of the mesa, discharging directly into Los Alamos Canyon. This site is now designated as SWMU 32-004. No sampling activities were conducted at this site during the Phase I investigation. Therefore, a Phase II investigation is recommended to define the location of the drain line and to determine the nature and extent of any contamination that may be present at the site.

Sampling needed

1.0 INTRODUCTION

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the site of former Technical Area (TA) 32 at Los Alamos National Laboratory (LANL). This report includes site background, data analysis and assessment approach, site-specific results, conclusions, and recommendations, and a Phase II sampling plan.

1.1 Facility Background

TA-32 is located south of Trinity Drive, behind the present Los Alamos County Roads Division, near the north edge of Los Alamos Canyon (Fig. 1-1). The site served as the medical research and training facility at Los Alamos Scientific Laboratory from 1944 to 1954. Research at TA-32 included work in the areas of organic chemistry, radiobiology, and biochemistry.

The TA-32 facilities included four laboratories (TA-32-1, -2, -5, and -11), a building that housed both laboratories and offices (TA-32-3), three warehouses (TA-32-4, -12, and -13), an incinerator (TA-32-9), two septic tanks (TA-32-7 and -8), a valve house (TA-32-6), and a transformer station (TA-32-10). In addition, recent analysis of engineering drawings indicates the presence of a drain line from building TA-32-3 that was not associated with a septic tank (no structure number designated). According to the RFI Work Plan for OU 1079, the incinerator probably received any combustible waste from the medical research facilities, and the two septic systems possibly received several types of hazardous and radioactive wastes from laboratory sinks and drains. Therefore, the RFI Work Plan for OU 1079 identifies the solid waste management units (SWMUs) for this site as the former incinerator location (SWMU 32-001), and the two former septic tank systems [SWMUs 32-002(a, b)]. Two additional SWMUs were identified as a result of the Phase I investigation: the former transformer location (SWMU 32-003), and the drain line and outfall from building TA-32-3 (SWMU 32-004) (Fig. 1-2). The RFI Work Plan for Operable Unit (OU) 1079 identifies the potential contaminants of concern at TA-32 as carbon-14, plutonium-238 and -239, americium-241, tritium, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and target analyte list (TAL) metals (LANL 1992, 0783).

TA-32 was abandoned in 1953 and operations were moved to the Health Research Laboratory at TA-43. TA-32 was decommissioned in 1954 and all of the structures were removed by a contractor, Bert G. Clark, as part of the 1954 site clearing. The former incinerator location, SWMU 32-001, is currently under a paved parking lot within the Los Alamos County Roads Division storage yard. SWMU 32-002(a), a septic tank, was thought to have been left at the site following decommissioning in 1954. SWMU 32-002(b), a reinforced concrete septic tank, was

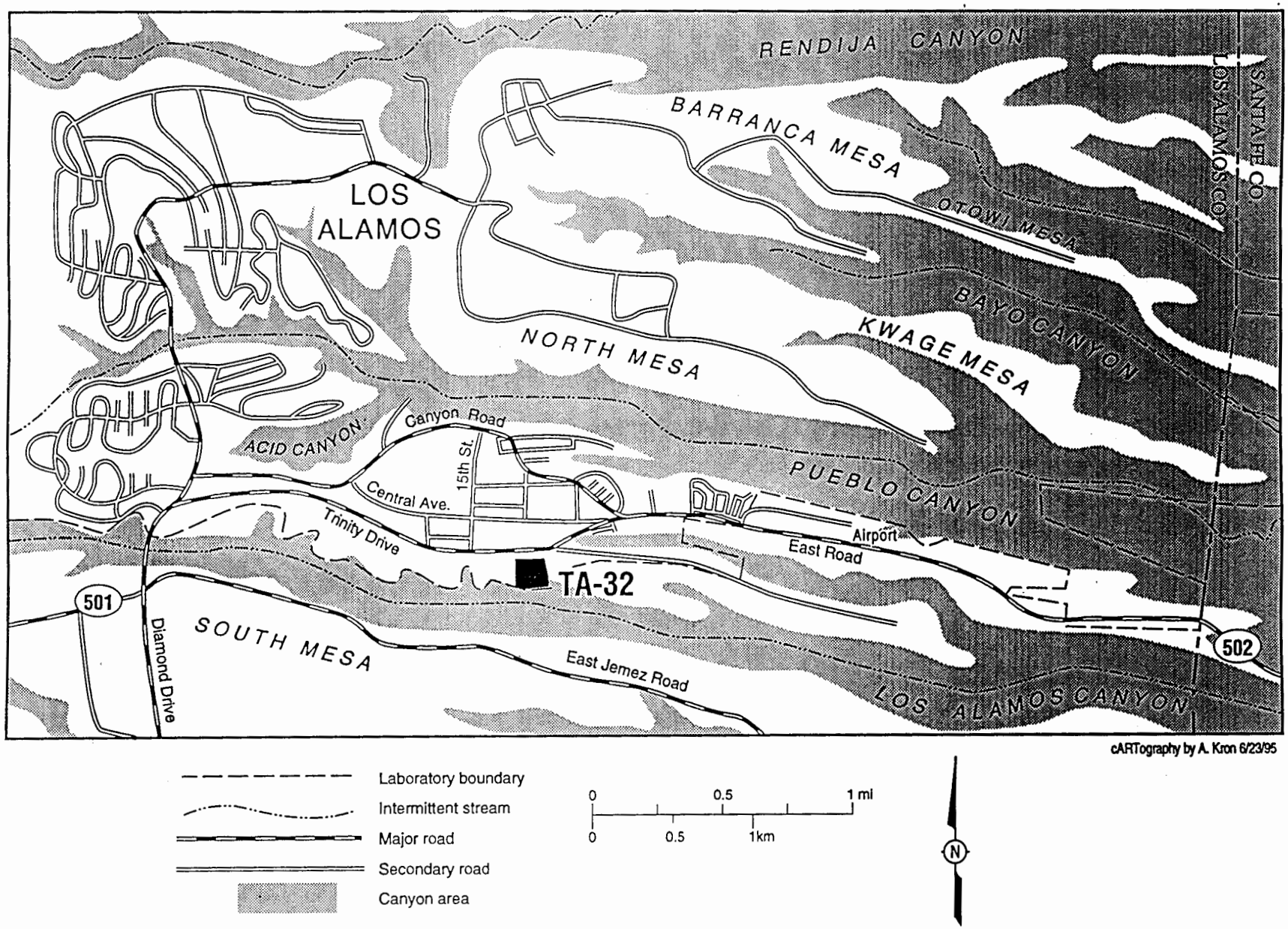
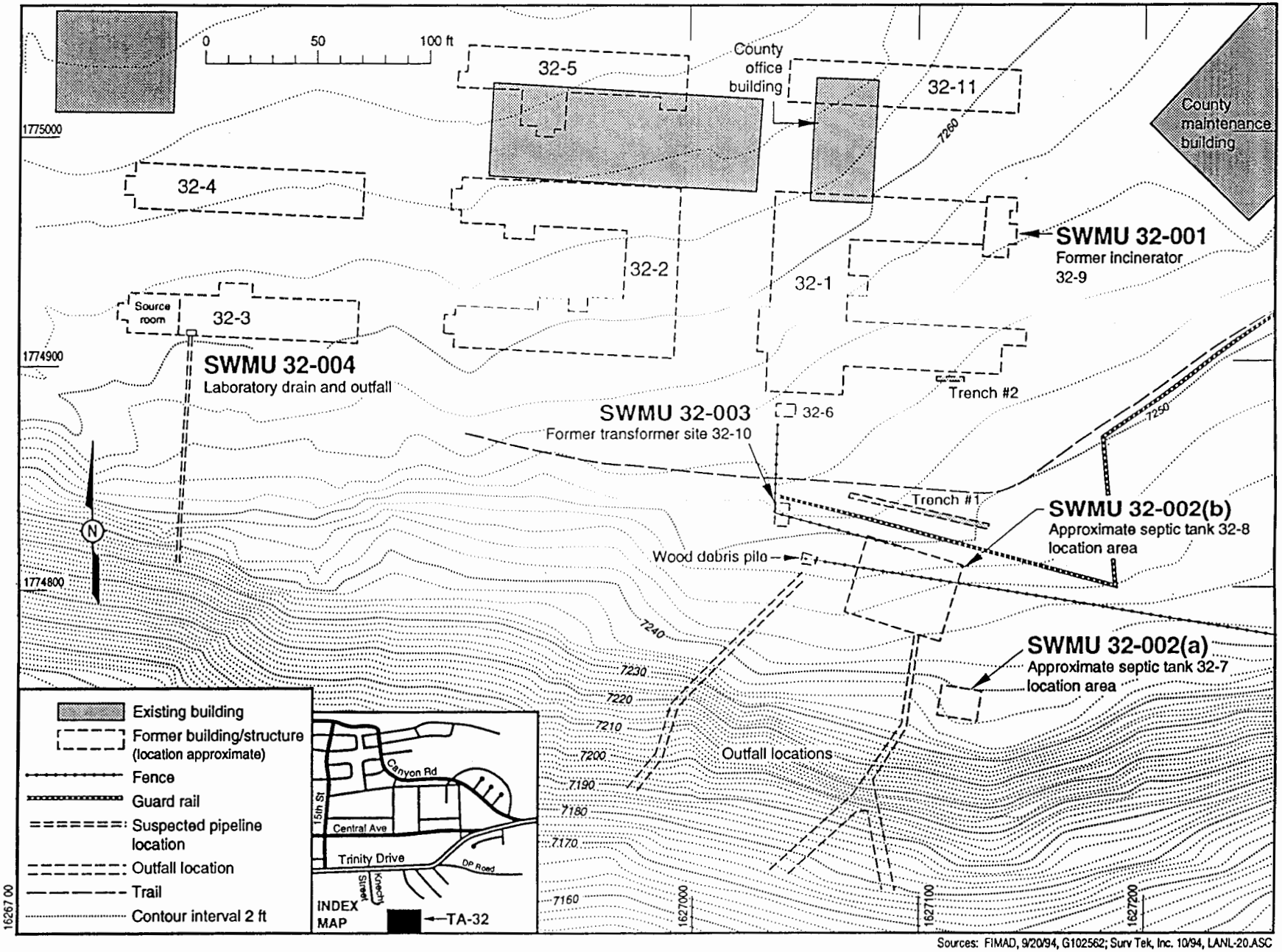


Fig. 1-1. General location of TA-32.



Sources: FIMAD, 9/20/94, G102562; Surv Tek, Inc. 10/94, LANL-20.ASC
Modified by: cARTography by A. Kron 6/25/95

Fig. 1-2. Locations of SWMUs at TA-32.

removed in 1988. It was unknown whether the septic lines were removed during decommissioning. No septic lines were found during the septic tank removal in 1988 (LANL 1992, 0783).

1.2 RFI Phase I Work Plan Overview

The objectives of the Phase I investigation at TA-32 were to 1) determine if there was residual soil contamination associated with the incinerator, the septic tank systems, and the related outfall areas, 2) determine whether or not contaminants were present along the drainages that run from the mesa top to the toe of the hill slope, which are related to the septic system outfalls; and 3) determine if the septic lines from the former TA-32 laboratory buildings to the former septic tanks remained and, if found, remove them.

1.3 Field Activities

Field activities at TA-32 consisted of sampling at the former incinerator (SWMU 32-001), one of the former septic tanks [SWMU 32-002(b)], and the former transformer location (32-003). In addition, two trenches were dug to locate the former septic system lines and soil samples were taken from each trench (ICF Kaiser 1993, 06-0103). No samples were collected at the second septic tank [SWMU 32-002(a)] because it was incorrectly located.

All samples were field screened for radioactivity using a Ludlum Model 2221 with a Ludlum probe 44-9 (standard Geiger-Mueller) and for volatile organic vapors using a photoionization detector (HNu). If radioactivity was detected in any sample during the field screening, that sample was to be analyzed to identify individual radionuclides. If volatile organic vapors were detected in any sample during field screening, that sample was to be analyzed for VOCs. All soil samples were then analyzed for TAL metals and SVOCs. The TAL list includes aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

For the purposes of waste characterization, all samples were analyzed for polychlorinated biphenyls (PCBs), and all subsurface soil samples were analyzed for VOCs. Six field duplicates and one rinsate sample were collected for quality assurance (QA) purposes. In addition, one field blank was collected in order to meet the LANL Quality Assurance Project Plan (QAPjP) requirements (LANL 1991, 0412; ICF Kaiser 1993, 06-0103).

2.0 ENVIRONMENTAL SETTING

2.1 Climate

The Los Alamos area of north-central New Mexico is classified as a semiarid, temperate mountain climate. Annual precipitation in the area normally reaches about 18 in., 40% of which occurs as brief, intense thunderstorms during July and August. Winter snowfall averages about 51 in. annually. In summer months, maximum daily temperatures in the area are usually below 90°F, dropping into the 50s at night. Winter temperatures typically range from 30°F to 50°F during the day, and from 15°F to 25°F at night, occasionally dropping to 0°F or below (LANL 1993, 1017). Winds in Los Alamos often vary greatly with the time of day and location, due in large part to the complex terrain. Prevailing winds at TA-32 are generally from the west-southwest to south-southwest, averaging about 12 mph (LANL 1992, 0783).

2.2 Geology

TA-32 is situated on the Pajarito Plateau. The plateau has a relatively flat, eastward-sloping surface dissected by numerous steep-sided canyons. TA-32 is located on the south side of East Mesa at an elevation of 7 260 ft. East Mesa is bounded by Pueblo Canyon to the north, Los Alamos Canyon to the south, and DP Canyon on the southeastern edge. The ground at the site slopes gently to the south to the edge of Los Alamos Canyon. The canyon wall adjacent to the mesa top consists of alternating steep slopes and cliffs, with a gently sloping bench about 100 ft below the top of the escarpment. The surface soils at TA-32 are made up of alluvial deposits and well-drained, sandy loams. Bandelier Tuff, composed of volcanic air-fall and ash-flow deposits, forms the bedrock at the site. Areas of exposed bedrock exist near the edges of the mesa (LANL 1992, 0783).

2.3 Hydrology

There is no surface water present at TA-32, but surface water runoff can occur in response to rain or melting snow. Surface runoff from the TA-32 mesa top currently exits to the south, flowing over the bench and down to the bottom of Los Alamos Canyon by way of natural drainages (LANL 1992, 0783). The prevalence of short, intense summer thunderstorms suggests that water-driven erosion of surface soils may be an important mechanism in transporting surface contaminants at TA-32.

The Los Alamos Canyon watershed stretches from above the townsite all the way to the Rio Grande. Los Alamos Canyon contains an intermittent stream along most of its length, including the section of the canyon directly below TA-32.

The main aquifer beneath the Pajarito Plateau is at an elevation of nearly 6 000 ft and lies chiefly within the sediments of the Puye and Tesuque geologic formations. At mesa top sites such as TA-32, between 1 000 and 1 200 ft of unsaturated tuff sediments separate the surface from the main aquifer. A shallow alluvial aquifer and a perched aquifer were located at an intermediate depth (325 ft below Los Alamos Canyon) in drill hole LADP-3 at nearby TA-21. The lateral continuity of these aquifers is not known, so they may or may not be present beneath TA-32 (Broxton et al. in preparation, 1162).

2.4 Wildlife Habitats and Threatened and Endangered Species

Because the topography at TA-32 varies from gently sloping mesa tops to steep canyon walls and cliffs, the site is readily discernible into two wildlife habitats: the mesa top and the cliff side. The mesa top is characterized by heavy commercial development and urban disturbance from the Los Alamos townsite. Comprehensive plant and animal inventories were not performed for the mesa top because of the high disturbance levels. Because the wildlife habitat on the mesa top can be characterized as artificial urban plant and animal communities, the screening assessment for the mesa top will not include an ecological component.

However, the wildlife habitats on the south-facing cliff side at TA-32 and in the bottom of Los Alamos Canyon were not highly disturbed until the recent installation of a gas pipeline. These habitats are described in Appendix L of the Installation Work Plan (LANL 1993, 1017) and in the Biological Assessment for Environmental Restoration Program Operable Unit 1079 (Biggs 1993, 06-0101). Below and east of TA-32, the Los Alamos Canyon bottom has some disturbance from TA-41 and TA-2 operations, but the lower canyon from TA-2 to State Road 4 is restricted and undisturbed. A paved highway runs along the canyon bottom from the west to TA-2 and TA-41. A restricted-access dirt road continues east along the canyon bottom.

Los Alamos Reservoir in upper Los Alamos Canyon on US Forest Service land lies above and west of the TA-32 hillside areas. A stream flows in Los Alamos Canyon during spring runoff and intermittently due to summer rains, supporting ponderosa pine and riparian plant communities. On the south-facing slopes in the TA-32 area, two habitats are evident: a rocky cliff-face habitat and a habitat made up of various benches and drainages. The latter supports a transitional community composed of species from the pinion-juniper and ponderosa pine plant communities. These

communities graduate to a ponderosa pine habitat on the canyon bottom and then merge to mixed conifer habitats on the north-facing slope across from the hillside areas at former TA-1.

Biological surveys did not find any threatened and endangered plant or animal species within the hillside areas or along Los Alamos Canyon, but the potential presence of these species must still be considered (Bennett 1992, 06-0100; Biggs 1993, 06-0101). The Jemez Mountain salamander, protected as endangered in New Mexico, has been found on the north-facing slope of Los Alamos Canyon just below the bridge, but the habitats on the south-facing hillsides are not suitable. The spotted bat, a federal candidate for endangered species status and protected as endangered in New Mexico, may use the rocky cliffs as a roosting area. Portions of the upper canyon bottom may be suitable for the meadow jumping mouse, a federal candidate for endangered species status and protected as threatened in New Mexico. However, the disturbed canyon bottom with the intermittent stream below the hillside is considered only a marginal habitat for the jumping mouse. Portions of lower Los Alamos Canyon may offer suitable nesting and feeding areas for the northern goshawk, a federal candidate for endangered species status, and for the peregrine falcon, federally endangered and protected as endangered in New Mexico. However, these predators have large feeding ranges and great mobility and should not be impacted by any potential contamination at TA-32.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSIS

Subsection 3.1 describes the analytical methodology and data evaluation techniques used in the Phase I investigation at TA-32. Subsections 3.2 and 3.3 present the human health and ecotoxicological screening assessment methodologies used to evaluate the data.

3.1 Analytical Methodology

All samples were submitted with chain-of-custody documentation to the sample coordination facility (SCF) or to the CST-9 mobile radiological analysis laboratory (MRAL) for analysis. Selected samples were analyzed for TAL metals by flame atomic absorption (EPA SW-846 Method 7420), cold vaporization atomic absorption (EPA SW-846 Method 7471), and inductively coupled plasma emission spectroscopy (EPA SW-846 Method 6010). The TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. Analyses for VOCs were conducted using gas chromatography/mass spectrometry, EPA SW-846 Method 8260 (Purge and Trap/Capillary Column Method). Analyses for SVOCs were conducted using gas chromatography/mass spectrometry, EPA SW-846

Method 8270 (Solvent Extraction/Direct Injection). Analyses for pesticides and PCBs were conducted using gas chromatography/electron capture detection, EPA SW-846 Method 8080. Analyses for cesium-137 and americium-241 were conducted using gamma spectroscopy. Analyses for uranium-234, -235, and -238 and plutonium-238 and -239 were conducted using alpha spectroscopy. At the MRAL, percent moisture analyses were conducted using a Denver Instruments IR100 Moisture Analyzer, tritium analyses were conducted using liquid scintillation counting, gross alpha and gross beta analyses were conducted using a gas flow proportional counting technique, and gross gamma analyses were conducted using a Bicron 5 in. by 7 in. sodium iodide (NaI) well counter.

Data validation was performed on all data from the analytical laboratories. Ten percent of the data were validated at the highest level (level 3), and all other data were validated at the basic level (level 1). These data validation levels are defined in the Health and Environmental Chemistry Quality Assurance Program Plan (Gladney and Gautier 1991, 0410). When there were specific questions concerning data from a level 1 validation, a level 3 validation was requested. Validation was performed in accordance with the guidelines from the LANL Environment Restoration (ER) Project Generic Quality Assurance Project Plan (LANL 1991, 0553).

3.1.1 Quality Assurance/Quality Control Activities

Thirty-two soil samples, including six field duplicates and one field blank, were collected at TA-32. One liquid sample, an equipment rinsate, was also submitted for analyses. Radiation screening results (gross alpha, gross beta, and gross gamma) for all samples were below detection limits with the exception of one outfall soil sample, AAA4705. Radiological emissions from this sample were detected at a level slightly above background when it was screened in the field using a Ludlum Model 2221 with a Ludlum Probe 44-9 (standard Geiger-Mueller). The instrument registered 200 counts per minute (cpm) for this sample at the time of its collection, compared to background levels of 80 to 140 cpm. The sample was further analyzed by the MRAL, and was found to contain a concentration of gamma radiation of 24.9 pCi/g, compared to a minimum detection activity for gamma radiation of 4.4 pCi/g. The sample was inadvertently not sent to a laboratory for isotopic analysis. However, during the Phase II investigation at TA-32, if the gross radioactivity measurements from a sample indicate the presence of radiological contamination, the sample will be analyzed for selected radioisotopes depending on the type of radioactivity detected.

All 32 soil samples were analyzed for TAL metals under request numbers 15719 and 15735. In request 15719, there was one blind quality control (QC) sample in which almost all of the analyte values were outside of acceptable QC limits. A second blind QC sample had analyte values within the allowable limits for all analytes except mercury. Since all of the matrix spikes, duplicates, and

run-time QC samples had values within the allowable limits for all analytes during the analysis of all 32 samples, the TAL metals data in request 15719 are rated as valid for all analytes except mercury.

The mercury value was analyzed in the two problematic blind QC samples. The mercury values for the first blind QC sample were 30% to 40% lower than the expected value. All QC analyses run during the analyses of these samples were within allowable limits. However, because there was some variation in the mercury value in the sample duplicates as well as the problematic blind QC samples, the mercury data from request 15719 are rated as "J" or "UJ," detected or undetected estimated quantities (EPA 1989, 0305). This means that the mercury values have uncertainties up to 40%. As long as no mercury values are detected within 40% of the screening action level (SAL), there should be no problem in using this data. The SAL for mercury is 24 mg/kg. Forty percent of 24 mg/kg is 9.6 mg/kg. Therefore, any mercury value of 14.4 mg/kg or greater may be at or above the mercury SAL. All values of mercury below 14.4 mg/kg are valid.

In the QC samples in TAL metals request 15735, all analytes except cadmium had values within allowable limits. The cadmium values were 25% lower than expected in the QC samples. However, the cadmium values for all of the samples were very low, ranging from less than 0.4 to 0.6 mg/kg compared to a SAL of 80 mg/kg. Therefore, the 25% error does not affect the usability of the data. All of the data associated with TAL metals in this request are rated as valid.

Twenty-five samples were analyzed for VOCs under request number 15718. All of the QC results for the analysis in this request were within allowable limits; therefore, all of the data associated with VOCs in this request are rated as valid.

All thirty-two samples were analyzed for SVOCs under request numbers 15718 and 15736. In request 15718, all of the QC results for the analysis were within allowable limits; therefore, all of the data associated with SVOCs in this request are not qualified and are valid. In request 15736, di-n-butyl phthalate (0.73 mg/kg), butyl benzyl phthalate (0.67 mg/kg), and bis (2-ethylhexyl) phthalate (1.3 mg/kg) were detected in the method blank as well as in the samples. However, since all of the compounds were found in the method blank and the samples at similar concentrations, the presence of these compounds is attributed to laboratory contamination. There were also several high surrogate recoveries in this request. However, since the only analytes detected in the samples in this request (other than laboratory contaminants) were several PAHs at low levels, this does not affect the usability of the data. All of the data concerning SVOCs in requests 15718 and 15736 are rated as valid.

Thirty-two samples were analyzed for PCBs under requests 15718 and 15736. All analyte levels in request 15718 were within allowable QC limits. In request 15736, the equipment rinsate sample, AAA4712, exceeded the holding time by 48 hours. All other samples were analyzed within the holding times. However, because no PCBs were found in any of the samples in this request, and the equipment rinsate is related to these samples, the missed holding time does not affect the usability of the data. All of the data for PCBs in these requests are rated as valid.

Under request 15721, one field blank was analyzed for uranium-234, -235, and -238, cesium-137, americium-241, and plutonium-238 and -239. All of the QC results for the analyses in this request were within allowable limits; therefore, all of the data associated with this request are rated as valid.

All of the QC results for analyses in which QC issues were a concern are summarized in Table 3-1.

TABLE 3-1

QUALITY CONTROL RESULTS FOR TA-32 SAMPLES

LOCATION ID	SAMPLE ID	MATRIX	SUITE	REQUEST NUMBER	COMMENTS
32-1036	AAA1285	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1037	AAA1286	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1035	AAA1287	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1001	AAA4690	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1002	AAA4691	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1003	AAA4692	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1004	AAA4693	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1005	AAA4694	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1007	AAA4695	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.

TABLE 3-1 (CONTINUED)

QUALITY CONTROL RESULTS FOR TA-32 SAMPLES

LOCATION ID	SAMPLE ID	MATRIX	SUITE	REQUEST NUMBER	COMMENTS
32-1007	AAA4696	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1008	AAA4697	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1009	AAA4698	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1010	AAA4699	Soil/sediment	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1011	AAA4700	Soil/sediment	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1012	AAA4701	Soil/sediment	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1013	AAA4702	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1014	AAA4703	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1015	AAA4704	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1016	AAA4705	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1016	AAA4705	Surface soil	PCBs[a]	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1017	AAA4706	Surface soil	Inorganics	15735	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid.
32-1017	AAA4706	Surface soil	SVOCs[b]	15736	Phthalate contamination of method blank due to lab contamination. QC results within allowable limits; all data are valid.
32-1017	AAA4706	Surface soil	PCBs	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1018	AAA4707	Surface soil	Inorganics	15735	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid.

TABLE 3-1 (CONTINUED)

QUALITY CONTROL RESULTS FOR TA-32 SAMPLES

LOCATION ID	SAMPLE ID	MATRIX	SUITE	REQUEST NUMBER	COMMENTS
32-1018	AAA4707	Surface soil	SVOCs	15736	Phthalate contamination of method blank due to lab contamination. QC results within allowable limits; all data are valid.
32-1018	AAA4707	Surface soil	PCBs	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1019	AAA4708	Surface soil	Inorganics	15735	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid.
32-1019	AAA4708	Surface soil	SVOCs	15736	Phthalate contamination of method blank due to lab contamination. QC results within allowable limits; all data are valid.
32-1019	AAA4708	Surface soil	PCBs	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1020	AAA4709	Surface soil	Inorganics	15735	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid.
32-1020	AAA4709	Surface soil	SVOCs	15736	Phthalate contamination of method blank due to lab contamination. QC results within allowable limits; all data are valid.
32-1020	AAA4709	Surface soil	PCBs	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1021	AAA4710	Surface soil	Inorganics	15735	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid.
32-1021	AAA4710	Surface soil	SVOCs	15736	Phthalate contamination of method blank due to lab contamination. QC results within allowable limits; all data are valid.
32-1021	AAA4710	Surface soil	PCBs	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1022	AAA4711	Surface soil	Inorganics	15735	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid.
32-1022	AAA4711	Surface soil	SVOCs	15736	Phthalate contamination of method blank due to lab contamination. QC results within allowable limits; all data are valid.
32-1022	AAA4711	Surface soil	PCBs	15736	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data. All data are valid.
32-1003	AAA4713	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.

TABLE 3-1 (CONTINUED)

QUALITY CONTROL RESULTS FOR TA-32 SAMPLES

LOCATION ID	SAMPLE ID	MATRIX	SUITE	REQUEST NUMBER	COMMENTS
32-1025	AAA4715	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1013	AAA4716	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1013	AAA4717	Surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1002	AAA4718	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.
32-1002	AAA4719	Near-surface soil	Inorganics	15719	Mercury results are estimated ("UJ" or "J") because of low blind QC sample recoveries. Mercury values below 14.4 mg/kg are valid. All other data are valid.

[a] PCBs = Polychlorinated biphenyls.
[b] SVOCs = Semivolatile organic compounds.

3.2 Screening Assessment Methodology

Screening assessment of the data makes use of simple comparisons to determine which chemicals require further evaluation and which do not. Chemicals requiring further evaluation are retained as chemicals of potential concern (COPCs). Figure 3-1 shows the decision logic used in the data analysis and screening assessment process. Screening is conducted on all COPCs detected at a site. COPCs that are not detected are eliminated from the screening process. A detailed discussion of the screening assessment is located in Appendix J of the Installation Work Plan (LANL 1993, 1017). Subsection 4.0 of this document presents the screening assessments performed on the data from each of the SWMUs at TA-32.

3.2.1 Background Comparison Methodology

The first step in the screening assessment is a background comparison. The background comparison is carried out for all inorganic analytes, polycyclic aromatic hydrocarbons (PAHs), and radionuclides.

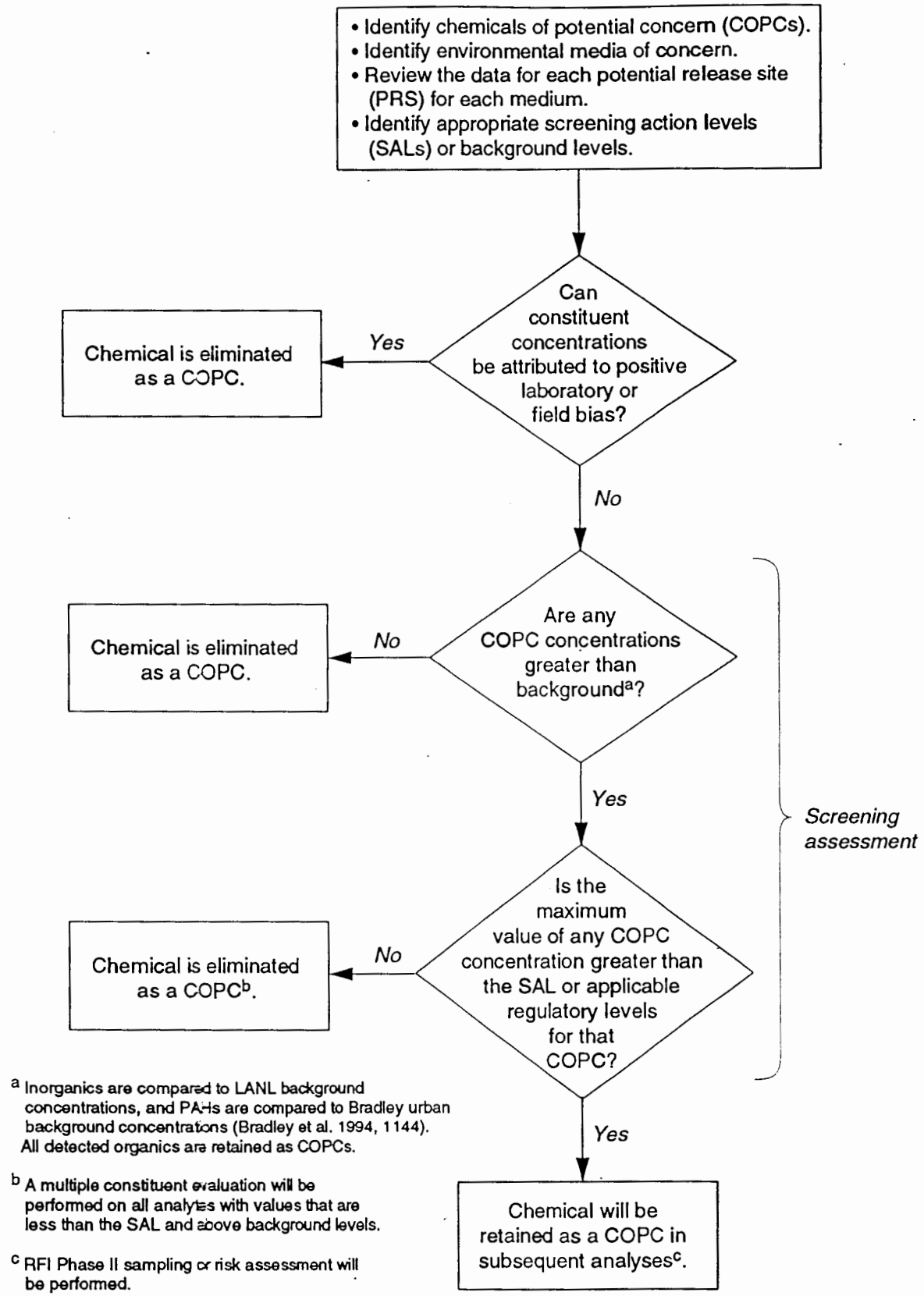


Fig. 3-1. Data analysis and screening assessment decision logic flow chart.

Inorganics. COPCs that occur naturally in soils, including most inorganics, are statistically compared with background concentrations in comparable uncontaminated soils. The statistical comparisons to background in this report follow the general guidance in the LANL Environmental Restoration Project policy paper, "Statistical Comparisons to Background, Part I" (LANL 1995, 06-0105).

This policy paper uses methods described in the Environmental Protection Agency (EPA) guidance document, Statistical Analysis of Groundwater Monitoring Data (EPA 1989, 1141). The hot measurement test was used as the statistically-based screening tool for background comparisons of TA-32 data. This test identifies the site data that exceed the highest background concentrations. It is based on the upper tolerance limits (UTLs) calculated for naturally occurring inorganics (Table 3-2). The UTL is the 95% upper confidence level of the 99th percentile. The 99th percentile is a value, estimated from the data distribution, that will be exceeded by only 1% of the data. For more information on UTLs, see the LANL Environmental Restoration Project policy paper on background comparisons (LANL 1995, 06-0105). UTLs were not calculated for inorganics with a detection frequency of less than or equal to 50% (antimony, cadmium, mercury, selenium, and thallium). The background maximum was used as their screening value. The LANL background soil data do not currently include silver measured by the SW-846 method, so the maximum of the total elemental concentration as measured by instrumental neutron activation analysis, which is 1.61 mg/kg, was used as the screening value.

Inorganic chemicals with values less than their background UTLs are eliminated as COPCs. Inorganic chemicals with values greater than their background UTLs are advanced in the screening process to the comparison with SALs.

PAHs. PAHs are chemicals formed during the incomplete combustion of coal, wood, oil, gas, garbage, or other organic materials. PAHs are manufactured only in small quantities for research purposes or for limited commercial applications (Clement International Corporation 1990, 0873). PAHs are widely distributed in urban environments such as the Los Alamos townsite due to human activities (Bradley et al. 1994, 1144). Therefore, it is appropriate to compare PAH concentrations at Los Alamos sites with urban background concentrations to determine if a release has occurred. No LANL-specific background PAH data are available, so background PAH data are derived from literature values reported for PAHs in other urban environments (Bradley et al. 1994, 1144).

If the maximum concentration for a given PAH is less than the urban background UTL, that PAH is eliminated as a COPC. If the maximum concentration for a given PAH is greater than the urban background UTL, that PAH will be included in subsequent screening assessment evaluations.

TABLE 3-2

LIST OF UPPER TOLERANCE LIMITS FOR LOS ALAMOS NATIONAL LABORATORY SOIL BACKGROUND DATA FOR INORGANIC ANALYTES

ANALYTE	SAL[a] (mg/kg)	MEAN[b]	STANDARD DEVIATION	UTL[c] 99%, 0.95	NUMBER OF SAMPLES	NUMBER OF SAMPLES > LOD[d]
Aluminum	78 000	19 000	13 800	123 000	47	47
Antimony	32	2.45	0.36	2.5[f]	46	2
Arsenic	NA[e]	4.4	2.5	11.6	46	46
Barium	5 600	161	129	1 140	47	47
Beryllium	NA[e]	1.15	0.75	3.31	47	47
Cadmium	39	0.39	0.54	2.7[f]	47	5
Calcium	NA[e]	5 790	12 500	54 400	47	47
Chromium (Total)	g	11.7	7.8	34.2	47	47
Cobalt	4 700	15.2	7.6	51.1	47	47
Copper	3 000	5.3	3.6	15.7	47	45
Iron	NA[e]	14 500	7 320	35 600	47	47
Lead	400[h]	15.0	8.3	39.0	47	44
Magnesium	NA[e]	2 920	2 150	16 100	47	47
Manganese	390	343	238	1 030	47	47
Mercury	24	0.05	0.01	0.1[f]	48	4
Nickel	1 600	9.7	5.9	26.7	47	45
Potassium	NA[e]	2 420	1 304	6 180	47	47
Selenium	400	0.43	0.41	1.7[f]	46	23
Silver	400	1.69	0.40	1.61[f, i]	50	1
Sodium	NA[e]	577	453	3 320	47	47
Thallium	6.4	0.27	0.24	0.9[f]	45	21
Vanadium	560	25	14	66	47	47
Zinc	24 000	41	21	101	47	47

a SAL = Screening action level.
b Concentration values less than the limit of detection (LOD) were replaced by one-half the LOD.
c UTL = Background upper tolerance limit.
d LOD = Limit of detection.
e NA = No applicable value is available.
f The maximum value is used as the screening value rather than the UTL.
g The SAL for chromium VI is 400 mg/kg; the SAL for chromium III is 80 000 mg/kg.
h EPA 1989, 06-0109.
i Analysis by instrumental neutron activation.

Non-PAH Organics. With the exception of PAHs, background data are not available for organic chemicals. For these chemicals, the reporting limits are used as a point of comparison. It should be noted, however, that reporting limits are dependent on a number of factors (e.g., the presence of other chemicals and matrix interference), and may vary from chemical to chemical or from analysis to analysis. As such, the actual reporting limit for a particular chemical for a particular analysis must be used in this comparison.

If a chemical has a reported concentration that exceeds its reporting limit, then that chemical is carried forward through the screening assessment process. If a chemical does not have a reported concentration that exceeds the reporting limit, then that chemical is generally removed from further consideration. It should be noted, however, that a chemical that does not have a reported concentration greater than the reporting limit may be carried through the screening assessment process if the chemical is expected to be present at the site based on knowledge of historical operations and the maximum reporting limit is greater than the SAL or ecological screening action level (ESAL).

3.2.2 Human Health Screening Action Levels Comparison Methodology

The second step in performing the screening assessment is a comparison with SALs. SALs are protective risk-based levels, based primarily on formulas presented in the proposed RCRA Subpart S, that are intended for use as a preliminary screening tool (EPA 1990, 0432). Appendix J of the Installation Work Plan explains how the SALs used in the screening assessment are derived (LANL 1993, 1017). All inorganic COPCs and PAHs detected at concentrations greater than their background UTLs, and all detected non-PAH organic COPCs are compared with their respective SALs. Based on this comparison, each COPC is placed into one of three categories: greater than or equal to SAL, no SAL, or below SAL.

Greater than or equal to SAL indicates that at least one chemical value is greater than or equal to the SAL for that chemical. Any chemical that is greater than or equal to its SAL remains a COPC unless an applicable regulatory guideline takes precedent.

No SAL indicates that there is currently no SAL available for comparison and that at least one chemical value is greater than the reporting limit. Regulatory guidelines are checked to determine if there are any appropriate criteria for comparison to determine if these chemicals should be maintained as COPCs (Vocke 1993, 1073).

Below SAL indicates that the chemical values are all less than their respective SALs. Chemicals with concentrations below their respective SALs in all samples generally pose no risk. However, these chemicals are further evaluated to determine the potential for adverse health effects due to

exposure to the COPC in combination with other chemicals. This is called the multiple constituent evaluation.

It is possible that chemicals in combination, while near but not exceeding their SALs, could prove harmful to human health. In evaluating the effects of multiple chemicals, a simplistic screening approach that assumes additive effects is used to normalize concentration data by comparing concentration data to SALs, as shown in following equation:

$$M = \sum_{COPCs} C_i / SAL_i$$

where:

M = maximum sum of proportions,

C_i = maximum concentration of the ith constituent for a given site, and

SAL_i = chemical-specific SAL for the ith constituent.

If the sum of the proportions between each chemical that is below SAL (C_i) and its SAL (SAL_i) is less than one, then the chemicals are eliminated as COPCs. If the sum of the proportions is greater than one, then the effect of the multiple constituents has the potential to be adverse. It should be noted that this evaluation is used for screening purposes only, and that the normalized sums or proportions do not indicate risk levels. For more information regarding this method, refer to Appendix J of the Installation Work Plan (LANL 1993, 1017).

3.3 Ecotoxicological Screening Assessment Methodology

A discussion of the requirements and generic approach for ecotoxicological screening and ecological risk assessment is presented in Appendix L of the LANL Installation Work Plan (LANL 1993, 1017). A detailed method for determining ESALs was developed to determine if further action at hazardous waste sites is warranted based on the toxicological effects of certain analytes to birds, mammals, and reptiles inhabiting a site (Ebinger 1994, 06-0102; Ebinger 1995, 06-0115). Figure 3-2 shows the decision tree used for the ecotoxicological screening assessment performed for TA-32 SWMUs.

Soil samples from areas with undisturbed habitats are first screened for non-PAH organic analytes with values above the reporting limit and inorganic analytes and PAHs with values above background UTLs. At TA-32, these undisturbed areas are the outfalls, hillsides, and channels. After this background comparison, an ecotoxicological screening assessment is performed. Non-PAH organic analytes with values greater than the reporting limit and inorganic analytes and

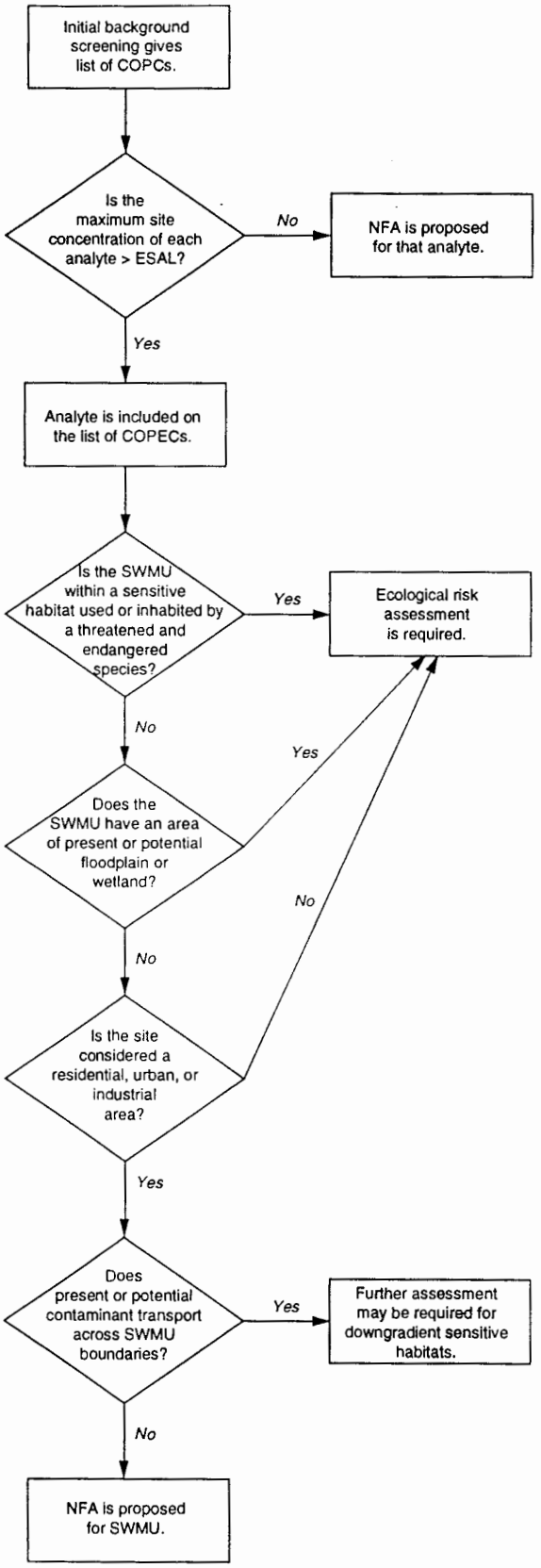


Fig. 3-2. Ecotoxicological screening assessment decision logic flow chart.

PAHs with values greater than the background UTL are compared with ESALs to determine whether they should be retained as chemicals of potential ecotoxicological concern (COPECs). Once the presence of COPECs is determined, a number of decisions are possible depending on: 1) the size and accessibility of the contaminated area, as compared to the ranges of animals inhabiting the area; 2) whether or not threatened or endangered plants and animals inhabit or use the area; and 3) whether or not the site and/or adjacent sites contain sensitive habitats. An initial biological evaluation was performed for Field Unit 1 SWMUs, identifying possible threatened and endangered species, major plant communities, sensitive habitats, wetlands, and floodplains (Biggs 1992, 06-0116; Biggs 1993, 06-0101).

Note that the ecotoxicological screening assessment at TA-32 was performed for each SWMU and for a larger set of adjacent sites, called the ecological exposure unit, which could be impacted by past and future transport of COPECs from TA-32. This ecological exposure unit approach assures that the source terms, contaminant concentrations in soil and water, and potential impacts to the biota are evaluated in context with the topography, hydrology, and sensitive habitats within and near a site. Ecotoxicological screening does not identify risks to organisms in sensitive habitats. An ecological risk assessment may be required if screening indicates a potential impact to such organisms. If no potential impact is found (i.e., no COPECs are identified at an outfall or within its drainage), then no further action is necessary at the SWMU or the adjacent ecological exposure unit. If COPECs are identified at an outfall or within its drainage, then further assessment may be necessary if sensitive habitats exist downgradient.

3.4 Development of Conclusions and Recommendations

Conclusions are based on the initial screening assessment performed on the analytical results for each potential release site. Recommendations are based on the potential for human health or ecological risk, and on applicable regulations.

4.0 SITE SPECIFIC RESULTS, CONCLUSIONS AND RECOMMENDATIONS

4.1 SWMU 32-001: Former Incinerator Location

4.1.1 Description of SWMU 32-001

SWMU 32-001 is the location of a former incinerator that was adjoined to the northeast corner of the medical research facility's main laboratory building. The incinerator was constructed of brick and was 2.5 ft wide, 2.5 ft long, and 10 ft high. It was removed sometime prior to 1954. According to the RFI Work Plan for OU 1079, the incinerator probably received any combustible waste from

the medical research facilities (LANL 1992, 0783). Disposition of the ash from the incinerator is unknown. The former incinerator location is currently under the asphalt parking lot of the Los Alamos County Roads Division.

4.1.2 Field Investigation and Sampling Activities at SWMU 32-001

Two samples were collected at SWMU 32-001. One sample was collected near the base of the former incinerator at a depth of 14 in. It is unclear if this measurement was 14 in. below ground surface (bgs) or 14 in. below the soil/asphalt interface. The second sample was collected from a location downslope from the initial sampling location at a depth of 11 in. (Fig. 4-1). The sample locations were selected to correspond with fractures in the asphalt pavement. Both samples were collected using a stainless-steel hand auger. These two samples were screened in the field for gross alpha, beta, and gamma radiation and organic vapors. There were no positive field screening results, and both samples were submitted for fixed lab analysis of SVOCs, VOCs, TAL metals, and PCBs.

4.1.3 Human Health Screening Assessment Results for SWMU 32-001

Appendix A presents the analytical results used in the screening assessment. It consists of tables showing summaries of samples collected and analyses performed, summaries of analyses for nondetected analytes, and specific data for all detected analytes at TA-32 .

4.1.3.1 Background Comparison for SWMU 32-001

Inorganics. All inorganic COPCs detected at SWMU 32-001 were compared with their natural background UTLs. All inorganic COPCs except lead, mercury, and silver were below their respective background UTLs and were eliminated as COPCs. Lead, mercury, and silver exceeded their respective background UTLs and were carried forward to the comparison with SALs. The results from soil samples with inorganic analyte concentrations exceeding background UTLs are presented in Table 4-1. The locations of samples with inorganic analyte concentrations greater than background UTLs are shown on Fig. 4-2.

PAHs. No PAHs were detected at SWMU 32-001.

Non-PAH Organics. Three non-PAH organic analytes were detected at SWMU 32-001: acetone, Aroclor 1260™, and toluene. The soil concentrations for these chemicals are presented in Table 4-2. The locations of samples with detected concentrations of organic analytes are shown on Fig. 4-2.

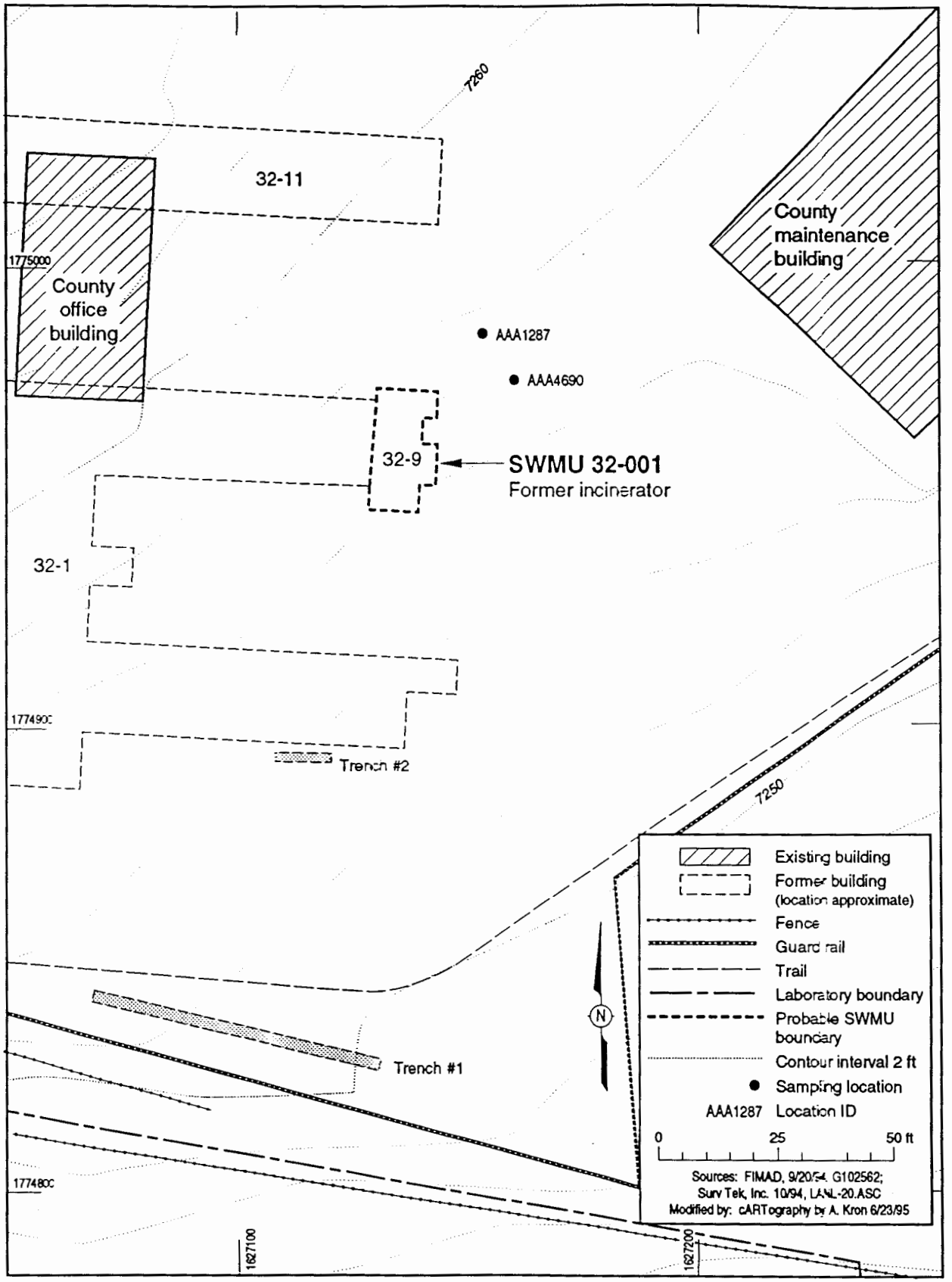


Fig. 4-1. Locations of SWMU 32-001 Phase I samples.

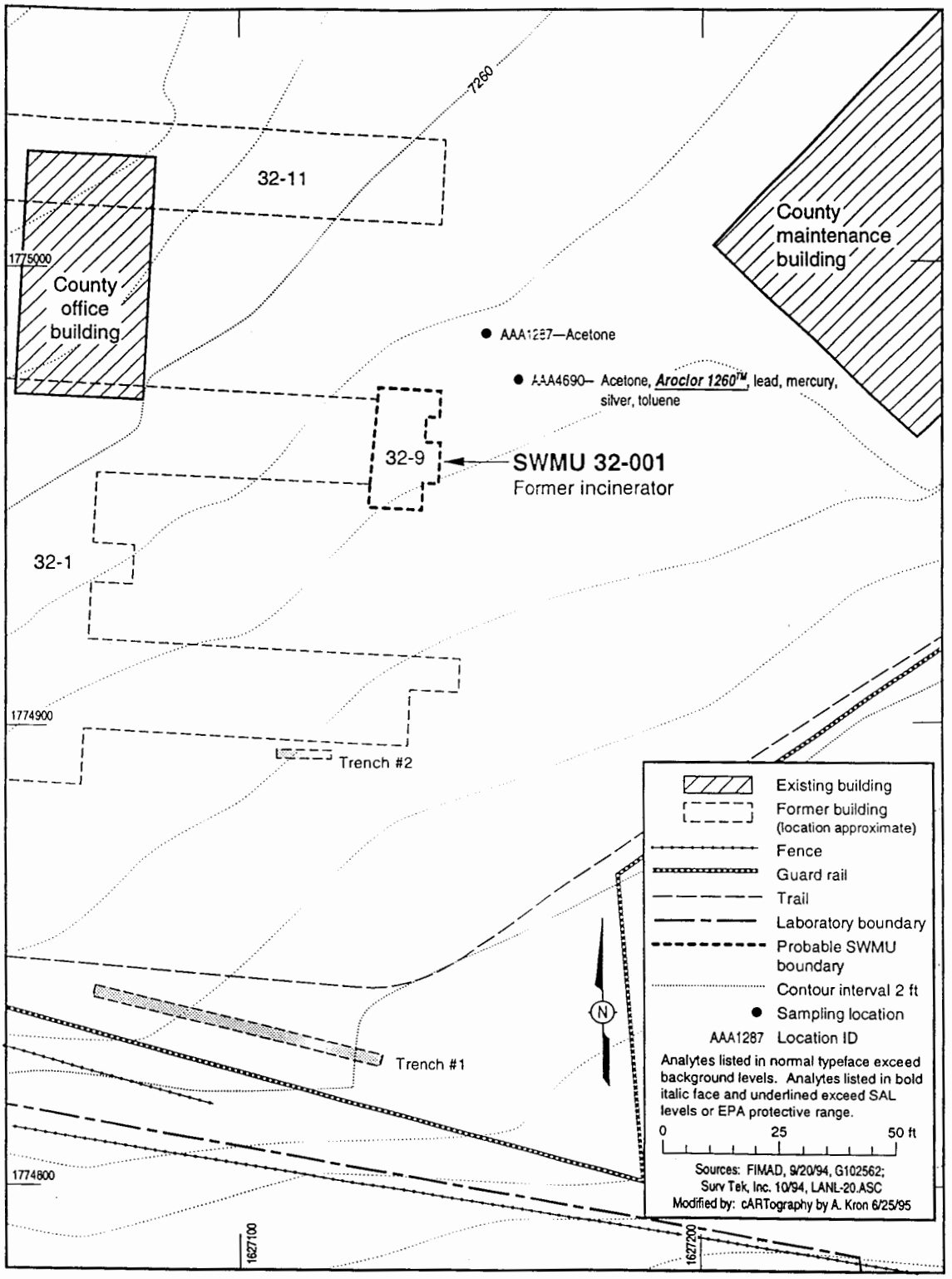


Fig. 4-2. Locations of detected organic analytes, inorganic analytes that exceed background UTLs, and all analytes that exceed SALs at SWMU 32-001.

TABLE 4-1

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs AT SWMU 32-001

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH (in.)
Lead	AAA4690	70	400	39	-	10-14
Mercury	AAA4690	0.1	24	NA[d]	0.1	10-14
	AAA4690R[e]	0.2	24	NA	0.1	10-14
	AAA4690R	0.2	24	NA	0.1	10-14
Silver	AAA4690	3	400	NA	1.61	10-14

[a] SAL = Screening action level.
[b] UTL = Upper tolerance limit.
[c] MAX = There was an insufficient number of samples to calculate the UTL for this analyte; therefore, the maximum value in the background range was used.
[d] NA = Not available.
[e] Sample ID numbers with an "R" notation were submitted for replicate analyses of one or more analytes.

TABLE 4-2

NON-PAH ORGANIC ANALYTES DETECTED AT SWMU 32-001

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	DEPTH (in.)
Acetone	AAA1287	0.027	8000	10-14
	AAA4690	0.046	8000	10-14
Aroclor 1260™	AAA4690	2	1	10-14
Toluene	AAA4690	0.0098	910	10-14

[a] SAL = Screening action level.

4.1.3.2 Screening Action Levels Comparison for SWMU 32-001

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background UTLs or with no background data for comparison at SWMU 32-001.

Greater than or equal to SAL. Aroclor 1260™ is the only COPC detected at SWMU 32-001 to fall into the greater than or equal to SAL category.

No SAL. No COPCs detected at SWMU 32-001 fall into the no SAL category.

Below SAL. Five COPCs, acetone, lead, mercury, silver, and toluene, were detected at concentrations below the SAL. These five COPCs are addressed in the multiple constituent evaluation, shown in Table 4-3.

To evaluate multiple constituent effects for this data set, COPCs below their respective SALs were grouped according to their toxicological effects (carcinogenic or noncarcinogenic). SALs for all constituents were normalized to one and summed as described in Subsection 3.2.2. There are no COPCs in the carcinogenic category. The results of the analysis based on noncarcinogenic effects is less than one at 0.2, indicating that potential resultant adverse human health effects from exposure are unlikely. Therefore, all of the chemicals with concentrations below their respective SALs are eliminated as COPCs.

TABLE 4-3

MULTIPLE CONSTITUENT EVALUATION FOR SWMU 32-001

COPC[a]	MAXIMUM CONCENTRATION (mg/kg)	SOIL SAL[b] (mg/kg)	MAXIMUM CONCENTRATION ÷ SAL (NORMALIZED VALUES)
SAL BASED ON NONCARCINOGENIC EFFECTS			
Acetone	0.046	8 000	5.75×10^{-06}
Lead	70.0	400	0.175
Mercury	0.2	14.4[c]	0.014
Silver	3.0	400	7.5×10^{-03}
Toluene	0.0098	910	1.08×10^{-05}
Total Normalized Sum			**0.2**

[a] COPC = Chemical of potential concern.
[b] SAL = Screening action level.
[c] The soil SAL for mercury, 24 mg/kg, has been decreased by 40% to compensate for the 40% uncertainty in mercury values noted in Subsection 3.1.1, Quality Assurance/Quality Control Activities.

4.1.4 Ecological Screening Assessment for SWMU 32-001

The habitats on the mesa top can be characterized as artificial urban plant and animal communities and, therefore, do not need to be addressed further from the ecological risk assessment perspective.

4.1.5 Conclusions and Recommendations for SWMU 32-001

At SWMU 32-001, Aroclor 1260™ was the only COPC retained. Aroclor 1260™ was detected in sample AAA4690 at a concentration of 2.0 mg/kg, relative to a SAL of 1.0 mg/kg. Sample AAA4690 was collected near the former incinerator location beneath the asphalt parking lot at a depth of 11 in.

Aroclor 1260™ is a PCB. The Toxic Substances Control Act (TSCA) cleanup level for PCBs in soil on property where access is nonrestricted (such as TA-32), is 10 mg/kg, provided that the soil is excavated to a minimum depth of 10 in. and replaced with clean soil containing less than 1 mg/kg of PCBs. Although sample AAA4690 meets the TSCA cleanup criteria, the first 11 in. of soil have not been characterized, and the vertical and horizontal extent of the Aroclor 1260™ has not been determined. Therefore, a Phase II investigation is recommended to further evaluate the extent of PCB contamination potentially associated with the incinerator. The Phase II Work Plan, Subsection 5.0, addresses this recommendation.

4.2 SWMU 32-002(a): Septic Tank TA-32-7

4.2.1 Description of SWMU 32-002(a)

The Work Plan for OU 1079 describes SWMU 32-0002(a) as a wood-frame septic tank that was 4 ft wide, 8 ft long, and 4 ft deep (LANL 1992, 0783). Since radionuclides were used for experiments in the TA-32 laboratories, and no industrial waste line served TA-32, it is possible that radionuclides were disposed of through this septic system. The septic tank was connected to an outfall over the edge of Los Alamos Canyon. SWMU 32-002(a) is thought to have been abandoned in place.

During the 1993 Phase I investigation, a pile of wood debris was assumed to be the remains of SWMU 32-002(a) (LANL 1992, 0783) (ICF Kaiser 1993, 06-0103) (Fig. 1-2). However, archival engineering drawings located after the Phase I investigation was complete indicate that SWMU 32-002(a) is actually east of the wood debris pile. The wood debris may have been the remains of the platform for the former transformer (TA-32-10).

4.2.2 Field Investigation and Sampling Activities at SWMU 32-002(a)

The field investigation for SWMU 32-002(a) is now considered to be the field investigation for the former transformer location. No samples were collected at the actual location of former septic tank TA-32-7 or its outfall.

4.2.3 Conclusions and Recommendations for SWMU 32-002(a)

Because no sampling has been conducted at the actual location of SWMU 32-002(a), it is recommended that additional investigation be conducted to determine if the septic tank and any associated septic lines are in place. Samples should be collected at the septic tank location and in the sediment accumulation areas in the outfall below the septic tank to determine if there is any contamination. The Phase II Work Plan, Subsection 5.0, addresses these recommendations.

4.3 SWMU 32-003: Former Transformer Location

4.3.1 Description of SWMU 32-003

In the RFI Work Plan for OU 1079 and consequently during the 1993 Phase I investigation, a pile of wood debris was assumed to be the remains of SWMU 32-002(a) (LANL 1992, 0783) (Fig. 4-3). However, as described above, archival engineering drawings located after the Phase I investigation indicate that the wood debris may have been the platform for the former transformer (TA-32-10). No documented spills occurred at the former transformer location. Following the results of the Phase I investigation and additional archival research, the former transformer location is now designated SWMU 32-003. The former transformer location is currently beneath the asphalt parking area of the Los Alamos County Roads Division. The wood debris pile and the outfall area located downgradient from the former transformer location are on DOE property.

4.3.2 Field Investigation and Sampling Activities

Two samples were collected at the wood debris pile. These samples were collected using a stainless steel hand auger at depths immediately above the bedrock, 0 to 4 in. bgs. Three additional samples were collected from locations in the drainage immediately downgradient from the former transformer location. These samples were collected in areas of sediment accumulation.

4.3.3 Human Health Screening Assessment Results for SWMU 32-003

Appendix A presents the analytical results used in the screening assessment. Appendix A tables show summaries of samples collected and analyses performed, summaries of analyses performed for nondetected analytes, and specific data for all detected analytes at TA-32.

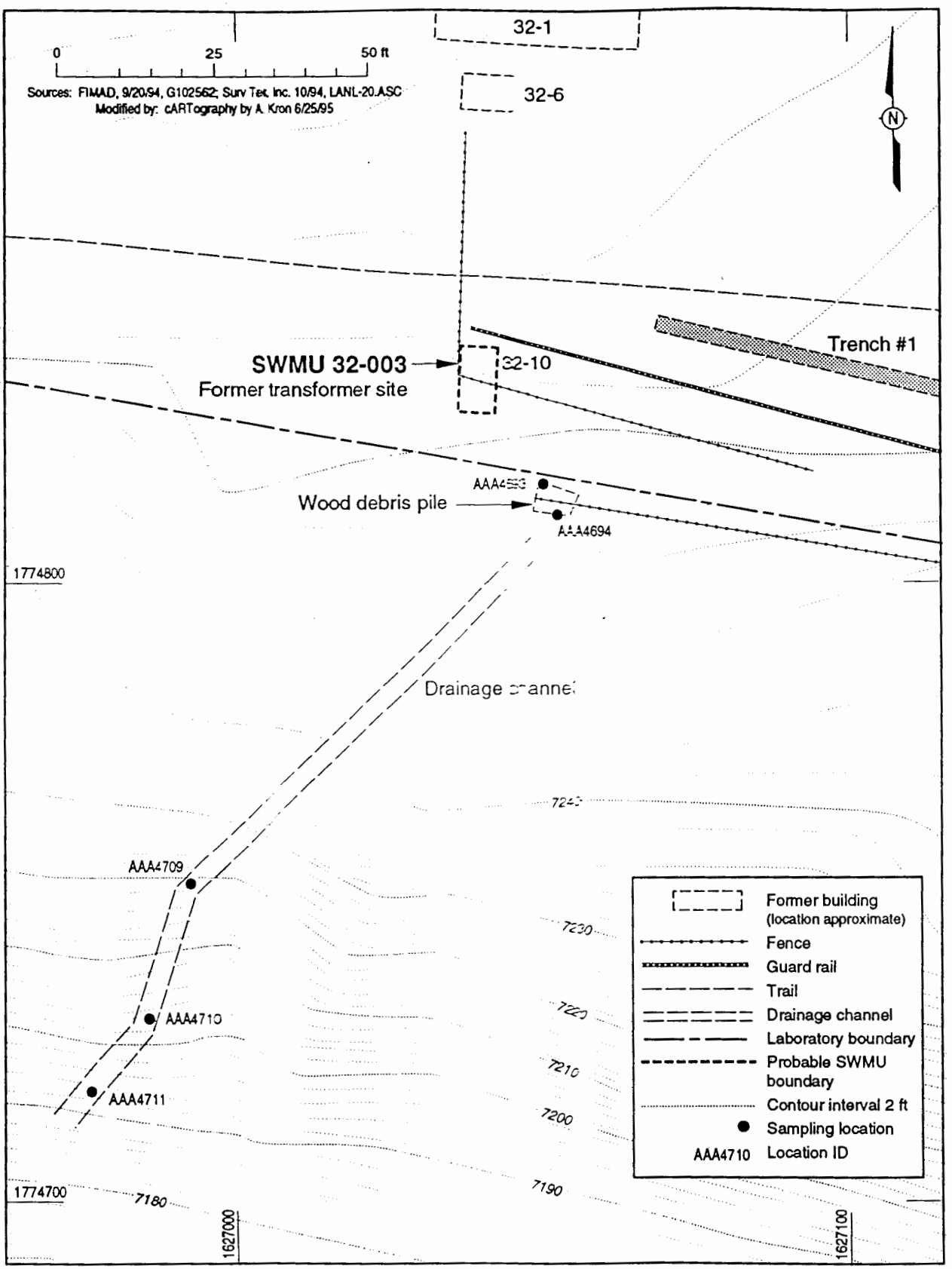


Fig. 4-3. Locations of SWMU 32-003 Phase I samples.

4.3.3.1 Background Comparison for SWMU 32-003

Inorganics. All inorganic COPCs detected downgradient from the former transformer location were compared with their natural background UTLs. All inorganic COPCs except lead and zinc were below their respective background UTLs and were eliminated as COPCs. Lead and zinc exceeded their respective background UTLs and were carried forward to the comparison with SALs. The results from soil samples with inorganic analyte concentrations exceeding background UTLs are presented in Table 4-4. The locations of samples with analyte values greater than background UTLs are shown on Fig. 4-4.

TABLE 4-4

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs AT SWMU 32-003

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b]	DEPTH (in.)
Lead	AAA4693	46	400	39	0-2
	AAA4694	230	400	39	0-4
	AAA4709	40	400	39	0-15
Zinc	AAA4694	110	24 000	101	0-4

[a] SAL = Screening action level.
[b] UTL = Upper tolerance limit.

PAHs. All PAHs that were detected at SWMU 32-003 were compared with their anthropogenic background UTLs as described in Subsection 3.2.1 (Bradley et al. 1994, 1144). All of the PAHs detected downgradient from the former transformer location were below their respective background UTLs and are eliminated as COPCs.

Non-PAH Organics. Six non-PAH organic analytes were detected at SWMU 32-003: Acetone, Aroclor 1260™, toluene, di-n-butyl phthalate, bis(2-ethylhexyl) phthalate, and butyl benzyl phthalate. The method blank contained di-n-butyl phthalate, bis (2-ethylhexyl) phthalate, and butyl benzyl phthalate, therefore, these chemicals are considered laboratory contaminants and are eliminated as COPCs. The soil concentrations for the chemicals retained, acetone, Aroclor 1260™, and toluene, are presented in Table 4-5. The locations of samples with detected concentrations of organic analytes are shown on Fig. 4-4.

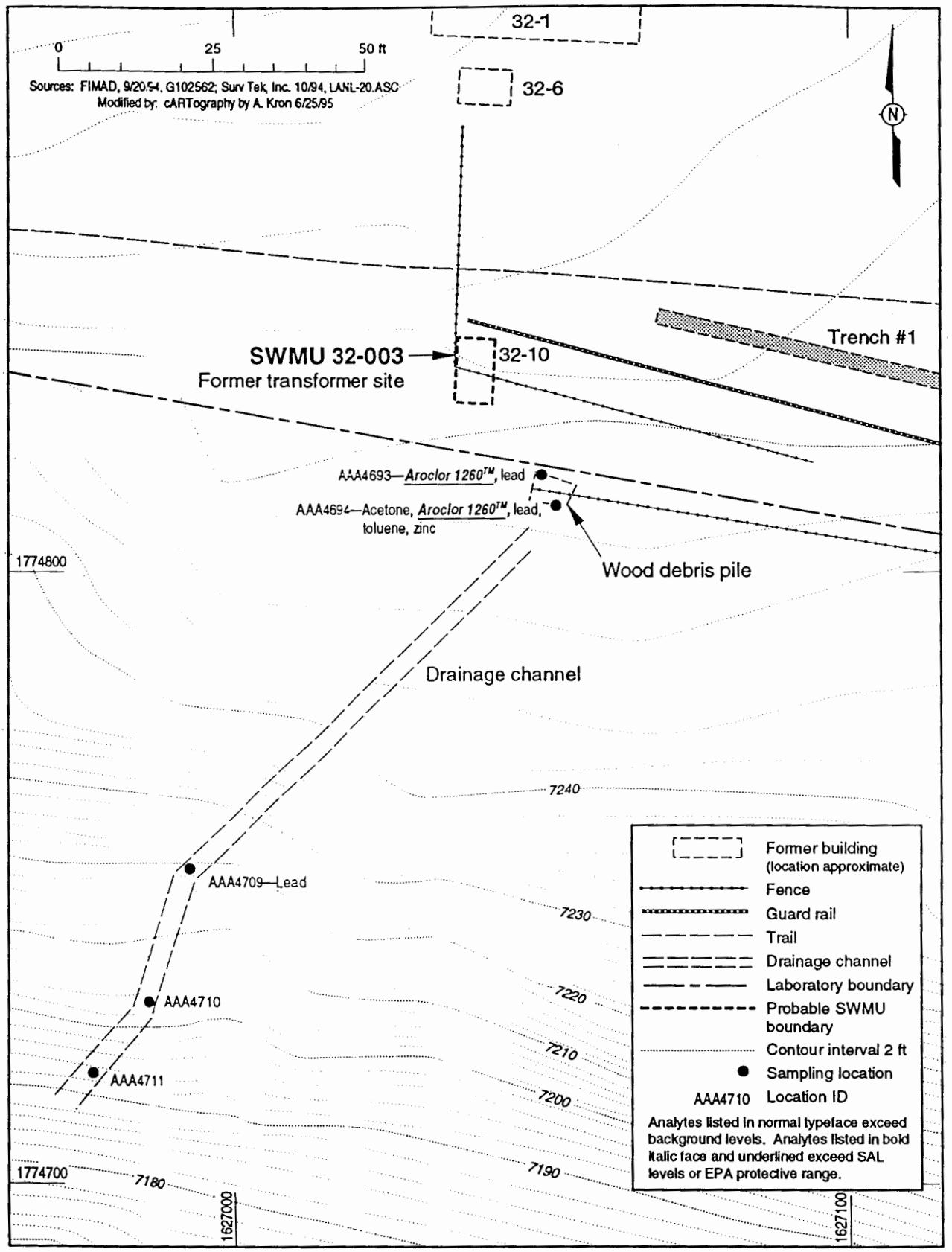


Fig. 4-4. Locations of detected organic analytes, inorganic analytes that exceed background UTLs, and all analytes that exceed SALs at SWMU 32-003.

TABLE 4-5

NON-PAH ORGANIC ANALYTES DETECTED AT SWMU 32-003

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	DEPTH (in.)
Acetone	AAA4694	0.025	8 000	0-4
Aroclor 1260™	AAA4694	1.5	1	0-4
Toluene	AAA4694	0.013	910	0-4

[a] SAL = Screening action level.

4.3.3.2 Screening Action Levels Comparison for SWMU 32-003

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background UTLs or with no background data for comparison at the former transformer location.

Greater than or equal to SAL. Aroclor 1260™ falls into the greater than or equal to SAL category.

No SAL. No COPCs fall into the no SAL category.

Below SAL. Four COPCs were detected at concentrations below their respective SALs: acetone, lead, toluene, and zinc. These four COPCs are addressed in the multiple constituent evaluation, Table 4-6.

To evaluate multiple constituent effects for this data set, COPCs below their respective SALs were grouped according to their toxicological effects (carcinogenic or noncarcinogenic). SALs for all constituents were normalized to one and summed as described in Subsection 3.2.2. The results of the evaluation indicate that there are no carcinogenic constituents less than SAL. The normalized sum for the noncarcinogenic constituents is less than one at 0.58, indicating that potential resultant adverse human health effects from exposure are unlikely. Therefore, all of the chemicals with concentrations below their respective SALs are eliminated as COPCs.

4.3.4 Ecotoxicological Screening Assessment for SWMU 32-003

The background comparisons in Subsection 4.3.3.1 indicate that two inorganic analytes, lead and zinc, exceeded their respective background UTLs at SWMU 32-003. In addition, three non-PAH organic analytes were detected: acetone, Aroclor 1260™, and toluene. These five analytes were compared to their respective ESALs (Ebinger et al. 1994, 06-0102).

TABLE 4-6

MULTIPLE CONSTITUENT EVALUATION FOR SWMU 32-003

COPC[a]	MAXIMUM CONCENTRATION (mg/kg)	SOIL SAL[b] (mg/kg)	MAXIMUM CONCENTRATION ÷ SAL (NORMALIZED VALUES)
SAL BASED ON NONCARCINOGENIC EFFECTS			
Acetone	0.025	8 000	3.125×10^{-06}
Lead	230	400	0.575
Toluene	0.013	910	1.43×10^{-05}
Zinc	110	24 000	4.58×10^{-03}
Total Normalized Sum			**0.58**

[a] COPC = Chemical of potential concern.
[b] SAL = Screening action level.

4.3.4.1 Ecological Screening Action Levels Comparison for SWMU 32-003

Greater than ESALs. Lead, zinc, and Aroclor 1260™ all exceed their respective ESALs. Table 4-7 shows the analytical results for samples with concentrations that exceed ESALs. Lead, zinc, and Aroclor 1260™ are above ESALs at the sample locations at the wood debris pile (AAA4693 and AAA4694). Concentrations of lead and zinc fall within their respective background ranges farther down the drainage. While these COPECs could be transported to the sensitive habitats in Los Alamos Canyon, the concentrations would be too low to have any impact. Aroclor 1260™, however, must be retained as a COPEC. The locations of analytes with values greater than ESALs and background levels are shown on Fig. 4-5.

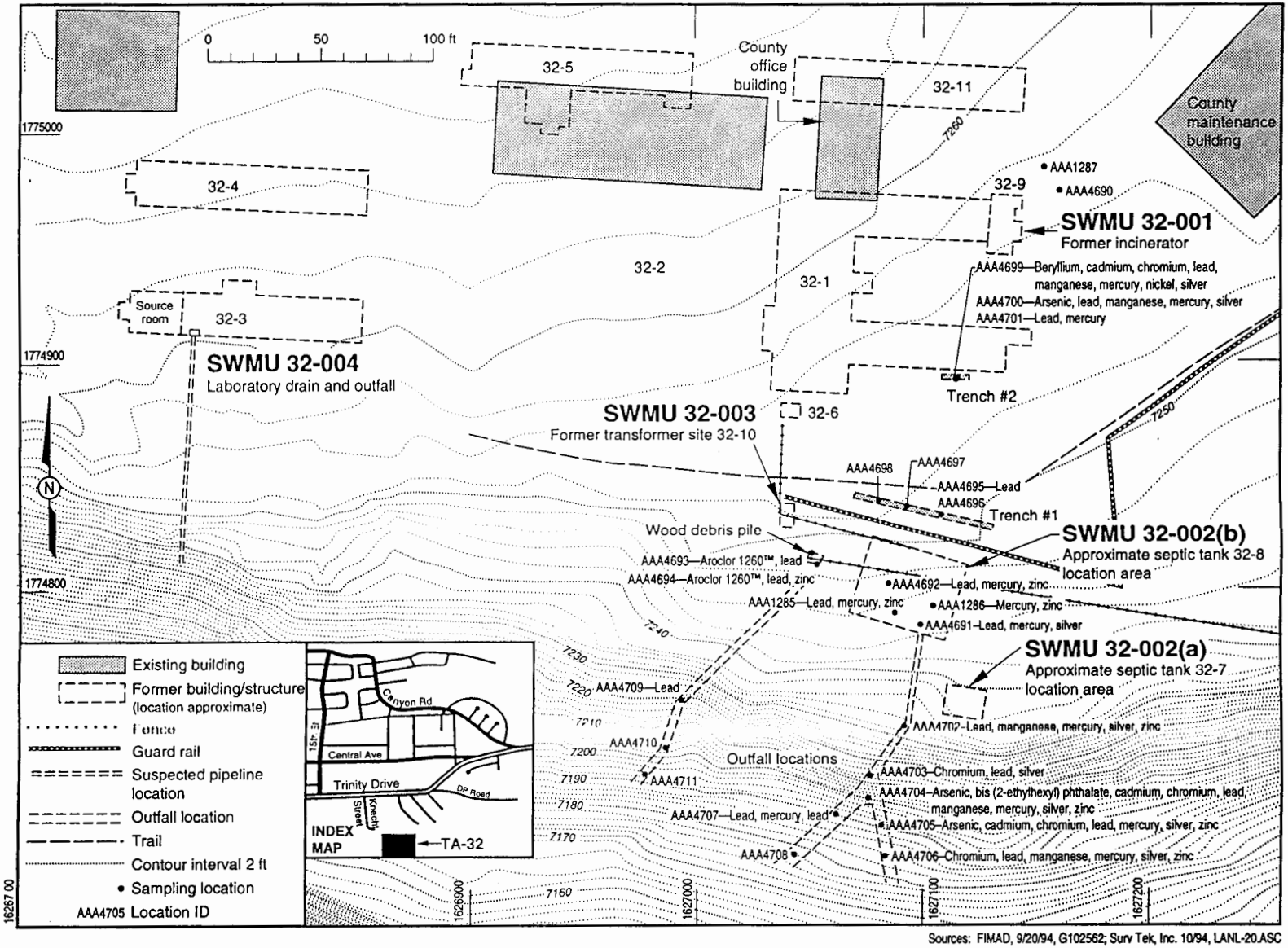
No ESALs. No COPCs fall into the no ESALs category.

TABLE 4-7

SOIL SAMPLE VALUES ABOVE ESALs AT SWMU 32-003

ANALYTE	SOIL SAMPLE RANGE (mg/kg)	ESAL[a] RANGE (mg/kg)	TOXICITY
Lead	23 - 230	0.39 - 33.7	Systemic
Zinc	39 - 110	0.04 - 3.75	Systemic
Aroclor 1260™	1.5 - 4	0.003 - 0.26	Carcinogen

[a] ESAL = Ecotoxicological screening action level.



Sources: FIMAD, 9/20/94, G102562; Surv Tek, Inc. 10/94, LANL-20.ASC
Modified by: cARTography by A. Kron 6/25/95

Fig. 4-5. Locations of analytes with values that exceed ESALs and background levels at TA-32.

Below ESALs. Two COPCs were detected at concentrations below their respective ESALs: acetone, and toluene. These COPCs are addressed in the ecological multiple constituent analysis presented in Table 4-8. The result of the analysis is less than one at 0.0007, indicating that the potential for adverse ecological effects is virtually nonexistent, regardless of whether the toxicological effects are or are not additive.

TABLE 4-8

ECOLOGICAL MULTIPLE CONSTITUENT EVALUATION FOR SWMU 32-003

COPEC[a]	MAXIMUM CONCENTRATION (mg/kg)	MINIMUM ESAL[b] (mg/kg)	MAXIMUM CONCENTRATION ÷ ESAL (NORMALIZED VALUES)
Acetone	0.025	43.4	0.0006
Toluene	0.013	97	0.0001
Total Normalized Sum			0.0007

[a] COPEC = Chemical of potential ecological concern.
[b] ESAL = Ecotoxicological screening action level.

4.3.5 Conclusions and Recommendations for SWMU 32-003

At SWMU 32-003, Aroclor 1260™ is the only analyte retained as a COPC in the human health and ecological screening assessments. Aroclor 1260™ was detected at concentrations exceeding its SAL, 1.0 mg/kg, in the two samples collected at the location of the former transformer. Sample AAA4693, collected at a depth of 0 to 2 in., had a concentration of 4.0 mg/kg. Sample AAA4694, collected at a depth of 0 to 4 in., had a concentration of 1.5 mg/kg. Aroclor 1260™ is retained as a COPC because 1) there is historical information indicating that a PCB-containing transformer was located upgradient from the locations where the PCB was detected, and 2) the samples containing the detected PCB were surface samples, indicating that there is the possibility of a complete exposure pathway from the Aroclor 1260™ to a receptor.

As a result of the human health and ecological screening assessments, it is recommended that additional samples be collected in the vicinity of the former transformer and the drainage below to evaluate the extent of PCB contamination detected during the Phase I investigation. The Phase II Work Plan, Subsection 5.0, addresses these recommendations. When the overall ecological impact of multiple sites is considered, the data from this site and others should be evaluated for possible contributions to cumulative impacts.

4.4 SWMU 32-002(b): Influent Septic Lines, Septic Tank, and Outfall

4.4.1 Description of SWMU 32-002(b)

Two septic tank systems served TA-32: TA-32-7 and -8, designated as SWMUs 32-002(a,b), respectively. It is suspected that septic tank TA-32-8 was added when septic tank TA-32-7 was no longer able to handle the needs of laboratory building TA-32-1. According to the engineering drawings, the septic line from laboratory building TA-32-1 to septic tank TA-32-7 was then diverted to septic tank TA-32-8. Septic tank TA-32-8 was constructed of reinforced concrete and was 9 ft wide, 5 ft long, and 6 ft deep. A vitrified clay pipe septic line was also installed between laboratory building TA-32-2 and septic tank TA-32-8. Thus, septic tank TA-32-8 is assumed to have served laboratory buildings TA-32-1 and -2 (Engineering drawings ENG4-C552, A5-C116, and A5-C117). Septic tank TA-32-8 was removed in 1988. The former location of septic tank TA-32-8 and its outfall are located on Department of Energy (DOE) property, while the influent septic lines are beneath the asphalt of the Los Alamos County Roads Division parking lot.

4.4.2 Field Investigation and Sampling Activities

Samples for SWMU 32-002(b) were collected at the influent septic line locations, the septic tank location, and the associated outfall (Fig. 4-6).

Influent Septic Line Locations. Two trenches were excavated perpendicular to the suspected septic line locations between laboratory buildings TA-32-1 and -2 and septic tank TA-32-8 in order to determine if these lines had been previously removed (Fig. 4-6). Both trenches were excavated in an east-to-west direction using a backhoe. The length of the trenches was determined in the field and was based on exposing enough area to locate the pipe. The width of the trenches was dictated by the width of the backhoe bucket. The depth of the trenches was dictated by the depth to tuff or exposed pipe. The trenches were dug by excavating to the soil/tuff interface and digging or scraping until either a pipe or evidence of a previously-excavated line was encountered. Samples were collected from the trenches using stainless-steel spoons and bowls at depths of 1.5 to 3.2 ft above the bedrock tuff (Fig. 4-6).

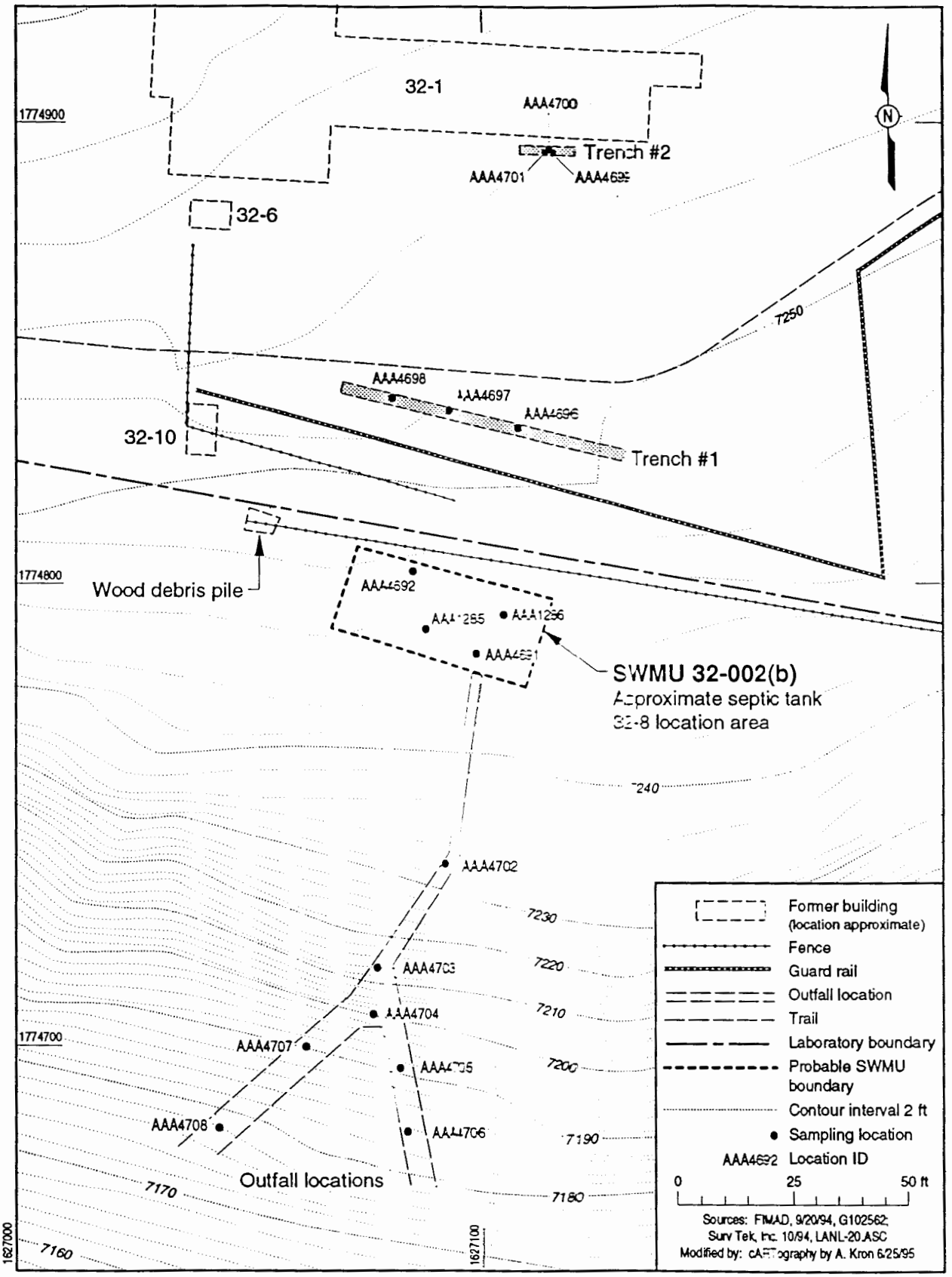


Fig. 4-6. Locations of SWMU 32-002(b) Phase I samples.

Trench 1 was excavated approximately 35 ft north of the former location of septic tank TA-32-8, and was 60 ft long by 1.6 ft wide by 3.4 ft deep. No septic system pipe was found in trench 1. Three soil samples were collected along the walls of trench 1 at the soil/tuff interface, two at a depth of 1.5 ft, and one at a depth of 1.7 ft (Fig. 4-6) (ICF Kaiser 1993, 06-0103).

Trench 2 was excavated approximately 40 ft north of trench 1, and was 14 ft long by 1.6 ft wide by 3.2 ft deep. A septic system line was found in trench 2. The seamed pipe was made of steel and had a clean-out extension. Three samples were collected from trench 2, one from within the clean-out extension and two from beneath the pipe seam on either side of the pipe (Fig. 4-6) (ICF Kaiser 1993, 06-0103).

No radioactivity was detected in samples from trenches 1 and 2 using the field screening instruments. The samples were submitted to the MRAL for analyses. MRAL results indicated no radioactive contamination, and trenches 1 and 2 were backfilled.

Septic Tank Location. A single point described as a septic tank in a field log dating from the early 1950s gave the location of this tank for Phase I sampling purposes. The site of this former septic tank was surveyed according to information from a laboratory employee who was in charge of the 1988 tank removal (ICF Kaiser 1993, 06-0103). Four samples were collected from the former location of the septic tank. Three samples were collected at the soil/bedrock interface, and one from the influent tank line location at a point called the "surveyed septic tank point" (Fig. 4-6) (ICF Kaiser 1993, 06-0103).

Outfall. A four-inch vitrified clay pipe was located in its original position near SWMU 32-002(b) and was assumed to be the outfall pipe for SWMU 32-002(b). This outfall pipe formerly discharged directly onto the hillside in Los Alamos Canyon.

One sample was collected directly at the mouth of the vitrified clay pipe assumed to be the discharge point from SWMU 32-002(b). Two additional samples were collected downgradient in the main drainage channel from this pipe at the point where the topography causes the drainage to split into two separate drainage channels (Fig. 4-6). In addition, two samples were collected from the eastern drainage channel, and two samples were collected from the western drainage channel. All samples in the outfall area were collected from sediment traps in order to bias the samples toward detecting any accumulated contamination. All samples from the septic tank area and outfall were collected with stainless steel spoons and bowls.

4.4.3 Human Health Screening Assessment Results for SWMU 32-002(b)

Appendix A presents the analytical results used in the screening assessment. Appendix A tables show summaries of samples collected and analyses performed, summaries of analyses performed for nondetected analytes, and specific data for all detected analytes at TA-32.

4.4.3.1 Background Comparison for SWMU 32-002(b)

Inorganics. All inorganic COPCs detected in the trenches, at the septic tank location, and the outfall were compared with their natural background UTLs. Aluminum, antimony, barium, calcium, magnesium, potassium, selenium, sodium, and vanadium were below their respective background UTLs and were eliminated as COPCs. Arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, thallium, and zinc exceeded their respective background UTLs. These fourteen COPCs were carried forward to the comparison with SALs. The results from soil samples with concentrations exceeding background UTLs are presented in Table 4-9. The locations of samples with analyte values greater than background UTLs are shown on Fig. 4-7.

TABLE 4-9

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH
Arsenic	AAA4700	25	NA[d]	11.6	-	3.2 ft
	AAA4705	18	NA[d]	11.6	-	0 - 5 in.
Beryllium	AAA4699	130	NA	3.31	-	3.2 ft
Cadmium	AAA4699	19	80	-	2.7	3.2 ft
	AAA4704	3	80	-	2.7	0-4 in.
	AAA4705	5.6	80	-	2.7	0-5 in.
Chromium	AAA4699	42	400	34.2	-	3.2 ft
	AAA4700	170	400	34.2	-	3.2 ft
	AAA4703	37	400	34.2	-	0-4 in.
	AAA4704	100	400	34.2	-	0-4 in.
	AAA4705	440	400	34.2	-	0-5 in.
	AAA4706	58	400	34.2	-	0-6 in.
Cobalt	AAA4699	430	4 700	51.1	-	3.2 ft
Copper	AAA4700	73	3 000	15.7	-	3.2 ft

TABLE 4-9 (CONTINUED)

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH
Copper	AAA4703	16	3 000	15.7	-	0-4 in.
	AAA4704	38	3 000	15.7	-	0-4 in.
	AAA4705	170	3 000	15.7	-	0-5 in.
	AAA4706	17	3 000	15.7	-	0-6 in.
	AAA4716 (duplicate of AAA4702)	22	3 000	15.7	-	0-15 in.
	AAA4716R1[e] (duplicate of AAA4702)	23	3 000	15.7	-	0-15 in.
	AAA4717 (duplicate of AAA4702)	24	3 000	15.7	-	0-15 in.
Iron	AAA4700	62 000	NA	35 600	-	3.2 ft
Lead	AAA1285	70	400	39	-	0-4 in.
	AAA4692	50	400	39	-	4-6 in.
	AAA4695	49	400	39	-	1.5 ft
	AAA4699	120	400	39	-	3.2 ft
	AAA4700	570	400	39	-	3.2 ft
	AAA4701	81	400	39	-	3.2 ft
	AAA4702	110	400	39	-	0-15 in.
	AAA4703	150	400	39	-	0-4 in.
	AAA4704	450	400	39	-	0-4 in.
	AAA4705	1 600	400	39	-	0-5 in.
	AAA4706	200	400	39	-	0-6 in.
	AAA4707	46	400	39	-	0-15 in.
	AAA4716 (duplicate of AAA4702)	130	400	39	-	0-15 in.
	AAA4716R1 (duplicate of AAA4702)	120	400	39	-	0-15 in.
	AAA4717 (duplicate of AAA4702)	130	400	39	-	0-15 in.

TABLE 4-9 (CONTINUED)

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH
Lead	AAA4718 (duplicate of AAA4691)	63	400	39	-	4-6 in.
	AAA4719 (duplicate of AAA4691)	76	400	39	-	4-6 in.
Manganese	AAA4702	1 300	390	1 030	-	0-15 in.
Mercury	AAA1285	4.7	24	-	0.1	0-4 in.
	AAA1285R1	4.9	24	-	0.1	0-4 in.
	AAA1285R2	6.5	24	-	0.1	0-4 in.
	AAA1286	0.3	24	-	0.1	0-4 in.
	AAA1286R1	0.2	24	-	0.1	0-4 in.
	AAA1286R2	0.2	24	-	0.1	0-4 in.
	AAA4691	14	24	-	0.1	4-6 in.
	AAA4691R1	13	24	-	0.1	4-6 in.
	AAA4691R2	14	24	-	0.1	4-6 in.
	AAA4692	2.2	24	-	0.1	4-6 in.
	AAA4692R1	1.3	24	-	0.1	4-6 in.
	AAA4692R2	2.2	24	-	0.1	4-6 in.
	AAA4699R2	0.2	24	-	0.1	3.2 ft
	AAA4700	150	24	-	0.1	3.2 ft
	AAA4700R1	380	24	-	0.1	3.2 ft
	AAA4700R2	420	24	-	0.1	3.2 ft
	AAA4701	4.5	24	-	0.1	3.2 ft
	AAA4701R1	0.9	24	-	0.1	3.2 ft
	AAA4701R2	4.1	24	-	0.1	3.2 ft
	AAA4702	16	24	-	0.1	0-15 in.
	AAA4702R1	15	24	-	0.1	0-15 in.
	AAA4702R2	15	24	-	0.1	0-15 in.
	AAA4703	17	24	-	0.1	0-4 in.
	AAA4703R1	12	24	-	0.1	0-4 in.
	AAA4703R2	16	24	-	0.1	0-4 in.

TABLE 4-9 (CONTINUED)

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH
Mercury	AAA4704	36	24	-	0.1	0-4 in.
	AAA4704R1	35	24	-	0.1	0-4 in.
	AAA4704R2	51	24	-	0.1	0-4 in.
	AA4705	276	24	-	0.1	0-5 in.
	AA4705R1	236	24	-	0.1	0-5 in.
	AA4705R2	303	24	-	0.1	0-5 in.
	AAA4706	17	24	-	0.1	0-6 in.
	AAA4706R1	12	24	-	0.1	0-6 in.
	AAA4706R2	14	24	-	0.1	0-6 in.
	AAA4707	3.3	24	-	0.1	0-15 in.
	AAA4707R1	1.1	24	-	0.1	0-15 in.
	AAA4707R2	1.3	24	-	0.1	0-15 in.
	AAA4713	1.7	24	-	0.1	4-6 in.
	AAA4713R1	1.2	24	-	0.1	4-6 in.
	AAA4713R2	1.7	24	-	0.1	4-6 in.
	AAA4716	20	24	-	0.1	0-15 in.
	AAA4716R1 (duplicate of AAA4702)	15	24	-	0.1	0-15 in.
	AAA4716R2 (duplicate of AAA4702)	15	24	-	0.1	0-15 in.
	AAA4717 (duplicate of AAA4702)	16	24	-	0.1	0-15 in.
	AAA4717R1 (duplicate of AAA4702)	16	24	-	0.1	0-15 in.
	AAA4717R2 (duplicate of AAA4702)	17	24	-	0.1	0-15 in.
	AAA4718 (duplicate of AAA4691)	8.4	24	-	0.1	4-6 in.

TABLE 4-9 (CONTINUED)

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH
Mercury	AAA4718R1 (duplicate of AAA4691)	10.2	24	-	0.1	4-6 in.
	AAA4718R2 (duplicate of AAA4691)	12.6	24	-	0.1	4-6 in.
	AAA4719 (duplicate of AAA4691)	13	24	-	0.1	4-6 in.
	AAA4719R1 (duplicate of AAA4691)	10	24	-	0.1	4-6 in.
	AAA4719R2 (duplicate of AAA4691)	15	24	-	0.1	4-6 in.
Nickel	AAA4699	260	1 600	26.7	-	3.2 ft
Silver	AAA1285	4.3	400	-	1.61	0-4 in.
	AAA4699	200	400	-	1.61	3.2 ft
	AAA4700	9.2	400	-	1.61	3.2 ft
	AAA4702	3.5	400	-	1.61	0-15 in.
	AAA4703	7	400	-	1.61	0-4 in.
	AAA4704	28	400	-	1.61	0-4 in.
	AAA4705	150	400	-	1.61	0-5 in.
	AAA4706	12	400	-	1.61	0-6 in.
	AAA4707	2.6	400	-	1.61	0-15 in.
	AAA4716 (duplicate of AAA4702)	5.4	400	-	1.61	0-15 in.
	AAA4716R1 (duplicate of AAA4702)	4.9	400	-	1.61	0-15 in.
	AAA4717 (duplicate of AAA4702)	5.5	400	-	1.61	0-15 in.
	AAA4718 (duplicate of AAA4691)	2.6	400	-	1.61	4-6 in.

TABLE 4-9 (CONTINUED)

INORGANIC ANALYTES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	UTL[b] (mg/kg)	MAX[c]	DEPTH
Silver	AAA4719 (duplicate of AAA4691)	4.5	400	-	1.61	4-6 in.
Thallium	AAA4700	1.4	6.4	-	0.9	3.2 ft
	AAA4705	2.4	6.4	-	0.9	0-5 in.
Zinc	AAA1285	290	24 000	101	-	0-4 in.
	AAA1286	200	24 000	101	-	0-4 in.
	AAA4692	120	24 000	101	-	4-6 in.
	AAA4702	120	24 000	101	-	0-15 in.
	AAA4704	170	24 000	101	-	0-4 in.
	AAA4705	320	24 000	101	-	0-5 in.
	AAA4706	140	24 000	101	-	0-6 in.
	AAA4716	130	24 000	101	-	0-15 in.
	AAA4716R1	120	24 000	101	-	0-15 in.
	AAA4717	130	24 000	101	-	0-15 in.

[a] SAL = Screening action level.
[b] UTL = Upper tolerance limit.
[c] MAX = There was an insufficient number of samples to calculate the UTL for this analyte; therefore, the maximum value in the background range was used.
[d] NA = No applicable SAL is available.
[e] Sample ID numbers with an "R" notation were submitted for replicate analyses for one or more analytes.

PAHs. All PAHs that were detected at SWMU 32-002(b) were compared with their anthropogenic background UTLs as described in Subsection 3.2.1 (Bradley et al. 1994, 1144). All of the PAHs detected at SWMU 32-002(b) were below their respective background UTLs. However, the PAHs were detected in sample AAA4700, located in the clean-out extension of the steel pipe. It is not appropriate to make a comparison between the Bradley urban background concentrations (which are attributable to sources such as vehicular exhaust, forest fires, and wood-burning stoves) and results from the contents of a closed piping system. Therefore, PAHs will be retained as COPCs and carried forward to the SAL comparison.

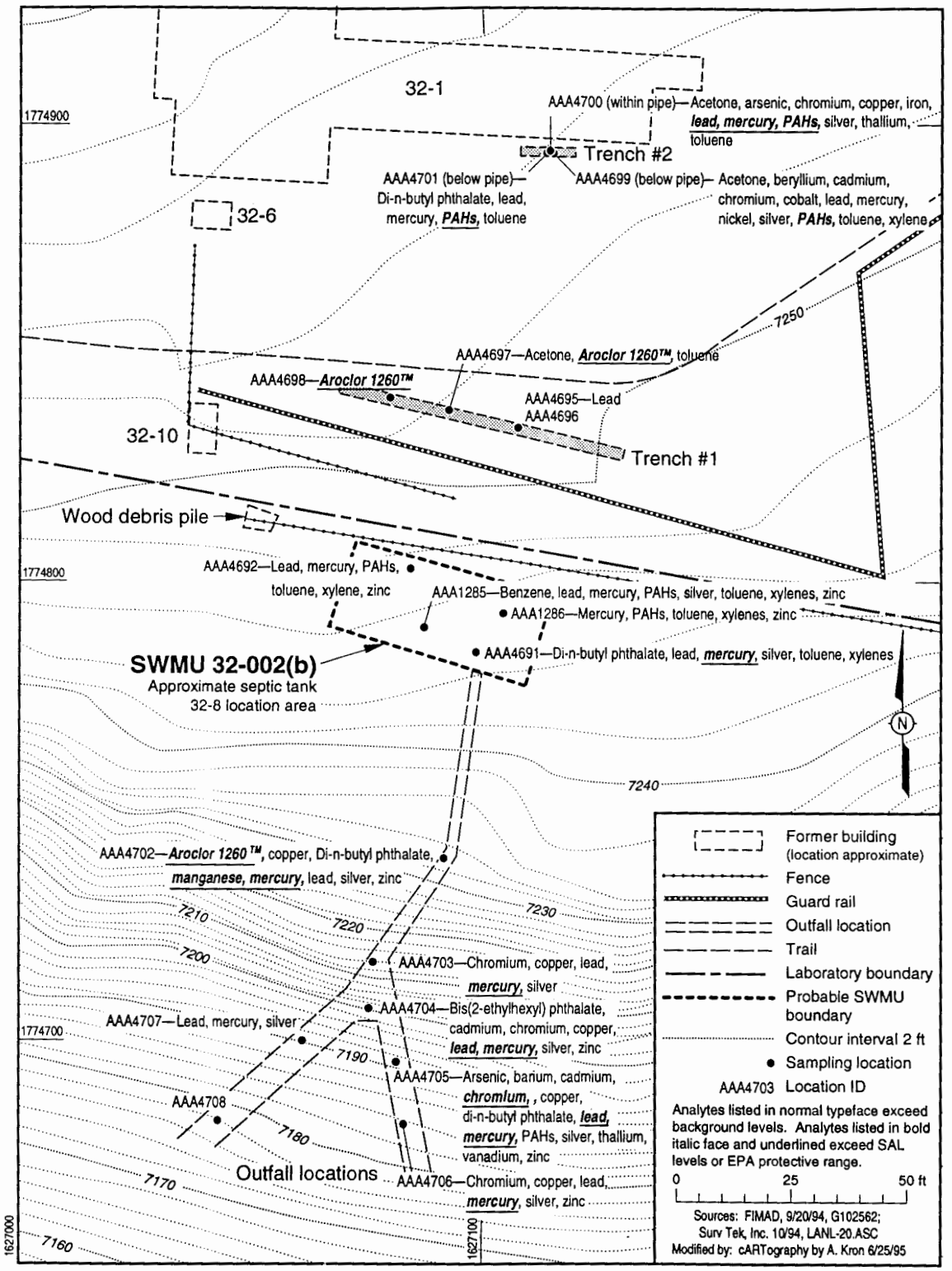


Fig. 4-7. Locations of detected organic analytes, inorganic analytes that exceed background UTLs, and all analytes that exceed SALs at SWMU 32-002(b).

Non-PAH Organics. Seven non-PAH organic analytes were detected at SWMU 32-002(b): Acetone, Aroclor 1260™, benzene, bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, toluene, and xylenes. The soil concentrations for these chemicals are presented in Table 4-10. The locations of samples with detected concentrations of organics analytes are shown on Fig. 4-7.

TABLE 4-10

NON-PAH ORGANIC ANALYTES DETECTED AT SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	DEPTH
Acetone	AAA4699	0.037	8 000	3.2 ft
	AAA4700	0.034	8 000	3.2 ft
Aroclor 1260™	AAA4697	1.0	1	1.7 ft
	AAA4698	1.0	1	1.5 ft
	AAA4702	17.0	1	0-15 in.
Benzene	AAA1285	0.01	0.67	0-4 in.
Di-n-butyl phthalate	AAA4701	0.46	8 000	3.2 ft
	AAA4716 (Duplicate of AAA4702)	0.68	8 000	0-15 in.
	AAA4717 (Duplicate of AAA4702)	0.81	8 000	0-15 in.
	AAA4719 (Duplicate of AAA4691)	0.48	8 000	4-6 ft
	AAA4705	0.92	8 000	0-5 in.
Bis(2-ethylhexyl) phthalate	AAA4704	5.5	50	0-4 in.
Toluene	AAA1285	0.029	910	0-4 in.
	AAA1286	0.013	910	4-6 in.
	AAA4691	0.011	910	4-6 in.
	AAA4691	0.029	910	4-6 in.
	AAA4697	0.011	910	1.7 ft
	AAA4699	0.023	910	3.2 ft
	AAA4700	0.012	910	3.2 ft
	AAA4701	0.0096	910	3.2 ft

TABLE 4-10 (CONTINUED)

NON-PAH ORGANIC ANALYTES DETECTED AT SWMU 32-002(b)

ANALYTE	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL[a]	DEPTH
Toluene	AAA4718 (duplicate of AAA4691)	0.018	910	4-6 in.
	AAA4719	0.012	910	4-6 in.
Xylenes	AAA1285	0.012	160 000	0-4 in.
	AAA1286	0.0095	160 000	0-4 in.
	AAA4692	0.039	160 000	4-6 in.
	AAA4699	0.028	160 000	3.2 ft
	AAA4718	0.0097	160 000	4-6 in.
	AAA4719	0.0098	160 000	4-6 in.

[a] SAL = Screening action level.
[b] UTL = Upper tolerance limit.
[c] MAX = There was an insufficient number of samples to calculate the UTL for this analyte; therefore, the maximum value in the background range was used.
[d] NA = No applicable SAL is available.

4.4.3.2 Screening Action Levels Comparison

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background UTLs or with no background data for comparison at SWMU 32-002(b).

Greater than or equal to SAL. Aroclor 1260™, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, chromium, indeno(1,2,3-cd)pyrene, lead, manganese, and mercury fall into the greater than or equal to SAL category.

No SAL. Arsenic, benzo(g,h,i)perylene, beryllium, iron, and phenanthrene fall into the no SAL category and are retained as COPCs. The SALs for arsenic and beryllium are below Los Alamos background concentrations and are not used.

Below SAL. Seventeen COPCs were detected at concentrations below their respective SALs: acetone, benzene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, cadmium, cobalt, copper, chrysene, di-n-butyl phthalate, fluoranthene, nickel, pyrene, silver, thallium, toluene, xylenes, and zinc. These seventeen COPCs are addressed in the multiple constituent evaluation, shown in Table 4-11.

TABLE 4-11

MULTIPLE CONSTITUENT EVALUATION FOR SWMU 32-002(b)

COPC[a]	MAXIMUM CONCENTRATION (mg/kg)	SOIL SAL[b] (mg/kg)	MAXIMUM CONCENTRATION ÷ SAL (NORMALIZED VALUES)
SAL BASED ON CARCINOGENIC EFFECTS			
Benzene	0.01	0.67	0.02
Benzo(k)fluoranthene	0.77	1.0	0.77
Bis (2-ethylhexyl) phthalate	5.5	50	0.11
Chrysene	2.0	96	0.02
Total Normalized Sum			**0.92**
SAL BASED ON NONCARCINOGENIC EFFECTS			
Acetone	0.04	8 000	5×10^{-06}
Bis(2-ethylhexyl) phthalate	5.5	1 600	0.0034
Cadmium	19	80	**0.24**
Copper	170	3 000	0.06
Di-n-Butyl Phthalate	2.0	8 000	3×10^{-08}
Fluoranthene	2.2	3200	0.0007
Nickel	260	1 600	**0.16**
Pyrene	4.1	2 400	0.002
Silver	200	400	**0.5**
Thallium	2.4	6.4	**0.38**
Toluene	0.03	910	3.3×10^{-05}
Xylenes	0.039	160 000	2×10^{-07}
Zinc	320	24 000	0.013
Total Normalized Sum			**1.35**

[a] COPC = Chemical of potential concern.
[b] SAL = Screening action level.

To evaluate multiple constituent effects for this data set, COPCs below their respective SALs were grouped according to their toxicological effects (carcinogenic or noncarcinogenic). SALs for all constituents were normalized to one and summed as described in Subsection 3.2.2. The results of the analysis based on carcinogenic effects is less than one at 0.92 indicating that potential resultant adverse human health effects from exposure are unlikely. Therefore, benzene, benzo(k)fluoranthene, chrysene, and bis(2-ethylhexyl phthalate are eliminated as COPCs. The results of the analysis based on noncarcinogenic effects is greater than one. The chemicals which contribute significantly to the normalized sum (cadmium, nickel, silver, and thallium) are retained as COPCs and highlighted in bold typeface in Table 4-11. Acetone, bis(2-ethylhexyl) phthalate,

di-n-butyl phthalate, fluoranthene, toluene, pyrene, xylenes, and zinc contribute negligibly to the normalized sum. Therefore, these chemicals are eliminated as COPCs.

4.4.4 Ecotoxicological Screening Assessment for SWMU 32-002(b)

The background comparisons summarized in Subsection 4.4.3.1 indicate that 14 inorganics exceeded their respective background UTLs at SWMU 32-002(b): arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, thallium, and zinc. PAHs, plus seven non-PAH organic analytes were detected: acetone, Aroclor 1260™, benzene, bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, toluene, and xylenes. These analytes were compared to their respective ESALs (Ebinger et al. 1994, 06-0102).

4.4.4.1 Ecological Screening Action Levels Comparison

Greater than ESALs. The soil sample values for arsenic, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, beryllium, bis(2-ethylhexyl) phthalate cadmium, chromium, chrysene, indeno(1,2,3-cd)pyrene, lead, manganese, mercury, nickel, silver, zinc, and Aroclor 1260™ all exceed their respective ESALs and are retained as COPECs. Table 4-12 shows the analytical results for samples with concentrations that exceed ESALs. The locations of analytes with values greater than ESALs and background levels are shown in Fig. 4-5.

No ESALs. There are no ESALs for cobalt, copper, iron, sodium, thallium, phenanthrene, benzo[a]anthracene, and di-n-butyl phthalate.

Below ESALs. Five COPCs for which ESALs exist (acetone, fluoranthene, pyrene, toluene, xylenes) were detected at concentrations below their respective ESALs. These COPCs are evaluated using a multiple constituent analysis presented in Table 4-13. The normalized sum for these contaminants is below one. Thus, the potential for adverse ecological effects is highly unlikely, regardless of whether the toxicological effects are or are not additive.

TABLE 4-12

SOIL SAMPLE VALUES ABOVE ESALs AT SWMU 32-002(b)

COPEC[a]	SOIL SAMPLE RANGE (mg/kg)	ESAL[b] RANGE (mg/kg)	TOXICITY
Aroclor	1.5-4	0.003-0.26	Carcinogen
Arsenic	1.1-2.5	0.0035-0.24	Systemic
Benzene	0.01	0.0458-196.7	Carcinogen
Benzo(a)pyrene	2.0	0.0002-0.78	Carcinogen
Benzo(b)fluoranthene	0.36-3.1	0.0012-5.2	Carcinogen
Benzo(g,h,i)perylene	1.3	0.008-36	Carcinogen
Benzo(k)fluoranthene	0.77	0.0028-12	Carcinogen
Beryllium	0.45 - 130	0.23 - 20.2	Carcinogen
Bis(2-ethylhexyl) phthalate	5.5	0.095-407.5	Carcinogen
Cadmium	0.53 - 19	0.002 - 0.187	Systemic
Chromium	1 - 440	1.0 - 5 503	Systemic
Chrysene	0.39-2.0	0.042-178	Carcinogen
Indeno(1,2,3-cd)pyrene	1.2	0.0078-3.4	Carcinogen
Lead	16 - 1 600	0.39 - 33.7	Systemic
Manganese	180 - 1 600	0.002 - 0.187	Systemic
Mercury	0.2 - 420	0.14 - 12.0	Systemic
Nickel	2 - 260	2.2 - 187	Systemic
Silver	2.6 - 200	0.0006 - 0.053	Systemic
Zinc	28 - 320	0.04 - 3.75	Systemic

[a] COPEC = Chemical of potential ecological concern.
[b] ESAL = Ecotoxicological screening action level.

TABLE 4-13

ECOLOGICAL MULTIPLE CONSTITUENT EVALUATION FOR SWMU 32-002(b)

COPEC[a]	MAXIMUM CONCENTRATION (mg/kg)	MINIMUM ESAL[b] (mg/kg)	MAXIMUM CONCENTRATION ÷ ESAL (NORMALIZED VALUES)
Acetone	0.04	43.4	0.0009
Fluoranthene	2.2	54	0.0407
Pyrene	4.1	33	0.1242
Toluene	0.029	97	0.0003
Xylenes	0.039	78	0.0005
Total			**0.1666**

[a] COPEC = Chemical of potential ecological concern.
[b] ESAL = Ecotoxicological screening action level.

4.4.5 Conclusions and Recommendations for SWMU 32-002(b)

The results of the human health screening assessment indicate that analyte concentrations that may pose an unacceptable risk are concentrated in the eastern drainage at sampling point AAA 4705. All of the inorganic COPCs (arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, thallium, and zinc) are present at this spot. Chromium and lead values at this spot were above their respective SALs. Mercury and silver were found at levels above background UTLs at the sampling points upgradient from this spot and, at lesser concentrations, downgradient from this spot (Fig. 4-7).

Radiological emissions from one soil sample, AAA 4705, were detected at a level slightly above background levels when it was screened in the field using a Ludlum Model 2221 with a Ludlum probe 44-9 (standard Geiger-Mueller). The instrument registered 200 cpm for this sample at the time of its collection, compared to background levels of 80 to 140 cpm. The sample was further analyzed by the MRAL and was found to contain a concentration of gamma radiation of 24.90 pCi/g, compared to an minimum detection activity for gamma radiation of 4.4 pCi/g. This sample was inadvertently not sent to a laboratory for isotopic analysis.

At the location of sample AAA4702, a soil sample taken at the mouth of the vitrified clay pipe, Aroclor 1260™ was detected at a concentration of 17 mg/kg. Copper, lead, mercury, silver, and zinc were also detected in this sample at levels above background levels, but below their

respective SALs (Fig. 4-7). Manganese was detected at levels above the background level and the SAL at this location.

Five chemicals, arsenic, beryllium, benzo(g,h,i)perylene, iron, and phenanthrene, remain a concern because they exceeded background levels and there is no applicable SAL available for comparison. Arsenic, detected above background in AAA4705 and AAA4700 was retained as a COPC. The concentrations of beryllium and iron exceeded background levels only within the pipe (AAA4700) and in the soil at the seam of the pipe (AAA4699); benzo(g,h,i)perylene was only detected within the pipe. If the pipe and surrounding soil are removed, these COPCs will be eliminated. Phenanthrene was detected in the pipe and at AAA1286. If the pipe is removed, phenanthrene will be eliminated as a concern at the location of the pipe. Because there are no published toxicological values for phenanthrene, it can only be compared to urban background values. The value of phenanthrene at AAA1286 was 0.4 mg/kg, compared to urban background of 24.2 mg/kg. Therefore, phenanthrene is eliminated as a COPC.

It is appropriate to compare PAHs detected at the septic tank and outfall locations with urban background levels because they are not contained within a closed piping system. All PAHs detected outside the pipe were within background and SAL levels. Therefore, they are eliminated as COPCs. The only PAHs detected above SAL were within the pipe. If the pipe is removed, PAHs will be eliminated as a concern.

The results of the ecotoxicological screening assessment indicate that residual contamination is of ecological concern. Residual contamination might be transported into Los Alamos Canyon, where it could interact with contaminant discharges from other sources to cause cumulative effects. From an ecological perspective, further sampling is recommended to define the nature and extent of the contamination.

As described above, the Phase I investigation did not fully bound the extent of contamination in the outfall associated with SWMU 32-002(b). The presence of heavy metals in the outfall area and the possibility of radiological contamination substantiates the need for further sampling and analysis both in the septic tank outfall area and in the drainage channels into Los Alamos Canyon. Therefore, further sampling is recommended to define the nature and extent of the contamination found in the outfall area at SWMU 32-002(b). From an ecological perspective, this proposed sampling should aim towards determining the impact of any potential contamination to the biota. More generally, the proposed sampling should ultimately support a recreational risk assessment for the outfall area. The initial should also aim to detemine the nature and volume of waste associated with removal of the pipe. The Phase II Work Plan, Subsection 5.0, addresses this recommendation.

4.5 SWMU 32-004: Building TA-32-3 Drain Line and Outfall

4.5.1 Drain Line Description

Recent evaluation of engineering drawings revealed the location of a vitrified clay drain line believed to have served a room adjacent to a radiation source room in building TA-32-3 (Engineering drawing ENG4-C552, A5-C116, and A5-C117). The line lead directly to an outfall located at the edge of the mesa. This line did not pass through a septic tank. Rather, it discharged directly to the hillside in Los Alamos Canyon. It is unknown if the pipe remains in place.

4.5.2 Field Investigation and Sampling Activities

No sampling activities were conducted at this site during the Phase I investigation, and no previous investigations are documented.

4.5.3 Conclusions and Recommendations for SWMU 32-004

A Phase II investigation is recommended to define the location of the drain line associated with building TA-32-3. The Phase II investigation will include the collection of samples in the outfall beneath the drain line discharge point from building TA-32-3. Additional samples will be taken in the soil at the location of the former source room. If contamination is found at these locations, additional sampling will be conducted to determine the nature and extent of the contamination. The Phase II Work Plan, Subsection 5.0, addresses these recommendations.

5.0 PHASE II WORK PLAN

Sampling was conducted at TA-32 in September of 1993, as specified by the RFI Work Plan for OU 1079 (LANL 1992,0783). The purpose of the Phase I sampling and analysis was to determine whether any residual radioactive or nonradioactive contaminants remained at the site. The Phase I investigation was also intended to determine if any of the septic tanks and associated septic lines remained at the site, and, if found, remove them.

The Phase I investigation consisted of reconnaissance sampling of the areas most likely to be contaminated if a release had occurred. These areas were: the former incinerator location (SWMU 32-001), the suspected location of a former septic tank and its associated outfall [SWMU 32-002(a)], and the location of another septic tank, its inflow piping, and its associated outfall on the north side of Los Alamos Canyon [SWMU 32-002(b)].

Archival research subsequent to the Phase I investigation produced an engineering drawing showing that the location thought to be SWMU 32-002(a) was actually a location downgradient

from the former transformer (Engineering drawing A5-C117). Therefore, no samples were collected at the actual location of SWMU 32-002(a) during the Phase I investigation. SWMU 32-002(a) will be investigated as part of the Phase II investigation. The area downgradient from the former transformer location, where the sampling actually occurred, along with the former transformer location, has been designated SWMU 32-003.

The engineering drawing also indicated an additional drain line and outfall leading from building TA-32-3. There are no documented investigations of this drain line and outfall. The drain line is believed to have served a room adjacent to a radioactive source room. The area that previously contained the radioactive source, as well as the drain line and associated outfall, have subsequently been designated as SWMU 32-004.

A Phase II investigation has been recommended at TA-32. The objectives of this investigation will be to: 1) determine the extent of the PCBs detected at the former incinerator location, SWMU 32-001, 2) define the nature and extent of contamination associated with the inlet pipe, former septic tank location, outfall area, and runoff channels associated with SWMU 32-002(a), 3) define the nature and extent of contamination associated with the inlet pipe, outfall area, and runoff channels associated with SWMU 32-002(b), 4) investigate the extent of PCB contamination at the former transformer location, SWMU 32-003, and 5) characterize the newly identified source room, drain line, and outfall at SWMU 32-004.

The actions taken and analytes chosen during the Phase II investigation will be dictated by the level and distribution of contamination found during the field activities and during the Phase I investigation. If site characterization activities present obvious remedies for any of the sites, a corrective action may be implemented. This chapter describes the technical approach that will be used during Phase II sampling activities at TA-32.

5.1 Site Geology

The site geology and topography drive the outfall sampling strategy at SWMUs 32-002(b), 32-002(a), and 32-004. This subsection describes the geology and topography at TA-32 and explains the rationale used to determine Phase II sampling locations.

The mesa at TA-32 is developed on Bandelier tuff, which forms cliff faces that descend from the mesa edge. The outfall pipes associated with SWMUs 32-002(a,b) discharged over one of these cliffs. The slope below the discharge point is characterized by thin sediment and vegetation cover. This slope descends to a lower cliff, and another slope descends from the lower cliff to the

flat alluvial floor of the canyon. No sediment catchment areas were identified on any of the bare rock cliffs.

Phase I sampling of the outfall area was limited to the upper slope. The drainages that have developed on this slope are shallow, narrow, and discontinuous. Where the drainages are well defined, no sediment catchment basins are present. Minor catchments occur between talus boulders and, in some cases, within the thin alluvial fans on the slopes.

The main drainage from TA-32 divides near the top of the upper slope (Fig. 5-1). At this point the major drainage is to the west. There were no analytes detected at levels exceeding background UTLs in samples from the western drainage, while samples from the smaller eastern drainage had elevated concentrations of metals. At the base of the upper slope, drainages from above flow over the cliff in two separate areas and discharge onto the fan-shaped slope at the base of the lower cliff. One of these drainages flows to the east and the other slightly to the west before entering the ephemeral main channel of Los Alamos Canyon. Both of the drainages on the lower slope will be sampled during the Phase II investigation.

5.2 Phase II Work Plan

5.2.1 Conceptual Exposure Model

A conceptual site model was developed for the TA-32 SWMUs to identify the location and magnitude of sampling needed to accurately characterize each site. The conceptual site model identifies historical sources of environmental release, migration pathways, potential current sources, potential release mechanisms, contact media, and exposure routes for contaminants at TA-32 (Fig. 5-2). The conceptual site model for TA-32 is based on information currently available. Further refinement or development of separate models may be necessary based on data gathered during the Phase II investigation.

Chemicals or radionuclides at TA-32 may have been released into the environment via drainages, outfalls, spills, leaks, or deposition of incinerator emissions. After potential contaminants have been released into the environment, they might migrate via: 1) liquid infiltration into near-surface or subsurface soils that may reach groundwater (via faults) or surface water (via seeps); 2) volatilizaton into ambient air; 3) wind entrainment of contaminated dust and deposition onto surface soils; and 4) surface water runoff resulting in the contamination of sediments in drainage channels. The environmental media that may be contacted by receptors and the resulting potential exposure pathways are described below.

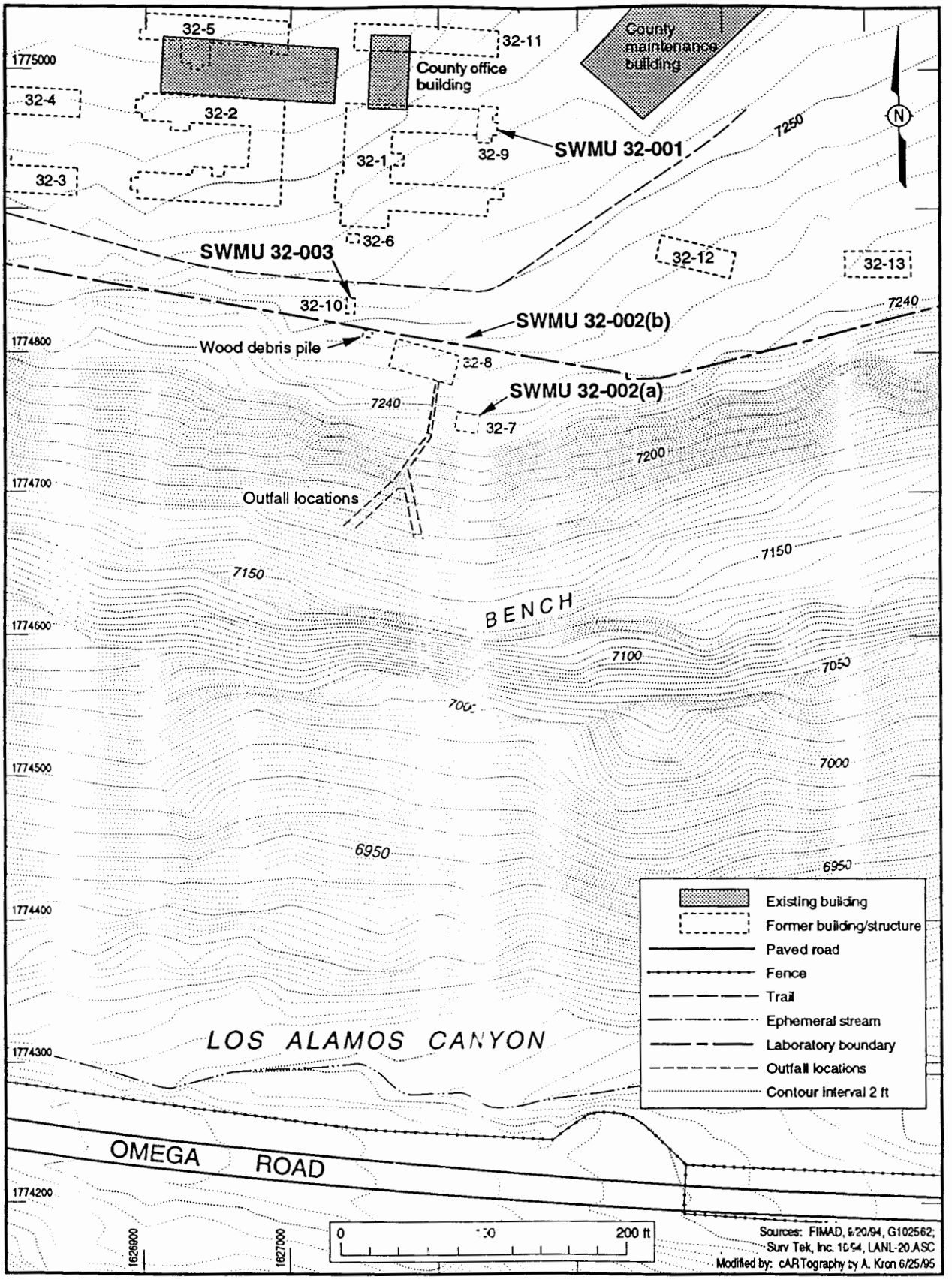


Fig. 5-1. Geomorphic setting of TA-32.

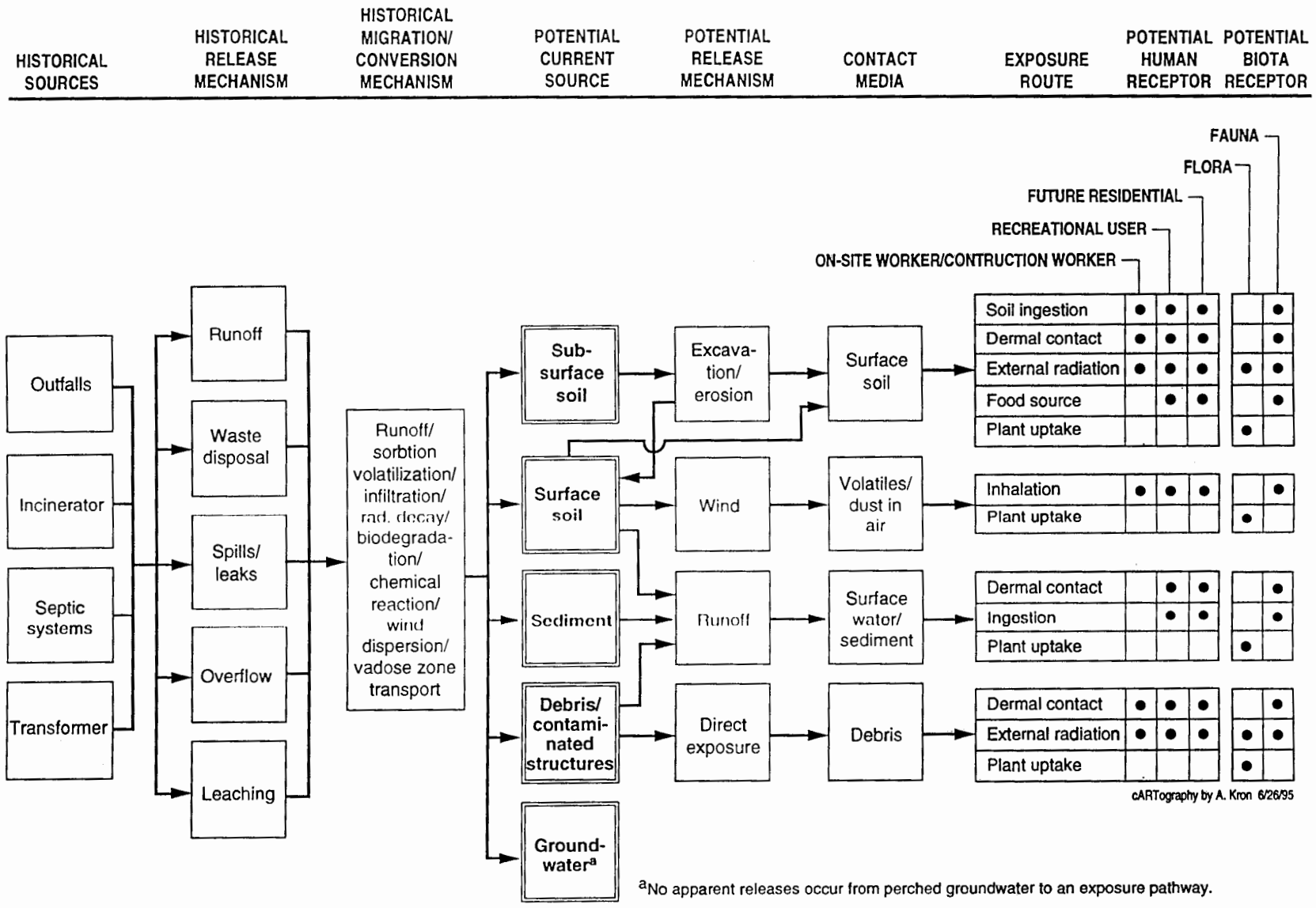


Figure 5-2. Conceptual site model for TA-32.

5.2.1.1 Potential Human Exposure

The environmental media through which human exposure could occur include soil, air, surface water and sediments, and debris. There is no surface water at TA-32. Runoff from the site due to rain and snow melt flows into Los Alamos Canyon, where there is an intermittent stream. Although contaminants could migrate to perched groundwater via faults or fractures, such perched groundwater does not present a potential human exposure pathway because the main aquifer, at more 1 000 to 1 200 ft below the site, is the only aquifer used for domestic water supply. It is highly unlikely that contaminants could migrate to this depth. Subsection 2.3 discusses the hydrology of the main aquifer beneath TA-32. Currently, there are no groundwater wells on site.

If environmental media are found to be contaminated and SALs are exceeded, the potential for human exposure to these contaminants will be quantified in a baseline risk assessment. Human exposure may be estimated for both current and future land use assumptions.

Currently, TA-32 is used by the Los Alamos County Roads Division as a storage yard. Future land use could include 1) continued use by the county, 2) future residential use of the mesa top area, and 3) recreational use of the hillside area. Assumptions made for these three land-use scenarios are described below.

5.2.1.1.1 Continued Use by Los Alamos County Roads Division Scenario

In the foreseeable future, land use at TA-32 is likely to be similar to current use of the site. Populations of on-site workers (individuals who work on or near the site) and construction workers (individuals who would be exposed to near-surface and subsurface soils through various activities including excavation) are likely to be the reasonably maximum-exposed individuals in the continued Los Alamos County operations exposure scenarios. The continued county use scenario is applicable to all of the TA-32 SWMUs.

On-site workers are expected to be routinely exposed to contaminated media (wind entrained contaminants in dust); therefore, this scenario is considered a reasonable maximum exposure scenario for current use conditions. Surface contamination above SALs will be evaluated for both current and future risks in a baseline risk assessment using the on-site worker scenario.

The construction worker is expected to be exposed to subsurface contamination during excavation activities. Once subsurface soil is excavated and brought to the surface, on-site workers could also be exposed. Therefore, subsurface contaminants above SALs will be evaluated in a baseline risk assessment using the future construction worker and future on-site worker scenarios.

Exposure routes relevant to workers include: 1) inhalation of fugitive dust or volatile compounds; 2) incidental ingestion of contaminated soils; 3) direct dermal contact with contaminated soils; and 4) external radiation (Table 5-1).

TABLE 5-1

SUMMARY OF EXPOSURE ROUTES IN THE CONTINUED COUNTY USE SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by soil disturbances (i.e., bulldozers, trucks and other earth-moving equipment) during construction activities • Construction activities may expose subsurface chemicals to the surface (i.e., excavation) • There may be volatile organic compounds in near-surface and subsurface soils that would contribute to the inhalation exposure • For dust transport indoors, it can be assumed that indoor concentrations are less than those outdoors • For vapor transport indoors, concentrations indoors and outdoors can be assumed to be equivalent, except at sites where subsurface soil gases are entering indoors; in this case, vapor concentrations inside could exceed those outdoors
2. Incidental ingestion of soil	• Incidental soil ingestion of surface or subsurface soils may occur as a result of construction activities • Office workers would be expected to contact much less soil and dust than construction workers
3. Dermal contact with soil	• Skin surface area available for contact with soil includes arms, hands, face, and head
4. External radiation	• Irradiation from radionuclides on the ground surface may occur

5.2.1.1.2 Residential Scenario

Future residential use is an unlikely land-use scenario for TA-32; however, residential development cannot be ruled out, so this scenario must be considered. Potential future on-site residents would be exposed routinely to near-surface soils through activities such as recreation and gardening. Therefore, this is considered a conservative exposure scenario for TA-32. Surface contamination above SALs will be evaluated in a baseline risk assessment using the conservative on-site residential scenario. The residential scenario is applicable to all of the mesa top SWMUs at TA-32.

The on-site resident might also be exposed to subsurface contamination if it is brought to the surface during excavation for a home, or to subsurface volatile contamination that migrates in vapor form into the on-site residence. Therefore, subsurface contaminants above SALs will be evaluated in a baseline risk assessment using the on-site residential scenario.

The potentially applicable exposure routes for a residential scenario are described in Table 5-2. Construction workers building future residences would be exposed by the same routes discussed in the continued Los Alamos County use scenario.

TABLE 5-2

SUMMARY OF EXPOSURE ROUTES IN THE RESIDENTIAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by wind and outdoor activities (e.g., gardening) • There may be volatile constituents on site that would contribute to the inhalation exposure
2. Incidental ingestion of soil	• Incidental soil/sediment ingestion may occur as a result of outdoor activities (standard daily soil ingestion rates for adults and children are used)
3. Dermal contact with soil	• Skin surface area available for contact with soil includes arms, hands, face, legs, upper body, and head
4. External radiation	• Irradiation from radionuclides on the ground surface may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after rainfall event before it seeps into the ground
6. Accidental ingestion of surface water	• Ephemeral streams may be present in the canyon bottom as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after rainfall event before it seeps into the ground
7. External radiation	• Irradiation from radionuclides on the ground surface may occur
8. Ingestion of produce grown on site	• Thirty percent of produce eaten at the residence is grown at the residence.

5.2.1.1.3 Recreational Scenario

The recreational scenario is the most probable future scenario for the canyon wall or canyon bottom. Recreational use might include camping, hiking, and hunting. The outfalls from the septic tanks [SWMUs 32-002(a,b] and the outfall from the former laboratory in building TA-32-3 (SWMU 32-004) are the primary potential release sites (PRSs) that might be contaminant sources for the recreational scenario. All have surface runoff into drainage channels and sediment traps beginning at the mesa top and continuing to the toe of the hill slope.

Exposure routes associated with recreational activities include: 1) inhalation of fugitive dust; 2) soil ingestion; 3) dermal contact with soil; 4) external radiation; 5) dermal contact with surface water; 6) incidental ingestion of surface water; and 7) ingestion of contaminated edible plants (e.g. pinion nuts and berries). Recreational exposure routes are further described in Table 5-3.

TABLE 5-3

SUMMARY OF EXPOSURE ROUTES IN THE RECREATIONAL SCENARIO

EXPOSURE ROUTE	ASSUMPTIONS
1. Inhalation of ambient air (fugitive dust or volatiles)	• Fugitive dust is generated by the wind and during recreational activities (e.g., dirt biking) • There may be volatile constituents on site that would contribute to the inhalation exposure
2. Incidental ingestion of soil/sediment	• Incidental soil/sediment ingestion of surface soil or sediments may occur as a result of recreational activities (standard daily soil ingestion rates for adults and children are used)
3. Dermal contact with soil/sediment	• Skin surface area available for contact with soil includes arms, hands, face, legs, upper body, and head (the camping event occurs in warm weather).
4. External radiation	• Irradiation from radionuclides on the ground surface may occur
5. Dermal contact with surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
6. Accidental ingestion of surface water	• Ephemeral streams may be present as a result of snowmelt and summer rainfall • Rainfall events result in pooled water • Standing water occurs after the rainfall event before it seeps into the ground
7. Ingestion of edible plants	• Edible plants (such as pinion nuts or berries) growing at the site may have taken up contaminants from soil/runoff

5.2.2 Data Needs and Data Quality Objectives

Phase II sampling is proposed for five SWMUs at TA-32: SWMU 32-001, SWMUs 32-002(a,b), SWMU 32-003, and SWMU 32-004. The data quality objectives for the Phase II investigation are presented in the following subsections. Subsection 5.2.2.1 presents the data quality objectives for the investigation of SWMUs 32-001 and 32-003, where PCBs were identified during Phase I sampling and a decision of whether or not to implement a voluntary corrective action (VCA) will be made during the Phase II investigation. Subsection 5.2.2.2 presents the data quality objectives for the investigation of the drain lines associated with SWMUs 32-002(a,b) and SWMU 32-004, where a decision of whether or not to implement a VCA will be made during the Phase II investigation. Subsection 5.2.2.3 presents the data quality objectives for the investigation of the septic tanks and outfalls associated with SWMUs 32-002(a) and 32-003, where a combined screening assessment and risk assessment strategy is planned. Lastly, Subsection 5.2.2.4 presents the data quality objectives for the investigation of the outfall associated with SWMU 32-002(b), where samples will be collected to support a risk assessment.

5.2.2.1 Data Quality Objectives for Phase II Investigation of SWMUs 32-001 and 32-003

During the Phase I investigation at SWMUs 32-001 and 32-003, PCBs were detected at levels exceeding 1 mg/kg, which is the recommended cleanup level for property of unrestricted use (McCann 1994, 1145). A limited number of samples were collected at these SWMUs during the Phase I investigation. Therefore, additional samples will be collected during the Phase II investigation to meet the recommendations in the EPA guidance document on PCB spill verification (EPA 1985, 06-0117).

It is unclear if the source of the PCBs detected during the Phase I investigation is historical activities at TA-32 or more recent activities that occurred after the property was released to Los Alamos County. The proposed sampling will collect samples at several depths to determine when the PCBs were introduced at the site. If the depth of the PCBs proves to be above the level of the former site, the need for a VCA at these SWMUs will be reconsidered. If the source of the PCBs is linked to historical activities at TA-32, the 95th percentile upper confidence limit (UCL) of the mean of all PCB data for each SWMU will be calculated and compared to the cleanup values. If PCBs levels at these SWMUs exceed 1 mg/kg at a depth of 0 to 10 in., or 10 mg/kg at a depth of greater than 10 in., a VCA will be conducted. If the additional sampling does not identify PCBs above these cleanup levels, no further action will be proposed for these SWMUs.

The EPA sampling strategy for estimating the extent of PCB contamination is to lay out a grid that is centered over the spill. This grid is based on a calculation that determines the minimum size of PCB spill that will be detected at a given grid spacing. Since SWMUs 32-001 and SWMU 32-003 are both relatively small (approximately 20 ft in diameter) seven sampling locations will detect any spill that is 10 ft in diameter or larger. To determine the source of the PCBs and support the potential VCA, each sampling location must be sampled at three depth intervals: 0 to 5 in., 5 to 10 in., and 10 to 15 in. Each sample will be screened for radioactivity (gross alpha, beta, and gamma). If the gross radioactivity measurements indicate the presence of radiological contamination, the sample will be analyzed for selected radioisotopes depending on the type of radioactivity detected. These radioisotopes include tritium, carbon-14, uranium-234, -235, and -238, plutonium-238 and -239/240, and americium-241.

5.2.2.2 Data Quality Objectives for Phase II Investigation of Drain Lines at SWMUs 32-002(a,b) and 32-004

The Phase II investigation of the drain lines at SWMUs 32-002(a,b) and 32-004 has two main objectives. The first objective is to determine for waste characterization purposes whether hazardous or radioactive constituents are present inside the drain lines. The second objective is to determine if a release of hazardous or radioactive constituents has occurred from the drain lines. These two objectives will determine whether the VCA at these SWMUs should include removal of the drain lines.

Geophysical surveys will be used to determine the specific length and location of the drain lines for SWMUs 32-002(a,b) and 32-004. Once the lengths and locations of the drain lines have been determined, trenches will be excavated to provide access points to the drain lines. The number of trenches and their locations will be chosen on the basis of professional judgment, based on the drain line's length and the likely locations of sediment accumulation within each drain line.

The number and locations of samples needed for characterization of the wastes that would be generated during removal of the drain lines are determined on the basis of professional judgment. This judgment is based on the length and composition of the drain line, and on the Phase I toxicity characteristic leaching procedures (TCLP) metals data. If any gaps or leaking joints are detected in the drain line, the soil or tuff at the location of the gap or leak will be sampled. If no indications of leakage are detected, one sample per trench will be collected below the drain line and analyzed for hazardous constituents.

Since the Phase I TCLP metals data do not indicate the presence of hazardous constituents, one sample of sediment will be collected from each trenched access point. Each of these samples will

represent as large a volume of the sediment in the pipeline as practical. The samples will be analyzed for TCLP metals and screened for radioactivity (gross alpha, beta, and gamma). If the gross radioactivity measurements of a sample exceeds background levels, that sample will be analyzed for selected radioisotopes depending on the type of radioactivity detected. These radioisotopes include tritium, uranium-234, -235, and -238, plutonium-238 and -239/240, carbon-14, and americium-241. Samples collected outside of the drain line will be analyzed for TAL metals, VOCs, and SVOCs and screened for radioactivity (gross alpha, beta and gamma). If the gross radioactivity measurements of a sample indicate the presence of radiological contamination, that sample will be analyzed for selected radioisotopes depending on the type of radioactivity detected. These radioisotopes include tritium, uranium-234, -235, and -238, plutonium-238 and -239/240, carbon-14, and americium-241.

5.2.2.3 Data Quality Objectives for Phase II Investigation of Septic Tank and Outfall Areas at SWMUs 32-002(a) and 32-003

The Phase II investigation at the septic tank and outfall areas of SWMUs 32-002(a) and 32-003 is intended to support both a screening assessment and a risk assessment. The goal of the screening assessment is to compare site results to conservative risk-based SALs. Quick-turnaround methods will be used to conduct the screening assessment for portions of these two PRSs that were not sampled during the Phase I investigation. If COPCs are identified, additional samples will be collected, if necessary, to support a risk assessment. These additional samples will be collected during the same field mobilization. The risk assessment will be based on a residential exposure scenario for the areas of these PRSs on the mesa, and a recreational scenario for the areas on the canyonside. Additional data to support the risk assessment will be based on the spatial distribution of the COPCs identified by the screening assessment relative to the potential exposure units. A minimum of four samples will be collected in each exposure unit (500 m^2 for the residential scenario and 2 000 m^2 for the recreational scenario). Additional samples may be collected if the variability of COPCs within the exposure units is greater than currently expected. For example, if additional source areas of contamination are located during the Phase II investigation, variability of COPCs will be greater than currently anticipated.

The initial sample locations for SWMU 32-002(a) and 32-003 will be based on the most likely sediment accumulation areas adjacent to the outfalls, and the location of the former septic tank. Samples will be analyzed for TAL metals and screened for radioactivity (gross alpha, beta, and gamma). SWMU 32-002(a) samples will be analyzed additionally for SVOCs and PCBs. If the gross radioactivity measurements of a sample indicate the presence of radiological contamination, that sample will be analyzed for selected radioisotopes depending on the type of radioactivity

detected. These radioisotopes include tritium, carbon-14, uranium-234, -235, and -238, plutonium-238 and -239/240, and americium-241.

5.2.2.4 Data Quality Objectives for Phase II Investigation of the Outfall Area at SWMU 32-002(b)

The Phase I investigation in the outfall area at SWMU 32-002(b) identified localized areas where concentrations of certain analytes (metals and Aroclor 1260™) exceeded their respective SALs. The Phase II investigation will supplement the Phase I data in order to bound the extent of the contamination sufficiently to support a recreational scenario risk assessment. A minimum of four samples will be collected from each exposure unit (2 000 m^2 for the recreational scenario). Additional samples may be collected if the variability of COPCs within the exposure units is greater than currently expected. For example, if additional source areas of contamination are located during the Phase II investigation, variability of COPCs will be greater than currently anticipated.

The Phase II samples for SWMU 32-002(b) will be collected downgradient from the source term along the most likely pathways of COPC migration to support an evaluation of the risk. The proposed sampling locations will be biased by the topographic and geological features to best delineate COPC migration from the source area. Samples will be analyzed for TAL metals, PCBs, and SVOCs, and screened for radioactivity (gross alpha, beta, and gamma). If the gross radioactivity measurements of a sample indicate the presence of radiological contamination, that sample will be analyzed for selected radioisotopes depending on the type of radioactivity detected. These radioisotopes include tritium, carbon-14, uranium-234, -235, and -238, plutonium-238 and -239/240, and americium-241.

5.2.2.5 Analytical Strategy for the Phase II Investigation

The Phase II investigation at TA-32 will rely heavily on field-based laboratory results for site characterization decisions. The immediate availability of the data will provide flexibility in the field to assure that characterization is completed during this phase of the investigation. It will also allow the possibility of taking immediate corrective action at sites where a simple and obvious remedy is available. Where appropriate, confirmation samples will be collected and analyzed using Level III analytical procedures. Waste management decisions regarding RCRA hazardous wastes will also rely on Level III analyses.

The MRAL will be on site to conduct analyses for gross alpha, beta, and gamma radiation. Extended count times (compared to the standard five minute count) will be implemented to lower the detection limits and reduce the relative error. If possible, sample preparation, such as sample digestion, will also be performed to further reduce the detection limits. This will provide a more

sensitive screening for radioactive components. Any sample results that indicate the presence of radioactive contamination will be further analyzed.

5.2.2.6 Sample Quality Assurance and Quality Control

Appropriate QC samples, including blanks, replicates, and rinsates, will be submitted to the analytical laboratory to provide the means to assess the quality of the data resulting from the Phase II field sampling program. Blank samples will be analyzed to determine whether procedural contamination and ambient conditions at the site may have caused sample contamination. Replicate samples will be analyzed to verify sampling and analytical reproducibility.

5.2.3 SAMPLING PLAN

5.2.3.1 SWMU 32-001: Former Incinerator Location

The objective of the Phase II investigation at the former incinerator will be to further characterize the extent of the PCB contamination detected during the Phase I sampling. A total of twenty-one samples will be collected and analyzed for PCBs in the mobile chemistry analytical laboratory (MCAL), and for gross alpha, beta, and gamma radiation in the MRAL. Seven sample locations (six perimeter and one center point) will be established surrounding the location where the Phase I investigation identified PCBs (Fig. 5-3). Samples will be collected from three depth intervals at each location: 0 to 5 in., 5 to 10 in., and 10 to 15 in. The 0-in. point will be considered to be the asphalt/fill interface. Samples depths might decrease if the soil/tuff interface is reached; sample depths might increase if soil staining is evident or field screening instrument readings indicate the presence of contaminants. If the radiation screening results indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-4.

If the results provided by the field laboratory indicate a limited extent of PCB contamination and the analytical results are above TSCA cleanup levels for PCBs, then a corrective action may be implemented to remove contaminated soil.

TABLE 5-4

PHASE II SAMPLE LOCATIONS FOR SWMU 32-001

SAMPLE LOCATION	LOCATION DESCRIPTION	DEPTH	FIELD SCREENING/ FIELD ANALYSIS
1	Center of array, adjacent to AAA 4690	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
2	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
3	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
4	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
5	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
6	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
7	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]

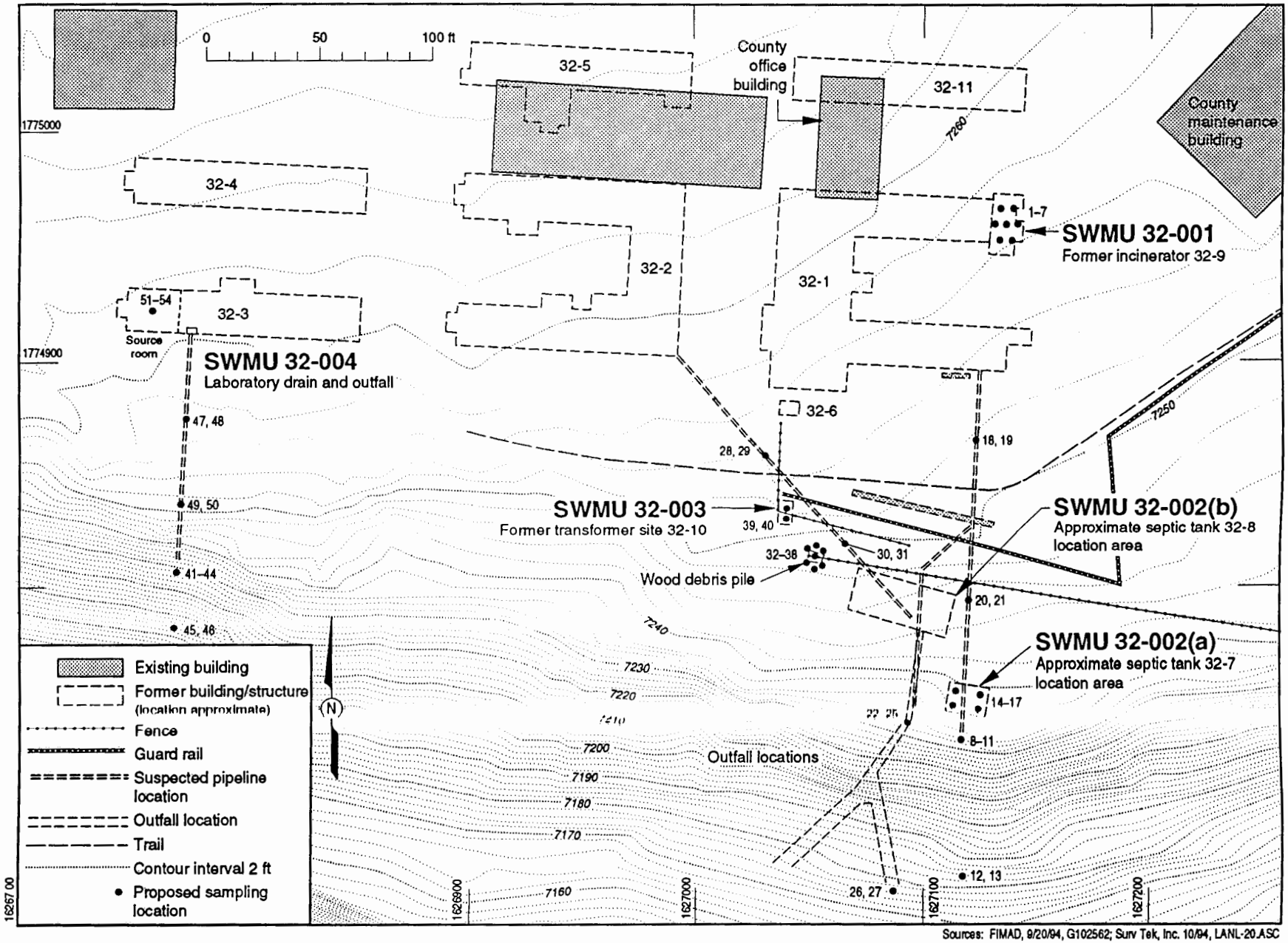
[a] Samples will be will be further analyzed for select radionuclides if field results indicate the presence of rad contamination

5.2.3.2 SWMU 32-002(a): Septic Tank 32-7, Inflow Line(s), and Outfall

The objective of the investigation at SWMU 32-002(a) is to locate and characterize the former septic tank, any associated septic system lines, and the associated outfall. Geophysics, air photos, and archival engineering drawings will be used to determine the locations of each of these features.

Septic Tank 32-7. One sample location will be established in each of four quadrants of the former septic tank footprint (Fig. 5-3). Samples will be collected at each location from the soil/tuff interface, which is expected to be less than 2 ft bgs. If the results from these samples indicate the presence of contamination, additional samples may be collected from locations adjacent to the septic tank footprint.

Samples will be analyzed for SVOCs, PCBs, and TAL metals using the MCAL, and for gross alpha, beta, and gamma radiation using the MRAL. If gross radiation analyses indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures.



Sources: FIMAD, 9/20/94, G102562; Surv Tek, Inc. 10/94, LANL-20.ASC
Modified by: cARTography by A. Kron 6/25/95

Fig. 5-3. Proposed Phase II sampling locations.

Inflow Pipe. Non-intrusive geophysical methods and archival resources such as air photos and engineering drawings will be used to locate the inflow pipe. Non-intrusive methods will be supplemented with exploratory trenches in areas where the pipe is suspected to be located. If a pipe is located, the contents will be sampled to determine if there is contamination within the pipe. Samples will also be collected from soil surrounding the pipe to evaluate the possibility of historical releases. These sample locations will be determined judgmentally (Fig. 5-3).

Samples will be analyzed for VOCs, SVOCs, PCBs, and TAL metals in the MCAL, and for gross alpha, beta, and gamma radiation using the MRAL. Samples collected for waste management purposes will also be analyzed for TCLP metals. If the gross radiation analyses indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-5.

If field analytical results indicate a limited extent of contamination and no potential waste management problems exist due to the nature of the contaminants, and if an obvious remedy is available, then a corrective action may be implemented to remove the inflow pipe. At least four verification samples will be collected in the trench after the pipe is removed.

Outfall Area. The outfall area will be characterized by focusing on the upper portion of the hillside near the former location of the mouth of the outfall pipe. At least four samples will be collected at that location (Fig. 5-3). Areas of sediment accumulation below the outfall will also be evaluated using the field-screening results. Two additional samples will be collected at the base of the hillside to bound the extent of any contamination that is found. The samples will be analyzed for SVOCs, PCBs and TAL metals in the MCAL, and for gross alpha, beta, and gamma radiation in the MRAL. If gross radiation screening indicates the presence of radiological contamination, samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-5.

If relatively small and distinct areas of contamination are discovered during the field operations and a human health or ecological risk is determined, a corrective action may be implemented to remove contaminated soil.

TABLE 5-5

PHASE II SAMPLE LOCATIONS FOR SWMU 32-002(a)

SAMPLE LOCATION	LOCATION DESCRIPTION	SAMPLE DEPTHS	FIELD SCREENING/ FIELD ANALYSIS
Outfall			
8	Near mouth of outfall, judgemental	0-6 in.	SVOCs, PCBs, TAL Metals, Rad[a]
9	Near mouth of outfall, judgemental	0-6 in.	SVOCs, PCBs, TAL Metals, Rad[a]
10	Near mouth of outfall, judgemental	0-6 in.	SVOCs, PCBs, TAL Metals, Rad[a]
11	Near mouth of outfall, judgemental	0-6 in.	SVOCs, PCBs, TAL Metals, Rad[a]
12	Base of slope/sed accum area, judgemental	0-6 in.	SVOCs, PCBs, TAL Metals, Rad[a]
13	Base of slope/sed accum area, judgemental	0-6 in.	SVOCs, PCBs, TAL Metals, Rad[a]
Tank			
14	Northwest quadrant of tank footprint	Soil/tuff interface (approx. 1 foot)	SVOCs, PCBs, TAL Metals, Rad[a]
15	Northeast quadrant of tank footprint	Soil/tuff interface (approx. 1 foot)	SVOCs, PCBs, TAL Metals, Rad[a]
16	Southeast quadrant of tank footprint	Soil/tuff interface (approx. 1 foot)	SVOCs, PCBs, TAL Metals, Rad[a]
17	Southwest quadrant of tank footprint	Soil/tuff interface (approx. 1 foot)	SVOCs, PCBs, TAL Metals, Rad[a]
Inflow Pipe			
18	Interior of pipe	NA	VOCs, SVOCs, PCBs, TAL Metals, Rad[a], TCLP
19	In trench/Soil surrounding pipe	depth of pipe (approx. 3 feet)	VOCs, SVOCs, PCBs, TAL Metals, Rad[a], TCLP
20	Interior of pipe	NA	VOCs, SVOCs, PCBs, TAL Metals, Rad[a], TCLP
21	In trench/Soil surrounding pipe	depth of pipe (approx. 3 feet)	VOCs, SVOCs, PCBs, TAL Metals, Rad[a], TCLP

[a] Samples will be further analyzed for select radionuclides if field results indicate the presence of radiological contamination.

5.2.3.3 SWMU 32-002(b): Septic Lines and Outfall

The objective of the investigation of SWMU 32-002(b) will be to further characterize the inflow pipe(s) and determine the extent of contamination found in the outfall area during the Phase I investigation.

Inflow Pipe(s). Non-intrusive geophysical methods and archival resources such as air photos and engineering drawings will be used to help to locate the inflow pipe(s) associated with the septic tank at SWMU 32-002(b). Non-intrusive methods will be supplemented with exploratory trenches in areas where the pipe is suspected to be located. If a pipe is located, the contents will be sampled to determine the nature of any contamination in the pipe. Samples will also be collected from soil surrounding the pipe to evaluate the possibility of historical releases. These sample locations will be determined judgmentally (Fig. 5-3). Samples will be analyzed for SVOCs, VOCs, PCBs, and TAL metals in the MCAL, and for gross alpha, beta, and gamma radiation in the MRAL. Samples collected for waste management purposes will also be analyzed for TCLP metals. If the gross radiation analyses indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-6.

If field analytical results indicate a limited extent of contamination and no potential waste management problems exist due to the nature of the contaminants, and if an obvious remedy is available, then a corrective action may be implemented to remove the inflow pipe.

Outfall Area. Samples will be collected in the outfall area to supplement the results of the Phase I investigation. This sampling will focus on sediment accumulation areas. Sediment accumulation areas farther downslope from the locations of the Phase I samples will be evaluated using field-screening techniques including X-ray fluorescence and hand-held radiation-detection instruments. Two samples will also be collected in areas of sediment accumulation near the bottom of the canyon to bound the extent of the known contamination (Fig. 5-3). Samples will be analyzed for PCBs and TAL metals in the MCAL, and for gross alpha, beta, and gamma radiation in the MRAL. If the gross radiation analyses indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-6.

If small and distinct areas of contamination are discovered during the field operations and a human health or ecological risk is determined, then a corrective action may be implemented to remove the contaminated soil.

TABLE 5-6

PHASE II SAMPLE LOCATIONS FOR SWMU 32-002(b)

SAMPLE LOCATION	LOCATION DESCRIPTION	SAMPLE DEPTHS	FIELD SCREENING/ FIELD ANALYTICAL
Outfall			
22	Near mouth of outfall, judgmental	0-6 in.	PCBs, TAL metals, Rad[a]
23	Near mouth of outfall, judgmental	0-6 in.	PCBs, TAL metals, Rad[a]
24	Near mouth of outfall, judgmental	0-6 in.	PCBs, TAL metals, Rad[a]
25	Near mouth of outfall, judgmental	0-6 in.	PCBs, TAL metals, Rad[a]
26	Base of slope/sediment accumulation area, judgmental	0-6 in.	PCBs, TAL metals, Rad[a]
27	Base of slope/sediment accumulation area, judgmental	0-6 in.	PCBs, TAL metals, Rad[a]
Inflow Pipe			
28	Interior of pipe	NA	VOCs, SVOCs, PCBs, TAL metals, Rad[a], TCLP
29	In trench/soil surrounding pipe	depth of pipe (approx. 3 feet)	VOCs, SVOCs, PCBs, TAL metals, Rad[a]
30	Interior of pipe	NA	VOCs, SVOCs, PCBs, TAL metals, Rad[a], TCLP
31	In trench/soil surrounding pipe	depth of pipe (approx. 3 feet)	VOCs, SVOCs, PCBs, TAL metals, Rad[a]

[a] Samples will be analyzed for select radionuclides if field results indicate the presence of radiological contamination.

5.2.3.4 SWMU 32-003: Former Transformer Location

The objective of the Phase II investigation at SWMU 32-003 will be to further characterize the extent of the PCB contamination detected during the Phase I sampling. The initial action taken at the site will be to remove the wood debris pile. If possible, samples of the wood will be collected and analyzed for PCBs for waste management purposes. A total of twenty-one samples will be collected and analyzed for PCBs in the MCAL. Seven sample locations (six perimeter and one center point) will be established surrounding the location where the highest concentrations of PCBs were detected in Phase I (Fig. 5-3). Samples will be collected from three depth intervals at each location: 0 to 5 in., 5 to 10 in., and 10 to 15 in. Additionally, at least 6 samples from two locations will be collected in the vicinity of transformer site, TA-32-10. These samples will be

analyzed for PCBs in the MCAL and for gross radioactivity in the MCAL. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-7.

If the results indicate a limited extent of PCB contamination in the soil at either location and analytical results are above TSCA cleanup levels for PCBs, then a corrective action may be implemented.

TABLE 5-7

PHASE II SAMPLE LOCATIONS FOR SWMU 32-003

SAMPLE LOCATION	LOCATION DESCRIPTION	DEPTH	FIELD SCREENING/ FIELD ANALYSIS
32	Center of array, adjacent to AAA 4693	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
33	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
34	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
35	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
36	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
37	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
38	Perimeter	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
39	Former 32-10 location	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]
40	Former 32-10 location	0-5 in., 5-10 in, 10-15 in.	PCBs, Rad[a]

[a] Samples will be analyzed for select radionuclides if field results indicate the presence of radiological contamination.

5.2.3.5 SWMU 32-004: Building TA-32-3 Radiation Source Room and Vault, Drain Line, and Outfall

The objective of the investigation at SWMU 32-004 is to locate and characterize the soil beneath the former radiation source room and vault and the associated drain line, and to characterize the outfall.

Radiation Source Room and Vault. The former location of the source room will be determined using historical survey points. The area will be screened for radioactive contamination using hand-held instruments. Four samples will be collected, guided by field screening, around the footprint of the vault where the radioactive source was stored (Fig. 5-3). These samples will be analyzed for gross alpha, beta, and gamma radiation in the MRAL. If the results of the gross radiation screening indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-8. If field analytical results indicate a limited extent of contamination, and an obvious remedy is available, then a corrective action may be implemented to remove soil associated with the radiation source room.

Drain line. Non-intrusive geophysical methods and archival resources such as air photos and engineering drawings will be used to locate the pipe. In addition to non-intrusive methods, exploratory trenches may be excavated where the pipe is suspected to be located. If a pipe is located, the contents will be sampled to determine the nature of the contamination, if any, within the pipe. Samples will also be collected from soil surrounding the pipe to evaluate the possibility of historical releases. These sample locations will be determined judgmentally (Fig. 5-3). Samples will be analyzed for VOCs, SVOCs, and TAL metals in the MCAL, and for gross alpha, beta, and gamma radiation in the MRAL. If results indicate the presence of radiological contamination, then samples will be further analyzed for select radionuclides. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-8.

If field analytical results indicate a limited extent of contamination, and no potential waste management problems exist due the nature of the contaminants, and an obvious remedy is available, then a corrective action may be implemented to remove the drain line.

Outfall Area. The outfall area will be characterized by focusing on the upper portion of the hillside near the former location of the mouth of the outfall pipe. At least four samples will be collected at that location, guided by hand-held radiation-screening results. Areas of sediment accumulation below the outfall will also be investigated. Two additional samples will be collected at

the base of the hillside to bound the extent of any existing contamination (Fig. 5-3). All samples will be screened using hand-held radiation-screening instruments, and analyzed in the MRAL for gross alpha, beta, and gamma radiation. If gross radiological contamination is indicated by the screening results, then samples will be further analyzed for select radionuclides. Samples will also be analyzed for SVOCs and TAL metals. Site confirmation samples will be analyzed using Level III analytical procedures. Phase II sample locations are described in Table 5-8. If small, distinct areas of contamination are discovered during the field operations, and a human health or ecological risk is determined, then a corrective action may be implemented to remove contaminated soil from the outfall area.

TABLE 5-8

PHASE II SAMPLE LOCATIONS FOR SWMU 32-004

SAMPLE LOCATION	LOCATION DESCRIPTION	SAMPLE DEPTHS	FIELD SCREENING/ FIELD ANALYSIS
Outfall			
41	Near mouth of outfall	0-6 in.	SVOCs, TAL metals, Rad[a]
42	Near mouth of outfall	0-6 in.	SVOCs, TAL metals, Rad[a]
43	Near mouth of outfall	0-6 in.	SVOCs, TAL metals, Rad[a]
44	Near mouth of outfall	0-6 in.	SVOCs, TAL metals, Rad[a]
45	Base of slope/sediment accumulation area	0-6 in.	SVOCs, TAL metals, Rad[a]
46	Base of slope/sediment accumulation area	0-6 in.	SVOCs, TAL metals, Rad[a]
Drain Line			
47	Interior of pipe	NA	SVOCs, VOCs, PCBs, TAL metals, Rad[a], TCLP
49	Interior of pipe	NA	SVOCs, VOCs, PCBs, TAL metals, Rad[a], TCLP
48	In trench/soil surrounding pipe	depth of pipe (approx. 3 feet)	Rad[a]
50	In trench/soil surrounding pipe	depth of pipe (approx. 3 feet)	Rad[a]
Source Room			
51	Soil in vault area	0–6 in., below base of excavation	Rad[a]
52	Soil in vault area	0–6 in., below base of excavation	Rad[a]
53	Soil in vault area	0–6 in., below base of excavation	Rad[a]
54	Soil in vault area	0–6 in., below base of excavation	Rad[a]

[a] Samples will be analyzed for select radionuclides if field results indicate radiological contamination.

5.2.3.6 Soil Sampling Method

Surface soil samples are defined as samples collected from the upper 0 to 10 cm of soil. Surface soil samples will be gathered using a decontaminated stainless steel or disposable Teflon scoop. Care will be used to collect the sample to a full 10 cm depth and to cut the sides of the hole vertically to ensure equal volumes of soil are taken over the full 10 cm depth. This procedure will be followed when the soil depth allows. The applicable standard operating procedure (SOP) is LANL-ER-SOP-6.09, R0, Spade and Scoop Method for Collection of Soil Samples.

5.2.3.7 Equipment Decontamination

Decontamination is performed as a QA measure and a safety precaution. It prevents cross contamination among samples and helps to maintain a clean working environment for the safety of personnel. Sampling tools are decontaminated by washing, rinsing, and drying. All efforts will be made to minimize fluids used for equipment decontamination because these fluids are considered wastes and must be collected and contained for proper disposal. The effectiveness of the decontamination process is documented through rinsate blanks submitted for laboratory analysis.

5.2.3.8 Waste Management

Requirements for segregating, containing, characterizing, treating, and disposing of each type and category of waste are provided in the LANL administrative procedure, LANL-ER-AP-05.3, R0, Management of Environmental Restoration Program Waste, and in the approved Site-Specific Waste Management Plan (SSWMP).

The on-site waste manager shall be responsible for completing all waste forms and ensuring that all waste containers are labeled in accordance with the SSWMP. Records will be kept of wastes generated on site, and waste analyses will be evaluated. The on-site waste manager will assist with the coordination of waste disposal.

5.2.3.9 Health and Safety

Samples acquired as part of this sampling plan will be screened at the point of collection to identify the presence of gross contamination or other conditions that may pose a threat to the health and safety of field personnel.

The site safety officer (SSO) is responsible for health and safety procedure development and implementation in accordance with the approved Site-Specific Health And Safety Plan (SSHSP). The SSO coordinates health and safety monitoring activities and ensures that LANL's health and

safety officers are kept informed of health and safety procedures and problems. In addition, the SSO ensures that safe and environmentally sound work practices are followed during the sampling campaign.

5.2.3.10 Field Documentation

The following sampling documentation is required under LANL-ER-SOP-1.04, R2, Sample Control and Field Documentation: sample labels, sample collection logs, chain-of-custody/request for analysis forms, and custody seals. Sample information shall be collected and entered on the forms and subsequently initialed and signed by the field team leader. The data will be stored in a field management database and uploaded to the ER project's central database repository, the facility for information management, analysis, and display (FIMAD). A field logbook will be used for detailed summaries of information pertaining to the field investigation and for recording field data.

A daily sampling report will be submitted by the field team leader to the field project leader and the field operations manager. This report will briefly summarize each day's sampling activities and will be submitted in electronic format. The format of this report will follow Attachment G of LANL-ER-SOP-1.04, R2 and will contain all information required in this daily report form.

5.2.3.11 Site Restoration

The sampling methods to be used during the Phase II investigation will create minor disturbances to the existing soils profile. Excavation operations may be conducted to locate sewer system pipes. The sample locations and trenches will be restored to their previous condition upon completion of the Phase II field investigation.

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TABLE A-1
SUMMARY OF SAMPLES COLLECTED AT TA-32

SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE TYPE	LOCATION	ANALYSES PERFORMED				
				TAL[a] METALS	RAD[b]	VOCs[c]	SVOCs[d]	PCBs[e]
32-1001	AAA4690	Soil	Incinerator	X		X	X	X
32-1002	AAA4691	Soil	Septic tank	X		X	X	X
32-1002	AAA4718	Soil	Duplicate of AAA4691	X		X	X	X
32-1002	AAA4719	Soil	Duplicate of AAA4691	X		X	X	X
32-1003	AAA4692	Soil	Septic tank	X		X	X	X
32-1003	AAA4713	Soil	Duplicate of AAA4692	X		X	X	X
32-1004	AAA4693	Soil	Septic tank	X		X	X	X
32-1005	AAA4694	Soil	Septic tank	X		X	X	X
32-1007	AAA4695	Soil	Duplicate of AAA4696	X		X	X	X
32-1007	AAA4696	Soil	Trench 1	X		X	X	X
32-1008	AAA4697	Soil	Trench 1	X		X	X	X
32-1009	AAA4698	Soil	Trench 1	X		X	X	X
32-1010	AAA4699	Soil	Trench 2	X		X	X	X
32-1011	AAA4700	Soil	Trench 2	X		X	X	X
32-1012	AAA4701	Soil	Trench 2	X		X	X	X
32-1013	AAA4702	Soil	Outfall	X		X	X	X
32-1013	AAA4716	Soil	Duplicate of AAA4702	X		X	X	X
32-1013	AAA4717	Soil	Duplicate of AAA4702	X		X	X	X
32-1014	AAA4703	Soil	Outfall	X		X	X	X
32-1015	AAA4704	Soil	Outfall	X		X	X	X
32-1016	AAA4705	Soil	Outfall	X		X	X	X
32-1017	AAA4706	Soil	Outfall	X			X	X
32-1018	AAA4707	Soil	Outfall	X			X	X
32-1019	AAA4708	Soil	Outfall	X			X	X
32-1020	AAA4709	Soil	Outfall	X			X	X
32-1021	AAA4710	Soil	Outfall	X			X	X
32-1022	AAA4711	Soil	Outfall	X			X	X
32-1025	AAA4715	Soil	Field blank	X	X	X	X	X
32-1035	AAA1287	Soil	Incinerator	X		X	X	X
32-1036	AAA1285	Soil	Septic tank	X		X	X	X
32-1037	AAA1286	Soil	Septic tank	X		X	X	X
None	AAA4712	Water	Rinsate	X			X	X

[a] TAL Metals = Target analyte list metals.
[b] RAD = Radionuclide analysis for plutonium-238 and -239, uranium-234, -235, and -238, strontium-90, cesium-1
[c] VOCs = Volatile organic compounds.
[d] SVOCs = Semivolatile organic compounds.
[e] PCBs = Polychlorinated biphenyls.

TABLE A-2

TA-32 ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 32-001[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
			SAL[b]	78 000	32	NA[d]	5 600	NA	39	NA	400	4 700	3 000	NA	400	NA	390	24	1 600	NA	400	400	NA	6.4	560	24 000
			UTL[c]	123 000	2.5[e]	11.6	1 140	3.31	2.7[e]	54 400	34.2	51.1	15.7	35 600	39	16 100	1 030	0.1[e]	26.7	6 180	1.7[e]	1.61[f]	3 320	0.9	66	101
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
AAA1287	32-1035	10 - 14	Incinerator	6 400	<0.1	2.8	130	0.56	<0.4	5 600	6.8	4	4.5	9 300	11	1 600	150	<0.1	7	990	<0.3	<2	750	0.5	17	34
AAA1287 (Duplicate)	32-1035	10 - 14	Incinerator	11 000	-	-	140	0.7	<0.4	5 400	9	4.2	4.9	11 000	13	2 000	180	-	9	1 300	-	-	810	-	21	42
AAA1287 (Replicate)	32-1035	10 - 14	Incinerator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	<2	-	-	-	-
AAA1287 (Replicate)	32-1035	10 - 14	Incinerator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4690	32-1001	10 - 14	Incinerator	3 700	<0.1	2.7	50	0.6	1	930	19	1.3	9	4 900	70	680	210	0.1	6	560	<0.3	3	330	0.6	9	60
AAA4690 (Replicate)	32-1001	10 - 14	Incinerator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-
AAA4690 (Replicate)	32-1001	10 - 14	Incinerator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable value is available.
[e] No UTL can be calculated, so the maximum of the background range is used for comparison.
[f] There are no background values for silver measured by comparable analytical methods, so a maximum value using instrumental neutron activation analysis was used (Longmire et al. 1994, 1142).

TABLE A-3

ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC ANALYTES DETECTED AT SWMU 32-001[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aroclor [mixed-]	Aroclor 1260™	Benzo[a]pyrene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Bis(2-ethylhexyl)phthalate	Butyl benzyl phthalate	Chrysene	Di-n-butyl phthalate	Fluoranthene	Indeno[1,2,3-cd]pyrene	Phenanthrene	Pyrene
			SAL[b]	1	1	0.1	1	1	1	NA	50	16 000	96	8 000	3 200	1	NA	2 400
			UTL[c]	NA[d]	NA	12.1	12.4	12.2	19.4	5.9	NA	NA	19.5	NA	32.5	6	24.2	12.8
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Aroclor [mixed-]	Aroclor 1260™	Benzo[a]pyrene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Bis(2-ethylhexyl)phthalate	Butyl benzyl phthalate	Chrysene	Di-n-butyl phthalate	Fluoranthene	Indeno[1,2,3-cd]pyrene	Phenanthrene	Pyrene
AAA1287	32-1035	10 - 14	Incinerator	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4690	32-1001	10 - 14	Incinerator	2	2	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable value is available.

TABLE A-4

ANALYTICAL RESULTS FOR VOLATILE ORGANIC ANALYTES

DETECTED AT SWMU 32-001a

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Acetone	Toluene
			SAL[b]	8 000	910
			UTL[c]	NA[d]	NA
SAMPLE ID	LOCATION ID	DEPTH (In.)	LOCATION	Acetone	Toluene
AAA1287	32-1035	10 - 14	Incinerator	0.027	<0.005
AAA4690	32-1001	10 - 14	Incinerator	0.046	0.0098

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable SAL is available.

TABLE A-5

TA-32 ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 32-003[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)			Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
		SAL[b]	78 000	32	NA[d]	5 600	NA	39	NA	400	4 700	3 000	NA	400	NA	390	24	1 600	NA	400	400	NA	8.4	560	24 000
		UTL[c]	123 000	2.5[e]	11.6	1 140	3.31	2.7[e]	54 400	34.2	51.1	15.7	35 600	39	16 100	1 030	0.1[e]	26.7	8 180	1.7[e]	1.61[f]	3 320	0.9	66	101
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
AAA4693	32-1004	0 - 2	Transformer	4 900	<0.1	2.6	98	0.42	0.7	3 200	6	2.5	14	6 400	46	1 200	270	<0.1	8	1 000	<0.3	<2	110	0.5	12	100
AAA4693 (Replicate)	32-1004	0 - 2	Transformer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4693 (Replicate)	32-1004	0 - 2	Transformer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4694	32-1005	0 - 4	Transformer	4 800	<0.1	3.2	78	0.47	0.46	2 400	5	2.5	14	6 500	230	1 000	290	<0.1	4	910	<0.3	<2	100	0.4	10	11
AAA4694 (Replicate)	32-1005	0 - 4	Transformer	–	<0.1	3.1	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	<0.3	–	–	0.3	–	–
AAA4694 (Replicate)	32-1005	0 - 4	Transformer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4709	32-1020	0 - 15	Outfall	4 100	<0.1	5.4	65	0.54	<0.4	3 300	4.4	2.1	6.5	5 500	40	1 000	250	<0.1	5.7	770	0.7	<2	190	0.3	8.2	65
AAA4709 (Replicate)	32-1020	0 - 15	Outfall	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4709 (Replicate)	32-1020	0 - 15	Outfall	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4710	32-1021	0 - 15	Outfall	2 900	<0.1	2.1	51	0.32	<0.4	5 300	3.7	2.2	4.1	5 000	25	900	200	<0.1	4	660	0.4	<2	180	<0.1	8.6	39
AAA4710 (Replicate)	32-1021	0 - 15	Outfall	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4710 (Replicate)	32-1021	0 - 15	Outfall	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4711	32-1022	0 - 15	Outfall	2 400	<0.1	2.7	47	0.31	<0.4	1 700	3	1.8	4.7	5 600	23	770	230	<0.1	4	480	0.8	<2	140	0.2	9.4	48
AAA4711 (Replicate)	32-1022	0 - 15	Outfall	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4711 (Replicate)	32-1022	0 - 15	Outfall	–	–	–	–	–										<0.1	–	–	–	–	–	–	–	–

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable value is available.
[e] No UTL can be calculated, so the maximum of the background range is used for comparison.
[f] There are no background values for silver measured by comparable analytical methods, so a maximum value using instrumental neutron activation analysis was used (Longmire et al. 1994, 1142).

TABLE A-6

ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC ANALYTES DETECTED AT SWMU 32-003[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aroclor [mixed-]	Aroclor 1260™	Benzo[a]pyrene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Bis(2-ethylhexyl)phthalate	Butyl benzyl phthalate	Chrysene	Di-n-butyl phthalate	Flouranthene	Indeno[1,2,3-cd]pyrene	Phenanthrene	Pyrene
			SAL[b]	1	1	0.1	1	1	1	NA	50	16 000	98	8 000	3 200	1	NA	2 400
			UTL[c]	NA[d]	NA	12.1	12.4	12.2	19.4	5.9	NA	NA	19.5	NA	32.5	6	24.2	12.8
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Aroclor [mixed-]	Aroclor 1260™	Benzo[a]pyrene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Bis(2-ethylhexyl)phthalate	Butyl benzyl phthalate	Chrysene	Di-n-butyl phthalate	Flouranthene	Ideno[1,2,3-cd]pyrene	Phenanthrene	Pyrene
AAA4693	32-1004	0 - 2	Transformer	4	4	<0.33	<0.33	0.69	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.7	<0.33	<0.33	0.74
AAA4694	32-1005	0 - 14	Transformer	1.5	1.3	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4709	32-1020	0 - 15	Outfall	<1	<1	<0.33	<0.33	0.51	<0.33	<0.33	<0.33	<0.33	0.36	1.4	0.53	<0.33	<0.33	0.8
AAA4710	32-1021	0 - 15	Outfall	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	1.4	1.1	<0.33	1.3	<0.33	<0.33	<0.33	<0.33
AAA4711	32-1022	0 - 15	Outfall	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	3.5	<0.33	<0.33	<0.33	0.61

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable value is available.

TABLE A-7

ANALYTICAL RESULTS FOR VOLATILE ORGANIC ANALYTES

DETECTED AT SWMU 32-003a

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Acetone	Toluene	Xylenes (o+m+p)[mixed-]
			SAL[b]	8 000	910	160 000
			UTL[c]	NA[d]	NA	NA
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Acetone	Toluene	Xylenes (o+m+p)[mixed-]
AAA4694	32-1005	0 - 4	Transformer	0.025	0.013	<0.005

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable SAL is available.

TABLE A-8

TA-32 ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 32-002(b)[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
			SAL[b]	78 000	32	NA[d]	5 600	NA	39	NA	400	4 700	3 000	NA	400	NA	390	24	1 600	NA	400	400	NA	6.4	560	24 000
			UTL[c]	123 000	2.5[e]	11.6	1 140	3.31	2.7[e]	54 400	34.2	51.1	15.7	35 600	39	16 100	1 030	0.1[e]	26.7	6 180	1.7[e]	1.61[f]	3 320	0.9	66	101
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
AAA1285	32-1036	0 - 4	Septic Tank	4 700	<0.1	3.7	76	0.56	0.5	2 100	11	2.7	13	6 100	70	1 000	310	4.7	9.5	860	<0.3	4.3	63	0.2	10	290
AAA1285 (Replicate)	32-1036	0 - 4	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	-	-	-	-	-	-
AAA1285 (Replicate)	32-1036	0 - 4	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5	-	-	-	-	-	-	-	-
AAA1286	32-1037	0 - 4	Septic Tank	2 800	<0.1	2.6	36	0.46	<0.4	1 300	3	1.8	5.9	3 800	16	720	180	0.3	9.5	600	<0.3	<2	66	0.7	5.5	200
AAA1286 (Replicate)	32-1037	0 - 4	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-
AAA1286 (Replicate)	32-1037	0 - 4	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-
AAA4691	32-1002	4 - 6	Septic Tank	10 000	<0.1	3.7	100	0.8	<0.4	2 100	8	4.5	8	11 000	22	1 800	230	14	7.3	1 300	<0.3	<2	110	0.6	18	54
AAA4691 (Replicate)	32-1002	4 - 6	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-
AAA4691 (Replicate)	32-1002	4 - 6	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-
AAA4692	32-1003	4 - 6	Septic Tank	4 800	<0.1	6.6	55	0.45	<0.4	1 600	9	2.6	9	5 600	50	950	210	2.2	6	77	<0.3	3	64	0.4	9	120
AAA4692 (Replicate)	32-1003	4 - 6	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-
AAA4692 (Replicate)	32-1003	4 - 6	Septic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-
AAA4695	32-1007	1.5	Trench 1	9 900	<0.1	2.7	110	0.74	<0.4	1 100	9	4.8	6	13 000	49	1 600	350	<0.1	9	1 400	<0.3	<2	110	0.4	20	58
AAA4695 (Replicate)	32-1007	1.5	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4695 (Replicate)	32-1007	1.5	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4696	32-1007	1.5	Trench 1	11 000	<0.1	2.4	120	0.75	<0.4	1 400	9	5.6	6.5	11 000	31	1 800	370	<0.1	9	1 500	0.4	<2	880	0.4	22	50
AAA4696 (Replicate)	32-1007	1.5	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4696 (Replicate)	32-1007	1.5	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4697	32-1008	1.7	Trench 1	11 000	<0.1	3.5	120	0.8	<0.4	1 200	10	5.5	5.8	11 000	28	1 800	370	<0.1	12	1 600	0.4	<2	110	0.3	23	50
AAA4697 (Replicate)	32-1008	1.7	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4697 (Replicate)	32-1008	1.7	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4698	32-1009	1.5	Trench 1	9 000	<0.1	3.2	130	0.7	<0.4	1 400	8	4.8	5.7	10 000	28	1 600	330	<0.1	12	1 300	<0.3	<2	840	0.3	21	43
AAA4698 (Replicate)	32-1009	1.5	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4698 (Replicate)	32-1009	1.8	Trench 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-
AAA4699	32-1010	3.2	Trench 2	6.7	<0.1	2	91	130	19	1 200	42	430	1.3	300	120	1 200	400	<0.1	260	180	<0.3	200	120	0.7	23	28

TABLE A-8 (CONTINUED)

TA-32 ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 32-002(b)[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
			SAL[b]	78 000	32	NA[d]	5 600	NA	39	NA	400	4 700	3 000	NA	400	NA	390	24	1 600	NA	400	400	NA	6.4	560	24 000
			UTL[c]	123 000	2.5[e]	11.6	1 140	3.31	2.7[e]	54 400	34.2	51.1	15.7	35 600	39	16 100	1 030	0.1[e]	26.7	6 180	1.7[e]	1.61[f]	3 320	0.9	66	101
SAMPLE ID	LOCATION ID	DEPTH	LOCATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
AAA1285	32-1036	0-4 in.	Septic Tank	4 700	<0.1	3.7	76	0.56	0.53	2 100	11	2.7	13	6 100	70	1 000	310	4.7	9.5	860	<0.3	4.3	63	0.2	10	290
AAA1285R1	32-1036	0-4 in.	Septic Tank															4.9								
AAA1285R2	32-1036	0-4 in.	Septic Tank															6.5								
AAA1286	32-1037	0-4 in.	Septic Tank	2 800	<0.1	2.6	36	0.46	<0.4	1 300	3	1.8	5.9	3 800	16	720	180	0.3	9.5	600	<0.3	<2	66	0.7	5.5	200
AAA1286R1	32-1037	0-4 in.	Septic Tank															0.2								
AAA1286R2	32-1037	0-4 in.	Septic Tank															0.2								
AAA4691	32-1002	4-6 in.	Septic Tank	10 000	<0.1	3.7	100	0.8	<0.4	2 100	8	4.5	8	11 000	22	1 800	290	14	7.3	1 300	<0.3	<2	1 100	0.6	18	54
AAA4691R1	32-1002	4-6 in.	Septic Tank															13								
AAA4691R2	32-1002	4-6 in.	Septic Tank															14								
AAA4692	32-1003	4-6 in.	Septic Tank	4 800	<0.1	6.6	55	0.45	<0.4	1 500	9	2.6	9	5 600	50	950	210	2.2	6	77	<0.3	3	84	0.4	9	120
AAA4692R1	32-1003	4-6 in.	Septic Tank															1.3								
AAA4692R2	32-1003	4- in.	Septic Tank															2.2								
AAA4695	32-1007	1.5'	Trench 1	9 900	<0.1	2.7	110	0.74	<0.4	1 100	9	4.8	6	13 00	49	1 600	350	<0.1	9	1 400	<0.3	<2	1 100	0.4	20	58
AAA4695R1	32-1007	1.5'	Trench 1															<0.1								
AAA4695R2	32-1007	1.5'	Trench 1															<0.1								
AAA4696	32-1007	1.5'	Trench 1	11 000	<0.1	2.4	120	0.75	<0.4	1 400	9	5.6	6.5	11 000	31	1 800	370	<0.1	9	1 500	0.4	<2	830	0.4	22	50
AAA4696R1	32-1007	1.5'	Trench 1															<0.1								
AAA4696R2	32-1007	1.5'	Trench 1															<0.1								
AAA4697	32-1008	1.7	Trench 1	11 000	<0.1	3.5	120	0.8	<0.4	1 200	10	5.5	5.8	11 000	28	1 800	370	<0.1	12	1 600	0.4	<2	1 100	0.3	23	50
AAA4697R1	32-1008	1.7	Trench 1															<0.1								
AAA4697R2	32-1008	1.7	Trench 1															<0.1								
AAA4698	32-1009	1.5	Trench 1	9 000	<0.1	3.2	130	0.7	<0.4	1 400	8	4.8	5.7	10 000	28	1 600	330	<0.1	12	1 300	<0.3	<2	840	0.3	21	43
AAA4698	32-1009	1.5	Trench 1															<0.1								
AAA4698	32-1009	1.5	Trench 1															<0.1								

TABLE A-8 (CONTINUED)

TA-32 ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 32-002(b)[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
			SAL[b]	78 000	32	NA[d]	5 600	NA	39	NA	400	4 700	3 000	NA	400	NA	390	24	1 600	NA	400	400	NA	6.4	560	24 000
			UTL[c]	123 000	2.5[e]	11.6	1 140	3.31	2.7[e]	54 400	34.2	51.1	15.7	35 600	39	16 100	1 030	0.1[e]	26.7	6 180	1.7[e]	1.61[f]	3 320	0.9	66	101
AAA4699 (Replicate)	32-1010	3.2	Trench 2	6.7	<0.1	2	91	130	19	1 200	42	430	1.3	300	120	1 200	490	<0.1	260	180	<0.3	200	120	0.7	23	28
AAA4699 (Replicate)	32-1010	3.2	Trench 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.2	–	–	–	–	–	–	–	–
AAA4700	32-1011	3.2	Trench 2	5 700	<0.1	25	150	0.55	<0.4	2 300	170	6.6	73	62 000	570	1 400	420	150	17	1 000	1.1	9.2	300	1.4	42	89
AAA4700 (Replicate)	32-1011	3.2	Trench 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	380	–	–	–	–	–	–	–	–
AAA4700 (Replicate)	32-1011	3.2	Trench 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	420	–	–	–	–	–	–	–	–
AAA4701	32-1012	3.2	Trench 2	7 400	<0.1	2.9	71	0.75	<0.4	1 800	5.6	2.2	4.1	8 800	81	1 300	250	4.5	7	1 000	0.7	<2	110	0.5	14	53
AAA4701 (Replicate)	32-1012	3.2	Trench 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.9	–	–	–	–	–	–	–	–
AAA4701 (Replicate)	32-1012	3.2	Trench 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.1	–	–	–	–	–	–	–	–
AAA4702	32-1013	0 - 15 in.	Outfall b	5 900	<0.1	2.8	120	0.8	1.3	7 400	31	2.3	22	6 700	110	1 400	1 300	18	9	1 200	0.9	3.5	200	0.3	13	120
AAA4702 (Replicate)	32-1013	0 - 15 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	–	–	–	–	–	–	–	–
AAA4702 (Replicate)	32-1013	0 - 15 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	–	–	–	–	–	–	–	–
AAA4703	32-1014	0 - 4 in.	Outfall b	2 900	<0.1	3.1	77	0.65	1.5	1 000	37	1	16	4 300	150	570	290	17	8	480	0.4	7	78	0.3	11	73
AAA4703 (Replicate)	32-1014	0 - 4 in.	Outfall b	–	<0.1	3.5	–	–	–	–	–	–	–	–	–	–	–	12	–	–	0.6	–	–	0.3	–	–
AAA4703 (Replicate)	32-1014	0 - 4 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	–	–	–	–	–	–	–	–
AAA4704	32-1015	0 - 4 in.	Outfall b	4 400	<0.1	6.6	180	0.64	3	2 400	100	2.2	38	6 200	450	890	580	36	6	800	0.9	28	80	0.8	20	170
AAA4704 (Replicate)	32-1015	0 - 4 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35	–	–	–	–	–	–	–	–
AAA4704 (Replicate)	32-1015	0 - 4 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	51	–	–	–	–	–	–	–	–
AAA4705	32-1016	0 - 5 in.	Outfall b	6 500	<0.1	18	920	0.71	5.6	2 200	440	3.2	170	8 400	160	1 100	180	276	11	970	1.7	150	82	2.4	59	320
AAA4705 (Replicate)	32-1016	0 - 5 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	236	–	–	–	–	–	–	–	–
AAA4705 (Replicate)	32-1016	0 - 5 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	303	–	–	–	–	–	–	–	–
AAA4706	32-1017	0 - 6 in.	Outfall b	5 800	<0.1	1.1	110	0.71	0.6	2 700	58	3.1	17	8 200	200	1 100	630	17	6	1 100	0.4	12	78	<0.1	18	140
AAA4706 (Replicate)	32-1017	0 - 6 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12	–	–	–	–	–	–	–	–
AAA4706 (Replicate)	32-1017	0 - 6 in.	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	–	–	–	–	–	–	–	–
AAA4707	32-1018	0 - 15 in.	Outfall a	1 700	<0.1	2.1	33	0.68	0.4	820	8.6	<0.5	4.3	5 800	46	470	290	3.3	2	390	0.6	2.8	73	<0.1	6.5	50
AAA4707 (Replicate)	32-1018	0 - 15 in.	Outfall a	–	–													1.1				–				–

TABLE A.8 (CONTINUED)

TA-32 ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 32-002(b)[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
			SAL[b]	78 000	32	NA[d]	5 600	NA	39	NA	400	4 700	3 000	NA	400	NA	390	24	1 600	NA	400	400	NA	6.4	560	24 000
			UTL[c]	123 000	2.5[e]	11.6	1 140	3.31	2.7[e]	54 400	34.2	51.1	15.7	35 600	39	16 100	1 030	0.1[e]	26.7	6 180	1.7[e]	1.61[f]	3 320	0.9	66	101
SAMPLE ID	LOCATION ID	DEPTH (in.)	LOCATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
AAA4707 (Replicate)	32-1018	0 - 15	Outfall a	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.3	–	–	–	–	–	–	–	–
AAA4708	32-1019	0 - 15	Outfall a	960	<0.1	2.3	16	0.59	<0.4	310	1	0.5	2 1.6	4 700	15	220	210	<0.1	<2	220	0.5	<2	66	<0.1	3.3	32
AAA4708 (Replicate)	32-1019	0 - 15	Outfall a	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4708 (Replicate)	32-1019	0 - 15	Outfall a	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<0.1	–	–	–	–	–	–	–	–
AAA4713 (Duplicate of AAA4692)	32-1003	4 - 6	Septic Tank	3 500	<0.1	7	49	0.51	<0.4	1 500	5	1.7	7.5	4 400	34	750	180	1.7	3.2	600	0.5	<2	83	<0.1	7	96
AAA4713 (Replicate)	32-1003	4 - 6	Septic Tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.2	–	–	–	–	–	–	–	–
AAA4713 (Replicate)	32-1003	4 - 6	Septic Tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7	–	–	–	–	–	–	–	–
AAA4716 (Duplicate of AAA4702)	32-1013	0 - 15	Outfall b	6 400	<0.1	2.4	130	0.79	2.1	8 100	32	2.8	22	7 100	130	1 500	1 500	20	8.3	1 200	0.8	5.4	230	0.3	13	130
AAA4716 (Replicate)	32-1013	0 - 15	Outfall b	7 000			130	0.89	1.6	8 000	32	2 4	23	7 700	120	1 600	1 500	15	8	1 200		4.9	230		15	120
AAA4716 (Replicate)	32-1013	0 - 15	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	–	–	–	–	–	–	–	–
AAA4717 (Duplicate of AAA4702)	32-1013	0 - 15	Outfall b	6 900	<0.1	3.8	130	0.81	1.6	8 500	33	2.9	24	8 100	130	1 600	1 600	16	11	1 200	0.6	5.5	250	0.3	14	130
AAA4717 (Replicate)	32-1013	0 - 15	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	–	–	–	–	–	–	–	–
AAA4717 (Replicate)	32-1013	0 - 15	Outfall b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	17	–	–	–	–	–	–	–	–
AAA4718 (Duplicate of AAA4691)	32-1002	4 - 6	Septic Tank	4 000	<0.1	3.9	46	0.55	0.7	4 830	18	1.4	8.6	5 300	63	700	230	8.4	6.3	570	0.5	2.6	420	0.2	10	54
AAA4718 (Replicate)	32-1002	4 - 6	Septic Tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10.2	–	–	–	–	–	–	–	–
AAA4718 (Replicate)	32-1002	4 - 6	Septic Tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.6	–	–	–	–	–	–	–	–
AAA4719 (Duplicate of AAA4691)	32-1002	4 - 6	Septic Tank	5 500	<0.1	3.7	49	0.61	1	1 000	23	1.6	10	6 800	76	950	250	13	7	790	0.5	4.5	480	0.2	12	62
AAA4719 (Replicate)	32-1002	4 - 6	Septic Tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	–	–	–	–	–	–
AAA4719 (Replicate)	32-1002	4 - 6	Septic Tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	–	–	–	–	–	–	–	–

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable value is available.
[e] No UTL can be calculated, so the maximum of the background range is used for comparison.
[f] There are no background values for silver measured by comparable analytical methods, so a maximum value using instrumental neutron activation analysis was used (Longmire et al. 1994, 1142).

TABLE A-9

ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC ANALYTES DETECTED AT SWMU 32-002(b)[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Aroclor [mixed-]	Aroclor 1260™	Benzo[a]pyrene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Bis(2-ethylhexyl)phthalate	Chrysene	Di-n-butyl phthalate	Flouranthene	Indeno[1,2,3-cd]pyrene	Phenanthrene	Pyrene
			SAL[b]	1	1	0.1	1	1	1	NA	50	96	8 000	3 200	1	NA	2 400
			UTL[c]	NA[d]	NA	12.1	12.4	12.2	19.4	5.9	NA	19.5	NA	32.5	6	24.2	12.8
SAMPLE ID	LOCATION ID	DEPTH	LOCATION	Aroclor [mixed-]	Aroclor 1260™	Benzo[a]pyrene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[g,h,i]perylene	Bis(2-ethylhexyl)phthalate	Chrysene	Di-n-butyl phthalate	Flouranthene	Ideno[1,2,3-cd]pyrene	Phenanthrene	Pyrene
AAA1285	32-1036	0 - 4 in.	Septic Tank	<1	<1	<0.33	<0.33	0.38	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA1286	32-1037	0 - 4 in.	Septic Tank	<1	<1	<0.33	<0.33	0.43	<0.33	<0.33	<0.33	<0.33	<0.33	0.53	<0.33	0.4	0.48
AAA4691	32-1002	4 - 8 in.	Septic Tank	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4692	32-1003	4 - 8 in.	Septic Tank	<1	<1	<0.33	<0.33	0.36	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.36
AAA4695	32-1007	1.5 ft	Trench 1	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4696	32-1007	1.8 ft	Trench 1	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4697	32-1008	1.7 ft	Trench 1	1	1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4698	32-1009	1.5 ft	Trench 1	1	1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4699	32-1010	3.2 ft	Trench 2	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4700	32-1011	3.2 ft	Trench 2	<1	<1	2	1.8	3.1	0.77	1.3	<0.33	2	<0.33	2.2	1.2	0.59	4.1
AAA4701	32-1012	3.2 ft	Trench 2	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.46	<0.33	<0.33	<0.33	0.58
AAA4702	32-1013	0 - 15 in.	Outfall b	17	17	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4703	32-1014	0 - 4 in.	Outfall b	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4704	32-1015	0 - 4 in.	Outfall b	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	5.5	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4705	32-1016	0 - 5 in.	Outfall b	<1	<1	<0.33	<0.33	0.42	<0.33	<0.33	<0.33	<0.33	0.92	<0.33	<0.33	<0.33	<0.33
AAA4706	32-1017	0 - 6 in.	Outfall b	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	1.7	<0.33	<0.33	<0.33	<0.33
AAA4707	32-1018	0 - 15 in.	Outfall a	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	2.2	<0.33	<0.33	<0.33	<0.33
AAA4708	32-1019	0 - 15 in.	Outfall a	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	2.9	<0.33	<0.33	<0.33	<0.33
AAA4713 (Duplicate of AAA4692)	32-1003	4 - 8 in.	Septic Tank	<1	<1	<0.33	<0.33	0.47	<0.33	<0.33	<0.33	0.39	<0.33	0.42	<0.33	<0.33	0.86
AAA4716 (Duplicate of AAA4702)	32-1013	0 - 15 in.	Outfall b	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.68	<0.33	<0.33	<0.33	<0.33
AAA4717 (Duplicate of AAA4701)	32-1013	0 - 15 in.	Outfall b	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.81	<0.33	<0.33	<0.33	<0.33
AAA4718 (Duplicate of AAA4691)	32-1002	4 - 8 in.	Septic Tank	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
AAA4719 (Duplicate of AAA4691)	32-1002	4 - 8 in.	Septic Tank	<1	<1	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.48	<0.33	<0.33	<0.33	<0.33

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable value is available.

TABLE A-10

ANALYTICAL RESULTS FOR VOLATILE ORGANIC ANALYTES DETECTED AT SWMU 32-002(b)[a]

COMPARISON LEVELS FOR SOIL SAMPLES (mg/kg)				Acetone	Benzene	Toluene	Xylenes (o+m+p)[mixed-]
			SAL[b]	8 000	0.67	910	160 000
			UTL[c]	NA[d]	NA	NA	NA
SAMPLE ID	LOCATION ID	DEPTH	LOCATION	Acetone	Benzene	Toluene	Xylenes (o+m+p)[mixed-]
AAA1285	32-1036	0 - 4 in.	Septic Tank	<0.02	0.01	0.029	0.012
AAA1286	32-1037	0 - 4 in.	Septic Tank	<0.02	<0.005	0.013	0.0095
AAA4691	32-1002	4 - 6 in.	Septic Tank	<0.02	<0.005	0.011	<0.005
AAA4692	32-1003	4 - 6 in.	Septic Tank	<0.02	<0.005	0.029	0.039
AAA4695	32-1007	1.5 ft	Trench 1	<0.02	<0.005	<0.005	<0.005
AAA4696	32-1007	1.5 ft	Trench 1	<0.02	<0.005	<0.005	<0.005
AAA4697	32-1008	1.7 ft	Trench 1	0.04	<0.005	0.011	<0.005
AAA4698	32-1009	1.5 ft	Trench 1	<0.02	<0.005	<0.005	<0.005
AAA4699	32-1010	3.2 ft	Trench 2	0.037	<0.005	0.023	0.028
AAA4700	32-1011	3.2 ft	Trench 2	0.034	<0.005	0.012	<0.005
AAA4701	32-1012	3.2 ft	Trench 2	<0.02	<0.005	0.0096	<0.005
AAA4713 (Duplicate of AAA1285)	32-1003	4 - 6 in.	Septic Tank	<0.02	<0.005	<0.005	<0.005
AAA4718 (Duplicate of AAA1285)	32-1002	4 - 6 in.	Septic Tank	<0.02	<0.005	0.018	0.0097
AAA4719 (Duplicate of AAA1285)	32-1002	4 - 6 in.	Septic Tank	<0.02	<0.005	0.012	0.0098

[a] All data were extracted from FIMAD on June 6, 1995, and all results are measured in mg/kg.
[b] SAL = Screening action level.
[c] UTL = Background upper tolerance limit.
[d] NA = No applicable SAL is available.

TABLE A-11

SUMMARY OF NON-DETECTED ANALYTES AT TA-32[a]

ANALYTE	SAL[b]	TOTAL	REPORTING LIMITS	
			MINIMUM	MAXIMUM
Acenaphthene	4 800	30	0.33	0.33
Acenaphthylene	NA[c]	30	0.33	0.33
Aniline	120	30	0.33	0.33
Anthracene	24 000	30	0.33	0.33
Antimony	32	32	0.1	0.1
Aroclor 1242	NA	30	1	1
Aroclor 1254	NA	30	1	1
Azobenzene	6.4	30	0.33	0.33
Benzidine [m-]	0	30	0.33	0.33
Benzoic acid	320 000	30	0.33	0.33
Benzyl alcohol	24 000	30	0.33	0.33
Bis(2-chloroethoxy)methane	NA	30	0.33	0.33
Bis(2-chloroethyl)ether	0.12	30	0.33	0.33
Bis(2-chloroisopropyl)ether	100	30	0.33	0.33
Bromobenzene	NA	18	0.005	0.005
Bromochloromethane	NA	18	0.005	0.005
Bromodichloromethane	11	18	0.005	0.005
Bromoform	89	18	0.005	0.005
Bromomethane	0.43	18	0.01	0.01
Bromophenylphenyl ether [4-]	NA	30	0.33	0.33
Butanone [2-]	4 000	18	0.02	0.02
Butylbenzene [n-]	NA	18	0.005	0.005
Butylbenzene [sec-]	NA	18	0.005	0.005
Butylbenzene [tert-]	NA	18	0.005	0.005
Carbon disulfide	7.4	18	0.005	0.005
Carbon tetrachloride	0.21	18	0.005	0.005
Chloro-3-methylphenol [4-]	16 000	30	0.33	0.33
Chloroaniline [4-]	320	30	0.33	0.33
Chlorobenzene	67	18	0.005	0.005
Chlorodibromomethane	83	18	0.005	0.005
Chloroethane	2 900	18	0.01	0.01
Chloroform	0.21	18	0.005	0.005
Chloromethane	6.4	18	0.01	0.01
Chloronaphthalene [2-]	6 400	30	0.33	0.33
Chlorophenol [o-]	400	30	0.33	0.33
Chlorophenylphenyl ether [4-]	NA	30	0.33	0.33
Chlorotoluene [o-]	1 600	18	0.005	0.005
Chlorotoluene [p-]	NA	18	0.005	0.005
Di-n-octyl phthalate	1 600	30	0.33	0.33

ANALYTE	SAL[b]	TOTAL	REPORTING LIMITS	
			MINIMUM	MAXIMUM
Dibenzo[a,h]anthracene	0.1	30	0.33	0.33
Dibenzofuran	NA	30	0.33	0.33
Dibromo-3-chloropropane [1,2-]	0.5	18	0.01	0.01
Dibromoethane [1,2-]	NA	18	0.005	0.005
Dibromomethane	0.01	18	0.005	0.005
Dichlorobenzene (1,2) [o-]	1 600	48	0.005	0.33
Dichlorobenzene (1,3) [m-]	7 200	48	0.005	0.33
Dichlorobenzene (1,4) [p-]	29	48	0.005	0.33
Dichlorobenzidine [3,3'-]	1.6	30	0.33	0.33
Dichlorodifluoromethane	16 000	18	0.01	0.01
Dichloroethane [1,1-]	410	18	0.005	0.005
Dichloroethane [1,2-]	0.2	18	0.005	0.005
Dichloroethene [1,1-]	0.4	18	0.005	0.005
Dichloroethene [trans-1,2-]	1 600	18	0.005	0.005
Dichloroethylene [cis-1,2-]	800	18	0.005	0.005
Dichlorophenol [2,4-]	240	30	0.33	0.33
Dichloropropane [1,2-]	6.5	18	0.005	0.005
Dichloropropane [1,3-]	NA	18	0.005	0.005
Dichloropropane [2,2-]	NA	18	0.005	0.005
Dichloropropene [1,1-]	NA	18	0.005	0.005
Dichloropropene [cis-1,3-]	0.17	18	0.005	0.005
Dichloropropene [trans-1,3-]	0.17	18	0.005	0.005
Diethyl phthalate	64 000	30	0.33	0.33
Dimethyl phthalate	800 000	30	0.33	0.33
Dimethylphenol [2,4-]	1 600	30	0.33	0.33
Dinitrophenol [2,4-]	160	30	0.33	0.33
Dinitrotoluene [2,4-]	1	30	0.33	0.33
Dinitrotoluene [2,6-]	1	30	0.33	0.33
Ethylbenzene	3 100	18	0.005	0.005
Fluorene	3 200	30	0.33	0.33
Hexachlorobenzene	0.44	30	0.33	0.33
Hexachlorobutadiene	90	30	0.33	0.33
Hexachlorocyclopentadiene	560	30	0.33	0.33
Hexachloroethane	80	30	0.33	0.33
Hexanone [2-]	NA	18	0.02	0.02
Isophorone	7 400	30	0.33	0.33
Isopropylbenzene	3 200	18	0.005	0.005
Isopropyltoluene [4-]	NA	18	0.005	0.005
Methyl iodide	NA	18	0.005	0.005

ANALYTE	SAL[b]	TOTAL	REPORTING LIMITS	
			MINIMUM	MAXIMUM
Methyl-2-pentanone [4-]	510	18	0.02	0.02
Methyl-4,6-dinitrophenol [2-]	NA	30	0.33	0.33
Methylene chloride	5.6	18	0.005	0.005
Methylnaphthalene [2-]	NA	30	0.33	0.33
Methylphenol [2-]	4 000	30	0.33	0.33
Methylphenol [4-]	400	30	0.33	0.33
Naphthalene	3 200	30	0.33	0.33
Nitroaniline [2-]	NA	30	0.33	0.33
Nitroaniline [3-]	240	30	0.33	0.33
Nitroaniline [4-]	240	30	0.33	0.33
Nitrobenzene	5.3	30	0.33	0.33
Nitrophenol [2-]	NA	30	0.33	
Nitrophenol [4-]	5 000	30	0.33	
Nitrosodi-n-propylamine [N-]	0.1	30	0.33	0.33
Nitrosodimethylamine [N-]	0.01	30	0.33	0.33
Nitrosodiphenylamine [N-]	140.	30	0.33	0.33
Pentachlorophenol	5.8	30	0.33	0.33
Phenol	48 000	30	0.33	0.33
Propylbenzene	NA	18	0.005	0.005
Styrene	3 300	18	0.005	0.005
Tetrachloroethane [1,1,1,2-]	270	18	0.005	0.005
Tetrachloroethane [1,1,2,2-]	3.9	18	0.005	0.005
Tetrachloroethylene	5.9	18	0.005	0.005
Trichloro-1,2,2-trifluoroethane [1,1,,2-]	NA	18	0.005	0.005
Trichlorobenzene [1,2,4-]	160	30	0.33	0.33
Trichloroethane [1,1,1-]	1 000	18	0.005	0.005
Trichloroethane [1,1,2-]	6.3	18	0.005	0.005
Trichloroethene	3.2	18	0.005	0.005
Trichlorofluoromethane	24 000	18	0.005	0.005
Trichlorophenol [2,4,5-]	8 000	30	0.33	0.33
Trichlorophenol [2,4,6-]	64	30	0.33	0.33
Trichloropropane [1,2,3-]	480	18	0.005	0.005
Trimethylbenzene [1,2,4-]	40	18	0.005	0.005
Trimethylbenzene [1,3,5-]	32	18	0.005	[illegible]
Vinyl chloride	0.01	18	0.01	

[a] All data were extracted from FIMAD on June 6,1995.
[b] SAL = Screening action level.
[c] NA = No applicable value is available.

TABLE B-7 (CONTINUED)

ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 0-030(q)

LOCATION ID	SAMPLE ID	ANALYTE	ANALYSIS RESULTS (mg/kg)	UTL[a]	SAL[b]
00-1515	AAB0205	Manganese	340	1 030	11 000
00-1515	AAB0205	Manganese	250	1 030	11 000
00-1515	AAB0189	Mercury	0.03	0.1	24
00-1515	AAB0189	Mercury	0.04	0.1	24
00-1515	AAB0189	Mercury	0.03	0.1	24
00-1509	AAB0202	Mercury	2.6	0.1	24
00-1509	AAB0202	Mercury	1	0.1	24
00-1509	AAB0202	Mercury	2.2	0.1	24
00-1513	AAB0203	Mercury	0.09	0.1	24
00-1513	AAB0203	Mercury	0.1	0.1	24
00-1513	AAB0203	Mercury	0.07	0.1	24
00-1514	AAB0204	Mercury	0.2	0.1	24
00-1514	AAB0204	Mercury	0.2	0.1	24
00-1514	AAB0204	Mercury	0.1	0.1	24
00-1515	AAB0205	Mercury	0.04	0.1	24
00-1515	AAB0205	Mercury	0.03	0.1	24
00-1515	AAB0205	Mercury	0.04	0.1	24
00-1515	AAB0189	Nickel	5.8	26.7	1 600
00-1509	AAB0202	Nickel	5.2	26.7	1 600
00-1513	AAB0203	Nickel	7.4	26.7	1 600
00-1514	AAB0204	Nickel	5.8	26.7	1 600
00-1515	AAB0205	Nickel	5.5	26.7	1 600
00-1515	AAB0205	Nickel	7.5	26.7	1 600
00-1477	AAB0304	Nickel	7.6	26.7	1 600
00-1515	AAB0189	Potassium	1 200	6 179	NA
00-1509	AAB0202	Potassium	900	6 179	NA
00-1513	AAB0203	Potassium	950	6 179	NA
00-1514	AAB0204	Potassium	650	6 179	NA
00-1515	AAB0205	Potassium	1 000	6 179	NA
00-1515	AAB0205	Potassium	1 300	6 179	NA
00-1515	AAB0189	Selenium	0.3	1.7	400
00-1509	AAB0202	Selenium	0.7	1.7	400
00-1509	AAB0202	Selenium	0.7	1.7	400
00-1515	AAB0205	Selenium	0.5	1.7	400
00-1509	AAB0202	Silver	2.4	1.61	400
00-1515	AAB0189	Sodium	250	1 884	NA
00-1509	AAB0202	Sodium	180	1 884	NA
00-1513	AAB0203	Sodium	190	1 884	NA
00-1514	AAB0204	Sodium	230	1 884	NA
00-1515	AAB0205	Sodium	250	1 884	NA

TABLE B-7 (CONTINUED)

ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT SWMU 0-030(q)

LOCATION ID	SAMPLE ID	ANALYTE	ANALYSIS RESULTS (mg/kg)	UTL[a]	SAL[b]
00-1515	AAB0205	Sodium	210	1 884	NA
00-1515	AAB0189	Thallium	0.2	0.9	6.4
00-1515	AAB0205	Thallium	0.2	0.9	6.4
00-1515	AAB0189	Vanadium	15	66	560
00-1509	AAB0202	Vanadium	11	66	560
00-1513	AAB0203	Vanadium	14	66	560
00-1514	AAB0204	Vanadium	9.8	66	560
00-1515	AAB0205	Vanadium	18	66	560
00-1515	AAB0205	Vanadium	12	66	560
00-1515	AAB0189	Zinc	53	101	24 000
00-1509	AAB0202	Zinc	250	101	24 000
00-1513	AAB0203	Zinc	93	101	24 000
00-1514	AAB0204	Zinc	140	101	24 000
00-1515	AAB0205	Zinc	46	101	24 000
00-1515	AAB0205	Zinc	38	101	24 000

[a] UTL = Upper tolerance limit.
[b] SAL = Screening action level.
[c] Not available.