# Environmental Compliance Audit & Assessment Program Manual

Prepared by:
Environment, Health, and Safety Division
Environmental Services Group

March 2009

Revision 1


Ernest Orlando Lawrence Berkeley National Laboratory
Berkeley, CA 94720

This work was supported by the U.S. Department of Energy under Contract No. DE- AC02-05CH11231.

## DISCLAIMER

# Table of Contents

# Record of Revisions

| Revision Number | Description | Section(s) | Date of Revision |
|---|---|---|---|
| Rev. 0 | Original Issue | All | December 2008 |
| Rev. 1 | Rename manual; allow for internal and external review; add review schedule and revise worksheets | All | March 2009 |

# 1.0
# Purpose of Program

This document describes the elements, schedule, roles, and responsibilities of the Lawrence Berkeley National Laboratory (LBNL) Environmental Compliance Audit & Assessment Program (ECAAP). The ECAAP has been developed to meet the requirements of DOE Order 450.1A,[1] and Executive Order 13423.[2] These referenced Orders stipulate that government agencies must develop environmental compliance audit programs to monitor and improve compliance with environmental regulations. As stated specifically in the DOE Order, as a part of a DOE facility's Environmental Management System (EMS), "An environmental compliance audit and review program that identifies compliance deficiencies and root causes of non-compliance" shall be developed and implemented.

The ECAAP has also been developed to satisfy LBNL's institutional technical assurance assessment requirements promulgated in the *Environment, Safety and Health (ES&H) Self-Assessment Program* (LBNL/PUB-5344) and described by the *ES&H Technical Assurance Program (TAP) Manual* (LBNL/PUB-913E). The *ES&H TAP Manual* provides the framework for systematic reviews of ES&H programs with the intent to provide assurance that these programs comply with their guiding regulations, are effective, and are properly implemented.

As required by the DOE and Executive Orders and by LBNL's TAP, the goal of the ECAAP is to identify environmental regulatory compliance deficiencies and to determine their respective causes. The ECAAP then provides a means of correcting any deficiencies identified, and leads to continually improving environmental compliance performance.

[1] U.S. Department of Energy, *Requirements,* DOE Order 450.1A, Section 4, (2008).
[2] U.S. Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management,* (January 24, 2007).

# 2.0
# Overview and Strategy of Compliance Audit and Review Program

The ECAAP is implemented through a program of ongoing, systematic audits or assessments of LBNL's environmental programs and facilities. These audits and assessments are to be undertaken in a manner that is consistent with LBNL's existing Issues Management Program (IMP), and will be managed in such a way that they maintain the same degree of legal privilege or confidentiality as is maintained for other issues managed through the IMP. The IMP provides a system for "*the continuous monitoring of work programs, performance and safety to promptly identify issues to determine their risk and significance, their causes, and to identify and effectively implement corrective actions to ensure successful resolution and prevent the same or similar problems from occurring.*"[3] The goal of this program is to provide assurance to LBNL and DOE that potential environmental risks and impacts are properly assessed and controlled across the entire Laboratory by all divisions, consistent with the *ES&H Technical Assurance Program*.

Each calendar quarter, the audit or assessment will focus on at least one environmental category (Appendix A). Each review may be performed by a LBNL subject matter expert (SME), LBNL peer, or by an environmental contractor who is knowledgeable about the environmental regulations and requirements of the specific environmental category being reviewed. Using standard methodologies such as site visits, interviews, and document review, the review will identify specific instances of environmental compliance deficiencies, as well as noteworthy practices. The review will include an analysis to determine why each deficiency has occurred.

The program review report will include sections that describe the review scope, summary, results, causal analysis and issues management. It will be signed by the review author, SME, and group leader at the end of the report. A completed worksheet will be appended to the report. Further details about the report are provided in Section 8.0 and Appendix B.

[3] Ernest Orlando Lawrence Berkeley National Laboratory, *Issues Management Program Manual*, LBNL/PUB-5519 (1), Revision 0 (July 2007).

# 3.0
# Environmental Categories to Be Reviewed

This ECAAP divides LBNL's environmental programs into the following nine categories for purposes of performing audits and assessments:

- Air Emissions (non-radiological)
- Environmental Management System
- Environmental Radiation Protection
- Environmental Restoration
- Hazardous Waste Fixed Treatment Units
- Storm Water Management
- Toxic Release Determination
- Underground and Aboveground Storage Tanks
- Wastewater Discharges

Audits and assessments of hazardous waste activities, other than the fixed treatment unit category listed above, are performed and reported by LBNL's Waste Management Group under conditions of a Resource Conservation and Recovery Act Part B permit for its Hazardous Waste Handling Facility and are not included in the scope of the ECAAP manual.

Under the ECAAP, at least one category will be reviewed each quarter, and, at a minimum, each category being reviewed once every three years. The intent is to have the categories with the highest potential risks reviewed more frequently during the three-year cycle, as determined by each subject matter expert. The current three-year review cycle schedule for the environmental categories is presented in Appendix A. The frequency of review for each category is planned to occur with the completion of every three-year cycle, although significant changes to external or internal requirements may initiate a within cycle update.

The three-year review schedule, along with other relevant documents prepared for or generated by the ECAAP will be maintained electronically in a secured area of LBNL's computer network that is accessible by all members of the Environmental Services Group involved in ECAAP reviews.

# 4.0
# Audit and Assessment Methodology

This section provides additional details governing how the reviews will be conducted. The reviews will consist of preparatory activities; the review itself, including the site visit, interviews, and document review; and follow-up reporting activities.

## 4.1 PREPARATORY ACTIVITIES

Prior to a scheduled review, relevant environmental documents will be identified and reviewed. Relevant documents include, but are not limited to, plans, procedures, permits, reports and previous reviews. If the review will be performed by an external party, the external party will be asked to review chapters of the latest Berkeley Lab *Site Environmental Report*[4] (SER) to obtain the necessary background information on the site. The SER provides valuable information for planning and preparation, intended to ensure that the on-site compliance portion of the investigation results in an efficient review of relevant facilities and processes.

A preparatory meeting or telephone call will be necessary to address the logistics, schedule, communications and confidentiality considerations of the review. During these preparations, it will also be the responsibility of the SME of the program being reviewed to highlight any changes in the program or related facilities that may have occurred since the previous review. This way, the auditor(s) will have a complete understanding of the current program and be able to more accurately assess the program's compliance status. Following the completion of the planning meeting, the reviewer shall be responsible for being familiar with the information gathered prior to the on-site audit.

For large programs where it may not be possible to review all facets of a program during a review of reasonable duration, a representative subset of elements may be reviewed. This determination of representative sampling will be performed during the planning phase. Further details about considerations for conducting representative sampling are described in Section 5.0.

## 4.2 REVIEW ACTIVITIES

The reviewer will inspect all designated activities to evaluate environmental compliance at the specific facility being reviewed. Upon arriving at the designated site, the reviewer will meet with appropriate staff to review the schedule and logistics of audit activities, and ask clarifying questions. Relevant site-related documents including operation and maintenance manuals, plans, programs, permits, monitoring data, training records reports, and procedures will have been reviewed prior to arrival. Key staff will be

[4] Ernest Orlando Lawrence Berkeley National Laboratory, *Site Environmental Report for 2007, Volumes I and II,* Environment, Health, and Safety Division, LBNL-27170 (2008).

interviewed to better understand the nature of facility operations and to validate observations gained from reviewing records and observing site activities. The reviewer will record their findings and observations through detailed notes and photographs. With this information, any deficiencies identified during the audit requiring follow-up can easily be identified by the personnel tasked with correcting those deficiencies.

The reviewer may lead a debriefing meeting with key LBNL staff to discuss preliminary findings and observations and to address outstanding issues. The debriefing may occur either after the review is completed or at the end of each review day, depending on logistics and personnel involved. The debriefing may also be used to plan activities for any remaining days of the review. In the event that a reviewer observes a non-compliant matter that poses an imminent environmental, safety, or health hazard, the coordinator of environmental compliance for the facility and the program manager will be notified immediately.

## 4.3 REPORTING

A draft program audit and assessment report will be submitted within thirty days for review and comment by appropriate staff. The report shall include a review scope, summary, results, causal analysis, issues management, approval signatures, and a completed review worksheet will be appended to the report. Details about reporting are described in Section 8.0 and Appendix B.

# 5.0
# Sampling Strategy

For certain program elements, it may not be possible during a site visit to evaluate every item that is potentially the subject of the review. Some examples of items that may have a large population size necessitating a representative sampling approach include, but are not limited to:

- Inspection records,
- Training records,
- Stand-by generators,
- Refrigerant-containing systems,
- Discharge monitoring reports.

For program items that have a large population size, in order to conduct an audit in a reasonable amount of time, a representative sample of those population elements will be necessary. The representative sampling will be determined by the SME of the program that is to be reviewed. A representative sample may be selected based upon a probabilistic (statistical) sampling strategy, or based upon the professional judgment of the SME.

The minimum elements for determining a sample selection should include:

- A baseline minimum number of elements to be reviewed (such as 1% or 10% of a given population).
- Items or specific elements identified by a program manager or relevant SME as being of a particular concern from a compliance standpoint based upon their judgment as a professional manager.
- Items or specific elements identified during previous audits as having had deficiencies, to determine whether those deficiencies have been corrected.

# 6.0
# Worksheets for Review of Environmental Program Areas

Integral to this ECAAP is the development and maintenance of environmental review "worksheets" that are tailored for each environmental category subject to review. The worksheets will be used as tools for gathering information that will support the issues management processes, allowing for correction of environmental compliance deficiencies and prevention of their recurrence. Examples of tailored worksheets are provided in Appendix C. These worksheets have been adapted from local, regional, state and federal requirements and customized to LBNL in accordance with the existing LBNL operations, facilities, and associated environmental impacts.

The applicable set of environmental requirements is referenced on the worksheets for each category, and is also found in the University of California's *ES&H Standards Set*[5] for LBNL. The *ES&H Standards Set* is a listing of the laws and regulations explicitly cited in the prime contract between DOE and the Regents of the University of California for managing and operating the Laboratory. They are determined in accordance with a documented process that defines how LBNL maintains a set of ES&H standards tailored to the hazards and activities at the Lab called Work Smart Standards Change Management Process. This process is an important component of the LBNL Integrated Safety Management System and provides assurance that employees, the public and the environment are adequately protected. The process also describes how LBNL and the DOE Berkeley Site Office integrate their change management efforts to the *ES&H Standards Set*. Further information can be found in LBNL's *Integrated Environment, Health and Safety Management Plan.*[6]

At the time of a review, it will be the responsibility of the SME to ensure that the worksheet has been updated to incorporate any new relevant laws or regulations promulgated since the previous audit of the area being reviewed. In addition, it shall be the responsibility of the SME to ensure that any modifications to LBNL facilities or operations that have occurred since any previous audit are incorporated in the customized worksheets. Where appropriate, these modifications must also be brought to the attention of any second-party reviewers during the planning phase to ensure that these new aspects are properly considered.

Through the course of the audit, the reviewer will check whether the LBNL program is meeting the compliance requirements summarized in the worksheet. Individual worksheets have been developed for every environmental program, and are important tools that support the assessments. A completed worksheet will be included with each review report.

---

[5] U.S. Department of Energy, *Contract between the United States of America and the Regents of the University of California, DE-AC02-05CH11231* (November 2008).

[6] Ernest Orlando Lawrence Berkeley National Laboratory, *Integrated Environment, Health and Safety Management Plan, Appendix C, Work Smart Standards Change Management Process* (September 2007).

# 7.0
# Identification of Deficiencies

When facility operations do not meet environmental standards, the reviewer will document the noncompliant issue and characterize it as either a "finding" or "observation."

A finding represents an exceedance or violation of a regulatory standard or DOE order. Review findings may include violations of federal, state, or local laws and ordinances, DOE Orders or LBNL policies. Possible findings may include but are not limited to deficiencies in equipment, programmatic gaps, incomplete or incorrect implementation of existing procedures and rules, incomplete personnel training or inadequate training programs, and incorrect or missing required documentation.

An observation may include either an exemplary activity (i.e., a positive observation) or a condition that either violates a non-regulated, internal policy or a recommended good or best management practice (GMP or BMP). GMPs and BMPs assist in promoting continuous improvement in environmental programs (NOTE: BMP in this context is not to be confused with the term BMP as it is used under regulatory programs, such as storm water, where BMPs are considered regulatory standards). Findings and observations will form the basis of the written audit report.

## 7.1 PRIORITIZATION OF FINDINGS

As a part of the report, each finding of non-compliance will be assigned a priority for correction based upon the potential risks they represent. The prioritization scheme described below has been developed to help LBNL environmental program managers evaluate the most efficient way to deploy resources to respond to findings and observations.

Priorities for each finding will be assigned as follows:

**Priority 1:**

- actual or likely substantial endangerment to the environment
- serious violation of federal, state, or local law
- should be remedied immediately

**Priority 2:**

- result in a notice of violation of law or company requirement that represents a reasonable likelihood of endangerment to the environment
- should be remedied as soon as practicable

**Priority 3:**

- minor violation with little potential environmental impact
- show be corrected within a reasonable timeframe

Each finding will be further characterized as a repeat finding, carryover finding, or new finding. A repeat finding represents a condition from a prior audit which was observed again in a later audit. A carryover finding is a finding from an earlier audit that was not corrected prior to the subsequent audit. The difference between the two is the consecutive nature of a carryover finding. Finally, a new finding is one that was not previously observed.

## 7.2 CAUSAL ANALYSIS

To effectively correct any deficiencies identified during a review, it is necessary to understand the underlying factors that led to the deficiency occurring in the first place—that is, to conduct an analysis to understand the root cause of the problem. As noted in the LBNL document *Root Cause Analysis Program Manual*, "*Root Cause Analysis (RCA) identifies the cause of an adverse condition that, if corrected, will preclude recurrence or greatly reduce the probability of recurrence of the same or similar adverse conditions and thereby protect the health and safety of the public, the workers, and the environment.*"[7]

While a formal and very rigorous RCA program overseen by LBNL's Office of Contract Assurance (OCA) is set forth in the *Root Cause Analysis Program Manual*, for the purposes of this ECAAP, a more informal RCA process will be integrated into the review for all but the most extreme findings (i.e., Priority 1). The deficiencies will be reviewed against a summary list of the likeliest causes of a regulatory or programmatic deficiency. This list, attached as Appendix D, provides an expedited means of identifying the cause of a deficiency without undertaking a time- and resource-intensive, full-scale RCA.

The reviewer will use the information they have gathered during the interviews, site visits, and other information gathering activities and compare it against this summary list. Based upon their professional judgment and the responses of interviewees, one or more suspected root causes for each finding will be identified. These suspected root causes will be included with each deficiency in the final report, and will aid in the development of an appropriate corrective action for the finding.

For the most extreme findings, or for findings that are repeated or carried over, it may be appropriate to conduct a full RCA in accordance with the LBNL *Root Cause Analysis Program Manual*. Findings subject to this more rigorous analysis would likely be the Priority 1 findings, or perhaps any finding that could have a major regulatory or environmental consequence if repeated. Based upon the findings of the review, the SME shall determine when this more rigorous examination is necessary.

[7] Ernest Orlando Lawrence Berkeley National Laboratory, *Root Cause Analysis Program Manual*, LBNL/PUB-5519 (2), Revision 1 (July 2008).

# 8.0
# Report Format and Content

As noted above, a draft report will be submitted by the reviewer within thirty days of each site inspection for comment by appropriate LBNL staff. A draft report may be maintained as privileged and confidential information, in coordination with LBNL's legal office.

The draft report shall include the following sections:

- **Scope:** Area(s) of emphasis within the program, limitations encountered during the audit review, as well as any sampling strategies employed, as described in Section 5.0.
- **Summary:** Brief overview of the findings and observations, with a special emphasis on the high priority findings.
- **Results:** Findings, observations, and noteworthy practices.
- **Causal Analysis:** Brief description of the cause(s) of each finding and observation.
- **Issues Management:** Corrective actions, trending and/or lessons learned (if applicable).
- **Approval Signatures:** Program reviewer and group leader.
- **Completed Worksheet:** Appended to the review report.

The report is intended primarily to meet the applicable requirements of DOE Order 450.1A. It also satisfies LBNL's internal *Technical Assurance Program* quarterly reporting requirements. The scope of this report is a snapshot of the environmental program's compliance status observed at the time of the site visit, not a report that tracks environmental compliance issues or corrective actions over time. It also does not provide a historic review of an EH&S Division program other than through an assessment against the findings of the previous audit. Completion of other types of documents or reports, including but not limited to those described in the next section, may be necessary for complying with the requirements of other regulations, LBNL policies, or DOE policies.

The heart of the ECAAP report will be a tabular summary of all findings. This table may include the following type of information:

- A detailed description of the observed finding and observation, including where it was identified, or to whom it was related;[8]
- A regulatory citation and summary of the associated requirement; and
- The recommended degree of prioritization for correction, based upon the criteria described above

[8] This description may include a photograph, if appropriate to help with identification or description of the finding.

An example of a findings table is found in the results section of Appendix B.

Another key section of the audit report will be the causal analysis. This section will be developed by the SME. Appendix D contains a list of common root causes that can be used to facilitate the SME's determination of the required corrective actions.

Corrective actions will be entered into the LBNL *Corrective Action Tracking System* (CATS), allowing for follow up and ultimately, resolution as described in more detail below.

# 9.0
# Management of Deficiencies through the Issues Management Program

At LBNL, correction of identified deficiencies is managed through a detailed program known as the Issues Management Program. The IMP is a process that provides for the continuous monitoring of programs to allow for identification of issues of concern, followed by a way to implement corrective and preventative actions. According to the IMP system, for any identified issue or deficiency that is not immediately correctable, follow up and tracking must be conducted in accordance with the process outlined in the *Issues Management Program Manual* (LBNL/PUB-5519).[9]

This section provides highlights of how the findings of an ECAAP review will incorporate the various aspects of the existing IMP process. Further details about IMP are found in respective referenced IMP manuals.

## 9.1 CORRECTIVE ACTION TRACKING SYSTEM

As noted in *ES&H Self-Assessment Program Manual*, *"(T)he Laboratory's Corrective Action Tracking System (CATS) is used to document and track through resolution issues identified from employee discovery, internal or external oversight assessments, external reporting, suggested process improvements an associated actions that require formal corrective action. Divisions are required to enter assessment findings and corrective actions into CATS, and EH&S SMEs enter and track programmatic deficiencies."*[10]

As described earlier in this document, the intent of the ECAAP review is to identify environmental compliance deficiencies that require correction. Following completion of the review, the SME of the program reviewed shall enter all findings that are not immediately resolvable into the CATS. Further information about this tracking process is found in both the *Self-Assessment Program Manual* (LBNL/PUB-5344), and the *CATS Database User Manual* (OIA-OCA-0001).

## 9.2 LESSONS LEARNED (if applicable)

In accordance with *Lessons Learned and Best Practices Program Manual*, "Events, issues, or incidents that may have a significant impact on safety and operations and/or could lead to potential fines for regulatory infractions will be identified and addressed in Lessons Learned Briefings."[11] If any of the

[9] Ernest Orlando Lawrence Berkeley National Laboratory, *Issues Management Program Manual*, LBNL/PUB-5519 (1), Revision 0 (July 2007).
[10] Ernest Orlando Lawrence Berkeley National Laboratory, *Environment, Safety, and Health Self-Assessment Program*, LBNL/PUB-5344, Revision 6 (September 2007).
[11] Ernest Orlando Lawrence Berkeley National Laboratory, *Lessons Learned and Best Practices Program Manual*,

environmental findings of the review or subsequent corrective actions result in development of a best practice or identification of an issue likely faced by other LBNL personnel, the development of a Lessons Learned/Best Practices entry may be warranted. For further details, see the *Lessons Learned and Best Practices Program Manual* (LBNL/PUB-5519 (4)).

## 9.3 TREND ANALYSIS (if applicable)

According to the *ES&H Self-Assessment Program Manual*, "*Divisions are required to monitor and periodically (e.g., upon completion of all formal inspections, at mid-year, or at year's end) analyze deficiencies, individually or collectively, in order to identify system issues and to identify recurrence of issues, generic issues, trends and vulnerabilities…*"[12] The ECAAP review represents a formal review as set forth in the *Self Assessment Program Manual*. Therefore, following completion of the review and submittal of the report, the SME will need to analyze the audit findings to determine if they meet the criteria required for data monitoring and analysis. Further details about these requirements are found in the *Data Monitoring and Analysis Program Manual* (LBNL/PUB-5519 (3)).

LBNL/PUB-5519 (4), Revision 0 (June 2007).

[12] Ernest Orlando Lawrence Berkeley National Laboratory, *Environment, Safety, and Health Self-Assessment Program*, LBNL/PUB-5344, Revision 6 (September 2007).

# 10.0
# Allocation of Funding

Findings will be entered into the Corrective Action Tracking System. Findings are categorized in CATS as either institutional or programmatic (divisional). Funding for deficiencies will generally come from LBNL operating funds, rather than specific requests made to DOE. CATS is not designed to explicitly determine how funding is allocated to resolve deficiencies, though it is an integral tool that LBNL management uses when prioritizing funding for either institutional or programmatic issues.

Following each ECAAP review, the SME for the program that has been reviewed is responsible for preparing a consolidated list of findings that require funding to implement. This list shall be submitted for review to the Environmental Services Group (ESG) Leader for review and final prioritization. The ESG leader coordinates funding requests for environmental projects with the EH&S Business Manager and they determine which funding mechanism is most appropriate for each candidate project.

A potential funding mechanism is through LBNL's CATS committee that is chaired by the Office of Contract Assurance and consists of representatives from the EH&S and Facilities divisions. The EH&S Business Manager, who oversees approval of funding allocation for the division, is a key member of the committee. The charter for the committee includes:

- Reviewing and validating institutional issues in CATS that are over $1000 or lack funding,
- Prioritizing institutional issues by their ES&H significance and cost benefit,
- Determining appropriate categorization of issues (when differences of opinions exist), and
- Forwarding contentious or unresolved issues, whether due to lack of funding or resources, to the LBNL Chief Operating Officer for final determination.

# Appendix A
## Three-Year ECAAP Schedule by Environmental Program

**Compliance Audit and Assessment Program's**
**3-Year Review Schedule**

| Program | SME | Frequency | 2009 | | | | 2010 | | | | 2011 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Air Emissions (non-radiological) | NB | 3Y | | | ■ | | | | | | | | | |
| Environmental Management System | PT | 1Y | | ■ | | | | | ■ | | | | ■ | |
| Environmental Radiation Protection | LW | 3Y | | | | | | | | | | | | ■ |
| Environmental Restoration | DB | 3Y | ■ | | | | | | | | | | | |
| Hazardous Waste Fixed Treatment Units | RF | 2Q | | ■ | | | | ■ | | | | ■ | | |
| Storm Water Management | DF | 1Y | ■ | | | | ■ | | | | ■ | | | |
| Toxic Release Determination | RF | 3Y | | | | | | | | ■ | | | | |
| Underground and Aboveground Tanks | RF | 1Y | | | ■ | | | | ■ | | | | ■ | |
| Wastewater Discharges | RF | 3Y | | | | ■ | | | | | | | | |

# Appendix B
## Review Report Form

### Environmental Compliance Audit and Assessment Report

| | |
|---|---|
| Program | |
| Date | |
| Review Author | |

**Scope**

**Summary**

**Assessment Results**

Findings

| Regulatory Requirement | Finding Description | Priority | New/Repeat/Carryover |
|---|---|---|---|
| | | | |
| | | | |

Observations

Noteworthy Practices

**Causal Analysis**

**Issues Management**

Corrective Actions

Trending (if applicable)

Lessons Learned (if applicable)

**Approval Signatures**

Report Author _____ Date: _____
Name, Title

Subject Matter Expert: _____ Date: _____
Name, Title

Group Leader: _____ Date: _____
Name, Title

Note: Worksheet should be appended to this report.

# Appendix C
## Examples of Tailored Worksheets

### Environmental Compliance Audit and Assessment Worksheet

| | |
|---|---|
| Environmental Program: | **Storm Water Management** |
| EH&S Group: | **Environmental Services** |
| Subject Matter Expert (SME): | **David Franklin** |
| Worksheet Last Revised: | **February 13, 2009** |

**Program Description:**

Storm water discharge is regulated by a site-wide *General Permit for Storm Water Discharge Associated with Industrial Activity* issued by the State Water Resources Control Board (SWRCB), enforced by the Regional Water Quality Control Board (RWQCB) and the City of Berkeley. A *General Permit for Storm Water Discharge from Construction Activity* is also obtained for appropriate construction projects. Non-compliance with either permit can result in a Notice of Violation and fines. In order to remain in compliance with the regulations, the Storm Water Program performs periodic sampling, validates analytical results, evaluates and trends results, conducts routine inspections and observations, prepares documents in accordance with permitting requirements, and recommends and implements Best Management Practices (BMPs). Specific program responsibilities include:

- LBNL prepares and maintains an Alternative Storm Water Monitoring Plan (ASWMP) and a Storm Water Pollution Prevention Plan (SWPPP).
- At times LBNL also obtains storm water construction permits for specific projects greater than 1 acre, as required.
- Environmental Services Group (ESG) technicians collect samples, prepare samples for shipment, and maintain needed sampling equipment and facilities.
- Samples are analyzed by a laboratory that is state-certified and validated by the Department of Energy (DOE) *Consolidated Audit Program*.
- The ESG subject matter expert (SME) for storm water management validates analytical laboratory results, resolves problems with contract analytical laboratories, and evaluates and trends analytical data.
- The ESG SME prepares or oversees the preparation of reports and documents which may be available for inspection on-site or be submitted to the RWQCB, as required by the relevant permit.
- The ESG SME periodically inspects the LBNL site and promotes general staff awareness and training to help ensure that storm water discharge controls are applied and effective.
- The ESG SME works closely with LBNL staff to ensure that Best Management Practices (BMPs) as detailed in permit documents are implemented and effective.

**Hazards and Controls:** Activities at Lawrence Berkeley National Laboratory (LBNL) have the potential to impact the quality and quantity of storm water runoff from the site. Within construction areas and some industrial areas, storm drain inlets are protected with filtration devices. No other treatment of storm water runoff is performed, and all drainage is by means of gravity through the on-site storm drainage system to nearby Strawberry Creek and its tributaries.

**References:**

- Regulatory:
  - 40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants*
  - 40 CFR 122-125, various aspects of *The National Pollutant Discharge Elimination System (NPDES)* Program
  - 40 CFR 110, *Discharge of Oil*
  - 40 CFR 112, *Oil Pollution Prevention*
  - Berkeley Municipal Code 17.20, City of Berkeley, *Discharge of Non-Storm Water into the City's Storm Drain System—Reduction of Storm Water Pollution* (except discharges of Atomic Energy Act materials)
  - Oakland Municipal Code Ordinance 12024, City of Oakland, *Creek Protection, Storm Water Management, and Discharge Control*, (except discharges of Atomic Energy Act materials)
  - SWRCB Water Quality Order #97-003-DWQ, NPDES General Permit No. CAS000001, *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activity*
  - Federal Register, Environmental Protection Agency, FRL-6880-5, Final Reissuance of national Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit for Industrial Activity, page 64767 (October 30, 2000).

- DOE:
  - DOE Order 450.1A, *Environmental Protection Program*
  - DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*

- Program Documents:
  - Alternative Storm Water Monitoring Plan
  - Storm Water Pollution Prevention Plan (SWPPP)
  - Storm Water Program Annual Reports
  - Documents required by any construction permits
  - PUB-3000, Chapter 11.3.11, *Storm Water Discharges*
  - Environmental Monitoring Plan (storm water discharge section), latest version
  - Site Environmental Report (storm water discharge section), latest version
  - ESG procedures (201, 252, 256, and 263)

**External Review History:**

| Reviewer | Description of Review | Date |
|---|---|---|
| | | |

| QUESTION | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|
| **Monitoring Activities** | | |
| Are samples taken on time and in accordance with procedures? | | |
| Are maintenance logs maintained? | | |
| Is sampling equipment calibrated according to procedure? | | |
| Are sample collection records correctly entered in the data management system? | | |
| Are quality assurance (QA) samples within acceptable limits? | | |
| Has the SME observed and reviewed a sample collection during the preceding year? | | |
| Are monthly observations complete? | | |
| **Sample Analysis Activities** | | |
| Has the analytical laboratory performed the analyses using SWRCB-required methods? | | |
| Have any Nonconformance & Corrective Action Reports (NCARs) been generated against an analytical laboratory? | | |
| Has the NCAR been resolved appropriately? | | |
| Are all records in the data management system authenticated? | | |
| Are laboratory QA samples within acceptable limits? | | |

| QUESTION | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|
| **Program Documents and Required Reports** | | |
| Are the SWPPP and ASWMP up to date and accurate? | | |
| Was the annual report complete and submitted on time, as required in the permit? | | |
| Was there a violation or Occurrence Report during the past year, and, if so: | | |
| • Was it due to a failure of the SWPPP? | | |
| • Has it been properly investigated and have corrective actions been carried out? | | |
| • Have corrective actions been effective, or have BMPs been changed appropriately? | | |
| • Were appropriate actions recommended and implemented to avoid such situations in the future? | | |
| • Are there any discernible trends in Occurrence Reports, CATS entries, or Lessons Learned that would warrant specific follow-up actions toward a particular division or program? | | |
| **Storm Discharge Controls and Awareness** | | |
| Are storm water benchmarks exceeded? | | |
| Are existing storm water BMPs adequately maintained? | | |
| Are additional storm water BMPs required? | | |
| Has EHS 0690 been given as required? | | |
| Have any unauthorized non-storm water discharges been identified? | | |
| Have storm drains been labeled properly? | | |

| QUESTION | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|
| **Storm Discharge Controls and Awareness (cont.)** | | |
| Was one general communication on storm water discharge awareness developed and/or disseminated within the past year? | | |
| **Long-Term Trends:** | | |
| | | |
| | | |
| | | |
| **Program Improvement:** | | |
| | | |
| | | |
| | | |
| **Noteworthy Accomplishments:** | | |
| | | |
| | | |
| | | |
| **Completed By (sign and date):** | | |

# Environmental Compliance Audit and Assessment Worksheet

| | |
|---|---|
| Environmental Program: | **Environmental Restoration (ERP)** |
| EH&S Group: | **Environmental Services (ESG)** |
| Subject Matter Expert (SME): | **David Baskin** |
| Worksheet Last Revised: | **February 18, 2009** |

**Program Description:** In May 1993, LBNL was issued a Hazardous Waste Facility (HWF) Permit by the California Department of Toxic Substances Control (DTSC). One of the conditions of the permit required LBNL to investigate and clean up historical releases of hazardous chemicals in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA) Corrective Action Program (CAP). The ERP is responsible for carrying out the CAP-required activities. Responsibilities of the ERP include the following:

- ERP technicians collect groundwater, surface water, soil water, and soil gas samples; complete required sampling documentation; prepare samples for shipment to analytical laboratories; and maintain sampling equipment. A separate program of soil and sediment sampling is conducted by ESG annually.
- ERP technicians measure water levels monthly in site wells.
- ERP technicians regularly inspect the in situ soil flushing systems that have been constructed to remediate contaminated groundwater, and are responsible for the routine maintenance of the systems.
- ERP technicians mix and inject Hydrogen Release Compound into wells as an enhanced bioremediation measure to remediate contaminated groundwater.
- The ERP Database Manager enters all analytical data into the ERP database, and prepares tables of analytical results and graphical presentations of the data for inclusion in ERP reports.
- The Program Leader (PL) ensures analytical laboratory results are validated, problems with contract analytical laboratories are resolved, and analytical data is evaluated and trended, as necessary.
- The PL prepares or oversees the preparation of Quarterly Progress Reports and other permit-required reports that are submitted to the DTSC.
- The PL evaluates LBNL activities for potential human exposure to contaminated soil and/or groundwater and provides recommendations for their handling and management.

**Hazards and Controls:** The primary hazards addressed by ERP are: 1) health and safety hazards to ERP workers associated with ERP field activities; 2) potential health hazards to LBNL employees from exposure to contaminated soil and groundwater; and, 3) potential impacts to environmental receptors (e.g. wildlife, groundwater, or surface water) from contaminated soil or groundwater. Controls for these hazards are provided in the program documents discussed in the following paragraphs.

The ERP Health and Safety Program Plan (HSPP) identifies and addresses health and safety hazards to ERP workers during ERP field activities. The HSPP identifies potential health and safety hazards that may be encountered in the field, assigns responsibilities for monitoring and enforcing safe work practices, and provides contingency plans for emergencies that may arise during ERP activities. In addition, a Worksite Safety Plan (WSP) that describes worksite-specific health and safety requirements is required before starting intrusive (e.g., drilling, excavation, soil sampling) and/or non-routine field activities.

The ERP Soil Management Plan (SMP) and Groundwater Monitoring and Management Plan (GMMP) describe specific institutional controls (ICs) for site soil and groundwater to reduce potential human

health risks from exposures associated with contaminated soil and groundwater, to reduce potential impacts to environmental receptors, and to provide procedures for the management and disposal of contaminated groundwater and waste soils generated during construction activities.

Program field personnel must have completed 40-hour Hazardous Waste Operations and Emergency Response Training (HAZWOPER) in compliance with Federal regulations (CFR 1910.120). In addition, field personnel must complete an annual 8-hour refresher course. All personnel must receive three days of field training by a trained supervisor before conducting field work without direct supervision. Supervisory personnel must have completed an 8-hour supervisor-training course.

**References:**

- Regulatory:
  - CFR 1910.120
  - California EPA Guidance Manual for Groundwater Investigations
  - California EPA Guidelines for Hydrogeologic Characterization of Hazardous Substance Release Sites
  - California Well Standards, Bulletin 74-90. California Department of Water Resources (DWR)

- DOE:
  - DOE Order 450.1, Environmental Protection

- Program Documents:
  - ERP Quality Assurance Program Plan (QAPP)
  - ERP Groundwater Monitoring and Management Plan (GMMP)
  - ERP Soil Management Plan (SMP)
  - ERP Health and Safety Program Plan (HSPP)
  - LBNL PUB-3000, Chapter 11.3.6, Contaminated Soil and Groundwater Management
  - ERP RCRA Corrective Measures Implementation Plan
  - ERP RCRA Corrective Measures Implementation Report
  - ESG Procedure 202 – Environmental Contamination Assessment
  - ESG Procedure 208 – Nonconformance and Correction Action Reporting
  - ESG Procedure 230 – Groundwater Treatment System Monitoring and Maintenance
  - ESG Procedure 231 – Drilling, Logging, Sampling, and Abandoning Exploratory Borings
  - ESG Procedure 232 – Installing, Developing, and Destroying Groundwater Wells
  - ESG Procedure 233 – Sampling Groundwater
  - ESG Procedure 234 – Groundwater Treatment System Monitoring and Maintenance
  - ESG Procedure 235 – Processing, Handling, and Shipping of ERP Samples
  - ESG Procedure 236 – Containerization and Disposal of Investigation-Derived Wastes
  - ESG Procedure 237 – Equipment Decontamination
  - ESG Procedure 252 – Data Quality Objectives and Assessment
  - ESG Procedure 268 – Environmental Sample Tracking and Data Management

**Review History:**

| Reviewer | Description of Review | Date |
|---|---|---|
| DTSC | Approval of Corrective Measures Implementation Report | July 2007 |
| DTSC | Quarterly Progress Reports | |

| QUESTION | Reference Document(s) | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|---|
| **Sample Collection Activities** | | | |
| Are samples collected according to procedures? | Procedures 231, 233 and 234 | | |
| Is sampling equipment calibrated according to procedures, the QAPP and manufacturers' requirements? | Procedure 232, QAPP and equipment specifications | | |
| Are samples handled, packaged, and shipped according to procedure? | Procedure 235 | | |
| Are investigation-derived wastes managed according to procedure? | Procedure 236 | | |
| Is equipment decontamination completed according to procedure? | Procedure 237 | | |
| Do technicians keep records and report their activities to the PL? | All procedures | | |
| **Sample Analysis Activities** | | | |
| Were all contract labs audited by an LBNL representative within the past year? | DOE Consolidated Audit Program (CAP) | | |
| Have any Nonconformance and Corrective Action Reports (NCARs) been generated against an analytical laboratory within the past year? | Procedure 208 | | |

| QUESTION | Reference Document(s) | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|---|
| **Sample Analysis Activities (cont.)** | | | |
| Has the NCAR been resolved appropriately? | Procedure 208 | | |
| Have all findings from the last audit been resolved? | Procedure 208 | | |
| Has the laboratory analysis information in the data management system been authenticated for accuracy and precision? | Procedure 268 | | |
| Has the laboratory analysis information in the data management system been authenticated for timeliness, completeness and correctness? | Procedure 268 | | |
| **Soil Flushing Operation and Maintenance** | | | |
| Are systems and associated components regularly inspected? | Procedure 230 | | |
| Are Treatment System Checklists completed for each system? | Procedure 230 | | |
| Are filters changed when required? | Procedure 230 | | |
| Are treatment system monitoring data spreadsheets updated? | Procedure 230 | | |
| Is the PL or appropriate person informed when unusual conditions are noted or when components require maintenance or repair? | Procedure 230 | | |

| QUESTION | Reference Document(s) | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|---|
| **Soil Flushing Operation and Maintenance (cont.)** | | | |
| Were any health and safety issues observed? | | | |
| **Program Documents and Records** | | | |
| Do ERP staff have the required training? | Procedures 231, 233 and 234; HSPP | | |
| Do ERP personnel have access to reference documents? | Procedures 231, 233 and 234; HSPP | | |
| Were all activities conducted in accordance with health and safety policies and procedures? | HSPP, LBNL Health & Safety Manual, EHS ISM Plan | | |
| Were the Quarterly Progress Reports submitted on schedule? | | | |
| Were all newly identified releases reported to DTSC in accordance with RCRA Permit requirements? | | | |
| Were findings from the previous ECAAP audit/assessment that could not be immediately corrected entered into the CATS database? | | | |
| Were findings managed through resolution in a timely manner? | | | |
| Were corrective actions effective? | | | |

| QUESTION | Reference Document(s) | ANSWER (Yes/No) | COMMENT(S) |
|---|---|---|---|
| **Program Documents and Records (cont.)** | | | |
| Are Lessons Learned and Best Practices developed and disseminated to appropriate target audiences? | | | |
| Are Lessons Learned and Best Practices incorporated into work processes and used during work planning activities? | | | |
| **Long-Term Trends:** | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Program Improvements:** | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Noteworthy Accomplishments:** | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Completed By (sign and date):** | | | |

# Appendix D
## Root Cause Analysis Summary List

| Root Cause Category | Root Cause Description |
|---|---|
| Communication | Working relationships are ineffective within the organization. |
| | Personnel concerns are not solicited, addressed, or documented. |
| | The organization does not have a good working relationship with tenant agencies or contractors. |
| Procedures Implementation | Procedures have not been developed. |
| | Procedures have been developed but are inadequate. |
| | Procedures have been developed but are not effectively implemented. |
| Contract Management | Contract documents are inadequate (e.g., specifications, statements of work do not hold contractor accountable for noncompliance with EH&S requirements). |
| | Contract documents are adequate but contractor does not fulfill requirements. |
| Management Organization and Oversight Implementation | Known deficient item, facility, or equipment, not formally identified for action/funding (not acting on a known deficiency). |
| | Higher priority requirements took precedence. |
| | Insufficient skills to execute procedures properly (individual has received the proper training but is not proficient in skills). |
| | Procedures have been developed and implemented but are not being followed. |
| | Inadequate allocation of personnel. |
| | EH&S management does not participate at key strategic and operations planning meetings. |
| | Personnel do not show commitment and/or responsibility for minimizing EH&S impacts within operations area. |
| | EH&S responsibilities are not clearly defined and understood by personnel. |

| Root Cause Category | Root Cause Description |
|---|---|
| Policy Statement and Implementation | Formal policies are not issued from an appropriate level of authority. |
| | Existing policies conflict with EH&S initiatives. |
| | Formal statements of EH&S goals and objectives are lacking. |
| | EH&S requirements are not adequately considered when developing policies. |
| | EH&S considerations are not adequately integrated into accomplishment of LBNL research and administrative activities. |
| Roles and Responsibilities | Personnel understood requirement, but simply forgot to act. |
| | EH&S responsibilities are not clearly defined in job descriptions. |
| | EH&S responsibilities are not included in performance standards. |
| | EH&S responsibilities are not clearly defined and understood by personnel. |
| | Procedures have been developed and implemented but are not being followed. |
| External Factors | Act of God, Animal Activity, Unforeseen Accident, Acts of Vandalism, Weather Related |
| Plans and Implementations | Assessments of inspections are not conducted by trained and qualified professionals. |
| | Inadequate or conflicting guidance exists for conducting assessments or inspections |
| | Appropriate review and follow-up of self-assessment and/or inspection program are not conducted. |
| Compliance Tracking and Reporting | Tracking system for key regulatory compliance deadlines does not exist or is inadequate. |
| | No formal mechanisms exist to investigate, report, correct, track, or monitor EH&S problems and incidents. |
| Documentation/Regulations Tracking/Recordkeeping | System not in place to track new or changing regulations. |
| | New regulatory requirements are not being incorporated into standard operating procedures. |
| | Regulations are misinterpreted or unknown. |
| | Document control system and record retention policy does not exist or is inadequate. |

| Root Cause Category | Root Cause Description |
|---|---|
| Emergency Plans | Emergency plans and/or procedures are not established. |
| | Emergency plans and/or procedures are inadequate. |
| | System is not in place to properly coordinate the review and acceptance of new and/or updated plans and/or procedures. |
| | Emergency plans and/or procedures are not effective and/or properly implemented. |
| Technical Assurance Program | Technical Assurance Assessment Plan (TAAP) is not established. |
| | TAAP is inadequate. |
| | System is not in place to properly coordinate the review and acceptance of new and/or updated TAAP. |
| | TAAP is not effective and/or properly implemented. |
| EH&S Management Plans | EH&S management plans and/or procedures are not established. |
| | EH&S management plans and/or procedures are inadequate. |
| | System is not in place to properly coordinate the review and acceptance of new and/or updated plans and/or procedures. |
| | Plans and/or procedures are not effective and/or properly implemented. |
| Infrastructure/Facilities and Equipment | Inadequate facility design. |
| | Equipment failure. |
| Funding | Deficient item, or equipment properly identified, but not funded. |
| | Deficient manpower properly identified, but not funded. |
| Supplies and Contracts (Documentation) | Supplies have been ordered but have not been received. |
| | Contract deliverables are not properly identified and/or delivered. |
| | Time delay due to complex acquisition process. |
| Training | Personnel not trained. |
| | Personnel trained but course content inadequate. |
| | Personnel trained but did not fully understand requirement. |
| | Training not properly documented. |