WORKPLAN
FOR INITIAL LANL RESPONSE TO ACTION 1

NMED August 12, 1994 COMPLIANCE ORDER 94-12

1.0 INTRODUCTION

On August 12, 1994, the New Mexico Environment Department (NMED) issued Compliance Order NMHWA 94-12 against the Department of Energy (DOE) and Los Alamos National Laboratory (LANL) which alleged, among other things, improper disposal of Resource Conservation and Recovery Act (RCRA)-regulated hazardous waste in a non-RCRA-permitted disposal unit, Pit 37 in Area G at Technical Area (TA)-54. Ordered Action No. 1 requires that DOE/LANL prepare "... *a complete site characterization plan for Pit 37,... in order to determine the vertical and horizontal extent of any* ***hazardous waste contamination***" [emphasis added].

It is DOE/LANL's belief, pending the full review described in Section 3.0 herein, that only three potential or "suspect" RCRA waste streams were ever disposed in Pit 37: TA-3-30 Environmental Restoration (ER) Project contaminated soils; the "Catholic Church" ER wastes, and the TA 50 sludges; and that these three streams represent the **only** potential or "suspect" hazardous waste in the pit. (It should be noted that in Compliance Order NMHWA 94-09, in Conclusions 68 and 70, NMED described the latter two waste streams as having been inadequately characterized). DOE and LANL intend to analyze the available data and develop information demonstrating the true nature of these three streams are not hazardous wastes.

This document provides a workplan for review of the existing Pit 37 waste inventory/location data, and for development of position papers which present detailed assessments of the Catholic Church wastes and TA 50 sludges already disposed. The remaining portions of Section 1 of this workplan will provide a review of site history and geology, and a description and history of Area G and Pit 37 operations. Section 2 provides brief comments on the TA 3-30 ER soils. Section 3 presents the plan for review and analysis of the data available on wastes disposed in Pit 37. Sections 4 and 5 will briefly describe the plans for detailed assessments of the already-disposed TA 50 sludges and "Catholic Church wastes," respectively.

This workplan does not provide for further sampling in the pit. The discussion in Section 3 will address the issues and hazards associated with physical sampling. It will describe the extent of available information on wastes disposed in Pit 37, and how this information will be used to meet NMED's pit characterization requirement.

16579

1.1 SITE DESCRIPTION

LANL is located in Los Alamos County, an incorporated county, in north-central New Mexico, approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL, which occupies an area of 43 square miles, and the associated residential and commercial areas of Los Alamos County, which occupies an area of 109 square miles, are situated on the Pajarito Plateau. The plateau consists of a series of finger-like mesas separated by deep east-west trending canyons. Ephemeral, or intermittent, streams lie at the bottoms of all the canyons. The mesa tops range in elevation from approximately 7,800 feet above mean sea level (amsl) at the flank of the Jemez Mountains, located to the west of Los Alamos, to about 6,200 feet amsl at their eastern extent, where they terminate above the Rio Grande Valley.

1.1.1 TA-54, AREA G DESCRIPTION

Area G at TA-54 is the low-level waste (LLW) disposal facility, and the solid low-level mixed waste (LLMW) and transuranic (TRU) waste storage facility for Los Alamos National Laboratory (see Figure 1 for location of TA-54). Area G is not authorized to accept liquid wastes; henceforth, the term "solid" will be used in this document to distinguish these wastes from the liquid waste form. Solid low-level waste in a variety of forms is disposed in pits and shafts. TRU waste was placed belowgrade in Pits 9 and 29 and in several trenches and shafts, and abovegrade in Domes 153 and 48 and on Pads 1, 2, and 4. Located on Mesita del Buey, Area G has been managing solid radioactive waste since 1957 and will remain LANL's solid radioactive waste management area. In the early 1990s, the US Department of Energy (DOE) designated Area G a nonreactor nuclear facility, thereby requiring rigorous quality assurance and control and formality of operations.

Area G is primarily regulated under DOE Orders such as 5820.2A, "Radioactive Waste Management." Collectively, the Area G subunits also constitute a number of the Solid Waste Management Units (SWMUs) listed in Module VIII (Hazardous and Solid Waste Amendments (HSWA) module) of LANL's RCRA permit. These SWMUs are required to be addressed by the LANL ER Project under the workplan for Operable Unit (OU) 1148, through which they will undergo the RCRA Facility Investigation/Corrective Measures Study/Corrective Measures Implementation process according to a schedule agreed upon by the EPA.

1.1.2 AREA G ENVIRONMENT

TA-54 is located on Mesita del Buey, an east-west-trending finger mesa bounded by Cañada del Buey to the north and by Pajarito Canyon to the south. Mesa-top elevations at TA-54 range from approximately 6,900 to 6,650 feet

amsl. The locations of the waste management areas at TA-54, Area G are shown on Figure 2.

Mesita del Buey was chosen as the site for TA-54, Area G because of its then-remote location and because the United States Geological Survey (USGS) determined that environmental conditions at the site were ideal for isolating the waste from potential receptors. The USGS concluded that *"Movement of water in the tuff is slow . . . large amounts of water (more than available from precipitation) would be required to move contaminants from the pits to the main groundwater body . . . ."* A brief description of the Pit 37 site environment is presented in the following paragraphs.

Wells and Surface Waters. The municipal and industrial water supply for LANL and Los Alamos County is supplied by water pumped from the main aquifer, the surface of which ranges from approximately 600 to 1,200 feet below the surface of the plateau. Surface water on LANL property is limited primarily to ephemeral or intermittent streams in the canyon bottoms. The volume of water flow in these streams is generally dependent upon storm runoff, snow melt, and the National Pollutant Discharge Elimination System (NPDES) outfalls discharging treated sanitary and industrial effluents. Surface, well, and spring waters are sampled routinely and analyzed for radionuclides as well as organics (volatiles, semivolatiles, pesticides, herbicides, and polychlorinated biphenyls), heavy metals, fluorides, nitrates, carbonates, bicarbonates, silica, sodium, magnesium, and conductivity. Analytical results are published annually by LANL. Copies of this publication are submitted annually to the NMED and the U.S. Environmental Protection Agency (EPA), Region 6, Administrator.

Soils. The soils in TA-54 are Hackroy sandy loam and are classified in the Unified Soil Classification System as sandy loam (SM), sandy loam-sandy clay (SM-SC), loam (ML), clay loam-loam (CL-ML), and clay loam (CL). The Hackroy soils typically range from a brown SM in the top 8 centimeters (cm) to a reddish brown from 8 to 30 cm in depth. Permeability rates range from 5 to 15 cm per hour (cm/hr) in the top layers down to 0.15 to 0.50 cm/hr in the lower layers. The shrink-swell potential is low. Available water-holding capacity is 0.11 to 0.21 cm per cm, and the soil pH is 6.6 to 7.8. Native vegetation in TA-54 is mainly blue grama, piñon pine, and one-seed juniper (Nyhan et al., 1978).

Geology. TA-54 is located in the central part of the Pajarito Plateau, which forms an apron of volcanic and sedimentary rocks around the eastern flanks of the Jemez Mountains (Gardner et al., 1986). Pit 37 is situated in the Bandelier Tuff, which is the most widespread rock unit on the Pajarito Plateau (Griggs and Hem, 1964). The Tshirege Member of the Bandelier Tuff was erupted from the Valles Caldera approximately 1.3 million years ago (Spell et al., 1990). It consists of multiple flow units of crystal-rich ignimbrite, which have significant variations in welding and alteration, both in a single stratigraphic section and

with varying distance from the caldera. Flow units are locally separated by volcanic surge deposits of well-sorted, fine-grained, cross-bedded crystalline pumice fragments. Vapor -phase alteration occurs in much of this unit.

Often the base of the Tshirege is marked by 1.5 to 10 feet of bedded, unconsolidated, pumice-rich ash-fall tuff of Tsankawi pumice (Bailey et al., 1969; Crowe et al., 1978). In ash-flow tuffs, cooling joint spacing varies primarily with the thickness of the unit, emplacement temperature, substrate temperature, and topography. Joint density tends to be greatest in welded tuff and least in nonwelded tuff. Hydraulic conductivities are generally greatest in the fractured, welded parts of ash flow tuffs and least in nonwelded parts (Crowe et al., 1978).

Additional geologic and stratigraphic information can be found in the October, 1993 RCRA Part B permit application and other LANL documents.

Ground Water. In the Los Alamos area, ground water occurs in three modes: (1) water in shallow alluvium in some of the larger canyons, (2) as perched water (a ground-water body above a less permeable layer that separates it from the underlying main aquifer by an unsaturated zone), and (3) the main aquifer of the Los Alamos area. Further discussion of canyon alluvium ground water is not presented here, since Pit 37 is not located in a canyon. Additional hydrologic information can be found in the October, 1993 RCRA Part B permit application and other LANL documents.

Perched ground-water bodies occur at intermediate depths in the conglomerates and basalts beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia Canyons. Depth to perched water ranges from about 90 feet in the midreach of Pueblo Canyon to about 450 feet in lower Sandia Canyon. Water from the Pueblo Canyon perched aquifer discharges at Basalt Spring in lower Los Alamos Canyon.

The only aquifer of the Pajarito Plateau capable of providing a large-scale municipal and industrial water supply is in rocks of the Santa Fe Group and Puye Formation. The upper surface of this main aquifer rises westward from the Rio Grande through the Santa Fe and into the lower part of the Puye beneath the central and western parts of the plateau. Work using tritium as a hydrologic tracer indicates that some downward movement of moisture occurs beneath the canyons (LANL, 1993e). Water-level elevations suggest that ground water flows from the Jemez Mountains east and east-southeast toward the Rio Grande, where a part is discharged into the river through seeps and springs. The ground-water flow rate ranges from 20 feet per year (ft/yr) in the Tesuque Formation to 345 ft/yr in the more permeable Puye (Purtymun et al., 1980; Purtymun, 1984).

The hydraulic gradient of the aquifer averages about 60 to 80 feet per mile within the Puye but increases to 80 to 100 feet per mile along the eastern edge of the plateau as the water enters the Santa Fe. The depth to the water table under LANL ranges from about 600 to 1,200 feet. The wells in the main aquifer near the Rio Grande exhibit artesian conditions.

Water-balance calculations for the area of LANL indicate that the annual evapotranspiration rate exceeds the annual precipitation rate. Additionally, field investigations have shown that infiltration of precipitation into the Bandelier Tuff is essentially zero. At depths below 10 feet, the volumetric moisture content of the tuff at LANL varies from about 4 to 6 percent on the mesas and from approximately 6 percent to saturation in the canyons with perched aquifers. In canyons where no perched aquifers are present, the volumetric moisture content of the tuff at depths below ten feet ranges from about 4 to 10 percent. If sufficient moisture is present to permit migration of moisture, unsaturated flow would be the predominant mechanism of movement in the Bandelier Tuff. If insufficient moisture is present, vapor phase transport appears to be the predominant mechanism of movement. Additional information on ground-water and vadose zone characteristics in the vicinity of Pit 37 is presented in "*Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory,*" Docket No. NMHWA 001007 (IT Corporation, 1987).

Additional descriptive information on TA-54 location characteristics and site geology, and the complete references for documents cited in this section, are provided in the LANL RCRA Part B permit application submitted to NMED in October, 1993.

1.2 SITE HISTORY AND OPERATIONS

1.2.1 HISTORY OF AREA G

Early operations. Solid radioactive waste has been managed at several material disposal areas (MDAs) throughout the history of LANL. Most notably, MDAs A, B, and T at TA-21 and MDA C at TA-50 all predate operations at Area G. In 1956, as pit space at Area C was exhausted, a request was made for a new location to dispose of radioactive waste, and the USGS was contracted to assist in siting a new repository. Mesita del Buey was chosen due to its remoteness—the town of White Rock had not yet been established—and because environmental conditions at the site were believed to be optimal for isolating the waste from potential receptors.

Construction of Area G. Construction at Area G began in 1957 with Pit 1, on the southeast end of the site (Fig. 1). It was governed by engineering drawing ENG-C 18463, which was the basis for construction until 1965, when the USGS issued updated guidance, and a new drawing, ENG-C 25703, was prepared.

The first shafts were drilled at Area G in 1965 as room for continued shaft disposal at TA-50, Area C, became scarce. The USGS construction guidance prevented constructing disposal units closer than 50 ft from the competent canyon rim, and specified that disposal units not be excavated deeper than the adjacent canyon bottom. Thus, the early pits were approximately 25 ft deep, 400 ft long, and 80 to 100 ft wide. Early shafts ranged from 2 to 8 ft in diameter, and were approximately 25 ft deep.

Current operations. Today, Area G contains approximately 35 pits and 220 shafts which have been used for disposal of low-level waste (LLW) since 1957. Most of the pits and shafts are unlined, although several shafts used to dispose of tritium are lined with corrugated metal pipes coated with asphalt. The newer pits and shafts located further west, where the mesa is deeper, were usually excavated to a depth of 65 feet.

Additional trenches contain ^{238}Pu waste, and two domes on-site store TRU waste. Legacy TRU waste is contained in Pits 9 and 29 and in several shafts for remote-handled TRU waste. The estimated remaining capacity of Area G will support continued operations at least through fiscal year 1997 (FY97, or September 1997), but all expansion plans are suspended until a revised site-wide environmental impact statement (EIS) covering the entire LANL operation can be completed.

Disposal Records. In 1970, the Atomic Energy Commission (AEC), the DOE predecessor, issued Directive AEC-IAD-0511-21, which implicitly required radioactive waste characterization and segregation. Formal storage and disposal record-keeping was initiated, and the use of waste disposal request forms began. For waste disposed prior to that time, however, less detailed logbooks were kept.

1.2.2 LLW OPERATIONS

Waste acceptance at Area G is governed by safe operating procedures (SOPs) and is done to ensure that all waste complies with the appropriate waste acceptance criteria (WAC). Waste acceptance criteria are formal documents that govern waste acceptance at Area G. They are generated by the Waste Acceptance Subteam and incorporated into a waste acceptance criteria and certification (WACC) document that covers all waste types. The Waste Acceptance Subteam develops criteria for low-level radioactive solid waste disposal at Area G and for safe storage of TRU waste at Area G. The WAC contains regulatory-driven requirements for waste characterization, including radioactive and hazardous constituents; container specifications; labeling; packaging; and documentation. LANL closely monitors adherence to these criteria.

The Low-Level Waste Disposal Subteam at Area G receives, handles, and disposes of low-level radioactive waste (LLW). LLW is nonhazardous waste that contains radioactive material and is not classified as high-level, TRU waste, spent nuclear fuel, or tailings from the milling of uranium or thorium ore.

Generating waste disposal records. Working with the Customer Service Group and the Waste Acceptance Subteam, waste generators complete records and supporting documentation for the disposal of the waste. Required forms are provided in the WAC, and include a waste disposal request form and a waste characterization form. Examples of forms currently used at LANL are provided as Attachments 1 and 2. These waste disposal records and the database used by LANL will be discussed further in Section 3 of this workplan.

Transportation. Qualified LANL contractors ship radioactive material to Area G. Strong administrative controls ensure that DOT and DOE requirements for waste packaging, labeling and transportation are met. The generator arranges most shipments through LANL Facility Support Services, but the Solid Radioactive Waste Group routinely transports dumpster loads.

Waste acceptance at the control gate. Before accepting waste at Area G, the LLW Disposal Subteam reviews and approves the associated documentation for completeness and accuracy. The Subteam weighs the load and visually inspects it using a checklist; the radiation control technicians (RCTs) survey the load for radiation. All survey information is compared with the disposal documentation for consistency and accuracy.

Dumpsters. Dumpsters throughout LANL allow groups to dispose of LANL radioactive waste routinely in a controlled container. Pickup and disposal of this waste is scheduled through the CST-17 Customer Service Group. The Solid Radioactive Waste Group picks up and disposes of the waste.

Pit disposal. Routine LLW loads are transported to the disposal pit, where they are unloaded, compacted in place, and, if they are uncontained and could be dispersed, covered with a protective layer of crushed tuff. Waste loads are placed in specific locations inside the pit to maximize disposal volume, and locations are recorded with surveying equipment.

Shaft disposal. Waste streams that exhibit special characteristics such as high external dose rates, biological decay, or inhalation hazards are placed in engineered shafts augered into the mesa top. This disposal method enhances control of the waste form. Soil is used periodically between emplaced wastes as a barrier to shield workers from penetrating radiation. When shafts reach capacity, they are capped, and a permanent identification marker is attached.

Exit radiation surveys. All vehicles, equipment and tools associated with the disposal of LLW that leave the controlled area require a radiation survey. The RCTs survey the items and release the items only if they are below levels specified in DOE Order 5400.5.

Nonconformance reports. Nonconformance reports are issued for all occurrences associated with improper handling, packaging, labeling, and transportation of LLW. Reports initiated by the LLW Disposal Subteam and resulting from inspections at the Control Gate are sent to the waste generators for completion and resolution. For transportation occurrences, the transportation group in Business Operations (BUS) Division is also notified. The Waste Acceptance Subteam tracks trends in nonconformances with CST-17 Customer Service. Multiple similar occurrences can result in a moratorium being placed on the generating organization.

1.3 DESCRIPTION OF PIT 37

All pit designs are developed, reviewed and approved by a professional engineer. Pit 37 was constructed in 1990. It was excavated in the Bandelier tuff with dimensions of 730 feet in length, 80 feet in width and approximately 61 feet in depth. The pit is oriented with its long axis trending east to west. The west entrance ramp had a 3:1 (horizontal:vertical) slope, while the east ramp was completed with a 6:1 (h:v) slope. Pit walls are vertical, with benching installed every 20 feet at a minimum width of 5 feet (Figure 3). Receipt of LLW began in April, 1990 following approval of readiness for use of the pit by a professional engineer and certified geologist. As of October, 1994, Pit 37 has a remaining volume of 15,568 cubic meters.

Surveying of Waste Locations. All waste loads accepted and placed in Pit 37 were surveyed, and their vertical and horizontal locations within the pit were recorded in logbooks and later transferred to an electronic database. This survey data is used by LANL Waste Management program staff for several purposes:

- To account for volume tracking and changing availability of space in Pit 37 for purposes of effective management and long-range planning.
- To identify locations of each emplaced waste package within the pit. This waste location information will be used to support development of source term and risk characterization information for the performance assessment. LANL is developing a site-specific radiological performance assessment (PA) for Area G. The PA evaluates the radiological dose consequences of low-level radioactive waste disposal compared with a set of performance objectives established by the DOE to conform with the requirements of DOE Order 5820.2A.

Overall site performance will be assessed by modeling the potential for radionuclide migration within the waste in the disposal pits and shafts, the transport of the radionuclides through the host medium to the accessible environmental—for example, air and water—and the human-receptor exposure pathways. Because the facility model will provide the radiological source term for the PA, an accurately-developed waste inventory is crucial. Thus, compliance with the waste acceptance criteria is crucial to establish confidence in the source term, and conversely, the results of the PA may be used to modify the WAC to ensure that DOE performance objectives are met.

Development of the PA is a long-term effort. Initial results of the PA modeling will be available for review in approximately July, 1995, and will be incorporated into the site-specific risk assessment information developed as part of the ER program's implementation of the OU 1148 workplan.

Pit 37 was the first LLW disposal unit at Area G in which LANL installed Leica total station electronic transit survey capability, which now allows for direct transfer of waste location data to the LANL LLW database described in the following section.

1.4 ANALYSIS OF LLW DISPOSAL DATA

LLW Management System. The LLW Management System (LLWMS) is the database which stores information for each LLW package received for disposal. Waste package data is based on the waste disposal request form. This form (see example of currently-used form at Attachment 1) is received from the waste generator, and the data on the first page is screened to preapprove acceptance of the load and entered into the LLWMS. At that time, several rad load values are calculated and checked against low-level radionuclide acceptance limits and saved for future reporting and analyses. Loads failing the criteria are not accepted and undergo the nonconformance process described in Section 1.2.2.

At the time the waste load is received and emplaced in the pit, the "receiving site" information on the second page of the waste disposal request form is entered into the LLWMS. Radiological calculations are made based on check-in data, and compared to the preapproval calculations. Data on compaction and disposal is entered as appropriate. Figure 4 summarizes the LLWMS data management process that was used for organizing and storing Pit 37 waste data.

2.0 HISTORY OF TA-3-30 SOIL REMOVAL PROJECT

The history of this ER project, following the soils through initial sampling, the nature of the decision process involved in their characterization, and the process of disposal and subsequent initial remedial actions regarding this waste stream

was presented in the DOE letter to NMED dated June 1, 1994, and as part of the DOE/LANL Answer to the Compliance Order, dated September 14, 1994.

3.0 WORK TO BE PERFORMED

Through the Order, NMED has alleged that one or more waste packages or loads disposed in Pit 37 are of concern, i.e., a possibility exists that RCRA wastes may have been erroneously identified as nonhazardous. The purpose of this Pit 37 characterization plan is to identify any such "suspect RCRA" waste loads that may exist through a thorough analysis of the available data on the entire pit inventory. Waste characterization data contained in the records will be reevaluated to verify the accuracy of the original waste identification process for each waste. The reevaluation will then focus on any wastes for which questions arise about the adequacy or accuracy of the original data, or for any generating processes for which questions of data completeness or accuracy arise. Data will be supplemented from generator interviews and files as necessary. The final report will characterize the location of all disposed waste loads, particularly any for which "suspect RCRA" status remains following thorough reevaluation of all available data.

3.1 Analysis of Pit 37 LLWMS Waste Inventory

The LLWMS database contains information on the complete inventory of individual waste packages accepted in Pit 37 during its operating lifetime. The Pit 37 LLWMS data will be analyzed for presence and location of potential or "suspect RCRA" wastes. The following LLWMS data elements will be examined for each waste package in Pit 37:

waste disposal request form number (currently identified as "RSWD")
waste characterization form number (currently identified as "WPF")
Total Curie content
LANL database waste code
date of waste acceptance
generator location (TA, building)
waste description
nuclides present
waste location (position, layer, Post A/Post B)

Sample information available in LLWMS is presented in Attachment 3. This data will be cross-checked against available location data on any disposed waste packages or loads identified to be of concern, i.e., any for which a reasonable possibility exists that RCRA wastes may have been erroneously identified as nonhazardous. For any such "suspect RCRA" waste loads, original waste characterization and disposal request forms and files for each waste load will be retrieved and reviewed for the potential presence of RCRA wastes.

3.2 Detailed Records Evaluation

Data packages will be assembled for each "suspect RCRA" waste load, containing all available records, including information from LANL waste databases, copies of all generator forms, and any additional information in the files. This information will be reviewed by a team of knowledgeable professionals who will characterize the wastes for the presence of RCRA listed wastes or constituents, and the potential presence of RCRA characteristic wastes, using the evaluation process outlined in Figure 5. This process is being used to evaluate legacy LLMW in compliance with the *Low-Level Mixed Waste Characterization Plan,* which was developed pursuant to the Federal Facility Compliance Agreement (FFCA) signed with the EPA on March 15, 1994.

This evaluation process will provide additional validation to support the original reviews of the waste characterization forms at the time of waste acceptance, when the wastes in Pit 37 were originally identified as nonhazardous. It will identify any gaps in the knowledge, if such exist, and these will be further analyzed.

3.3 Generator Interviews

Where the investigators, based on their best professional judgment, conclude that insufficient information is available from record reviews to clearly support or refute a waste determination, the original generators will be contacted and interviewed to gain additional data. Generators will be requested to gather all pertinent data from their own files in connection with each interview. Following the interviews, supplemental engineering or chemical process data, Material Safety Data Sheets, and any other applicable information will be compiled for each waste where waste determinations remain in question. All data will be reviewed according to guidelines established in the Quality Assurance Plan and Data Quality Objectives to be developed for the project.

3.4 Presentation of Findings and Results

All information and analyses will be presented in the final report. Locations of any potential/"suspect RCRA" wastes will be presented as clearly as available data allows, using graphics to present their locations within Pit 37 in three dimensions. Conclusions will be presented to NMED for review regarding all waste loads disposed in the pit throughout its operating lifetime.

3.5 Concerns With Performing Physical Sampling in Pit 37

Worker Health and Safety Issues. There are several potential hazards and resulting consequences to personnel associated with soil sampling and

characterization operations which raise serious concerns that such activities should be avoided. These are described briefly in the following paragraphs.

Direct exposure to radiation will be increased if wastes that have been covered with daily soil cover are to be reexposed during sampling or other activities. While intact containers were placed in Pit 37 for disposal, they were undoubtedly damaged during routine compaction using a bulldozer following their initial placement. Therefore, the potential for radionuclide exposure increases if these covered wastes were to be reexposed during sampling or other activities in the pit. This raises concerns that such processes would not minimize worker radiation exposure to levels that are as low as reasonably achievable, as mandated by DOE requirements.

During core soil sampling operations, radiation inhalation may result from the close contact necessary in retrieving those soil samples that may be potentially radioactively contaminated. Surface and airborne radiological contamination can lead to ingestion and inhalation of resuspended materials, resulting in internal radiation exposures. Under normal operating conditions, it is unlikely that Area G personnel would be exposed to airborne radionuclides. Because Pit 37 characterization efforts would likely result in the breaching of highly contaminated waste packages (or additional exposure to previously breached packages, as described above), radiological exposure to workers is likely. Inhalation is the most probable route by which workers may be exposed to radionuclides.

During soil characterization, radiologically contaminated soils and exposed waste packages may also pose a serious health hazard in windy conditions because contaminants may readily become airborne. The use of water sprays to mitigate dust spreading would have negative consequences, since it could spread contaminants through liquid migration beneath the pit itself, and could change the physical appearance of the contaminated soils and other materials within the pit, making it more difficult to identify appropriate sampling locations (for example, the TA 3-30 ER soils originally could be identified visually due to discoloration).

Dust (silica) from the Bandelier tuff excavated at Area G has the potential of being radiologically contaminated. Silica is the crystalline form of silicon dioxide (SiO_2), which is a colorless, odorless, noncombustible solid. The route of concern for workers disturbing soil at Pit 37 for silica exposure is inhalation. Analysis of the Bandelier Tuff from TA-54, Area G, Pit-37 has revealed concentrations of silica at 50.9% cristobalite and 4.45% quartz. Silica is a health hazard only when it is inhaled in the crystalline form. The inhalation of silica to the deep lung may cause silicosis. Silicosis is the scarring of the lungs due to the deep deposition of crystalline silica. The scar tissue causes the lungs to become stiff and unable to expand.

Preliminary sampling conducted at TA-54, Area G indicates that there are several categories of activities that place workers at an increased risk of silica exposure. The activities of elevated risk to silica exposure include any earth disturbing operations such as shoveling, trenching, and mini-dozer operations. Dust will be present during all operations, i.e. earth disturbing activities, which could cause elevated dust/radionuclide exposure.

Existing Pore Gas Beneath Area G. Sampling of pore gas in subsurface soils beneath several waste management areas at TA-54 has indicated an apparent migration of organic vapors. Compounds such as 1,1,1-trichloroethane and trichloroethylene have been detected. The sources of these pore gas contaminants are not definitively known. It is unclear that the contents of disposal pits at Area G would not have been tainted with this contaminated pore gas. Therefore, determination of the source of these compounds, if detected in wastes sampled in Pit 37, would be difficult to attribute to a material placed in the pit or pore gas contamination. Therefore, sampling in the pit could not provide conclusive evidence of the source of the contaminants. Additional evaluations are being conducted by the LANL ER Project pursuant to the HSWA permit and the workplan for OU 1148, through which they will undergo the RCRA Facility Investigation/Corrective Measures Study/Corrective Measures Implementation process according to a schedule agreed upon by the EPA

4.0 ANALYSIS OF TA 50 SLUDGES

A position paper will be developed through analyses of existing data for the TA 50 waste sludges, which will include an analysis of past sampling data for liquid waste influents to the TA 50 liquid waste treatment facility. DOE and LANL propose to demonstrate that the waste stream in question was in fact adequately characterized for metals and should not be regulated under RCRA.

5.0 ANALYSIS OF "CATHOLIC CHURCH" WASTES

A position paper will be developed based on the use of guidance provided in EPA document SW-846, *Test Methods for Evaluating Solid Waste, Volume II: Field Methods* (Third Edition, November, 1986). Through the use of this guidance, DOE and LANL propose to demonstrate that the waste stream in question was adequately characterized for metals and in fact should not be regulated under RCRA.

6.0 REFERENCES

The complete references for documents cited in this workplan were provided in the LANL RCRA Part B permit application submitted to NMED in October, 1993.

Additional information and references can be found in the October, 1993 RCRA Part B permit application and other LANL documents.

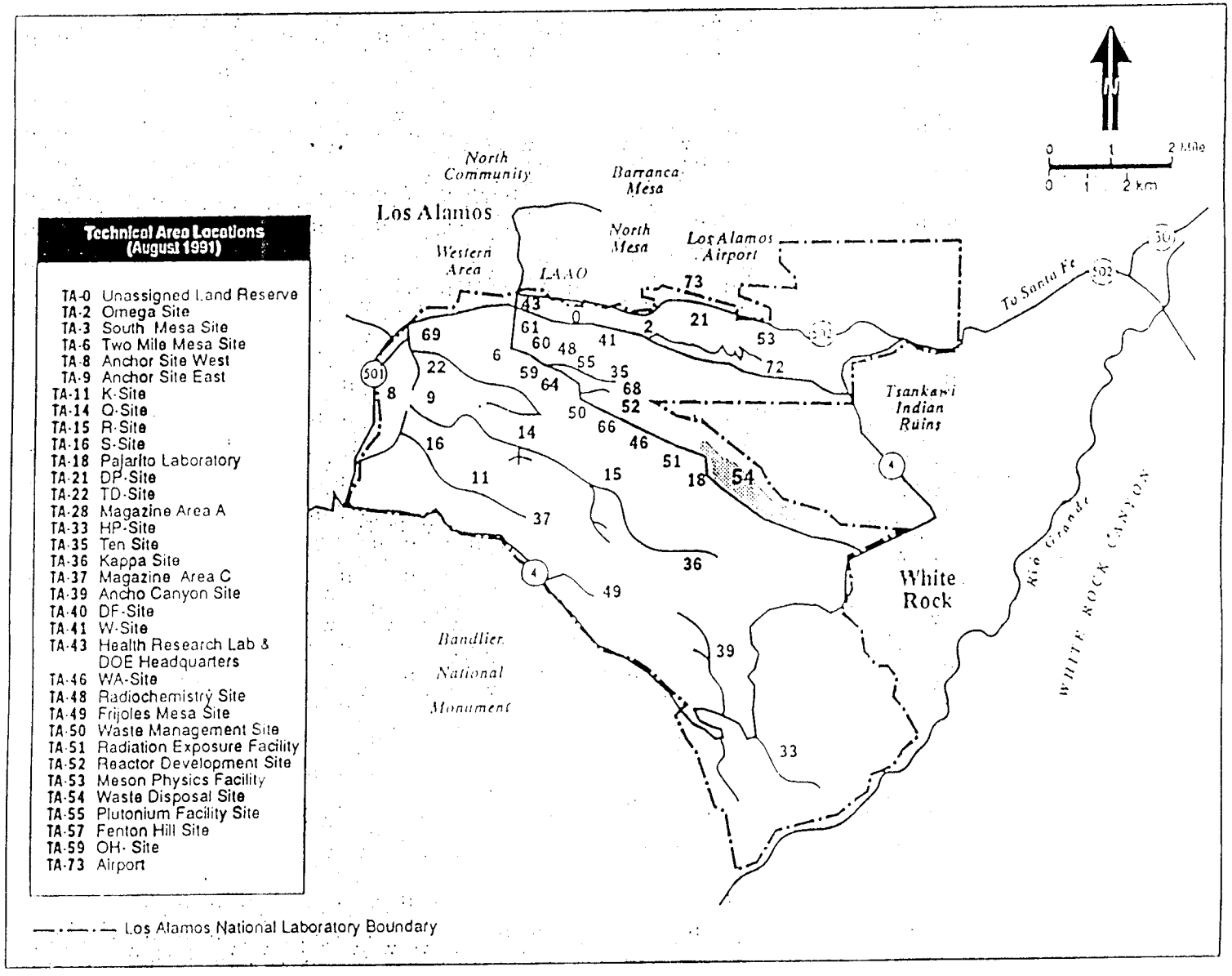

FIGURE 1

Los Alamos National Laboratory Technical Area Locations

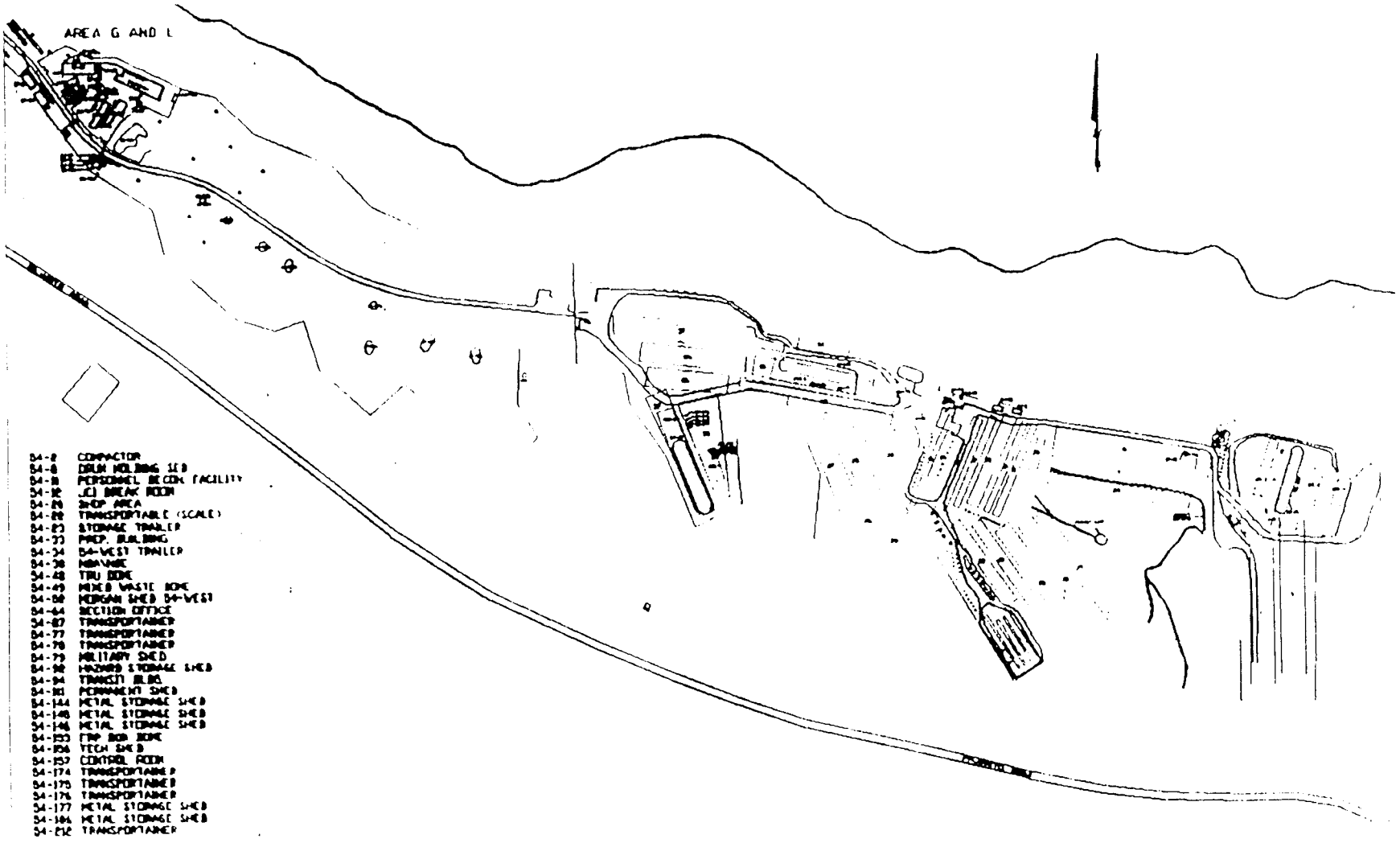

Figure 2

Location of Area G Waste Management Areas

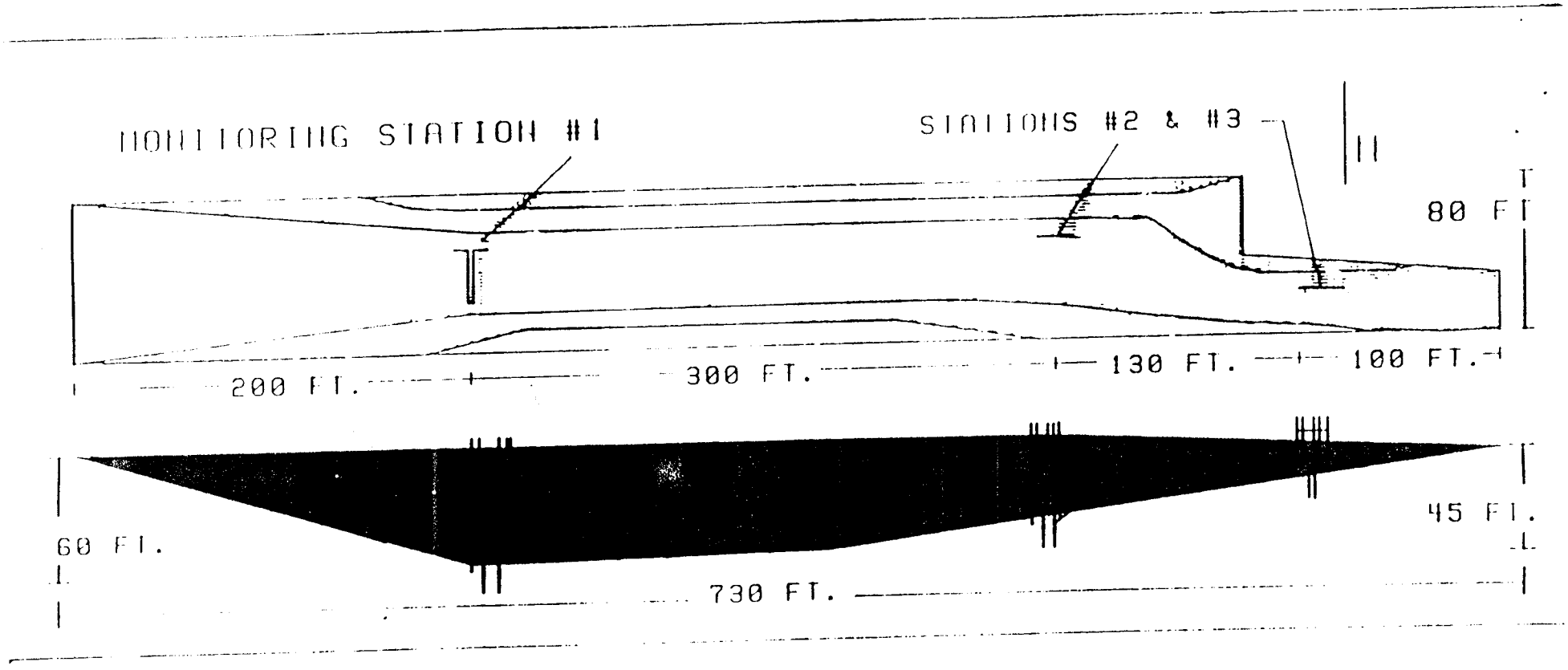

Figure 3
Pit 37 Plan View and Cross-section

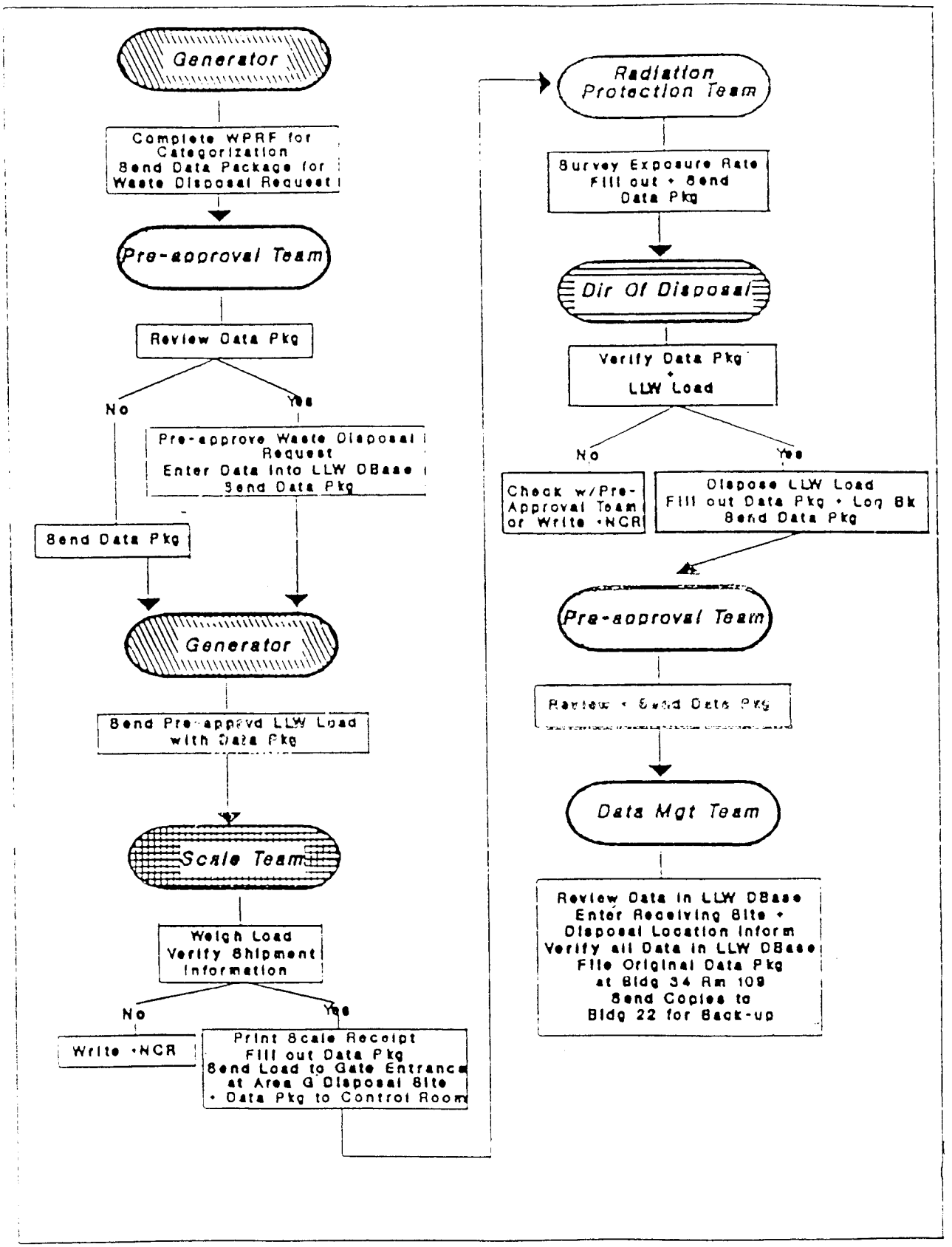

Figure 4

Schematic of the LANL Low-Level Waste Management System

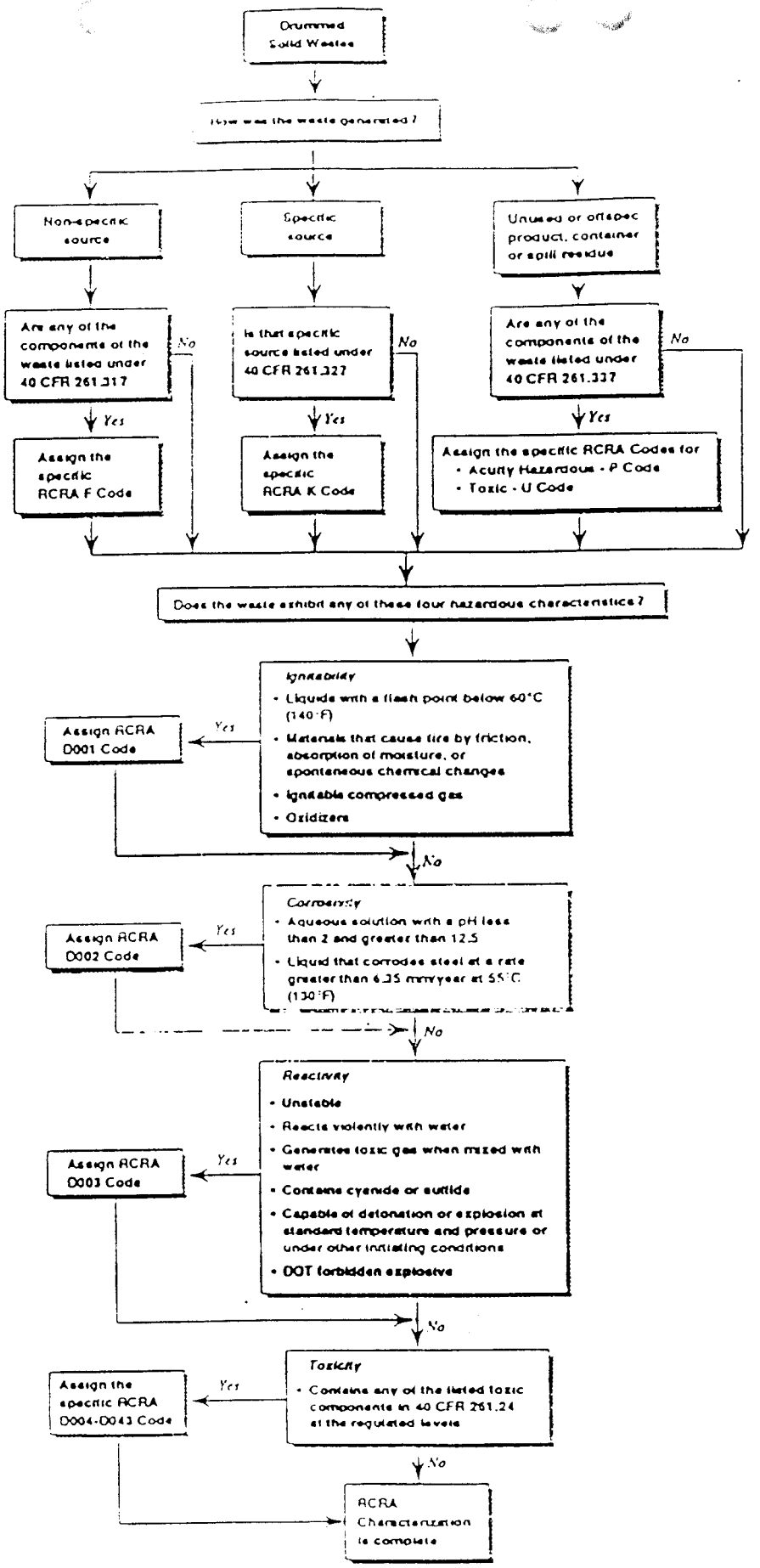

Figure 5
Proposed Waste Record Re-evaluation Process

LOS ALAMOS
NATIONAL LABORATORY

EM-7 USE ONLY

RADIOACTIVE SOLID WASTE DISPOSAL (RSWD) RECORD
APPLICATION FOR STORAGE/DISPOSAL

Date
Group
Technical Area
Building
Return Mail Stop

INSTRUCTIONS

1. Read and follow detailed instructions on last page.
2. For further assistance contact your Waste Management Coordinator.
3. Send completed form to "LLW Reviewer," EM-7, MS J595, for approval.

Form 1354 (5/92) (ES&H Form 10-2A)

Attachment 1

Current LANL Waste Disposal Request Form

EM-7 USE ONLY

1. Waste Originator Information

Date (MM.DD.YY)	Group	TA	Building	Wing	Mail Stop	Telephone	Certified WS No

Generator No.	Waste Stream No.	Cost Code	Program Code	WMC No.

2. Waste Characterization and Packaging Information

Waste Profile Request No.	Hazardous Materials Transfer Form HM No.	Waste Code	☐ Actual Rad ☐ Suspect Rad ☐ Mixed Waste ☐ Non-Rad

Total Waste Volume	☐ Meters^3 ☐ Feet^3 ☐ Gallons	Estimated Weight	☐ Kilograms ☐ Pounds ☐ Tons	Serial No.	Is this a dumpster? ☐ Yes ☐ No If yes, ☐ Compactible ☐ Non-Compactible Dumpster No.

Waste Description

Radiation Exposure Rate ☐ R/hr ☐ mR/hr

C & D Form Numbers

Comments

Package Codes*	Package Code*	Package Volume (Individual Package)	Volume Units**	Number of Packages	Total Vol. of Package Type (Pkg. Vol. X No. of Pkgs.)	Volume Units**
01 - Bulk (unpackaged)						
02 - Wooden crate						
03 - Drum						
04 - Cardboard box						
05 - Plastic bag						
06 - Steel box						
07 - Shield cask						
08 - Other (specify below)						

Volume Units**: M = Meters^3, F = Feet^3, G = Gallons

Radionuclide	Amount			Units+	Uncertainty		Method++	SS Acct.	Proj. Code
		E	+/-		+/-	%			
		E	+/-		+/-	%			
		E	+/-		+/-	%			
		E	+/-		+/-	%			
		E	+/-		+/-	%			
		E	+/-		+/-	%			
		E	+/-		+/-	%			
		E	+/-		+/-	%			

+Units: C = Curies M = Grams

++Methods: A = Analysis M = Measurement C = Calculation E = Estimation

3. Waste Certification

GENERATOR CERTIFICATION STATEMENT: My signature certifies that the waste is as described here and on the attached Waste Profile Request form. Waste meets all applicable acceptance and storage or disposal criteria listed in Administrative Requirement 10-2, "Low-Level Radioactive Solid Waste," and in "Waste Acceptance Criteria for Low-Level Radioactive Waste Disposal at TA-54, Area G."

Generator's Name (Print)	Signature	Z Number	Date

WASTE MANAGEMENT COORDINATOR STATEMENT: My signature certifies that all information on this form has been reviewed and is correct to the best of my knowledge.

Waste Management Coordinator's Name (Print)	Signature	Z Number	Date

Attachment 1 continued

This Page For EM-7 Use Only	EM-7 USE ONLY

4. EM-7 Approval *(No waste can be accepted without approval signature)*

EM-7 APPROVAL STATEMENT: My signature certifies that the waste described on this application is acceptable, AS DESCRIBED, for storage or disposal by EM-7.

EM-7 Approver's Name *(Print or Stamp)*	Signature	Date Approved

Disposition

☐ MAP Shaft	☐ Low-Level H3 Shaft	☐ Source Shaft	☐ LLW Pit
☐ Be Shaft	☐ High-Level H3 Shaft	☐ Powder Shaft	☐ Asbestos Pit
☐ PCB Shaft	☐ Animal Tissue Shaft	☐ Holding Shed	☐ MW Storage Dome
☐ MW Storage Shaft	☐ MFP Shaft	☐ MW H3 Shed	☐ Certifiable TRU Dome
☐ Other _____	☐ HEPA Filter Shaft	☐ Compactor	☐ Uncertified TRU Storage

5. Receiving Site Information

Date Waste Received	*(MM.DD.YY)*
Actual Volume	☐ Meters³ ☐ Feet³ ☐ Gallons
Gross Weight (lbs)	
Tare Weight (-)	
Net Weight	

Vehicle Code
- ☐ Dumpster (01)
- ☐ Dump truck (02)
- ☐ Flatbed (03)
- ☐ Pickup (04)
- ☐ Shield cask (05)
- ☐ EM-7 truck (06)
- ☐ Other *(specify below)* (07) _____

Treatment Code
- ☐ Compaction (01)
- ☐ Incineration (02)
- ☐ Other (03)
- ☐ None (04)

Exposure Rate Contact _____ mR/hr

Exposure Rate at 1 Meter _____ mR/hr

Number of RSWDs on this load _____

Driver's Signature	HS-1 Monitor's Signature *(TA-54)*	Non-Conformance? ☐ No ☐ Yes	Non-Conformance Report No.

6. Compaction Information

Bale No	Compaction Date	Bale Volume (M^3)	Comments
	(MM.DD.YY)		

7. Disposal Location Information

Disposal Date	Area	Shaft	Pit	Transit Sequence No.	Post(s)	Layer	Position
(MM.DD.YY)							

8. Storage Location Information

Storage Date	Area	Shaft	Building	Column	Layer	Row	Pad	Post(s)	Layer	Position
(MM.DD.YY)										

9. Director of Disposal Operations

DIRECTOR OF DISPOSAL OPERATIONS CERTIFICATION: My signature certifies that all waste receiving, storage, and/or disposal requirements were met.

Director of Disposal or Storage Operations *(Print)*	Signature	Date

10. Data Management Information

	Date Entered in Logbook	Date Entered in Database	Date Entry Verified
Screened Paperwork *(Initial)*	*(MM.DD.YY)*	*(MM.DD.YY)*	*(MM.DD.YY)*
Supervised Disposal *(Initial)*	Initial	Initial	Initial

Attachment 1 continued

INSTRUCTIONS FOR COMPLETING APPLICATION

Filling out the application. The waste generator must complete all sections on the front sheet and on page 1 of this application to document the nature of all waste disposed of or stored at TA-54, Area G. Be sure to complete each section before proceeding to the next. Print all information legibly in ink; illegible information will result in disapproval of the application and will delay the shipment of your waste. Do not use correction fluid. Make all corrections by marking out the incorrect information with a single line, initializing the change, and adding the correct information. Do not change any documents or forms (including the Waste Profile Request [WPR] form and the Radioactive Solid Waste Disposal [RSWD] Record) after they have been approved.

NOTE: These instructions apply only to low-level radioactive solid waste (LLW). For mixed waste, please call the Chemical and Mixed Waste Operations Section of EM-7 at 7-7579.

RSWD APPLICATION PROCESS

1. The waste generator obtains this application from his/her waste management coordinator (WMC) and completes all sections on the cover sheet and on page 1.
2. The waste generator signs the certification statement in section 3 and delivers the completed application to his/her WMC.
3. The WMC reviews and signs the application and then forwards the application to the EM-7 LLW Reviewer at MS J595 for approval.
4. EM-7 reviews the application. If it is approved, EM-7 returns it to the WMC, who delivers the application to the generator and assists in arranging for transportation of the waste. If the application is disapproved, EM-7 contacts the WMC to determine how best to correct the discrepancies.
5. RSWD approval is good for six months. If six months has elapsed and the waste has not been shipped, a new application must be prepared.

NOTE: For waste to be accepted at TA-54, Area G, each shipment must be accompanied by (at a minimum) an approved RSWD Record, a current completed and signed WPR, and a Hazardous Materials Transfer Form (available from the Packaging and Transportation Group of the Materials Management [MAT] Division). See AR 10-2, "Low-Level Radioactive Solid Waste," for further details.

INSTRUCTIONS FOR WASTE GENERATOR

1. Do not use more than the allotted spaces on the application.
2. Print legibly.
3. Note where decimal point positions are indicted. Enter information accurately in relation to these decimal points. *Do not alter decimal point positions.*
4. Use the number zero on the application *ONLY* for entries requiring that numerical designation. *Do not use zeros to fill blank spaces.*
5. When the amount of information available for a waste load is greater than the space available on one application, use additional applications.
6. When code numbers or letters are requested, choose the appropriate code from the list of current waste codes supplied by EM-7 (contact your WMC for assistance).
7. Where boxes are to be checked, use an *X* and be sure each box is clearly marked.
8. Sign the application.
9. Attach a photocopy of the approved WPR for this waste (keep the original WPR in your files).
   NOTE: If personnel other than those in EM-8 change a WPR, the RSWD data package will be disapproved.
10. See detailed instructions for completing the technical information.

INSTRUCTIONS FOR WASTE MANAGEMENT COORDINATOR

1. Review the information on this application that the generator provides.
2. Verify that all required information has been provided and is in the proper format (that is, decimal locations and field lengths are observed).
3. Verify that "*to the best of your knowledge*" the information provided is correct.
4. Sign the application.
5. Forward the application to EM-7 for approval.
6. When the approved application is returned to you, assist the waste generator in arranging for transportation of the waste. If the application has been disapproved, relay to the waste generator the reasons for disapproval and aid in correcting the problems(s).
7. If you have any questions or need help, call EM-7 at 5-WAST.

Attachment 1 continued

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WASTE PROFILE REQUEST

HSE-8 USE ONLY
Reference Number

Complete both sides of this form using a black or blue pen. Inadequate information will result in processing delays.
Send completed form to: ATTN: WPRF, MS K490

Division Group	Telephone	Mail Stop	Technical Area	Building	Room

☐ Knowledge of Process
☐ MSDS Attached

☐ Chemical/Physical Analyses (Specify Below)
☐ Request For Analysis ☐ Analysis Attached

Choose one or more of the items below which best describes your waste:

☐ Flammable	☐ Pesticide	☐ Photographic	☐ Spent Coolant	☐ Plastics
☐ Combustible	☐ Beryllium	☐ Sanitary	☐ Aerosol Cans	☐ Filter Media
☐ High Explosive	☐ Asbestos	☐ Radiochemistry	☐ Motor Oil	☐ Vacuum Filter Sludge
☐ Oxidizer	☐ Solvent	☐ Paint Waste	☐ Pump Oil	☐ Cement Paste
☐ Pyrophoric	☐ Waste Rags	☐ Laboratory Trash	☐ Capacitor Oil	☐ Non-Salvageable
☐ Cyanide	☐ Glass	☐ Metallurgic	☐ UST Remediation	☐ Non-Recyclable
☐ Heavy Metal	☐ Plating Solution	☐ Scrap Metal	☐ Soils	☐ Building Debris
☐ Corrosive	☐ Etchant	☐ Medical-Biological	☐ Environmental	☐ Firing Site Debris

Additional Description (Optional)

General Description Of Waste (check at least one block for each column):

FORM	FLASH POINT (°F)	pH	REACTIVITY	PCBs
☐ Solid	☐ Less Than 100	☐ 2.0 or Less	☐ Unstable	☐ <50 ppm
☐ Cemented Sludge	☐ 100 to 139	☐ 2.1 to 12.4	☐ Reacts With Water	☐ 50-500 ppm
☐ Semi-Solid Sludge	☐ 140 to 200	☐ 12.5 or Greater	☐ Cyanides	☐ >500 ppm
☐ Absorbed Liquid	☐ Greater Than 200	☐ Not Applicable	☐ Sulfides	☐ No PCBs
☐ Liquid	☐ None		☐ Shock Sensitive	
☐ Gas			☐ Class A or B Explosive	
☐ Multi-Layer			☐ Non Reactive	
☐ Suspended Solids				
☐ Powder or Ash				

Indicate Known Radioactivity Of Your Waste:

☐ Not Radioactive (Go To Next Section)

☐ <2.0 nC/g	☐ Alpha
☐ >2.0 nC/g	☐ Beta
☐ >10.0 nC/g	☐ Gamma
☐ >100.0 nC/g	☐ Tritium

List Known Radioisotopes:

☐ Determined By Assay ☐ Determined By Estimate

Radioisotope 1. _____ Activity/Unit of Measure _____
Radioisotope 2. _____ Activity/Unit of Measure _____
Radioisotope 3. _____ Activity/Unit of Measure _____
Radioisotope 4. _____ Activity/Unit of Measure _____

GENERATOR CERTIFICATION

Based upon my knowledge of the waste, and/or chemical/physical analysis, I certify that the information provided regarding the waste specified on th form is correct. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Print Generator's Name (Last, First MI)	Z Number	Generator's Signature	Date

If your Group's Waste Coordinator is the custodian of your waste management documentation, provide the name and mail stop of this person (optional).	Print Group Waste Coordinators Name (Last, First MI)	Mail Stop

Attachment 2

Current LANL Waste Characterization Form

Heavy Metals (indicate whether the following heavy metals exist in your waste, at the posted concentration):

	None			KOP	Analysis	TCLP	Other
Arsenic	☐	☐ < 5.0 ppm	☐ ≥ 5.0 ppm	☐	☐ →	☐	☐
Barium	☐	☐ < 100.0 ppm	☐ ≥ 100.0 ppm	☐	☐ →	☐	☐
Cadmium	☐	☐ < 1.0 ppm	☐ ≥ 1.0 ppm	☐	☐ →	☐	☐
Chromium	☐	☐ < 5.0 ppm	☐ ≥ 5.0 ppm	☐	☐ →	☐	☐
Lead	☐	☐ < 5.0 ppm	☐ ≥ 5.0 ppm	☐	☐ →	☐	☐
Mercury	☐	☐ < 0.2 ppm	☐ ≥ 0.2 ppm	☐	☐ →	☐	☐
Nickel	☐	☐ < 134.0 ppm	☐ ≥ 134.0 ppm	☐	☐ →	☐	☐
Selenium	☐	☐ < [illegible] ppm	☐ ≥ [illegible] ppm	☐	☐ →	☐	☐
Silver	☐	☐ < 5.0 ppm	☐ ≥ 5.0 ppm	☐	☐ →	☐	☐
Thallium	☐	☐ < 130.0 ppm	☐ ≥ 130.0 ppm	☐	☐ →	☐	☐

Organic Compounds (indicate if the following organic compounds exist in your waste, at the posted concentration):

	None			KOP	Analysis	TCLP	Other
Benzene	☐	☐ < 0.5 ppm	☐ ≥ 0.5 ppm	☐	☐ →	☐	☐
Carbon Tetrachloride	☐	☐ < 0.5 ppm	☐ ≥ 0.5 ppm	☐	☐ →	☐	☐
Chlorobenzene	☐	☐ < 100.0 ppm	☐ ≥ 100.0 ppm	☐	☐ →	☐	☐
Chloroform	☐	☐ < 6.0 ppm	☐ ≥ 6.0 ppm	☐	☐ →	☐	☐
Cresol	☐	☐ < 200.0 ppm	☐ ≥ 200.0 ppm	☐	☐ →	☐	☐
1,4 Dichlorobenzene	☐	☐ < 7.5 ppm	☐ ≥ 7.5 ppm	☐	☐ →	☐	☐
1,2 Dichloroethane	☐	☐ < 0.5 ppm	☐ ≥ 0.5 ppm	☐	☐ →	☐	☐
1,1 Dichloroethylene	☐	☐ < 0.7 ppm	☐ ≥ 0.7 ppm	☐	☐ →	☐	☐
2,4 Dinitrotoluene	☐	☐ < [illegible] ppm	☐ ≥ [illegible] ppm	☐	☐ →	☐	☐
Hexachlorobenzene	☐	☐ < 0.13 ppm	☐ ≥ 0.13 ppm	☐	☐ →	☐	☐
Hexachlorobutadiene	☐	☐ < [illegible] ppm	☐ ≥ [illegible] ppm	☐	☐ →	☐	☐
Hexachloroethane	☐	☐ < [illegible] ppm	☐ ≥ [illegible] ppm	☐	☐ →	☐	☐
Methyl Ethyl Ketone	☐	☐ < 200.0 ppm	☐ ≥ 200.0 ppm	☐	☐ →	☐	☐
Nitrobenzene	☐	☐ < 2.0 ppm	☐ ≥ 2.0 ppm	☐	☐ →	☐	☐
Pentachlorophenol	☐	☐ < 100.0 ppm	☐ ≥ 100.0 ppm	☐	☐ →	☐	☐
Pyridine	☐	☐ < 5.0 ppm	☐ ≥ 5.0 ppm	☐	☐ →	☐	☐
Tetrachloroethylene	☐	☐ < 0.7 ppm	☐ ≥ 0.7 ppm	☐	☐ →	☐	☐
Trichloroethylene	☐	☐ < 0.5 ppm	☐ ≥ 0.5 ppm	☐	☐ →	☐	☐
2,4,5 Trichlorophenol	☐	☐ < 400.0 ppm	☐ ≥ 400.0 ppm	☐	☐ →	☐	☐
2,4,6 Trichlorophenol	☐	☐ < 2.0 ppm	☐ ≥ 2.0 ppm	☐	☐ →	☐	☐
Vinyl Chloride	☐	☐ < 0.2 ppm	☐ ≥ 0.2 ppm	☐	☐ →	☐	☐

CHECK ONE

☐ Additional hazardous components in the waste are listed below:

☐ There are no additional hazardous constituents in this waste.

	Compound Name	Concentration		Compound Name	Concentration
1.			5.		
2.			6.		
3.			7.		
4.			8.		

HSE-8/HSE-7 USE ONLY (Do Not Write Below This Line)

WASTE CLASSIFICATION

☐ Non-Radioactive, Non-Hazardous
- ☐ Solid Waste
- ☐ Non-Regulated Chemical Waste
- ☐ Sanitary Waste
- ☐ Other Non-Disposable Waste

☐ Radioactive
- ☐ Low-Level Radioactive Waste
- ☐ Transuranic Waste
- ☐ Special Nuclear Material

☐ Hazardous or Mixed
- ☐ Hazardous Waste
- ☐ Mixed Low-Level Waste
- ☐ Mixed Transuranic Waste

Hazardous or Mixed Waste Codification:

Waste Code 1	Waste Code 2	Waste Code 3	Waste Code 4	Waste Code 5	Waste Code 6	Waste Code 7

HSE-8 Reviewer's Signature	Date	Cost Center/ProgramCode For HSE Analysis Backcharge

Attachment 2 continued

Waste Disposed at Area-G at PIT 37

RSWD ID	Disposal Date	Grp/TA	Wt.(kg)	Vol.(m3)	Waste Code	Description	Location (Pos./Layer/PstA/PstB)	Nuclide	Total Curies
S911397	02/28/91	EES4/57	226.84	0.50	78	pump motor 69 - 7ppm pcb sample 9017244	C/4/32/	PCB	0.000e+00
S911860	03/05/91	HSE13/59	1,179.56	3.96	90	borehole cuttings from mda k and e	S/4/32/33	H3	1.650e-03
S911064	03/06/91	WX1/16	2,268.38	5.20	19	test debris and cleanup materials	S/4/31/32	U238	1.066e-02
S911251	03/07/91	MST5/03	1,814.70	7.08	41	pn equip from hot cells c&d 20088,20087	C/4/29/	PU239	2.000e-06
							C/4/29/	U235	1.000e-05
							C/4/29/	MFP	1.000e-05
							C/4/29/	MAP	1.000e-05
S911552	03/07/91	HSE7/50	1,088.82	3.96	19	compactable dumpster	S/4/30/	PU238	0.000e+00
							S/4/30/	AM241	0.000e+00
S910567	03/07/91	MEC1/03	1,361.03	3.96	19	compactable rad dumpster	S/4/29/	U238	0.000e+00
S910928	03/07/91	NMT4/55	470.19	4.20	15	compactable - compactor inoperable	S/4/30/	PU52	4.629e-03
S911808	03/07/91	INC11/48	907.35	3.96	19	compactible dumpster-compactor down	C/4/30/	PU239	1.000e-09
							C/4/30/	U235	1.000e-09
S910350	03/11/91	MP7/53	1,814.70	4.25	52	cable/tubing/rad mat screened fm salvage	C/4/28/	MAP	5.000e-03
S910352	03/11/91	MP7/53	1,088.82	4.79	19	noncompactable	S/4/26/27	MAP	9.160e-03
S910386	03/11/91	MP7/53	412.84	1.47	19	noncompactable dumpster	S/4/28/	MAP	3.830e-02
S910351	03/13/91	MP7/53	90.74	0.57	19	bagged contam plast fm a-1/2 tgt cells	S/4/32/	MAP	5.000e-03
S910838	03/18/91	NMT1/21	907.35	11.33	30	pn items, c&d# 18176,18177,18178,18180,	S/4/27/28	U235	0.000e+00
							S/4/27/28	U238	0.000e+00
S910494	03/18/91	M4/15	5,444.10	5.00	85	firing debris	S/4/26/27	U238	0.000e+00
S911216	03/18/91	M8/36	2,722.05	1.53	85	cables possible du contamination	S/4/26/27	U238	0.000e+00
S911213	03/18/91	NMT1/21	907.35	3.68	30	property numbered equipment	S/4/26/27	U235	0.000e+00
							S/4/26/27	U238	0.000e+00
S910354	03/18/91	MP7/53	3,629.40	3.40	36	concrete stacking blocks, metal contain-	S/4/27/28	MAP	5.000e-03
S911995	03/19/91	HSE5/03	1,361.03	8.50	30	equip. from surety facility c&d# 20091b	S/4/26/	C14	0.000e+00
							S/4/26/	H3	0.000e+00
S910694	03/19/91	MST6/03	725.88	3.40	19	noncompactible waste dumspter	N/4/30/	U238	0.000e+00
S911790	03/19/91	INC11/48	725.88	3.79	19	noncompactible dumpster trash	S/4/26/	MAP	0.000e+00
S911159	03/19/91	CLS1/03	2,268.38	11.33	19	mixed combustible/noncombustible waste	N/4/29/	U235	0.000e+00
							N/4/29/	PU239	0.000e+00
S911809	03/19/91	INC11/48	907.35	3.68	19	noncompactible dumster	S/4/26/	MFP	1.000e-09
S910685	03/19/91	MST6/03	725.88	3.40	19	noncompactible waste dumpster	S/4/25/	U238	0.000e+00
S910348	03/20/91	ENG6/53	362.94	1.42	55	spent hepa and pre filters	C/4/30/	MAP	3.000e-08
S910078	03/20/91	INC4/21	907.35	2.95	19	mixed compactible/noncompactible	C/4/28/	PU239	0.000e+00
							C/4/28/	AM241	0.000e+00
							C/4/28/	PA233	0.000e+00

Attachment 3
Data Sample from LLWMS

RESPONSE TO COMPLIANCE ORDER REQUIREMENT 2 - KNOWLEDGE OF PROCESS CORRECTIVE ACTION PLAN

Introduction

This response provides the Los Alamos National Laboratory (the Laboratory) Environmental Restoration (ER) Project's corrective action plan to modify the method used for identifying hazardous wastes. The ER Project has used the term "knowledge of process" broadly in the past to describe all the existing information used to design sampling plans for ER Project site investigations, as well as all the existing information used to characterize the waste under Resource Conservation and Recovery Act (RCRA), Subtitle C. Because the broad use of this term has caused confusion in the past, it will no longer be used in relation to site investigation or waste characterization.

This response consists of two sections. Section 1 presents background information on how existing knowledge and acceptable knowledge have been used within the ER Project to make site characterization and waste management decisions. Section 1 is presented as background information to guide the New Mexico Environment Department (NMED) in its evaluation of the corrective action plan. Section 2 consists of the corrective action plan required by the Compliance Order NMHWA 94-12 that was issued by the NMED on August 12, 1994 and received by the Laboratory on August 15, 1994.

Definitions

The following terms will be used to describe the information used by the ER Project for site characterization and waste characterization.

Acceptable knowledge refers to information that is used for waste characterization in lieu of waste sampling and analysis. Acceptable knowledge includes process knowledge and previous chemical/analytical results associated with the waste, if any. Acceptable knowledge is a term used by the Environmental Protection Agency (EPA) in its guidance document, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes," (OSWER 9938.4-03, April 1994).

Acceptable knowledge includes the component of "existing knowledge" as defined below, as it relates to waste characterization. In addition, acceptable knowledge includes any relevant information collected during the field activities (e.g., site investigation activities). For example, acceptable knowledge for wastes generated during a site investigation could include existing information that describes the disposal of listed hazardous wastes at the site plus the site investigation analytical results. For a corrective action, acceptable knowledge could include the results of the past sampling and analysis of soil that is to be excavated.

Existing knowledge refers to the body of information that existed about a site before an ER activity is undertaken. For ER site investigations, existing knowledge for a particular site will

include all of the historical information concerning past operations and waste disposal at the site, physical characteristics of the site, the environmental setting of the site, the identification of hazardous materials used at the site, and the results of previous environmental or waste sampling at the site (if any). The existing knowledge is obtained from archival record searches, personnel interviews, and visual site inspections. The primary purpose of this information is to design investigations needed to characterize potential contamination at the site and thus determine the need for corrective actions. For ER corrective actions, existing knowledge will include all of the information gathered before the investigation as well as all information collected during the investigation.

Potential contaminants of concern are any compounds or elements potentially present in environmental media or on structural debris at a concentration that may present a risk to human health or the environment. Potential contaminants of concern include, but are not limited to, hazardous constituents identified in the New Mexico Hazardous Waste Management Regulations (20 NMAC 4.1), Part 261, Appendix VIII.

Potential hazardous waste constituents are defined as constituents of listed or characteristic wastes that could potentially be present in ER Project waste. These constituents are identified in Appendix A and are among those constituents identified in 20 NMAC 4.1, Part 261, Subpart D or in Table 1 of Part 261.24. The potential hazardous waste constituents are a subset of the hazardous constituents identified in 20 NMAC 4.1, Part 261, Appendix VIII.

Previous chemical/physical analytical results are defined as existing, published, or documented waste analysis data, site characterization analytical results, or other previous analytical results or studies. A description of the previous chemical/physical analytical results will include the following information, if available: the sampling strategy (e.g., random sampling), the number of samples collected, sample collection technique (e.g., grab sampling using a pole-mounted beaker), analytical methods, quality assurance/quality control sample results, and detection limits. The description of previous analytical results must include all constituents identified in the past, not just those of concern for health risks.

Process knowledge refers to a subset of acceptable knowledge that describes the generation process for the wastes potentially managed at a site or that resulted in the contamination at a site. Process knowledge is used to identify specific constituents that may be present and the sources of these constituents. The latter information is especially important for determining whether associated wastes are RCRA-listed. Process knowledge will be described in the site specific waste management plan (WMP). Process knowledge is defined as the site history, which includes, to the extent possible, the start and end dates and a description of all previous and current activities affecting a specific site. Process knowledge could also include the processes generating the wastes that may have come to be located at a site, the raw materials used and associated material safety data sheets, products produced, and associated wastes.

1.0 BACKGROUND

This section presents background information on the current use of existing knowledge, acceptable knowledge, management of wastes generated by the ER Project, and potential limitations in the use of existing knowledge for waste management.

1.1 Existing Knowledge

Existing knowledge is used extensively in the ER Project for planning ER activities. Existing knowledge for individual solid waste management units (SWMU) is used to develop conceptual models describing site contamination and to design sampling plans. The existing knowledge for each SWMU is described in the RCRA Facility Investigation (RFI) Work Plans prepared by the ER Project for each Operable Unit (OU).

The evaluation of existing knowledge in the RFI Work Plan is used to identify potential contaminants of concern (PCOC) for each SWMU. If contaminants may be present, a sampling plan is developed to collect data on the presence or absence of PCOCs and the concentrations of PCOCs in order to make risk-based decisions to determine whether corrective actions are required at the site.

The completeness of existing knowledge is one factor that determines the level of investigation required at a SWMU. For example, if existing knowledge does not identify all specific PCOCs, which is typically the case for the Phase I investigations at most ER sites, screening-type analyses capable of quantifying a wide range of analytes will be used (i.e., gas chromatography/mass spectrometry [GC/MS] for volatile and semivolatile organics and inductively coupled plasma- emission spectroscopy [ICP-ES] for metals). Evaluation of the adequacy of existing knowledge is discussed in more detail in Section 2.2.

The evaluation of existing knowledge in the RFI Work Plan is specifically directed toward risk decisions rather than waste management decisions. Evaluation of existing knowledge in order to arrive at acceptable knowledge (i.e., process knowledge and previous chemical/physical analytical results) for waste management is first done during preparation of WMPs for ER field activities. The WMPs describe the wastes that will be generated by ER activities and how these wastes will be managed. The acceptable knowledge for WMPs may include any of the information evaluated for the RFI Work Plan plus any additional information collected since the work plan was prepared, such as results of environmental sampling and analysis. In preparing the WMP, acceptable knowledge is evaluated to assist in making a determination of the regulatory status of the waste that will be generated. The use of acceptable knowledge for waste characterization is described in Section 2.2.

1.2 Management of ER-Generated Wastes

Two general categories of ER Project activities are now generating wastes: site investigations and expedited cleanups. The general approach to managing wastes from these activities is discussed in subsection 1.2.1 and 1.2.2 below. This discussion includes the use of

acceptable knowledge, including process knowledge, for waste characterization. The incidence of waste management decisions based solely on process knowledge is very limited. In most cases, the acceptable knowledge used to make waste management decisions will include sampling and analysis data.

1.2.1 Site Investigations

Wastes generated during ER site investigations (investigation-derived wastes [IDW]) include such things as PPE, disposable sampling equipment, decontamination wastes, and borehole cuttings. Before a site investigation is begun, the wastes to be generated during the site investigation are characterized using acceptable knowledge contained in the RFI Work Plan. As the site investigation proceeds, the initial characterization is verified using field screening and analytical results from environmental samples. In most cases, analytical results from environmental samples and process knowledge should provide the waste generator with sufficient information to characterize the waste for RCRA. However, waste sampling and analysis is needed for potential RCRA-characteristic wastes if

- minimum detectable activity for field radiological methods is not low enough to determine whether the waste is nonradioactive, and/or
- analytical results for environmental samples are high enough to indicate that the waste could exceed RCRA characteristic limits.

Sampling of IDW to identify constituents of listed wastes is usually not necessary, because these constituents will have been previously identified by the analysis of environmental samples.

Site investigations being conducted as part of the ER Project generally fall into two categories: screening assessments and risk assessment sampling. As described below, data from both types of assessments are considered adequate for making proper waste management decisions.

Screening assessments are directed at quantifying concentrations of PCOCs at a site to determine whether they are above background and above risk-based screening action levels (SAL). (PCOCs include any contaminants that could pose a risk to human health and the environment). This type of sampling is performed at sites where little is known about the identity and concentrations of PCOCs. Analytical methods for screening assessment samples usually consist of GC/MS and ICP-ES.

Risk assessment sampling is implemented to collect data needed to perform a baseline risk assessment. This type of sampling is performed at sites where contaminants are known to be present. The technical approach for risk assessment sampling usually includes statistically based sampling designed to quantify contamination. Samples are analyzed using methods such as GC/MS and ICP-ES. Sufficient samples are collected to determine the representative concentrations of contaminants to which receptors would be exposed. If all contaminants at

the site have been identified by previous investigations, analytical methods focused to these constituents may be used.

Although RCRA waste characterization is not an immediate objective of either sampling approach, the data that are collected are considered adequate for characterizing the wastes generated by the investigation. The rationale for this determination is provided below.

Potential hazardous waste constituents comprise a subset of the constituents important for assessing site risk (e.g., PCOCs). The analytical methods used to detect constituents of concern for risk assessment would identify constituents of importance for waste characterization. ER investigations, including screening assessments, use best-available EPA-approved methods for analyzing environmental samples to determine concentrations of PCOCs. If constituents of importance for RCRA waste characterization decisions are present in environmental samples, they would be detected because the larger universe of PCOCs would be evaluated initially. Environmental sample data collected during the screening assessment or risk assessment sampling, along with other site-specific process knowledge, should be sufficient to determine whether IDW may ultimately be managed as characteristic or listed wastes.

The determination of whether the IDW is potentially characteristic due to toxicity is made by comparing measured concentrations of toxicity characteristic leaching procedures (TCLP) constituents in environmental media with TCLP regulatory levels. If these concentrations are high enough to indicate that TCLP levels could be exceeded, testing wastes using the TCLP may be necessary. The decision of whether sampling is necessary depends upon the levels present in the environmental media and the amount of environmental media present in the IDW. For example, if total concentrations are only slightly greater than TCLP levels and the contaminated environmental media constitutes only a small fraction of the IDW, TCLP analysis may not be needed (see Appendix B, RCRA Characteristic Wastes).

The determination of whether the IDW is potentially characteristic due to ignitability, corrosivity, or reactivity can also be made generally on the basis of results of process knowledge and/or environmental analyses (e.g., concentrations of explosives in soil). If not, waste sampling is conducted to make this determination.

If constituents of listed wastes are detected in environmental samples, the associated IDW may ultimately be managed as listed waste. In this case, identifying the source of these constituents is necessary. If process knowledge from the RFI Work Plan is not adequate to identify the source, it then becomes necessary to conduct additional interviews or otherwise collect additional information.

1.2.2 Expedited Cleanups

Expedited cleanups conducted after a site investigation is completed will use the results of the site investigation for RCRA waste characterization. As described for IDW, the site investigation identifies constituents important for RCRA waste characterization and their

concentrations. For some sites, it may be possible that the results at the investigation are sufficient to identify the need for a cleanup, but not sufficient for RCRA waste characterization. For these sites, a preliminary screening should be conducted for RCRA waste characterization prior to generation of the waste. Based on this information, a preliminary determination of the regulatory status of the waste is made before cleanup begins. Specific waste analyses for obtaining the data necessary for waste characterization and for ensuring proper management are identified in a cleanup plan. Waste disposal should not occur until waste analysis data have been received and reviewed. As described for IDW, additional information on the source of constituents of listed wastes may be needed to identify listed wastes. Collection of this additional process knowledge is done before the cleanup begins.

1.3 Limitations In Use Of Existing Knowledge For Waste Management

The major limitation with the use of existing knowledge for management of ER-generated wastes concerns not the type and quality of data but its evaluation. Data evaluation has tended to focus on risk assessment rather than waste management. Data may exist that have implications for waste management decisions not immediately relevant to site risk decisions. For example, constituents of listed wastes present below risk levels in environmental media may be considered irrelevant when evaluating data to plan cleanup activities. Although not important from a risk perspective, these constituents could be very important from a waste management perspective.

A related limitation concerns the adequacy of previously collected site characterization information as it relates to waste management decisions. For example, to assess the risk posed by contamination at a site, it is important to know the concentrations of constituents. From a site risk perspective, knowing the source of the constituent is not important. Information concerning the source of the constituent is very important, however, from a waste management perspective; this information is needed to determine whether listed wastes may be present.

To address these limitations, all existing knowledge needs to be evaluated with respect to waste management considerations in addition to site characterization considerations.

2.0 CORRECTIVE ACTION PLAN

The corrective action plan presented in this section describes the waste characterization process that will be used for identifying and characterizing hazardous or mixed wastes generated by the ER Project. The process is premised on the regulations currently in effect. In the event that diminimus levels are established for listed wastes or changed for characteristic wastes by the EPA or NMED, then the process will be amended to reflect these changes.

2.1 Corrective Action Plan Objectives

To ensure that the Laboratory properly characterizes ER Project wastes in accordance with 20 NMAC 4.1, the ER Project will implement the waste characterization process provided in this corrective action plan. This process will ensure that appropriate waste characterization data are used for decisions involving management of hazardous or mixed waste generated by the ER Project during the investigation phase and corrective action phase of the RCRA Corrective Action Program. This corrective action plan only addresses waste characterization required by RCRA Subtitle C and 20 NMAC 4.1.

2.2 Waste Characterization Process For ER Waste

The ER Project waste will be characterized for RCRA using

- acceptable knowledge, and/or
- waste-sample analytical results.

As discussed below (Step 4), waste samples will be collected and analyzed if the waste cannot be characterized for RCRA based solely on the acceptable knowledge.

A detailed explanation of the waste characterization process is provided below.

1. Evaluate the Acceptable Knowledge

   Before generating any ER waste, the acceptable knowledge (i.e., process knowledge and previous chemical/analytical results if available) will be described and evaluated in a site-specific WMP. References and any data gaps will be identified in the WMP.

   The acceptable knowledge will include a description of the site history and waste-generating activities. Based on the knowledge of the waste-generating activities, the potential hazardous waste constituents and potential RCRA waste classes will be identified (Appendix A).

   The WMP will be sent to the Hazardous and Solid Waste Group (ESH-19) and the Waste Services Group (CST-17) for review and comment.

2. Determine the RCRA Status of the Waste Based on Preliminary Information

   Based on the evaluation of the acceptable knowledge, a preliminary determination will be made on the RCRA status of each type of waste (Appendix B).

   If the acceptable knowledge is sufficient to determine that the waste is not RCRA, the waste will be classified as non-RCRA waste (Appendix B). If the acceptable knowledge is sufficient to determine that the waste is RCRA, the waste will be

classified as RCRA waste (Appendix B). If acceptable knowledge is not sufficient to determine that the waste is RCRA or non-RCRA, or the acceptable knowledge indicates that the waste is potentially RCRA waste, then additional acceptable knowledge will be compiled and reviewed as described in Step 4 below.

3. Manage Wastes Based on the Preliminary Determination

Management of the wastes will be based on this preliminary determination unless and until additional information described below is received that would change the RCRA status of the waste.

4. Identify and Review Additional Information and Reevaluate RCRA Status

After the waste-generating activities described in the WMP have begun, additional acceptable knowledge generated by these activities will be reviewed and the RCRA status of the waste re-evaluated. This additional acceptable knowledge may include site investigation or waste analytical results and/or evidence of contamination encountered during the field activities.

If this additional information does not adequately confirm the RCRA status of the waste, then the following information will be required:

Additional Interviews

Additional personnel interviews will be needed if a constituent of a listed waste is identified in the previous chemical/physical analytical results, including the site investigation or waste analytical results, but the existing acceptable knowledge does not provide sufficient information for determining whether the waste meets the listing description in 20 NMAC 4.1, Part 261, Subpart D.

A generic interview checklist (which is in the process of being developed) will be completed to ensure that the interviews are consistent, that they address the potential sources of the constituents of listed waste, and that they are properly documented. Before conducting interviews, the waste may be resampled to confirm the presence of constituents of listed wastes, especially in situations where the concentrations are slightly above the detection limits.

Additional Sampling and Analyses of the Waste

Additional waste sampling and analyses will be needed if any of the following situations occur:

- The site characterization analytical results are high enough to indicate that the waste could exceed RCRA characteristic limits.

- Constituents of listed waste are found to be near the detection limit.
- The site characterization samples or the waste samples, if any, are discovered to not have been analyzed for the potential hazardous waste constituents identified in Step 1.
- The site investigation samples or the waste samples, if any, were not analyzed using acceptable methods as described below.
- Evidence of contamination (e.g., organic vapors or visible contamination) that is not consistent with the site history is encountered during the field activities.
- The additional interviews identified waste-generating activities that could have produced potential hazardous waste constituents incapable of being detected by the previous analytical methods used.
- Additional sampling and analysis is required to ensure that the waste meets other applicable regulatory requirements, waste acceptance criteria (WAC), and/or waste analysis plan (WAP) requirements of the treatment, storage, or disposal facility that will receive the waste. The WAC/WAP criteria will be referenced in the WMP.

The waste must be sampled and analyzed using acceptable analytical methods. Acceptable methods are defined as methods in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) identified in Appendix A, other EPA-approved methods (e.g., Contract Laboratory Program methods), or other methods approved by NMED. Methods will be selected that will detect the potential hazardous waste constituents (Step 1) at the site.

If an EPA or NMED-approved method does not exist for a particular constituent or RCRA characteristic, then an industry-approved method may be used.

5. Determine Final RCRA Status

Based on the acceptable knowledge (including the additional information) and/or waste analytical results, a final determination will be made as to whether each type of waste is RCRA-regulated or not (Appendix B).

A determination of listed waste will be made after a reasonable effort has been made to identify the source of the listed-waste constituents (Step 4). To classify a waste as a listed waste, the source of the waste must be known, (i.e., it must be determined if the waste meets the listing descriptions). If the process knowledge has been thoroughly evaluated, and there is no indication that the waste meets the listing descriptions, the waste is not a listed waste and will be managed as a non-listed waste.

Based on the additional information described in Step 4 above (if any), the preliminary RCRA status of the waste will be reevaluated and a final determination of the RCRA status will be made.

6. Manage Waste According to RCRA Status

The wastes will be managed based on this final determination. The appropriate paperwork will be completed and submitted to ESH-19 and CST-17 so that the waste can be transported to the appropriate treatment, storage, or disposal facility.

If the waste is classified as a non-RCRA waste but poses a risk or threat to human health or the environment, the waste will be managed in a manner that protects human health or the environment.

APPENDIX A
POTENTIAL WASTESTREAM EVALUATION

Potential Waste Class	Potential Waste Constituents	Analytical Methods for Constituents	Comments
Spent halogenated solvents - F001, F002	Halogenated volatile alkanes	8010, 8240, or 8260	
Spent nonhalogenated ignitable solvents - F003	Nonhalogenated volatile aromatics and alkanes	8010, 8240, or 8260	
Spent nonhalogenated toxic solvents - F004	Nonhalogenated aromatics and alkanes	8250 or 8270	
Spent nonhalogenated toxic solvents - F005	Nonhalogenated aromatics and alkanes	8260	
Electroplating sludges and baths - F006-F012	Cyanide, cadmium, chromium, lead, nickel, silver	9010 (CN), and 6010 or 6020 (metals)	
TCLP metals - D004-D011	Arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver	6010 or 6020, and 7470 (may also include 7060 for As and 7740 for Se depending on required quantitation limit)	

Potential Waste Class	Potential Waste Constituents	Analytical Methods for Constituents	Comments
TCLP volatile organics - D018, D019, D021, D022, D027-D029, D035, D038, D039, D040, D043	Benzene, carbon tetrachloride, chlorobenzene, chloroform, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethylene, methyl ethyl ketone, pyridine, tetrachloroethylene, trichloroethylene, vinyl chloride	8240 or 8260	
TCLP semivolatile organics - D023-D026, D032-D034, D036, D037, D041, D042	Cresols, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, nitrobenzene, pentachlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol	8250 or 8270	
TCLP explosives - D030	2,4-Dinitrotoluene	8090, 8250, or 8270	
TCLP pesticides -D012, D013, D014, D015, D020, D031	Endrin, lindane, methoxychlor, toxaphene, chlordane, heptachlor,	8080, 8250, or 8270	
TCLP herbicides - D016, D017	2,4-D, 2,4,5-TP	8150	
Corrosives - D001	Acids, caustics	9040	

Potential Waste Class	Potential Waste Constituents	Analytical Methods for Constituents	Comments
Ignitables - D002	Ignitable liquids	ASTM D-93-79, D-93-80, or D-3278-78	
Reactive explosives - D003	High explosives	LANL HE field spot test	
Water reactive - D003	Alkali metals	No method	
Reactive sulfide - D003	Sulfide	9030	
Reactive cyanide - D003	Cyanide	9010	
Discarded chemical products - P and U lists (see HWMR-7, Part 261.33 for specific waste codes)	See HWMR-7, Part 261.33 for specific chemicals	See SW-846 for specific methods	

Note: Identification of a waste as an RCRA-listed waste requires documented archival information and/or personnel interviews.

APPENDIX B
DETERMINATION OF RCRA WASTES

To determine if a waste is a RCRA waste, it must first be determined whether it is a listed waste. Next, it will be determined if the waste is a RCRA characteristic waste.

RCRA Listed Waste

A waste will be classified as a RCRA listed waste if it meets the listing descriptions in 20 NMAC 4.1, Part 261, Subpart D or if the waste is "mixed with" or "derived from" a listed hazardous waste or listed mixed waste. The waste must be designated as listed waste if the source of a waste constituent of a listed waste is known to be any of the following:

- Wastes from non-specific sources listed in 20 NMAC 4.1, Part 261.31 (F-listed wastes)
- Wastes from specific sources listed in 20 NMAC 4.1, Part 261.32 (K-listed wastes)
- Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof listed in 20 NMAC 4.1, Part 261.33 (U- and P-listed wastes)

To determine that a waste is a F- or a K-listed waste, the following criteria must be met:

- There must be sufficient information to identify a waste-generating process listed in 20 NMAC 4.1, Part 261.31 and Part 261.32 at the particular site.
- A hazardous waste constituent identified in 20 NMAC 4.1, Part 261.31 and Part 261.32 must be detected in the waste associated with the waste-generating process. Table B.1 includes the constituents of listed wastes that may be present in the ER waste, based on the types of activities and materials historically used at the Laboratory.

Sufficient historical information dating back to the Manhattan Project is often available to determine the waste-generating processes at each site that may have produced F- or K-listed wastes. In addition, if a constituent of a listed waste is detected in the environmental or waste samples, additional interviews may need to be conducted to determine if the waste is listed. Based on an analysis of historical information, the only F-listed wastes that potentially were generated at the Laboratory in the past were F001-F005 solvent wastes and F006-F012 electroplating wastes. The only K-listed wastes that potentially were generated at the Laboratory in the past were K044-K047 explosive manufacturing wastes. Table B.1 includes the hazardous waste constituents expected to be present in F-listed and K-listed wastes and the hazardous waste constituents identified in 20 NMAC 4.1, Part 261.31 and Part 261.32 associated with these specific waste codes.

To determine that a waste is a P- or a U-listed waste, the following criteria must be met:

- There must be sufficient information to determine that commercial chemical products, off-specification species, and container residues listed in 20 NMAC 4.1, Part 261.33 were discarded or spilled at the site.
- A P- or U-listed substance must be detected in the waste.

Little information indicating historical spills or product disposal is available at the Laboratory. Therefore, at most sites it is unlikely that the ER waste will include P- and U-listed wastes. If a constituent of a listed waste is detected in the environmental or waste samples, additional interviews can be conducted to determine if the waste is RCRA-listed waste or non-RCRA waste.

RCRA Characteristic Waste

A waste will be classified as a RCRA characteristic waste if it exhibits any of the four characteristics (ignitability, reactivity, corrosivity, toxicity) described in 20 NMAC 4.1, Part 261, Subpart C.

To determine whether the waste exhibits the characteristic of toxicity, the samples must be analyzed using the TCLP. If the analytical results equal or exceed the toxicity characteristic (TC) regulatory levels (see Table B.2) in 20 NMAC 4.1, Part 261.24, the wastes must be designated as characteristic waste. In accordance with 20 NMAC 4.1, Part 261, Appendix II, a total analysis of a waste can be used to determine whether the waste exhibits the toxicity characteristic if the concentrations of the analytes are so low that the TC regulatory levels could not possibly be exceeded. Also, the total analyses of solid samples can be compared with "TC screening levels" (see Table B.2) to determine whether the TC regulatory levels could potentially be exceeded. The TC screening levels (mg/kg) are numerically equivalent to 20 times the TC regulatory levels (mg/L). The factor of 20 is based on the twenty-fold dilution that is incurred during the TCLP analyses. If the total analyses equal or exceed the TC screening levels, the samples should be analyzed using the TCLP. The comparison of the total analyses with the TC screening levels is valid only for solid samples or solid portions of sludge samples. This comparison is not valid for liquids or liquid portions of sludge samples. For liquids, the total analyses would be compared directly with the TC regulatory levels.

Use of Acceptable Knowledge to Determine the RCRA Status of the Waste

Acceptable knowledge can be used (in lieu of analyzing the waste) to determine that the waste is not RCRA if the following conditions are met:

- A complete site history has been compiled. A complete site history includes the start and end dates for the previous and current activities at a specific site. There must be no time gaps in the site history.

- The waste-generating activities have been identified. There must be sufficient information to identify the activities (e.g., using solvents to clean machinery, plating and etching, photo-processing, explosive manufacturing) at a site that could have generated RCRA wastes.

- The potential hazardous waste constituents at the site have been identified (Step 1).

- Acceptable analytical methods were used to analyze for the potential hazardous waste constituents identified in Step 1. Acceptable methods include SW-846 methods, other EPA-approved methods (e.g., Contract Laboratory Program Methods), or other methods approved by NMED.

- Based on process knowledge and previous chemical/physical analytical results, it can be determined that the waste

  - does not potentially contain any of the TCLP constituents (Table B.2);

  - does not potentially exhibit the characteristic of ignitability, corrosivity, or reactivity; and

  - is not potentially contaminated with solvents (including RCRA F-listed solvents), plating wastes (including RCRA F-listed plating wastes), explosive manufacturing wastes (including K-listed explosive manufacturing wastes), or discarded commercial chemical products, off-specification species, container residues, and spill residues thereof (i.e., potential RCRA P- or U-listed wastes).

Acceptable knowledge can be used to determine that the waste is RCRA if the conditions described in the first four bullets above are met and if the waste exhibits the characteristic of ignitability, corrosivity, reactivity, or toxicity or is a listed waste as defined above.

Use of Process Knowledge to Determine the RCRA Status of Disposable PPE and Disposable Sampling Equipment Waste

Process knowledge can be used to determine that the disposable PPE and disposable sampling equipment waste is not RCRA if the following conditions are met:

- The visible contamination is removed from contaminated or potentially contaminated items.
- The visibly uncontaminated items are segregated from the visibly contaminated items.

Note: If the visible contamination cannot be removed, the items will be segregated and characterized using the analytical results of the associated site characterization or waste samples.

Use of Process Knowledge to Determine the RCRA Status of Decontamination Liquids and Monitor Well Purge and Development Water Wastes

Rarely, will decontamination liquids and monitor-well purge and development water wastes exhibit the RCRA characteristics because of the dilution effects of the wash and rinse solutions or groundwater. In many cases, the concentrations of TC organics and metal constituents can be assumed to be present at very low concentrations and below the TC regulatory levels because they are diluted. The decontaminated items or the groundwater would have to be grossly contaminated for the decontamination liquids or the groundwater to equal or exceed the TC regulatory levels (which were developed by multiplying the federal drinking water standards by 100). If the process knowledge can be used to sufficiently demonstrate that these liquids are not listed wastes as described above and are not characteristic wastes because of dilution effects, sampling and analyzing these liquids to determine if they are RCRA-regulated may not be necessary. However, if the liquids are potentially contaminated with RCRA-listed waste, sampling and analyzing the liquids will be necessary. In addition,sampling and analyzing these liquids may be necessary if the decontamination liquids result from the cleaning of grossly contaminated items or if the groundwater is grossly contaminated.

Table B.1
Constituents of Listed "F" and "K" Wastes and Listing Description

EPA CODE	PROCESS DESCRIPTION	HAZARDOUS WASTE CONSTITUENTS
F001	The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of 10 percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures	tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons
F002	The following spent halogenated solvents: tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of 10 percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures	tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane
F003	The following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of 10 percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures	xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, methanol Note: Presence of these nonhalogenated organic compounds means the waste is a listed waste only if the waste also exhibits the characteristic of ignitability.

EPA CODE	PROCESS DESCRIPTION	HAZARDOUS WASTE CONSTITUENTS
F004	The following spent non-halogenated solvents: cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of 10 percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures	cresols and cresylic acid, nitrobenzene
F005	The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, (before use) a total of 10 percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures	toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, 2-nitropropane
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum	cadmium, hexavalent chromium, nickel, cyanide (complexed)
F007	Spent cyanide-plating bath solutions from electroplating operations	Cyanide (salts)
F008	Plating bath residues from electroplating operations where cyanides are used in the process	Cyanide (salts)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process	Cyanide (salts)

EPA CODE	PROCESS DESCRIPTION	HAZARDOUS WASTE CONSTITUENTS
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process	Cyanide (salts)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations	Cyanide (salts)
F012	Quenching wastewater treatment sludges from metal heat-treating operations where cyanides are used in the process	Cyanide (complexed)
K044	Wastewater treatment sludges from the manufacturing and processing of explosives.	Note: Only constitutes a listed hazardous waste when the reactivity characteristic is exhibited. No hazardous waste constituents.
K045	Spent carbon from the treatment of wastewater containing explosives	Note: Only constitutes a listed hazardous waste when the reactivity characteristic is exhibited; no hazardous waste constituents
K046	Wastewater treatment sludges from the manufacturing, formulation, and loading of lead-based initiating compounds	Lead
K047	Pink/red water from TNT operations	Note: Only constitutes a listed hazardous waste when the reactivity characteristic is exhibited. No hazardous waste constituents

Table B.2 - 40 CFR Part 261.24 - Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA CODE	CONTAMINANT	REGULATORY LEVEL (mg/L)	TC SCREENING LEVELS (mg/kg)
D004	Arsenic	5.0	100.0
D005	Barium	100.0	2000.0
D018	Benzene	0.5	10.0
D006	Cadmium	1.0	20.0
D019	Carbon tetrachloride	0.5	10.0
D020	Chlordane	0.03	0.60
D021	Chlorobenzene	100.0	2000.0
D022	Chloroform	6.0	120.0
D007	Chromium	5.0	100.0
D023	o-Cresol	[a]200.0	4000.0
D024	m-Cresol	[a]200.0	4000.0
D025	p-Cresol	[a]200.0	4000.0
D026	Cresol	[a]200.0	4000.0
D016	2,4,D	10.0	200.0
D027	1,4-Dichlorobenzene	7.5	150.0
D028	1,2-Dichloroethane	0.5	10.0
D029	1,1-Dichloroethylene	0.7	14.0
D030	2,4-Dinitrotoluene	[b]0.13	2.60
D012	Endrin	0.02	0.40
D031	Heptachlor (and its epoxide)	0.008	0.160
D032	Hexachlorobenzene	[b]0.13	2.60
D033	Hexachlorobutadiene	0.5	10.0
D034	Hexachloroethane	3.0	60.0

EPA CODE	CONTAMINANT	REGULATORY LEVEL (mg/L)	TC SCREENING LEVELS (mg/kg)
D008	Lead	5.0	100.0
D013	Lindane	0.4	8.0
D009	Mercury	0.2	4.0
D014	Methoxychlor	10.0	200.0
D035	Methyl Ethyl Ketone	200.0	4000.0
D036	Nitrobenzene	2.0	40.0
D037	Pentachlorophenol	100.0	2000.0
D038	Pyridine	[b]5.0	100.0
D010	Selenium	1.0	20.0
D011	Silver	5.0	100.0
D039	Tetrachloroethylene	0.7	14.0
D015	Toxaphene	0.5	10.0
D040	Trichloroethylene	0.5	10.0
D041	2,4,5,Trichlorophenol	400.0	8000.0
D042	2,4,6-Trichlorophenol	2.0	40.0
D017	2,4,5-TP	1.0	20.0
D043	Vinyl chloride	0.2	4.0

TC = Toxicity Characteristic

[a] If o-, m-, and p-cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/L.

[b] Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.