AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been broken down into sections.

EDMC#: 0057728
SECTION: / OF 2

DOCUMENT #: 02-RCA-0416

TITLE: Quarterly Notification of Class 1 Modifications to Hanford Facility RCRA Permit Dangerous Waste Portion (Quarter Ending June 30, 2002 – Permit Condition I.C.3)

0057728

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JUL 10 2002

02-RCA-0416

Ms. L. E. Ruud, Permit Specialist
Nuclear Waste Program
State of Washington
Department of Ecology
1315 West Fourth Avenue
Kennewick, Washington 99336

RECEIVED
JUL 15 2002
EDMC

Dear Ms. Ruud:

QUARTERLY NOTIFICATION OF CLASS 1 MODIFICATIONS TO THE HANFORD FACILITY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) PERMIT, DANGEROUS WASTE (DW) PORTION (QUARTER ENDING JUNE 30, 2002 – PERMIT CONDITION I.C.3)

In accordance with Condition I.C.3 of the Hanford Facility RCRA Permit, enclosed for your notification are the Class 1 modifications to the Hanford Facility RCRA Permit, DW Portion. Modifications this quarter included updating information in Part III and Part VI of the RCRA Permit, DW Portion. The Part III Class 1 modifications pertain to the 305-B Storage Facility and 325 Hazardous Waste Treatment Units. The Part VI Class 1 modifications pertain to the 300 Area Process Trenches and the 183-H Solar Evaporation Basins. The Class 1 modifications are being made to ensure that all activities conducted are in compliance with the RCRA Permit, DW Portion.

Should you have any questions regarding this information, please contact Dee W. Lloyd, Regulatory Compliance and Analysis Division, at (509) 372-2299.

Joel Hebdon, Director
Regulatory Compliance and Analysis Division
DOE Richland Operations Office

Richard H. Gurske, Director
Environmental and Regulation
Fluor Hanford, Inc.

Roby D. Enge, Director
Environment, Safety, and Health
Pacific Northwest National Laboratory

RCA:DWL

Enclosure

cc: See page 2

JUL 10 2002

cc w/encl:
F. W. Bond, Ecology
L. J. Cusack, Ecology
B. G. Erlandson, BNI
R. Gay, CTUIR
A. K. Ikenberry, PNNL
F. C. Jamison, Ecology
R. Jim, YN
R. J. Landon, BHI
P. Sobotta, NPT
S. A. Thompson, FHI
M. A. Wilson, Ecology
Administrative Record
HF Operating Record, G1-27
Ecology NWP Kennewick Library
Environmental Portal, LMSI

cc w/o encl:
M. Y. Anderson-Moore, Ecology
R. D. Enge, PNNL
R. H. Gurske, FHI
J. B. Price, Ecology

Hanford Facility RCRA Permit Modification Notification Forms
Part III, Chapter 2 and Attachment 18
305-B Storage Facility

Index

Hanford Facility RCRA Permit Modification Notification Form	
Unit: 305-B Storage Facility	Permit Part & Chapter: Part III, Chapter 2 and Attachment 18

Description of Modification:

Hanford Facility RCRA Permit, Condition III.2.A:

III.2.A. COMPLIANCE WITH APPROVED PERMIT APPLICATION

The Permittees shall comply with all the requirements set forth in Attachment 18, including all Class 1 Modifications specified below, and the Amendments specified in Condition III.2.B. Enforceable portions of the application are listed below; all subsections, figures, and tables included in these portions are also enforceable, unless stated otherwise:

Section 1.0	Part A, Form 3, Permit Application, from Class 1 Modification for quarter ending December 31, 2001
Section 2.1.2	The 305-B Storage Unit, from Class 1 Modification for quarter ending March 31, 2001
Section 2.2.1	General Requirement from Class 1 Modification for quarter ending March 31, 2001
Section 2.5	Performance Standard, from Class 1 Modification for quarter ending March 31, 2001
Section 2.6	Buffer Monitoring Zones, from Class 1 Modification for quarter ending March 31, 2001
Section 2.8	Manifest System, from Class 1 Modification for quarter ending March 31, 2001
Chapter 3.0	Waste Characteristics, from Class 1 Modification for quarter ending March 31, 2002
Chapter 4.0	Process Information, from Class 1 Modification for quarter ending March 31, 2002
Chapter 6.0	Procedures to Prevent Hazards, from Class 1 Modification for quarter ending March 31, 2002
Chapter 7.0	Building Emergency Procedure, from Class 1 Modification for quarter ending June 30, 2002~~1~~
Chapter 8.0	*Personnel Training, from Class 1 Modification for quarter ending September 30, 2001*
Chapter 11.0	Closure and Post-Closure Requirements, from Class 1 Modification for quarter ending September 30, 2000
Chapter 12.0	Reporting and Recordkeeping, from Class 1 Modification for quarter ending June 30, 1999
Section 13.8	Toxic Substances Control Act, from Class 1 Modification for quarter ending September 30, 2000
Section 13.9	Other Requirements, from Class 1 Modification for quarter ending September 30, 2000
Appendix 2A	Hanford Site and 300-Area Topographic Maps, Plates 2-2 Through 2-9, from Class 1 Modification for quarter ending June 30, 2001

Modification Class: [1 2 3] Please check one of the Classes:	Class 1	Class[1] 1	Class 2	Class 3
	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions
   1. Administrative and Informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
[signature]	6-19-02	[signature]	6/26/02				
A.K. Ikenberry	Date	R.F. Christensen	Date	F. Jamison	Date	L.E. Ruud	Date

[1] Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal *modification request, and consequently implement the required Public Involvement processes when required.*

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed *modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology,* or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part & Chapter:
305-B Storage Facility	Part III, Chapter 2 and Attachment 18

Description of Modification:

Chapter 7.0: Replace Chapter 7.0 with the attached Chapter 7.0.

Modification Class: [1 2 3]	Class 1	Class [1] 1	Class 2	Class 3
Please check one of the Classes:	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions

1. Administrative and Informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
[signature]	6-19-02	[signature]	6/26/02				
A.K. Ikenberry	Date	for R.F. Christensen	Date	F. Jamison	Date	L.E. Ruud	Date

[1] Class 1 modifications requiring prior Agency approval.

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Hanford Facility RCRA Permit Modification
Part III, Chapter 2 and Attachment 18
305-B Storage Facility

Replacement Sections

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CONTENTS

7.0 BUILDING EMERGENCY PROCEDURE 305-B STORAGE FACILITY

7.1 General Information

The information contained in this chapter is the unit contingency plan, as required under WAC 173-303-806(4)(a)(vii). This chapter is also the Building Emergency Procedure (BEP) as required under the DOE-RL Hanford Emergency Management Plan and PNNL Manual, PNNL-MA-110. It supersedes all previous contingency plans and building emergency procedures (BEPs). It is to be maintained in the locations shown in Section 7.13 of this procedure.

The 305B Storage Facility is required to maintain a BEP under the DOE-RL Hanford Emergency Management Plan. This Contingency Plan has been designed to meet the requirements for a BEP as well as the Ecology requirements for a contingency plan for the 305-B Storage Facility. The Hanford Emergency Management Plan details the membership of the DOE-RL Site Management Team (SMT) mentioned in Section 7.3 and following sections, and the procedure for notifying and mobilizing the team.

PNNL shall review and immediately amend, if necessary, this procedure whenever:

- Applicable regulations or the facility permit are revised;
- The procedure fails in an emergency;
- The facility changes (in its design, construction, operation, maintenance, or other circumstances) in a way that materially increases the potential for fires, explosions, or releases of dangerous waste or dangerous waste constituents, or in any way that changes the response necessary in an emergency;
- The list of emergency equipment changes.

Amendments to the procedure, if necessary following review, will be made in accordance with Chapter 1, Section 1.5 of the 305-B Storage Facility Part B Permit Application.

7.1.1 Facility Name

305-B Storage Facility
Alaska St., 300 Area
Richland, WA 99352

7.1.2 Facility Location

305-B Storage Facility is located in the Northwest portion of the 300 Area of the Hanford Site on Alaska Street.

7.1.3 Owner/Operator

The 305-B Storage Facility is owned by the United States Department of Energy (DOE) and is co-operated by Pacific Northwest National Laboratory (PNNL).

7.1.4 Facility Description

The 305-B Storage Facility is a dangerous and radioactive mixed waste storage facility located in the 300 Area of the Hanford Site. The unit is owned and operated by DOE-RL and co-operated by PNNL. It is used for the collection, consolidation, and packaging of containerized dangerous and radioactive mixed waste. Typically, 305-B Storage Facility handles various types of small volume wastes from research laboratory activities.

7.1.5 Hanford Site Emergency Sirens/Alarms

Signal	Meaning	Response
Gong (2 gongs/sec)	Fire	Evacuate building. Move upwind. Keep clear of emergency vehicles.
Siren (steady blast)	Area Evacuation	Proceed promptly to north parking lot accountability area. Follow instructions.
Wavering Siren	Take Cover	Close all exterior doors, turn off all intake ventilation and notify EMSD of your whereabouts. Requests call back for status and monitor portable radios.
Howler (Aa-oo-gah)	Criticality	Follow "take cover" instructions above. (No criticality will take place in 305-B Storage Facility since fissile materials are not accepted for storage.)
To hear these signals and a description of actions to take, call 373-2345.		

The following is presented to define specific emergency actions for personnel assigned to 305-B Storage Facility for different types of emergencies that could be encountered during normal operations.

Area-wide Evacuation. (Signal: Steady siren of 3-5 minutes' duration) In the event of an area-wide evacuation of the 300 Area, 305-B Storage Facility personnel will shut down equipment, secure wastes (especially RMW), and secure classified documents (or carry them with them), if time permits. They will then report to the north parking lot accountability area. Notify the BED of any ongoing processes or any compromises to security. The zone warden will account for all facility personnel.

Take Cover. (Signal: Wavering siren) In the event a take cover alarm is sounded, 305-B Storage Facility personnel will stay inside the 305-B Storage Facility, close all exterior doors, and turn off all intake ventilation. They will secure all wastes and classified documents. Personnel will then contact Environmental Management Services with their whereabouts and request a call back for status.

7.1.6 Building Specific Emergency Alarms

The 305-B Storage Facility has an alarm system (2 gongs/sec) that is monitored by the Hanford Fire Department (HFD). A manual fire alarm pull box is located near each exit door.

7.1.7 Communication Equipment

Unit operations personnel may also use telephones, or the building PA system. Further description of communication equipment is located in Chapter 6, Sections 6.3.1.1 and 6.3.1.2 of the 305-B Storage Facility Part B Permit Application.

7.2 Purpose of the Building Emergency Procedure

This procedure provides for the safety of employees, other contractor personnel, visitors, and members of the general public in the event of an emergency. It also is designed to minimize hazards resulting from fires, explosions, or any other unplanned sudden or non-sudden release of dangerous waste or dangerous waste constituents to air, soil, or water. The provisions of the procedure will be carried out immediately whenever the criteria in 7.4 are met.

7.2.1 Coordination Agreements

Interfaces and coordination with offsite agencies are in the planning, preparedness, response and recovery elements of the Hanford emergency management program. RL has developed and maintains agreements to formalize areas of understanding, cooperation and support with offsite agencies. These agreements are applicable to all Hanford facilities, including the 305B Storage Facility. Summaries of these memoranda of agreement (MOA) are given in Table 3-1 of the Hanford Emergency Management Plan (DOE/RL-94-02). Copies of the MOAs are provided in Appendix B of DOE/RL 94-02.

7.3 Building Emergency Response Organization

The 305-B Storage Facility BERO is an emergency response organization with clearly defined responsibilities. The BERO consists of pre-designated and trained individuals who have been assigned emergency response activities associated with 305-B Storage Facility.

Note: DOE-RL and other prime contractor personnel are trained to notify Hanford Emergency number (911 from onsite telephones) operated by the Hanford Patrol who then notifies the PNNL Single Point-of-Contact.

7.3.1 Building Emergency Directors and Alternates

The Building Emergency Director (BED) has the responsibility for the welfare and safety of the building personnel and for directing efforts to control, evaluate, and terminate the event if the building is the site of an event. The BED performs the duties of the Emergency Coordinator as prescribed under WAC 173-303-360 and has the authority to commit the resources needed to carry out the BEP.

The BED manages facility operations and personnel and is responsible for ensuring implementation of appropriate emergency procedures and their follow-up 24 hours a day. Activities include:

- Training of the Building Emergency Response Organization (BERO).
- Maintain the facility emergency postings boards/building emergency procedure.
- Ensure that facility personnel are aware of hazards.
- Ensuring that facility personnel are trained to respond to emergencies.
- Determine when an event has occurred or a condition exists that requires response in accordance with applicable state and/or federal regulations.
- Communicate with the Environmental Point of Contact for RCRA emergencies.
- Activating internal facility alarms or communications systems, where applicable, to notify building occupants of protective actions to be taken.
- Verifies the appropriate alarm is sounded when necessary.
- Reporting events or conditions in accordance with the applicable state and/or federal regulations.
- Identify the character, exact source, amount, and areas extent of any released materials.
- Assessing possible hazards to human health and the environment that may result from the release, fire, or explosion.
- In the event of an extended building evacuation during inclement weather, the BED will identify an Alternate Staging Area.
- Taking reasonable measures (e.g., stopping process/operations, collecting/containing released waste, removing/isolating containers) necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other dangerous waste; and monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.
- Implement Emergency Response and Follow-up.
- Direct configuration control over facility systems and components.
- Responsible for the duties of the Facility Operations Specialist per PNNL MA-110 or delegate to someone to act as Facility Operations Specialist if necessary.
- Activates the BERO and allocates personnel to conduct facility-specific emergency response actions (within the affected facility boundary).

- Categorization of DOE Emergencies and performing incident notification in accordance with the BED checklist (Exhibit 7.12.4).
- Directing implementation of initial preplanned area/site protective actions.
- Coordinate emergency response measures.
- Acts as a member of the ICP and provide information and assistance to the responding agencies as requested to mitigate the event.
- Arranges care for any injured persons.
- Maintenance of emergency equipment.
- Timely implementation of contingency plan in the event of an emergency.
- Be thoroughly familiar with:
  - 305-B Storage Facility Emergency Procedure
  - All operations and activities
  - Location and characteristics of waste handled
  - Location of all records
  - Physical layout of the building and area of responsibility

7.3.2 Other Members of the Building Emergency Response Organization (BERO)

7.3.2.1 Zone Wardens

Zone Wardens provide information to the BED via the Staging Area Supervisor to ensure that no one is unaccounted for, and assists as required in additional duties as determined by the BED. They determine if all personnel have left their assigned area by performing a thorough room-by-room search, if safe to do so (refer to Note below), including unoccupied spaces such as stairwells, corridors, closets, and other common areas. They determine if aid and/or rescue are required and aid those who may need help in evacuating the building. Ensure that disabled persons receive whatever assistance may be required for a safe and orderly evacuation. Report the occupancy status of the assigned zone(s) to the Staging Area Supervisor and note areas that could not be checked. The Zone Warden also assists the BED in communicating emergency messages to the building occupants.

Note: The function of the zone warden is to verify (when possible), that assigned zones have been evacuated, as a means of assisting other emergency responders, and verifying locations of building personnel. The function of zone wardens does not include search and rescue; they are not obligated to enter any area they feel presents a hazard to them. Once the evacuation alarm is sounded, zone wardens should not enter any location in the facility where there are indications that a hazard may exist. The indications include such things as: visible smoke, fire, unusual odors, local alarms, spilled chemicals, indications on the fire alarm supervisory panel, incapacitated personnel, etc. If a zone warden is not in the facility when the evacuation alarm sounds; is a significant distance from their assigned zones; or has been isolated from their zone, they should report to the Staging Area Supervisor at the Staging Area or Incident Command Post for instructions.

7.3.2.2 Staging Area Supervisor

The Staging Area Supervisor (SAS) will direct all activities at the Building Staging Area and is responsible for notifying the BED if all personnel are accounted for, or if help is needed to locate or account for missing personnel. The SAS will also support the BED, if requested.

- The SAS collects the occupancy/accountability status from the Zone Wardens at the Staging Area.
- Report status to the BED at the Staging Area or Incident Command Post.
- Assist in arranging transportation away from the staging area as necessary.
- Maintain a log of staging area activities.

7.3.2.3 Recorder

Records, in a time-line format, event related notifications and activities associated with the direction administered and information received by the ICP.

7.3.2.4 Environment, Safety & Health

Provides guidance for establishing safety requirements for mitigation and recovery actions, which include:

- Coordinating any support needed from other disciplines of the PNNL ES&H Directorate (i.e., Environmental Compliance Representatives, Radiological Control, Industrial Hygiene and Field Service Representative).
- Provide telephone notification of incident to DOE-RL contact personnel, Sections 12.4.1.5.1 and 12.4.1.6 of the 305-B Storage Facility Permit Application.
- The Environmental Support Contact (375-2966) will provide any necessary notifications to regulatory agencies such as the Washington State Department of Ecology and ensure that required written reports to regulatory agencies are completed within 15 days of event termination.
- Provide notification of releases to the National Response Center and to Ecology in accordance with the site-wide hazardous waste permit, 40 CFR 302.6, and WAC 173-303-145.

7.3.2.5 Individual Staff Members

- Announce or activate the appropriate alarm and notify management upon observing an emergency.
- Read and understand the Building Emergency Postings and BEP.
- Avoid exposure to harmful and life-threatening conditions.
- Aid those who need help.
- Report to the staging area and cooperate with management in accounting for all staff.
- Provide the BED with any information to assist in evaluating the emergency condition.
- Perform the following tasks *only* if time and conditions permit:
  - Follow shutdown procedures in BEP.
  - Remove contaminated clothing
  - Secure classified documents, material, and nuclear material.

7.3.2.6 Management Support Group Leader (MSG)

The Facilities Operations Manager or his delegate will respond when requested by the BED, as the MSG leader. The MSG leader is responsible for the following:

- performing the necessary steps listed in the "Emergency Checklist for Emergency Management Support Group," Exhibit 7.12.7
- having applicable notifications made to PNNL and DOE-RL management
- having the event classified per established PNNL procedures
- providing senior management assistance to the BED as necessary
- assisting in handling communications and notifications
- obtaining personnel, supplies, and equipment as necessary.

7.4 Implementation of the BEP

The overall responsibility for implementation of this Procedure lies with the Building Emergency Director (BED) or the designated alternates. The BED has the responsibilities of the Emergency Coordinator as named in WAC 173-303-360. The BED and alternates are on call 24 hours per day and have the authority to commit all necessary resources (both equipment and personnel) to respond to any facility emergency.

Response by an emergency coordinator is usually obtained through the PNNL Single Point-of-Contact at (509) 375-2400. The Single Point-of-Contact has been designated as the contact point to mobilize a response to any PNNL emergency on the Hanford Site. The Single Point-of-Contact is available at all times and has the responsibility to contact the BED or alternate to begin responses to emergencies under this procedure.

Due to the security requirements at the Hanford Site, DOE-RL does not submit names or phone numbers of personnel acting as emergency contacts as part of permit applications or other public documents. All emergency notifications to the BED, building managers, etc., are made through the PNNL Single Point-of-Contact. A complete Building Emergency Response Organization listing of positions, names work and home telephone numbers for the 305-B Storage Facility is maintained in a separate, internally controlled, facility document. Copies are distributed, as a minimum, to appropriate facility locations, the Single Point-of-Contact, and with the BEP at the 305-B Storage Facility.

The decision by the BED or alternate to implement this Procedure depends on whether an incident in progress may threaten human health or the environment. Immediately after being notified of an emergency, the BED or alternate will go to the site and evaluate the situation. Based on evaluation of the event, the BED or alternate will implement this procedure to the extent necessary to protect human health or the environment.

The decision to implement the Building Emergency Procedure (contingency plan) should be made whenever unusual or emergency conditions exist that require the response of facility and/or emergency personnel and the establishment of an incident command post. For RCRA events, the BEP must be implemented and the Department of Ecology notified, if all of the following criteria are met.

1. The event involves an unplanned spill, release, fire or explosion;

AND

2a. The unplanned spill or release involves a dangerous waste, or the material involved becomes dangerous waste as a result of the event (e.g., product that is not recoverable);

OR

2b. The unplanned fire or explosion occurred at a facility or transportation activity subject to RCRA contingency planning requirements;

AND

3. Time-urgent response from an emergency services organization is required to mitigate the event or a threat to human health or the environment exists.

- Based on evaluation of the event, the BED or alternate will implement the BEP to the extent necessary to protect human health and/or the environment. The BED has the authority to commit the resources necessary to carry out the actions required by the BEP.

- The BED will direct that additional checklists identified in the BEP exhibits be initiated and completed. When the materials and quantities involved in the incident have been identified, it should be possible to evaluate the magnitude of the hazard.

During an emergency event, the BED will take all reasonable measure to ensure that fires, explosions and releases do not occur, recur or spread to other dangerous waste in the facility. Measures include stopping processes and operations, collecting and containing released waste, and removing or isolating containers, as appropriate.

In any emergency, priority is given to protection of the health and safety of persons in the immediate area. Containment and cleanup are secondary objectives. When responding to minor spill events, onsite personnel will generally perform immediate cleanup of minor spills or releases using facility equipment. Remediation of such spills and releases would not normally constitute activation of the BEP. A spill or release of dangerous waste is considered "minor" if the criteria identified in 7.6.1.6.1 "Response to Minor Spills or Releases" is met.

Incidents discovered by unit personnel trained in emergency response may be responded to according to these procedures prior to the arrival of the BED. However, immediate notification of the BED is still required prior to implementing these procedures.

7.5 Facility Hazards

7.5.1 Hazardous Materials

The facility may contain hazardous material typically found in an industrial facility including:

- Chemical hazards such as corrosives, oxidizers, flammable solids and liquids, poisons, etc.,
- Radioactive materials,
- Hazardous wastes,
- Radioactive mixed wastes

7.5.2 Physical (Industrial) Hazards

The facility may contain industrial hazards such as high-voltage equipment, and overhead hazards.

7.5.3 Dangerous Mixed Waste

Refer to section 7.5.1.

7.5.4 Radioactive Materials

Refer to Section 7.5.1.

7.5.5 Criticality

Not applicable.

7.6 Potential Emergency Conditions and Appropriate Response

7.6.1 Facility Operations Emergencies

For an Off-Normal Event or Emergency Condition not specifically addressed, call the PNNL Single-Point-of-Contact on 375-2400. PNNL staff who observe a facility condition that may include, but not limited to the following: smoke, heat, vibration, or unusual sounds such as hissing should leave the area immediately and make the appropriate emergency notifications. The following guidance is offered for *specific listed incidents:*

7.6.1.1 Loss of Utilities

In the event of power failure, all containers of waste will be checked for closure and, if the duration of the outage exceeds 30 minutes, will be returned to their storage cells if they have been removed for labpacking or bulking. Facility equipment will be shut down to allow orderly restoration of power.

In a power failure incident, the Building Manager and the BED are to be notified. The Building Manager is responsible to arrange for restoration of power service to the unit. The BED is responsible to evaluate whether the Contingency Plan should be implemented or whether an evacuation is advisable. If the Contingency Plan is not implemented immediately, site personnel may be required to monitor the unit for continuing release potential during extreme temperature periods. The BED will determine the need for, and extent of, any such monitoring, in consultation with an industrial hygienist if appropriate.

In the event of power loss to site equipment, which results in failure of the equipment, the Building Manager is to be contacted to arrange for repair of the affected equipment and/or provide restoration of power. The BED should be contacted in the event that any failure results in a release or potential release to the environment as described in Section 7.4.

7.6.1.2 Major Process Disruption/Loss of Building Control

Not applicable.

7.6.1.3 Pressure Release

Not applicable.

7.6.1.4 Fire and/or Explosion

In the event of a fire or explosion, the discoverer will pull one of the manual fire alarms and call the Single Point-of-Contact. Automatic initiation of a fire alarm (through the smoke detectors and sprinkler systems) is also possible. The personnel operating the facility are trained in the use of portable fire extinguishers. They will use their best judgment whether to extinguish a fire or evacuate. Under no circumstances will personnel remain in the facility to extinguish a fire if unusual hazards exist.

An explosive (cell 15) magazine is located in the high bay of 305-B. Any fire in the high bay may result in the involvement of the magazine with an attendant risk of explosion. Facility personnel, including the BED, should carefully consider the potential for involvement of the magazine in a fire if one occurs. This potential may determine the advisability of fighting a fire in the high bay, the need to request an evacuation of nearby facilities, and other factors.

The following actions will be taken in the event of a fire or explosion:

1. Upon actuation of the fire alarm, personnel will shut down equipment, secure wastes, and lock up classified documents (or carry them with them), ONLY if time permits.

2. The alarm automatically signals both the 300 Area HFD station and the Hanford Patrol Headquarters. Both will respond immediately.

3. Personnel shall leave 305-B Storage Facility by the nearest safe exit, and move upwind, keeping the driveway clear.

4. The Single Point-of-Contact shall be immediately notified, who shall in turn notify the BED (or alternate).

5. The BED will go directly to the scene.

6. The BED will obtain all necessary information pertaining to the incident.

7. The BED will contact the Single Point-of-Contact and advise whether to notify the PNNL Occurrence Representative, depending on the severity of the event. Inform the Single Point-of-Contact as to the extent of the emergency (including estimates of dangerous waste or RMW quantities released to the environment) and any actions necessary to protect nearby facilities.

8. Activation of the Emergency Operations Center sets into motion the notification process for DOE, other Hanford contractors, and outside agencies.

9. The Hanford Patrol/Benton County Sheriffs Office will set up roadblocks within the area to route traffic away from the emergency scene.

10. Emergency medical technicians will remove injured personnel to a safe location, apply first aid, and prepare for transport to the medical department (DOE/HEHF) or to hospitals.

11. The HFD will extinguish the fire.

12. All emergency equipment will be cleaned and restored for its intended use immediately after completion of cleanup procedures.

7.6.1.5 Hazardous Material Spill

In addition to the foregoing contingency plan provisions, the following specific actions may be taken for leaks or spills from containers at the unit:

- Container leaks will be stopped as soon as possible through tightening closures, tipping the container to stop the leak, use of plugging or patching materials, or overpacking. Appropriate protective equipment will be used.
- If it is inadvisable to approach the container, build a containment of absorbent materials and restrict access pending notification of the BED and potential activation of the contingency plan.
- Contents of leaking containers may be transferred to appropriate non-leaking containers. Transfer procedures for fire safety will be followed for ignitable or reactive wastes (e.g., use of non-sparking tools, bonding and grounding of containers, isolation of ignition sources, and use of explosion-proof electrical equipment).
- Overpacked containers will be marked and labeled in the same manner as the contents. All containers of spill debris; recovered product, etc., will be managed in the same manner as waste containers received from outside the unit. Overpacks in use at the facility will be marked with information pertaining to their contents, and noting whether the container inside the overpack, is leaking or is in good condition.

7.6.1.6 Dangerous/Mixed Waste Spill

The initial response to any emergency will be to immediately protect the health and safety of persons in the immediate area. Identification, containment, treatment, and disposal assessment will be the secondary response.

7.6.1.6.1 Response to Minor Spills or Releases

Unit personnel will generally perform immediate cleanup of minor spills or releases using unit equipment, absorbents and emergency equipment noted in Section 7.10 Personnel detecting such spills or releases shall contact the PNNL Single Point-of-Contact (375-2400) to notify of the detection of such release and arrange for notification of the BED. For spills or releases occurring within individual storage cells during routine handling and storage, refer to Chapter 4, Section 4.1.1.8 of the 305-B Storage Facility Part B Permit Application.

A spill or release of hazardous material or dangerous waste is considered "minor" if all of the following are true:

- The spill is minor in size (generally less than five gallons of liquid or 50 lbs. of solids);
- The composition of the material or waste is known or can be immediately determined from label, manifest, MSDS, or disposal request information;
- The spill does not threaten the health and safety of building occupants, i.e., an evacuation is not necessary;
- Unit personnel have received appropriate training in accordance with Chapter 8 of the 305-B Storage Facility Permit Application; and
- Unit personnel have appropriate protective equipment, respiratory protection, and emergency response equipment to immediately respond and remediate the spill or release.

If any of the foregoing conditions are not met the provisions of Section 7.6.1.6.2. Major Dangerous Waste and/or RMW Spill or Material Release should be followed.

7.6.1.6.2 Response to Major Dangerous Waste and/or RMW Spill or Material Release

The following actions will be taken in the event of a major release:

<u>Discoverer</u>

1. If within the unit, notify unit personnel of discovery of spill or release by sounding the fire alarm.
2. Immediately notify the PNNL Single Point-of-Contact (375-2400) and provide all known information, including:
   - Name(s) of chemical(s) involved and amount(s) spilled, on fire, or otherwise involved, or threatened by, the incident.
   - Name and callback phone number of person reporting the incident.
   - Location of spill or discharge (pinpoint as closely as possible).
   - Time incident began or was discovered.
   - Where the materials involved are going or may go, such as into secondary containment, under doors, through air ducts, etc.
   - Source and cause, if known, of spill or discharge.
   - Name(s) of anyone contaminated or injured in connection with the incident.
   - Any corrective actions in progress.
   - Anyone else who the caller has contacted.
3. Take action to contain and/or stop the spill if all of the following are true:
   - The identity of the substance(s) involved is known;
   - Appropriate protective equipment and control/cleanup supplies are immediately available;
   - The employee has the proper training and can perform the action(s) contemplated without assistance, or assistance is immediately available from other trained unit employees; and

- Time is of the essence; i.e., the spill/discharge will get worse if immediate action is not taken.

If any of the above conditions are not met, or there is doubt, the employee should evacuate the area and remain outside the unit and upwind from it pending the arrival of the BED. He/she should remain available for consultation with the BED, HFD, or other emergency Management personnel.

__Single Point-of-Contact__

1. The Single Point-of-Contact will notify the BED or one of his alternates if the BED cannot be immediately reached, to arrange immediate response to the incident.
2. The Single Point-of-Contact will arrange for immediate response from HFD for fire or ambulance services as needed based on the report of the discoverer.
3. The Single Point-of-Contact will notify EMSD of the spill or release incident.
4. The Single Point-of-Contact will support the BED in providing further notification and coordination of response activities if needed. Potential activities requiring Single Point-of-Contact participation are:
   - Activate the general evacuation alarm for the 300 Area, if the BED determines that evacuation is necessary.
   - Notify the Emergency Operations Center (EOC) operated for DOE by Project Hanford Management Contractor (PHMC) if evacuation of the 300 Area or adjacent areas is necessary.
   - Notify the DOE-RL Emergency Operations Center in accordance with the Hanford Emergency Management Plan if necessary to evacuate areas lying outside the Hanford Site.
   - Any other activities found in the DOE-RL Hanford Emergency Management Plan.

__Building Emergency Director (BED)__ **(or alternate)**

1. Go directly to the unit to coordinate further activity. Take command of the scene from discovering unit employee.
2. Obtain all immediately available information pertaining to the incident. Determine need for assistance from agencies and arrange for their mobilization and response through the Single Point-of-Contact.
3. If building evacuation is necessary, sound the fire alarm.
4. Arrange for care of any injured employees, and provide for any additional help necessary to safely evacuate any disabled staff or visitors.
5. If a threat to surrounding facilities/operations exists. The BED (or alternate) will identify the hazards and any appropriate actions needed in the case of an unplanned release and activate the Emergency Operations Center if required.
6. Provide for event notification in accordance with Section 7.3.2.4.
7. Maintain access control at the site by keeping unauthorized personnel and vehicles away from the area. Security personnel may be used to assist in site control if control of the boundary is difficult, e.g., repeated incursions. In determining controlled-access areas, be sure to consider environmental factors such as wind velocity and direction.

8. Remain available to fire, police, and other authorities on scene and provide all required information. If round-the-clock work is anticipated, enlist the assistance of alternate BEDs to provide coverage. Make no comment to media unless authorized to do so. Refer media inquiries to the Media Relations office.

9. If unit personnel perform remediation, ensure use of proper protective equipment, proper remedial techniques (including ignition source control for flammable spills), and decontamination procedures by all involved personnel. Consult a PNNL industrial hygienist for assistance in determining necessary equipment or procedures.

10. If remediation is performed by outside agencies such as the Hanford Hazardous Materials Response Team or other remedial contractors, remain at the site to oversee activities and provide information.

11. Ensure proper containerization, packaging, and labeling of recovered spill materials and overpacked containers.

12. Ensure decontamination (or restocking) and restoration of emergency equipment used in the spill remediation prior to resumption of unit operations in compliance with Chapter 12, Section 12.4.1.5.3 of the 305-B Storage Facility Part B Permit Application.

13. Provide reports after the incident in accordance with Chapter 12, Section 12.4.1.5. of the 305-B Storage Facility Part B Permit Application.

7.6.1.7 Transportation and/or Packaging Incidents

1. (Signal): NONE

2. Response/Action

   - When a damaged shipment of hazardous material or dangerous waste arrives at the 305B Storage Unit, and the shipment is unacceptable for receipt under the criteria identified in section 2.8.3.2 of the permit. Do NOT move the shipment

   - Notify the BED and the generator of the damaged shipment and obtain any chemical information necessary to assist in the response

   - The BED will evaluate the event and initiate appropriate actions for minor events/spills such as over packing damaged containers, re-labeling, tightening caps, etc, using facility expertise and equipment

   - Treat any major release from the package as a hazardous material spill and perform response actions per Section 7.6.1.6.2 " Response to Major Dangerous Waste and/or RMW Spill or Material Release".

   - Take actions to protect any uninvolved hazardous waste that may be threatened.

7.6.1.8 Unusual, Irritating, or Strong Odors

7.6.1.8.1 Inside of the Facility

If an unusual, irritating, or strong odor is detected, and the person detecting it has reason to believe that the odor may be the result of an uncontrolled release of a toxic or dangerous material, they shall:

- Immediately activate the building fire alarm system to evacuate the building, and
- Notify the Single Point-of-Contact, the building manager, and cognizant line management.

In the event that the discoverer has knowledge of the source and scope of the release and believes that the release poses no immediate threat to others, the release shall immediately be reported to the building manager and to the discoverer's manager. Measures shall be taken to contain the release and ventilate the area, if safe and advisable to do so.

In the event that an unusual odor is detected within the facility, and the source of the odor is unknown, the BED must consider whether the facility should be evacuated.

7.6.1.8.2 Outside of the Facility

If an unusual odor is detected and believed to come from outside the 305-B Building, the following actions should be taken:

- Notify 375-2400.
- Determine wind direction. The duty forecaster at 373-2716 can give the immediate wind direction in the 300 Area.
- Evacuate building to an upwind position regardless of primary designated Staging Area.
- In some cases it may be better to remain inside and shut down the HVAC System. The Building Emergency Director will determine response.

7.6.1.9 Radiological Material Release

Same as Section 7.6.1.6. Dangerous/Mixed Waste Spill.

7.6.1.10 Criticality

Not applicable.

7.6.2 Identification of Hazardous Materials in and around Facility

305-B Storage Facility is utilized for the storage of hazardous wastes that pose a potential hazard to the public, adjacent facilities, personnel, programs and the environment. 305-B Storage Facility also contains a currently inactive radioactive mixed waste storage area. References to radioactive mixed waste in this plan are presently inapplicable since the storage areas are inactive, but the areas may be utilized if permitted storage availability elsewhere in unavailable. Facilities adjacent to 305-B Storage Facility may contain hazardous material typically found in an industrial facility including: chemical hazards such as corrosives, oxidizers, flammable solids and liquids, poisons, etc., radioactive materials, hazardous wastes, and radioactive mixed wastes. They also may contain industrial hazards such as high-voltage equipment, high-temperature equipment, high-speed equipment (such as drill presses, lathes, drive belts), and overhead hazards. However, none of these facilities pose an imminent threat to 305-B Storage Facility in the event of an emergency.

7.6.3 Natural Phenomena

Natural phenomena or events including range fire, flood, high winds/tornado, volcanic eruption/ashfall, seismic events, etc may occur at any time. Follow directions given by Crash Alarm Telephone or 305-B Storage Facility Building Emergency Director.

7.6.3.1 Seismic Event

The 305-B Storage Facility is located in Benton County, Washington, and is not within one of the political jurisdictions identified in Appendix VI of Title 40 Code of Federal regulations (CFR) Part 264 (EPA 1988). Therefore, no further demonstration of compliance with the seismic standard is required.

7.6.3.2 Volcanic Eruption/Ashfall

Follow directions given by Crash Alarm Telephone or 305-B Storage Facility Building Emergency Director.

7.6.3.3 High Winds/Tornadoes

Follow directions given by Crash Alarm Telephone or 305-B Storage Facility Building Emergency Director.

7.6.3.4 Flood

The 305-B Storage Facility is located in the 300 Area, which is adjacent to the Columbia River, approximately at river mile 345. Floods of the Columbia River were, therefore, considered for determining compliance with floodplain standards. Floods of other water bodies (i.e., the Yakima River, ephemeral streams on the Hanford Site) were not considered because of their great distance when compared to the distance to the Columbia River.

One hundred-year floodplain is identified in flood insurance rate maps developed by the Federal Emergency Management Agency (FEMA). The FEMA maps for Benton County, Washington, do not include the Hanford Site. Determination of whether 305-B Storage Facility is located in a 100-year floodplain, therefore, was made by comparing the land surface elevation at 305-B Storage Facility with the nearest downstream 100-year flood base elevation identified on the FEMA maps for Benton County. The nearest 100-year floodplain identified on the Benton County FEMA maps is at Columbia Point, approximately nine miles downstream of 305-B Storage Facility at river mile 336. The FEMA map for this area (FEMA 1982) identifies a 100-year flood base elevation of 352 ft above mean sea level (AMSL). This elevation is significantly below the elevation of 305-B Storage Facility, which is 387 ft AMSL (see topographic maps in Appendix 2A).

The potential for the 305-B Storage Facility to be inundated during a flood was also evaluated by comparison to the maximum probable flood for the Columbia River, which is greater than the 100-year flood level.

7.6.3.5 Range Fire

Follow directions given by Crash Alarm Telephone or 305-B Storage Facility Building Emergency Director.

7.6.4 Security Contingencies

7.6.4.1 Bomb Threats

- When condition is observed or bomb threat received, notify the PNNL Single Point-of-Contact 375-2400 or Building Emergency Director.
- If necessary, clear the area of personnel
- Do not move any suspicious objects
- Post warnings if applicable
- Provide Emergency Responders with Appropriate Information

If a Telephone Bomb Threat is received record the exact message and attempt to obtain the following information:

- When will it go off?
- Where is it located?
- What does it look like?

- What kind is it?
- Why was it placed?
- How do you know so much about it?
- Who put it there?
- Where are you calling from?
- What is your name and address?

Note: After receiving the information notify the PNNL Single Point-of-Contact 375-2400, give the information obtained from the caller and then notify the BED. If you receive a Written Bomb Threat, Notify the PNNL Single Point-of-Contact 375-2400 and provide the Written Bomb Threat to PNNL Security Personnel.

7.6.4.2 Hostage Situation/Armed Intruder

When condition is observed, notify the PNNL Single Point-of-Contact 375-2400 or Building Emergency Director.

- If necessary, clear the area of personnel
- Do not move any suspicious objects
- Post warnings if applicable
- Provide emergency responders with appropriate information
- Follow the instructions of the BED and/or security

7.6.4.3 Classified Material During Evacuation Events

Not applicable

7.7 Facility Take Cover – Shutdown of HVAC

If there is a potential for a hazardous plume to be drawn into the building -OR- if, the Patrol Operations Center (POC) directs securing the HVAC via the Single-Point of Contact for PNNL at 375-2400:

- The BED or Alternate BED will contact the Power Operator on duty and request that the building HVAC systems be secured for emergency protective actions.
- Notify the BED when HVAC shut down is complete.

7.7.1 Local Shutdown Using Power Operator, BED, or Alternate BED

If there is a potential for a hazardous plume to be drawn into the building -OR- if, the Patrol Operations Center (POC) directs securing the HVAC via the Single Point-of-Contact for PNNL at 375-2400:

- The BED or Alternate BED will contact the Power Operator on duty and request that the building HVAC System be secured for emergency protective actions.
- If the power operator cannot respond to the Building, the BED or Alternate will shut down the two (one for the highbay and one for the office area) HVAC systems using the main disconnects located on the north wall in the 305-B Storage Facility highbay.
- Notify the BED and the Power Operator when HVAC shut down is complete.

7.8 Utility Disconnects Locations

Utility disconnects may be necessary under extreme emergency conditions. The Building Emergency Director will determine if utility disconnects are necessary. Location of the utility disconnects or valves are described below:

7.8.1 Compressed Air

Plant air and shut off valves are located behind cell 5 in the southwest corner of the highbay area.

7.8.2 Sanitary and Process Water

Water lines and shut-off valves are located behind the bulking module in the southwest corner of the highbay area.

7.8.3 Main Electrical Power

There are three separate main electrical disconnects located in 305-B Storage Facility. One is located on the north wall of the highbay area. The second is located on the east wall of the lowbay area, and the third is located on the east wall in the original wing of the building, leading to the basement.

7.8.4 HVAC Systems

The main disconnects switches to the two HVAC systems (one for the highbay and one for the office area) are located on the north wall in the 305-B Storage Facility highbay.

7.9 Termination, Incident Recovery, and Restart

7.9.1 Termination

The Incident Commander in consultation with the 305-B Storage Facility Building Emergency Director will recommend termination of the event when conditions indicate that it is safe to do so.

7.9.2 Prevention of Recurrence or Spread of Fires, Explosions, or Releases

The BED is responsible for taking the steps necessary to ensure that a secondary release, fire, or explosion does not occur after the initial incident. Procedures that will be implemented may include:

- Inspection of containment for leaks, cracks, or other damage
- Inspection for toxic vapor generation
- Isolation of residual waste materials and debris
- Reactivation of adjacent operations in affected areas only after cleanup of residual waste materials is achieved

7.9.3 Recovery

A Recovery Team, consisting of the Incident Commander, 305-B Storage Facility Building Emergency Director, and appropriate representation of all facility interests, will develop and recommend a recovery plan. A recovery plan is needed following an event when further risk could be introduced to personnel, a facility, or the environment through recovery action and/or to maximize the preservation of evidence.

The recovery plan will be reviewed and approved by cognizant PNNL line management and EMSD staff, meeting the requirements of PNNL-MA-110, Section 9.0, Termination, Re-entry, and Recovery. Restart of operations must be performed in accordance with the approved plan. For emergencies not involving activation of the Emergency Operations Center, the BED is responsible for ensuring that conditions are restored to normal before operations are resumed

7.9.3.1 Storage and Treatment of Released Material

Restart of operations after an emergency is conducted in accordance with established procedures for recovery from off-normal events. Treatment and/or storage and disposal of released material and contaminated debris is part of the recovery process leading to restart.

Immediately after an emergency, the BED or the recovery organization will make arrangements for the cleanup phase. Procedures for treatment, storage, and/or disposal of released material and contaminated debris are implemented at this time.

Released material and contaminated debris will be managed in the same manner as wastes received from outside the unit (see Chapter 4, Section 4.3 of the 305-B Storage Facility Part B Permit Application for procedures). All waste so generated will be containerized in drums or other appropriate containers and stored in an appropriate storage area pending analysis and determination of final treatment/disposal requirements. Unit operations personnel will take cleanup actions or other personnel meeting the training requirements of Chapter 8 of the 305-B Storage Facility Part B Permit Application. Actions to be taken may include, but are not limited to, any of the following.

- Neutralization of corrosive spills
- Chemical treatment of reactive materials to reduce hazard
- Overpacking or transfer of contents from leaking containers
- Using absorbents to contain and/or absorb leaking liquids for containerization and disposal
- Decontamination of solid surfaces impacted by released material, e.g., intact containers, facility equipment, floors, containment systems, etc.
- Disposal of contaminated porous materials which cannot be decontaminated, and any contaminated soil
- Containerization and sampling of recovered materials for classification and determination of proper disposal technique
- Follow up sampling of decontaminated surfaces to determine adequacy of cleanup techniques as appropriate.

Waste from cleanup activities will be analyzed and stored in the same manner as are wastes received from outside the unit, in the manner prescribed in Chapter 4 of the 305-B Storage Facility Part B Permit Application. Incompatible wastes will not be placed in the same container. Containers of waste will be placed in storage areas appropriate for their compatibility class.

If it is determined that incompatibility of waste was a factor in the incident, the BED or the recovery organization will ensure that the cause is corrected. Corrective examples would be modification of an incompatibility chart, or increased scrutiny of wastes from a generating unit (in accordance with Chapter 3, Section 3.2 of the 305-B Storage Facility Part B Permit Application) when incorrectly designated waste caused or contributed to an incident.

7.9.3.2 Post-Emergency Equipment Maintenance

All equipment used during an incident will be decontaminated (if practicable) or disposed of as spill debris. Decontaminated equipment will be checked for proper operation prior to storage for subsequent use. Consumables and disposed materials will be restocked in the quantities shown in the inventories of Table 6-2. Fire extinguishers will be recharged or replaced.

The BED is responsible to ensure that all equipment is cleaned and fit for its intended use prior to the resumption of operations. Depleted stocks of neutralizing and absorbing materials will be replenished, self-contained breathing apparatus (SCBAs) cleaned and refilled, protective clothing cleaned or disposed and restocked, etc. Notification of state and local authorities will be made through DOE-RL of completion of cleanup, decontamination and emergency equipment re-supply activities pursuant to WAC 173-303-360(2)(j). Upon notification and approval of PNNL line management, normal facility operations may be resumed.

7.9.4 Required Reports [G-8]

Three types of written post-incident reports, summarized below are required for incidents at the 305-B Storage Facility.

7.9.4.1 Report to Ecology/EPA

The Environmental Support Contact (375-2966) will provide any necessary notifications to regulatory agencies such as the Washington State Department of Ecology and ensure that required written reports to regulatory agencies are completed within 15 days of event termination.

Within 15 days of the incident, a written report will be submitted to Ecology concerning the incident. The report must include:

- Name, address, and telephone number of DOE-RL contact;
- Name, address, and telephone number of 305-B Storage Facility;
- Date, time, and type of incident (e.g., fire, explosion);
- Name and quantity of material(s) involved;
- The extent of any injuries;
- Assessment of any actual or potential hazards to human health or the environment caused by the incident;
- Estimated quantity and disposition of recovered material that resulted from the incident;
- Cause of the incident; and
- Description of corrective action taken to prevent recurrence of the incident.

7.9.4.2 DOE Occurrence Reporting

Under DOE Order 232.1A and HFID 232.1B an occurrence report is required for incidents occurring at the 305-B Storage Facility involving hazardous materials release, fire, etc. Specific details of this reporting system are found in the Order. To summarize, the BED is responsible to file the following occurrence reports with DOE-RL under the Order:

- Within 24 hours of discovery, file a Notification Report.
- File an updated Occurrence Report whenever significant new information relating to the incident becomes available.
- File a final Occurrence Report when cause of the incident has been analyzed, root cause and contributing causes determined, corrective actions determined and scheduled, and "lessons learned" identified.

7.9.4.3 Off-Normal Event Reporting

Under off-normal event reporting procedures, occurrences shall be promptly investigated, reported, and analyzed to ensure that effective corrective actions are taken in compliance with contractual, statutory, and corporate requirements. All incidents are recorded in the building logbook. In the DOE reporting system, four levels of incidents are described in descending order of severity: emergency, unusual occurrence, off-normal occurrences, and logbook entry only.

An "off-normal event" is a significant deviation from normal operation that requires categorization and reporting as noted above. PNNL management is required to evaluate an event to determine the depth of investigation and level of reporting required.

Reporting of emergencies, unusual occurrences, and off-normal occurrences takes place as described under Section 7.9.4.2.

The BED is responsible for investigating each event in his/her area(s) of responsibility and submitting the appropriate report.

7.10 Emergency Equipment (crash alarm phones, fire extinguishers, etc.)

Support equipment available to assist in responding to an emergency can be found by referring to DOE/RL 94-02, Section 10.2, and the HFD emergency equipment listing in Appendix C of 94-02.

<u>Hanford Site Emergency Equipment</u>

The Hanford Site has fire and patrol personnel trained and equipped to respond in emergency situations. These personnel are employees of the site-operating contractor. The HFD Hazardous Material Response Team is trained for mobilization and control of hazardous material emergencies. The HFD will take control of the incident scene until the incident is under control and personnel rescue is complete

The Hanford Patrol provides support to the Fire Department during an incident, including such activities as activation of area crash alarm telephone systems or area sirens (for evacuation or take cover), access control, traffic control, and emergency notifications.

If an emergency threatens other facilities and/or there is a danger of release of hazardous materials to the environment, the HFD will respond. The HFD will coordinate protective response actions and notifications, and furnish any necessary technical assistance.

7.10.1 Portable Emergency Equipment

- Portable Fire Extinguishers are located throughout the facility. These locations are identified in Exhibit 7.12.1 "305-B Storage Facility Emergency Equipment Locations"
- A Mobile Command Post Vehicle can be obtained via HFD main telephone number (373-2230). The HFD Battalion Commander will approve and dispatch vehicle.

7.10.2 Communications equipment/warning systems

- Fire Alarm Pull Boxes are located at every exit throughout the facility. All locations are shown on Exhibit 7-1 "305-B Storage Facility Emergency Equipment Locations".
- The Crash Alarm Phone is located in the low-bay conference room area of the 305-B Storage Facility.

7.10.3 Personal Protective Equipment (PPE)

The unit has a safety shower and eyewash unit at each end of the high bay. Drainage from these units flows into the containment trenches. In addition to these units, a safety shower and eyewash unit is maintained at the protective equipment storage area just outside the high bay, adjacent to the office area and outside cell 7 in the basement. These eyewash/shower units are inspected for clear and unobstructed accesses weekly in accordance with Chapter 6, Section 6.2 of the 305-B Storage Facility Part B Permit Application.

Protective clothing and respiratory protective equipment are maintained at the facility for use during both routine and emergency operations. This protective equipment includes at a minimum:

- 6 sets of chemically resistant suits, aprons, boots, and gloves

- 20 protective glasses
- 5 pair chemical goggles
- 4 face shields
- 4 full face respirators
- Respirator cartridges (variety)
- 3 self-contained breathing apparatus (30 minute type).

This protective equipment is stored in cabinets located outside of the high bay east entrance. Personnel assigned to 305-B Storage Facility are available to assist other trained personnel (e.g., firefighters) in emergency situations or possible immediately dangerous to life or health spill cleanup situations.

7.10.4 Spill Control and Containment Supplies

Supplies of absorbent pillows are located in the high bay operating area near the east entrance. These pillows absorb organic or inorganic materials and have a rated absorption capacity of approximately one-liter of waste each. They may be used for barriers to contain liquid spills as well as for absorbent purposes. The work area also has an ample supply of diatomaceous earth or vermiculite for absorption of liquid waste spills. Neutralizing absorbent is available for response to acid or caustic spills. A supply of empty drums (DOT UN1A1 closed head and DOT UN1A2 open head) and salvage drums (overpacks) is maintained in the high bay area along with brooms, shovels, and miscellaneous spill response supplies.

7.11 Evacuation of Persons with a Disability or Visitors

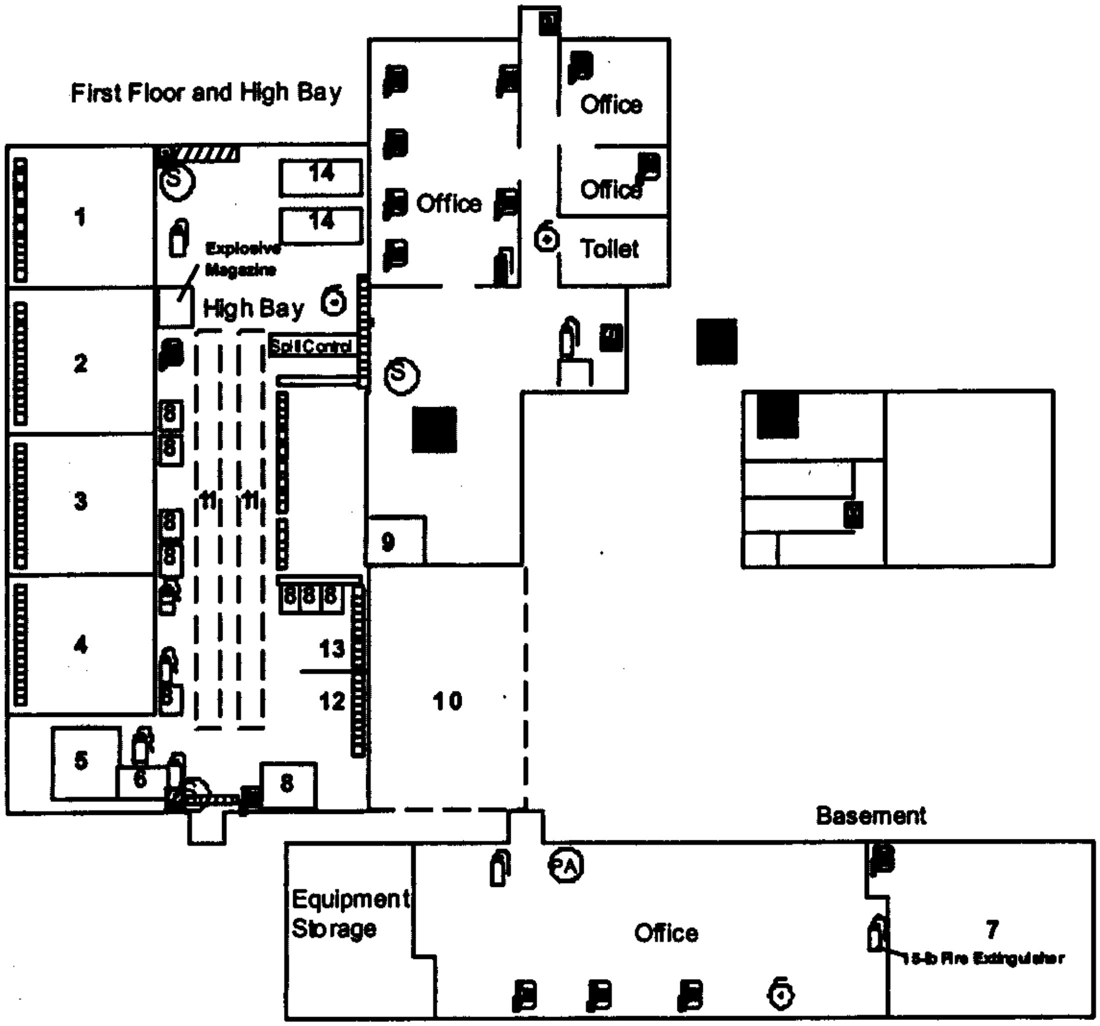
The 305-B Storage Facility has an evacuation plan, which includes emergency signal identification and staging area location. In the event an evacuation is required, 305-B Storage Facility personnel depart by one of the exit doors noted in Exhibit 7.12.2 and proceed through the north gate. Personnel are to assemble in the north parking lot Exhibit 7.12.3, Lane 2 accountability area for accounting. If the north gate is blocked by the emergency, personnel may escape through the Apple Street (west) gate opening to Stevens Drive or the south gate.

The safety of building visitors is the responsibility of the facility host, who shall ensure that visitors are provided a safe and orderly evacuation. The facility host will report the visitor status to the Staging Area Supervisor as soon, as is practical after the evacuation.

7.12 Exhibits

Exhibit 7.12.1 305-B Storage Facility Emergency Equipment Location
Exhibit 7.12.2 305-B Storage Facility Building Evacuation Exits
Exhibit 7.12.3 305-B Storage Facility Evacuation Route
Exhibit 7.12.4 Building Emergency Director Checklist for Low-Hazardous Facilities
Exhibit 7.12.5 Staging Area Occupancy/Accountability Status Sheet
Exhibit 7.12.6 Facility Operations Specialist - Checklist Duties
Exhibit 7.12.7 Emergency Checklist for Emergency Management Support Group
Exhibit 7.12.8 Emergency Telephone Numbers

7.12.1 Exhibit – 305-B Storage Facility Emergency Equipment Locations

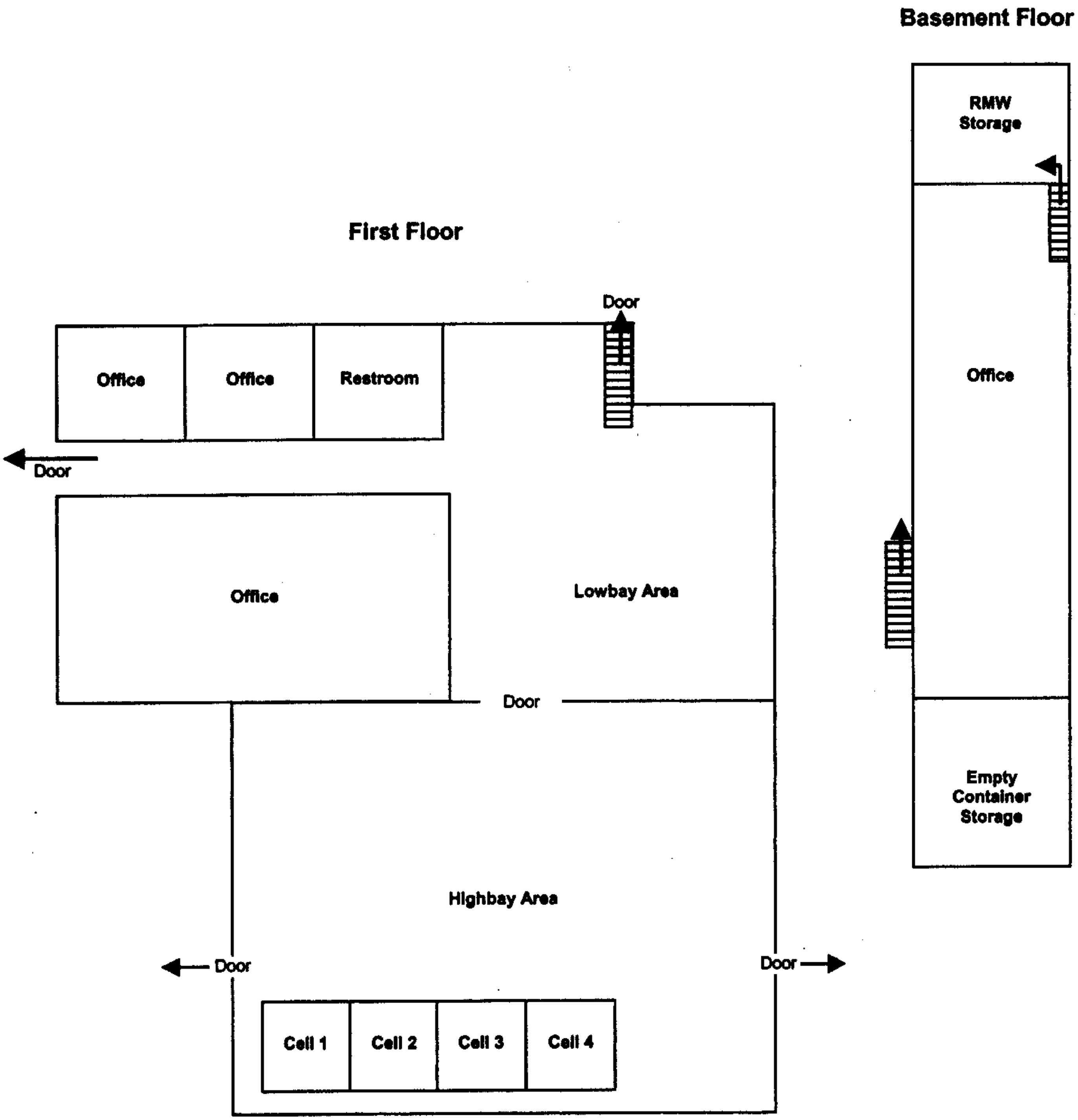


Legend

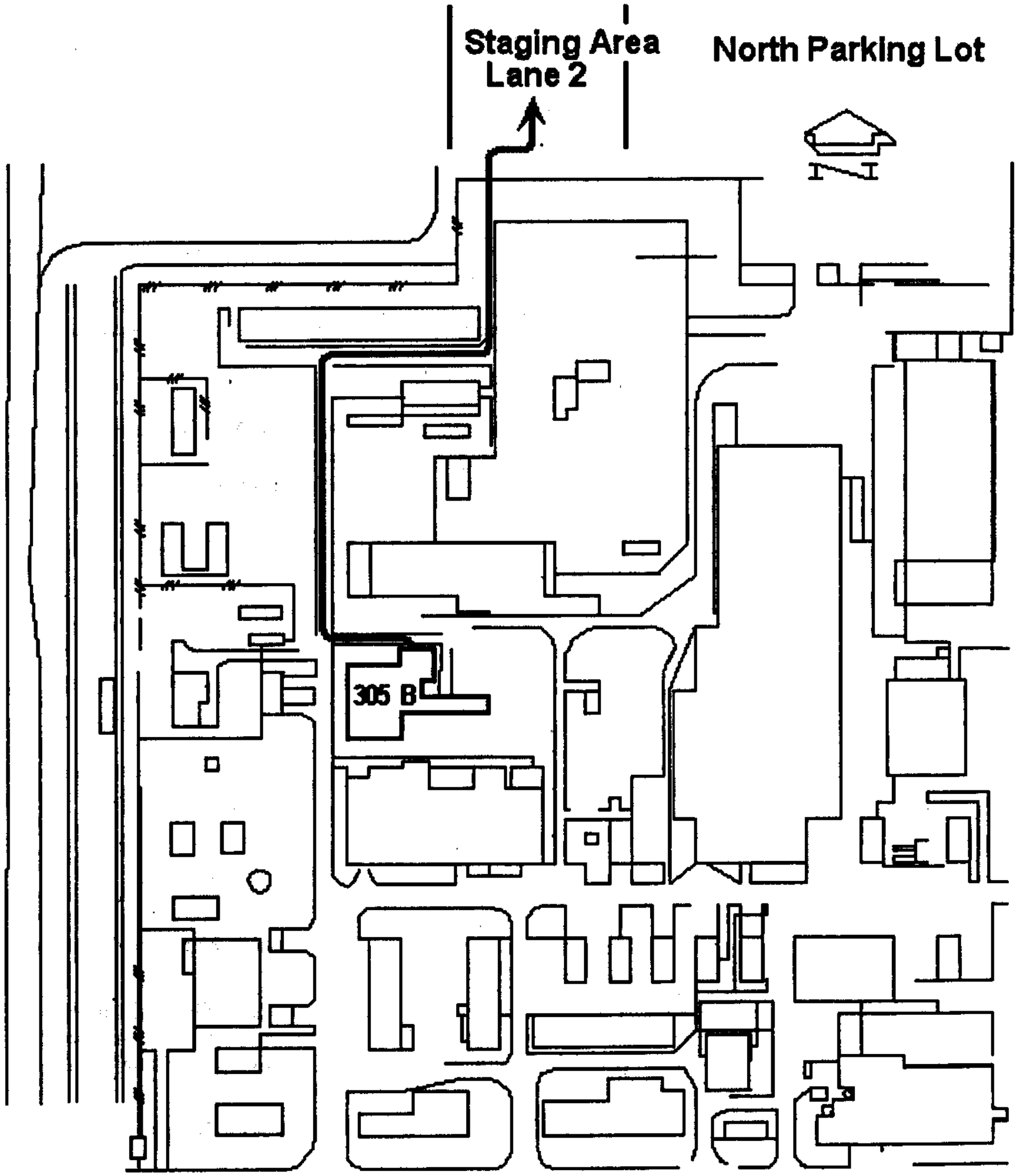
1. Acids, Oxidizers
2. Poisons, Class 9's
3. Alkalines, WSDW, Organic Peroxides
4. Organics and Compressed Aerosols
5. Flammable Liquid Bulking Module and compressed gases
6. Asbestos Cabinet
7. RMW Storage Cell
8. Flammable Storage
9. Small Quantity Flammable RMW
10. Outdoor Non-Regulated Drum Storage
11. WSDW/ORM/Non-Reg Drums
12. UW Drums
13. Acid Drums
14. Alkaline Drums

- Safety Shower/Eyewash
- Phone
- Fire Alarm Bell
- Fire Alarm Pull Box
- 14-lb Halon Fire Extinguisher
- 10-lb ABC Fire Extinguisher
- 15-lb Class D Fire Extinguisher
- Removable Access to Basement
- Emergency Equipment Cabinet
- Collection Sumps

7.12.2 Exhibit – 305-B Storage Facility Building Evacuation Exits



7.12.3 Exhibit – 305-B Storage Facility Evacuation Route



7.12.4 Exhibit – Building Emergency Director Checklist for Low-Hazardous Facilities

Maintain a log or assign a log keeper to record your activities, including the date and time information was received or time when an action was taken. This checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

Immediate Actions

1. _________ Upon initial discovery/notification, complete the following:
    - Stop non-emergency activities in the event scene hazard area.
    - Warn personnel in event scene hazard area.
    - Call and report the incident to the SPC (375-2400) and request assistance as needed.
    - Determine and initiate mitigation actions that cannot be delayed without threatening human health and/or the environment.
    - Designate someone to meet arriving emergency responders in order to provide direction to the event scene.
    - If available, direct a facility knowledgeable person(s) to meet and collocate with arriving emergency responders and perform the Facility Operations Specialist - Checklist Duties.
2. _________ Implement protective actions.
    - During an evacuation, assign staff (e.g., Zone Wardens) to monitor facility access points to prevent unauthorized reentry.
    - During a take cover assign door monitors as appropriate to inform personnel of potential hazardous conditions.
    - Evaluate the situation and determine appropriate staging area relocation outside any plume pathway, if necessary.

    Note: The BED for low-hazardous facilities (until the IC arrives) may permit coordinated personnel movement during protective actions.
3. _________ Provide initial briefing to IC and ICP personnel including the following:
    - Potentially affected personnel
    - Incident and facility conditions
    - Notifications (environmental/emergency and person or agency contacted)
    - Protective actions implemented
    - Mitigation efforts underway
    - Accountability status of facility personnel
    - Status of injured, contaminated, or exposed personnel
    - Status of assigned ICS functions.
4. _________ IF the incident involves a spill, release, fire, a threat to human health, or explosion, or exceeds environmental permits.

    THEN notify the Environmental Support Contact (EMSD) to initiate regulatory required notifications and follow your contractor specific spill/release notification process or procedure. (Contact the SPC for a Prime Contractor specific single-point-of-contact if necessary).
5. ________ Notify the PNNL SPC (375-2400) of the location of the ICP and a safe route of travel to the ICP.
6. _________ Check with the Cognizant Space Managers to determine if operations of a hazardous nature were in progress at the time of the evacuation. If so, coordinate with the Safety Advisor and determine the actions necessary for incident response.

7. ________ If necessary, establish the Management Support Group.

8. ________ In the event of a total loss of electrical power, evacuate the facility.

Note: At the completion of turnover from the BED for low-hazardous facilities to the IC, the IC shall assume responsibility.

Follow-Up Actions

9. ________ Confirm that facility personnel accountability has been conducted and evacuated personnel (if any) have been moved to a safe location.

10. See that all event-reporting requirements per the appropriate procedure are made in accordance with HFID 232.1B, Notification, Reporting, & Processing of Operations Information.

11. Coordinate establishment of operations protocols with IC based on availability of personnel.

- Discuss location of Resource Staging Area.
- Assist IC in assigning other functional components of the ICP, as necessary.
- Additional resources and event monitoring support can be obtained by requesting activation of the Event Coordination Team and the EDO.

12. ________ Notify the IC of the status of facility personnel and activities.

13. ________ If any personnel are deceased, injured, contaminated, potentially exposed, or transported by ambulance.

- Then notify the appropriate Health Advocate (line management).
  Note: Cellular telephone or radio users shall not use the name(s) or payroll number(s) of involved personnel.

14. ________ Participate in ICP briefings as required.

15. ________ When the incident is stabilized, participate in a debriefing with the IC and assume actions to return facility to normal operations.

16. ________ When incident is stabilized, refer to DOE 0223, RLEP 3.4, Event Termination, Reentry and Recovery, to coordinate termination of the emergency.

17. ________ See that all hazardous material generated is handled appropriately and that incompatible waste is handled or stored in the area until necessary cleanup has occurred.

18. ________ Treat the affected incident area as a crime scene by eliminating any unnecessary disturbance of physical evidence.

- Witnesses to the event may be able to provide critical information to emergency responders.
- Document your initial observations.

19. ________ When the incident is stabilized, participate in a debriefing with the IC and assume action to return facility to normal. (Refer to PNNL-MA-110, Emergency Preparedness Manual, Section 9, Termination, Reentry, and Recovery)

20. ________ Upon event termination, make a copy of all logs and turn it over to the Liaison Officer or IC designee.

7.12.5 Exhibit – Staging Area Occupancy/Accountability Status Sheet

Facility Staging Area Supervisor - Check listed Duties

The Facility Staging Area Supervisor is responsible for coordination of actions at the facility staging area. A facility representative staffs this position. This list below is not designed to be all encompassing, nor is it necessary to perform each of these actions in sequence. The Facility Staging Area Supervisor is responsible for implementing the following checklist duties for non-declared, RCRA, and DOE-declared emergencies, as appropriate. Maintain a log of your activities or assign a log keeper.

1. ________Upon notification of an emergency event requiring facility personnel to evacuate, proceed to the staging area.

2. ________Verify through the BED the staging area is in a safe location.

3. ________Segregate personnel in personal protective equipment (PPE) and direct RCT to survey personnel in PPE.

4. ________Conduct personnel accountability and report the results to the BED. Attempt to locate any missing personnel (DO NOT reenter the facility).

5. ________Query staff at the staging area to determine if any hazardous processes are on going in the facility and notify BED.

6. ________Determine if any personnel were injured or potentially exposed to hazardous materials. Communicate any positive responses to the BED.

7. ________Update personnel on the event status on a periodic basis.

8. ________If notified to evacuate, identify all personnel with vehicle keys in their immediate possession. Match up people with rides. Verify destination and route with each driver.

9. ________Use government vehicles to transport personnel in PPE, if required. Reserve vehicles for personnel with late shutdown duties.

10. ________Perform turnover with the fire department staging officer upon his arrival to cover all information listed above.

7.12.6 Exhibit – Facility Operations Specialist - Checklist Duties

Maintain a log or assign a log keeper to record your activities, including the date and time information was received or time when an action was taken. This checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. ___ Obtain briefing on operational/mitigative activities and obtain any necessary facility specific procedures, utility disconnects, etc.

2. ___ Following BED briefing, and after receiving safe routes of travel, respond to a safe location upwind of the event scene.

   - Ensure personnel who were in the immediate area are accounted for and located in a safe, upwind area
   - Ensure that first aid is administered as-soon-as possible
   - Begin segregation of any contaminated personnel.

3. ___ Meet emergency personnel responding to the event scene and provide information on event status and initial actions underway. Collocate with the HFD/Hanford Patrol Operations Section Chief upon their arrival and act as the facility point-of-contact at the incident scene hazard area.

4. ___ Assist the HFD/Hanford Patrol Operations Section Chief with development of a mitigation plan by providing facility expertise.

5. ___ Identify, contact, and supervise additional facility personnel as required to Support Operations Section activities.

6. ___ Coordinate with HFD/Hanford Patrol Operations Section Chief to ensure that all facility emergency responders are wearing appropriate PPE for assigned tasks.

7.12.7 Exhibit – Emergency Checklist for Emergency Management Support Group

The Management Support Group (MSG) will use the following checklist to support the BED in managing the administrative aspects of the event.

Emergency Checklist for Emergency Management Support Group

Item	Yes	No	Comment
Has 375-2400 been notified? (Use 375-9959 if 375-2400 is unavailable)			
Have all building occupants been accounted for? PNNL staff? PNNL visitors? Other Contractor personnel? Consultants, vendors, others?			
Have any persons received injuries or been subjected to conditions requiring medical attention? If Yes, has medical attention been arranged?			
Has the BED classified the event? Alert Site General			
Has activation of the EOC been requested?			
Do any persons require medication for non-event reasons (e.g., heart medicine)?			
Has access control been initiated by the appropriate Law Enforcement Agency?			
Has the Area Operations Manager/Building Manager been notified? Has he reported to the event scene?			
Has a location for the ICP been established?			
Has a location for the Management Support Group been established and communicated to the appropriate Fire Department and Law Enforcement Agency, and the PNNL Technical Rep. in the EOC (376-7148) (if activated)?			
Has an open line between the ICP Communicator and Event Scene Liaison in the EOC been established (if activated)?			
Has the Emergency Duty Officer made contact with the BED?			
Has event log been set up?			
Are additional staff required for support? Line Management? Clerical? Technical? Other?			
Has the Incident Commander established a schedule for periodic briefings?			
Are additional RCTs required?			
Is there a need for a facility inventory? Chemical-hazardous, toxic, flammable? Radio chemical? Nuclear or fissile material? If inventory information is required, contact the following: Chemical inventory - 376-0812, 372-1043, or 375-6315 Nuclear/fissile - Safeguards & Security Duty Officer or Cognizant operations staff.			
Has Public Relations been notified?			

Emergency Checklist for Emergency Management Support Group			
Item	**Yes**	**No**	**Comment**
Has DOE Headquarters been notified?			
Has EOC contacted other facilities not immediately involved?			
Is technical or operational spokesperson needed? If so, has he/she been contacted?			
Has Program Manager been notified?			
Will relief staff be required for the Incident Command Post (Event and Support Teams)?			
Is transportation needed? Available?			
Is there a need for additional equipment or supplies (including food)?			
Has PNNL Security made arrangements with Patrol for access of special equipment (radios, cellular telephones)?			
Has the need for a facility(s) HVAC system shutdown been analyzed?			
Do subgroups need to be developed to assist with special activities that may need to occur (e.g., identifying essential personnel, accountability, termination and recovery efforts, etc.)?			
Has the impact to all work or projects in PNNL facilities been considered if the work force is reduced to only essential personnel (e.g., rad work, security/classified work, etc.)?			
Has the necessary line management been contacted to determine if research project equipment is in a safe condition?			
Are event terminations, recovery and reentry plans, checklists/procedures being developed?			
Has the necessary administrative support been acquired?			
Has the following been planned for during a Partial Evacuation (essential personnel only)? 1. Determining who is essential. 2. Identify the staging location for essential personnel. 3. Notify essential personnel to report to work (recorded message, EOC media release, direct phone call, etc.), route of access, staging location, and person to report to. 4. Communicate list of essential personnel to the POC (911 or 373-3800). 5. Controlling accountability and assignment of staged essential personnel.			
Is there adequate controls established to prevent unauthorized Building/Site access entry and/or work initiation?			
Has Line Management for Safeguards and Security been directed to report to the Control Room (SPC)?			
For mass casualties has HR been directed to the Red Cross Family and Friends Support Center?			
Has consideration for establishing shifts of emergency personnel (EOC/MSG) been made?			
Are additional radiation instruments required? What type? How many of each type?			
Is the Hazardous Materials (HazMat) team needed?			

7.12.8 Exhibit – Emergency Telephone Numbers

Not provided per Condition II.A.4 of the RCRA permit.

This is available thru 375-2400 (SPC) and maintained in accordance with section 4.0 of this Building Emergency Procedure.

7.13 Distribution

Controlled copies of the BEP will be located in the following areas:

- BED Emergency response bag
- Building Manager's file
- Emergency Preparedness Program Office
- Control Room
- Hanford Emergency Operations Center.

Uncontrolled copies of the BEP may be viewed via the PNNL Facilities and Operations Website at http://facilities.pnl.gov/building/index.html.

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Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part & Chapter:
325 Hazardous Waste Treatment Units	**Part III, Chapter 6 and Attachment 36**

Description of Modification:

Hanford Facility RCRA Permit, Condition III.6.A:

III.6.A. COMPLIANCE WITH APPROVED PERMIT APPLICATION

The Permittees shall comply with all requirements set forth in Attachment 36, including the Amendments specified in Condition III.6.B. Enforceable portions of the application are listed below. All subsections, figures, and tables included in these portions are also enforceable, unless stated otherwise:

Part A, Form 3, Permit Application, Revision 4A, from Class 1 Modification for quarter ending June 30, 2000

Chapter 2.2	Topographic Map, Chapter 2.0 non-enforceable sections modified in Class 1 Modification for quarter ending December 31, 2000
Chapter 3.0	Waste Characteristics, from Class 1 Modification for quarter ending December 31, 1998
Chapter 4.0	Process Information from Class 1 Modification for quarter ending March 31, 2002
Chapter 6.0	Procedures to Prevent Hazards from Class 1 Modification for quarter ending December 31, 2000
Chapter 7.0	Contingency Plan, from Class 1 Modification for quarter ending June 30, 2002
Chapter 8.0	Personnel Training, from Class 1 Modification for quarter ending September 30, 2001
Chapter 11.0	Closure and Financial Assurance, from Class 1 Modification for quarter ending December 31, 2000
Chapter 12.0	Reporting and Recordkeeping, from Class 1 Modification for quarter ending December 31, 1998
Chapter 13.0	Other Relevant Laws, from Class 1 Modification for quarter ending December 31, 1998
Appendix 3A	325 HWTUs Waste Analysis Plan from Class 1 Modification for quarter ending December Engineering Drawings
Appendix 7A	Building Emergency Plan for the 325 HWTUs, from Class 1 Modification for quarter ending June 30, 2001

Modification Class: [1 2 3]	Class 1	Class [1]1	Class 2	Class 3
Please check one of the Classes:	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions

1. Administrative and Informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
A.K. Ikenberry	Date 6-25-02	R.F. Christensen	Date 6/26/02	F. Jamison	Date	L.E. Ruud	Date

[1] Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, *if appropriate.*

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **325 Hazardous Waste Treatment Units**	Permit Part & Chapter: **Part III, Chapter 6 and Attachment 36**

Description of Modification:

Chapter 7.0: Replace Chapter 7.0 with the attached Chapter 7.0.

Modification Class: [1 2 3]	Class 1	Class[1] 1	Class 2	Class 3
Please check one of the Classes:	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions
   1. Administrative and Informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
[signature]	6-25-02	[signature]	6/26/02				
A.K. Ikenberry	Date	for R.F. Christensen	Date	F. Jamison	Date	L.E. Ruud	Date

[1] Class 1 modifications requiring prior Agency approval.

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[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification
Part III, Chapter 6 and Attachment 36
325 Hazardous Waste Treatment Units

Replacement Section

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Chapter 7.0

CONTENTS

EXHIBITS

TABLES

7.0 BUILDING EMERGENCY PROCEDURE RPL BUILDING

7.1 GENERAL INFORMATION

The Radiochemical Processing Laboratory (RPL), (325 Building) Building Emergency Procedure (BEP) has been designed to provide information necessary to minimize risks to personnel, facilities, programs, and the environment in the event of an emergency. This procedure applies to all resident staff, visitors, vendors and contractor/subcontractor personnel. If an event is of a security nature (bomb threat, hostage situation, or other act of violence), security procedures may supersede this procedure; this will be assessed on a case-by-case basis.

This facility contains both radioactive and hazardous materials in operations, storage, and handling. The RPL Facility poses a possible significant hazard to adjacent facilities, personnel, programs and the environment.

This BEP includes the contingency plans and emergency procedures for hazardous waste management activities as referenced by the Washington Administrative Code (WAC) [173-303-340, -350, and -360]. This plan must be implemented whenever an emergency threatens human health and the environment.

Emergencies may arise from, but are not limited to the following:

- fire
- explosion
- loss of service systems
- a medical emergency
- bomb threats
- criticality
- criminal activity
- incidents at other facilities
- natural hazards or natural forces
- spill/release to the environment requiring assistance
- hazardous materials release.

Expected responses are those actions, which are intended to minimize the effects of a situation while providing optimum protection to personnel. Expected responses include notification to the PNNL Single-Point-Contact (SPC), Building Manager (BM), Building Emergency Response Organization (BERO) and personnel in the facility. This procedure also provides plans for notifying personnel to take safe actions, such as "Take Cover," "Evacuate" or other planned actions dictated by the event. The procedure provides for formal notification and reporting.

Other emergency response agencies available to assist the Building Emergency Director and Incident Commander from offsite are described in Hanford Facility RCRA Permit, Attachment 4, DOE/RL 94-02, Section 3.0. [WAC 173-303-350(3)(c)]

The BED will provide BERO members BEP training annually. The BED and Alternate BEDs will receive annual training by the PNNL Emergency Preparedness office.

The policy of PNNL is to provide for the safety of its staff, contractor/subcontractor personnel, visitors, and members of the public in case of an emergency incident. PNNL Line Management has the responsibility to execute this policy and to see that all staff understand their responsibilities and know the action to be taken in an emergency. Every staff member is responsible for doing his or her job by using the appropriate safety instructions and procedures, and to remain alert to unsafe conditions or acts. All personnel are responsible for responding to emergency conditions to minimize adverse impacts.

In the event of an emergency condition in the facility, members of the RPL BERO will perform their duties as described in this procedure. Specific emergency actions for response to events will be applicable as specified in this BEP. Those BERO members whose assistance is needed to mitigate a lesser event will be notified by telephone or personal contact by the BED or a delegate. Occupants of the facility who are not members of the BERO shall follow the standard PNNL Emergency Preparedness requirements (http://sbms.pnl.gov/standard/83/8300t010.htm).

The building fire alarm is the primary means of notification for an event that requires full activation of the BERO. Emergency telephone numbers are listed in Exhibit 12.2.

This procedure will be reviewed at least annually and amended if necessary or whenever any of the following occurs [WAC 173-303-350 (5)]:

- The applicable regulations or the HWTU's permit is revised
- The procedure fails in an emergency.
- The facility changes in a manner that materially increases or decreases the potential for fire, explosions, or release of hazardous waste or hazardous waste constituents, or in a way that changes the response necessary in an emergency.
- The emergency coordinating personnel list changes.
- The emergency equipment list changes.

7.1.1 Facility Name/Identification

Name: Radiochemical Processing Laboratory (RPL), 325 Building.
Address: Cypress St., 300 Area
Richland, WA 99352

EPA Generator Identification Number: WA 7890008967

7.1.2 Facility Location

The RPL Facility is in the southern portion of the 300 Area, East of the 329 Building and West of the 308 Building.

7.1.3 Owner/Operator

The RPL Facility is owned/operated by DOE-RL and co-operated by PNNL. The primary research organization in the RPL is the Radiochemical Science and Engineering Group (RS&EG) from the Environmental Technology Directorate (ETD). The Manager of the RS&EG is also the RPL Manager (senior Line Manager in the RPL) and is ultimately responsible for every aspect of operations in the RPL. Facilities and Operations, through the Building Manager, support operation and maintenance of the facility. The Building Manager is the primary Building Emergency Director (BED).

7.1.4 Facility Description

The RPL as referred to in this BEP consists of the RPL Building and the East Storage Yard located East of the RPL Building.

The RPL Building houses laboratories and specialized facilities including general-purpose chemical laboratories, high-level radiochemistry facility, shielded analytical laboratory, fissionable material storage areas and 325 Hazardous Waste Treatment Units (HWTUs) (Rooms 32, 200-203, 520, 524, and 528). The general-purpose laboratories characterize fuel, single and double-shell tank waste, environmental samples, fusion/tritium samples, and other wastes. The radiochemistry facility includes areas for glove boxes, hot cells, cask handling, storage and the isolation of isotopes for unique applications like medical use. Analytical laboratory operations are conducted on small amounts of highly radioactive materials such as samples of single-shell tank waste. The Hazardous Waste Treatment Facility treats hazardous, mixed, low-level and transuranic waste.

The East Storage Yard is a fenced enclosure adjacent to the east side of the RPL Building and is designated as an outdoor Radioactive Material Area (RMA).

7.1.5 Hanford Site Emergency Sirens/Alarms

SIGNAL	MEANING	ACTIONS
Gong/electronic chime/strobe light	Fire	Vacate building; proceed to staging area.
Steady tone on whistle, klaxon horn, or siren	Area Evacuation	Vacate building; proceed to staging area
Wavering siren or short blasts on whistle, klaxon horn, or siren.	Shelter (take cover)	Proceed to shelter or stay indoors. Close all exterior doors, turn off all intake ventilation (only if it can be done safely), and notify manager of whereabouts. Personnel in vehicles shall proceed to the nearest occupied facility and report to facility management.
AH-OO-GA horn (howler) or flashing blue light (in high noise areas)	Nuclear criticality	Run at least 100 feet from building; proceed to staging area.
Variable color (red, amber) light with ringing bell or whistle	Airborne Radioactivity or Area Radiation Monitor	Stop work activities; immediately exit the area; notify Radiological Control personnel.
Ringing of a red crash alarm telephone	Emergency communications	Lift receiver, do not speak, listen to caller, and relay message(s) to the BED and the building occupants.

Note: *Some signals may not be applicable to the building; however, they may be heard in other parts of* the Hanford Site. In the event of a "take cover" or "evacuation" alarm, the BERO will respond to the RPL lunchroom/lobby for BED direction.

7.1.6 Building-Specific Emergency Alarms

The following Local Alarms are located within Radiological Control Areas of the RPL Building. Facility staff that has unescorted access to Radiological Control Areas shall be cognizant of the response to these alarms. Staff/Vendors who are under escort shall follow the directions of their escort.

SIGNAL	MEANING	ACTIONS
Area Radiation Monitor (ARM) -------------------------------------- Various colored lights (red, amber) Various high pitch noises (bell, whistle)	Radiation in the vicinity of the monitor has exceeded the alarm set point	• Stop work • Alert personnel in the area • Exit the RCA that is monitored by the alarm • Notify an RCT • Notify the Building Manager • Notify the Single Point Contact (SPC) on 375-2400
Continuous Air Monitor (CAM) -------------------------------------- Rotating/flashing red light Various high-pitch noises (bell, whistle)	High level of airborne contamination	• Stop work • Alert others working in the area • Exit the area monitored by the alarm • Get into another breathing space • Notify an RCT • Notify the Building Manager • Notify the Single Point Contact (SPC) on 375-2400
Glove Box High Differential Pressure Alarm -------------------------------------- Steady high pitch whistle noise*	Potential loss of negative pressure in the glove box	• Stop work • Alert others in the area • Exit the immediate area • Notify an RCT • Notify the Building Manager • Notify the Single Point Contact (SPC) on 375-2400

*Note: <u>IF</u> a local audible alarm actuates as a result of a transient condition associated with a known work condition, <u>**THEN**</u> it is acceptable to wait 10 seconds for the alarm to reset before taking emergency actions. <u>IF</u> the alarm lasts longer than 10 seconds or the direct cause of the alarm is unknown, <u>**THEN**</u> immediately perform the emergency actions.

7.1.7 Coordination Activities with Local Emergency Responders

Interfaces and coordination with offsite agencies are in the planning, preparedness, response and recovery elements of the Hanford emergency management program. RL has developed and maintains agreements to formalize areas of understanding, cooperation and support with offsite agencies. These agreements are applicable to all Hanford facilities, including the RPL. Summaries of these memoranda of agreement (MOA) are given in Table 3-1 of the Hanford Emergency Management Plan (DOE/RL 94-02). Copies of the MOAs are provided in Appendix B of DOE/RL 94-02.

7.2 PURPOSE OF THE BUILDING EMERGENCY PROCEDURE

This procedure describes the processes and information necessary in the event of an emergency for the RPL BERO members to react to the emergency and to perform the following actions:

- Maximize safety, minimize risk to life, and provide prompt efficient treatment for injured persons.
- Provide all members of the BERO with an understanding of their roles and responsibilities in the event of an emergency.
- Minimize the effects on the health and safety of personnel, property, the environment, programs, and the public.
- Prompt internal and external notifications to the responsible authorities.

7.2.1 Distribution

Controlled copies of the BEP will be located in the following areas:

- BED Emergency response bag
- RPL Power Operator Office (Room 900)
- Building Manager's file
- EP Program Office
- PNNL Control Room
- Hanford Emergency Operations Center (Hanford Site facilities only).
- Management Support Group Emergency Response Bag.

Uncontrolled copies of the BEP may be viewed via the PNNL Facilities and Operations website at http://facilities.pnl.gov/building/buildinginfo.html.

7.2.1.1 Making Changes to the BEP

Section 8.1.3 of PNNL-MA-110 requires the BED to keep the Emergency Preparedness Office (EPO) advised of all changes in the Building Emergency Response Organization. This may be accomplished by memo to the EPO. The Hazardous Waste Treatment Unit (HWTU) Permit Coordinator and RCRA Subject Matter Expert are also required to be notified before any changes are made to the BEP.

7.3 BUILDING EMERGENCY RESPONSE ORGANIZATION

The RPL Building Emergency Response Organization (BERO) is an emergency response organization with clearly defined responsibilities. The BERO consists of pre-designated and trained individuals who have been assigned emergency response activities associated with RPL. In addition, other positions in RPL have responsibilities associated with emergency responses and preparedness.
Line Management

The responsibilities of Line Management include the following activities:

- keeping the BED informed of changes in programmatic activities that could affect an emergency event
- providing or verifying that your staff are trained as specified in PNNL-MA-110, Section 8.4.1
- providing training for unescorted visitors for whom you are responsible, as specified in PNNL-MA-110, Section 8.4.7
- keeping the BED and Zone Wardens informed of any staff member assigned to RPL who has a physical disability
- being familiar with the SBMS subject area "Injury or Illness."

Line management has the responsibility to ensure that each PNNL staff member annually reviews this RPL Building Emergency procedure and documents the review with their Training Coordinator.

7.3.1 New Staff Assigned to RPL

All new assignees to the RPL Facility shall complete initial training within 10 working days of assignment. All temporary personnel with unescorted access are required to receive this training before beginning work in the RPL Facility.

7.3.2 Individual Staff Member Responsibilities

Announce and activate the appropriate alarm and notify management upon observing an emergency. Read and understand the Building Emergency Postings and BEP. Become familiar with the BEP homepage and the Emergency Preparedness SBMS Subject Area. Avoid exposure to harmful and life-threatening conditions. If it can be done safely, secure classified documents and electronic storage media (ESM) before leaving limited areas. If this cannot be done without endangering your self, take the classified documents and ESM with you, if time permits. Inform the BED and then call 375-2400 to report an incident of security concern. Report to the staging area. Provide the BED with any information to assist in evaluating the emergency condition. Remain at the Staging Area and follow the instructions of the BED. Wear your individual Emergency Preparedness Information Card.

7.3.3 Facility Visitor Responsibilities

The safety of building visitors is the responsibility of the facility host, who shall ensure that visitors are provided a safe and orderly evacuation. The facility host will report the visitor status to the Staging Area Supervisor as soon as is practical after the evacuation.

7.3.4 Supervisors/Manager Responsibilities

Account for all staff members. Report missing or injured members to the Staging Area Supervisor and if requested, assist the Staging Area Supervisor.

7.3.5 Unique Program Laboratory Expertise

The technical knowledge of specific programs/laboratory activities is usually known by the laboratory occupant or program manager. When applicable, Cognizant Space Managers, Alternate Cognizant Space Managers, and Team Leads may be contacted in regards to Emergencies or Off-Normal Events in assigned laboratories. Hazard Awareness Summaries containing this information are posted throughout the facility.

Rooms/Areas 43, 44, 45, 63, 64, 517, 529, 601, 603, and East Storage Yard are less than 90-Day Radioactive Hazardous Waste Accumulation Areas. The treatment, storage, and disposal (TSD) consists of the following rooms/areas: 32, 200, 201, 202, 203, 520, 524, and 528.

These rooms may contain significant quantities of hazardous waste for short periods of time. This waste can be radioactive, toxic, corrosive, ignitable, reactive, carcinogenic, or environmentally persistent according to the WAC [WAC 173-303].

No one will enter these rooms without permission from one of the individuals whose names are posted on the door.

Wastes stored in these rooms could have significant environmental or health hazards. Incidents involving any of these locations will require hazardous materials expertise by the responders.

7.3.6 Environment, Safety, and Health Advisors Responsibilities

Provides guidance for establishing safety requirements for mitigation and recovery actions, which include coordinating any support needed from other disciplines of the PNNL Environment, Safety and Health (ES&H) Directorate (i.e., Environmental Compliance Representatives, Radiological Control, Industrial Hygiene, and Field Service Representatives [FSR]).

The Environmental Compliance and Field Services Representatives conduct activities within specific Hazardous Waste Management Activity Areas and provide support to the BED in case of an emergency. The Environmental Support Contact (375-2966) will provide any necessary notifications to regulatory agencies such as the Washington State Department of Ecology and ensure that required written reports to regulatory agencies are completed within 15 days of event termination.

7.3.7 Building Emergency Directors and Alternates

7.3.7.1 Building Emergency Director

The BED has responsibility for the welfare and safety of the building personnel and for directing efforts to control, evaluate, and terminate the event if the building is the site of an event. The BED performs duties of the Emergency Coordinator as prescribed under [WAC 173-303-360] until relieved by the Incident Commander, and has the authority to commit the resources needed to carry out the BEP.

The BED manages facility operations and personnel during an emergency and is responsible for implementation of appropriate emergency procedures and their follow up 24 hours a day. The BED has the authority to commit the resources necessary to carry out emergency plan activities. Activities include:

- directing configuration control over facility systems and components
- activating the BERO and allocating personnel to conduct facility-specific emergency response actions (including acting as or delegating duty as the Facility Operations Specialist [FOS] within the affected facility boundary)
- categorizing the incident and notifying the site contractor, SPC, and/or the Occurrence Notification Center (ONC)
- cooperating with the Environmental Management Services Department
- initiating establishment of a Management Support Group (MSG)
- reviewing the EAL criteria (RLEP-1.0-Appendix 1-PNNL.325 in the back of DOE -0223, Emergency Plan Implementation Procedures) and providing an initial EAL
- directing implementation of initial preplanned area/site protective actions
- performing the necessary steps in the "Building Emergency Director Checklist for Hazardous Facilities," Exhibit 12.4
- developing and transmitting event reports
- verifying the appropriate alarms are sounded when necessary

- acting as the IC and a member of the Incident Command Post (ICP) and providing information and assistance to the responding agencies as requested to mitigate the event.
- arranging care for any injured persons and contacting their line management
- notifying the HWTU permit personnel of any planned changes to the BEP
- verifying hazardous spill/release events are logged in the HWTU operating records
- providing a thorough turnover to the Hanford Site emergency responder (e.g., Hanford Fire Department, Hanford Patrol, etc.)
- maintaining emergency equipment
- verifying that the Environmental Support Contact will provide any necessary notifications to regulatory agencies such as the Washington State Department of Ecology and verifying that required written reports to regulatory agencies are completed within 15 days of event termination
- performing an annual review and update of the BEP
- informing the Emergency Response Organization of any changes in RPL BERO staff.
- being thoroughly familiar with the following:
  - the RPL Building Emergency Procedure
  - all operations and activities
  - locations and characteristics of waste handling
  - locations of all records
  - physical layout of the building and area of responsibility.

7.3.8 Other Members of the Building Emergency Response Organization

7.3.8.1 Incident Command Post (ICP) Communicator

The individual responsible for completing and transmitting the Hanford Emergency Notification Form (Exhibit 12.12) to the ONC, phoning the POC at 911 to initiate a conference telephone bridge between the POC, ONC and ICP Communicator and conduct a line by line review of the Hanford Emergency Notification Form. Initiates and maintains a communication line between the Event Scene Liaison at the RL-EOC and the Incident Command Post (ICP). As a precautionary measure, the BED makes sure that this position is staffed for all events. Assures that the "ICP Communicator Checklist for Hazardous Facilities" is completed, Exhibit 12.5.

7.3.8.2 Assisting Communicator

Initiates and maintains a communication line with the Technical Support Representative in the RL-EOC and the ICP throughout the incident.. He/she ensures that the IC and BED are aware of all transmitted and received information. Also, performs as directed by the ICP Communicator.

7.3.8.3 Incident Command Post (ICP) Recorder

Records, in a time-line format, event related notifications and activities associated with the direction administered and information received by the ICP.

7.3.8.4 Management Support Group (MSG) Lead

The Facilities Operations Manager or his delegate will respond when requested by the BED, as the Management Support Group (MSG) leader. The MSG leader is responsible for the following:

- performing the necessary steps listed in the "Emergency Checklist for Emergency Management Support Group," Exhibit 12.10
- having applicable notifications made to PNNL and DOE-RL management
- having the event classified per established PNNL procedures
- providing senior management assistance to the BED as necessary
- assisting in handling communications and notifications
- obtaining personnel, supplies, and equipment as necessary.

7.3.8.5 Management Support Group (MSG) Recorder

Records, in a time-line format, event related notifications and activities associated with the direction administered and information received by the MSG.

7.3.8.6 Staging Area Supervisor (SAS)

The Staging Area Supervisor (SAS) will direct all activities at the Building Staging Area and is responsible for notifying the BED if all personnel are accounted for or if help is needed to locate or account for missing personnel. The SAS will also support the BED, if requested. (In the event of an extended building evacuation during inclement weather, the BED will identify an Alternate Staging Area.) During events requiring facility evacuation, the SAS ensures accountability of visitors by obtaining the PNAD sign-out sheet at the facility receptionist desk. The SAS completes the SAS checklist, Exhibit 12.7.

7.3.8.7 Zone Wardens

Zone Wardens provide the results of their accountability sweeps information to the BED via the SAS and assists as required in additional duties as determined by the BED. They determine if all personnel have left their assigned area by performing a thorough room-by-room search, if safe to do so (see Note below), including unoccupied spaces such as stairwells, corridors, elevators, closets, and other common areas. They determine if aid and/or rescue are required and aid those who may need help in evacuating the building. They see that disabled persons receive whatever assistance may be required for a safe and orderly evacuation, and they report the occupancy status of the assigned zone(s) to the SAS and note areas that could not be checked. The Zone Warden completes the Zone Warden Checklist, Exhibit 12.8.

NOTE: The function of the Zone Warden is to verify (when possible) that assigned zones have been evacuated as a means of assisting other emergency responders and to verify the locations of building personnel. The function of Zone Wardens does not include search and rescue; they are not obligated to enter any area they feel presents a hazard to them. Once the Evacuation Alarm is sounded, Zone Wardens should not enter any location in the facility where there are indications that a hazard may exist. The indications include such things as visible smoke, fire, unusual odors, local alarms, spilled chemicals, indications on the fire alarm supervisory panel, incapacitated personnel, etc. If a Zone Warden is not in the facility when the evacuation or take cover alarm is initiated, is a significant distance from their assigned zones, or has been isolated from their zone, they should report to the SAS at the Staging Area or ICP for instructions.

7.3.8.8 Facility Operations Specialist (FOS)

This individual, either the BED or his/her designee, is responsible to ensure that immediate mitigative actions that cannot be delayed without threatening human health and/or the environment are taken at the event scene. The FOS is responsible for meeting emergency responders at the event scene and providing information on event status and initial actions that are underway. This position will serve under the direction of the Hanford Fire Department/City of Richland Fire Department or Hanford Patrol Operations/Local Law Enforcement Chiefs, upon their arrival, and will provide facility expertise to support Operations Section activities. The FOS is responsible for implementing the Facility Operations Specialist check listed duties, Exhibit 12.11, and maintains a log of activities, conversations, and directives given and received.

7.3.8.9 Hazard Communicator

This individual maintains a log or assigns a log keeper to record all activities, including the date and time information was received or the time when an action was taken. They also provide the UDAC Hazards Communicator with incident scene radiological or chemical data as reported by Hazard Assessors. Respond to requests for information from the UDAC and ensures that requests for information are relayed to the Hazards Assessor(s) for response. The Hazard Communicator is responsible for implementing the Hazard Communicator check listed duties, Exhibit 12.13.

7.3.8.10 Hazards Assessors

There are two different Hazard Assessors. One deals with radiological assessments and the other deals with chemical assessments.

The Radiological Hazards Assessors are responsible for coordinating and ensuring accomplishment of radiological control functions throughout the scene. This position reports to the Operations Section Chief at any assigned location. The affected facility's radiological control manager or equivalent will fill this position. The Radiological Hazards Assessor is responsible for implementing Part 1, Radiological, of Exhibit 12.6 – ICP Hazards Assessor Checklist and maintains a log of activities, conversations and both directives given and received. Ensure that a log of RCT activities is maintained.

The Chemical Hazards Assessors position is filled by an Industrial Hygienist assigned to the HFD (HFD may use facility IH personnel if available until HFD IH personnel arrive), in support of the HFD HazMat Team HFD-Medical Staff, and HFD-Safety Officer who will provide technical expertise in chemical and toxicological hazard identification, evaluation, reactivity and dispersion modeling at the incident scene. The Industrial Hygienist may also serve as a chemical/decontamination Safety Officer, if designated by the IC. Activities will be conducted in accordance with this procedure and other internal HFD procedures as applicable. The Chemical Hazards Assessor is responsible for Part 2, Chemical, of Exhibit 12.6, ICP Hazards Assessor Checklist and maintains a log of activities, conversations and both directives given and received. This position may be staffed for non-declared, RCRA, and DOE declared emergencies as necessary.

7.4 IMPLEMENTATION OF THE BEP

The decision to implement the BEP should be made whenever unusual or emergency conditions exist that require the response of facility and/or emergency personnel and the establishment of an ICP. For RCRA events, the BEP must be implemented and the Washington State Department of Ecology notified, if all of the following criteria are met:

1. The event involves an unplanned spill, release, fire, or explosion;

AND

2a. The unplanned spill or release involves a dangerous waste, or the material involved becomes dangerous waste as a result of the event (e.g., product that is not recoverable)

OR;

2b. The unplanned fire or explosion occurred at a facility or transportation activity subject to RCRA contingency planning requirements;

AND

3. Time-urgent response from an emergency services organization is required to mitigate the event or a threat to human health or the environment exists.
    - Based on evaluation of the event, the BED or alternate will implement the BEP to the extent necessary to protect human health and/or the environment. The BED has the authority to commit the resources necessary to carry out the actions required by the BEP.
    - The BED will direct that additional checklists identified in the BEP exhibits be initiated and completed. When the materials and quantities involved in the incident have been identified, it should be possible to evaluate the magnitude of the hazard.

During an emergency event, the BED will take all reasonable measures to ensure that fires, explosions and releases do not occur, recur or spread to other dangerous waste in the facility. Measures include stopping processes and operations, collecting and containing released waste, and removing or isolating containers, as appropriate.

In any emergency, priority is given to protection of the health and safety of persons in the immediate area. Containment and cleanup are secondary objectives. When responding to minor spill events, onsite personnel will generally perform immediate cleanup of minor spill or releases using facility equipment. Remediation of such spills and releases would not normally constitute activation of the BEP. A spill or release of dangerous waste is considered "minor' if **ALL** of the following are true:

- The spill is either contained or, if outside a secondary containment, is minor in quantity (generally less than ten gallons of liquid or 100 pounds of solids);
- The composition of the material or waste is known and can be immediately determined from the label, manifest, MSDS, or other records;
- The spill does not threaten the health and safety of building occupants such that an area evacuation is necessary;
- Response personnel have appropriate training and equipment to expeditiously remediate the spill or release.

7.5 FACILITY HAZARDS

The RPL contains both radioactive and hazardous chemicals that pose a potential hazard to the public, adjacent facilities, personnel, programs, and the environment during an emergency. Because the location of hazardous materials and equipment within the facility can change on a frequent basis due to specific research needs, a variety of informational tools have been created and integrated into daily operations. These databases are designed to help maintain the safety of all individuals and the environment. Some of the tools available within the facility are the Map Information Tool (MIT), Chemical Management System (CMS), and Hazard Awareness Summaries.

7.5.1 Hazardous Materials

This facility contains hazardous material typically found in an industrial facility including:

- chemicals exhibiting one or more hazards such as corrosives, oxidizers, flammable solids and liquids, poisons, etc.
- radioactive materials
- hazardous wastes, including listed wastes and waste exhibiting one or more characteristics such as corrosivity, reactivity, ignitability, toxicity, and/or environmental persistence
- mixed wastes (wastes containing both radioactive and hazardous components).

Hazards associated with these materials vary depending on type, quantity, and concentration of the material(s) involved in the incident as well as the type of incident.

During an emergency, the PNNL Chemical Management System (CMS) may be consulted to determine the identity and quantity of hazardous chemicals located in affected areas of the facility. The listing of satellite and 90-day accumulation areas (available on the Environmental Management Services Department (EMSD) internal web page) is consulted to identify the location and type of wastes (hazardous and mixed) in the facility. For the 325 Building RCRA permitted unit, the inventory of waste stored is accessed through EMSD.

Arrangements for local response agencies (fire, police, medical, and emergency response teams) are required to assist in pre-emergency planning. These arrangements include familiarization with the properties of dangerous waste handled at the facility and associated hazards. PNNL Emergency Preparedness provides these coordination efforts, with input from individual BEDs and others as appropriate.

7.5.2 Physical (Industrial) Hazards

The RPL facility may contain chemical hazards such as corrosives, oxidizers, flammable solids and liquids, poisons, as well as industrial hazards such as high-voltage equipment, high temperature equipment, and overhead hazards. Refer to the Facility Use Agreement (FUA) and Chemical Management System (CMS) for specific details and limits.

7.5.3 Dangerous and Mixed Waste

See Section 5.1 above. Refer to the RPL MIT to identify the location of any dangerous mixed waste located in a specific room.

7.5.4 Radioactive Materials

See Section 5.1 above. Refer to the RPL MIT and FUA to identify if radioactive materials are located in a specific room.

7.5.5 Criticality

The RPL is a Hazard Category II non-reactor nuclear facility designed as a multi-purpose research facility. Fissionable materials are stored in various locations in the RPL, including the first floor storage room (Room 530), laboratories, and the East Storage Yard.

Storage of fissionable material uses a combination of mass, spacing, geometry, and moderation limits to provide criticality safety. An important criticality control element is through limiting the mass in storage containers so that even if two batches were inadvertently stored together, criticality would not occur.

The RPL Safety Analysis Report (SAR) analyzed various scenarios regarding potential criticality incidents. The nuclear criticality safety program administered within the RPL provides the administrative and physical controls necessary to ensure the possibility of a criticality event remains extremely unlikely. The criticality alarms for the facility are tested on a quarterly basis.

7.6 POTENTIAL EMERGENCY CONDITIONS AND APPROPRIATE RESPONSE

7.6.1 Facility Operations Emergencies

For an Off-Normal Event or Emergency Condition not specifically addressed, call the PNNL SPC on 375-2400. If an unknown facility condition includes, but is not limited to, the following: smoke, heat, vibration, or unusual sounds (such as hissing) direct staff to leave the area immediately and make the appropriate emergency notifications. The following guidance is offered for specific listed incidents:

7.6.1.1 Loss of Electrical Power

1. (Signal): NONE
2. Response/Action (If Time Permits)
   - Verify fume hoods and sashes are closed.
   - Verify equipment is shutdown.
   - Verify nuclear material(s) are secure.
   - Verify all hazardous materials are secure.
3. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the Limited Area (LA) or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."
4. If Standby Power Fails: Evaluate if an evacuation is advisable. If an evacuation is ordered, assemble at the Staging Area. Zone Wardens report to the Staging Area Supervisor.
   - *If personnel are wearing Personal Protective Equipment (PPE) clothing, or are suspected of being* contaminated, isolate them from other building occupants and request they be surveyed by Radiological Control Personnel. If possible, direct staff to discard PPE clothing outside exterior doors.
   - Zone Wardens and all Staff are to remain at the staging area unless otherwise directed/released by the BED.
5. If a total loss of power occurred with the potential for a spread of radioactive contamination, a radiological survey shall be performed prior to re-entry.

7.6.1.2 Major Process Disruption/Loss of Building Control

Information applicable to this emergency condition is found in Sections 6.1.1, "Loss of Electrical Power," 6.1.4.1, "Explosion," and 7.0, "Facility Take Cover – Shutdown of HVAC Systems."

7.6.1.3 Pressure Release

Information applicable to this emergency condition is found in Sections 6.1.4.1, "Explosion," 6.1.5.1, "Major Hazardous Material Spill/Release or Tank Spill," 6.1.9, "Radiological Material Release," and 6.1.12, "Area Evacuation."

7.6.1.4 Fire

1. (Signal): GONG/VIBRATONE/STROBE LIGHT
2. Response/Action (If time permits):
   - Verify equipment is shutdown
   - Verify doors/windows are closed.
   - Verify nuclear materials are secured.
   - Evacuate the building through the nearest exit that you can safely use.
   - Obtain all necessary information pertaining to the incident.
   - Initiate action to protect uninvolved hazardous waste if necessary.
3. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."
4. Assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.
   - Zone Wardens and all staff are to remain at the staging area unless directed/released by the Building Emergency Director.
   - If personnel are wearing PPE clothing, or are suspected of being contaminated, isolate them from other building occupants and request they be surveyed by Radiological Control personnel. If possible, direct staff to discard PPE outside exterior doors.
5. If you discover a fire, the following steps are to be performed:
   - Sound the alarm.
   - Notify PNNL Single-Point-Contact (SPC) 375-2400 and provide all known information, if the information can be obtained without jeopardizing personnel safety, include the following:
     - name and callback telephone number of person reporting the incident
     - name(s) of chemical(s) involved and amount(s) on fire, or otherwise involved in the incident
     - location of incident (identify as closely as possible and include information about multiple building numbers)
     - time incident began or was discovered
     - where the materials involved are going or might go, such as into secondary containment, under doors, through air ducts, etc.
     - source and cause, if known
     - name(s) of anyone contaminated or injured in connection with the incident
     - any corrective actions in progress.
   - Fight the fire, (if comfortable in doing so).

7.6.1.5 Explosion

1. (Signal): None
2. Response/Action
   - Pull Fire Alarm and notify nearby personnel of the emergency.
   - Immediately notify the Single Point-of-Contact at 375-2400 and provide all known information, if the information can be obtained without jeopardizing personnel safety, include the following:
     - name and callback telephone number of person reporting the incident

- o name(s) of chemical(s) involved and amount(s) involved in the incident
- o location of incident (identify as closely as possible and include information about multiple building numbers)
- o time incident began or was discovered
- o where the materials involved are going or might go, such as into secondary containment, under doors, through air ducts, etc.
- o source and cause, if known
- o name(s) of anyone contaminated or injured in connection with the incident
- o anyone else who the discoverer has contacted
- o any corrective actions in progress.

3. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."

4 Assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.

- If personnel are wearing PPE clothing, or are suspected of being contaminated, isolate them from other building occupants and request they be surveyed by Radiological Control Personnel. If possible, discard PPE outside exterior doors.
- Zone Wardens and all Staff are to remain at the Staging Area and follow the instructions of the Building Emergency Director.

7.6.1.6 Minor Hazardous Material Spill/Release (radioactive, non-radioactive, toxic, or hazardous material)

NOTE: A spill or release of dangerous waste is considered "minor" if **ALL** of the following are true. If not refer to the following section 6.1.5.1, Major Hazardous Material Spill/Release or Tank Spill.

- The spill/release is either contained or, if outside of a secondary containment, is minor in quantity (generally less than ten gallons of liquid or 100 pounds of solids).
- The composition of the material or waste is known and can be immediately determined from the label, manifest, MSDS, or other records.
- The spill/release does not threaten the health and safety of building occupants such that a building evacuation is necessary.
- Response personnel have appropriate training and equipment to expeditiously remediate the spill or release.

1. (Signal): NONE
2. Response/Action
   - Move personnel away from the substance.
   - Notify nearby personnel of the emergency.
   - Notify the PNNL Single-Point-Contact (SPC) 375-2400 and provide the following:
     - o name, location and callback telephone number of person reporting the incident
     - o name(s) of chemical(s) involved and amount(s) involved in the incident
     - o location of incident (identify as closely as possible and include information about multiple building numbers)
     - o time incident began or was discovered

- where the materials involved are going or might go, such as into secondary containment, under doors, through air ducts, etc.
- source and cause, if known
- name(s) of anyone contaminated or injured in connection with the incident
- any corrective actions in progress
- anyone else who the discoverer has contacted
- any known hazards
- where and when the chemical condition or spill occurred
- if any material was released to the environment (e.g., to a stack or sewer system)
- the status of the situation

• Prevent personnel exposure (e.g., set up barricades).
• Contact the Cognizant Space Manager (CSM).
• Notify the Safety and Health Representative.
• Take steps to contain the spill ONLY IF ALL THE FOLLOWING EXIST:
  - the identity of the substance is known
  - the hazards of the substance are known (flammable, toxic, radioactive, corrosive material) and can either be controlled or they do not present an immediate threat
  - appropriate protective equipment and control/cleanup supplies are readily available
  - the individual(s) performing the task have had training related to spill/leak control and can safely perform the action(s) without assistance, or assistance is readily available from other trained personnel.
• Do not attempt to clean up a spill if you believe that any of the following conditions exist:
  - the identity of the substance is NOT known
  - clean up activities may result in exposures to chemicals above established safety limits
  - the appropriate equipment, experience, or trained personnel are not available.
  - clean up may result in an uncontrolled release of a hazardous material from the building
• Consider performing the following actions:
  - build a containment of sorbent materials and restrict access
  - tighten closures, tip the container to stop the leak, use plugging or patching materials, or overpacking
  - transfer contents to appropriate non-leaking containers using appropriate procedures and tools (e.g., for ignitable materials, use non-sparking tools, bonding and grounding of containers, isolation of ignition sources, and use of explosion proof electrical equipment)
  - transfer the leaking container into an overpack container.

7.6.1.7 Major Hazardous Material Spill/Release or Tank Spill (radioactive, non-radioactive, toxic, or hazardous material)

1. (Signal): NONE
2. Response/Action
   • Move personnel away from the substance.
   • Notify nearby personnel of the emergency.
   • Notify the PNNL Single-Point-Contact (SPC) 375-2400 and provide the following:

- Name, location and callback telephone number of person reporting the incident
- name(s) of chemical(s) involved and amount(s) involved in the incident
- location of incident (identify as closely as possible and include information about multiple building numbers)
- time incident began or was discovered
- where the materials involved are going or might go, such as into secondary containment, under doors, through air ducts, etc.
- source and cause, if known
- name(s) of anyone contaminated or injured in connection with the incident
- any corrective actions in progress
- anyone else who the discoverer has contacted
- any known hazards
- where and when the chemical condition or spill occurred
- if any material was released to the environment (e.g. to a stack or a sewer system)
- the status of the situation.

- Prevent personnel exposure (e.g., set up barricades).
- If the spill threatens the health and safety of building occupants such that a building evacuation is necessary, pull the fire alarm.
- Contact the Cognizant Space Manager (CSM).
- Notify the Safety and Health Representative.
- Take steps to contain the spill ONLY IF ALL THE FOLLOWING EXIST:
  - the identity of the substance is known
  - the hazards of the substance are known (flammable, toxic, radioactive, corrosive material) and can either be controlled or they do not present an immediate threat
  - appropriate protective equipment and control/cleanup supplies are readily available
  - the individual(s) performing the task have had training related to spill/leak control and can safely perform the action(s) without assistance, or assistance is readily available from other trained personnel.
- Initiate actions to mitigate a tank spill/leak using trained personnel:
  - Stop the source of the leak if possible (shutting valves, turning off pumps, etc.),
  - prevent further additions of liquid to the tank,
  - visually inspect the tank system to determine the source of the leak,
  - within 24 hours remove as much of the liquid from the tank as is practicable to prevent further leakage,
  - remove any leakage contained in a secondary containment within 24 hours or as soon as practicable,
  - prevent any further leakage or migration of the leak to soils or surface waters.
- If the fire alarm was pulled, assemble at the Staging Area. Zone Wardens report to the Staging Area Supervisor.
- If personnel are wearing PPE clothing, or are suspected of being contaminated, isolate them from other building occupants and they be surveyed by Radiological Control Personnel. If possible, direct staff to discard PPE outside exterior doors.

- Zone Wardens and all Staff are to remain at the Staging Area and follow the instructions of the Building Emergency Director.

NOTE: Clean-up materials are located in specific laboratories.

3. If evacuated, assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.
4. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."

7.6.1.8 Dangerous/Mixed Waste Spill

Included in emergency response for Section 6.1.5, "Minor Hazardous Material Spill/Release" and Section 6.1.5.1, "Major Hazardous Material Spill/Release or Tank Spill."

7.6.1.9 Transportation and/or Packaging Incidents

1. (Signal): NONE
2. Response/Action
   - When a damaged shipment of hazardous material or dangerous waste arrives at the HWTU, the shipment is unacceptable for receipt under the criteria identified in the HWTU permit. Do NOT move the shipment.
   - The BED will evaluate the event and initiate appropriate actions for minor events/spills such as over packing damaged containers, re-labeling, tightening caps, etc, using facility expertise and equipment.
   - Treat any major release from the package as a hazardous material spill and perform response actions per Section 6.1.5.1, "Major Hazardous Material Spill/Release or Tank Spill."
   - Take actions to protect any uninvolved hazardous waste that may be threatened.

7.6.1.10 Unusual, Irritating, or Strong Odors

1. (Signal): NONE
2. Response/Action
   a. If potentially dangerous:
      - Activate Building Fire Alarm.
      - Notify the PNNL Single-Point-Contact (SPC) 375-2400.
      - Evacuate building to the Staging Area.
3. If evacuated, assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.
4. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."

NOTE: If an unusual odor is detected and the source is unknown, the Building Emergency Director will determine if the building should be evacuated.

7.6.1.11 Radiological Material Release

1. (Signal): NONE
2. Response/Action
   - Move personnel away from substance.
     - Notify nearby personnel of the emergency.
   - Notify the PNNL Single-Point-Contact (SPC) 375-2400 and provide the following:
     - Name and callback telephone number of person reporting the incident
     - name(s) of material(s) involved and amount(s) involved in the incident
     - location of incident (identify as closely as possible and include information about multiple building numbers)
     - time incident began or was discovered
     - where the materials involved are going or might go, such as into secondary containment, under doors, through air ducts, etc.
     - source and cause, if known
     - name(s) of anyone contaminated or injured in connection with the incident
     - any corrective actions in progress
     - anyone else who has been contacted.
   - Prevent personnel exposure (e.g., set up barricades).
   - If the release threatens the health and safety of building occupants such that a building evacuation is necessary, pull the fire alarm
   - Take steps to contain the release ONLY IF ALL THE FOLLOWING EXIST:
     - the identity of the substance is known
     - the hazards of the substance are known (flammable, toxic, radioactive, corrosive material) and can either be controlled or they do not present an immediate threat
     - appropriate protective equipment and control/cleanup supplies are readily available
     - The individual(s) performing the task have had training related to spill/leak control and can safely perform the action(s) without assistance, or assistance is readily available from other trained personnel.
   - Take action to protect any uninvolved hazardous waste if necessary.
   - If the fire alarm was pulled, assemble at the Staging Area. Zone Wardens report to the Staging Area Supervisor.
   - If personnel are wearing PPE clothing, or are suspected of being contaminated, isolate them from other building occupants and request they be surveyed by Radiological Control Personnel. If possible, direct staff to discard PPE outside exterior doors.
   - Zone Wardens and all Staff are to remain at the Staging Area.

NOTE: Clean-Up Materials are located in Specific Laboratories.

3. If evacuated, assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.

4. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."

7.6.1.12 Criticality

Criticality is an event, which is limited to a few specific facilities. This information is provided to all personnel entering a PNNL Nuclear Facility (RPL Building).

1. (Signal): HOWLER (ah-OO-gah)
2. Responses/Action
   - Leave the building immediately.
   - Run away from Alarm Sound/Building.
     1. Assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.
        - If personnel are wearing PPE clothing, or are suspected of being contaminated, isolate them from other building occupants and request they be surveyed by Radiological Control Personnel. If possible, direct staff to discard PPE outside exterior doors.
        - Zone Wardens and all Staff are to remain at the Staging Area and follow the instructions of the RPL Building Emergency Director
     2. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."

NOTE: Instrumentation and procedures shall be provided for determining the radiation dose levels at the staging area and in the evacuated area following a criticality accident. Information should be correlated at a central control point (Incident Command Post).

7.6.1.13 Reduced Ventilation Flows (due to normal power failure or exhaust fan failure)

1. (Signal): NONE
2. Response/Action
   - Verify fume hood sashes are closed.
   - Evacuate radiological control areas in an orderly manner.
   - Stage personnel in the main floor lunchroom/lobby.

3. After ventilation has been fully restored, perform surveys of the Radiological Control Areas (RCA) of the facility to ensure no loss of contamination control occurred prior to allowing unrestricted access to the RCA's.
4. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."

7.6.1.14 Area Evacuation

1. (Signal): STEADY SIREN (3 to 5 minutes)
2. Response/Action
   - Follow instructions; evacuate through the nearest safe exits.
   - Shut down equipment (if time permits).
   - Secure nuclear materials(s) (if time permits).
   - Direct personnel to remove PPE clothing prior to exiting the Radiological Control Areas, if possible. If not, have personnel discard PPE outside exterior doors, if possible.___."
3. If classified materials (documents, electronic storage media, test materials, etc.) are removed from the LA or left unsecured within the LA, inform the BED and then call 375-2400 and report that "there is an incident of security concern in Building ___, Room ___."
4. Assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.
   - Zone Wardens and all Staff remain at the Staging Area and follow the instructions of the Building Emergency Director.

7.6.2 Identification of Hazardous Materials in and Around the Facility

PNNL facilities contain both radioactive and hazardous materials that pose a potential hazard to the public, adjacent facilities, personnel, programs and the environment. Because the location of hazardous materials and equipment within the facility can change on a frequent basis due to specific research needs, a variety of informational tools have been created and integrated into daily operations. These databases are designed to help maintain the safety of all individuals and the environment. Some of the tools available within the facility are:

- Integrated Operations System (IOPS)– identifies the specific spaces an individual is authorized to access, the training requirements needed to access the space, and whether the requirements have been completed.
- Map Information Tool (MIT) – provides the capability to look up information about a specific room within the facility to identify all the hazards contained in that location. This tool also identifies evacuation routes, and emergency equipment locations
- Laboratory Handbook – contains reference use information and procedures to do work safely in facilities.
- Chemical Management System (CMS) – The Laboratory-wide Chemical Management System provides an effective way to track chemicals, ensure that safety and health information for each individual chemical in a given inventory is readily available and up-to-date, and to furnish an overall chemical management system.
- Hazard Awareness Summaries: provides a list of all spaces to which a user has been granted unescorted access. When the user clicks on a space, it brings the user to the Hazard Awareness

Summary that the Cognizant Space Manager (CSM) has created for the space. The Hazard Awareness Summary performs the following functions:

- communicates the hazards that are in the space to users of the space
- allows the CSM to communicate space specific information using the annotations field
- provides links to Handbook Work Practices related to each hazard
- provides links to SBMS information applicable to each hazard.

7.6.3 Natural Phenomena

Follow directions given by Crash Alarm telephone or Building Emergency Director.

7.6.3.1 Seismic Event

Follow directions given by Crash Alarm telephone or Building Emergency Director.

7.6.3.2 Volcanic Eruption/Ashfall

Follow directions given by Crash Alarm telephone or Building Emergency Director.

7.6.3.3 High Winds/Tornadoes

Follow directions given by Crash Alarm telephone or Building Emergency Director.

7.6.3.4 Flood

Follow directions given by Crash Alarm telephone or Building Emergency Director.

7.6.3.5 Range Fire

Follow directions given by Crash Alarm telephone or Building Emergency Director.

7.6.4 Security Contingencies

7.6.4.1 Bomb Threats or Suspicious Objects (e.g., suspicious objects, threats, sabotage)

1. (Signal): NONE
2. Response/Action
    - When condition is observed or bomb threat received, notify the PNNL SPC at 375-2400 or BED.
    - If necessary, clear the area of personnel.
    - Do not move any suspicious objects.
    - Post warnings, if applicable.
    - Provide emergency responders with appropriate information.
3. If a Telephone Bomb Threat is received, record the exact message and attempt to obtain the following information:
    - When will it go off?
    - Where is it located?

- What does it look like?
- What kind is it?
- Why was it placed?
- How do you know so much about it?
- Who put it there?
- Where are you calling from?
- What is your name and address?

NOTE: After receiving the information notify the PNNL Single-Point-Contact (SPC) 375-2400, give the information obtained from the caller and then notify the BED. If you receive a written bomb threat, notify the PNNL Single-Point-Contact (SPC) 375-2400 and provide the written bomb threat to PNNL Safeguards and Security Duty Officer.

7.6.4.2 Hostage Situation/Armed Intruder

1. (Signal): NONE
2. Response/Action
   - When condition is observed, notify the PNNL SPC at 375-2400 or the BED.
   - If necessary, clear the area of personnel.
   - Do not move any suspicious objects.
   - Post warnings, if applicable.
   - Provide emergency responders with appropriate information.

7.6.4.3 Handling Classified Material During Evacuation Events

1. (Signal): STEADY SIREN or FIRE/EVACUATION ALARM
2. Response/Action

   Follow instructions; evacuate through the nearest safe exit (Exhibits 13.1, 13.2, 13.3, and 13.4). If time permits,
   - Shut down equipment.
   - Secure nuclear materials or classified test articles.
   - Secure classified documents and electronic storage media (ESM) or take them with you. If you take classified documents with you or leave classified material unsecured within a LA, inform the BED and then call 375-2400 and report that there is an "incident of security concern in RPL Room _____."
   - If it is not possible to secure tests in progress, leave the classified test article in the Limited Area. Inform the BED and then call 375-2400 and report that there is an "incident of security concern in RPL Room _____."
3. Assemble at the Staging Area, located at the Lower South Parking Lot, North End of Lane #9 (Exhibit 13.4). Zone Wardens report to the Staging Area Supervisor.
   - Zone Wardens and all Staff remain at the Staging Area and follow the instructions of the RPL Building Emergency Director.
   - When the emergency event is over, staff and security personnel will confirm that the test article has not been compromised, and secure the test article.

7.7 FACILITY TAKE COVER - SHUTDOWN OF HVAC SYSTEMS

1. (Signal): WAVERING SIREN, CRASH PHONE MESSAGE
2. Response/Action
   - Stay inside the RPL Building.
   - Exit Radiological Control Areas in an orderly manner and report to the RPL main floor lunchroom/lobby.
   - If outside, take cover inside nearest building.
   - Remain in the lunchroom/lobby and follow the instructions of the RPL Building Emergency Director.
3. Building Emergency Director (BED) response

   Secure the facility HVAC system per procedure SOP 325-3, "325 Building Heating and Ventilation (HVAC) Emergency Shutdown," if there is a potential for a hazardous plume to be drawn in the building OR if directed to do so by the Patrol Operations Center (POC) via a Crash Phone message.

7.8 UTILITY DISCONNECTS

Utility Disconnects may be necessary under extreme emergency conditions. The RPL Building Emergency Director will determine if utility disconnects need to be disconnected/shut. Locations of the utility disconnects or values are described as follows:

7.8.1 Electrical

The RPL Building Main Electrical Control Center Switchgear is located along the central West wall in the basement. Extreme caution shall be used if disconnecting this power.

7.8.2 Potable/Process Water

The internal valves are located in the southwest corner of Room 22 in the basement. The external PIV (black standpipe PIV) is located outside at the southwest corner of the RPL Building.

7.8.3 Gas Supplies

The Acetylene, Propane, and P-10 Gas distribution systems are located at the northeast end of the North Gas Cylinder Dock. Turn cylinders off as directed by the RPL Building Emergency Director.

7.8.4 Steam

The high-pressure steam supply valves are located above the Power Operator's workstation entry door on the second floor East Equipment Room.

7.8.5 Air

The High Pressure Compressed Air supply valve is located at the northeast wall of the basement near the air receiver tank.

7.8.6 Ventilation

Facility Exhaust and Supply Fan Controls are located:

- in the Power Operator Workstation (Room 900)
- in the North part of the basement, just West of the elevator
- on the starter enclosure for each fan in the North Filter building.

The Manual Transfer Switches for the Main Exhaust Fans are located at the North side exterior of the North Filter Building.

7.8.7 Fire Protection Supply Water

Fire Suppression Supply Water Post Indicator Valves (Red PIVs) for Riser 1 through 5 are located outside the RPL Building in the following locations:

- Riser #1 PIV, is located at the northwest corner of the RPL Building by the 328 Building boiler annex.
- Riser #2 PIV, is located at the North area inside the fenced area South of the 328 Building.
- Riser #3 PIV, is located at the southwest corner of the RPL Building.
- Riser #4 PIV, is located southeast of the RPL-A annex.
- Riser #5 PIV, is located southeast of the RPL-A annex.

7.8.8 Dry Pipe OS&Y

The OS&Y valve for the Dry Pipe Fire Protection System on the North Gas Cylinder Dock is located on the second floor in the East Equipment Room at the North wall. Suppression water for this system is supplied from Riser #2.

7.9 TERMINATION, INCIDENT RECOVERY, AND RESTART

7.9.1 Termination

The Incident Commander in consultation with the RPL Building Emergency Director will recommend termination of the event when conditions indicate that it is safe to do so. Exhibit 12.14, "Emergency Closeout Checklist," should be completed before any recommendation is made to terminate a declared emergency.

7.9.2 Recovery

Depending on the circumstances of the event that caused activation of the BEP, a recovery team, consisting of the Incident Commander, RPL Building Emergency Director, and appropriate representation of all facility interests, will develop and recommend a recovery plan for restoring the facility to operable status. Emphasis will be placed on the careful cleanup of released material and contaminated debris to minimize further risk to personnel or the environment. All waste materials generated by the cleanup will be containerized in drums or other appropriate containers and stored in an approved storage area pending analysis, designation and determination of the final treatment/disposal requirements. The recovery plan will be reviewed, approved, and meet the requirements of PNNL-MA-110, Section 9.0, Termination, Re-entry, and Recovery.

The BED is responsible for ensuring that equipment is clean and fit for its intended use prior to resumption of operations. Equipment used during an incident will be decontaminated (if practicable) or disposed of as spill debris. Decontaminated equipment will be checked for proper operation prior to storage for subsequent use. Consumables and disposed materials will be restocked. Fire extinguishers will be recharged or replaced.

For emergency events involving the TSD or a 90-day accumulation area, the recovery plan will include the appropriate notification of the Department of Ecology and appropriate local authorities of recovery actions taken, prior to restart. The operator of the TSD will also provide written report to the Department of Ecology within 15 days after the incident.

7.9.2.1 Emergency Decontamination Facilities

The RPL Facility Personnel Decontamination Room is located in the RPL-A annex, room 606. Radiological Control Personnel are the only staff that may perform Personnel Decontamination. The decontamination shower in this room is out of service.

If an evacuation of the RPL Facility occurs and re-entry is not possible to decontaminate affected personnel, Radiological Control Supervision may use the 329 Building Personnel Decontamination Facility or transfer the contaminated staff to the Hanford Site Emergency Decontamination Facility.

7.9.2.2 Emergency Radiological Exposure Guidelines

In extremely rare cases, emergency exposure to radiation may be required to rescue personnel or protect major property. Emergency exposure may be authorized in accordance with the provisions contained in 10 CFR 835. The dose limits for personnel performing these operations are listed in Table 9.1.

The lens of the eye dose limit should be three (3) times the listed values. The shallow dose limit to the skin of the whole body and the extremities is ten (10) times the listed values.

Table 7-1 . Emergency Dose Limits

Dose Limit (Total Effective Dose Equivalent)	Activity Performed	Conditions
5 rem	All	
10 rem	Protecting major property	Only on a voluntary basis where lower dose limit not practicable
25 rem	Lifesaving or protection of large populations	Only on a voluntary basis where lower dose limit not practicable
> 25 rem	Lifesaving or protection of large populations	Only on a voluntary basis to personnel fully aware of the risk involved

7.9.3 Restart

Restart of the facility following emergencies will be conducted in a manner consistent with the recovery plan. Before operations are resumed in the facility, all emergency equipment used during the emergency event shall be cleaned and restored to a usable, operable condition. If the event involved a container storage area within the HWTU, the container storage and containment system should be evaluated before restart. If the event involved a tank system leak, repairs must be certified by an independent, qualified, registered professional engineer.

7.10 EMERGENCY EQUIPMENT

Support equipment available to assist in responding to an emergency can be found by referring to DOE/RL 94-02, Section 11.2, and the Hanford Fire Department emergency equipment listing in Appendix C of 94-02.

7.10.1 Fire Control Equipment

- Portable Class ABC Fire Extinguishers are located throughout the facility. Each Class ABC extinguisher is capable of suppressing fires involving ordinary combustible materials, flammable liquids, oils, paints, flammable gases, and fires involving electrical equipment. Class D extinguishers are located in areas vulnerable to Class D fires (e.g., dangerous waste storage room if reactive metals are stored). Manual dry chemical fire extinguishers are installed in the SAL hot cells and are available outside the HLRF A and B hot cells. The fire extinguisher locations are identified on the RPL Building Floor Plans (Appendices 13.3.1, 13.3.2, 13.3.3, 13.3.5, 13.3.6, and 13.3.7).

- The RPL is equipped with automatic fire detection and alarm system. Five wet pipe and one dry pipe sprinkler systems provide automatic fire suppression for the RPL.

    - A Mobile Command Post Vehicle can be obtained via Hanford Fire Department (HFD) main telephone number (373-2230). The HFD Battalion Commander will approve and dispatch the vehicle.

7.10.2 Communications Equipment/Warning Systems

- Fire Alarm Pull Boxes are located throughout the facility. The primary locations are at all Exits of the RPL Facility. All locations are shown on the RPL Building Floor Plans (Appendices 13.3.1, 13.3.2, 13.3.3, 13.3.5, 13.3.6, and 13.3.7).
- The Crash Alarm phone is located in Room 109, which is in the lobby area of the RPL Building.
- A Criticality Alarm System (CAS) is present in the building where fissionable material is handled. The system is equipped with neutron sensitive criticality detectors. The CAS alarms in locations where the expected dose from an accidental criticality may exceed 12 rads in free air. The system is tested and maintained in accordance with preventive maintenance procedures.
- Other non-emergency communications equipment installed at the RPL include (Note - These systems are not considered emergency equipment and may not be available during all types of emergencies):
    - public address system
    - commercial telephone system that may also be used to summon assistance during an emergency.

7.10.3 Personal Protective Equipment (PPE)

- Safety showers and eyewash units are installed at several locations throughout the facility, including waste storage areas. All locations are shown on the RPL Building Floor Plans (Appendices 13.3.5, 13.3.6, 13.3.7).
- Personnel protective clothing and respiratory equipment is available in the RPL facility for use during both routine and emergency operations. This equipment includes:

- chemically resistant suits, aprons, boots and gloves
- protective glasses
- chemical goggles
- face shields
- full face respirators with extra cartridges
- radiological clothing.

Kits containing a variety of radiation monitoring instruments, forms, and equipment are available for use in an emergency. PNNL maintains these kits, which contain protective apparel, instruments, and equipment for personnel decontamination and other immediate emergency needs. These supplies and equipment are to fulfill immediate needs only during the initial stages of an emergency.

7.10.4 Spill Control and Containment Supplies

Spill kits are located throughout the facility and are maintained by the Cognizant Space Managers. Additional spill kit materials can be obtained in Room 527. Supplies include absorbent materials for organic and inorganic liquids, diatomaceous earth for liquid waste spills, neutralizing agents for response to acid or caustic spills, containers and salvage containers (overpacks), brooms, shovels, and miscellaneous spill response supplies.

7.11 EVACUATION OF PERSONS WITH A DISABILITY OR VISITORS

The RPL Building Occupants shall be aware of disabled resident staff that may require assistance in evacuating the building. A Specific Evacuation Plan may be required for disabled staff. Alternate housing for staff that is sensitive to excessive hot or cold conditions (temperately disabled) may be required due to Emergency Response Actions. The Zone Warden, as part of assigned responsibilities, will ensure that disabled persons receive whatever assistance may be required for a safe and orderly evacuation.

NOTE: Alternate Staging Area – In the Event of an Extended Building evacuation during Inclement weather, the 3760 Building may be used for housing staff at the discretion of the Building Emergency Director.

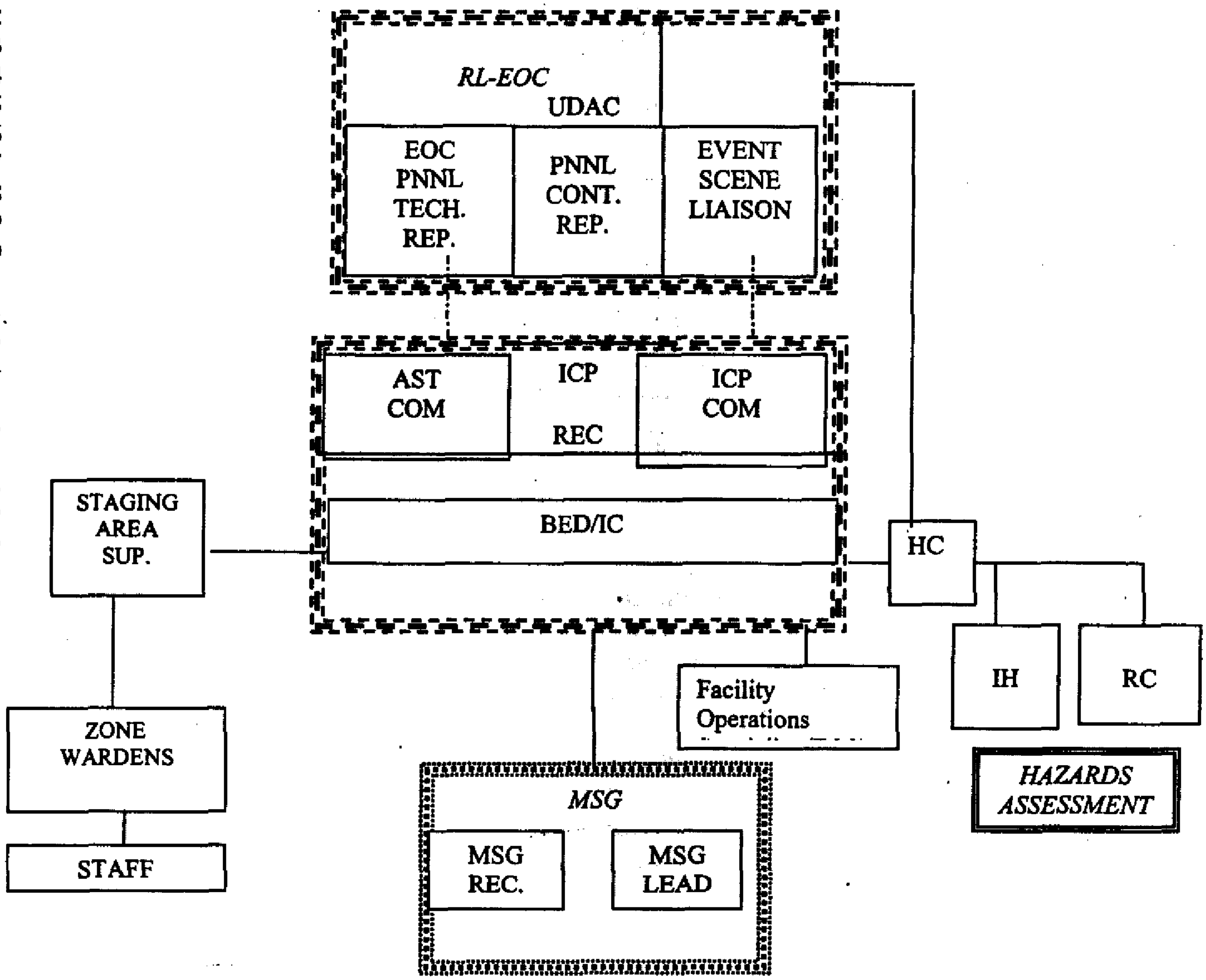
Staff who is planning to bring a disabled visitor to the RPL Building shall contact the RPL Building Emergency Director to determine if a specific evacuation plan will be required.

The safety of RPL Building visitors is the responsibility of the host, who shall ensure that visitors are provided a safe and orderly evacuation. The host shall report the visitor status to the appropriate Zone Warden as soon as practical, after the evacuation.

7.12 EXHIBITS

Exhibit 12.1 – Building Emergency Response Organization
Exhibit 12.2 – Emergency References
Exhibit 12.3 – (Formerly Drawings & Maps – moved to new Section 13)
Exhibit 12.4 – Building Emergency Director Checklist for Hazardous Facilities
Exhibit 12.5 – ICP Communicator Checklist for Hazardous Facilities
Exhibit 12.6 – ICP Hazards Assessor Checklist for Hazardous Facilities

7.12.1.1 Exhibit – BERO - EOC Interface



Legend

AST	Assisting	IH	Industrial Hygienist
BED	Building Emergency Director	MSG	Management Support Group
COM	Communicator	RC	Radiation Control
CONT	Contractor	REC	Recorder
EOC	Emergency Operations Center	REP	Representative
FOS	Facility Operations Specialist	SUP	Supervisor
HC	Hazards Communicator	UDAC	Unified Dose Assessment Cntr
IC	Incident Commander		
ICP	Incident Command Post		

7.12.2 Exhibit – Emergency References

ANY EMERGENCY PNNL SINGLE-POINT-CONTACT 375-2400	
Hanford Fire Department If Inoperable	375-2400 911
Hanford Ambulance If Inoperable	375-2400 911
Benton County Sheriff If Inoperable	375-2400 911
PNNL Duty Officer	375-2400
300 Area ONC	376-2900
Off-Normal Event Reporting	375-2400

7.12.2.1 Building Emergency Director

**Building Emergency Director/Emergency Coordinator (BED/EC)
and Alternates Emergency Telephone Numbers**
(If unsuccessful using numbers provided below contact
the PNNL Single Point Contact 375-2400)

RPL Building Emergency Director	
William (Bill) Buyers	376-5746
Cellular Phone	521-0343
Pager	546-3002
RPL Building, First Alternate BED	
Stanley L. Jones	376-7449
Cellular Phone	544-8499
Pager	546-6369
RPL Building, Second Alternate BED	
Glenn Buckley	373-0312
Cellular Phone	539-4712
Pager	85-9023

7.12.2.2 Zone Warden Assignments

Zone Warden Assignments		
Zone 1		
Rooms	200, 201, 201A, 202, 203, 209, 300, 301, 303, 305, 306, 308, 309, 310, 312, 313, 316, 317, 319, 319A, 320, 324, 325, 330, 327, 327A, 700, 701, 702, 703, and 705	
Primary	Randy Thornhill	376-6769
Secondary	F. Vaughn Hoopes	376-3089
Zone 2		
Rooms	400, 401, 403, 404, 405, 406, 409, 410, 411, 414, 415, 416, 419, 420, 421, 425, 426, 427, 430, 500, 501, 504, 504A, 505, 506, 507, 510, 511, 514, 515, 516, 517, 520, 524, 525, 527, 527A, 528, 529, 530, 706, 710 and 711	
Primary	Randall D. Scheele	376-0956
Secondary	Joel M. Tingey	376-2580
Zone 3		
Rooms	600, 601, 603, 604, 607, 608, 609, 610 and 611	
Primary	Clay O'Laughlin	376-0310
Secondary	Donald E. Rinehart	376-4337
Zone 4		
Rooms	34, 35A, 36,40, 40A, 40B, 40C, 42, 43, 43A, 44, 48 50, 50A, 52, 54, 57, 57E, 57W 58,90, 93, 94, 94A, 94B, 95, 96, 97, 97A, 98, and Basement Common Space adjoining these rooms	
Primary	Paul J. MacFarlan	376-5313
Secondary	Lauren (Shane) Loper	376-7302
Zone 4A		
Rooms	22, 22A, 22B, 23, 23A, 23B, 30A, 31, 31A, 32, 33, 55, 56, 60, 61, 62, 63, 64, 91, and Basement Common Space adjoining these rooms	
Primary	Lauren (Shane) Loper	376-7302
Secondary	Paul J. MacFarlan	376-5313
Zone 5		
Rooms	5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 25, 26, 27, 28, 70, 72, 74, 76 and 78	
Primary	Scott M. Tingey	372-2961
Secondary	Juai Jao	373-1181
Zone 6		
Rooms	905, 910, 911, 912, 914, 915, 917, 918, 919, 920, 921, 923, 924, 925, 926, 927, 928, 929, 933, 935, 937, 939, 968, and the South & West Equipment Rooms	
Primary	Larry R. Greenwood	376-6918
Secondary	Chuck Z. Soderquist	376-3773
Zone 7		
Rooms	930, 932, 936, 938, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 954, 955, 956, 957, 958, 960, 961, 964, 965, 967, and the East Equipment Room	
Primary	Sandy L. Kranwinkle	376-8412
Secondary	Katherine Carson	376-4299

Zone Warden Assignments		
Zone 8		
Rooms	101, 102, 102A, 103, 104, 104A, 105, 106, 107, 108, 109, 109A, 204, 205, 206, and the Men's Change Room & Lunchroom	
Primary	Jeff Rencken	376-2654
Secondary	Lewis H. Hogan	372-1427
Zone 9		
Rooms	110, 110A, 110B, 110C, 111, 111A, 112, 112A, 113, 114, 115, 116, 117, 118, 119, the Women's Change Room, Main Conference Room	
Primary	Tim Reining	376-0310
Secondary	Elena Hernandez	376-2251

7.12.2.3 Staging Area Supervisor and Alternates

Staging Area Supervisors		
	Name	**Phone**
Staging Area Supervisor	Teresa T. Schlotman	376-3206
First Alternate	Karla J. Smith	373-6481
Second Alternate	Robert Schumacher	376-9697

7.12.2.4 Emergency RPL Facility Contact Phone Numbers

In the event of an Emergency, specific detailed facility information may be needed. Knowledge of the Building, Utilities and Radiation Hazards can be obtained from the staff listed in Table 12.1. (Contact the PNNL Single Point Contact at 375-2400 if unable to contact these staff members using the numbers provided.)

Table 7-2 . Building, Utilities, and Radiation Hazards Emergency Contacts

Title	Name	Work Phone	Cellular & Pager
RPL Building Ventilation & Power Operations Supervisor	Don Janssen	376-1233	539-4007 85-9673
RPL Building Radiological Control Supervisor	Myra P. Long	376-2575	430-0879
RPL Facilities Project Manager	Jeff Rencken	376-2654	430-4992 85-5952
PNNL Single Point of Contact		375-2400	
Fire Protection Engineer (FPE)	Karl Bohlander	372-3177	85-5105
Industrial Hygiene/Occupational Safety	Michael W. Fullmer	376-1886	727-8246/ 85-7184
Waste Management			
90-Day Storage	Lauren S. Loper	376-7302	85-6320
TSDs	Wayne B. Larson	376-2483	85-8009
Low-Level Waste	David L. Kania	376-0481	530-0467

7.12.3 Exhibit – Building Emergency Director Checklist for Hazardous Facilities

The BED manages facility operations and personnel, and is responsible for ensuring implementation of appropriate emergency procedures. Activities include direct configuration control over facility systems and components, allocations of plant personnel to conduct facility specific emergency response actions (within the affected facility boundary), categorization and reporting of the incident, and directing implementation of initial preplanned area/site protective actions. The BED is responsible for completing the following check listed duties for non-declared, RCRA, and DOE declared emergencies as appropriate.

During declared emergencies, when an EAL classification has been made, the shaded duties are required to be implemented.

Maintain a log or assign a log keeper to record your activities, including the date and time information was received or time when an action was taken. The checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

IMMEDIATE ACTIONS

1. _____ Upon initial discovery/notification complete the following:

- Stop non-emergency activities in the event scene hazard area and monitor systems for potential secondary leaks or pressure buildup.
- Warn personnel in event scene hazard area.
- As information becomes available, identify the character, source, and amount of released material and evaluate the release situation.
- Initiate mitigation actions that cannot be delayed without threatening human health and/or the environment.
- Call 375-2400.
- Have the Single Point Contact (SPC) notify appropriate State or local agencies if their help is needed to mitigate the event.
- Have the Single Point of Contact (SPC) notify the PNNL Chemical Assessment Committee if Chemical assistance is needed.
- If available, assign and direct a facility knowledgeable person(s) to an upwind location to meet and collocate with arriving emergency responders and perform the Facility Operations Specialist (FOS) checklist.
- If a Facility Operations Specialist is not available, assign personnel to act as the facility point-of-contact at the incident scene hazard area and perform the FOS checklist.

NOTE: Immediate hazardous material responses are handled by the Hanford Fire Department for onsite facilities.

2. _____ Implement protective actions for facility personnel (i.e., take cover/evacuate).

- Assign door monitors as appropriate at access points during a take cover or facility evacuation, to inform personnel of potential hazardous conditions and to protect sensitive materials.
- Evaluate the situation and determine an appropriate staging area location outside any plume pathway.
- During an evacuation, assign staff (e.g., Zone Wardens) to monitor facility access points to prevent unauthorized reentry.

The BED (until IC arrives) may permit coordinated personnel movement during protective actions.

3. _____ IF there is a chemical/radiological release that immediately threatens nearby facilities:

- Initiate a take cover for the affected area, by calling 375-2400 or by calling the Patrol Operations Center (POC) at 911 (if using a cell phone to contact the POC dial 373-3800).

Personnel arriving at Hanford Patrol access control points will be required to obtain BED (until IC arrives) approval and safe routes of travel before being allowed to proceed to the ICP.

- Direct the Hanford Patrol to isolate the affected area and relieve door monitors when appropriate.

4. _____ Provide location and recommended safe route to facility operations personnel meeting emergency responders.
5. _____ Establish an initial ICP and report location to the SPC 375-2400.

- Assign Communicator and begin assigning other initial ICS functions as required to meet the needs of the incident
- Assemble and brief the facility BERO and make initial assignments.
- Inform the SPC of the location of the Facility Operations Specialist (FOS).

6. _____ Refer to the facility EAL criteria (RLEP-1.0-Appendix 1-PNNL.325 in the back of DOE – 0223, Emergency Plan Implementation Procedures) for recognizing and classifying emergencies and/or event classification descriptions for event classification.
   IF the EAL criteria is met:

- Direct the ICP Communicator to implement checklist duties.
- NOTE: If the ICP Communicator is not available, delegate completion of the Hanford Emergency Notification form to the ONC and provide the necessary information.
- Ensure the POC has implemented onsite protective actions.
- Review items 1-9 on the Hanford Emergency Notification form once completed. Correct any discrepancies as necessary.
- Sign in approval block and note time of declaration of event classification.
- Return RL Notification form to ICP communicator for transmittal to ONC.
- Proceed to Step #7.

IF the EAL criteria is not met:

- Ensure the ONC (376-2900) is notified for evaluation of event against "not classified event" notification criteria. Review the appropriate occurrence reporting procedure(s) or process, for notifications, which must be completed within 30 minutes of discovery.
- Proceed to step #7.

7. _____ IF incident involves a spill, release, fire, or explosion, or exceeds environmental permits, <u>THEN</u> notify the Environmental Support Contact (EMSD) at 375-2966 or 375-2400 to initiate regulatory required notifications and follow your contractor specific spill/release

notification process or procedure. (Contact the SPC for a Prime Contractor specific single-point-of-contact if necessary).

8. _____ Provide initial briefing to IC and ICP personnel including:

- Potentially affected personnel
- Incident and facility conditions
- Notifications (environmental/emergency and person or agency contacted)
- Protective actions implemented
- Status of event classification
- Mitigation efforts underway
- Accountability status of facility personnel
- Status of injured, contaminated or exposed personnel
- Status of assigned ICS functions
- Status of shutdown equipment
- Status of current personal protective equipment (PPE).

> At the completion of turnover from the BED to the IC, the IC shall assume responsibility for command and control of the incident; the BED retains responsibility for classification until the EOC is declared operational.

FOLLOW-UP ACTIONS

9. _____ Ensure occurrence reporting requirements per the appropriate contractor procedure in accordance with HFID 232.1B, "Notification, Reporting, & Processing of Operations Information" are initiated.

10. _____Confirm that facility personnel accountability has been conducted and evacuated personnel have been moved to a safe location.

11. _____Coordinate the establishment of operations protocols with the IC based on the availability of personnel.

- Discuss location of Resource Staging Area.
- Assist IC in assigning other functional components of the ICP, as necessary.

12. _____Contact the SPC and direct the following:

- Inform the RL ICP Representative of facility incident status and location of the ICP.
- If the facility RL ICP Representative is not available, direct the SPC to contact the divisional on-call DOE representative listed in the Site Weekly On-Call Directory.
- If the Site Weekly On-Call List is not available, contact the ONC (dial 376-3030).

13. _____IF the IC directs you to conduct a turnover briefing with the SED, THEN dial 376-6185 and provide a briefing as previously outlined above.

14. _____For [redacted]

15. _____Upon RL-EOC becoming operational, transfer the responsibility for event classification and ensuring the implementation of onsite protective actions to the SED after providing turn over briefing.

16. _____Ensure the IC is kept informed on the status of facility personnel and activities.

17. _____IF any personnel are deceased, injured, contaminated, potentially exposed, or transported by ambulance and the RL-EOC is not activated,

    THEN notify the EDO, via the ONC (at 376-2900) to have the Health Advocate notified.

- Cellular telephone or radio users shall not use the name(s) or payroll number(s) of involved personnel.

18. _____IF any personnel are deceased, injured, contaminated, potentially exposed, or transported by ambulance and the RL EOC is activated:

    THEN verify with the Liaison Officer (EDO) at the ICP that the following notifications were made:

- Employee line managers
- Employee Health Advocate
- Cellular telephone or radio users shall not use the name(s) or payroll number(s) of involved personnel
- Refer to Exhibit 12.9, "Handling of Radiologically Contaminated/Deceased Worker Checklist"

19. _____Participate in ICP briefings as required (IC may have BED lead ICP briefings).

20. _____Discuss event reclassification with the IC and Liaison Officer (EDO), and provide recommendation to the SED (dial 376-6185) if warranted by incident conditions.

21. _____When the incident is stabilized, participate in a debriefing with the IC and take actions to return facility to normal operations.

    NOTE: Refer to Exhibit 12.14 "Emergency Closeout Duties" for checklist items to consider before any recommendation is made to terminate a declared emergency.

22. _____When incident is stabilized, refer to RLEP 3.4, Event Termination, Reentry and Recovery, to coordinate termination of the emergency.

23. _____Ensure all hazardous material generated is handled appropriately and that incompatible waste is handled or stored in the area until necessary cleanup has occurred.

24. _____Ensure the Environmental Support Contact is notified (375-2966) or (375-2400) to initiate EPA and Ecology notification if the event involved a hazardous material spill/release and that the event is logged in the HWTU operating record.

25. _____When the emergency event has ended, verify there has not been a compromise regarding an incident of security concern.

26. _____Verify re-entry into the facility is controlled by assigned staff (i.e. Zone Wardens) to check badging.

27. _____Ensure that any emergency equipment used during the emergency is cleaned and restored to a ready condition after the emergency is terminated and prior to operations being resumed in the facility.

28. _____If a facility that has reportable quantities of Special Nuclear Material (SNM) has been completely evacuated, then notify the on-call security representative who will contact the Manager, Safeguard and Security. A physical inventory of the SNM may be required before restoring normal operations to the facility.

29. _____Upon event termination, turnover a copy of all logs to the Liaison Officer or IC designee.

7.12.4 Exhibit – ICP Communicator Checklist for Hazardous Facilities

The ICP Communicator must ensure that the IC and BED are aware of all transmitted and received information. As a precautionary measure, the BED ensures that this position is staffed for all events, however for the purposes of this checklist, the ICP Communicator is responsible for implementing the following check listed duties for non-declared, RCRA, and DOE declared emergencies, as appropriate. [redacted] Maintain a log of ICP communications to record activities, including date and time when information was received and time when actions were taken. The checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. _____ Upon notification, and after receiving safe routes of travel, respond to the ICP as soon as practical and receive incident status from the BED.

- Assist the BED with event communications.

2. _____ Get a current copy of Hanford Emergency Notification Form (RL-F-5540.1).

3. _____ Get current area meteorological data.

- Contact the Pacific Northwest National Laboratory Weather Station (373-2710 or 373-2716 – 24 hours Mon-Fri, 0600-1400 hrs on weekends/holidays).
- Record the wind speed (in miles/hour), direction (from/to), and stability class on the Hanford Emergency Notification Form.
- If meteorological data is not available, enter the words "Not Available" in Section 8 of the Hanford Emergency Notification Form.
- Provide meteorological data to ICP Hazards Assessors.

4. _____ Complete items 1 – 9 of Hanford Emergency Notification Form, as known.

- [redacted]

NOTE: For DOE Alert level or higher declared events, Event Classifier reporting duties are no longer required.

5. _____ After BED approves the Hanford Emergency Notification Form, complete the following actions to transmit the information to the ONC:

- FAX completed Hanford Emergency Notification form to the ONC on 376-3781.
- Dial 911 and make notification of declared emergency (Cell Phone dial 373-3800)
- Wait for the POC to initiate the POC/ONC conference bridge, and provide the ONC Duty Officer the information listed in items 1 – 9 from the Hanford Emergency Notification Form.
- Confirm with POC that they are initiating onsite protective actions and the ONC is initiating offsite notifications.

6. _____ [redacted]

7. _____ Establish the ERO Communication Line.

- Dial 372-8145.
- Identify yourself as the ICP Communicator.
- When the RL-EOC Event Scene Liaison comes on the line you will hear a series of beeps.
- Serve as the ICP Communicator providing continuous incident status over the ERO Communication Line.

8. _____ [redacted]

9. _____ [redacted]:

- Protective actions implemented by facility.
- Protective action requested of other organizations (i.e., HPD, HFD).
- Incident conditions.
- Mitigative actions.
- Injured, deceased, contaminated, or potentially exposed personnel, and personnel transported by ambulance.(only identify individuals by name when using a hard line telephone system).

10. _____ [redacted]

11. _____ [redacted]

- Most resource requests should be provided to you to pass over the communication line, however, other ICP functions (i.e., Logistics, Planning) may make resource requests over this line if necessary.

12. _____ [redacted]

13. _____ [redacted]

[redacted]

7.12.5 Exhibit– ICP Hazards Assessor Checklist for Hazardous Facilities

This checklist has two parts: 1) Radiological Hazards Assessor and 2) Chemical Hazards Assessor.

7.12.5.1 Part 1, Radiological

The Radiological Hazards Assessors are responsible for coordinating and ensuring accomplishment of radiological control functions throughout the scene. This position reports to the Operations Section Chief at any assigned location. The affected facility's radiological control manager or equivalent will fill this position. The Hazards Assessor is responsible for implementing the following check listed duties for non-declared RCRA and DOE Declared emergencies, as appropriate[redacted]. Maintain a log of your activities (include date and time), conversations and both directives given and received. Ensure that a log of RCT activities is maintained. The checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. _____ Upon notification, and after receiving safe routes of travel, report to the assigned location.

Specifically request the location and any pertinent information related to personnel who may have received a radiological exposure.

2. _____ Ensure the following initial tasks are completed:

- Perform initial assessment of hazards (i.e., source term identified, stack samples collected)
- Estimate boundary of plume
- Identify radiological constituents
- Coordinate PPE requirements for personnel entering plume
- Assist in development of monitoring requirements to detect radiological material
- Understand known radiological and weather conditions
- Consider physical source term (steam, pressure systems, etc.).

3. _____ Establish monitoring to ensure initial and ongoing personnel radiological safety throughout incident scene.

- This should be discussed with the ICP (Hanford Fire Dept.) Safety Officer.
- Monitor emergency worker exposure.
- Evaluate and determine need to perform habitability surveys throughout the incident scene. Habitability may include dose and contamination surveys, and if applicable, a high volume air sample. Inform the Operations Section Chief of habitability survey
- results and recommend moving any resources out of an area that is above background.

4. _____ Ensure that RCT resources are available to the Operations Section Chief to perform ingress and egress surveys as required.

- For additional RCT resources, contact the on-call Radiological Control Manager via the PNNL weekly on-call list.

5. _____ Support survey teams as required, providing safe routes of travel, recommended PPE, and necessary monitoring equipment.

6. _____ Under the direction of the Operations Section Chief, ensure that RCTs are available to control access, monitor for, and post the boundary of the radiological plume within the affected facility. If a plume is found, assure appropriate grab air samples are taken.

- If the release is projected to go beyond the affected facility boundary, the event has likely required an RL-EOC activation, and will require implementation of RLEP 3.16, Hanford Plume Assessment, and Tracking.

7. _____ provide radiological control support for mitigation activities throughout the event's duration.

8. _____ ensure processing of potentially contaminated personnel inside the affected facility boundary.

- If the number of contaminated personnel exceeds available decontamination capability, initiate a response in accordance with RLEP 3.17, Large Group Survey Sort and Decontamination.
- If there is an injured and contaminated worker that needs transportation to a local hospital, ensure that the POC is notified. The POC will in turn contact the HEHF On-Call Physician to implement RLEP 3.18.
- If there is a contaminated/deceased worker, assure that a recovery and decontamination plan is developed as described in Exhibit 12.9 of the BEP.

9. _____ Provide radiological control support for contaminated and injured personnel (facility Radiological Control Technician is to accompany personnel to hospital in ambulance).

10. _____IF the incident involves a transportation incident on the Site,

    <u>THEN</u> attempt to locate shipping papers or manifests to ensure the contents of the shipment can be verified.

11. _____Review safety and health issues, concerns, and survey priorities with the survey team members.

12. _____Ensure the data received has been converted to factor in the efficiency of the instrument or measurement (i.e., cpm to dpm, and air samples in mCi/cc).

13. _____[redacted]

14. _____[redacted]

15. _____Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.5.2 Part 2, Chemical

Maintain a log of your activities (including date and time), conversations and both directives given and received. The checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. _____ Upon notification, and after receiving safe routes of travel, report to the assigned location.

Specifically request the location and any pertinent information related to personnel who may have received a chemical exposure.

2. _____ Support the Operations Section Chief to provide chemical monitoring for purposes of initial hazard evaluation ("size up") to ensure protection of emergency responders, ICP habitability, and to monitor habitability changes in the incident scene.

3. _____ Recommend and execute chemical sampling strategies for purposes of incident characterization, determination of employee exposure, and subsequent analysis of the incident.

4. _____ IF the incident involves a transportation incident on the Site:

   THEN attempt to locate shipping papers or manifests to ensure the contents of the shipment can be verified.

5. _____ Obtain a Material Safety Data Sheet (MSDS) for the involved chemical(s) and ensure a copy is provided to the HFD Medical Staff.

6. _____ In conjunction with the Radiological Hazards Assessor, make recommendations on respiratory protective equipment and other PPE for chemical and physical hazards to the ICP (Hanford Fire Department) Safety Officer.

7. _____ Support the HFD in the on-scene assessment and methodology for decontamination of ambulatory and non-ambulatory patients and/or equipment when the event involves chemical or mixed hazards.

8. _____ Recommend additional resource needs (IH support, equipment or PPE) to the Operations Section Chief.

9. _____ Address safety and health issues of emergency response team.

10. _____Communicate with the IC, BED, HazMat Team, Safety Officer and others as necessary.

11. _____Participate in ICP briefings as required.

12. _____[redacted].

13. _____Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.6 Exhibit – Staging Area Supervisor Checklist

The Facility Staging Area Supervisor is responsible for coordination of actions at the facility staging area. This position is staffed by a facility representative. The list below is not designed to be all encompassing, nor is it necessary to perform each of these actions in sequence. The Facility Staging Area Supervisor is responsible for implementing the following check listed duties for non-declared, RCRA, and DOE declared emergencies, as appropriate. Maintain a log of your activities or assign a log keeper, including the date and time information was received or time when action was taken. This checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. _____ Upon notification of an emergency event requiring facility personnel to evacuate, proceed to the 325 Building staging area with the appropriate tools and information to perform the Staging Area Supervisor duties. Obtain PNAD sign-out sheet at the receptionist desk when exiting the facility to provide an accounting of visitors to the facility.
2. _____ Verify through the BED that the staging area is in a safe location.
3. _____ Segregate personnel, who could be potentially contaminated, who did not survey when exiting RCA, or are in personal protective equipment (PPE). Direct RCTs to survey personnel.
4. _____ Collect Building Occupancy/Accountability status from Zone Wardens at staging area. (DO NOT re-enter the facility).
5. _____ Verify that the Zone 2 and Zone 8 Zone Wardens turned on the flashing red access warning lights identified in the Zone Warden Checklist.
6. _____ Query staff at staging area to determine if hazardous processes are on going in the facility and notify BED.
7. _____ Query staff at staging area to determine if there are any security issues. Have LA's and classified documents been secured prior to exiting?
8. _____ Determine if any personnel were injured or potentially exposed to hazardous materials. Communicate any positive responses to the BED.
9. _____ Contact the BED to determine if the Northwest corner of the RPL needs to be manned.
   - Assign a Zone Warden to man the Northwest corner of RPL if necessary to control re-entry to the facility.
10. _____Update personnel on the event status on a periodic basis.
11. _____If notified to evacuate, identify all personnel with vehicle keys in their immediate possession. Match up people with rides. Verify destination and route with each driver.
12. _____Use government vehicles to transport personnel in PPE, if required. Reserve vehicles for personnel with late shutdown duties.
13. _____In the event of an extended building evacuation during inclement weather, direct personnel to utilize the 3760 Building (old PNNL library) as the alternate staging areas.
14. _____Were there any disabled staff or visitors in the building that need assistance for exiting the facility.
15. _____Perform turnover with the fire department staging officer upon his arrival to cover all information listed above.
16. _____Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.7 Exhibit – Zone Warden Checklist

1. _____ Zone Wardens activate flashing red access warning lights in the following Zones:
   - Zone 2 – turn on the flashing red light that is mounted on the wall across from the elevator.
   - Zone 8 - turn on the flashing red light that is mounted on the cabinet to the right, inside the West shop door.
2. _____ For your zone determine if all personnel have left:
   - their assigned work areas in the facility
   - unoccupied spaces, such as stairwells, corridors, elevators, and closets.
3. _____ Perform a thorough room-by-room search (if safe to do so) to provide a high degree of assurance that the facility is free of personnel.
4. _____ Report the occupancy/accountability status to the Staging Area Supervisor and determine if aid or rescue is required.
5. _____ Ensure that disabled persons receive whatever assistance may be required for a safe and orderly evacuation.
6. _____ Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.8 Exhibit – Handling of Radiologically Contaminated/Deceased Worker Checklist

1. _____ Assure a plan is developed to assess victim(s) and surrounding area contamination levels, without compromising the event scene evidence.

2. _____ If the Emergency Operations Center (EOC) is activated, assure that victim and event scene data is communicated to the EOC and Unified Dose Assessment Center as described in RLEP 1.1. If not activated, assure that the victim and event scene information is communicated to the Patrol Operations Center (POC). Assure that the POC informs the Department of Energy Senior Management Duty Officer, on-call Hanford Site Occupational Medical Contractor (HSOMC) provider, line manager(s) for affected employee(s) or Health Advocate, and the appropriate points of contact for all other contractors.

3. _____ Upon the Coroners arrival, provide a briefing on radiological conditions and proper personal protective equipment required (if necessary) to enter the area of the victim(s).

4. _____ Discuss and implement a plan to decontaminate the victim with input from coroner, event contractor Human Resources, and Radiological Control as a minimum. The plan should consider the following factors:

   - Determine mutually agreeable level of decontamination (Non detectable or ALARA) Consider the residual radiation level 30 centimeters from the body, and/or where the radioactivity is found on or in the deceased worker.
   - Determine with assistance from the event contractor Human Resources if there are any societal, religious, and/or cultural implications.
   - Request input from the Radiological Control organization concerning the application of the NCRP 37 and 65 recommendations.
   - Consider the type and composition of casket and funeral (open or closed casket), if known.
   - Consider movement of deceased worker when appropriate.
   - Consider cold storage if decontamination cannot be readily completed.
   - Arrange for disposition and disposal of contaminated biological wastes.
   - Consider the radiological, biological, and other hazards to attending personnel.
   - Determine method(s) of decontamination (consider use of the Hanford Fire Department Mobile Decontamination Facility).
   - Evaluate the event investigation implications.

5. _____ Assure decontamination of the victim is completed in accordance with the decontamination plan.

6. _____ Move the victim to appropriate staging area if in a radiation or contamination area, while awaiting transportation to designated funeral home.

7. _____ Clean the area and handle, label, and dispose of the decontamination waste as biological hazardous material. The waste is disposed as radiological waste but labeled as biological hazardous material.

8. _____ Assure that the HEHF psychologist is notified and dispatched to address the workers who decontaminated the worker and were involved in the incident, if needed.

9. _____ Maintain a chronological log of all interfaces and activities. Collect and maintain copies of documentation and activity logs from the event.

10. _____Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.9 Exhibit – Emergency Checklist for Emergency Management Support Group

The Management Support Group will use the following checklist to support the BED in managing the administrative aspects of the event.

Item	Yes	No	Comment
Has 375-2400 been notified? (Use 375-9959 if 375-2400 is unavailable)			
Have all building occupants been accounted for? PNNL staff? PNNL visitors? Other Contractor personnel? Consultants, vendors, others?			
Have any persons received injuries or been subjected to conditions requiring medical attention? If Yes, has medical attention been arranged?			
Has the BED classified the event? Alert Site General			
Has activation of the EOC been requested?			
Do any persons require medication for non-event Reasons (e.g., heart medicine)?			
Has access control been initiated by the appropriate Law Enforcement Agency?			
Has the Area Operations Manager/Building Manager been notified? Has he reported to the event scene?			
Has a location for the ICP been established?			
Has location for the Management Support Group been established and communicated to the appropriate Fire Department, Law Enforcement Agency, and the PNNL Technical Rep. in the EOC (376-7148) (if activated)?			
Has an open line between the ICP Communicator and the Event Scene Liaison in the EOC been established?			
Has the Emergency Duty Officer made contact with the BED?			
Has the event log been set up?			
Is additional staff required for support? Line Management? Clerical? Technical? Other?			
Has the Incident Commander established a schedule for periodic briefings?			
Are additional RCTs required?			

Item	Yes	No	Comment
Is there a need for a facility inventory? Chemical-hazardous, toxic, flammable? Radio chemical? Nuclear or fissile material? If inventory information is required, contact the following: Chemical inventory – 376-0812 – 372-1043 or 375-6315 Nuclear/fissile – Safeguards & Security Duty Officer or Cognizant operations staff			
Has Public Relations been notified?			
Has DOE Headquarters been notified?			
Has EOC contacted other facilities not immediately involved?			
Is technical or operational spokesperson needed? If so, has he/she been contacted?			
Has Program Manager been notified?			
Will relief staff be required for the Incident Command Post (Event and Support Teams)?			
Is transportation needed? Available?			
Is there a need for additional equipment or supplies (including food)?			
Has PNNL Security made arrangements with Patrol for access of special equipment (radios, cellular telephones)?			
Has the need for facility HVAC system shutdown been analyzed?			
Do subgroups need to be developed to assist with special activities that may need to occur (e.g., identifying essential personnel, accountability, termination and recovery efforts, etc.)?			
Has the impact to all work or projects in PNNL facilities been considered if the work force is reduced to only essential personnel (e.g., rad work, security/classified work, etc.)?			
Has the necessary line management been contacted to ensure research project equipment is in a safe condition?			
Is an event termination, recovery and reentry plan, checklists/procedures being developed?			
Has the necessary administrative support been acquired?			

Item	Yes	No	Comment
Has the following been planned for a partial evacuation (essential personnel only)? 1. Determining who is essential. 2. Identify the staging location for essential personnel. 3. Notify essential personnel to report to work (recorded message, EOC media release, direct phone call, etc.), route of access, staging location, and person to report to. 4. Communicate list of essential personnel to the POC (911 or 373-3800) 5. Controlling accountability and assignment of staged essential personnel.			
Are there adequate controls established to prevent unauthorized Building/Site access entry and/or work initiation?			
Has Line Management for Safeguard and Security been directed to reports to the Control Room (SPC)?			
Has consideration for establishing shifts of emergency personnel (EOC/MSG) been made?			
Are additional radiation instruments required? What type? How many of each type?			
Is the Hazardous Materials (HazMat) team needed?			

7.12.10 Exhibit – Facility Operations Specialist – Checklist Duties

The individual, when assigned by the BED, is responsible to ensure that immediate mitigative actions that cannot be delayed without threatening human health and/or the environment, are taken at the event scene. The Facility Operations Specialist (FOS) is responsible for meeting emergency responders at the event scene and providing information on event status and initial actions that are underway. This position is normally filled by the BED or his/her designee. The FOS is responsible for implementing the following check listed duties for non-declared, RCRA, and DOE declared emergencies, as appropriate. Maintain a log or assign a log keeper to record your activities, including time and date information was received or time when action was taken. This checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. _____ Obtain briefing on operational/mitigative activities and obtain any necessary facility specific procedures, utility disconnects, etc.
2. _____ Following BED briefing, and after receiving safe routes of travel, respond to a safe location upwind of the event scene.
   - Ensure personnel who were in the immediate area are accounted for and located in a safe, upwind area
   - Ensure that first aid is administered as-soon-as possible
   - Begin segregation of any contaminated personnel.
3. _____ Meet emergency personnel responding to the event scene and provide information on event status and initial actions underway. Collocate with the HFD/Hanford Patrol Operations Section Chief upon their arrival and act as the facility point-of-contact at the incident scene hazard area.
4. _____ Assist the HFD/Hanford Patrol Operations Section Chief with development of a mitigation plan by providing facility expertise.
5. _____ Identify, contact, and supervise additional facility personnel as required to Support Operations Section activities.
6. _____ At the direction of the BED, turn off the gas cylinders located on the North Gas Dock.
7. _____ Coordinate with HFD/Hanford Patrol Operations Section Chief to ensure that all facility emergency responders are wearing appropriate PPE for assigned tasks.
8. _____ Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.11 Exhibit –Hanford Emergency Notification Form

RL-F-5540.1
(06/00)

U.S. DEPARTMENT OF ENERGY
HANFORD EMERGENCY NOTIFICATION FORM

No. ____________

1 **NOTIFICATION PROVIDED BY:** Name: ______________________ Phone: (509) __________

2 **AREA AND FACILITY:** ______________________

3 **TYPE EVENT:** a. ☐ Emergency b. ☐ Exercise/Drill

4 **CLASSIFICATION/STATUS:**
a. ☐ Initial Classification b. ☐ Reclassification c. ☐ Termination d. ☐ PAR Change/Addition e. ☐ Information

5 **EMERGENCY CLASSIFICATION LEVEL AND PROTECTIVE ACTION RECOMMENDATIONS:**

AREA	a. ☐ ALERT EMERGENCY	b. ☐ SITE AREA EMERGENCY	c. ☐ GENERAL EMERGENCY
☐ 100K	Evacuate Columbia River from White Bluffs to Vernita Bridge.	Evacuate Columbia River from White Bluffs to Vernita Bridge.	• Evacuate Columbia River from White Bluffs to Vernita Bridge. • Evacuate Section 5, east of Hwy. 24.
☐ 200	None	Evacuate Columbia River from Vernita to Leslie Groves Park.	• Evacuate Columbia River from Vernita to Leslie Groves Park. • Evacuate Sections 5, 6, and 7.
☐ 300	None	Evacuate Columbia River from White Bluffs to Howard Amon Park.	• Evacuate Columbia River from White Bluffs to Howard Amon Park. • Evacuate 3 mile radius.
☐ 400	None	Evacuate Columbia River from White Bluffs to Leslie Groves Park.	Evacuate Columbia River from White Bluffs to Leslie Groves Park.
☐ Others	None	None	None

6 **TYPE OF INCIDENT:** *check all that apply*

a. ☐ Fire b. ☐ Explosion c. ☐ Radiological d. ☐ Security e. ☐ Hazardous Materials f. ☐ Electrical
g. ☐ Other

EAL No.: DOE-0223, RLEP 1.0, Appendix 1-____________ Table ________

Description of Incident: ______________________

7 **RELEASE INFORMATION:**
a. ☐ No Release
b. ☐ Airborne Release
c. ☐ Spill
d. ☐ Release to Columbia River
e. ☐ Unknown
f. ☐ Release Terminated

Estimated Start Time of Release ____________

Assumed Duration of Release ____________

8 **METEOROLOGICAL DATA:**
Wind Speed ________ mph
Wind Direction: from ________ toward ________
Precipitation: ☐ Yes ☐ No
Stability Class:
A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐

9 **PROGNOSIS OF SITUATION:**
a. ☐ Unknown b. ☐ Stable c. ☐ Escalating d. ☐ Improving

FOR EOC USE ONLY

10 **ADDITIONAL OFFSITE PROTECTIVE ACTION RECOMMENDATIONS:**
____

11 **BASIS FOR ADDITIONAL OFFSITE PROTECTIVE ACTION RECOMMENDATIONS:**
a. ☐ Security c. ☐ Hazardous Materials Release
b. ☐ Facility Condition d. ☐ Other ____________

APPROVED: ____________ DATE: ________ TIME: ________

7.12.12 Exhibit –Hazards Communicator – Checklist Duties

[redacted]. Maintain a log or assign a log keeper to record your activities, including date and time information was received or time when action was taken. The checklist is not meant to be performed step-by-step, but is to be used as a reference document, as appropriate to the incident.

1. _____ [redacted]
   - This line is not required to be continually open.

2. _____ [redacted]

UDAC uses the data to refine calculations for offsite impacts. This data is vital for refining consequence assessments to determine if additional onsite and offsite protective action recommendations are required.

3. _____ [redacted]

4. _____ Upon event termination, turn over all logs to the Liaison Officer or IC designee.

7.12.13 Exhibit – Emergency Closeout – Checklist Duties

The following emergency closeout check listed items are to be referred to by the BED, Operations Section Chief, FOS, and the IC before recommending termination of a declared emergency.

Criteria	Criteria Met Date/Time or NA
1. Initiating Condition is (circle one): (a) stabilized (b) corrected	
2. Radiation or hazardous material exposure levels within the affected facility are corrected, stable or decreasing with time.	
3. Fires are extinguished, flooding conditions are under control.	
4. Damage to facilities and/or process-related systems and equipment are stabilized or corrected.	
5. Injured personnel have been properly treated and/or transported to medical facilities.	
6. Check with Cognizant Space Managers to determine if operations of a hazardous nature were in progress at the time of the evacuation. If so, coordinate with the Safety Advisor and determine the actions necessary before a general staff re-entry occurs.	
7. Fire, flood, earthquake, or similar emergency conditions no longer constitute a hazard to critical systems/equipment or to personnel.	
8. Security of the affected facilities is controlled. **NOTE:** **IF** a facility that has reportable quantities of special nuclear material (SNM) has been completely evacuated, **THEN** notify the on-call security representative who will contact the manager, Safeguards and Security. A physical inventory of SNM may be required before restoring normal operations to the facility.	
9. Release of hazardous material offsite or beyond controlled areas onsite have ceased or are controlled within permissible regulatory limits, and the potential for an uncontrolled release is low.	
10. Management agreement for termination of the emergency condition.	
11. Notification of emergency condition termination to PNNL Control Room.	
12. Upon facility re-entry, access control has been established to prevent inadvertent or uncontrolled entry into (1) the event scene and (2) areas that were contaminated during the event.	
13. Operators will ensure that the fire doors are open for remaining staff to re-enter the laboratories and office areas.	
14. Operations reviews current facility system conditions to determine if there is any significant system degradation and reports status back to the BED or IC.	
15. Operations performs a walk down of all mechanical level spaces looking for abnormal conditions and reports status back to the BED or IC.	
16. Existing conditions no longer meet the established Emergency Action Levels for the facility/site and it appears unlikely that conditions will deteriorate.	
17. Before operations are resumed, all emergency equipment used shall be cleaned and restored to a usable, operable condition.	
IC/BED ______________________ (Signature) ____________ (Date)	

7.13 BUILDING MAPS

Exhibit 13.0 – Evacuation Routes/Emergency Equipment Locations
Exhibit 13.1 – Evacuation Routes – 1st Floor
Exhibit 13.2 - Evacuation Routes – 2nd and 3rd Floors
Exhibit 13.3 - Evacuation Routes – Mezzanine and Basement
Exhibit 13.4 - RPL Staging Area
Exhibit 13.5 - Emergency Equipment Locations – Basement
Exhibit 13.6 - Emergency Equipment Locations – 1st Floor
Exhibit 13.7 - Emergency Equipment Locations – 2nd Floor
Exhibit 13.8 - Location of RPL in the 300 Area

Exhibit 7-1. Evacuation Routes – 1st Floor

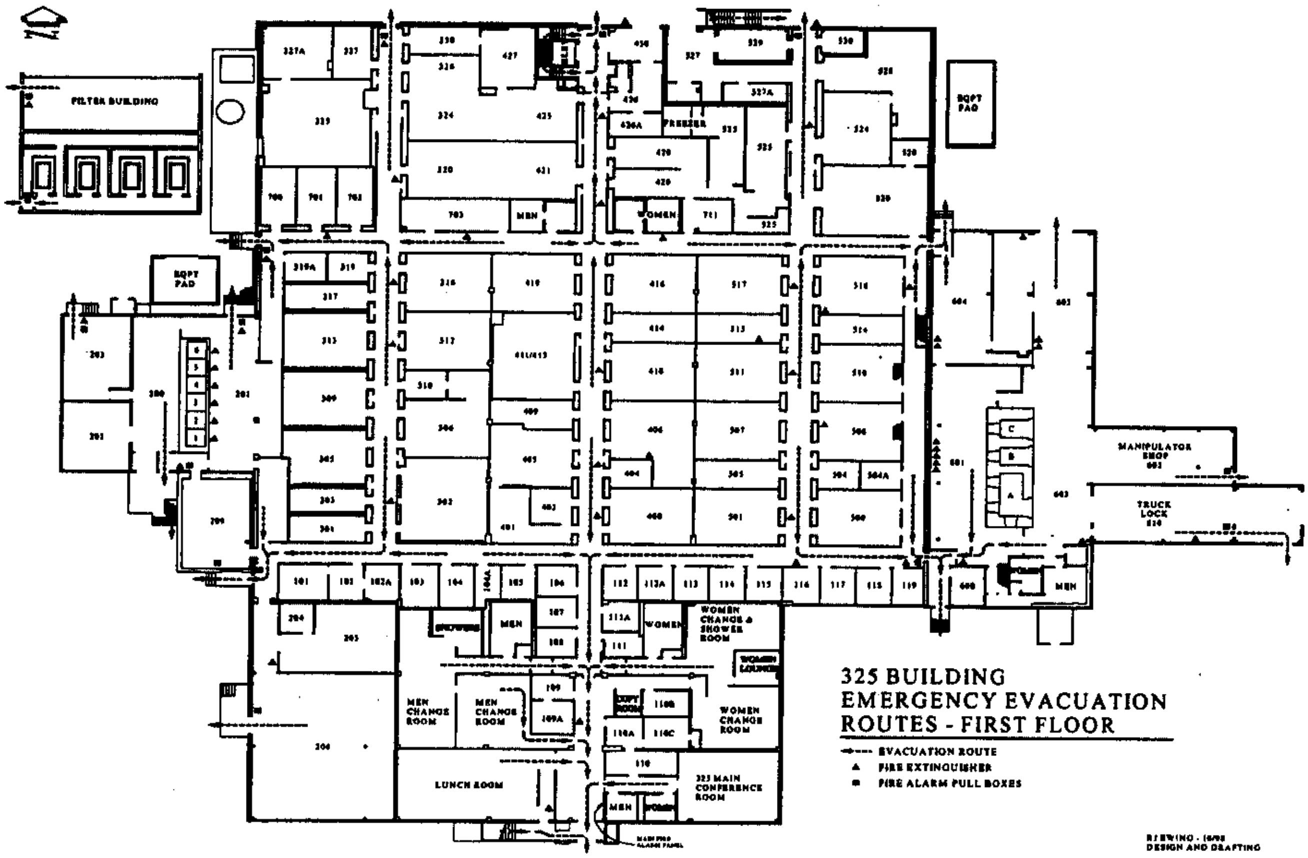


Exhibit 7-2 . Evacuation Routes – 2nd and 3rd Floors

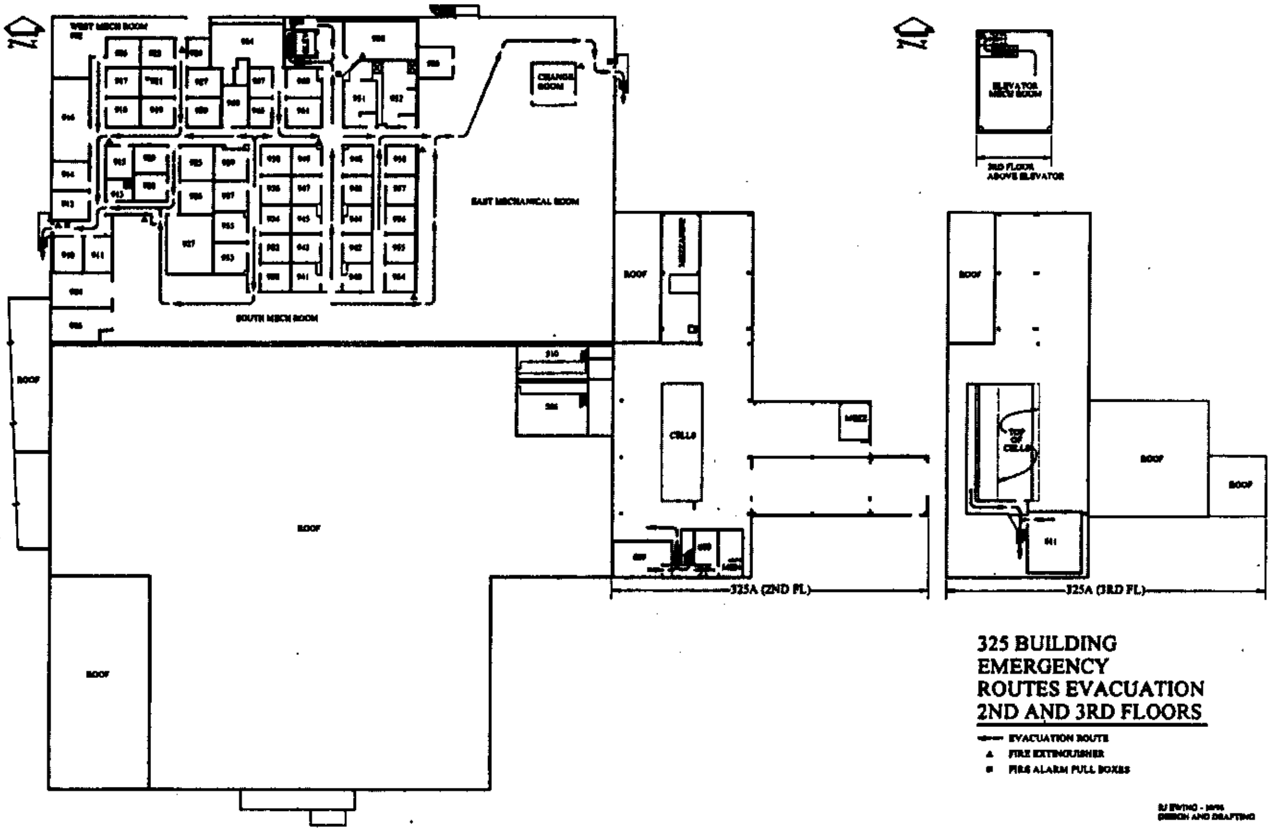


Exhibit 7-3 . Evacuation Routes – Mezzanine and Basement

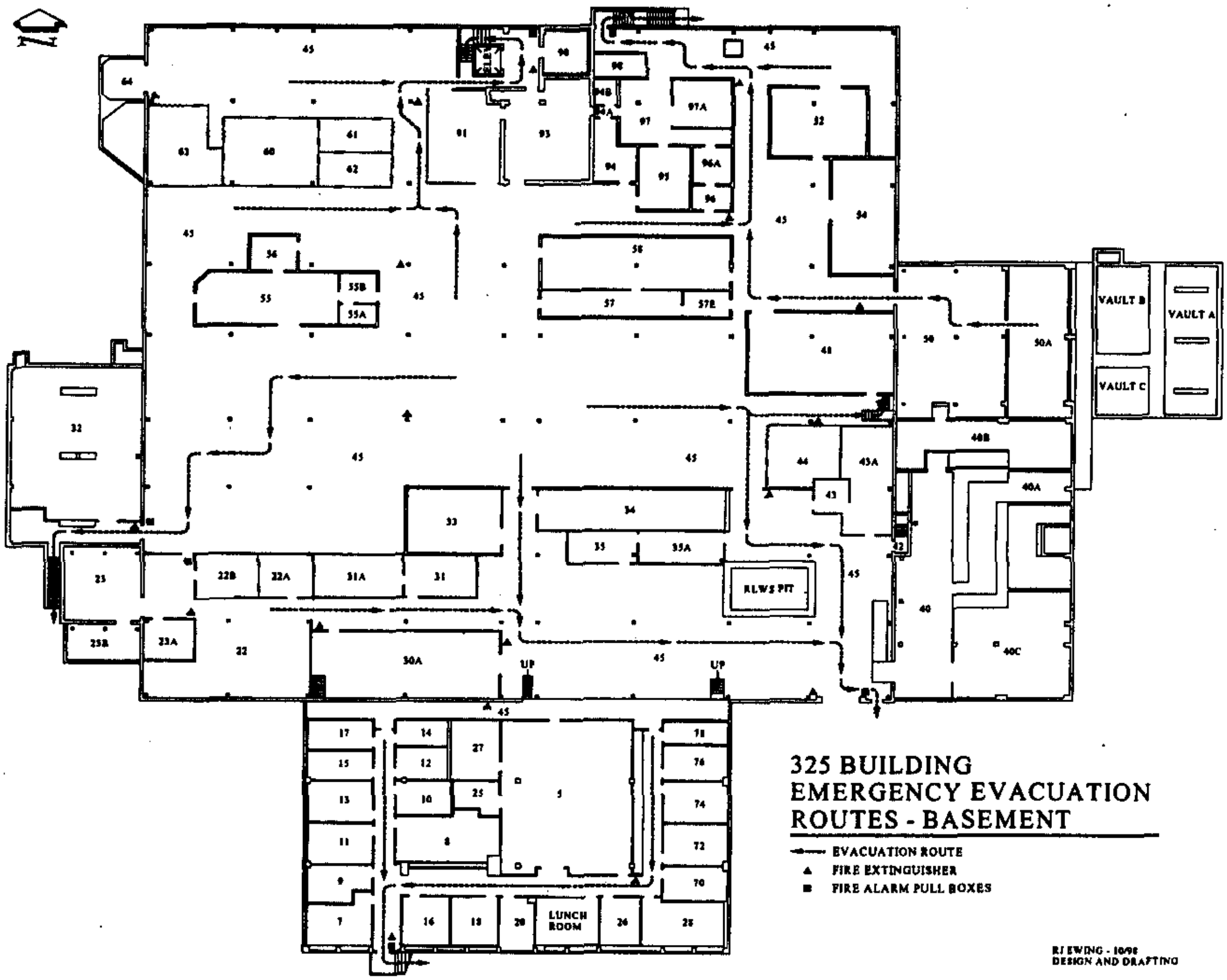


Exhibit 7-4 . RPL Staging Area

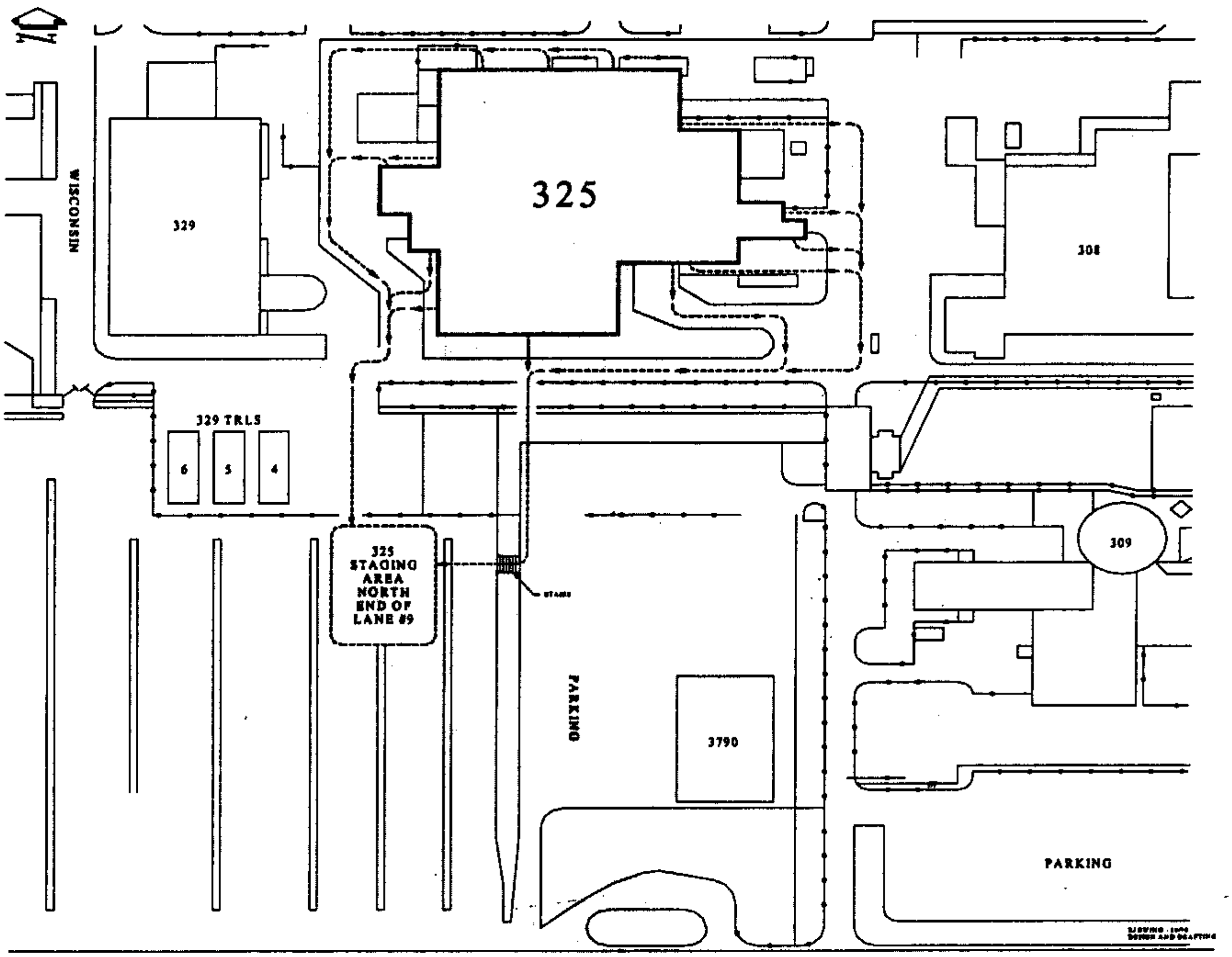
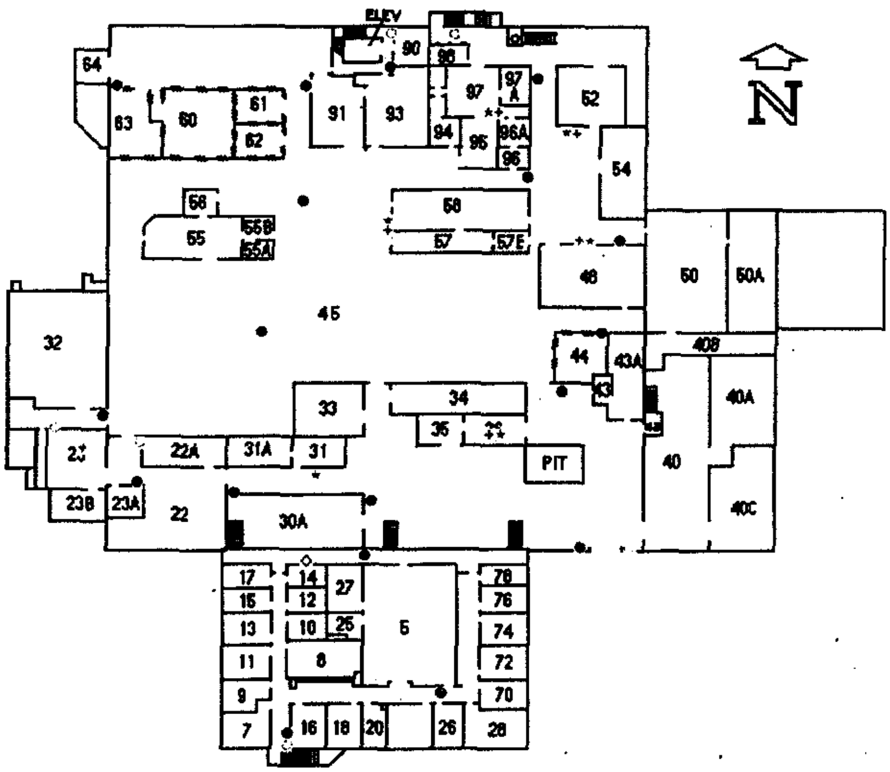


Exhibit 7-5 . Emergency Equipment Locations – Basement

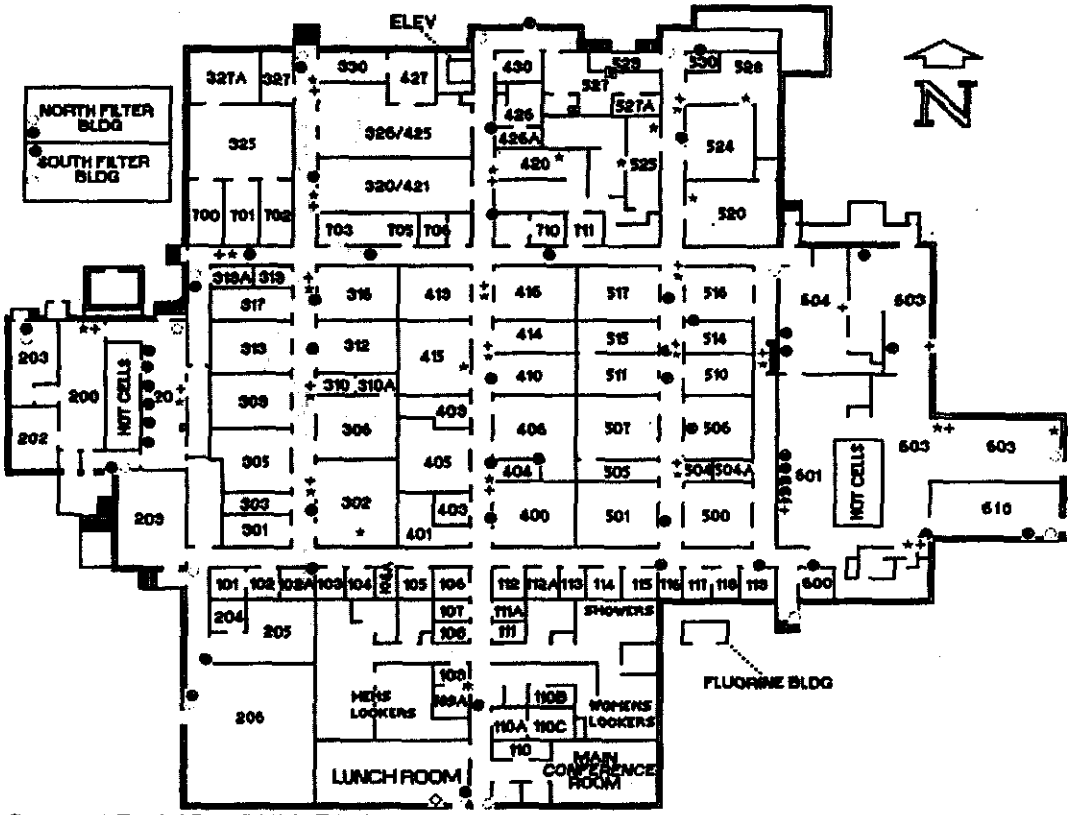
325 BASEMENT



○ FIRE ALARM PULL BOX
◉ FIRE EXTINGUISHER (ABC)
□ FIRE MASTER CONTROL PANEL
▣ SPILL KIT
◇ FIRST AID STATION
◈ RADIO ALARM
⅄ PIV
+ SAFETY SHOWER
★ EYE WASH STATION
✱ CRASH ALARM PHONE

Exhibit 7-6. Emergency Equipment Locations – 1st Floor

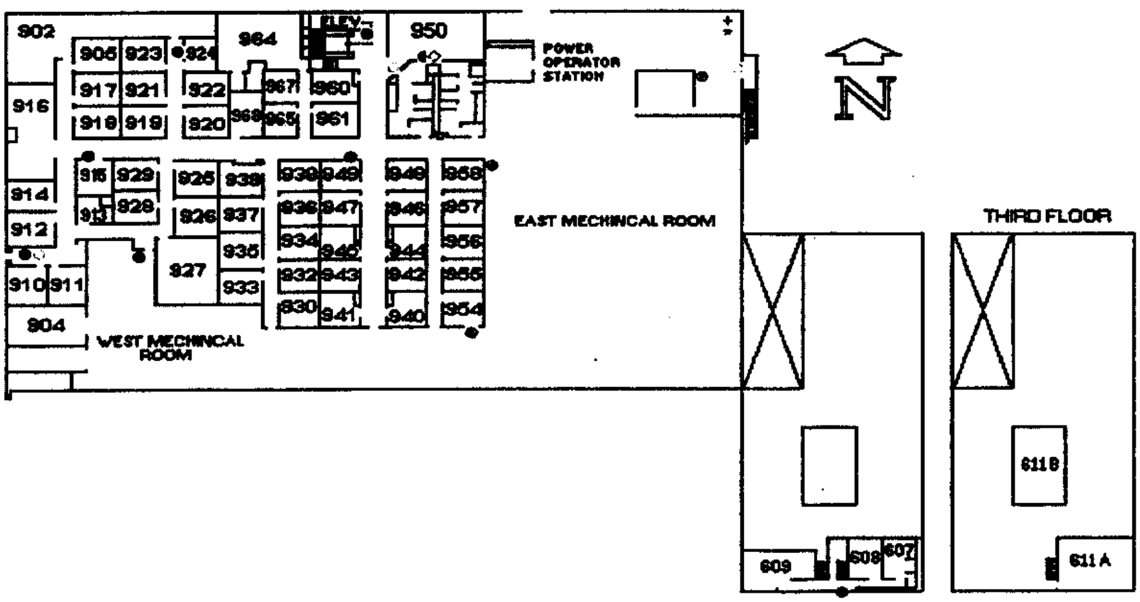
325 FLOOR 1



- ○ FIRE ALARM PULL BOX
- ◉ FIRE EXTINGUISHER (ABC)
- □ FIRE MASTER CONTROL PANEL
- ▣ SPILL KIT
- ◇ FIRST AID STATION
- ◈ RADIO ALARM
- ⅄ PIV
- + SAFETY SHOWER
- ★ EYE WASH STATION
- ✱ CRASH ALARM PHONE

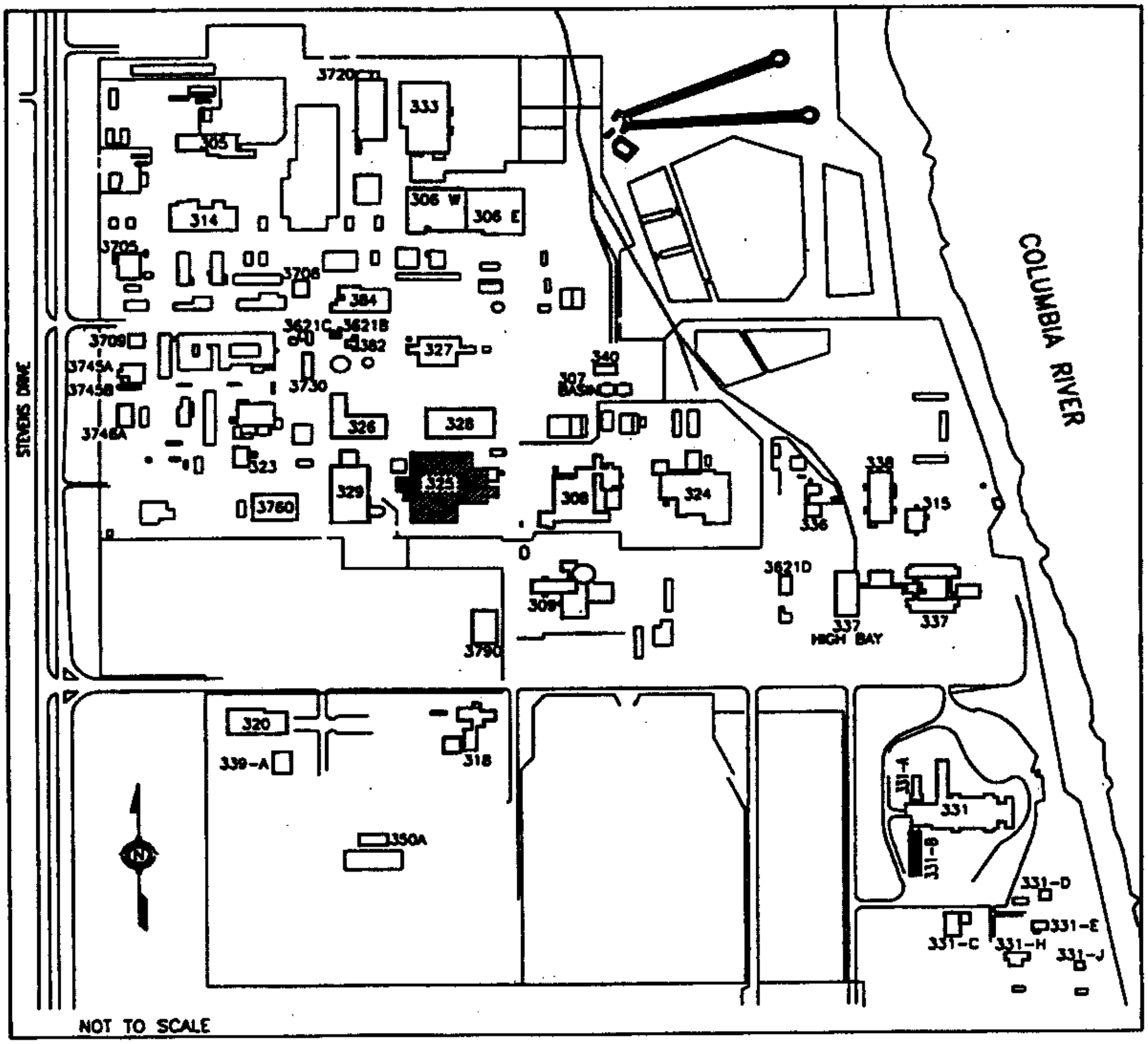
Exhibit 7-7 . Emergency Equipment Locations – 2nd Floor

325 FLOOR 2



- FIRE ALARM PULL BOX
- FIRE EXTINGUISHER (ABC)
- FIRE MASTER CONTROL PANEL
- SPILL KIT
- FIRST AID STATION
- RADIO ALARM
- PIV
- SAFETY SHOWER
- EYE WASH STATION
- CRASH ALARM PHONE

Exhibit 7-8 . Location of RPL in the 300 Area



7.14 EMERGENCY ACTION LEVELS

7.14.1 300 Area Protective Actions

Alert Emergency

1. Assure that all affected facility personnel "take cover" or evacuate.
2. Verify that the POC completes the following items contained in the 300 Area checklist for Alert Emergencies:
   - Activates 300 Area's Emergency Alerting System
   - Crash alarm message to "take cover" provided to 300 Area, and all 600 Area residents in areas adjacent to the incident scene
   - Restricts access at WNP-1 Access Road and Route 4S, and at the Horn Rapids intersection with George Washington Way and Horn Rapids intersection with Stevens Drive
3. Plan for subsequent 300 Area evacuation as required.

Site Area/General Emergency

1. Verify that all Alert Emergency protective actions are implemented.
2. Plan for area evacuation (RL-EOC will provide evacuation instructions).
3. Verify that the POC has initiated Columbia River Alerting.

Index

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **300 Area Process Trenches**	**Permit Part & Chapter:** **Part VI, Chapter 1 and Attachment 31**

Description of Modification:

Hanford Facility RCRA Permit, LIST OF ATTTACHMENTS

Attachment 31:

Attachment 31 300 Area Process Trenches ~~Modified Closure Plan and Part A, Form 3, DOE/RL-93-73, Revision 4, May 1995,~~ and approved modifications

Modification Class: [1 2 3] Please check one of the Classes:	Class 1	Class [1]1	Class 2	Class 3
	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation
A. General Permit Provisions
1. Administrative and informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
N C Boyter (signature)	6.14.02	(signature) for	6/25/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

[1]Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit:	Permit Part & Chapter:
300 Area Process Trenches	Part VI, Chapter 1 and Attachment 31

Description of Modification:

Hanford Facility RCRA Permit, VI.1.A

VI.1.A COMPLIANCE WITH APPROVED MODIFIED CLOSURE PLAN

The Permittees shall comply with all requirements set forth in Attachment 31, including ~~all Class 1 Modifications specified below, and Amendments specified in~~ Conditions specified in VI.1.B. ~~Enforceable portions of the plan are listed below; all subsections, figures, and tables included in these portions are also enforceable, unless otherwise stated.~~ The Permittees shall also comply with all the requirements in the 300-FF-1 and 300-FF-5 Record of Decision. ~~and Addendum and the Groundwater Monitoring Plan (WHC-SD-EN-AP-185, Rev. 0A~~ Enforceable portions of the permit application have been incorporated in Attachment 31 and are identified as follows. All sections, figures, and tables included in these portions are also enforceable. ~~The 300 Area Process Trenches achieved closure in May 1998 in accordance with the Closure Plan contained in Attachment 31, and Permit Conditions contained in this Chapter. Therefore, enforceable portions of the plan currently consist of those associated with post-closure care. These portions are Sections 8.2, 8.4, and 8.5.~~

ATTACHMENT 31

Chapter 1.0 Part A, Form 3, Permit Application, Revision 4~~5~~ ~~May 1995~~, from Class 1 Modification for quarter ending June 30, 2002

Chapter 2.0 ~~Section ADD-1 Addendum,~~ Introduction, from Class 1 Modification for quarter ending June 30, 2002

Chapter 3.0 300 Area Process Trenches Groundwater Monitoring Plan, PNNL-13645, from temporary authorization approved June 10, 2002.

Chapter 8.0 Postclosure, from Class 1 Modification for quarter ending June 30, 2002

~~Section 8.2. Inspection Plan, from Class 1 Modification for quarter ending September 30, 1998~~

~~Section 8.4. Maintenance Plan, from Class 1 Modification for quarter ending September 30, 1998~~

~~Section 8.5. Personnel Training, from Class 1 Modification for quarter ending September 30, 1998~~

Modification Class: [1 2 3] Please check one of the Classes:	Class 1	Class [1]1	Class 2	Class 3
	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions

1. Administrative and informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
(signature)	6.14.02	(signature)	6/14/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

[1]Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **300 Area Process Trenches**	**Permit Part & Chapter:** **Part VI, Chapter 1 and Attachment 31**

<u>Description of Modification:</u>

Hanford Facility RCRA Permit, VI.1.B:

VI.1.B. <u>AMENDMENTS TO THE APPROVED MODIFIED CLOSURE PLAN</u>

VI.1.B.a~~b~~. Pursuant to Condition II.K.7. of the Hanford Facility Wide Permit, the 300 Area Process Trenches (APT) closure shall be a Modified Closure in coordination with the Record of Decision (ROD) for 300-FF-1 and 300-FF-5. Sections of CERCLA documents (examples may include, but are not limited to, Remedial Design/Remedial Action CERCLA work plan, the Operation and Monitoring Work Plan, etc.), which satisfy requirements and Conditions of this Modified Closure Plan, will be reviewed and approved by Ecology.

VI.1.B.b~~i~~. As stipulated through Attachment 31, Chapter 3.0 ~~the RCRA Final Status Compliance Monitoring Plan (i.e., WHC-SD-EN-AP-185)~~ Appendix IX, sampling shall not be required unless post-closure monitoring results indicate a need to do so.

~~VI.1.B.q. Page 8-3, line 20. Well condition will be assessed pursuant to Condition II.F. of the Permit.~~

~~VI.1.B.r Page 8-5, Section 8.5. This section will reference Section II.C. of the Permit for additional training requirements.~~

Modification Class: [1 2 3] Please check one of the Classes:	Class 1	Class [1]1	Class 2	Class 3
	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

<u>Enter wording of the modification from WAC 173-303-830, Appendix I citation</u>

A. General Permit Provisions
1. Administrative and informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
[signature]	6.14.02	[signature] for	6/25/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

---

[1]Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit:	**Permit Part & Chapter:**
300 Area Process Trenches	**Part VI, Chapter 1 and Attachment 31**

Description of Modification:

Attachment 31, Chapter 8.0, Section 8.1.2:

8.~~2.~~1.2 Well Condition

Inspection of groundwater monitoring wells will be conducted pursuant to Permit Condition II.F.and carried out under internal procedure BHI-EE-01 (BHI 1995) or equivalent guidance. This procedure calls for a surface inspection of a well at each sampling event. The procedure also calls for a subsurface inspection of the well at a minimum of every 3 to 5 years. This routine subsurface inspection may consist of pulling and inspecting the pump, brushing the inner walls of the casing and screen, and conducting a down-hole television survey.

Modification Class: [1 2 3]	Class 1	Class [1]1	Class 2	Class 3
Please check one of the Classes:	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions

1. Administrative and informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
N C Boyter (signature)	6-24-02	Owen Robertson for (signature)	6/25/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

[1]Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: 300 Area Process Trenches	Permit Part & Chapter: Part VI, Chapter 1 and Attachment 31

Description of Modification:

Attachment 31, Chapter 8.0, Section 8.3:

8.35 PERSONNEL TRAINING

This section describes the training of personnel required to maintain the 300 APT in a safe and secure manner during postclosure care as required by 40 CFR 265.16, WAC 173-303-330, and Condition II.C.2 of the Hanford Facility Dangerous Waste Permit.

Modification Class: [1 2 3]	Class 1	Class '1	Class 2	Class 3
Please check one of the Classes:	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions

1. Administrative and informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
[signature]	6.14.02	[signature]	6/25/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

[1] Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class '1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to '1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: 300 Area Process Trenches	Permit Part & Chapter: Part VI, Chapter 1 and Attachment 31

Description of Modification:

Attachment 31, Part A, Form 3:

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Owner/Operator
Keith A. Klein ~~John D. Wagoner~~, Manager
U.S. Department of Energy
Richland Operations Office

~~5/25/95~~
Date

Co-Operator
E. Keith Thomson ~~Joseph F. Nemec~~, President
Fluor Hanford ~~Bechtel Hanford, Inc.~~

~~4/28/95~~
Date

Modification Class: [1 2 3] Please check one of the Classes:	Class 1	Class [1]1	Class 2	Class 3
		X		

Relevant WAC 173-303-830, Appendix I Modification: A.7.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions
   7. Changes in ownership or operational control of a facility

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
N C Boyter	6.14.02	Alan Roberts for	6/25/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

[1]Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: 300 Area Process Trenches	Permit Part & Chapter: Part VI, Chapter 1 and Attachment 31

Description of Modification:

Attachment 31, Part A, Form 3:

Updated aerial photograph.

Modification Class: [1 2 3]	Class 1	Class [1]1	Class 2	Class 3
Please check one of the Classes:	X			

Relevant WAC 173-303-830, Appendix I Modification: A.1.

Enter wording of the modification from WAC 173-303-830, Appendix I citation

A. General Permit Provisions

1. Administrative and informational changes

Submitted by Co-Operator:		Reviewed by RL Program Office:		Reviewed by Ecology:		Reviewed by Ecology:	
N C Boyter (signature)	6.14.02	(signature) for	6/28/02				
N. C. Boyter	Date	M. S. McCormick	Date	J. B. Price	Date	L.E. Ruud	Date

[1]Class 1 modifications requiring prior Agency approval.

[2] This is only an advanced notification of an intended Class [1]1, 2, or 3 modification, this should be followed with a formal modification request, and consequently implement the required Public Involvement processes when required.

[3] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to [1]1, if appropriate.

Hanford Facility RCRA Permit Modifications

Part IV, Chapter 1 and Attachment 31

300 Area Process Trenches

Replacement Sections

Index

CONTENTS

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FORM 3	DANGEROUS WASTE PERMIT APPLICATION	I. EPA/State I.D. No.
		W A 7 8 9 0 0 0 8 9 6 7

OR OFFICIAL USE ONLY

Application Approved	Date Received (month/ day / year)	Comments

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA/STATE I.D. Number, or If this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.

A. First Application (place an "X" below and provide the appropriate date)

☐ 1. **Existing Facility** (See instructions for definition of "existing" facility. Complete item below.)

MO	DAY	YEAR
03	22	1943

*For existing facilities, provide the date (mo/day/yr) operation began or the date construction commenced. (use the boxes to the left)

*The date construction of the Hanford Facility commenced

☐ 2. **New Facility** (Complete item below.)

MO	DAY	YEAR

For new facilities, provide the date (mo/day/yr) operation began or is expected to begin

B. Revised Application (Place an "X" below and complete Section I above)

☒ 1. **Facility has an Interim Status Permit**

☒ 2. **Facility has a Final Permit**

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. Process Code – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the codes(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process (including its design capacity) in the space provided on the (Section III-C).

B. Process Design Capacity – For each code entered in column A enter the capacity of the process.

1. Amount – Enter the amount.
2. Unit of Measure – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
STORAGE:		
Container (barrel, drum, etc.)	S01	Gallons or liters
Tank	S02	Gallons or liters
Waste pile	S03	Cubic yards or cubic meters
Surface impoundment	S04	Gallons or liters
	S06	Cubic yards or cubic meters*
DISPOSAL:		
Injection well	D80	Gallons or liters
Landfill	D81	Acre-feet (the volume that would cover one acre to a Depth of one foot) or hectare-meter
Land application	D82	Acres or hectares
Ocean disposal	D83	Gallons per day or liters per day
Surface impoundment	D84	Gallons or liters
TREATMENT:		
Tank	T01	Gallons per day or liters per day
Surface impoundment	T02	Gallons per day or liters per day
Incinerator	T03	Tons per hour or metric tons per hour; gallons per hour or liters per hour
Other (use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Section III-C.)	T04	Gallons per day or liters per day

Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code
Gallons	G	Liters Per Day	V	Acre-Feet	A
Liters	L	Tons Per Hour	D	Hectare-Meter	F
Cubic Yards	Y	Metric Tons Per Hour	W	Acres	B
Cubic Meters	C	Gallons Per Hour	E	Hectares	Q
Gallons Per Day	U	Liters Per Hour	H		

*Add per request of Washington State Department of Ecology (01/2001)

III. PROCESS – CODES AND DESIGN CAPACITIES (continued)

Example for Completing Section III (shown in line numbers X-1 and X-2 below): A facility has two storage tanks; one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

Line No.	A. Process Code *(from list above)*			B. Process Design Capacity: 1. Amount *(Specify)*	2. Unit of Measure *(enter code)*			For Official Use Only			
X-1	S	0	2	600		G					
X-2	T	0	3	20		E					
1	D	8	4	11,356,200		V					
2											
3											
4											
5											
6											
7											
8											
9											
10											

C. Space for additional process codes or for describing other process (code "T04"). For each process entered here include design capacity.

D84

The 300 Area Process Trenches received nonregulated process cooling water from operations in the 300 Area of the Hanford Site. The process trenches also received dangerous waste from several research and development laboratories and from the fuels fabrication process. The waste was discharged to the 300 Area Process Trenches and allowed to percolate into the soil column underlying the trenches. The annual quantity of waste identified under item IV.B. reflects the total flow to the process trenches in 1 year, and not a volume of dangerous waste discharged to the unit. This estimate was made because accurate records are unavailable regarding dangerous waste volumes discharged to the trenches. The process trenches were designed to percolate up to 11,356,200 liters (3,000,000 gallons) per day of wastewater. The 300 Area Process Trenches no longer receive dangerous waste and will be closed under interim status. The process design capacity reflects the maximum volume of water that was discharged daily, rather than the physical capacity of the unit. Closure activities have been completed and postclosure groundwater monitoring is being conducted.

IV. DESCRIPTION OF DANGEROUS WASTES

A. Dangerous Waste Number – Enter the digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four-digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.

B. Estimated Annual Quantity - For each listed waste entered in column A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. Unit of Measure - For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate odes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
Pounds	P	Kilograms	K
Tons	T	Metric Tons	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. Processes

1. Process Codes:

For listed dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. Process Description: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER - Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "Included with above" and make no other entries on that line.
3. Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

Example for completing Section IV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste.

Line No.	A. Dangerous Waste No. *(enter code)*				B. Estimated Annual Quantity of Waste	C. Unit of Measure *(enter code)*			D. Processes				
									1. Process Codes *(enter)*				2. Process Description *(if a code is not entered in D(1))*
X-1	K	0	5	4	900		P		T03	D80			
X-2	D	0	0	2	400		P		T03	D80			
X-3	D	0	0	1	100		P		T03	D80			
X-4	D	0	0	2					T03	D80			Included with above

Photocopy this page before completing if you have more than 26 wastes to list.

I.D. Number *(enter from page 1)*											
W	A	7	8	9	0	0	0	8	9	6	7

IV. DESCRIPTION OF DANGEROUS WASTES *(continued)*

Line No.	A. Dangerous Waste No. *(enter code)*				B. Estimated Annual Quantity of Waste	C. Unit of Measure *(enter code)*			D. Processes 1. Process Codes *(enter)*				D. Processes 2. Process Description *(if a code is not entered in D(1))*
1	D	0	0	2	453,592,370		K		D84				Percolation
2	D	0	0	7			K		D84				Percolation
3	F	0	0	1			K		D84				Percolation
4	F	0	0	2			K		D84				Percolation
5	F	0	0	3			K		D84				Percolation
6	F	0	0	5			K		D84				Percolation
7	U	2	1	0			K		D84				Percolation
8	W	T	0	2			K		D84				Percolation
9													
10													
11													
12													
13													
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40													

IV. DESCRIPTION OF DANGEROUS WASTE (continued)

E. Use this space to list additional process codes from Section D(1) on page 3.

The 300 Area Process Trenches received dangerous waste discharges from research and development laboratories in the 300 Area and from the fuels fabrication process. This waste consisted of state-only toxic, dangerous waste (WT02), discarded chemical product (U210), corrosive waste (D002), chromium (D007), spent halogenated solvents (F001, F002, and F003), and spent nonhalogenated solvent (F005). Accurate records are unavailable concerning the amount of dangerous waste discharged to the trenches. The estimated annual quantity of waste (item IV.B.) reflects the total quantity of both regulated and nonregulated waste water that was discharged to the unit in one year.

V. FACILIITY DRAWING Refer to attached drawing(s).

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS Refer to attached photograph(s).

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION This information is provided on the attached drawings and photos.

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information," place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. Name of Facility's Legal Owner	2. Phone Number *(area code & no.)*

3. Street or P.O. Box	4. City or Town	5. St.	6. Zip Code

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(print or type)*	Signature	Date Signed
Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office	[signature]	7/1/02

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(Print Or Type)*	Signature	Date Signed
See attachment		

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

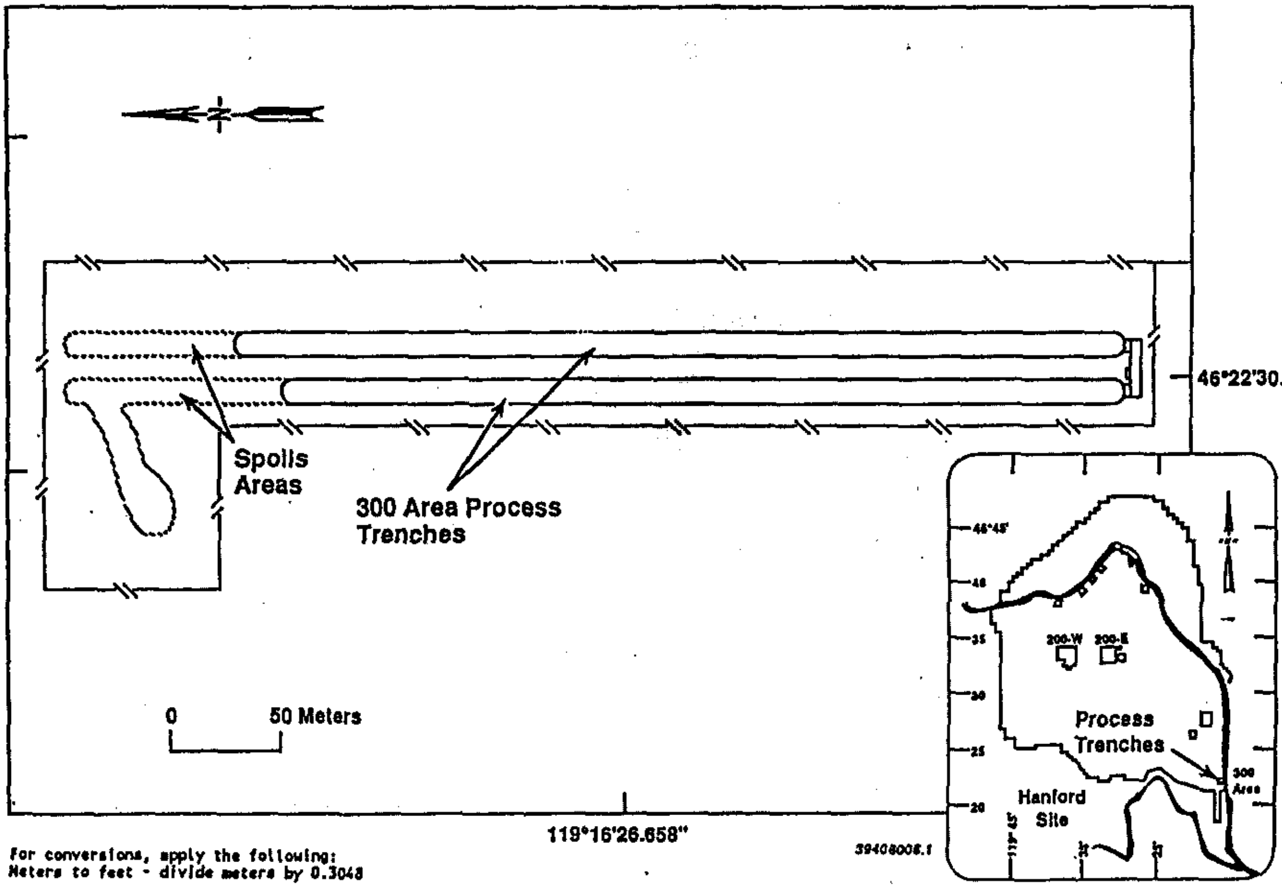
Owner/Operator
Keith A. Klein, Manager
U.S. Department of Energy
Richland Operations Office

7/1/02
Date

/FOR
Co-operator
E. Keith Thomson
President and Chief Executive Officer
Fluor Hanford

5-30-02
Date

300 AREA PROCESS TRENCHES SITE PLAN



For conversions, apply the following:
Meters to feet - divide meters by 0.3048

39408008.1

300 AREA PROCESS TRENCHES

46°22'30.195"
119°16'26.658"

E0203055_1.JPG
(PHOTO TAKEN 2002)

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FIGURES

TABLES

2.0 300-FF-1 PROPOSED PLAN DISCUSSIONS AND EFFECTS ON THE 300-FF-1 PHASE III FEASIBILITY STUDY AND 300 AREA PROCESS TRENCHES MODIFIED CLOSURE/POSTCLOSURE PLAN

2.1 INTRODUCTION

The purpose of this addendum is to document the discussions and present the data and evaluations that have been developed after submittal of the 300-FF-1 Phase III Feasibility Study (FS) to the regulatory agencies for review. A number of issues were raised by the regulatory agencies that have been addressed over the past several months. Discussions of issues between the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the U.S. Department of Energy (DOE) resulted in additional technical reviews of analytical data and site conditions that, in some cases, enhance or modify certain aspects within the 300-FF-1 Phase III FS and the 300 Area Process Trenches (300 APT) Modified Closure/Postclosure Plan. Rather than completely revise each document, this addendum is included which summarizes the discussions, data review, evaluations, and technical changes made. It supersedes related discussions in both documents and by inclusion in these documents is made part of the 300-FF-1, 300-FF-5, and 300 Area APT Administrative Records.

A listing of topics the addendum addresses is discussed in the next paragraph. The first item on that list is very important and warrants discussion in the introduction. A key conclusion resulting from using data collected prior to the Remedial Investigation (RI)/FS is that several chemical constituents are identified above regulatory standards for the 300 APT. The text in the 300 APT Modified Closure/Post Closure Plan currently indicates no chemical constituents are above *Model Toxics Control Act* (MTCA) Level C Industrial Soil Cleanup Values. This results in a substantial change to the conclusions made within the closure plan. Exceedance of this regulatory standard is a new regulatory driver to take cleanup action in the 300 APT in addition to the previously documented uranium risk driver. There were no changes to conclusions in the 300-FF-1 Phase III FS risk assessment using the older data. The magnitude of this change suggests that it is very important for reviewers to read this addendum as it supersedes some analyses in both the 300-FF-1 Phase III FS and the 300 APT Modified Closure/Postclosure Plan.

The key areas addressed in the addendum are (1) change in use of (SW-846) data collected prior to *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) characterization activities, (2) evaluation and use of additional cobalt-60 data from the South Process Pond, (3) development of a uranium cleanup standard, (4) evaluation of a cost-efficient technique to meet MTCA C Industrial Soil Cleanup Values, (5) review of volume and cost estimates, (6) revision of remedial alternatives, and (7) establishing proposed preferred remedial alternatives.

Another topic that merits a brief discussion here is the combining of the 300-FF-1 and 300-FF-5 Operable Units Proposed Plans. During review of the separate 300-FF-1 and 300-FF-5 Proposed Plans, the regulators determined that the documents should be combined to create a more integrated approach. Therefore, the proposed plan has been written to combine information from both operable units. Once the Public Comment Period is completed, the remedial alternatives for both operable units and the 300 APT will be presented in the Record of Decision. In addition, 300 APT-specific permit conditions will be administratively incorporated into the site-wide permit.

2.2 CHANGE IN USE OF SW-846 ANALYTICAL DATA IN DECISION MAKING

Investigation of several 300 Area sites began prior to the 300 Area being listed on the National Priorities List in 1989. Two separate sampling events were conducted in the mid-1980's: one for the 300 APT and one for the North and South Process Ponds. Samples were analyzed to SW-846 protocols. Analytical results were reported in Zimmerman and Kossick (1987) and Dennison et al. (1989) for the 300 APT and North and South Process Ponds, respectively. For the 300-FF-1 Operable Unit, these reports were cited and used in conjunction with process knowledge and other data to scope the 300-FF-1 Phase 1 RI. At that time and throughout the entire 300-FF-1 RI/FS, this data was only used in that context with the understanding that validated Contract Laboratory Program (CLP) data would be collected and used for RI/FS decision making. The older data is specifically included in the 300-FF-1 Operable Unit work plan and reiterated in the 300-FF-1 Phase I RI report.

The regulators indicated strong preference to factor the SW-846 data into the decision-making data set. This request was honored; however, the quality of that data is not documented and is discussed below. However, there is no objective evidence that the data is invalid.

The CLP data results consistently indicate lower concentrations of contaminants and contradict the SW-846 data for some constituents. The MTCA regulations require that no single sample can be more than twice (2X) the cleanup standard. It should be noted that all of the constituents that were more than twice MTCA Method C levels were identified from the SW-846 data set except chrysene from a CLP sample which value was greater than twice MTCA Method C value. However, the validated data was qualified as an estimated value.

A summary of the data comparisons is provided in Table AD-1. A total of 630 samples were reviewed including both SW-846 and CLP data. The data indicate that eight samples were identified with six constituents above MTCA Method C Industrial Levels. The eight samples were collected at four different locations. Three of these sample locations were in the Process Trenches. The soils sampled were physically relocated to the north end of the trenches during an expedited response action conducted in 1991.

The 300 APT SW-846 data show 4 of 114 samples above MTCA Method C Industrial Soil Cleanup Values for arsenic, cadmium, thallium, and benzo(a)pyrene. The 300 APT Modified Closure/Postclosure Plan as written was based solely on CLP data that indicate no *Resource Conservation and Recovery Act* (RCRA) contaminants above MTCA Method C Industrial Soil Cleanup Values.

For the North and South Process Pond, the SW-846 data identified 1 of 70 samples above MTCA Method C for polychlorinated biphenyls (PCB). Analyses of these data indicate that the outcome of the risk assessment performed in the 300-FF-1 RI report would not change. However, remediation would be necessary to meet applicable or relevant and appropriate requirements.

2.3 COBALT-60 SAMPLING

Cobalt-60 sampling results during the RI/FS show that there is a present risk in the South Process Pond. The potential increase in cancer risks is 2×10^{-4} due to external exposure. The risk is determined from limited data. During evaluation and selection of the proposed preferred alternative, the questions arose of how much remediation should be completed based on cobalt-60.

Because the risk was driven by only one value, it was decided to conduct additional field screening to confirm the concentration of cobalt-60. The field screening data confirmed that the average concentrations were approximate 5.0 pCi/g, which is shown in the RI/FS. Figure AD-1 show that higher concentrations are limited to several hot spots. These hot spots coincide with uranium hot spots and will be removed when the uranium is removed.

The remaining low cobalt-60 concentrations will be left in place because cobalt-60 does not contribute to long-term dose. Cobalt-60 has a short 5.26-year half-life so concentrations will diminish by natural decay by the time cleanup is complete.

2.4 URANIUM CLEANUP STANDARD

The 300-FF-1 Phase III FS evaluated a range of dose-based cleanup levels from 3 to 25 mrem/year. The Tri-Parties propose to use a cleanup standard for the 300-FF-1 Operable Unit of 15 mrem/year dose to an industrial worker based on the radiation site cleanup standards in 40 CFR 196 (proposed). To be able to implement cleanup in the field, the 15 mrem/year dose limit had to be converted to a uranium concentration. The first step of this process was to establish a reasonable exposure scenario. An industrial land-use scenario had been previously agreed upon. Industrial scenario exposure pathways and durations believed to represent the scenario in a conservative but realistic manner were then determined. The worst-case industrial scenario that is thought to be possible is a worker spending 1,500 hours/year in a building on a waste site and 500 hours outside a building on a waste site. The RESRAD[1] model was the software tool used to calculate exposure levels under the agreed-upon scenario. A soil concentration of 350 pCi/g total uranium corresponds to a 15 mrem/year dose based exposure under the 300-FF-1 industrial scenario.

A review of the 300-FF-1 Phase III FS Appendix F was performed to understand the difference between the dose-based radionuclide concentrations reported in that document versus those developed and used for the proposed cleanup standard described above. The difference is the inclusion of cobalt-60 in the Appendix F calculations and applying the highest concentration from the South Process Pond to all of the waste sites. This has the effect of lowering the allowable concentration of uranium in the soils. Cobalt-60 is present in small concentrations in the North Process Pond and Process Trenches and not in the burial grounds at all. Cobalt-60 contributes to short-term dose only in the South Process Pond. In fact, the 300-FF-1 FS III Appendix F looked at the dose contributions from multiple radionuclides using site-specific data including the uranium isotopes, cobalt-60, cesium-137, and zinc-65, all which are insignificant dose contributors except the uranium. The RESRAD run described above used to develop a cleanup standard only included uranium in the model. The rationale for this decision is described below.

Cobalt-60 has a short half-life of 5.26 years, meaning that it will naturally decay to below cleanup concentration levels fairly quickly. In fact, the data indicates that the average cobalt-60 current concentration is about 5 pCi/g as discussed earlier in the addendum. This level of cobalt-60 will decay naturally to a level of insignificant dose contribution by the time cleanup of the operable unit is completed. Cobalt-60 accounted for a large percentage of the 15 mrem/year in the short term, thus forcing a lower allowable concentration of uranium. No other radionuclides contribute significantly to the total dose.

2.5 DATA CORRELATION SUPPORTING EFFICIENT CLEANUP

Part of the discussions between the Tri-Parties included developing a site-specific method to measure attainment of the MTCA Method C Industrial Soil-Based Cleanup Values during cleanup. It was suspected that there would be a high likelihood that a correlation could be made between the uranium cleanup standard discussed above and MTCA C Industrial Cleanup levels. If so, during cleanup when contaminated soil is removed based on the uranium cleanup standard, then all the chemical contaminants above MTCA C would also be removed. This would simplify field decisions based on uranium field screening analysis, thus reducing costs of remediation. Therefore, an evaluation of this potential was performed and is discussed in the following paragraphs.

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[1] RESRAD is a pathway analysis computer code used to calculate radiation doses to individuals.

First, data from all sample locations were evaluated to identify constituents above the MTCA Method C Industrial Soil Cleanup Values. The uranium concentrations at those locations were compared to the cleanup standard of 350 pCi/g. The data strongly conclude that uranium can be used as an indicator parameter for field screening. It can be further concluded that, when the uranium (350 pCi/g) is removed, all potential chemical contaminants will also be removed meeting the MTCA Method C Industrial Soil Cleanup Values. Analyzing for chemical constituents will be required only for final verification sampling.

A site-specific verification sampling and analysis plan will be developed during the remedial design. Final verification samples will be evaluated against the cleanup standard to show that (1) no more than 10% of the samples are above the cleanup standard (MTCA C Industrial Soil Cleanup Values and 350 pCi/g total uranium), (2) no one sample can be more than twice the cleanup standard, and (3) the 95% upper confidence level (UCL) is below the cleanup standard. Using MTCA cleanup attainment criteria [WAC 173-340-740(7)(e)(ii)] for uranium is site specific and is based in part on the ability to correlate the uranium cleanup standard with the chemical cleanup standards.

2.6 VOLUME AND COST ESTIMATES

Appendices H and I of the 300-FF-1 Phase III FS include volume and rough-order-of-magnitude (ROM) cost estimates for the various cleanup alternatives. The estimates are grouped into burial ground and process waste unit categories. The ROM estimates are accurate to plus 50%, minus 30%. The FS III volume and cost estimates have been changed, and new tables are attached to this addendum. The reasons for changes to these estimates are discussed in the following paragraphs.

Volume estimates were revised from (1) reevaluating RI data to help reduce uncertainty in the cost estimates and (2) regrouping of some waste units. Uncertainties in excavation and contaminated volume estimates result in uncertainties in the cost estimates. Some volume changes were made; the most significant change related to the Process Ponds berm and scrapings areas where no RI data exist. The landfill units were all included with the process waste units and are described later in the addendum.

Cost estimates were revised for a variety of reasons: (1) some unit rates were challenged by the regulators, (2) volume changes were made as discussed above, and (3) revision/refinement of some alternatives was made. First, several of the unit rates applied in the FS III ROM cost estimates were reviewed and challenged. The entire cost estimate was reevaluated and new unit rates were applied. Some changes included unit rate changes for excavating, screening, hauling, and sampling and analysis as well as overhead adjustments. The Environmental Restoration Disposal Facility (ERDF) fixation or stabilization costs were removed from the estimate after the ERDF waste acceptance criteria had been updated and revised.

The volumes for each waste management unit were further refined after performing a more detailed evaluation of sample data. Also, the regrouping of waste sites affects apportioning of costs between the burial grounds and process waste units. In addition, some of the alternatives were revised, which affects the cost estimates. For example, one of the original FS alternatives allowed consolidation of the Process Trenches Spoils Pile into the North Process Pond followed by construction of a soil cover. It has been determined that the process trenches cannot be moved to any place but a RCRA- compliant disposal facility. This changed the consolidation volumes and associated costs. Tables AD-2 through AD-16 reflect the new volume and cost estimates. The table format is the same as used in Appendices H and I in the 300-FF-1 Phase III Feasibility Study.

2.7 REVISED REMEDIAL ALTERNATIVES

The actions for several alternatives are being revised. These changes have been made because new information has become available or because discussions between the Tri-Parties have led to better solutions and better use of resources or to add consistency between 100 Area and 300 Area remediations. Several modifications, which revise the original alternatives, include the following:

- Landfills 1a, 1b, 1c, and 1d are being grouped to the process waste units. Landfills 1a, 1b, 1c, and 1d were originally grouped with the burial grounds in the RI/FS. However, after further evaluation, the landfills have been included with the process waste units because the remedy for the process waste units will also apply for the landfills. This is true for the following reasons. They are small in area and volume with respect to the burial grounds. Landfills 1b and 1d are co-located within part of the scraping disposal areas. Landfills 1a and 1c are near the river edge and the North Process Pond.
- The 618-5 Burial Ground is being transferred to the 300-FF-2 Operable Unit. The 300-FF-2 operable unit includes the remaining 300 Area burial grounds.
- The Process Spoils Piles will be excavated instead of placing a RCRA barrier over the piles. It was determined that for small areas (less than 10 acres) it was more cost effective to excavate than placing a RCRA barrier over the waste.

2.8 300-FF-1 PROCESS WASTE UNITS

2.8.1 Alternative P-1 – No Action

The No-Action alternative has not changed.

2.8.2 Alternative P-2a – Soil Cover

There is only one change to the P-2a Soil Cover option. The change is that the contamination in the Process Trenches Spoils Pile would be excavated instead of leaving in place with a RCRA barrier.

The objectives remain the same. This alternative limits the infiltration of surface water at process units and therefore, limits migration of contaminants through the soil to groundwater preventing contamination of the groundwater above preliminary remediation goals (PRGs). This alternative also provides protection from direct exposure to contaminants present in soils. This alternative contains all contamination in place.

The new alternative reads as follows:

This alternative leaves soil contamination in place under a new 2-ft-thick vegetated silty soil cover to prevent direct exposure and inhalation and ingestion of contaminated soils. Soils contaminated above cleanup levels from the Process Trenches Spoils Pile would be excavated and disposed in ERDF or other RCRA Subtitle C compliant facility. Since uranium is long-lived, institutional controls would be required to maintain the 45-acre silty soil cover indefinitely. Other potential controls include fences, signs, and deed restrictions. Since remaining contamination is greater than cleanup standards, groundwater monitoring would be required.

2.8.3 Alternative P-2b – Consolidation and Soil Cover

This alternative remains the same, although now instead of using PRGs the cleanup levels in Table AD-17 are used. In the new alternative, the Process Spoils Pile will be excavated and disposed in ERDF.

The new alternative reads as follows:

This alternative reduces the vegetated silty soil cover size required for the process waste sites as compared to alternative P-2a. This is implemented by excavating soil/debris above cleanup standards from Landfill 1a and 1b and the North Pond Scraping Disposal Area, and consolidating those materials into the North Process Pond. Excavated soil from the Process Sewers, Landfill 1d, and the South Process Pond Scraping Disposal Area would be consolidated in the same manner into the South Process Pond. Soils contaminated above cleanup levels from the Process Trenches Spoils Pile would be excavated and disposed in ERDF or other RCRA Subtitle C compliant facility. Since uranium is long-lived, institutional controls would be required to maintain the 14-acre silty soil cover indefinitely. Other potential controls include fences, signs, and deed restrictions. Groundwater monitoring would be required since contamination is left in place greater than cleanup levels.

2.8.4 Alternative P-3 – Selective Excavation and Disposal

The original P-3 Selective Excavation and Disposal alternative removes all contamination above PRGs. In the new alternative, the process waste units are now separated into three zones. The first zone contains soils above cleanup levels that would be excavated and disposed. The second zone soils are below cleanup levels and would be left in place without a soil cover. The third zone sampling results are inconclusive, and field screening will be used to determine if soils will be disposed or left in place without a soil cover. The three zones are shown in Figure AD-2.

The new alternative reads:

This alternative requires removal of contaminated soil/debris with concentrations above cleanup standards. The individual process waste units can be divided into three zones: areas where the data shows that the soil is above the cleanup standard, areas where the data shows the soil is below cleanup standards, and areas where the data is inconclusive. The locations of these three zones within the process waste units are shown on Figure AD-2. Under this alternative, soil would be removed from the areas where it is known that the soil is contaminated (above the cleanup standards) with little sampling and analysis except for confirming all contaminated soil had been removed. Areas that are already below the cleanup standard would be left in place. The areas where the data is inconclusive would require field analyses to determine if the soil was contaminated above the cleanup standards or not and therefore would be removed or not. Excavated soil and debris would be disposed of at ERDF or other regulated landfill. Present data indicate that once total uranium above the cleanup standard is removed, the average concentrations of total uranium and cobalt-60 will be such that the dose will not exceed 15 mrem/year. If verification sampling unexpectedly indicates that the 15 mrem/year cleanup level is exceeded, institutional controls may be used to allow the cobalt-60 to decay. No additional institutional controls would be required.

2.8.5 Alternative P-4 – Excavation, Soil Washing, and Fines Disposal

This alternative remains the same although now instead of using PRGs the clean up levels in Table AD-17 are used.

The new alternative reads:

This alternative is similar to Alternative P-3, with the addition of soil washing to reduce the quantity of soil requiring disposal. Data from the 300 Area show that the contaminants are concentrated in the fines (silt and clay). The coarser soils (gravel and sand) are generally clean. Soil washing separates soil according to particle size, and therefore the soil with the concentrated contaminants could be separated from the clean soil. The concentrated soil would be disposed of in ERDF or other regulated landfill, and the soils within cleanup standards would be replaced. Verification sampling would also be required. No additional institutional controls would be required.

2.9 300-FF-1 BURIAL GROUNDS

As stated above the Landfills will be remediated with the process waste units and the 618-5 Burial Ground will be transferred and remediated as part of the 300-FF-2 Operable Unit.

2.9.1 Alternative B-1 – No Action

The No-Action alternative has not changed.

2.9.2 Alternative B-2 – Institutional Controls

There are no changes to the Institutional Controls Alternative. The new alternative reads:

This alternative requires setting up and maintaining institutional controls above those currently in place. Institutional controls may include: deed and/or access restrictions; maintenance of the existing fences, signs, and existing soil covers; and groundwater monitoring to verify effectiveness of the existing soil cover. These controls and the soil cover would need to be maintained long enough for uranium to decay (millions of years).

2.9.3 Alternative B-3 – Consolidation and Surface Barrier

2.9.4 Alternative B-4 –Selective Excavation and Disposal

These alternatives have been replaced with Alternative B-3: Excavation and Removal of Burial Ground 618-4 after reviewing data. Burial grounds have been difficult to characterize because of their complexity and limited documented history. The 300 Area burial grounds were investigated during the RI in the following way. Soil gas, surface radiation, and surface geophysics were used to locate two test pits. Test pits were excavated to collect samples. Sample data was used to determine risk numbers.

The 618-4 and 618-5 Burial Grounds have potential increased cancer risks of 1×10^{-4} and 3×10^{-5}, respectively. This is based on limited data from two test pits. Uranium contributes most of the risk, and the exposure routes are direct contact with contaminated soil, external radiation, and inhalation and ingestion of contaminated soils or debris. While the risk estimate for the 618-4 Burial Ground is technically within EPA's target risk range, it is at the upper limit of that range. This fact, along with the uncertainties in the representativeness of the data and the risk assessment, has led EPA, Ecology, and DOE to conclude that remedial action should be taken.

The action should be a phased approach. Therefore, one burial ground (618-4) is proposed to be excavated and one burial ground (618-5) will be further evaluated as part of 300-FF-2, which contains the rest of the burial grounds for the 300 Area. The information and experience gained from 618-4 will be used to develop remedial alternatives for the 618-5 Burial Ground. Landfills 1a, 1b, 1c, and 1d, which were originally in the burial ground alternatives have been grouped with the process waste unit alternatives as discussed above.

This alternative does not require a new detailed analysis because it is essentially the same as the previous B-4 selective excavation and disposal alternative. The difference is only one of the two major burial grounds is addressed. Therefore, the only evaluation criteria that changes is cost.

The new alternative reads:

The 618-4 Burial Ground would be remediated through excavation and disposal of materials greater than cleanup levels. Contaminated soil and debris would be disposed of in ERDF or other regulated landfill. Any material that exceeds the disposal facility acceptance criteria would be stored onsite consistent with requirements until treated to meet acceptance criteria or a treatability variance is approved. Verification sampling shall also be required. No additional institutional controls or post-cleanup monitoring are required for this alternative.

2.10 CONCLUSIONS

The 300-FF-1 Proposed Plan issue resolution resulted in changes that keep resources focused on remediation and risk-reduction activities and enhance the cleanup strategy for the 300-FF-1 Operable Unit. Combining the 300-FF-1 and 300-FF-5 Proposed Plans into one document further integrates the 300 Area source and groundwater operable units and will facilitate public review.

Proposed preferred alternatives for the process waste units and burial grounds are presented in the proposed plan. All of the revised remedial alternatives generally enhance or optimize concepts already presented in 300-FF-1 Phase III FS. It is recognized that implementation of the burial ground preferred alternative will provide greatly needed data to facilitate characterization and remediation decisions on future burial grounds.

Data collected in the 300 APT and process ponds prior to the CERCLA RI/FS were evaluated for impacts to the 300-FF-1 risk assessment and ARARs criteria. The risk assessment conclusions for the 300 APT and process ponds did not change. However, there are several constituents that were over twice the MTCA C Industrial Soil Cleanup Values in the 300 APT that were not included in the 300-FF-1 ARARs analysis and not factored into the 300 APT Closure Plan earlier. In addition, a uranium cleanup standard of 350 pCi/g was developed. New cobalt-60 data was factored into cleanup standard decision-making. A review of old and new data showed contaminants above MTCA Method C Industrial Cleanup Values are co-located with uranium contamination above the uranium cleanup standard. The fact that these data are correlated will simplify implementation of the cleanup action by allowing field decisions based on field screening for uranium.

This addendum functions as a revision to the 300 APT Closure Plan and 300-FF-1 Phase III FS. The documentation contained herein overrides any contrary information or statements made in those documents.

2.11 REFERENCES

Dennison, D. I., D. R. Sherwood, and J. S. Young, 1989, *Status Report on Remedial Investigation of the 300 Area Process Ponds*, PNL-6442, Pacific Northwest Laboratory, Richland, Washington.

Zimmerman, M. G. and C. D. Kossick, 1987, *300 Area Process Trench Sediment Analysis Report*, WHC-SP-0193, Westinghouse Hanford Company, Richland, Washington.

Figure AD-1. Cobalt-60 Contour Map of South Process Pond.

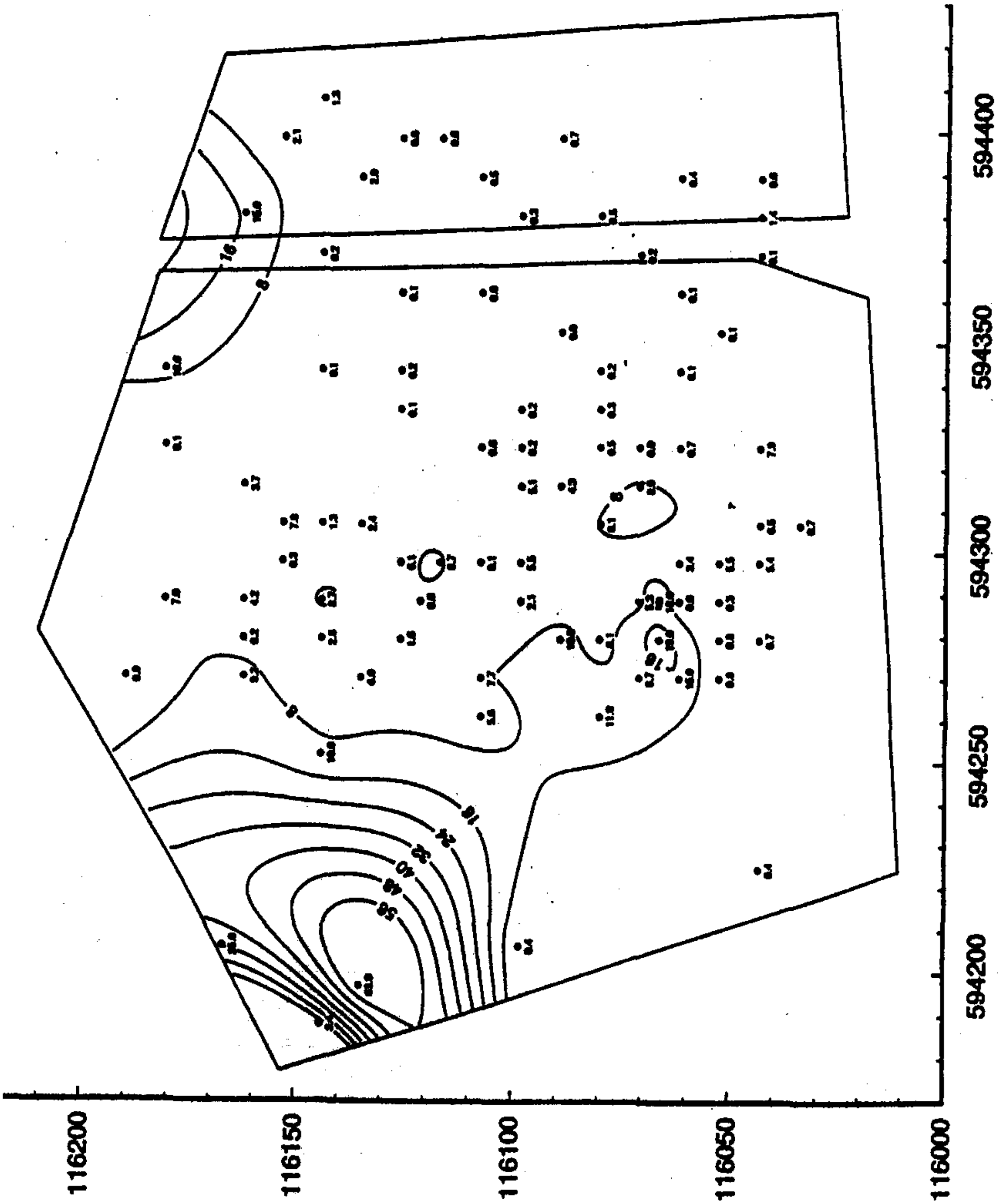

Figure AD-2. Alternative P-3 Process Waste Cleanup Zones.

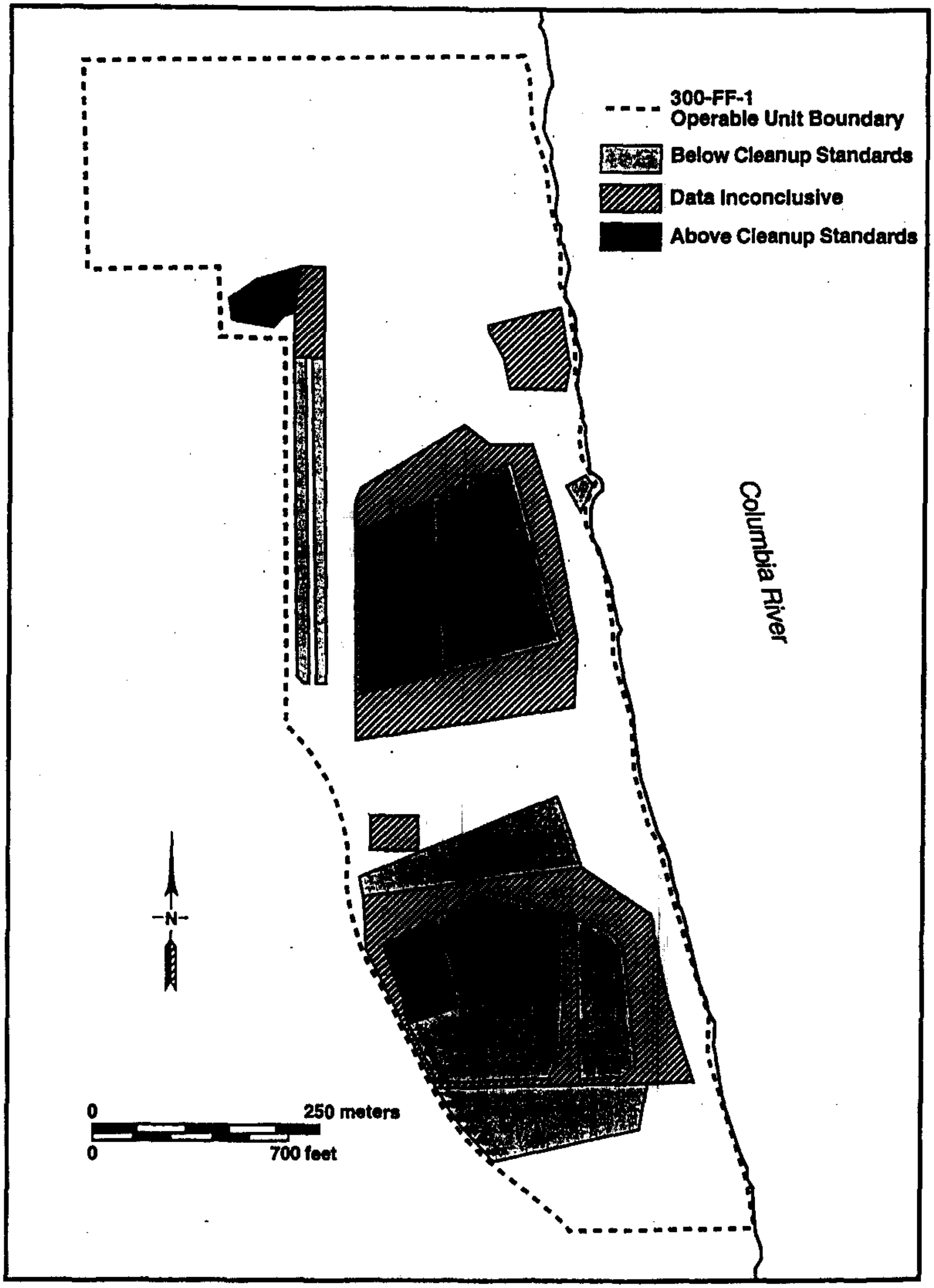

Table AD-1. Data Review Summary.

Constituent	Location	MTCA C (mg/kg)	Maximum Conc. (mg/kg)	Uranium Conc. (pCi/g)	Data Set
Arsenic	300 APT	188	319	*	SW-846
Thallium	300 APT	245	25,000	*	SW-846
Cadmium	300 APT	21.5	222	*	SW-846
Benzo(a)pyrene	300 APT	18	27	>15,000	CLP
Chrysene	300 APT	18	43	>15,000	CLP
PCBs	300 APT	17	19.5	20,000	CLP
PCBs	NPP	17	42	-3,600	SW-846

* Samples associated with the SW-846 data in the 300 APT were only analyzed for Lo-Alpha and Beta. For the three samples with arsenic, thallium, and cadmium the Lo-Alpha values were 250 pCi/g, 1,260 pCi/g, and 52 pCi/g, respectively. The Beta values were 1,460 pCi/g, 9,140 pCi/g, and 262 pCi/g, respectively. The PCB sample contained Lo-Alpha of 1,960 pCi/g and Beta of 2,140 pCi/g.

NOTES:

1. All 300 APT samples are Pre-ERA analyses, meaning all contaminants were moved to the spoils pile during the ERA.
2. The maximum concentrations indicated from the CERCLA data set are all estimated quantities assigned during data validation.

Table AD-2. Cost Estimate for Alternative P-1 – No Action.

Item		Cost[a]	Notes
CAPITAL COSTS (thousands)		$0	Use existing wells
POST-CLOSURE CARE COSTS			
Present value of monitoring costs		$1,263	See Table AD-12
Contingency	25%	$316	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[b]		$1,579	
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[c]		$1,579	In thousands

[a] Costs are for mid-1994, in thousands.
[b] Monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.
[c] *The sum of capital and operating costs and the net present value of the post-closure care costs.*

Table AD-3. Cost Estimate for Alternative P-2a – Soil Cover.

Item	Unit Cost	Units	Qty	Cost[a]	Notes
CAPITAL COSTS					
Silty soil cover[b]	$55,725	ac	50	$2,786	See Table AD-13 (excludes sanitary facilities)
Fencing	$15.00	lf	10,000	$150	
Air monitoring - capital				$50	
Air monitoring analyses	$50,000	yr	1	$50	During remedial action
Groundwater monitoring wells	$30,330	wells	8	$243	For performance monitoring
Site preparation (Mob, Demob & Rd. Maint.)				$165	Avg. of MCACES mob/demob calc. (w/50% rd. maint)
Subtotal Capital				$3,444	
Contractor overhead and profit	25%			$861	
Subtotal				$4,305	
Engineering and construction surveillance	70%			$3,014	
Subtotal				$7,319	
Contingency	25%			$1,830	
TOTAL CAPITAL COSTS (thousands)				$9,149	
POST-CLOSURE CARE COSTS					
Soil cover maintenance	$900	ac-yr	50	$692	Present value calculation
Fence maintenance	$0.50	lf-yr	10,000	$77	Present value calculation
Present value of monitoring costs				$1,263	See Table AD-12
Subtotal post-closure costs (net present value)				$2,032	
Contingency	25%			$508	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[c]				$2,540	In thousands
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[d]				$11,689	In thousands

[a] Costs are for mid-1994, in thousands.
[b] 2 feet of silty soil over entire contaminated area; to prevent direct contact.
[c] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.
[d] The sum of capital and operating costs and the net present value of the post-closure care costs, rounded to hundred thousands.

Table AD-4. Cost Estimate for Alternative P-2b – Consolidation and Soil Cover.

	Unit		15 mrem/yr		
Item	Cost	Units	Qty	Cost[b]	Notes
CAPITAL COSTS					
Consolidate contaminated soil	$10.30	cy	279,000	$2,874	c
Silty soil cover	$55,725	ac	14	$780	e
Fencing	$15.00	lf	6,000	$90	
Air monitoring - capital				$50	
Air monitoring analyses	$50,000	yr	1	$50	f
Groundwater monitoring wells	$30,330	well	8	$243	g
Site preparation (Mob, Demob & Rd. Maint.)				$165	h
Subtotal Capital				$4,252	
Contractor overhead and profit	25%			$1,063	
Subtotal				$5,315	
Engineering and construction surveillance	70%			$3,721	
Subtotal				$9,036	
Contingency	25%			$2,259	
TOTAL CAPITAL COSTS (thousands)				$11,295	
POST-CLOSURE CARE COSTS					
Soil cover maintenance	$900	ac-yr	14	$194	i
Fence maintenance	$0.50	lf-yr	6,000	$46	i
Present value of monitoring costs				$1,263	j
Subtotal post-closure costs (net present value)				$1,503	
Contingency	25%			$376	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[k]				$1,879	
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[l]				$13,174	

[a] Not a remediation alternative; provided for comparison.
[b] Costs are for mid-1994, <u>in thousands</u>.
[c] Includes regrading & compaction. Excludes sanitary facility and process trenches.
[d] See Table AD-13.
[e] 2 feet of silty soil over contamination to prevent direct contact with residual contamination.
[f] During remedial action.
[g] For performance monitoring.
[h] Avereage of Pond/Trench and Burial Ground MCACES calc. and 50% of road maintenance (assumed road gets half the traffic).
[i] Present value calculation.
[j] See Table AD-12.
[k] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation (in thousands).
[l] The sum of capital and operating costs and the net present value of the post-closure care costs (in thousands).

Table AD-5. Cost Estimates for Alternative P-3 – Excavation and Disposal.

Item	Unit Cost	Units	15 mrem/yr Qty	15 mrem/yr Cost[b]	Notes
CAPITAL COSTS					
Excavation & pre-screening of soil (red)	$17.69	cy	257,615	$4,557	i
Excavation of soil, no screening (green)	$3.36	cy	66,385	$223	i
Weight of contaminated soil		tons	137,700		c
Backfill over-excavated clean soil	$6.27	cy	324,000	$2,031	i
Regrading (w/above)	$0.00	cy	0	$0	
Fixation to meet ERDF leachate criteria	varies	ton	0	$0	n/a
Hauling & ERDF disposal of fixated soil	$20.22	ton	0	$0	n/a
Hauling & ERDF disposal of untreated soil	$20.22	ton	137,700	$2,784	e
Silty soil cover	$55,725	ac	0	$0	n/a
Air monitoring - capital				$50	
Air monitoring analyses	$50,000	yr	1.5	$75	g
Groundwater monitoring wells	$30,330	well	0	$0	n/a
Site preparation (Mob, Demob & Road Maint.)				$217	i
Subtotal Capital				$9,937	
Contractor overhead and profit	25%			$2,484	
Subtotal				$12,421	
Engineering and construction surveillance	70%			$8,695	
Subtotal				$21,116	
Contingency	25%			$5,279	
TOTAL CAPITAL COSTS (thousands)				$26,395	
POST-CLOSURE CARE COSTS					
Soil cover maintenance	$900	ac-yr	0	$0	n/a
Present value of monitoring costs				$0	n/a
Subtotal post-closure costs (net present value)				$0	
Contingency	25%			$0	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE [l]				$0	
TOTAL ALTERNATIVE COST (NET PRESENT VALUE) [m]				$26,395	

[a] Excavation and disposal of all contamination

[b] Costs are for mid-1994, <u>in thousands</u>.

[c] After pre-screening.

[e] Unit cost per Table AD-13.

[g] During remedial action.

[h] For performance monitoring.

[i] Rate derived from Pond/Trench MCACES calc.

[l] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.

[m] The sum of capital and operating costs and the net present value of the post-closure care costs.

Table AD-6. Cost Estimate for Alternative P-4 – Excavation, Soil Washing, and Fines Disposal.

Item	Unit Cost	Units	15 mrem/yr Qty	15 mrem/yr Cost[a]	Notes
CAPITAL COSTS					
Excavation and pre-screening of soil	$17.69	bcy	324,000	$5,732	h
Weight of contaminated soil		*tons*	137,700		*b*
Backfill over-excavated clean soil	$6.27	bcy	324,000	$2,031	h
Regrading (w/above)	$0.00	bcy	0	$0	n/a
Soil washing	varies	tons	137,700	$7,436	c
Hauling and ERDF disposal	$20.22	tons	12,668	$256	d
Backfill treated coarse soil	$6.27	bcy	w/above	w/above	e, h
Silty soil cover	$55,725	ac	0	$0	n/a
Air monitoring - capital				$50	
Air monitoring analyses	$50,000	yr	3.2	$160	g
Groundwater monitoring wells	$30,330	well	0	$0	n/a
Site preparation (Mob, Demob & Road Maint.)				$217	h
Subtotal Capital				$15,882	
Contractor overhead and profit	25%			$3,971	
Subtotal				$19,853	
Engineering and construction surveillance	70%			$13,897	
Subtotal				$33,750	
Contingency	25%			$8,438	
TOTAL CAPITAL COSTS (thousands)				**$42,188**	
POST-CLOSURE CARE COSTS					
Soil cover maintenance	$900	ac-yr	0	$0	N/A
Present value of monitoring costs				$0	N/A
Subtotal post-closure costs (net present value)				$0	
Contingency	25%			$0	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[l]				**$0**	
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[m]				**$42,188**	

[a] Costs are for mid-1994, in thousands.
[b] After pre-screening.
[c] *See Table AD-15.*
[d] Dewatered fines after fixation.
[e] *Soil meeting direct exposure remediation goals (assumes 1.61 ton/bcy).*
[f] 2 feet of silty soil over entire contaminated area; to protect groundwater and prevent direct contact with residual contamination.
[h] Rate derived from Pond/Trench MCACES calc.
[i] For performance monitoring.
[k] See Table AD-12
[l] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation (in thousands).
[m] The sum of capital and operating costs and the net present value of the post-closure care costs (in thousands).

Table AD-7. Cost Estimate for Alternative B-1 – No Action.

Item	Quantity	Units	Unit Cost	Cost[a]	Notes
CAPITAL COSTS					
Groundwater monitoring wells	8	wells	$30,330	$243	For performance monitoring
Contractor overhead and profit			25%	$61	
Subtotal				$304	
Engineering and construction surveillance			70%	$213	
Subtotal				$517	
Contingency			25%	$129	
TOTAL CAPITAL COSTS (thousands)				$646	
POST-CLOSURE CARE COSTS					
Present value of monitoring costs				$1,263	See Table AD-12
Contingency			25%	$316	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[b]				$1,579	In thousands
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[c]				$2,225	In thousands

[a] Costs are for mid-1994, in thousands.

[b] Monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.

[c] The sum of capital and operating costs and the net present value of the post-closure care costs.

Table AD-8. Cost Estimate for Alternative B-2 – Institutional Controls.

Item	Quantity	Units	Unit Cost	Cost[a]	Notes
CAPITAL COSTS					
Fencing	400	lf	$15	$6	
Groundwater monitoring wells	8	wells	$30,330	$243	For performance monitoring
Subtotal Capital				$249	
Contractor overhead and profit			25%	$62	
Subtotal				$311	
Engineering and construction surveillance			70%	$218	
Subtotal				$529	
Contingency			25%	$132	
TOTAL CAPITAL COSTS (thousands)				$661	
POST-CLOSURE CARE COSTS					
Present value of monitoring costs				$1,263	See Table AD-12
Fence maintenance	400	lf-yr	$0.50	$3	Present value calculation
Subtotal post-closure costs (net present value)				$1,266	
Contingency			25%	$317	
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[b]				$1,583	In thousands
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[c]				$2,244	In thousands

[a] Costs are for mid-1994, in thousands.

[b] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.

[c] The sum of capital and operating costs and the net present value of the post-closure care costs.

Table AD-9. Cost Estimate for Alternative B-3 – Consolidation and Surface Barrier.

Item	Unit Cost	Units	B-3 Qty	B-3 Cost[c]		Notes
CAPITAL COSTS						
Excavation and pre-screening of soil	$18.36	cy	26,222	$481	f	
Weight of contaminated soil		tons	17,000			
Backfill / Regrading	$9.86	cy	26,222	$259	f	Clean & contaminated soil
Regrading (w/above)	$0.00	cy	0	$0	n/a	
Fixation to meet ERDF leachate criteria	$0	ton	0	$0	n/a	
Hauling & ERDF disposal of fixated soil	$20.22	ton	0	$0	n/a	
Hauling & ERDF disposal of untreated soil	$20.22	ton	17,000	$344	g	Assume 1.61 ton per bcy
Silty soil cover (surface barrier)	$55,725	ac	0	$0	n/a	
Air monitoring - capital				$50		
Air monitoring analyses	$50,000	yr	1	$50		During remedial action
Groundwater monitoring wells	$30,330	well	0	$0	n/a	
Site preparation (Mob, Demob & Road Maint.)				$184		Derived from Burial Ground MCACES calc.
Subtotal Capital				$1,368		
Contractor overhead and profit	25%			$342		
Subtotal				$1,710		
Engineering and construction surveillance	70%			$1,197		
Subtotal				$2,907		
Contingency	25%			$727		
TOTAL CAPITAL COSTS (thousands)				$3,634		
POST-CLOSURE CARE COSTS:						
Soil cover maintenance	$900	ac-yr	0	$0	n/a	Present value calculation, N/A
Present value of monitoring costs				$0	n/a	See Table AD-12
Subtotal post-closure costs (net present value)				$0		
Contingency	25%			$0		
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[d]				$0		In thousands
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[e]				$3,634		In thousands

[a] Excavation to achieve direct exposure PRGs

[c] Costs are for mid-1994, in thousands.

[d] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.

[e] The sum of capital and operating costs and the net present value of the post-closure care costs.

[f] Rate derived from MCACES Burial Ground Calc.

[g] Unit Cost per Table AD-13.

Table AD-10. Cost Estimates for Alternative B-4 – Excavation and Disposal.

Item	Unit Cost	Units	B-4 Qty	B-4 Cost[c]		Notes
CAPITAL COSTS						
Excavation and pre-screening of soil	$18.36	cy	113,000	$2,075	f	
Weight of contaminated soil		tons	100,000			
Backfill / Regrading	$9.86	cy	113,000	$1,114	f	Clean & borrow soil.
Regrading w/above	$0.00	cy	0	$0	n/a	
Fixation to meet ERDF leachate criteria	$0	ton	0	$0	n/a	
Hauling & ERDF disposal of fixated soil	$20.22	ton	0	$0	n/a	
Hauling & ERDF disposal of untreated soil	$20.22	ton	100,000	$2,022	g	Assume 1.61 ton per bcy
Silty soil cover (surface barrier)	$55,725	ac	0	$0	n/a	
Air monitoring - capital				$50		
Air monitoring analyses	$50,000	yr	2	$100		During remedial action
Groundwater monitoring wells	$30,330	well	0	$0	n/a	Performance monitoring, N/A
Site preparation (Mob, Demob & Road Maint.)				$184		Derived from Burial Ground MCACES calc.
Subtotal Capital				$5,545		
Contractor overhead and profit	25%			$1,386		
Subtotal				$6,931		
Engineering and construction surveillance	70%			$4,852		
Subtotal				$11,783		
Contingency	25%			$2,946		
TOTAL CAPITAL COSTS (thousands)				$14,729		
POST-CLOSURE CARE COSTS:						
Soil cover maintenance	$900	ac-yr	0	$0		Present value calculation, N/A
Present value of monitoring costs				N/A		See Table AD-12
Subtotal post-closure costs (net present value)				$0		
Contingency	25%			$0		
NET PRESENT VALUE COST FOR POST-CLOSURE CARE[d]				$0		In thousands
TOTAL ALTERNATIVE COST (NET PRESENT VALUE)[e]				$14,729		In thousands

[a] Excavation to achieve direct exposure PRGs
[c] Costs are for mid-1994, in thousands.
[d] Maintenance and monitoring for 30 years; interest (discount) rate of 5 percent, net of inflation.
[e] The sum of capital and operating costs and the net present value of the post-closure care costs.
[f] Rate derived from MCACES Burial Ground Calc.
[g] Unit cost per Table AD-13.

Table AD-11. Common Factors.

Item	Value	Source/Comments
Interest rate (net of inflation)	5%	EPA value; for present value calculations
Post-closure care period	30 yr	RCRA post-closure care period
Present value factor using above	15.37	Calculated
Contractor overhead & profit (OH&P)	25%	Mid-range value for site remediation
Engineering & construction surveillance (E&CS)	70%	Rounded sum of factors
Definitive design	9%	Average of Pond & Burial Ground calc. (100BC 1995 Baseline adjusted to 300-FF-1 parameters).
On-site indirects (field non-manual including QA and Safety, training, direct distribs and general indirects).	46%	Average of MCACES Pond & Burial Ground calc.
PM/CM	15%	Average of MCACES Pond & Burial Ground calc.
Contingency	25%	Appropriate for FS
Combined factor	266%	OH&P, E&CS, contingency

Table AD-12. Basic Unit Cost.

Item	Unit Cost	Units	Source/Comments
SITE WORK (labor, materials and equipment):			Not including contractor overhead & profit
Pond & Trench Excavation/Placement:			
Excavate waste/contaminated soil (red)	$17.69	bcy	Total of the following rates from MCACES and Excel calcs.
excavation	$3.36	bcy	Excavation (cont. & non-cont.)/dust supr/laundry/container decon/lighting
screening	$14.33	bcy	Rad mon/anal eq/sampling/samples/hpt support
Backfill/Regrade, (W/Haul @24 miles round trip)	$6.27	bcy	Spread & compact clean stockpiled soil
Regrading (same activity as backfill)	$6.27	bcy	Spread & compact contaminated soil
Excavate waste/contaminated soil (green)	$3.36	bcy	Same as above but excludes field screening
Burial Ground Excavation/Placement:			
Excavate waste/contaminated soil	$18.36	bcy	Total of the following rates from MCACES and Excel calcs.
excavation	$4.33	bcy	excav/dust supr/laundry/container decon/lighting
screening	$14.03	bcy	rad mon/anal eq/sampling/samples/hpt support
Backfill/Regrade, (W/Haul @24 miles round trip)	$9.86	bcy	Spread & compact clean stockpiled soil & borrow
Regrading (same activity as backfill)	$9.86	bcy	Spread & compact contaminated soil.
Misc Placement:			
Consolidate waste	$10.30	bcy	Total of the following rates (without field separation or pre-screening)
excavation/compile/compact/dust supr	$9.79	bcy	Rate from MCACES calculation.
ppe laundry service	$0.51	bcy	Rate from MCACES Pond/Trench calc.
Fencing	$15.00	lf	Escalated from Means 1993; 6-ft fence w/ barbed wire
Materials (in place, including normal compaction):			
Soil Cover	$0.00	n/a	See Table AD-13
General construction:			
Office building	$47.00	sf	WHC 1994
Temporary structure cover	$27.80	sf	WHC 1994
TREATMENT PLANT LABOR:			WHC 1994
Plant manager	$101,500	yr	
Plant engineer	$72,500	yr	
Operator, plant	$50,750	yr	
Operator, equipment	$43,500	yr	
Laborer	$36,250	yr	
Radiation/Health & Safety Officer	$72,500	yr	
Health Physics Technician	$50,750	yr	
Clerical	$36,250	yr	
UTILITIES AND CHEMICALS:			
Electricity	$60.00	1000 kwh	Typical for northwest region
Water	$7.00	1000 gal	WHC 1994
Portland cement	$95.00	ton	Vendor estimate
Fly ash	$35.00	ton	
OTHER:			
Fence maintenance	$0.50	lf-yr	Allowance
Soil cover maintenance	$900.00	ac-yr	Allowance, including construction surveillance
Air monitoring capital costs	$50,000	LS	Sampling stations, 10ea, quoted price.
Annual air monitoring costs	$50,000	yr	During remedial action; allowance
Misc. Site Preparation, Soil Washing	$100,000	ls	Allowance
Misc. Site Prep., Pond/Trch (mob/demob/rd. maint.)	$217,080	ls	Pond/Trench MCACES calcs @ 1994 dollars ($.67/total exc. bcy)
Misc. Site Prep., Burial Gnd. (mob/demob/rd maint.	$184,000	ls	Burial Ground MCACES calcs @ 1994 dollars ($1.84/total exc. bcy)
Groundwater monitoring well	$30,330	each	4" stainless steel; 40 ft deep (WHC memo 6/17/94 @ 1994 dollars).
Long-term groundwater monitoring costs:			
Annual monitoring costs - first 5 years	$100,000	yr	Allowance for quarterly monitoring
Annual monitoring costs - after 5 years	$50,000	yr	Allowance for semi-annual monitoring
Performance review (every 5 years)	$100,000	each	Allowance
Present value of long-term monitoring costs	$1,263,000	LS	Assuming 30 years @ 5% net interest; includes 5-yr reviews

Table AD-13. Derived Unit Costs.

Item	Quantity	Units	Unit Cost	Cost	Notes
NOTE:					
All unit costs used in the cost estimates are base costs ("raw"), before addition of OH&P, E&CS, and contingency.					
The costs for OH&P, E&CS, and contingency are added as percentages in the costs estimates for each alternative.					
ERDF Disposal Cost:					Total costs include OH&P, E&CS, and contingency
Initial construction plus operations	$2.2 E+7	lcy	$50.91	$1.1 E+9	WHC budget estimates (verbal communication)
Modified Hanford Barrier	$2.8 E+7	lcy	$7.25	$2.0 E+8	Total cost from DOE/RL 1994d, Table 9-7
Post-closure care			$2.00		Allowance
Total unit cost for disposal			$60.16		
Divide by combined factor			/ 2.7		OH&P, E&CS, contingency (Table AD-11)
			$23.00		Rounded to units
Transportation (truck @ 48 miles round trip)			$5.31		Avg. of hauling cost from Pond & Burial Ground MCACES calcs.
ERDF Disposal Unit Cost (raw)		LCY		$28.31	Base unit cost (w/o OH&P, E&CS, or contingency)
		LCY		$75.19	Fully burdened unit cost (for comparison)
		TON		$20.22	Same as above only converted to $/tn (1.4TN per LCY)
		TON		$53.70	Same as above only converted to $/tn (1.4TN per LCY)
Soil Cover:					For groundwater protection
Silt 2ft/sf — silt cost	3,227	bcy	$0.00	$0	No charge for silt from McGee Ranch
load/haul silt	3,227	bcy	$13.46	$43,431	Rate from MCACES calc. (68 miles round trip).
spread & compact	3,227	bcy	$3.81	$12,294	Rate from MCACES Pond/Trench calc.
Soil Cover Unit Cost		ac		$55,725	

Table AD-14. Estimated Costs for Ex-Situ Fixation.

Item	Unit Cost	Units	15 mrem/yr Qty	15 mrem/yr Cost[a]	Notes
DESIGN ASSUMPTIONS:					
Weight of soil treated		tons	137,700		See Table 6-1
Soil processing rate		tons/hr	25		
Operating schedule		hrs/wk	50		
Staffing		hrs/wk	72		
On-line time (calculated)			69%		Operating time / staffing
Treatment period		yr	2.2		Calculated
CAPITAL COSTS:					
Soil washing equipment				$4,709	See Figure 6-4 and Table AD-16
Depreciated capital for project life				$1,816	7 yr life; operating time plus 6 mo.
Site preparation				$231	Grading, utility connections, soil pad
Mobilization and startup				$529	
Process building	$27.80	sf	7,200	$200	
Plant support building	$47.00	sf		$150	Decontamination, lab., admin.
TOTAL CAPITAL COST (thousands)				$2,926	
OPERATING COSTS (for period of operation:					
Labor annual cost				$932	15 mrem value avg of 10 & 25 values
Labor total cost		yr	2.2	$2,050	See Table AD-16
Polymers	$2.00	/ ton	137,700	$275	For flocculation & filter press
Fixation chemicals (for fines)	$24	/ ton	12,668	$304	Per ton of dewatered fines
Power	$60	1000 kwh	6,500	$390	
Water	$7	1000 gal	3,194	$22	
Personnel protection	$1.50	/ ton	137,700	$207	Laundry, monitoring, & expendables
Supplies and miscellaneous	$1.75	/ ton	137,700	$241	
Maintenance				$622	Est. 6% of equipment cost annually
Treatment system air monitoring	$200	samp	220	$44	2 per week
Offsite analytical	$200	samp	1,100	$220	QA for onsite XRF; 10 per week
Process studies				$200	To fine-tune processing
TOTAL OPERATING COST (thousands)				$4,575	
SOIL WASHING BASE UNIT COST		per feed ton		$54	In whole dollars

[a] Costs are for mid-1994, in thousands.

Table AD-15. Estimated Costs for Soil Washing.

Item	Unit Cost	Units	3 mrem/yr Qty	3 mrem/yr Cost[a]	10 mrem/yr Qty	10 mrem/yr Cost[a]	15 mrem/yr Qty	15 mrem/yr Cost[a]	25 mrem/yr Qty	25 mrem/yr Cost[a]	Notes
DESIGN ASSUMPTIONS:											
Weight of contaminated soil		tons									See Table 6-1
Percent requiring fixation (estimated)											To meet ERDF leachate criteria
Weight of soil treated		tons									
Soil processing rate		tons/hr									
Operating schedule		hrs/wk									
Staffing		hrs/wk									
On-line time (calculated)											Operating time / staffing
Treatment period		yr									Calculated
CAPITAL COSTS:											
Package system											Vendor est.; includes size reduction
Front-end loader											
Air monitoring for treatment system											
Equipment Cost (subtotal)											
Depreciated capital for project life											7 yr life; used operating time plus 1 mo.
Site preparation											Grading, utility connections, soil pad
Mobilization and startup											
TOTAL CAPITAL COST (thousands)											
OPERATING COSTS (for period of operation):											
LABOR:			Man-years		Man-years		Man-years		Man-years		See Table AD-16
Plant manager/engineer	$101,500	ea/yr	0		0		0		0		1 shift; 8 hr/day
Operators (2)	$50,750	ea/yr	0		0		0		0		
Laborers (2)	$36,250	ea/yr	0		0		0		0		
Radiation / Health & safety officer	$72,500	ea/yr	0		0		0		0		
Health physics technician	$50,750	ea/yr	0		0		0		0		
Clerical	$36,250	ea/yr	0		0		0		0		Administrative
LABOR SUBTOTAL											Rounded to thousands
MATERIALS AND MAINTENANCE:											
Fixation chemicals	$0	/ ton	0		0		0		0		
Personnel protection	$1.50	/ ton	0		0		0		0		
Maintenance											Est. 6% of equipment cost annually
Treatment system air monitoring	$200	samp	0		0		0		0		2 per week
Offsite analytical (QA for onsite XRF)	$200	samp	0		0		0		0		10 per week
Utilities, supplies and miscellaneous	$2.00	/ ton	0		0		0		0		Allowance
TOTAL OPERATING COST (thousands)											For treatment period
EX-SITU FIXATION BASE UNIT COST		per feed ton									In whole dollars

[a] Costs are for mid-1994, in thousands.

Table AD-16. Breakdown of Soil Washing Costs.

Item	Unit Cost	Units	50 ton/hr System Qty	50 ton/hr System Cost[a]	25 ton/hr System Qty	25 ton/hr System Cost[a]	Notes
ESTIMATED EQUIPMENT COSTS:							WHC 1994
Feed module				$575,000		$448,000	Grizzly, conveyors, apron feeder
Rotary scrubber				$430,000		$350,000	
Coarse screen				$280,000		$222,000	4 mm screen, water spray, cyclone #1
Screen pumping module				$295,000		$243,000	Conveyor, pumping, piping, controls
Flocculation module				$210,000		$175,000	Flocculator, tanks, mixers, cyclone #3
Reagent module				$130,000		$114,000	For polymer addition
Attrition scrubber				$465,000		$365,000	6 attrition cells, 3 pumps, conveyor
Dewatering screen module				$225,000		$188,000	vibrating screen, cyclones #2 & #3
Thickener				$415,000		$273,000	Lamella thickener, pump, tank
Belt filter press				$505,000		$412,000	
Filter support module				$185,000		$152,000	Compressor and conveyors for filter press
Electrical controls				$325,000		$302,000	Control panel in control room
Water treatment (precipitation / ion exchange)				$0		$0	Assume flocculation/settling sufficient
Stabilization equipment				$400,000		$300,000	
Air monitoring for treatment system				$125,000		$125,000	
Sampling equipment and XRF				$150,000		$150,000	
Front-end loader				$150,000		$150,000	
Plant engineering by supplier				$300,000		$300,000	
Freight, assembly and startup				$475,000		$440,000	By equipment vendor
TOTAL SOIL EQUIPMENT COST				$5,640,000		$4,709,000	
ESTIMATED LABOR COSTS:			2 shifts (72 hr/wk)		1 shift (40 hr/wk)		WHC 1994
Plant manager	$101,500	ea/yr	1	$101,500	1	$101,500	
Plant engineer	$72,500	ea/yr	1	$72,500	1	$72,500	
Plant operators	$50,750	ea/yr	10	$507,500	5	$253,750	
Equipment operators	$43,500	ea/yr	2	$87,000	1	$43,500	
Laborers	$36,250	ea/yr	2	$72,500	3	$108,750	
Radiation / Health & safety officer	$72,500	ea/yr	2	$145,000	1	$72,500	
Health physics technicians	$50,750	ea/yr	2	$101,500	1	$50,750	
Clerical	$36,250	ea/yr	1	$36,250	1	$36,250	
TOTAL SOIL WASHING LABOR				$1,123,750		$739,500	

[a] Costs are for mid-1994.

Table AD-17. Contaminants of Concern Maximum Concentrations the 300-FF-1 Operable Unit Soil.

Contaminants of Concern	Maximum Concentration[a] Detected in Soils	Cleanup Levels	Source of Cleanup Level
Cobalt-60	81 pCi/g	15 mrem/yr[b]	40 CFR 196[c]
Uranium-234	9,700 pCi/g		
Uranium-235	1,600 pCi/g		
Uranium-238	9,100 pCi/g		
Arsenic[d]	319 mg/kg[e]	188 mg/kg	MTCA[f]
Benzo(a)pyrene[d]	27 mg/kg[e]	18 mg/kg	MTCA[f]
Chrysene[d]	43 mg/kg[e]	18 mg/kg	MTCA[f]
Cadmium[d]	222 mg/kg[e]	21.5 mg/kg	MTCA[f]
Polychlorinated Biphenyls	42 mg/kg[e]	17 mg/kg	MTCA[f]
Thallium[d]	25,000 mg/kg[e]	245 mg/kg	MTCA[f]

[a] Data presented are maximum levels. These contaminant levels are limited to only a few areas (see Figure AD-2).

[b] An exposure assessment model is used to convert between soil concentrations (pCi/g) and dose levels (mrem/yr). For example, in 300-FF-1, the 15 mrem/yr dose from total uranium (uranium-234, -235, and -238) equates to 350 pCi/g.

[c] 40 CFR 196 is a proposed regulation.

[d] Contaminants found only in the 300 Area Process Trenches Spoils Pile.

[e] These contaminant concentrations were found in locations that also had high total uranium concentrations (above 350 pCi/g).

[f] State of Washington, Model Toxic Control Act, Method C, Industrial Cleanup Values For Soils (MTCA Cleanup Levels and Risk Calculations, update August 31, 1994).

2.12 EXECUTIVE SUMMARY

The Hanford Facility is owned by the U.S. Government and operated by the U.S. Department of Energy, Richland Operations Office. Dangerous waste and mixed waste (containing both radioactive and dangerous components) are produced and managed on the Hanford Facility. The dangerous waste is regulated in accordance with the *Resource Conservation and Recovery Act of 1976* (RCRA) and the *State of Washington Hazardous Waste Management Act of 1976* [as administered through the Washington State Department of Ecology, "Dangerous Waste Regulations," *Washington Administrative Code*, Chapter 173-303]. The radioactive component of mixed waste is interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act of 1954*; the nonradioactive dangerous component of mixed waste is interpreted to be regulated under RCRA and the *Washington Administrative Code*, Chapter 173-303.

For the purposes of RCRA, the Hanford Facility is considered to be a single facility. The single dangerous waste permit identification number issued to the Hanford Facility by the U.S. Environmental Protection Agency and the Washington State Department of Ecology is Environmental Protection Agency/State Identification Number WA7890008967. This identification number encompasses a number of treatment, storage, and/or disposal units within the Hanford Facility. Treatment, storage, and/or disposal units that are no longer operating will be closed under interim status (using final status standards in the *Washington Administrative Code*, Chapter 173-303-610).

The *300 Area Process Trenches Modified Closure/Postclosure Plan* (Rev. 1) consists of a *Resource Conservation and Recovery Act of 1976* Part A Dangerous Waste Permit Application, Form 3 and a RCRA Closure/Postclosure Plan. An explanation of the Part A Permit Application, Form 3 submitted with this document is provided at the beginning of the Part A Section. The closure plan consists of nine chapters and six appendices.

This treatment, storage, and/or disposal unit closure is unique because it is integrated with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* 300-FF-1 Operable Unit remedial action. This integration is necessary to ensure that the activities of the two units remain physically consistent in accordance with the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Section 5.5) so that unit contamination is most economically and efficiently addressed.

2.13 ACRONYMS

300 APT	300 Area Process Trenches
ACV	administrative control value
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirements
BHI	Bechtel Hanford, Inc.
CAS	Chemical Abstract System
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CLARC II	Cleanup Levels and Risk Calculation
CPF	cancer potency factor [same as slope factor (SF)]
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objective
DWS	drinking water standards
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERA	expedited response action
ERDF	Environmental Restoration Disposal Facility
FS	feasibility study
HBL	health-based level
HEAST	Health Effects Assessment Summary Tables
HEDL	Hanford Engineering Development Laboratory
HQ	hazard quotient
HSBRAM	Hanford Site Baseline Risk Assessment Methodology
ICR	incremental cancer risk
IRIS	Integrated Risk Information System
LOQ	limit of quantitation
MCL	maximum contaminant levels
MPC	maximum permissible concentration
MTCA	*Model Toxics Control Act*
O&M	operation and maintenance
PCB	polychlorinated biphenyl
PNL	Pacific Northwest Laboratory
PRG	preliminary remediation goal
QA	quality assurance
QAPjP	quality assurance project plan

QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RfD	reference dose
RI	remedial investigation
RLWS	Radioactive Liquid Waste Sewer System
ROD	record of decision
SAP	sampling and analysis plan
SDWA	*Safe Drinking Water Act*
SF	slope factor
TEDF	Treated Effluent Disposal Facility
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
UCL	upper confidence limit
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company

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PNNL-13645

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

300 Area Process Trenches Groundwater Monitoring Plan

J. W. Lindberg
C. J. Chou

August 2001

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RL01830

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Richland, Washington 99352

Summary

The 300 Area process trenches, also designated 316-5 process trenches, were operated to receive effluent containing dangerous wastes from nuclear research and fuel fabrication laboratories in the 300 Area between 1975 and 1994. They are regulated as a treatment, storage, or disposal facility under the *Resource Conservation and Recovery Act of 1976* (RCRA) and are within the 300-FF-5 Operable Unit regulated under the *Comprehensive Environmental Response, Compensation, and Recovery Act of 1980* (CERCLA). Currently, the trenches are included in the Hanford Site RCRA Dangerous Waste Permit, have an approved closure/post-closure plan, and are regulated under a RCRA final-status, corrective action groundwater monitoring program (WAC 173-303-645, and by reference 40 CFR 264). They are also in a CERCLA remedial action process under a record of decision allowing natural attenuation as a groundwater cleanup remedy.

The objective of groundwater monitoring during the corrective-action period is to monitor the trend of the constituents of concern to confirm that they are attenuating naturally, as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit. In addition, the corrective-action groundwater monitoring program must be at least as effective as the previous compliance monitoring program in determining compliance with groundwater protection standards.

The existing groundwater monitoring plan (Lindberg et al. 1995) is being replaced by this document. This monitoring plan includes well and constituent lists; summarizes sampling, analytical, and quality control requirements; and incorporates all the interim changes made since the last revision of the groundwater monitoring plan for the 300 Area process trenches. Changes from the previous monitoring plan include updating the discussion on hydrogeology and conceptual model, redesigning the monitoring well network to include 11 wells rather than the previous eight, and adopting a control chart statistical approach that will track the contamination trends better than the previous plan with reduced costs.

Analytes to be tested in groundwater samples from network wells are uranium, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene. Uranium and cis-1,2-dichloroethene remain above drinking water standards in wells of the network, trichloroethene continues to be detected in network wells but there is an additional source offsite, and tetrachloroethene is no longer detected in the network wells, but exceeded the drinking water standard as recently as 1998.

Contents

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1.0 Introduction

This document is a proposed groundwater monitoring plan for the 300 Area process trenches to comply with Resource Conservation and Recovery Act (RCRA) final status, corrective-action groundwater monitoring requirements (WAC 173-303-645, and by reference 40 CFR 264). It will replace the existing groundwater monitoring plan for the 300 Area process trenches (Lindberg et al. 1995).

The 300 Area and 300 Area process trenches, also designated 316-5 process trenches, are located in the southeastern part of the U.S. Department of Energy's (DOE's) Hanford Site in southeastern Washington (Figure 1.1). They were operated between 1975 and 1994 as a waste facility to receive process wastewater containing dangerous waste constituents (up until 1985) from nuclear research and nuclear fuel fabrication laboratories. The Washington State Department of Ecology (Ecology) regulates the trenches under the *Resource Conservation and Recovery Act of 1976* (RCRA). Because the trenches are within the 300-FF-1 and 300-FF-5 Operable Units (source and groundwater operable units, respectively) (Figure 1.2), they also are regulated by the U.S. Environmental Protection Agency (EPA) under the *Comprehensive Environmental Response, Compensation, and Recovery Act of 1980* (CERCLA). Bechtel Hanford, Inc. (BHI) is responsible for remediating the 300 Area process trenches as part of the 300 FF-1 and 5 Operable Units for the U.S. Department of Energy, Richland Operations Office (DOE/RL). BHI is also responsible for post-operation administration of the 300 Area process trenches, and groundwater is monitored by Pacific Northwest National Laboratory.

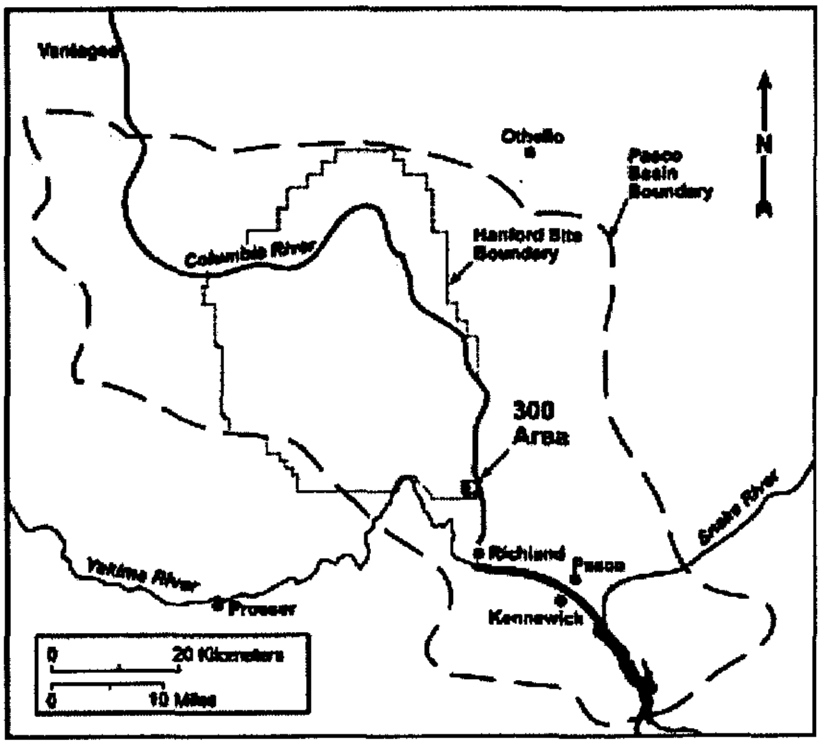

Figure 1.1. Location of the 300 Area at the Hanford Site, Washington

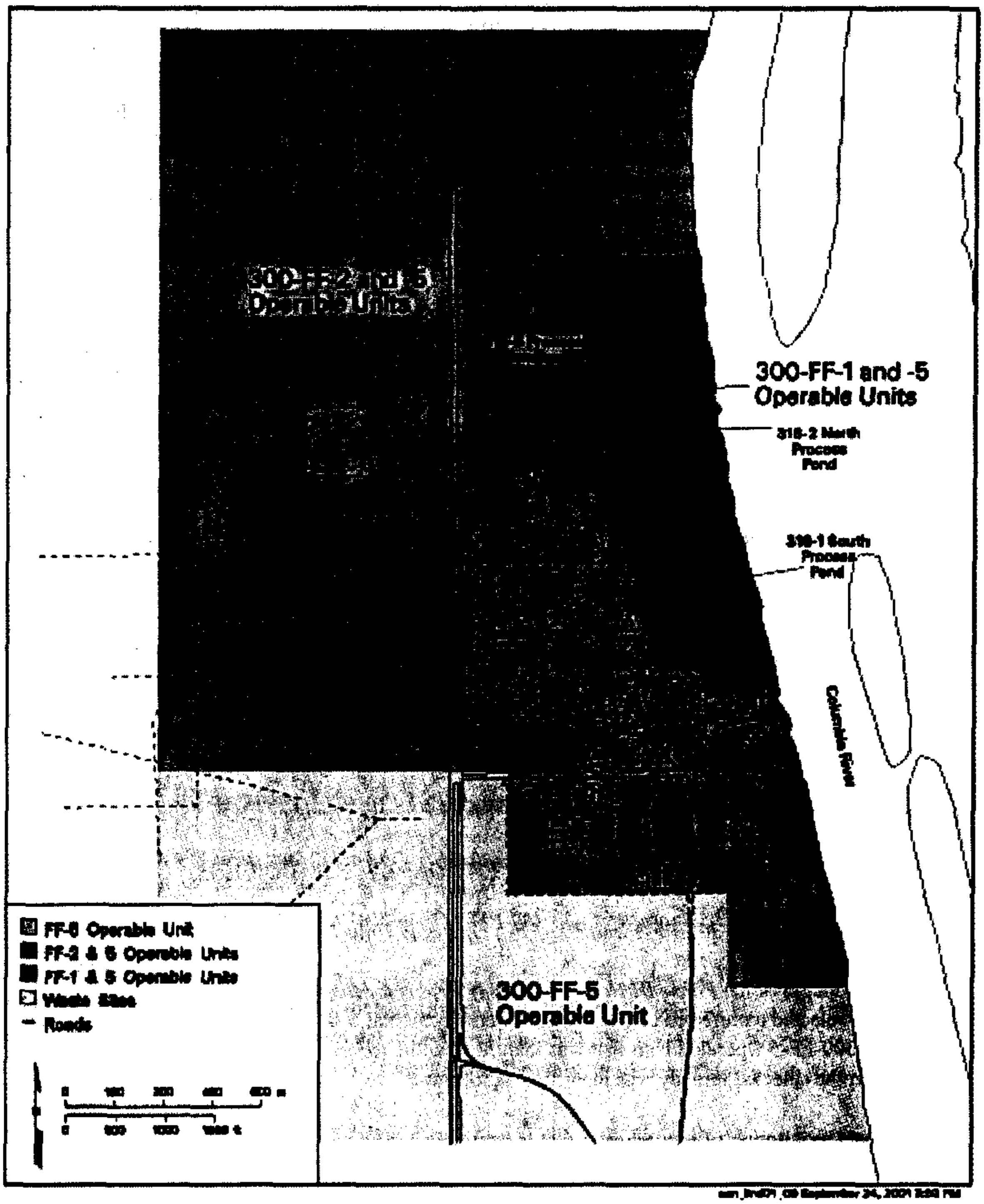

Figure 1.2. Locations of Main Facilities in the 300 Area and Operable Unit Boundaries

The 300 Area process trenches are regulated by a number of documents because of the need to integrate compliance to both governmental acts (RCRA and CERCLA) administrated by the two governmental agencies (Ecology and EPA, respectively). The trenches were permanently removed from service in December 1994 in support of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) Milestone M-17-10 for Project L045H, Treated Effluent Disposal Facility (Ecology et al. 1998), and they are included in the *Hanford Site Dangerous Waste Permit* Number WA7890008967 (DOE 1988), Revision 3, Part VI (Unit Specific Conditions For Units In Post-Closure). The applicable closure/post-closure plan is the *300 Area Process Trenches Modified Closure/Postclosure Plan* (DOE 1997a). The existing groundwater monitoring plan (Lindberg et al. 1995) is being replaced by this document.

From a CERCLA perspective, the 300 Area process trenches were involved in a succession of studies and documents that characterized the site, developed and examined multiple remedial strategies, and culminated in a record of decision for remedial action. The CERCLA documents include the following:

- *Remedial Investigation/Feasibility Study Work Plan for the 300-FF-1 Operable Unit, Hanford Site, Richland, Washington* (DOE 1992a)

- *Phase I Remedial Investigation Report for the 300-FF-1 Operable Unit* (DOE 1993a)

- *Phase I and II Feasibility Study for the 300-FF-1 Operable Unit* (DOE 1993b)

- *Phase II Remedial Investigation Report for the 300-FF-1 Operable Unit: Physical Separation of Soils Treatability Study* (DOE 1994)

- *Phase I Remedial Investigation Report for the 300-FF-5 Operable Unit* (DOE 1993c)

- *Expedited Response Action Assessment for the 316-5 Process Trenches* (DOE 1992b)

- *Phase III Feasibility Study Report for the 300-FF-1 Operable Unit* (DOE 1995a)

- *Proposed Plan for the 300-FF-1 and 300-FF-5 Operable Units* (DOE 1995b)

With the release of the *Phase III Feasibility Study Report for the 300-FF-1 Operable Unit* (DOE 1995a), EPA selected a preferred alternative (or interim remedial action) for the remediation of groundwater in the 300-FF-5 Operable Unit that was identified in the record of decision (ROD 1996). For groundwater, the selected remedy was identified as follows:

- Continued monitoring of groundwater that is contaminated above health-based levels to ensure that concentrations continue to decrease

- Institutional controls to ensure that groundwater use is restricted to prevent unacceptable exposures to groundwater contamination.

The *Operation and Maintenance Plan for the 300-FF-5 Operable Unit* (DOE 1996), which evolved from the record of decision and CERCLA documents, describes the monitoring program and administrative tasks that are being used to implement the selected remedy in the 300-FF-5 Operable Unit. The objectives of the operation and maintenance plan and this groundwater monitoring plan are very similar as both were derived from the record of decision; that is, they both monitor in order to "verify the effectiveness of the selected remedy." The main difference between the two plans is the scope (and the institutional controls that will not be addressed by this groundwater monitoring plan). The scope of this groundwater monitoring plan includes groundwater contamination by the contaminants of concern exclusively from the 300 Area process trenches, whereas the scope of the operation and maintenance plan includes groundwater contamination by contaminants of concern in the entire 300-FF-5 Operable Unit (see Figure 1.2).

In June 2000, the three members of the Tri-Party Agreement (Ecology et al. 1998) issued an *Explanation of Significant Difference for the 300-FF-5 Record of Decision* (EPA 2000a) which specified that the boundaries of the 300-FF-5 Operable Unit were to be moved outward to include five additional waste sites northeast of the 300 Area (Figure 1.3). These sites include the following:

- 618-10 burial ground
- 618-11 burial ground
- 316-4 crib source waste site
- 600-63 source waste site
- 600-259 source waste site.

These five sites are currently in the 300-FF-2 Operable Unit, but the underlying groundwater was not contained in the scope of 300-FF-5 as it was originally defined in the July 1996 record of decision. Because of the change in scope, the explanation of significant difference also required an update to the *Operation and Maintenance Plan for the 300-FF-5 Operable Unit* (DOE 1996) to ensure that an adequate monitoring and institutional control plan is in place for groundwater beneath 300-FF-1 and 300-FF-2 waste sites. This is significant because the operation and maintenance plan and the 300 Area process trenches groundwater monitoring plan (this document) have (at least in part) the same objectives, and the sampling and analysis efforts are complementary. At the time of release of this document, however, the update to the operation and maintenance plan will not have been released.

The CERCLA record of decision process required a review by the EPA after five years from the original time of issuance to assess the progress of the selected remedial remedy. This is significant because the results of the review would have an impact on the record of decision and the selected remedy. If the selected remedy changed, then the objectives of RCRA groundwater monitoring at the 300 Area process trenches would change also. The results of the first 5-year review (EPA 2001) indicated that the 300 Area cleanups were proceeding in a protective and effective manner. The EPA still considered that the cleanup goals and remedy selection decisions were appropriate at the time the 5-year review was released. Therefore, the objectives of RCRA groundwater monitoring at the 300 Area process trenches will remain the same.

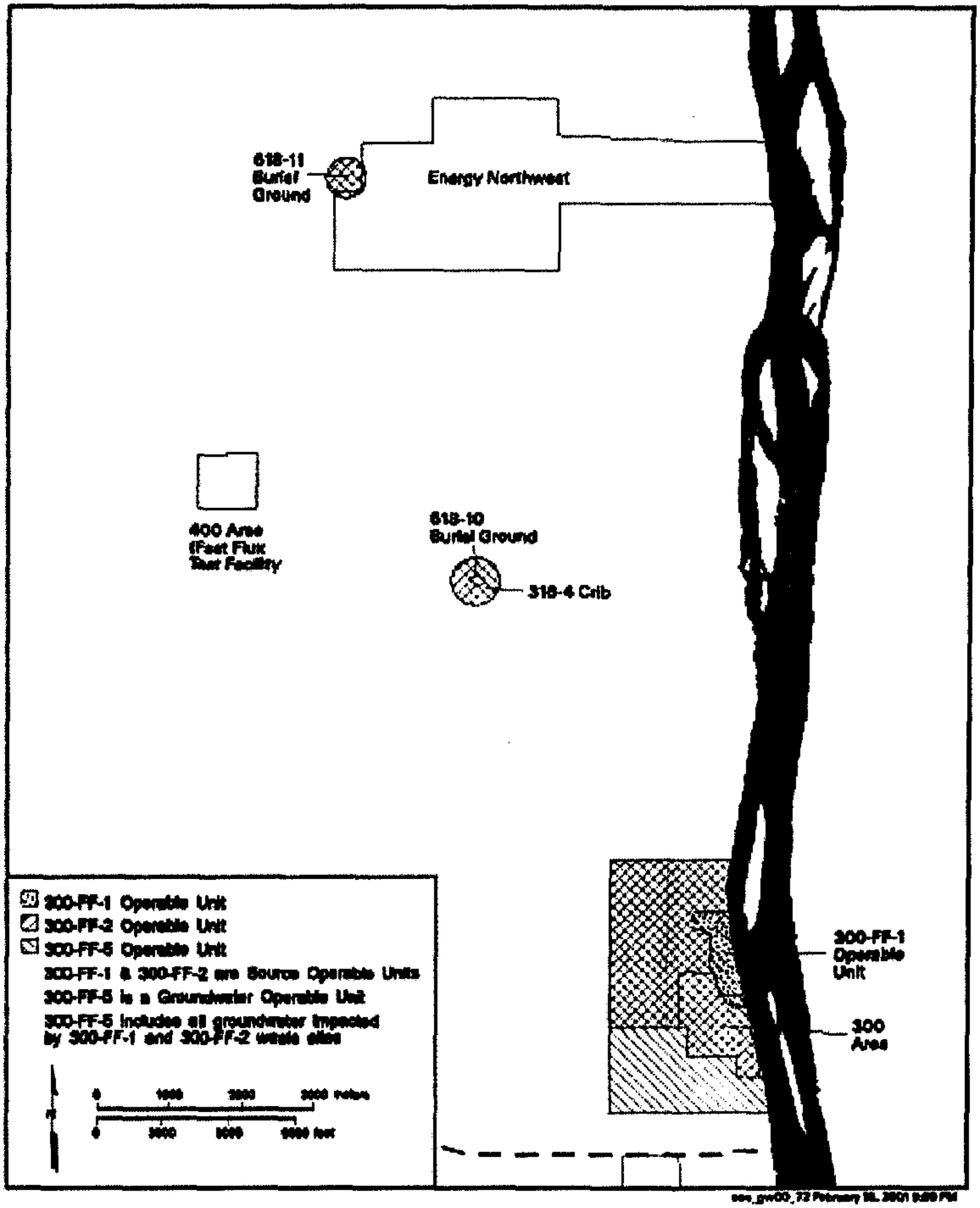

Figure 1.3. Locations of the 300-FF-1, 300-FF-2, 300-FF-5 Operable Units; 618-10 Burial Ground; *316-4 Crib; and 618-11 Burial Ground*

The proposed monitoring network for the 300 Area process trenches includes 11 wells located downgradient (predominantly southeast) of the trenches, an addition of five wells and removal of two wells from the previous version of the 300 Area process trenches groundwater monitoring plan (Lindberg et al. 1995). These 11 wells include all the existing WAC-173-160 compliant wells between the 300 Area process trenches and the Columbia River, the point where groundwater in the uppermost aquifer discharges. Five wells were added to the network to fully characterize the plumes of uranium and volatile organics (i.e., the contaminants of concern cis-1,2-dichloroethene [DCE], trichloroethene [TCE], and tetrachloroethene [PCE]) originating from the area between the trenches and the river. The two wells that were dropped from the network are the former upgradient wells. Upgradient wells are no longer needed because the purpose of the monitoring well network has changed (see Section 1.1). Other changes in the proposed plan include the use of the Combined Shewhart-CUSUM control chart statistical analysis method (See Section 6.3), which is an intra-well method to track the contaminant concentration trend with time within one well (upgradient well data not needed).

1.1 Purpose

The purpose of groundwater monitoring during the corrective action period is to monitor the trend of the concentrations of contaminants of concern downgradient in the groundwater from the 300 Area process trenches to confirm that they are attenuating naturally, as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit (ROD 1996). The corrective action groundwater monitoring program must be at least as effective as the previous compliance monitoring program (Lindberg et al. 1995) in determining compliance with groundwater protective standards. This document supersedes all previous monitoring plans (Schalla et al. 1986; Schalla et al. 1988a; Lindberg et al. 1995). The monitoring program proposed in this document is based on current conceptualization of the site and is consistent with data collected during at least 24 years of monitoring the site.

1.2 RCRA Regulatory Status and History

An extensive groundwater monitoring program was carried out during the operational life of the 300 Area process trenches (1975 to 1994), and monitoring continues today. Prior to, and continuing beyond the time the trenches went into service, many of the wells in the 300 Area were monitored for both radioactive and nonradioactive constituents, as well as water levels. The groundwater near the 300 Area process trenches has been monitored by a RCRA well network since June 1985. However, since that time the status has changed several times.

Initially, the 300 Area process trenches were placed in an interim status groundwater quality "assessment" monitoring program by the *Consent Agreement and Compliance Order* (Ecology and EPA 1986) and bypassed the "detection" monitoring stage. The assessment-level status was based on the decision that

1) the well network to monitor groundwater around the trenches was considered inadequate for "alternate" groundwater monitoring as described in 40 CFR 265.90(d) and Washington Administrative Code (WAC) 173-303-400. This assessment was made because there were not enough wells around and downgradient of the 300 Area process trenches to adequately detect

groundwater contamination and the existing wells were mostly not compliant with up-to-date standards for resource protection wells such as WAC 173-160.

2) the groundwater quality in the 300 Area had been adversely affected by the operations of the 300 Area process trenches.

In response to the *Consent Agreement and Compliance Order*, the first RCRA groundwater monitoring plan (Schalla et al. 1986) was written for the site, and over 20 additional wells were installed and monitored. The trenches were extensively characterized (Schalla et al. 1988b), and a revised groundwater monitoring compliance plan (Schalla et al. 1988a) was implemented in 1988.

The interim status, groundwater quality assessment program continued until December 1996 when the program was changed to final status compliance monitoring. The schedule for modifying the Hanford Site RCRA Permit (Ecology 1994) required that a modified closure plan and accompanying revised groundwater monitoring plan be submitted. The documents were prepared, and the closure plan (DOE 1997a) accompanied the revised groundwater monitoring plan (Lindberg et al. 1995, ICN-WHC-SD-EN-AP-185.1). This documentation is referenced in the revised Hanford Site RCRA Permit (Ecology 1994) and became effective December 26, 1996. (Note: The 300 Area process trenches achieved closure in May 1998 in accordance with the closure plan [a revision of DOE 1997a] contained in Attachment 31 of the current permit revision [Number 6].)

As expected, groundwater samples from well 399-1-16B, a downgradient well sampling the base of the uppermost aquifer, showed that cis-1,2-dichloroethene (cis-DCE) and trichloroethene (TCE) were in concentrations higher than the specified concentration limits (70 μg/L and 5 μg/L maximum contaminant levels, respectively). Similarly, the three downgradient wells monitoring the aquifer at the water table (399-1-10A, 399-1-16A, and 399-1-17A) had concentrations of uranium that exceeded the 20 μg/L EPA-proposed maximum contaminant level (note: the new maximum contaminant level of 30 μg/L for uranium has been promulgated, but does not take effect until December 8, 2003). After the first four independent samples were collected in December 1996, and January, February, and March 1997, the exceedances of maximum contaminant levels for cis-DCE, TCE, and uranium were confirmed and the regulator (Ecology) was notified. The facility then entered a corrective action period.

Upon entering the corrective action period, the existing compliance monitoring plan became obsolete, and a new groundwater monitoring plan was required (WAC 173-303-645[2][a][ii]). A new plan was proposed, but it was not approved by the regulator because of unresolved issues over the proposed statistical procedures (statistical procedures similar to those in this document). As a result, the previous compliance-monitoring plan (Lindberg et al. 1995) remained in effect until May 2001 when the regulator accepted the proposed statistical procedures. Those statistical procedures are hereby included (see Section 7.3) in the new plan (this document) along with the other appropriate changes to the plan summarized in the introduction to this section (Section 1.0).

2.0 Description of the 300 Area Process Trenches

This section discusses the physical structures, operational history, and waste characteristics at the 300 Area process trenches and is taken largely from the previous groundwater monitoring plan (Lindberg et al. 1995), the *Phase I Remedial Investigation Report for the 300-FF-1 Operable Unit* (DOE 1993a), or the *300 Area Process Trenches Modified Closure/Postclosure Plan* (DOE 1997a).

2.1 Physical Structure and Operation History

The 300 Area process trenches are located in the northern part of the 300 Area about 300 meters west of the Columbia River (Figure 2.1). They began operating March 16, 1975, and were the main facility for disposal of most liquid process waste generated in the 300 Area until the trenches were remove from service in December 1994. The liquid waste discharged to the 300 Area process trenches came only from the 300 Area process sewer and consisted mostly of wastewater with relatively low concentrations of chemical contaminants. More concentrated waste was generally not discharged to the process sewer and trenches. The discharge rate varied over the years, but it reached a maximum average of about 8,648 liters per minute during 1979. Total discharge for that year was 4.5 billion liters. Between 1987, when fuels fabrication ceased in the 300 Area, and 1994, when waste discharges ceased, the wastewater has consisted of cooling water with small quantities of non-hazardous maintenance and process waste. When the 300 Area process trenches were in use, the east and west trenches were used alternately for periods of up to approximately 8 months. The west trench was removed from service in November 1992; the east remained in service with an average discharge of 814 liters per minute. The trenches were administratively isolated from receiving further discharges in December 1994 and were physically isolated in January 1995.

The 300 Area process trenches consisted of two separate 457-meter-long trenches excavated 3.7 meters into the subsurface and separated by an earthen berm. The unlined trenches were excavated into the sandy gravels of the Hanford formation, and the bottoms of the trenches were about 6 meters above the average water-table elevation (however, the water table elevation varies with river stage, which fluctuates several meters depending on the season and operation of the several dams on the Columbia River). Figure 2.2 contains a schematic cross-section showing the dimensions and relationship of the eastern trench to the water table and the nearby Columbia River. It also shows the area in view with the location of the schematic cross-section, some example well locations, and nearby facilities. If the cross-section were continued to the west to include the western trench, it would look similar to the eastern trench except for the enlarged northern end that is a natural depression (Figure 2.3). In 1990, the depression was separated from the west trench by a berm needed to support a bird-screen placed over the trench. From 1991 until surface restoration activities reclaimed the site, the northern 91meters of the original trenches, including the natural depression, were used as an impoundment for low-level radioactive and low-level, mixed waste soil dredged from the southern portions of the trenches.

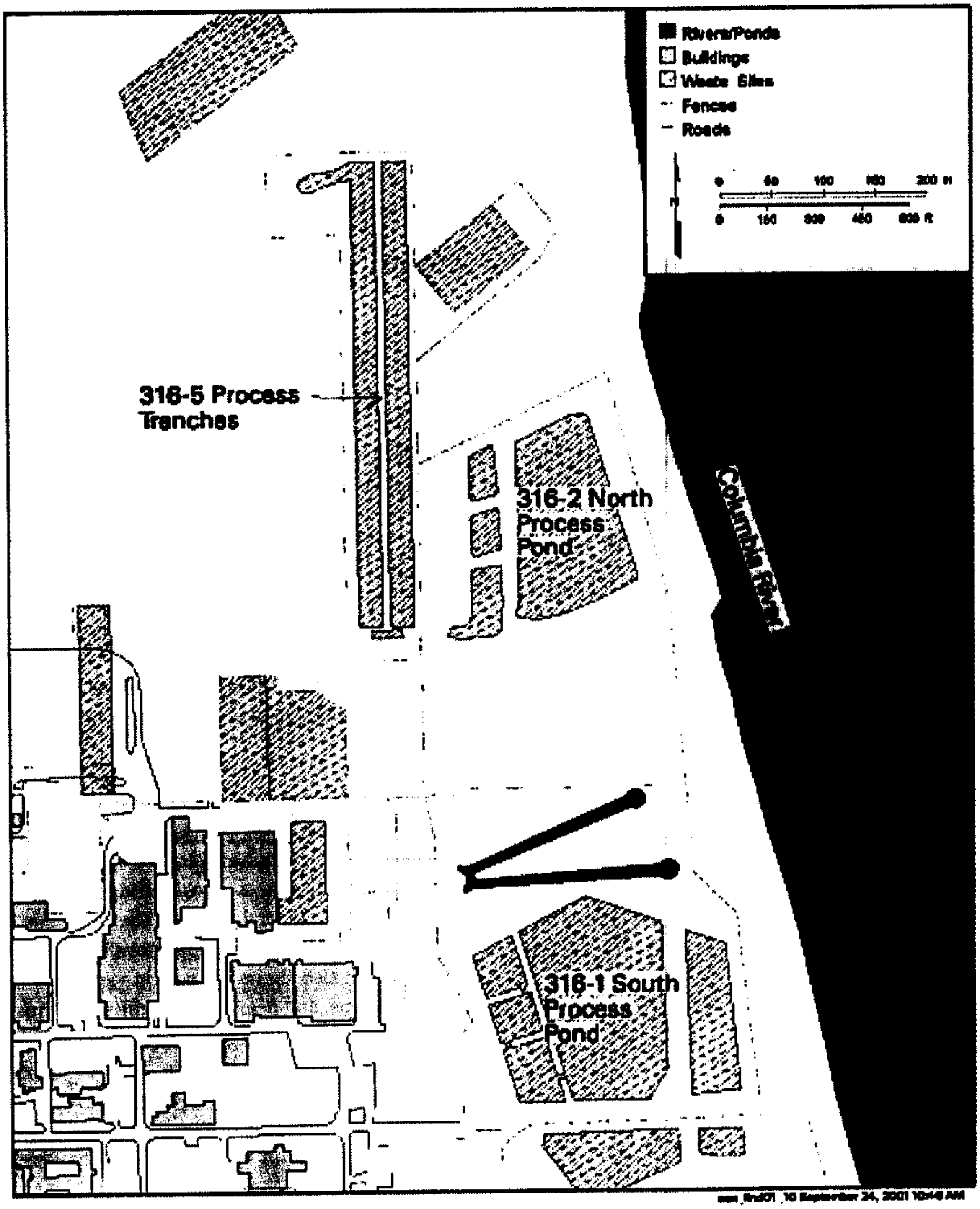

Figure 2.1. Location of 300 Area Process Trenches in 300 Area

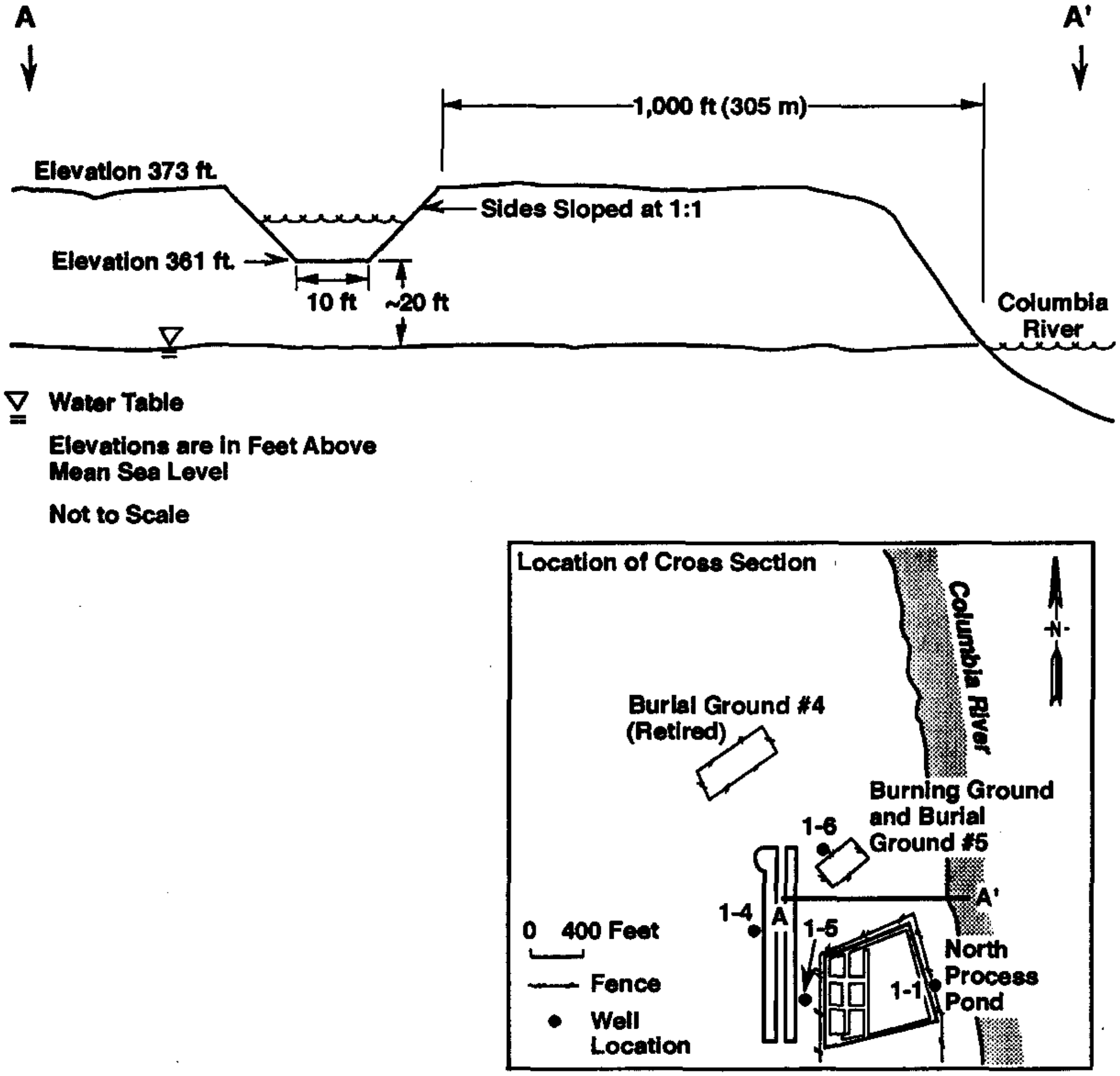

Figure 2.2. Schematic Cross Section of the 300 Area Process Trenches (modified from Schalla et al. 1988b)

A concrete weir box was located at the southern end of the trenches. Process sewer effluent reached the trenches through 0.6 meter diameter 300 Area Process Sewer System pipe that was connected to the weir box. The weir box measured 21.3 meters long (east-west dimension), 3 meters high, and 3 meters wide. It had two sluice gates that allowed the trenches to be operated alternately.

Administrative controls to prevent disposal of dangerous wastes to the 300 Area process trenches were instituted on February 1, 1985. Prior to that time, a variety of chemical waste was included with the wastewater. However, no large quantity of any one waste was included in the process waste. From the

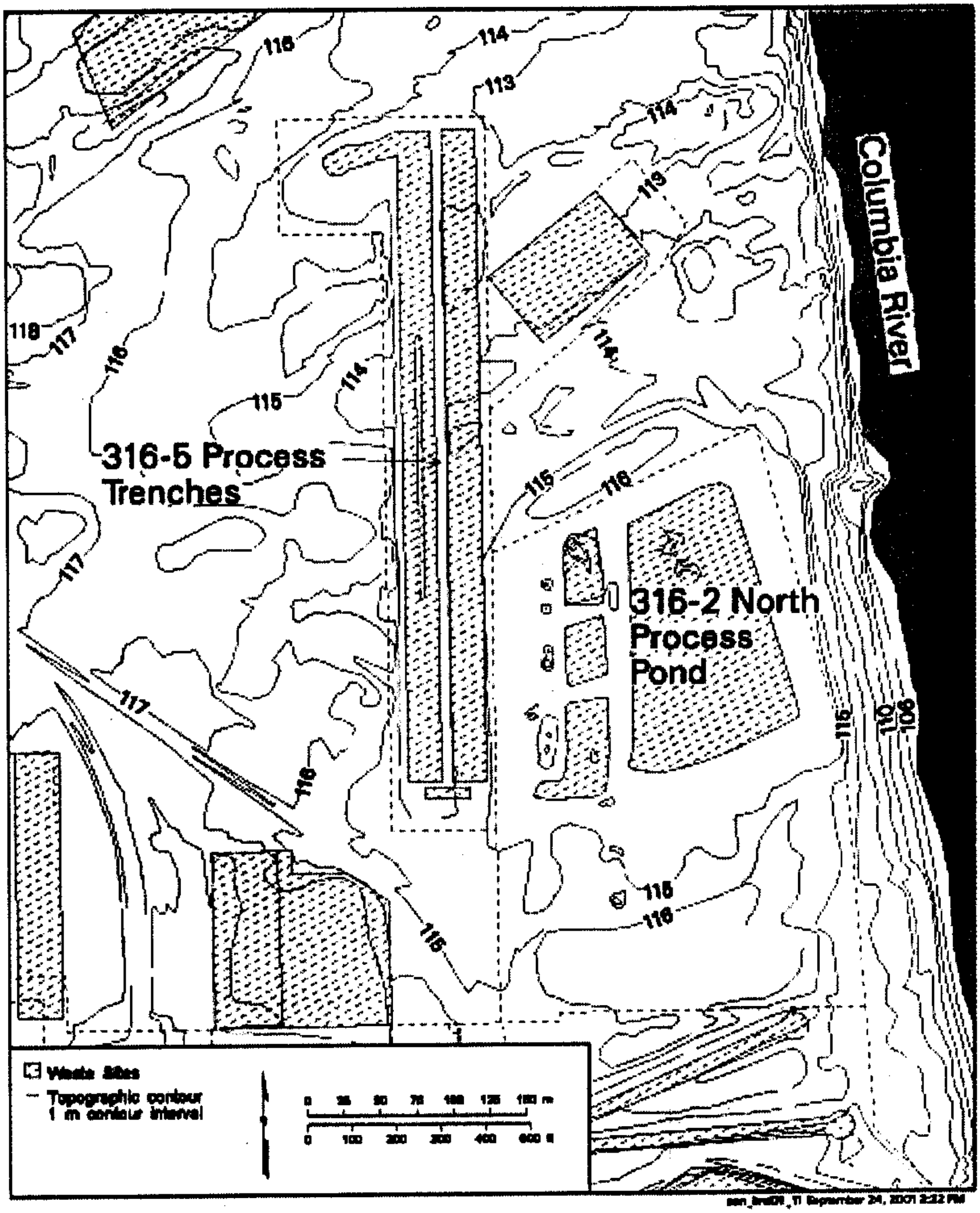

Figure 2.3. Topography in the Vicinity of the 300 Area Process Trenches

beginning of operations in 1975 until October 1993, a continuous, composite sampler was located at the headwall to analyze the wastewater at the point of discharge to the trenches. Subsequently, a sampler located outside the unit analyzed the effluent. In addition, chemical spills are known to have entered the process sewer through 300 Area building floor drains. The types and amounts of dangerous wastes discharged to the 300 Area process trenches are discussed in the following section (Section 2.2).

In 1991, at the request of the regulator (Ecology), an expedited response action was undertaken at the 300 Area process trenches. This action was based on regulator concerns of analytical results of trench sampling performed in 1986 (Table 15 of DOE 1992a). The data identified the presence of radioactive and inorganic contaminants (primarily heavy metals) in the trench soil at levels potentially harmful to groundwater and to the nearby Columbia River. The expedited response action was initiated under the authority of the Tri-Party Agreement Action Plan (Section 6.4) as an interim action pending final cleanup activities for the 300-FF-1 Operable Unit (Ecology et al. 1998). The results of the expedited response action are documented in DOE (1992b).

The objective of the expedited response action was to reduce the potential migration of contaminants to groundwater. The specific goal was to reduce the measurable level of radiation in the trenches to less than three times the upper tolerance limit of background. This was accomplished by removing contaminated sediment, using it to fill in the north ends of the trenches, and immobilizing the sediment. The removal of sediment contaminated with radionuclides also reduced the levels of inorganic constituents remaining in the trenches. Approximately 5,400 cubic meters of sediment were removed and relocated in each trench. About 0.3 meter of contaminated soil was removed from the sides and 1.3 meters from the bottom of each trench. The less radioactively contaminated sediment (less than 2,000 counts/second) was relocated to the north end of each trench. The more radioactively contaminated sediment (greater than 2,000 counts/second) was consolidated in the depression located at the northwest corner of the west trench. The contaminated sediments were isolated from the effluent and then covered with a plastic barrier and a layer of clean aggregate. Results of pre- and post-ERA sampling and analysis of the sediments indicate that the ERA successfully reduced trench contamination at all areas of the trenches other than the positions where contaminated sediment was stockpiled (DOE 1992b). Results of groundwater sampling and analysis after the expedited response action also showed a drop in concentrations of groundwater contamination, but the effects were only temporary (see Section 3.2 of this document).

In fiscal year 1997, remediation of the 300-FF-1 Operable Unit started by removing the contaminated sediment at the 300 Area process trenches that had been stockpiled earlier during the 1991 expedited response action. By the end of fiscal year 1999, the stockpiled contaminated sediment had been completely removed and replaced with clean soil. Remediation of soil at the 300 Area process trenches is now considered complete, and the soil has been clean closed (BHI 1998a; BHI 1998b).

2.2 Waste Characterization

The waste generating processes in the 300 Area that produced liquid waste that, in turn, was sent to the 300 Area process trenches by way of the process sewer, include fuel fabrication process waste, laboratory process waste, unplanned waste releases, and some miscellaneous waste. Highly radioactive liquid waste was generally diverted away from the process sewer and went to the Radioactive Liquid Waste

Sewer (RLWS). Estimated quantities for all chemicals discharged to the process sewer from 1975 until the implementation of administrative controls in 1985 are listed in Table 2.1. Table 2.2 provides the flow history for the process sewer.

From 1975 when the trenches entered service until 1987 when fuel fabrication essentially ceased, fabrication of fuel elements was primarily for N Reactor. The primary discharge from fuel fabrication was cooling and rinse water. However, fuel fabrication activities routinely used a broad range of organic and inorganic lubricants, organic solvents, and other chemicals that were discharged to the process sewer. (These chemicals, along with radionuclides generated by fuel fabrication, are listed in Table 2.3.) Fuel fabrication was also a source of approximately 1% enriched uranium discharged to the trenches, but was not the source of the types of fission products found in the 300 Area process trenches. These radionuclides other than uranium, originated from the re-anodizing of aluminum spacers used in the old reactors before 1975. Most of this waste was supposed to have gone to the RWLS but occasionally may have entered the process sewer. Also, some of these radionuclides were likely deposited in process sewer sludge and could have been released to the 300 Area process trenches after 1975 during high sewer flows or deviations from normal pH trends.

The chemical makeup and quantity of 300 Area laboratory waste has not been documented. Although a wide variety of laboratory activities occurred in the 300 Area, laboratory waste is considered to be similar to fuel fabrication process waste because most of the buildings supported fuel fabrication. Typical laboratory waste could also have consisted of standard laboratory cleaners, reagents, organic solvents, neutralizers, and drying agents. These chemical wastes could have been discharged directly to the process sewer through laboratory drains or from the retention process sewer in quantities insignificant to the waste stream.

Chemical spills are known to have entered the process sewer through 300 Area building floor drains. The majority of these releases were of spent uranium-contaminated acid etch solutions. Other unplanned releases to the process sewer system include two spills of tetrachloroethene in 1982 (455 liters) and 1984 (76 liters), and two releases of ethylene glycol in April 1993 (1,364 liters) and October 1993 (7.6 liters).

While the 300 Area process trenches were in operation, some of the facilities in the 300 Area connected to the process sewer performed activities related to reactor operations, irradiated fuel examinations, chemical separations processes, photographic processing, and waste management. Other facilities also supported such activities as peaceful uses of plutonium, reactor fuels development, liquid metal technology, environmental remediation technology development, and life science programs. Although such facilities may have contributed small quantities of radioactive or dangerous waste to the process sewer, trench soil analytical results indicate that their contribution to the waste stream and to subsequent trench soil and potential groundwater contamination is insignificant compared to that of fuel fabrication.

Table 2.1. Estimated Nonradiological Chemical Waste Inventory for the Process Trenches

Total of Intermittent Discharges of Dangerous Chemicals Ending February 1, 1985[a,b]		Larger Discharges[c] Continuing until September 1986[d]		Total of Larger Discharges[e] (1975-1986)
<u>Less than 1g</u>	<u>Less than 1kg</u>	Copper	≈ 30 kg/mo[f]	3,960 kg
Ammonium biofluoride	Benzene	Detergents	≤30 kg/mo[f]	3.460 kg
Antimony	Carbon tetrachloride	Ethylene glycol	≤200 L/mo[f]	26,400 L
Arsenic	Chromium	Heating oil	≈ 300 L[g]	300 L
Barium	Chlorinated benzenes	Hydrofluoric acid	≈ 100 kg/mo[f]	13,200 kg
Cadmium	Formaldehyde	Nitrates	≤2000kg/mo[f]	264,000 kg
Dioxine	Formic acid	Nitric acid	≤300 L/mo[f]	39,600 L
Dioxin	Hexachlorophene	Paint solvents	≤100 L/mo[f]	13,200 L
Hydrocyanic acid	Kerosene	Tetrachloro-ethene	≈ 450 L[g]	450 L
Pyridine	Lead	Photo chemicals	≤700 L/mo[f]	92,400 L
Selenium compounds	Methyl ethyl ketone	Sodium chloride	≈ 75 tons/yr[f]	825 ton
Thiourea	Mercury	Sodium hydroxide	≤300 L/mo[f]	39,600 L
Misc. lab. chemicals	Sulfuric acid	Uranium	≈ 20 kg/mo[f]	2,640 kg
	Tetrachloroethene			
	Toluene			
	Tri-butyl-phosphate			
	1,1,1-trichloro-ethane			
	Trichloroethene			
	Xylenes			

Source: Adapted from DOE (1992b).

(a) February 1, 1985, is date of administrative controls disallowing discharge of dangerous waste to the process sewer.
(b) Includes organics that were not analyzed for by process sewer effluent sampling.
(c) These discharges, except for the spills, were relatively continuous.
(d) September 1986 is approximate end of fuel fabrication activities.
(e) Total is monthly average discharge x 12 (mo per yr) x 11 (operating year from March 1975 to September 1986).
(f) Monthly or annual quantity is an average over a 17-month period February 1985 – September 1986.
(g) Known spills.

Table 2.2. Flow History for the 300 Area Process Trenches

Year	Amount Discharged (millions of liters)	Liters/Minute
1975	682	1,298
1976	3,447	6,554
1977	1,894	3,601
1978	1,894	3,601
1979	4,545	8,642
1980	3,180	6,050
1981	3,218	6,122
1982	3,218	6,122
1983	3,445	6,554
1984	3,520	6,698
1985	3,558	6,770
1986	3,407	6,482
1987	3,255	6,194
1988	1,628	3,097
1989	1,893	3,601
1990	1,968	3,745
1991	1,287	2,449
1992	568	1,080
1993	416	792
1994	379	720

Table 2.3. Fuel Fabrication Chemicals and Radionuclides

Chemicals Routinely Used in Fuel Fabrication	Radionuclides Generated by Fuel Fabrication
Chromic acid	Scandium-46
Chromium trioxide	Chromium-51
Copper sulfate	Cobalt-58
Hydrofluoric acid	Iron-59
Nitric acid	Cobalt-60
Oxalic acid	Zinc-65
Phosphoric acid	*Zirconium/niobium isotopes*
Potassium nitrite	Cesium-137
Sodium aluminate	Promethium-147
Sodium bisulfate	Thorium-234
Sodium carbonate	Uranium isotopes
Sodium dichromate	Plutonium isotopes
Sodium fluorosilicate	
Sodium gluconate	
Sodium hydroxide	
Sodium nitrate	
Sodium nitrite	
Sodium pyrophosphate	
Sodium silicate	
Sulfuric acid	
Trichloroethene	
Source: DOE (1992a).	

3.0 Hydrogeology

Information about geology, groundwater hydrology, and groundwater contamination in the vicinity of the 300 Area process trenches has been derived predominantly from wells (see Figure 3.1 for the location of existing 300 Area groundwater monitoring wells). Since the first 300 Area groundwater monitoring well was installed in 1943 (well 399-3-6), many additional wells of a variety of construction types have been installed to monitor the groundwater and characterize the geology. Most wells fit into one of two types: 1) a pre-1985 type that is nominally 0.15 to 0.30-meter-diameter carbon steel casing that is perforated (early design) or screened (later design) in the saturated zone, and 2) a 1985 to recent type that meets the requirements of WAC 173-160, *Minimum Standards for Construction and Maintenance of Wells*. These more modern regulatory-compliant wells have nominal 10-centimeter or 15-centimeter stainless steel casing with stainless steel, wire-wrap screens in the saturated zone, and extensive annular and surface seals.

3.1 Geology

This section summarizes the geology and groundwater hydrology in the vicinity of the 300 Area process trenches. More detailed discussions of these subjects are found in Lindberg and Bond (1979); Schalla et al. (1988b); Delaney et al. (1991); Gaylord and Poeter (1991); and Swanson et al. (1992).

The 300 Area process trenches are underlain by (from upper to lower) zero to 2 meters of eolian sand or fluvial deposits, approximately 15 meters of Hanford formation (an informal name) composed of cataclysmic flood deposits, and about 37 meters of the fluvial Ringold Formation (Figure 3.2). The bedrock below this sediment is the Saddle Mountains Basalt.

The surficial Holocene sediment in the 300 Area, and elsewhere at Hanford, are eolian deposits that are in the form of thin sheets (0 to 2 meters thick) and thicker dunes (2 to 5 meters), and fluvial deposits associated with the Columbia River. Dunes are especially well developed and remain active in the area to the north of the 300 Area. Inside the 300 Area the eolian deposits are mostly absent or reduced in thickness as a result of construction activities. Recent fluvial deposits such as overbank silts and channel deposits of sand and gravel are found in, and immediately adjacent to, the river.

Delaney et al. (1991) discuss three main facies associated with the Hanford formation, the sediment deposited by cataclysmic floods during the late Pleistocene. The three facies include the gravel-dominated facies, the sand-dominated facies, and the slackwater deposits composed of silts and fine sands. The Hanford formation in the vicinity of the 300 Area contains only the first two facies. Slackwater deposits are missing. In the vicinity of the 300 Area process trenches, the Hanford formation is about 15 meters thick and is mostly the gravel-dominated facies (see Figure 3.2). Locally, the gravel-dominated facies can be further divided into two types, pebble to cobble gravel and boulder gravel. The pebble to cobble gravel is the most abundant Hanford formation sediment in the 300 Area. Except for minor interbedded strata consisting of boulder-rich deposits and a few sand-rich horizons (the sand-dominated facies), this

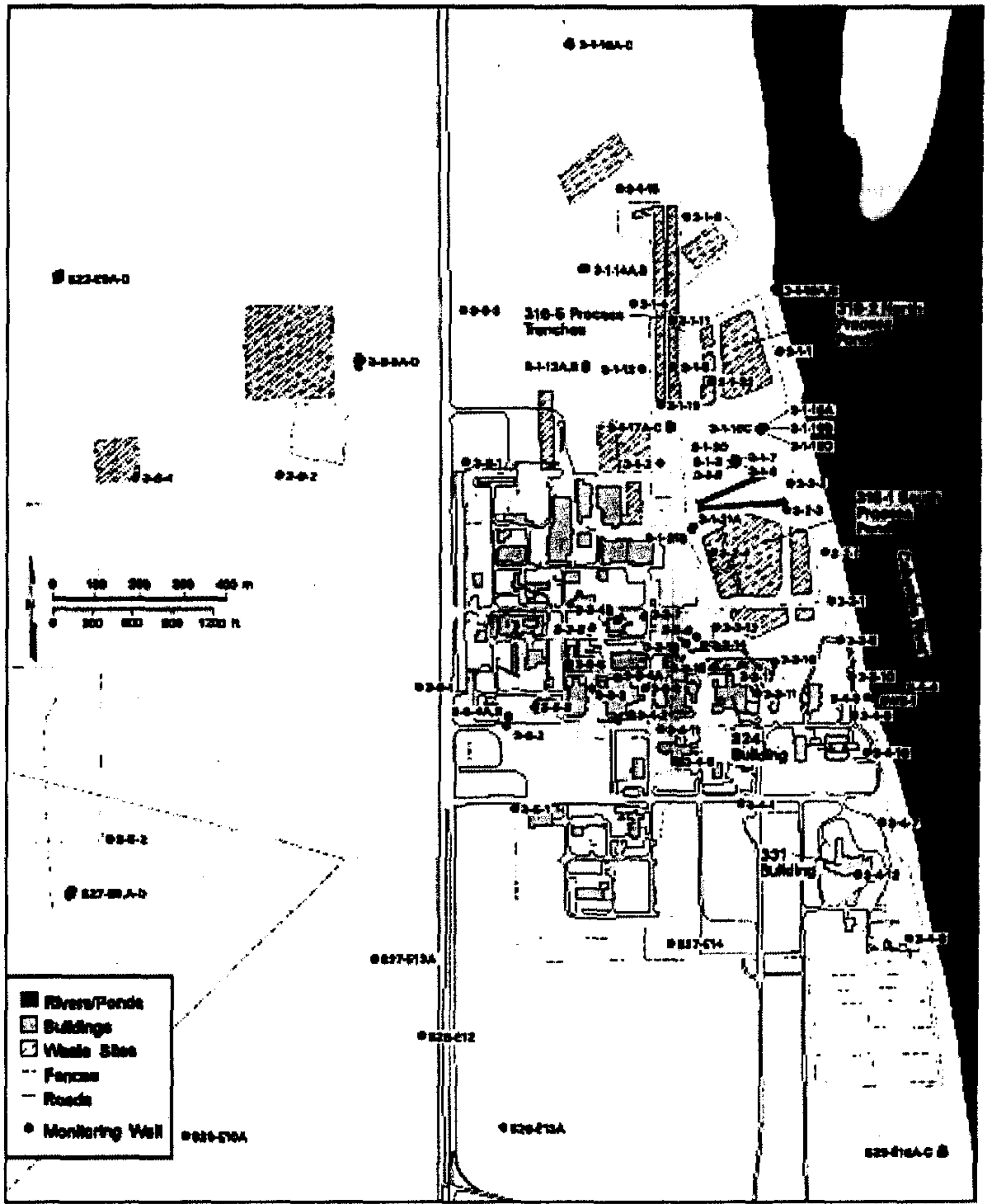

Figure 3.1. Existing Resource Protection Wells in the 300 Area. Note: Well numbers have been abbreviated. Well numbers starting with "3" should have the prefix "399," and well *numbers starting with "6" should have the prefix "699."*

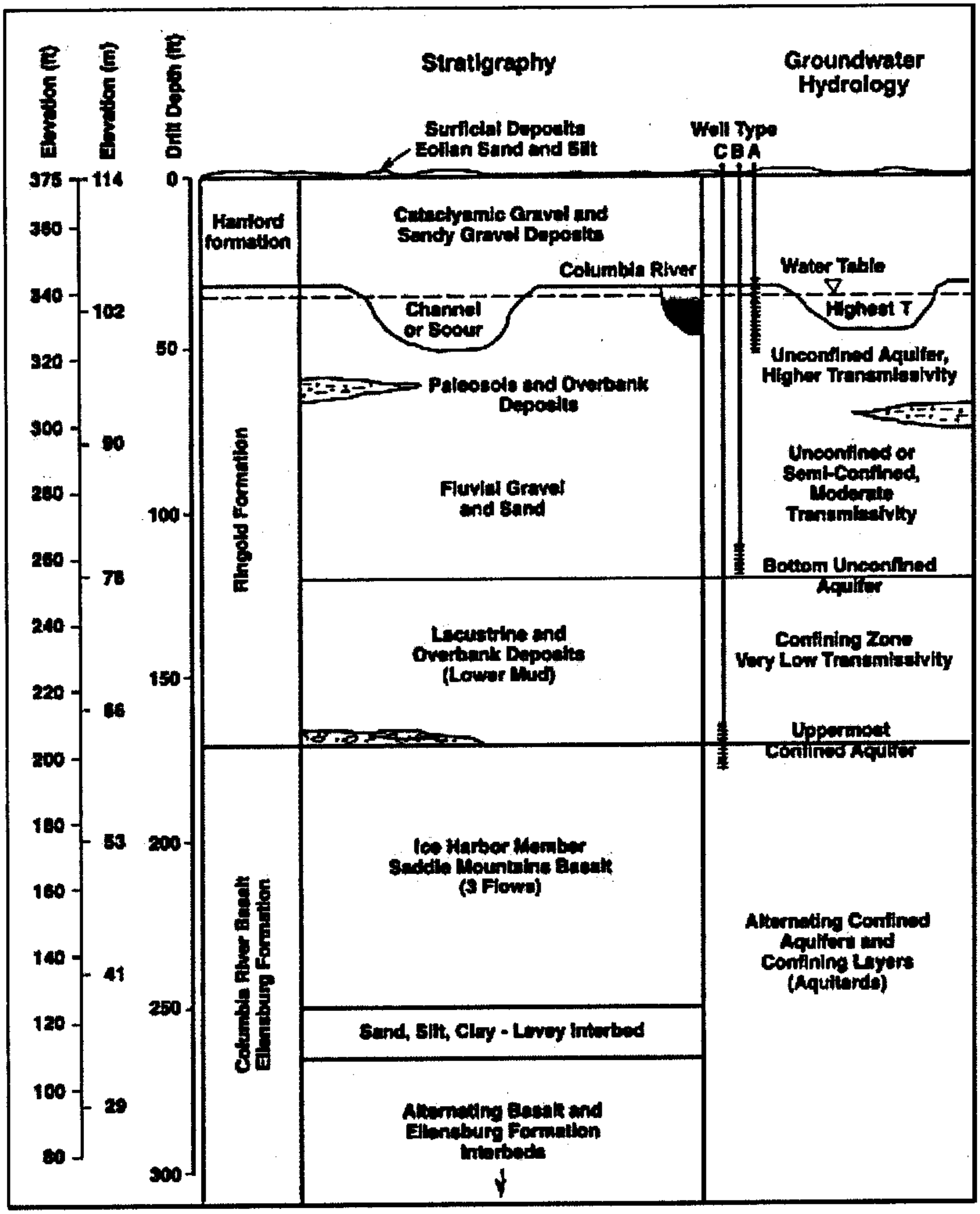

Figure 3.2. Generalized Hydrogeology Comparison of Geologic and Hydrologic Units in the 300 Area

this sediment type makes up the bulk of the Hanford formation. The thickest occurrence of boulder-rich gravels in the 300 Area is found southeast of the 300 Area process trenches along the Columbia River (Figure 2.1) where up to 18 meters of such strata have been logged. Thin beds of the sand-dominated facies are common and often intercalated with layers in the pebble to cobble gravel of the gravel-dominated facies.

The Ringold Formation near the 300 Area process trenches is about 37 meters thick and contains three facies. The three facies are the fluvial gravel facies, the overbank deposits facies, and the lacustrine deposits facies and they are described briefly below:

Fluvial Gravel – Clast-supported granule-to-cobble gravel with a sandy matrix dominates the facies. Intercalated lenses of sand and mud are common. The association was deposited in a gravelly fluvial braidplain characterized by wide, shallow, shifting channels.

Overbank Deposits – This facies dominantly consists of laminated to massive silt, silty fine-grained sand, and paleosols containing variable amounts of pedogenic calcium carbonate. Overbank deposits occur as thin (<0.5 to 2 meters) lenticular interbeds in the fluvial gravel facies and as thick (up to 10 meters) laterally continuous sequences. This sediment records deposition in proximal levee to more distal floodplain conditions.

Lacustrine Deposits – Plane laminated to massive clay with thin silt and silty sand interbeds displaying some soft-sediment deformation characterize this association. Coarsening upward sequences less than 1 to 10 meters thick are common. Strata comprising the association were deposited in a lake under standing water to deltaic conditions.

Ringold Formation strata in the 300 Area are generally divided into a lower, mud-dominated sequence and an upper, gravelly sequence (see Figure 3.2). The lower 17 meters composed of mud is laterally extensive and consists of lacustrine deposits overlying overbank deposits. It is correlated to the lower mud sequence found elsewhere throughout the Hanford Site near the bottom of the Ringold Formation. The gravelly sequence overlying the lower mud sequence is composed dominantly of the fluvial gravel facies and is roughly correlated to Ringold Formation units (B, C, and E) (Delaney et al. 1991; Lindsey 1991) or hydrostratigraphic units 5 and 7 of Thorne et al. (1993). Two mud-dominated intervals are found in the upper gravel sequence in the 300 Area. They are discontinuous, pinch out, and are not found in the immediate vicinity of the 300 Area process trenches. However, they do occur to the west and south and consist dominantly of paleosols typical of overbank deposits.

There is evidence of erosion and channelization of the top of the Ringold Formation throughout the 300 Area (Lindberg and Bond 1979; Schalla et al. 1988b; Swanson et al. 1992). These channels cause the upper Ringold Formation surface (and overlying contact with Hanford formation gravels) to be lower by approximately 3 to 9 meters in the channels. One of these channels may occur in the vicinity of the 300 Area process trenches as inferred by Lindberg and Bond (1979). However, well spacing in the 300 Area is too large to resolve structural details of these channels (such as size and orientation) on the Hanford formation-Ringold Formation contact.

Underlying the 52 meters of Hanford and Ringold formation sediments is the Saddle Mountain Basalt, which is a formation within the overall Columbia River Basalt Group. The uppermost basalt member of this formation in the vicinity of the 300 Area is the approximately 24-meter-thick Ice Harbor Member, which contains three flows that erupted from vents near Ice Harbor Dam on the Snake River east of Pasco, Washington (Helz 1978; Swanson et al. 1979; DOE 1988b) (see Figure 3.2). These basalt flows are typical in that they have rubbly or scoriacious flow tops and bottoms and relatively dense interiors. Underlying the lowest Ice Harbor Member flow is the Levey interbed, which is one of the intercalated members of the Ellensburg Formation. The Levey interbed is probably stratigraphically equivalent to the lower portion of the Ringold Formation further westward because the Ice Harbor flows pinch out westward. Below the Levey interbed is the Elephant Mountain Member, and below the two flows of the Elephant Mountain Member there are other basalt formations, members, and interbeds for over 3,000 meters.

3.2 Groundwater Hydrology

This section discusses the different aquifers within the suprabasalt aquifer system (Delaney et al. 1991). Aquifers below the suprabasalt aquifer system, although mentioned, are not relevant to this groundwater monitoring plan and are not discussed in detail.

Aquifers within the suprabasalt aquifer system are those that are above the uppermost, regionally extensive, confining layer (generally the dense interior of the uppermost basalt flow). In the 300 Area, there is another confining layer above the basalt and within the lower portion of the Ringold Formation, the lower mud unit (see Figure 3.2). Other mud units above the lower mud unit exist within the Ringold Formation, but they are discontinuous. Therefore, the uppermost or unconfined aquifer beneath the 300 Area extends from the water table (at about 10.1 meters below the ground surface) to the top of the Ringold Formation lower mud unit. Elsewhere, in the 300 Area where one or more of the upper muds are present, the aquifer(s) between the partially confining mud units is (are) partially confined. In the immediate vicinity of the 300 Area process trenches, the uppermost aquifer (unconfined or at most partially confined aquifer) is composed of a few meters of Hanford formation (depending on Columbia River stage) and 20 to 25 meters of Ringold Formation. The Hanford formation there is composed primarily of the gravel-dominated facies, and the Ringold Formation above the lower mud unit is dominantly the fluvial-gravel facies.

Aquifers below the Ringold Formation lower mud unit are confined. These confined aquifers include any coarse-grained Ringold Formation sediment below the lower mud unit, high permeability zones within basalt flows such as rubbly or scoriacious flow tops and bottoms, and interbeds of the Ellensburg Formation if the permeability is high. Except for the uppermost confined aquifer, they are intercalated with – and confined by – dense interiors of the basalt flows.

3.2.1 Aquifer Properties

The most recent aquifer tests and laboratory tests of drill core or borehole samples are reported in Swanson et al. 1992. The following are pertinent conclusions of the reported testing:

- The best estimate for unconfined aquifer properties came from multiple-well analysis of constant discharge tests. Test results for the uppermost portion of the unconfined (uppermost) aquifer at well clusters 699-S22-E9ABCD and 699-S27-E9ABCD (see Figure 3.1 for well locations) were, respectively, 36 and 49 meters per day for horizontal hydraulic conductivity, 2.1 and 5.5 meters per day for vertical hydraulic conductivity, 0.37 and 0.02 for specific yield, and 0.013 and 0.005 for storativity.

- Water levels measured at the two sites (cluster wells in lower Ringold Formation confined aquifer, lower unconfined aquifer, and upper portion of unconfined aquifer) show an upward hydraulic gradient, demonstrating that this area is probably a discharge area for the semiconfined and confined aquifers below the unconfined aquifer. (The unconfined aquifer, in turn, discharges to the Columbia River.)

- Barometric efficiencies estimated for wells screened at the bottom of the unconfined aquifer (B wells) are 10% and 18% for the two cluster sites. For the uppermost confined aquifer (C wells) the efficiencies are 28% and 22% for the two cluster sites.

- The specific yield result of 0.02 may indicate a semiconfining condition.

- Laboratory test results on split-tube samples yielded vertical hydraulic conductivities that were at least one order of magnitude lower than the best estimated horizontal values.

The well clusters used for the aquifer testing reported in Swanson et al. (1992) are effectively screened entirely in the Ringold Formation because the water table is either at or lower than the Ringold/Hanford formation contact at those cluster sites. However, the water table near the 300 Area process trenches is at or above the Ringold/Hanford formation contact, depending on river stage, possibly because of channeling in the top of the Ringold Formation.

Table 3.1 shows previously collected hydraulic conductivity data derived from well pumping tests (Schalla et al. 1988b, Appendix D). These data are from wells that are closer to the 300 Area process trenches than the wells reported in Swanson et al. (1992). As expected, hydraulic conductivities are higher at the top of the unconfined aquifer in wells near the trenches than they are at the well clusters reported in Swanson et al. (1992). These higher hydraulic conductivities in the wells closer to the 300 Area process trenches are the result of a greater contribution of groundwater from the Hanford formation which generally has a higher hydraulic conductivity than the Ringold Formation.

Table 3.1. Hydraulic Conductivities Estimated from Aquifer Tests in Wells Near the 300 Area Process Trenches (from Schalla et al. 1988b)

Well	Hydraulic Conductivity (m/d)	Aquifer
	A-Wells	
399-1-13	3,353	Top unconfined[a]
399-1-18A	15,240	Top unconfined[a]
399-1-16A	152	Top unconfined[a]
	B-Wells	
399-1-18B	0.58	Bottom of unconfined
399-1-17B	3.66	Bottom of unconfined
399-1-16B Test #1	0.61	Bottom of unconfined
399-1-16B Test #2	0.91	Bottom of unconfined
	C-Wells	
399-1-18C	1.83	Uppermost confined
399-1-17C	79.2	Uppermost confined
399-1-16C	2.72	Uppermost confined
399-1-9	1.83	Uppermost confined

(a) Top of the unconfined aquifer at this well is mostly within the lower portion of the Hanford formation.

3.2.2 Groundwater Flow

Groundwater in the uppermost aquifer flows into the 300 Area from the northwest, west, and southwest (Hartman et al. 2001, Plate 1). Groundwater flow direction near the 300 Area process trenches, which is in the northern portion of the 300 Area, is predominantly to the east-southeast, as is determined from depth-to-water measurements at 300 Area wells, but is affected by fluctuations in Columbia River stage. Figure 3.3 is a water-table map with the depth-to-water measurements collected March 2000 and shows the configuration of the water table when river stage is normal to low (typical throughout most of the year). However, when the river stage is high, as it often is in the late spring and early summer during heavy runoff, the configuration changes because of the elevated river level and bank storage of river water that occurs temporarily during high river stage events. Figure 3.4 is an example of the water table configuration during high river stage, and represents the water table June 1997 when the groundwater flow direction in the vicinity of the trenches changed to a south or southwesterly flow direction. Also, during the high river stage events the lowest portions of the vadose zone become saturated and temporarily become part of the uppermost (or unconfined) aquifer.

There is an upward gradient between the uppermost confined aquifer and the unconfined aquifer. At wells 399-1-17A (screened at the water table) and 399-1-17C (screened within the uppermost confined aquifer) the head difference is about 11 m with the higher head in the deeper well. This supports the

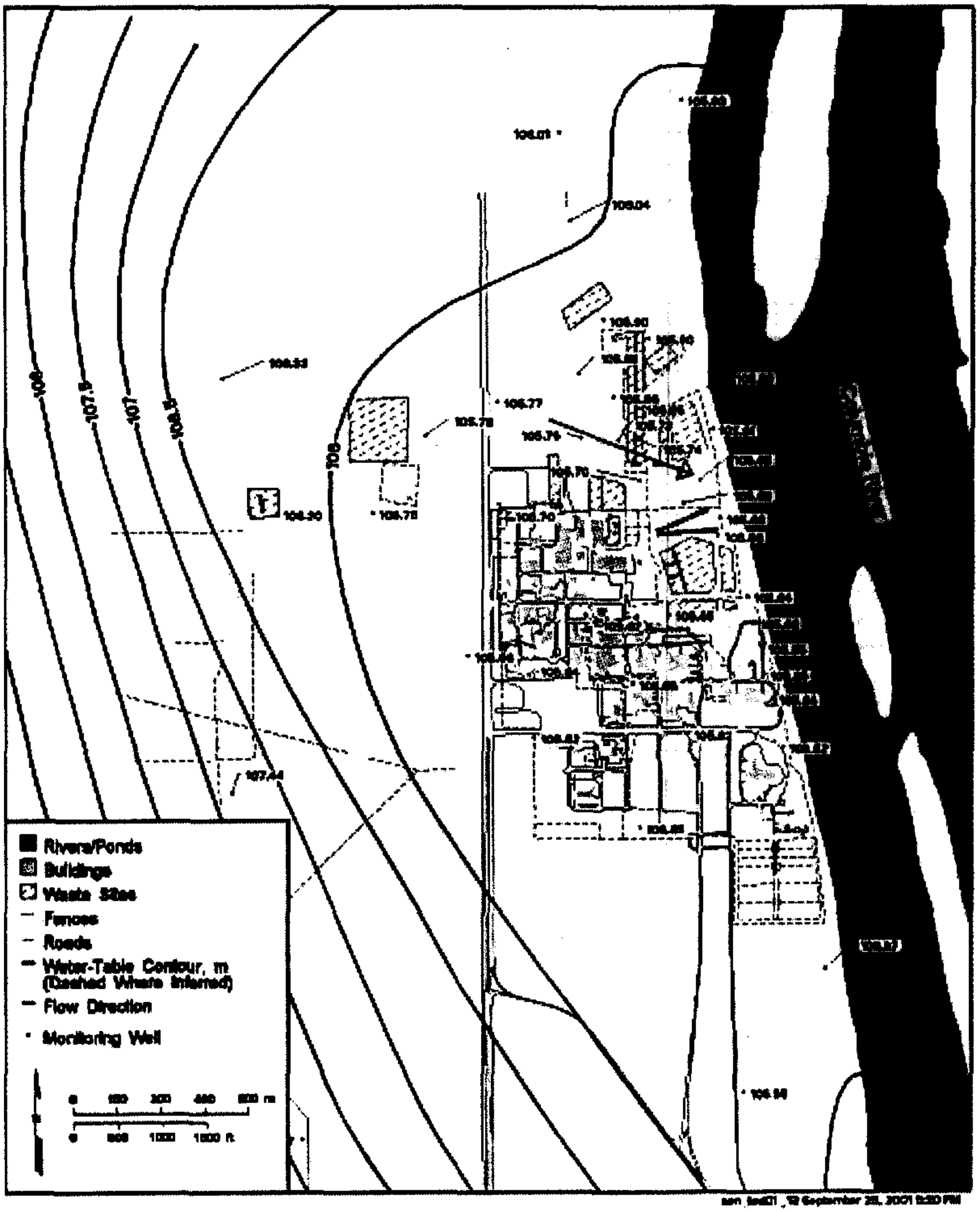

Figure 3.3. 300 Area Water-Table Map, March 2000

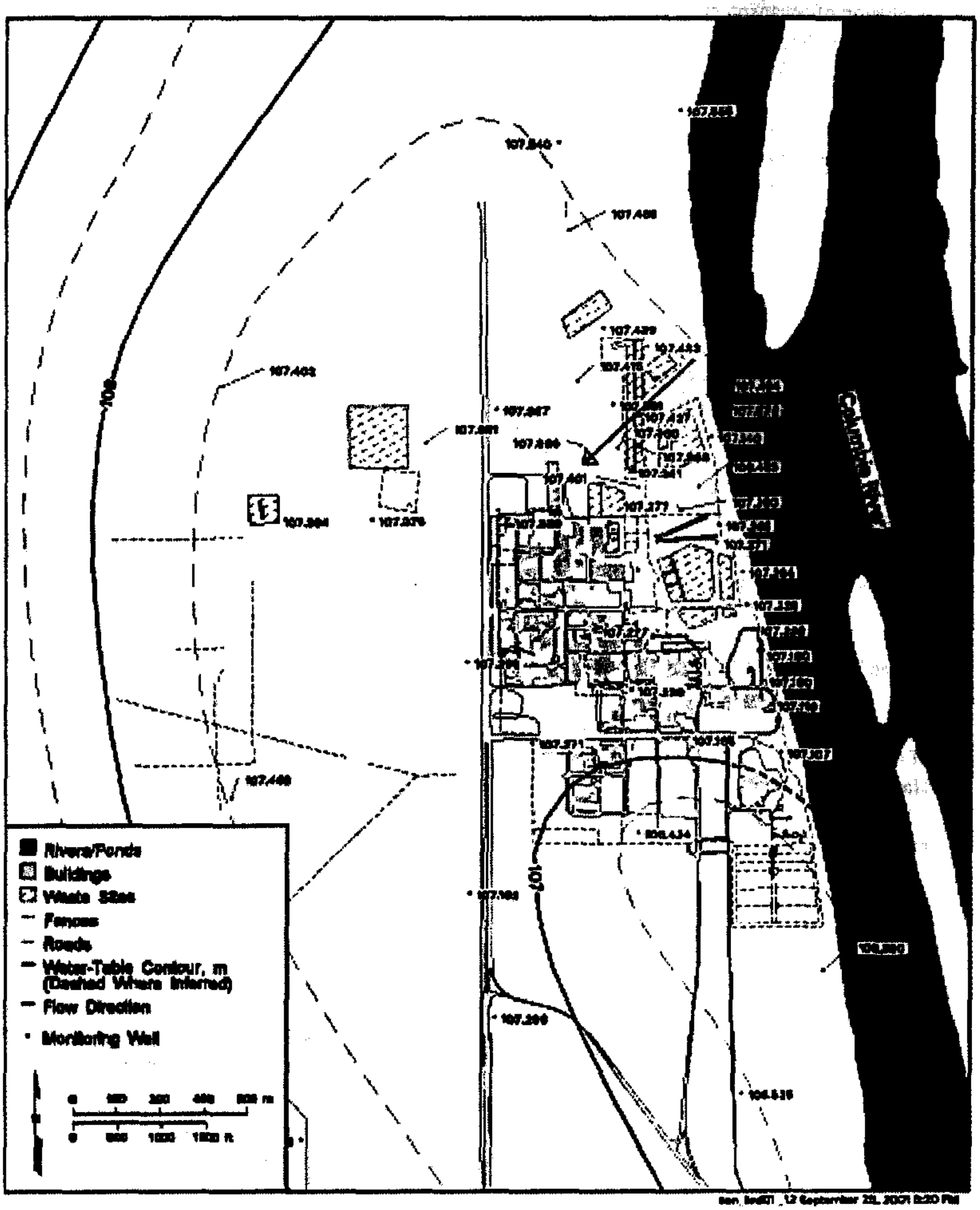

Figure 3.4. 300 Area Water-Table Map, June 1997

conclusion of Swanson et al. (1992) that the 300 Area is within a discharge area for the uppermost confined aquifer, and that, if communication is established between the confined aquifer and overlying unconfined aquifer, the flow direction is upward.

The groundwater flow rate at the top of the unconfined aquifer was estimated to be approximately 10.7 meters per day near the 300 Area process trenches based on evaluating groundwater chemistry data following a tetrachloroethene spill (Cline et al. 1985). The average groundwater flow rate can also be estimated roughly by using the Darcy equation.

$$v = \frac{Ki}{n_e} \tag{1}$$

where v = average linear groundwater flow rate
K = hydraulic conductivity
I = hydraulic gradient
n_e = effective porosity.

Schalla et al. (1988b) reported values of hydraulic conductivity for the unconfined aquifer in the vicinity of the trenches from 150 to 15,000 meters per day (see Table 3.1). Swanson et al. (1992) reported hydraulic conductivities for the Ringold Formation as 36 and 49 meters per day for two well sites southwest of the 300 Area process trenches. The hydraulic gradient near the trenches was 0.00031 for the water table depicted in Figure 3.3 (March 2000) and 0.00023 for the water table depicted in Figure 3.4 (June 1997). Estimates of effective porosity for the unconfined aquifer range from 0.10 to 0.30. Using the above-stated values for input parameters to the Darcy equation (1), the range of average linear groundwater flow rate is 0.12 to 46.5 meters per day. The large range in flow rate values is a result of the large range in values of hydraulic conductivity reported for the aquifer. If it is assumed that the Hanford formation is a major contributor to the hydraulic conductivity parameter in the vicinity of the 300 Area process trenches, then the average flow rate may actually be closer to the upper portion of the range, which is supported by the estimate of Cline et al. (1985).

By examining specific conductance versus time plots of wells at increasing distances from the Columbia River it is possible to estimate the distance from the Columbia River that river water displaces or mixes with groundwater during times of high river stages. The distance from the river that river water displaces groundwater during high river stages is significant because during high river stages the wells near the river may actually be sampling a mixture of groundwater and river water. Figures 3.5, 3.6, and 3.7 (respectively) show trend plots of specific conductance at wells 399-1-10A (34 meters from river), 399-1-16A (122 meters from river), and 399-1-17A (335 meters from river). Typically, Columbia River water has a specific conductance of about 120 to 150 µS/cm, and groundwater entering the 300 Area in the upper portion of the unconfined aquifer has a specific conductance in the range of 400 to 500 µS/cm. Figure 3.5 shows that in the late spring to early summer of each year the specific conductance drops below about 250 µS/cm at well 399-1-10A.

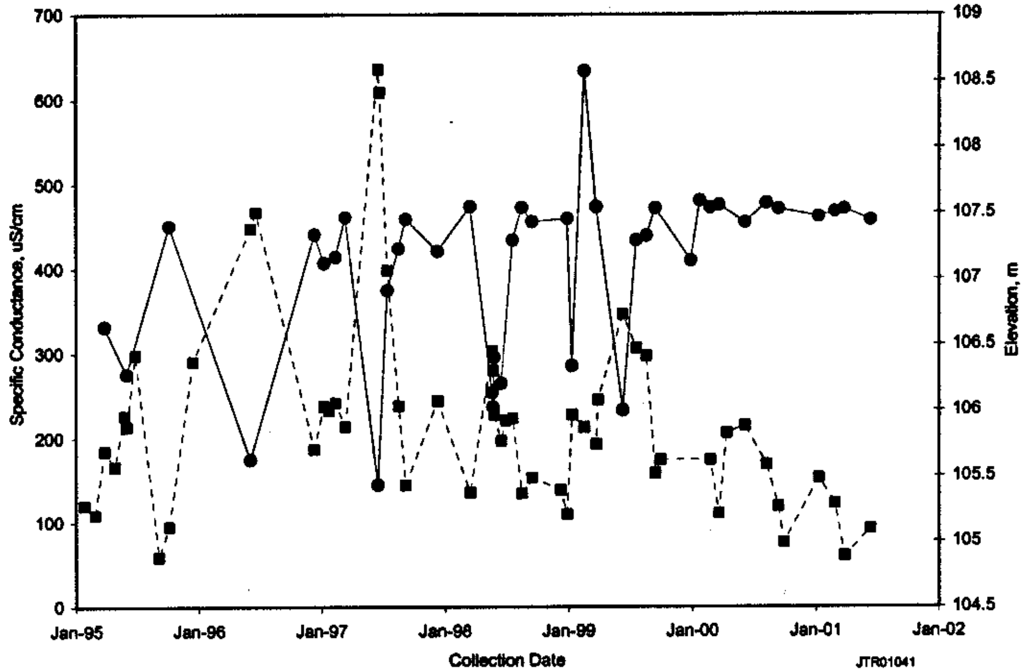

Figure 3.5. Specific Conductance and Water Level at Well 399-1-10A

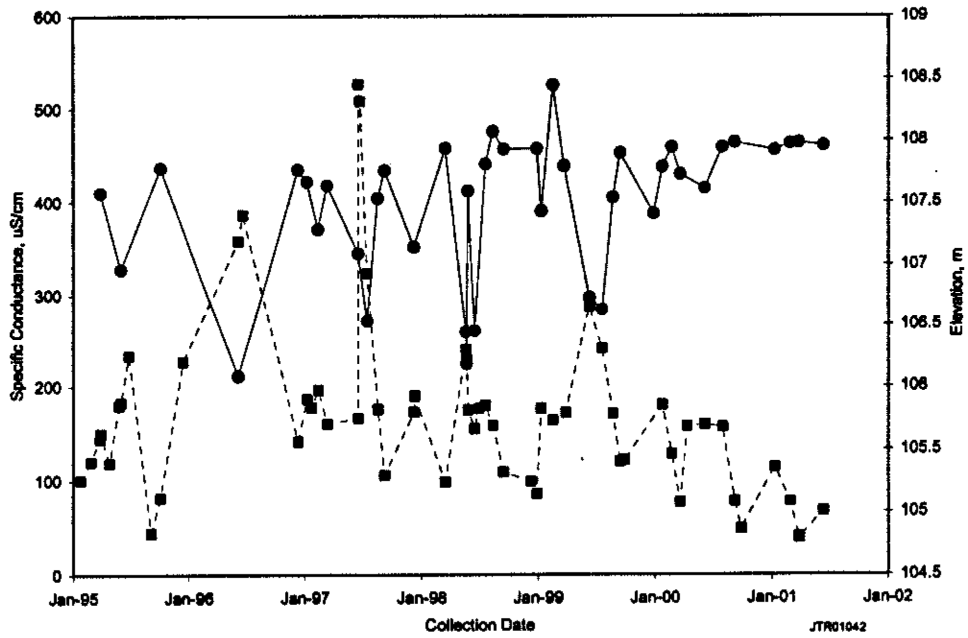

Figure 3.6. Specific Conductance and Water Level at Well 399-1-16A

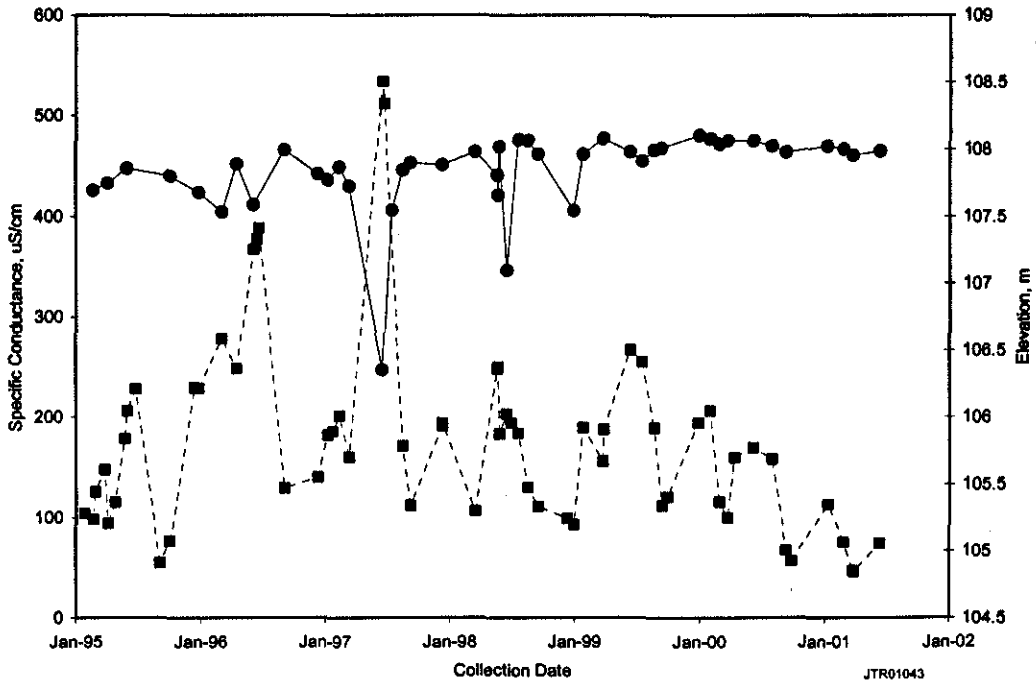

Figure 3.7. Specific Conductance and Water Level at Well 399-1-17A

These decreases in specific conductance correspond to high river stages of the Columbia River that, in turn, correspond to the annual spring runoff. Specific conductance dipped as low as 150 μS/cm during the 1997 spring runoff and indicates an almost complete displacement of groundwater with river water. (Note: This reported value of 150 μS/cm during June 1997 is about the same time as the water table map in Figure 3.4.) Figure 3.6 shows that specific conductance dipped to the range of 200 to 300 μS/cm at well 399-1-16A during high river stages each spring. Specific conductance in the range of 200 to 300 would indicate partial mixing. Figure 3.7 shows that specific conductance dipped slightly (to 250 to 350 μS/cm) in the high river stages of the years 1997 and 1998 at well 399-1-17A. Apparently, it was only during the high river stages of those years that the river was high enough for sufficient enough time to allow river water to flow inward as far as well 399-1-17A. In other years, the water table was affected as far west as well 399-1-17A, but river water did not reach that distance.

4.0 Summary of Groundwater Monitoring Results

Groundwater monitoring results associated with the three groundwater monitoring plans (Lindberg and Bond 1979; Schalla et al. 1988a; Lindberg et al. 1995) are discussed in this section. Appendix A lists groundwater monitoring analytical results for wells in the proposed groundwater monitoring well network.

4.1 Geohydrology and Groundwater Quality Beneath the 300 Area, Hanford Site, Washington

The earliest major study of groundwater contamination in the 300 Area is reported in Lindberg and Bond (1979). In that study, groundwater samples were collected monthly for one year (during calendar year 1977) from 29 wells in the 300 Area. The samples were analyzed for the following constituents:

Radioactive Constituents	Nonradioactive Constituents
Gross alpha	Bicarbonate
Gross beta	Carbonate
Gamma scan	Calcium
Uranium	Magnesium
Tritium	Sodium
	Chloride
	Sulfate
	Nitrate
	Chromium
	Copper
	Potassium
	Fluoride
	pH
	Specific conductivity

At that time, the 29 wells in the sampling network were all constructed of perforated carbon steel casing with dedicated submersible electric pumps. This well type does not meet current regulatory standards (WAC 173-160).

Results showed that calcium, magnesium, sodium, bicarbonate, and sulfate were lower in concentration near the 300 Area process trenches than in background wells (dilution). Constituents that were found to be in higher concentrations (or activity) near and downgradient of the trenches were gross alpha, uranium, chloride, and nitrate. Presumably, discharges to the trenches were responsible for the constituents with the higher concentrations.

4.2 Tetrachloroethene Spill

Following two accidental releases of tetrachloroethene (PCE) to the 300 Area process trenches (455 liters on November 4, 1982, and 76 liters on July 6, 1984), several wells were closely monitored to track the plume. The following wells shows elevated levels of PCE (see Figure 3.1):

399-1-5	399-1-2	399-1-3	399-2-1
399-2-2	399-3-1	399-4-7	399-4-10

Peak concentrations of PCE (1,840 µg/L) was found in well 399-1-5 about 5 days after the first release. Movement of the peak concentration was estimated at 10.7 m/d (Cline et al. 1985).

4.3 Early RCRA Monitoring

By 1985, a RCRA interim status groundwater monitoring program for the 300 Area process trenches was in effect (see Section 1.2). The effort was based on the groundwater monitoring requirements in 40 CRF 265.90, WAC 173-303-400, and past groundwater monitoring conducted in the 300 Area. The well network consisted of the following 16 wells (see Figure 4.1 for their locations).

399-1-1	399-1-2	399-1-3	399-1-4	399-1-5
399-1-6	399-1-7	399-1-8	399-2-1	399-3-7
399-3-10	399-4-1	399-4-7	399-8-2	699-S19-E13
699-S30-E15A				

Fourteen monitored the upper portion of the unconfined aquifer near the water table and two wells (399-1-8 and 399-4-1) monitored the base of the unconfined aquifer. Six of the wells have stainless-steel screens, and the other 10 have perforated casings.

Based on instructions given in *Test Methods for Evaluating Solid Waste* (EPA 1986) and information provided by the facility manager concerning the composition of the wastes, the constituents listed in Table 4.1 were analyzed in the groundwater samples collected from the 16 wells. EPA guidance suggested that analyses should be conducted for the Primary Drinking Water Standards (DWS) and for specific dangerous waste constituents known to have been discharged to the 300 Area process trenches. Additional parameters, such as the contamination indicator parameters that are required for a detection-level program, but not necessary for an alternate or assessment-level program, were added to provide consistency with other interim-status programs. In addition, samples from two wells sampled quarterly were also being analyzed for some additional parameters, including the dangerous waste constituents in WAC 173-303-9905). These additional analyses (Table 4.2) provided information needed for the permitting process and to further ensure that potential contaminants were not overlooked. The two wells chosen for the extra analyses included one upgradient well (699-S19-E13) and one downgradient (399-1-3).

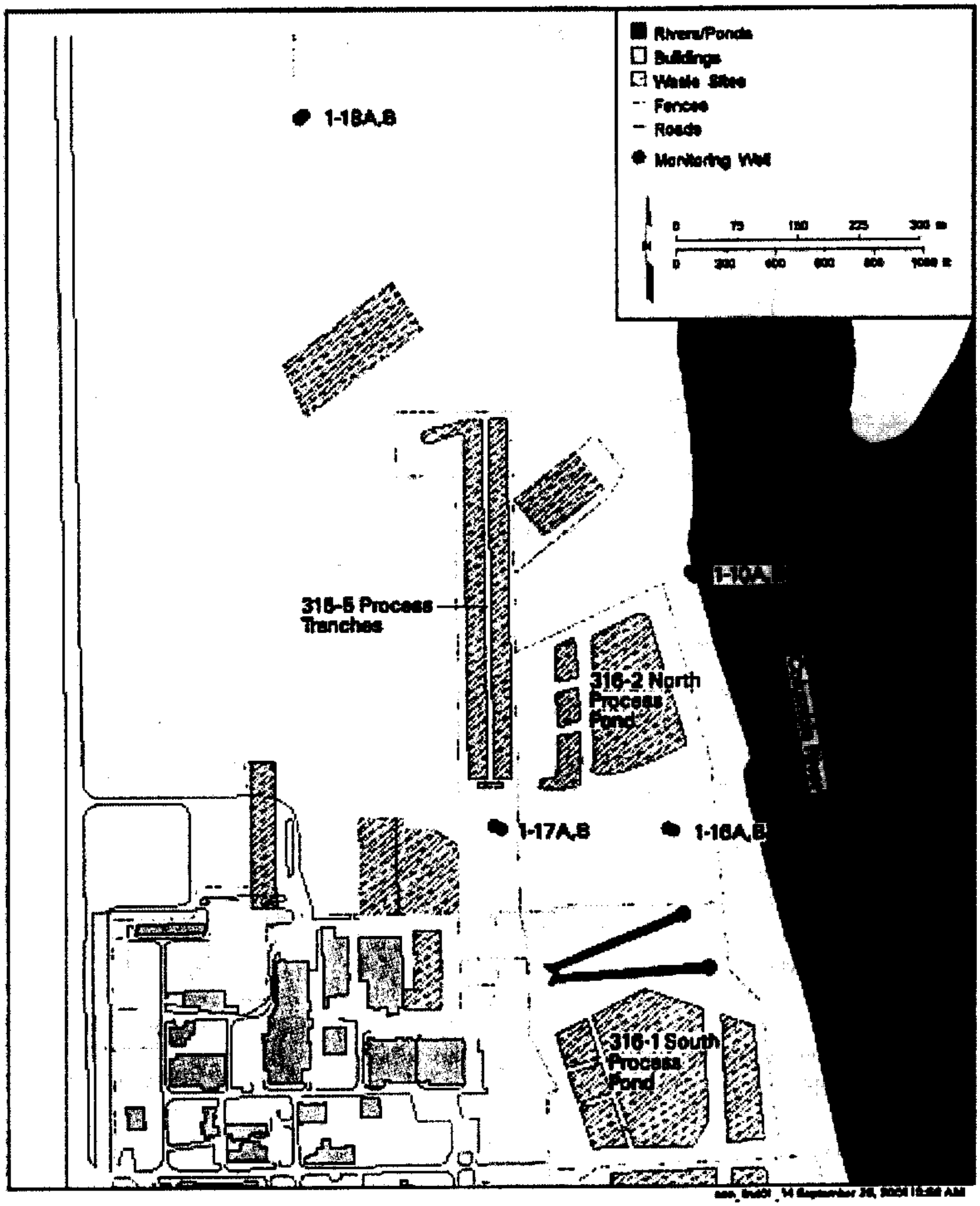

Figure 4.1. Locations of Monitoring Wells of 300 Area Process Trenches Groundwater Monitoring Plan (Lindberg et al. 1995)

Table 4.1. Standard List of Analytes for the 300 Area Process Trenches Groundwater Monitoring Network (Schalla et al 1988a)

Barium	Cadmium	Chromium
Silver	Sodium	Nickel
Copper	Aluminum	Manganese
Iron	Calcium	Zinc
Arsenic	Mercury	Selenium
Lead	Nitrate	Sulfate
Fluoride	Chloride	Cyanide
Sulfide	Radium	Gross Alpha
Gross Beta	Uranium	Strontium-90
Gamma Scan	Total organic halogen	Total organic carbon
Ammonium Ion	Hydrazine	Endrin
Methoxychlor	Toxaphene	Lindane
2,4-D	2,4,5-TP silvex	1,1,1-trichloroethane
Tetrachloroethene (PCE)	Chloroform	Methylene chloride
1,1,2-trichloroethane	1,1,2-trichloroethene	Methylethyl ketone
Coliform bacteria	Temperature	Specific conductance
pH		

The dangerous waste constituents list in WAC 173-303-9905 is very similar to Appendix IX of 40 CFR 264, Subpart F. However, there are some differences. Those constituents in Appendix IX that are not in WAC 173-303-9905 are listed in Table 4.3. All of the constituents listed in Table 4.3 were analyzed later in the 300 Area process trenches monitoring well network.

Results of the early analyses under the interim-status program are documented in Schalla et al. (1988b, Tables 6 and 7) and Schalla et al. (1988a). Schalla et al. (1988b), Table 6 (Summary of Constituents Sampled to Date), shows that the herbicides and pesticides on the interim primary drinking water standards list were never reported above the detection limits nor were the phenols in the list of water quality parameters. Very few of the constituents in the site-specific list and almost none of the additional constituents sampled as part of the WAC 173-303-9905 list were detected. Several other constituents have only been reported above detection limits sporadically. Among those constituents that are regularly reported as being above the detection limit are gross alpha, gross beta, barium, nitrate, sodium, iron, sulfate, chloride, copper, ammonium, vanadium, potassium, chloroform, and methylchloride.

Schalla et al. (1988b), Table 7 (Analytical Data, June 1988-May 1986), compiles the results for those constituents that had at least one value reported above detection limits. Gross alpha and beta both exceeded their screening limit for Interim Primary DWS. Gross alpha and uranium are closely correlated because uranium is an alpha emitter. However, subtraction of uranium from gross alpha would probably bring gross alpha to below the "adjusted" gross alpha limit of 15 pCi/L. Chromium, mercury, selenium, and fluoride were reported as being above interim primary drinking water standard at least once.

Table 4.2. Additional Analytical Parameters (Schalla et al. 1988a)

Beryllium	Osmium	Strontium
Antimony	Vanadium	Potassium
Thallium	Thiourea	1-acetyl-2-thiourea
1-(o-chlorophenyl) thiourea	Diethylstilbesterol	Ethylenethiourea
1-naphthyl-2-thiourea	N-phenylthiourea	DDD
DDE	DDT	Heptachlor
Heptachlor epoxide	Dieldrin	Aldrin
Chlordane	Endosulfan I	Endosulfan II
Chlorobenzilate	2,4,5-T	Perchlorate
Phosphate	Carbophenothion	Tetraethylpyrophosphate
Disolfoton	Dimethoate	Methyl parathion
Parathion	Citrus red #2	Paraldehyde
Cyanogen bromide	Cyanogen chloride	Acrylamide
Allyl alcohol	Chloral	Chloroacetaldehyde
3-chloropropionitrile	Cyanogen	Dichloropropanol
Ethyl carbamate	Ethyl cyanide	Ethylene oxide
Fluoroacetic acid	Glycidylaldehyde	Isobutyl alcohol
Methyl hydrazine	n-propylamine	2-propyn-1-ol
1,1-dimethyl hydrazine	1,2 dimethyl hydrazine	Acetronitrile
Tetrachloromethane	Xylene-o,p	Xylene-m
Formaldehyde	Additional volatiles	Hexachlorophene
Naphthalene	Phenol	Kerosene
Hexachlorobenzene	Pentachlorobenzene	1,2-dichlorobenzene
1,3-dichlorobenzene	1,4-dichlorobenzene	1,2,3-trichlorobenzene
1,3,5-trichlorobenzene	1,2,3,4-tetrachlorobenzene	1,2,3,5-tetrachlorobenzene
Additional semi-volatiles	Ethylene glycol	

Table 4.3. Appendix IX Contaminants not in WAC 173-303-9905 List

Acenaphthalene	Acetone	Allyl chloride
Aniline	Anthracene	Antimony
Aramite	Benzo[k]fluoranthene	Benzo[ghi]perylene
Benzyl alcohol	Alpha-BHC	Beta-BHC
Delta-BHC	Gamma-BHC	Lindane
Bis(2-chloro-1-methyl-ethyl) ether		2,2'-dichlorodiisopropyl ether
Bromodichloromethane	4-chlorophenyl phenyl	Chloroprene
Cobalt	Copper	Dibenzofuran
Dibromochloromethane	Chlorodibromomethane	1,2-Dibromo-3-chloro-propane
DBCP	p-(Dimethylamino) azobenzene	Dinoseb
DNBP	2-sec-butyl-4,6-dinitrophenol	Ethylbenzene
Fluorene	Isodrin	Isophorone
Methoxychlor	Methylene bromide	Dibromomethane
Methylene Chloride	Dichloromethane	2-methylnaphthalene
4-methyl-2-pentanone	Methyl isobutyl ketone	o-nitroaniline
m-nitroaniline	Nitrobenzene	p-nitrophenol
N-Nitrosodipropylamine	Di-n-propylnitrosamine	Phenanthrene
Pyrene	Safrole	Styrene
Sulfide	Tin	Vanadium
Vinyl acetate	Xylene	Zinc

In 1986 and 1987, 19 new wells were installed to enhance the understanding of the hydrogeology at the 300 Area process trenches and to help characterize the direction and extent of contamination in Hanford and Ringold Formation sediment. The new wells, which were designed to meet WAC 173-160 standards, included five well clusters (399-1-16ABCD, 399-1-17ABC, 399-1-18ABC, 399-1-14AB, and 399-1-10AB) and five single wells, including the following (see Figure 3.1 for locations):

399-1-11	399-1-12	399-1-13	399-1-15	399-1-19

Each well cluster included one well in the upper portion of the unconfined aquifer (the "A" well), one well at the bottom of the unconfined aquifer (the "B" well), and sometimes one well in the uppermost confined aquifer below the Ringold Formation lower mud unit ("C" well), or in a basalt aquifer ("D" well). Total number of wells in the network temporarily rose to 35 (17 original plus 19 newer wells). The samples from the network of 35 monitoring wells were analyzed for a list of constituents that included the list of dangerous waste constituents in WAC 173-303-9905 (PNL 1988).

During the years 1989 to 1994, wells were periodically dropped from the network and the sampling schedule was changed from monthly to quarterly and eventually to semiannually. These changes were made because data quality objectives in the groundwater monitoring plan (Schalla et al. 1988a) regarding hydrogeology and contamination were satisfied, the expedited response action in 1991 appeared to have significantly reduced contamination in the trenches, and fewer wells sampled less frequently would still provide adequate groundwater monitoring. The well network was dropped to 11 wells sampled semi-annually. The 11 wells included the following (see Figure 3.1 for well locations):

399-1-10	399-1-11	399-1-12	399-1-14
399-1-16AB	399-1-17AB	399-1-18A	399-2-1
399-3-10			

Table 4.4 lists the contaminant analyzed and the frequency of the sampling.

Chromium, lead, selenium, lindane, and gross alpha had reported results greater than the maximum contaminant levels. Chromium exceedances have been the result of an excessive amount of suspended particles (turbidity) in groundwater samples because the exceedances are associated with unfiltered samples. Lead exceedances occurred prior to the expedited response action in 1991 in two wells that did not meet WAC 173-160 standards for construction. Since the expedited response action and prior to 1994, lead concentrations have been below the maximum contaminant level of 50 µg/L. Exceedances of selenium and lindane may actually be analytical problems due to detection limits that were greater than respective maximum contaminant levels. Other constituents of interest such as gamma-emitting radio-nuclides and strontium-90, copper, sulfate, zinc, chloride, and silver were all below the primary and secondary drinking water standard or the 4 mrem/yr equivalent activity level for radionuclides.

Table 4.4. Groundwater Contaminants Analyzed from Schalla et al. (1988a) Before Discharges Ended at the 300 Area Process Trenches

Semiannual Schedule – All 11 300 Area Process Trenches Network Wells
Alkalinity
Gross alpha
Gross beta
Uranium
Coliform bacteria
Specific conductance (lab)
ICP metals (including arsenic, selenium, and lead) unfiltered and filtered
Mercury (filtered and unfiltered)
pH (lab)
Radium
TOC
TOX
Tritium
Volatile organics analysis (GC)
Quarterly Schedule – Well 399-1-17A Only
Anions
Specific conductance (lab)
Gamma scan
pH (lab)
Strontium-90
TOX
TOC
Isotropic uranium
Uranium (chemical)
Volatile organics analysis (GC)

Volatile organic analysis (VOA) results indicate that several constituents were detected downgradient of the 300 Area process trenches during this period. The detected VOA constituents include PCE, toluene, xylene, benzene, TCE, chloroform, ethylbenzene, and cis-DCE. However, only TCE and cis-DCE were consistently above the drinking water standard of 5 and 70 µg/L, respectively. The well showing the exceedances of TCE and cis-DCE was 399-1-16B.

Concentrations of iron and manganese in filtered samples were consistently higher than drinking water standard for two wells (399-1-16B and 399-1-17B). Both wells are screened at the bottom of the unconfined aquifer. These results may be due to reducing conditions and the effect on well structures such as stainless steel casing and the effects of drilling. A similar relationship between sampling depth and concentration profiles for redox-sensitive species has been documented in Johnson and Chou (1994).

Uranium continued to be detected in several wells in the vicinity of the 300 Area process trenches during this period and was correlated to gross alpha. The expedited response action in 1991 reduced the concentrations of uranium significantly in all the network wells such that uranium exceeded the 20-µg/L EPA-proposed guidance in only two wells (399-1-17A and 399-1-10A).

4.4 Groundwater Monitoring After Discharges Ceased

In December 1994, wastewater discharges from the 300 Area process trenches ceased, and shortly thereafter, the current groundwater monitoring plan (Lindberg et al. 1995) was prepared and implemented. The revision was done because the trenches were initially scheduled to be included in the final status RCRA Permit as a treatment, storage, and disposal unit undergoing closure through the permit modification process originally planned for September 1995. The groundwater monitoring plan was changed because groundwater near the 300 Area process trenches needed to be monitored under a final status/compliance monitoring program.

4.4.1 Changing from Assessment to Compliance Monitoring

The major objective of the compliance monitoring program was to determine whether appropriate concentration limits for the identified groundwater contaminants were exceeded. For the constituents of concern, the proposal was to use the maximum contaminant levels as the concentration limits. However, for uranium, there was no drinking water standard established, so the 20-µg/L EPA-proposed limit was used until the rule containing the subject standard was promulgated. (Note: The final rule for the uranium drinking water standard was promulgated December 7, 2000, at 30 µg/L, and becomes effective December 8, 2003 [EPA 2000b].)

Based on the results of previous groundwater monitoring, the revised groundwater monitoring plan stipulated a network of eight well (4 well pairs of "A" and "B" wells) that were to be sampled initially on a semiannual basis (see Figure 4.1). The constituent list included chemical uranium, VOAs (especially TCE and cis-DCE), and the metals iron and manganese. At the request of the regulator (Ecology), thallium, PCBs, chrysene, and benzo(a)pyrene were added to the constituent list because of their concern about dangerous waste leaching from the relocated sediment stockpiled at the northern ends of the trenches.

Final status/compliance monitoring officially commenced at the 300 Area process trenches in December 1996, and at that time the sampling schedule changed from semiannual (as it was under interim status/assessment monitoring) to a modified semiannual sampling schedule. The modified semiannual schedule included two sets of sampling efforts per year (therefore retaining the semiannual classification), but collecting four time-independent samples during each semiannual sampling period for each well in the network (as required by WAC 173-303-645 for compliance monitoring). Using EPA guidelines (EPA 1989), the time duration between the independent samples was calculated to be at least 48 hours. However, to reduce any potential for autocorrelation and to better accommodate the normal sampling schedules of the sampling teams, the sampling interval was lengthened to one month. Therefore, the resulting sampling schedule was set such that the wells in the network were sampled in June (when the Columbia River was likely to be in its highest stages), July, August, and September, and in December (when the Columbia River was likely to be in low stages), January, February, and March. During this more rigorous sampling schedule, the constituents to be analyzed were uranium and the VOAs. Samples were analyzed for the metals, iron and manganese, and for the four Ecology-requested constituents during the June and December sampling events only.

4.4.2 Changing from Compliance Monitoring to Corrective Action Monitoring

As was expected, cis-DCE, TCE, and uranium exceeded their concentration limits (70 μg/L, 5 μg/L, and 20 μg/L, respectively) in wells downgradient of the 300 Area process trenches during the first series of time-independent samples (December 1996; January, February, and March 1997). Cis-DCE and TCE exceeded the limits in the deeper well 399-1-16B, and uranium exceeded its limit in 399-1-10A, 399-1-16A, and 399-1-18A. The regulator was notified and the groundwater monitoring plan was modified to become a corrective action plan. At that point, the objective of the groundwater monitoring plan changed from determining if concentration limits were exceeded to monitoring the concentration trends of the constituents of concern to confirm that they were naturally attenuating, as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit (ROD 1996). (Note: The RCRA modified closure/post-closure plan [DOE 1997a, Rev. 2, page 6-4] remediation goals for groundwater are deferred to the CERCLA 300-FF-5 Operable Unit.) A revised groundwater monitoring plan was proposed to sample the network wells only once per semiannual sampling period, and to initiate a control chart method of statistics (similar to the proposed plan in this document – see Section 7.3). The plan was written and submitted to the regulator for approval, but the statistical approach was not approved until May 7, 2001[1] (Ecology Letter 2001). Therefore, in the period between March 1997 and the present, the current groundwater monitoring plan remained in effect with a sampling schedule requiring eight independent samples collected per year from each of the eight network wells. The proposed groundwater monitoring plan in this document will implement the changes approved by the regulator.[2]

4.4.3 Reported Values of the Constituents of Concern in Groundwater

Each of the constituents of concern was detected in groundwater samples from 300 Area process trenches network wells. Tritium and nitrate were detected also, but these constituents are from upgradient sources. The source of tritium is the 200 East Area, and the source of nitrate is outside the Hanford Site area to the southwest (Hartman et al. 2001). (Note: Appendix B contains concentration versus time plots for the four constituents of interest, uranium, TCE, cis-DCE, and PCE for each of the wells in the proposed well network.)

Uranium. Since the expedited response action in 1991, the concentration of uranium in wells downgradient of the 300 Area process trenches initially decreased in two of the three wells monitoring the unconfined aquifer near the water table (wells 399-1-10A [Figure 4.2] and 399-1-17A [Figure 4.3]) and then increased again when the wastewater discharges ceased in December 1994. The concentration of uranium at the other downgradient well screened at the water table (well 399-1-16A [Figure 4.4]) remained relatively steady except for two questionable results in late 1993 and late 1994. In the "B" wells (wells at the bottom of the unconfined aquifer) downgradient of the trenches, the concentration

[1] Letter from Dib Goswami (Washington State Department of Ecology, Olympia, Washington) to Marvin Furman (U.S. Department of Energy, Richland, Washington), *Statistical Assessment for the 300 Area Resource Conservation and Recovery Act of 1976 (RCRA) Ground Water Monitoring Plan*, dated May 7, 2001 (see Appendix D).
[2] Ibid.

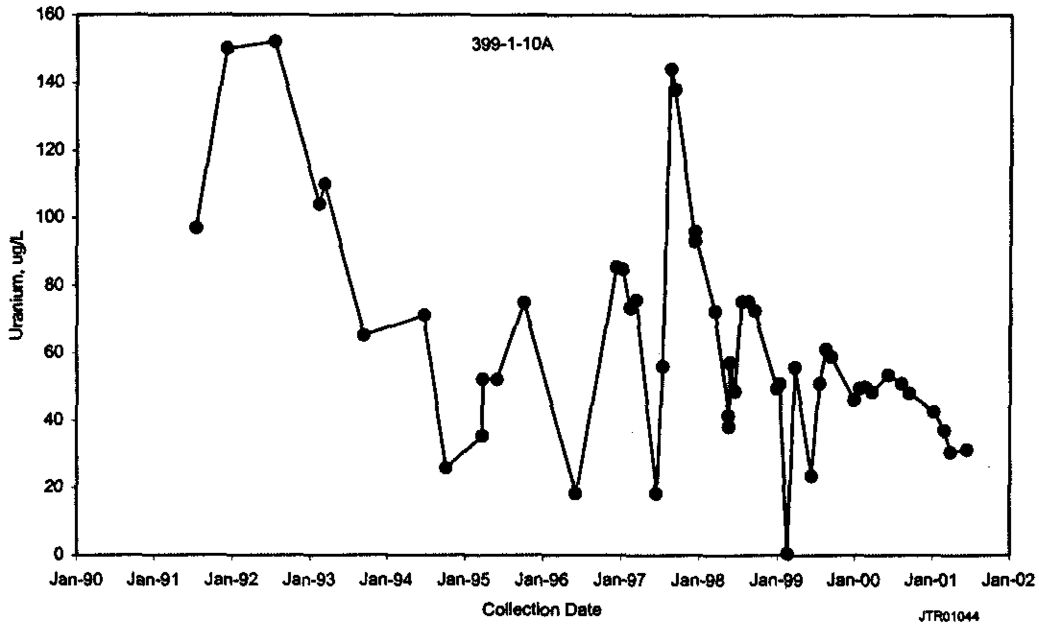

Figure 4.2. Uranium Concentration in Well 399-1-10A

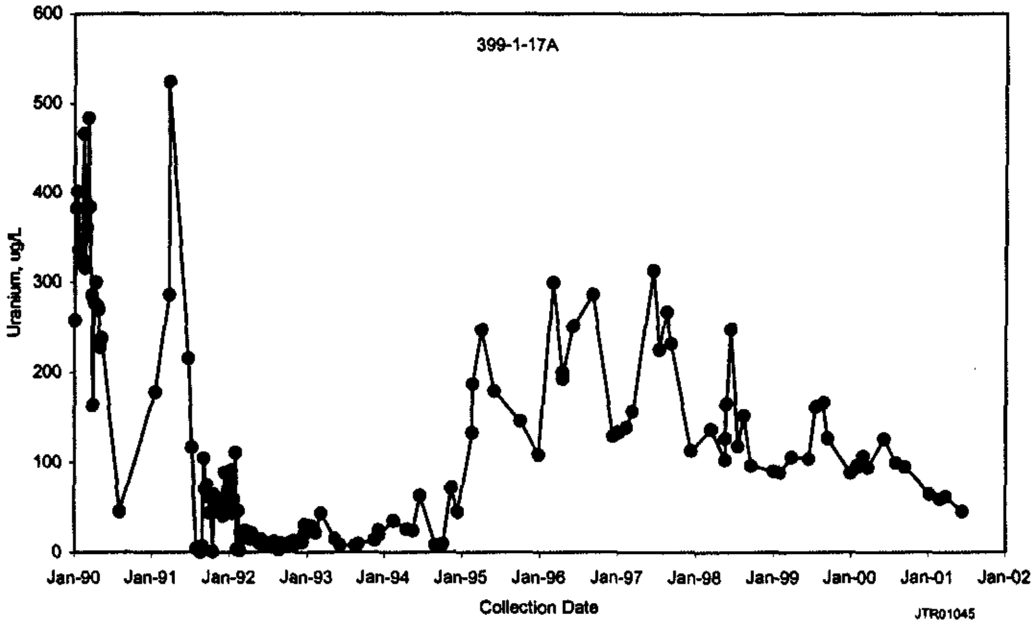

Figure 4.3. Uranium Concentration in Well 399-1-17A

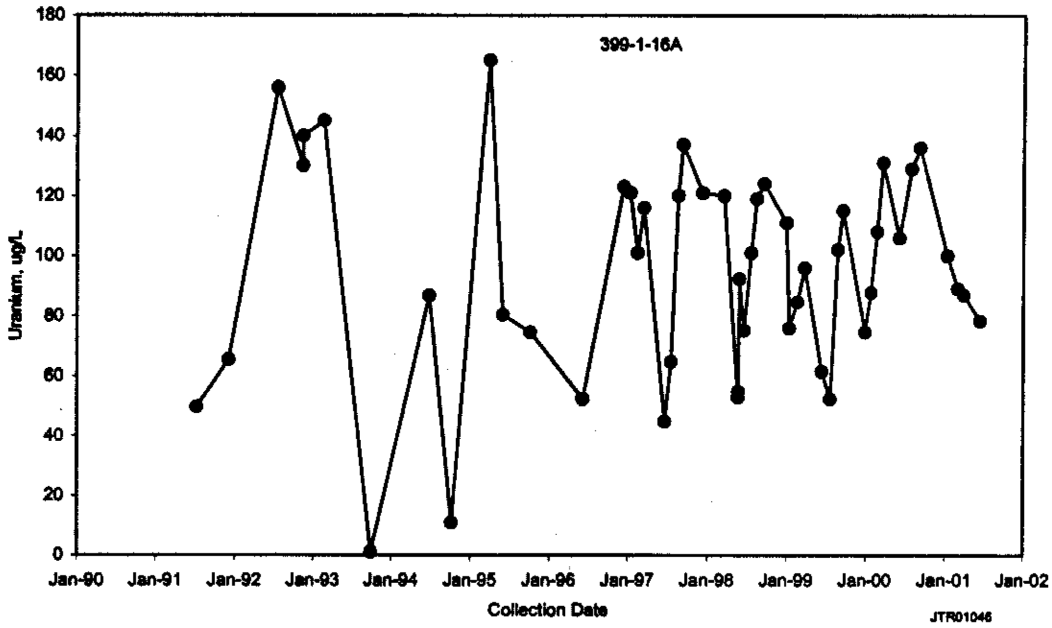

Figure 4.4. Uranium Concentration in Well 399-1-16A

remained below 1.0 pCi/L except for well 399-1-16B (Figure 4.5) where uranium concentrations have been rising since the expedited response action, but never exceeding the proposed 20 µg/L drinking water standard.

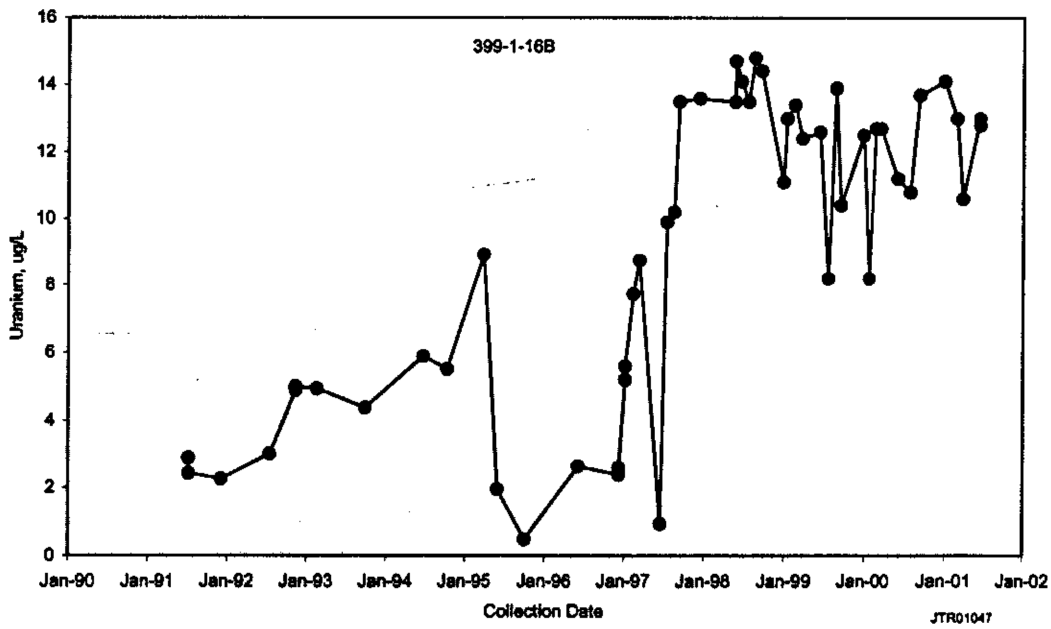

Figure 4.5. Uranium Concentration in Well 399-1-16B

Efforts during the expedited response action to reduce the amount of uranium in groundwater appeared to be at least partially successful because the trend plot of uranium concentration with time at well 399-1-17A (immediately downgradient of the trenches) (see Figure 4.3) shows that uranium concentration dropped dramatically immediately after the expedited response action. Low levels of uranium continued for 3 to 4 years until wastewater discharges ceased at the 300 Area process trenches. Subsequently, reported uranium results at well 399-1-17A rose again to levels as high as 300 μg/L in 1997 before decreasing to more recent reported levels around 50 μg/L. Apparently, when the trenches were in operation between 1991 and 1994, dilution by the large quantities of relatively clean process water (largely composed of cooling water) kept the concentration of uranium at the relatively low levels detected during that period. However, when use of the trenches stopped in late 1994 and the dilution no longer occurred, uranium concentration in the groundwater rose to the higher levels measured after 1994. In addition, this dilution effect was only slightly apparent at well 399-1-16A (see Figure 4.4) and was not observed at all at well 399-1-10A (see Figure 4.2).

Figure 4.6 shows that the distribution of uranium in the upper part of the unconfined aquifer was widespread throughout the 300 Area during the year 2000 but is concentrated in the plume downgradient (southeast) of the 300 Area process trenches. The uranium in the concentrated portion of the plume is probably from the process trenches, but much of the rest of the plume may have come from other sources in the 300 Area (e.g., North and South Process Ponds). Trend plots of uranium concentration versus time at wells 399-10A, -16A, and -17A show an annual cyclical pattern related to the water levels in those wells, which in turn is directly related to river stage of the Columbia River (see Figures 4.2, 4.4, and 4.3, respectively). Figure 4.2 shows that when the water level rose in well 399-1-10A, the concentration of uranium decreased as would be expected with the mixing of river water as discussed in Section 3.2.2. Similar results are noted in Figure 4.4 for well 399-1-16A. When river level rose, uranium concentration tended to decrease. However, in Figure 4.3, uranium concentration seemed to rise rather than decrease at well 399-1-17A during periods of high river stage. Apparently, well 399-1-17A (near the trenches) is far enough from the river that there is reduced amount of river water incursion at that distance, as discussed in Section 3.2.2. Furthermore, as the water table rises with high river stages, uranium waste retained in the vadose zone is mobilized temporarily, increasing uranium concentration in groundwater. As the magnitude of high river stages decreased from 1997 to 2001, the levels of reported uranium at well 399-1-17A have also decreased. An important consideration in future years will be to determine whether the reported levels of uranium at well 399-1-17A will increase when river stages rise again to (or near) the levels experienced in 1997.

The increased concentration in uranium found in groundwater during higher river stages is most likely from a secondary source of uranium in the lower portion of the vadose zone and/or upper portions of the aquifer. This has to be the case because only the lower portions of the vadose zone become saturated during high river stages, thus providing the potential for leaching uranium from the sediment. In turn, this secondary source of uranium is most likely from the uranium-bearing waste discharged to the 300 Area process trenches from 1975 to 1985 (or earlier from the process ponds). The uranium in the wastewater discharges may have been in the form of uranyl nitrate, uranium oxides, elemental uranium from millings, uranium tetrafluoride, or other forms (Young and Fruchter 1991). These forms of uranium are known to have entered the process sewer during the fuel fabrication process and may have been discharged to the 300 Area process trenches as both suspended solids (uranium metal and oxides) or as

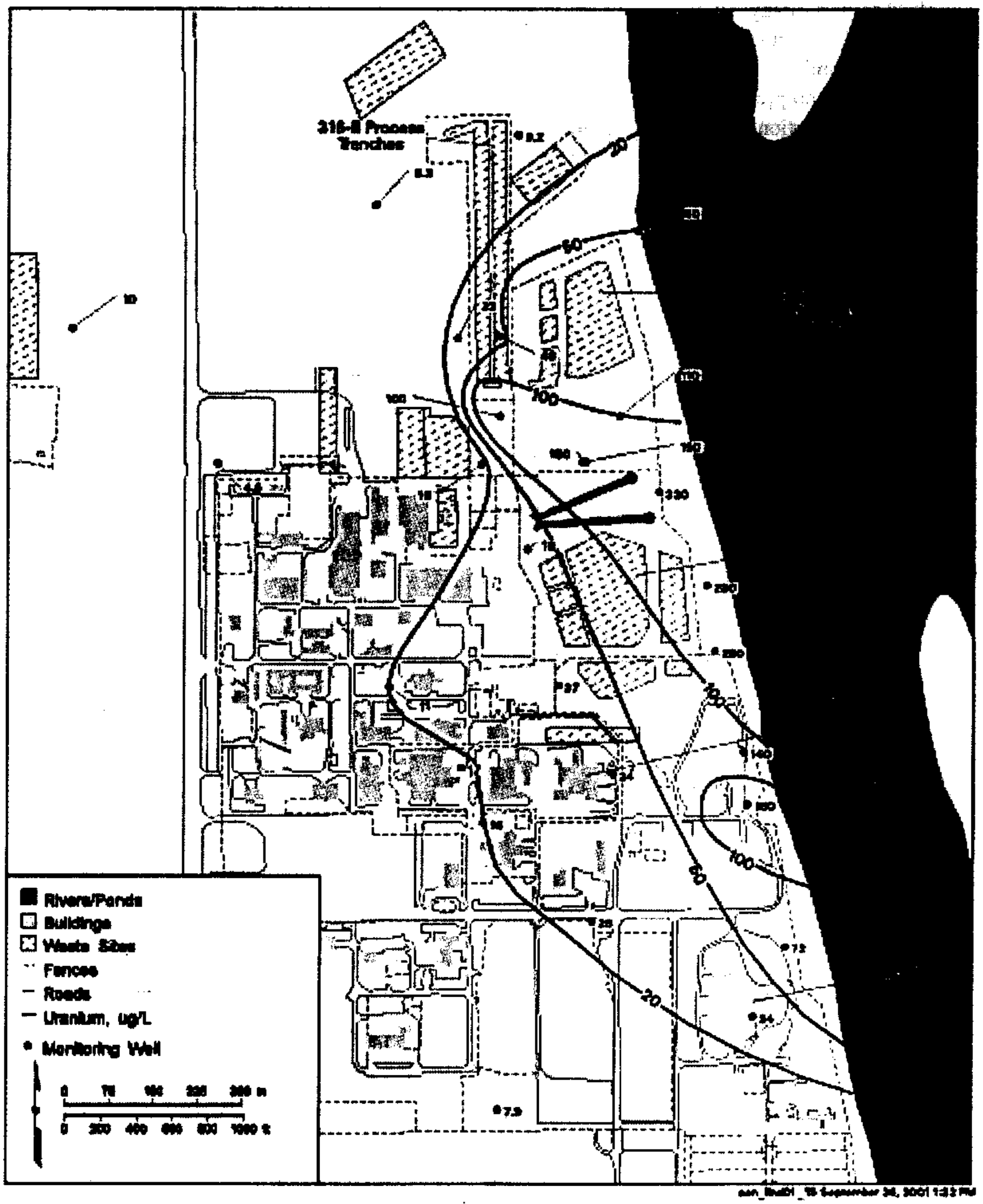

Figure 4.6. Average Uranium Concentrations in Groundwater at the 300 and Richland North Areas, Top of Unconfined Aquifer

dissolved solutes (uranyl nitrate). The suspended uranium-bearing solids likely were filtered out close to the trench bottoms, but the soluble uranium likely migrated deeper into the vadose zone where it interacted with sediment. The uranium was retained in the lower vadose zone by either a surface site adsorption process or a co-precipitation process whereby the uranium is removed from pore fluids. In both cases (surface site adsorption/desorption or co-precipitation), the amount and rates of adsorption or leaching of uranium are sensitive to environmental parameters such as pH or alkalinity (in this case bicarbonate/carbonate concentration) and possibly ionic strength (i.e., competing cations and anions) (EPA 1999). What is not yet known is the precise nature of the chemical species of uranium in the sediment near the fluctuating water table and specific details about the adsorption/desorption and/or co-precipitation processes that control the partitioning of uranium between sediment and groundwater.

Trichloroethene. TCE exceeded the maximum contaminant level (5.0 μg/L) in the 300 Area process trenches only at well 399-1-16B (Figure 4.7), though it was detected in most wells of the network. Since well 399-1-16B was first sampled in 1987, the concentration of TCE has steadily decreased from about 24.0 μg/L to below 1.0 μg/L in 1995. However, the concentration rose again to over 10 μg/L by early 1997, and then decreased steadily to approximately 2.0 μg/L in 2001. The lower concentrations reported more recently are approaching the values reported in the upper portion of the unconfined aquifer in wells 399-1-16A and 399-1-17A. The lower reported values of 0.5 to 2.0 μg/L in the wells of the upper portion of the unconfined aquifer most likely are caused by a source upgradient and offsite to the southwest (Hartman et al. 2001) (Figure 4.8).

TCE was apparently discharged to the trenches as a separate waste product from PCE (i.e., it was not a degradation product of PCE). Because PCE was never detected in well 399-1-16B in more than trace concentrations, it was not available in sufficient quantities to be the source of the TCE detected.

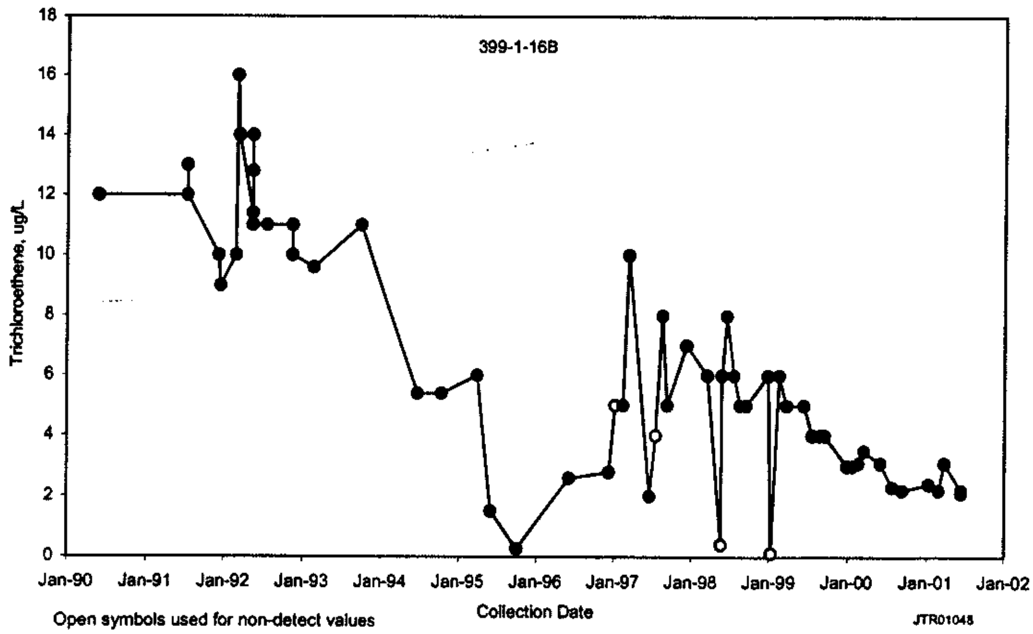

Figure 4.7. Trichloroethene Concentration in Well 399-1-16B

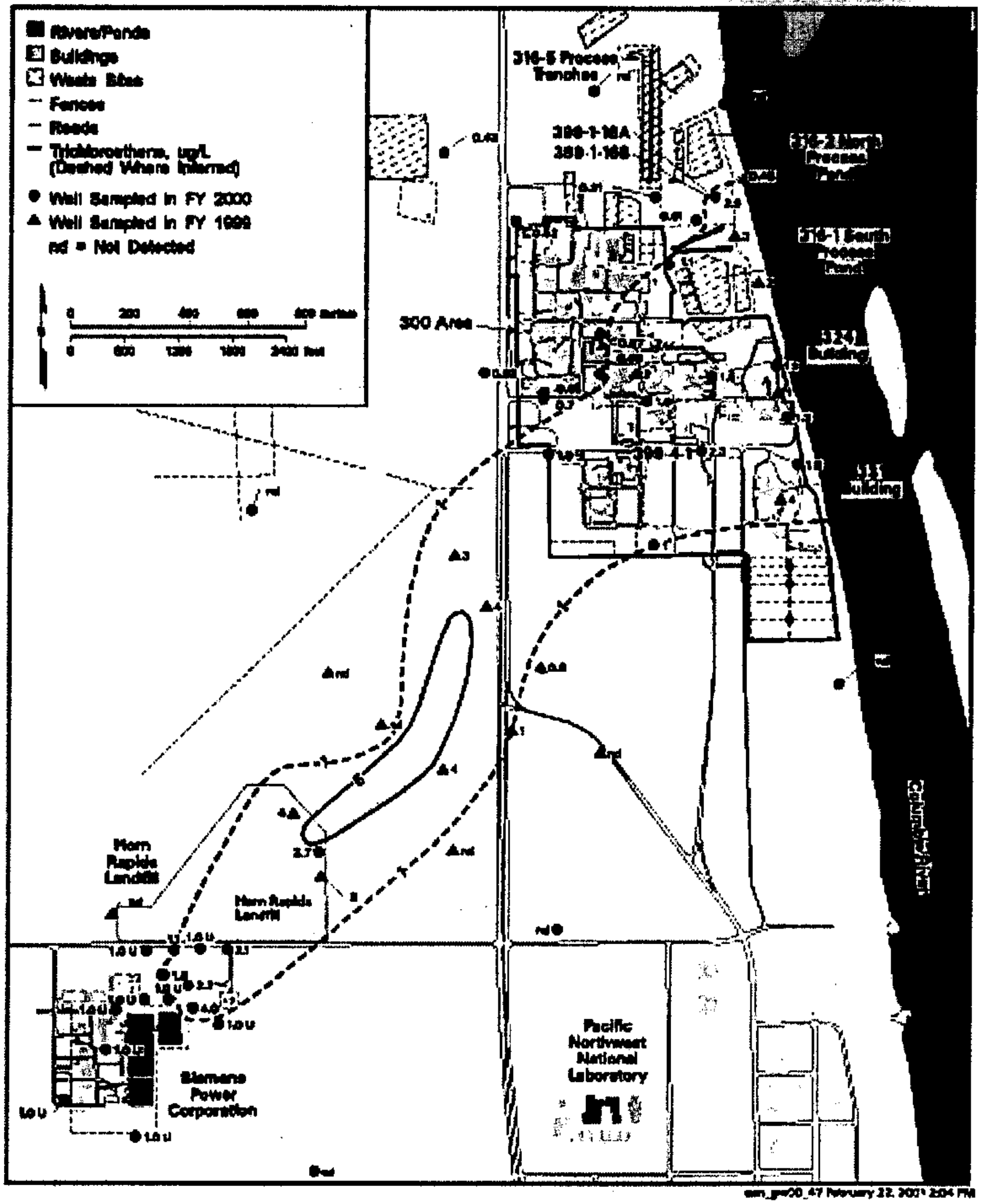

Figure 4.8. Average Trichloroethene Concentrations in the 300 and Richland North Areas, Top of the Unconfined Aquifer

The nature of the TCE in the aquifer beneath the 300 Area process trenches is unknown, but because TCE is detected mostly in the well screened at the bottom of the unconfined aquifer, it is possible that the nature of the TCE discharged was at least in part a dense non-aqueous phase liquid. This is consistent with its position in the aquifer and the length of time to disperse. That is, in its dissolved phase it moves in the aquifer much quicker. On the other hand, the groundwater flow rates in the deeper part of the unconfined aquifer are probably much lower than in the upper portions of the unconfined aquifer, and a dissolved phase of TCE could then disperse slowly at its position at the bottom of the aquifer.

Cis-1,2-Dichloroethene. Cis-DCE (maximum contaminant level = 70 µg/L) was detected at several wells downgradient of the 300 Area process trenches, but results at only three wells were significant. The network well with the highest levels of cis-DCE was well 399-1-16B (Figure 4.9), which is screened at the bottom of the unconfined aquifer. After 1991, the concentration of cis-DCE rose steadily to over 180 µg/L by 1997 and remained over 100 µg/L since that time. Cis-DCE was detected continuously since 1994 at well 399-1-17B (Figure 4.10) but never higher than 5.0 µg/L. One reported result for cis-DCE at well 399-1-17A had a value of 5.0 µg/L. However, a sample collected 4 days earlier had a reported value of 0.10 µg/L, and another sample collected 21 days later had a reported value of 0.8 µg/L. Therefore, the 5.0 µg/L result is suspected to be an analytical or sampling error.

Cis-DCE may be a degradation product of TCE because the concentration of cis-DCE rose in well 399-1-16B while the concentration of TCE steady decreased (see section on TCE). However, it is difficult to reconcile that the highest concentrations of TCE never exceeded 25 µg/L, whereas the concentration of cis-DCE was as high as 180 µg/L in early 1997.

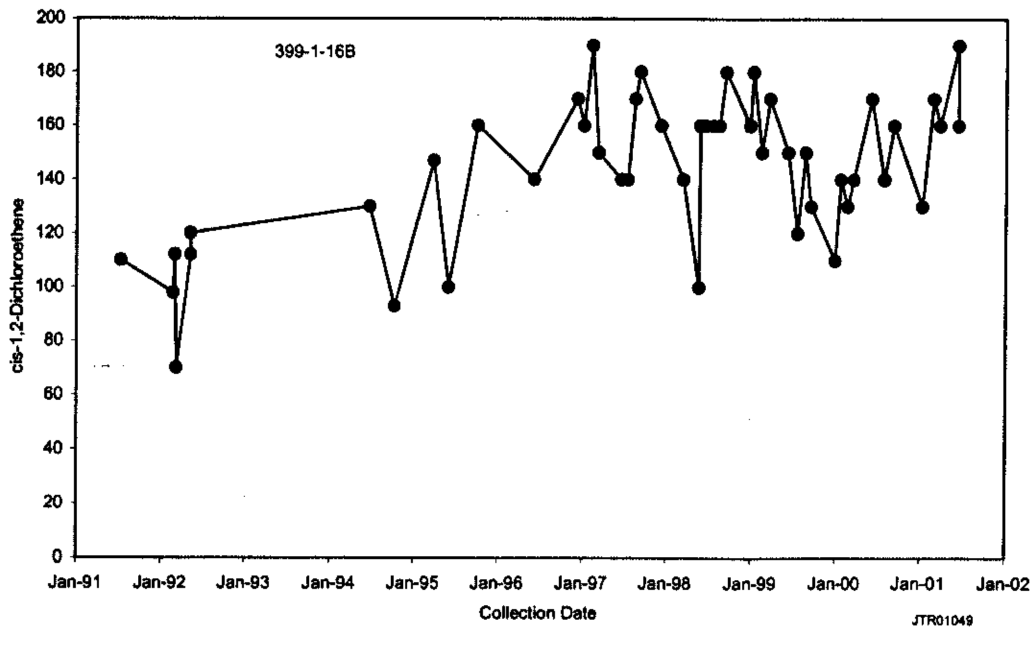

Figure 4.9. Cis-1,2-Dichloroethene Concentration in Well 399-1-16B

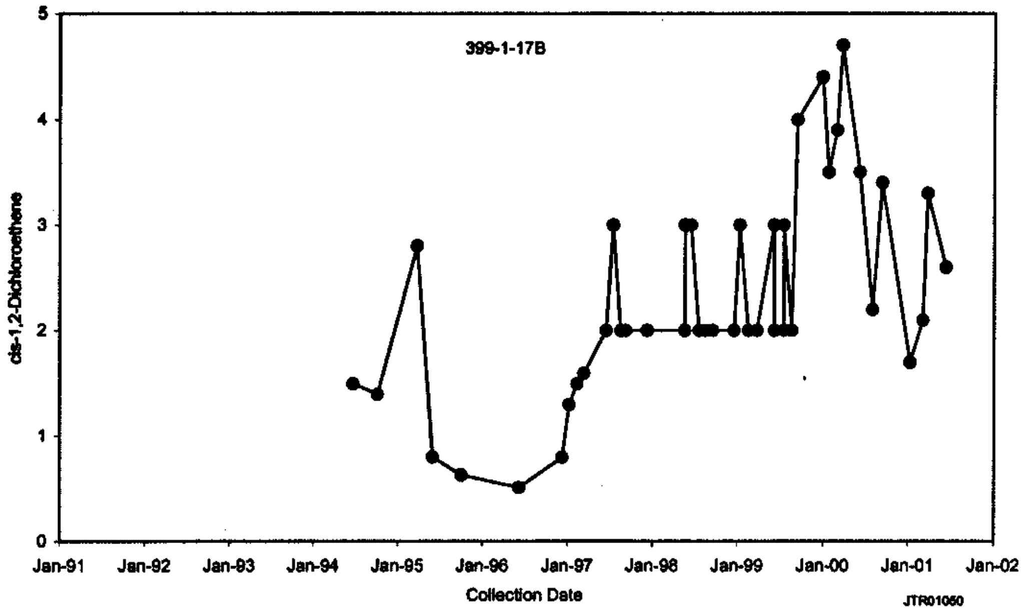

Figure 4.10. Cis-1,2-Dichloroethene Concentration in Well 399-1-17B

Tetrachloroethene. Other than the known accidental releases discussed earlier, PCE (maximum contaminant level = 5.0 µg/L) was detected as a short-duration plume in 1998 and early 1999 at three wells downgradient of the 300 Area process trenches that are screened at the water table. The highest detected value was 38 µg/L at well 399-1-17A (Figure 4.11). In the other two wells where the plume was detected during that time, it reached a concentration of 17 µg/L at well 399-1-16A (Figure 4.12) and 8.0 µg/L at well 399-1-10A (Figure 4.13). PCE was only detected in trace amounts in well 399-1-16B, indicating that the occurrence was mostly restricted to the upper portion of the unconfined aquifer. By the end of 1999, the concentration of PCE in all these wells had returned the to low concentrations detected before the plume was detected.

The source of the temporary PCE plume is unknown, but probably came from the vicinity of the 300 Area process trenches or upgradient of the trenches. However, by 1998 the wastewater discharges at the trenches had been turned off for more than three years. The most likely scenario for this surge or pulse of PCE is that the higher than normal Columbia River stages of 1997 may have remobilized PCE in the vadose zone near or upgradient of the trenches when the water table rose to record levels during that period. The time lag from the high river stage and the arrival of the pulse of PCE is 6 to 12 months. A more accurate estimate of the time lag is not possible because there were no samples collected between December 1997 and May 1998. Using the 10.7 meter per day estimate of PCE velocity in 300 Area groundwater, the distance traveled in 365 days would range from 1,950 to 3,900 meters, which would put the source nearly 2 to 4 kilometers upgradient of the trenches. However, it is unknown what amount of time that PCE would take to travel through the vadose zone after saturation by the higher-than-normal water table rises in 1997. Therefore, the source could be considerably closer to the 300 Area process trenches than the 2 to 4 kilometer estimate. In addition, at a source distance of 2 to 4 kilometers, the expected dispersion of PCE in the groundwater would probably cause the PCE to be detected in additional wells than the three wells in which it was detected near the trenches.

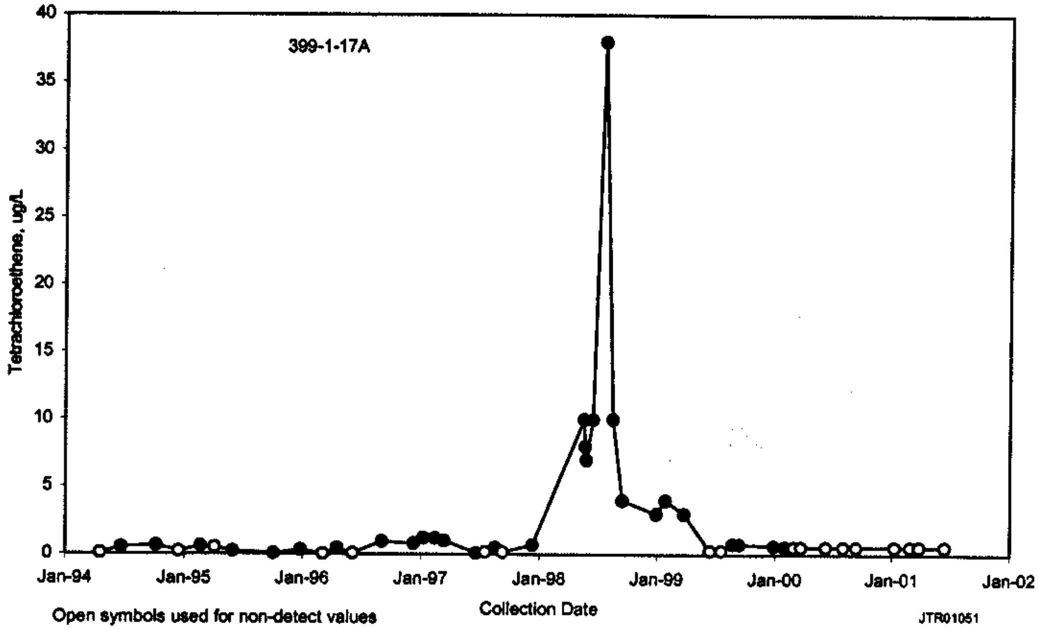

Figure 4.11. Tetrachloroethene Concentration in Well 399-1-17A

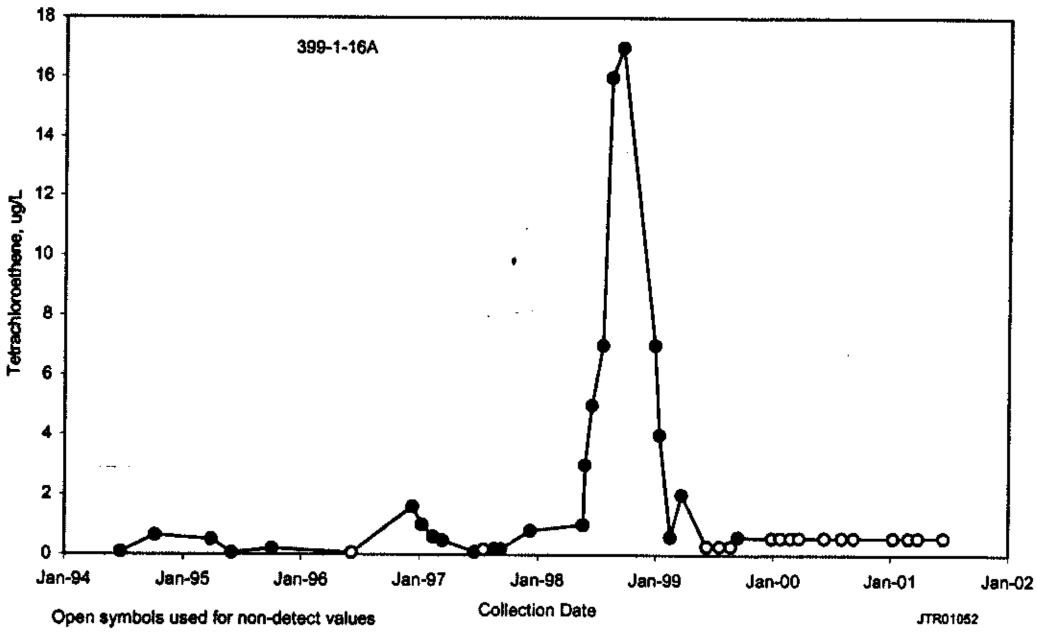

Figure 4.12. Tetrachloroethene Concentration in Well 399-1-16A

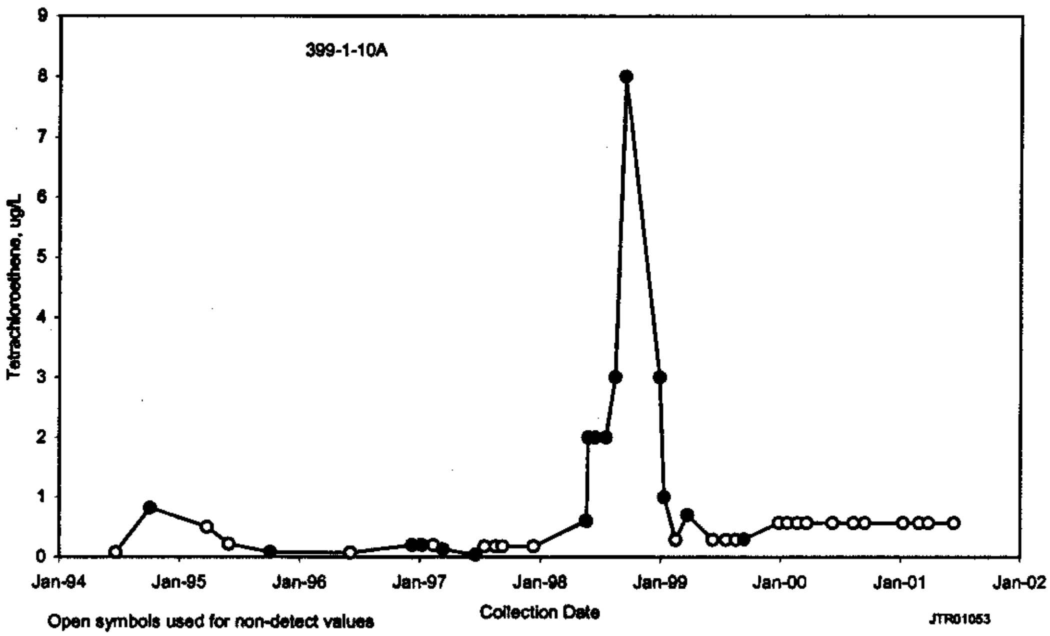

Figure 4.13. Tetrachloroethene Concentration in Well 399-1-10A

5.0 Conceptual Model

Waste disposal at the 300 Area process trenches has affected groundwater quality downgradient. The following statements summarize the current interpretation ("Conceptual Model") of groundwater flow, waste characterization, and the current situation at the site.

- Wastewater from the process sewer (containing fuels fabrication and other laboratory waste) was discharged to the 300 Area process trenches, two unlined trenches that allowed wastewater to flow directly into the ground. The trenches were in used from 1975 to 1994.

- The wastewater discharged to the 300 Area process trenches contaminated the vadose zone beneath the trenches, as well as the aquifer.

- The concentration of waste constituents in the wastewater that was discharged to the 300 Area process trenches decreased with time. Administrative controls to prevent hazardous waste from entering the process sewer were put into effect in 1985. After that time, the amount of hazardous waste reaching the trenches was very low even though the rate of discharge remained above 750 liters per minute.

- The expedited response action in 1991 removed some contaminated sediment from the sides and bottoms of the trenches, but soil contamination extended below and to the side of the material removed.

- Although the expedited response action appeared to significantly lower the concentration of uranium at well 399-1-17A (immediately downgradient of the trenches), four years later the concentration rose again after waste discharges at the 300 Area process trenches ceased. The previously lower concentrations in the groundwater were due to the dilution by large quantities of relatively clean cooling water that were discharged to the trenches. When the discharges to the trenches stopped, the concentration of uranium rose to levels that would occur without dilution.

- Although there was a large list of potential waste constituents discharged to the 300 Area process trenches, the only constituents of concern that continue to be detected in the aquifer are uranium, cis-DCE, and TCE.

- Cis-DCE and TCE from the 300 Area process trenches remain in the lower portion of the unconfined aquifer downgradient of the trenches. Levels of TCE have dropped to below the MCL (5 µg/L). Levels of cis-DCE are still above the MCL (70 µg/L) in only one well (399-1-16B). TCE detected in the upper portions of the unconfined aquifer (below the MCL) is most likely from upgradient sources to the southwest.

- Nitrate and tritium are detected in network wells, but the sources of these constituents are upgradient.

- The Hanford formation (sand and gravel deposits of Pleistocene cataclysmic flooding) overlies the Ringold Formation (fluvial gravel, sand, and mud) with the contact near the water table. The Hanford formation has higher hydraulic conductivity than the Ringold Formation, thereby allowing higher groundwater flow rates when the water table extends above the contact.

- The silt and clay of the lower mud unit of the Ringold Formation constitute the base of the unconfined aquifer. This lower mud unit also effectively prevents groundwater contamination in the unconfined aquifer from contaminating groundwater below the lower mud unit. Hydraulic head below the mud unit is higher than above the unit, indicating that if communication were established between the confined aquifer below and unconfined aquifer above that the general flow would be upward.

- Groundwater in the unconfined aquifer (the uppermost aquifer beneath the 300 Area process trenches) flows into the 300 Area from the northwest, west, and southwest, and then discharges to the Columbia River. During normal to low stages of the river, the flow direction beneath the trenches is toward the east-southeast. The average or cumulative ground water flow direction (including periods of high river stage) is southeast.

- Fluctuating river stages cause water table fluctuations, which in turn, affects water table gradient and groundwater flow direction in the vicinity of the 300 Area process trenches. During high river stages, the water table gradient can be reversed causing bank storage of river water and a temporary groundwater flow direction to the south or southwest.

- The annual cyclical nature of uranium concentration in downgradient wells is due to fluctuations in river stage (Figure 5.1). Near the trenches (well 399-1-17A), uranium concentration rises with higher water-table levels due to increased amounts of uranium coming from the upper portion of the aquifer (secondary source) that were vadose zone prior to the rise in water-table elevation. Near the Columbia River shore (well 399-1-10A), uranium concentration deceases with higher water-table levels due to mixing of groundwater and river water accompanied with bank storage of river water.

- The secondary source of uranium is an accumulation of uranium in the lower portions of the vadose zone from earlier 300 Area process trenches releases. This secondary source of uranium is desorbed from the lower vadose zone (which becomes upper aquifer) during high river stages. The adsorption/desorption properties of uranium are sensitive to changes in pH and alkalinity (bicarbonate/carbonate concentrations) (see Section 4.4.3 for more details).

- Fluctuations in river level do not have much of an effect on cis-DCE because it is mostly within the lower portions of the unconfined aquifer.

- The more recent remediation activities from 1997 to 1999, including the removal of the stockpiled contaminated sediment at the north ends of the trenches, has had little affect on the concentrations of uranium and volatile organic compounds in the groundwater thus far. However, removal has eliminated potential leaching of contaminants from the stockpiled sediment and additional contamination of groundwater in the future.

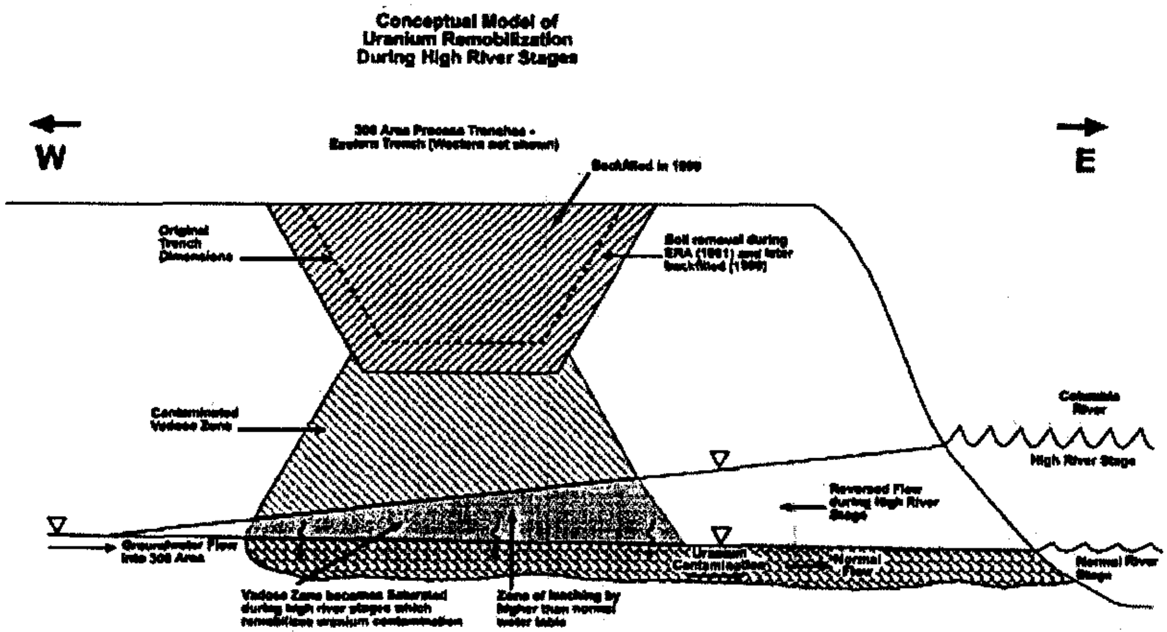

Figure 5.1. Near River Contaminant Fate and Transport Conceptual Model

6.0 Groundwater Monitoring Program

Concentration limits (in this case, drinking water standards or EPA-proposed drinking water standards) for two of the constituents of interest (cis-DCE and uranium) have been, and still are, exceeded in some downgradient wells at the 300 Area process trenches. Therefore, a plan for corrective action groundwater monitoring is required.

6.1 Objectives

In accordance with WAC-173-303-645(11)(d), the groundwater monitoring program must demonstrate the effectiveness of the corrective action and must be at least as effective as a compliance monitoring program in determining compliance with the groundwater protection standards. The compliance monitoring program must, in turn, provide for a sufficient number of samples (a sequence of at least four samples collected at least semiannually, unless an alternative sampling procedure has been approved in accordance with WAC 173-303-645[8][g][ii]). Additionally, a compliance monitoring program should use one of four specified statistical methods (including control charts), unless an alternative method has been approved by Ecology in accordance with WAC 173-303-645(8)(h)(iv).

This corrective action program proposes to use both an alternative sampling procedure and a revised statistical method (see Section 7.3) to satisfy the corrective action groundwater monitoring requirements. These alternative approaches will improve the ability of the monitoring program to monitor for trends and to detect impacts to groundwater quality while achieving significant savings by reducing the number of routine groundwater samples required for statistical testing purposes. The proposed alternate corrective action program will

1. meet the needs of final status compliance monitoring

2. provide for an efficient sampling plan that relies on only one groundwater sample per well per sampling period.

6.2 Special Conditions

There are two conditions that are of special concern to the development of this groundwater monitoring plan. The first concern is related to the depth in the aquifer of the residual contamination. Uranium and the contaminants from upgradient sources are in the upper part of the unconfined aquifer. Therefore, they need to be monitored by wells that are screened at the water table (the "A" wells). Volatile organic compounds such as cis-DCE and TCE are found in higher concentrations at the bottom of the unconfined aquifer (the "B" wells), and, thus, need to be monitored by wells screened at the bottom of the aquifer. Therefore, the monitoring well network needs to be a combination of "A" and "B" wells.

The second special condition is the relationship of the water table to fluctuations in Columbia River stage. How quickly river stage fluctuates and the magnitude of the fluctuations determines the water table gradient and overall elevation of the water table. In turn, the water-table gradient influences the direction and rate of groundwater flow beneath the 300 Area process trenches. The overall elevation of the water table determines whether the lower vadose zone becomes temporarily saturated, mobilizing waste constituents stored in the vadose zone. Selection of wells for the monitoring network must consider the variability in groundwater flow direction and rate due to the river fluctuations. Furthermore, the sampling schedule must be consistent with high and low stages of the river in order to test the full variability of contaminant concentration as it is affected by river stage.

6.3 Monitoring Well Network

The 11 downgradient wells of the proposed monitoring well network (Figure 6.1) are located downgradient of the 300 Area process trenches in an eastward to southward direction. (Upgradient wells are no longer needed to support the objectives of this groundwater monitoring plan.) The network includes all the available wells in this arc that meet the requirements of WAC 173-160 for resource protection wells and are within 300 meters of the 300 Area process trenches. The location of these wells is designed to intercept existing or potentially new plumes originating at the trenches during low to high stages of the Columbia River. Wells that do not meet WAC 173-160 requirements are not included in the network in order to avoid making decisions on the effectiveness of the corrective action by the use of data from wells that do not meet the minimum requirements of WAC 173-160.

The six wells monitoring the upper portion of the uppermost aquifer (the unconfined aquifer) include

399-1-7	399-1-11	399-1-17A
399-1-10A	399-1-16A	399-1-21A

With the exception of well 399-1-11, each of the wells listed above has a corresponding deeper well screened in the lower portion of the unconfined aquifer. The deeper wells include

399-1-8 (near 399-1-7)	399-1-16B	399-1-21B
399-1-10B	399-1-17B	

Appendix C contains construction details of the proposed wells.

In addition to using "A" and "B" wells (bottom and top of aquifer) to differentiate groundwater contamination in the lower versus upper portions of the unconfined aquifer, further discrimination of contaminant stratification can be tested with the Spider sampler. This tool will be used on a limited basis in a few wells (e.g., 399-1-16B) to determine the vertical profile for contaminants across the screened interval. At well 399-1-16B, screened at the bottom of the unconfined aquifer, the tool will be used to determine if the contamination is localized at the base of the aquifer (due to volatile organic compounds as dense non-aqueous phase liquids) or more dilute over a larger portion of the screened interval.

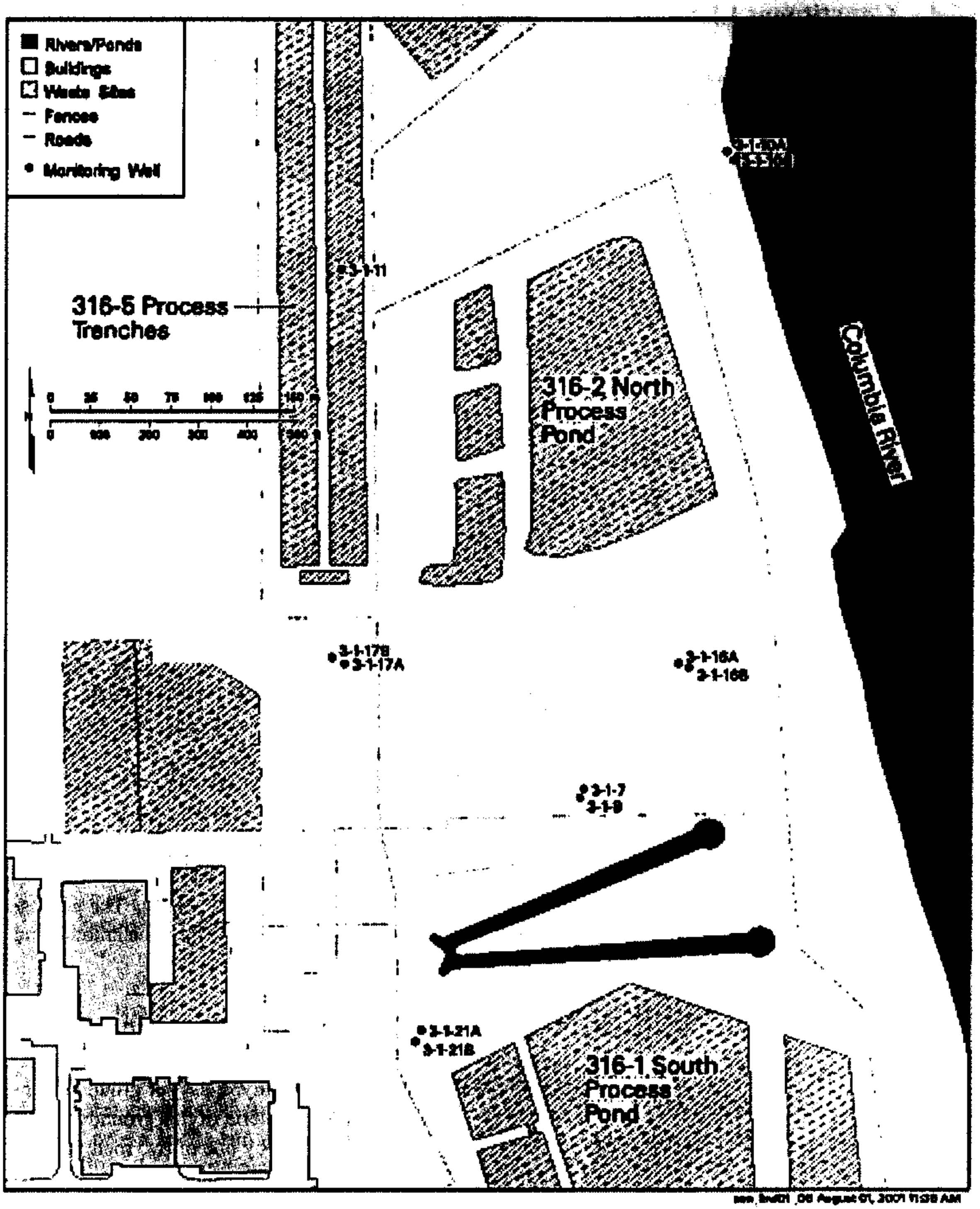

Figure 6.1. Location of Wells in the Proposed Well Network

6.4 Constituent List and Sampling Frequency

As discussed in Section 4.4.3 the constituents of concern that remain above the groundwater quality criteria are uranium and cis-DCE. (Note: The maximum contaminant levels are the groundwater quality criteria at this site.) These two constituents constitute the main constituent list. TCE and PCE no longer exceed the maximum contaminant levels, but remain as contaminants of concern because of their exceedances in recent years and potential to reappear.

Tritium from one or more upgradient sources to the northwest and nitrate from offsite sources to the southwest (Hartman et al. 2001) are not included as contaminants of concern for the 300 Area process trenches and will not be monitored for RCRA objectives by this groundwater monitoring program. However, they will be monitored by the Hanford Groundwater Monitoring Project for the *Atomic Energy Act of 1954*.

While analyzing groundwater samples from the 300 Area process trenches for cis-DCE, TCE, and PCE, other volatile organic compounds are included also because of the nature of the volatile organic analysis (8260_VOA_GCMS – Gas Chromatograph/Mass Spectroscopy). Therefore, other volatile organic compounds such as 1,2-dichloroethane, 1,1,1-trichloroethane, acetone, benzene, carbon tetrachloride, and many others are included also. This will provide confidence that additional volatile organic compounds are not escaping detection by this groundwater monitoring program.

Sampling frequency will depend on the recent history for each groundwater analyte at each network well. A guidance letter from the regulator (Ecology 2001) requires that at wells where the contaminant of concern exceeds the groundwater quality criteria (i.e., maximum contaminant level) the sampling frequency shall be quarterly. In wells where the concentration of constituents of concern is less than the groundwater quality criteria the sampling frequency shall be semiannually (see Section 7.3). Table 6.1 provides the details about whether the contaminants of concern are currently exceeding the groundwater quality criteria and the resulting sampling frequency for each well of the proposed network.

In addition to the contaminants of concern mentioned above, groundwater samples will occasionally be tested on a limited basis in a few selected wells for ICP metals, anions, and alkalinity. The purpose of these additional tests is to characterize the groundwater for parameters that may affect the amount and rates of adsorption or leaching of uranium.

6.5 Groundwater Parameter Analyses and Method Detection Limit

Table 6.2 lists the groundwater analysis method detection limits currently in use for groundwater parameters required in Section 6.3.2, as well as the groundwater quality criteria of this groundwater monitoring program. Uranium will be analyzed as total chemical uranium by one of two methods, either kinetic phosphorescence or laser induced phosphorimetry. The volatile organic compounds will be analyzed by method SW-846 8260 gas chromatography/mass spectroscopy.

Table 6.1. Well Sampling Frequency Based on Current Concentration Levels of Contaminants of Concern in Network Monitoring Wells

Well GWQC	Uranium 20 μg/L[a]	Cis-DCE 70 μg/L[a]	TCE 5 μg/L[a]	PCE 5 μg/L[a]	Frequency[d]
399-1-7	Y[b]	N[c]	N	N	Quarterly
399-1-8	N	N	N	N	Semiannual
399-1-10A	Y	N	N	N	Quarterly
399-1-10B	N	N	N	N	Semiannual
399-1-11	Y	N	N	N	Quarterly
399-1-16A	Y	N	N	N	Quarterly
399-1-16B	N	Y	N	N	Quarterly
399-1-17A	Y	N	N	N	Quarterly
399-1-17B	N	N	N	N	Semiannual
399-1-21A	N	N	N	N	Semiannual
399-1-21B	N	N	N	N	Semiannual

(a) Groundwater quality criteria (maximum contaminant levels at this site).
(b) Y = Yes, the groundwater quality criterion is exceeded.
(c) N = No, the groundwater quality criterion is not exceeded.
(d) Resultant frequency based on current concentration levels of contaminants of concern. The concentration levels may change in the future causing the sampling frequencies to change appropriately.

Table 6.2. Groundwater Quality Criteria for the 300 Area Process Trenches Groundwater Waste Parameters (Constituents of Concern) and Associated Method Detection Limits

Groundwater Contaminant	GWQC[a] (MCL)	MDL[b]
Uranium	20 μg/L	0.1 μg/L
Cis-1,2-Dichloroethene	70 μg/L	0.5 μg/L
Trichloroethene	5 μg/L	0.31 μg/L
Tetrachloroethene	5 μg/L	0.36 μg/L

(a) Groundwater quality criteria are federal drinking water standards and maximum contaminant levels.
(b) Method detection level.

6.6 Determination of Groundwater Flow

Depth to water measurements will continue to be collected from each monitoring well when each is sampled. In addition, a complete list of wells sampled for this plan, for the *Atomic Energy Act of 1954*, and for the CERCLA 300-FF-5 Operable Unit Operations and Maintenance Plan will be measured annually in March to provide a detailed water-table map. The water-table maps, in turn, will provide the information necessary to estimate groundwater flow direction by "contouring" the water-table surface and to estimate flow rate from the water-table gradient. Using the Darcy equation (1), the average flow rate of groundwater will be calculated from estimates of hydraulic conductivity, the water-table gradient, and effective porosity.

Another method of determining groundwater flow direction and flow rate is the use of a down-well flow meter. One type of flow meter currently being used at the Hanford Site uses a down-hole camera capable of viewing colloidal-size particles. The probe containing the down-hole camera is coupled to a magnetometer for orientation. The flow meter tracks the movement of the colloidal-size particles, and flow rate and direction of the particles are recorded and used to calculate groundwater flow rate and flow direction. This type of flow meter will be used at one or more of the wells in the 300 Area process trenches network. The flow meter also has continuous mode capabilities that make it useful for tracking the flow direction and rate of groundwater for extended periods (e.g., days or weeks). By applying this flow meter to wells near the river, the tool may provide a better understanding of the movement of water under the transitory conditions that exist in the zone of groundwater/river interaction. The data obtained can be used to refine and calibrate numerical models for groundwater and contaminant transport through this zone.

6.7 Sampling and Analysis Protocol

Groundwater monitoring at the 300 Area process trenches well network is part of the Hanford Groundwater Monitoring Project. Procedures for groundwater sampling, documentation, sample preservation, shipment, and chain-of-custody requirements are described in PNNL or subcontractor procedures manuals (ES-SSPM-001) and quality requirements are provided in the quality assurance plan[3]. Samples generally are collected after three casing volumes of water have been purged from the well or after field parameters (pH, temperature, specific conductance, and turbidity) have stabilized. For routine groundwater samples, preservatives are added to the collection bottles before their use in the field. Samples to be analyzed for metals are usually filtered in the field so that the results represent dissolved metals.

Procedures for field measurements are specified in the subcontractor's or manufacturer's manuals. Analytical methods are specified in contracts with laboratories, and most are standard methods from *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods* (EPA 1986). Alternate procedures meet the guidelines of SW-846, Chapter 10. Analytical methods are described in Gillespie (1999).

6.8 Quality Assurance and Quality Control

The groundwater monitoring project's quality assurance/quality control (QA/QC) program is designed to assess and enhance the reliability and validity of groundwater data. The primary quantitative measures or parameters used to assess data quality are accuracy, precision, completeness, and the method detection limit. Qualitative measures include representativeness and compatibility. Goals for data representativeness for groundwater for groundwater monitoring projects are addressed qualitatively by the

[3] PNNL ETD-012, *Quality Assurance Plan*, Rev. 1. Hanford Groundwater Monitoring Project, Pacific Northwest National Laboratory, Richland, Washington.

specifications of well locations, well construction, sampling intervals, and sampling and analysis techniques in the groundwater monitoring plan for each facility. Comparability is the confidence with which one data set can be compared to another.

The QC parameters are evaluated through laboratory checks (e.g., matrix spikes, laboratory blanks), replicate sampling and analysis, analysis of blind standards and blanks, and interlaboratory comparisons. Acceptance criteria have been established for each of these parameters, based on guidance from EPA (1986). When a parameter is outside the criteria, corrective actions are taken to prevent a future occurrence and affected data are flagged in the database.

7.0 Data Management, Evaluation, and Reporting

This section describes how groundwater data are stored, retrieved, evaluated, and interpreted. Statistical evaluation methods and reporting requirements are also described.

7.1 Data Management

The contract laboratories report analytical results electronically. The results are loaded into the Hanford Environmental Information System (HEIS) database. Field-measured parameters are entered manually or through electronic transfer. Paper data reports and field records are considered to be the record copies and are stored at PNNL.

The data undergo a validation/verification process according to a documented procedure (Procedure QC-5, RCRA Groundwater Data Validation and Verification Process in PNL-MA-567 Manual) cited in the project QA plan[4]. QC data are evaluated against the criteria listed in the project QA plan and data flags are assigned when the data do not meet those criteria. In addition, data are screened by scientists familiar with the local hydrogeology, compared to historical trends or spatial patterns, and flagged if they are not representative. If necessary, the lab may be asked to check calculations or reanalyze the sample, or the well may be resampled.

7.2 Interpretation

After data are validated and verified, the data are used to interpret groundwater conditions at the site. Interpretive techniques include

- Hydrographs – graph water levels versus time to determine decreases, increases, seasonal, or manmade fluctuations in groundwater levels.

- Water-table maps – use water-table elevations from multiple wells to construct contour maps to estimate flow directions. Groundwater flow is assumed to be perpendicular to lines of equal potential.

- Flow meter – results provide highly localized measurements of groundwater flow directions and flow rates at the locations of wells where the tools are used.

- Spider sampler – allows collection of groundwater at discrete intervals within a monitoring well's screened portion thereby helping to characterize the vertical profile of groundwater contamination.

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[4] PNNL ETD-012, *Quality Assurance Plan*, Rev. 1. Hanford Groundwater Monitoring Project, Pacific Northwest National Laboratory, Richland, Washington.

- Trend plots – graph concentrations of chemical or radiological constituents versus time to determine increases, decreases, and fluctuations. May be used in tandem with hydrographs and/or water-table maps to determine if concentrations relate to changes in water level or in groundwater flow directions.

- Plume maps – map distributions of chemical or radiological constituents areally in the aquifer to determine the source and extent of contamination. Changes in plume distribution over time aid in determine of movement of plumes and direction of flow.

- Contaminant ratios – can sometimes be used to distinguish between different sources of contamination.

7.3 Statistical Evaluation

This section describes the statistical evaluation methods, their objectives, and provides agreed upon control limits for the 300 Area process trenches specified in Ecology letter (2001). Some wells (i.e., 399-1-10A and 399-1-10B) and their respective control limits, however, are not provided in the letter to DOE from Ecology[5]. For these wells, control limits are established in this document following Ecology guidance. Statistical evaluations are not performed on some of the proposed network wells at the 300 Area process trenches (i.e., wells 399-1-7, 399-1-8, 399-1-11, 399-1-21A, and 399-1-21B) because of insufficient data (less than the minimum required eight baseline data points). Control limits for the constituents of concern (cis-DCE, TCE, and uranium) for these wells will be established as soon as sufficient baseline data become available.

7.3.1 Objectives of Statistical Evaluation

Concentration limits for the constituents of concern have been, and still are exceeded in some compliance wells at the 300 Area process trenches. Therefore, a plan for a corrective action groundwater monitoring program is required (WAC 173-303-645[2][a][iii]). The objective of the groundwater monitoring program at the trenches during the corrective action period is to demonstrate the effectiveness of the corrective action program (WAC 173-303-645[11][d]). Such a monitoring program must be as effective as the compliance monitoring program in determining compliance with the groundwater protection standards (WAC 173-303-645[11][d]). Accordingly, the objective of the statistical evaluation for the trenches is to monitor the trend of the contaminants of concern to confirm that natural attenuation is occurring as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit. This is best achieved through the use of the combined Shewhart-CUSUM (cumulative sum) control chart approach as depicted in the next section.

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[5] Letter from Dib Goswami (Washington State Department of Ecology, Olympia, Washington) to Marvin Furman (U.S. Department of Energy, Richland, Washington), *Statistical Assessment for the 300 Area Resource Conservation and Recovery Act of 1976 (RCRA) Ground Water Monitoring Plan*, dated May 7, 2001 (see Appendix D).

7.3.2 Rationale for Using Shewhart-CUSUM Control Chart Method

In accordance with WAC 173-303-645(8)(h), acceptable statistical methods include analysis of variance (ANOVA), tolerance intervals, prediction intervals, control charts, test of proportions, or other statistical methods approved by Ecology. The type of monitoring, the nature of the data, the proportions of non-detects, spatial and temporal variations are some of the important factors to be considered in the selection of appropriate statistical methods. One of the alternative statistical tests, allowable under final status regulations WAC 173-303-645(8)(h), is the use of a combined Shewhart-CUSUM control chart approach, first referenced by Westgard et al. (1977) and further developed by Lucas (1982). This method is also discussed in a groundwater context by Starks (1989), Gibbons (1994), and ASTM (1996) and first adopted into EPA guidance in 1989 (EPA 1989, 1992). Statisticians of Washington State University evaluated the efficacy of this method for monitoring groundwater quality on behalf of Ecology (WSU 1999). In their report, the university endorsed the control chart method of monitoring groundwater quality. There are several advantages in applying the control chart procedure:

- This method can be implemented with a single observation at any monitoring event (i.e., this method is efficient).

- This method could be applied to monitoring each well individually and yet maintain desired site-wide false positive and false-negative error rates. That is, this method is effective. The spatial variations that adversely affect the ANOVA procedure do not play a role under the control chart procedure. (Note: Due to the elimination of spatial variability, the uncertainty in measured concentrations is decreased making intra-well comparisons more sensitive to a real release [that is, false negatives] and false positive results [ASTM 1996]).

- The power of the control chart method could be enhanced by the combined Shewhart and CUSUM procedures. It is well known that the Shewhart procedure is sensitive to sudden shifts and the CUSUM procedure is sensitive to gradual changes in the mean concentrations. A combined Shewhart and CUSUM procedure, therefore, is well designed to detect both types of changes.

7.3.3 Shewhart-CUSUM Control Chart Procedures

The combined Shewhart–CUSUM method can be implemented following a baseline of eight or more independent sampling periods for a given well (ASTM 1996). The method assumes that the groundwater baseline data and future observations will be independent and normally distributed. The most important assumption is that the data are independent. The assumption of normality can usually be met by log-transforming the data or by other Box-Cox transformations. The method is more fully discussed in Lucas (1982), Starks (1989), Gibbons (1994), ASTM (1996), and Montgomery (1997).

The method is a sequential testing procedure to test for an upward shift in the mean concentration of a contaminant of concern. The Shewhart portion of the test checks for any sudden upward shift in groundwater quality parameters based on a single observation, while the CUSUM checks for any gradually increasing trend in the groundwater quality parameters. The procedure can be implemented as follows: Let x'_i be a series of independent baseline observations $i = 1, \ldots, b$ ($b = 8$). Let x_i be a series of future monitoring measurements $i = 1, 2, 3 \ldots$.

Then, using the baseline data, the following steps are applied:

1. Determine if the x'_i can be assumed to follow a normal distribution with mean μ and standard deviation σ. If not, transform the x'_i using the appropriate Box-Cox transformation and work with the transformed data.

2. Use the baseline data to compute the estimates $\bar{x}' = \sum_{i=1}^{b} x'_i / b$ for μ and $s' = \sqrt{\sum_{i=1}^{b} (x'_i - \bar{x}')^2 / (b-1)}$ for σ.

3. Determine the upper Shewhart control limit (SCL) for the procedure by calculating $SCL = \bar{x}' + z_s s'$ where z_s is a percentile from the standard normal distribution used to set the false negative and false positive values of the Shewhart control limit. The value of z_s that is most often suggested for groundwater use is 4.5 by Lucas (1982), Starks (1989), EPA (1989), and ASTM (1996). Other values may also be used, depending on the sampling scheme used and whether verification sampling is used to modify the false positive and false negative error rates.

4. Determine the upper CUSUM control limit (CCL), with $CCL = \bar{x}' + z_c s'$. The value of z_c suggested by Lucas (1982), Starks (1988), and EPA (1989) is $z_c = 5$. This value can also be adjusted to reach desired false negative and false positive error rates. In practice setting $z_c = z_s = 4.5$ results in a single limits with no compromise in leak detection capabilities (ASTM 1996).

5. Determine the amount of increased shift in the mean of the water quality parameter of interest to detect an upward trend. This value is referenced as k and is usually measured in σ units of the water quality parameter. Lucas (1982), Starks (1988), and EPA (1989) suggest a value of $k = 1$ if there are less than 12 baseline observations; and a value of $k = 0.75$ if there are 12 or more baseline observations.

Using the monitoring data after the baseline measurements have been established:

6. Compute the CUSUM statistic as $S_i = \max\{0, (x_i - ks') + S_{i-1}s'\}$ as each new monitoring measurement, x_i becomes available, where $i = 1,2,3,\ldots$ and $S_0 = 0$

7. Compute the Shewhart and CUSUM tests as each new monitoring measurement becomes available; a verification sampling will be conducted if either $x_i \geq SCL$ or $S_i \geq CCL$. A well is declared to be out of control only if the verification result also exceeds the SCL or the CCL. If both $x_i < SCL$ and $S_i < CCL$, then continue monitoring.

8. Update the baseline mean and standard deviation periodically (every year or two) to incorporate new data as monitoring continues and the process is shown to be in control. This updating process should continue for the life of the monitoring program.

If resampling is implemented during the monitoring, the analytical result from the resample is substituted into the above formulas for the original value obtained, and the CUSUM statistic is updated. Note in the above combined test that the Shewhart portion of the test will quickly detect extremely large deviations from the baseline period. The CUSUM portion of the combined test is sequential; thus, a small shift in the mean concentration over the baseline period will slowly aggregate in the CUSUM statistic and eventually cause the test to exceed the CUSUM control limit CCL.

7.3.4 Detection Status

In order to arrive at appropriate control limits, the detection history for each constituent of concern at each well must first be evaluated. Historical measurements subsequent to January 1995 were judged to be most relevant for data evaluation purposes because in December 1994 the trenches were administratively isolated and all discharges were terminated and complete physical isolation occurred in January 1995. Detection status of constituents of concern using data obtained from February 1995 through March 2001 is presented in Table 7.1.

7.3.5 Baseline Summary Statistics and Control Limits

The 300 Area process trenches were operated to receive effluent discharges containing dangerous waste from nuclear research and fuel fabrication laboratories in the 300 Area between 1975 and 1994. Uranium was one of the contaminants of concern. In July 1991, the trenches were modified as part of an expedited response action that involved removing bottom sediment from the inflow end of the trench and placing it at the opposite end of the trench behind a berm. In December 1994, the trenches were administratively isolated and all discharges were terminated. Complete physical isolation occurred in January 1995. In addition, the first proposal to change from a compliance monitoring plan to a corrective action plan was initiated in June 1997 when results from the first four independent samples confirmed the exceedance of maximum contaminant levels for cis-DCE, TCE, and uranium (see Section 1.2). The proposed baseline period (from February 1995 to July 1997) and sampling and statistical methods are adopted in Ecology letter[6] except for special conditions noted at the site. These special conditions included

1. Uranium in well 399-1-17A – This is a case where a steady process mean and less variability are noted subsequent to original baseline period, February 1995 – July 1997 (see concentration versus time plot in Appendix B). Use of data obtained from August 1998 – August 2000 as the revised baseline period results in a lower and tighter control limits.

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[6] Letter from Dib Goswami (Washington State Department of Ecology, Olympia, Washington) to Marvin Furman (U.S. Department of Energy, Richland, Washington), *Statistical Assessment for the 300 Area Resource Conservation and Recovery Act of 1976 (RCRA) Ground Water Monitoring Plan*, dated May 7, 2001 (see Appendix D).

Table 7.1. Detection Status of Contaminants of Concern Analyzed for the 300 Area Process Trenches (February 1995 through March 2001)

Contaminant of Concern	Total Number of Observations	Number of Detects	Number of Non-Detects	Detect Frequency[a] (%)	Maximum Detected Value (µg/L)
Well 399-1-16A					
cis-DCE	38	14	24	37	0.7
TCE	38	30	8	79	1
Uranium	39	39	0	100	165
Well 399-1-16B					
cis-DCE	38[b]	38	0	100	190
TCE	39[b]	35	4	90	10
Uranium	37	37	0	100	14.8
Well 399-1-17A					
cis-DCE	42	6	36	14	5
TCE	41	29	12	71	2
Uranium	43	43	0	100	313
Well 399-1-17B					
cis-DCE	38	38	0	100	4.7
TCE	38	1	37	3	0.03
Uranium	38	15	23	39	0.70
Well 399-1-10A					
cis-DCE	38	2	36	5	0.43
TCE	38	5	33	13	0.3
Uranium	39	39	0	100	144
Well 399-1-10B					
cis-DCE	35	1	34	3	0.25
TCE	35	0	35	0	ND
Uranium	33[b]	20	13	61	0.392

(a) Obtained by using the number of detected observations divided by the number of total observations.
(b) Outlier removed.
ND = Not detected.

2. TCE in well 399-1-16B – This is a case where a downward trend is observed subsequent to the original baseline period, February 1995 – June 1997 (see concentration versus time plot in Appendix B). Use of the maximum contaminant level (5 micrograms per liter) as the control limit is more protective of human health and the environment.

Table 7.2 provides respective baseline periods and the summary statistics for the contaminants of concern analyzed from samples from the wells monitoring the 300 Area process trenches where sufficient data exist. The baseline periods originally proposed to Ecology in 1997 were kept intact unless current site conditions warrant a revision (e.g., uranium in wells 399-1-16B and 399-1-10A, cis-DCE in well 399-1-17B).

Table 7.2. Baseline Summary Statistics for Contaminants of Concern Analyzed for the 300 Area Process Trenches

Contaminant	Baseline Period	Baseline Observation	Detected	Non-Detect	Detect %	√ (µg/L)	s (µg/L)
Well 399-1-16A							
cis-DCE	3/29/95 - 6/19/97	9	3	6	33	0.213	0.131
TCE	3/29/95 – 6/19/97	9	9	0	100	0.641	0.242
Uranium	3/29/95 – 6/19/97	9	9	0	100	97.55	38.33
Well 399-1-16B							
cis-DCE	3/29/95 – 6/19/97	9	9	0	100	150.8	24.8
TCE[(a)]	3/29/95 – 6/19/97	9	8	1	89	3.907	2.949
Uranium	8/17/98 –8/01/00[(b)]	16	16	0	100	12.02	1.94
Well 399-1-17A							
cis-DCE	2/21/95 – 6/19/97	14	2	12	14	NC	NC
TCE	2/21/95 – 6/19/97	13	10	3	77	0.346	0.255
Uranium[(a)]	8/17/98 –8/01/00[(b)]	16	16	0	100	112.3	26.40
Well 399-1-17B							
cis-DCE	8/17/98 –8/01/00[(b)]	16	16	0	100	2.888	0.969
TCE	3/27/95 – 7/18/97	10	1	9	10	NC	NC
Uranium	3/27/95 – 7/18/97	10	7	3	70	0.059	0.136
Well 399-1-10A							
cis-DCE	3/27/95 – 6/19/97	9	1	8	11	NC	NC
TCE	3/27/95 – 6/19/97	9	2	7	22	NC	NC
Uranium	8/17/98 – 8/8/00[(b)]	15	15	0	100	53.067	11.858
Well 399-1-10B							
cis-DCE	3/27/95 – 9/9/97	9	0	9	0	NC	NC
TCE	3/27/95 – 9/9/97	9	0	9	0	NC	NC
Uranium	3/27/95 – 12/9/97	8	8	0	100	0.097	0.104

(a) Special conditions adopted by Ecology (Letter from Dib Goswami [Washington State Department of Ecology, Olympia, Washington] to Marvin Furman [U.S. Department of Energy, Richland, Washington], *Statistical Assessment for the 300 Area Resource Conservation and Recovery Act of 1976 (RCRA) Ground Water Monitoring Plan*, dated May 7, 2001 [see Appendix D].)
(b) Revised baseline period (more representative of current site conditions).
NC = Not calculated.

A summary of various control limits for the 300 Area process trenches is presented in Table 7.3. It should be noted that one of the contaminants of concern, uranium, has a natural background resulting from water-rock reaction during evolution of the ambient groundwater. This natural background forms a permanent baseline above which changes due to addition from the regulated unit will be detected. Therefore, when the calculated control limits (SCL and CCL) are less than the natural background for uranium, the control limits should be set at the natural background 12.8 µg/L that is the maximum observed background value for the Hanford Site (see Table ES-1, DOE 1997b). This is consistent with ASTM guidance (1996) in using the nonparametric prediction limit (which is the maximum observed value) as the control limit. For contaminants other than uranium where detection frequency is less than 25% (i.e., cis-DCE in wells 399-1-17A, 399-1-10A, and 399-1-10B and TCE in wells 399-1-17B, 399-1-10A, and 399-1-10B), most recently determined quantitation limit (e.g., Hartman et al. 2001, Table B.20) will be used as control limits.

Special procedures to be used as specified by Ecology[7] are as follows:

1. For wells where the maximum contaminant level has been and still is exceeded, quarterly monitoring will be conducted. One sample will be collected from each well during each sampling event and compared to the agreed upon control limits (see Table 7.3) for each identified constituent of concern (i.e., cis-DCE, TCE, and uranium). If a control limit is exceeded (proof by verification sampling), a notification process will be followed.

2. For wells where the maximum contaminant level has not been exceeded, semiannual monitoring will be conducted. One sample will be collected from each well during each sampling event and compared to the agreed upon control limits (see Table 7.3) for each identified constituent of concern (i.e., cis-DCE, TCE, and uranium). A notification process will be followed after a confirmed exceedance (by verification sampling).

3. Currently, tetrachloroethene (PCE) is not detected in the wells monitoring the 300 Area process trenches. However, it has been detected in the past. PNNL will continue to monitor PCE and report detected results.

The proposed statistical approach shall be in effect for a period of two years. Based on the results of this evaluation period, Ecology will decide whether to continue, modify, or abandon the proposed approach at the 300 Area process trenches.

7.4 Reporting

Chemistry and water-level data are reviewed at least quarterly and are available in HEIS.

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[7] Letter from Dib Goswami (Washington State Department of Ecology, Olympia, Washington) to Marvin Furman (U.S. Department of Energy, Richland, Washington), *Statistical Assessment for the 300 Area Resource Conservation and Recovery Act of 1976 (RCRA) Ground Water Monitoring Plan*, dated May 7, 2001 (see Appendix D).

Table 7.3. Summary of Various Control Limits at the 300 Area Process Trenches

Contaminant of Concern	Shewhart-CUSUM Parameter Value	Control Limit[a] (µg/L)
Well 399-1-16A		
cis-DCE	4.5	0.803
TCE	4.5	1.72
Uranium	4.5	270
Well 399-1-16B		
cis-DCE	4.5	[39, 262][c]
TCE	NA	5[d]
Uranium	4[b]	[4.3, 19.8]
Well 399-1-17A		
cis-DCE	NA	0.81[e]
TCE	4[b]	1.36
Uranium	4[b]	[7, 218]
Well 399-1-17B		
cis-DCE	4[b]	6.77
TCE	NA	0.72[e]
Uranium	NA	12.8[f]
Well 399-1-10A		
cis-DCE	NA	0.81[e]
TCE	NA	0.72[e]
Uranium	4[b]	[6, 101]
Well 399-1-10B		
cis-DCE	NA	0.81[e]
TCE	NA	0.72[e]
Uranium	NA	12.8[f]

(a) Obtained by using applicable Shewhart-CUSUM parameter value times the baseline standard deviation (see Table 7.2) and adding the product to the baseline mean (see Table 7.2).
(b) Use 4 sigma because there are more than 12 data points in the baseline period (ASTM 1996).
(c) Numbers in brackets indicate upper and lower limits.
(d) Use maximum contaminant level MCL (5 µg/L) as the control limit because of the downward trend noted in this well subsequent to the baseline period.
(e) Use most recently determined quantification limit (see Table B.20, Hartman et al. 2001, Appendix B) because analyte detection frequency is less than 25% (ASTM 1996).
(f) Use maximum observed uranium background value (see Table ES-1, DOE 1997b) as the control limit because calculated control limit is less than the natural background level at the Hanford Site.

Semiannual reports on the current status of groundwater under corrective action are supplied to the regulator as required by sites in RCRA final status.

Results and interpretations of groundwater monitoring data will be reported in the annual groundwater monitoring report of the Hanford Site Groundwater Monitoring Project (e.g., Hartman et al. 2001).

When a statistical control limit has been exceeded and verification sampling has confirmed the exceedance, the regulator will be notified of the exceedance by phone and, if follow-up action is required, the phone call and action required will be confirmed by written notification. PNNL will keep a phone log.

8.0 References

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Appendix A

Results of Groundwater Monitoring (1986-2001) at Wells in the Proposed Monitoring Network

Appendix A

Results of Groundwater Monitoring (1986-2001) at Wells in the Proposed Monitoring Network

Table A.1 contains minimum, maximum, and average concentrations of constituents detected at least once in the proposed monitoring network for the 300 Area process trenches. Obvious outliers were assumed to be erroneous and were removed before calculating summary values. Values below detection limits (flagged "U" in HEIS) were changed to zero to prevent historical, high detection limits from skewing ranges and averages.

Table A.1. Minimum, Maximum, and Average Concentrations of Constituents Detected in the 300 Area Process Trenches

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
1,1,1-Trichloroethane	399-1-10A	N	ug/L	0.00	1.40	0.02	63
1,1,1-Trichloroethane	399-1-11	N	ug/L	0.00	5.00	0.09	75
1,1,1-Trichloroethane	399-1-16A	N	ug/L	0.00	2.00	0.03	65
1,1,1-Trichloroethane	399-1-16B	N	ug/L	0.00	2.00	0.04	73
1,1,1-Trichloroethane	399-1-17A	N	ug/L	0.00	9.00	0.09	230
1,1,1-Trichloroethane	399-1-17B	N	ug/L	0.00	2.30	0.04	64
1,1,1-Trichloroethane	399-1-21B	N	ug/L	0.00	2.00	0.33	6
1,1,2,2-Tetrachloroethane	399-1-18B	N	ug/L	0.00	3.00	0.50	6
1,1,2-Trichloro-1,2,2-trifluoroethane	399-1-18A	N	ug/L	7.00	7.00	7.00	1
1,1-Dichloroethane	399-1-16B	N	ug/L	0.00	0.90	0.01	67
1,2-Dichloroethane	399-1-11	N	ug/L	0.00	8.00	0.32	25
1,2-Dichloroethane	399-1-16B	N	ug/L	0.00	0.80	0.01	67
1,2-Dichloroethene(Total)	399-1-16A	N	ug/L	0.00	31.00	3.88	8
1,2-Dichloroethene(Total)	399-1-16B	N	ug/L	88.00	180.00	120.73	11
1,2-Dichloroethene(Total)	399-1-17B	N	ug/L	0.00	9.00	5.02	10
1,4-Dichlorobenzene	399-1-10A	N	ug/L	0.00	0.26	0.01	54
1,4-Dichlorobenzene	399-1-10B	N	ug/L	0.00	0.11	0.00	43
1,4-Dichlorobenzene	399-1-16A	N	ug/L	0.00	0.08	0.00	54
1,4-Dichlorobenzene	399-1-16B	N	ug/L	0.00	1.80	0.05	59
1,4-Dichlorobenzene	399-1-17A	N	ug/L	0.00	0.10	0.00	182
1,4-Dichlorobenzene	399-1-17B	N	ug/L	0.00	0.50	0.01	57
1,4-Dichlorobenzene	399-1-18A	N	ug/L	0.00	0.08	0.00	65
1,4-Dichlorobenzene	399-1-18B	N	ug/L	0.00	0.08	0.00	42
1,4-Dichlorobenzene	399-1-21A	N	ug/L	0.00	0.21	0.03	7
2,4,5-T	399-1-11	N	ug/L	0.00	0.38	0.04	9
2,4,5-TP	399-1-11	N	ug/L	0.00	0.36	0.03	14
2,4-Dichlorophenoxyacetic acid	399-1-11	N	ug/L	0.00	0.91	0.07	14
2,4-Dichlorophenoxyacetic acid	399-1-17A	N	ug/L	0.00	0.68	0.05	14
2,6-Bis(1,1-dimethylethyl)-4-methyl phenol	399-1-8	N	ug/L	3.20	3.20	3.20	1
2-Butanone	399-1-10B	N	ug/L	0.00	0.80	0.02	36
2-Butanone	399-1-16A	N	ug/L	0.00	44.00	1.20	55
2-Butanone	399-1-16B	N	ug/L	0.00	23.00	0.46	55
2-Butanone	399-1-17A	N	ug/L	0.00	11.00	0.05	213
2-Butanone	399-1-17B	N	ug/L	0.00	2.10	0.04	54

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
2-Butanone	399-1-18A	N	ug/L	0.00	45.00	0.69	65
2-Butanone	399-1-18B	N	ug/L	0.00	21.00	0.49	43
2-Butanone	399-1-21A	N	ug/L	0.00	11.00	0.92	12
4-Methyl-2-Pentanone	399-1-10B	N	ug/L	0.00	2.00	0.06	36
4-Methyl-2-Pentanone	399-1-16B	N	ug/L	0.00	0.20	0.00	50
4-Methyl-2-Pentanone	399-1-18B	N	ug/L	0.00	3.00	0.08	39
4-Methyl-2-Pentanone	399-1-8	N	ug/L	0.00	3.00	0.43	7
Acetone	399-1-10A	N	ug/L	0.00	10.00	0.73	45
Acetone	399-1-10B	N	ug/L	0.00	32.00	1.03	36
Acetone	399-1-11	N	ug/L	0.00	6.10	0.32	19
Acetone	399-1-16A	N	ug/L	0.00	12.00	0.65	43
Acetone	399-1-16B	N	ug/L	0.00	9.00	0.67	46
Acetone	399-1-17A	N	ug/L	0.00	84.00	2.44	162
Acetone	399-1-17B	N	ug/L	0.00	9.00	0.66	47
Acetone	399-1-18A	N	ug/L	0.00	18.00	0.63	52
Acetone	399-1-18B	N	ug/L	0.00	250.00	7.50	36
Acetone	399-1-21A	N	ug/L	0.00	10.00	0.83	12
Acetone	399-1-7	N	ug/L	0.00	42.00	4.32	19
Alkalinity	399-1-10A	N	ug/L	67,000.00	130,000.00	104,909.09	11
Alkalinity	399-1-10B	N	ug/L	150,000.00	160,000.00	152,800.00	5
Alkalinity	399-1-11	N	ug/L	120,000.00	130,000.00	123,000.00	10
Alkalinity	399-1-16A	N	ug/L	58,000.00	122,000.00	99,416.67	12
Alkalinity	399-1-16B	N	ug/L	124,000.00	140,000.00	132,615.38	13
Alkalinity	399-1-17A	N	ug/L	0.00	120,000.00	76,866.67	15
Alkalinity	399-1-17B	N	ug/L	160,000.00	190,000.00	174,800.00	10
Alkalinity	399-1-18A	N	ug/L	120,000.00	140,000.00	128,181.82	11
Alkalinity	399-1-21A	N	ug/L	90,000.00	121,000.00	105,500.00	2
Alkalinity	399-1-21B	N	ug/L	148,000.00	151,000.00	149,500.00	2
Alkalinity	399-1-7	N	ug/L	51,000.00	60,000.00	57,000.00	3
Alkalinity	399-1-8	N	ug/L	79,000.00	87,000.00	83,000.00	2
Alpha	399-1-10A	N	pCi/L	8.75	25.00	18.62	3
Alpha	399-1-11	N	pCi/L	10.10	22.60	16.35	2
Alpha	399-1-16A	N	pCi/L	6.93	17.80	12.37	2
Alpha	399-1-16B	N	pCi/L	0.00	1.97	0.99	2
Alpha	399-1-17A	N	pCi/L	64.90	162.00	125.90	6
Alpha	399-1-18A	N	pCi/L	2.62	3.51	3.07	2
Alpha	399-1-7	N	pCi/L	54.30	100.00	69.10	4
Aluminum	399-1-10A	N	ug/L	0.00	31.20	2.68	21

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Aluminum	399-1-10A	Y	ug/L	0.00	55.30	3.50	26
Aluminum	399-1-10B	N	ug/L	0.00	278.00	69.50	4
Aluminum	399-1-10B	Y	ug/L	0.00	32.50	3.25	10
Aluminum	399-1-16A	N	ug/L	0.00	24.00	2.37	20
Aluminum	399-1-16A	Y	ug/L	0.00	26.00	0.87	30
Aluminum	399-1-16B	Y	ug/L	0.00	43.00	2.81	29
Aluminum	399-1-17A	N	ug/L	0.00	169.00	14.41	22
Aluminum	399-1-17A	Y	ug/L	0.00	66.00	4.95	37
Aluminum	399-1-17B	Y	ug/L	0.00	35.90	2.90	23
Aluminum	399-1-18A	N	ug/L	0.00	55.40	6.44	17
Aluminum	399-1-18A	Y	ug/L	0.00	52.60	3.67	22
Aluminum	399-1-18B	Y	ug/L	0.00	25.20	2.56	17
Aluminum	399-1-21A	N	ug/L	0.00	1,600.00	505.00	5
Aluminum	399-1-21A	Y	ug/L	0.00	150.00	25.00	6
Aluminum	399-1-21B	N	ug/L	260.00	997.00	746.00	4
Aluminum	399-1-21B	Y	ug/L	0.00	51.30	16.95	6
Aluminum	399-1-7	N	ug/L	0.00	1,350.00	46.42	31
Aluminum	399-1-7	Y	ug/L	0.00	117.00	7.31	16
Aluminum	399-1-8	N	ug/L	0.00	326.00	13.73	25
Aluminum	399-1-8	Y	ug/L	0.00	18.60	1.09	17
Ammonia	399-1-10A	N	ug/L	0.00	130.00	47.50	4
Ammonia	399-1-10B	N	ug/L	50.00	160.00	95.00	4
Ammonia	399-1-16A	N	ug/L	0.00	60.00	30.00	2
Ammonia	399-1-16B	N	ug/L	0.00	110.00	55.00	2
Ammonia	399-1-17A	N	ug/L	0.00	70.00	23.33	3
Ammonia	399-1-17B	N	ug/L	80.00	80.00	80.00	2
Ammonia	399-1-18A	N	ug/L	50.00	200.00	125.00	2
Ammonia	399-1-18B	N	ug/L	70.00	180.00	102.50	4
Ammonia	399-1-21A	N	ug/L	0.00	70.00	23.33	3
Ammonia	399-1-21B	N	ug/L	60.00	100.00	76.67	3
Ammonia	399-1-7	N	ug/L	0.00	50.00	16.67	3
Ammonia	399-1-8	N	ug/L	0.00	90.00	47.50	4
Ammonium ion	399-1-10A	N	ug/L	0.00	73.00	15.88	8
Ammonium ion	399-1-11	N	ug/L	0.00	70.00	17.00	8
Ammonium ion	399-1-16B	N	ug/L	71.00	125.00	96.00	7
Ammonium ion	399-1-17B	N	ug/L	0.00	125.00	89.71	7
Ammonium ion	399-1-18A	N	ug/L	0.00	63.00	7.88	8
Ammonium ion	399-1-18B	N	ug/L	0.00	129.00	92.86	7

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Ammonium ion	399-1-7	N	ug/L	0.00	67.00	6.55	20
Ammonium ion	399-1-8	N	ug/L	0.00	102.00	26.35	19
Antimony	399-1-17B	N	ug/L	0.00	37.00	2.18	17
Antimony	399-1-18A	Y	ug/L	0.00	24.10	1.27	19
Antimony	399-1-21A	Y	ug/L	0.00	41.00	6.83	6
Antimony	399-1-8	Y	ug/L	0.00	15.10	3.02	5
Antimony-125	399-1-17A	N	pCi/L	0.00	19.50	2.50	102
Arsenic	399-1-10A	N	ug/L	0.00	4.80	0.18	37
Arsenic	399-1-10A	Y	ug/L	0.00	3.50	0.51	11
Arsenic	399-1-11	N	ug/L	0.00	3.70	0.28	31
Arsenic	399-1-11	Y	ug/L	0.00	4.10	1.53	10
Arsenic	399-1-16A	N	ug/L	0.00	3.10	0.09	33
Arsenic	399-1-16A	Y	ug/L	0.00	3.10	0.71	11
Arsenic	399-1-16B	N	ug/L	0.00	2.40	0.14	32
Arsenic	399-1-16B	Y	ug/L	0.00	2.00	0.17	12
Arsenic	399-1-17A	N	ug/L	0.00	2.30	0.13	36
Arsenic	399-1-17A	Y	ug/L	0.00	2.40	0.20	12
Arsenic	399-1-17B	N	ug/L	0.00	0.00	0.00	32
Arsenic	399-1-17B	Y	ug/L	0.00	0.00	0.00	12
Arsenic	399-1-18A	N	ug/L	0.00	10.70	4.46	34
Arsenic	399-1-18A	Y	ug/L	0.00	7.40	5.57	12
Arsenic	399-1-18B	N	ug/L	0.00	1.90	0.09	22
Arsenic	399-1-21A	N	ug/L	0.00	2.80	0.93	3
Arsenic	399-1-7	N	ug/L	0.00	8.50	0.18	46
Arsenic	399-1-7	Y	ug/L	0.00	2.30	0.46	5
Barium	399-1-10A	N	ug/L	21.00	60.00	40.81	26
Barium	399-1-10A	Y	ug/L	17.90	67.30	39.00	29
Barium	399-1-10B	N	ug/L	34.90	48.30	41.08	4
Barium	399-1-10B	Y	ug/L	35.50	58.80	44.88	12
Barium	399-1-11	N	ug/L	11.00	45.00	27.59	20
Barium	399-1-11	Y	ug/L	11.00	45.00	26.08	29
Barium	399-1-16A	N	ug/L	23.00	62.00	37.53	25
Barium	399-1-16A	Y	ug/L	22.00	68.90	40.31	33
Barium	399-1-16B	N	ug/L	44.00	56.00	49.25	26
Barium	399-1-16B	Y	ug/L	42.00	165.00	52.79	33
Barium	399-1-17A	N	ug/L	0.00	45.20	19.63	26
Barium	399-1-17A	Y	ug/L	0.00	52.60	26.61	39
Barium	399-1-17B	N	ug/L	62.00	70.00	65.24	23

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Barium	399-1-17B	Y	ug/L	56.00	80.00	64.72	27
Barium	399-1-18A	N	ug/L	39.00	56.00	46.41	24
Barium	399-1-18A	Y	ug/L	43.00	64.50	47.55	26
Barium	399-1-18B	N	ug/L	35.00	48.00	39.38	13
Barium	399-1-18B	Y	ug/L	36.00	50.00	40.08	17
Barium	399-1-21A	N	ug/L	34.70	49.00	42.28	5
Barium	399-1-21A	Y	ug/L	33.70	47.50	39.80	6
Barium	399-1-21B	N	ug/L	47.50	59.00	52.53	4
Barium	399-1-21B	Y	ug/L	29.90	52.00	45.80	6
Barium	399-1-7	N	ug/L	0.00	59.60	23.27	35
Barium	399-1-7	Y	ug/L	0.00	30.00	20.20	18
Barium	399-1-8	N	ug/L	27.00	43.40	32.35	25
Barium	399-1-8	Y	ug/L	26.00	43.80	32.45	17
Benzene	399-1-10A	N	ug/L	0.00	0.03	0.00	55
Benzene	399-1-11	N	ug/L	0.00	0.04	0.00	25
Benzene	399-1-16B	N	ug/L	0.00	0.06	0.00	67
Benzene	399-1-17A	N	ug/L	0.00	1.50	0.01	180
Benzene	399-1-17B	N	ug/L	0.00	0.06	0.00	58
Benzene	399-1-7	N	ug/L	0.00	5.00	0.22	23
Beryllium	399-1-10A	Y	ug/L	0.00	1.10	0.14	22
Beryllium	399-1-10B	Y	ug/L	0.00	0.50	0.04	12
Beryllium	399-1-16A	Y	ug/L	0.00	1.40	0.07	27
Beryllium	399-1-16B	Y	ug/L	0.00	1.20	0.09	27
Beryllium	399-1-17A	N	ug/L	0.00	1.00	0.08	19
Beryllium	399-1-17A	Y	ug/L	0.00	1.30	0.08	24
Beryllium	399-1-17B	N	ug/L	0.00	0.00	0.00	17
Beryllium	399-1-17B	Y	ug/L	0.00	1.20	0.06	21
Beryllium	399-1-18A	N	ug/L	0.00	5.00	0.31	16
Beryllium	399-1-18A	Y	ug/L	0.00	1.60	0.12	19
Beryllium	399-1-18B	Y	ug/L	0.00	0.68	0.06	11
Beryllium	399-1-21B	Y	ug/L	0.00	1.20	0.20	6
Beryllium	399-1-7	Y	ug/L	0.00	8.00	0.62	13
Beryllium-7	399-1-17A	N	pCi/L	0.00	29.00	3.20	19
Bis(2-ethylhexyl) phthalate	399-1-10A	N	ug/L	0.00	9.00	2.25	4
Bis(2-ethylhexyl) phthalate	399-1-10B	N	ug/L	0.00	9.00	5.00	3
Bis(2-ethylhexyl) phthalate	399-1-16A	N	ug/L	0.00	9.00	1.80	5
Bis(2-ethylhexyl) phthalate	399-1-17A	N	ug/L	0.00	9.00	1.80	5
Bis(2-ethylhexyl) phthalate	399-1-17B	N	ug/L	0.00	9.00	1.80	5

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Bis(2-ethylhexyl) phthalate	399-1-18A	N	ug/L	0.00	9.00	2.25	4
Bis(2-ethylhexyl) phthalate	399-1-18B	N	ug/L	0.00	9.00	3.00	3
Boron	399-1-10A	N	ug/L	0.00	24.00	12.00	2
Boron	399-1-10A	Y	ug/L	11.00	24.00	17.50	2
Boron	399-1-11	N	ug/L	11.00	14.00	12.50	2
Boron	399-1-11	Y	ug/L	13.00	14.00	13.50	2
Boron	399-1-16A	N	ug/L	12.00	15.00	13.75	4
Boron	399-1-16A	Y	ug/L	0.00	17.00	11.50	4
Boron	399-1-16B	N	ug/L	40.00	51.00	43.25	4
Boron	399-1-16B	Y	ug/L	36.00	47.00	42.00	4
Boron	399-1-17A	N	ug/L	11.00	20.00	15.50	2
Boron	399-1-17A	Y	ug/L	14.00	26.00	20.00	2
Boron	399-1-17B	N	ug/L	36.00	41.00	38.50	2
Boron	399-1-17B	Y	ug/L	42.00	42.00	42.00	2
Boron	399-1-18A	N	ug/L	25.00	50.00	37.67	3
Boron	399-1-18A	Y	ug/L	23.00	26.00	24.50	2
Boron	399-1-18B	N	ug/L	77.00	77.00	77.00	1
Boron	399-1-18B	Y	ug/L	59.00	59.00	59.00	1
Boron	399-1-7	N	ug/L	12.00	19.00	15.50	4
Boron	399-1-7	Y	ug/L	0.00	74.00	26.50	4
Bromide	399-1-10A	N	ug/L	0.00	60.00	10.00	6
Bromide	399-1-10B	N	ug/L	0.00	30.00	7.50	4
Bromide	399-1-16A	N	ug/L	0.00	100.00	14.29	7
Bromide	399-1-16B	N	ug/L	0.00	40.00	5.71	7
Bromide	399-1-17A	N	ug/L	0.00	190.00	3.93	148
Bromide	399-1-17B	N	ug/L	0.00	80.00	20.00	4
Bromide	399-1-18A	N	ug/L	0.00	110.00	15.26	19
Bromide	399-1-21A	N	ug/L	0.00	155.00	101.25	4
Bromide	399-1-21B	N	ug/L	0.00	140.00	46.67	3
Bromide	399-1-7	N	ug/L	0.00	100.00	14.29	7
Bromide	399-1-8	N	ug/L	0.00	70.00	35.00	2
Cadmium	399-1-10A	N	ug/L	0.00	0.98	0.04	26
Cadmium	399-1-10A	Y	ug/L	0.00	1.00	0.03	29
Cadmium	399-1-11	N	ug/L	0.00	2.60	0.13	20
Cadmium	399-1-11	Y	ug/L	0.00	1.90	0.07	29
Cadmium	399-1-16A	N	ug/L	0.00	3.00	0.17	25
Cadmium	399-1-16A	Y	ug/L	0.00	2.90	0.24	33
Cadmium	399-1-16B	Y	ug/L	0.00	2.00	0.12	33

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Cadmium	399-1-17A	Y	ug/L	0.00	2.00	0.12	39
Cadmium	399-1-17B	N	ug/L	0.00	1.40	0.10	23
Cadmium	399-1-17B	Y	ug/L	0.00	3.40	0.38	27
Cadmium	399-1-18A	N	ug/L	0.00	1.60	0.07	24
Cadmium	399-1-18A	Y	ug/L	0.00	1.50	0.06	26
Cadmium	399-1-18B	Y	ug/L	0.00	3.00	0.29	17
Cadmium	399-1-21B	Y	ug/L	0.00	2.20	0.37	6
Cadmium	399-1-7	N	ug/L	0.00	2.00	0.11	35
Cadmium	399-1-8	N	ug/L	0.00	4.00	0.16	25
Calcium	399-1-10A	N	ug/L	14,900.00	52,400.00	35,661.54	26
Calcium	399-1-10A	Y	ug/L	15,200.00	55,500.00	33,855.17	29
Calcium	399-1-10B	N	ug/L	13,100.00	14,900.00	14,075.00	4
Calcium	399-1-10B	Y	ug/L	13,800.00	16,000.00	14,625.00	12
Calcium	399-1-11	N	ug/L	15,600.00	51,000.00	33,445.00	20
Calcium	399-1-11	Y	ug/L	15,700.00	50,000.00	28,679.31	29
Calcium	399-1-16A	N	ug/L	15,800.00	52,000.00	30,064.00	25
Calcium	399-1-16A	Y	ug/L	16,700.00	54,700.00	32,206.06	33
Calcium	399-1-16B	N	ug/L	16,000.00	21,000.00	17,823.08	26
Calcium	399-1-16B	Y	ug/L	14,000.00	21,500.00	17,787.88	33
Calcium	399-1-17A	N	ug/L	14,100.00	47,300.00	23,315.38	26
Calcium	399-1-17A	Y	ug/L	14,700.00	53,500.00	27,517.95	39
Calcium	399-1-17B	N	ug/L	14,500.00	21,600.00	18,760.87	23
Calcium	399-1-17B	Y	ug/L	16,000.00	21,400.00	18,577.78	27
Calcium	399-1-18A	N	ug/L	36,900.00	57,200.00	45,187.50	24
Calcium	399-1-18A	Y	ug/L	37,500.00	50,500.00	45,380.77	26
Calcium	399-1-18B	N	ug/L	11,100.00	13,700.00	12,153.85	13
Calcium	399-1-18B	Y	ug/L	10,100.00	14,400.00	12,517.65	17
Calcium	399-1-21A	N	ug/L	34,700.00	45,200.00	38,940.00	5
Calcium	399-1-21A	Y	ug/L	36,500.00	49,200.00	40,733.33	6
Calcium	399-1-21B	N	ug/L	15,600.00	17,000.00	16,275.00	4
Calcium	399-1-21B	Y	ug/L	15,700.00	17,000.00	16,250.00	6
Calcium	399-1-7	N	ug/L	16,200.00	46,500.00	24,828.57	28
Calcium	399-1-7	Y	ug/L	15,600.00	32,700.00	24,027.78	18
Calcium	399-1-8	N	ug/L	14,400.00	30,300.00	20,827.78	18
Calcium	399-1-8	Y	ug/L	15,700.00	31,300.00	20,976.47	17
Carbon disulfide	399-1-10A	N	ug/L	0.00	0.84	0.04	38
Carbon disulfide	399-1-10B	N	ug/L	0.00	0.52	0.01	35
Carbon disulfide	399-1-18A	N	ug/L	0.00	1.00	0.03	35

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Carbon disulfide	399-1-18B	N	ug/L	0.00	18.00	0.50	36
Carbon tetrachloride	399-1-10A	N	ug/L	0.00	0.05	0.00	63
Carbon tetrachloride	399-1-16A	N	ug/L	0.00	0.60	0.01	65
Carbon tetrachloride	399-1-16B	N	ug/L	0.00	0.90	0.01	73
Carbon tetrachloride	399-1-17A	N	ug/L	0.00	3.10	0.01	230
Carbon tetrachloride	399-1-18A	N	ug/L	0.00	6.00	0.08	76
Carbon tetrachloride	399-1-21A	N	ug/L	0.00	0.90	0.06	15
Cesium-134	399-1-17A	N	pCi/L	0.00	2.00	0.33	23
Cesium-137	399-1-17A	N	pCi/L	0.00	10.50	0.98	109
Chemical Oxygen Demand	399-1-10A	N	ug/L	0.00	9,300.00	4,650.00	2
Chemical Oxygen Demand	399-1-10B	N	ug/L	0.00	53,000.00	17,666.67	3
Chemical Oxygen Demand	399-1-21B	N	ug/L	0.00	32,000.00	16,000.00	2
Chloride	399-1-10A	N	ug/L	3,610.00	19,500.00	11,082.86	21
Chloride	399-1-10B	N	ug/L	7,300.00	7,700.00	7,503.33	6
Chloride	399-1-11	N	ug/L	3,320.00	81,800.00	15,164.50	60
Chloride	399-1-16A	N	ug/L	10,700.00	27,700.00	17,137.50	24
Chloride	399-1-16B	N	ug/L	9,590.00	12,700.00	11,238.33	18
Chloride	399-1-17A	N	ug/L	1,200.00	150,000.00	26,206.23	207
Chloride	399-1-17B	N	ug/L	8,600.00	11,500.00	9,865.83	12
Chloride	399-1-18A	N	ug/L	14,100.00	23,700.00	17,636.84	38
Chloride	399-1-18B	N	ug/L	9,900.00	14,600.00	11,311.11	9
Chloride	399-1-21A	N	ug/L	15,000.00	24,400.00	20,022.22	9
Chloride	399-1-21B	N	ug/L	5,300.00	5,800.00	5,575.00	4
Chloride	399-1-7	N	ug/L	9,150.00	57,400.00	23,915.00	30
Chloride	399-1-8	N	ug/L	9,290.00	76,000.00	21,253.33	24
Chloroform	399-1-10A	N	ug/L	0.00	24.00	3.58	63
Chloroform	399-1-11	N	ug/L	0.00	37.00	14.21	75
Chloroform	399-1-16A	N	ug/L	0.00	24.00	4.72	64
Chloroform	399-1-16B	N	ug/L	0.00	6.20	0.26	73
Chloroform	399-1-17A	N	ug/L	0.00	36.00	11.45	230
Chloroform	399-1-18A	N	ug/L	0.00	5.00	0.07	76
Chloroform	399-1-18B	N	ug/L	0.00	4.00	0.08	48
Chloroform	399-1-21A	N	ug/L	0.00	9.00	2.28	15
Chloroform	399-1-7	N	ug/L	0.00	24.00	13.32	37
Chloroform	399-1-7	Y	ug/L	1.00	1.00	1.00	1
Chloroform	399-1-8	N	ug/L	0.00	16.00	4.28	24
Chromium	399-1-10A	N	ug/L	0.00	89.00	12.62	26
Chromium	399-1-10A	Y	ug/L	0.00	19.00	1.16	29

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Chromium	399-1-10B	N	ug/L	0.00	85.20	37.48	4
Chromium	399-1-11	N	ug/L	0.00	48.00	8.18	20
Chromium	399-1-11	Y	ug/L	0.00	21.00	1.23	29
Chromium	399-1-16A	N	ug/L	0.00	147.00	14.05	25
Chromium	399-1-16A	Y	ug/L	0.00	7.60	0.95	33
Chromium	399-1-16B	N	ug/L	0.00	88.30	17.12	26
Chromium	399-1-16B	Y	ug/L	0.00	3.50	0.11	33
Chromium	399-1-17A	N	ug/L	0.00	140.00	14.70	26
Chromium	399-1-17A	Y	ug/L	0.00	5.60	0.71	39
Chromium	399-1-17B	N	ug/L	0.00	76.00	13.80	23
Chromium	399-1-18A	N	ug/L	0.00	120.00	17.48	24
Chromium	399-1-18A	Y	ug/L	0.00	19.00	1.80	26
Chromium	399-1-18B	N	ug/L	0.00	52.00	18.09	13
Chromium	399-1-18B	Y	ug/L	0.00	16.00	0.94	17
Chromium	399-1-21A	N	ug/L	0.00	60.00	21.18	5
Chromium	399-1-21B	N	ug/L	17.10	150.00	70.40	4
Chromium	399-1-7	N	ug/L	0.00	219.00	13.12	35
Chromium	399-1-7	Y	ug/L	0.00	6.30	0.69	18
Chromium	399-1-8	N	ug/L	0.00	71.70	6.07	25
Chromium	399-1-8	Y	ug/L	0.00	3.20	0.36	17
cis-1,2-Dichloroethylene	399-1-10A	N	ug/L	0.00	0.43	0.01	41
cis-1,2-Dichloroethylene	399-1-10B	N	ug/L	0.00	0.25	0.01	41
cis-1,2-Dichloroethylene	399-1-16A	N	ug/L	0.00	0.70	0.13	40
cis-1,2-Dichloroethylene	399-1-16B	N	ug/L	0.00	190.00	140.86	49
cis-1,2-Dichloroethylene	399-1-17A	N	ug/L	0.00	5.00	0.14	48
cis-1,2-Dichloroethylene	399-1-17B	N	ug/L	0.51	4.70	2.35	42
cis-1,2-Dichloroethylene	399-1-8	N	ug/L	0.20	0.30	0.25	2
Cobalt	399-1-17A	Y	ug/L	0.00	5.80	0.28	21
Cobalt	399-1-17B	N	ug/L	0.00	7.60	0.51	15
Cobalt	399-1-21A	N	ug/L	0.00	1.40	0.28	5
Cobalt	399-1-21B	Y	ug/L	0.00	8.70	1.45	6
Cobalt	399-1-7	N	ug/L	0.00	5.40	0.45	12
Cobalt	399-1-8	Y	ug/L	0.00	1.60	0.40	4
Cobalt-60	399-1-17A	N	pCi/L	0.00	12.40	1.49	109
Cobalt-60	399-1-17B	N	pCi/L	0.00	6.42	1.28	5
Coliform (Membrane Filter Technique)	399-1-11	N	ug/L	0.00	4.00	2.00	2
Coliform Bacteria	399-1-11	N	MPN	0.00	5.10	0.51	10
Coliform Bacteria	399-1-16A	N	Col/10	0.00	3.00	0.33	9

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
			0mL				
Coliform Bacteria	399-1-16B	N	Col/10 0mL	0.00	1.00	0.11	9
Coliform Bacteria	399-1-17A	N	Col/10 0mL	0.00	1.00	0.11	9
Coliform Bacteria	399-1-18B	N	MPN	0.00	2.20	0.24	9
Copper	399-1-10A	N	ug/L	0.00	19.00	2.21	26
Copper	399-1-10A	Y	ug/L	0.00	29.10	3.76	29
Copper	399-1-10B	Y	ug/L	0.00	10.80	2.02	12
Copper	399-1-11	N	ug/L	0.00	31.00	9.25	20
Copper	399-1-11	Y	ug/L	0.00	31.00	11.30	29
Copper	399-1-16A	N	ug/L	0.00	21.00	5.55	25
Copper	399-1-16A	Y	ug/L	0.00	16.00	5.05	33
Copper	399-1-16B	N	ug/L	0.00	3.80	0.15	26
Copper	399-1-16B	Y	ug/L	0.00	7.80	0.24	33
Copper	399-1-17A	N	ug/L	0.00	32.00	10.60	26
Copper	399-1-17A	Y	ug/L	0.00	33.00	8.74	39
Copper	399-1-17B	Y	ug/L	0.00	2.90	0.11	27
Copper	399-1-18A	N	ug/L	0.00	5.30	0.37	24
Copper	399-1-18A	Y	ug/L	0.00	14.50	0.65	26
Copper	399-1-21A	N	ug/L	0.00	7.20	2.42	5
Copper	399-1-21A	Y	ug/L	0.00	6.90	1.15	6
Copper	399-1-21B	N	ug/L	0.00	8.60	3.05	4
Copper	399-1-7	N	ug/L	0.00	72.00	15.63	35
Copper	399-1-7	Y	ug/L	0.00	24.00	3.94	18
Copper	399-1-8	N	ug/L	0.00	42.00	8.57	25
Copper	399-1-8	Y	ug/L	0.00	11.00	1.82	17
Cyanide	399-1-21B	N	ug/L	21.10	21.10	21.10	1
Delta-BHC	399-1-10B	N	ug/L	0.00	0.05	0.01	4
Delta-BHC	399-1-16A	N	ug/L	0.00	0.01	0.00	17
Delta-BHC	399-1-16B	N	ug/L	0.00	0.05	0.00	18
Delta-BHC	399-1-18B	N	ug/L	0.00	0.05	0.00	11
Endosulfan sulfate	399-1-17B	N	ug/L	0.00	0.01	0.00	10
Endosulfan sulfate	399-1-18A	N	ug/L	0.00	0.05	0.00	10
Ethylbenzene	399-1-16B	N	ug/L	0.00	0.08	0.01	26
Ethylbenzene	399-1-21A	N	ug/L	0.00	0.06	0.01	10
Ethylbenzene	399-1-21B	N	ug/L	0.00	0.05	0.01	6
Europium-154	399-1-17A	N	pCi/L	0.00	11.20	1.50	22
Europium-155	399-1-17A	N	pCi/L	0.00	11.80	1.99	21

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Fluoride	399-1-10A	N	ug/L	0.00	700.00	233.45	22
Fluoride	399-1-10B	N	ug/L	1,000.00	1,400.00	1,233.33	6
Fluoride	399-1-11	N	ug/L	0.00	600.00	27.26	61
Fluoride	399-1-16A	N	ug/L	0.00	700.00	185.96	25
Fluoride	399-1-16B	N	ug/L	901.00	1,610.00	1,223.74	19
Fluoride	399-1-17A	N	ug/L	0.00	770.00	156.71	208
Fluoride	399-1-17B	N	ug/L	748.00	1,500.00	1,009.92	13
Fluoride	399-1-18A	N	ug/L	0.00	1,120.00	159.15	39
Fluoride	399-1-18B	N	ug/L	1,140.00	2,000.00	1,491.82	11
Fluoride	399-1-21A	N	ug/L	300.00	700.00	438.33	9
Fluoride	399-1-21B	N	ug/L	800.00	1,100.00	950.00	4
Fluoride	399-1-7	N	ug/L	0.00	602.00	176.35	31
Fluoride	399-1-8	N	ug/L	0.00	900.00	358.13	24
Gross alpha	399-1-10A	N	pCi/L	6.70	112.00	39.05	23
Gross alpha	399-1-11	N	pCi/L	5.53	156.00	45.21	20
Gross alpha	399-1-11	Y	pCi/L	80.00	80.00	80.00	1
Gross alpha	399-1-16A	N	pCi/L	6.82	126.00	43.43	25
Gross alpha	399-1-16B	N	pCi/L	0.00	7.37	2.03	23
Gross alpha	399-1-17A	N	pCi/L	1.75	200.00	67.18	54
Gross alpha	399-1-17B	N	pCi/L	0.00	2.24	0.20	22
Gross alpha	399-1-18A	N	pCi/L	0.00	5.49	2.95	22
Gross alpha	399-1-21A	N	pCi/L	12.00	34.00	20.30	5
Gross alpha	399-1-7	N	pCi/L	12.60	111.00	40.25	29
Gross alpha	399-1-8	N	pCi/L	5.42	93.00	23.23	25
Gross beta	399-1-10A	N	pCi/L	4.22	72.60	19.07	26
Gross beta	399-1-10B	N	pCi/L	2.62	5.90	3.70	4
Gross beta	399-1-11	N	pCi/L	4.17	51.80	16.62	22
Gross beta	399-1-11	Y	pCi/L	63.00	63.00	63.00	1
Gross beta	399-1-16A	N	pCi/L	5.21	88.00	20.84	27
Gross beta	399-1-16B	N	pCi/L	4.43	10.80	6.68	25
Gross beta	399-1-17A	N	pCi/L	1.18	113.00	31.85	61
Gross beta	399-1-17B	N	pCi/L	0.00	11.10	6.40	25
Gross beta	399-1-18A	N	pCi/L	5.10	22.40	10.36	24
Gross beta	399-1-18B	N	pCi/L	3.20	13.90	8.08	12
Gross beta	399-1-21A	N	pCi/L	11.00	27.00	18.02	5
Gross beta	399-1-21B	N	pCi/L	3.80	8.44	5.41	3
Gross beta	399-1-7	N	pCi/L	12.60	53.00	27.70	33
Gross beta	399-1-8	N	pCi/L	10.40	41.00	21.53	25

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Hardness	399-1-10B	N	mg/L	56.00	58.00	57.00	3
Hardness	399-1-21A	N	mg/L	113.00	163.00	138.00	2
Hardness	399-1-21B	N	mg/L	60.00	61.00	60.50	2
Hardness	399-1-8	N	mg/L	74.00	82.00	77.00	3
Hexane	399-1-16A	N	ug/L	14.00	14.00	14.00	1
Hexane	399-1-16B	N	ug/L	15.00	15.00	15.00	1
Hexane	399-1-17A	N	ug/L	14.00	14.00	14.00	1
Iodine-129	399-1-17A	N	pCi/L	0.00	0.26	0.05	6
Iodine-129	399-1-18A	N	pCi/L	0.43	0.43	0.43	1
Iron	399-1-10A	N	ug/L	0.00	392.00	73.09	234
Iron	399-1-10A	Y	ug/L	0.00	75.00	18.44	261
Iron	399-1-10B	N	ug/L	259.00	550.00	375.75	36
Iron	399-1-10B	Y	ug/L	85.90	740.00	305.91	108
Iron	399-1-11	N	ug/L	0.00	220.00	66.40	180
Iron	399-1-11	Y	ug/L	0.00	85.60	10.64	261
Iron	399-1-16A	N	ug/L	0.00	622.00	91.15	225
Iron	399-1-16A	Y	ug/L	0.00	79.70	17.03	297
Iron	399-1-16B	N	ug/L	90.00	577.00	175.85	234
Iron	399-1-16B	Y	ug/L	0.00	130.00	85.46	297
Iron	399-1-17A	N	ug/L	0.00	620.00	111.49	234
Iron	399-1-17A	Y	ug/L	0.00	167.00	16.12	351
Iron	399-1-17B	N	ug/L	152.00	730.00	377.83	207
Iron	399-1-17B	Y	ug/L	115.00	504.00	309.59	243
Iron	399-1-18A	N	ug/L	0.00	570.00	139.63	216
Iron	399-1-18A	Y	ug/L	0.00	96.70	16.62	234
Iron	399-1-18B	N	ug/L	175.00	617.00	289.69	117
Iron	399-1-18B	Y	ug/L	135.00	482.00	233.71	153
Iron	399-1-21A	N	ug/L	0.00	2,200.00	772.96	45
Iron	399-1-21A	Y	ug/L	0.00	38.00	13.93	54
Iron	399-1-21B	N	ug/L	631.00	2,400.00	1,752.75	36
Iron	399-1-21B	Y	ug/L	0.00	370.00	134.02	54
Iron	399-1-7	N	ug/L	0.00	2,500.00	163.97	315
Iron	399-1-7	Y	ug/L	0.00	105.00	26.05	162
Iron	399-1-8	N	ug/L	0.00	336.00	56.88	225
Iron	399-1-8	Y	ug/L	0.00	86.00	17.94	153
Lead	399-1-10A	N	ug/L	0.00	6.60	0.33	429
Lead	399-1-10A	Y	ug/L	0.00	3.10	0.66	121
Lead	399-1-10B	N	ug/L	0.00	2.90	1.50	44

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Lead	399-1-10B	Y	ug/L	0.00	3.00	1.28	44
Lead	399-1-11	N	ug/L	0.00	3.20	0.27	341
Lead	399-1-11	Y	ug/L	0.00	1.90	0.19	110
Lead	399-1-16A	N	ug/L	0.00	6.00	0.39	363
Lead	399-1-16A	Y	ug/L	0.00	2.20	0.32	110
Lead	399-1-16B	N	ug/L	0.00	5.20	0.34	352
Lead	399-1-16B	Y	ug/L	0.00	5.20	0.77	132
Lead	399-1-17A	N	ug/L	0.00	5.90	0.26	396
Lead	399-1-17A	Y	ug/L	0.00	4.10	0.79	132
Lead	399-1-17B	N	ug/L	0.00	3.50	0.33	352
Lead	399-1-17B	Y	ug/L	0.00	1.80	0.32	132
Lead	399-1-18A	N	ug/L	0.00	10.00	0.77	385
Lead	399-1-18A	Y	ug/L	0.00	1.70	0.14	132
Lead	399-1-18B	N	ug/L	0.00	3.20	0.25	242
Lead	399-1-18B	Y	ug/L	0.00	2.60	0.65	44
Lead	399-1-21A	N	ug/L	0.00	2.20	1.43	33
Lead	399-1-21B	N	ug/L	0.00	2.90	1.77	33
Lead	399-1-21B	Y	ug/L	0.00	3.10	1.40	33
Lead	399-1-7	N	ug/L	0.00	5.70	0.38	506
Lead	399-1-7	Y	ug/L	0.00	5.70	1.96	55
Lead	399-1-8	N	ug/L	0.00	5.60	0.44	418
Lead	399-1-8	Y	ug/L	0.00	2.10	1.03	44
Lithium	399-1-11	Y	ug/L	0.00	10.00	5.00	2
Lithium	399-1-16B	N	ug/L	0.00	12.00	5.75	4
Lithium	399-1-16B	Y	ug/L	11.00	11.00	11.00	4
Lithium	399-1-17A	N	ug/L	15.00	19.00	17.00	2
Lithium	399-1-17A	Y	ug/L	15.00	20.00	17.50	2
Lithium	399-1-17B	N	ug/L	12.00	13.00	12.50	2
Lithium	399-1-17B	Y	ug/L	0.00	13.00	6.50	2
Lithium	399-1-18B	N	ug/L	18.00	18.00	18.00	1
Lithium	399-1-18B	Y	ug/L	18.00	18.00	18.00	1
Lithium	399-1-7	N	ug/L	14.00	14.00	14.00	4
Lithium	399-1-7	Y	ug/L	12.00	14.00	13.25	4
Magnesium	399-1-10A	N	ug/L	3,630.00	11,000.00	7,390.77	104
Magnesium	399-1-10A	Y	ug/L	3,490.00	12,400.00	7,195.17	116
Magnesium	399-1-10B	N	ug/L	5,270.00	5,780.00	5,570.00	16
Magnesium	399-1-10B	Y	ug/L	5,460.00	6,310.00	5,853.33	48
Magnesium	399-1-11	N	ug/L	3,550.00	11,000.00	7,422.50	80

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Magnesium	399-1-11	Y	ug/L	3,520.00	11,000.00	6,472.07	116
Magnesium	399-1-16A	N	ug/L	3,380.00	9,600.00	5,661.20	100
Magnesium	399-1-16A	Y	ug/L	3,310.00	11,200.00	6,223.94	132
Magnesium	399-1-16B	N	ug/L	5,400.00	7,010.00	5,995.77	104
Magnesium	399-1-16B	Y	ug/L	4,900.00	6,990.00	5,988.48	132
Magnesium	399-1-17A	N	ug/L	3,110.00	11,000.00	5,081.92	104
Magnesium	399-1-17A	Y	ug/L	3,090.00	11,900.00	5,983.85	156
Magnesium	399-1-17B	N	ug/L	6,250.00	7,830.00	6,749.57	92
Magnesium	399-1-17B	Y	ug/L	5,800.00	7,550.00	6,667.41	108
Magnesium	399-1-18A	N	ug/L	11,000.00	14,600.00	12,533.33	96
Magnesium	399-1-18A	Y	ug/L	11,600.00	14,600.00	12,634.62	104
Magnesium	399-1-18B	N	ug/L	4,850.00	5,690.00	5,195.38	52
Magnesium	399-1-18B	Y	ug/L	5,030.00	6,100.00	5,277.06	68
Magnesium	399-1-21A	N	ug/L	6,950.00	9,100.00	7,904.00	20
Magnesium	399-1-21A	Y	ug/L	7,300.00	9,910.00	8,270.00	24
Magnesium	399-1-21B	N	ug/L	4,940.00	5,520.00	5,172.50	16
Magnesium	399-1-21B	Y	ug/L	4,900.00	5,270.00	5,063.33	24
Magnesium	399-1-7	N	ug/L	3,520.00	12,400.00	4,903.57	112
Magnesium	399-1-7	Y	ug/L	3,550.00	6,340.00	4,680.00	72
Magnesium	399-1-8	N	ug/L	5,030.00	7,940.00	6,109.44	72
Magnesium	399-1-8	Y	ug/L	5,060.00	8,190.00	6,191.18	68
Manganese	399-1-10A	N	ug/L	0.00	7.60	1.29	130
Manganese	399-1-10A	Y	ug/L	0.00	6.00	0.78	145
Manganese	399-1-10B	N	ug/L	77.80	170.00	129.95	20
Manganese	399-1-10B	Y	ug/L	82.20	224.00	130.07	60
Manganese	399-1-11	N	ug/L	0.00	5.90	0.71	100
Manganese	399-1-11	Y	ug/L	0.00	1.90	0.17	145
Manganese	399-1-16A	N	ug/L	0.00	20.00	2.89	125
Manganese	399-1-16A	Y	ug/L	0.00	10.00	1.92	165
Manganese	399-1-16B	N	ug/L	62.00	92.00	79.13	130
Manganese	399-1-16B	Y	ug/L	54.80	96.00	73.97	165
Manganese	399-1-17A	N	ug/L	0.00	170.00	9.41	130
Manganese	399-1-17A	Y	ug/L	0.00	170.00	5.43	195
Manganese	399-1-17B	N	ug/L	59.00	87.00	75.28	115
Manganese	399-1-17B	Y	ug/L	63.00	85.90	74.11	135
Manganese	399-1-18A	N	ug/L	0.00	11.00	1.58	120
Manganese	399-1-18A	Y	ug/L	0.00	7.60	0.68	130
Manganese	399-1-18B	N	ug/L	34.00	51.90	44.45	65

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Manganese	399-1-18B	Y	ug/L	34.20	49.90	43.18	85
Manganese	399-1-21A	N	ug/L	0.00	49.00	16.18	25
Manganese	399-1-21A	Y	ug/L	0.00	12.00	2.83	30
Manganese	399-1-21B	N	ug/L	118.00	190.00	154.00	20
Manganese	399-1-21B	Y	ug/L	71.00	160.00	135.00	30
Manganese	399-1-7	N	ug/L	0.00	59.70	2.46	175
Manganese	399-1-7	Y	ug/L	0.00	5.60	0.44	90
Manganese	399-1-8	N	ug/L	0.00	58.00	24.10	125
Manganese	399-1-8	Y	ug/L	0.00	42.00	19.56	85
Mercury	399-1-10A	N	ug/L	0.00	0.11	0.00	117
Mercury	399-1-10A	Y	ug/L	0.00	0.12	0.01	33
Mercury	399-1-11	N	ug/L	0.00	0.09	0.00	93
Mercury	399-1-11	Y	ug/L	0.00	0.14	0.01	30
Mercury	399-1-16A	N	ug/L	0.00	0.13	0.01	90
Mercury	399-1-16A	Y	ug/L	0.00	0.14	0.02	33
Mercury	399-1-16B	N	ug/L	0.00	0.09	0.00	93
Mercury	399-1-16B	Y	ug/L	0.00	0.09	0.02	36
Mercury	399-1-17A	N	ug/L	0.00	0.13	0.00	108
Mercury	399-1-17A	Y	ug/L	0.00	0.09	0.02	36
Mercury	399-1-17B	N	ug/L	0.00	0.13	0.01	102
Mercury	399-1-17B	Y	ug/L	0.00	0.07	0.02	36
Mercury	399-1-18A	N	ug/L	0.00	0.09	0.00	102
Mercury	399-1-18A	Y	ug/L	0.00	0.12	0.01	36
Mercury	399-1-8	N	ug/L	0.00	0.20	0.01	114
Methylenechloride	399-1-10A	N	ug/L	0.00	20.00	0.88	504
Methylenechloride	399-1-10B	N	ug/L	0.00	20.00	1.20	360
Methylenechloride	399-1-11	N	ug/L	0.00	18.00	0.27	600
Methylenechloride	399-1-16A	N	ug/L	0.00	18.00	0.89	520
Methylenechloride	399-1-16B	N	ug/L	0.00	97.00	3.60	584
Methylenechloride	399-1-17A	N	ug/L	0.00	15.00	0.40	1848
Methylenechloride	399-1-17B	N	ug/L	0.00	10.00	0.72	512
Methylenechloride	399-1-18A	N	ug/L	0.00	5.00	0.22	608
Methylenechloride	399-1-18B	N	ug/L	0.00	5.00	0.25	376
Methylenechloride	399-1-21A	N	ug/L	0.00	14.00	1.20	120
Methylenechloride	399-1-21B	N	ug/L	0.00	16.00	2.67	48
Methylenechloride	399-1-7	N	ug/L	0.00	370.00	13.29	248
Methylenechloride	399-1-8	N	ug/L	0.00	130.00	8.75	160
Nickel	399-1-10A	N	ug/L	0.00	99.60	7.65	104

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Nickel	399-1-10A	Y	ug/L	0.00	20.00	1.10	116
Nickel	399-1-10B	N	ug/L	0.00	44.60	19.73	16
Nickel	399-1-10B	Y	ug/L	0.00	14.90	1.24	48
Nickel	399-1-11	N	ug/L	0.00	48.00	3.30	80
Nickel	399-1-16A	N	ug/L	0.00	180.00	63.24	100
Nickel	399-1-16A	Y	ug/L	0.00	170.00	56.58	132
Nickel	399-1-16B	N	ug/L	0.00	106.00	11.29	104
Nickel	399-1-16B	Y	ug/L	0.00	4.50	0.14	132
Nickel	399-1-17A	N	ug/L	0.00	72.00	7.35	104
Nickel	399-1-17A	Y	ug/L	0.00	16.00	0.67	156
Nickel	399-1-17B	N	ug/L	0.00	50.00	6.19	92
Nickel	399-1-18A	N	ug/L	0.00	55.00	8.93	96
Nickel	399-1-18A	Y	ug/L	0.00	31.00	1.77	104
Nickel	399-1-18B	N	ug/L	0.00	37.10	8.05	52
Nickel	399-1-21A	N	ug/L	0.00	32.00	13.86	20
Nickel	399-1-21A	Y	ug/L	0.00	6.80	1.13	24
Nickel	399-1-21B	N	ug/L	9.10	83.00	38.00	16
Nickel	399-1-21B	Y	ug/L	0.00	69.00	15.33	24
Nickel	399-1-7	N	ug/L	0.00	89.80	5.96	140
Nickel	399-1-7	Y	ug/L	0.00	13.60	0.76	72
Nickel	399-1-8	N	ug/L	0.00	35.00	3.33	100
Nickel	399-1-8	Y	ug/L	0.00	13.40	2.10	68
Nitrate	399-1-10A	N	ug/L	1,250.00	27,003.48	12,771.68	120
Nitrate	399-1-11	N	ug/L	0.00	24,200.00	3,530.48	310
Nitrate	399-1-16A	N	ug/L	1,300.00	28,375.79	9,585.45	130
Nitrate	399-1-16B	N	ug/L	0.00	1,606.93	145.35	100
Nitrate	399-1-17A	N	ug/L	0.00	39,841.20	4,054.06	1070
Nitrate	399-1-17B	N	ug/L	0.00	12.00	0.86	70
Nitrate	399-1-18A	N	ug/L	19,400.00	30,544.92	22,660.99	200
Nitrate	399-1-18B	N	ug/L	0.00	885.36	136.21	65
Nitrate	399-1-21A	N	ug/L	9,738.96	27,800.30	20,208.07	55
Nitrate	399-1-21B	N	ug/L	0.00	885.36	230.89	30
Nitrate	399-1-7	N	ug/L	132.80	31,000.00	10,150.28	165
Nitrate	399-1-8	N	ug/L	0.00	17,600.00	5,654.93	135
Nitrite	399-1-10A	N	ug/L	0.00	100.00	13.00	26
Nitrite	399-1-17A	N	ug/L	0.00	105.11	0.71	298
Nitrite	399-1-18A	N	ug/L	0.00	100.00	4.00	50
Nitrite	399-1-18B	N	ug/L	0.00	100.00	50.00	8

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Nitrite	399-1-21A	N	ug/L	0.00	370.00	41.11	18
Nitrite	399-1-21B	N	ug/L	0.00	100.00	20.00	10
Oxidation Reduction Potential	399-1-10A	N	mV	214.00	214.00	214.00	1
Oxidation Reduction Potential	399-1-10B	N	mV	66.00	193.00	129.50	2
Oxidation Reduction Potential	399-1-16A	N	mV	212.00	212.00	212.00	1
Oxidation Reduction Potential	399-1-16B	N	mV	177.00	177.00	177.00	1
Oxidation Reduction Potential	399-1-17A	N	mV	55.00	55.00	55.00	1
Oxidation Reduction Potential	399-1-17B	N	mV	291.00	291.00	291.00	1
Oxidation Reduction Potential	399-1-18A	N	mV	190.00	190.00	190.00	1
Oxidation Reduction Potential	399-1-18B	N	mV	196.00	196.00	196.00	1
pH Measurement	399-1-10A	N	pH	6.60	7.70	7.38	142
pH Measurement	399-1-10B	N	pH	6.90	8.45	7.96	88
pH Measurement	399-1-11	N	pH	5.80	8.50	7.40	166
pH Measurement	399-1-16A	N	pH	6.10	8.08	7.42	152
pH Measurement	399-1-16B	N	pH	6.40	8.54	8.01	158
pH Measurement	399-1-17A	N	pH	5.80	9.22	7.36	600
pH Measurement	399-1-17B	N	pH	5.30	8.20	7.80	132
pH Measurement	399-1-18A	N	pH	7.32	8.60	7.89	168
pH Measurement	399-1-18B	N	pH	6.80	8.40	7.89	100
pH Measurement	399-1-21A	N	pH	6.92	9.13	7.59	34
pH Measurement	399-1-21B	N	pH	7.58	9.32	8.26	18
pH Measurement	399-1-7	N	pH	6.00	8.51	7.26	92
pH Measurement	399-1-8	N	pH	6.80	8.20	7.61	68
Phenol	399-1-8	N	ug/L	0.00	2.83	0.20	14
Phosphate	399-1-10B	N	ug/L	0.00	239.00	39.83	24
Phosphate	399-1-11	N	ug/L	0.00	357.00	5.95	240
Phosphate	399-1-17A	N	ug/L	0.00	690.00	12.59	788
Phosphate	399-1-21A	N	ug/L	0.00	434.00	166.80	20
Phosphate	399-1-21B	N	ug/L	0.00	400.00	100.00	16
Plutonium-239	399-1-10B	N	pCi/L	0.00	0.02	0.01	2
Potassium	399-1-10A	N	ug/L	2,040.00	4,190.00	2,904.62	104
Potassium	399-1-10A	Y	ug/L	0.00	4,570.00	2,875.86	116
Potassium	399-1-10B	N	ug/L	5,330.00	5,650.00	5,460.00	16
Potassium	399-1-10B	Y	ug/L	4,460.00	5,900.00	5,467.50	48
Potassium	399-1-11	N	ug/L	978.00	3,600.00	2,203.90	80
Potassium	399-1-11	Y	ug/L	908.00	3,900.00	2,062.34	116
Potassium	399-1-16A	N	ug/L	2,270.00	4,000.00	2,859.60	100
Potassium	399-1-16A	Y	ug/L	0.00	3,890.00	2,796.36	132

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Potassium	399-1-16B	N	ug/L	3,600.00	5,580.00	5,065.77	104
Potassium	399-1-16B	Y	ug/L	3,490.00	5,840.00	5,082.73	132
Potassium	399-1-17A	N	ug/L	340.00	2,810.00	1,670.00	104
Potassium	399-1-17A	Y	ug/L	0.00	3,760.00	1,941.33	156
Potassium	399-1-17B	N	ug/L	5,400.00	7,100.00	6,150.00	92
Potassium	399-1-17B	Y	ug/L	4,760.00	7,120.00	5,845.19	108
Potassium	399-1-18A	N	ug/L	5,600.00	11,000.00	6,475.42	96
Potassium	399-1-18A	Y	ug/L	4,640.00	7,480.00	6,210.00	104
Potassium	399-1-18B	N	ug/L	6,000.00	7,460.00	6,402.31	52
Potassium	399-1-18B	Y	ug/L	5,670.00	7,630.00	6,396.47	68
Potassium	399-1-21A	N	ug/L	4,450.00	5,000.00	4,670.00	20
Potassium	399-1-21A	Y	ug/L	4,600.00	5,200.00	4,880.00	24
Potassium	399-1-21B	N	ug/L	4,610.00	5,400.00	4,945.00	16
Potassium	399-1-21B	Y	ug/L	4,500.00	5,500.00	4,866.67	24
Potassium	399-1-7	N	ug/L	1,800.00	5,080.00	2,619.43	140
Potassium	399-1-7	Y	ug/L	1,900.00	3,110.00	2,544.44	72
Potassium	399-1-8	N	ug/L	3,970.00	5,850.00	4,782.00	100
Potassium	399-1-8	Y	ug/L	3,710.00	5,920.00	4,751.18	68
Potassium-40	399-1-17A	N	pCi/L	0.00	228.00	87.31	21
Radium	399-1-10A	N	pCi/L	0.00	0.58	0.04	21
Radium	399-1-11	N	pCi/L	0.00	0.32	0.04	21
Radium	399-1-16A	N	pCi/L	0.00	0.40	0.08	20
Radium	399-1-16B	N	pCi/L	0.00	0.28	0.06	21
Radium	399-1-17A	N	pCi/L	0.00	0.01	0.00	23
Radium	399-1-17B	N	pCi/L	0.00	0.38	0.05	21
Radium	399-1-18A	N	pCi/L	0.00	0.21	0.04	22
Radium	399-1-18B	N	pCi/L	0.00	0.20	0.04	9
Radium	399-1-7	N	pCi/L	0.00	0.15	0.01	29
Radium	399-1-8	N	pCi/L	0.00	0.26	0.03	21
Radium-226	399-1-10B	N	pCi/L	0.00	27.34	6.84	4
Radium-226	399-1-17A	N	pCi/L	0.00	2.10	0.53	4
Ruthenium-106	399-1-17A	N	pCi/L	0.00	91.20	16.30	106
Selenium	399-1-10A	N	ug/L	0.00	10.10	0.75	444
Selenium	399-1-10A	Y	ug/L	0.00	4.80	0.96	132
Selenium	399-1-11	N	ug/L	0.00	2.70	0.16	372
Selenium	399-1-11	Y	ug/L	0.00	9.70	1.56	120
Selenium	399-1-16A	N	ug/L	0.00	17.20	0.88	396
Selenium	399-1-16A	Y	ug/L	0.00	3.00	0.93	132

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Selenium	399-1-16B	N	ug/L	0.00	2.00	0.06	384
Selenium	399-1-16B	Y	ug/L	0.00	2.50	0.21	144
Selenium	399-1-17A	N	ug/L	0.00	2.90	0.08	432
Selenium	399-1-17A	Y	ug/L	0.00	2.90	0.55	144
Selenium	399-1-17B	N	ug/L	0.00	4.00	0.13	384
Selenium	399-1-18A	N	ug/L	0.00	2.60	0.20	408
Selenium	399-1-18A	Y	ug/L	0.00	4.80	1.13	144
Selenium	399-1-21A	Y	ug/L	0.00	7.20	3.60	24
Selenium	399-1-21B	N	ug/L	0.00	20.00	6.67	36
Silicon	399-1-10A	N	ug/L	4,790.00	6,150.00	5,470.00	2
Silicon	399-1-10A	Y	ug/L	5,080.00	5,930.00	5,505.00	2
Silicon	399-1-11	N	ug/L	2,600.00	3,900.00	3,250.00	2
Silicon	399-1-11	Y	ug/L	2,580.00	3,890.00	3,235.00	2
Silicon	399-1-16A	N	ug/L	6,040.00	7,880.00	7,275.00	4
Silicon	399-1-16A	Y	ug/L	6,160.00	7,680.00	7,082.50	4
Silicon	399-1-16B	N	ug/L	19,900.00	21,100.00	20,575.00	4
Silicon	399-1-16B	Y	ug/L	19,600.00	21,700.00	20,650.00	4
Silicon	399-1-17A	N	ug/L	3,190.00	3,840.00	3,515.00	2
Silicon	399-1-17A	Y	ug/L	3,150.00	3,990.00	3,570.00	2
Silicon	399-1-17B	N	ug/L	21,300.00	21,900.00	21,600.00	2
Silicon	399-1-17B	Y	ug/L	20,500.00	21,900.00	21,200.00	2
Silicon	399-1-18A	N	ug/L	15,500.00	17,700.00	16,500.00	3
Silicon	399-1-18A	Y	ug/L	16,900.00	17,700.00	17,300.00	2
Silicon	399-1-18B	N	ug/L	24,600.00	24,600.00	24,600.00	1
Silicon	399-1-18B	Y	ug/L	23,900.00	23,900.00	23,900.00	1
Silicon	399-1-7	N	ug/L	5,440.00	6,710.00	6,105.00	4
Silicon	399-1-7	Y	ug/L	5,340.00	6,320.00	5,880.00	4
Silver	399-1-10A	Y	ug/L	0.00	6.10	0.21	87
Silver	399-1-10B	N	ug/L	0.00	2.30	0.58	12
Silver	399-1-10B	Y	ug/L	0.00	0.00	0.00	36
Silver	399-1-11	N	ug/L	0.00	9.60	0.48	60
Silver	399-1-11	Y	ug/L	0.00	8.90	0.31	87
Silver	399-1-16B	Y	ug/L	0.00	9.20	0.28	99
Silver	399-1-17A	Y	ug/L	0.00	3.60	0.09	117
Silver	399-1-17B	Y	ug/L	0.00	7.80	0.29	81
Silver	399-1-18A	Y	ug/L	0.00	6.40	0.25	78
Sodium	399-1-10A	N	ug/L	7,570.00	22,000.00	14,071.54	78
Sodium	399-1-10A	Y	ug/L	7,280.00	24,300.00	14,452.76	87

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Sodium	399-1-10B	N	ug/L	42,000.00	44,800.00	43,775.00	12
Sodium	399-1-10B	Y	ug/L	41,300.00	46,600.00	43,958.33	36
Sodium	399-1-11	N	ug/L	5,400.00	24,000.00	15,712.00	60
Sodium	399-1-11	Y	ug/L	5,130.00	24,000.00	13,794.48	87
Sodium	399-1-16A	N	ug/L	10,000.00	20,000.00	13,932.00	75
Sodium	399-1-16A	Y	ug/L	10,000.00	23,200.00	15,163.64	99
Sodium	399-1-16B	N	ug/L	44,000.00	55,500.00	48,723.08	78
Sodium	399-1-16B	Y	ug/L	39,600.00	57,800.00	48,193.94	99
Sodium	399-1-17A	N	ug/L	7,600.00	33,000.00	15,926.92	78
Sodium	399-1-17A	Y	ug/L	7,700.00	33,000.00	16,697.44	117
Sodium	399-1-17B	N	ug/L	43,700.00	54,700.00	49,560.87	69
Sodium	399-1-17B	Y	ug/L	44,000.00	56,100.00	49,940.74	81
Sodium	399-1-18A	N	ug/L	21,300.00	26,100.00	22,987.50	72
Sodium	399-1-18A	Y	ug/L	21,700.00	24,900.00	22,730.77	78
Sodium	399-1-18B	N	ug/L	59,600.00	70,600.00	63,430.77	39
Sodium	399-1-18B	Y	ug/L	58,300.00	75,400.00	64,676.47	51
Sodium	399-1-21A	N	ug/L	14,500.00	22,700.00	18,560.00	15
Sodium	399-1-21A	Y	ug/L	17,100.00	22,600.00	20,283.33	18
Sodium	399-1-21B	N	ug/L	37,000.00	40,000.00	38,775.00	12
Sodium	399-1-21B	Y	ug/L	37,900.00	42,000.00	39,933.33	18
Sodium	399-1-7	N	ug/L	10,300.00	31,600.00	15,380.00	105
Sodium	399-1-7	Y	ug/L	10,200.00	31,900.00	14,227.78	54
Sodium	399-1-8	N	ug/L	18,300.00	29,800.00	24,720.00	75
Sodium	399-1-8	Y	ug/L	17,500.00	29,500.00	23,535.29	51
Specific Conductance	399-1-10A	N	uS/cm	143.00	819.00	363.21	142
Specific Conductance	399-1-10B	N	uS/cm	204.00	567.00	312.61	92
Specific Conductance	399-1-11	N	uS/cm	126.00	523.00	229.17	154
Specific Conductance	399-1-16A	N	uS/cm	138.00	665.00	350.54	148
Specific Conductance	399-1-16B	N	uS/cm	247.00	570.00	328.32	156
Specific Conductance	399-1-17A	N	uS/cm	66.00	672.00	300.44	598
Specific Conductance	399-1-17B	N	uS/cm	237.00	639.00	352.08	142
Specific Conductance	399-1-18A	N	uS/cm	307.00	889.00	449.73	170
Specific Conductance	399-1-18B	N	uS/cm	278.00	577.00	365.04	106
Specific Conductance	399-1-21A	N	uS/cm	331.00	502.00	411.69	26
Specific Conductance	399-1-21B	N	uS/cm	288.00	304.00	297.60	10
Specific Conductance	399-1-7	N	uS/cm	152.00	474.00	272.83	84
Specific Conductance	399-1-8	N	uS/cm	190.00	495.00	279.28	58
Strontium	399-1-10A	N	ug/L	84.00	103.00	94.25	8

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Strontium	399-1-10A	Y	ug/L	75.00	245.00	152.70	24
Strontium	399-1-10B	Y	ug/L	87.60	93.60	90.20	8
Strontium	399-1-11	N	ug/L	78.00	95.00	85.00	8
Strontium	399-1-11	Y	ug/L	79.00	220.00	139.86	14
Strontium	399-1-16A	N	ug/L	82.00	110.00	94.33	18
Strontium	399-1-16A	Y	ug/L	83.00	236.00	129.94	34
Strontium	399-1-16B	N	ug/L	99.00	113.00	104.67	18
Strontium	399-1-16B	Y	ug/L	78.00	113.00	99.52	32
Strontium	399-1-17A	N	pCi/L	1.63	1.63	1.63	2
Strontium	399-1-17A	N	ug/L	80.00	222.00	125.83	12
Strontium	399-1-17A	Y	ug/L	78.00	244.00	175.46	26
Strontium	399-1-17B	N	ug/L	108.00	121.00	114.50	8
Strontium	399-1-17B	Y	ug/L	10.00	113.00	95.64	22
Strontium	399-1-18A	N	ug/L	190.00	244.00	221.60	10
Strontium	399-1-18A	Y	ug/L	218.00	259.00	233.11	18
Strontium	399-1-18B	N	ug/L	75.00	89.00	80.33	6
Strontium	399-1-18B	Y	ug/L	74.80	87.00	78.64	14
Strontium	399-1-21A	Y	ug/L	170.00	170.00	170.00	2
Strontium	399-1-21B	Y	ug/L	89.00	89.00	89.00	2
Strontium	399-1-7	N	ug/L	94.00	116.00	106.57	14
Strontium	399-1-7	Y	ug/L	89.00	112.00	99.86	14
Strontium	399-1-8	N	ug/L	109.00	109.00	109.00	2
Strontium	399-1-8	Y	ug/L	104.00	104.00	104.00	2
Strontium-90	399-1-10A	N	pCi/L	0.00	1.21	0.30	8
Strontium-90	399-1-11	N	pCi/L	1.96	1.96	1.96	2
Strontium-90	399-1-11	Y	pCi/L	1.60	1.60	1.60	2
Strontium-90	399-1-16A	N	pCi/L	0.00	0.94	0.47	4
Strontium-90	399-1-16B	N	pCi/L	0.00	2.94	0.49	12
Strontium-90	399-1-17A	N	pCi/L	0.00	2.12	0.28	166
Strontium-90	399-1-17B	N	pCi/L	0.00	5.28	0.75	14
Strontium-90	399-1-18B	N	pCi/L	0.00	0.93	0.16	12
Strontium-90	399-1-7	N	pCi/L	0.00	0.68	0.23	6
Strontium-90	399-1-8	N	pCi/L	0.00	4.10	1.11	8
Sulfate	399-1-10A	N	ug/L	12,900.00	62,200.00	32,018.18	110
Sulfate	399-1-11	N	ug/L	13,300.00	53,100.00	18,930.00	300
Sulfate	399-1-16A	N	ug/L	14,100.00	64,100.00	25,595.83	120
Sulfate	399-1-16B	N	ug/L	4,880.00	25,800.00	11,811.67	90
Sulfate	399-1-17A	N	ug/L	11,000.00	66,700.00	19,587.44	1035

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Sulfate	399-1-17B	N	ug/L	0.00	4,620.00	2,077.50	60
Sulfate	399-1-18A	N	ug/L	46,200.00	69,700.00	50,884.62	195
Sulfate	399-1-18B	N	ug/L	0.00	701.00	70.10	50
Sulfate	399-1-21A	N	ug/L	27,000.00	57,900.00	44,340.00	50
Sulfate	399-1-21B	N	ug/L	0.00	1,000.00	216.00	25
Sulfate	399-1-7	N	ug/L	12,400.00	34,200.00	17,680.00	150
Sulfate	399-1-8	N	ug/L	5,210.00	26,000.00	11,739.62	130
Sulfide	399-1-7	N	ug/L	0.00	1,100.00	55.00	20
Technetium-99	399-1-10A	N	pCi/L	10.00	10.00	10.00	1
Technetium-99	399-1-10B	N	pCi/L	0.00	15.10	3.22	5
Technetium-99	399-1-17A	N	pCi/L	2.08	54.40	23.03	3
Technetium-99	399-1-18A	N	pCi/L	8.63	8.78	8.70	2
Technetium-99	399-1-21A	N	pCi/L	0.00	5.46	2.63	4
Technetium-99	399-1-7	N	pCi/L	71.80	71.80	71.80	1
Technetium-99	399-1-8	N	pCi/L	0.00	2.26	0.56	4
Tetrachloroethene	399-1-10A	N	ug/L	0.00	8.00	0.39	189
Tetrachloroethene	399-1-11	N	ug/L	0.00	0.85	0.03	225
Tetrachloroethene	399-1-16A	N	ug/L	0.00	17.00	1.10	195
Tetrachloroethene	399-1-16B	N	ug/L	0.00	1.00	0.05	219
Tetrachloroethene	399-1-17A	N	ug/L	0.00	38.00	0.49	693
Tetrachloroethene	399-1-17B	N	ug/L	0.00	0.20	0.00	192
Tetrachloroethene	399-1-21A	N	ug/L	0.00	1.00	0.10	45
Tetrachloroethene	399-1-8	N	ug/L	0.00	0.30	0.02	81
Tetraethylpyrophosphate	399-1-7	N	ug/L	0.00	3.12	1.04	3
Tetrahydrofuran	399-1-10B	N	ug/L	0.00	3.60	0.18	40
Thallium	399-1-10A	Y	ug/L	0.00	2.40	0.28	26
Thallium	399-1-10B	Y	ug/L	0.00	2.40	0.16	30
Thallium	399-1-11	N	ug/L	0.00	23.40	4.68	10
Thallium	399-1-16B	Y	ug/L	0.00	2.40	0.18	26
Thallium	399-1-17A	Y	ug/L	0.00	1.80	0.14	26
Tin	399-1-10A	Y	ug/L	0.00	33.00	2.75	12
Tin	399-1-16A	N	ug/L	0.00	37.00	2.85	13
Tin	399-1-16A	Y	ug/L	0.00	53.00	3.79	14
Tin	399-1-16B	Y	ug/L	0.00	28.00	1.87	15
Tin	399-1-17A	N	ug/L	0.00	41.00	3.42	12
Tin	399-1-17A	Y	ug/L	0.00	34.00	2.62	13
Tin	399-1-18A	N	ug/L	0.00	65.00	5.42	12
Tin	399-1-18A	Y	ug/L	0.00	49.00	4.08	12

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Tin	399-1-21B	N	ug/L	53.00	53.00	53.00	1
Tin	399-1-21B	Y	ug/L	0.00	45.00	15.00	3
Toluene	399-1-10A	N	ug/L	0.00	0.06	0.00	220
Toluene	399-1-10B	N	ug/L	0.00	0.00	0.00	180
Toluene	399-1-11	N	ug/L	0.00	0.05	0.00	100
Toluene	399-1-16A	N	ug/L	0.00	3.00	0.05	232
Toluene	399-1-16B	N	ug/L	0.00	3.00	0.05	268
Toluene	399-1-17A	N	ug/L	0.00	3.00	0.02	724
Toluene	399-1-17B	N	ug/L	0.00	4.00	0.31	232
Toluene	399-1-18A	N	ug/L	0.00	0.03	0.00	252
Toluene	399-1-7	N	ug/L	0.00	1.00	0.04	92
Toluene	399-1-8	N	ug/L	0.00	0.90	0.06	56
Total carbon	399-1-10A	N	ug/L	16,400.00	16,700.00	16,550.00	2
Total carbon	399-1-11	N	ug/L	13,500.00	16,200.00	14,850.00	2
Total carbon	399-1-16A	N	ug/L	12,600.00	16,500.00	14,757.14	7
Total carbon	399-1-16B	N	ug/L	34,000.00	41,900.00	37,500.00	7
Total carbon	399-1-17A	N	ug/L	15,000.00	16,000.00	15,633.33	3
Total carbon	399-1-17B	N	ug/L	40,700.00	44,900.00	42,666.67	3
Total carbon	399-1-18A	N	ug/L	29,500.00	29,800.00	29,650.00	2
Total carbon	399-1-18B	N	ug/L	42,400.00	43,500.00	42,950.00	2
Total carbon	399-1-7	N	ug/L	16,500.00	17,200.00	16,850.00	2
Total carbon	399-1-8	N	ug/L	22,900.00	22,900.00	22,900.00	1
Total dissolved solids	399-1-10A	N	ug/L	221,000.00	248,000.00	234,500.00	4
Total dissolved solids	399-1-10B	N	ug/L	187,000.00	202,000.00	195,000.00	6
Total dissolved solids	399-1-21A	N	ug/L	217,000.00	260,000.00	238,500.00	4
Total dissolved solids	399-1-21B	N	ug/L	172,000.00	188,000.00	180,000.00	4
Total dissolved solids	399-1-8	N	ug/L	160,000.00	184,000.00	172,000.00	6
Total halogens (all)	399-1-17A	N	ug/L	5.40	14.60	7.80	4
Total organic carbon	399-1-10A	N	ug/L	0.00	2,000.00	231.71	84
Total organic carbon	399-1-11	N	ug/L	0.00	1,180.00	212.16	75
Total organic carbon	399-1-16A	N	ug/L	0.00	1,000.00	131.00	90
Total organic carbon	399-1-16B	N	ug/L	0.00	1,000.00	100.52	87
Total organic carbon	399-1-17A	N	ug/L	0.00	2,000.00	441.89	225
Total organic carbon	399-1-17B	N	ug/L	0.00	400.00	48.00	75
Total organic carbon	399-1-18A	N	ug/L	0.00	500.00	70.46	78
Total organic carbon	399-1-21A	N	ug/L	600.00	600.00	600.00	3
Total organic carbon	399-1-7	N	ug/L	0.00	4,670.00	282.06	102
Total organic carbon	399-1-8	N	ug/L	0.00	1,490.00	131.43	63

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Total organic halides	399-1-10A	N	ug/L	0.00	44.00	11.58	78
Total organic halides	399-1-11	N	ug/L	0.00	82.00	25.07	75
Total organic halides	399-1-16A	N	ug/L	0.00	52.00	16.31	84
Total organic halides	399-1-16B	N	ug/L	0.00	108.00	58.14	87
Total organic halides	399-1-17A	N	ug/L	0.00	100.00	28.27	204
Total organic halides	399-1-17B	N	ug/L	0.00	26.00	7.72	75
Total organic halides	399-1-7	N	ug/L	0.00	335.00	30.87	90
Total organic halides	399-1-8	N	ug/L	0.00	215.00	10.24	63
Total suspended solids	399-1-10A	N	mg/L	0.00	7.00	3.50	4
Total suspended solids	399-1-21A	N	mg/L	0.00	33.00	16.50	4
Total suspended solids	399-1-21B	N	mg/L	0.00	35.00	17.50	4
Total suspended solids	399-1-8	N	mg/L	0.00	5.00	3.33	6
trans-1,2-Dichloroethylene	399-1-10A	N	ug/L	0.00	0.04	0.00	90
trans-1,2-Dichloroethylene	399-1-11	N	ug/L	0.00	0.62	0.03	40
trans-1,2-Dichloroethylene	399-1-16B	N	ug/L	0.00	135.00	15.59	124
trans-1,2-Dichloroethylene	399-1-17B	N	ug/L	0.00	31.00	3.74	108
Trichloroethene	399-1-10A	N	ug/L	0.00	0.30	0.01	252
Trichloroethene	399-1-11	N	ug/L	0.00	0.43	0.01	300
Trichloroethene	399-1-16A	N	ug/L	0.00	3.00	0.57	260
Trichloroethene	399-1-16B	N	ug/L	0.00	24.10	8.45	292
Trichloroethene	399-1-17A	N	ug/L	0.00	2.00	0.08	916
Trichloroethene	399-1-17B	N	ug/L	0.00	0.03	0.00	256
Trichloroethene	399-1-21A	N	ug/L	0.00	3.00	1.54	60
Trichloroethene	399-1-21B	N	ug/L	0.00	0.41	0.07	24
Trichloroethene	399-1-7	N	ug/L	0.00	4.00	0.32	148
Trichloroethene	399-1-8	N	ug/L	0.00	3.00	0.24	108
Tritium	399-1-10A	N	pCi/L	0.00	12,300.00	7,282.82	40
Tritium	399-1-10B	N	pCi/L	0.00	113.00	22.65	24
Tritium	399-1-11	N	pCi/L	0.00	12,700.00	7,970.33	30
Tritium	399-1-16A	N	pCi/L	0.00	12,400.00	6,502.79	38
Tritium	399-1-16B	N	pCi/L	0.00	1,240.00	298.50	40
Tritium	399-1-17A	N	pCi/L	0.00	12,300.00	3,649.76	98
Tritium	399-1-17B	N	pCi/L	0.00	151.00	15.37	42
Tritium	399-1-18A	N	pCi/L	6,450.00	14,100.00	11,584.94	36
Tritium	399-1-18B	N	pCi/L	0.00	586.00	96.52	14
Tritium	399-1-21A	N	pCi/L	3,151.00	9,650.00	6,769.20	20
Tritium	399-1-21B	N	pCi/L	0.00	85.48	27.26	10
Tritium	399-1-7	N	pCi/L	0.00	2,290.00	376.75	24

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Tritium	399-1-8	N	pCi/L	0.00	3,590.00	791.25	16
Turbidity	399-1-10A	N	NTU	0.10	7.03	1.36	39
Turbidity	399-1-10A	Y	NTU	0.48	0.48	0.48	1
Turbidity	399-1-10B	N	NTU	0.28	11.20	3.41	34
Turbidity	399-1-10B	Y	NTU	0.74	0.74	0.74	1
Turbidity	399-1-11	N	NTU	0.10	1.33	0.71	5
Turbidity	399-1-16A	N	NTU	0.12	4.20	1.01	40
Turbidity	399-1-16A	Y	NTU	0.14	0.53	0.34	2
Turbidity	399-1-16B	N	NTU	0.10	17.00	2.05	40
Turbidity	399-1-16B	Y	NTU	0.21	0.55	0.38	2
Turbidity	399-1-17A	N	NTU	0.00	5.26	1.55	44
Turbidity	399-1-17A	Y	NTU	0.73	1.21	0.97	2
Turbidity	399-1-17B	N	NTU	0.10	4.78	1.92	39
Turbidity	399-1-17B	Y	NTU	0.59	0.59	0.59	1
Turbidity	399-1-18A	N	NTU	0.00	4.33	1.15	39
Turbidity	399-1-18A	Y	NTU	0.31	0.68	0.50	2
Turbidity	399-1-18B	N	NTU	0.00	3.84	1.50	32
Turbidity	399-1-18B	Y	NTU	0.73	0.73	0.73	1
Turbidity	399-1-21A	N	NTU	0.64	84.50	15.47	6
Turbidity	399-1-21B	N	NTU	9.64	41.00	25.32	2
Turbidity	399-1-7	N	NTU	0.10	0.70	0.38	6
Unknown aliphatic hydrocarbon	399-1-10A	N	ug/L	90.00	90.00	90.00	1
Unknown amide	399-1-17A	N	ug/L	10.00	10.00	10.00	1
Unknown amide	399-1-17B	N	ug/L	31.00	31.00	31.00	1
Uranium	399-1-10A	N	ug/L	0.48	152.00	58.68	224
Uranium	399-1-10A	Y	ug/L	35.40	35.40	35.40	4
Uranium	399-1-10B	N	ug/L	0.00	141.00	3.61	160
Uranium	399-1-11	N	ug/L	13.59	279.00	66.61	280
Uranium	399-1-16A	N	ug/L	1.08	165.00	81.79	232
Uranium	399-1-16B	N	ug/L	0.48	14.80	7.94	232
Uranium	399-1-17A	N	ug/L	0.00	524.00	113.96	960
Uranium	399-1-17A	Y	ug/L	133.00	192.77	162.89	8
Uranium	399-1-17B	N	ug/L	0.00	17.40	0.40	224
Uranium	399-1-18A	N	ug/L	3.32	7.66	5.48	268
Uranium	399-1-18B	N	ug/L	0.00	0.53	0.06	168
Uranium	399-1-21A	N	ug/L	17.70	101.00	39.83	56
Uranium	399-1-21B	N	ug/L	0.04	0.37	0.18	16
Uranium	399-1-7	N	ug/L	27.80	329.00	104.25	104

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Uranium	399-1-8	N	ug/L	0.48	110.00	34.97	32
Uranium-233/234	399-1-10A	N	pCi/L	60.00	67.00	63.50	6
Uranium-233/234	399-1-11	Y	pCi/L	58.00	58.00	58.00	3
Uranium-233/234	399-1-16A	N	pCi/L	74.00	74.00	74.00	3
Uranium-233/234	399-1-16B	N	pCi/L	1.80	1.80	1.80	3
Uranium-233/234	399-1-17A	N	pCi/L	5.60	5.60	5.60	3
Uranium-233/234	399-1-18A	N	pCi/L	2.30	2.30	2.30	3
Uranium-233/234	399-1-18B	N	pCi/L	0.17	0.17	0.17	3
Uranium-233/234	399-1-21A	N	pCi/L	0.00	35.00	17.50	6
Uranium-233/234	399-1-21B	N	pCi/L	0.63	0.63	0.63	3
Uranium-233/234	399-1-7	N	pCi/L	45.00	45.00	45.00	3
Uranium-233/234	399-1-8	N	pCi/L	54.00	54.00	54.00	3
Uranium-234	399-1-10A	N	pCi/L	6.74	22.50	14.62	4
Uranium-234	399-1-10A	Y	pCi/L	20.90	20.90	20.90	2
Uranium-234	399-1-10B	N	pCi/L	0.23	0.36	0.30	4
Uranium-234	399-1-11	N	pCi/L	50.62	50.62	50.62	2
Uranium-234	399-1-16A	N	pCi/L	41.56	41.56	41.56	2
Uranium-234	399-1-16B	N	pCi/L	0.89	0.89	0.89	2
Uranium-234	399-1-17A	N	pCi/L	0.51	171.00	28.35	186
Uranium-234	399-1-17A	Y	pCi/L	88.80	89.68	89.24	4
Uranium-234	399-1-17B	N	pCi/L	0.07	0.12	0.09	4
Uranium-234	399-1-18A	N	pCi/L	2.27	2.27	2.27	2
Uranium-234	399-1-18B	N	pCi/L	4.53	4.53	4.53	2
Uranium-234	399-1-21A	N	pCi/L	11.30	11.30	11.30	2
Uranium-234	399-1-21B	N	pCi/L	1.50	1.50	1.50	2
Uranium-234	399-1-8	N	pCi/L	29.68	32.34	31.01	4
Uranium-235	399-1-10A	N	pCi/L	0.28	5.40	2.76	10
Uranium-235	399-1-10A	Y	pCi/L	1.02	1.02	1.02	2
Uranium-235	399-1-11	N	pCi/L	6.29	6.29	6.29	2
Uranium-235	399-1-11	Y	pCi/L	3.60	3.60	3.60	2
Uranium-235	399-1-16A	N	pCi/L	4.58	5.20	4.89	4
Uranium-235	399-1-16B	N	pCi/L	0.07	0.15	0.11	4
Uranium-235	399-1-17A	N	pCi/L	0.00	10.39	1.79	190
Uranium-235	399-1-17A	Y	pCi/L	2.92	11.00	6.96	4
Uranium-235	399-1-18A	N	pCi/L	0.06	0.19	0.12	4
Uranium-235	399-1-18B	N	pCi/L	0.00	0.34	0.11	6
Uranium-235	399-1-21A	N	pCi/L	1.10	4.00	1.95	8
Uranium-235	399-1-21B	N	pCi/L	0.00	0.09	0.03	6

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Uranium-235	399-1-7	N	pCi/L	5.90	7.70	6.80	4
Uranium-235	399-1-8	N	pCi/L	0.70	5.80	3.46	8
Uranium-238	399-1-10A	N	pCi/L	6.14	59.00	36.81	10
Uranium-238	399-1-10A	Y	pCi/L	18.40	18.40	18.40	2
Uranium-238	399-1-10B	N	pCi/L	0.00	0.36	0.17	8
Uranium-238	399-1-11	N	pCi/L	37.17	37.17	37.17	2
Uranium-238	399-1-11	Y	pCi/L	46.00	46.00	46.00	2
Uranium-238	399-1-16A	N	pCi/L	35.59	61.00	48.30	4
Uranium-238	399-1-16B	N	pCi/L	0.80	1.80	1.30	4
Uranium-238	399-1-17A	N	pCi/L	0.00	142.00	21.11	192
Uranium-238	399-1-17A	Y	pCi/L	64.40	65.61	65.01	4
Uranium-238	399-1-17B	N	pCi/L	0.01	0.04	0.03	6
Uranium-238	399-1-18A	N	pCi/L	1.60	1.74	1.67	4
Uranium-238	399-1-18B	N	pCi/L	0.00	3.78	1.32	6
Uranium-238	399-1-21A	N	pCi/L	9.10	27.00	14.31	8
Uranium-238	399-1-21B	N	pCi/L	0.00	1.29	0.62	6
Uranium-238	399-1-7	N	pCi/L	32.99	33.00	33.00	4
Uranium-238	399-1-8	N	pCi/L	7.50	37.00	22.31	8
Vanadium	399-1-10A	N	ug/L	0.00	9.70	1.29	78
Vanadium	399-1-10A	Y	ug/L	0.00	35.40	5.07	87
Vanadium	399-1-10B	Y	ug/L	0.00	12.20	1.99	36
Vanadium	399-1-11	N	ug/L	0.00	8.20	1.39	60
Vanadium	399-1-11	Y	ug/L	0.00	9.50	2.44	87
Vanadium	399-1-16A	N	ug/L	0.00	6.00	0.90	75
Vanadium	399-1-16A	Y	ug/L	0.00	38.70	2.98	99
Vanadium	399-1-16B	Y	ug/L	0.00	31.00	2.32	99
Vanadium	399-1-17A	N	ug/L	0.00	13.30	1.96	78
Vanadium	399-1-17A	Y	ug/L	0.00	43.70	4.61	117
Vanadium	399-1-17B	Y	ug/L	0.00	35.10	1.80	81
Vanadium	399-1-18A	N	ug/L	0.00	15.00	7.80	69
Vanadium	399-1-18A	Y	ug/L	0.00	55.40	11.04	78
Vanadium	399-1-18B	N	ug/L	0.00	2.00	0.31	39
Vanadium	399-1-18B	Y	ug/L	0.00	10.50	1.15	51
Vanadium	399-1-21A	N	ug/L	0.00	11.00	3.80	15
Vanadium	399-1-21A	Y	ug/L	0.00	6.50	1.70	18
Vanadium	399-1-21B	N	ug/L	0.00	4.70	1.98	12
Vanadium	399-1-7	N	ug/L	0.00	19.30	1.62	105
Vanadium	399-1-7	Y	ug/L	0.00	11.80	2.81	54

Constituent	Well Number	Filtered	Units	Minimum	Maximum	Average	# Samples
Vanadium	399-1-8	N	ug/L	0.00	8.00	0.62	75
Vanadium	399-1-8	Y	ug/L	0.00	5.00	0.45	51
Vinyl chloride	399-1-10A	N	ug/L	0.00	0.60	0.01	162
Vinyl chloride	399-1-10B	N	ug/L	0.00	0.30	0.01	123
Vinyl chloride	399-1-16A	N	ug/L	0.00	0.30	0.01	171
Vinyl chloride	399-1-16B	N	ug/L	0.00	0.30	0.01	180
Vinyl chloride	399-1-17A	N	ug/L	0.00	0.30	0.00	534
Vinyl chloride	399-1-17B	N	ug/L	0.00	0.40	0.01	171
Vinyl chloride	399-1-18A	N	ug/L	0.00	0.40	0.01	186
Vinyl chloride	399-1-18B	N	ug/L	0.00	0.40	0.01	123
Xylenes (total)	399-1-11	N	ug/L	0.00	0.26	0.00	225
Xylenes (total)	399-1-16A	N	ug/L	0.00	10.00	0.15	195
Xylenes (total)	399-1-16B	N	ug/L	0.00	0.06	0.00	219
Zinc	399-1-10A	N	ug/L	0.00	24.00	3.63	182
Zinc	399-1-10A	Y	ug/L	0.00	23.20	3.20	203
Zinc	399-1-10B	N	ug/L	0.00	13.40	3.35	28
Zinc	399-1-10B	Y	ug/L	0.00	20.40	4.14	84
Zinc	399-1-11	N	ug/L	0.00	25.00	6.20	140
Zinc	399-1-11	Y	ug/L	0.00	25.00	5.10	203
Zinc	399-1-16A	N	ug/L	0.00	232.00	20.69	175
Zinc	399-1-16A	Y	ug/L	0.00	49.00	11.64	231
Zinc	399-1-16B	N	ug/L	0.00	40.00	9.37	182
Zinc	399-1-16B	Y	ug/L	0.00	136.00	13.56	231
Zinc	399-1-17A	N	ug/L	0.00	24.00	4.60	182
Zinc	399-1-17A	Y	ug/L	0.00	17.00	3.01	273
Zinc	399-1-17B	N	ug/L	0.00	53.00	6.91	161
Zinc	399-1-17B	Y	ug/L	0.00	16.10	3.21	189
Zinc	399-1-18A	N	ug/L	0.00	100.00	7.68	168
Zinc	399-1-18A	Y	ug/L	0.00	20.00	2.38	182
Zinc	399-1-18B	N	ug/L	0.00	16.00	6.78	91
Zinc	399-1-18B	Y	ug/L	0.00	27.00	6.04	119
Zinc	399-1-21A	N	ug/L	0.00	11.40	2.28	35
Zinc	399-1-21B	N	ug/L	0.00	11.90	4.53	28
Zinc	399-1-7	N	ug/L	0.00	808.00	48.17	196
Zinc	399-1-7	Y	ug/L	0.00	7.00	2.06	126
Zinc	399-1-8	N	ug/L	0.00	32.00	4.51	126
Zinc	399-1-8	Y	ug/L	0.00	18.00	1.71	119
Zirconium/Niobium-95	399-1-17A	N	pCi/L	0.00	108.00	12.39	16