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Draft Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement

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Summary

Prepared by:

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Abstract: The National Nuclear Security Administration (NNSA), a separately organized agency within DOE, has the responsibility to maintain and enhance the safety, reliability, and performance of the U.S. nuclear weapons stockpile to meet national security requirements. NNSA manages DOE's nuclear weapons programs and facilities, including those at Lawrence Livermore National Laboratory (LLNL). The continued operation of LLNL is critical to NNSA's Stockpile Stewardship Program and to preventing the spread and use of nuclear weapons worldwide. LLNL maintains core competencies in activities associated with research and development, design, and surveillance of nuclear weapons, as well as the assessment and certification of their safety and reliability.

This *Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS) prepared pursuant to NEPA, analyzes the potential environmental impacts of continued operation, including near term proposed projects of LLNL. Alternatives analyzed in this LLNL SW/SPEIS include the No Action Alternative, the Proposed Action, and the Reduced Operation Alternative. This document is also a Supplement to the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* for use of proposed materials at the National Ignition Facility (NIF). This combination ensures timely analysis of these activities concurrent with the environmental analyses being conducted for the site-wide activities and will be referred to as the LLNL SW/SPEIS.

This document assesses the environmental impacts of LLNL operations on land uses and applicable plans, socioeconomic characteristics and environmental justice, community services, prehistoric and historic cultural resources, aesthetics and scenic resources, geology and soils, biological resources, water, noise, traffic and transportation, utilities and energy, materials and waste management, human health and safety, site contamination, and accidents.

Public Comments: In preparing this Draft LLNL SW/SPEIS, NNSA considered comments received during the public scoping period, from June 17, 2002, through September 16, 2002. Two public scoping meetings were held on July 10 and 11, 2002, in Livermore and Tracy, California. Comments made at these meetings, as well as comments received by fax, e-mail and U.S. mail during the scoping period, were considered in the preparation of this LLNL SW/SPEIS. A summary of the comments is included in this draft.

The comment period for this document will run from February 27, 2004, to May 27, 2004. Public hearings on the Draft LLNL SW/SPEIS will also be held during this 90-day comment period. The dates, times, and locations of these hearings will be announced in the *Federal Register* and in local newspapers. All comments received during the comment period will be considered by NNSA in the Final LLNL SW/SPEIS.

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ABBREVIATIONS AND ACRONYMS

ALVIS	Atomic Vapor Laser Isotope Separation
BSL-3	BioSafety Level-3
CFR	*Code of Federal Regulations*
DOE	Department of Energy
EPA	Environmental Protection Agency
FR	*Federal Register*
FY	Fiscal year
ITP	Integrated Technology Project
LCF	Latent cancer fatalities
LLNL	Lawrence Livermore National Laboratory
MEI	Maximally exposed individual
NEPA	*National Environmental Policy Act*
NEUMA	Neutron Multiplying Assembly
NIF	National Ignition Facility
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NRDC	Natural Resources Defense Council
ROD	Record of Decision
SSM PEIS	*Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*
SBSSMP	Science-Based Stockpile Stewardship and Management Program
TRUPACT II	Transuranic Package Transporter-II
USFWS	United States Fish and Wildlife Services
WIPP	Waste Isolation Pilot Plant

UNIT OF MEASURE AND ABBREVIATIONS

A-weighted decibel	dBA
cubic meters	m^3
cubic meters per year	m^3/yr
cubic yards	yd^3
decibel	dB
gallons per day	gal/day
gallons per year	gal/yr
kilowatt hour	kWh
kilowatt hours per year	kWh/yr
megawatt	MW
million	M
million gallons per day	M gal/day
million gallons per year	M gal/yr
millirem	mrem
millirem per year	mrem/yr
particulate matter of aerodynamic diameter less than 10 micrometers	PM_{10}
square feet	ft^2

CONVERSION CHART

TO CONVERT FROM U.S. CUSTOMARY INTO METRIC			TO CONVERT FROM METRIC INTO U.S. CUSTOMARY		
If you know	**Multiply by**	**To get**	**If you know**	**Multiply by**	**To get**
		Length			
inches	2.540	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.03281	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.6214	miles
		Area			
square inches	6.452	square centimeters	square centimeters	0.1550	square inches
square feet	0.09290	square meters	square meters	10.76	square feet
square yards	0.8361	square meters	square meters	1.196	square yards
acres	0.4047	hectares	hectares	2.471	acres
square miles	2.590	square kilometers	square kilometers	0.3861	square miles
		Volume			
fluid ounces	29.57	milliliters	milliliters	0.03381	fluid ounces
gallons	3.785	liters	liters	0.2642	gallons
cubic feet	0.02832	cubic meters	cubic meters	35.31	cubic feet
cubic yards	0.7646	cubic meters	cubic meters	1.308	cubic yards
		Weight			
ounces	28.35	grams	grams	0.03527	ounces
pounds	0.4536	kilograms	kilograms	2.205	pounds
short tons	0.9072	metric tons	metric tons	1.102	short tons
		Temperature			
Fahrenheit (^{o}F)	subtract 32, then multiply by 5/9	Celsius (^{o}C)	Celsius (^{o}C)	multiply by 9/5, then add 32	Fahrenheit (^{o}F)
kelvin (^{o}k)	subtract 273.15	Celsius (^{o}C)	kelvin (^{o}k)	Multiply by 9/5, then add 306.15	Fahrenheit (^{o}F)

Note: 1 sievert = 100 rems

SUMMARY

SUMMARY

S.1 INTRODUCTION

This *Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS) describes the purpose and need for agency action for the continued operation of LLNL and analyzes the environmental impacts of these operations. The primary purpose of continuing operation of LLNL is to provide support for the National Nuclear Security Administration's (NNSA's) nuclear weapons stockpile stewardship missions. LLNL, located about 40 miles east of San Francisco, California, is also needed to support other U.S. Department of Energy (DOE) programs and Federal agencies such as the U.S. Department of Defense, Nuclear Regulatory Commission, U.S. Environmental Protection Agency (EPA), and the newly established U.S. Department of Homeland Security. This LLNL SW/SPEIS analyzes the environmental impacts of reasonable alternatives for ongoing and foreseeable future operations, facilities, and activities at LLNL. The reasonable alternatives include the No Action Alternative, Proposed Action, and the Reduced Operation Alternative.

The major decision to be made by DOE/NNSA is to select one of the alternatives for the continued operation of the LLNL. As part of the Proposed Action, DOE/NNSA is considering: using additional materials including plutonium on the National Ignition Facility (NIF); increasing the administrative limit for plutonium in the Superblock, which includes the Plutonium Facility, the Tritium Facility, and the Hardened Engineering Test Building; conducting the Integrated Technology Project, using laser isotope separation to provide material for Stockpile Stewardship experiments, in the Plutonium Facility; increasing the material-at-risk limit for the Plutonium Facility; and increasing the Tritium Facility material-at-risk. A discussion of these issues is presented in Section S.5.2, Proposed Action.

The *National Environmental Policy Act* (NEPA) establishes environmental policy, sets goals, and provides means for implementing the policy. NEPA contains provisions to ensure that Federal agencies adhere to the letter and spirit of the Act. The key provision requires preparation of an environmental impact statement on "major Federal actions significantly affecting the quality of the human environment" (40 *Code of Federal Regulations* [CFR] §1502.3). NEPA ensures that environmental information is available to public officials and citizens before decisions are made and actions are taken (40 CFR §1500.1[b]). DOE has a policy to prepare site-wide environmental impact statements documents for certain large, multiple-facility sites such as LLNL (10 CFR §1021.330). In August 1992, DOE released the *Final Environmental Impact Statement and Environmental Impact Report for Continued Operations of Lawrence Livermore National Laboratory and Sandia National Laboratories, Livermore* (LLNL EIS/EIR). A Record of Decision (ROD) (58 *Federal Register* [FR] 6268) was issued in January 1993. With the passage of more than 10 years since the publication of the 1992 LLNL EIS/EIR (DOE/EIS-0157) and because of proposed modifications to existing projects and new programs, NNSA determined that it was appropriate to prepare a new LLNL SW/SPEIS.

S.2 PURPOSE AND NEED

The continued operation of LLNL is critical to NNSA's Stockpile Stewardship Program and to preventing the spread and use of nuclear weapons worldwide. LLNL maintains core competencies in activities associated with research and development, design, and surveillance of nuclear weapons, as well as the assessment and certification of their safety and reliability. In response to the end of the Cold War and changes in the world's political regimes, the emphasis of the U.S. nuclear weapons program has shifted from developing and producing new weapon designs to dismantling obsolete weapons and maintaining a smaller weapons stockpile.

S.2.1 Nuclear Posture Review

In 2001, Congress directed the U.S. Department of Defense to conduct a comprehensive nuclear posture review to lay out the direction for the U.S. nuclear forces over the next 5 to 10 years. The centerpiece of the nuclear posture review is the new triad, with flexible response capabilities. The new triad is composed of three elements: (1) offensive strike systems, nuclear and nonnuclear; (2) active and passive defenses; and (3) a revitalized defense infrastructure that will provide capabilities in a timely fashion to meet emerging threats.

Of particular interest to DOE and NNSA is the third element of the new triad, which reflects a broad recognition of the importance of a robust and responsive nuclear weapons infrastructure in sustaining deterrence. In this respect, the nuclear posture review notes that the flexibility to sustain the U.S. nuclear weapons stockpile depends on a robust program for stockpile stewardship and peer-review-based stockpile certification.

DOE developed several goals in its draft NNSA Strategic Plan to achieve its missions in support of the nuclear posture review. The nuclear weapons stewardship goal is to ensure that our nuclear weapons continue to serve their essential deterrence role by maintaining and enhancing the safety, security, and reliability of the U.S. nuclear weapons stockpile. Achieving these goals requires the continued operation of LLNL.

NNSA has developed strategic objectives to support the DOE strategic goals. The strategic objectives that support the nuclear posture review and relate to the purpose for continued operations of LLNL are listed below:

- Conduct a program of warhead evaluation, maintenance, refurbishment, and production planned in partnership with the U.S. Department of Defense
- Develop the scientific, design, engineering, testing, and manufacturing capabilities needed for long-term stewardship of the stockpile
- Attract and retain the best laboratory workforce
- Provide state-of-the-art facilities and infrastructure supported by advanced scientific and technical tools to meet the operations and mission requirements
- Protect classified information and assets

NNSA currently certifies the stockpile through the Stockpile Stewardship Program, designed to implement DOE goals and NNSA objectives. LLNL programs and operations are integral components of DOE and NNSA strategies. In order to ensure the safety, reliability, and performance of the nuclear weapons stockpile, DOE has determined that it should: construct the NIF and the Terascale Simulation Facility; operate existing facilities such as Building 332 Plutonium Facility, Building 331 Tritium Facility, and Building 801 Contained Firing Facility; and retain skilled scientists and engineers.

S.2.2 Annual Assessment Review

LLNL participates in the formal review processes and assessments of weapons safety, security, and reliability. The seventh cycle to certify the stockpile, since the cessation of underground nuclear testing, was completed for the President in 2002. The annual assessment review is based on the technical evaluations made by the three weapons laboratories, provided through DOE to U.S. Strategic Command and the Nuclear Weapons Council. To prepare for this process, LLNL scientists and engineers collect, review, and integrate all available information regarding each stockpile weapons system, including physics, engineering, chemistry, and materials science data.

The annual assessment review and the formal certification of refurbished warheads require weapons experts to "depend" on an extensive range of aboveground experiments, vastly improved simulation capabilities, and the historical nuclear test database. LLNL and Los Alamos National Laboratory are also developing and beginning to apply a rigorous set of quantitative standards as the basis for formal certification actions and setting programmatic priorities.

Pit—The central core of a nuclear weapon containing plutonium-239 or highly enriched uranium that undergoes fission when compressed by high explosives.

Primary—The pit and high explosives component of a nuclear weapon.

LLNL conducts a wide range of stockpile surveillance activities to assess the condition of LLNL-designed weapons in the stockpile and to better understand the effects of aging on weapons. These surveillance activities include evaluating the pits in the primaries of nuclear weapons. LLNL is the design laboratory for four weapons systems in the stockpile: the W87 and W62 intercontinental ballistic missile warheads, the B83 bomb, and the W84 cruise missile.

S.2.3 Other Lawrence Livermore National Laboratory Program Activities

Countering the proliferation and use of weapons of mass destruction is another national security program that uses LLNL's research and development expertise. On December 10, 2002, LLNL introduced a new organization to support the U.S. Department of Homeland Security. This new organization will ensure LLNL capabilities and resources are available and used effectively to fulfill the objectives of the U.S. Department of Homeland Security.

LLNL is organized into a number of other programs to support DOE- and NNSA-assigned missions. These programs include nuclear materials stewardship, energy security and long-term energy needs, environmental assessment and management, advancing bioscience, and

breakthroughs in fundamental sciences and applied technology. Additionally, LLNL supports other government organizations and science and industry through the transfer of technology.

S.3 OVERVIEW OF LAWRENCE LIVERMORE NATIONAL LABORATORY

LLNL was founded in September 1952 as a second nuclear weapons design laboratory to promote innovation in the design of our Nation's nuclear stockpile through science and engineering. The University of California has been the sole contractor operating LLNL since its inception.

S.3.1 Site Description

LLNL consists of two sites: an 821-acre site in Livermore, California (Livermore Site); and a 7,000-acre experimental test site near Tracy, California (Site 300). Most LLNL operations are located at the Livermore Site. LLNL also conducts limited activities at several leased properties near the Livermore Site. Figures S.3.1–1 and S.3.1–2 show the locations of the Livermore Site, Site 300, offsite leased properties, and features of the surrounding area.

The Livermore Site is located about 40 miles east of San Francisco, at the southeast end of the Livermore Valley in southeastern Alameda County. The city of Livermore's central business district is located about 3 miles west of the site.

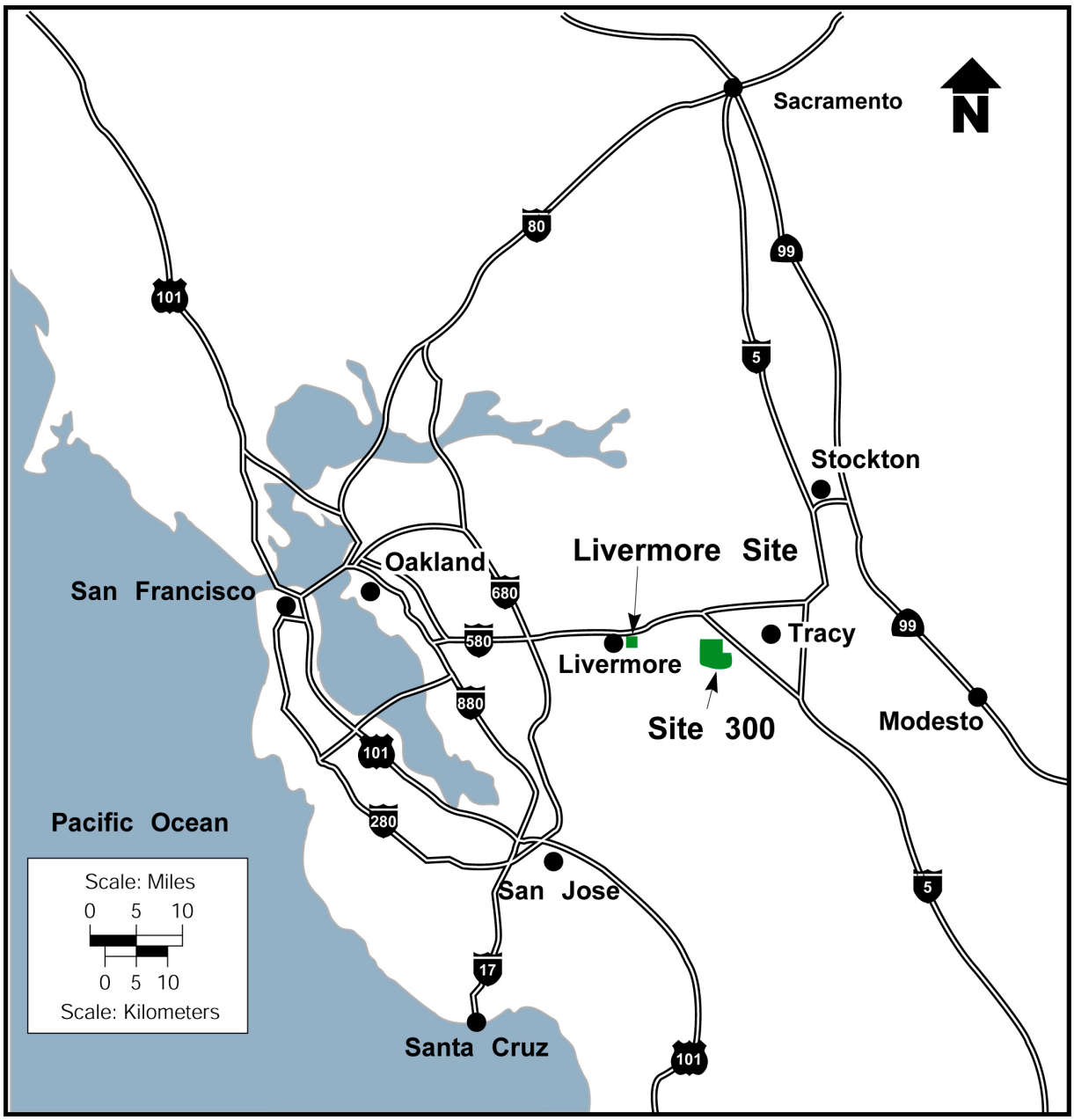
Located about 15 miles southeast of Livermore in the hills of the Diablo Range, Site 300 is primarily a nonnuclear explosives and nonnuclear weapons component test site. The site is marked by rolling hills and steep ravines. Most of Site 300 is located in San Joaquin County; the western edge of the site is in Alameda County.

S.3.2 Operations, Personnel, and Facilities

LLNL is a research and development laboratory with infrastructure necessary to support its operations and personnel. Research and development activities at LLNL are focused on stockpile stewardship; achieving robust and vital scientific, engineering, and manufacturing capability; inertial confinement fusion; laser technology; materials and process science; computational and information sciences; basic sciences; engineering sciences; and biological sciences.

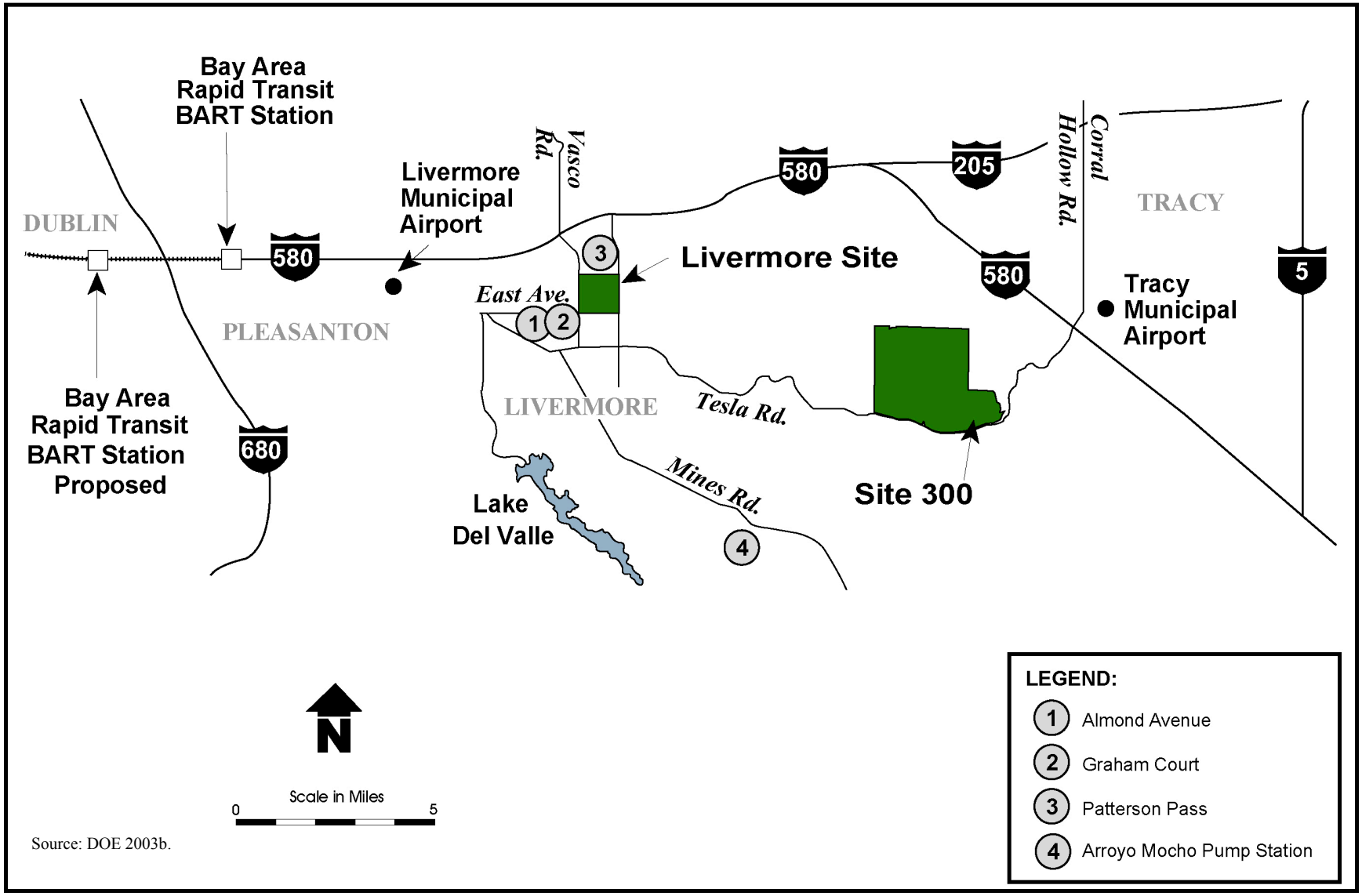
Approximately 10,600 personnel were located at LLNL as of September 2002. This total includes LLNL employees, Federal employees, and contractor personnel. Of these, approximately 10,360 were located at the Livermore Site and 240 at Site 300. Of LLNL employees, approximately 40 percent are scientists and engineers, 37 percent are technical personnel and skilled tradesmen, and 24 percent are administrative and clerical. Forty-five percent of LLNL employees currently reside within the neighboring cities of Livermore, Pleasanton, and Dublin. The remaining 55 percent are distributed throughout the Bay Area and the Central Valley.

This LLNL SW/SPEIS analyzes more than 100 facilities at the Livermore Site with more than 4,000,000 gross square feet of floorspace. Figure S.3.2–1 shows a map of the Livermore Site, which is roughly 1.3 square miles. At Site 300, the LLNL SW/SPEIS examines 30 facilities with more than 260,000 gross square feet.



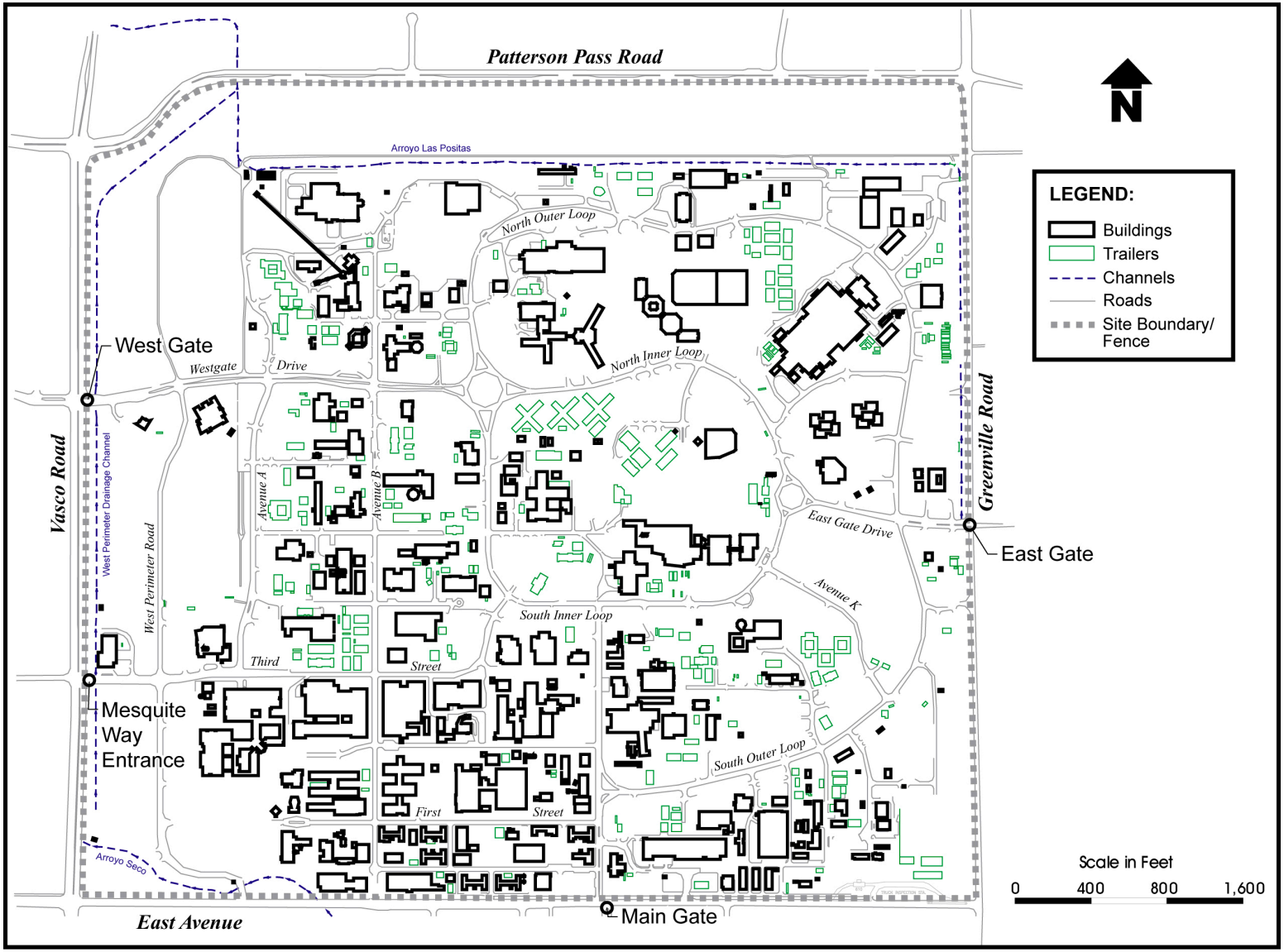
Source: LLNL 2003l.

FIGURE S.3.1–1.— ***Livermore Site and Site 300 in Relation to Surrounding Areas***



Source: DOE 2003b.

FIGURE S.3.1–2.—*Locations of Livermore Site, Site 300, and Offsite Facilities Relative to Surrounding Communities*



Source: LLNL 2003o.

FIGURE S.3.2–1.—*Livermore Site Map*

S.4 PUBLIC INVOLVEMENT

Public involvement is an integral part of NEPA and on June 17, 2002, NNSA published a Notice of Intent (67 FR 41224) announcing its intent to prepare this LLNL SW/SPEIS. Consistent with NEPA (42 *United States Code* §4321, et seq.) and Council on Environmental Quality regulations (40 CFR Parts 1500–1508), NNSA conducted an early and open public scoping process to identify and determine the scope of issues to be addressed in the LLNL SW/SPEIS. The Notice of Intent invited interested parties to attend public scoping meetings on July 10 and 11, 2002, in Livermore and Tracy, California, respectively. They were encouraged to submit written comments through August 13, 2002. Subsequently, in response to a request from the public, NNSA extended the deadline for submission of written comments to September 16, 2002.

Major Comments Received During Scoping

During the LLNL SW/SPEIS scoping process, NNSA received 250 scoping comment documents from members of the public; interested groups; and Federal, state, and local officials. These included transcripts from the public scoping meetings held in Livermore and Tracy, California. A total of 380 individual comments were identified. These comments requested that the LLNL SW/SPEIS analyze a shutdown of LLNL, conversion of LLNL to an academic laboratory, or conversion of LLNL to an environmental research laboratory. These comments centered on concerns with the LLNL operation of the Plutonium Facility, the NIF, and the classified project known as the Integrated Technology Project. These alternatives were considered as unreasonable; however, the Reduced Operation Alternative represents a significant reduction of Stockpile Stewardship activities at LLNL. SNL/CA is not included in the scope of this LLNL SW/SPEIS.

Some comments received stated that the LLNL SW/SPEIS should analyze the hazards associated with biological materials that might be used in the BioSafety Level-3 (BSL-3) Facility included under the No Action Alternative. A final environmental assessment (DOE/EA-1442) provided NEPA analysis for the construction and operation of this facility including the impacts of normal and accident conditions. A DOE Finding of No Significant Impact (NNSA 2002e), dated December 2002, approved construction and operation of the BSL-3 Facility at LLNL. Therefore, this LLNL SW/SPEIS does not provide additional information beyond what is provided for the BSL-3 Facility in the environmental assessment.

Comments also indicated that the LLNL SW/SPEIS should evaluate the increased levels of melanoma and birth defects in Livermore, California. An investigation of cancer among LLNL employees did not identify any link between employment at LLNL and increased risk of cancer. Another study found that the cancer rates among children and young adults in the city of Livermore do not differ appreciably from elsewhere in Alameda County. Another study found that birth defect rates in Livermore are similar to the overall rates for the state of California. Therefore, an analysis of the rates for melanoma or birth defects in the city of Livermore was not included in this LLNL SW/SPEIS.

EPA's Notice of Availability (NOA) for the Draft LLNL SW/SPEIS, published in the *Federal Register*, initiates a 90-day comment period. After the comment period, NNSA will consider the comments and, as appropriate, make changes to the Draft LLNL SW/SPEIS. NNSA will then

issue a Final LLNL SW/SPEIS. NNSA will consider the Final LLNL SW/SPEIS, along with other information, in making a decision on the continuing operations of LLNL. No sooner than 30 days after EPA publishes its NOA for the Final LLNL SW/SPEIS, NNSA may issue a ROD, which will announce its decision and explain all factors, including environmental impacts, that NNSA considered in reaching its decision. The ROD would make decisions among the three alternatives.

S.5 ALTERNATIVES

The Notice of Intent (67 FR 41224) proposed that the No Action Alternative and Proposed Action be considered in the LLNL SW/SPEIS, as well as the Reduced Operation Alternative that was included to show a range of alternatives. Figure S.5–1 illustrates a qualitative comparison of the level of operation under the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

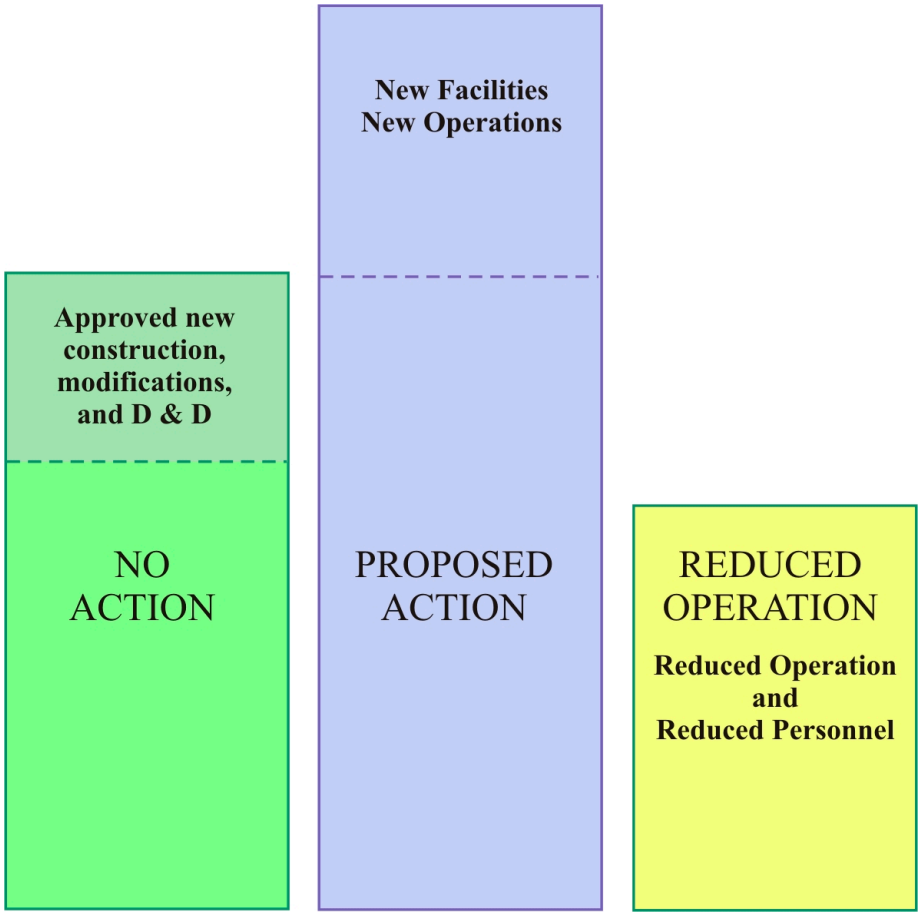


FIGURE S.5–1.—*Qualitative Comparison of Operation Under the No Action Alternative, Proposed Action, and Reduced Operation Alternative*

Some activities at LLNL, defined as balance-of-operations activities, are not expected to change significantly, regardless of which alternative NNSA selects for continued operations. Balance-of-operations analyses were included for each resource area, along with more detailed analyses of specific facilities, to provide the impacts from all operations. Examples of balance-of-operations activities are maintenance, fire hazard management, safety and health enhancements, asbestos management, custodial services, reconfiguration of research facilities and offices, infrastructure projects, and landscaping.

S.5.1 No Action Alternative

The No Action Alternative, required by the Council on Environmental Quality's NEPA implementing regulations (40 CFR Parts 1500–1508), provides a baseline against which the impacts of the Proposed Action and Reduced Operation Alternative are compared. Under the No Action Alternative, LLNL would continue to support major DOE and NNSA programs such as defense programs, environmental management, nuclear nonproliferation, and energy research. The No Action Alternative includes approved interim actions, facility construction, facility expansion or modification, and facility decontamination and decommissioning for which NEPA analysis and documentation already exist. Therefore, the No Action Alternative would be a level of operation for LLNL greater than exists today. The No Action Alternative encompasses existing facilities and operations, and those facilities currently under construction or planned in the near future that are described below.

S.5.1.1 *National Ignition Facility*

Conventional facilities construction of the NIF is complete. Completion of systems leading to full operations in fiscal year (FY) 2008 is in progress. In operation, the NIF would perform fusion ignition, high energy density, and radiation effects experiments in support of stewardship of the Nation's nuclear weapons stockpile and fusion energy and applied sciences objectives. The NIF is designed and constructed for a 30-year operating life. The *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (SSM PEIS) (DOE/EIS-0236) provides NEPA coverage for the construction and operation of this facility. The ROD for the SSM PEIS (61 FR 68014) announced DOE's decision to proceed with NIF construction and operations. The SSM PEIS was amended by the *Supplement Analysis for Use of Hazardous Materials in NIF Experiments* (DOE/EIS-SA236-SA2) and the *National Ignition Facility Final Supplemental Environmental Impact Statement to the Stockpile Stewardship and Management Environmental Impact Statement* (DOE/EIS-0236-S1F).

S.5.1.2 *BioSafety Level 3 Facility*

A BSL-3 Facility would provide for environmentally safe and physically secure manipulation and storage of infectious micro-organisms, many of which are potential bioweapon agents.[1] NNSA's BSL-3 work at LLNL would require efficient, high-quality sample processing for scientific and security reasons. The BSL-3 Facility would be a 1,500-square-foot laboratory and office complex designed to accommodate work on detection and counter-terrorism technologies.

[1] BSL-3 facilities are suitable for work with infectious agents which may cause serious or potentially lethal disease as a result of exposure by the inhalation route.

The facility is scheduled to be constructed and become operational in FY2004. The projected life of this facility is 30 years. An environmental assessment provides NEPA coverage for the construction and operation of this facility. A Finding of No Significant Impact (DOE/EA-1442), dated December 16, 2002, was issued for the BSL-3 Facility at LLNL.

S.5.1.3 *Terascale Simulation Facility*

The Terascale Simulation Facility is a new facility currently under construction in the center of the Livermore Site scheduled to be operational in FY2005. The 253,000-square-foot facility would accommodate parallel processing computer systems of increasing computational power within the same footprint and building space. The facility would be capable of housing the 100-Teraflops-class (trillion operations per second) computers, networks, data, and visualization capabilities necessary to perform the simulations essential to ensuring the safety and reliability of the U.S. nuclear stockpile. The projected lifetime of the building is beyond 30 years. An environmental assessment providing NEPA coverage for this facility was issued in 1999, along with a Finding of No Significant Impact (DOE/EA-1305) issued October 29, 1999.

S.5.1.4 *Superblock Stockpile Stewardship Program Operations*

The LLNL Superblock has several stockpile stewardship programs and operations under the No Action Alternative. These include the Shelf Life Program, Enhanced Surveillance Program, Emergency Response Program, W88 Stockpile-to-Target Sequence Testing Program, and disassembly and feed preparation demonstrations. The SSM PEIS provides NEPA coverage for these operations. The ROD for the SSM PEIS, published December 26, 1996, approved these operations in the LLNL Superblock. Full implementation of these projects would become constrained in the future by the existing administrative limit of 700 kilograms of fuel-grade equivalent plutonium unless a disposition pathway becomes available. NNSA is working on a long-term comprehensive solution for disposal of excess plutonium. Superblock operations would have to be modified or curtailed if a disposition pathway is not established for plutonium.

Superblock

Superblock is comprised of the Building 332 Plutonium Facility, Building 331 Tritium Facility, and Building 334 Hardened Engineering Test Building.

S.5.1.5 *Container Security Testing Facility*

The Container Security Testing Facility is a planned NNSA facility wherein an intermodal cargo container can be introduced, with a variety of contents, and evaluated while stationary, moving laterally, being lifted, or being stacked. Various actual or simulated threat materials that could be illicitly introduced to the U.S. for the purposes of terrorists would be loaded in the container along with other contents. These configurations would then be used to challenge the best available detection methods. The construction would start in FY2005. Facility lifetime is 30 years. DOE determined that this facility was categorically excluded from further NEPA review.

S.5.1.6 *East Avenue Security Upgrade*

The East Avenue security upgrade project administratively controls a portion of East Avenue between South Vasco and Greenville roads. This project would be completed in FY2004. This project provides NNSA with the ability to control access to the roadway by the general public on either a temporary or permanent basis to improve security at LLNL and Sandia National Laboratories/California. This is consistent with DOE's overall security enhancement plan at both institutions. An environmental assessment (DOE/EA-1439) was prepared and a Finding of No Significant Impact was issued in September 2002 for this security upgrade.

S.5.1.7 *Central Cafeteria Replacement*

The replacement for the central cafeteria would be located near the existing Drainage Retention Basin. The 16,300-square-foot facility would accommodate food preparation and dining and can also be used as meeting rooms. Construction has started and the facility is to be operational in FY2004. The life of the facility is beyond 30 years. DOE determined that this facility was categorically excluded from further NEPA review.

S.5.1.8 *International Security Research Facility*

The International Security Research Facility is a new 64,000-square-foot, two-story building currently under construction on the west side of the Livermore Site, adjacent to and north of Building 132 Defense Programs Research Facility. The facility would provide enhancements in information management, optical-fiber networking, storage and retrieval, and real-time communications with NNSA and the intelligence community. The International Security Research Facility would contain capabilities for handling classified information. Construction is ongoing and operation is scheduled to begin in FY2004. The projected life of the facility is beyond 30 years. DOE determined that this facility was categorically excluded from further NEPA review.

S.5.1.9 *Waste Isolation Pilot Plant Mobile Vendor*

In an effort to expedite the removal of transuranic waste from the Livermore Site, a Waste Isolation Pilot Plant (WIPP)-qualified "mobile" contractor would package and ship more than 1,000 drums of transuranic and mixed transuranic waste to the WIPP. This work would be initiated in FY2004. DOE determined that this facility was categorically excluded from further NEPA review.

S.5.1.10 *Modifications, Upgrades, and Decontamination and Decommissioning*

In addition to the new construction described above, a number of facilities at LLNL would undergo modification, upgrades, or decontamination and decommissioning. For the Livermore Site, these would include Plutonium Facility ductwork replacement, Tritium Facility modernization, Engineering Technology Complex upgrade, modifications to the biological safety and security laboratories, roof replacement on a number of facilities, and seismic and safety upgrades on a number of facilities. Nearly 255,000 square feet of floorspace would undergo decontamination and decommissioning. Decontamination and decommissioning facilities are listed in Appendix A, Table A.2.3–2 and Table A.3.3–2. In addition to these projects, three major

road-related projects are planned to improve site security and movement of traffic at the Livermore Site. They are to extend Fifth Street to improve traffic circulation, Westgate Drive widening and improvements, and security upgrades. At Site 300, modifications would include wetlands enhancements, completion of the hookup to the Hetch Hetchy water supply, and modification to an existing building for emergency response training.

Decontamination and Decommissioning

Decontamination and decommissioning may include deactivation, decontamination, decommissioning, or demolition. Deactivation is the process of placing a facility in a stable and known condition including the removal of readily removable hazardous and radioactive materials to ensure adequate protection of the worker, public health and safety, and the environment. Decommissioning takes place after deactivation and includes surveillance and maintenance, decontamination, and/or dismantlement. Decontamination is the removal or reduction of residual radioactive and hazardous material. Demolition is the destruction and removal of facilities or systems from the construction site.

S.5.2 Proposed Action

The Proposed Action would result in an increase in LLNL operations to support reasonably foreseeable mission requirements. This includes the expansion or modification of current facilities and construction of new facilities.

S.5.2.1 *Use of Proposed Materials on the National Ignition Facility*

In 1996, the programmatic impacts of conducting DOE/NNSA's Stockpile Stewardship and Management Program at all NNSA sites were evaluated in the SSM PEIS. The SSM PEIS ROD documented the decision to construct and operate the NIF at LLNL. In 1997, the Natural Resources Defense Council (NRDC) and 39 other organizations brought suit against DOE in NRDC v. Peña, Civ. No. 97-936(SS) (D.D.C.), challenging the adequacy of the SSM PEIS, partially on the basis that DOE should have analyzed conducting experiments on the NIF using plutonium, other fissile materials, fissionable materials, and lithium hydride. DOE maintained that the use of these materials was not reasonably foreseeable at that time. In August 1998, the judge in the lawsuit issued a Memorandum Opinion and Order that dismissed the plaintiffs' case. The Memorandum Opinion and Order provided in Paragraph 6 that:

> No later than January 1, 2004, DOE shall (1) determine whether any or all experiments using plutonium, other fissile materials, fissionable materials other than depleted uranium (as discussed in the Supplement Analysis for the Use of Hazardous Materials at the NIF Experiments, A.R. doc. VIIA-12), lithium hydride, or a Neutron Multiplying Assembly (NEUMA), such as that described in the document entitled Nuclear Weapons Effects Test Facilitization of the National Ignition Facility (A.R. doc VII.A-4) shall be conducted at the NIF; or (2) prepare a Supplemental SSM PEIS, in accordance with DOE NEPA regulation 10 C.F.R.1021.314, analyzing the reasonably foreseeable environmental impact of such experiments. If DOE undertakes the action described in subpart (2) of this

> paragraph, DOE shall complete and issue the Supplemental SSM PEIS and the Record of Decision based thereon within eighteen (18) months after issuing a notice of intent to prepare the Supplemental SSM PEIS.

In November 2002, the NNSA Deputy Administrator for Defense Programs approved proposing experiments on the NIF using plutonium, other fissile materials, fissionable materials, and lithium hydride. NNSA has chosen to use the LLNL SW/SPEIS as the mechanism for complying with the court's instruction to prepare a supplemental SSM PEIS. The inclusion of this supplemental SSM PEIS in the LLNL SW/SPEIS ensures timely analysis of these proposed experiments within the environmental impacts being evaluated for the continued operation of LLNL. In any ROD to be issued, NNSA will address decisions on the use of any or all of these proposed materials in NIF experiments within the context of continuing LLNL operations. During the LLNL SW/SPEIS scoping period, comments were received from members of the public and nongovernment organizations stating their concerns and objections to NIF operations.

The evaluation of the reasonably foreseeable environmental impacts of performing experiments with these proposed materials is contained in Appendix M, and the results of the analysis are reflected in the comparison of impacts presented in Appendix M, Section M.5. These results show that the primary impacts from use of the proposed materials would be increased low-level waste and increased worker exposure to radiation. The projected increase in waste would be approximately 50 percent of the total volume estimated under the No Action Alternative. The increase in worker exposure was conservatively estimated and is within the range normally accepted for radiological work and is below both DOE regulatory limits and those enforced through the LLNL Environmental Safety and Health Manual.

S.5.2.2 *Increased Administrative Limits for Plutonium in the Superblock*

In the 1992 LLNL EIS/EIR, a primary goal of LLNL was to reduce the plutonium inventory to 200 kilograms through offsite disposition of significant portions of the inventory. This goal was partially achieved by relocating approximately half of the excess material offsite; however, DOE facilities were unable to accept all materials identified to be shipped. In 1999, DOE prepared a supplement analysis (DOE/EIS-0157-SA-01) that reexamined future program requirements at LLNL and identified the need to modify certain radioactive material limits established in the 1992 LLNL EIS/EIR. The 1999 supplement analysis confirmed the need for an administrative limit of 700 kilograms of plutonium to provide for continued LLNL support of the Stockpile Stewardship Program.

Administrative Limits

Administrative limits are defined as the maximum amount of the referenced material allowed at a facility. The actual inventory for some materials at LLNL for which there is an administrative limit may be classified.

NNSA continues to rely on LLNL to meet its Stockpile Stewardship Program mission objectives. These objectives include campaigns relating to pit manufacturing and certification, advanced radiography, dynamic materials testing, materials shelf life experiments, and enhanced surveillance research, which contribute to the need for long-term storage of plutonium. Further details on these programs are included in Chapter 3, Section 3.1, in the Stockpile Stewardship Program section. These NNSA-assigned campaigns and programs require continued and

increasing use of plutonium. NNSA continues to work on a solution for disposal of plutonium, but no pathway for LLNL to dispose of excess plutonium currently exists, requiring an increase in the plutonium administrative limits. Therefore, NNSA proposes to increase the administrative limit for fuel-grade-equivalent plutonium to 1,500 kilograms from the existing 700 kilograms. The limit for enriched uranium would remain unchanged at 500 kilograms. During the LLNL SW/SPEIS scoping period comments were received from members of the public and nongovernment organizations stating their concerns that NNSA had not reduced the amount of excess plutonium stored at the Superblock, and that the environment and population surrounding LLNL was at considerable risk to accidents or terrorist acts involving the plutonium inventory.

The Superblock plutonium inventory is stored in robust vaults and no accident scenario involving the material in the vaults is considered reasonably foreseeable. Terrorist acts and Superblock security are considered in the LLNL SW/SPEIS. The information on these accidents is provided in classified or official use only documents. The accidents discussed in the LLNL SW/SPEIS bound the environmental impacts associated with the proposed higher plutonium inventory limit.

S.5.2.3 *Conduct Integrated Technology Project in the Plutonium Facility*

In the Notice of Intent (67 FR 41224) and at the public scoping meetings for the LLNL SW/SPEIS, NNSA identified a proposed project that might be restricted to a classified appendix that would not be publicly available. During the LLNL SW/SPEIS scoping period, comments were received from members of the public and nongovernment organizations stating their concerns and objections that the LLNL SW/SPEIS would include a classified appendix not available for public review. After completing a classification review, it was decided that a classified appendix was not required. Although certain information remains classified, a detailed description of the project's purpose and need, material processing, and the environmental impacts of the project are included in the LLNL SW/SPEIS in Appendix N, Integrated Technology Project (ITP).

Science-Based Stockpile Stewardship and Management Program (SBSSMP) experiments are needed to increase the understanding of the complex physics and behavior of materials in nuclear weapons and ultimately to certify the efficacy of the Nation's aging stockpile. Accurate, theoretical, scientific, and experimental data are required to validate the computer models of the weapon performance. SBSSMP experiments involve the use of both surrogate and actual materials that would be used in the weapon system.

The Advanced Materials Program involves the development and demonstration of the Atomic Vapor Laser Isotope Separation (AVLIS) technology. The ITP is a follow-on activity to the Advanced Materials Program to produce material to augment the current inventory of special nuclear materials (e.g., plutonium and enriched uranium) for use in SBSSMP experiments. The ITP would not proceed until the Advanced Materials Program demonstrations are complete. The expected ITP start would be FY2008. The ITP is one of the bases for the increase in the plutonium material-at-risk limit from the current 20 kilograms in any room of the Plutonium Facility to 60 kilograms of fuel-grade equivalent plutonium in each of two rooms. This material-at-risk increase would enable LLNL to pursue multiple Stockpile Stewardship Program missions simultaneously. Details of the Advanced Materials Program and ITP are presented in Appendix N.

S.5.2.4 *Increased Material-at-Risk Limit for the Plutonium Facility*

The Proposed Action would increase the plutonium material-at-risk limit from 20 to 60 kilograms of fuel-grade equivalent plutonium in each of two rooms of the Plutonium Facility. This increase is needed to meet future Stockpile Stewardship Programs such as ITP and the casting of plutonium parts. These activities support campaigns for advanced radiography, pit manufacturing, and certification programs. If the material-at-risk is increased, the bounding Plutonium Facility accident consequences to the population surrounding LLNL would increase from an aircraft crash resulting in 5.82×10^{-2} latent cancer fatalities (LCFs) per year under the No Action Alternative to an unfiltered fire involving 60 kilograms fuel-grade equivalent plutonium resulting in 1.68×10^{-1} LCFs per year under the Proposed Action.

Material-at-Risk

A material-at-risk limit is defined as the maximum amount of the referenced material that is involved in the process and thus at risk in the event of a postulated accident. Material locked in secure storage is not considered material at risk.

S.5.2.5 *Increase of Tritium Facility Material Limits*

The Proposed Action would increase the Building 331 Tritium Facility tritium administrative limit from 30 to 35 grams and the material-at-risk at a single workstation from 3.5 to 30 grams. These increases are needed to support future planned Stockpile Stewardship Program activities such as the high-energy density physics target fill and the Test Readiness Program. The activities support the campaign for inertial confinement fusion and high yield and the readiness to resume testing, if directed. Analysis in the LLNL SW/SPEIS shows the increased material-at-risk would result in higher consequences from an aircraft crash into the Tritium Facility. This accident has an annual frequency of 1.53×10^{-6} and would result in lower consequences (i.e., a lower number of LCFs) than other radiological accidents under all alternatives.

S.5.2.6 *National Ignition Facility Neutron Spectrometer*

A neutron spectrometer would be constructed and operated as part of the NIF core facility diagnostics capability. The neutron spectrometer would provide a sensitive and accurate measure of the neutrons generated in experiments. The construction would not start before FY2008 and when completed, the neutron spectrometer would become part of the NIF operational facility. The neutron spectrometer would be installed in a specially constructed concrete shaft from the target chamber to a point 52 feet below the surface. The neutron spectrometer would reside at the end of the shaft and contain solid plastic scintillation sheets layered between sheets of lead, with a total mass of approximately 20 tons.

S.5.2.7 *High Explosives Development Center Project*

The High Explosives Development Center Project would construct new buildings and renovate the current complex located in the south-central section of Site 300. The construction and renovation would be completed and the center would become operational in FY2013. The lifetime of new construction would be beyond 30 years. This project would consolidate operations currently conducted in four existing buildings. Operations and equipment would include mechanical pressing; vertical temperature-controlled mixers for mixing explosives,

binders, plasticizers, and other compounds; a 50-cubic-inch deaerator loader for processing the extrudable explosives; vacuum ovens for drying materials; mills for reducing particle sizes; a loader for processing extrudable explosives; blenders and kettles for preparing explosives; an environmental chamber, and associated control and interlock modules; electrical resistance measurement devices; a gas-sampling oven; and a computer system.

S.5.2.8 *Energetic Materials Processing Center Replacement*

Existing energetic materials processing facilities and equipment at Site 300 are becoming obsolete and inadequate to meet the requirements of LLNL programs. This project would move the operations currently conducted in Building 805 High Explosives Assembly/Machining, Building 806 High Explosives Machine Shop, Building 807 High Explosives Machining, Buildings 810A-C High Explosives Assembly Facility, Building 813 Change House, and 823A-B LINAC Radiography Facility into a new, modern facility. The Building 810A-C complex would be retained for some assembly operations currently conducted there and for waste package operations currently conducted in Building 805. The proposed Energetic Materials Processing Center would be located at the Site 300 process area, in the vicinity of the Magazine 21-24 loop. The project would include the construction of a new 40,000-square-foot processing facility and four magazines: two capable of storing 1,000 pounds of high explosives and two capable of storing 500 pounds of explosives. The center would house explosives machining, pressing assembly, inspection, and radiography. Additionally, the facility would provide an inert machine shop, offices, inert storage, showers/changing room facilities, equipment rooms, and miscellaneous support spaces. The construction would be completed and operation begun in FY2008. The life of the new Energetic Materials Processing Center would be beyond 30 years.

S.5.2.9 *Materials Science Modernization Project*

The Materials Science Modernization Project is an upgrade of existing facilities in the southwest quadrant of the Livermore Site. A modern materials research complex would provide LLNL with infrastructure in the areas of materials fabrication, characterization, and testing relevant to LLNL's national security mission. The facility would be engineered to conduct precision experiments and precision fabrication of designer materials to a level not currently available. The facility construction would be completed and begin operations in FY2013. The lifetime of the facility would be beyond 30 years.

S.5.2.10 *Chemical and Biological Nonproliferation Program Expansion*

NNSA proposes to perform research and development activities to develop a variety of biodetector technologies in Building 132S NAI/Physics Facility, and Building 153 Microfabrication Laboratory at the Livermore Site. Two classes of detectors would require DNA sequences or antibodies to identify and characterize biological pathogens. Planned activities would include fluid manipulation experiments using LLNL equipment for optical or flow cytometer analysis. This activity would be performed no sooner than FY2005.

Other experiments would evaluate the performance of an electrophoresis detection system for applications involving trace detection of biological warfare agents and precursors. Lasers and an ultra-violet-visible-near-infrared spectrometer would also be used in the laboratories.

S.5.2.11 *Petawatt Laser Prototype*

The proposed petawatt laser prototype would be installed and operation would begin no earlier than FY2005. The petawatt laser is a short-pulse, high-power laser that can be generated by modifying existing solid state glass laser technology developed at LLNL and other laboratories. The first petawatt laser prototype was demonstrated in Building 391 Inertial Confinement Fusion Laser Facility at the Livermore Site and then dismantled when the NOVA laser facility was shut down. To continue this area of research, a second petawatt prototype is proposed for installation and operation in Building 381.

S.5.2.12 *Consolidated Security Facility*

The proposed Consolidated Security Facility would result in the physical consolidation of security services to improve functionality, efficiency, and effectiveness. The scope of work would include the construction of a multipurpose security structure of approximately 50,000 square feet at the Livermore Site. The facility would contain offices, vaults, conference and meeting rooms, interview rooms, shops, and specialized technical support areas. The facility would be operational in FY2012 and would operate for 30 years. The new facility would be collocated with the existing Security Department Administration Facility.

S.5.2.13 *Waste Management*

Under the Proposed Action, waste management activities would change to accommodate increased waste generation and to improve overall operational methods. These proposed changes would include modifying the permit status of existing facilities to allow different types of waste to be stored or treated, e.g., obtaining hazardous waste facility permits for areas now used for nonhazardous or radioactive waste management, and to improve operational flexibility and efficiencies, e.g., relocating permitted waste treatment units from old facilities to newer facilities.

S.5.2.14 *Building 625 Waste Storage*

The amount of transuranic waste stored in Building 625 Radiological and Hazardous Waste Storage Facility would be increased to consolidate waste from LLNL facilities planned for decontamination and decommissioning and to accept drums from facilities prior to shipment to WIPP. The maximum curie limit under the Proposed Action would be equivalent to an array of drums where one drum contains 60 plutonium-equivalent curies and the other surrounding drums contain 12 plutonium-equivalent curies. Possible configurations of drums would be limited to those where the consequences of the bounding accident for Building 625 Radiological and Hazardous Waste Storage Facility analyzed in Appendix D would not be exceeded.

S.5.2.15 *Direct Shipment of Transuranic Wastes from the Superblock*

NNSA is proposing to develop the capability to load transuranic waste into pipe overpacks in the Superblock, beginning in FY2005. These pipe overpacks would allow for significantly higher

actinide loading into each drum for disposal at WIPP. The proposed pipe overpack would allow up to 80 plutonium-equivalent curies per drum and up to 200 fissile-gram equivalents. The pipe overpack provides a way for LLNL to dispose of waste, such as plutonium with high americium levels. The pipe overpack can be loaded and stored into Transuranic Package Transporter-II (TRUPACT-II) shipping containers, and shipped from Superblock to WIPP without increasing the nuclear material inventory or hazard levels in other LLNL facilities. The TRUPACT-II shipping containers would be loaded to the limits of the WIPP waste acceptance criteria.

S.5.2.16 *Berkeley Waste Drums*

DOE/NNSA is proposing that LLNL accept up to 14 drums of low-activity transuranic and mixed transuranic waste from the Lawrence Berkeley National Laboratory. All liquids would be solidified and corrosive mixed transuranic waste would be neutralized before shipment to LLNL. DOE would use mobile vendors to certify the waste for shipment to the WIPP. This activity would be performed no sooner than FY2005. This one-time shipment is proposed in order to remove legacy waste from Lawrence Berkeley National Laboratory without creating a WIPP-certified packaging operation. The packaged waste would then be shipped directly to WIPP in a single TRUPACT-II container.

S.5.2.17 *Building Utilities Upgrades*

Within the next 10 years, many of LLNL's key facilities will be past their expected life, severely outdated, and code deficient. The proposed building utilities upgrade project would provide state-of-the-art technological upgrades and reduce maintenance backlog items to selected mission critical laboratory and office buildings at the Livermore Site. Examples of technological upgrades include expanding building network capability for computing environments; rewiring facilities for high-speed networking; replacing secondary electrical distribution system components such as transformers, panelboards, wiring, lighting systems, and power conditioning equipment for sensitive computing and instrumentation equipment; and increasing capacities of mechanical systems to handle increased cooling requirements for computing and laboratory environments.

S.5.2.18 *Building Seismic Upgrades*

Executive Order 12941, *Seismic Safety of Existing Federally Owned or Leased Buildings*, requires that all federally owned and leased buildings that do not meet current seismic design and construction standards should be identified and mitigated if necessary. There were 108 buildings identified at LLNL as having potential seismic deficiencies relative to current codes. The deficiencies of these buildings have been prioritized based on a scoring approach that incorporates building vulnerability, failure consequence, and mission essential factors. This project includes designing and installing seismic upgrades needed to bring these 108 buildings into compliance with applicable seismic design and construction standards.

S.5.2.19 *Decontamination and Decommissioning*

LLNL would decontaminate and decommission excess facilities totaling approximately 820,000 square feet of floorspace, including approximately 255,000 square feet under the No Action Alternative. Decontamination and decommissioning facilities are listed in Appendix A, Tables

A.2.3–2 and Table A.3.3–2. The decontamination and decommissioning process includes performance of surveillance, maintenance, and minor facility deactivation to ensure facilities remain in stable condition pending their final disposition. Facility deactivation may include disposition of stored or surplus materials that may be potentially contaminated. These materials and equipment are designated as legacy items, meaning there is no identified sponsor or program. Most legacy materials are materials that were placed in storage or set aside for a future need that never materialized.

S.5.2.20 *Increased Administrative Limit for Highly Enriched Uranium for Building 239*

Building 239, Radiography Facility, contains equipment for performing nondestructive evaluations. Facility operations involving radiography are carried out in the basement of the building. The Proposed Action would increase the Building 239 HEU administrative limit from 25 to 50 kilograms to support Stockpile Stewardship Program activities. The use of 50 kilograms of HEU is analyzed in Appendix D and is bounded by the consequences of an accident involving the use of plutonium in Building 239.

S.5.3 Reduced Operation Alternative

The Reduced Operation Alternative includes reductions in LLNL operations supporting the NNSA Stockpile Stewardship Program. A commensurate reduction in scientific and institutional support is part of the analysis. The Reduced Operation Alternative maintains full operational readiness for NNSA facilities and operations, but does not represent the level of operation required to fulfill the Stockpile Stewardship Program mission assigned to LLNL for the foreseeable future. However, LLNL operations would not be reduced beyond those required to maintain safety and security activities, such as maintaining nuclear materials, explosives, or other hazardous materials in storage or use.

The Reduced Operation Alternative is broadly defined as approximately a 30-percent scaledown from the Stockpile Stewardship Program operations under the No Action Alternative. This includes reduction in support activities in addition to direct program cuts. This alternative considers and analyzes reasonable proposals provided by the public for the reduction or cessation of specific operations to reduce adverse environmental impacts.

As stated in the Notice of Intent for this LLNL SW/SPEIS (67 FR 41224), NNSA will not consider the complete closure and decontamination and decommissioning of the Livermore Site or Site 300, as this is inconsistent with the LLNL mission defined by NNSA. Though the Reduced Operation Alternative includes reductions in specific project areas, it maintains existing LLNL capabilities and infrastructure. This alternative would affect planned operations and activities, new facilities, and decontamination and decommissioning of structures described in Section S.5.1 under the No Action Alternative. The changes to planned operations and activities under the Reduced Operation Alternative are discussed in the following sections.

S.5.3.1 *Integrated Technology Project*

The Advanced Materials Program demonstration activities would be discontinued. No laser separation of isotopes of surrogate material or plutonium would take place. The Plutonium Facility Engineering Demonstration System equipment would remain in its current status of cold

standby. These changes would reduce specific environmental impacts such as transuranic waste generation and worker dose.

S.5.3.2 *National Ignition Facility Operations Reduction*

Annual yield from NIF ignition experiments would decrease by approximately 30 percent under the Reduced Operation Alternative, from 1,200 megajoules per year to 800 megajoules per year. The individual experiment yields would remain at up to 20 megajoules (45 megajoules maximum credible yield), but the total number of experiments with high yield would be reduced and the annual tritium throughput would be reduced by approximately 250 curies. The evaluation of reasonably foreseeable environmental impacts of performing experiments on the NIF is contained in Appendix M.

S.5.3.3 *Reduce Number of Engineering Demonstration Units*

LLNL fabricates engineering demonstration units to demonstrate the acceptability of different nuclear weapons pit technologies for several weapons systems in the U.S. stockpile. Engineering demonstration units are used to recapture the technology needed to manufacture pits of various types and to develop and demonstrate pit fabrication processes. Under the Reduced Operation Alternative, NNSA proposes only to fabricate engineering demonstration units for half of the pits under the No Action Alternative in the U.S. stockpile. These changes would reduce specific environmental impacts such as transuranic waste generation and worker dose.

S.5.3.4 *Reduce Pit Surveillance Efforts*

LLNL performs surveillance activities for pits in the active and inactive U.S. stockpiles. Pit surveillance activities include determination of important pit characteristics through destructive examination of the pits to assess suitability for safety and performance. Under the Reduced Operation Alternative, NNSA proposes to perform pit surveillance activities on LLNL-designed pits only, a reduction of 50 percent from the No Action Alternative. These changes would reduce specific environmental impacts such as transuranic waste generation and worker dose.

S.5.3.5 *Reduce the Number of Subcritical Assemblies*

LLNL fabricates subcritical assemblies for the U.S. weapons testing program. Under the Reduced Operation Alternative, NNSA would fabricate subcritical assemblies for the LLNL testing program only. This nearly 50-percent reduction in operations from the No Action Alternative would reduce specific environmental impacts such as transuranic waste generation and worker dose.

S.5.3.6 *Terascale Simulation Facility Operations Reduction*

Under the Reduced Operation Alternative, NNSA proposes to operate the Terascale Simulation Facility computer at 60-percent capacity versus 100-percent capacity under the No Action Alternative. These changes would reduce energy requirements for the facility from 25 megawatts to 15.3 megawatts, but would not meet the full Stockpile Stewardship Program mission. However, by maintaining the facility in full operational readiness in terms of hardware, software, and operations staff, the Terascale Simulation Facility could be ramped back to full capacity in a

very short time. Therefore, the Reduced Operation Alternative would include no reduction in staff.

S.5.3.7 *Reduce Number of Hydroshots at Site 300*

NNSA proposes fewer detonation experiments containing tritium at Site 300 firing tables or the Building 801 Contained Firing Facility, resulting in a reduction in the maximum annual tritium emissions to 150 curies versus 200 curies under the No Action Alternative. Other types of experiments, e.g., environmental testing of explosives assemblies, would continue unchanged from the No Action Alternative in the number of experiments and amounts of tritium. The programmatic impacts of this alternative would include less confidence in the evaluation of nuclear weapons systems.

S.6 COMPARISON OF ALTERNATIVES

A comparison of the environmental consequences for the continued operation of LLNL is provided in Table S.6–1 included at the end of this Summary. At this time, NNSA has not identified a preferred alternative among the three alternatives. The table compares the potential impacts to environmental resources associated with the continued operation of LLNL under Baseline (2002) conditions, the No Action Alternative, the Proposed Action, and the Reduced Operation Alternative. The data in Table S.6–1 includes data for both the construction and operational phases of the Proposed Action at LLNL.

The major impacts occur in three areas: materials and waste management, human health and safety, and radiological accidents. These impacts are significant in both an absolute level and relative levels among the alternatives.

There are no major differences in the environmental impacts among the alternatives in land uses and applicable plans, prehistoric and historic cultural resources, geology and soils, nonradiological air quality, water, and noise.

For other resource areas evaluated, the analyses indicate that there maybe some environmental impact differences, or based on scoping comments are of greater interest to the public. Resource areas falling into these categories include: socioeconomic characteristics and environmental justice, community services, aesthetics and scenic resources, biological resources, radiological air quality, traffic and transportation, utilities and energy, and site contamination. These are discussed below in addition to materials and waste management, human health and safety, and radiological accidents.

S.6.1 Socioeconomics Characteristics and Environmental Justice

The socioeconomic impact for continued operations at LLNL would vary under the No Action Alternative, Proposed Action, and Reduced Operation Alternative and would primarily affect Alameda and San Joaquin counties. For the Livermore Site and Site 300, worker population would increase for both counties under the No Action Alternative and Proposed Action. For the No Action Alternative, LLNL employment would increase by 300 workers resulting in 10,650 workers at the Livermore Site and 250 workers at Site 300. For the Proposed Action, 11,150 workers would be required at the Livermore Site and 250 workers would be required at Site 300.

For the Reduced Operation Alternative, worker population would be 9,770 at the Livermore Site and 230 at Site 300. The number of housing units affected would be proportional to the changes in worker population in both counties.

S.6.2 Community Services

Within the umbrella of community services, the only notable impact would be to the generation and disposal of nonhazardous solid waste. For the No Action Alternative, it is estimated that 4,600 metric tons per year of nonhazardous solid waste would be generated at the Livermore Site. Under the Proposed Action, the Livermore Site would generate 4,900 metric tons per year of nonhazardous solid waste. Under the Reduced Operation Alternative, nonhazardous solid waste generation at the Livermore Site would be reduced to 4,200 metric tons per year. Site 300 nonhazardous waste generation would be 208 metric tons per year under both the No Action Alternative and the Proposed Action. Under the Reduced Operation Alternative, Site 300 nonhazardous solid waste generation would be reduced to 191 metric tons per year.

S.6.3 Aesthetics and Scenic Resources

Changes to aesthetics would be similar under the No Action Alternative, Proposed Action, and Reduced Operation Alternative at the Livermore Site and at Site 300. The offsite views of the Livermore Site would change due to the completion of the East Avenue security upgrade project, the International Security Research Facility, and the NIF. At Site 300, the proposed changes would have little or no impact on aesthetics and scenic resources. Changes would be consistent with the existing character of LLNL.

S.6.4 Biological Resources

As a result of initial consultation with the U.S. Fish and Wildlife Service (USFWS), it was identified that LLNL operations could potentially affect six federally listed endangered, threatened, proposed threatened, or candidate species due to potential disturbance of habitat: the California red-legged frog, California tiger salamander, San Joaquin kit fox, large-flowered fiddleneck, valley elderberry longhorn beetle, and Alameda whipsnake. All of these species exist at Site 300 with only one species, the California red-legged frog, at the Livermore Site. Land disturbance in undeveloped zones at the Livermore Site would total 462,000 square feet under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Potential impacts to habitat would be the same under the No Action Alternative, Proposed Action, and Reduced Operation Alternative at the Livermore Site, with no impacts to the California red-legged frog. Jurisdictional wetlands along Arroyo Las Positas could be affected if the Environmental Restoration Program terminated the discharge of treated water. For Site 300, the impacts are the same under the No Action Alternative, Proposed Action, and Reduced Operation Alternative, with potential impacts to threatened, proposed threatened, or candidate species. There would be limited land disturbance in undeveloped areas except for 40,000 square feet required by the Energetic Materials Processing Center under the Proposed Action. NNSA will complete necessary Biological Assessments and obtain Biological Opinions from USFWS on any identified impacts on critical habitat(s).

S.6.5 Radiological Air Quality

There are differences among the No Action Alternative, Proposed Action, and Reduced Operation Alternative regarding the potential radiological air quality impacts, all of which would be low. The maximally exposed individual (MEI) would be located due east of the NIF, once the NIF becomes operational. The MEI dose for the Livermore Site under the No Action Alternative would be 0.1 millirem per year. This compares to an MEI dose of 0.13 millirem per year under the Proposed Action and 0.09 millirem per year under the Reduced Operation Alternative. The population dose for the Livermore Site would be 1.8 person-rem per year under the No Action Alternative, Proposed Action, and the Reduced Operation Alternative. At Site 300, the MEI would be located west-southwest of Firing Table 851, the only outdoor firing facility that would use tritium. The MEI dose at Site 300 would be 0.055 millirem per year under the No Action Alternative and the Proposed Action, and 0.054 under the Reduced Operation Alternative. The population dose for Site 300 would be 9.8 person-rem per year under the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

S.6.6 Traffic and Transportation

Traffic at the Livermore Site would be directly affected by the change in worker population under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Under the No Action Alternative, traffic would increase slightly as a result of the increase in worker population by 290 workers (22,600 total vehicle trips per day). Traffic volume would increase further under the Proposed Action due to the addition of 500 workers (23,700 total vehicle trips per day). Traffic volume would decrease under the Reduced Operation Alternative due to the loss of 880 workers at the Livermore Site (21,000 total vehicle trips per day). At Site 300, the impact to traffic due to changes in the number of workers would be negligible under the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

Transportation of radioactive materials offsite would increase under the No Action Alternative and Proposed Action, primarily as a result of programmatic agreements. Under the No Action Alternative, modeling of the offsite shipments yields a collective dose of 5.9 person-rem per year. Under the Proposed Action, the modeling of offsite shipments yields a collective dose of 6.2 person-rem per year. This would decrease for the Reduced Operation Alternative to 4.9 person-rem per year. The potential cancer risk as a result of shipments of radioactive materials from the Livermore Site would be low under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The calculated potential LCF under the No Action Alternative and Proposed Action would be 4×10^{-3}. Under the Reduced Operation Alternative, the LCF would fall to 3×10^{-3}. Under the Proposed Action, the amount of explosive materials transported to Site 300 would increase slightly. Under the Reduced Operation Alternative, transportation of these materials would decrease.

S.6.7 Utilities and Energy

Under the No Action Alternative, the projected peak electrical demand at LLNL would be 82 megawatts and the annual total use would be 446 million kilowatt-hours. Peak demand is a measure of the maximum electrical load being used by LLNL at a single moment in time, usually on the hottest day of the year. In 2004, the State of California projects the statewide peak

demand will be 53,464 megawatts and projects a growth in peak demand of about 2.4 percent per year. LLNL's projected peak demand in 2004 would be 0.1 percent of the total State demand. There would be virtually no change in the peak demand under the Proposed Action and the Reduced Operation Alternative. Annual electric use among the No Action Alternative, Proposed Action, and Reduced Operation Alternative would be 446, 442, and 371 million kilowatt-hours, respectively. The State currently projects an adequate supply/demand balance through 2008, but has not made supply projections beyond that year. LLNL's essentially flat projection of electrical demand and usage from 2004 to 2014 reflects an ongoing commitment to energy conservation. The decrease in electricity usage from the No Action Alternative to the Proposed Action is due to a cumulative reduction of LLNL floorspace under the Proposed Action. For the same reason the Livermore Site would experience a decrease in water consumption and sewage discharges under the Proposed Action.

S.6.8 Materials and Waste Management

Waste generation for both routine wastes and nonroutine wastes would be higher under the Proposed Action than under the No Action Alternative or Reduced Operation Alternative, primarily due to differences in the operation of the ITP and the NIF. Routine waste is generated from the normal operation of facilities. Nonroutine waste is generated from construction, decontamination and decommissioning, and environmental restoration. Notable differences in the amount of waste generated include routine low-level waste at 200 cubic meters per year under the No Action Alternative, 340 cubic meters per year under the Proposed Action, and 180 cubic meters per year under the Reduced Operation Alternative. Differences for routine transuranic waste are 50 cubic meters per year under the No Action Alternative, 60 cubic meters per year under the Proposed Action, and 45 cubic meters per year under the Reduced Operation Alternative.

Differences in waste generation cover all major waste categories across the No Action Alternative, Proposed Action, and Reduced Operation Alternative, with generation the highest under the Proposed Action and the lowest under the Reduced Operation Alternative. These quantities are summarized in Table S.6–1. Levels of waste generation are within the capacities for treatment, transportation, or storage either onsite or at waste repositories such as the WIPP.

S.6.9 Human Health and Safety

The occupational (involved) worker ionizing radiation dose was 28 person-rem per year in 2002. Under the No Action Alternative, the dose would increase to 90 person-rem per year. The increase includes a worker dose of 15 person-rem per year for NIF operations and a projected increase from approximately 26 person-rem per year to 72 person-rem per year due to a higher level of operation associated with approved projects for which NEPA analysis has been completed. These projects include stockpile stewardship and the packing in the Building 332 Plutonium Facility of excess plutonium in canisters certified for a 50-year shelf life. The Proposed Action would increase occupational worker dose to ionizing radiation to approximately 125 person-rem per year, including 32 person-rem per year from the ITP and approximately 5 person-rem per year from the use of the proposed materials in the NIF. Under the Reduced Operation Alternative, worker dose to ionizing radiation would be approximately 38 person-rem per year. LCFs calculated from these exposures would be 5.4×10^{-2}, 7.5×10^{-2}, and 2.3×10^{-2}

per year of exposure under the No Action Alternative, Proposed Action, and Reduced Operation Alternative, respectively.

The ionizing radiation dose to the general public was 0.5 person-rem per year from the Livermore site and 2.5 person-rem per year from Site 300 in 2002. The population dose to the general public under all three alternatives would increase to 1.8 person-rem per year from the Livermore Site and 9.8 person-rem per year from Site 300. The corresponding LCFs for all three alternatives would be 1.1×10^{-3} from the Livermore Site and 5.9×10^{-3} from Site 300. The dose from both sites is within the envelope of doses seen within the past 5 years.

S.6.10 Site Contamination

Areas of soil and groundwater contamination exist at the Livermore Site and Site 300. These are primarily the result of past waste management practices, some of which took place during the 1940s when the Livermore Site was a naval air station. Although there is no immediate or long-term threat to human health from this contamination, there is localized degradation of groundwater. Remediation systems are currently operating to reduce the concentrations and extent of contamination. Appropriate cleanup measures implemented with the concurrence of regulators would continue regardless of the action selected.

Increased site activities under the No Action Alternative or Proposed Action could increase the likelihood of soil contamination due to increased levels of activity and corresponding increases in the potential for accidental releases. However, minimal deposition of contaminants is expected because of spill prevention and control procedures. Under the Reduced Operation Alternative, a lower likelihood of soil contamination would be expected.

S.6.11 Accidents

The LLNL SW/SPEIS discusses accidents for all major facilities. Appendix D has detailed information about potential accidents at LLNL facilities. Assessment of the impacts of aircraft crashes into LLNL facilities was not presented in the 1992 LLNL EIS/EIR. It is being included in this LLNL SW/SPEIS because of advances in DOE/NNSA's methods for performing safety analyses for nuclear and radiological facilities. Potential LCFs in the offsite population for median meteorological conditions were used to identify bounding radiological accidents for nuclear material handling and waste management operations.

The bounding radiological accident for nuclear material handling under the Proposed Action is an unfiltered fire involving radioactive material in the Building 332 Plutonium Facility resulting in 0.168 LCF within the offsite population. The calculated annual frequency for this accident is 3.9×10^{-7} which is less frequent than once in a million years. Under the No Action and Reduced Operation Alternatives the bounding accident for nuclear material handling in the Building 332 Plutonium Facility is a single piston engine aircraft accident resulting in 0.058 LCF within the offsite population.

The bounding radiological accident for waste management operations is a single engine piston aircraft accident at the Building 625 Radiological and Hazardous Waste Storage Facility that would result in 1.21 LCFs within the offsite population under the Proposed Action. The number of LCFs calculated for the same accident under the No Action and Reduced Operation

Alternatives is 0.397 LCF. The calculated annual frequency of an aircraft crashing into the building structure with subsequent gasoline pool fire is 6.1×10^{-7}, which is less frequent than once in a million years. The aircraft accident scenario evaluated at the Building 625 Radiological and Hazardous Waste Storage Facility is very conservative in that it assumes the facility is loaded to its physical limit with containers of transuranic waste loaded to their maximum curie limit. The maximum curie limit under the Proposed Action is equivalent to an array of drums where one drum contains 60 plutonium-equivalent curies and the other surrounding drums contain 12 plutonium-equivalent curies. It is planned that by the end of 2005, all legacy transuranic waste drums in Building 625 Radiological and Hazardous Waste Storage Facility would be shipped to WIPP. It is projected that waste shipments to WIPP would be completed before Building 625 Radiological and Hazardous Waste Storage Facility and other LLNL transuranic waste storage facilities are fully loaded. Therefore, the consequences discussed above are associated with what would be considered a maximum peak inventory in the Building 625 Radiological and Hazardous Waste Storage Facility that would be allowed under the facility's operational procedures but may never occur.

Bounding accident scenarios for chemical, explosive, and biological accidents are the same among the No Action Alternative, the Proposed Action, and the Reduced Operation Alternative, and are unlikely to result in fatalities to the general public.

TABLE S.6–1.—*Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Land Uses and Applicable Plans				
Livermore Site	Land uses at Livermore Site are compatible with surrounding areas and with the land use plans of local jurisdictions.	Planned and approved projects have gone through the land use compatibility process. No new land use changes or development would occur. No change to existing land uses or the approved amount of onsite development would occur. There would be no change to the total acreage of the site.	New facility construction and upgrades represent minor infill in areas of compatible land use. No major alterations in the types of land use would occur. There would be no change to the total acreage of the site.	Same as No Action Alternative
Site 300	Land uses at Site 300 are compatible with surrounding areas and with the land use plans of local jurisdictions.	Planned and approved projects have gone through the land use compatibility process. Minor new development would occur. Existing facilities are dispersed, and they would not represent infill of land uses. The existing character of the site would remain unaltered.	Although there would be some development of additional land, projects and facilities would be dispersed and would not represent infill of land uses. The existing character of the site would remain unaltered.	Same as No Action Alternative
Socioeconomic Characteristics and Environmental Justice				
Livermore Site and Site 300				
Employment				
Livermore Site	10,360 LLNL and other site workers	10,650 LLNL and other site workers	11,150 LLNL and other site workers	9,770 LLNL and other site workers
Site 300	240 LLNL employees	250 LLNL employees	Same as No Action Alternative	230 LLNL employees
Payroll	$668 M	$690 M	$729 M	$635 M

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Socioeconomic Characteristics and Environmental Justice (continued)				
Worker Population and Housing				
Alameda County				
Employment	10,360 total LLNL employment in county	10,650 total LLNL employment in county	11,150 total LLNL employment in county	9,770 total LLNL employment in county
Housing units	5,883 housing units occupied by LLNL workers living in county	6,050 housing units occupied by LLNL workers living in county	6,327 housing units occupied by LLNL workers living in county	5,550 housing units occupied by LLNL workers living in county
San Joaquin County				
Employment	240 total LLNL employment in county	250 total LLNL employment in county	250 total LLNL employment in county	230 total LLNL employment in county
Housing units	1,961 housing units occupied by LLNL workers living in county	2,017 housing units occupied by LLNL workers living in county	2,109 housing units occupied by LLNL workers living in county	1,850 housing units occupied by LLNL workers living in county
Environmental Justice	No predominantly minority or low-income populations within 5 miles of Livermore Site or Site 300	No disproportionately high and adverse impacts	Same as No Action Alternative	Same as No Action Alternative
Community Services				
Livermore Site				
Fire protection and emergency services	Mutual assistance agreements in effect with neighboring jurisdictions	No additional burden on local fire protection and emergency services	Same as No Action Alternative	Same as No Action Alternative
Police and security services	Mutual assistance agreements in effect with neighboring jurisdictions	No additional burden on local police and security services	Same as No Action Alternative	Same as No Action Alternative
Nonhazardous solid waste disposal	4,500 metric tons/yr	4,600 metric tons/yr	4,900 metric tons/yr	4,200 metric tons/yr

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Community Services (continued)				
Site 300				
Fire protection and emergency services	Mutual assistance agreements in effect with neighboring jurisdictions	No additional burden on local fire protection and emergency services	Same as No Action Alternative	Same as No Action Alternative
Police and security services	Mutual assistance agreements in effect with neighboring jurisdictions	No additional burden on local police and security services	Same as No Action Alternative	Same as No Action Alternative
Nonhazardous solid waste disposal	200 metric tons/yr	208 metric tons/yr	Same as No Action Alternative	191 metric tons/yr
Livermore Site and Site 300				
Workers' students enrolled in Livermore Valley Joint Unified School District	2,090 students	2,150 students	2,250 students	1,970 students
Prehistoric and Historic Cultural Resources				
Livermore Site				
Prehistoric	No resources identified	No impacts	Same as No Action Alternative	Same as No Action Alternative
Historic	Some buildings may be eligible for NRHP. Not all buildings have been assessed.	Potential impacts from D&D and renovation. Programmatic agreement to avoid or mitigate any potential impacts.	Same as No Action Alternative	Same as No Action Alternative
Site 300				
Prehistoric	Potentially significant resources identified	Impacts unlikely. Areas protected under Programmatic agreement.	Same as No Action Alternative	Same as No Action Alternative

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Prehistoric and Historic Cultural Resources (continued)				
Historic	Some buildings may be eligible for NRHP. Not all buildings have been assessed.	Potential impacts from D&D and renovation. Programmatic agreement to avoid or mitigate any potential impacts.	Same as No Action Alternative	Same as No Action Alternative
Aesthetics and Scenic Resources				
Livermore Site	Offsite views consist primarily of security fencing, buffer areas, and trees with facilities and industrial storage yards in the background. LLNL facilities dominate view on East Avenue. Light industry across north boundary, scenic roadway to the east, SNL/CA facilities to the south, and residential areas to the west.	Three facilities to be built would be visible from residential areas and scenic roadways. Short-term impacts from construction. Long-term changes in view in character with remainder of site.	Same as No Action Alternative	Same as No Action Alternative
Site 300	Offsite views of site structures limited to GSA building complex. Interior facilities generally hidden from public view. Tesla Road is designated a scenic route by Alameda County.	Changes in interior hidden from public view. Changes in GSA in character of existing public view.	New buildings in built areas. No change to visual character.	Same as No Action Alternative
Geology and Soils (geologic hazards are considered in Accidents)				
Livermore Site				
Mineral deposits and fossils	No mineral deposits onsite. Fossils have been found at 20-to-30 foot depths.	No mineral deposits onsite. Fossils have been found at 20- to 30-foot depths.	Same as No Action Alternative	Same as No Action Alternative
Soils	Site is 80% developed. Undeveloped areas along west and north sides and east of central pond. Soils not used for agriculture.	462,000 ft^2 would be disturbed by construction activities in undeveloped zones	Same as No Action Alternative	Same as No Action Alternative

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Geology and Soils (continued)				
Site 300				
Mineral deposits and fossils	Region has potential presence of mineral deposits, fossils, and soil resources.	No known geologic resource would be adversely impacted.	Same as No Action Alternative	Same as No Action Alternative
Soils	Soils are potentially useful for limited agriculture and grazing and wildlife.	No projects would disturb soils in undeveloped areas.	Construction of EMPC would disturb 40,000 ft^2 of undeveloped area.	Same as No Action Alternative
Biological Resources				
Livermore Site				
Habitat disturbance	Site is 80% developed and landscaped, consisting mainly of disturbed habitat. Wildlife diversity is low. California red-legged frog (federally listed threatened species) present onsite.	462,000 ft^2 would be disturbed by construction activities in undeveloped zones resulting in minor direct and indirect loss of animals and habitat. No impacts to California red-legged frog habitat.	Same as No Action Alternative	Same as No Action Alternative
Wetlands	1.96 acres, primarily along Arroyo Las Positas, could qualify as jurisdictional wetlands.	Wetlands along Arroyo Las Positas could be impacted upon termination of treated water discharge from environmental restoration program.	Same as No Action Alternative	Same as No Action Alternative

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Biological Resources (continued)				
Site 300				
Habitat disturbance	6,800 acres of mostly undisturbed land. Site supports a diversity of wildlife species. Six federally listed endangered, threatened, proposed threatened, or candidate species present onsite: large-flowered fiddleneck, Valley elderberry longhorn beetle, California tiger salamander, California red-legged frog, Alameda whipsnake, and possibly the San Joaquin kit fox.	No previously undeveloped areas would be impacted by construction. Habitat for the California red-legged frog would be adversely affected by proposed termination of releases to breeding ground at artificial wetland at Building 865. Fire prevention program has potential to affect critical habitat for Alameda whipsnake. Stormwater runoff improvement activities could adversely affect California tiger salamander habitat.	Construction of EMPC would disturb 40,000 ft^2 of undeveloped area.	Same as No Action Alternative
Wetlands	8.6 acres of wetlands, 4.4 acres of which that could qualify as jurisdictional wetlands.	Water releases to artificial wetlands near Buildings 801, 827, 851, and 865 would be terminated.	Same as No Action Alternative	Same as No Action Alternative

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Air Quality				
Livermore Site and Site 300 Nonradiological	Bay Area and San Joaquin air basins are in nonattainment for PM_{10} and ozone and so these pollutants and organic precursors to ozone are strictly regulated. LLNL is in compliance with all BAAQMD regulations and has been found to have good controls on oxides of nitrogen and precursor organic compounds.	Carbon monoxide concentration would remain within 20% to 30% of ambient standards. Total projected air pollutant emissions would be a small fraction of project significance levels and threshold levels for conformity. No adverse impact to air resources.	Carbon monoxide emissions dominated by current regional traffic levels and background sources. Emissions associated with proposed projects do not differ appreciably from the No Action Alternative. Total projected air pollutant emissions would be a small fraction of project significance levels and threshold levels for conformity. No adverse impact to air resources.	Emissions associated with the proposed projects do not differ appreciably from the No Action Alternative. There would be a reduction in vehicular activity and electrical and fuel demand. Therefore, there would be a small reduction in air pollutant loading and a net positive impact on air quality.
Livermore Site Radiological	The MEI is located at the UNCLE Credit Union outside the eastern perimeter of site. The MEI dose is 0.023 mrem/yr. The population dose is 0.50 person-rem/yr.	The MEI location would be due east of the NIF stack because of NIF emissions. The MEI dose would be 0.1 mrem/yr. The population dose would be 1.8 person-rem/yr.	The MEI location would be the same as the No Action Alternative. The MEI dose would be 0.13 mrem/yr. The population dose would be 1.8 person-rem/yr.	The MEI location would be the same as the No Action Alternative. The MEI dose would be 0.09 mrem/yr. The population dose would be 1.8 person-rem/yr.
Site 300 Radiological	The MEI is located on the south central boundary bordering the Carnegie State Vehicular Recreation Area. The MEI dose is 0.021 mrem/yr. The population dose is 2.5 person-rem/yr.	The MEI would be west-southwest of Firing Table 851. The MEI dose would be 0.055 mrem/yr. The population dose would be 9.8 person-rem/yr.	Same as No Action Alternative	The MEI location would be the same as No Action. The MEI dose would be 0.054 mrem/yr. The population dose would be 9.8 person-rem/yr.

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
		Water		
Livermore Site				
Surface water	Discharges within NPDES requirements. Ongoing spill prevention, stormwater runoff, and erosion control management.	Surface water discharges within NPDES requirements. Ongoing spill prevention, stormwater runoff, and erosion control management.	Same as No Action Alternative	Same as No Action Alternative
Floodplains	100-year and 500-year floodplains near Arroyo Las Positas and Arroyo Seco	No new facilities in either 100-year or 500-year floodplain.	Same as No Action Alternative	Same as No Action Alternative
Groundwater	Groundwater contamination above drinking water standards. Remediation ongoing.	Contaminants above drinking water standards. Would continue to be remediated.	Same as No Action Alternative	Same as No Action Alternative
Site 300				
Groundwater supply	Water supplied by onsite wells.	Planned to link to Hetch Hetchy system.	Same as No Action Alternative	Same as No Action Alternative
Surface water	Ongoing spill prevention, stormwater runoff, and erosion control management. Discharges within NPDES requirements.	Ongoing spill prevention, stormwater runoff, and erosion control management.	Same as No Action Alternative	Same as No Action Alternative
Floodplains	100-year floodplain extends onsite.	No activities within floodplain.	Same as No Action Alternative	Same as No Action Alternative
Groundwater	Groundwater contamination above drinking water standards. Remediation ongoing.	Contaminants above drinking water standards. Continues to be remediated. Discharges within NPDES requirements.	Same as No Action Alternative	Same as No Action Alternative

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Noise				
Livermore Site and Site 300				
Construction	Ongoing short-term noise due to construction.	Ongoing short-term noise due to construction. Noise from near – fence line projects as high as 82 dB(A).	Same as No Action Alternative	Same as No Action Alternative
Operations	Normal operations long-term noise not noticeable beyond fence line. Administrative limit for impulse noise of 126 dB. Highest recorded was 99.3 dB.	Normal operations long-term noise not noticeable beyond fence line.	Same as No Action Alternative	Same as No Action Alternative
Traffic	Peak one hour daytime L_{eq} (dBA) along roadways surrounding site is 60 to 75 L_{eq} (dBA).	Transportation vehicle noise levels 81 to 87 dB(A).	Same as No Action Alternative	Same as No Action Alternative
Traffic and Transportation				
Livermore Site				
Traffic in vicinity of site	Heavy traffic in vicinity of site. Site-related commuter traffic of 22,000 total vehicle trips/day.	Slight increase in employment under No Action would have negligible impact to commuter traffic (22,600 total vehicle trips/day). Fewer construction projects would result in smaller temporary increases in commuter traffic and deliveries.	Employment would increase amount of commuter traffic (23,700 total vehicle trips/day). Construction projects would result in temporary increases in commuter traffic and deliveries.	Slight decrease in employment would have small beneficial impact to commuter traffic (21,000 total vehicle trips/day). Few construction projects would result in small temporary impacts to commuter traffic and deliveries.
Material (annual shipments radioactive, chemical, and explosives)	470	540	600	550

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Traffic and Transportation (continued)				
Waste (includes hazardous and radioactive, annual shipments)	88	240	310	200
Sanitary waste (maximum annual shipments)	518	534	570	492
TRU legacy waste shipments (total)	0	24	Same as No Action Alternative	Same as No Action Alternative
LLW legacy waste shipment (total)	1	64	Same as No Action Alternative	Same as No Action Alternative
MLLW legacy waste shipment (total)	1	80	Same as No Action Alternative	Same as No Action Alternative
LBNL TRU shipment (one time)	0	0	1	Same as No Action Alternative
Mixed TSCA waste shipments	1	13	Same as No Action Alternative	Same as No Action Alternative
Dose to public	Collective dose would be 1.5 person-rem/yr with the risk of 9×10^{-4} LCFs.	Collective dose would be 5.9 person-rem/yr with a risk of 4×10^{-3} LCFs.	Collective dose would be 6.2 person-rem/yr with a risk of 4×10^{-3} LCFs.	Collective dose would be 1.9 person-rem/yr with a risk of 1×10^{-3} LCFs.
Site 300				
Traffic in vicinity of site	Site is in a rural location with low traffic volumes.	No substantial changes in traffic or transportation.	No change in workforce commuting. Construction projects would result in temporary increases in commuter traffic and deliveries. Transportation of explosive materials would increase slightly.	Slight decrease in workforce commuting. No construction projects. Transportation of explosive materials would decrease.

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Utilities and Energy				
Livermore Site				
Water				
Capacity	2.88 M gal/day	2.88 M gal/day	Same as No Action Alternative	Same as No Action Alternative
Use	212 M gal/yr	276 M gal/yr	273 M gal/yr	230 M gal/yr
Sewer discharge	216,400 gal/day	224,000 gal/day	222,000 gal/day	Same as No Action Alternative
Electricity use				
Peak demand	57 MW	82 MW	82 MW	82 MW
Annual	321 M kWh	446 M kWh	442 M kWh	371 M kWh
Fuel (natural gas) use	12,900 therms/day	23,600 therms/day	23,000 therms/day	22,600 therms/day
Site 300				
Water				
Capacity	930,000 gal/day	648,000 gal/day	Same as No Action Alternative	Same as No Action Alternative
Use	67,900 gal/day[a]	67,900 gal/day	Same as No Action Alternative	Same as No Action Alternative
Sewer discharge	2,100 gal/day[a]	2,100 gal/day	Same as No Action Alternative	Same as No Action Alternative
Electricity use	16.3 M kWh/yr[a]	16.3 M kWh/yr	Same as No Action Alternative	Same as No Action Alternative
Fuel (fuel oil) use	16,600 gal/yr[a]	16,600 gal/yr	Same as No Action Alternative	Same as No Action Alternative
Materials and Waste Management				
Livermore Site and Site 300				
Waste storage facility modifications	NA	Within existing footprint	Same as No Action Alternative	Same as No Action Alternative
Class 1 permit modifications (total requests)	NA	75	100	50
Class 2 permit modifications (total requests)	NA	10	20	0

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)		No Action Alternative		Proposed Action		Reduced Operation Alternative	
Materials and Waste Management (continued)								
Class 3 permit modifications (total number)	NA		0		2		Same as No Action Alternative	
RCRA closures	NA		4 closures		Same as No Action Alternative		Same as No Action Alternative	
Waste Generation by Type	**Routine[b,g]**	**Nonroutine[b,g]**	**Routine[g]**	**Nonroutine[g]**	**Routine[g]**	**Nonroutine[g]**	**Routine[g]**	**Nonroutine[g]**
LLW	170 m^3/yr	480 m^3/yr	200 m^3/yr	630 m^3/yr	340 m^3/yr	710 m^3/yr	180 m^3/yr	550 m^3/yr
MLLW	67 m^3/yr	44 m^3/yr	61 m^3/yr	72 m^3/yr	88 m^3/yr	81 m^3/yr	42 m^3/yr	63 m^3/yr
TRU	35 m^3/yr	4.2 m^3/yr	50 m^3/yr	55 m^3/yr	60 m^3/yr	10 m^3/yr	45 m^3/yr	5 m^3/yr
Mixed TRU	2.6 m^3/yr	0 m^3/yr	1.7 m^3/yr	0 m^3/yr	2.8 m^3/yr	0 m^3/yr	0.7 m^3/yr	0 m^3/yr
Total hazardous	440 metric tons/yr	880 metric tons/yr	390 metric tons/yr	1,500 metric tons/yr	510 metric tons/yr	1,700 metric tons/yr	300 metric tons/yr	1,300 metric tons/yr
Sanitary solid	4,700 metric tons/yr	Included in routine	4,800 metric tons/yr	Included in routine	5,100 metric tons/yr	Included in routine	4,400 metric tons/yr	Included in routine
Wastewater	300,000 gal/day	Included in routine	310,000 gal/day	Included in routine	330,000 gal/day	Included in routine	290,000 gal/day	Included in routine
Human Health and Safety								
Receptor	**Annual Dose**	**Annual LCFs**	**Annual Dose**	**Annual LCFs**	**Annual Dose**	**Annual LCFs**	**Annual Dose**	**Annual LCFs**
Livermore Site								
MEI	0.023 mrem	1.4×10^{-8}	0.30 mrem	1.8×10^{-7}	0.33 mrem	2.0×10^{-7}	0.22 mrem	1.3×10^{-7}
Population[d]	0.5 person-rem	3.0×10^{-4}	1.8 person-rem	1.1×10^{-3}	Same as No Action Alternative		Same as No Action Alternative	
Involved-worker population[df]	28 person-rem	1.7×10^{-2}	90 person-rem	5.4×10^{-2}	125 person-rem	7.5×10^{-2}	38 person-rem	2.3×10^{-2}
Noninvolved worker population[d]	Included in involved worker population		0.14 person-rem	8.9×10^{-5}	0.16 person-rem	9.6×10^{-5}	0.14 person-rem	8.2×10^{-5}
Site 300								
MEI	0.021 mrem	1.3×10^{-8}	0.055 mrem	3.3×10^{-8}	Same as No Action Alternative		0.054 mrem	3.3×10^{-8}
Population	2.5 person-rem	1.5×10^{-3}	9.8 person-rem	5.9×10^{-3}	Same as No Action Alternative		Same as No Action Alternative	
Involved-worker population	See footnote F.		90 person-rem	5.4×10^{-2}	125 person-rem	7.5×10^{-2}	38 person-rem	2.3×10^{-2}
Noninvolved worker population	Included in involved worker population		0.005 person-rem	2.8×10^{-6}	Same as No Action Alternative		Same as No Action Alternative	

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)		No Action Alternative		Proposed Action		Reduced Operation Alternative	
Site Contamination								
Livermore Site and Site 300	Continued possibility of soil contamination from ongoing activities. Minimal deposition of contaminants expected due to precautions and quick response procedures. Continued removal of known contaminants.		Increased likelihood of soil contamination due to increase in activities and increased potential for accidents and releases. Minimal deposition of contaminants is expected due to precautions and quick response procedures. Continued removal of known contaminants.		Same as No Action Alternative		Decreased likelihood of soil contamination due to decrease in activities and decreased potential for accidents and releases. Minimal deposition of contaminants is expected due to precautions and quick response procedures. Continued removal of known contaminants.	
Accidents								
Bounding Radiological Accidents	**Dose**	**LCFs**	**Dose**	**LCFs**	**Dose**	**LCFs**	**Dose**	**LCFs**
Materials Handling Accident, Offsite Population (Building 332 Plutonium Facility)	Same as No Action Alternative		97 person rem	5.82×10^{-2} [h]	280 person rem	1.68×10^{-1} [h]	Same as No Action Alternative	
Waste Management Accident, Offsite Population (Building 625 Radiological and Hazardous Waste Storage Facility)	Same as No Action Alternative		662 person rem	0.397	2,020 person-rem	1.21	Same as No Action Alternative	

TABLE S.6–1.— *Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)*

Site / Environmental Component	Baseline (2002)	No Action Alternative	Proposed Action	Reduced Operation Alternative
Accidents (continued)				
Bounding Chemical Accident (Building 332 Plutonium Facility – Chlorine release)	Same as No Action Alternative	ERPG-2 level would extend 600 meters beyond site boundary.	Same as No Action Alternative	Same as No Action Alternative
Bounding Explosive Accident (Building 801, Contained Firing Facility or Open Air Firing Table)	Same as No Action Alternative	Up to 20 worker fatalities.	Same as No Action Alternative	Same as No Action Alternative
Bounding Biological Accident (Building 368, BioSafety Level 3 Facility)	Same as No Action Alternative	Population—no credible hazard Noninvolved worker—no credible hazard Involved worker—1 potential illness	Same as No Action Alternative	Same as No Action Alternative

[a] average from 1998 through 2002
[b] based on average quantities since 1992 and one standard deviation
[c] based on 1999 measurements
[d] includes both Livermore Site and Site 300
[e] based on median meteorology
[f] Total LLNL involved worker population (Livermore Site and Site 300)
[g] Routine waste is generated from the normal operation of the facility. Nonroutine waste is generated from construction, decontamination and decommissioning, and environmental restoration.
[h] Increased number of latent cancer fatalities.
BAAQMD = Bay Area Air Quality Management District; D&D = decontamination and decommissioning; dB = decibel; dBA = A-weighted decibel; EMPC = Energetic Material Processing Center; ft^2 = square feet; gal/day = gallons per day; gal/yr = gallons per year; GSA = General Services Area; kWh/yr = kilowatt hours per year; LBNL = Lawrence Berkeley National Laboratory; LCF = latent cancer fatality; Leq = equivalent continuous sound level; LLNL = Lawrence Livermore National Laboratory; LLW = low-level waste; MLLW = mixed low-level waste; M = million; m^3/yr = cubic meters per year; MEI = maximally exposed individual; MW = megawatts; mrem/yr = millirems per year; NA = not applicable; NIF = National Ignition Facility; NPDES = National Pollution Discharge Elimination System; NRHP = National Register of Historic Places; PM_{10} = particulate matter smaller than 10 microns in diameter; RCRA = *Resource Conservation and Recovery Act*; SNL/CA = Sandia National Laboratories/California; TRU = transuranic; therm = a unit of heat equal to 100,000 British thermal units; TSCA = *Toxic Substances Control Act*.