



**U.S. Department of Energy**  
Oakland Operations Office, Oakland, California

---

**WORK PLAN FOR PACKAGING AND SHIPMENT  
OF INVESTIGATION-DERIVED WASTES STORED AT  
THE FORMER COBALT-60 FIELD**

at the

**LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH  
UNIVERSITY OF CALIFORNIA, DAVIS**

*Prepared for:*

**United States Department of Energy**  
Oakland Operations Office  
1301 Clay Street  
Oakland, California 94612-5208

*Prepared by:*

**IT Corporation**  
4005 Port Chicago Highway  
Concord, California 94520-1120

and

**Weiss Associates**  
5801 Christie Avenue, Suite 600  
Emeryville, California 94608-1827

August 16, 2000  
Rev. 0

DOE Oakland Operations Office Contract DE-AC03-96SF20686

---

WORK PLAN FOR PACKAGING AND SHIPMENT OF INVESTIGATION-  
DERIVED WASTES STORED AT THE FORMER COBALT-60 FIELD

at the

LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH  
UNIVERSITY OF CALIFORNIA, DAVIS

*Prepared for:*

**United States Department of Energy**  
Oakland Operations Office  
1301 Clay Street  
Oakland, California 94612-5208

*Prepared by:*

**IT Corporation**  
4005 Port Chicago Highway  
Concord, California 94520-1120

and

**Weiss Associates**  
5801 Christie Avenue, Suite 600  
Emeryville, California 94608-1827

August 16, 2000

Rev. 0

DOE Oakland Operations Contract DE-AC03-965F20686

Issued To: \_\_\_\_\_ Date: \_\_\_\_\_

Copy No.: \_\_\_\_\_  Controlled  Uncontrolled

Approvals Page

WORK PLAN FOR PACKAGING AND SHIPMENT OF INVESTIGATION-  
DERIVED WASTES STORED AT THE FORMER COBALT-60 FIELD

at the

LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH  
UNIVERSITY OF CALIFORNIA, DAVIS

*Prepared for:*

**United States Department of Energy**  
Oakland Operations Office  
1301 Clay Street  
Oakland, California 94612-5208

*Prepared by:*

**IT Corporation**  
4005 Port Chicago Highway  
Concord, California 94520-1120

and

**Weiss Associates**  
5801 Christie Avenue, Suite 600  
Emeryville, California 94608-1827

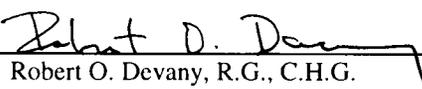
August 16, 2000

Rev. 0

Approved by:  Date: 8/22/00  
David Ochs  
Radiological Safety Officer/Waste Broker  
IT Corporation

Approved by:  Date: 8/17/00  
Dolores Loll  
Project Quality Assurance Manager  
Weiss Associates

Approved by:  Date: 8-17-00  
Michael D. Dresen  
Program Manager  
Weiss Associates

Approved by:  Date: 8/17/00  
Robert O. Devany, R.G., C.H.G.  
Project Manager  
Weiss Associates

## CONTENTS

1.	INTRODUCTION	1-1
	1.1 Background	1-1
	1.2 Objective	1-1
	1.3 Preparatory Activities	1-2
2.	FIELD ACTIVITIES	2-1
	2.1 Work Area Set-up	2-1
	2.2 Packaging of Investigation Derived Waste for Transportation and Disposal	2-2
	2.2.1 Required Equipment	2-2
	2.2.2 Detailed Procedure	2-2
	2.3 Documentation	2-3
	2.3.1 Field Logbook and/or Field Activity Daily Logs	2-3
3.	QUALITY ASSURANCE	3-1
	3.1 Responsibilities	3-1
	3.2 Quality Control Management	3-2
	3.3 Document Control and Records Management	3-2
	3.4 Personnel Training and Qualification	3-2
	3.5 Instructions, Procedures, and Drawings	3-2
	3.6 Procurement Quality Assurance Activities	3-3
	3.7 Review of Work Activities	3-3
	3.8 Inspections	3-3
	3.9 Calibration and Maintenance of Measuring and Test Equipment	3-3
	3.10 Nonconformance Control and Corrective Actions	3-3

---

3.11	Change Control	3-4
3.12	Audits and Surveillance	3-4
4.	WASTE MANAGEMENT	4-1
5.	HEALTH AND SAFETY	5-1
5.1	Hazard Analysis	5-1
5.1.1	Confined Space Entry	5-1
5.1.2	Radiological Exposure	5-1
5.1.3	Chemical Exposure	5-2
5.1.4	Heat Stress	5-2
5.2	Hazard Controls	5-3
5.2.1	Hazardous Work Permit	5-3
5.2.2	Site Control and Work Zones	5-4
5.2.3	Heat Stress	5-4
5.2.4	Personal Protective Equipment	5-4
5.2.5	Decontamination Procedures	5-5
5.2.6	Training	5-5
5.2.7	Buddy System	5-6
5.2.8	Safety Equipment	5-7
5.2.9	Spill Containment	5-7
5.2.10	Air Monitoring	5-8
6.	REFERENCES	6-1

## ACRONYMS

AHA	Activity Hazard Analysis
ALARA	As-Low-As-Reasonably-Achievable
CA	Contamination Area
Co-60	Cobalt-60
CPGERP	Contingency Plan and General Emergency Response Procedures
D&M	Dames & Moore
DOT	Department of Transportation
EMS	Environmental Management Services
FADL	Field Activity Daily Log
FWC	Field Waste Coordinator
GERT	General Employee Radiological Training
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSP	Health and Safety Procedure
HWP	hazardous work permit
IDW	investigation-derived waste
IT	IT Corporation
LEHR	Laboratory for Energy-Related Health Research
LFI	Limited Field Investigation
PHSP	Project Health and Safety Plan

PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
RCT	Radiological Control Technician
RPP	Radiation Protection Program
RSO	Radiological Safety Officer
SC	Site Coordinator
SHSO	Site Health and Safety Officer
SOP	Standard Operating Procedure
SQP	Standard Quality Procedure
TSM	tailgate safety meeting
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WA	Weiss Associates

## TABLE

Table 5-1. Airborne Radiological Action Levels

## ATTACHMENT

Attachment 1. Activity Hazard Analysis

## 1. INTRODUCTION

This work plan presents the general approach and procedures for packaging and shipment of the investigation-derived waste (IDW) currently stored at the former Cobalt-60 (Co-60) Field at the Laboratory for Energy-Related Health Research (LEHR) Site in Davis, California.

### 1.1 Background

Since 1987, two major phases of soil, ground water, and trenching investigation have been completed at LEHR and have resulted in the generation of IDW. These include a Phase I investigation conducted by Wahler and Associates from 1987 to 1988, and a Phase II investigation conducted by Dames & Moore (D&M) in 1990. Wastes resulting from these investigations were stored in labeled, 55-gallon drums. The wastes consist mainly of soil cuttings from soil borings and monitoring wells.

In November 1992, D&M completed a waste characterization for wastes generated during the Phase I and II investigations (D&M, 1992). This characterization identified the concentrations of LEHR site constituents in stored wastes for evaluation and disposal classification. Results were compared to 1992 background levels for radiological parameters and California regulatory or action limits for other chemical parameters.

In December 1997, IT Corporation (IT Corp.) completed and submitted to Weiss Associates (WA) a *Draft Miscellaneous Materials and Waste Inventory Summary at the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California, Revision B* (IT Corp., 1997). As part of the inventory, trained radiation workers recorded the locations of each of the drums containing IDW stored in the former Co-60 Field, opened each drum, and recorded its contents.

### 1.2 Objective

The objective of this task is to package and ship the IDW stored in the former Co-60 Field to Envirocare of Utah, Inc. for disposal as low-level radioactive waste.

### 1.3 Preparatory Activities

Several steps were carried out in preparation for this task, including:

1. Reviewing all available data for the drums and developing a preliminary drum segregation scheme based on the origin of the drum contents and the available analytical data;
2. Attempting to identify the origin of those drums of unknown origin;
3. Comparing the available metals data for all drums with the waste designation criteria (i.e. total threshold limit concentration, soluble threshold limit concentration, and toxicity characteristic leaching procedure);
4. Sampling waste in order to complete characterization;
5. Completing the waste designation process and identifying the most appropriate disposal option;
6. Completing the waste profiling requirements for disposal at Envirocare of Utah;
7. Collection of pre-shipment samples for analysis at Envirocare of Utah;
8. Shipment scheduling with Envirocare of Utah and a selected trucking vendor; and,
9. Procurement of supplies and equipment to conduct the work.

## 2. FIELD ACTIVITIES

This section describes the proposed field activities for packaging and shipment of IDW stored at the former Co-60 Field. All work will be conducted in accordance with this detailed work plan, the LEHR Quality Assurance Project Plan (QAPP; WA, 2000a), and appropriate LEHR Standard Operating Procedures (SOPs; WA, 1999a).

### 2.1 Work Area Set-up

Currently, the IDW is stored in the former Co-60 Field. Therefore, all materials and equipment will be staged in the vicinity of the drums within the work area. The following steps shall be carried out to ensure that the site is properly prepared for waste packaging operations:

- Clear the proposed work area and vicinity of all brush.
- Remove all unnecessary materials in and around the work area, for example, stacks of pallets, etc.
- Make adjustments to temporary site fencing in order to accommodate the work area.
- Remove all canvas covers from the palletized drums of IDW.
- Stage roll-off containers such that there is adequate area for heavy equipment operations during loading. At this time, the Field Waste Coordinator (FWC) shall perform a receipt inspection on all containers in order to ensure procedural and regulatory compliance.
- Place plastic sheeting or equivalent on the concrete surface in areas of waste handling/loading.
- A water supply shall be available at the work area for dust mitigation measures.
- Mobilize and inspect required equipment. The equipment will include one small fork-lift, one hydraulic excavator, and one drum handling device.
- The work area shall be controlled and demarcated as a Contamination Area (CA) and Radioactive Materials Area in accordance with SOP 24.1, "Radiological Areas and Posting."
- Verify that all required radiological and industrial hygiene monitoring equipment is available and in good working order.

- The task leader or designee shall verify an adequate inventory of personal protective equipment (PPE) prior to commencing fieldwork.
- The task leader or designee shall ensure that a Hazardous Work Permit (HWP) is approved prior to commencing field activities.

## **2.2 Packaging of Investigation Derived Waste for Transportation and Disposal**

This section provides a detailed outline of operations and required equipment/material required to properly package the IDW for transportation and disposal. The following activities will be carried out at the direction of the task leader or designee. Some activities may be performed concurrently as worker safety dictates.

### *2.2.1 Required Equipment*

The following equipment will be mobilized and staged during site set-up prior to commencing this task:

- Small fork-lift (5,000 lb. minimum capacity) with drum handling device;
- Hydraulic excavator;
- Twenty-yard hard top roll-off waste disposal bins with liners;
- Portable truck scales;
- Hand tools; and,
- Fuel supply.

### *2.2.2 Detailed Procedure*

The following activities will be carried out to implement this plan:

- Radiological Control Technicians (RCTs) will verify that the work area is set up and properly posted. This includes, at a minimum: step-off pad, waste receptacles, signage, and radiological monitoring equipment.
- Drum lids will be removed and placed in the roll-off container being loaded.
- Upon lid removal, the drums will be lifted and emptied into the roll-off container with the fork-lift with drum attachment.
- During waste loading operations, a Waste Packaging Observer will be present to ensure that all waste materials meet the requirements of the approved waste

disposal profile and maintain a written inventory (container log) including the final waste volume for each roll-off container loaded.

- Secondary waste (PPE, etc.) generated in the course of performing this work will be placed in the roll-off containers for disposal with the IDW.
- Wastes that can be compacted (e.g. bags of PPE or trash), will be placed in the roll-off container under more dense material such as soil in order to ensure that waste volume is minimized.
- Once the IDW is emptied from the drums, the drums will be flattened using the excavator. Flattened drums will be placed in the roll-off container. A method for application of a water spray shall be available and used as needed to prevent generation of airborne dust.
- Upon completion of waste loading, a portable truck scale will be mobilized to weigh all roll-off containers. Container weight will be recorded on the corresponding container log and reviewed by the Waste Broker.
- Upon satisfactory loading and weighing of the roll-off containers, the roll-off container lids shall be caulked in order to ensure a complete seal of the containers.
- The RCT shall complete radiological surveys of all equipment, work areas, and waste containers and support any potential decontamination efforts involved in demobilization and de-posting of the work area.
- The Waste Broker shall prepare the waste containers for transportation consistent with the approved waste disposal profile and in accordance with all applicable Department of Transportation (DOT) regulations and project SOPs.
- The Waste Coordinator will review and approve all manifests and shipping papers.

## 2.3 Documentation

### 2.3.1 *Field Logbook and/or Field Activity Daily Logs*

Descriptions and observations made during field and sampling activities will be documented in the field logbook and/or Field Activity Daily Logs (FADLs). The following will be recorded in the field logbook/FADL:

- Project name and number;
- Location of site;

- Description of field activities;
- Names of personnel;
- Date and time of entries;
- Field observations;
- Results of field measurements; and,
- Results of instrument field calibrations.

### 3. QUALITY ASSURANCE

This section presents the quality assurance/quality control procedures applicable to the packaging and shipment of the IDW. The objective of this section is to provide a framework to ensure that quality is integrated within every aspect of the project work. This section is prepared in conjunction with the Final QAPP (WA, 2000a) by referencing applicable and appropriate sections of the QAPP.

Personnel involved in conducting or supervising the work presented in this work plan are responsible for certifying that they have been instructed in the applicable sections of the work plan, including health and safety, which may effect their work. This certification will be obtained, documented and filed for each affected worker by the Project Task Leader, or designee, in accordance with the requirements outlined in the QAPP.

#### 3.1 Responsibilities

Section 2 of the QAPP, "Organization and Responsibilities," is applicable in its entirety to the IDW packaging and shipment. Roles and responsibilities of specific individuals are defined in the QAPP. Responsibilities for WA, IT Corp., and Environmental Management Services, Inc. (EMS) are summarized below.

*Weiss Associates*—WA will manage and oversee all work. WA will provide on-site health and safety oversight.

*IT Corporation*—IT Corp. is responsible for providing qualified equipment operators and all required on-site radiological support/oversight. The IT Corp. Waste Broker will coordinate with the trucking vendor and the RCTs, complete all waste manifests and DOT shipping papers, and ensure that the shipments comply with all applicable regulations.

*Environmental Management Services, Inc.*—EMS will act as a liaison with the disposal facility for all waste management activities, including the evaluation of disposition options and preparation of the waste disposal profile. EMS will be the point of contact for waste profiling and acceptance matters.

### **3.2 Quality Control Management**

Section 3 of the QAPP, "Quality Control Management," is applicable in its entirety. The SOPs, specifications and other supporting documents prepared for this work comply with specific requirements of the QAPP. This section serves as the Total Quality Control Plan for this action. Quality control meetings, including inspections, will be held as necessary to discuss all aspects of work that impact quality.

### **3.3 Document Control and Records Management**

Section 4 of the QAPP, "Document Control and Records Management," is applicable in its entirety. The IDW packaging, shipment, and disposal will result in development of a number of documents and records that are to be managed as set forth in this section. Typical records that will be generated under this task include certifications, training and health and safety records, field activity logs, and photographs. The Field Coordinator will be responsible for maintenance and updates for the specified project submittals.

### **3.4 Personnel Training and Qualification**

Section 5 of the QAPP, "Personnel Training and Qualification," is applicable in its entirety. The fieldwork will be conducted by individuals who are physically capable of performing the work, have demonstrated capability to perform the specific functions in accordance with the approved procedures and work plan, and are familiar with technical aspects of the equipment and procedures that are used. Field personnel will be trained to meet the requirements of the PHSP and quality affecting tasks prior to commencement of work. Subcontractors will be selected based on a demonstrated record of experience and will have the certifications necessary to perform the assigned project tasks safely and accurately.

### **3.5 Instructions, Procedures, and Drawings**

Section 6 of the QAPP, "Instructions, Procedures, and Drawings," is applicable in its entirety. The applicable project SOPs, Standard Quality Procedures (SQPs) and Health and Safety Procedures (HSPs) have been developed in accordance with this section of the QAPP. Additional SOPs, SQPs, and HSPs may be developed as needed according to the guidelines of the QAPP.

### **3.6 Procurement Quality Assurance Activities**

Section 7 of the QAPP, "Procurement Quality Assurance Activities," is applicable in its entirety. This section describes the requirements for preparation, review, and approval of procurement documents and changes thereto to ensure that quality assurance controls are maintained.

### **3.7 Review of Work Activities**

Section 12 of the QAPP, "Review of Work Activities," is applicable in its entirety. This section describes the technical and formal peer review required on end-products of the project activities.

### **3.8 Inspections**

Section 13 of the QAPP, "Inspections," is applicable in its entirety. This section provides the criteria for inspection of IDW work. These inspections typically cover field activities that require planned inspections to evaluate whether the quality of work meets project standards. A three-phase inspection system will be utilized during the packaging and shipping activities. Preparatory and initial phase inspections will be conducted for each phase of work, and follow-up phase inspections will be conducted weekly for all tasks lasting more than one week.

### **3.9 Calibration and Maintenance of Measuring and Test Equipment**

Section 14 of the QAPP, "Calibration and Maintenance of Measuring and Test Equipment," is applicable in its entirety. This section of the QAPP describes the responsibilities and methods for the control, calibration, and preventative maintenance of measurement and test equipment used in activities affecting quality to assure their proper operation.

### **3.10 Nonconformance Control and Corrective Actions**

Section 16 of the QAPP, "Nonconformance Control and Corrective Actions," is applicable in its entirety. This section of the QAPP describes the responsibilities and methods for all personnel to promote and ensure continuous improvement of items and work processes, thereby enhancing the effectiveness of the program or project tasks and resultant quality.

### **3.11 Change Control**

Section 17 of the QAPP, "Change Control," is applicable in its entirety. This section of the QAPP addresses the process to be implemented for changes to the Work Plan, procedures, or specific requirements. In the case where actual field conditions result in a significant impact to the way work can be completed, a change can be made to the work process under this guidance.

### **3.12 Audits and Surveillance**

Section 18 of the QAPP, "Audits and Surveillance," is applicable in its entirety. This section of the QAPP establishes the methods and responsibilities for planning, scheduling, and performing audits, surveillance, and management assessments. Audits shall be performed by the Project Quality Assurance Specialist or designee in order to verify compliance with all aspects of this Work Plan.

## 4. WASTE MANAGEMENT

Methods for handling and minimizing waste are outlined in this Work Plan. As stated in this plan, all secondary wastes generated will be disposed with the IDW stream. The Waste Coordinator is responsible for ensuring that all project staff comply with all procedures related to waste management at all times.

Following completion of this task, waste-tracking sheets will be completed by field staff and provided to the FWC for review. Following approval by the FWC, the completed forms will be provided to the Waste Tracking System Administrator for incorporation into the LEHR Waste Tracking System electronic database.

## 5. HEALTH AND SAFETY

Health and safety considerations for the activities described in this work plan are covered by the following documents: the PHSP (WA, 2000b), HSPs (WA, 1999b), SOPs (WA, 1999a), the Contingency Plan and General Emergency Response Procedures (CPGERP; WA, 1998), the As-Low-As-Reasonably-Achievable (ALARA) Program (WA, 1999c), and the Radiation Protection Program (RPP; WA, 1999d). The health and safety considerations presented in this section along with the foregoing listed documents represent the safety and health program required by 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER), and 10 CFR 835, Occupational Radiation Protection, for these work activities.

### 5.1 Hazard Analysis

An activity hazard analysis (AHA) (Attachment 1) identifies the potential safety, health and environmental hazards and provides for the protection of personnel. Hazard analysis helps to ensure that all safety concerns are addressed. All workers participating in the execution of this work plan will be briefed on the AHA for tasks covered. An AHA for these activities, as well as specific additional control measures to be followed, are described in Section 5 of the PHSP. Specific PHSP sections describing hazard analysis and control have been included, where applicable.

During these activities, the Site Coordinator (SC), Site Health and Safety Officer (SHSO), Radiological Safety Officer (RSO), RCT, and Health and Safety Coordinator will monitor the site for any changes in conditions that would require modification of hazard controls (i.e., PPE). In the event that changes arise in radiological or industrial health and safety conditions that are not covered by this Work Plan or referenced documents, this Work Plan will be modified in accordance with the procedures contained in SQP 11.1, "Fieldwork Variances/Request For Information" (WA, 2000c).

#### 5.1.1 *Confined Space Entry*

Confined space entry is not anticipated for the performance of any work anticipated under this work plan. If a confined space entry becomes necessary, procedures specified in HSP 5.1, "Confined Space Entry," will be followed.

#### 5.1.2 *Radiological Exposure*

The IDW soil, PPE, and other materials generated by the work to be conducted under this Work Plan may contain low-level radioactive material from prior environmental restoration

activities. The predominant radionuclides detected during these activities were radium-226 and strontium-90.

Exposure to radionuclides will be evaluated and controlled by the RCTs in accordance with SOPs and HSPs established as part of the RPP. Alpha, gross beta, and gross gamma contamination levels will be determined by RCTs using field procedures/analysis and utilized as indicators of the presence of radionuclides above background levels. Ingestion of radionuclides will be minimized by whole-body frisks, proper use of PPE and personal hygiene (e.g. washing of hands and face). Engineering controls will be used wherever possible to reduce the potential for internal and external exposure to ALARA levels. Engineering controls are the preferred method to reduce airborne radioactivity exposure and will be utilized in lieu of respiratory protection whenever possible. The use of administrative procedures for the control of occupational radiological worker exposures is not anticipated for this project. Applicable ALARA procedures and principles to be followed for this work are presented in the ALARA Program (WA, 1999c). ALARA procedures, as may be necessary, will be presented to the workforce prior to the start of work as outlined in Section 5.2.6.

Personnel in the CA associated with the IDW drums shall wear modified Level D PPE as described in Section 5.2.4. The level of PPE will be modified if monitoring results dictate a need for a change in the PPE ensemble.

### *5.1.3 Chemical Exposure*

This waste stream is designated as non-hazardous; therefore, no chemicals are anticipated at levels that may present an occupational exposure. No volatile organic compounds (VOCs) of occupational concern have been identified in the IDW; therefore, monitoring for VOCs will not be conducted during this task.

IDW handling and packaging may result in exposure to nuisance dust. Airborne dust shall be controlled/minimized by applying a water spray as needed. Aerosol monitoring shall be performed to verify adequate dust control and that action levels are not exceeded.

### *5.1.4 Heat Stress*

The IDW work is scheduled to be performed between August and September when wearing PPE puts workers at considerable risk of heat stress. All workers will have medical clearance prior to working onsite and there will be an acclimation period for workers. Measurements with a wet bulb globe temperature instrument will be conducted and working conditions will be evaluated to minimize heat stress. Based on weather conditions and the PPE used, a work regime will be established in accordance with the PHSP, Section 5 and HSP 3.1, "Working in Hot Environments."

Heat stress prevention will include the following mitigation measures:

- properly rested workers prior to work;
- scheduled breaks;
- appropriate water intake; and,
- rotation of heavy work tasks.

Monitoring will also be conducted by body temperature measurements and visual observations of workers as discussed in Section 5 of the PHSP. In addition, HSP 3.1, "Working in Hot Environments," will be implemented for any work conducted during the hot weather months at LEHR.

## 5.2 Hazard Controls

The following control measures will be implemented during the IDW packaging activities. These control measures are intended to supplement the PHSP.

### 5.2.1 Hazardous Work Permit

HWPs will be used to control work in the exclusion zone and other areas where hazardous conditions may exist. An HWP will be issued in accordance with the procedures specified in the PHSP (WA, 2000b) and in accordance with HSP 17.1, "Hazardous Work Permits." The following information will be described or referenced in the HWP:

- Scope of work to be performed;
- Anticipated radiological, safety, and industrial hygiene conditions;
- PPE and respiratory protection requirements;
- Radiological and industrial hygiene monitoring requirements;
- Dosimetry requirements;
- Work Plan or AHA (Attachment 1);
- Period for which the HWP is valid; and,
- Additional requirements for entry.

### 5.2.2 *Site Control and Work Zones*

The site control and work zones will be enclosed by boundary ropes or ribbons supported with stanchions. The placement of the stanchions and boundaries will be controlled by the RSO and/or the SHSO to facilitate access to the work area for equipment and personnel. The boundaries for site control and work zones will be set up and signs will be posted in accordance with the PHSP and the RPP.

### 5.2.3 *Heat Stress*

To minimize the effects of heat-related injuries, an area will be established to conduct entrance/exit activities and other support functions. This area will be covered with a portable awning, when necessary, to provide the workers with shade. The controls associated with heat stress are specified in the PHSP. The SHSO shall ensure that all workers are aware of the signs and symptoms of heat stress, engineering control measures, and the need to replenish body fluids during morning tailgate safety meetings (TSMs). The buddy system will also be used to help monitor heat stress symptoms while working and during break times. Integrated heat stress monitoring will be performed daily to determine the proper work/rest cycle.

### 5.2.4 *Personal Protective Equipment*

Workers in the exclusion zone will wear modified Level D PPE in accordance with the PPE selection matrix in the PHSP unless otherwise specified in the HWP for the task.

Modified Level D PPE will consist of the following when specified in the HWP:

- Hard hat, American National Standards Institute approved;
- Steel-toed chemical resistant boots or boot covers;
- Tyvek coveralls;
- Safety glasses with side shields;
- Chemical-resistant inner and outer gloves;
- Full tape of wrists and ankles; and,
- Leather work gloves.

### 5.2.5 Decontamination Procedures

Decontamination procedures will be conducted in accordance with Section 10 of the PHSP for personnel, equipment, and PPE decontamination. For radiological work the radiological workers will perform whole-body frisks and, if contamination is found, the RCT will be notified to determine the extent of contamination and direct/supervise decontamination.

Equipment will be cleaned and, prior to removal from the decontamination area, will be surveyed by the RCT in accordance with Section 10 of the PHSP.

### 5.2.6 Training

Personnel performing activities associated with the IDW packaging activities will receive training covering this Work Plan.

Workers who will enter radiologically controlled areas shall complete:

- At least 40 hours of hazardous waste operations-related training, as required by Occupational Safety and Health Administration Regulation 29 CFR 1910.120;
- An 8-hour refresher course within the past 12 months if they completed the 40-hour training more than 12 months prior to the start of the field activities;
- Training covering the CPGERP (WA, 1998);
- A minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. The SC shall have also completed an additional eight hours of relevant supervisory health and safety training;
- Hazard Communications training in accordance with Section 15 of the PHSP;
- Site hazard briefing to include instructions on emergency response procedures, location of emergency equipment, and location of emergency notification list;
- Radiological Worker II training in accordance with the RPP;
- Site-specific Radworker training in accordance with the RPP;
- Training in accordance with the requirements specified in SQP 3.2, "Indoctrination and Training" (WA, 2000c), for the specific job assignments;
- General Employee Radiological Training (GERT) for those workers that are not Radiological Worker-trained and routinely enter controlled areas encountering radiological barriers, postings or radioactive material; and,
- A briefing covering the information found in *ALARA Guidelines for Removal Actions at the Ra/Sr Treatment System Area I* (WA, 2000d).

In addition, all workers will attend daily TSMs.

Employees engaged with hazardous waste materials shall have:

- Initial assignment training as defined in Section 14 of the PHSP;
- Training on the health and safety planning documents as defined in Section 14 of the PHSP;
- PPE training;
- Verification of a respirator fit test (if respirator usage is required);
- Medical surveillance; and,
- Training on preparing hazardous materials for shipment.

All visitors entering the site areas that require Level A, B, or C PPE for entry will provide evidence of having completed the 40-hour HAZWOPER course. Visitors entering the work zone will be escorted and required to complete GERT training. With appropriate justification, the Project Health and Safety Manager may deny site access to any personnel.

Two or more people certified in First Aid, CPR and Blood Borne Pathogens will be on-site at all times when hazardous waste operations are conducted.

### 5.2.7 *Buddy System*

The buddy system is a method of organizing employees into work groups and is designed to provide those employees with assistance when needed. Each employee in a work group is designated to be observed by at least one other person. Assignment of designated partners should take place during the TSM.

The responsibility of the buddy is to:

- Provide assistance, if needed;
- Maintain line of sight contact or verbal contact with workers in the work zone;
- Observe for signs of chemical exposure, physical trauma, or heat stress such as:
  - changes in complexion and skin discoloration;
  - changes in coordination or demeanor;
  - excessive saliva and pupillary response; or,
  - changes in speech pattern;
- Periodically verify the integrity of all protective clothing; and,
- Notify the SC if emergency help is needed.

Entry to or exit from the work zone under the conditions described earlier without a designated partner is prohibited.

### 5.2.8 *Safety Equipment*

In addition to other equipment specified in this Work Plan, the following safety equipment will be staged in the support zone:

- First aid kit;
- Portable eyewash station and hand shower;
- Hearing protection;
- Spill kit;
- Air horn;
- Directions to medical facilities;
- Heat stress monitoring equipment;
- Portable radio for emergency communications;
- Hearing protection; and,
- Fire extinguisher.

### 5.2.9 *Spill Containment*

In addition to the mitigation measures presented in this Work Plan, a spill and discharge control plan has been prepared to provide contingency measures for potential spills and discharges from handling and movement of potentially hazardous wastes such as contaminated soil and ground water encountered during field activities. This spill and discharge control plan is in the PHSP and the CPGERP.

#### 5.2.9.1 **Task-Specific Equipment Requirements**

At a minimum, the following spill/containment equipment will be pre-positioned in the work area.

- Absorbent and booms (capable of containing and absorbing 55-gallons of liquid);
- Containers to hold spent absorbent material; and,
- High Efficiency Particulate Air vacuum cleaner with power source.

### 5.2.10 Air Monitoring

Air monitoring is essential to ensure that all field personnel will be adequately protected from airborne contaminants. Radiological air monitoring will be conducted in accordance with HSP 14.1, "Airborne Radioactive Monitoring."

The appropriate air monitoring equipment will be acquired and assessed for suitability prior to the readiness review. All equipment will be maintained and calibrated in accordance with manufacturer's recommendations. Air monitoring will be conducted daily or until collected data is sufficient to predict exposures to airborne contaminants. Airborne radiological action levels are shown in Table 5-1.

Table 5-1 Airborne Radiological Action Levels

Compound	Action Level	Action
Gross Alpha	3E-11 microCi/ml	Action to include the following progressive steps: <ul style="list-style-type: none"><li>• Notify RSO of concentrations;</li><li>• RSO to stop work or evaluate engineering controls, as necessary; and,</li><li>• RSO to decide if upgrade of PPE to Level C with full-face respirators with HEPA cartridges is necessary.</li></ul>
Gross Beta	8E-10 microCi/ml	

**Abbreviations:**

HEPA	High Efficiency Particulate
microCi/ml	microCuries per milliliter
PPE	personal protective equipment
RSO	Radiological Safety Officer

## 6. REFERENCES

- Dames and Moore (D&M), 1992, *Waste Characterization, Stored Wastes*, LEHR Environmental Restoration, Davis, California, November.
- IT Corporation (IT Corp.), 1997, *Draft Miscellaneous Materials and Waste Inventory Summary at the Laboratory for Energy-Related Health Research (LEHR)*, University of California at Davis, IT Corporation, December.
- WA, 1998, *Final Contingency Plan and General Emergency Response Procedures*, Rev. 1, LEHR, University of California at Davis, California, Weiss Associates, November.
- WA, 1999a, *Final Standard Operating Procedures*, LEHR, University of California at Davis, California, Weiss Associates, December.
- WA, 1999b, *Final Health and Safety Procedures*, LEHR, University of California at Davis, California, Weiss Associates, March.
- WA, 1999c, *Final As Low As Reasonably Achievable (ALARA) Program Management*, Rev. 3, LEHR, University of California at Davis, California, July.
- WA, 1999d, *Final Radiological Protection Program at the Laboratory for Energy-Related Health Research*, University of California at Davis, California, Weiss Associates, Rev. 3, November.
- WA, 2000a, *Final Quality Assurance Project Plan for Environmental Waste Management at the Laboratory for Energy-Related Health Research*, University of California at Davis, California, Weiss Associates, Rev 3, June.
- WA, 2000b, *Final Project Health and Safety Plan for Environmental Restoration/Waste Management*, Rev. 3, LEHR, University of California at Davis, California, Weiss Associates, June.
- WA, 2000c *Final Standard Quality Procedures for Environmental Restoration/Waste Management, Rev. 0, LEHR*, University of California at Davis, California, Weiss Associates, June.
- WA, 2000d, *ALARA Guidelines for Removal Actions at the Ra/Sr Treatment System Area I for the Laboratory for Energy-Related Health Research*, Rev. 2, July.

**ATTACHMENT 1**

**ACTIVITY HAZARD ANALYSIS**

### ACTIVITY HAZARD ANALYSIS

Work Plan Activity	Associated Hazards	Hazard Controls
Work area set up	1. Vehicle traffic	1. Personnel on foot will wear traffic vests during periods of heavy traffic.
	2. Heavy equipment operations	2. Only properly trained operators will operate heavy equipment. Operators will complete daily equipment safety inspections. Spotters will be present during operations.
	3. Heat stress	3. As necessary, the SHSO will conduct heat stress monitoring and institute appropriate work/rest cycles.
	4. Slips, trips and falls	4. Walking surfaces will be kept clear of debris. The SHSO will enforce good housekeeping standards.
	5. Spiders	5. Workers will be aware of their surroundings and be familiar with the species of spiders inhabiting the Site.
Waste loading	1. Vehicle traffic	1. Personnel on foot will wear traffic vests during periods of heavy traffic.
	2. Heavy equipment operations	2. Only properly trained operators will operate heavy equipment. Operators will complete daily equipment safety inspections. Spotters will be present during operations.
	3. Heat stress	3. As necessary, the SHSO will conduct heat stress monitoring and institute appropriate work/rest cycles.
	4. Slips, trips and falls	4. Walking surfaces will be kept clear of debris. The SHSO will enforce good housekeeping standards.
	5. Spiders	5. Workers will be aware of their surroundings and be familiar with the species of spiders inhabiting the Site.
	6. Nuisance dust	6. Water spray will be used on surfaces and when loading waste to minimize generation of dust.

---

ACTIVITY HAZARD ANALYSIS (continued)

---

Work Plan Activity	Associated Hazards	Hazard Controls
	7. Radiological contamination	7. Work will be conducted in accordance with the HWP for this task. RCTs will be present to provide radiological oversight and ensure all appropriate controls are in place in accordance with the RPP.
	8. Airborne radioactivity	8. Work will be conducted in accordance with the HWP for this task. RCTs will be present to provide radiological oversight and ensure all appropriate controls are in place in accordance with the RPP. Water spray will be used on surfaces and when loading waste to minimize generation of dust.

---