DETAILED WORKPLAN

INNOVATIVE TECHNOLOGY DEMONSTRATIONS TO SUPPORT EXISTING TREATMENT OPERATIONS AT THE INSTALLATION LOGISTICS CENTER, DSERTS SITE FTLE-33 FORT LEWIS, WASHINGTON

MIPR No. MIPR8FDOEX4017
PNNL Project No. 29225

July 1998

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Prepared for

U.S. Department of the Army
Directorate of Public Works
Fort Lewis, Washington

Pacific Northwest National Laboratory
Richland, Washington 99352

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DETAILED WORKPLAN
for
Innovative Technology Demonstrations
to Support Existing Treatment Operations
at the Installation Logistics Center, DSERTS Site FTLE-33
Fort Lewis, Washington

PNNL Project No. 29225

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ACRONYMS

API	American Petroleum Institute
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DERA	Defense Environmental Restoration Account
DNAPL	dense non-aqueous phase liquid
DOE	(U.S.) Department of Energy
EPA	(U.S.) Environmental Protection Agency
ERAP	Environmental Restoration Action Plan
ESD	Explanation of Significant Difference
ETD	Environmental Technology Division
FFA	Federal Facilities Agreement
FORSCOM	(U.S. Army) Forces Command
HASP	Health and Safety Plan
HazWOper	Hazardous Waste Operations
IADC	International Association of Drilling Contractors
IRP	Installation Restoration Program
MIPR	Military Interdepartmental Purchase Request
NEPA	National Environmental Policy Act
NPL	National Priorities List
NWIS	National Water Information System
OSHA	Occupational Safety and Health Administration
PNNL	Pacific Northwest National Laboratory
PPE	personal protective equipment
PTS	Progress Tracking System
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control

RCRA	Resource Conservation and Recovery Act
RIDS	Records Inventory and Disposition Schedule
ROD	Record of Decision
SBMS	Standards-Based Management System
SOW	Statement of Work
TCE	trichloroethene
TSD	treatment, storage, and disposal
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WBS	Work Breakdown Structure

1. INTRODUCTION

This workplan is an assemblage of documents for use by Pacific Northwest National Laboratory (PNNL) to direct and control project activities at Fort Lewis, Washington. PNNL Project No. 29225, entitled Innovative Technology Demonstrations to Support Existing Treatment Operations at the Installation Logistics Center, DSERTS Site FTLE-33, Fort Lewis, Washington, is being performed under Task 3.4 Design and Implementation of Non-Standard Environmental Response Actions, as presented in the U.S. Army Forces Command (FORSCOM) Program Statement of Work (SOW), dated 3 September 1997. Funding is being provided by the U.S. Department of Army via Military Interdepartmental Purchase Request (MIPR) No. MIPR8FDOEX4017, per the Memorandum of Understanding between FORSCOM and the U.S. Department of Energy (DOE).

Site background information and brief descriptions of the Fort Lewis project and the main supporting documents, which will be used to direct and control the project activities, are provided below. These are followed by a summary of the Work Breakdown Structure (WBS) elements, a general project schedule, a list of major deliverables, and a budget synopsis. Test plans for specific elements (Bench-Scale Testing) will be developed separately as those elements are initiated. If additional activities not specifically addressed in the *Project Management Plan* (Attachment 1) are added to the work scope, addendums to this workplan will be prepared to cover those activities.

2. SITE BACKGROUND

Fort Lewis is a FORSCOM installation, whose Logistics Center (DSERTS Site FTLE-33) was placed on the National Priorities List (NPL) in December 1989, as a result of trichloroethene (TCE) contamination in groundwater beneath the site. A Federal Facilities Agreement (FFA) between the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology, and the Army was formalized in January 1990. This FFA established a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at the Logistics Center. The selected remedial action consists of installation of two permanent pump and treat systems to treat groundwater in the upper aquifer, and further investigation of the lower aquifer and remaining potential sources of soil contamination.

3. PROJECT DESCRIPTION

The purpose of this project is to provide technical support in accelerating Installation Restoration Program (IRP) site remediation and significantly reducing program life-cycle costs at the Logistics Center. The objectives are to accomplish the following:

- apply innovative remedial technologies to identify, isolate/contain, or treat in an accelerated fashion contaminant sources and plumes of concern to regulatory acceptable levels
- evaluate, optimize, and enhance the effectiveness of existing groundwater remediation systems in reducing contaminants to regulatory acceptable levels, leading to closure of these systems significantly earlier than current model estimates
- complete associated remedial and administrative tasks to remove the Logistics Center from the NPL.

Detailed task descriptions, as well as information on schedules, deliverables, and budgets can be found in the *Project Management Plan* (Attachment 1).

3.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

The *Project Management Plan* (Attachment 1) sets forth the organization and the functional responsibilities, levels of accountability and authority, lines of authority and communication, and management systems to direct and control the project activities.

This project is being conducted under the direction of Task 3.4 Program Manager Jim Bush and Project Manager Terry Liikala. Terry Liikala (or his deputy) is the primary point of contact with the Fort Lewis IRP Manager Dennis Korycinski. Principal technical contributors include John Fruchter, George Last, Mark Williams, Tyler Gilmore, Vince Vermeul, and Charlie Cole.

3.2 QUALITY ASSURANCE/QUALITY CONTROL

The Quality Engineer for this project is Taffy Almeida. Project activities are governed by the *Quality Assurance Project Plan* (Attachment 2), based on PNNL's Standards-Based Management System (SBMS) and EPA QA/R-5.

3.3 HEALTH AND SAFETY

The Health and Safety Officer for this project is Mike Fullmer. Project activities are governed by the *Health and Safety Requirements* outlined in Attachment 3. Element-specific Health and

Safety Plans (HASP) will be developed for inclusion with the various test plans (site-specific characterization) as those elements are initiated. These HASPs will address training/site entry requirements; waste types, characteristics, and hazards; monitoring strategy/action levels; personal protective equipment (PPE); and decontamination and emergency procedures.

3.4 DATA MANAGEMENT

The methodologies to be used in receiving, storing, validating, and reporting data derived from project activities are contained in the *Data Management Plan* (Attachment 4). Data receipt includes filing original hardcopy, sample tracking, and data entry. Data storage includes merging entered data into a computer database, verification of entered data, and backup of electronic data. Data validation includes reviewing hardcopy data packages with regard to the overall technical quality of the data being provided by the laboratories. Data reporting includes the processes for extracting information from the database into tabular, graphic, and other informational forms.

3.5 INVESTIGATION DERIVED WASTE

The *Investigation Derived Waste Management Plan* (Attachment 5) presents the waste screening, handling, evaluation, storage, and classification strategies to be used in support of the project activities. The following general approaches to waste management will be employed.

- A site will be left in no worse condition than existed prior to investigation.
- The quantity/volume of wastes generated will be minimized.
- Wastes that do not require offsite disposal or extended containerization will be left onsite.
- Removal of wastes from a site will be minimized as long as those wastes do not pose a threat to human health or the environment.

Element-specific waste management plans will be developed for inclusion with the various test plans (site-specific characterization) as those elements are initiated.

3.6 PROCEDURES

Procedures used to carry out and control the technical aspects of the project activities (site-specific characterization, performance assessment) are available under separate cover. National standards, including procedures published by the American Society for Testing and Materials (ASTM), the U.S. Army Corps of Engineers (USACE), and the U.S. Geological Survey (USGS), were utilized in developing these procedures.

4. ACTIVITIES

New and innovative (nonstandard) remedial technologies will be identified to clean up the site to regulatory acceptable levels, shorten the timeframe for cleanup, and significantly reduce currently estimated IRP life-cycle costs. Promising candidates will be implemented in a phased approach to minimize risk to the project. For the upper aquifer, four specific areas within the TCE plume will be addressed. They are, in order of priority, Area #1 – the vadose zone source; Area #2 – the saturated zone source; Area #3 – a containment area downgradient of Areas #1 and #2; and Area #4 – the remainder of the plume. The leading candidates presently being considered are In Situ Redox Manipulation for Area #3, Enhanced Bioremediation for Area #4, and Phytoremediation for Area #1. Initial efforts will focus primarily on Area #3, as ongoing characterization activities at Areas #1 and #2 (source areas in the East Gate Disposal Yard) preclude any further work in these areas at this time. These characterization activities include surface geophysics, soil gas sampling, trenching, drive point sampling, and soil boring and monitoring well installation. Technologies for the vadose and saturated zones, the remainder of the plume, and the lower aquifer will be defined in greater detail as ongoing characterization work, budget and schedule, and regulatory oversight dictate.

The work described herein will be completed under Task 3.4 Design and Implementation of Non-Standard Environmental Response Actions as presented in the FORSCOM Program SOW, dated 3 September 1997. The scope of work for this Detailed Workplan includes the following:

- Project Management
- Workplan Development
- Support Activities
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process Changes
- Technology Screening
- Bench-Scale Testing
- Site-Specific Characterization
- Proof-of-Principle Tests
- Treatability Test Selection and Design
- Treatability Tests

- Final Technology Selection and Design
- Contingency
- Full-Scale Demonstrations
- Technology Transfer and Remedial Contractor Training
- Technology Evaluations/Demonstrations for Other Areas.

Details for each WBS element are provided in the *Project Management Plan* (Attachment 1). PNNL will conduct numerous tasks in parallel such as technology screening, bench-scale testing, and site-specific characterization to achieve the early closure goal for the existing treatment systems.

5. SCHEDULE

A general project schedule is given in Table 1. The detailed project schedule is included in the *Project Management Plan* (Attachment 1).

6. DELIVERABLES

Table 2 provides a list of the major deliverables for this project and their expected due dates as outlined in the *Project Management Plan* (Attachment 1).

7. BUDGET

This project is being funded under MIPR No. MIPR8FDOEX4017 in the amount of \$950,000 as the first increment towards the estimated project ceiling of \$15,726,000. Estimated project period of performance extends from 18 March 1998 through 31 December 2005. Period of performance for the funds made available through this MIPR extends through 1 March 1999. Amendments increasing funding are expected as FORSCOM budget and project needs allow.

Table 1. Schedule of Activities

<u>Project Management (WBS 01)</u>	
1. Receive DERA funds at PNNL	18Mar98
2. Prepare monthly reports	15 th of each month
<u>Workplan Development (WBS 02)</u>	
1. Prepare detailed workplan	Apr-May98
<u>Support Activities (WBS 03)</u>	
1. Prepare Environmental Restoration Action Plan (ERAP) Matrix	Apr-May98
2. Review treatment operations	Apr-Jun98
<u>CERCLA Process Changes (WBS 04)</u>	
1. Prepare ESD	Mar-Jun98
<u>Technology Screening (WBS 05)</u>	
1. Perform technology screening	Apr-Oct98
2. Prepare technology screening report	Sep-Oct98
<u>Bench-Scale Testing (WBS 06)</u>	
1. Prepare bench-scale test plans	Apr-May98
2. Perform bench-scale testing	Apr-Oct98
3. Prepare bench-scale test reports	Sep-Oct98
<u>Site-Specific Characterization (WBS 07)</u>	
1. Prepare site-specific characterization test plan	May-Jun98
2. Perform site-specific characterization	May-Nov98
3. Prepare site-specific characterization report	Oct-Nov98
<u>Proof-of-Principle Tests (WBS 08)</u>	TBD
<u>Treatability Test Selection and Design (WBS 09)</u>	TBD
<u>Treatability Tests (WBS 10)</u>	TBD
<u>Final Technology Selection and Design (WBS 11)</u>	TBD
<u>Contingency (WBS 12)</u>	Apr98-Mar99
<u>Full-Scale Demonstrations (WBS 13)</u>	TBD
<u>Technology Transfer and Remedial Contractor Training (WBS 14)</u>	TBD
<u>Technology Evaluations/Demonstrations for Other Areas (WBS 15)</u>	TBD

Table 2. List of Deliverables

1. Monthly Reports	15 th of each month
2. Detailed Workplan	May98
3. Environmental Restoration Action Plan (ERAP) Matrix	May98
Review Treatment Operations Report	Jun98
4. ESD	Jun98
5. Technology Screening Report	Oct98
6. Bench-Scale Test Plans	May98
Bench-Scale Testing Reports	Oct98
7. Site-Specific Characterization Test Plan	Jun98
Site-Specific Characterization Report	Nov98
8. Proof-of-Principle Test Plans	TBD
Proof-of-Principle Test Reports	TBD
9. None	
10. Treatability Test Plans	TBD
Treatability Test Reports	TBD
11. None	
12. None	
13. Full-Scale Demonstration Plans	TBD
Full-Scale Demonstration Reports	TBD
14. Contractor Training Materials	TBD
15. TBD	TBD

ATTACHMENT 1
PROJECT MANAGEMENT PLAN

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1. INTRODUCTION

This project management plan sets forth the plans, organization, and systems to be used by Pacific Northwest National Laboratory (PNNL) to direct and control project activities at Fort Lewis, Washington. PNNL Project No. 29225, entitled Innovative Technology Demonstrations to Support Existing Treatment Operations at the Installation Logistics Center, DSERTS Site FTLE-33, Fort Lewis, Washington, is being funded by the U.S. Department of Army via Military Interdepartmental Purchase Request (MIPR) No. MIPR8FDOEX4017. The work will be performed under Task 3.4 Design and Implementation of Non-Standard Environmental Response Actions, as presented in the U.S. Army Forces Command (FORSCOM) Program Statement of Work (SOW), dated 3 September 1997, in keeping with the Memorandum of Understanding between FORSCOM and the U.S. Department of Energy (DOE).

1.1 PURPOSE

The purpose of this project is to provide technical support in accelerating Installation Restoration Program (IRP) site remediation and significantly reducing program life-cycle costs at the Logistics Center. The objectives are to accomplish the following:

- apply innovative remedial technologies to identify, isolate/contain, or treat in an accelerated fashion contaminant sources and plumes of concern to regulatory acceptable levels
- evaluate, optimize, and enhance the effectiveness of existing groundwater remediation systems in reducing contaminants to regulatory acceptable levels, leading to closure of these systems significantly earlier than current model estimates
- complete associated remedial and administrative tasks to remove the Logistics Center from the National Priorities List (NPL).

1.2 BACKGROUND

Fort Lewis is a FORSCOM installation located approximately 10 miles south of Tacoma, Washington. The installation Logistics Center was placed on the NPL in December 1989, as a result of trichloroethene (TCE) contamination in groundwater beneath the site. A Federal Facilities Agreement (FFA) between the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology, and the Army was formalized in January 1990. This FFA established a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at the Logistics Center. The selected remedial action consists of installation of two permanent pump and treat systems to treat groundwater in the upper aquifer, and further investigation of the lower aquifer and remaining potential sources of soil contamination.

The pump and treat systems began operation in August 1995. To date, they provide hydraulic containment of the TCE plume, but have relatively high operation and maintenance costs. Additionally, the systems were installed with incomplete characterization of the source areas, little effort to delineate expected dense non-aqueous phase liquid (DNAPL), the probability of source items (drums) still being buried, and with one of the injection areas designed to "clean-water sweep" the primary source area. Mass balance calculations indicate under non-declining performance parameters, the plume will be cleaned up in approximately 78 years. Under more realistic conditions of asymptotic performance, the time to clean up the plume could be many times longer, and in fact, the systems may not be able to completely clean up the site. Further, the systems fail to address issues related to potential contaminant loss to the lower aquifer through hole(s) in the underlying aquitard.

1.3 APPROACH

New and innovative (nonstandard) remedial technologies will be identified to clean up the site to regulatory acceptable levels, shorten the timeframe for cleanup, and significantly reduce currently estimated IRP life-cycle costs. Promising candidates will be implemented in a phased approach to minimize risk to the project. For the upper aquifer, four specific areas within the TCE plume will be addressed. They are, in order of priority, Area #1 – the vadose zone source; Area #2 – the saturated zone source; Area #3 – a containment area downgradient of Areas #1 and #2; and Area #4 – the remainder of the plume. The leading candidates presently being considered are In Situ Redox Manipulation for Area #3, Enhanced Bioremediation for Area #4, and Phytoremediation for Area #1. Initial efforts will focus primarily on Area #3, as ongoing characterization activities at Areas #1 and #2 (source areas in the East Gate Disposal Yard) preclude any further work in these areas at this time. These characterization activities include surface geophysics, soil gas sampling, trenching, drive point sampling, and soil boring and monitoring well installation. Technologies for the vadose and saturated zones, the remainder of the plume, and the lower aquifer will be defined in greater detail as ongoing characterization work, budget and schedule, and regulatory oversight dictate.

1.4 ASSUMPTIONS AND CONDITIONS

The scheduling and completion of this work are dependent on the timely receipt of full funding, the timely completion and transmittal of results from other contractors (U.S. Geological Survey [USGS], U.S. Army Corps of Engineers [USACE]), and the timely review of deliverables by Fort Lewis and EPA, as well as the factual makeup of the data received during the life of this project.

2. WORK BREAKDOWN STRUCTURE

This section describes the project objectives and provides detailed task descriptions.

2.1 PROJECT OBJECTIVES

The primary technical objectives of this project are to accomplish the following:

- apply innovative remedial technologies to identify, isolate/contain, or treat in an accelerated fashion contaminant sources and plumes of concern to regulatory acceptable levels
- evaluate, optimize, and enhance the effectiveness of existing groundwater remediation systems in reducing contaminants to regulatory acceptable levels, leading to closure of these systems significantly earlier than current model estimates
- complete associated remedial and administrative tasks to remove the Logistics Center from the NPL.

2.2 TASK DESCRIPTIONS

This project has been divided into 15 Work Breakdown Structure (WBS) elements, some of which are further subdivided into subelements (Figure 1). The main WBS elements are listed below followed by detailed descriptions.

1. Project Management
2. Workplan Development
3. Support Activities
4. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process Changes
5. Technology Screening
6. Bench-Scale Testing
7. Site-Specific Characterization
8. Proof-of-Principle Tests
9. Treatability Test Selection and Design
10. Treatability Tests
11. Final Technology Selection and Design
12. Contingency
13. Full-Scale Demonstrations
14. Technology Transfer and Remedial Contractor Training
15. Technology Evaluations/Demonstrations for Other Areas

Figure 1. Work Breakdown Structure

2.2.1 Project Management (WBS 01)

This work element covers overall administration and integration of the technical work tasks, including planning, management, and control of these activities. The principal project management activities entail coordination of internal and external project planning, communications, identification and control of resources (manpower and subcontracts), fiscal control and management, internal PNNL quality control, and monthly progress/status reporting. All task rebase-lining (reallocation of funds across tasks), scope modifications, as well as scoping and planning for newly identified needs will be conducted under this task. Cost sharing (bench-scale testing) opportunities with other PNNL projects may be available and will be managed, as appropriate, within this task.

Lead: Terry Liikala
Key Staff: Jim Bush, John Fruchter, Kathy Lavender, Lilly Burns, Shannon Moss, Becky Willborn
FY98 Funding: \$179K
Status: Active
Major Deliverables: Monthly Reports

2.2.2 Workplan Development (WBS 02)

This work element covers development of the Detailed Workplan, which will be used to direct and control project activities. The workplan will provide a brief description of the Fort Lewis project and contain the main supporting documents to be used throughout the project. These supporting documents include the *Project Management Plan*, the *Quality Assurance Project Plan*, *Health and Safety Requirements*, the *Data Management Plan*, and the *Investigation Derived Waste Management Plan*.

Currently, specific procedures have been devised for DOE sites; however, these procedures are generally geared toward mixed waste (radiological and hazardous constituents) and as a result, may be unnecessary for non-radiological contaminants. A small component of this task may include revising the procedures for FORSCOM sites. A specific project with this objective is currently underway, however, it does not focus on implementing remedial technologies.

Lead: Terry Liikala
Key Staff: Lilly Burns, Taffy Almeida, Mike Fullmer, JoAnne Rieger, Tom Lazarski, David Lanigan
FY98 Funding: \$55K
Status: Active
Major Deliverables: Detailed Workplan

2.2.3 Support Activities (WBS 03)

Level-of-effort support activities including, but not limited to, technical working group meetings, integration with the USGS, integration with the USACE/Woodward-Clyde, preparation of an Environmental Restoration Action Plan (ERAP) matrix, and a review of the existing treatment operations will be covered under this work element. Other activities including evaluation of borehole logging needs, assessment of pumping test data, and evaluation of the lower aquifer fall under this task, but are inactive at this time.

Lead: Terry Liikala
Key Staff: Jim Bush, John Fruchter, Mark Williams, Charlie Cole, Vince Vermeul, Kirk Cantrell, Tyler Gilmore, George Last
FY98 Funding: \$100K
Status: Active
Major Deliverables: ERAP Matrix, Review Treatment Operations Report

2.2.4 CERCLA Process Changes (WBS 04)

This work element covers activities devoted to gaining acceptance of the proposed actions, usually the implementation of a specific remedial technology, within the CERCLA process. Most activities will likely be related to the public process resulting from post-Record of Decision (ROD) changes or other modifications. It is our understanding that the ROD incorporates language that allows modification of the in-place remedy, and to the extent that language permits this program to proceed without formal post-ROD changes, costs incurred by this task may be reduced. However, at this time, such savings can not be guaranteed, therefore, the costs for post-ROD changes are included in this task.

It is estimated that the process will include preparation of an Explanation of Significant Difference (ESD), two public meetings, a Proposed Plan, a simplified news release, a formal administrative decision supporting the proposed changes, and reports documenting these events.

Lead: Terry Liikala
Key Staff: John Fruchter, Jim Bush
FY98 Funding: \$65K
Status: Active
Major Deliverables: ESD

2.2.5 Technology Screening (WBS 05)

This work element covers activities leading to selection of the preferred technologies to be implemented at the Logistics Center. In general, the activities occur in the following steps: 1) identification of pertinent regulatory issues, 2) identification of remedial action objectives, 3) preliminary identification and screening of technologies, 4) site selection, 5) site-specific technology comparison and selection of preferred technologies, and 6) economic study/justification. Since the site is currently operating under a ROD, much of the preliminary work

identified for this WBS has already been conducted. However, it appears to have been conducted without considering innovative technologies. PNNL will attempt to utilize all of the preliminary work, providing it is applicable and valid when considering innovative technologies.

Traditional feasibility studies conducted under CERCLA incorporate a standard set of criteria against which the technologies (site remedial alternatives) are ranked. While some of these criteria may be applicable to Fort Lewis, other rationale, particularly economic and mission related, may be added to the traditional criteria. In particular, the urgency to remove the economic and administrative burdens of completing CERCLA actions from the ever-growing list of activities for which Fort Lewis is responsible, is a significant criterion. PNNL will negotiate a set of criteria with Fort Lewis and EPA, for use in ranking technologies. Furthermore, PNNL retains several software systems whose primary purpose is to screen, rank, and economically assess remedial technologies for environmental sites. These systems (ReOpt, RAAS, RACER) will be implemented or modified, as necessary and cost effective, to better evaluate technologies for application to the Logistics Center.

Lead: George Last
Key Staff: Khrist Olsen, Jim Bush
FY98 Funding: \$130K
Status: Active
Major Deliverables: Technology Screening Report

2.2.6 Bench-Scale Testing (WBS 06)

This work element covers bench-scale testing that will be required for each of the selected technologies. Because the likely nonstandard technologies are deployed in situ, they are more sensitive to site-specific conditions than conventional technologies. Therefore, it is important to test the performance of these technologies at the bench scale using soils and groundwater from the actual site before field testing and demonstration.

Bench-scale tests will include both characterization and simulation activities. Relevant properties of the solid and liquid materials will be measured to determine suitability of the site for each proposed technology. For those found to be suitable (three technologies assumed for costing purposes), batch and column tests or other appropriate bench-scale simulations will be performed. The data will be used in conjunction with the site-specific characterization data to design proof-of-principle tests.

Lead: John Fruchter
Key Staff: Mark Williams, Jim Szecsody, John Evans, Tyler Gilmore
FY98 Funding: \$210K
Status: Active
Major Deliverables: Bench-Scale Test Plans, Bench-Scale Test Reports

2.2.7 Site-Specific Characterization (WBS 07)

This work element covers drilling, targeted characterization data collecting (soil core and groundwater sampling and analysis), well installing, and pre-technology emplacement hydrologic/tracer testing. The data will be used in conjunction with the bench-scale testing data to design proof-of-principle tests. Existing data will be used to expedite the characterization effort where possible.

Lead: Vince Vermeul
Key Staff: Mark Williams, Charlie Cole, Bruce Bjornstad
FY98 Funding: \$161K
Status: Active
Major Deliverables: Site-Specific Characterization Test Plan, Site-Specific Characterization Report

2.2.8 Proof-of-Principle Tests (WBS 08)

This work element covers proof-of-principle tests for innovative technologies that are selected through the technology screening process and that bench-scale testing has shown are applicable to the site and TCE contamination in groundwater. Proof-of-principle tests are particularly important for innovative technologies that do not have a history of operations on which to base engineering design and cost estimates.

The proof-of-principle tests will be implemented in the field at scales smaller than treatability testing and full-scale demonstrations, but will involve all of the steps required for both. An in situ permeable barrier emplaced using one vertical injection well through a 20-ft-thick saturated zone, one reactive well, and one technology to be determined were assumed for costing purposes. Specific steps for proof-of-principle tests include test plan preparation; review and approval by regulatory agencies; engineering design; acquisition, setup, and emplacement of equipment and materials; operation in the field; performance monitoring and evaluation (tracer testing, chemical analyses, modeling); and interpretation and reporting. The goal will be to determine parameters for scale-up, accurate costing information, performance under field conditions, and regulatory and public acceptance. Every effort will be made to immediately and seamlessly incorporate the proof-of-principle tests into the treatability tests and full-scale demonstrations.

Lead:
Key Staff:
FY98 Funding: \$0K
Status: Inactive
Major Deliverables: Proof-of-Principle Test Plans, Proof-of-Principle Test Reports

2.2.9 Treatability Test Selection and Design (WBS 09)

This work element covers selection and design activities that occur before and in concert with treatability testing of technologies. At the conclusion of WBS elements 05 through 08, specific

technologies will be selected for treatability testing and application to the TCE plume beneath the Logistics Center. Treatability test selection includes not only the specification of a technology type, but also the scale of implementation, the precise objectives expected to be achieved by the technology, and the selection of methods to be used to determine how those objectives are met (performance monitoring, post proof-of-principle hydrologic characterization, barrier coring). Design work will include such actions as preparing design drawings and specifications for an in situ redox manipulation barrier, or size and flow-rate design for a reactive well installation. In general, design actions represent the final closing activities required before field implementation of a technology, as well as the on-going design modifications likely to occur during field installation. Design activities, and technology-specific and site-wide activities will be closely coordinated. For example, site-wide monitoring undertaken by the USACE/ Woodward-Clyde and the USGS, will be closely coordinated with the performance monitoring of remedial technologies implemented by PNNL.

Lead:

Key Staff:

FY98 Funding: \$0K

Status: Inactive

Major Deliverables: None

2.2.10 Treatability Tests (WBS 10)

This work element covers treatability tests for innovative technologies that are selected through the technology screening process, and that bench-scale testing and proof-of-principle testing have shown are applicable to the site and TCE contamination in groundwater. Many innovative technologies do not have field-testing histories, therefore, there is no guarantee that technology performance at the treatability-test level will meet design parameters. The goal of treatability testing is to show that the demonstrated innovative technologies function within parameters defined in WBS elements 05 through 09 in an acceptable and cost-effective manner.

The treatability tests will be implemented in the field at scales that are smaller than full-scale demonstrations, but will involve all of the steps required for full scale. A 300-ft-long in situ permeable barrier emplaced using a combination of 10 vertical and horizontal injection wells through a 50-ft-thick saturated zone with 15 monitoring wells, and three reactive wells were assumed for costing purposes. Specific steps for treatability testing include test plan preparation; review and approval by regulatory agencies; engineering design; acquisition, setup, and emplacement of equipment and materials; operation in the field; performance monitoring and evaluation (tracer testing, chemical analyses, modeling); and interpretation and reporting. The goal will be to determine parameters for further scale-up, refined costing information, performance under field conditions, and regulatory and public acceptance. Every effort will be made to immediately and seamlessly incorporate the treatability tests into the full-scale demonstrations.

Lead:

Key Staff:

FY98 Funding: \$0K

Status: Inactive

Major Deliverables: Treatability Test Plans, Treatability Test Reports

2.2.11 Final Technology Selection and Design (WBS 11)

This work element covers final selection and design activities that occur before and in concert with full-scale demonstrations. At the conclusion of WBS elements 05 through 10, specific technologies will be selected for full-scale demonstration and application to the TCE plume beneath the Logistics Center. Final technology selection includes not only the specification of a technology type, but also the scale of implementation, the precise objectives expected to be achieved by the technology, and the selection of methods to be used to determine how those objectives are met (performance monitoring, cross-barrier tracer testing, barrier coring). Design work will include such actions as preparing design drawings and specifications for an in situ redox manipulation barrier, or size and flow-rate design for a reactive well installation. In general, design actions represent the final closing activities required before field implementation of a technology, as well as the on-going design modifications likely to occur during field installation. Design activities, and technology-specific and site-wide activities will be closely coordinated. For example, site-wide monitoring undertaken by the USACE/Woodward-Clyde and the USGS, will be closely coordinated with the performance monitoring of remedial technologies implemented by PNNL.

Lead:

Key Staff:

FY98 Funding: \$0K

Status: Inactive

Major Deliverables: None

2.2.12 Contingency (WBS 12)

A risk management contingency account will be set up under this task and used only at the discretion and permission of the Fort Lewis IRP Manager. These funds will be reserved for unforeseen field activities (equipment breakdown, weather delays, increased sampling needs, managing personnel changes, additional drilling) or any other unexpected costs or minor scope alteration that is not anticipated at this time.

Lead: Terry Liikala

Key Staff: Jim Bush

FY98 Funding: \$9K

Status: Active

Major Deliverables: None

2.2.13 Full-Scale Demonstrations (WBS 13)

This work element covers activities leading to demonstration of the selected innovative technologies at a scale that would be consistent with site remediation. Many of the innovative

technologies do not have full-scale demonstration histories, therefore, there is no guarantee that technology performance at the full-scale level will meet design parameters. Because of this, there is no guarantee that the technologies will remediate the site, hence the activities should be thought of as full-scale demonstrations, rather than true remediation. The goal of full-scale demonstrations is to show that the demonstrated innovative technologies function within parameters defined in WBS elements 05 through 11 in an acceptable and cost-effective manner.

The full-scale demonstrations will include test plan preparation; review and approval by regulatory agencies; engineering design; acquisition, setup, and emplacement of equipment and materials; operation in the field; performance monitoring and evaluation (tracer testing, chemical analyses, modeling); and interpretation and reporting. An additional 500-ft-long (for 800 ft total) in situ permeable barrier injected using a combination of 15 vertical and horizontal injection wells through a 50-ft-thick saturated zone with 15 monitoring wells was assumed for costing purposes.

Lead:

Key Staff:

FY98 Funding: \$0K

Status: Inactive

Major Deliverables: Full-Scale Demonstration Test Plans, Full-Scale Demonstration Reports

2.2.14 Technology Transfer And Remedial Contractor Training (WBS 14)

After full-scale demonstration of any innovative remedial technologies, there will be an on-going process of performance monitoring and operations and maintenance. Once the remedial systems are functioning reliably and PNNL is confident that data being obtained from the performance monitoring systems will indeed serve their appropriate purpose, the monitoring and operations effort shall be transferred to a Fort Lewis remedial contractor. This effort will not be a simple hand-off process, but rather a systematic effort containing training, oversight, and eventual independent function for the remedial contractor.

This effort will start at the completion of initial performance monitoring for each installation of any individual technology. For example, for reactive wells, the technology transfer will commence shortly after performance monitoring of the first well, even though wells of different design or purpose may be emplaced at a later date. Thus, this work element may be ongoing for one technology while PNNL continues with the same or other technologies through the design or testing phases.

Lead:

Key Staff:

FY98 Funding: \$0K

Status: Inactive

Major Deliverables: Contractor Training Materials

2.2.15 Technology Evaluations/Demonstrations for Other Areas (WBS 15)

This work element covers evaluation or demonstration of other innovative technologies for the vadose and saturated zones, the remainder of the plume, and the lower aquifer. These technologies may be implemented singularly or in combination, and in multiple locations. Activities under this task will be defined in greater detail as ongoing characterization work, budget and schedule, and regulatory oversight dictate.

Lead:

Key Staff:

FY98 Funding: \$0K

Status: Inactive

Major Deliverables:

3. PROJECT SCHEDULE

The detailed project schedule is shown in Figure 2. This schedule is contingent on the timely receipt of full funding, the availability of existing data and information, the timely completion and transmittal of results from other contractors (USGS, USACE/Woodward-Clyde), and the timely review of deliverables by Fort Lewis and EPA.

Figure 2. Project Schedule

4. DELIVERABLES

Table 1 lists the major deliverables for this project and their due dates.

Table 1. List of Deliverables

1. Monthly Reports	15 th of each month
2. Detailed Workplan	29May98
3. Environmental Restoration Action Plan Matrix	29May98
Review Treatment Operations Report	26Jun98
4. ESD	1Jun98
5. Technology Screening Report	30Oct98
6. Bench-Scale Test Plans	14May98
Bench-Scale Testing Reports	30Oct98
7. Site-Specific Characterization Test Plan	12Jun98
Site-Specific Characterization Report	30Nov98
8. Proof-of-Principle Test Plans	TBD
Proof-of-Principle Test Reports	TBD
9. None	
10. Treatability Test Plans	TBD
Treatability Test Reports	TBD
11. None	
12. None	
13. Full-Scale Demonstration Plans	TBD
Full-Scale Demonstration Reports	TBD
14. Contractor Training Materials	TBD
15. TBD	TBD

5. BUDGET

This project is being funded under MIPR No. MIPR8FDOEX4017 in the amount of \$950,000 as the first increment towards the estimated project ceiling of \$15,726,000. Estimated project period of performance extends from 18 March 1998 through 31 December 2005. Period of performance for the funds made available through this MIPR extends through 1 March 1999. Amendments increasing funding are expected as FORSCOM budget and project needs allow. Estimated costs for the project period of performance are shown in Table 2.

Table 2. Estimated Costs for Project Period of Performance

Task	Fiscal Year															
	1998		1999		2000		2001		2002		2003		2004		2005	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
1.0 Project Management	\$179	\$179	\$397		\$252		\$300		\$120		\$120		\$120		\$120	
2.0 Workplan Development	\$55	\$55														
3.0 Support Activities	\$100	\$100														
4.0 CERCLA Process Changes	\$65	\$65														
5.0 Technology Screening	\$130	\$130														
6.0 Bench-Scale Testing	\$210	\$210														
7.0 Site-Specific Characterization	\$190	\$161														
8.0 Proof-of-Principle Tests	\$615		\$485													
9.0 Treatability Test Selection and Design			\$210													
10.0 Treatability Tests	\$25		\$2,675		\$300											
11.0 Final Technology Selection and Design			\$10		\$300											
12.0 Contingency	\$100	\$11														
13.0 Full-Scale Demonstrations					\$1,500		\$1,500									
14.0 Technology Transfer and Remedial Contractor Training							\$100		\$100		\$100		\$100		\$100	
15.0 Technology Evaluations/Demonstrations for Other Areas							\$900		\$900		\$900		\$900		\$900	
Subtotals	\$1,669	\$911	\$3,777		\$2,352		\$2,800		\$1,120		\$1,120		\$1,120		\$1,120	
DOE Adder (4.3%)	\$72	\$39	\$162		\$101		\$120		\$48		\$48		\$48		\$48	
Totals	\$1,741	\$950	\$3,939		\$2,453		\$2,920		\$1,168		\$1,168		\$1,168		\$1,168	

Note: Costs in thousands

6. ROLES AND RESPONSIBILITIES

This project is being conducted under the direction of the Task 3.4 Program Manager Jim Bush and Project Manager Terry Liikala. The WBS or organizational structure of the project team is illustrated in Figure 1. A brief description of the roles, responsibilities, and authorities of the project participants follows.

6.1 PROGRAM MANAGER

The Task 3.4 Program Manager (Jim Bush) will assume the overall responsibility for the success of the project activities, and will review and approve the scope, schedule, and budget for the work in conjunction with Fort Lewis.

6.2 PROJECT MANAGER

The Project Manager (Terry Liikala) will be the primary contact with the Fort Lewis IRP Manager (Dennis Korycinski). He or his deputy will direct required work to various qualified PNNL organizations or subcontractors and authorize the work to be performed. The project manager also measures the project progress, manages funds, approves changes and corrective actions, and reports to the program office.

Direct communication between PNNL technical contributors, Fort Lewis, EPA, USGS, USACE/Woodward-Clyde, or any subcontractor is encouraged for the purpose of exchanging information. However, all communications that are directive or task assignment in nature will be controlled through the project manager.

6.3 WBS ELEMENT MANAGERS

The WBS element managers (George Last, John Fruchter, Vince Vermeul) are responsible for their respective tasks (see Figure 1). They plan, review, and approve technical work plans; authorize work of technical contributors; report progress to the project manager; analyze significant variances; and review, approve, and initiate corrective actions.

6.4 TECHNICAL CONTRIBUTORS

Technical contributors (JoAnne Rieger, Tom Lazarski, David Lanigan, Kirk Cantrell, Tyler Gilmore, Khris Olsen, Mark Williams, Jim Szecsody, John Evans, Bruce Bjornstad) are responsible for performing high quality technical work and producing deliverables on time and within budget. They also plan the work, account for costs, explain significant variances, and initiate and implement corrective actions.

6.5 QUALITY ENGINEER

The Quality Engineer for this project (Taffy Almeida) is responsible for assisting project staff in implementing the applicable PNNL, DOE, and FORSCOM quality assurance requirements and verifying compliance with these requirements.

6.6 HEALTH AND SAFETY OFFICER

The Health and Safety Officer for this project (Mike Fullmer) is responsible for ensuring that project safety and health requirements and element-specific Health and Safety Plans (HASP) comply with the applicable PNNL, DOE, and FORSCOM health and safety requirements. The Site Safety Officer is responsible for ensuring that all field work is conducted in a safe and environmentally friendly manner.

6.7 LINE MANAGEMENT

Line managers (Dick Ecker and Joseph Devary) are responsible for verifying that staff assigned to the project are suitably qualified and available to do the work. Line managers are also responsible for managing staff development, providing general training, maintaining high professional standards, and ensuring high technical quality.

7. PROJECT AND ADMINISTRATIVE CONTROLS

This project will be controlled in accordance with PNNL's Standards-Based Management System (SBMS) and the Progress Tracking System (PTS). SBMS is an electronic compilation of the laboratory's mission, values, and aspirations; roles, responsibilities, authorities, and accountabilities; management system descriptions; policies; standards; procedures; and manuals. PTS is an electronic means for tracking project costs.

7.1 MANAGEMENT REPORTING AND REVIEW REQUIREMENTS

The project manager will prepare monthly reports for the previous month that will be submitted to Fort Lewis by the 15th of each month. These reports will document the project status including technical progress, schedule, budget, and problems encountered and proposed solutions.

7.2 TECHNICAL REPORTING AND REVIEW REQUIREMENTS

The WBS element managers will conduct their own management and technical reviews before submitting draft deliverables to the project manager for review. Technical reviews will be performed on all major project deliverables, to ensure they are technically correct, of high quality, and meet the technical objectives. The major deliverables scheduled for technical review are listed in Table 1.

7.3 QUALITY ASSURANCE

This project is governed by a Quality Assurance Project Plan (QAPjP), which is included as Attachment 2 of the Detailed Workplan. Procedures used to carry out and control the technical aspects of the project activities, (site-specific characterization, performance assessment) are available under separate cover.

7.4 ENVIRONMENT, SAFETY, AND HEALTH

Health and Safety Requirements and an Investigation Derived Waste Management Plan are included as Attachments 3 and 5, respectively, of the Detailed Workplan. Element-specific HASP and waste management plans will be prepared for inclusion with the various test plans (site-specific characterization) as those elements are initiated. Review and approval of these plans by Fort Lewis is required before initiation of any hazardous field work activities.

7.5 SAFEGUARDS AND SECURITY

There are no safeguards or security issues associated with this project, with the exception of business sensitive information. The Detailed Workplan and the results of all work conducted under this project are considered sensitive, subject to verbal release by Fort Lewis. The dissemination of reports and information will be authorized jointly by PNNL and Fort Lewis.

7.6 RECORDS MANAGEMENT

All records and documents produced during the performance of this project will be maintained and stored in accordance with the QAPjP and a Data Management Plan (Attachments 2 and 4, respectively, of the Detailed Workplan). PNNL will provide access to the project files, records, and procedures to DOE and Fort Lewis for the purpose of audits or surveillance of activities. A copy of the project file index is provided in Appendix A. The project files will include the following as a minimum:

- Detailed Workplan
- copies of correspondences, meeting minutes, and progress reports
- financial records, requests for proposals, bid documents, and subcontracts
- contract documentation, including the preliminary workplan, dated 25 February 1998
- change control documentation

- quality assurance, health and safety, and related surveillance and audit documentation
- field and analytical data.

7.7 CHANGE CONTROL

Major changes (addition of tasks, task rebaselining) to the current project scope, schedule, or budget, as defined in PNNL's preliminary workplan, dated 25 February 1998, and in this Detailed Workplan will be negotiated by the Program or Project Manager and formally documented via a letter to Fort Lewis. Minor changes (internal milestone) will be documented by the Project Manager via a memo or E-mail to file. Revisions to the field scope of work will be documented in the appropriate field records by the corresponding WBS Element Manager.

7.8 PROJECT CLOSEOUT

Following the completion of all deliverables, the project manager will obtain assurances from Fort Lewis that contractual requirements have been met. The project will then be formally terminated and all WBS elements and subelements will be closed. The QAPjP will be closed and the project files will be transferred to PNNL Records Management for storage according to the Records Inventory and Disposition Schedule (RIDS)/File Index. Line management will reassign staff, facilities, and equipment upon project closeout.

APPENDIX A

PROJECT FILE INDEX

FORT LEWIS PROJECT FILE INDEX
PROJECT NO. 29225

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 - A1 Policy and Management
 - A1.1 Detailed Workplan
 - A4 Activities and Associations
- B Business Development**
 - B3 Proposals
- F Finance and Accountability**
 - F1 Budgets and Forecasts
 - F3 Travel
- O Other Services**
 - O5 Graphics
 - O6 Photography
- Q Quality Assurance**
 - Q1 QA Program
- T Technical**
 - T1 Review Treatment Operations
 - T2 Supporting Documents
 - T3 Battery Acid Pit EE/CA
 - T4 Independent Site Evaluations
 - T5 Satcom Facility
 - T6 YTC/VABA RRSEs
 - T7 Environmental Restoration Action Plan
 - T8 ESD
 - T9 DSERTS Database
 - T10 Maps
 - T11 Redox Bench-Scale Test Plan
 - T12 Reactive Wells Bench-Scale Test Plan
 - T13 Site-Specific Characterization Test Plan

ATTACHMENT 2
QUALITY ASSURANCE PROJECT PLAN

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1. PROJECT/TASK ORGANIZATION

The internal Pacific Northwest National Laboratory (PNNL) organization and reporting relationships for this project are shown in Figure 1. This chart also includes subcontractors and stakeholders. The work is divided into tasks that are led by Task Leaders. The line of communication goes from the staff to the respective Task Leader, to the Project Manager, to the Program Manager to Product Line Management.

Quality and Safety staff communicate and implement PNNL and project requirements to project staff either directly or through the Project Manager, depending on the nature of the requirement or the authority given.

If changes in organizational structure occur that do not reflect a change in the overall scope or focus of the project activities, this Quality Assurance Project Plan (QAPjP) will remain valid. Information corresponding to such organizational changes shall be incorporated in the next revision of this QAPjP. If significant organizational changes occur, this plan will be updated.

It is expected that the U.S. Army-Fort Lewis, Washington, (Fort Lewis), the Environmental Protection Agency (EPA), and PNNL will be involved in the negotiation of a set of criteria for use in ranking the technologies to be implemented at the site. Additionally, project staff will coordinate with the EPA in the preparation of an Explanation of Significant Difference (ESD), public meetings, formal administrative decisions supporting the proposed changes, and formal reports.

1.1 RESPONSIBILITIES

The **Project Manager** is responsible for the following:

- Act as the primary contact with Fort Lewis and stakeholders on all project-related issues.
- Participate in the data quality objective process, as required.
- Ensure compliance with the data quality objectives; approve Fort Lewis-requested modifications and project-specific training.
- Complete a Preliminary Proposal and Risk Assessment form to assess risk and address *National Environmental Policy Act* (NEPA) requirements.
- Prepare and distribute appropriate instructions to staff regarding project requirements, track project performance for compliance with those instructions, and approve final reports to Fort Lewis.

Figure 1. Project Organization Chart

- Oversee project including identification of potential problems, coordination of corrective actions, monitoring of the financial status, and ensuring adequate documentation and storage of project records.

Task Leaders are responsible for the following:

- Provide direction of activities to accomplish task objectives, coordination of planning and organizing, tracking and reporting the status of scope, cost, and schedule.
- Authorize work of technical contributors.
- Interface with the Project Manager, Quality Representative, and others as appropriate.
- Ensure work is performed on schedule, within budget, and in accordance to plans, policies, and procedures.

Technical Staff are responsible for the following:

- Perform work according to procedural and project requirements and applicable safety requirements.
- Identify hazards, concerns, unsafe conditions, and stop unsafe work.
- Identify and initiate corrective actions and complete corrective actions in a timely manner.
- Maintain records and prepare documentation of work performed.
- Seek further instruction if requirements or procedures are not understood.
- Ensure procedures developed are technically correct and in compliance with this QAPjP.
- Perform work within established schedule and budget; inform management when schedule and budget will not be achievable as soon as possible.

The **PNNL Quality Representative** is responsible for the following:

- Assist staff in implementing PNNL QA Program and project requirements.
- Review and approve the QAPjP, procedures and documents, and provide independent verification of compliance with the requirements identified in technical plans and this and other documents.

- Communicate with project staff, management, clients, and stakeholders on PNNL and project quality-related issues.
- Perform assessments as required that focus on PNNL's ability to meet Fort Lewis, program, and regulatory requirements.

2. PROBLEM DEFINITION/BACKGROUND

Fort Lewis is an U.S. Army Forces Command (FORSCOM) Installation. The installation Logistics Center (DSERTS Site FTLE-33) was placed on the National Priorities List (NPL) in December 1989, as a result of trichloroethene (TCE) contamination in groundwater beneath the site. A Federal Facilities Agreement (FFA) between the EPA, the Washington Department of Ecology, and the Army was formalized in January of 1990. This FFA established a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at the Logistics Center. The selected remedial action consists of installation of two permanent pump and treat systems to treat groundwater in the unconfined aquifer, and further investigation of the lower aquifer and remaining potential sources of soil contamination.

Fort Lewis has requested PNNL to provide technical support in accelerating Installation Restoration Program (IRP) site remediation and significantly reducing program life-cycle costs at the Logistics Center. PNNL will demonstrate new and innovative (nonstandard) remedial technologies to clean up the site to regulatory acceptable levels and significantly reduce currently identified IRP life-cycle costs.

3. PROJECT/TASK DESCRIPTION

See the Project Management Plan, Attachment 1 of the Detailed Workplan.

4. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

4.1 PRECISION, ACCURACY, AND DETECTION LIMITS

The precision, accuracy, and detection limits required for each measurement shall be specified in the element-specific test plans for each technology. The precision, accuracy, and detection limits shall also be communicated to the PNNL analytical staff and any contract labs through the Statement of Work (SOW).

Each technology may employ several analytical options; field screening, mobile laboratory, or contract laboratory. The test plans shall describe the analytical options for each phase of the technology testing.

4.2 REPRESENTATIVENESS

In this project, representativeness depends largely on homogeneous sampling. The test plans shall describe the methods for ensuring a representative sample.

4.3 COMPARABILITY

One of the ways the project ensures comparability is to require standard methods for sampling and analysis. The test plans shall describe the analytical methods to be used, which shall also be described in the applicable SOW to the laboratories.

4.4 COMPLETENESS

The fraction of planned data that must be usable in order to fulfill project objectives shall be stated in the test plans.

5. TRAINING REQUIREMENTS/CERTIFICATIONS

All PNNL project staff shall be trained to this QAPjP as a minimum. Additional training shall be identified by the Project Manager as deemed appropriate to the work to be performed. The Standards-Based Management System (SBMS) subject area, *Training and Qualification for Staff*, shall be followed.

Element-specific Health and Safety Plans (HASP) will address training and site entry requirements applicable to PNNL staff that will perform field work at the Fort Lewis Logistics Center. The following training courses may be applicable:

- Hazardous Waste Operations Training (HazWOper) – 40 hours – Course #000835
- HazWOper – 3 Day Field Experience – Course #000836
- HazWOper Refresher Training - 8 hours – Course #000839
- HazWOper for Supervisors – 8 hours – Course #000840.

6. DOCUMENTATION AND RECORDS

6.1 REQUIREMENTS

All laboratory records shall be maintained as required by PNL-MA-68, *Records Management and Document Control*. The records system is established to:

- support physical control of samples as they are processed
- provide traceability of laboratory actions and analytical measurements to raw laboratory data
- document quality control (QC) activities
- facilitate auditing activities
- improve defensibility of information generated within the project.

Records include, but are not limited to:

- planning documents and test procedures
- laboratory record books and equivalent records that document data and observations
- sampling logs and field record forms
- sample custody and tracking records (chain-of-custody)
- project documentation (Contracts, SOW, Work Orders)
- sample analytical data
- analyses of standards (including calibrations)

- QC data
- corrective action documentation
- correspondence with Fort Lewis and stakeholders
- documentation of reviews and approvals
- reports (audit/assessment, interim progress reports, final reports).

6.2 RESPONSIBILITIES/IMPLEMENTATION

Responsibility for establishment and continuing operation of the Records Inventory and Disposition Schedule (RIDS)/File Index, mandated by PNL-MA-68, *Records Management and Document Control*, rests with the project manager. Implementation of the requirements is the responsibility of staff associated with record management activities. Record maintenance requirements apply to all project activities and staff members.

SOW to subcontractors shall specify the required deliverables/records and any necessary requirements for record retention by the subcontractor.

7. SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

The experimental design shall be stated in the test plans for each technology. Each measurement shall be described and include the classification of "critical" (required to achieve project objectives) or "non-critical" (for informational purposes only). A description of the experimental design include as appropriate:

- types and number of samples required
- design of the sampling network
- sampling locations and frequencies
- sample matrices
- measurement parameters of interest
- rationale for the design.

Test plans shall be approved by the project manager and reviewed and signed for concurrence by the project Quality Representative to ensure conformance to the requirements within this QAPjP.

8. SAMPLING METHOD REQUIREMENTS

Test plans shall include information on sampling method, equipment, containers used, sample preservation, and holding times, as applicable to the parameters of interest. This information shall be stated in the SOW to any subcontractor.

9. SAMPLE HANDLING AND CUSTODY

Test plans or procedures shall include requirements for proper labeling in the field (location, date and time of collection, sample type, sampler's name, and sample preservation); sample tracking and shipment (including packaging); chain-of-custody; and collecting, transferring, storing, analyzing, and disposal of samples. These requirements shall be communicated to any subcontractor through the SOW.

10. ANALYTICAL METHOD REQUIREMENTS

Test plans shall list the analytical methods to be used. If it differs from standard methods, the procedure shall be cited and attached and include sub-sampling or extraction methods and any waste disposal requirements. The analytical methods to be used shall be communicated to any subcontractor through the SOW.

11. QUALITY CONTROL REQUIREMENTS

Test plans shall list the number and type of field control samples that will be taken (field blanks, equipment or rinsate blanks, field splits, and field spikes), determine if the laboratory QC is required to be performed on the samples submitted, and communicate this to the laboratory.

The laboratory methods/procedures shall be reviewed for adequacy prior to sample analysis. This review shall include ensuring:

- duplicates, matrix spikes, laboratory control samples, and surrogates are performed and are at the appropriate frequency

- the formulas/calculations and reporting methods (including data qualifiers and "less than" or "greater than" values) are addressed and documented
- when an analytical failure occurs, corrective action is determined, implemented, and documented.

12. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

The test plans or procedures shall describe the preventative and corrective maintenance program, including periodic maintenance and critical spare parts. These requirements shall be communicated to any subcontractors through the SOW.

13. INSTRUMENT CALIBRATION AND FREQUENCY

The test plans or procedures shall describe how the sampling and analytical instruments will be calibrated and at what frequency and what standards or certified equipment will be used to calibrate the instruments. The calibration records shall be maintained as project records and shall be traceable to the instrument and standards used. These requirements shall be communicated to any subcontractor through the SOW. PNNL staff shall implement the SBMS subject area, *Calibration*.

14. REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

Supplies, standard materials, equipment and services shall be purchased in accordance with PNL-MA-67, *User's Guide to Acquisitions*, and PNL-MA-66, *Battelle Purchasing Card*. Items or services requiring QA clauses, as described in section 4.0 of PNL-MA-67, require a Quality Representative approval. Standard material certifications/reports and other supplier submittals shall be verified by a qualified Quality Representative prior to use.

15. DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

It is anticipated that data/information from other sources will be used for historical purposes. Data obtained from sources other than this project shall be identified with the data owner identification (flag). Reports that reference or include this type of data or information shall identify the owners within the report. Any questions to the validity of data/information from other sources shall be referred to the data owner.

16. DATA MANAGEMENT

See the project Data Management Plan, Attachment 4 of the Detailed Workplan.

17. ASSESSMENT AND CORRECTIVE ACTIONS

17.1 ASSESSMENTS

Assessment activities will be directed by the project manager and may include:

- field activities
- mobile and PNNL laboratories
- contract laboratories
- subcontractors
- data quality
- procedural adherence.

Assessments shall be conducted in accordance with SBMS subject area, *Conducting and Using Results from Operational Assessments*, and PNL-MA-531 manual, procedure QP-19, *Independent Source Inspections, Tests, and Surveillances*.

In accordance with PNL-MA-67, *User's Guide to Acquisitions*, potential subcontractors will be evaluated before award of contract.

17.2 CORRECTIVE ACTIONS

PNNL staff shall implement the SBMS subject area, *Resolving Quality Problems*, for problems/issues raised during the course of the work. Procedural noncompliance shall be documented using the *Quality Problem Report*. The SOW for subcontractors shall include requirements for a corrective action system.

18. REPORTS TO MANAGEMENT

Task Leaders are required to report the progress of work to the project manager as stated in the Project Management Plan, Attachment 1 of the Detailed Workplan.

The Quality Representative shall provide a quarterly report to the project manager that includes, but is not limited to, results of assessments, data reviews, and quality assurance problems and recommended solutions. The project manager shall use this report for continuous improvement of activities and operations conducted within the project.

19. DATA REVIEW, VALIDATION, AND VERIFICATION

A procedure for the review, validation, and verification of data will be prepared. This procedure will describe the process, including identification of data outliers and possible anomalies, issue resolution, rechecks, and qualification of data.

20. PROCEDURES

Procedures shall be developed, revised, and used in accordance with SBMS subject area, *Technical and Operating Procedures*. Procedures that will be used by PNNL staff for this project are available under separate cover. Additional procedures may be developed as necessary in accordance with the cited subject area.

Procedures used by subcontractors shall be reviewed for adequacy before start of work.

21. DOCUMENT CONTROL

Documents that specify quality requirements or prescribe activities affecting quality are controlled in order to ensure that the versions are complete, correct, and current. As a minimum, the Detailed Workplan shall be controlled as per PNL-MA-68, *Records Management and Document Control*.

Requirements for a document control system shall be specified in the SOW to any subcontractor.

22. SOFTWARE AND DATABASE CONTROL

Software and databases shall be developed and acquired in accordance with SBMS subject area, *Computer Software and Databases*.

Requirements for a software and database control system shall be specified in the SOW to any subcontractor.

23. REPORTING

Reports and presentations to Fort Lewis or other outside agencies shall be reviewed and released in accordance with SBMS subject area, *Information Release*, and *Environmental Technology Division (ETD) Information Release Steps*.

ATTACHMENT 3

HEALTH AND SAFETY REQUIREMENTS

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1. INTRODUCTION

In support of the U.S. Army Installation Restoration Program (IRP), Pacific Northwest National Laboratory (PNNL) will be conducting work activities at Fort Lewis and PNNL laboratory facilities. PNNL has an established formal health and safety program that covers laboratory operations and associated activities that are compliant with regulatory requirements.

Activities performed at Fort Lewis will be conducted in accordance with the following safety and health requirements associated with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Additionally, element-specific (site-specific characterization) health and safety plans (HASP) will be developed in accordance with 29 CFR 1910.120, state, and local requirements - whichever is most stringent for onsite activities.

Unless otherwise directed through individual task orders, PNNL shall adhere to the following health and safety requirements for work performed under contractual agreements. The requirements herein shall be in effect for all work tasks ordered after the release date of this document.

2. GENERAL REQUIREMENTS

While conducting hazardous waste operations (activities that include, but are not limited to, characterization and remediation) within a hazardous waste site, PNNL will provide sufficient detailed information within the element-specific HASP to substantiate that assigned jobs or tasks will be accomplished in the safest manner achievable. PNNL's plans will demonstrate that worker protection will not be compromised, that the intent of all applicable regulatory health and safety regulations are followed, and that the task(s) will be accomplished in a manner that will minimize the risk of employee exposure to any acute or chronic injury, irritation, or trauma.

All HASPs will be clear, concise, and user friendly. In preparing the HASP, PNNL will consider the audience for which the plan is being written. Recognition of the audience (drillers, technicians, equipment operators, samplers) is critical to ensuring that the document will be read, understood, and followed.

2.1 PROGRAM REQUIREMENTS

The Occupational Safety and Health Administration (OSHA) requires an employer to have a written safety and health program that shall incorporate the following in accordance with 29 CFR 1910.120:

- an organizational structure
- a comprehensive work plan

- a site-specific safety and health plan which need not repeat the employer's standard operating procedures
- a safety and health training program
- a medical surveillance program
- the employer's standard operating procedures for safety and health
- any necessary interfaces between general program and site-specific activities.

2.2 SPECIFIC REQUIREMENTS

The following specific requirements are areas of emphasis that require special attention and will be addressed in every HASP:

- project or task summary
- applicable health and safety regulations - Federal, state, and local
- corporate policies and procedures - health and safety related
- risk identification and mitigation
- engineering controls and support systems
- personnel protection levels
- tools and equipment
- personnel monitoring, sampling, and record keeping
- adequacy of site controls
- health and safety personnel
- health and safety training
- emergency response
- decontamination
- incident reporting.

3. PROJECT OR TASK SUMMARY

The HASP will contain a short summary of the task(s) to be conducted. The specific boundaries of activity shall be established within the plan. It is important that the limits or components of the project for which the HASP is written are clearly shown within the plan. The summary shall be extensive enough that a reviewer who is neither familiar with the site nor the activity required can understand what will be done under the requirements of the plan. PNNL will write one HASP if the job is short or easily defined, but if the project is large and long-term, a master, higher tier plan may be prepared. Higher tier plans will be supplemented with job or site-specific sub-tier plans as the project develops.

4. HEALTH AND SAFETY REGULATIONS - FEDERAL, STATE, AND LOCAL

PNNL shall comply with applicable Federal, state, and local health and safety rules and regulations; in cases where requirements vary, the more protective shall be invoked. Where no existing regulation governs a certain activity that requires control, (the technical inspection of a drilling rig) PNNL shall invoke selected industry-based standards or guidelines such as American Petroleum Institute (API) or International Association of Drilling Contractors (IADC). HASP will not itemize every conceivably applicable regulation; however, regulatory controls, which are of unique risk to the assigned job, will be used in developing the plan. For example, PNNL would not specify code requirements for the width of a stairway.

5. CORPORATE POLICIES AND PROCEDURES - HEALTH AND SAFETY

All corporate health and safety standards that are applicable to the task(s) will either be included or referenced within the HASP; if incorporated by reference, a copy of the specific language will be available for periodic audits. Referenced policies or standards will be available for review by all project employees. For example, if a corporate policy dealing with the use of respirators is referenced within the HASP, a copy will be available to all project employees; such policies and standards will be discussed during routine safety and health orientations.

6. RISK IDENTIFICATION AND MITIGATION

Thorough pre-job planning should successfully mitigate the risks associated with any task. PNNL will conduct the necessary scoping, physical reconnaissance, investigatory discussions, and historical data review to provide a preliminary list of credible risks. PNNL will analyze the

job at hand, segment the job into manageable elements, and systematically evaluate and assess all credible risk categories associated with the job. Workers must be aware and understand the risks associated with each task, the potential consequences, and how the risks will be mitigated. The HASP will list all credible risks in such a manner that any worker can understand the relative risk of the task being undertaken. A risk assessment will be included which contains, as a minimum, a summary of the workers' health and safety risks and the toxicological properties (in the case of chemical risks, the mandated or permissible exposure limits coupled with the described methods for monitoring exposure action and warning levels). Risk mitigation actions must also be provided.

7. ENGINEERING CONTROLS AND SUPPORT SYSTEMS

PNNL will describe in the HASP any engineering controls that will be utilized in the conduct of the work. An example of the kind of control that could be included would be the utilization of a remote filling system for collecting purgewater in tanker trucks or the use of portable exhausters in potentially hazardous excavations. In addition, all support systems that are an integral part of worker health and safety will be described.

8. PROTECTION LEVELS

All personal protective equipment (PPE) and clothing required to provide adequate worker protection will be listed in the HASP. The onsite project manager will use the action/warning levels for the credible risks listed in the Risk Identification and Mitigation section of the HASP to identify areas where certain concise steps must be followed to ensure that adequate protection is provided. Although many regulatory guidance documents depict a suite of protective clothing and respiratory protection from level A through level D, PNNL will conduct prudent planning that could result in modifications of this categorical description of apparel that are commensurate with the potential hazards. In addition, PNNL will evaluate the risks, the PPE, and the ambient work environment and make technically protective tradeoff decisions by instituting such other activities as onsite analytical screening capabilities in order to make prompt upgrade/downgrade decisions based upon "real-time" analysis. PNNL will weigh the risk of wearing extensive PPE in an environment that may be life threatening (heat stress) against the perceived risk of personal exposure to an agent and develop a smarter, innovative method of accomplishing the job without exceeding any personnel exposure levels.

9. TOOLS AND EQUIPMENT

PPNL will describe in the HASP a fitness for safe use protocol for all tools and equipment used on the job. Further, PNNL will demonstrate that adequate tools will be available to perform the task(s) safely. Every tool that will be used on the job does not have to be listed in this plan;

however, PNNL will demonstrate that a system is in place to ensure that the appropriate tools and equipment are utilized and that the tools and equipment will be inspected routinely and for safe condition and operability. Inspection of tools and equipment will comply with all applicable rules and regulations; in instances where no regulatory standard applies, appropriate industry standards will be used.

10. PERSONNEL MONITORING AND SAMPLING PROTOCOLS

If the potential exists that job site personnel may be exposed to a chemical(s) which exceeds the established action level(s), PNNL will specify the kinds of onsite personnel sampling that will be conducted; such sampling will be in addition to area monitoring with direct-reading instruments. For example, if PNNL expects to encounter hydrocarbon levels that may exceed the OSHA action levels, then the HASP must address not only the type of instrument that will be used for area monitoring but the industrial hygiene personnel sampling that will take place as well. When sampling pumps and tubes are anticipated to be used, the HASP will describe where the tubes will be analyzed. Likewise, if PNNL states that sound level or heat stress surveys will be conducted, a brief procedure description and frequency of such surveys will be included in the HASP.

All monitoring methods will be described in enough detail that the worker will know how the risk will be monitored, by what method, and with what frequency. PNNL will also describe the dosimetry/exposure data that will be generated, how that data will be recorded and transmitted to the employees, and how the records will be maintained.

PNNL will provide the appropriate direct-reading instrument(s), which are rated for safe use in the atmospheres to be monitored and for the specific risks identified. All other ancillary warning devices, such as wind socks and smoke tubes, will also be described.

11. ADEQUACY OF SITE CONTROLS

The HASP will provide a description of the duties of health and safety personnel on a particular job. The criteria for qualification will include experience, education, technical training, and licenses. PNNL recognizes that on some jobs, the site safety officer will be wearing dual "hats;" that is, he or she may also be serving as a geologist or engineer. When this occurs, PNNL will specify in the HASP the technical preparation that such an individual must have prior to his or her assignment as the site safety officer.

12. HEALTH AND SAFETY TRAINING

All corporate health and safety training requirements required by 29 CFR 1910 and 1926 or applicable requirements will be referenced in the HASP. PNNL will describe the training that will be provided for all project employees and the procedures for managing and updating training records at the job site. Additional and unique training and documentation that goes beyond the specific requirements of 29 CFR 1910.120 may be required for such areas as asbestos removal, fork lift operators' training, hearing conservation, and the use of direct reading instruments. Such additional training will be discussed in the HASP.

13. INCIDENT REPORTING

All significant injuries (injuries or illnesses that require medical attention) and environmental incidents will be reported immediately to Fort Lewis. The HASP shall specify the incident reporting sequence and time constraints for providing the information to Fort Lewis.

14. EMERGENCY RESPONSE

PNNL will develop an emergency response plan that is directed toward anticipated emergencies. Emergency procedures will be readily available to site personnel and they will conduct drills to ensure procedures will be followed in the event of an emergency. Emergency notifications and actions will be coordinated with the Fort Lewis Emergency Response Plan to ensure consistency with anticipated actions. If PNNL does not have the capability to mitigate an identified potential emergency safely, arrangements will be made before work startup for coverage with other trained entities.

15. DECONTAMINATION

PNNL could encounter situations where personnel and equipment may need to be decontaminated. Procedures will be included in the HASP that address personnel and equipment decontamination. PNNL will be responsible for providing necessary decontamination equipment and containing decontamination waste for proper disposal.

ATTACHMENT 4
DATA MANAGEMENT PLAN

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1. DATA MANAGEMENT PLAN

1.1 DATA ACQUISITION REQUIREMENTS

Past and current site groundwater data from the Fort Lewis Logistics Center are stored in the U.S. Geological Survey's (USGS) National Water Information System (NWIS) database, which has a standard format used across the country. If these data are used by Pacific Northwest Laboratory (PNNL), they will be identified in a manner to distinguish it from data collected by PNNL.

1.2 DATA MANAGEMENT

Data will be collected during several phases of the project and will be handled differently based on their intended use. Original hardcopies of all project data will be filed according to standard PNNL practices.

1.2.1 Bench-Scale Testing

Bench-scale testing data will consist of laboratory-generated data for the various innovative remedial technologies. These data will be recorded in laboratory record books or generated by analytical instruments; if deemed necessary, the data may be entered into a spreadsheet or database program for project use.

1.2.2 Site-Specific Characterization

Site-specific characterization data will include mainly site characterization information such as lithologic descriptions, physical analyses (grain-size distribution, bulk density), and hydrologic parameters. At this time, it is planned that the site-specific data will be stored using a spreadsheet product such as Excel 97, in a standard format agreed to by the technology leads.

1.2.3 Follow-On Activities

Proof-of-principle testing, treatability testing, and full-scale demonstration data will consist of predominantly groundwater samples collected before, during, and following these activities. These data, along with sample tracking information, will be stored using a database product such as Access 97. The database format will be designed to meet the needs of the project. Data entry forms and reports will be designed using the same database product; some data may be reported in a spreadsheet product such as Excel 97. Data collected to support these project activities will be generated by a combination of field screening, mobile lab, and commercial lab. All samples will be documented with appropriate field forms and chains-of-custody. At this time, it is not known if any data will be reported electronically. If data are reported electronically, a data-loading program will be developed to process the data into the database. A one-over-one data

verification will be performed on all manually entered data. The details of data verification and validation are covered in the Quality Assurance Project Plan (QAPjP), which is included as Attachment 2 of the Detailed Workplan.

ATTACHMENT 5
INVESTIGATION DERIVED WASTE
MANAGEMENT PLAN

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1. INVESTIGATION DERIVED WASTE MANAGEMENT PLAN

Project activities potentially generating solid or liquid wastes include bench-scale testing, proof-of-principle testing, treatability testing, and full-scale demonstrations. Specific activities include, but are not limited to, drilling of soil borings, groundwater monitoring well and injection well installation, groundwater testing and sampling, equipment decontamination, and incidental solid waste generation. The generation and storage of these waste streams will be managed in accordance with existing Fort Lewis Logistics Center protocol (or as approved by the lead regulatory agency) and with Federal, state, and local environmental rules and regulations. Pacific Northwest National Laboratory (PNNL) assumes that the "generator" for these waste streams will be identified as Fort Lewis. Management of the following waste streams will be performed in accordance with Applicable or Relevant and Appropriate Requirements (ARAR) identified in the Record of Decision (ROD) for the Department of the Army, Logistics Center, Fort Lewis, Washington, dated September 1990.

1.1 BENCH-SCALE TESTING

Bench-scale testing for the In Situ Redox Manipulation and Reactive Well technologies will be performed at PNNL. In accordance with the ARAR identified in the Fort Lewis Logistics Center ROD, all Fort Lewis groundwater utilized in these tests will be managed as Resource Conservation and Recovery Act (RCRA) listed spent halogenated solvent (F001). This includes by-products associated with these tests that may be commingled with the groundwater. In addition, groundwater samples obtained from Fort Lewis will be managed as a "treatability study" in accordance with WAC 173-303-040. Simulated materials utilizing TCE supplied by PNNL would not be managed as a F001 waste, but in accordance with WAC 173-303-070 rules and regulations for determining the appropriate state waste designation criteria. PNNL may return unused groundwater and residues to Fort Lewis for disposal, as needed. PNNL will manage all waste streams generated from the bench-scale tests at their laboratory.

2. PROOF-OF-PRINCIPLE TESTING, TREATABILITY TESTING, AND FULL-SCALE DEMONSTRATIONS

2.1 SOIL BORINGS

Soils generated from drilling into the subsurface will be managed based upon existing site characterization information, field screening, or analytical results. Soils will be stockpiled adjacent to the soil boring for those areas previously characterized where contamination does not exist. Soils that may be potentially contaminated, as determined through field screening, previous characterization, or visual inspection, will be placed on plastic sheeting and covered. These soils will remain covered until verification of soil sampling and analytical data. The soils would then be containerized upon receipt of analytical data that demonstrate the characteristics of hazardous or

dangerous waste. Soils excavated in previously characterized areas with known contamination data will be containerized and disposed onsite with existing site protocol or offsite to an authorized RCRA treatment, storage, and disposal (TSD) facility. At a minimum, all containers generated and stored onsite will be marked and labeled with the date, soil boring location, contents and potential constituents, and cognizant site contact or sampler name.

2.2 GROUNDWATER MONITORING AND INJECTION WELL INSTALLATION

Groundwater monitoring wells or injection wells installed at the site will generate soils and well development waste. Soils generated from these activities will be managed in accordance with the process previously described for soil borings. The generation of well development waste will typically contain both a liquid and solid fraction. Therefore, well development waste will be initially containerized, allowing the solid fraction to settle, with the liquid fraction discharged to either the onsite air stripping system, the sanitary sewer system, or containerized for offsite disposal. These disposal options will be coordinated with Fort Lewis and will be evaluated based upon existing or acquired analytical data, waste acceptance criteria for the disposal pathway, and any pretreatment requirement. The solid fraction resulting from well development activities will be managed as previously described for soil borings.

2.3 GROUNDWATER TESTING AND SAMPLING

Groundwater waste and by-products may include groundwater tracers, hydrologic testing discharge water, injection test water, and purgewater. These groundwater sources will be evaluated before generation to determine the appropriate disposal pathway. Disposal pathways may include the onsite air stripping system, sanitary sewer system, offsite TSD, or other as determined by the source characteristics and volume that may be generated. At a minimum, all groundwater generated from routine characterization, sampling, and monitoring activities will be containerized. Other groundwater sources may be containerized or discharged directly into the disposal system (air stripper, sanitary sewer).

It is anticipated that proof-of-principle testing, treatability testing, and full-scale demonstrations will generate large volumes of groundwater waste. The test plans will contain an element-specific waste management plan. All residuals will be evaluated and managed in accordance with site ARAR.

2.4 EQUIPMENT DECONTAMINATION

Routine decontamination of well installation equipment (drill rig, augers, tools), groundwater monitoring and hydrologic testing equipment (submersible pumps) will be performed in accordance with WAC 173-160-530. Previous site characterization or field screening will determine containment of decontamination rinsate. When required, rinsate will be contained in steel 209-L (55-gal) open head drums or other approved water tank or tanker truck. Decontamination of equipment will be performed by steam cleaning with potable water (with no additives). Containers will be marked and labeled with the following:

- project name and contents
- constituents (potable water and contaminant)
- contact information (name and phone number).

All decontamination waste generated onsite will be managed and disposed by Fort Lewis.

2.5 INCIDENTAL SOLID WASTE

Miscellaneous trash items (rags, wipes, disposable personal protective equipment [PPE]) will be managed as nonregulated waste. However, should chemical contamination be encountered, regulated waste will be contained and disposed of onsite. The subcontractor, in accordance with state and local rules and regulations, will manage materials generated from subcontractor equipment (motor oils, hydraulic oils, grease, antifreeze).

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