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RAPID REACTIVATION PROJECT

ENVIRONMENTAL ASSESSMENT

February 10, 1999

FINAL

Prepared for the
United States Department of Energy
Kirtland Area Office

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U. S. DEPARTMENT OF ENERGY
FINDING OF NO SIGNIFICANT IMPACT

RAPID REACTIVATION PROJECT
At
SANDIA NATIONAL LABORATORIES, NEW MEXICO

The United States Department of Energy (DOE) has prepared an environmental assessment (EA) for the Rapid Reactivation Project at Sandia National Laboratories, New Mexico. The EA analyzes the potential effects of a proposal to increase production of neutron generators from the current capability of 600 units per year up to 2000 units per year. The project would use existing buildings and infrastructure to the maximum extent possible to meet the additional production needs. The increased production levels would necessitate modifications and additions involving a total area of approximately 26,290 gross square feet at Sandia National Laboratories, New Mexico, Technical Area I. Additional production equipment would be procured and installed. The no-action alternative would be to continue production activities at the current capability of 600 units per year. The EA analyzes effects on health, safety, and air quality, resulting from construction and operation and associated cumulative effects. A detailed description of the proposed action and its environmental consequences is presented in the EA.

Based on the analysis presented in the EA and the concerns of interested stakeholders, the DOE finds that there would be no significant impacts associated with the proposed action. DOE makes this Finding of No Significant Impact pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.), the Council on Environmental Quality implementing regulations (40 CFR 1500), and the DOE NEPA regulations (10 CFR 1021). The proposed action does not constitute a major federal action that would significantly affect the human environment within the mandate of NEPA. Therefore, no environmental impact statement is required for this proposal.

Signed in Albuquerque, New Mexico this 11 day of February, 1999

Michael J. Zamorski
Area Manager
Kirtland Area Office

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ACRONYMS AND ABBREVIATIONS

A/BC AQCB – Albuquerque/Bernalillo County Air Quality Control Board

ACL – Administrative Control Level

ALARA – As-Low-As-Reasonably-Achievable

AMPF – Advanced Manufacturing Prototyping Facility

AMPL – Advanced Manufacturing Processing Laboratory

AQC – Air Quality Compliance

CAA – Clean Air Act

CAN – Clean Air Network

CFR – Code of Federal Regulations

Ci - curies

CO – carbon monoxide

D – deuterium ions

DOE – Department of Energy (U. S.)

DOE-STD – DOE Standard

EA - environmental assessment

EDE – effective dose equivalent

ECF – Explosive Components Facility

EPA – Environmental Protection Agency (U. S.)

ES&H – Environment, Safety and Health

FM – Factory Mutual Approval Guide

ft³ – cubic feet

FY – fiscal year

gal/day – gallons per day

gal/year – gallons per year

gsf – gross square feet

HAP(s) – hazardous air pollutant(s)

HEPA – high-efficiency particulate air

HVAC – heating, ventilation, and air conditioning

KAFB – Kirtland Air Force Base

kg – kilogram(s)

KUMMSC – Kirtland Underground Munitions Maintenance and Storage Complex

L – liter(s)

LCF – latent cancer fatality

LFL – lower flammable limit

lbs/hr – pounds per hour

lbs/yr – pounds per year

m² - square meters

m³ - cubic meters

MAR - material at risk

MCL - maximum contaminant level

MDA - methylenedianiline

MEI - maximally exposed individual

mrem - millirems

MSA - metropolitan statistical area

MT - metric tonnes (per year)

NAAQS - national ambient air quality standards

NESHAP - National Emission Standards for Hazardous Air Pollutants (Program)

NFPA - National Fire Protection Act

NGF - Neutron Generator Facility

NMAC - New Mexico Administrative Code

NMEIB - New Mexico Environmental Improvement Board

NMWQCC - New Mexico Water Quality Control Commission

NPDES - National Pollutant Discharge Elimination System

NTS - Nevada Test Site

OSHA - Occupational Health and Safety Administration

PCE - perchloroethylene

pCi/L - picocuries per liter

PEL(s) - permissible exposure limit(s)

POTW - publicly owned treatment works

PPE - personal protective equipment

RCRA - Resource Conservation and Recovery Act

RF - radio frequency

RMWMF - Radioactive and Mixed Waste Management Facility

SNL/NM - Sandia National Laboratories/New Mexico

START - Strategic Arms Reductions Treaty

T - metal tritide

TA - technical (tech) area

TCA - trichloroethane

TCE - trichloroethylene

TCS - tritium capture system

TEDE - total effective dose equivalent

TPY - tons per year

TTA - transfer testing analysis

UBC - Uniform Building Code

UFC – Uniform Fire Code

UPC – Uniform Plumbing Code

USAF – U. S. Air Force

VOC – volatile organic compound

yd³ – cubic yards

RAPID REACTIVATION PROJECT ENVIRONMENTAL ASSESSMENT

1.0 PURPOSE OF AND NEED FOR AGENCY ACTION

1.1 Background

On June 16, 1992, President Bush of the United States and President Yeltsin of Russia signed an arms agreement, the terms of which indicated agreement to significantly reduce nuclear stockpiles and the corresponding production operations that support them. Based on this event, the Secretary of Energy reconfigured and consolidated the Nonnuclear Weapons Complex (see the Nonnuclear Consolidation Environmental Assessment, DOE/EA-0792, June 1993). Among other issues, the Nonnuclear Consolidation Environmental Assessment (EA) examined the potential consequences of conducting certain activities, including neutron generator production, at various U. S. Department of Energy (DOE) facilities throughout the United States. Based on the analysis in the EA, DOE made a decision to transfer neutron generator production from the Pinellas Plant in Largo, Florida, to Sandia National Laboratories/New Mexico (SNL/NM). Production of neutron generators began at SNL/NM in fiscal year 1998 (FY98); the current production capacity of 600 neutron generators per year will be met in FY99.

The current decision facing DOE is whether or not to expand the SNL/NM production capability to approximately 2000 neutron generators per year. Construction related to implementation of the original scope of the Nonnuclear Consolidation Program at SNL/NM was completed in January 1996. The production development phase is currently in its final stages, and written permission to initiate neutron generator production as described in the Nonnuclear Consolidation EA has been issued by DOE.

Neutron generators facilitate and sustain nuclear fission in a nuclear weapon by providing a flux of neutrons to the nuclear weapon system. An assembled neutron generator is approximately 8 inches long by 3 inches wide. It consists of a neutron tube, a miniature linear accelerator, a power supply, and a timer. Neutron tubes are ceramic-to-metal hermetically sealed devices containing deuterium ions (D) that are accelerated by an electric field toward collision with a target containing a metal tritide (T). The resulting D/T fusion reaction results in high-energy (14 megavolt) neutrons. Tritium is the radioactive material used in the neutron tube. Because tritium has a half-life of 12.33 years, neutron generators must be replaced periodically to ensure reliability of weapons systems. Manufacture of replacement and new neutron generators is the mission of the SNL/NM neutron generator production program.

Two types of neutron generators are manufactured. They differ from each other primarily in terms of their power supplies. Electronic generators use conventional electronic circuits to provide power and timing. Ferroelectric generators receive electric charge from ferroelectric ceramics through explosively controlled timing and shock generation.

1.2 Purpose and Need for Action

The original Nonnuclear Consolidation Program was intended to support DOE directives based on an assumed stockpile level established by the Strategic Arms Reductions Treaty (START) II treaty. In order to comply with START II, a production rate of 600 neutron generator units per year was established. However, START II was not ratified. The enduring stockpile levels have been re-evaluated and are currently established at a level near the higher START I treaty levels. Current production facilities and infrastructure are not adequate to provide a sufficient number of neutron generators to ensure the reliability of the nuclear weapons stockpile at the START I levels. Therefore, DOE needs to expand production capability to approximately 2000 units per year in support of the increased neutron generator production rates required by the START I enduring stockpile levels.

Neutron generator fabrication activities at SNL/NM currently rely on existing infrastructure and previously renovated buildings for small lot production and development. The neutron generator production program has a production and delivery capacity of 600 neutron generators per year, of which approximately 100 are destructively tested. The current facilities and associated infrastructure were designed to START II production schedules with a single shift. Short-term production increases were to be accomplished by sprints (overtime and extra shifts). This production method was adequate for the original production rate described in the Nonnuclear Consolidation EA. Production increases associated with the Proposed Action cannot be met simply by providing additional shifts. Some of the production equipment requires steps that run longer than one shift; therefore, additional work shifts would not increase the production rate significantly. Additional equipment is also needed to accommodate the increased stockpile levels. Modified and expanded facilities are required because the existing production facilities are too small to accommodate the proposed new equipment.

2.0 NO ACTION AND PROPOSED ACTION ALTERNATIVES

This chapter describes the No Action Alternative and the Proposed Action assessed for the Rapid Reactivation Project at SNL/NM, in Albuquerque, New Mexico. The No-Action Alternative (Section 2.1) would involve continued neutron generator production at the FY99 rate of 600 neutron generators per year. The Proposed Action (Section 2.4) would accommodate production of approximately 2000 neutron generators per year. Building modifications, renovations, and construction of additions to two existing facilities would be necessary to facilitate the increase in production.

SNL/NM is located within the Kirtland Air Force Base (KAFB), which encompasses land owned by the DOE and portions of the U. S. Forest Service withdrawn land. KAFB is surrounded geographically by the city of Albuquerque to the north, the Manzanita Mountains to the east, the Pueblo of Isleta to the south, and the Albuquerque International Sunport and University of New Mexico land held in trust by the State Land Office to the west.

Figure 2-1 shows the locations of the SNL/NM technical areas in relation to KAFB, the state of New Mexico, and Bernalillo county. Figure 2-2 indicates locations of facilities in Technical Area (TA)-I and TA-II of SNL/NM that are associated with the neutron generator production program under both the No Action Alternative and the Proposed Action.

2.1 No Action Alternative

SNL/NM conducts activities in support of development, production, and testing of neutron generators at a number of facilities located in TA-I and TA-II of SNL/NM. These activities are performed as described in the following sections. Other facilities used in support of the program include buildings 805, 806, 807, 840, 860, and 897, located in TA-I (see Figure 2.2).

Under the No Action Alternative, the production rate of neutron generators would remain at 600 per year. The following sections describe activities that occur in the various facilities used for neutron generator production. A variety of inspections and tests on raw materials, in-process, and completed products are conducted during the production process. These include monitoring neutron output, tube conditioning, and destructive and nondestructive testing (mechanical shock, vibration, centrifuge, environmental, explosive component, and leak). Gas and wet chemistry analyses are also performed. Testing activities are conducted on failed and returned units for analysis and to verify performance capabilities after exposure to operating conditions.

Figure 2.1
Location Map of the SNL/NM Technical Areas

Figure 2.2
Rapid Reactivation Project Facilities Site Map

2.1.1 Neutron Generator Facility (Building 870)

The Neutron Generator Facility (NGF), Building 870 in TA-I, is the primary neutron generator production facility at SNL/NM. It contains approximately 96,000 gross square feet (gsf) (8918 square meters [m^2]). Building 870 is located at the southeast boundary of TA-I. Production related activities and operations in the NGF include:

- *Metallizing*: Formulation of metallized paints and hand painting, robotic-controlled air brush painting, and screen painting of a metallized slurry to ceramic surfaces. Metallizing also includes quasi-metallizing, hydrogen sintering processes, nickel plating over metallized surfaces, and post plating.
- *Chemical Cleaning*: Chemical cleaning with acids and solvents
- *Plating*: Chemical plating with nickel, copper, tin, lead, and gold, and associated firing processes
- *Joining and Welding*: Furnace and radio frequency (RF) brazing; tungsten, plasma-inert-gas, and laser welding and marking; and final product inspections
- *Ceramic Processing*: Blending, pressing, and firing powder compacts
- *Vacuum Processing*: Vapor depositing films of titanium, erbium, zirconium, scandium, chromium, vanadium, or gold; hydriding titanium, erbium, zirconium, and scandium films
- *Neutron tube assembly*: Tube welding, exhaust, and testing
- *Encapsulation*: Vacuum encapsulation of electrical components with highly filled epoxy resins that provide mechanical support, environmental protection, and high voltage hold-off
- *Generator Assembly*: Assembly operations, in-process tests, and resistance welding completed prior to preparation for encapsulation
- *Mold Assembly*: Assembly of encapsulation molds and fixtures, including cleaning and preparation, and inspection prior to processing
- *X-ray*: Digital x-rays of completed tubes and generators for acceptance testing
- *Abrasive Blast*: Surface preparation and cleaning of generator piece parts and assembly fixtures
- *Metal Flame Spray*: Metal coatings deposited on neutron generator subassemblies, which are epoxy filled. An oxygen and methane flame is used to melt the metal, and high-pressure gas is used to disperse and increase movement of the metallic particles.
- *Machining Process*: Milling and machining of a variety of neutron generator parts
- *Metal Processing*: Metal preparation, including purification
- *Conformal Coating*: Protective coating applied to external surfaces of neutron generators
- *Mold Prep*: Cleaning and preparation of encapsulation molds and fixtures prior to processing
- *Neutron Generator Final Assembly*: Assembly of neutron tubes and ferroelectric generators

2.1.2 Explosive Components Facility (Building 905)

The Explosive Components Facility (ECF), Building 905, is used for testing and component assembly of neutron generators, in support of the project. Neutron generator activities conducted in the ECF include:

- *Assembly*
- *Destructive neutron generator functional testing*
- *Failure analysis*
- *Transformer testing analysis*
- *Bonded storage*

2.1.3 Advanced Manufacturing Processing Laboratory (Building 878)

The Advanced Manufacturing Processing Laboratory (AMPL), Building 878, provides space for fabrication of active ceramic parts and activities associated with development of encapsulant materials. These materials, used in the production of neutron generators, are electrically active parts of the ferroelectric neutron generator power supply. Grinding of the ceramic parts is performed in Building 878, in a dedicated ceramic grinding shop. Project activities conducted within the AMPL include:

- *Active ceramic processing*
- *Polymer development*
- *Material storage*

2.1.4 Advanced Manufacturing Prototyping Facility (Building 700)

The Advanced Manufacturing Prototyping Facility (AMPF), Building 700, was completed in July 1997. The building is approximately 9800 gsf (910 m²) and includes an approximately 5600 gsf (520 m²) high-bay manufacturing space and an office and light laboratory support space. Project-related activities and operations in the AMPF include:

- *New equipment assembly, checkout, and characterization*
- *New process validation*
- *Scale-up of laboratory processes*
- *Ancillary production support*
- *Furnace operations*
- *Offices*

2.1.5 Building 857A

Building 857A is used for administrative offices in support of the neutron generator production program.

2.1.6 Building 841

Portions of Building 841 are used for storage of equipment used for neutron generator production.

2.2 No Action Alternative Construction Activities

No new construction or modification activities would be conducted under the No Action Alternative.

2.3 No Action Alternative Operations

Under the No Action Alternative, operations would proceed as described in Section 2.1. Following is a description of environmental and worker health and safety resources that would be routinely impacted under the No Action Alternative.

2.3.1 Air Emissions

Radiological and chemical air emissions currently generated by the neutron generator production project would continue under the No Action Alternative. The emissions include hazardous air pollutants (HAPs), volatile organic compounds (VOCs), and criteria pollutants that are regulated by Federal and local laws. The NGF (Building 870) operates under Authority to Construct permits issued by the Albuquerque/Bernalillo County Air Quality Control Board (A/BC AQCB). The permits place federally enforceable emission limits and standards on emission sources within the building. These emission sources include the radiological exhaust, chemical exhaust and solvent cleaning machine, encapsulation and curing exhaust, and diesel-fired standby generators. As required by the permits, SNL/NM-wide HAPs usage may not exceed 10 tons per year (TPY) (9.1 metric tonnes [MT]) for any single HAP or 25 TPY (22.7 MT) for any combination of HAPs. Based on chemical inventory and usage, a conservative estimate of approximately 1.9 TPY (1.7 MT) of HAP and 11.8 TPY (10.7 MT) of VOC emissions could be released under the No Action Alternative. This estimate assumes that the entire chemical inventory would be released. The current criteria pollutant emissions from the standby generators, which would not be altered by the No Action Alternative, are also extremely low in comparison to permit limitations.

Buildings 870 and 905 are the only two buildings associated with neutron generator production that contain sources of radiological emissions. Based on existing data, it is estimated that the maximum potential release would be approximately 94 curies (Ci) of tritium (H-3) per year under the No Action Alternative. Tritium emissions from these facilities are due to production processing, analytical testing, and equipment calibration and maintenance. Under the No Action Alternative, the tritium inventory contained in Building 870 would be approximately 682 Ci. Every several years the inventory would increase by approximately 400 Ci for a period of two to three months, during the time that new gas standards would be received to replace aged standards. Aged standards would be returned to the supplier. This inventory estimate is based on the maximum number of tritium-containing generator parts and gas cylinders (tritium standards) that would be in the building at any given time.

Estimated tritium emissions from Building 905 and from the powered evaporator for tritiated process water in Building 870 (see Section 2.3.3) are included in the annual estimated release of tritium (U. S. Department of Energy, 1992). The combined estimates for releases from Building 905 and the evaporator located in the basement of Building 870 are well below 1 Ci per year and are included within the estimate of 94 Ci of tritium released annually as a result of neutron generator production activities. Neutron generator production activities in Building 870 generate the majority of the estimated 94 Ci of tritium that could be emitted per year under the No Action Alternative.

2.3.2 Water Use and Liquid Effluents

Water use by the project has been projected at approximately 3,000,000 gallons (11,355,000 liters [L]) for FY99. The potable and process water systems provide potable water throughout the facilities and process water for the various laboratory users. Potable water would continue to be provided for the entire project under the No Action Alternative, and the baseline rate of water use and wastewater discharge would continue unchanged.

The primary water supply for the domestic, process, and fire protection systems is the existing site water system. The existing water storage capacity available for fire suppression, sanitary, and process use consists of one 3,500,000-gallon (13,247,500 L) tank and one 1,000,000-gallon (3,785,000 L) tank, which would continue to serve the neutron generator production operations under the No Action Alternative.

SNL/NM produces both sanitary and industrial effluents that are discharged to the city of Albuquerque's sanitary sewer system. Sanitary effluents include wastewater from rest rooms, cafeterias, and other domestic activities. Industrial discharges originate from laboratory processes, general manufacturing, and experimental activities. SNL/NM monitors all its liquid effluent discharges and strives to minimize toxic pollutants through pollution prevention and waste minimization tactics. All discharges from SNL/NM facilities are required to be below city of Albuquerque wastewater discharge standards. Routine discharges are periodically sampled to demonstrate compliance. Non-routine (batch) discharges require approval from SNL/NM Department 7575 prior to discharge. These policies and procedures would remain in place under

the No Action Alternative. Discharges into the publicly owned treatment works (POTW) are regulated by the city of Albuquerque Public Works Department, Liquid Waste Division. All wastewater is treated by the city in accordance with National Pollutant Discharge Elimination System (NPDES) permit requirements before being discharged into the Rio Grande. Wastewater generated by the neutron generator project is currently produced by discharge from restrooms, plating bath rinse water, chemical clean rinse water, soap and other cleaning solutions, process cooling water with rust inhibitors, and water from air handler condensation.

2.3.3 Tritiated Process Water

Neutron generator production operations generate tritiated process water that is accumulated in two 1000-gallon (3785 L) tanks in the basement of Building 870. The No Action Alternative would generate approximately 10,000 gallons (37,850 L) of tritiated process water per year. The level of radioactivity of the tritiated water in the two tanks is well below the U. S. Environmental Protection Agency (EPA) drinking water limit of 20,000 picocuries per liter (pCi/L). Under the No Action Alternative, one method of disposal would be to discharge into the public sewer. The DOE, as a matter of comity, has agreed with the city of Albuquerque to explore alternate disposal methods that might be operationally and economically feasible. For this reason, a powered evaporator to evaporate the tritiated process water is included in the scope of the No Action Alternative. The evaporator is located in the basement of Building 870, within the tritium envelope. Evaporated tritiated process water will be released through the radiological exhaust system. Radiological air emissions resulting from the No Action Alternative are discussed in Section 2.3.1.

2.3.4 Waste Management

Neutron generator production operations generate non-hazardous, hazardous, low-level radioactive, and mixed wastes. The majority of the project wastes are generated in buildings 870 and 905. Non-hazardous waste consists of materials such as office paper, cardboard, plastic, glass, scrap metal, packaging materials, and wood. The majority of these waste materials are recycled through SNL/NM's recycling program. Remaining non-hazardous waste, approximately 110 to 162 cubic feet (ft³) (3115 to 4588 kilograms [kg]) per week, is removed and taken to the SNL/NM Solid Waste Transfer Facility, where it is sorted and baled and transported for disposal in local commercial and municipal landfills.

Hazardous waste is stored in satellite accumulation areas at or near the point of generation, as designated by the Resource Conservation and Recovery Act (RCRA), 40 Code of Federal Regulations (CFR) 262.34, prior to being transported to the hazardous waste management facility. Hazardous wastes include acid solutions used in chemical cleaning operations, spent plating baths, off-spec chemicals, expired chemicals, spent solvents, spent alcohol solutions, spent acetone solutions, and wipes contaminated with alcohol and acetone. Approximately 98 ft³ (2760 kg) of hazardous waste per year would result from production of neutron generators under the No Action Alternative.

Low-level radioactive waste consists of personal protective equipment, scrap neutron generator parts, scrap equipment parts resulting from maintenance activities, and sludge removed from the tritiated process water holding tanks. Secondary low-level radioactive waste streams would be generated from regularly flushing the evaporator tank to prevent sludge build-up and from replacement of the mole sieve beds from the tritium capture system (TCS). Approximately 106 ft³ (3000 kg) of low-level radioactive waste would be generated per year from neutron generator production operations under the No Action Alternative. The waste would be transported to the Radioactive and Mixed Waste Management Facility (RMWMF) prior to final disposition at the Nevada Test Site (NTS).

Mixed waste resulting from neutron generator project operations, including destructive testing, consists of tritium-contaminated chromium thermocouples, cadmium-plated bolts, tin-and lead-solder circuit boards, high-efficiency particulate air (HEPA) filters with entrapped lead dust, and acid solutions. Approximately 5 ft³ (150 kg) of mixed waste per year would result from operations proposed under the No Action Alternative. The waste would be transported to the SNL/NM RMWMF for storage and further management.

2.3.5 Worker Health and Safety

Worker health and safety precautions and controls for current neutron generator production operations are implemented according to the SNL/NM Environment, Safety and Health (ES&H) Manual (Sandia National Laboratories/New Mexico, 1998a) and supplemental job-specific procedures. Each major piece of process equipment has an operating procedure. All production processes are performed using a work instruction. Radiological work is conducted using radiation work permits that establish protective measures, monitoring, and other work controls.

The following engineered barriers and administrative functions are currently used to control personnel exposure to tritium, and would be continued under the No Action Alternative:

- Hard plumbing of specific equipment for processing gaseous tritium (or equipment that has the potential to release gaseous tritium during processing) to the TCS
- Single-pass-through ventilation for rooms that have equipment for processing gaseous tritium
- Maintenance of the tritium envelope at negative pressure with respect to areas outside of the envelope (i.e., hallways)
- Glove boxes and fume hoods for processes that could potentially generate particulate tritium contamination
- Limitation on the quantity of tritium to less than the hazard Category 3 threshold of DOE Standard (DOE-STD)-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.25, Nuclear Safety Analysis Reports*
- Confinement of most operations likely to result in loose surface contamination or to generate gaseous tritium to the tritium envelope, which is subject to environmental health and safety controls

- Systematic surface-wipe sampling in all tritium areas to ensure that surface contamination stays within allowable levels commensurate with the potential for exposure
- Continuous air monitoring in locations where airborne radioactivity is anticipated
- Designated radiological areas, as necessary, that are properly posted
- Appropriate personal protective equipment (PPE)
- Appropriately employed personnel bioassay and dosimetry
- Restricted access to tritium areas for all but authorized personnel

Engineered controls are used to minimize personnel exposures. As appropriate, however, personnel participate in the SNL/NM internal dosimetry program. Exposure to tritium is measured using urine bioassay analyzed by liquid scintillation counting. As described in the Sandia Radiological Protection Procedures Manual (RPPM) (Sandia National Laboratories/New Mexico, 1998b) a system of administrative control levels (ACLs) have been implemented to control radiological worker doses at levels below the occupational exposure limits provided in the Occupational Radiation Protection Standard, 10 CFR 835.202. At SNL/NM each individual's total effective dose equivalent (TEDE) shall be limited to 100 mrem per calendar year. However, an individual's ACL can be increased to 500 mrem with written approval from their manager and the signed ACL Approval Form placed in the person's Health Hazard Case File. ACLs are reviewed and approved annually or when individual exposure levels require a change to an ACL. Measurable radiation exposure from neutron generator production activities is only expected due to functional testing operations in Building 870. The maximum individual dose due to functional testing operations under the No Action alternative is estimated at 50 mrem. The number of potentially exposed individuals would be between 3 and 6 persons.

Hydrogen is used as a cover gas during the thermal processing of neutron generator parts. The hydrogen system has a sensor, alarm, and control system. The system is calibrated to alarm at 20 percent of the hydrogen lower flammable limit (LFL), which also activates the emergency exhaust system. At 40 percent of the hydrogen LFL, a second differentiated alarm triggers a partial facility evacuation, isolation of the hydrogen supply tank, and inerts the hydrogen piping in the facility with argon gas.

Hazards from chemicals in the facility are controlled through engineered barriers, such as fume hoods, local exhaust ventilation, and volume limits. The chemicals and solvents used in the fabrication process of neutron generators are common industrial materials. Accidental exposures to chemicals are handled in accordance with provisions outlined in the SNL/NM ES&H Manual, Chapter 6, Industrial Hygiene (Sandia National Laboratories/New Mexico, 1998a).

Process and test equipment voltage ranges from 115 volts to 300 kilovolts. Personnel training and procedures are utilized for normal work and calibration of the equipment. When activities outside normal maintenance and calibration are encountered, a Safe Work Permit is generated to identify and mitigate hazards attendant to these activities. Only high voltage trained and qualified engineers and technicians perform work on high voltage equipment.

Explosives in quantities of less than two grams per test are used in the performance of functional testing of neutron generator assemblies. Trained personnel and operating procedures are utilized

for performing these tests. Procedures for explosive testing are reviewed and approved by the ES&H Team and the technical staff of the ECF (Building 905). Due to the inherent shielding and isolation provided by the explosive test cells, no personnel exposure is anticipated from neutron generator functional testing operations in Building 905.

Operations that employ laser and x-ray hazards are performed using appropriate administrative controls and engineered barriers. These controls include, but are not limited to, operator training and shielding of personnel according to current requirements, including equipment housing that shields operators from laser beam or x-ray exposure.

The NGF is a low-hazard nonnuclear facility and does not require accident analysis per DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.25, Nuclear Safety Analysis Reports*. However, safety procedures and requirements have been developed for implementation in the case of accidents. Both natural and man-made external initiating events were considered in design of the facility and procedures, which establish the safety conditions under which operations must be performed.

2.4 Proposed Action

The existing annual neutron generator production and delivery capacity at SNL/NM is 600 neutron generators. Under the Proposed Action, the production and delivery capacity would be increased to a maximum of 2000 neutron generators annually. The project would use existing buildings and infrastructure to the maximum extent possible to meet the additional production needs.

The SNL/NM facilities used for neutron generator production are currently designated as low-hazard, non-nuclear facilities; the Proposed Action would not change that designation. Space allocations for the functional areas within these buildings under the Proposed Action are based on the assumption that the facility would operate as a single-shift fabrication plant with temporary capacity expansion provided by overtime and extra shifts. The total area of renovated or modified and new space under the Proposed Action would be approximately 26,290 gsf (2442 m²).

2.5 Proposed Action Construction Activities

Implementation of the Proposed Action would necessitate modifications and additions involving a total area of approximately 26,290 gsf (2442 m²) associated with existing facilities used by the neutron generator project. Six SNL/NM buildings have been identified with the Proposed Action, including buildings 870, 878, 700, 841, and 857, in TA-I, and Building 905 in TA-II. The project would require various degrees of interior modification and renovation work in these buildings, involving approximately 10,000 gsf (929 m²). Building 870 would be the most affected of the currently operating facilities; fairly extensive renovations would be required under the Proposed Action. Building 857 would be expanded through construction of an

approximately 15,000 gsf (1394 m²) addition to support ancillary processes that could be moved from Building 870, and additional office and storage space would be provided through an addition of approximately 1290 gsf (120 m²) to the ECF, Building 905. Total new area provided through construction of additions to these buildings would be approximately 16,290 gsf (1513 m²) (Sandia National Laboratories Manufacturing Engineering and Support Center and Facilities Development Center, 1998).

Building 870 modifications would include addition of new equipment, relocation of existing equipment within the building, expansion of the tritium envelope, and other modifications to production areas, final assembly areas, and office spaces. The tritium production area of the tritium envelope would be increased from 7000 gsf (650 m²) to 8500 gsf (790 m²). The existing tritium service area in the basement of Building 870 would be expanded into adjacent space to increase the area by approximately 1300 gsf (121 m²), from 1400 gsf (130 m²) to 2700 gsf (251 m²). Building infrastructure, including air-handlers, exhaust functions, electrical, and plumbing, would also be upgraded. Equipment such as welders, furnaces, and final exhaust systems would be relocated within the building as necessary to accommodate space reconfiguration. Additional production equipment would be procured and installed.

Changes proposed for the ECF, Building 905, include the addition of approximately 1290 gsf (120 m²) of office space. The addition would be constructed to match the existing building architecture and would include the extension of an existing corridor for access to four new, two-person staff offices and a storage area.

The AMPL (Building 878) renovations, including necessary mechanical, electrical, and plumbing changes, would result in consolidation of the work into one large room. The new, larger space created by combining rooms would become a vault-type space requiring intrusion alarm equipment. The Assembly Room would also be modified and two offices constructed within the space. Doors would be relocated and installed to support the modifications. Other areas in Building 878 serve as space for process equipment and would be altered only as necessary to accommodate equipment relocation.

The AMPF (Building 700) modifications would provide for storage of additional equipment necessary for the proposed increased production of neutron generators.

Building 841 would be used for bonded storage in support of the project. Minor modifications would include removal of walls to consolidate storage areas into one larger space and addition of storage equipment such as racks and cabinets.

The Proposed Action would also involve construction of an approximately 15,000 gsf (1394 m²) addition to Building 857. The design program for the new space includes a vault-type room with electrical and mechanical rooms and a process equipment chase. Office, lobby, restroom, locker, and break room space would also be included in the additional area as transition space between the existing Building 857 and the added area. Construction would take place immediately north of Building 857 in a previously disturbed area of SNL/NM's TA-I (Dekker/Perich, 1998).

Following is a description of environmental and worker health and safety resources that would be impacted by construction activities under the Proposed Action.

2.5.1 Air Emissions

Bernalillo county has been designated as a maintenance area for carbon monoxide (CO) and is in attainment for other federally regulated pollutants. Trucks and construction equipment would generate CO emissions. Estimated hours of operation for diesel and gasoline engines and subsequent CO emissions that would result from project construction are included in Table 2.1.

The New Mexico Administrative Code, Title 20, Part 11.04, (20 NMAC 11.04), entitled *General Conformity*, implements Section 176(c) of the Clean Air Act (CAA), as amended (42 U.S.C 7401 et seq.), and regulations under 40 CFR 51, subpart W, with respect to conformity of general Federal action in Bernalillo county. Regulation 20 NMAC Part 11.04.11.1.2, paragraph B, establishes the emission threshold of 100 TPY of CO at SNL/NM that would trigger the requirement to conduct a conformity analysis. Based on the estimated total pounds per year (lbs/yr) of CO emissions related to project construction, a conformity analysis is not required.

Table 2.1 - Carbon Monoxide Emissions Related to Construction

Equipment	Estimated Hours of Project Operation	CO Generated Pounds per hour (lbs/hr)*	Estimated Total Pounds per year (lbs/yr) of CO
Gasoline Engines:	116	0.48	56
Diesel Engines	180	0.11	20
Total lbs/yr			76
Total TPY			0.04 TPY

*CO emission factors are based on Environmental Protection Agency National Vehicle and Fuel Emission Laboratory (Ann Arbor, Michigan) average emission rates for idling vehicles (EPA's AP-42, 5th Edition, January 1995). CO emissions for light duty trucks are estimated at 219 grams/hr, for heavy duty gas vehicles at 245 grams/hr, and for heavy-duty diesel vehicles at 50 grams/hr. Calculations are based on a conversion factor of 0.035 ounce per gram (grams x 0.035) divided by 16 (ounces per pound) times hours of operation divided by 2,000 (pounds per ton) to obtain tons/year for the project.

2.5.2 Water Use and Liquid Effluents

Water use would increase slightly during Proposed Action construction activities due to additional construction personnel onsite and water requirements related to installation and adjustments in the mechanical and plumbing systems of the buildings proposed for modification.

Building 870 heating, ventilation, and air conditioning (HVAC) and plumbing systems are designed and constructed in accordance with current codes and standards. These systems would be altered to accommodate proposed reconfiguration of spaces and their functions, but the basic systems would remain intact because the building volume would not increase under the Proposed Action. Water usage by these systems would not change substantially during construction.

Restroom, locker, and break room spaces would be added as part of the addition to Building 857, which would increase the amount of water usage by the facility under the Proposed Action.

2.5.3 Waste Management

It is anticipated that construction activities would result in the generation of non-hazardous wastes (primarily construction debris and sanitary wastewater), and possibly low-level radioactive wastes and emissions related to reconfiguration of ductwork in Building 870. Construction debris would consist of packaging material including wood crates, cardboard, and plastic; scrap material such as electrical wire, insulation, gypsum drywall, floor tile, carpet, scrap metal, and empty adhesive and paint containers; and concrete debris resulting from the wash-down process following pours. Approximately 20 dumpsters of standard construction debris (2 per month, assuming a 10-month construction period) would result from the Proposed Action, and 7.5 cubic yards (yd³) (5.7 cubic meters [m³]) of concrete debris, based on utilization of 30-10 yd³ (7.7 m³) concrete trucks. It is not anticipated that asbestos would be generated during the renovation and remodeling activities. However, the SNL/NM Asbestos Team would assess areas prior to construction activities. In the event that construction activities would impact asbestos-containing materials, the Asbestos Team would conduct asbestos abatement operations, as required, and properly manage such waste.

Low-level radioactive waste consisting of PPE, paper wipes, plastic bags, plastic sheeting, exhaust ducting, exhaust fans, and metal piping and fittings would also be generated from construction activities (see Section 2.5.4). It is estimated that less than 600 ft³ (16,992 kg) of low-level radioactive waste would be generated during the construction activities.

2.5.4 Worker Health and Safety

Construction in Building 870 and other buildings and facilities associated with neutron generator production would incorporate all applicable health and safety standards common to each of the construction disciplines employed in the project and would follow all Occupational Health and Safety Administration (OSHA) standards for health and safety practices.

Facility modifications and process equipment moves would occur during the construction process, under the Proposed Action. Construction activities that could potentially result in worker exposure to radioactive materials during the expansion of the Building 870 tritium envelope include extension of the existing radiological exhaust ducting, relocation of three tube exhaust stations, and an increase in the size of the radiological exhaust fans. Personnel exposure to tritium compounds through inhalation, ingestion, or skin contact with tritium-contaminated objects or surfaces would be prevented during the construction process through enforcement of contamination-control work practices and utilization of qualified radiation workers and PPE.

2.6 Proposed Action Operations

Implementation of the Proposed Action would result in an increase in operations and activities related to neutron generator production at SNL/NM. Modifications, renovation, and construction of new space to accommodate the increased production would include relocation of some equipment and processes. The most significant transfer of process activities would involve relocation of the following activities from the NGF (Building 870) to the proposed Building 857 addition:

- *Abrasive Blast*: Surface preparation and cleaning of generator piece parts and assembly fixtures
- *Metal Flame Spray*: Metal coating deposition on neutron generator subassemblies
- *Encapsulation*: Vacuum encapsulation of electrical components with epoxy resins
- *Mold Assembly*: Assembly and inspection of encapsulation molds and fixtures
- *X-ray*: Digital x-rays of completed tubes and generators for acceptance testing
- *Mold Preparation*: Cleaning and preparation of encapsulation molds and fixtures prior to processing
- *Machining Processes*: Milling and machining neutron generator parts
- *Conformal Coating*: Application of a protective coating to external surfaces of neutron generators
- *Generator Assembly*: Assembly operations, in-process tests, and resistance welding completed prior to preparation for encapsulation
- *Neutron Generator Final Assembly*: Assembly of neutron tubes and ferroelectric generators
- *Joining and Welding*: Furnace and RF brazing; tungsten, plasma-inert-gas, and laser welding and marking; and final product inspections

The following sections describe issues that may lead to changes in the effects on the environment that would occur as a result of the increase in neutron generator production, including changed or increased rates of air emissions, waste generation, water use, and process water. Environmental effects are discussed in Chapter 4, Environmental Consequences.

2.6.1 Air Emissions

Air emissions identified under the No Action Alternative (Section 2.3.1) would increase under the Proposed Action. Based on chemical inventory and usage, a conservative estimate of approximately 3.6 TPY (3.3 MT) of HAP and 35.3 TPY (32.0 MT) of VOC emissions could be released under the Proposed Action. This estimate assumes that the entire chemical inventory would be released.

The Building 870 tritium inventory would be approximately 836 Ci under the Proposed Action. Every several years the inventory would increase by approximately 400 Ci for a period of two to three months, during the time that new gas standards would be received to replace aged standards. Aged standards would be returned to the supplier. Radiological air emissions (tritium) could also increase. It is estimated that the maximum potential release would be approximately 156 Ci per year under the Proposed Action, compared to 94 Ci per year under the

No Action Alternative. This estimate encompasses emissions from Building 870, including the evaporator, and Building 905 (U. S. Department of Energy, 1992).

2.6.2 Water Use and Liquid Effluents

Increased production of neutron generators under the Proposed Action would increase water use from current use of approximately 3,000,000 gallons (11,355,000 L) per year (13,800 gallons [52,233 L] per work day) to approximately 5,000,000 gallons (18,925,000 L) per year (22,000 gallons [83,270 L] per work day). Sanitary wastewater would be produced through water use of restrooms, plating bath rinse water, chemical clean rinse water, soap and other cleaning solutions, process cooling water with rust inhibitors, and water from air handler condensation.

The potable and process water systems provide potable water throughout the facilities and process water for the various laboratory users. Existing domestic water lines would continue to provide water for the project-related facilities. Sanitary and process water would also continue to be discharged separately.

Sanitary wastewater would be produced through water use of restrooms, plating bath rinse water, chemical clean rinse water, soap and other cleaning solutions, process cooling water with rust inhibitors, and water from air handler condensation. All discharges from SNL/NM facilities are required to be below city of Albuquerque wastewater discharge standards. Routine discharges are periodically sampled to demonstrate compliance. Non-routine (batch) discharges require approval from SNL/NM Department 7575 prior to discharge. These policies and procedures would remain in place under the Proposed Action. Wastewater generation would increase in proportion to water use under the proposed action.

2.6.3 Tritiated Process Water

Approximately 14,000 gallons (52,990 L) per year of tritiated process water would be generated under the Proposed Action. This represents approximately 4000 gallons (15,140 L) more per year than the amount that would be generated under the No Action Alternative. Tritiated process water is generated within the tritium envelope of Building 870. The sources of tritiated process water are analytical laboratories and neutron tube production areas.

As with the No Action Alternative, a powered evaporator used to evaporate the tritiated process water would be included in the scope of the Proposed Action. The evaporator would be located within the tritium envelope in the basement of Building 870. Evaporated tritiated process water would be released through the radiological exhaust system. Analysis of samples using liquid scintillation counting would make accurate determination of the radioactivity of the tritiated process water prior to evaporation. Radiological air emissions, including those resulting from use of the evaporator, are discussed in Section 2.6.1.

2.6.4 Waste Management

The waste types identified in Section 2.3.4 would be also generated under the Proposed Action. Waste volumes, not including wastes generated by construction, are expected to increase by 25 to 50 percent with the proposed increase in neutron generator production. Hazardous waste would increase to approximately 3680 kg per year (25 percent), low-level radioactive waste to 4000 kg per year (25 percent), and mixed waste to 300 kg per year (50 percent). Non-hazardous waste is also expected to increase to approximately 624 yd³ (477 m³) per year (33 percent). Storage, further management, and disposal of these wastes would remain within the capacity of existing facilities.

2.6.5 Worker Health and Safety

Worker health and safety precautions and controls implemented for operations under the Proposed Action would follow procedures according to the current SNL/NM ES&H Manual (Sandia National Laboratories/New Mexico, 1998a), supplements, and additional job-specific procedures. Each major piece of process equipment would have an operating procedure. All production processes would be performed using a work instruction. Radiological activities would be conducted using radiation work permits or other technical work documents that establish protective measures, monitoring, and other work controls. Changes in health and safety procedures would be made as needed to ensure adequate worker health and safety provisions for the expanded production that would result from implementation of the Proposed Action.

Section 2.3.5 describes health and safety procedures and safeguards currently used by the neutron generator project to ensure protection from exposures to tritium, hydrogen gases, chemicals, and laser hazards. Similar procedures would be enforced for protection of personnel working in the facilities expanded under the Proposed Action. The only measurable radiation exposure from neutron generator production activities is expected to occur as a result of functional testing operations in Building 870. The maximum individual dose from functional testing operations under the Proposed Action would be approximately 100 mrem. The number of potentially exposed individuals would be between 4 and 8 persons.

3.0 AFFECTED ENVIRONMENT

The following sections include discussion of the local environment currently and potentially affected by neutron generator production operations. The buildings and facilities utilized for production of neutron generators are located in an industrially developed area of TA-I at SNL/NM. Surrounding areas have been disturbed as a result of development of the area. For this reason, there are minimal biological resources (and no threatened or endangered species) present at the site, and the possibility of encountering previously unidentified cultural resources is low. Natural water flow has already been interrupted by the previous site disturbances. Neither of the alternatives would involve disturbance of previously contaminated soils. Therefore, those aspects of the environment are not addressed in this EA.

3.1 Air

SNL/NM is located along the eastern margin of the regional area known as the Albuquerque Basin. The geography of this area, which consists of mountains, canyons, and the Rio Grande valley, greatly influences the meteorological conditions. Temperature inversions occur during the winter months, restricting dispersion and dilution of air pollutants in the basin area by trapping the pollution near the surface. The most important implication of meteorological variation across SNL/NM, however, is the effect of wind variability on transport and dispersion of pollutants. Wind characteristics vary across SNL/NM based on proximity to topographical and urban features. The mountains and canyons to the east create the predominant wind directions at SNL/NM. Dispersion occurs as a result of wind patterns developing from the complex interactions of the numerous geographic features. When constituents are emitted to the atmosphere, they are carried away from the source by wind transport and diluted by mixing with the ambient air.

Meteorological monitoring commenced at SNL/NM in January 1994. The 8-tower meteorological monitoring network consists of six 10-meter towers, one 60-meter tower, and one 50-meter tower. All towers are instrumented at the 3- and 10-meter levels. Instrumentation is also installed at the top of the tall towers. Meteorological variables measured at all tower levels include wind speed, wind direction, and temperature. Relative humidity, precipitation, and atmospheric pressure are also measured.

SNL/NM is located in the Albuquerque Middle Rio Grande Intrastate Air Quality Control Region. Under the national ambient air quality standards (NAAQS), Bernalillo County is currently in maintenance status for the CO NAAQS. Depending on emission levels, modification to existing sources or construction of new sources emitting CO may require a general or transportation conformity analysis as well as additional levels of controls to comply with the NAAQS. In addition, modification to existing sources or construction of new sources emitting the other criteria pollutants for which a pre-construction permit must be obtained are required to comply with the NAAQS.

NESHAP compliance support is provided to all SNL/NM source owners subject to radionuclide air emissions regulations. The EPA regulates radionuclide air emissions in accordance with 40 CFR 61, Subpart H. Dose is calculated using the CAP88 computer code. NESHAP regulation stipulates that direct stack or diffuse monitoring is only required if a facility has the potential to produce an effective dose equivalent (EDE) to the maximally exposed individual (MEI) of greater than 0.1 mrem per year. Currently there are no facilities with this potential and, therefore, no stack monitoring is required at SNL/NM. However, while not required by regulation, stack monitoring and calculations based on measured parameters are performed as a Best Management Practice at several facilities. All emissions based on measurements (i.e., continuous monitoring, periodic monitoring, and calculations based on measured parameters) are used to calculate the doses.

There are currently fifteen NESHAP sources at SNL/NM that reported radionuclide releases in 1997. Two of the facilities associated with the Neutron Generator Production Program are among the fifteen sources; the NGF (Building 870) and the ECF (Building 905). The NESHAP sources estimate their potential radionuclide air emissions. The EPA has set a maximum individual public dose limit of 10 mrem per year resulting from the combined radiological emissions produced from any DOE facility. Historically, radioactive releases from SNL/NM have been, and continue to be, several orders of magnitude below this maximum allowable standard.

3.2 Water Resources

SNL/NM, southeast and adjacent to the city of Albuquerque, overlies the eastern portion of the main aquifer of the Albuquerque Basin and borders some of the most productive parts of the groundwater system that is currently the sole source for drinking water for the Albuquerque metropolitan statistical area (MSA). SNL/NM has instituted a management plan with matching water conservation goals as part of its total environmental management program. Some of the water protection programs routinely monitor water discharges and groundwater. Monitoring data is used to help assess SNL/NM's effect on water quality.

The groundwater at SNL/NM is the source of drinking water for SNL/NM, KAFB, and adjacent portions of the city of Albuquerque and Pueblo of Isleta. Groundwater characteristics within KAFB area vary among and within three hydrogeologic regions. These characteristics include aquifer type, hydraulic properties, horizontal groundwater-flow directions, vertical hydraulic gradients, trends in water-level decline resulting from water supply pumping, and groundwater geochemistry. Many of these characteristics are directly related to the geologic media that provide the local framework for the regional aquifer.

Groundwater withdrawal from city of Albuquerque and KAFB water supply wells has resulted in significant changes to the groundwater flow regime in the aquifer system over the past 30 years, as discharge exceeds recharge. Water level declines have been occurring within the

Albuquerque Basin since the 1960s, when significant increases in groundwater withdrawal began.

The surface water system within KAFB consists primarily of ephemeral drainages, including Tijeras Arroyo, Arroyo del Coyote, and an unnamed drainage south of Arroyo del Coyote. Storm water from TA-I is collected in a storm sewer system consisting of curb and gutter open channels, and underground pipes. The northwest portion of the TA-I system discharges into the KAFB storm sewer system. The remainder of TA-I storm water discharges directly to Tijeras Arroyo. Floods and runoff occur most commonly during the summer thunderstorm season (July through September), when approximately 50 percent (3.75 to 5 inches) of the average annual precipitation of 7.5 to 10 inches falls.

3.3 Population

SNL/NM is located in the Albuquerque MSA in central New Mexico, which is projected to reach a population of 700,000 by the year 2000. It is the fifth largest private employer in New Mexico and the third largest in Bernalillo county, providing employment for approximately 7578 people as of the end of FY97.

The majority of the facilities and infrastructure utilized for production of neutron generators are located in a secured portion of TA-I of SNL/NM. It is the most developed and populated of the tech areas at SNL/NM, with an employee population of approximately 6663. The neutron generator program at SNL/NM currently employs approximately 240 people, approximately 140 to 150 of whom work in Building 870.

3.4 Site Services

Security is provided by the SNL/NM Protection Services Department, which consists of dispatchers, an offensive force, and a defensive force. In addition, the SNL/NM Emergency Management Team provides planning for emergency preparedness and response, including the analysis of potential impacts of unmitigated and mitigated releases of chemicals and radioactive materials from accidents that could affect SNL/NM personnel and operations, natural phenomenon events, and security-related events. Fire protection is provided by the U.S. Air Force (USAF), which operates five fire stations located throughout KAFB.

The Occupational Health Programs Department services SNL/NM's medical needs by providing medical assistance and treatment of sick or injured personnel.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes and compares the environmental consequences of the No Action Alternative and the Proposed Action for the Rapid Reactivation Project. Descriptions of the No Action and Proposed Action alternatives are provided in Chapter 2 of this EA, and affected aspects of the environment are discussed in Chapter 3. The following sections compare potential environmental consequences of the two alternatives. Other aspects of the environment were considered in the scoping of the analysis; however, only those potentially affected by the proposed project are discussed in this chapter.

The Proposed Action and No Action alternatives would both result in air emissions, waste generation, process and facility water use, and discharge of liquid effluents into the Albuquerque sanitary sewer system. Table 4.1 comparatively summarizes air emissions and other waste volumes related to operations under the No Action Alternative and the Proposed Action. The issues summarized in the table are addressed in the following sections.

Table 4.1 – Comparison of Estimated Annual Emissions, Water Use, and Wastes for the No Action and Proposed Action Alternatives

Emissions and Wastes	No Action Alternative	Proposed Action ¹
Air Emissions (tritium)	94 Ci per year	156 Ci per year
Air Emissions (HAPs)	1.9 TPY (1.7 MT)	3.6 TPY (3.3 MT)
(VOCs)	11.8 TPY (10.7 MT)	35.3 TPY (32.0 MT)
Hazardous Waste	98 ft ³ per year (2760 kg per year)	130 ft ³ per year (3680 kg per year)
Water Use	3,000,000 gallons per year (11,355,000 L per year)	5,000,000 gallons per year (18,925,000 L per year)
Tritiated Process Water	10,000 gallons per year (37,850 L per year)	14,000 gallons per year (52,990 L per year)
Low-Level Radioactive Waste	106 ft ³ per year (3000 kg per year)	141 ft ³ per year (4000 kg per year)
Mixed Waste	5 ft ³ per year (150 kg per year)	11 ft ³ per year (300 kg per year)
Non-hazardous Waste ²	11,229 ft ³ per year (318,012 kg per year)	16,843 ft ³ per year (477,004 kg per year)

¹ Does not include construction wastes

² Includes recycled materials

4.1 No Action Alternative

SNL/NM would continue production of neutron generators at a rate of 600 per year under the No Action Alternative. Facilities, infrastructure, equipment, and staffing level would be maintained, and any environmental consequences associated with current operations would continue to exist.

4.2 No Action Alternative Construction Activities

No construction activities are associated with the No Action Alternative; therefore, no effects on air quality, water use, or human health resulting from construction would be attributed to the No Action Alternative. No construction-related waste would be generated.

4.3 No Action Alternative Operations

Description of the projected environmental effects of the No Action Alternative is based on information available from monitoring and tracking of current project operations in comparison to total SNL/NM operations. The following sections are organized according to environmental issues. Discussion of each issue is inclusive of effects or potential effects of all neutron generator production operations and emissions, and is not facility- or process-specific.

4.3.1 Air Emissions

SNL/NM manages air quality through the Environmental and Emergency Management Department. Compliance programs are divided between the Air Quality Compliance (AQC) Program, the Radiological National Emission Standards for Hazardous Air Pollutants (NESHAP) Program, and the Clean Air Network (CAN) Program, all of which are monitored by the Environmental and Emergency Management Department. Meteorological data and ambient air monitoring data assist the Environmental and Emergency Management Department in assessing the impact of emissions.

Air emissions regulated by Federal and local laws include HAPs, VOCs, and criteria pollutants. The permits for Building 870 place federally enforceable emission limits and standards on emission sources within the building. These emission sources include radiological exhaust, chemical exhaust and solvent cleaning machine, encapsulation and curing exhaust, and diesel-fired standby generators. As required by the DOE permits, SNL/NM-wide HAP usage may not exceed 10 TPY (9.1 MT) for any single HAP or 25 TPY (22.7 MT) for any combination of HAPs. Based on chemical inventory and usage, a conservative estimate of approximately 1.9 TPY (1.7 MT) of HAP and 11.8 TPY (10.7 MT) of VOC emissions could be released under the No Action Alternative. These emission estimates are based on the assumption that the chemical inventory within Building 870 would be released. It should be noted, however, that this estimate does not take into account engineered controls such as pollution control equipment, which would result in lower emissions. A screening methodology was applied to each chemical. Two

chemicals had emissions in excess of screening levels and were further assessed to determine health risk (see Section 4.3.5). Through this evaluation the concentration of the chemical pollutants were found to be below regulatory standards and human health guidelines. The current criteria pollutant emissions are low in comparison to permit limitations and would not be altered under the No Action Alternative.

The National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy (DOE) Facilities regulation (40 CFR 61, Subpart H) requires all DOE installations that potentially emit radionuclides into the air to evaluate the resulting dose to the public. This regulation requires that radionuclides released to the ambient air not exceed those amounts that would cause any member of the public to receive an effective dose equivalent (EDE) of 10 millirems (mrem) per year. Compliance procedures for DOE facilities require the use of CAP88-PC or other approved computer models to calculate EDE to the maximally exposed member of the public. The CAP88-PC computer model estimates dose and risk from point sources of radionuclide air emissions and calculates exposure to radionuclide releases.

Buildings 870 and 905 are the only two buildings associated with neutron generator production that are considered to be sources for radiological emissions. Based on existing data, it is estimated that 94 Ci per year would be released under the No Action Alternative. This estimate includes tritium emissions that could occur from Building 905 and Building 870, including the powered evaporator used for tritiated process water in Building 870 (U. S. Department of Energy, 1992). Using the CAP88-PC computer program, an annual release of 94 Ci of tritium (H-3) was modeled as an upper bounding release condition. The calculated EDE to the maximally exposed individual (MEI) was determined to be 1.05×10^{-2} mrem per year. The lifetime fatal cancer risk that could occur under the No Action Alternative was estimated at 2.88×10^{-7} .

Much of the air that could potentially contain tritium is passed through the Building 870 tritium capture system (TCS), which uses a molecular sieve method to remove tritium from the air prior to its release into the environment. However, since not all of the potential tritium sources are connected to the TCS, the evaluation of consequences from air emissions does not take the system into account. Hence, it is likely that the EDE would be substantially lower than that indicated by the modeling.

4.3.2 Water Use and Liquid Effluents

Water use and discharge of liquid effluents by facilities and processes associated with neutron generator production would continue at the current rate of approximately 13,800 gallons (52,233 L) per work day under the No Action Alternative. The current total SNL/NM water use is approximately 1,206,000 gallons (4,564,710 L) of water per workday.

4.3.3 Tritiated Process Water

Approximately 10,000 gallons (37,850 L) of tritiated process water would be generated annually under the No Action Alternative. However, no radioactive waste would be discharged into the public sewer system. A powered evaporator to manage the tritiated process water is included in the scope of the No Action Alternative. Air emissions related to evaporation of the tritiated process water are discussed in Section 4.3.1.

4.3.4 Waste Management

No impacts to existing waste storage, transportation, or other related processes are anticipated under the No Action Alternative. Waste volumes that would be generated under the No Action Alternative, including non-hazardous, hazardous, low-level radioactive, and mixed waste are described in Section 2.3.4 and summarized in Table 4.1. All wastes would continue to be managed by SNL/NM's waste management program.

4.3.5 Health and Safety

Chemicals used in neutron generator production that are carcinogens as described in the EPA Integrated Risk Information System (IRIS), include soluble nickel and methylene chloride. IRIS is a database of human health effects that may result from exposure to various substances found in the environment (EPA, 1998). One chemical, methylenedianiline (MDA), is not in the IRIS database but is an occupational hazard of concern. MDA is a component of a curing agent for one of the encapsulants used in the production process. Exposure to MDA is controlled through local exhaust, one-time pass-through air, and compliance with the OSHA MDA Standard. Exposure to nickel and methylene chloride is controlled through local exhaust, limiting of chemical quantities, and work plans.

Air is the primary pathway for possible worker or public exposure; however, no adverse human health effects would be expected to occur from HAP exposure resulting from the No Action Alternative. All possible HAPs used for neutron generator production have been identified and summarized based on their toxicity, concentration, and frequency of use, in Hazard Indexes (U. S. Department of Energy, 1993), which indicate the risk of a noncarcinogenic health effect. The ratio of the estimated exposure level of a chemical to the reference exposure level (below which it is unlikely that even sensitive populations would experience adverse health effects) is its hazard quotient. Hazard quotients for all the HAPs are added to obtain a Total Hazard Index. If the Total Hazard Index is less than 1.0, health effects are not expected. The Nonnuclear Consolidation EA analyzed the potential human health impacts of air emissions of acetone, chromium trioxide, methylene chloride, nickel chloride, toluene, trichloroethane (TCA), and trichloroethylene (TCE). Operations proposed under the No Action Alternative would yield a Hazard Index of approximately 0.046 (U. S. Department of Energy, 1993). The chemical assessment process involving chemical inventory and use within Building 870 identified two chemicals of concern that are routinely emitted. An assessment of potential human health risks from these chemical air emissions indicates low risk to the offsite public and no expected

adverse health effects. Analysis of a scenario involving maximum exposure for 30 years of an individual located at the SNL/NM site boundary indicated a lifetime cancer health risk of less than 10^{-6} , (less than one in 1,000,000) and a non-cancer health risk, measured as a Hazard Index, of less than 0.01. Therefore, no adverse health effects to workers or the public are anticipated.

No measurable effects on worker health and safety are anticipated to result from chemical exposure under the No Action Alternative. Engineering and administrative controls are enforced at the NGF to ensure that no worker is exposed to chemicals beyond the permissible exposure limits (PELs) established by the OSHA. Engineering and administrative controls, including the use of volume control, closed containers, closed loop systems, and fume hoods would further ensure that worker exposures to all chemicals would be kept As-Low-As-Reasonably-Achievable (ALARA). Potential scenarios for exposure to chemicals would continue to be handled in accordance with provisions outlined in the SNL/NM ES&H Manual, Chapter 6, Industrial Hygiene (Sandia National Laboratories/New Mexico, 1998a).

Exposure to ionizing radiation could result from activities or processes associated with:

- Tritium-loaded occluder films
- Neutron tube and generator function testing
- Neutron tubes and generators
- Enclosed beam x-ray
- Incidental radiation-producing devices
- Calibration standards

Exposure to tritium contamination from the handling of tritium-loaded occluder films and exposure to neutron radiation from the functional testing of neutron tubes and generators are the only two potential sources of measurable personnel exposure that could occur during normal operations.

Neutron tubes and neutron generators are functionally tested at various steps in the production process. The functional test produces fast-moving neutron radiation. Equipment operators and personnel in adjacent rooms would be exposed to minor amounts of radiation under the No Action Alternative, due to the penetrating ability of fast-moving neutrons. The location of functional test equipment is a critical parameter in determining the exposure to personnel from these operations. Exposure to operating personnel and members of the public would be maintained ALARA, through a combination of facility design, equipment location, shielding, and administrative controls. Under the No Action Alternative, estimated maximum individual dose to facility operations personnel would be 50 mrem per year, based on production of 600 neutron generators per year. The population of potentially exposed individuals would be between 3 and 6. The latent cancer fatality (LCF) can be calculated by assuming that the 6 potentially exposed individuals would be exposed to the maximum dose of 50 mrem per year for 30 years. The resulting number of fatal cancers that would occur among the workers is estimated at 3.6×10^{-3} LCF, which calculates to less than 1. Therefore, it is unlikely that fatal cancers

would be attributable to the potential exposures. Consequences arising from dose to the public resulting from air emissions are addressed in Section 4.3.1.

Engineering controls under the No Action Alternative would serve to minimize ionizing radiation exposure; however personnel would continue to participate in the SNL/NM internal dosimetry program. Exposure to tritium is measured using urine bioassay analyzed by liquid scintillation counting. Administrative controls would include adherence to worker health and safety precautions and controls according to the current ES&H Manual, supplements, and additional job-specific procedures.

Explosives in quantities of less than two grams per test are used in the performance of function testing of neutron generator assemblies. However, trained personnel and operating procedures approved by the ES&H Team and the technical staff of the ECF (Building 905) would ensure minimal risk to the health and safety of workers under the No Action Alternative.

4.4 Proposed Action

SNL/NM would increase production of neutron generators to 2000 per year under the Proposed Action. Current facilities, infrastructure, and equipment would be modified and renovated, infrastructure would be reconfigured, and equipment would be relocated and supplemented to facilitate the increased production. Additions to the NGF and Building 857 would also be constructed. The following sections summarize potential environmental consequences associated with the Proposed Action.

4.5 Proposed Action Construction Activities

Modifications, renovation, and construction of facilities necessary for implementation of the Proposed Action would result in short-term environmental effects, including noise generated by construction, fugitive dust, and safety and security issues associated with construction personnel on the site. However, these effects would be minimal and confined to relatively small areas for short periods of time.

4.5.1 Air Emissions

No discernible effects to air quality are anticipated as a result of Proposed Action construction activities. CO emissions from equipment used for construction would affect air emissions under the Proposed Action. However, CO emissions are projected to be less than 0.04 TPY (0.04 MT). Water would be used for dust suppression as appropriate.

4.5.2 Water Use and Liquid Effluents

The short-term increase in water use due to construction activities is anticipated to have minimal impact in comparison to SNL/NM's site-wide water use. Water use during construction for installation of equipment and dust suppression would occur during the construction process.

4.5.3 Waste Management

Generation and proper management of construction wastes related to the Rapid Reactivation Project Proposed Action would not have substantial impact on the environment. Typical construction debris, as identified in Section 2.5.3, would be generated from building renovations and modifications under the Proposed Action. Construction projects are common at SNL/NM; wastes associated with construction are considered routine and are managed according to prescribed procedure. Waste generated during construction of the Proposed Action would be stored in dumpsters and ultimately disposed of at local commercial and municipal landfills.

It is anticipated that less than 600 ft³ (16,992 kg) of low-level radioactive waste would be generated from ductwork renovations. These wastes would be managed through SNL/NM's low-level radioactive waste program.

4.5.4 Health and Safety

Little impact on worker health and safety is anticipated as a result of construction activities associated with the Proposed Action. Workers may have limited exposure to chemical or radiological hazards during construction. Hazards would be analyzed prior to performing the work. Personnel exposure to tritium compounds through inhalation, ingestion, or skin contact with tritium-contaminated objects or surfaces could occur during construction activities (see Section 4.5.1). Worker protection measures, including hazard training, work procedures, and the use of PPE, would be enforced. Therefore, no adverse health effects due to radiation exposure during construction activities are anticipated.

4.6 Proposed Action Operations

Implementation of the Proposed Action would result in an increased capacity to achieve production of 2000 neutron generators per year. The following sections describe the environmental consequences of increased production that could result from implementation of the Proposed Action.

4.6.1 Air Emissions

Chemical emissions identified under the No Action Alternative would be generated under the Proposed Action. This would include all HAP chemicals used by the Proposed Action.

Air emissions regulated by Federal and local laws include HAPs, VOCs, and criteria pollutants. The permits for Building 870 place federally enforceable emission limits and standards on emission sources within the building. These emission sources include radiological exhaust, chemical exhaust and solvent cleaning machines, encapsulation and curing exhaust, and diesel-fired standby generators. As required by the DOE permits, SNL/NM-wide HAP usage may not exceed 10 TPY (9.1 MT) for any single HAP or 25 TPY (22.7 MT) for any combination of HAPs. Based on chemical inventory and usage, a conservative estimate of approximately 3.6 TPY (3.3 MT) of HAP and 35.3 TPY (32.0 MT) of VOC emissions could be released under the Proposed Action. These emission estimates are based on the assumption that the chemical inventory within Building 870 would be released. A screening methodology was applied to each chemical. Two chemicals had emissions in excess of screening levels and were further assessed to determine health risk (see Section 4.6.5). Through this evaluation the concentration of the chemical pollutants were found to be below regulatory standards and human health guidelines. The current criteria pollutant emissions are low in comparison to permit limitations and would not be altered under the Proposed Action.

Radiological air emissions (tritium) would increase as a result of implementation of the Proposed Action. It is estimated that the maximum potential release would be approximately 156 Ci per year under the Proposed Action. This estimate was modeled as an upper bounding release condition using the CAP88-PC computer program. The calculated EDE to the MEI was determined to be 1.75×10^{-2} mrem per year. The lifetime fatal cancer risk that could occur under the Proposed Action was estimated at 4.78×10^{-7} .

4.6.2 Water Use and Liquid Effluents

The increase in water use from approximately 13,800 gallons (52,233 L) to approximately 22,000 gallons (83,270 L) per work day under the Proposed Action would have minimal impact compared to SNL/NM's total water use of more than 1,200,000 gallons (4,542,000 L) per work day (Sandia National Laboratories, 1997). Water used to support the increase in production of neutron generators would not substantially affect current or projected water supply to SNL/NM. Capacity of the existing sanitary waste system would not be affected by the increase in liquid effluents resulting from implementation of the Proposed Action.

4.6.3 Tritiated Process Water

It is estimated that approximately 14,000 gallons (52,990 L) per year of tritiated process water would be generated under the Proposed Action, which is an increase of approximately 4000 gallons (15,140 L) per year over the No Action Alternative. A powered evaporator located within the tritium envelope in Building 870 would be used to evaporate the tritiated process water. Environmental consequences of radiological emissions resulting from operation of the evaporator are discussed in Section 4.6.1.

4.6.4 Waste Management

Impacts due to increases in waste volumes are expected to be minimal under the Proposed Action. Waste volumes would increase from levels generated by the No Action Alternatives by 25 to 50 percent (see Table 4.1). However, storage and further management of these wastes would remain within the capacity of existing facilities and operations.

4.6.5 Health and Safety

Minimal impact to workers is anticipated to result from implementation of the Proposed Action.

Air is the primary pathway for possible worker or public exposure; however, no adverse human health effects would be expected to occur from HAP exposure resulting from the Proposed Action. All possible HAPs used for neutron generator production were identified and summarized based on their toxicity, concentration, and frequency of use, in Hazard Indexes (U.S. Department of Energy, 1993), which indicate the risk of a noncarcinogenic health effect. Neutron generator production activities under the Proposed Alternative would yield approximately 3 times the change in the Hazard Indexes that would occur under the No Action Alternative, or a total of approximately 0.14 onsite. The cumulative Hazard Indexes at the site would remain well below the value of 1.0. The chemical assessment process involving chemical inventory and use within Building 870 identified two chemicals of concern that are routinely emitted. An assessment of potential human health risks from these chemical air emissions indicates low risk to the offsite public and no expected adverse health effects. Analysis of a scenario involving maximum exposure for 30 years of an individual located at the SNL/NM site boundary indicated a lifetime cancer health risk of less than 10^{-6} , (less than one in 1,000,000) and a non-cancer health risk, measured as a Hazard Index, of less than 0.01. This indicates that no adverse human health effects would be expected.

No measurable effects on worker health and safety are anticipated to result from chemical exposure under the Proposed Action. Engineering and administrative controls would continue to be enforced at the NGF to ensure that no worker would be exposed to chemicals beyond the PEL established by the OSHA. Engineering and administrative controls, including the use of volume control, closed containers, closed loop systems, and fume hoods would further ensure that worker exposures to all chemicals would be ALARA. Accidental exposure to chemicals would be handled in accordance with provisions outlined in the SNL/NM ES&H Manual, Chapter 6, Industrial Hygiene (Sandia National Laboratories/New Mexico, 1998a).

Increased neutron generator production would require some increase in the tritium inventory maintained in the facility and subsequent increased handling and potential for personnel exposure. Engineering controls under the Proposed Action would minimize ionizing radiation exposure; however, personnel would participate in the SNL/NM internal dosimetry program. Exposure to tritium is measured using urine bioassay analyzed by liquid scintillation counting. Administrative controls would include adherence to worker health and safety precautions and controls according to the current ES&H Manual, supplements, and additional job-specific

procedures.

Increased generator production under the Proposed Action would increase dose estimates for process operators and calibration and maintenance personnel. Exposure to ionizing radiation could result from activities or processes associated with neutron generator production, as discussed in Section 4.3.5.

It is estimated that the maximum individual dose to facility operations personnel would be less than 100 mrem under the Proposed Action production schedule of 2000 neutron generators per year. The population of potentially exposed individuals would be between 4 and 8. The latent cancer fatality (LCF) can be calculated by assuming that the 8 potentially exposed individuals would be exposed to the maximum dose of 100 mrem per year for 30 years. The resulting number of fatal cancers that would occur among the workers is estimated at 9.6×10^{-3} LCF, which calculates to less than 1. Therefore, it is unlikely that fatal cancers would result from the potential exposures. Consequences arising from dose to the public resulting from air emissions are addressed in Section 4.6.1.

Administrative controls would follow worker health and safety precautions and controls according to the current ES&H Manual, supplements, and additional job-specific procedures. Changes in health and safety procedures would be made as needed to accommodate health and safety provisions for the expanded production capabilities that would result from the Proposed Action.

4.7 Cumulative Effects

DOE considered the cumulative effects of the Proposed Action with other activities at SNL/NM. Projected air emissions, water use, liquid effluents and waste generation rates were compared to data previously compiled by SNL/NM, SNL/NM site-wide permits, and information provided by project personnel. These projected amounts would be small and would not add substantially to existing levels. Therefore, the effects of the Proposed Action when combined with those effects of other actions defined in the scope of this section do not result in substantial cumulative impacts.

As required by the DOE permits, SNL/NM-wide HAP usage may not exceed 10 TPY (9.1 MT) for any single HAP or 25 TPY (22.7 MT) for any combination of HAPs. Based on chemical inventory and usage, a conservative estimate of approximately 1.9 TPY (1.7 MT) of HAP and 11.8 TPY (10.7 MT) of VOC emissions could be released under the No Action Alternative. Under the Proposed Action, estimated emissions could increase to 3.6 TPY (3.3 MT) of HAPs and 35.3 TPY (32.0 MT) of VOCs.

The radiation dose to the public resulting from the Proposed Action would not add substantially to that resulting from SNL/NM site-wide operations. The calculated EDE to the MEI under the No Action Alternative and the Proposed Action for the Rapid Reactivation Project was estimated at 1.05×10^{-2} mrem per year and 1.75×10^{-2} mrem per year, respectively. The lifetime fatal

cancer risk was estimated at 2.88×10^{-7} for the 94 Ci release that could occur under the No Action Alternative and 4.78×10^{-7} for the 156 Ci release that could occur under the Proposed Action. The MEI for this analysis was located at the Sandia Federal Credit Union. Under either of the alternatives for the Rapid Reactivation Project, the total MEI dose would be substantially below the NESHAP dose standard of 10 mrem per year. By comparison, the EDE calculated for the SNL/NM 1997 Annual Site Environmental Report was estimated to be 7.7×10^{-4} mrem per year. The MEI for this environmental report was located at the Kirtland Underground Munitions Maintenance and Storage Complex (KUMMSC) (Sandia National Laboratories/New Mexico, 1998c).

The increase in water use from approximately 13,800 gallons (52,233 L) to approximately 22,000 gallons (83,270 L) per work day under the Proposed Action would not add substantially to SNL/NM's total water use of more than 1,200,000 gallons (4,542,000 L) per work day (Sandia National Laboratories, 1997). Capacity of the existing sanitary waste system would not be affected by the increase in liquid effluents resulting from implementation of the Proposed Action.

Waste generation projections for the Rapid Reactivation Project No Action Alternative and Proposed Action would not add substantially to SNL/NM's waste generation. SNL/NM waste storage, treatment, and disposal operations would not be substantially impacted by the proposed Rapid Reactivation Project wastes.

Hazardous waste generated under the No Action Alternative would be approximately 98 ft³ (2760 kg) per year. The Proposed Action would result in approximately 130 ft³ (3680 kg) per year of hazardous waste. These volumes are compared to the approximately 1695 ft³ (48,000 kg) of hazardous waste generated by SNL/NM in 1996. Off-site shipment and disposal of hazardous waste would likewise not be substantially impacted, in comparison to the 3249 ft³ (92,000 kg) of hazardous waste that was transported in 1995.

Approximately 106 ft³ (3000 kg) per year of low-level radioactive waste would be generated under the No Action Alternative, while the Proposed Action would result in approximately 141 ft³ (4000 kg) per year of low-level waste. This amount would not add substantially to the 1996 site-wide low-level radioactive waste generation of 10,000 ft³ (approximately 283,206 kg).

The Rapid Reactivation Project low-level radioactive waste stream has already been approved for disposal at NTS. However, project waste resulting from either of the alternatives would not add substantially to the amount of waste shipped for disposal; by comparison, SNL/NM shipped approximately 6000 ft³ (169,924 kg) of low-level radioactive waste to the NTS in 1996.

Generation of mixed waste would be approximately 5 ft³ (150 kg) under the No Action Alternative and 11 ft³ (600 kg) under the Proposed Action. This would not add substantially to the amount of mixed waste generated site-wide by SNL/NM. For comparison, 5000 ft³ (approximately 14,160 kg) of mixed waste was generated site-wide by SNL/NM in 1996; therefore, neither amount would impact treatment, storage, or disposal operations. SNL/NM treatment and disposal options currently established with Perma-Fix, Incorporated, in

Gainesville, Florida, Diversified Scientific Solutions, Inc., in Oak Ridge, Tennessee, and Envirocare, in Salt Lake City, Utah, would continue to be utilized for management of mixed wastes.

Generation of non-hazardous waste that includes recycled materials is estimated to be approximately 11,229 ft³ (318,012 kg) under the No Action Alternative and 16,843 ft³ (477,004 kg) for the Proposed Action. This amount of waste would not add substantially to associated disposal operations. In 1996, it was estimated that SNL/NM generated a total of 38,856 ft³ (1,100,434 kg) of solid waste, which does not include recycled materials. This waste, combined with the estimated volumes from the Rapid Reactivation Project, would be disposed of at local commercial and municipal landfills.

4.8 Abnormal Occurrences

Abnormal occurrences include operational, external, or natural events postulated to affect SNL/NM activities. These could include radiological and toxicological releases, explosions, and airplane crashes. The worst case abnormal occurrence considered for this EA is an aircraft crash into Building 870 and the resulting facility fire. One accident scenario occurring at Building 870 was evaluated for the SNL/NM SWEIS, that being an unspecified event that represents a total release of the tritium inventory present in the facility.

Due to the close proximity of SNL/NM to the Albuquerque International Sunport, an accident involving an airplane crash into Building 870 of the neutron generator project was determined to represent a credible accident scenario. For this accident scenario, the assumed material at risk (MAR) was a tritium inventory of 836 Ci. The inventory was based on the total amount of tritium that would be contained in the maximum number of neutron generator parts and gas standards contained within the building at any given time. The likelihood of a catastrophic event resulting in release of the entire tritium inventory was calculated to be extremely low (1.0×10^{-5} per year). Consequences and risk estimates were calculated for the MEI, the maximally exposed noninvolved worker, the population within the surrounding 50-mile radius, and for all special receptors. The results indicate that the consequences of a radiological accident associated with Building 870 are very low. The highest consequence dose to the MEI in TA-I and TA-II was estimated at 7.8×10^{-6} rem and the highest off-site dose within a 50-mile population, was estimated at less than 1.0×10^{-1} person-rem. The increased probability of an LCF to the MEI, based on the consequence dose, was estimated at 3.9×10^{-9} , and the additional LCF within a 50-mile population was estimated at 1.4×10^{-5} . Because these LCF estimates are less than 1, it is not likely that fatal cancers attributable to exposures estimated from this accident scenario would occur. The major source of effects from the airplane crash is considered to be death of the facility occupants resulting from the crash itself (Maltese, 1998).

A fire due to causes other than an airplane crash was also considered. In this event, controls that have been designed into the building systems, including controls and features for fire protection within the tritium envelope of Building 870, would be deployed. These fire control features, described below, make it unlikely that there would be a fire of sufficient severity and extent to

destroy the facility and release the entire tritium inventory. Even if such a fire did occur, the maximum possible release of the assumed material at risk (tritium inventory of 836 Ci) and the associated impact to workers and the public are bounded by the analysis for an airplane crash.

Automatic and manual fire protection systems with audible and visual annunciation are located throughout Building 870. The systems are designed in accordance with Factory Mutual (FM) Approval Guide and National Fire Protection Act (NFPA) 13 guidelines to provide life safety, prevent large loss fires and production delays, and ensure that fire does not cause an unacceptable on- or off-site release of hazardous materials. Automatic sprinkler heads are installed in all areas that block overhead ceiling protection (for example: fume hoods, glove boxes, and exhaust systems). Automatic sprinkler heads in corrosive environments utilize corrosion-resistant heads and piping. A floor drain system designed to collect fire-water runoff and convey it to a holding tank and overflow sump is located in the basement. Fire-water runoff could be collected from the tank to be tested, analyzed, and managed as required.

Building 870 and other buildings associated with neutron generator production are protected with wet-pipe sprinkler systems served by the existing site firewater supply system. The primary water supply for the fire protection systems of the facility is the existing site water system. The existing storage capacity available for firewater, domestic, and process use consists of one 3,000,000-gallon tank and one 1,000,000-gallon tank. Specific equipment and/or production areas are provided with appropriate fire detection and suppression features as required by the unique hazard characteristics of the product or process.

Fire protection features for Building 870 and its associated buildings are in accordance with applicable codes and standards including, but not limited to, DOE Order 5480.7, Fire Protection; NFPA 101; the Uniform Building Code (UBC); the Uniform Plumbing Code (UPC); and the Uniform Fire Code (UFC). Tritium is contained in many devices and parts dispersed throughout the tritium envelope of the building. However, the various tritium envelope areas are provided with fire protection systems in accordance with NFPA 801 and are not vulnerable to total release from operational events. The walls of the Proposed Action expanded tritium envelope would be upgraded to provide a 2-hour fire separation.

A smoke detection system was designed and constructed throughout Building 870 to fully protect the facility from potentially serious property damage. The system is designed to activate the fire protection system in the affected areas and to shut down the respective HVAC system, including all supply (make-up and recirculating), exhaust, and HEPA filtration systems. A separate smoke removal system, integrated with the smoke detection system, is provided for cleanrooms in accordance with FM 1-56 (Sandia National Laboratories Manufacturing Engineering and Support Center and Facilities Development Center, 1998).

GLOSSARY

CAP88-PC - A set of computer programs, databases, and associated utility programs for estimating dose and risk from point sources of radionuclide air emissions. The model calculates exposure to radionuclide releases that can occur through the inhalation, ingestion, air immersion, and surface ground-shine pathways. Site-specific data, including meteorological, demographic, radiological, receptor location, and facility release parameters are required by the CAP88-PC computer code.

Groundwater contamination - As defined by the EPA, groundwater contamination is the introduction of microorganisms, chemicals, toxic substances, or wastes in a concentration that makes the water unfit for its next intended use.

Hazard Index - A summation of the Hazard Quotients for all chemicals, the Hazard Index is used to assess relative adverse human health effects for chemicals. A Hazard Index value of 1.0 or less means that no adverse human health effects (non-cancer) are expected to occur.

Hazard Quotient - A value used as an assessment of non-cancer associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is independent of a cancer risk, which is calculated only for those chemicals identified as carcinogens.

Non-hazardous waste - Waste that includes discarded materials such as scrap, paper, textiles, or rubber that are recyclable and that are not otherwise hazardous wastes as defined in Subtitle C of RCRA.

Point release - Point releases are characterized as sources that discharge material into the atmosphere through a facility's exhaust stack or roof-top vent. NESHAP regulations require continuous air monitoring for any source that contributes 0.1 millirem per year or more to the maximally exposed individual. No SNL/NM sources require continuous air monitoring.

Tritium envelope - Space designated for tritium operations that are subject to appropriate environmental safety and health controls, including engineered barriers and administrative controls.

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