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**ENVIRONMENTAL ASSESSMENT
FOR
TRANSURANIC WASTE WORK-OFF PLAN
LOS ALAMOS NATIONAL LABORATORY**

October 26, 1990

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FINAL
REPORT

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1.0 STATEMENT OF PURPOSE AND NEED

1.1 Purpose

The Los Alamos National Laboratory (LANL) generates transuranic (TRU) waste in a variety of programs related to national defense. TRU waste is a specific class of radioactive waste requiring permanent isolation. Most defense-related TRU waste will be permanently disposed of in the Waste Isolation Pilot Plant (WIPP). WIPP is a deep geologic repository located in southeastern New Mexico and is now in the testing phase of development. All waste received by WIPP must conform with established Waste Acceptance Criteria (WAC).

The purpose of the proposed action is to retrieve stored TRU waste and prepare the waste for shipment to and disposal at WIPP. Stored TRU waste at LANL is represented by four waste forms. The facilities necessary for work-off activities are tailored to the treatment and preparation of these four waste forms. Preparation activities for newly generated TRU waste are also covered by this action.

1.2 Need

Generation of TRU waste at LANL began in the early 1940s with the advent of atomic energy defense activities. Up until 1971, the TRU waste was comingled with low-level waste and disposed of on-site. Beginning in 1971, in response to a new policy established by the Atomic Energy Commission, LANL ^{has segregated} ~~segregates~~ TRU waste from low-level waste and ^{has stored} ~~stores~~ the TRU waste in retrievable storage modes. This EA addresses only that TRU waste generated since 1971.

LANL generates two categories of TRU waste, contact-handled (CH) and remote-handled (RH). Waste in both categories will be transported to WIPP for ultimate disposal, although acceptance

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criteria differ for the two categories. Newly generated CH-TRU waste is produced at a rate of approximately 200 m³ per year. For the period from 1971 through 1989, a total of 7665.3 m³ of CH-TRU and 28.4 m³ RH-TRU waste has accumulated in retrievable storage at LANL. Of this, 304.2 m³ of the CH-TRU waste has been prepared in accordance with the WIPP acceptance criteria, and, consequently, is identified as WIPP "certifiable."

The remaining volume of retrievably stored TRU waste must be exhumed, examined, and prepared for WIPP. All newly generated TRU waste must also meet WIPP acceptance criteria. This proposed action establishes a systematic method for preparation of post-1971 TRU waste for ultimate disposal at WIPP.

1.3 History of Transuranic Waste Work-Off Planning

Planning to reduce the backlog of stored transuranic waste at LANL was formalized in 1985 with the preparation of an Action Description Memorandum (ADM). In October 1985, while noting that the LANL activities did not appear to be a major Federal action having significant environmental effect, DOE notified LANL of the need to prepare an EA. The initial draft of this EA covering all proposed LANL TRU waste work-off activities was prepared in FY 1986 and submitted to DOE early in FY 1987. Subsequently, LANL responses to DOE final review comments were submitted in January 1988. A few additional comments then were received in August 1988. In May 1989 LANL was notified of the need for further modifications based upon other LANL environmental documentation activities and analyses and policy presented in the WIPP SEIS. This EA incorporates changes to ensure consistency within the laboratory's environmental programs and within DOE's TRU waste disposal program. Minor changes to the technical approach of the work-off plan have also been incorporated.

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2.0 Description of Proposed Action and Alternatives to the Proposed Action

2.1 Proposed Action

The proposed action is preparation of retrievably stored and newly generated TRU waste for transport to and ultimate disposal at WIPP. Transuranic waste work-off activities will be performed at three areas within LANL: TA-3, TA-50, and TA-54. The location of these areas with respect to the Laboratory, Los Alamos County, Bandelier National Monument, and New Mexico is shown in Figures 2.1-1 and 2.1-2. Prior to being shipped to WIPP, transportation of the waste will be primarily within Laboratory boundaries, some waste transportation along Pajarito Road, ^{DOE is used by the public} a ~~public~~ ^{road}, will be necessary.

2.1.1 Waste Characteristics and Streams

TRU waste is defined by DOE Order 5820.2A as radioactive waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and having alpha radioactivity concentrations greater than 100 nCi/g. Typical LANL-generated TRU waste includes metal, glass, process equipment, soil, laboratory waste, inorganic precipitate sludge from liquid waste treatment, filters, cemented liquids and process residues, clothing, and paper and plastic products.

In accordance with waste minimization principles, higher concentrations of TRU residues are assayed to segregate and recover scrap materials from TRU wastes. Routine area waste is assayed to segregate TRU from low-level waste (LLW). Radium-226 sources and uranium-233 and -235, when at concentrations greater than 100 nCi/g, also are managed as TRU (consistent with DOE/AL Order 58 and with earlier definitions of TRU waste). Requirements for reducing TRU waste generation that address waste segregation, materials handling, and decontamination have been established at LANL. Waste minimization efforts have been successful, with current

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Figure 2.1-1. Location of Los Alamos National Laboratory

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Figure 2.1-2. Location of Laboratory Technical Areas and Los Alamos Population Areas

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TRU waste production rates at half of the historical production rate.

Based upon the LANL TRU waste inventory through 12/31/89, the average content of a drum or crate of CH-TRU waste to be shipped to WIPP is as follows:

	<u>DRUM</u>	<u>CRATE</u>
Pu-238	6.9 alpha Ci	1.0 alpha Ci
Pu-239/Pu-240	1.9 alpha Ci	0.3 alpha Ci
Am-241	0.9 alpha Ci	12.6 alpha Ci
Other	<0.01 alpha Ci	<0.01 alpha Ci

Between thirty five and fifty percent of current and projected LANL TRU waste is classified as mixed waste, containing both radioactive and hazardous chemical constituents. A major chemical component of mixed TRU waste is lead, which is usually present in the form of glove box parts, lead-lined gloves, and other components, or as shielding for more highly contaminated waste items. Other metals (e.g., arsenic, cadmium, chromium) are also present in some of the waste (e.g., sludges), but in much smaller (trace) quantities. Organic solvents (e.g., acetone, trichlorethylene) also are present in some waste types, again usually in trace concentrations. These solvents exist primarily in residual quantities from the cleaning of equipment, plastics, and glassware. The waste types that have been identified by LANL as containing hazardous chemical constituents are cemented process waste, inorganic sludges from the treatment of aqueous waste, combustible waste, metal waste, other inorganic solids, and leaded rubber waste. LANL has identified the constituents and maximum expected quantities of these mixed TRU wastes based primarily on process knowledge. The majority of the waste types contain less than 1% by weight of any of the identified hazardous chemical constituents.

The mixed TRU waste is subject to regulation under RCRA. LANL facilities used to store and

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treat mixed TRU waste are currently operating under interim status. Additional information on RCRA compliance activities can be found in Chapter 6.

The LANL TRU waste, including mixed TRU, must be certified for acceptance at WIPP. The term certified means that the TRU waste, and its packaging and container, meet all of the WIPP WAC established by DOE (DOE 1989). The WAC require that the waste be free of liquids, pyrophorics (spontaneous ignition substances), pressurized containers, and explosives. Strict limitations have been levied on the quantity of particulates, TRU material, and fissile material; on package size and weight; and on external package radiation and surface contamination. Hazardous chemicals must be identified and quantities listed. The Los Alamos TRU Waste Certification Plan (LANL 1988) provides additional details on compliance with waste acceptance criteria for newly generated waste.

There are four distinct waste streams in retrievable storage, each to be prepared under a separate work-off system designed to ensure that all WIPP WAC are met. These streams are portrayed in Figure 2.1-3. The two most prevalent waste streams are 55-gallon drums and plywood crates, generally stored in earthen berms. The third waste stream is a cement paste product, solidified in corrugated metal pipes. Remote-handled (RH) TRU waste is the fourth waste stream. The work-off systems established to prepare these waste streams are described individually in the next section.

In addition to the retrievably stored waste, a fifth waste stream is made up of newly generated contract-handled TRU waste. The means by which this waste is managed and certified for WIPP are described in the next section.

2.1.2 Work-Off Facilities

The technical areas (TA) and facilities housing work-off activities are shown in Figure 2.1-4.

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Figure 2.1-3. TRU Waste Work-Off Streams

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Figure 2.1-4. TRU Waste Work-Off Facilities, Generators, and Technical Areas.

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TA-3, TA-55, and TA-50 are producers of newly generated TRU waste. Work-off facilities are located at TA-50 and TA-54. The facilities at TA-50 are the volume reduction facilities, the Size Reduction Facility (SRF) and the Controlled Air Incinerator (CAI). The SRF accepts bulky metallic wastes, both stored and newly generated, for volume reduction. The CAI will be used as a means of volume reduction for work-off activities if it is operating; however, the CAI is not an integral part of the work-off system and its operation is outside the scope of this EA. Environmental documentation for the CAI is being developed independently.

Two areas are of interest within TA-54. Storage facilities, for both certified and uncertified waste, are located in Area G of TA-54. Also at Area G are the Waste Preparation Facility (WPF) and the Drum Venting Facility (DVF). At the WPF, retrieved packages will be cleaned and examined for structural integrity. Drums from the WPF will be vented in the DVF and then staged for subsequent work-off activities.

The other area within TA-54 that includes work-off facilities is TA-54 West. The Nondestructive Assay and Examination (NDA/NDE) Facility is used to evaluate drums to ensure WIPP WAC are met. Also at TA-54 West is the Corrugated Metal Pipe (CMP) Saw Facility, designed to cut the stored CMPs into a size acceptable for WIPP. ~~The CMP Facility will later be transformed into the Waste Treatment Facility (WTF), where packages failing to meet WIPP WAC standards will be opened, the contents treated if necessary and repackaged.~~ Eventually, all WIPP certified packages will be transferred to the Transportation Facility, also at TA-54 West, for loading into DOT-approved Type B packaging for highway transport to WIPP.

All facilities involved in the waste work-off system, whether new, modified, or existing, are studied to determine the level of risk associated with each process conducted. Table 2.1-1 summarizes the safety documentation available for each facility as well as the dates that each facility became or will become operational. The following discussion of individual facilities' operations as they pertain to the TRU Waste Work-Off Plan have relied heavily upon information

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Table 2.1-1. TRU Waste Work-Off Facilities and Associated Environmental and Safety Documentation

FACILITY	LOCATION	NEW, EXISTING OR MODIFIED	CONSTRUCTION FINISH DATE	OPERATIONAL PERIOD	ENVIRONMENTAL AND SAFETY DOCUMENTATION
Retrievable Storage	TA-54 Area G Mesita Del Buey Road	Existing	-----	Since early 1970's	Draft SAR Complete 1990 ADM?
TRU Waste SRF	Pecos Drive	Existing	-----	Since late 1970's	SAR Approved July 1987 ADM 1983
Treatment Development (CAI)	Pecos Drive	Existing	-----	Since mid 1970's (CAI 1979)	Draft SAR Complete 1990 ADM?
TRU Waste Preparation Facility <i>mesita</i>	Within Area G Mission Del Buey Road	Existing	-----	Starting 1990	SA Approved May 1989 ADM 1983
TRU Waste ND/ANDE Facility	TA-54 West Mesita Del Buey Road	Existing	-----	Starting 1989	Draft SA Complete 1990 Initial Work-Off Plan EA
TRU Waste CMP Saw Facility	TA-54 West Mesita Del Buey Road	New	Approx. 1991	Approx. 1991 to 1993	Draft SAR Complete 1990 ADM?
TRU Waste Transportation Facility	TA-54 West Mesita Del Buey Road	Existing	-----	Starting 1988	Draft SA Complete 1990 ADM?
Drum Venting Facility	TA-54 Mesita Del Buey Road	New	?	?	SA In Progress 1990 DEC No. 90-0003
TRU Waste Processing Facility	TA-54 West Mesita Del Buey Road	Modified	1994?	Approx. 1994?	?
Liquid Waste Processing Facility	Pecos Drive	Modified	?	?	?

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from facilities' SAs and SARs. For more indepth information on each facilities' operation the appropriate SA or SAR should be consulted.

Each of these facilities is described in the following sections on work-off systems. A total of five work-off systems are presented, four systems for the four streams of retrieved waste and one for newly generated waste.

2.1.3 Work-Off System for Retrievably Stored Contact-Handled Waste in 55-Gallon Drums

The majority of LANL CH-TRU waste is retrievably stored in 55-gallon drums in either earthen mounds or trenches. This waste will be retrieved, prepared, examined, and if the waste meets the WIPP/WAC, it will be loaded for transport to WIPP. Figure 2.1-5 depicts the waste stream for CH waste in 55-gallon drums. The following sections detail this work-off system.

2.1.3.1 Storage and Retrieval

55-gallon steel drums are stored in subsurface trenches or above-ground earth berms at the LANL TRU waste storage site (TA-54, Area G). The 55-gallon drums, as well as some 30-gallon drums, contain small TRU-contaminated items. The drums are sealed and coated with bituminous corrosion protection material.

Most of the drums are stored on asphalt pads, measuring 12.2 m by 123.4 m (40 ft by 405 ft). A total of four such pads are used for storage, one of which is designated for WIPP-certifiable waste. Certifiable TRU waste is stored on a pad which is covered by a tension-support, polyester fabric-covered shelter.

The uncertified waste packages are stacked 3.6-4.8 m (12-16 ft) high on the pavement. As the

Figure 2.1-5. TRU Waste Work-Off Stream for Retrievably Stored C-H Waste in 55 Gal. Drums

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stack progress down the pad, the top and sides are covered with 19 mm-thick (0.75 in) plywood, and the entire stack is enclosed with 0.5 mm (0.02 in) nylon-reinforced vinyl sheeting. The stack is then covered with 1-2 m (3-6 ft) of tuff to create an artificial mound. One modified pit, pit 9, has also been used for TRU waste storage in much the same manner.

Retrieval of the uncertified TRU waste packages will require heavy earthmoving equipment to remove the overburden and a crane capable of about a 60 ft reach. A small rubber track front-end loader will also be required to assist in the final stages of this operation. As the backfill cover is removed from the TRU waste, personnel will probe the remaining cover with metal rods to measure the distance (thickness of cover) remaining to the waste. The equipment operator is thus kept informed to assure that waste packages will not be damaged. This method has proved effective in all prior excavations of this type. Final excavation, approximately the last 4 in, will require manual labor to ensure that no packages are breached. Waste then will be removed using a forklift.

2.1.3.2 Waste Preparation

After retrieval, the drums will be taken to the nearby Waste Preparation Facility. The Waste Preparation Facility is a tension-support, polyester fabric-covered shelter attached to a smaller, fixed structure. The tension support structure, measuring 50 ft wide by 110 ft long provides an environmental shelter for drum handling and staging. The fixed structure (masonry construction) provides 1250 ft² of space for drum cleaning and inspection operations. The Waste Preparation Facility is scheduled to be operational by the end of 1990. The facility was constructed in FY 1986 and FY 1987 following approval of an ADM (ADM 1983b) which covered an earlier version of the planned action. Beginning in 1990, retrieved waste drums will be cleaned at the Waste Preparation Facility.

Waste preparation consists of two steps. First, the drums must be cleaned to remove excess soil

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and bituminous corrosion protection coatings. Experience to date has indicated that high pressure steam and hot water are most effective for the types of cleaning required in the Waste Preparation Facility. A commercial-type, portable steam generator unit will be used. Operations at the TRU Waste Preparation Facility may necessitate periodic decontamination (washdown) of a portion of the interior of the facility (where cleaning will be performed) and the collection and processing of internal drainage.

All internal drainage and effluents emanating from the facility will be considered potentially contaminated and held for further treatment. Consequently, these liquids will be collected in a contained 5000 gallon storage tank for sampling and analyzing before periodic tank truck transfer to the LANL Liquid Waste Treatment Facility at TA-50. A new, 2700 gallon capacity, double contained, truck-mounted tank has been obtained for making these transfers. Residues from removal of the bituminous corrosion protection coating on steel storage drums will be removed from the drainage system, processed as a potentially contaminated low-level waste material, and buried at Area G, TA-54.

The second waste preparation is inspection, both visually and with ultrasonic equipment. In evaluating structural integrity, evidence of any external or internal corrosion will be sought. Unacceptable drums will be overpacked, as required by the WIPP WAC.

2.1.3.3 Drum Venting Facility

Following waste preparation activities, the drums will be moved to the Drum Venting Facility for vent installation and headspace gas sampling. The filter vent will prevent an unacceptable buildup of combustible gases (e.g., hydrogen). As the vent is installed, a headspace gas sample will be withdrawn for immediate, on-line analysis of combustible gas concentrations. If found unacceptable, the drum headspace will be purged with an inert gas.

The drum vent installation and headspace gas sampling will be conducted inside of a High

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Efficiency Particulate Air (HEPA)-filtered containment enclosure. This skid-mounted (moveable) equipment system will be located immediately adjacent to the Waste Preparation Facility tension-support structure. All drum movement within the Waste Preparation Facility and to and from the venting/sampling equipment will be via hand pulled, multi-wheeled dollies. During the venting/sampling operation, drums will be contained within an HEPA-filtered cabinet, inside of the skid-mounted enclosure, designed to contain any overpressurization event that conceivably might occur. Design and fabrication of this system is scheduled for completion during FY 1990 and FY 1991. Under DOE/AL guidance for implementation of SEN-15-90, a DOE Environmental Checklist (DEC No. 90-0003) was submitted to DOE in April 1990 for a NEPA determination. Drum venting operations are scheduled to begin in FY 1991.

2.1.3.4 Nondestructive Examination and Assay (NDA/NDE) Facility

Waste will be transported from the Drum Venting Facility to the NDE/NDA Facility by LANL truck. The NDE/NDA Facility and the Transportation Facility are constructed as a single building located at TA-54 West. These facilities were constructed in FY 1988 through early FY 1989. These facilities were included in the TRU Waste Work-Off Plan EA submitted originally in early FY 1987.

Drums will be examined and assayed in the TRU Waste NDA/NDE Facility to verify the nature of the waste matrix and the identity and quantity of radioactive isotopes contained in the waste. Where additional treatment of the waste is not required, this operation will provide the basis for directly certifying a large portion of stored waste as meeting the WIPP WAC.

Verification activities begin with the off-loading of drums from the special truck onto individual dollies. The drums will be subject to nondestructive assay (NDA) using an Active-Passive Drum Assay System constructed by the Los Alamos Advanced Nuclear Technology Group, N-2. The system uses passive-active neutron interrogation assay technology to determine the TRU

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inventory inside each drum. The nondestructive examination (NDE) equipment is a commercially available 320 KeV X-ray real-time radiography unit constructed to examine the contents of 210-1 (55-gallon) drums. Special features of the unit include image enhancement, magnification, video cassette recorder, and hard copy print capability. A commercially available drum weighing system is also in the NDA/NDE Facility.

Drums verified as meeting WIPP WAC will be certified. These drums will be reloaded into the special on-site transport truck for shipment to Area G where they will be stored in the certified TRU Waste Storage Facility. Those drums not certifiable also are returned to Area G by the same means for restorage with other uncertified wastes, pending a future drum opening and sorting operation (TRU Waste Treatment Facility). When shipments to the WIPP begin, certified drums will be moved directly to the Transportation Facility from NDA/NDE Facility through a common door between the two facilities to be loaded in NRC-approved Type B packages for shipment to the WIPP. Similarly, when the adjacent TRU Waste Treatment Facility is operational (FY 1994), uncertifiable drums will be taken directly to that facility for required opening and treatment.

A small fraction of newly generated waste drums will also be assayed and examined in the NDA/NDE Facility, providing a quality assurance check on the TRU waste generation certification process.

2.1.3.5 Waste Treatment Facility

For those drums found to be uncertifiable in the NDA/NDE examination, additional treatment of the waste is necessary. ~~The Waste Treatment Facility will be housed in the building previously operated as the CMP Saw Facility. Once CMP Saw operations have concluded, the building will be decommissioned, decontaminated, and refitted as the TRU Waste Treatment Facility. Operations of the Treatment Facility will begin in FY 1994.~~

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In the treatment operations, packages will be opened in a special glove box line, and the contents removed and sorted. Combustibles will be taken to the CAI for incineration, if operational. Some noncombustibles will be certifiable without processing, and others may be shredded and/or subsequently immobilized in a cement mix inside 55-gallon metal containers to meet WIPP WAC requirements. Until WIPP shipments begin, certified packages will be returned to Area G for certified waste storage. After LANL begins shipping wastes to WIPP, the containers will be held until space is available in the Transportation Facility to prepare them for direct transport to WIPP.

In addition to the equipment systems changeout, additional facility construction is anticipated to complete the transition to the Treatment Facility. The existing structure will be modified to meet all criteria for a "Moderate Hazard Nuclear Facility," as defined in DOE Order _____. Anticipated areas of upgrade include adding redundancies for fire protection, facility/process ventilation, and emergency power. Major equipment items include glove box lines for waste package opening and waste sorting, assay capability for small waste items, and waste treatment in the form of immobilization and, possibly, shredding and compacting.

2.1.3.6 Waste Transportation Facility

The Transportation Facility was designed and constructed as a single building with the NDA/NDE Facility located at TA-54 West. ~~These facilities will share a common wall with the CMP Saw Treatment Facility.~~ Construction of the joint NDA/NDE-Transportation Facility began in 1987 and was completed in 1988.

The Transportation Facility is a standard design warehouse. Here, the certified waste packages will be loaded into TRUPACT II, the DOE-developed and NRC-approved Type B overpack for shipment to WIPP. The semitrailer (TRUPACT II units) and tractor carrying the waste to WIPP will be brought into position inside the Transportation Facility to load the waste packages. A

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bridge crane will assist in removing the TRUPACT-II lids, transferring the waste into the TRUPACT containers, and then replacing and resealing the lids. The sealed TRUPACT containers will then be inspected and tested prior to shipment to WIPP. The Transportation Facility is sized to permit storage of up to five TRUPACT truck volumes.

2.1.4 Work-off System for Retrievably Stored Contact-Handled Waste in Crates

The second most common TRU waste stream at LANL is contact-handled TRU stored in plywood crates. Figure 2.1-6 demonstrates the work-off stream for these large crates. The crates, some up to 30 feet in length, accommodate those items too large for drum storage. The crates are sealed and coated with fiberglass reinforced polyester.

2.1.4.1 Storage and Retrieval

Plywood crates are stored in trenches and berms, alongside the 55-gallon drums. The crates are stacked up to 16 feet high on the pavement. The stack is covered with plywood, then enclosed with vinyl sheeting and covered with up to six feet of tuff.

The retrieval process for crates is the same as for drums, relying primarily on heavy machinery to remove the overburden. Manual labor will be used in the final stages of retrieval to prevent package breaches.

2.1.4.2 Waste Preparation

Once retrieved, the crates are transferred to the Waste Preparation Facility. As with the drums, the crates are washed to remove excess soil and are inspected. In this inspection, structural integrity is assessed and trapped moisture, if present, is drained. Any necessary repairs will be made prior to on-site transport to the Size Reduction Facility.

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Figure 2.1-6. TRU Waste Work-Off Streams for Retrievably Stored C-H Waste in Large Crates

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2.1.4.3 Size Reduction Facility

The Size Reduction Facility (SRF) is designed to cut large items of TRU waste into pieces suitable for WIPP certified containers. The retrieved crates contain large items, such as process equipment and ductwork, that will be processed in the SRF.

The SRF enclosure is divided into four modules according to function: airlock; disassembly; cutting; and, packaging/bagout. To process a waste item, the package is placed into the SRF building and the building locked. External packaging is removed and the item is brought into the airlock. The item passes from the airlock to the disassembly area where attached combustible items are removed. The item is then moved into the cutting area where a plasma torch is used to cut it into smaller pieces for packaging. The pieces are placed into WIPP-accepted Department of Transportation (DOT) Type A-approved metal containers in the bagout area. This package is then sealed for certified TRU waste storage at Area G, TA-54, pending future shipment to WIPP. The SRF has been operating successfully for several years.

After completion of the associated safety analyses, ^{and} the successful operation at the 150 g Pu 239 equivalent level, the TRU inventory limit for the SRF may later be raised (following proper approval procedures) to 400 g to allow subsequent processing of all appropriate LANL stored and newly generated TRU wastes. During its operational period from March 1987 through the end of 1989, the SRF has processed 328.8 m³ of newly generated and stored TRU waste, resulting in an output volume of 81.2 m³; the overall reduction factor is about 4:1. ~~All output packages from the SRF have been WIPP certified.~~

[Note: Additional detail on operations will be added, based on the SRF SAR. For example, how is the package transported into the building and how is packaging removed?]

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2.1.5 Work-Off System for Corrugated Metal Pipes

Delete - not a near-term process

A third waste stream, previously generated by the TA-21-257 liquid waste treatment plant, is a cement paste product. The paste was solidified in corrugated metal pipes (CMPs), .75 m (2.5 ft) in diameter and 6 m (20 ft) long. Both ends of each CMP were plugged with .3 m (1 ft) of uncontaminated concrete. Each CMP weighs between 12,000 and 15,000 lbs. The CMPs will be cut into sections five feet or less and will be packaged in WIPP-certified packages. All activities will take place in the CMP Saw Facility. A total of 158 CMPs will be cut and repackaged. Figure 2.1-7 details the work-off system for the CMPs.

2.1.5.1 Storage and Retrieval

After a period of storage in a deep pit, the TRU waste CMPs were retrieved in FY 1986. They were decontaminated and transported to TA-54, Area G. The CMPs will be moved by truck, carrying up to three CMPs to the CMP Saw Facility.

2.1.5.2 CMP Saw Facility

The CMP Saw Facility is located in TA-54 West. As they arrive by truck, the CMPs will be offloaded with a gantry crane and placed into the receiving area of the building. One CMP will be placed onto a hydraulic conveyor system in the receiving area from which it will be moved onto another hydraulic conveyor system housed inside a saw enclosure. The second conveyor system will advance the CMP through the bed of a hydraulically-powered band saw until a section can be cut by the saw. The cut section will be held on the second conveyor system until it can be removed by a trolley hoist and placed into the bag-out module. When one section of CMP has been placed into the bagged-on waste package, the waste package will be bagged off.

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Figure 2.1-7. TRU Waste Work-Off Stream for Corrugated Metal Pipes

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After a new waste package has been attached to the bag-out module, the bagged off package will be closed. Swipes will be assayed to document that the waste package surfaces are within permitted contamination limits. The waste package will be touch-up painted (if needed), labelled, and transferred to TA-54, Area G for storage. All operations of the CMP Saw Facility currently are scheduled to be completed prior to the start of LANL waste shipments to WIPP.

Cutting will be remotely performed by a large band saw housed inside a glove box-like enclosure which will be maintained at a reduced pressure with respect to the process room, which in turn will be maintained at a reduced pressure with respect to the outside environment. Process room and enclosure air will be exhausted through separate HEPA-filtered ventilation systems.

The band saw will use recirculated water as a cutting fluid to cool the carbide-impregnated blade, carry away cement paste removed from the cut, and minimize airborne particulates in the enclosure. The resultant sludge-like cuttings and some cutting fluids will be collected and managed in a series of tanks. Periodically, this material will be treated to immobilize it in drums that are certified for WIPP disposal. Low-level liquid wastes will be collected and stored for transport to the Laboratory TA-50 Liquid Waste Treatment Plant.

Approximately 4 CMPs per week will be the planned throughput. After all CMPs have been sectioned and packaged, the saw enclosure area will be decommissioned and the area decontaminated. CMP work-off activities are expected to be complete 18 months after start-up.

The facility will then be modified to house the Waste Treatment Facility (described in Section 2.1.3.5).

2.1.6 Work-Off System for Remote-Handled Wastes

[Note: This section to be added. More information from the LANL staff is needed.]

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2.1.7 Newly Generated Waste

TRU waste is being generated at an estimated rate of 200 m³ per year by operations in TA-3 and TA-55. This is roughly a 50% decrease from the historical generation rate. The reduction has been made possible by enhanced generator awareness and implementation of volume reduction efficiencies in operations.

Waste management operations within each TRU waste generator location are responsible for sorting and packaging newly generated waste. At each location the waste is sorted in a glove box line to remove pressurized containers, explosives, and any other items which are excluded from WIPP WAC. The sorted waste is placed in 90 mil thick plastic liners inside 55-gallon drums. Once the drum is full it is sealed and removed from the glove box line. The drum is then assayed to determine the mass and elemental composition of the radioactive materials contained. Each TRU waste container has a large label affixed to it, consisting of a unique bar code number, an EPA hazardous waste number, and a description of the type of waste in the drum (i.e., lead bricks). After the assaying and labeling, the waste containers proceed into the work-off waste stream.

The newly generated waste will enter the waste streams at the NDA/NDE facility. The generators will have the waste transported by LANL truck to the NDA/NDE facility where a predetermined number will be assayed and examined to determine conformance with WIPP WAC. Conforming drums will then proceed to the Transportation Facility where they will await shipment to WIPP.

The waste that contains questionable or non-certifiable items will be transferred to the Waste Processing Facility. Here the questionable and/or non-certifiable items will be removed, and processed so that they comply with the WAC. The remaining material will be repackaged in a Type A container and moved to the Transportation Facility for shipment to WIPP.

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2.1.8 On-Site Transportation

Implementation of DOE transportation requirements for on-site movement of hazardous materials, specifically DOE Orders _____ and _____, has resulted in the Laboratory acquiring a special transport truck for TRU waste activities.

Beginning in FY _____, all inter-facility on-site TRU waste transport will be accomplished with this truck. Only some limited movement of waste, such as some oversized boxes intended for SRF treatment, will have to be conducted still by special handling procedures including escort and, possibly, road closure.

The new truck consists of a reinforced, insulated box, mounted on a truck frame. Access doors can be sealed airtight. The inside of the box, sized to hold up to 18 55-gallon drums, will be equipped with thermal and radioactive contamination detectors. The unit has been evaluated as providing considerable added safety based upon the construction of the box and the limited length of on-site transportation routes.

Table 2.1-2 summarizes the different routes that will be utilized during the Waste Work-Off Plan. The table lists the origination and destination points, and the approximate distance for each leg of the waste stream. It also depicts the anticipated volume of waste to be transported during the duration of the work-off program.

2.2 Alternatives

2.2.1 The No-Action Alternative

The no-action alternative is to continue current storage practices at LANL. This alternative is not acceptable technically and is not consistent with Congressional directives or DOE policy.

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Table 2.1-2. TRU Waste Work-Off Transportation Routes, Volumes, and Distances Between Facilities

FROM	TO	VOLUME (m ³)	DISTANCE (KM)
Transportation	WIPP	14335	
New waste generated at TA-3, 50, 55	Transportation	3595	4.2
Uncertified storage at TA-54	Preparation	6518	1
Preparation	NDA & NDE	4432	2.6
NDA & NDE	Transportation	3139	0
Certified waste handling holding	Transportation	2891	2.6
New waste generated at TA-3, 50, 55	Incineration	890	0.5
NDA & NDE	Certified waste holding	2396	2.6
Preparation	Size reduction	2239	6.7
New waste generated at TA-3, 50, 55	Size reduction	1200	0.5
Size reduction	NDA & NDE	822	4.2
CMP Saw	NDA & NDE	1200	0
Treatment	NDA & NDE	805	0
NDA & NDE	Incineration	735	4.2
NDA & NDE	Treatment	700	0
New waste generated at TA-3, 50, 55	Certified waste holding	940	6.7
Uncertified storage at TA-21	CMP Saw	442	13.0
New waste generated at TA-3, 50, 55	Uncertified waste holding	25	6.7
NDA & NDE	LLW burial	272	2.6
Uncertified storage at TA-21	LLW burial	190	15.5
Uncertified storage at TA-54	Possible Uncertifiable Waste	213	0.5
Incineration	NDA & NDE	74	4.2

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From a technical standpoint, the no-action alternative is not acceptable because the current storage methods were designed as only an interim solution to a very long-term hazard. The 55-gallon drums are expected to maintain structural integrity for 20 years. Also, the storage units are designed to ensure retrievability and to prevent occupational exposures, not to provide long-term isolation from the environment. Thus, the no-action alternative presents significant technical questions of site suitability for extended storage purposes.

The no-action alternative is also contrary to Congressional directives and DOE policy. In 1980, Congress authorized the construction of WIPP as "...research and development facility to demonstrate the safe disposal of radioactive waste resulting from the defense activities..." (Public Law 96-164). Shortly thereafter, DOE published a Record of Decision (46 CFR 9162) announcing DOE's determination to proceed with the phased development of the WIPP site. The determination specified that WIPP be designed to accommodate approximately 6.2×10^6 cubic feet of CH-TRU waste and 250,000 cubic feet of RH-TRU waste. Most of the TRU waste produced by DOE generator facilities will be disposed of at the WIPP. Thus, the no-action alternative is unacceptable in view of the planned use and established capacity of the WIPP.

3.0 AFFECTED ENVIRONMENT

3.1 Physical Environment

3.1.1 Location

LANL and the associated residential areas of Los Alamos and White Rock are located in Los Alamos County, northcentral New Mexico, approximately 60 mi north-northeast of Albuquerque and 25 mi northwest of Santa Fe (Figure 2.1-1). The 43 mi² LANL site and adjacent communities are situated on Pajarito Plateau.

3.1.2 Geology and Seismology

The Pajarito Plateau consists of a series of finger-like mesas separated by deep east-west oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 7800 ft on the flank of the Jemez Mountains to about 6200 ft at their eastern termination above the Rio Grande valley. Ashfall, ashfall pumice, and rhyolite tuff form the surface of the plateau. The tuff ranges from nonwelded to welded and is in excess of 1000 ft thick in the western portion, thinning to about 260 ft toward the east above the Rio Grande. The area is one of low seismicity (magnitude 4.8-5.0 earthquake per 100-yr) (ref. LASL 1979a).

3.1.3 Hydrology

The regional water supply is limited. Los Alamos area surface water is primarily in intermittent streams. Springs on the flanks of the Jemez Mountains supply base flow into upper reaches of some canyons, but the amount is insufficient to maintain surface flows across LANL site before it is depleted by evaporation, transpiration, and infiltration. Runoff from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year. Groundwater occurs in three

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modes in the Los Alamos area: (1) water in shallow alluvium in canyons, (2) perched water (a groundwater body above an impermeable layer that is separated from an underlying main body of groundwater by an unsaturated zone), and (3) the main aquifer of the Los Alamos area. The main aquifer is the only aquifer in the area capable of serving as a municipal water supply. Depth to the aquifer decreases from 1200 ft along the western margin of the plateau to about 600 ft at the eastern margin. This aquifer is isolated from alluvial water and perched water by about 350 to 620 ft of dry tuff and volcanic sediments. There is no known hydrologic connection or potential for recharge to the main aquifer from alluvial or perched water.

3.1.4 Soils

Soil associations in the plateau region are shallow, with nearly half including extensive rock outcrops. Both the quality of the soils and water limitations have resulted in historically limited agricultural use of the land.

3.1.5 Climate

The Pajarito Plateau region is classed as a semiarid temperate mountain climate. Proceeding up the elevation gradient from near White Rock (about 6200 ft) to Los Alamos (about 7400 ft), the annual precipitation ranges from about 13 to about 19 in. More than two-thirds of the yearly total falls during the interval May through October. The growing season (limited by last and first freeze) is confined to the same relatively short interval. Brief afternoon and evening thundershowers are common, especially in July and August. Maximum summer temperatures are usually below 90°F. Winter temperatures rarely drop to 0°F.

3.1.6 Winds

Surface winds in Los Alamos often vary dramatically with time-of-day and location because of

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the complex terrain. However, a distinct daily wind cycle often exists: a light southeasterly to southerly upslope wind during the day and a light westerly to northwesterly drainage wind during the night. On the whole, the predominant winds are southerly to westerly over Los Alamos County. Strong winds with gusts exceeding 60 mph are common and widespread during the spring. There are no reports of tornadoes touching down in Los Alamos County.

Atmospheric mixing (dispersion) affects the transport of contaminants released into the air. Good mixing conditions result in greater transport and dilution. Poorer mixing conditions increase the potential for exposure to higher air concentrations. The frequency of atmospheric stability, an estimate of the dispersion capability of the atmosphere, is approximately 40% unstable (good mixing), 35% neutral (fair mixing), and 25% stable (poor mixing) on the mesa tops of the Los Alamos area.

3.2 Ecology

No threatened or endangered biota are affected by this project. The TA-50 site is a developed complex. Lists of plants and animals for the undisturbed TA-54 site and for LANL as a whole are contained in the LANL Site EIS (DOE 1979) and on file with the LANL Environmental Surveillance Group.

Plants. Almost 350 individual plant species have been tentatively identified in the general LANL area, and over 60 taxonomic families are recorded. The native vegetation of the mesa environs is predominantly a pinon-juniper or ponderosa pine/pinon-juniper overstory with interspersed shrub-grass-forb components. These well-adapted, drought-resistant species are successful competitors with species introduced by man. Pinon pine and one-seeded juniper are abundant in the TA-50 and TA-54 localities. The vegetative understory is in general sparse. Members of the composite and grass families occur with the highest frequency and comprise the highest percentage of the ground cover at all elevations.

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Animals. The combination of relatively dense vegetation in canyon bottoms and available free water provides excellent habitat for wildlife. Bird and mammal studies at LANL have determined initial species composition and diversity and have provided preliminary indications of densities, movement patterns, and food habits. There are some 17 small mammal species (representing six taxonomic families) and a number of species of large mammals. The Rocky Mountain mule deer and Rocky Mountain elk are the most important.

3.3 Land Use

Most LANL and community developments are confined to mesa tops. The surrounding land is largely undeveloped, with large tracts of land north, west, and south of LANL site held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County. San Ildefonso Indian Pueblo borders LANL to the east.

LANL land (Figure 2.1-2) is used for building sites, test areas, waste disposal locations, roads, and utility rights-of-way. However, due to the broken nature of the terrain these account for only a small fraction of the total land area. Most land provides isolation for security and safety and is a reserve for future structure locations. The Long Range Site Development Plan provides planning for future uses of available LANL lands.

The DOE controls the area within LANL boundary and has the option to completely restrict access.

3.4 Socio-Economic

3.4.1 Population Characteristics

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Los Alamos County has an estimated 1988 population of approximately 19,500 (based on the 1980 census adjusted for 1988). Two residential and related commercial areas exist in the county, the townsite of Los Alamos and White Rock (Figure 2.1-1). The Los Alamos townsite, the original area of development, has an estimated population of 12,200. The White Rock area has about 7200 residents. About one-third of those employed in Los Alamos commute from other counties. Population estimates for 1988 place about 203,000 people within a 80 km radius of Los Alamos (Table 3.4-1).

3.4.2 Economic Setting

The economy of the northern New Mexico region is based mainly on federal and state government operations, a large tourist trade, and agriculture. The proposed action is not expected to significantly affect the regional or local economy.

Government employment is the most important economic force in the northern New Mexico region. It amounts to one-fifth to one-third of the total employment per county, except for Los Alamos where the government sector directly accounts for three-fourths of the employment. Tourism is the second most important economic activity in the region. It is characterized by steady growth and is especially crucial to the economies of Santa Fe, Taos, and Bernalillo Counties. Agriculture was once the major economic activity in the region, but has been declining steadily since 1940. On many small farms most of the agricultural produce is consumed by the family. Truck farms supply some produce to local markets.

The economy of northern New Mexico is generally depressed, with low incomes and high unemployment rates. As a result of the economically depressed status of the region, the median income in the region is less than the national average and the percentage of families with income below the national poverty level is high. In this setting, LANL is the only major industrial employer in northcentral New Mexico. This has a large economic impact on Los Alamos

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Monitoring and sampling locations for various types of measurements are organized into three groups: (1) Regional stations located within the five counties surrounding Los Alamos County at distances up to 50 mi from LANL provide a basis for determining conditions beyond the range of potential influence from LANL operations. (2) Perimeter stations located within about 2.5 mi of LANL boundary document conditions in areas regularly occupied by the public and potentially affected by LANL operations. (3) Onsite stations within LANL boundary document environmental conditions at LANL where the public has limited access.

Samples of air particulates and gases, waters, soils, sediments, and foodstuffs are routinely collected at these stations for subsequent analyses. Additional samples are collected and analyzed to gain information about particular events, like major surface runoff events, nonroutine releases, or special studies.

3.5.2 Radiation Environment

LANL radiation environment is influenced by radiation from two sources: a) natural or background and b) humanmade.

A. Natural Background. Natural external penetrating radiation comes from terrestrial and cosmic sources. The natural terrestrial component results from decay of ^{40}K and from radioactive daughters in the decay chains of ^{232}Th , ^{235}U , and ^{238}U . Natural terrestrial radiation in the Los Alamos area is highly variable with time and location. During any year, external radiation levels can vary 15% to 25% at any location because of changes in soil moisture and snow cover. There are also fluctuations because of different soil and rock types in the area. The cosmic source of natural ionizing radiation increases with elevation because of reduced shielding by the atmosphere. Measurements at regional and perimeter stations over the year estimate annual background radiation in the Los Alamos area to be 336 mrem.

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B. Human-made. Above background radiation can be attributed to human sources. However, fluctuations in natural background radiation make it difficult to detect increases in radiation levels from human sources. This is especially true when the size of the increase is small relative to the magnitude of natural fluctuations.

No radiation measurement for a northern New Mexico location showed any statistically discernible increase over background in 1988. The only LANL boundary or perimeter measurements showing an effect attributable to LANL operations were from dosimeters located north of the LANL Meson Physics Facility (LAMPF, a linear particle accelerator). In 1988, the estimated maximum individual air pathway whole body dose to the public was 6.2 mrem, or 25% of the 25 mrem/yr EPA limit via the air pathway and about 6% of the 100 mrem/yr from naturally occurring radioactivity. Incremental cancer risks to residents of Los Alamos townsite caused by 1988 LANL onsite operations was estimated to be 1 chance in 83,000,000 (LANL 1988a). This risk is less than 0.04% of the 1 chance in 20,000 cancer risk from natural background radiation and the 1 chance in 110,000 risk from medical radiation [based on Publication 26 of the International Commission on Radiological Protection (ICRP), (Ref. ICRP 1977)].

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4.0 ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

4.1 Introduction

This section discusses the estimated effect of the TRU Waste Inventory Work-Off Plan due to normal operations on populations at and in the vicinity of LANL.

4.2 Expected Effects of On-Site TRU Waste Management

The expected effects on the environment and the general public from normal operations at LANL facilities involved in retrieving, processing, packaging, and certifying TRU waste for shipment to WIPP include routine construction impacts and generation of effluents and emissions from operating facilities. Workers in some of the operations will receive incremental radiation exposures. The operations will also carry some risk from potential accidents that could occur in the facilities and during onsite shipment. Risk from these potential accidents is addressed in Chapter 5.

4.2.1 Retrieval, Processing, Packaging, and Certifying

The principal environmental effects of normal operations in the existing and new facilities will be the production of airborne, liquid, and solid wastes. These wastes will be processed or controlled in the TRU waste facilities or in other related waste management facilities. Any emissions or effluents ultimately released to the environment will be within the limits of applicable regulations.

4.2.1.1 Airborne Emissions

Airborne emissions will include both radioactive and nonradioactive constituents. The

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nonradioactive emissions will be primarily normal combustion products from various heating, ventilating, and air conditioning systems. Some combustion products from the waste incinerator and size reduction will also be released but will be very small quantities because of the extensive air cleaning and filtering (HEPA filters) designed primarily to control radioactive emissions.

None of the facilities are expected to release types or quantities of nonradioactive materials that would be subject to control by either Federal or state regulations. Some generation or resuspension of airborne dust will be incidental to construction of new facilities and to uncovering of the retrievable TRU waste. Such fugitive dust will be controlled when necessary by conventional dust suppression methods.

Radioactive airborne emissions will be released from the Size Reduction Facility, the incinerator in the TDF, and the CMP Saw/Waste Processing Facility. In all cases, these emissions will be subject to air cleaning systems including HEPA filtration. The existing systems have been and the new or modified systems will be designed to assure compliance with the Federal regulation of airborne radioactive emissions from Federal Facilities (40 CFR 61, Subpart H), which generally limit exposures to the public to no more than 25 mrem whole body equivalent or 75 mrem to any organ a year. In addition, the releases will be further limited to meet the DOE and LANL policy on limiting releases to levels "As Low As Reasonably Achievable" (ALARA, LANL 1987 and DOE 1982).

The next three paragraphs briefly describe operating experience at the three existing facilities.

The Size Reduction Facility has been operational at one-fifteenth of current approved capacity (in terms of TRU inventory in the facility) for more than two years to develop and test actual procedures. Operating experience during that time has confirmed that the air cleaning system functions better than the theoretical evaluation suggests (LANL 1986c). Actual releases have been less than one tenth of the amount of radioactivity calculated for those releases in the Safety

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Analysis Report (LANL 1986c). The theoretically calculated doses for full-scale operations at the current approved production level at the Royal Crest Trailer Park is 0.0004 mrem/yr to bone, far below the 75 mrem/yr organ dose limit in the EPA regulation. Even if operations should be scaled up to higher production levels there should be no difficulty in staying well within regulatory limits.

The controlled air incinerator in the TDF has operated successfully in an extensive research and development program for several years. This experience has shown that the air cleaning system is extremely effective, performing at least as well as the theoretical estimate prepared for its SAR (LASL 1979). This system includes exhaust gas cooling, venturi scrubbing, packed column scrubbing, and two stages of HEPA filtration. During the research and development programs conducted with radioactive materials, no measurable releases have occurred from the facility. However, under an operational schedule with larger throughput of radioactive materials, there is some likelihood that routine releases will occur. An estimate of maximum likely release levels can be based on the theoretical analysis performed for the TDF SAR (LASL 1979). That analysis predicted a concentration of plutonium in the undiluted stack emissions of less than 0.1 % of the present DOE Derived Concentration Guides for Uncontrolled Areas. The average concentration level of materials handled under production conditions is expected to be about ten times the concentration evaluated for the previous research and development operations. However, actual doses would still be expected to be less than one percent of both the DOE guidance and EPA regulations because substantial dilution would occur between the stack release point and any member of the public. An upgrade of the CAI to make this unit a production-oriented incinerator, which will include a third stage HEPA filter, will reduce emissions by a factor of a thousand.

Retrieval operations at Area G would not be expected to result in any incremental radioactive emissions under normal circumstances. Routine operations have been monitored for many years at Area G. While on occasion airborne concentrations of plutonium around TA-54 have been

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higher than regional background, none has ever been more than a fraction of a percent of applicable DOE guidelines and EPA regulations (LANL 1986a), and have been attributable to contamination associated with the low-level waste disposal operations. The retrievably stored waste is in containers that were monitored for the absence of any external contamination before being placed in the storage locations. A recent study of the retrievable drums (LANL 1985b) found no external contamination on 44 retrieved drums that had been in storage for as much as 9 years. Some of the fiberglass reinforced plywood containers in one storage location apparently suffered structural damage under the earth cover as identified by subsidence. Investigation (after removal of subsided cover) showed that 4 boxes are damaged, but air sampling in the immediate vicinity of those boxes found no evidence of contamination escaping from the boxes. The internal packaging is evidently continuing to confine all TRU contaminants to the components inside the boxes. Because of multiple layer packaging and additional procedural precautions, retrieval of such boxes should be accomplished with no significant release of radioactivity.

4.2.1.2 Liquid Effluents

The existing and new facilities will produce both sanitary and radioactively-contaminated liquid wastes. The sanitary wastes will be treated by either existing sanitary waste treatment plants or by septic tanks. The facilities located at TA-50 (TDF, SRF) direct sanitary sewage to the TA-35 treatment lagoons which are operated under an NPDES permit. The facilities to be located at TA-54 (Waste Preparation, NDE/NDA, CMP Saw/Waste Processing, and Transportation) will direct sanitary sewage to septic tank systems designed and operated in accord with applicable New Mexico State Regulations.

These will be re-directed to the sewage ponds along Highway road East of TA-18.

All TRU liquid wastes (>100 nCi/g) from the TA-54 CMP Saw/Process Facility will be collected and treated at the point of generation, and thus there will be no release of contaminants. Extremely low-level ("suspect") liquid wastes generated at the TA-54 TRU Waste Preparation and CMP Saw/Process Facilities will be collected and transported by tank trailer to the TA-50-1

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plant. Activity levels are expected to be far less than 1 nCi/g, and the volume is estimated to be a maximum of 20,000 L/month.

The SRF will generate approximately 2500 L/year of TRU liquid waste that will be delivered via Dumpster tank to TA-50-1 for treatment. Also, approximately 4000 L/month of suspect, low-level waste (<1 nCi/g) will be disposed of via pipeline to TA-50-1.

This volume of waste will be stored in appropriate holding tanks, suitably designed to meet the requirements for underground waste storage tanks under Resource Conservation and Recovery Act (RCRA) requirements. The TDF incinerator is estimated to generate approximately 26,000 L/year of very low-level liquid waste from operations involving the incineration of newly generated and stored TRU combustible wastes.

During 1986 the TA-50-1 plant treated 25.1×10^6 L of low-level aqueous waste generated from throughout LANL operations. This waste contained 3.15 Ci of alpha and 1.0 Ci of beta activity (exclusive of tritium). Effluents released from the plant contained a total of 0.0142 Ci of alpha and 0.114 Ci of beta activity. Overall, operations of the TRU waste facilities are estimated to contribute about a 1% increase in plant volume, and less than 1% of the plant activity released to the environment. The total plutonium and americium activities in plant effluents are maintained by LANL at <50% of the DOE 5480.2 guideline for offsite, unrestricted releases, even though the releases are fully contained onsite. In practice, the activity levels are typically only a few percent of the DOE offsite guidelines.

4.2.1.3 Solid Wastes

The TRU waste operations will generate some new solid waste from the various processing operations. The new forms of waste will be appropriately immobilized, packaged, certified, and shipped to WIPP along with other newly-generated waste. Some of the processing, such as

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sorting of waste from retrieved containers, will result in low level waste that will be buried along with other newly generated, low-level waste in accord with standard procedures at TA-54, Area G. Any waste that is either nonradioactive hazardous waste or mixed (low-level) waste generated by these operations will be handled in accord with applicable RCRA regulations.

The Laboratory historically generates between 4000 and 8000 m³ of low-level waste annually, all of which is disposed of onsite. TRU waste processing activities in the SRF and CMP Saw-Process Facility will generate a small volume of low-level waste in operations, with the majority of this waste being the discarded packagings of some currently stored wastes. The buried volume of solid low-level waste from TRU waste retrieval/processing/certification operations is anticipated to be a maximum of 400 m³ annually. This is less than 10% of the average annual generation, and no significant impact is anticipated.

4.2.1.4 Occupational Radiological Exposures to Workers

Workers involved directly in the various operations to retrieve, process, package, and certify the TRU waste for shipment to WIPP will receive above-background radiation doses. The doses of workers at TDF and SRF have historically been <1.0 rem/year. This is not expected to change. These doses will be from penetrating radiation (mainly gamma rays) that passes through the containers. Because the workers directly involved will be in close proximity to the containers for extended periods while work is in progress, there is potential for higher-than-normal occupational exposures. Actual operating experience at the SRF and TDF has shown that all appropriate occupational standard will be met in those facilities. It is the policy of LANL to limit worker exposures to ALARA, which is well below DOE standards.

A task analysis was performed for operations involving CH waste in the work-off system facilities. The analysis addressed the assessment of maximum potential occupational exposure. Two operations within the Waste Preparation Facility were viewed as being most likely to have

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the highest normal occupational doses. The complete analysis is presented in Appendix C, Environmental Effects for Normal Operations. Table 4.2-1 and 4.2-2 summarize the resulting worker doses from cleaning, evaluation for structural integrity, and staging for further work-off activities for both 55 gallon drums and large wooden crates. The results of the evaluation demonstrate that doses to workers is below exposure standards.

4.2.2 Incident-Free (Normal) On-Site Transportation

Nonradiological impacts of transporting nuclear materials onsite in LANL under incident-free (normal) conditions are the same as those resulting from other routine LANL or commercial shipment. These are estimated to be principally the health effects from exposure to air pollutants generated by the transport vehicles. The expected consequences are expressed as a composite of health effects (fatalities expected after some latency period, such as from cancer death) for a unit distance travelled, or "unit consequence factor" (UCF). The calculated UCF for onsite transportation is 1×10^{-7} per kilometer for travel in an urban populations zones. (DOE 1986, Table 4-2).

Radiological impacts of transporting radioactive materials under incident-free (normal) conditions result from exposure of the public and workers to radiation penetrating the shipping containers and vehicles. These impacts have been calculated using the RADTRAN II computer model that estimates doses for each population group assuming they are exposed to either point or line sources of radiation at various distances for appropriate periods of time.

The analysis on incident free onsite transportation is discussed in detail in Appendix C, Environmental Effects of Normal Operations. Table 4.2-3 summarizes the estimated annual risk from these activities. The table breaks the risk into radiological and non-radiological categories for the public and occupationally exposed workers. The total risk to these groups of a latent cancer fatality occurring due to incident free onsite transportation is one chance in 1631.

Table 4.2.1 Task Doses for Preparation Facility - Large Crd

	Load Drum Into Facility	Removal of Coating	Inspecting of Box	Staging for Transport
# of workers	2	1	1	2
Task Time	5 min	1 min	5 min	5 min
Average Contact Dose Rate	5 mR/h	5 mR/h	5 mR/h	5mR/h
Task Distance	5 ft	3 ft	1 ft	5 ft
Average Dose to Worker	1.04 mR/h	1.72 mR/h	3.30 mR/h	1.04 mR/h
Total Man-rem Dose for Task	1.74×10^{-4} man-rem	2.86×10^{-4} man-rem	2.75×10^{-4} man-rem	1.74×10^{-4} man-rem
Total dose for each FRP box: 6.52×10^{-4} man-rem				

Titles reversed

Table 4.2-2 Task Doses for Preparation Facility - Steel Drums

	Load Drum Into Facility	Removal of Coating	Inspecting of Box	Repair and Overpacking	Staging for Transport
# of workers	2	1	1	2	2
Task Time	2 min	10 min	10 min	5 min	2 min
Average Contact Dose Rate	15 mR/h	15 mR/h	15 mR/h	15 mR/h	15 mR/h
Task Distance	5 ft	3 ft	3 ft	5 ft	5 ft
Average Dose to Worker	0.23 mR/h	0.51 mR/h	0.51 mR/h	0.23 mR/h	0.23 mR/h
Total Man-rem Dose for Task	1.56×10^5 man-rem	8.50×10^5 man-rem	8.50×10^5 man-rem	3.91×10^5 man-rem	1.56×10^5 man-rem
Total Dose for each Drum: 1.55×10^{-6} person-rem					

Table 4.2-3 Estimated Annual Risk from On-Site TRU Waste Transportation

TYPE OF RISK	PROBABILITY	CONSEQUENCES LCF
A. Risk to Public from Incident-Free Transportation		
Non-radiological	1×10^{-7} LCF/km (300 Trips at 10 km each)	3×10^{-4}
Radiological	1.8×10^{-2} person-rem	1.8×10^{-5}
B. Risk to Occupationally Exposed Workers		
Non-radiological	1.0×10^{-7} LCF/km (300 Trips at 10 km each)	3×10^{-4}
Radiological	1.12×10^{-1} person-rem	1.12×10^{-5}
Total		6.13×10^{-4}

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4.3 ENVIRONMENTAL EFFECTS OF ALTERNATIVE ACTIONS

4.3.1 Assumptions and Methodology

Assumptions and methodology for determining the estimated radiation doses and environmental effects of alternative course of action have been detailed in LANL 1981 (Sections 4 and 7), on file with the LANL Environmental Surveillance Group.

4.3.2 Environmental Effects

The combined radiation impact (sum of the collective doses) for alternatives to the Work-Off Plan are summarized in LANL 1981 (Table 7-10) and the following table, 4.8-3.

4.3.3 Environmental Effects of Improved Onsite Management

4.3.3.1 Improved Cover Practices

Improving the existing overburden for the TRU waste storage above-ground earth berms would be expected to have short-term, localized effects caused by increased dust levels during the earth-moving operations. Some longer range disruption might be expected at the locations where the additional cover and the rock riprap were obtained. Landscaping and reseeding of the borrow area would probably be required to mitigate these impacts. The addition of a cover, improved and deeper than previous covers, and riprap would enhance the local flora and fauna of the waste sites by acting as a barrier to erosion and by entrapment of airborne materials including dirt and windborne seeds. Additional cover and grading would decrease surface runoff of what little precipitation does occur. The combined radiation impact for long-term storage with improved cover is estimated at 8.8 person-rems/yr (LANL 1981, Table 7-10). This risk is occupational.

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Public risk would continue to be that currently associated with storing NG waste.

The alternative would not be expected to have short-term measurable effect upon local water use or water quality or quantity. However, as stated for the no action alternative, existing storage facilities at LANL are not designed for long-term use. This alternative could involve substantial onsite impacts in terms of permanent subsurface contamination and radiation dispersal should container integrity deteriorate.

This alternative would not change present options for the future.

4.3.3.2 Storage in a Deep Pit

Onsite storage of TRU waste in a deep pit as an alternative to the Waste Work-Off Plan has associated risks which are developed from additional site construction, waste treatment, and potential accidents. Construction of a deeper pit at LANL would be expected to add localized dust; however, this impact would be local and relatively short-term. Construction of the deep pit would denude local flora and fauna in that specific location. Final grading and landscaping, which could take a few years, would be required to mitigate these very localized effects. The risks associated with storing TRU waste in a new deep pit has an estimated impact of 90 to 190 person-rems/yr depending upon the extent of waste treatment. This occupational exposure is administratively controlled to ALARA. The surrounding population would be subjected to an additional risk of 0.06 to 0.11 person-rems/yr from activities in conjunction with this alternative.

TRU waste treatment facilities similar to those required for WIPP would be needed for onsite long-term central storage. Should storage be designated permanent (disposal), evaluation and determination of waste acceptance criteria defining waste forms and packagings would be required. Since the Los Alamos facility would not be at the considerable depth of WIPP (thus implying a lesser degree of geologic containment), more stringent waste form criteria likely could

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result for onsite disposal as compared with the WAC for WIPP. Consequently, the extent of waste handling and processing required for onsite disposal could well exceed that planned for wastes going to WIPP.

TRU waste disposal capability would require EPA/State RCRA permitting, and would need to show compliance with EPA 40 CFR 191 disposal requirements. Unlike the WIPP, receipt of either of these approvals is uncertain.

4.4 Cumulative and Long Term Effects of the Proposed Action Compared With the Alternatives

Table 5.1-1 Maximum Allowable Inventory by Facility

FACILITY	MAXIMUM INVENTORY (Equivalent Pu ₂₃₉)
TA-54 Area G (Storage)	No Limit
Waste Preparation	No Limit
Drum Venting	200 g
NDA/NDE	10,000 g *
Transportation	20,000 g *
Size Reduction	150 g
Treatment Development (CAI)	1,000 g
GMP Saw	800 g **
Waste Treatment	4,000 g
<p>* True maximum inventory is 30,000 g combined between these two facilities. The 2/3 - 1/3 ratio is arbitrary</p> <p>** This assumes maximum inventory per CMP is 200 g Pu₂₃₉ equivalent.</p>	

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6.0 REGULATORY COMPLIANCE

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8.0 REFERENCES

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