

3. Environmental Program Information

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LLNL is committed to enhancing its environmental stewardship and to reducing any impacts its operations may have on the environment. This chapter describes the lead organizations that support the LLNL's environmental stewardship and describes LLNL's Environmental Management System (EMS) and Pollution Prevention (P2) program.

3.1 Environmental Protection Program

Three organizations lead the environmental protection program and provide environmental expertise to the Laboratory: Environmental Protection Department (EPD), Radioactive and Hazardous Waste Management (RHWM) Division and Environmental Restoration Department (ERD). Spill response and energy, water and fleet management are also key components of environmental protection and sustainability.

3.1.1 Environmental Protection Department

EPD is responsible for environmental monitoring and environmental regulatory interpretation and implementation guidance in support of LLNL's programs. EPD prepares and maintains environmental plans, reports, and permits; maintains the environmental portions of the *Environment, Safety, and Health (ES&H) Manual*; informs management about pending changes in environmental regulations pertinent to LLNL; represents LLNL in day-to-day interactions with regulatory agencies and the public; develops and provides institutional environmental training; and assesses the effectiveness of pollution control programs. A principal part of EPD's mission is to work with LLNL programs to ensure that operations are conducted in a manner that limits environmental impact and that is in compliance with regulatory requirements. The EPD Department Head also serves as the LLNL EMS Coordinator and leads the EMS task force.

3.1.2 Radioactive and Hazardous Waste Management Division

RHWM manages all hazardous, radioactive, and mixed wastes generated at LLNL facilities in accordance with local, state, and federal requirements. RHWM processes, stores, packages, treats, and prepares waste for shipment and disposal, recycling, or discharge to the sanitary sewer. As part of its waste management activities, RHWM tracks and documents the movement of hazardous, mixed, and radioactive wastes from waste accumulation areas (WAAs), which are typically located near the waste generator, to final disposition; develops and implements approved standard operating procedures; decontaminates LLNL equipment; ensures that containers for shipment of waste meet the specifications of the U.S. Department of Transportation (DOT) and other regulatory agencies; responds to emergencies; and participates in the cleanup of potential hazardous and radioactive spills at LLNL facilities. RHWM prepares numerous reports in support of its mission including those required by regulation and various guidance and management plans.

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RHWM meets regulations for the treatment of LLNL's mixed waste in accordance with the requirements of the FFCA. The schedule for this treatment is negotiated with California and involves developing new on-site treatment options as well as finding off-site alternatives.

3.1.3 Environmental Restoration Department

ERD evaluates and remediates soil and groundwater contaminated by past hazardous materials handling and disposal practices and from leaks and spills that have occurred at the Livermore site and Site 300 prior to and during LLNL operations. ERD conducts field investigations at both sites to characterize the existence, extent, and impact of contamination. ERD evaluates and develops various remediation technologies, makes recommendations, and implements actions for site restoration. ERD is responsible for managing remedial activities, such as soil removal and groundwater and soil vapor extraction and treatment, and for decontamination, decommissioning, and demolition of closed facilities in a manner that prevents environmental contamination and completes the facility life cycle. As part of its responsibility for CERCLA compliance issues, ERD plans, directs, and conducts assessments to determine both the impact of past releases on the environment and the restoration activities needed to reduce contaminant concentrations to protect human health and the environment.

3.1.4 Response to Spills and Other Environmental Emergencies

LLNL has an active spill response program to investigate and evaluate all spills and leaks (releases) at LLNL that are potentially hazardous to the environment. During working hours incidents can be reported to the EPD environmental analysts supporting program areas, or the LLNL Fire Dispatch for investigation and response. Off-hour incidents are reported to Fire Dispatch who notifies the Environmental Duty Officer (EDO) and the on-site Fire Department if required. The EDO, who is available 24 hours a day, seven days a week, maximizes efficient and effective emergency environmental response. The EDO and environmental analysts also notify and consult with LLNL management and have seven-day-a-week, 24-hour-a-day access to the Office of Laboratory Counsel for questions concerning regulatory reporting requirements.

3.1.5 Energy, Water and Fleet Management

The Facilities and Infrastructure Directorate implements Laboratory-wide programs for energy and water conservation, fleet management, high performance sustainable building, and renewable energy. These programs are designed to meet the requirements of DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management. The programs contribute to environmental protection through implementation of lab-wide reduction initiatives (see **Table 3-2**).

3.2 Environmental Management System

LLNL established its EMS to meet the requirements of International Organization for Standardization (ISO) 14001:1996 in June 2004. In 2006, LLNL upgraded its EMS to meet the requirements of ISO 14001:2004, and developed a number of Environmental Management Plans (EMPs) that address lab-wide significant aspects. During FY07, the EMS expanded to incorporate

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EMPs at the programmatic level. During FY08, more focus was placed on raising lab-wide awareness of the EMS, and on continued development of EMPs at both the institutional and programmatic levels.

3.2.1 Environmental Management Plans

EMS representatives from each program area continue to develop EMPs and associated objectives and targets, based on program-specific aspects. During FY08, directorates completed a reorganization into five Principal Directorates, plus the Director's Office. Existing active environmental plans were adopted by the new organizations, and additional EMPs were developed.

Directorates selected aspects to pursue considering which ones they could reasonably affect, based on budget and mission. During 2008, the directorate EMPs listed in **Table 3-1** were active. In addition, a number of EMPs and initiatives have been implemented to address Lab-wide environmental aspects (see **Table 3-2**).

Table 3-1. LLNL Directorate Environmental Management Plans active in 2008

| Principal Directorate | Aspect(s) addressed | Environmental Management Plan(s) and Program(s) |
|-------------------------------|--|---|
| Operations & Business | • Mixed waste generation | • Development of Authorized Limits for ERD GAC Filters (closed in 2008) |
| | • Municipal waste generation | • Municipal Waste Generation |
| | • Municipal waste generation | • Recycling of Beverage Containers |
| | • Municipal waste generation | • Office Paper Use Reduction and Recycling |
| | • Nonhazardous materials use | |
| | • Nonhazardous materials use | • Nonhazardous Materials Use |
| | • Electrical energy use • Fossil fuel consumption | • IMF (Institutionally Managed Facilities) Energy Conservation |
| Weapons & Complex Integration | • Cultural resource disturbance | • Archaeological Resources |
| | • Ecological resource disturbance | • Ecological Resources |
| | • Electrical energy use | • Electrical Energy Use |
| | • Fossil fuel consumption | • Fossil Fuel Consumption |
| | • Hazardous materials use | • Hazardous Materials Use |
| | • Municipal waste generation | • Municipal Waste Generation |
| | • Nonhazardous materials use | • Nonhazardous Materials Use |
| | • Radioactive materials use | • Radioactive Materials Use |
| | • Renewable energy use | • Renewable Energy Use |
| Science & Technology | • Municipal waste generation • Nonhazardous materials use | • Computer Packaging Material Recycling Plan |
| | • Nonhazardous materials use | • Minimizing Outdoor Equipment Storage |

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Table 3-1 (cont.). LLNL Directorate Environmental Management Plans active in 2008

| Principal Directorate | Aspect(s) addressed | Environmental Management Plan(s) and Program(s) |
|---------------------------------|--|---|
| Science & Technology (cont.) | <ul style="list-style-type: none"> • Hazardous materials use • Waste reduction | <ul style="list-style-type: none"> • Preventing the Formation of Lead Oxide by Sealing Lead Shielding |
| | <ul style="list-style-type: none"> • All environmental aspects | <ul style="list-style-type: none"> • EMS Integration into Work Control Process |
| | <ul style="list-style-type: none"> • Electrical energy use | <ul style="list-style-type: none"> • Server Energy Efficiency Opportunities |
| | <ul style="list-style-type: none"> • Radioactive materials use | <ul style="list-style-type: none"> • Minimizing Radioactive Sealed Sources and Reducing Exposure Hazards |
| | <ul style="list-style-type: none"> • Municipal waste generation | <ul style="list-style-type: none"> • Office Paper Use Reduction and Recycling |
| | <ul style="list-style-type: none"> • Municipal waste generation | <ul style="list-style-type: none"> • Evaluation of Beverage Container Recycling Opportunities in the S&T PAD |
| | <ul style="list-style-type: none"> • Electrical energy use | <ul style="list-style-type: none"> • B453 Electrical Energy Conservation |
| | <ul style="list-style-type: none"> • Hazardous waste generation • Industrial waste generation | <ul style="list-style-type: none"> • Engineering Shop Consolidation |
| Global Security | <ul style="list-style-type: none"> • Municipal waste generation • Nonhazardous materials use | <ul style="list-style-type: none"> • Office Paper Use Reduction and Recycling (completed in 2008) |
| | <ul style="list-style-type: none"> • Municipal waste generation • Nonhazardous materials use | <ul style="list-style-type: none"> • Office Paper Use Reduction and Recycling |
| Director's Office | <ul style="list-style-type: none"> • Municipal waste generation • Nonhazardous materials use | <ul style="list-style-type: none"> • Office Paper Use Reduction and Recycling |
| | <ul style="list-style-type: none"> • | <ul style="list-style-type: none"> • |
| | <ul style="list-style-type: none"> • Waste reduction | <ul style="list-style-type: none"> • Pharmaceutical Inventory Reduction Review (completed in 2008) |
| | <ul style="list-style-type: none"> • | <ul style="list-style-type: none"> • |
| | <ul style="list-style-type: none"> • Hazardous air pollutants emissions • Hazardous waste generation • Industrial waste generation • Hazardous materials use | <ul style="list-style-type: none"> • Modified Procedure for the Analysis of Plutonium in Urine Samples (completed in 2008) |
| NIF & Photon Science | <ul style="list-style-type: none"> • Hazardous waste generation • Municipal waste generation | <ul style="list-style-type: none"> • Hazardous Materials Use Reduction |
| | <ul style="list-style-type: none"> • Hazardous waste management | <ul style="list-style-type: none"> • Legacy Waste Management |
| | <ul style="list-style-type: none"> • Hazardous waste management | <ul style="list-style-type: none"> • Online Service Request Button |

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Table 3-2. LLNL Environmental Management Plans and Initiatives for Lab-wide aspects active in 2008

| Environmental aspect | Objective summary | Status |
|---|---|---|
| Ecological resource disturbance | <ul style="list-style-type: none"> Establish an LLNL policy prohibiting the introduction of exotic species Educate LLNL employees about the consequences of exotic species introduction Control exotic species, e.g., feral pig, largemouth bass | Ongoing. |
| Electrical energy use ^(a) | <ul style="list-style-type: none"> Meet the energy use intensity goals outlined in DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management | Energy use intensity was reduced by 5.39% over the FY03 baseline, exceeding the 3% fixed target for FY08. |
| Fossil fuel consumption/renewable energy use ^(a) | <ul style="list-style-type: none"> Meet the Vehicle Fleet Management objectives outlined in DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management | The E85 fuel station continued operation in 2008. LLNL has 267 E85 compatible alternative fuel vehicles (AFV) on-site and 65 electric vehicles (GEMS). Fleet Management continues to replace conventional fuel vehicles with AFVs per the General Services Administration (GSA) replacement schedule. LLNL's fleet size was reduced by 24% during FY08, resulting in a net reduction in total fuel consumption of 29,601 gallons. |
| Hazardous materials use | <ul style="list-style-type: none"> Identify priority chemicals for reduction, assess current hazardous materials usage, and provide information to programs for reduction evaluation. | Revised in late 2008, and republished as "Promotion of Safe Alternatives to Toxic Chemical Use". |
| Mixed waste generation | <ul style="list-style-type: none"> Reduce the amount of mixed and California combined solid waste generated from routine LLNL programmatic operations when economically and technologically feasible | Evaluation report prepared and EMP updated. (completed in 2008) |
| Nonhazardous materials use | <ul style="list-style-type: none"> Incorporate affirmative procurement site-wide Increase site-wide use of products with recycled content | Remaining training sessions scheduled for Q2FY08. (completed Q2FY08) |
| Water use ^(a) | <ul style="list-style-type: none"> Meet the water conservation goals outlined in DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management | LLNL decreased potable water use in FY08 by 3.43% over the FY07 baseline, exceeding the 2% fixed target for FY08. |
| Construction and building maintenance ^(a) | <ul style="list-style-type: none"> Achieve Leadership in Energy & Environmental Design for Existing Buildings (LEED-EB) certification for 15% of site's existing building square footage by FY2015 | Submitted one office building for U.S. Green Building Council (USGBC) LEED-EB operations and maintenance certification review. |
| Renewable energy use ^(a) | <ul style="list-style-type: none"> Meet the renewable energy goals outlined in DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management | A renewable energy analysis was conducted in April 2008. The assessment included an analysis of potential opportunities for renewable energy technologies, including solar photovoltaics, solar thermal, wind turbines and biomass energy projects. |

(a) Aspect is addressed as part of the DOE Order 430.2B Executable Plan.

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3.2.2 Senior Management Review of EMS

No management review of the EMS was performed during FY 2008.

3.3 Pollution Prevention Program

LLNL's P2 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 P2 accomplishments, and fostering of P2 awareness through presentations, articles, and events. The P2 Program supports institutional and directorate P2 activities via environmental teams, including implementation and facilitation of source reduction and/or reclamation, recycling, and reuse programs for hazardous and nonhazardous waste; facilitation of environmentally preferable procurement; and preparation of P2 opportunity assessments. LLNL's P2 Program is described in the *ES&H Manual*, Document 30.1.

The P2 Program at LLNL strives to systematically reduce all types of waste generated, and to 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 P2 Program uses a hierarchical approach to waste reduction (i.e., source elimination or reduction, material substitution, reuse and recycling, and treatment and disposal), which is applied, where feasible, to all types of waste. Waste generation is tracked using RHWMS's HazTrack database. By reviewing the information in this database, program managers and P2 Program staff can monitor and analyze waste streams to determine cost-effective improvements to LLNL operations.

LLNL continues its efforts to phase-out Class I ozone depleting substances (ODSs). These efforts include recovery and recycling activities, refrigerant and coolant substitutions, preventative maintenance, leak detection programs, and equipment replacement. LLNL uses minimal quantities of ODSs for mission-critical laboratory research, under the "laboratory exemption" provided for in 40 CFR Part 82, Subpart A, Appendix G.

3.3.1 Routine Hazardous, Transuranic, and Radioactive Waste

Routine waste listed in **Table 3-3** includes waste from ongoing operations produced by any type of production, analysis, and research and development taking place at LLNL. Residues resulting from the treatment of routine waste are not included to avoid double counting. There was an increase in hazardous waste volume in FY 2008, including a large volume of waste oil resulting from decommissioned equipment, site consolidation, and maintenance activities.

Table 3-3. Routine hazardous, transuranic, and radioactive waste at LLNL, FY 2005–2008.

| Waste category | FY 2005 | FY 2006 | FY 2007 | FY 2008 |
|---|-------------------|-------------------|--------------------|-------------------|
| Routine hazardous waste generated | 127 MT | 153 MT | 138 MT | 248 MT |
| Routine low-level waste generated | 54 m ³ | 66 m ³ | 197 m ³ | 77 m ³ |
| Routine mixed waste generated | 16 m ³ | 18 m ³ | 30 m ³ | 17 m ³ |
| Routine TRU / mixed TRU waste generated | 1 m ³ | 1 m ³ | 3 m ³ | 4 m ³ |

3.3.2 Diverted Waste

LLNL maintains an active waste diversion program, encouraging recycling and reuse of both routine and nonroutine waste.

3.3.2.1 Routine Waste

Together, the Livermore site and Site 300 generated 3506 MT of routine nonhazardous solid waste in FY 2008. This volume includes diverted waste (e.g., material diverted through recycling and reuse programs) and landfill waste.

Both sites combined diverted a total 2242 MT of routine nonhazardous waste in FY 2008, which represents a diversion rate of 64%. The diverted routine nonhazardous waste includes waste recycled by RHWM and materials diverted through the surplus sales program. The portion of routine nonhazardous waste sent to landfill was 1264 MT. See **Table 3-4**.

In 2008, LLNL transferred or donated for reuse 1 MT of electronics and recycled 69 MT of electronics, which were managed as universal waste.

Table 3-4. Routine nonhazardous waste in FY 2008, Livermore site and Site 300 combined.

| Destination | Waste description | Amount in FY 2008 (MT) |
|-------------|---------------------------------------|------------------------------|
| Diverted | Batteries, small ^(a) | 7 |
| | Batteries, lead-acid ^(a) | 30 |
| | Beverage containers | 3 |
| | Cardboard | 131 |
| | Cooking grease | 2 |
| | Engine oils | 8 |
| | Fluorescent lights ^(a) | 5 |
| | Magazines, newspapers, phone books | 20 |
| | Metals | 1171 |
| | Paper | 220 |
| | Tires and scrap | 22 |

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Table 3-4 (cont.). Routine nonhazardous waste in FY 2008, Livermore site and Site 300 combined.

| Destination | Waste description | Amount in FY 2008 (MT) |
|---|--------------------------|---------------------------------------|
| Diverted (cont.) | Toner cartridges | 7 |
| | Wood (chips, compost) | 616 |
| | TOTAL diverted | 2242 |
| Landfill | Compacted (landfill) | 1264 |
| | TOTAL landfill | 1264 |
| TOTAL routine nonhazardous waste | | 3506 |

(a) Batteries and fluorescent lights are managed as universal waste.

3.3.2.2 Nonroutine Waste

Nonroutine nonhazardous solid wastes include excavated soils, wastes and metals from construction, and decontamination and demolition activities. The Livermore site and Site 300 generated a total of 6889 MT of nonroutine nonhazardous solid waste in FY 2008.

In FY 2008, the two sites combined diverted 6342 MT of nonroutine nonhazardous solid waste through reuse or recycling, which represents a diversion rate of 92%. Diverted nonroutine nonhazardous solid waste includes soil reused either on site for other projects or as cover soil at Class II landfills, and metals recycled through the metals recycling programs. See **Table 3-5**.

Table 3-5. Nonroutine nonhazardous waste in FY 2008, Livermore site and Site 300 combined.

| Destination | Waste description | Amount in FY 2008 (MT) |
|--|--|---------------------------------------|
| Diverted | Class II cover soil (reused at landfill) | 3622 |
| | Class II concrete (reused at landfill) | 2467 |
| | Nonroutine metals | 253 |
| | TOTAL diverted | 6342 |
| Landfill | Construction demolition (noncompacted landfill) | 425 |
| | Industrial (HazTrack ^(a)) | 122 |
| | TOTAL landfill | 547 |
| TOTAL nonroutine nonhazardous waste | | 6889 |

(a) RHWM Waste Data Management System

3.3.3 Environmentally Preferable Purchasing

LLNL has a comprehensive Environmentally Preferable Purchasing (EPP) program that includes preferential purchasing of recycled content and biobased products. During FY08 LLNL implemented additional tracking for recycled content, biobased, and Energy Star products to facilitate tracking and improvements in EPP.

In 2008, the EPP program continued to include a preference for Electronic Product Environmental Assessment Tool (EPEAT) registered products. 95% of all desktop electronics purchases in FY 2008 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.

3.3.4 Pollution Prevention Activities

3.3.4.1 Environmental Stewardship Accomplishments and Awards

The P2 Team nominated LLNL's Space Action Team (SAT) for the 2008 EPA Region 9 Environmental Award, for their "Assets for Value" accomplishments during the 2007 calendar year. The "Assets for Value" process gives contractors the opportunity to include the reuse/salvage value of equipment and recyclable materials from a decontamination and demolition area as an offset in their bid. This process, in place since 2002, reduces the cost of the decontamination and decommissioning (D&D) contracts and maximizes reuse and recycling. SAT D&D activities are critical to the ongoing ability of LLNL to support its mission because for each facility constructed, LLNL must tear down an equivalent amount of legacy facility space.

The P2 Team received the California Integrated Waste Management Board's 2008 WRAP award for recycling accomplishments during the 2007 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.

3.3.4.2 High Performance Sustainable Buildings

The Facilities and Infrastructure Directorate manages the implementation of DOE Order 430.2B objectives related to sustainable building materials and practices. In FY08, 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 purpose and goal of the Policy is to reduce the usage of potentially hazardous cleaning chemicals and their adverse impact on indoor air quality, occupant health, and the environment. Also in FY08, one office building at the Livermore site was submitted for USGBC LEED-EB Operations and Maintenance certification review. This submission is the initial LEED certification effort at LLNL.

3.3.4.3 Energy Conservation

During FY08, LLNL achieved an energy use intensity reduction of 9.94% from FY03 baseline levels, exceeding the cumulative three year 9.0% goal. A number of energy conservation

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initiatives were implemented or active during FY08, including a formalized Laboratory-wide energy contest, “Every Watt Counts”. The contest encouraged friendly competition between the Principal Directorates as a way to promote energy conservation measures. Employee awareness of energy conservation was promoted through a series of energy savings articles published in *NewsOnline* (the LLNL electronic newsletter).

3.3.5 Pollution Prevention Employee Training and Awareness Programs

In 2008, LLNL conducted a number of activities to promote employee awareness of pollution prevention. LLNL participated in a community Earth Day event, held April 19, 2008. The event was sponsored by the City of Livermore and the Livermore Area Recreation and Park District, and included a creek cleanup and a festival. Over 400 attendees and 25 organizations participated. The P2 Team and volunteers from the LLNL Environmental Protection Department staffed a table at the festival, which included a poster display of LLNL waste diversion activities. Information on LLNL and pollution prevention was distributed to festival attendees.

The P2 Team conducted other awareness activities during the year. Articles on pollution prevention appeared in *Newsline* (the LLNL newspaper) and *NewsOnLine*. The P2 Team conducted training for purchasing staff on EPA requirements for affirmative procurement.

The P2 Team maintains an internal P2 website for LLNL employees. The website is a resource for employees regarding pollution prevention, energy efficiency, reuse and recycling of materials, green building, and other environmental topics. Employees can also use the site to suggest P2 ideas, ask questions about P2 planning and implementation, and find out about P2 current events. The P2 Team also operates the Earth Hotline for employees to call with questions, suggestions, or ideas regarding LLNL’s pollution prevention and waste diversion endeavors.