

# Lawrence Berkeley National Laboratory

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### **Title**

Environment, Safety, and Health Self-Assessment Report, Fiscal Year 2008

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**LAWRENCE BERKELEY  
NATIONAL LABORATORY**

**ENVIRONMENT, SAFETY, AND  
HEALTH  
SELF-ASSESSMENT REPORT  
FISCAL YEAR 2008**

Office of Contract Assurance  
Laboratory Directorate  
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# I. Executive Summary

Lawrence Berkeley National Laboratory's Environment, Safety, and Health (ES&H) Self-Assessment Program ensures that Integrated Safety Management (ISM) is implemented institutionally and by all divisions. The Self-Assessment Program, managed by the Office of Contract Assurance (OCA), provides for an internal evaluation of all ES&H programs and systems at LBNL. The functions of the program are to ensure that work is conducted safely, and with minimal negative impact to workers, the public, and the environment. The Self-Assessment Program is also the mechanism used to institute continuous improvements to the Laboratory's ES&H programs. The program is described in LBNL/PUB 5344, *Environment, Safety, and Health Self-Assessment Program* and is composed of four distinct assessments: the Division Self-Assessment, the Management of Environment, Safety, and Health (MESH) review, ES&H Technical Assurance, and the Appendix B Self-Assessment.

The Division Self-Assessment uses the five core functions and seven guiding principles of ISM as the basis of evaluation. Metrics are created to measure performance in fulfilling ISM core functions and guiding principles, as well as promoting compliance with applicable regulations.

The five core functions of ISM are as follows:

1. Define the Scope of Work
2. Identify and Analyze Hazards
3. Control the Hazards
4. Perform the Work
5. Feedback and Improvement

The seven guiding principles of ISM are as follows:

1. Line Management Responsibility for ES&H
2. Clear Roles and Responsibilities
3. Competence Commensurate with Responsibilities
4. Balanced Priorities
5. Identification of ES&H Standards and Requirements
6. Hazard Controls Tailored to the Work Performed
7. Operations Authorization.

Performance indicators are developed by consensus with OCA, representatives from each division, and Environment, Health, and Safety (EH&S) Division program managers. Line management of each division performs the Division Self-Assessment annually. The primary focus of the review is workplace safety.

The MESH review is an evaluation of division management of ES&H in its research and operations, focusing on implementation and effectiveness of the division's ISM plan. It is a peer review performed by members of the LBNL Safety Review Committee (SRC), with staff support from OCA. Each division receives a MESH review every two to four years, depending on the results of the previous review.

The ES&H Technical Assurance Program (TAP) provides the framework for systematic reviews of ES&H programs and processes. The intent of ES&H Technical Assurance assessments is to provide assurance that ES&H programs and processes comply with their guiding regulations, are effective, and are properly implemented by LBNL divisions.

The Appendix B Performance Evaluation and Measurement Plan (PEMP) requires that LBNL sustain and enhance the effectiveness of integrated safety, health, and environmental protection through a strong and well-deployed system. Information required for Appendix B is provided by EH&S Division functional managers. The annual Appendix B report is submitted at the close of the fiscal year. This assessment is the Department of Energy's (DOE) primary mechanism for evaluating LBNL's contract performance in ISM.

## II. ES&H Improvements

Each year, as a result of the annual ES&H self-assessment process, LBNL identifies institutional issues that require management action. Actions completed to address opportunities for improvement identified in the fiscal year (FY) 2007 ES&H Self-Assessment Report include:

- Published new PUB-3000 Chapter 25 to clarify the policy on the selection, qualifications, training, and responsibilities of shop managers.
- Updated applicable sections of PUB-3000 to require that all existing or potential hazards and potentially hazardous equipment are identified and represented on the EH&S Hazard Management System (HMS) Summary Report.
- Improved ergonomics program; equipment loaner program; timeliness and reliability of ergonomics database information; and ergonomic equipment identification and procurement process.
- Added five new online ES&H training classes.
- Improved processes to ensure that division-specific ES&H training courses are consistent with LBNL policy and procedures.

Statuses of all institutional issues identified in the FY 2007 ES&H Self-Assessment Report are described in Appendix A, Status of FY 2007 Self-Assessment Institutional Opportunities for Improvement.

LBNL also completed 100% of the planned major activities on the FY 2008 Integrated Safety Management System Correction Action Plan (ISMS CAP). This plan included the corrective actions identified through the January 2006 Peer Review and seven major recommendations stemming from the September 2006 McCallum-Turner (M-T) ISMS review, which LBNL commissioned in an ongoing effort to improve implementation of ISM. The major activities in this CAP were designed to improve overall ES&H performance by addressing key organizational and cultural safety issues at LBNL. These included:

- Developing the safety work lead concept.
- Implementing the new Job Hazards Analysis (JHA) process.
- Expanding implementation of the ES&H technical assurance program.
- Developing new work-control processes for non-construction subcontractors, vendors, and guests.

Furthermore, LBNL commissioned an additional M-T review to examine the progress and effectiveness of implementing the ISMS CAP corrective actions. Results of their evaluation indicated that LBNL addressed the intent of the recommendations and that it is on the right trajectory for implementing them.



### III. Division ES&H Self-Assessments and Safety Review Committee MESH Reviews

This section describes the results of both Division ES&H Self-Assessment and Safety Review Committee (SRC) MESH reviews. Divisions track division-specific deficiencies identified from these reviews until they are resolved. This report addresses issues present in multiple divisions, where performance indicates recurrent inadequacies in implementation and/or programmatic weaknesses. Assessment results are reported under ISM core function as:

- Findings: Regulatory deficiencies and non-compliance with internal requirements, including formal authorizations or hazardous work permits.
- Observations: Observations indicate opportunities for improvement. They may be practices and conditions that are not necessarily out of compliance as observed, but could lead to non-compliance under other circumstances from those observed, or if left unaddressed.
- Noteworthy Practices: Practices or conditions that are recognized for their excellence and should be considered for application throughout LBNL.

A consolidated list of institutional findings and observations is located in Appendix B, FY 2008 Self-Assessment Institutional Findings and Observations. Appendix C, FY 2008 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from these assessments.

#### Division Self-Assessments

Divisions use the current Self-Assessment Program performance criteria to evaluate their work activities, workplaces, and operations for conformance to safe practices and environmental stewardship. Self-assessment activities include ongoing inspections, informal walkthroughs, hazard reviews, interviews with managers and staff, and review of ES&H performance indicators. At the end of the performance year, each division prepares a report that summarizes these activities and appraises its ES&H performance. OCA reviews these reports and conducts a validation session with division and DOE representatives. The validation is performed to provide feedback on the comprehensiveness of the divisions' self-assessment processes and to identify opportunities for improvement and noteworthy practices in these processes.

FY 2008 was the second year after LBNL transitioned from the criteria-focused model of assessment that had been employed previously and adopted a more comprehensive approach. Most divisions performed a more comprehensive self-assessment in FY 2008 as compared to FY 2007. Overall, the FY 2008 ES&H Division Self-Assessment Reports included a greater level of analysis than did the FY 2007 reports. However, much room for improvement remains. Each division director received

a validation report including opportunities for improving the divisions' self-assessment processes.

## **MESH Reviews**

The SRC conducts reviews of each division's management of environment, safety, and health in operations and/or research, focusing on the implementation and effectiveness of each division's ISM Plan. For FY 2008, the SRC conducted MESH reviews in the following divisions:

<u>Division</u>	<u>MESH Review Date</u>
Accelerator and Fusion Research Division (AFRD)	August 2008
Computing Sciences	August/September 2008
Directorate/Operations	January 2008
Earth Sciences	August 2008
Genomics Division	July/August 2008

## **Performance Results**

### ***ISM Core Function 1: Define Work***

Divisions describe their processes for sustaining the five core functions of ISM in division-specific ISM plans. Most divisions updated their ISM plans to reflect substantive policy changes made during the performance year, including the new JHA process and designation of Work Leads. Divisions also considered the Institutional ISM Plan, last revised September 2007, in updating their division-specific plans. Divisions communicated the content of their plans via all hands meetings, group meetings, and division Web sites. Some divisions include staff awareness of their ISM plan on self-assessment checklists and assessed effectiveness of communication during safety walkarounds. Division Self-Assessment and the MESH reviews both identified the need to improve awareness of ISM, division ISM plans, and how the division plan applies to employees' work.

A major FY 2008 initiative for LBNL was the replacement of the Job Hazards Questionnaire with the JHA, a newly implemented process that provides a documented mechanism to address the five core functions of ISM. Divisions expended tremendous effort to implement the new process, and LBNL achieved an overall JHA completion rate of 92% as of September 30, 2008.

## FINDINGS

**Finding 1-1.** *Division Self-Assessment and MESH reviews identified gaps in understanding and awareness of the principles of ISM.*

Although this issue was not limited to new employees, the reviews did reveal this weakness with new employees, even though they had completed new employee training. The new online EHS-10, Introduction to EH&S at LBNL, is comprehensive and includes a module on ISM. The training, however, is lengthy and not conducive to being used as a refresher. EH&S should consider an online ISM training similar to that required in the Engineering Division, which can be updated with significant new policies, procedures, and processes, such as the Work Lead concept and JHA.

**Finding 1-2.** *Some divisions did not update their ISM plans consistent with changes to PUB-3000.*

**Finding 1-3.** *Existing methods for communicating PUB-3000 revisions to all levels of division line and safety management are inadequate. Furthermore, divisions need improved direction on required modifications to division ISM plans.*

EH&S acted upon this issue identified in the FY 2007 Annual Self-Assessment Report by preparing semi-regular “Safety Notes” from the EH&S Division Director and Deputy, and distributing them to senior management, division directors, deputy division directors, and division safety coordinators. Recommend further attention to this issue, and development of a more formalized mechanism to inform the entire LBNL community.

**Finding 1-4.** *Some divisions cited less than full compliance with division walkaround requirements.*

Performance management processes need to fully address execution of safety responsibilities.

**Finding 1-5.** *Memoranda of Understanding for safety responsibilities are less than adequate.*

Division Self-Assessments and MESH reviews identified issues with inadequate, unclear, or nonexistent MOUs.

## OBSERVATIONS

**Observation 1-1.** *Some divisions’ ES&H Web sites contain outdated information.*

**Observation 1-2.** *While the fiscal year-end LBNL-wide JHA completion rate met institutional expectations, implementing the process identified opportunities for improvement in understanding and awareness of the JHA process.*

Institutional plans for feedback and improvements to the JHA process include implementation of EH&S TAP assessments of the JHA processes, scheduled to begin in FY 2009. Divisions also plan to improve awareness and understanding of the JHA process.

**Observation 1-3.** *The Life Sciences Division is responsible for the safety of UCB staff working in Donner Lab who have no program affiliation with LBNL.*

This matter is currently under discussion between LBNL and UCB senior management.

**Observation 1-4.** *Responsibility for telecommunications closets is inconsistent and unclear.*

The Information Technology (IT) Division identified this issue and is working with Facilities to resolve it.

## **NOTEWORTHY PRACTICES**

Noteworthy practices under Define Work include:

- ISM awareness lines of inquiry in some divisions' walkaround checklists.
- Division policy that department heads serve on a division's safety committee.
- Division-specific required ISM training.

Appendix C, FY 2008 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from Division Self-Assessments and MESH reviews.

### ***ISM Core Function 2: Identify and Analyze Hazards***

Divisions identify and analyze hazards by reviewing work activities and inspecting workspaces and operations. The new activity-based JHA process involves analyzing the work, determining what the hazardous tasks are, and defining the controls required to mitigate the hazards. The worker and his/her Work Lead achieve agreement before the work is authorized. Following initial implementation, some divisions identified the need to improve supervisors' and staff understanding of the process.

Most divisions documented their hazards and environmental impacts inherent in their work in the institutional Hazard Management System (HMS) database<sup>1</sup>, though some reported poor performance in this area and one division did not use HMS at all. Division Self-Assessments and TAP assessments of the chemical inventory process identified less than adequate performance in maintaining an accurate inventory.

LBNL staff demonstrated awareness of the environmental impacts of their activities and sought ways to reduce those impacts. Divisions conducted environmental performance reviews for selected new and existing work, and some completed an Environmental Review and Self-Assessment Checklist to guide their assessment activities in this area. All divisions addressed efforts at reducing paper use, recycling commonly used items, and purchasing Energy Star and recycled content products.

## **FINDINGS**

**Finding 2-1.** *Not all affected staff have a current JHA.*

Guests, in particular, pose a challenge for divisions in terms of JHA and training compliance, particularly those divisions that support an active user community/guest program. LBNL should consider adopting the Environmental Energy Technologies Division's (EETD) policy to not renew employment terms for guests and visitors until their JHAs are current and all required training is completed or scheduled.

**Finding 2-2.** *Use of the institutional systems to document hazards is less than adequate.*

Divisions reported less than adequate use of HMS and the Chemical Management System.

**Finding 2-3.** *The Facilities/EH&S/customer division planning processes need improvement.*

Several instances in FY 2008 indicate that construction projects did not receive the appropriate review by safety subject matter experts (SMEs):

- New chemical laboratories were constructed in Building 71 without shower or eye wash stations.
- Off-site shipment of contaminated soil from a construction site.
- Newly purchased standardized office furniture was not reviewed by ergonomics staff, and ergonomics metrics were not applied to the selection of furniture or to workstation adjustment features.

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<sup>1</sup> HMS is a hub for EH&S databases that queries 10 hazard, equipment, and authorization systems to produce a comprehensive EH&S Summary Report.

## OBSERVATIONS

**Observation 2-1.** *Off-site work lacks institutional policy on hazard identification, analysis, and control.*

Work performed off site is analyzed through division-specific processes. Earth Sciences Division (ESD) uses an Off-Site Safety and Environmental Protection Plan, and EETD completes its Off-Site Safety Review form.

**Observation 2-2.** *Access controls for viewing and updating data in the HMS and Chemical Management System (CMS) limit the functionality of these systems.*

In some situations, the access limitations seemingly defeat the purpose of updating the data. For instance, collocated Principal Investigators (PIs) cannot view the inventories of others who share their space.

**Observation 2-3.** *Divisions rely heavily on a small number of staff to enter data in EH&S databases and the Corrective Action Tracking System (CATS).*

Several divisions plan to train additional staff on the use of these databases in order to improve compliance with institutional requirements.

## NOTEWORTHY PRACTICES

Noteworthy practices under Identify and Analyze Hazards include:

- Mandatory JHA completion for proximity card access in some locations.
- Division policy to not renew employment terms for guests and visitors until their JHAs are current and all required training is completed or scheduled.
- Improved energy efficiency of the IT primary data center, 50B-1275.
- Emphasis and exceptional effort placed on recycling during laboratory and office moves.
- Large multi-laboratory groups have made efforts to place chemical containers under the ownership of a small number of owners, thus reducing the administrative burden of managing their proxy lists.

Appendix C, FY 2008 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from Division Self-Assessments and MESH reviews.

### ***ISM Core Function 3: Control Hazards***

Divisions administratively control work through line-management, formal, and facility-based authorizations. The JHA process provides uniformity in how line-management authorization is applied at LBNL. Formal authorizations are issued by the EH&S Division; some examples are Activity Hazard Documents (AHDs), Radiological Work Authorizations (RWAs), Biological Use Authorizations (BUAs), Confined Space Permits and Hot Work Permits. Facility-based authorizations include Safety Analysis Documents and environmental permits. In FY 2008, EH&S completed the migration of AHDs to the new Web-based system. The Web-based system is intended to improve document preparation and review process, although divisions noted the lengthy review time for some AHDs.

Divisions assessed their facilities and operations to ensure the appropriate engineering controls are in place and maintained. Both Division Self-Assessment and a MESH review identified a weakness in the ventilation program. EH&S is implementing TAP for ventilation in early FY 2008, which will provide more timely feedback on the status of the program.

Divisions continued to focus effort and resources to identify and control ergonomic hazards. EH&S and the divisions improved their ability to identify employees with high-risk factors before an injury occurs through the introduction of a Web-based employee ergonomic self-assessment and training program, implementing the ergonomic advocate program, and enhancing communications and awareness of safety to encourage employees to report injuries earlier.

## **FINDINGS**

### ***Finding 3-1. The EH&S ventilation database is not current.***

One division identified a laboratory hood overdue for inspection by many years. The EH&S Division identified in its self-assessment that the ventilation database is not up to date. EH&S plans to initiate TAP assessments of the ventilation program in FY 2009.

### ***Finding 3-2. Less than adequate completion for required online Remedy Interactive ergonomics training.***

## **OBSERVATIONS**

### ***Observation 3-1. EH&S review time of AHDs is uneven depending on the subject area.***

Review times should be addressed in AHD TAP assessments scheduled for implementation in FY 2009.

**Observation 3-2.** *External and internal assessments identified the need for improved communication and understanding of the Biological Use Authorization (BUA) process.*

EH&S should consider modifying the BUA process for new and renewed authorizations to include a meeting of the PI, group members, and the LBNL Biosafety Officer, analogous to the RWA process.

**Observation 3-3.** *The Ergonomics Advocate Program is limited to office environment hazards.*

Divisions identified the need for additional Ergonomic Advocates and, in particular, Ergonomic Advocates trained to identify ergonomic risks in laboratories with bench research. EH&S plans to develop laboratory ergonomics training and evaluation in FY 2009.

## **NOTEWORTHY PRACTICES**

Noteworthy practices under Control Hazards include:

- Division funding for ergonomic needs if programmatic funding is not available.
- Divisions devoting resources to ergonomic advocates.
- Intensive communications on ergonomic safety during the B937 move, including a video on proper moving techniques.

Appendix C, FY 2008 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from Division Self-Assessments and MESH reviews.

### **ISM Core Function 4: Perform Work**

Divisions assessed their activities to determine if work was performed within ES&H conditions and requirements specified by LBNL policies and procedures. Elements assessed include formal work authorization and hazardous work permit compliance, environmental compliance including waste management, required training completion, and accident and injury data.

Through their self-assessment activities, some divisions noted fully compliant Satellite Accumulation Areas (SAAs), while others determined that their performance was unsatisfactory. EH&S Waste Management Group (WMG) Technical Assurance assessments of 370 waste storage areas found 83% in full compliance with all policies and regulations. EH&S addressed this issue in FY 2008 by offering additional training if requested and performing additional inspections if requested and developing a One Minute 4 Safety (1X4) on SAA management. LBNL's average Quality Assurance waste sampling



compliance was 98.7% in FY 2008, and the Waste Management Group issued only one Non-conformance and Corrective Action Report (NCAR) during the performance period.

The Radiation Protection Group (RPG) issued eight Level 2 (major) violations in FY 2008, as compared to six Level 2 violations in FY 2007. RPG issued no Level 3 (safety significant) violations in FY 2008. Divisions responded to RPG's non-compliance memos and tracked their issues and corrective actions in CATS.

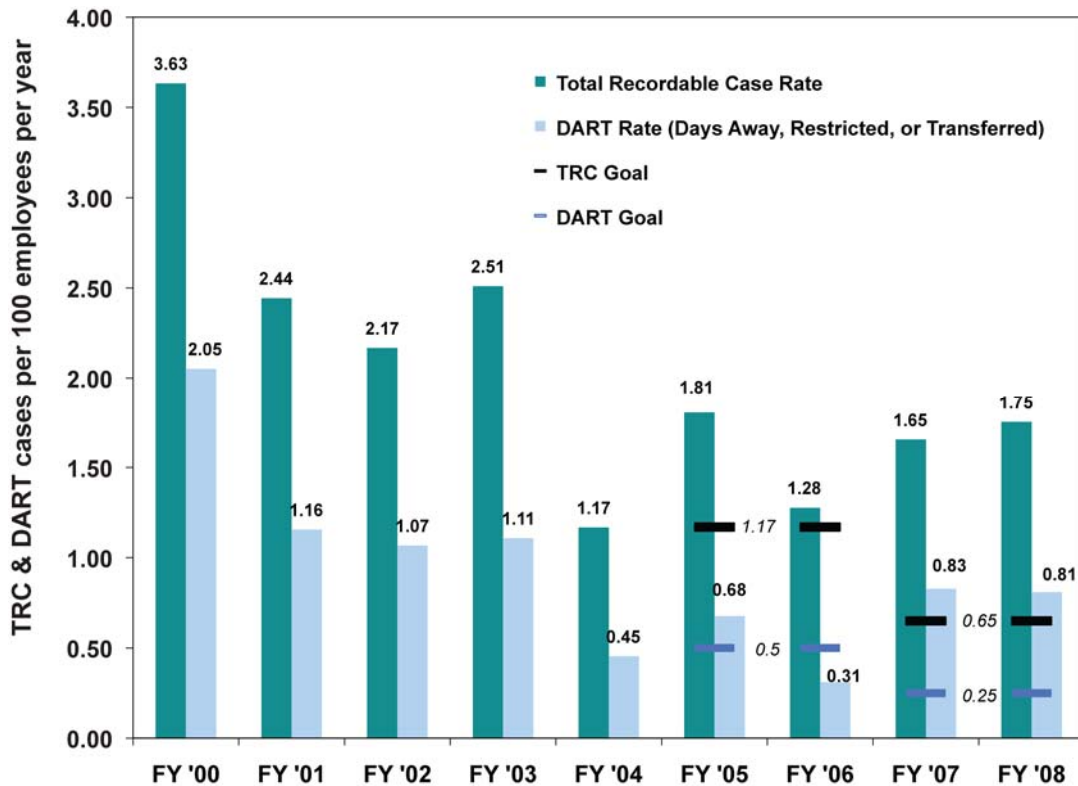
LBNL received four notices of violation (NOV) for minor non-compliance identified during inspections by external regulatory agencies. Two NOVs were from a City of Berkeley Toxics Management Group inspection of fixed treatment units that identified inadequate labeling and written inspection records. The Department of Health Services issued an NOV during its annual inspection of medical waste management for hand carrying of red biohazardous bags from point of generation to interim storage. Finally, the State of California Department of Toxic Substances Control issued an NOV to LBNL for minor labeling errors on three drums of hazardous waste following a multi-day inspection of the Hazardous Waste Handling Facility.

Overall, LBNL achieved a 92% ES&H training completion rate. This is a notable accomplishment given the number of additional courses required as a result of the newly implemented JHA process. Some divisions provide supplemental ES&H introductory training and orientation, which enables divisions to focus on pertinent issues, provides an opportunity for new employees to meet the division safety coordinator (DSC), and encourages safety discussions among division employees.

The FY 2008 Laboratory-wide total recordable cases (TRC) rate is 1.75, an increase over the FY 2007 TRC rate of 1.65 (see chart on page 13). The most serious individual recordable accidents during FY 2008 were a broken wrist due to a trip and fall, a fractured toe due to a falling object, and a fractured forearm due to a trip and fall.

In response to rising illness and injury case rates, LBNL continued its aggressive program to reduce the number and severity of injuries, specifically ergonomics injuries, which represented approximately 70% of injuries in FY 2008.

LBNL safety performance in construction continues to excel. During FY 2008, LBNL executed more than 80 capital and small-project construction projects representing approximately \$200 million in effort and involving more than 60,000 hours of subcontract labor. There were no lost-time injuries, and just one recordable injury for construction work in FY 2008. In August 2008, LBNL reached three years without a construction lost-time injury, significantly better than the industry average.



*Berkeley Lab site-wide TRC and DART rates (including all construction and service contractors) through September 30, 2008 (chart revised December 17, 2008).*

**FINDING**

**Finding 4-1.** *SAA compliance is less than adequate.*

**OBSERVATION**

**Observation 4-1.** *Divisions identified room for improvement in documenting on-the-job training (OJT).*

Specific examples of this issue include one division that identified the need to improve documentation of OJT in most of its activities, and another that determined that the need for improvement is isolated to documented OJT for guests.

**NOTEWORTHY PRACTICES**

Noteworthy practices under Perform Work include:

- Division/facility-specific training supplemental to the required institutional new employee training
- Division policy of no grace period for training available online.

Appendix C, FY 2008 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from Division Self-Assessments and MESH reviews.

### ***ISM Core Function 5: Feedback and Improvement***

Senior management in all divisions is involved in ES&H feedback and improvement. Divisions have established extensive communications networks in the form of division-wide meetings and e-mail distribution, senior leadership ES&H forums, safety committees and subcommittees, newsletters, Web pages, etc. Some divisions prepare and review quarterly management briefings on topics such as accidents/incidents, training/JHA completion, ergonomic evaluations, and corrective actions to address ES&H deficiencies.

During the performance period, divisions continued to implement and improve their safety walkaround programs. They focused on improving walkaround quality and their ability to identify technical issues such as electrical hazards, in addition to administrative issues such as signage. Divisions worked with EH&S and develop division-specific EHS027, Performing an Effective Safety Walkaround training. Some divisions also performed risk-based assessments of predominant hazards, such as biosafety and chemical management.

Divisions investigated adverse ES&H conditions reported in the DOE Occurrence Reporting and Processing System (ORPS), Non-compliance Tracking System (NTS) Reports, and Supervisor Accident Analysis Reports (SAARs). Some divisions improved the level of analysis they perform; notable examples include an analysis of several events that identified weakness in implementing ISM Core Function 1, Define Work; and a thorough investigation and analysis of an RWA violation that resulted in multiple process improvements.

At the direction of the Laboratory Director, divisions began to develop near-hit reporting systems. Some divisions offer incentives for near-hit reports and believe this has resulted in a greater willingness to share adverse experiences. However, this information is typically not broadly disseminated outside the source division.

In general, divisions are effectively tracking and resolving safety deficiencies. Some, however, identified less than adequate use of CATS.

## **FINDING**

### ***Finding 5-1. Some divisions are not tracking safety deficiencies in CATS.***

Performance in this area ranges from divisions that generally fail to use the system, to those that are largely compliant, but admit to circumventing the CATS/Maximo linkage to expedite correction of safety deficiencies. Those divisions sent Facilities work requests to correct safety deficiencies directly to the Work Request Center, rather than entering them into CATS, to avoid the requisite division and EH&S review of the entry.

## **OBSERVATIONS**

**Observation 5-1.** *The CATS database is not intuitive.*

Opportunities to improve CATS and compliance with issues management policy include:

- Implementing a more streamlined version of CATS, scheduled for February 2009.
- Including an introduction to the CATS database in the ISM slides of EHS010, *Introduction to ES&H at LBNL*.
- Provide online training for issue categorization and CATS data entry.

**Observation 5-2.** *Lessons Learned / Best Practices are shared within divisions but not broadly communicated to the LBNL community as a whole.*

Opportunities to improve effectiveness of the Lessons Learned program include:

- Include an introduction to the Lessons Learned/Best Practices database in the ISM slides of EHS010, *Introduction to ES&H at LBNL*.
- Provide online training on the Lessons Learned/Best Practice database.
- Reduce the review time for Lessons Learned Briefings, in order to expedite the communication of the lesson with the potentially affected groups

## **NOTEWORTHY PRACTICES**

Noteworthy practices under Feedback and Improvement include:

- Incentive programs for reporting of near-hits.
- Division policy to notify Division Safety Coordinator of near-misses.

Appendix C, FY 2008 Self-Assessment Divisional Noteworthy Practices, includes a comprehensive list of best practices identified from Division Self-Assessments and MESH reviews.

## IV. ES&H Technical Assurance Program (TAP)

The ES&H Technical Assurance Program provides the framework for systematic reviews of ES&H programs and processes. The intent of ES&H Technical Assurance assessments is to provide assurance that ES&H programs and processes comply with their guiding regulations, are effective, and are properly implemented by LBNL divisions.

OCA works with EH&S Division representatives to establish and maintain a three-year ES&H Technical Assurance assessment schedule. Review periodicity varies, depending on programs' and processes' hazards and risk levels. Program leads develop Technical Assurance Assessment Plans (TAAPs) and conduct assessments according to the TAAPs.

ES&H Technical Assurance assessments include regular inspections of the workplace, work activities, and facilities. Assessments also include reviews of documentation such as formal work authorizations, hazardous work permits, and EH&S and CATS databases. The primary elements of ES&H Technical Assurance assessments are:

- Formal authorization compliance
- Regulatory compliance
- Program or process effectiveness
- Issues documentation (via the CATS database) and timely resolution
- Corrective action effectiveness (implemented via data monitoring and analysis)
- Lessons Learned effectiveness.

Systematic assessments of the technical programs and processes provide the EH&S and other divisions a basis on which to direct resources for improved ES&H performance.

### Performance Results

EH&S Division implemented ES&H Technical Assurance for a limited number of programs and processes in FY 2007 and expanded the program to 23 subject areas in FY 2008. However, DOE technical reviews in FY 2008 demonstrated that TAP assessments were not implemented soon enough for some EH&S programs, and that TAP assessments required greater focus on regulatory compliance. In response to these identified weaknesses, LBNL took the following actions:

- Strengthened leadership:
  - Appointed EH&S Division Director chair of TAP Steering Committee
  - Appointed EH&S Division TAP Manager

- Established TAP Technical Guidance Committee
- Accelerated implementation in targeted areas
- Emphasized compliance.

These and other improvements to the TAP set the framework for improved assessments in FY 2009.

For each program assessed, this report includes a brief description of TAP assessments, notable achievements and improvements, and programmatic findings and observations. Division implementation deficiencies are communicated at the time of assessments and tracked through resolution by the divisions, whereas any programmatic findings are tracked by the EH&S Division.

### **Asbestos**

The FY 2008 fourth-quarter TAP assessment of the Asbestos Program and implementation determined that all asbestos personal air sampling results collected by either subcontractors or LBNL Industrial Hygienists (IHS) were below occupational exposure limits, signifying that engineering controls and work practices were effective. IH asbestos field assessments and hazard evaluations were performed as required.

**Finding.** All asbestos in place locations, such as those with asbestos concealed under floor tiles and linoleum, are not identified in HMS.

**Observation 1.** The Asbestos Management Plan does not include an agreement between EH&S and Facilities Division regarding installation of new floor coverings over existing asbestos vinyl floor tiles or linoleum.

**Observation 2.** There is only one trained asbestos worker (plumber) in the Facilities Division, which is insufficient to respond to customer requests for tasks such as anchoring equipment through asbestos floor tiles and other miscellaneous asbestos-related tasks that affect the various trades in Facilities.

### **Biosafety**

In fourth quarter FY 2008, the LBNL Biosafety Officer performed TAP field assessments focused on implementation of BUA and Biological Use Registration (BUR) requirements and compliance with biosafety standards. The TAP assessments identified findings and observations in program implementation and communicated them to the appropriate line management. The TAP assessment also identified a disconnect between training requirements as indicated on the BUAs and those in the JHA.

**Finding.** EHS0735/738 (Blood-borne Pathogen Training) and EHS0745 (Hepatitis B Medical Surveillance) are linked requirements in the JHA system as of mid-2008, but some training profiles that were completed early in the JHA implementation do not show

EHS0745 as a required course, whereas EHS0735/738 is required. Workers now required to take EHS0745 have typically taken the course, even if it is only listed in their JHA profile as an “extra” course. This administrative issue associated with linking EHS0735/738 and EHS0745 is being tracked in CATS.

### ***Chemical Hygiene and Safety Program***

Chemical Hygiene and Safety Program (CHSP) field assessments of ESD, EETD, the Molecular Foundry (TMF), and National Center for Electron Microscopy (NCEM) indicate that, in general, divisions and staff are properly implementing the CHSP. Isolated exceptions were communicated to the divisions for tracking and resolution.

Programmatic improvements include review and update of the Chemical Hygiene and Safety Plan to include Control Procedures for Engineered Nanomaterials, and Control Procedures for Chemicals with Explosive Properties; and development and deployment of three online training classes: Safe Handling of Engineered Nanoscale Particulate Matter, Chemical Hygiene and Safety Training, and Chemical Hygiene and Safety Refresher Training.

**Finding.** TAP assessments identified inconsistent CHSP implementation in the posting and labeling of laboratory entrances and designated areas; use of secondary containment for liquids; and lack of proper spill kits.

**Observation 1.** Non-high efficiency particulate air (non-HEPA) filtered hoods and enclosures are used for operations involving dispersible Engineered Nanomaterials (ENMs) and suspensions/solutions of ENMs (which may pose a dispersion hazard if dried).

**Observation 2.** With the exception of the Molecular Foundry, laboratory coat service vendors are not informed of potential ENM contamination.

### ***Chemical Inventory Program***

The FY 2008 fourth-quarter TAP assessment of the Chemical Management System (CMS) determined that CMS is an effective tool for tracking and maintaining chemical container data. However, the population and maintenance of the data is significantly lacking. The tool, though functionally sound, still lacks the necessary popularization and continuous usage needed to keep the program fully effective. There is a site-wide awareness for the need for an accurate chemical inventory, and there is sufficient initial input of chemical containers. Effort drops off after chemicals are entered into the CMS database and are not kept up to date. Additional effort is necessary on the part of chemical owners and their divisions to keep the inventory accurate during normal work operations, moves, and personnel and management changes.

**Finding.** Less than adequate population and maintenance of chemical container data.

### ***Confined Space Program***

Two TAP assessments of the Confined Space Program were completed during the year. The scope of the assessments included field reviews, analysis of entry permits and discussions with associated personnel. The TAP evaluations were useful in identifying programmatic and implementation improvements. There were no injuries or exposures during the year, and entries were safe. Notable improvements to the Confined Space Program include: addition of interactive training exercise; production of take-home handbook for training class participants; and verification of over 50% of the confined space inventory. The program created Safe Work Plans in cooperation with the owners and users of the spaces, to ensure good communication and program compliance.

**Finding.** HMS, and the EH&S Summary Report it generates, does not contain confined space hazards.

### ***Construction Safety***

The Construction Safety Department monitors subcontractor safety programs and performance to ensure compliance with LBNL requirements, and audits subcontractors for the LBNL Procurement Office evaluations of subcontractors' safety performance.

Technical assurance activities for construction safety began in the first quarter of FY 2008 and gradually increased in scope throughout the year. EH&S conducted 621 documented construction safety inspections and documented 7,590 work observations.

Fall protection issues continue to be a significant concern on construction sites at LBNL. Refer to the TAP section on Fall Protection for further details.

### ***Controlled Substance Protocol***

Schedule I and II chemicals listed in the Controlled Substance Act are used in research at LBNL and are subject to internal controls. The LBNL Controlled Substances Protocol provides guidelines for acquiring and accounting for controlled substances for scientific use at the LBNL.

One controlled substance transaction was assessed under TAP in FY 2008. The assessment determined that the controlled substance was transported in accordance with the Controlled Substances Protocol.

### ***Cranes, Hoisting, and Rigging***

The EH&S Cranes, Hoisting, and Rigging Safety SME and the Crane and Rigging Service Contractor assessed 50 cranes in FY 2008, more than double the 20 planned.

Cranes were selected at random during scheduled and unscheduled SME field visits. Assessments included inspections of the cranes and review of service records. Minor deficiencies in crane inspection documentation were identified and immediately corrected. All operators identified for the cranes reviewed were adequately trained.



However, a review of the list of crane managers revealed several who were not qualified; a few no longer worked for LBNL, and others were no longer working with the crane they had been assigned to manage. EH&S administratively locks cranes without qualified crane managers. A tag on the locks directs potential users to the Facilities Division rigging supervisor. The rigging supervisor acts as the crane manager and decides whether users are qualified to operate that particular crane.

EH&S improved crane, hoisting, and rigging training in FY 2008. The division facilitated an overhead crane train-the-trainer course and updated the “greater than two ton” lecture and practical courses.

**Finding.** Crane managers are not adequately identified. There is a crane manager associated with every crane; however, the list is outdated, some crane managers are not properly trained, and some were unaware that they were designated crane manager.

**Observation.** There were two high-consequence/high-value lifts performed without incident during the year. However, another DOE facility experienced an incident where a truck was overturned by an unbalanced load. Including the Transportation Manager in the planning of high-consequence/high-value lifts would mitigate potential issues with such lifts.

### ***Electrical Safety***

The purpose of the electrical safety program at LBNL is to ensure the electrical safety of every employee, visiting guest, and contractor at the Laboratory. The program helps line managers define safe work practices for workers who work with electrical equipment, including providing training and establishing a process for evaluating electrical hazards.

Technical assurance activities for electrical safety began in the second quarter of FY 2008, and gradually increased in scope throughout the year. LBNL performed 109 documented electrical safety inspections and documented 278 work observations.

Four electrical safety ORPS reports were filed during FY 2008, and resulted in a number of corrective actions. DOE also conducted an assessment of electrical safety at LBNL, which resulted in nine findings with 36 corrective actions. Overall, the majority of corrective actions for both the ORPS and DOE assessment have been completed.

**Finding.** The number of electrical shocks, improper use of Lock Out/Tag Out (LOTO), and the failure to comply with minimum Occupational Safety and Health Administration (OSHA) requirements for electrical safety indicates that the LBNL electrical safety program is not achieving its purpose. Line management has been slow to recognize and act on these issues; however, corrective actions to address recent electrical incidents and findings of a DOE assessment are under way.

## ***Ergonomics***

An annual TAP assessment of the ergonomics program reviewed data from the ergonomics evaluations and walkthroughs, the Ergo Database, the Remedy Interactive database, and the 4th Annual Safety Culture Survey conducted by Health Services.

Evaluations and walkthroughs revealed widespread awkward postures and repetitive movements in computer, laboratory, and support services at LBNL. EH&S made numerous improvements to the ergonomics program in FY 2008, including, but not limited to:

- Rolled out Remedy Interactive Web-based Ergonomic Self-Assessment for Computer Users (EHS0059) and an annual refresher (EHS0058), required for all employees using a computer four or more hours per day.
- Produced online Ergo Product Catalog with clear product and procurement information.
- Expanded Ergo Display Room with a trained ergonomics technician to assist with product testing, selection, and use.
- Established an equipment loaner program for computer input devices, pipetters, and mobile furniture (chairs and input tables), with priority assigned to those in discomfort.
- Upgraded the Ergonomics Database to help track ergonomics evaluations and to make its functionality more consistent with LBNL's Integrated Safety Management approach.
- Implemented a Team Response System, coordinated with Health Services, to quickly identify employees in discomfort for ergonomics-related reasons.
- Trained 40 divisional Ergonomic Advocates with periodic Webinar updates for new program elements (e.g., changes in Ergo Database, Remedy Interactive self-assessment).

**Observation 1.** The Remedy Interactive database indicates that, at any given time, approximately 100 to 150 (5%) LBNL computer users are working in high-risk postures, and 350 to 400 (15%) are working at moderate risk for musculoskeletal disorders. Finally, results of the Safety Culture Survey indicate that one-third of LBNL employees have occasional ergonomics-related discomfort, and approximately 17% have frequent or constant discomfort at work.

**Observation 2.** The Remedy Interactive database currently cannot track more than one location of computer use, so employees who are telecommuting cannot adequately participate. Improvement plans include a pilot study of additional programming in the Remedy Interactive database to allow assessment and tracking of secondary and tertiary work locations.

**Observation 3.** Risk factors for pipetting and other repetitive work at laboratory benches, microscopes, and in biosafety cabinets have not been addressed in a systematic manner. Improvement plans include development of laboratory ergonomics training and evaluation.

**Observation 4.** Several administrative databases in use at LBNL expose many employees to highly repetitive and unnecessary mouse use. Improvement plans include closer interaction between the Ergonomics Program and IT to decrease the repetition rates and increase the usability and efficiency of these software programs.

### ***External Dosimetry***

The ES&H Technical Assurance process for external dosimetry covers the DOE Laboratory Accreditation Program (DOELAP) checklist contained in DOE STD-1112, current version. To align with the biennial DOELAP assessment, the entire checklist is covered in six quarterly installments, which allows a six-month period between the last review and the DOELAP assessment. During the performance period, the Dosimetry Program of RPG performed three of the six quarterly assessments.

**Observation.** TAP assessments identified seven documentation control issues related to external dosimetry procedures.

### ***Fall Protection***

Technical assurance activities for fall protection began in the first quarter of FY 2008 and gradually increased in scope throughout the year. LBNL's documented inspections of fall protection included 332 work observations.

LBNL submitted a non-compliance report to the DOE Office of Enforcement through the DOE Non-compliance Tracking System (NTS) early in FY 2008 (NTS-BSO-LBL-EHS-2006-0007). This report documented programmatic weaknesses in fall protection at LBNL. LBNL has made steady progress on the corrective actions for this deficiency and expects to close the NTS report on schedule in November 2008.

**Finding.** The number of fall protection violations at active construction and maintenance job sites continues to be a concern. EH&S and Facilities management believes there is a gap between safety expectations for construction work in California and the much higher level of expectations for this work at LBNL. While the standards are the same, the expectations are vastly different. LBNL currently flows work expectations to contractors in written contract documents and on Job Hazards Analyses that every contract employee signs. But in practice, and once on the jobsite, the contractors revert to their "strong habits" and the misuse of fall protection. LBNL is currently evaluating the implementation of a construction contractor safety orientation to better communicate our safety expectations to contractors.

### ***Fire Protection—Hot Work Permits***

One TAP assessment of Hot Work Program implementation was conducted in the fourth quarter of FY 2008. The review was based on a sample of Hot Work Permits that were performed following the implementation of the new permit program in September 2008. The TAP assessment of six Hot Work permits noted no deficiencies in the permits.

**Observation.** The Subcontractor Safety Checklist description of what constitutes hot work should be revised to more closely follow NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work* (2009 edition).

### ***Laser Safety***

TAP assessments of laser safety were conducted each quarter in FY 2008. The Laser Safety Officer (LSO) typically conducts 40 to 50 workplace visits per quarter; these visits include AHD reviews, Experimental Summary Sheets for ALS Beamline work, and consultative and informal visits to laboratories. Laser operations were evaluated against the controls specified in the AHD. The results indicated that the controls outlined in the individual AHDs are being followed, with the exception of timeliness of room access interlock checks. To improve the communication of vendor requirements, all active laser AHDs now include a service vendor maintenance section describing requirements for service vendors performing work that requires open laser beams.

In addition to routine LSO visits and TAP assessments, LBNL management performed laser compliance walkthroughs of approximately 20 laboratories. The review team included the Chief Operating Officer, EH&S Deputy Director, and the LSO. These assessments found that eight laser interlock systems in use at LBNL did not meet life safety code requirements. Other deficiencies were communicated to the PI and/or Work Lead and corrected immediately.

**Finding 1.** TAP assessments of Temporary Work Authorizations (TWA) revealed that the format of the Laser TWA form did not capture all the information required by PUB-3000, Chapter 6. This was corrected immediately.

**Finding 2.** Some of the TWAs were not completely filled out. A field review indicated that work was performed as authorized by the TWAs. Feedback from some LBNL divisions indicated that some of the TWA elements were difficult to implement.

**Finding 3.** DOE's Berkeley Site Office informed LBNL Management that the Laser Safety Protocols on the laser safety Web page are considered deviations from the ANSI Z136.1-2000 Standard, and that they must approve these controls as they retain Authority Having Jurisdiction (AHJ) for laser safety at the Berkeley Lab. Laser safety protocols/ANSI interpretations have been written and await EH&S release to the BSO for review and approval.

**Finding 4.** Eight laser interlock systems in use at LBNL do not meet life safety code requirements.

**Observation.** A better system is needed to remind laser users with door access interlocks to perform their required checks.

### ***Lead Program***

TAP assessments completed during the year evaluated compliance with the Lead Program manual, by looking at field projects as well as a review of relevant databases, such as Lessons Learned, training, CATS, and ORPS. Personal air monitoring was conducted on a vast majority of the jobs, and it was determined that workers were well protected (that is, had exposure levels less than the Permissible Exposure Limit). Additionally, all known lead jobs had walkthroughs (either by the program manager or an affiliate Industrial Hygienist) and were either found to be in compliance or needed only minor on-the-spot corrections. Collectively, these observations indicate that the program is compliant and effective.

The Lead Program document was revised to facilitate its use by workers. One of the improvements was the inclusion of a new process, for small lead-related jobs, allowing the use of a standardized one-page “Lead Work Permit,” rather than a more detailed (and harder to develop and use) Lead Compliance Plan. The training program was also improved, including revisions to EHS0330 Lead Worker training designed to increase the direct applicability of the course and streamline some material.

**Finding.** Lead Worker training is not required on an annual basis, consistent with the 10 CFR 851 and OSHA requirements. This was corrected during the performance year.

**Observation.** TAP assessments of training completion rates indicated that there is some confusion as to how to appropriately answer the questions regarding lead in the new JHA.

### ***Medical Waste Program***

On a quarterly basis, WMG staff inspects the laboratories where medical waste is generated, in addition to areas where medical waste is temporarily stored. The two non-conformances noted during this year’s WMG quarterly inspections were immediately corrected. Waste generator personnel were counseled on the proper management of medical waste by their WMG Generator Assistants.

LBNL underwent two external assessments of medical waste management in 2008. In March, DOE conducted a Biosafety Program Assessment that included medical waste management. There were no findings regarding medical waste. In May, the California Department of Public Health conducted its annual medical waste inspection at LBNL and identified one violation. This violation was corrected on the same day, and the waste generator was counseled on the correct procedure. In response to TAP and external

assessments, the Medical/Biohazardous Waste Training Course (EHS-730) and the “One Minute 4 Safety” slides regarding medical waste were updated for clarity.

**Observation.** Non-regulated biohazardous waste accumulation (i.e., the LBNL “clear bag” waste program) may need to be included in TAP reviews for a more accurate assessment of the medical waste program.

### ***Noise/Hearing Conservation Program***

The FY 2008 fourth quarter TAP assessment of the Noise/Hearing Conservation Program reviewed noise surveys, training status, and input provided by routine IH field activities. There were a total of four noise surveys performed during the assessment period, and each survey was documented in the Comprehensive Tracking System (CTS). The surveys identified no deficiencies. Evaluation of the training completion rates for EHS0285 (Noise Exposure Hearing Test) was complicated by the rollout of the JHA. Employees who took the JHA and indicated that they worked in high-noise areas were directed to take EHS0285 and participate in the LBNL Hearing Conservation Program (HCP). A large number of these employees were not previously enrolled in the HCP and may not need to be in the program. The JHA was subsequently modified and no longer automatically requires employees who were not previously enrolled in the HCP or did not belong to an “exposure group” to take EHS0285 and participate in the HCP. Employees in this category will be directed to contact an EH&S Industrial Hygienist so that their potential noise exposure can be evaluated.

During the TAP assessment, an IH noted an example of effective feedback and improvement. A subcontractor filling a liquid nitrogen tank had earmuffs but did not wear them until the IH told him that hearing protection is required. On a subsequent field assessment, the same subcontractor was observed wearing appropriate hearing protection while dispensing liquid nitrogen.

**Finding 1.** There are employees who belong to an exposure group (as identified in their JHA) but are not included in the HCP. In some cases, this condition is justified but not documented.

**Finding 2.** There are employees who belong to an exposure group (as identified in their JHA) and have not taken EHS0285 (Noise Exposure Hearing Test). In some cases, this condition is justified but not documented.

### ***Occupational Injury and Illness Reporting and Recordkeeping***

A third-quarter technical assurance assessment of the Occupational Injury and Illness Reporting and Recordkeeping (OIIRR) Program found that the collection and management of the injury illness data under the OIIRR process meet requirements. Two deficiencies were corrected on the spot; minor OSHA log discrepancies, and lack of computer access security. The assessment identified good case management and case tracking between Health Services and Workers' Compensation Administrator, and excellent case review and incident rate tracking protocols by the OIIRR subject matter expert. Data monitoring and analysis OIIRR metrics identified a programmatic weakness (see finding below).

**Finding 1.** An analysis of the quality of accident reports determined that nominally 20% of injury reports were inadequately completed and were of little to no value in supporting the performance monitoring and review process. The analysis also identified misalignment of corrective actions to the appropriate ISM category.

**Finding 2.** The OIIRR process lacks a written procedure. The written procedure was finalized and referenced in PUB-3000, in October 2008.

### ***Powered Industrial Trucks***

There are over 40 Powered Industrial Trucks (PITs) at LBNL, including forklifts and electric pallet jacks. The TAP assessment of PITs and an investigation of an incident involving PIT operations identified implementation deficiencies in pre-use inspection and operators with expired licenses. These reviews also identified individuals who were identified by their JHA as needing PIT training, but had not been operating PITs. These individuals were either disqualified or retrained.

**Finding 1.** Pre-use inspection of two PITs located at the LBNL warehouse in Richmond have not been conducted per requirements.

**Finding 2.** Six PIT operators had expired licenses, and three had actually operated PITs without current licenses.

**Observation.** Five individuals identified as requiring PIT training, according to their JHA, did not have the training. They had not, however, been operating PITs. Individuals were either retrained or their licenses suspended pending retraining.

### ***Radiation Protection Program***

DOE requires LBNL to review all aspects of the LBNL Radiation Protection Program (RPP) on a triennial schedule. Accordingly, TAP assessments of the specific functional elements in the RPP are apportioned over a three-year period, with a summary

program-wide review performed in the third year of this triennial cycle. In FY 2008, LBNL assessed the following functional elements under the TAP:

### **Entry Control**

10 CFR 835 *Occupational Radiation Protection* establishes requirements for maintaining control over entries into radiological areas, high radiation areas and very high radiation areas. RPG performed a TAP assessment of compliance with entry control requirements. The review determined that for the 11 areas assessed, entry control functions as designed and is in accordance with 10 CFR 835 requirements.

### **Labeling**

A TAP assessment determined that 10 CFR 835-required labeling is used in a consistent and compliant manner and provides an effective way of communicating hazard to LBNL employees. The assessment reviewed 44 Radiological Work Authorizations (RWAs) and 21 Sealed Source Authorizations (SSAs). There were instances of minor labeling deficiencies that were not in accordance with LBNL procedure, but not 10 CFR non-compliance.

### **Monitoring: Individuals and Areas**

A TAP assessment determined that the programs for monitoring of individuals and areas for radiation protection are in compliance with the requirements of 10 CFR 835, but noted areas where steps are not proceduralized and/or procedure is outdated.

**Finding 1.** Quality assurance requirements for internal dose calculation software validation and verification and internal dose calculation independent review are not documented.

**Finding 2.** Procedures do not adequately address the evaluation process and documentation of all potential monitoring needs.

**Observation.** The use of supplemental (not required by 10 CFR 835) electronic dosimeters to monitor radiological workers working with higher-level radiation sources is not proceduralized.

### **Respiratory Protection Program**

TAP assessments of the Respiratory Protection Program included ten field inspections, 27 employee surveys, and reviews of training records, CATS, SAAR, ORPS, and Lessons Learned dissemination. The reviews indicate that, in general, respiratory protection is successfully implemented. Isolated exceptions were communicated to the divisions for tracking and resolution.

FY 2008 program improvements included revision of the Respiratory Protection Program document and modification of the respirator purchase category on the Procurement Restricted Items List from “Notification” to “Approval.” Implementation of



the JHA process resulted in numerous additional employees' requiring respiratory protection hazard evaluations and training.

**Observation.** The JHA respiratory protection question triggers three courses: EHS0310 Respirator Training, EHS0311 Respirator Awareness Training (Dust Mask), and EHS0318 Respirator Supervisor Training. Employees and supervisors are confused as to what training is required.

### ***Waste Storage Areas***

The Waste Management Group staff periodically inspects Satellite Accumulation Areas (SAAs) and Mixed Waste SAAs (MWSAAs) and provides guidance to waste generators and SAA managers on any deficiencies. These are corrected at the time of the inspection. During FY 2008, 370 waste storage areas were inspected, and 83% were in complete compliance with all policies and regulations. The vast majority of these storage areas were SAAs. The most prevalent area of non-compliance was in the category of SAA signs and labels. This overall rate reflects a lower compliance rate than in past years. While radioactive waste accumulation areas were not included last year, it is far more likely that the reason the compliance rate is lower is that the inspection was conducted in a more stringent manner than the consultative inspections completed by WM staff reported in prior years.

**Finding.** SAA compliance is less than adequate.

### ***Wastewater Discharge Program***

TAP assessments determined that waste water discharge program documentation was current and that wastewater discharge reviews were performed according the Environmental Services Group procedures. Sinks in nine LBNL buildings were checked for the presence of proper warning labels prohibiting the discharge of hazardous substances. All were properly labeled in accordance with internal procedures and relevant East Bay Municipal Utility District permit requirements.

### ***X-Ray Machine Safety Authorization Program***

TAP assessments found that the X-ray Authorizations (XAs) reviewed were current, complete, and accurately describe machine operations. All observed work activities were conducted in accordance with the XA requirements. Minor issues were identified with safety system analyses for two machines; one that was updated per a programmatic deadline, and another that had recently undergone installation of the Prox Key control system.

## V. UC/DOE Contract 31 Performance Evaluation and Measurement Plan Self-Assessment

The prime contract between DOE and the University of California (Contract 31, Clause I.86, and Appendix B) includes a PEMP that establishes annual performance goals, objectives, measures, and targets for environment, safety, and health. As part of the contract, LBNL and University of California Office of the President (UCOP) functional managers conduct self-assessments to evaluate performance against the PEMP. Although specific measures may change during the annual updating, the PEMP performance measures are always within the framework of the DOE Office of Science-mandated objectives. The Appendix B self-assessment is the LBNL's primary mechanism for evaluating its contract performance for ES&H.

The EH&S Division collects data and information quarterly, starting at the beginning of the fiscal year, to provide evidence of performance against the PEMP. This information is presented at joint quarterly meetings of LBNL, UCOP, and DOE staff. When applicable, they identify risks and recommend improvements to the ES&H program.

The FY 2008 UCOP/LBNL Self-Appraisal summarizes the cumulative ES&H performance for the year. This report is the formal submission to DOE to meet the assessment requirements of the DOE/UC contract. At the end of the fiscal year, DOE independently evaluates the program and makes recommendations for improvement.

### Performance Results

In FY 2008, DOE awarded LBNL a numerical score of 2.6, an equivalent B- score in Goal 5.0, *Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection*. The following practices and opportunities for improvement were identified through this self-assessment.

### Noteworthy Achievements

LBNL safety performance in construction continues to excel. During FY 2008, LBNL estimates that more than 80 capital and small project construction projects were executed, representing approximately \$200 million in effort and involving more than 60,000 hours of subcontract labor. There were no lost-time injuries this year—and just one recordable injury—for construction work. In August 2008, LBNL reached three years without a construction lost-time injury, significantly better than the industry average. Our current three-year average TRC rate for construction for the most recent period is approximately 2, which is 70% below the national average for construction of 6.4, as documented by the Bureau of Labor Statistics.

The Facilities Division has developed an aggressive Safety Improvement Plan to address its high injury rates in recent years. It has completed benchmarking activities at other Office of Science national laboratories to identify potential improvements. In April 2008, it introduced the Division Zero Accident Council (DZAC), which meets bimonthly. This is a new safety council modeled after a similar one at the Pacific Northwest National Laboratory, where it is contributing significantly to improving safety performance through enhanced teamwork and improved communications.

In May 2008, a radioactive waste shipment consisting of waste from the former National Tritium Labeling Facility (NTLF) treatability study and decommissioning was sent to Energy Solutions' facility in Barnwell, South Carolina, for certification and eventual shipment to the Nevada Test Site; the shipment contained approximately 1,720 curies of tritium and contaminated stainless steel tubing. In addition, in September 2008, a radioactive mixed-waste shipment of 83 curies of tritiated silica gel waste that was also generated at the NTLF was shipped for treatment at Diversified Scientific Services, Inc. (DSSI) in Kingston, Tennessee. These shipments represent a reduction of more than 95% of the curie inventory at the Hazardous Waste Handling Facility. Additional waste containing high levels of alpha isotopes was also shipped in February 2008. This demonstrates LBNL's commitment to reducing the long-term environmental liability posed by these wastes.

Using Non-Cap Alteration and General Plant and Equipment funding, LBNL funded a number of ES&H-related projects that allowed LBNL to make progress in addressing a number of fall protection and seismic issues and in completing the remediation project of the National Tritium Labeling Facility. Other significant projects for LBNL included supporting the Building 51 demolition project, seismic upgrade construction in Building 74, and removing the Heavy Ion Linear Accelerator (HILAC) accelerator tank and heavy steel and concrete shielding blocks that are currently attached to or surrounding the Building 71 structural system.

LBNL made improvements in the implementation of ISM for non-construction work performed by subcontractors, vendors, and guests at LBNL facilities. Non-construction safety assurance business processes for subcontractors, vendors, and guests underwent an extensive review, with participation from Operations and research divisions. The review generated new work-control processes for non-construction subcontractors, vendors, and guests that are documented in Chapter 31 of LBNL's Health and Safety Manual, or PUB-3000. This new chapter, titled "Non-construction Safety Assurance for Subcontractors, Vendors, and Guests at LBNL Facilities," was approved by the Safety Review Committee in July 2008. These new work-control processes are being implemented now, with a requirement that all LBNL divisions complete implementation by Dec. 31, 2008.

In April 2008, the DOE Berkeley Site Office coordinated an audit by environmental radiation experts from the DOE Oak Ridge Office and DOE Headquarters (SC-31.1). The audit assessed the Environmental Services Group's Radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAP) Program for compliance with federal regulations and DOE orders regarding airborne radionuclide emissions. The auditors found that the program is in compliance and well managed, all documentation is in place, and program staff is competent and trained. The team had no findings or observations and

listed three noteworthy practices. The audit report acknowledged “the good work done by LBNL as demonstrated by the results of this assessment.”

### ***Opportunities for Improvement***

LBNL leadership will continue its commitment and effort to sustain and improve upon its safety performance in FY 2009. It will do so by aggressively ensuring that the programs formulated in FY 2007 and FY 2008 are effective in reducing injuries and implementing new programs to achieve and maintain “best-in-class” ES&H program performance in both TRC and DART case rates. The University, the Laboratory, and the Berkeley Site Office have agreed to higher expectations and a renewed sense of urgency in improving safety systems and line management performance. Significant additional resources are being added to the EH&S Division, including an increase of 10 FTEs (full-time equivalents).

Despite LBNL’s commitment to and investments in improving ISM implementation, analysis of ORPS reports—along with causal analyses of incidents and assessments and DOE reviews—indicates that the progress made in work planning and control is insufficient and requires improvement. Numerous major changes are being made based on the ISM reviews in 2006, ongoing feedback, improvement activities, and external assessments. These changes range from improvements in line management responsibility by establishing the Work Lead concept; implementing a formal activity-level work authorization process; and establishing robust subcontractor safety assurance processes. LBNL management has also agreed to place ES&H professionals in each of the line organizations. These changes are in different stages of implementation; some have been in place for a sufficient time to evaluate their effectiveness, while others have only recently been instituted.

Critical challenges are twofold: ensuring that key constructs such as the JHA, Work Lead, and Division ISM Plans are executed in such a manner as to more effectively achieve basic principles and demonstrate value, and ensuring that “on the floor” adherence of ISM practices is executed consistently across and within all organizations. Additional areas that need improvement are:

- Conducting requirements-based assessments
- Strengthening feedback and improvement as part of maturing the new SME-based TAP
- Tailoring the Division Self-Assessments to the ISM goals and needs of each division, which would improve self-assessments and demonstrate more line management ownership.

Other areas for improvement include several ES&H functional program areas: electrical safety, fire protection, biosafety, facility hazard categorization, and nanomaterial safety. These areas were assessed by DOE headquarters, the Oak Ridge Site Office, and the Berkeley Site Office during the past year. Corrective actions are under way based on extent-of-condition reviews and causal analyses. In recognition of the need

to improve, LBNL management is investing institutional funds for external safety expertise, for backfilling vacancies in the EH&S Division, and for increasing EH&S personnel in critical areas based on risk and programmatic needs.

## Appendix A

### Status of FY 2007 Self-Assessment Institutional Opportunities for Improvement

Opportunity for Improvement	Status	Action Taken
<b>Division ES&amp;H Self-Assessment and MESH Reviews</b>		
Current processes for notifying affected personnel of substantive revisions to PUB-3000 are inadequate.	<b>Not fully effective</b>	To improve safety communications to LBNL management, semi-regular “Safety Notes” from the EH&S Director and Deputy were prepared and distributed to Senior Management, Division Directors, Deputy Division Directors, and Safety Coordinators. Substantial changes to PUB-3000 will be a feature of the notes. The 7/31/08 message included a section on PUB-3000 changes; there were no changes to PUB-3000 between the 7/31/ and 8/22 notes.  <i>Preliminary feedback from FY 2008 Division Self-Assessments and HSS review preparation activities indicate that further improvement in this area is necessary.</i>
Existing policy <sup>2</sup> on roles and responsibilities for matrixed staff may not adequately address all work conducted by LBNL personnel.	<b>In process</b>	Existing policy pending review.
The selection, qualifications, training, and responsibilities of shop managers need to be more clearly defined, communicated, and implemented.	<b>Completed</b>	New PUB-3000 Chapter 25 published, to clarify the policy on the selection, qualifications, training, and responsibilities of shop managers.

<sup>2</sup> LBNL/PUB-201 Regulations and Procedures Manual, Chapter 7.01, Section D (Matrixed Employees and Responsibilities for Safety)

Opportunity for Improvement	Status	Action Taken
<b>Division ES&amp;H Self-Assessment and MESH Reviews</b>		
Not all divisions have fully implemented an effective safety walkaround program.	<b>Not fully effective</b>	<p>The FY 2008 Division ES&amp;H Self-Assessment Performance Measures include a measure of the implementation and effectiveness of division walkaround programs and completion of ESH-0027, “Performing an Effective Safety Walkaround.”</p> <p>Implementation and effectiveness of divisions’ safety walkaround programs will be reassessed at the end of FY 2008.</p>
Hazard identification and analysis, including that for off-site work, needs improvement in some areas.	<b>Not fully effective</b>	Implementation of the new Job Hazards Analysis process.
User of the Lab’s HMS to inventory hazards is not mandatory.	<b>Completed</b>	Applicable sections of PUB-3000 updated; all existing or potential hazards and potentially hazardous equipment must be identified (via independent hazard systems or HMS itself) and represented on the EH&S Summary Report.
The Chemical Management System (CMS) has no method for a custodian to certify a non-changing inventory as accurate. Enhanced notification and reporting capabilities are also areas for improvement.	<b>Completed</b>	There is no institutional requirement for periodic documentation of non-changing chemical inventories. The CMS database is to be kept up to date and accurate at all times, and no action is required if no changes have occurred. This procedure was communicated back to the division that raised this issue. EH&S implemented the Technical Assurance Program (TAP) for the CMS during the fourth quarter of FY 2008. Ongoing TAP assessments will be used to identify future programmatic opportunities for improvement.
Inadequate or outdated emergency evacuation signs are posted at some Lab locations.	<b>In process</b>	In the second quarter of FY 2008, LBNL implemented an improved process for updating emergency evacuation signs. The process is complete for three buildings; the remainder of the buildings is in process.

<b>Opportunity for Improvement</b>	<b>Status</b>	<b>Action Taken</b>
<b>Division ES&amp;H Self-Assessment and MESH Reviews</b>		
The Lab's Ergonomics Program needs improvement in some areas.	<b>Completed</b>	Improvements made to equipment loaner program; timeliness and reliability of ergonomics database information; and ergonomic equipment identification and procurement process.
The Lab's EH&S Training Program needs improvement in some areas.	<b>In process</b>	The Job Hazards Analysis chapter in PUB-3000 specifies to whom the JHA requirement applies; EH&S added five new online training classes; and EH&S improved its processes to ensure division-specific training courses are consistent with LBNL policy and procedures. Other improvements are pending completion.
SAA compliance needs improvement.	<b>Not fully effective</b>	Improvement efforts include: EH&S offered additional training if requested and performs additional inspections if requested; the Waste Management Group identified poorly performing divisions and notified those so identified to develop corrective actions to address the deficiency within individual divisions; EH&S conducts quarterly TAP assessments; and developed a One Minute 4 Safety (1X4) on SAA management.  SAA compliance to be reassessed at the end of FY 2008.
Minor updates to radiological work documents may lead to unclear roles and responsibilities for divisions (noted during Engineering Division MESH).	<b>Completed</b>	The Radiation Protection Group (RPG) updated its X-ray Machine Authorization Program procedure classifying the change of X-ray System Supervisor to a major revision, requiring generation of a new X-ray Authorization.
The Lab's policy on workplace first aid kits is inconsistently applied.	<b>In process</b>	EH&S drafted a policy and procedure on first aid kits; implementation in process.



<b>Opportunity for Improvement</b>	<b>Status</b>	<b>Action Taken</b>
<b>Division ES&amp;H Self-Assessment and MESH Reviews</b>		
Notification of the responsible division is inconsistent when an employee is referred to the UCB campus medical services for treatment.	<b>Completed</b>	EH&S prepared a bulletin on steps to take when employees and students are injured while working on campus.
The CATS system has become less user-friendly over time and redevelopment.	<b>In process</b>	CATS database simplified for users. Pilot scheduled for January 2009 and LBNL-wide implementation scheduled for February 2009.
<b>ES&amp;H Technical Assurance Self-Assessments</b>		
The quarterly assessments of training completion suggest that, in some cases, staff incorrectly completes their JHQ, thereby prompting Chemical Hygiene and Safety Program training as a required course.	<b>Not fully effective</b>	Developed instructions for both workers and the Supervisor/Work Lead on how to properly complete the JHA.
The list of crane managers may contain inaccuracies. Some cranes that are no longer in use and/or without an appropriately designated crane manager are accessible for operation.	<b>In process</b>	List of crane managers updated; EH&S provides off-schedule training sessions to qualify crane managers; process to place administrative locks on cranes and hoists without identified and properly trained crane managers is ongoing.

<b>Opportunity for Improvement</b>	<b>Status</b>	<b>Action Taken</b>
<b>ES&amp;H Technical Assurance Self-Assessments</b>		
<p>External dosimetry program improvement opportunities: calibration algorithm document incomplete; tracking and closing out observations from internal and external assessments; document control-procedures and training records.</p>	<b>Completed</b>	<p>Calibration algorithm document completed; method to track observations established, as well as monthly generation of procedure and training status.</p>
<p>SAA compliance needs improvement.</p>	<b>Not fully effective</b>	<p>Improvement efforts include: EH&amp;S offers additional training if requested and performs additional inspections if requested; the Waste Management Group identified poorly performing divisions and notified those so identified to develop corrective actions to address the deficiency within individual divisions; EH&amp;S conducts quarterly TAP assessments; and developed a One Minute 4 Safety (1X4) on SAA management. SAA compliance to be reassessed at the end of FY 2008.</p>
<p>The method the Laboratory uses to record the groundwater treatment stations information can be improved for easier system-by-system review. Inspection logs for some fixed-treatment units need improvement. Some fixed-treatment unit operators are not inspecting leak detection probes according to procedure.</p>	<b>Completed</b>	<p>Improvements made to checklist, procedure, and data format.</p>

<b>Opportunity for Improvement</b>	<b>Status</b>	<b>Action Taken</b>
<b>Contract 31 PEMP Self-Assessment</b>		
<p>From June 2006 to June 2007, LBNL generated seven electrical ORPS reports. While these incidents occurred in different divisions, the majority shared a common general cause: “Work Planning Needs Improvement/Less than Adequate.”</p>	<p><b>In process</b></p>	<p>Improvements to date include: provided LOTO procedure writing training to Division Safety Coordinators and other responsible individuals; incorporated specific electrical safety criteria into vendor/subcontractor management/permitting initiative; and incorporated vendor and subcontractor audits into subcontractor permitting initiative. Additional improvements in process.</p>
<p>LBNL recognizes that a considerable portion of its research electrical apparatus and some electrical distribution systems have not been approved by one of the Nationally Recognized Testing Laboratories (NRTL), as required by NFPA 70E.</p>	<p><b>In process</b></p>	<p>Electrical Equipment Inspection Program/Implementation Plan established. Electrical safety staff developed a database to record, categorize, and track inspections.</p>

<b>Opportunity for Improvement</b>	<b>Status</b>	<b>Action Taken</b>
<b>Contract 31 PEMP Self-Assessment</b>		
Increasing illness and injury case rates.	<b>In process</b>	LBNL did not achieve the FY 2008 PEMP goals for the total recordable case (TRC) rate or for the Days Away, Restricted, or Transferred (DART) rate. Rates for FY 2008 are 0.78 and 1.62 for DART and TRC respectively. Ergonomic-related causes continued to dominate illness and injury case rates in FY 2008, with approximately 70% of recordable injuries attributable to ergonomic issues. LBNL will continue to give this performance area significant management attention in FY 2009, by aggressively ensuring that the programs formulated in FY 2007 and FY 2008 are effective in reducing injuries.
An investigation of the mercury spill at the Molecular Foundry in August 2007 identified opportunities for improvement of ISM at the institutional, facility and activity levels.	<b>In process</b>	As a result of this incident, a comprehensive set of near-term compensatory measures and corrective actions were developed and implemented in a joint effort between the UC Berkeley and LBNL management, as detailed in the 9/15/08 progress report on management control. The communications and requirements (i.e., Job Hazards Analysis, subcontractor/vendor safety review process, provisions for equipment containing hazardous materials in both the Hazard Management System and work authorizations, etc.) put in place helped to strengthen Integrated Safety Management at LBNL.



## **Appendix B**

### **FY 2008 Self-Assessment**

### **Institutional Findings and Observations**

#### ***Findings***

- F 1-1.** Division Self-Assessment and MESH reviews identified gaps in understanding and awareness of the principles of ISM.
- F 1-2.** Some divisions did not update their ISM plans consistent with changes to PUB-3000.
- F 1-3.** Existing methods to communicate PUB-3000 revisions to all levels of division line and safety management are inadequate. Furthermore, divisions need improved direction on required modifications to division ISM plans.
- F 1-4.** Some divisions cited less than full compliance with division walkaround requirements.
- F 1-5.** Memoranda of Understanding (MOUs) for safety responsibilities are less than adequate.
- F 2-1.** Not all affected staff members have a current JHA.
- F 2-2.** Use of the institutional systems to document hazards is less than adequate.
- F 2-3.** The Facilities/EH&S/customer division planning processes need improvement.
- F 3-1.** The EH&S ventilation database is not current.
- F 3-2.** Less than adequate completion for required online Remedy Interactive ergonomics training.
- F 4-1.** SAA compliance is less than adequate.
- F 5-1.** Some divisions are not tracking safety deficiencies in CATS.
- F TAP-1.** Not all asbestos in place locations, such as those with asbestos concealed under floor tiles and linoleum, are identified in HMS.
- F TAP-2.** EHS0735/738 Blood-borne Pathogen Training and EHS0745 Hepatitis B Medical Surveillance are linked requirements in the JHA system as of mid-2008, but some training profiles that were completed early in the JHA implementation do not show EHS0745 as a required course when EHS0735/738 is required. But workers required to take EHS0745 have typically taken EHS0745, even if it is only listed as an “extra” course on their profile. This administrative problem with linking EHS0735/738 and EHS0745 is covered by a CATS item 5871-5 to link training requirements in BUAs to the training database system.
- F TAP-3.** TAP assessments identified inconsistent Chemical Hygiene and Safety Program implementation.
- F TAP-4.** Less than adequate population and maintenance of chemical container data in the Chemical Management System.

**F TAP-5.** Hazards Management System, and the EH&S Summary Report it generates, does not contain confined space hazards.

**F TAP-6.** Crane managers are not adequately identified.

**F TAP-7.** The number of electrical shocks, improper use of Lock Out/Tag Out (LOTO), and the failure to comply with minimum OSHA requirements for electrical safety indicate that the LBNL electrical safety program is not achieving its purpose.

**F TAP-8.** The number of fall protection violations at active construction and maintenance job sites continues to be a concern.

**F TAP-9.** TAP assessments of laser Temporary Work Authorizations (TWA) identified revealed that the format of the Laser TWA Form did not capture all of the information required by PUB-3000, Chapter 6. This was corrected during the performance year.

**F TAP-10.** Some of the TWAs were incomplete. Feedback from some LBNL divisions indicated that some of the TWA elements were difficult to implement.

**F TAP-11.** BSO informed LBNL EH&S Management that the Laser Safety Protocols on the laser safety Web page are considered deviations from the ANSI Z136.1-2000 Standard, and that they must approve these controls as they retain Authority Having Jurisdiction (AHJ) for laser safety at LBNL.

**F TAP-12.** Eight laser-interlock systems in use at LBNL do not meet life safety code requirements.

**F TAP-13.** Lead worker training is not required on an annual basis, consistent with the 10 CFR 851 and OSHA requirements. This was corrected during the performance year.

**F TAP-14.** An analysis of the quality of accident reports determined that nominally 20% of all injury reports were inadequately completed and were of little to no value in supporting the performance monitoring and review process.

**F TAP-15.** There are employees who belong to an exposure group (as identified in their JHA) but are not included in the HCP. In some cases, this condition is justified but not documented.

**F TAP-16.** There are employees who belong to an exposure group (as identified in their JHA) and have not taken EHS0285 Noise Exposure Hearing Test. In some cases, this condition is justified but not documented.

**F TAP-17.** The OIIRR process lacks a written procedure. The written procedure was finalized and referenced in PUB-3000. in October 2008.

**F TAP-18.** Pre-use inspection of two Powered Industrial Trucks (PITs) located at the LBNL warehouse in Richmond had not been conducted per requirements.

**F TAP-19.** Six PIT operators had expired licenses, and three had actually operated PITs without current licenses.

**F TAP-20.** Quality Assurance requirements for internal dose calculation software validation and verification and internal dose calculation independent review are not documented.

**F TAP-21.** Procedures do not adequately address the evaluation process and documentation of all potential radiological monitoring needs.

**F TAP-22.** SAA compliance is less than adequate.

### **Observations**

**O 1-1.** Some divisions' ES&H Web sites contain outdated information.

**O 1-2.** While the fiscal year-end LBNL-wide JHA completion rate met institutional expectations, implementing the process identified opportunities for improvement in understanding and awareness of the JHA process.

**O 1-3.** The Life Sciences Division is responsible for the safety of UC Berkeley staff members working in Donner Lab who have no program affiliation with LBNL.

**O 1-4.** Responsibility for telecommunications closets is inconsistent and unclear.

**O 2-1.** Off-site work lacks institutional policy on hazard identification, analysis, and control.

**O 2-2.** Access controls for viewing and updating data in the HMS and CMS limit the functionality of these systems.

**O 2-3.** Divisions rely heavily on a small number of staff to enter data in EH&S databases and CATS.

**O 3-1.** EH&S review time of AHDs is uneven depending on the subject area.

**O 3-2.** External and internal assessments identified the need for improved communication and understanding of the Biological Use Authorization (BUA) process.

**O 3-3.** The Ergonomics Advocate Program is limited to office environment hazards.

**O 4-1.** Divisions identified room for improvement in documenting on-the-job training.

**O 5-1.** The CATS database is not intuitive.

**O 5-2.** Lessons Learned/Best Practices are shared within divisions but not broadly communicated to the LBNL community.

**O TAP-1.** The Asbestos Management Plan does not include an agreement between EH&S and Facilities Division regarding installation of new floor coverings over existing asbestos vinyl floor tiles or linoleum.

**O TAP-2.** There is only one trained asbestos worker (plumber) in the Facilities Division, which is not enough to respond to customer requests for tasks such as anchoring equipment through asbestos floor tiles and other miscellaneous asbestos-related tasks that affect the various trades in Facilities.

**O TAP-3.** Non-HEPA filtered hoods and enclosures are used for operations involving dispersible Engineered Nanomaterials (ENMs) and suspensions/solutions of ENMs (which may pose a dispersion hazard if dried).



**O TAP-4.** With the exception of the Molecular Foundry, laboratory coat service vendors are not informed of potential ENM contamination.

**O TAP-5.** Including the Transportation Manager in the planning of high consequence/high value lifts would mitigate potential issues with such lifts.

**O TAP-6.** The Remedy Interactive database cannot track more than one location of computer use currently, so employees who are telecommuting cannot adequately participate.

**O TAP-7.** Risk factors for pipetting and other repetitive work at laboratory benches, microscopes, and in biosafety cabinets have not been addressed in a systematic manner.

**O TAP-8.** Several administrative databases in use at LBNL expose many employees to highly repetitive and unnecessary mouse use.

**O TAP-9.** Seven documentation control issues related to external dosimetry program procedures.

**O TAP-10.** The Subcontractor Safety Checklist description of what constitutes hot work should be revised to follow NFPA 51B, Standard for Fire Prevention during Welding, Cutting, and Other Hot Work (2009 edition) more closely.

**O TAP-11.** A better system is needed to remind laser users with door access interlocks to perform their required checks.

**O TAP-12.** TAP assessments of training completion rates indicated that there is some confusion as to how to appropriately answer the questions regarding lead in the new JHA.

**O TAP-13.** Non-regulated biohazardous waste accumulation (i.e., the LBNL “clear bag” waste program) may need to be included in TAP reviews for a more accurate assessment of the medical waste program.

**O TAP-14.** Five individuals identified as requiring Powered Industrial Truck (PIT) training, per their JHA, did not have this training. They had not, however, been operating PITs. Individuals were either retrained or their licenses suspended pending retraining.

**O TAP-15.** The use of supplemental (not required by 10 CFR 835) electronic dosimeters to monitor radiological workers working with higher level radiation sources is not proceduralized.

**O TAP-16.** The JHA respiratory protection question triggers three courses: EHS0310 Respirator Training, EHS0311 Respirator Awareness Training (Dust Mask), and EHS0318 Respirator Supervisor Training. Employees and supervisors are confused as to what training is required.

## Appendix C

### FY 2008 Self-Assessment Divisional Noteworthy Practices

Division	Noteworthy Practices
AFRD	<ul style="list-style-type: none"> <li>• FY 2008 marked AFRD’s ninth consecutive year with no OSHA-recordable accidents/injuries.</li> <li>• 100% of active AFRD personnel had completed JHAs by Sept. 18, 2008.</li> <li>• All LOTO procedures were reviewed.</li> <li>• LOASIS staff developed and refined an IR-TV remote viewing system. This allows safer viewing of invisible beams from a wide degree of vantage points. It is being written up as a Best Practice for Q3.</li> <li>• The Accelerator and Fusion Research Division (AFRD) Environmental, Safety, and Health Committee is staffed with senior researchers. Meetings are held on a regular basis. Each AFRD program is represented, and attendance is high. This speaks well to the commitment of AFRD senior management to divisional safety and compliance. The division involves many of their supervisors in their self-assessment inspections of their space and operations (QUEST system).</li> <li>• Recognizing the potential for safety problems due to the direct involvement of matrixed Engineering Division (ED) personnel with AFRD programs, the two directors of these divisions meet on a regular basis to discuss mutual safety concerns. A recent Memo of Understanding (MOU) between these two divisions sufficiently details safety responsibilities of all the parties involved.</li> <li>• The identification of hazards and the establishment of controls is well documented in the Building 71A laser facility. A detailed process for working in (or visiting) the facility has been established. The hazards are well understood by the workers in the facility, and the required controls appear to be fully applied and enforced.</li> </ul>

Division	Noteworthy Practices
ALS	<ul style="list-style-type: none"> <li>• The ALS evaluates its safety performance not only against institutional requirements but also against internal criteria.</li> <li>• The ALS performed a trend analysis on the results of its performance specific to review of accidents, injuries, incidents, near-misses, and concerns.</li> <li>• The ALS reached 100% JHA completion on Sept. 15, 2008.</li> </ul>
CSD	<ul style="list-style-type: none"> <li>• The Chemical Sciences Division (CSD) pro-actively addressed two emerging new requirements by polling researchers on their use of engineered nanomaterials and Lock Out/Tag Out (LOTO) needs. CSD used the results of these polls to provide their researchers with the administrative controls appropriate for the work performed.</li> <li>• In an effort to address requirements for closed-toed shoes, one group purchased safety shoes for all staff from the onsite mobile shoe service.</li> </ul>
CS	<ul style="list-style-type: none"> <li>• The commitment of Computing Sciences (CS) senior management, beginning with Director Horst Simon, is outstanding and widely recognized by the staff. Walkthroughs by Director Simon set the tone throughout the Directorate, communicating that EH&amp;S and the implementation of suitable controls are of utmost importance to job performance and productivity and to a positive work environment. The pro-active approach of senior management in EH&amp;S matters is exemplified by the fact that CS lobbied vigorously for and participated in the rollout of online ergonomics awareness/self-evaluation training, EHS059. In addition, supervisor and manager training specific to CS has been implemented. For example, several offerings of EHS026 (Environment, Safety, and Health for Supervisors, Managers and Principal Investigators) from the Laboratory's EH&amp;S training group were tailored to CS and offered in conjunction with Simon's Supervisor and Group Leads meetings.</li> <li>• The electronic newsletter <i>In the Loop</i> has become a vital communication tool for EH&amp;S matters. It appears to be an effective way to reach all staff, as verified through interviews with several staff members from different levels of management during the walkthrough of computer facilities and office space/cubicles in Buildings 50A and B. The MESH review team suggests that CS consider including a regular EH&amp;S feature, such as a Safety Minute to further enhance the effectiveness of <i>In the Loop</i>.</li> </ul>

Division	Noteworthy Practices
CS (cont.)	<ul style="list-style-type: none"> <li>• Every staff member interviewed had ergonomic safety as a first priority on his/her mind. A diverse sample of staff (student, postdoc, engineer, safety coordinator, administrative assistant, and group leader) were interviewed, and it was evident that ergonomic safety is a high priority.</li> <li>• Senior management has implemented the policy of no budget constraints for ergonomic purchases. This has been effectively communicated to the staff. It was evident during informal interviews that the Computational Research Division (CRD) staff is well aware of this resource and would not hesitate to request solutions to ergonomic problems. Indeed, during the review team’s walkthrough, most computer set-ups were customized to fit the needs of the person working in the particular office/station. Besides dealing properly with ergonomics, CS is also pro-active in other areas of safety. These include safety related to the handling and maintenance of large numbers of computers, such as general electrical safety in computer floors and the implementation of special tools for removing floor tiles. CS continues to utilize the improved “Upright Tile Lifter” for accessing spaces below raised computer floors. Employees are trained in LOTO practices so that they can alert Facilities to perform LOTO when work on systems where electrical energy exceeds 50V is required.</li> <li>• CS achieved 100% completion of the new JHA. This achievement is particularly notable given CS’s past difficulties in achieving an acceptable completion rate for the Job Hazards Questionnaire.</li> <li>• Divisional funding available to address ergonomic issues. This enables the Division Safety Coordinator to order equipment where necessary and address issues expeditiously.</li> <li>• Computing Sciences exceeds established minimum training standards for staff regarding Electrical Safety, Lock Out/Tag Out, WorkSmart Training. Staff have been encouraged and in some cases required, to complete these trainings, in order to provide an extra measure of awareness in these areas.</li> <li>• CS arranged for a WorkSmart Ergonomics training for staff. The training in Building 50F was shared by video feed with staff at B943. A second WorkSmart Ergonomics class was subsequently presented at B943.</li> </ul>

Division	Noteworthy Practices
Directorate/ Ops	<ul style="list-style-type: none"> <li>• Special mention should be made of the upcoming move of staff out of Building 937. This move poses a potentially significant hazard for the employees, in particular in regard to material handling and office ergonomics. The Directorate/Operations has taken effective action to understand this hazard, has engaged special support from the EH&amp;S and other divisions, and is aggressively moving to ensure that the move takes place with minimum safety impact on the staff. These actions should be summarized when appropriate and shared with other divisions that are moving large numbers of staff.</li> </ul>
EETD	<ul style="list-style-type: none"> <li>• Environmental Energy Technologies Division (EETD) management, in cooperation with Human Resources, has a policy to not renew employment terms for guests and visitors until their JHAs are current and all required training is completed or scheduled.</li> <li>• In the Division’s two largest buildings, Buildings 70 and 90, dedicated collection areas have been established to promote and ease of recycling and proper disposal of materials.</li> <li>• EETD has established a Safety SPOT award program that recognizes exemplary performance and commends groups or individual employees that expend extra effort to conduct work operations in a safe and pollution-free manner.</li> <li>• The Division has established a pilot program of recording and analysis of near-hit situations. The goal of this program is to strengthen the feedback part of ISM, and identify possible patterns in the safety risks and deficiencies that need to be addressed on the Division level, to prevent accidents and injuries. EETD requires that supervisors report all near-hits to the Division Safety Coordinator.</li> </ul>
ENG	<ul style="list-style-type: none"> <li>• The Division Deputy Director authored, with the support of the DSC, the Division Self-Assessment Report.</li> <li>• The Division Director taught EHS0027, <i>Effective Safety Walkaround</i>, to all 46 of the Engineering Group (ENG) supervisors.</li> <li>• The Division Director takes ownership of all incidents, including performance of causal analysis and extent of condition reviews (as necessary) and the development of corrective actions and their corrective action any time one of his matrixed employees is involved in an incident at another facility.</li> <li>• The Engineering Division developed an online course called “Electrical Safety 101” designed to help employees properly define tasks involving electricity before taking action.</li> </ul>

Division	Noteworthy Practices
EH&S	<ul style="list-style-type: none"> <li>• The Environment, Health, and Safety Division (EH&amp;S) focuses on ergonomic safety in senior staff and safety committee meetings, and has implemented an Early Invention Program and Ergonomic Advocate program. Due in part to these efforts, the Division suffered no recordable ergonomic injuries in FY 2008. Also, ergonomic first aid cases were sufficiently addressed before they became recordable injuries.</li> <li>• The Division ISM Plan includes a listing of improvement opportunities developed and implemented to address Self-Assessment findings. The current plan includes FY 2007 findings, and the next update will incorporate the FY 2008 findings.</li> <li>• Interviewing line management and line staff, as EH&amp;S does as part of Division Self-Assessment, is a powerful tool for assessing ISM effectiveness. As a result of this process, EHS identified that ISM Plan communication and understanding is less than adequate.</li> </ul>
ESD	<ul style="list-style-type: none"> <li>• The Earth Sciences Division (ESD) Director supports the Division’s safety program, and leads through articulating his ES&amp;H vision and expectations at all divisional and department level gatherings and during walkthroughs. In FY 2008, the ESD Director encouraged staff to see safety as an integral part of the job requirement. He consistently communicated this message through the ESD weekly council meetings, in ESD Level 1 e-mails, and at Town Hall meetings.</li> <li>• The ESD Director emphasized the use of safety glasses at LBNL. ESD requires that all staff working in laboratories wear safety glasses. All staff were notified that they can get prescription safety glasses free of charge at the medical center.</li> <li>• The ESD Safety Coordinator submits a quarterly ES&amp;H report to the division’s management and safety committee. This report summarizes the main ESD ES&amp;H activities, incidents, authorization, training and JHA completion, Off-Site Safety and Environmental Protection Plans (OSSEPPS), Ergonomic evaluation and CATS. It is an effective tool for communicating the main safety issues to the division management.</li> <li>• The ESD Director participates in the ESD Safety Committee meetings as the schedule permits. The department heads have been assigned permanent members of the ESD Safety Committee. This is included in the ESD ISM Revision 8.</li> </ul>

Division	Noteworthy Practices
ESD (cont.)	<ul style="list-style-type: none"> <li data-bbox="384 285 1850 467">• In order to understand the hazards of nanotechnology and communicate them to the ESD staff, the ESD Safety Coordinator attended a daylong seminar entitled, “EH&amp;S Challenges of the Nanotechnology Revolution” on 8/6/08. This course was intended to introduce EH&amp;S personnel, scientists and managers to the field of nanotechnology and review potential health, safety and environmental concerns associated with this field. The division director supports the safety coordinator’s continuous education.</li> <li data-bbox="384 483 1850 586">• The ESD staff were requested to participate in the first ISM survey; 11.5% (32 of 278) of the staff responded. The results were discussed in the safety committee and will be further analyzed to implement processes as suggested.</li> <li data-bbox="384 602 1850 704">• DOE Berkeley Site Office’s verification and validation (V&amp;V) Effectiveness Review auditors identified a noteworthy practice, the ESD inspection log of the laboratories, which is used to document the monthly Lab-space Lead PI (LLPI) walkthrough.</li> <li data-bbox="384 721 1850 823">• The Centers for Disease Control (CDC) review of the ESD work did not identify any deficiencies and found that the Division’s select agent operation had good safety/security controls, and that the Division was well organized.</li> <li data-bbox="384 839 1850 941">• Sharing and feedback of safety information is evident in the Earth Sciences Division communications structure; Division Council meetings, safety committee, weekly meetings, quarterly town hall meetings, safety e-mails, laboratory safety primers and routine one-on-one interactions.</li> <li data-bbox="384 958 1850 1105">• Very effective and well-maintained divisional “Safety” Web site containing a variety of well-developed ES&amp;H guides. It includes links to the existing EH&amp;S policies and records of past performance, as well as the most recent issues and initiatives. ESD employees recognized during the interviews that they often referred to this Web site for basic ES&amp;H and EH&amp;S information and policy updates.</li> <li data-bbox="384 1122 1850 1269">• Employees clearly identify and recognize the line management authority for safety. The chain of command seems to be well established. Direct communication between the Safety Coordinator and the Division line management as well as the employees seems unobstructed. All line managers interviewed were clear about their responsibilities and the need to communicate safety to their staff.</li> </ul>

Division	Noteworthy Practices
ESD (cont.)	<ul style="list-style-type: none"> <li>• Laboratory safety documentation was up to date and readily produced at the facilities visited by the MESH review team. The Division was still in the transition period between the old JHQ and the new JHA system and in the process of reassessing the specific hazards and controls for each laboratory. Division personnel were making very good progress on documenting the identification of hazards and appropriate controls to adapt in the new system requirements ahead of the deadline.</li> <li>• The Building 64 ESD shop was of particular interest, since the area safety lead had just retired and returned to work only on a part-time basis. The Division had already set up a restricted access rule (qualified and authorized) for the shop as well as several ESD staff, who were qualified to grant access and provide oversight when the area safety lead was not present.</li> </ul>
FAC	<ul style="list-style-type: none"> <li>• The Facilities Division has been pro-active in addressing ergonomic hazards. FY 2008 initiatives to address ergonomic concerns include:               <ul style="list-style-type: none"> <li>○ Contracting a physical therapist to evaluate and work with craft employees</li> <li>○ Developing a comprehensive custodial ergonomic handbook</li> <li>○ Training custodians as ergonomic advocates</li> <li>○ Implementing a new mop and bucket system for custodians that is lighter and reduces strains to custodians' shoulders, backs, elbows, and wrists.</li> </ul> </li> <li>• Facilities has implemented several effective waste-minimization practices. These include:               <ul style="list-style-type: none"> <li>○ The new mop and bucket system reduces water and chemical usage by 70%</li> <li>○ Many products are recycled, including tires, oil, ethanol fuel, plastic, paint, toner, metals, building demolition materials, and concrete/asphalt debris</li> <li>○ Waste-minimization specifications are included in large construction contracts</li> <li>○ Installation of low-flow toilets, shower heads, and urinals in all buildings</li> <li>○ Replacement of defective obsolete chemical feeders in cooling towers to reduce chemical usage.</li> </ul> </li> <li>• OSHA 30-hour training for 29 supervisors, managers, and leads.</li> <li>• Benchmarking Facilities Division's safety program and performance with comparable organizations at PNNL and ORNL.</li> </ul>



Division	Noteworthy Practices
FAC (cont.)	<ul style="list-style-type: none"> <li>• Developing a Division Zero Accident Council to better engage employees in the Division’s safety program.</li> <li>• Three years of no construction work lost-work-time injuries, far exceeding the national average.</li> <li>• Facilities Division ISM Plan requires each safety line manager to write a safety improvement goal for FY 2009, due by Nov. 1, 2008. Each safety line manager must assess whether the goal was achieved and report the results by June 30, 2009. If a goal is not reached, the manager must describe the obstacles that prevented achievement.</li> <li>• After implementation of corrective actions to address recurring penetration permit deficiencies, Facilities has had no penetration permit incidents.</li> </ul>
GN	<ul style="list-style-type: none"> <li>• Senior Genomics Division (GN) leadership is actively involved in the safety program at the Joint Genome Institute (JGI) and supports the safety team efforts to help JGI employees successfully meet safety expectations.</li> <li>• Genomics has re-engineered research and scientific equipment on the production line to reduce the ergonomic impacts and risks.</li> <li>• Genomics has assigned responsible room individuals, who are responsible for their designated room(s) and for executing aspects of the safety program associated with each room. This responsible individual will help to enhance and maintain safety program elements, help the residents meet safety requirements, and ensure consistency with regard to implementation of safety expectations.</li> <li>• JGI relax/rejuvenation room for use on breaks (mats and massage aids and Pilates classes offered three times a week) promote health, safety, and wellness.</li> <li>• The involvement of workers in the safety subcommittee encourages worker-led safety, which raises safety awareness and promotes safety culture within the Division.</li> </ul>

Division	Noteworthy Practices
GN (cont.)	<ul style="list-style-type: none"> <li>• Because of five accidents that occurred from late October to November 2007 at the Production Department, JGI decided to stand down the Department for 21 working days. All workers participated in the stand-down activities, including the creation of production procedures for their work assignments designed to reduce frequency of ergonomic injuries. JGI also reduced cross-training of employees on different jobs to reduce injuries (i.e., employees have time to build muscle strength for assigned tasks). As a result, new procedure reduced throughput in the production department by ~20%.</li> <li>• The JGI Production Department has instituted a hazard and risk analysis process for new equipment and tasks. When a new task and/or a piece of equipment is to be used, a “process change notification” is generated, which warrants an analysis of the anticipated ergonomic impact. This process includes an evaluation by the ergonomic experts during the pre-production testing cycle, with feedback from the workers involved in the activity. (Note: The MOU between the campus and LBNL may need to be revised if the MOU does not allow formal walkthroughs by the Division management.)</li> <li>• JGI has developed its own training classes and trainings customized to its unique work environment. Also, ergonomic, one-of-a-kind tools are developed in house. For example, in 2007, JGI won the “Ergo Cup Award” at the tenth Applied Ergonomics Conference, for an ergonomic bacterial planting Ergo Cup Award instrument (currently, an improved, fully automated version is in use at the facility).</li> <li>• The JGI Safety Coordinator and the assistant coordinator conduct monthly walkthroughs to examine ergonomic and other ES&amp;H issues of the workers. Further, JGI has a unique self-reporting system (Safety Track) related to minor ES&amp;H issues, which encourages workers to report problems at an early stage. (Note: The Safety Track is not a preferred means to report injury or any other major ES&amp;H issues. The merits and demerits of the system are being discussed by the Safety Culture Group.)</li> <li>• JGI’s management of laboratory personal protective equipment (PPE) use within each laboratory space is a noteworthy practice. JGI requires use of standard PPE (e.g., safety glasses, laboratory coat, and/or gloves) for work within designated laboratory spaces in place of employees making activity-based decisions for general laboratory PPE use. JGI’s PPE polices are being reviewed by EH&amp;S management as a benchmark for application at the institutional level.</li> </ul>

Division	Noteworthy Practices
IT	<ul style="list-style-type: none"> <li>• Thanks to Division Director Rosio Alvarez setting an aggressive internal deadline, the IT Division was the first division to reach 100% JHA compliance.</li> <li>• Improved walkaround checklists so that they are topical and relevant to IT safety.</li> <li>• During FY 2008, the IT Division embarked on a project to increase the energy efficiency of its primary data center, 50B-1275. Working in collaboration with researchers in the Environmental Energy and Technologies Division, as well as the Facilities Division, IT engaged several consulting engineers to study the electrical, mechanical, and air flow characteristics of the data center space, and to offer recommendations for improvement. The Division has already converted the overhead cold air supply to a hot air return plenum; has added duct work to connect the data center air conditioners to the new return plenum; has eliminated wasteful and unnecessary humidification and dehumidification systems; and has installed a wireless environmental monitoring system to measure temperature, humidity, electrical current, and under-floor air pressure in the data center space. The monitoring system allows data center operators to obtain real-time, visual feedback in response to physical changes in the room. With the assistance of the monitoring system, operators have removed and relocated dozens of air-permeable floor tiles to eliminate “hot spots,” to reduce over-cooling, and to increase under-floor air pressure. Operators have actually turned off one 15-ton air-conditioning unit, and have increased the temperature set point on the others. In addition, IT is working to virtualize servers, with the aim of reducing space and electrical requirements. Finally, IT is installing the necessary plumbing and control systems to bring water-cooling technology to a limited number of computer cluster systems in the coming months.</li> </ul>

Division	Noteworthy Practices
Life Sciences	<ul style="list-style-type: none"> <li>• Life Sciences Division (LSD) and the Genomics Division (GN) Directors established a Memorandum of Understanding (MOU) regarding LSD safety support for Genomics West (that portion of GN located at LBNL in Building 84).</li> <li>• The Division funds support for processing hazardous waste generated during LBNL closures, chemical inventory, and chemical purge-to-waste activities. In FY 2008, LSD removed approximately 200 containers from Donner Lab and 550 from Building 55.</li> <li>• The Life Sciences Division provided \$186,000 in funds for workstation (both office and laboratory) improvements and replacements, as well as laboratory equipment (primarily electronic pipettes, lab stools, and microscope workstation upgrades). Individual research staff from over 30 Life Sciences research groups benefited from this program.</li> </ul>
MSD	<ul style="list-style-type: none"> <li>• The Material Sciences Division (MSD) implemented a vendor permit program to ensure that vendors working on MSD equipment or providing services work safely. This program was adopted by LBNL, with minimal modification.</li> <li>• In response an observation identified by the Department of Energy (DOE) Office of Health, Safety, and Security (HSS) review of Nanoscale Materials in FY 2008, MSD was the only division to install HEPA filters in fume hoods to filter effluent containing unbound engineered nanoparticles.</li> </ul>
NSD	<ul style="list-style-type: none"> <li>• The Nuclear Science Division (NSD) had a 99% completion rate for the JHA.</li> <li>• The safety program at the 88-inch Cyclotron is noteworthy in that it includes elements that go above and beyond institutional requirements. Specifically, in addition to the LBNL-required warning signage, NSD employs an additional communication system of separately keyed locks, in areas where exposure to ionizing radiation is most likely to occur during Prompt External Radiation Field (PERF) runs.</li> </ul>
PD	<ul style="list-style-type: none"> <li>• Physics had a 98% completion rate for the JHA.</li> </ul>

Division	Noteworthy Practices
PBD	<ul style="list-style-type: none"> <li>• Safety eyewear and laboratory coats are required to be worn in all Joint BioEnergy Institute (JBEI) laboratory areas, which is more rigorous than LBNL policy.</li> <li>• Training requirements at JBEI are more rigorous than LBNL policy.</li> <li>• In response to DOE Berkeley Site Office concerns about the safety culture of guests at the LBNL site, Physical Bioscience Division's (PBD) performed observations of all LBNL-funded work in UC Campus space to learn about the UC Campus safety program and how it compares and contrasts with LBNL-implemented safety programs. Follow-up contacts for the UC Campus EH&amp;S program will be pursued as appropriate.</li> <li>• The PBD analysis of Radiological Work Authorizations (RWAs) violation drove multiple process improvements.</li> </ul>

## **Appendix D**

### **FY 2008 ES&H Division Self-Assessment Performance Measures**

#### **ISM CORE FUNCTION 1: DEFINE WORK**

1. E1. Division revises division ISM plan to reflect a) ES&H policy changes (including Work Lead responsibilities), and b) updates to the Institutional ISM plan. Line management communicates updates to the plan to division personnel.
  
2. Per the Lab-wide implementation schedule, division ensures workers have a current Individual Baseline Job Hazards Analysis (JHA), authorizing regular and routine work that he/she performs, and if necessary one or more current Task-based JHA(s) to authorize unpredictable, short-term, or unusual work that is not included in the Individual Baseline JHA.

#### **ISM CORE FUNCTION 2: IDENTIFY HAZARDS**

3. Division reviews work activities to identify, analyze, and categorize hazards and environmental impacts for the associated work. Examples of hazard inventory include: Hazard Management System (HMS) database (or equivalent), project safety review, workspace safety review, Job Hazard Analyses (JHA), environmental review (NEPA/CEQA), and chemical inventory.
  
4. Division participates in pollution prevention, energy conservation, recycling, and waste minimization programs, as appropriate for the environmental impact of their activities.

#### **ISM CORE FUNCTION 3: CONTROL HAZARDS**

5. Division ensures appropriate engineering and other safety/environmental controls are in place and properly maintained.  
Examples of controls include, but are not limited to:
  - Guards, barriers and shields
  - Fume hoods, glove boxes, biosafety cabinets
  - Interlocks
  - Exhaust system filtration
  - Secondary spill containment
  - Personal protective equipment
  - In-lab alarm monitors
  - Stack emission monitors

- Lockout/tagout
  - Ergonomic workstation modifications (furniture, equipment and/or accessories)
  - Manual material handling lift assist devices
  - Cranes and hoists
6. Division ensures administrative controls are in place and maintained. Examples of administrative controls include: work authorizations (including but not limited to JHAs, AHDs, BUAs and RWAs), work permits (including but not limited to confined space, and energized electrical work), environmental permits, work procedures, and project safety reviews.
7. Division ensures that ergonomic hazards (computer, laboratory, and material handling) are adequately controlled and that employees and line management are knowledgeable and engaged in this process, including the early reporting of ergonomic pain or discomfort (before an injury).  
Ergonomic issues/concerns/discomfort/pain are reported promptly for appropriate corrective action.

#### **ISM CORE FUNCTION 4: PERFORM WORK**

8. Work is performed within the ES&H conditions and requirements specified by Lab policies and procedures. Performance criteria include work authorizations (including but not limited to JHAs, AHDs, BUAs, RWAs); work permits (including but not limited to confined space, energized electrical work); waste management criteria (SAAs, waste sampling, NCARs); and environmental permits and management criteria (resource conservation, pollution prevention and waste minimization).
9. Staff (including employees, participating guests, students and visitors) is properly trained.
- Percentage completion of JHQ/JHA in the previous 12 months.
  - Based on training profiles, percentage completion rate for required courses

#### **ISM CORE FUNCTION 5: FEEDBACK AND IMPROVEMENT**

10. Division implements an effective safety walkaround program per the requirements of the Division ISM Plan. Ensure all personnel required to perform safety walkarounds, as defined in the Division ISM Plan, have completed EHS 27 Performing an Effective Safety Walkaround.
11. Division performs a thorough review of all accidents, injuries, incidents, near misses and concerns according to Lab policy and the division's ISM plan. Corrective actions to

prevent recurrence are identified, effectively implemented, and shared via the Lab's Lessons Learned and Best Practices database, as appropriate.

12. ES&H deficiencies that cannot be resolved upon discovery are entered in CATS in a timely manner and tracked to resolution. Deficiencies include those from workspace inspections, self-assessment activities, SAARs, Occurrence Reports, Non-compliance Tracking System Reports, environmental inspections, Division Self-Assessment, EH&S technical reviews, Management of ES&H (MESH) Reviews, and external appraisals.





## Appendix E

### List of Acronyms and Abbreviations

AFRD	Accelerator and Fusion Research Division
AHD	Activity Hazard Document
AHJ	Authority Having Jurisdiction
ALS	Advanced Light Source
ANSI	American National Standards Institute
BDO	DOE Berkeley Site Office
BUA	Biological Use Authorization
BUR	Biological Use Registration
CAP	Corrective Action Plan
CATS	Corrective Action Tracking System
CHSP	Chemical Hygiene and Safety Program
CMS	Chemical Management System
CS	Computing Science Directorate
CSD	Chemical Sciences Division
CSE	Computational Science and Engineering
CTS	Comprehensive Tracking System
DART	Days Away, Restricted, or Transferred
DOE	U.S. Department of Energy
DOELAP	DOE Laboratory Accreditation Program
DSC	Division Safety Coordinator
DSSI	Diversified Scientific Services, Inc.
DZAC	Division Zero Accident Council
EETD	Environmental Energy Technologies Division
EH&S	Environment, Health, and Safety Division
ENM	Engineered Nanomaterials
ESD	Earth Sciences Division
ES&H	Environment, Safety, and Health
FTE	Full-Time Equivalent
HCP	Hearing Conservation Program
HEAR	Hazards, Equipment, Authorizations, and Review System
HEPA	High Efficiency Particulate Air
HILAC	Heavy Ion Linear Accelerator
HMS	Hazard Management System
IH	Industrial Hygienist
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
IT	Information Technology Division
JGI	Joint Genome Institute
JHA	Job Hazards Analysis
JHQ	Job Hazards Questionnaire
LOTO	Lock Out/Tag Out

LSD	Life Sciences Division
LSO	Laser Safety Officer
MESH	Management of Environment, Safety, and Health
MOU	Memorandum of Understanding
MSD	Materials Sciences Division
MWSAA	Mixed Waste Satellite Accumulation Area
NCAR	Non-conformance and Corrective Action Report
NCEM	National Center for Electron Microscopy
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOV	Notice of Violation
NSD	Nuclear Science Division
NTLF	National Tritium Labeling Facility
NTS	Noncompliance Tracking System
OCA	Office of Contract Assurance
OIIRR	Occupational Injury and Illness Reporting and Recordkeeping
OJT	On-the-Job Training
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PBD	Physical Biosciences Division
PEMP	Performance Evaluation and Measurement Plan
PERF	Prompt External Radiation Field
PI	Principal Investigator
PIT	Powered Industrial Trucks
PPE	Personal Protective Equipment
QUEST	Quality Assurance/Improvement and Environment, Safety, and Health through Self-Assessment and Teamwork
RPG	Radiation Protection Group
RPP	Radiation Protection Program
RWA	Radiological Work Authorization
RWP	Radiological Work Permit
SAA	Satellite Accumulation Area
SAAR	Supervisor Accident Analysis Report
SME	Subject Matter Expert
SRC	Safety Review Committee
SSA	Sealed Source Authorization
TAAP	Technical Assurance Assessment Plan
TAP	Technical Assurance Program
TMF	The Molecular Foundry
TRC	Total Reportable Case
TWA	Temporary Work Authorization
UCB	University of California at Berkeley
UCOP	University of California Office of the President
WMG	Waste Management Group
XA	X-ray Authorization