

3. Environmental Program Information

Jennifer Doman, Heather Ottaway, Kelly Heidecker, Alison Terrill

LLNL is committed to enhancing its environmental stewardship and to reducing any impacts its operations may have on the environment. This chapter describes LLNL's Environmental Management System (EMS) and Pollution Prevention/Sustainability Program (P2S).

3.1 Environmental Management System

LLNL continues to mature and enhance its EMS through systematic process improvements and increased focus on establishing specific environmental performance objectives and targets contained in Environmental Management Plans (EMPs). Progress toward goals is regularly measured and reported to senior management and other interested parties through a variety of means including regular senior management reports and the yearly update of the Site-wide Annual Environmental Report (SAER). The Laboratory's EMS has successfully maintained its International Organization for Standardization (ISO) 14001 registration since 2009, and is regularly audited by NSF International Strategic Registrations, an internationally recognized ISO auditor, for continued conformance and certification.

3.1.1 Environmental Management Plans

EMPs are designed and implemented to address the Laboratory's most significant environmental aspects and achieve environmental objectives and targets. EMPs are continually updated to incorporate new initiatives and effectively demonstrate LLNL's commitment to continuous improvement. During FY2010-2011, eight EMPs were implemented. **Table 3-1** lists the eight *EMPs along with their related DOE sustainability goals, progress towards those goals as of November 2011, and LLNL's noteworthy contributions towards achievement of those goals.*

3. Environmental Program Information

Table 3-1. Environmental Management Plans (EMPs) and Related DOE Sustainability Goals.

Title	Significant Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goals	Progress Towards DOE Sustainability Goals and Noteworthy EMP Contributions
Improving Environmentally Preferable Purchasing (EPP)	<ul style="list-style-type: none"> • Nonhazardous Materials Use • Municipal Waste Generation 	Improve Environmentally Preferable Purchases at LLNL through benchmarking with other sites and identifying and implementing best purchasing practices	4501A Goal: Maximize the acquisition and use of environmentally preferable products	<p>Progress: Electronic Product Environmental Assessment Tool (EPEAT) compliance increased from 69% to 93.6%; transitioned to use of green cleaning materials site-wide</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Outreach to Lab employees, with targeted training to Technical Release Representatives (TRRs) on Sustainable Acquisition and EPEAT goals and practices • Implemented new green cleaning program utilizing Green Seal garbage bags and non-hazardous cleaners
Municipal Waste Reduction	<ul style="list-style-type: none"> • Municipal Waste Generation 	Optimize use of printer/copier supplies and reduce municipal waste through recycling	450.1A Goal #1: Reduce or eliminate the generation of waste through pollution prevention 450.1A Goal #5: recycling	<p>Progress: Increased municipal landfill diversion rate to 74%</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Implemented alternative reuse/recycle options for several non-standard waste items (concrete rubble, lead shielding blocks, foam insulation panels, etc.) • Eliminated use of Styrofoam to-go containers in cafes
Greenhouse Gas Emissions Reductions	<ul style="list-style-type: none"> • Greenhouse Gas Emissions 	Reduce LLNL greenhouse gas emissions through management of sulfur hexafluoride (SF6) and vehicle fleet	430.2b.1.b(10) Goal: Replacement of conventional vehicles with alternative fuel and hybrid vehicles EO13514 Goal: Support DOE goal to reduce greenhouse gas emissions	<p>Progress: Reduced GHG emissions (Scope 1-2 >12%, Scope 3 ≈10%)</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Implemented boiler temperature set-back project • Developed SF6 Management Plan; funded SF6 reduction initiative in Center for Accelerator Mass Spectrometry (CAMS) (Building 190 [B190]) • Many of the accomplishments achieved in Energy Conservation and Fossil Fuel Consumption also contribute to the reduction of greenhouse gases

3. Environmental Program Information

Table 3-1 (cont). Environmental Management Plans (EMP) and Related DOE Sustainability Goals

Title	Significant Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goals	Progress Towards DOE Sustainability Goals
Energy Conservation	<ul style="list-style-type: none"> • Electrical Energy Use • Greenhouse Gas Emissions • Fossil Fuel Consumption 	Meet or exceed DOE O 430.2B and EO 13514 energy conservation goals	430.2b Goal: 30% reduction in energy intensity by FY2015 from FY2003 baseline	<p>Progress: Achieved 14.16% energy intensity reduction</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Continued programmable thermostat installation program (92 facilities by end of FY2011) • Implemented light-emitting diode (LED) street light conversion project (over 200 replaced by end of FY2011) • Installed automatic light shut-off capabilities in several facilities • Achieved Leadership in Energy and Environmental Design (LEED)-Silver certification for B451 • Received award for most (energy) efficient supercomputer from Green500 • Provided targeted training to TRRs on purchasing Energy Star appliances
Water Conservation	<ul style="list-style-type: none"> • Water Use 	Meet or exceed Performance Evaluation Plan (PEP) 7.5.3, DOE O 430.2B and EO 13514 water conservation goals	430.2b Goal: 16% reduction in potable water use by FY2015 from FY2007 baseline	<p>Progress: Achieved 15.52% water intensity reduction</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Installed Smart Irrigation Controllers in landscaped areas • Reused 100% of water associated with disinfecting and rinsing the pipeline used to transfer Hetch Hetchy water to Site 300 as dust control and/or as evaporation makeup water in the Site 300 sewage pond • Initiated project to survey and upgrade autoclaves to water (and energy) efficient models • Developed Newsline articles to inform employees of Lab and DOE water conservation goals
Fossil Fuel Consumption	<ul style="list-style-type: none"> • Fossil Fuel Consumption 	Reduce government vehicle fossil fuel consumption, replacement of light duty fleet with alternative fueled vehicles, and promote alternative fuels usage	Optimization of alternative fuel, hybrid and plug-in electric vehicles when commercially available, and the expansion and maintenance of an alternative fuel infrastructure as it is economically feasible	<p>Progress: Continued transition to hybrid fleet</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Continued Lab-wide initiative to swap out traditional vehicles for hybrids

3. Environmental Program Information

Table 3-1 (cont). Environmental Management Plans (EMP) and Related DOE Sustainability Goals

Title	Significant Aspect(s) Addressed	EMP Objective(s)	Related DOE Sustainability Goals	Progress Towards DOE Sustainability Goals
Hazardous Materials Use and Hazardous Waste Generation	<ul style="list-style-type: none"> • Hazardous Materials Use • Hazardous Waste Generation 	<p>Achieve targeted and overall reductions in the use of hazardous materials (not to include radioactive or biological materials) at the Laboratory</p> <p>Reduce the generation of hazardous waste</p>	<p>450.1 Goal #2: Reduce or eliminate the acquisition, use and release of toxic and hazardous chemicals and materials</p> <p>EO 13423.2(e) Goal: Reduce the quantity of toxic and hazardous chemicals and materials acquired, used or disposed of</p>	<p>Progress: Reduction of high-risk legacy inventory; custodial chemical usage declined from 6,224 to 1,960 gal</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Reduced legacy inventory of alkali metals, peroxidizable solvents, corrosive gases and toxic gases • Replaced six milling machines thereby reducing oil consumption and extend life of coolants by six months
Radioactive Materials use	<ul style="list-style-type: none"> • Radioactive Materials Use 	<p>Reduce significantly the amount of radioactive materials on-site in accordance with PEP 7.3.1</p>	<p>450.1A Goal: Reduce or eliminate the acquisition, use and release of toxic and hazardous chemicals and materials</p>	<p>Progress: Achieved 90% reduction of nuclear material inventory</p> <p>Noteworthy Accomplishments:</p> <ul style="list-style-type: none"> • Nuclear Material Inventory reduction was achieved under an accelerated timeframe

3. Environmental Program Information

3.1.2 EMS Audits and Reviews

The Laboratory successfully completed two external independent audits of its ISO 14001 EMS program (April 11–14 and August 15–18) with recommendations from the auditor to continue LLNL's ISO 14001:2004 registration. These independent audits were conducted by NSF International Strategic Registrations and validated the Laboratory's solid commitment to environmental stewardship.

3.1.2.2 Internal Assessments and Reviews

In May 2011, a Senior Management Review of the EMS was conducted, reaffirming its commitment to the Lab's environmental policy and stewardship through the implementation of EMS.

In accordance with LLNL's EMS, the Laboratory's environmental compliance is regularly evaluated through reviews of internal assessments including Management Self Assessments (MSAs); Management Observations, Verifications and Inspections (MOVIs); regulatory inspections; internal and external monitoring and compliance reports; and facility walk-throughs and work-control assessments. As a result of these reviews, LLNL identifies specific practices and recommendations for corrective and preventive measures, demonstrating the Laboratory's commitment to environmental compliance.

3.2 Pollution Prevention/Sustainability Program

LLNL's P2S Program operates within the framework of the Integrated Safety Management System (ISMS) and EMS and in accordance with applicable laws, regulations, and DOE orders as required by contract. It encompasses stewardship and maintenance, waste stream analysis, reporting of waste generation and P2S accomplishments, and fostering of P2S awareness through presentations, articles, and events. The P2S Program supports institutional and directorate P2S activities via environmental teams and includes implementation and facilitation of source reduction and/or reclamation, recycling, and reuse programs for hazardous and nonhazardous waste; facilitation of sustainable acquisition; and preparation of P2S opportunity assessments.

The P2S Program at LLNL strives to systematically reduce all types of waste generated and eliminate or minimize pollutant releases to all environmental media from all aspects of the operations at the Livermore site and Site 300. These efforts help protect public health and the environment by reducing or eliminating waste, improving resource usage, and reducing inventories and releases of hazardous chemicals. These efforts also benefit LLNL by reducing compliance costs and minimizing the potential for civil and criminal liabilities under environmental laws. In accordance with EPA guidelines and DOE policy, the P2S Program uses a hierarchical approach to waste reduction (i.e., source elimination or reduction, material substitution, reuse and recycling, and lastly treatment and disposal), which is applied, where feasible, to all types of waste. Waste generation is tracked using RHWM's HazTrack database. By reviewing the information in this database, program managers and P2S Program staff can

3. Environmental Program Information

monitor and analyze waste streams to determine cost-effective improvements to LLNL operations.

3.2.1 Routine Hazardous, Transuranic, and Radioactive Waste

Routine waste listed in **Tables 3-2 and 3-3** includes waste from ongoing operations produced by any type of production, analysis, and research and development taking place at LLNL. The increase in routine low-level waste in FY 2011 is attributed to radiological control protocols implemented at the National Ignition Facility following the introduction of tritiated targets. The slight increases in routine mixed waste and routine hazardous waste are attributed to normal variation in waste generation.

Table 3-2. Routine hazardous waste at LLNL, FY 2009–2011.

Waste category	FY 2009	FY 2010	FY 2011
Routine hazardous waste generated (MT)	159	116	143

Table 3-3. Routine transuranic and radioactive waste at LLNL, FY 2009–2011.

Waste category	FY 2009	FY 2010	FY 2011
Routine low-level waste generated (m ³)	203.5	211.2	678.3
Routine mixed waste generated (m ³)	24.6	21.0	27.4
Routine TRU/mixed TRU waste generated (m ³)	9.4	0.6	0.4

3.2.2 Diverted Waste

LLNL maintains an active waste-diversion program, encouraging recycling and reuse of both routine and non-routine waste. In 2010, DOE changed the annual reporting requirements for waste diversion in response to Executive Order 13514, issued October 5, 2009. This change required separate accounting for construction/demolition and municipal solid wastes and is reflected in the tables below.

3.2.2.1 Municipal Solid Waste

Together, the Livermore site and Site 300 generated 3,159 MT of routine nonhazardous solid waste in FY 2011. This volume includes diverted waste (e.g., material diverted through recycling and reuse programs) and landfill waste.

Both sites combined diverted a total 2,261 MT of routine nonhazardous waste in FY 2011, which represents a diversion rate of 72%. The diverted routine nonhazardous waste includes waste recycled by RHWM and materials diverted through the surplus sales program. In 2011, LLNL also diverted recyclable material, food scraps, and other compostable waste through a pilot comingled recycling and composting program implemented in May 2011 at select buildings throughout the Livermore site. The portion of routine nonhazardous waste sent to landfill was 898 MT. See **Table 3-4**.

3. Environmental Program Information

In 2011, LLNL transferred or donated for reuse 55 laptops computers and recycled 7,509 computers, monitors, and laptops, which were managed as universal waste.

LLNL recycled 40 MT of large and small batteries, which were also managed as universal waste.

Table 3-4. Routine municipal waste in FY 2011, Livermore site and Site 300 combined.

Destination	Waste description	Amount in FY 2011 (MT)
Diverted	Baled paper	67
	Corrugated cardboard	105
	Cooking grease	20
	Mixed metals	999
	Office paper	165
	Tires and scrap	8
	Toner cartridges	9
	Greenwaste (chips, compost, mulch)	555
	Wood	262
	Comingled recycling	32
	Compost (food scraps, paper towels, food containers)	39
	TOTAL diverted	
Landfill	Compacted (landfill)	898
	TOTAL landfill	898
TOTAL routine nonhazardous waste		3,159

3.2.2.2 Construction and Demolition (C&D) Waste

C&D wastes include excavated soils, wastes and metals from construction, decontamination and demolition activities. The Livermore site and Site 300 generated a total of 5821 MT of waste related to construction and demolition activities in FY 2011.

In FY 2011, the two sites combined diverted 5,015 MT of nonroutine nonhazardous solid waste through reuse or recycling, which represents a diversion rate of 86%. Diverted C&D waste includes soil reused either on site for other projects or as cover soil at Class II landfills. See **Table 3-5**.

3. Environmental Program Information

Table 3-5. Construction and Demolition waste in FY 2011, Livermore site and Site 300 combined.

Destination	Waste description	Amount in FY 2011 (MT)
Diverted	Class II cover soil (reused at landfill)	2,529
	Class II concrete (reused at landfill)	2,318
	Scrap metals (recycled)	168
	TOTAL diverted	5,015
Landfill	Construction and demolition (non-compacted landfill)	806
	TOTAL landfill	806
TOTAL non-routine non-hazardous waste		5,821

3.2.3 Sustainable Acquisition

LLNL has a comprehensive Sustainable Acquisition (formally Environmentally Preferable Purchasing) program that includes preferential purchasing of recycled content and biobased products. In 2011, the Sustainable Acquisition program continued to include a preference for Electronic Product Environmental Assessment Tool (EPEAT) registered products. 94% of all desktop electronics purchases in FY 2011 were EPEAT Silver or EPEAT Gold, indicating that the products meet or exceed the Institute of Electrical and Electronics Engineers (IEEE) 1680-2006 environmental performance standard for electronic products. Additional sustainable acquisition highlights can be found in the LLNL FY12 Site Sustainability Plan https://facilities.llnl.gov/documents/LLNL_FY12_SSP.pdf.

3.2.4 Pollution Prevention/Sustainability Activities

3.2.4.1 Environmental Stewardship Accomplishments and Awards

Each year, the P2S Program submits nominations for the NNSA environmental awards program, which recognizes exemplary performance in integrating environmental stewardship practices to reduce risk, protect natural resources, and enhance site operations. P2S also submits nominations for various other awards recognizing excellence in P2S projects. In 2011, LLNL received three NNSA Environmental Stewardship awards, two DOE EStar awards, a California Department of Resources Recycling and Recovery (CalRecycle) Waste Reduction Award Program (WRAP) award for recycling efforts, and a Federal Electronics Challenge Bronze award for management of electronics.

The LLNL Global Security Paperless eSystems project won an NNSA 2011 Environmental Stewardship Best-In-Class Award in the Change Agents category for a series of electronic paperless applications that save time, money, and the environment. Paperless systems were developed to perform employee move requests (eMove), travel approvals (eTravel), and checkout (eCheckout) of employees transferring out of the division. Based on eMove alone, approximately

3. Environmental Program Information

\$500,000 and 200 pounds of paper are saved annually. This project also won a DOE 2011 EStar Honorable mention award.

The LLNL Site 300 Sulfur Hexafluoride Reduction project won an NNSA 2011 Environmental Stewardship Award in the Cradle to Cradle category for minimizing Flash X-Ray (FXR) program releases of sulfur hexafluoride (SF₆), which had both environmental and economic benefits. The project involved installation of a reclamation system to capture SF₆, a recirculation system to purify the SF₆ for reuse, and electronic scales to more accurately measure the SF₆ used. Before these systems were put into place, operation of the FXR was estimated to release over 5,000 pounds of SF₆ annually. The same system now uses less than a single 115 pound cylinder of SF₆. This project also won a DOE 2011 EStar award.

The LLNL Beryllium Reduction project won an NNSA 2011 Environmental Stewardship Award in the Health and the Environment category for taking steps to minimize, and in many cases eliminate, the potential for worker exposure to beryllium. LLNL sent 2,086 pounds of beryllium materials for recycling or reuse, saving over \$28,000 in avoided disposal costs and earning \$186,842 for the sale of recyclable material.

LLNL received the CalRecycle 2011 WRAP award for recycling accomplishments during the 2010 calendar year. The award recognizes California businesses and organizations that have made outstanding efforts to reduce nonhazardous waste by implementing resource-efficient practices, aggressive waste reduction, reuse and recycling activities, and procurement of recycled-content products. This is the fourth consecutive year that LLNL has won the WRAP award.

LLNL won a Federal Electronics Challenge (FEC) Bronze award in 2011 for meeting all the general mandatory activities outlined in the FEC and all mandatory activities in the end-of-life management phase of the electronics life-cycle. The FEC is a partnership program that encourages federal facilities and agencies to purchase greener electronics, reduce impacts of electronics during use, and manage used electronics in an environmentally safe way.

3.2.4.2 SB14 Hazardous Waste Source Reduction and Management Review Act of 1989

Every four years, LLNL is required to conduct source reduction audits, prepare a progress report and source reduction plan. The P2S Program coordinated preparation of these documents in accordance with the California Department of Toxic Substances Control (DTSC) requirements. A combined document set was prepared for DOE California sites, including information from LLNL, Sandia National Laboratory/California and Stanford Linear Accelerator Laboratory.

3.2.4.3 High-Performance Sustainable Buildings and Energy Conservation

The Facilities and Infrastructure Directorate manages the implementation of DOE Order 430.2B objectives related to sustainable building materials and practices. In FY 2008, a Green Cleaning Policy was developed that meets the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) requirements. The goal of the Policy is to reduce the usage of potentially hazardous cleaning chemicals and their adverse impact on indoor air quality,

3. Environmental Program Information

occupant health, and the environment. LLNL continues to expand green cleaning lab-wide, with the goal to implement green cleaning at all applicable locations. Alternative solutions are evaluated as the industry improves and more green products that perform effectively become available. In FY11, the program identified an alternative floor finish and plans to investigate floor wax stripper products during FY 2012.

In FY11, another datacenter/office mixed-use building, Building 451, was awarded USGBC LEED-EB Operations and Maintenance “Silver” certification. Five additional buildings were assessed in FY 11 using the High Performance Sustainable Building (HPSB) Assessment tool. These buildings (T3724, T3725, T3726, T4727, and T4729) were studied and benchmarked using both the EPA’s Portfolio Manager Database and the HPSB Assessment Tool in six categories: integrated design, energy performance, water conservation, indoor air quality and reduction of environmental impact.

3.2.5 Pollution Prevention/Sustainability Employee Training and Awareness Programs

In celebration of Earth Day 2011, P2S staff held an awards ceremony and reception in honor of the 2011 NNSA Environmental Stewardship Award winners.

During 2011, LLNL and Sandia/CA worked together to bring a Farmers’ Market to the labs. The P2S Program collaborated with the Farmers’ Market project team to incorporate sustainability measures into the market events. P2S staff implemented a recycling and composting program for the market and distributed handout materials on the laboratory’s sustainability programs.

The P2S Program conducted other awareness activities during the year. Articles on pollution prevention appeared in *NewsOnLine* (LLNL’s internal online newsletter). The P2S Program continues to conduct training for purchasing staff on Sustainable Acquisition requirements.

The P2S Program maintains an internal P2S website for LLNL employees. The website is a resource for employees who have questions regarding pollution prevention, energy efficiency, reuse and recycling of materials, green building, and other environmental topics. Employees can also use the site to suggest P2S ideas, and ask questions about P2S planning and implementation.

The EFA Green Hotline provides support for employees with questions, suggestions, or ideas regarding LLNL’s pollution prevention and waste diversion endeavors, as well as other environmental issues.