0076021

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Columbia River Basin Field Office
11103 E. Montgomery Drive, Suite 2
Spokane, WA 99206

October 16, 1997

Mr. Jamie Zeisloft
U.S. Department of Energy
3350 George Washington Way, MSIN-H0-12
Richland, WA 99352

RECEIVED
FEB 06 2008
EDMC

Subject: Draft 2 Preassessment Screen (PAS) for Hanford 1100 Area

Dear Mr. Zeisloft:

Enclosed are three copies of the Draft 2 PAS for the Hanford 1100 Area. Please distribute copies of the PAS to appropriate staff for review. Also enclosed for your files is a set of all of the Trustee comments on the Draft 1 PAS. Appropriate and pertinent comments have been addressed in the Draft 2 PAS. Incorporated comments or additional information has been redlined (highlighted) and deleted information has been struck out. To make the Draft 2 as legible as possible, sections that have been moved show the heading of the section struck out and the rotest of the section has been deleted and redlined in its new location. Comments not incorporated will be discussed at the meeting. Please be prepared to discuss your comments and concerns about this draft at the October 24, 1997, meeting in Richland, WA.

To facilitate discussions at the October 24th meeting, please be prepared to discuss the following topics:

- Specific Sites of Concern for your Agency/Tribe
- Remedial Action vs. Natural Resource Restoration
- Information Gaps
- Review of PAS Criteria
- Cultural Issues/Areas of Cultural Significance
- Incorporation of Trustee Comments
- Schedule for Completion of Draft 2 PAS

At the closure of this meeting we hope to have any sites identified in need of further information. As outlined in the Interagency Agreement, this will be the last opportunity to discuss, as a group, concerns about the PAS. The period (to be determined at meeting) following the October 24th meeting will be the last comment period before the completion of the Draft 2 PAS.

If you have any questions or comments please contact Toni Davidson at (509) 921-0160.

Sincerely,

Philip Laumeyer
Field Supervisor

Enclosures

SPECIAL NOTE:

The system I have used to document changes from the Draft 1 PAS to the Draft 2 PAS can be confusing. To assist in your review of the second Draft, the following is an attempt to explain the coding I have used.

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IF A:

- Heading name or number has been ~~struck out~~ → this section has been moved or deleted.

- Heading name or number is highlighted → this section or heading is new or was moved.

- Page number has been ~~struck out~~ → this page number has changed.

- Page number has been highlighted → this page number is new.

Body of PAS Document

IF A:

- Section name or number has been ~~struck out~~ → this section has been moved or deleted.

- Section name highlighted → this section or heading is new.

- Section number is highlighted → this section number has been revised.

IF:

- Text has been ~~struck out~~ → this text has been moved or deleted from section.

- Text has been highlighted → this text has been revised or is new to document or section.

I hope these explanations help, if you have any questions please call me at (509) 891-0450.

Sincerely,

Toni Davidson

Toni Davidson

HANFORD 1100 AREA PREASSESSMENT SCREEN (PAS)

Draft ~~2~~ 3 PAS

Prepared for:
Hanford Natural Resource Trustees

Prepared by:
U.S. Fish and Wildlife Service
Upper Columbia River Basin Field Office
11103 East Montgomery Drive, Suite 2
Spokane, Washington
99206

~~October 15, 1997~~
11/20/97

DRAFT OUTLINE for FINAL DRAFT PAS

I. Introduction

A. ~~Purpose~~ Background of a Preassessment Screen (PAS)

(Similar to content in current draft of PAS)

B. ~~Purpose of the Hanford 1100 Area PAS~~ Hanford Trustee Council

(To be developed trustees (Chris))

C. Scope of 1100 Area Preassessment Screen

(Similar to content in current draft of PAS)

II. Background of the Hanford 1100 Area

A. General Site History

(Appendices will be referred to here)

~~III.~~ 1100 Area PAS Decision Process

A. Process

(Discuss how each site was evaluated using background information, site visits, and site photos)

B. Conclusions

(Discuss the conclusions as outlined in Geoff's November 14, 1997 letter to Toni)

C. Determination

(In this section the decision on whether or not or how to proceed with the 1100 Area will be discussed)

Toni's

I. Introduction

A. Background of a Preassessment Screen

Authority for response, remediation, and enforcement of hazardous waste sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) has been given to the Environmental Protection Agency (EPA). In addition to EPA's authority, section 301(c) of CERCLA required the President to promulgate rules for the assessment of damages for injury to, destruction of, or loss of natural resources resulting from a discharge or release of a hazardous substance. The President delegated this authority to the Department of the Interior (DOI) in Executive Order 12580. With this authority the DOI developed regulations for conducting a Natural Resource Damage Assessment (NRDA) (43 CFR Part 11) with the purpose of calculating monetary damages for injuries to natural resources, should a defensible claim become necessary in a court of law.

Through Executive Order 12580 and the National Contingency Plan (NCP), the President designated the Secretaries of the Interior, the Department of Energy, Commerce, Defense, and Agriculture as Federal Trustees. Trustees also include the Governors of each State, and Indian tribes that hold treaty rights. These agencies act as "natural resource Trustees" for resources that fall under their purview. To address overlapping trusteeship, the NRDA procedures encourage the formation of a Trustee Council for each NRDA case. The NCP spells out the responsibilities of the trustees following notification or discovery of a natural resource injury, loss, or threat. Natural resource trustees have a broad mandate to protect and restore resources under their jurisdiction. Therefore, the responsibilities of the trustees are not restricted to any single point in the Superfund process. CERCLA Section 104(b)(2) calls for coordination between the EPA and the trustees on assessments, investigations, and planning. This requirement applies to removal, remediation, and enforcement at a Superfund site.

Natural Resource Damage Assessment's are not intended to support response or remedial activities, but to supplement them by providing compensation to the public for injury to natural resources as a result of a chemical spill or release of a hazardous substance under CERCLA. If remedial actions are judged insufficient to protect and restore natural resources injured by releases from a Superfund site, or if the use of a natural resource is lost or curtailed, natural resource trustees may seek to collect damages from responsible parties through the NRDA process. The NRDA Regulations outline four major sequential phases for conducting a damage assessment: a) Preassessment; b) Assessment Planning; c) Conducting the Assessment; d) Post-assessment. The preassessment phase is used to determine if there is reason to proceed with an NRDA. Before beginning any NRDA efforts a preassessment screen (PAS) should be conducted making a determination as to whether an NRDA shall be carried out.

The purpose of a Preassessment Screen (PAS) is to determine whether a discharge or release of hazardous substances warrants proceeding with a Natural Resource Damage Assessment (NRDA). By definition, a PAS is "a rapid review of readily available information...[to] ensure that there is a reasonable probability of making a successful claim" and, therefore, whether to proceed with the damage assessment itself. (43 CFR § 11.23(b))

A Trustee may only proceed past the preassessment phase to a full NRDA if the trustee can demonstrate that the following conditions have been satisfied:

1. A release of a hazardous substance has occurred;

2. Natural resources for which a Federal Agency, State, or Indian Tribe may assert trusteeship under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) have been, or are likely to have been, adversely affected by the release;

3. The quantity and concentration of the released substances are sufficient to potentially cause injury to those natural resources;

4. Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost; and

5. Response actions, carried out or planned, do not and will not sufficiently remedy the injury to natural resources without further action.

As described at 42 U.S.C. § 9607, certain natural resource damages are excluded from liability under CERCLA. The damage assessment regulations, at 43 CFR § 11.24 (b)&(c), provide that an assessment under the rules should not be continued for potential injuries meeting one or more of the statutory exceptions under CERCLA and the CWA.

Damages excluded from liability under CERCLA include:

The authorized official shall determine whether the damages:

- Resulting from the discharge or release were specifically identified as an irreversible and irretrievable commitment of natural resources in an environmental impact statement or other comparable environmental analysis, that the decision to grant the permit or license authorizes such commitment of natural resources, and that the facility or project was otherwise operating within the terms of its permit or license so long as, in the case of an Indian tribe occurring pursuant to a Federal permit or license, the issuance of that permit or license was not inconsistent with the fiduciary duty of the United States with respect to such tribe; or

- And the release of a hazardous substance from which the release and all resulting damages occurred wholly before enactment of CERCLA; or

- Resulted from the application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act; or

- Resulted from any other federally permitted release, as defined in section 101(10) of CERCLA; or

- Resulting from the release or threatened release of recycled oil from a service station dealer described in section 107(a)(3) or (4) of CERCLA; if such recycled oil is not mixed with any other hazardous substance is stored, treated, transported or otherwise managed in compliance with regulations/or standards promulgated pursuant to section 3014 of the Solid Waste Disposal Act and other applicable authorities.

Damages excluded from liability under the CWA include:

- Discharges in compliance with a permit under section 402 or resulting from circumstances identified and reviewed and made a part of the public record with respect to a permit issued or modified under section 402 or continuous or anticipated intermittent discharges from a point source, identified in a permit or permit application under section 402; or

- Discharges of oil into the waters of the contiguous zone ore which may affect natural resources belonging to, appertaining to, or under exclusive management authority of the United States, where permitted under the International Convention for the Prevention of Pollution of the Sea by Oil; or

- Discharges of oil where permitted in quantities and at time and locations or under such circumstances or conditions as the President may, by regulation, determine not to be harmful.

B. Hanford Trustee Council

The Hanford Natural Resource Trustee Council (NRTC) was formed in 1993 as a collaborative working group chartered to address natural resources impacted by Hanford Site releases of hazardous substances. The NRTC consists of Trustee representatives from the United States Department of Energy, United States Department of the Interior, Nez Perce tribe, State of Oregon, Confederated Tribes of the Umatilla Indian Reservation, State of Washington (including the Departments of Ecology and Fish and Wildlife) and the

Confederated Tribes and Bands of the Yakama Indian Nation. The objectives of the NRTC are:

- To help ensure that natural resource values are fully considered in decision-making related to the Hanford Site.

- To integrate, to the extent practicable, natural resource restoration into cleanup actions and to minimize additional injuries to natural resources during cleanup.

- To encourage the development and implementation of sitewide natural resource planning whcih supports mitigation, restoration, and management goals, and encompasses good stewardship practices.

- To provide the Department of Energy and regulatory agencies the information necessary to achieve objectives 1-3 above.

In 1996, a Memorandum of Agreement (MOA) among Trustee agencies was signed. The MOA is intended to facilitate the coordination and cooperation of the Trustees in their efforts in restoring, and minimizing impacts to, natural resources injured as a result of, or during clean up of, releases associated with the Hanford Site. The Hanford 1100 Area is one of two areas where the NRTC is currently involved in the NRDA process.

C. Scope of 1100 Area Preassessment Screen

This 1100 Area PAS follows the requirements outlined in 43 CFR § 11.24 for conducting a PAS. It only addresses Operable Units (OUs) and potentially affected adjacent areas associated the 1100 Area National Priorities (NPL) List Site of the Hanford Site. Natural resource issues and concerns about other Superfund sites at or adjacent to Hanford will not be addressed in this document. The scope of the 1100 Area PAS was agreed upon by the Hanford Natural Resource Trustee Council. Department of Energy (DOE) and U.S. Fish and Wildlife Service (USFWS) entered into an Interagency Agreement (IAG) with concurrence from all natural resource trustee agencies to conduct the 1100 Area PAS.

Two CERCLA remediation documents have been previously written for the 1100 Area to be considered as PAS's; 1) the Remedial Investigation/Feasibility Study (RI/FS) for the 1100-EM-1 OU and 2) the Hanford Arid Lands Ecology Reserve (ALE) PAS. These documents were not produced by the entire natural resource trustee council nor did they contain the necessary information as required by 43 CFR 11 to be treated as official PAS's. However, relevant information from these documents has been incorporated into this current 1100 Area PAS.

1. Potentially Responsible Parties

Move to Appendix A.3

As defined in 42 U.S.C. § 9607 (107(a)) of CERCLA a potentially responsible party is any individual or company (such as owner, operator, transporter, or generator) potentially responsible for, or contributing to, the contamination problems at a Superfund site.

The current Hanford Site operations began in 1943, and DOE facilities are located throughout the Site. From 1950 to 1961 the Department of Defense (DOD) established Camp Hanford to provide air defense for the Hanford Works. In 1963, a large military maneuver took place over parts of the ALE Reserve. Land/ buildings on the Hanford Site are leased (?) To contractors and other companys conducting research and .....

II. Background of the Hanford 1100 Area

A. General Site History

The DOE's Hanford Site (Site) was listed on the National Priorities List (NPL) in July 1989 under authorities granted by CERCLA. The Hanford Site is a 560-square mile federal facility located along the Columbia River in southeastern Washington, situated north and west of the cities of Richland, Kennewick, and Pasco, an area commonly known as the Tri-Cities.

The Hanford Site was established during World War II as part of the Army's "Manhattan Project" to produce plutonium for nuclear weapons. Hanford Site operations began in 1943, and DOE facilities are located throughout the Site and the City of Richland. Certain portions of the Site are known to have cultural significance. Some sites are eligible for listing or have been listed in the National Register of Historical Places.

The land surrounding Hanford is used primarily for agriculture and livestock grazing. The major population center near Hanford is the Tri-Cities, with a combined population of over 100,000. The southwestern area of Hanford, covering 120 square miles, is designated as the Arid Lands Ecology Reserve (ALE) and is currently managed by the USFWS.

The Site is divided into designated areas and Operable Units (OU). Designated locations for identification include the 100, 200, 300, 400, 600, 700, 1100, and 3000 Areas. In 1988, the Hanford Site was scored using the Environmental Protection Agency's (EPA) Hazard Ranking System. As a result of the scoring, the Hanford Site was added to the National Priorities List as four sites (1100 Area, 100 Area, 200 Area, and 300 Area). The 1100 Area includes portions of the 600, 700, and 3000 Areas and Arid Lands Ecology Reserve (ALE). The 1100 area has been further divided into OUs (a grouping of individual waste management units based primarily on geographic area and common waste sources). Background on operations, discharges of hazardous substances, remediation, and potential injury to natural resources for each OU is thoroughly addressed in Appendix A.

3

In anticipation of the NPL listing, DOE, EPA, and Washington Department of Ecology (Ecology), entered into a Federal Facility Agreement and Consent Order (commonly referred to as the Tri-Party Agreement or TPA) in May 1989. The TPA established a procedural framework and schedule for developing, implementing, and monitoring remedial response actions at Hanford. The agreement also addresses Resource Conservation and Recovery Act (RCRA) compliance and permitting.

III. 1100 Area PAS Decision Process

A. Process

B. Conclusions

Determination part

May a Damage Assessment be Undertaken at a Reasonable Cost?

Some of the sites within the OU's require additional information to determine the extent of contamination or if remediation is needed. Additional data collection and analyses can (can not) be obtained at a reasonable cost. (Section will need to be completed by trustees)

Will Response Action Alone Restore Natural Resources?

Individual sites within the OU's were selected for remediation during the remedial investigation process. In some cases the remediation was sufficient to clean up contamination and in others residual contamination is likely to exist. Restoration of the remediated sites has been limited, revegetation has occurred at three of the landfills within the 1100 Area. No mitigation has occurred for any adverse affects to natural resources from the release of hazardous substances or the clean up process itself.

Evaluation and Conclusions

Evaluation of Criteria Addressed by the Preassessment Phase

As noted earlier, 43 CFR Part 11 defines criteria by which the decision to proceed past the preassessment phase to a full assessment must be based. These criteria, and the corresponding conclusions based on this preassessment phase screen, are presented below.

A discharge or release of a hazardous substance has occurred.

Releases of listed hazardous substances are documented at sites within the 1100 Area OU's.

Natural resources for which the Federal or State agencies or Tribes may assert trusteeship have been, or are likely to be, adversely affected by the release.

Natural resources over which the federal and state agencies and tribes may assert trusteeship have been adversely impacted (groundwater, soil, vegetation) or likely to be affected.

The quantity and concentration of the released substances are sufficient to potentially cause injury to those natural resources.

Hazardous substances have been measured at injury-associated concentrations in the groundwater and soils.

Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost.

Some of the sites within the OU's require additional information to determine the extent of contamination or if remediation is needed. Additional data collection and analyses can (can not) be obtained at a reasonable cost. (Section will need to be completed by trustees)

Response actions (i.e., remedial response activities at the site) will not sufficiently remedy the injury to natural resources.

Individual sites within the OU's were selected for remediation during the remedial investigation process. In some cases the remediation was sufficient to clean up contamination and in others residual contamination is likely to exist. Restoration of the remediated sites has been limited, revegetation has occurred at three of the landfills within the 1100 Area. Limited restoration has occurred for any adverse affects to natural resources from the release of hazardous substances or the clean up process itself.

C. Determination

Current information summarized within this Preassessment Screen ..... (This section needs to be completed by trustees for the final PAS)

- Comments by Nov 7th
- Draft 2 by Nov 17th
  - 1 hardcopy, 1 elec. file
- work Group meeting Nov 6th
  - design screening tree

HANFORD 1100 AREA PREASSESSMENT SCREEN (PAS)

Draft 2 PAS

Comments
- Cr. in G.W. in EW-2 above WCL
- No table of clean-up levels
- replace contaminant with compound until proof of a release
- info on background conc.

Prepared for:
Hanford Natural Resource Trustees
- taken vs needed

Prepared by:
U.S. Fish and Wildlife Service
Upper Columbia River Basin Field Office
11103 East Montgomery Drive, Suite 2
Spokane, Washington
99206

- remove PRPs, end section of report

October 15, 1997

Conf Call 1:30 11/13

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I. Introduction

The purpose of a Preassessment Screen (PAS) is to determine whether a discharge or release of hazardous substances warrants proceeding with a Natural Resource Damage Assessment (NRDA). By definition, a PAS is "a rapid review of readily available information...[to] ensure that there is a reasonable probability of making a successful claim" and, therefore, whether to proceed with the damage assessment itself. (43 CFR § 11.23(b))

The criteria on which the decision to proceed past the preassessment phase to a full assessment must be based on:

1. A release of a hazardous substance has occurred;

2. Natural resources for which a Federal or State agency or Indian Tribe may assert trusteeship under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) have been, or are likely to have been, adversely affected by the release;

3. The quantity and concentration of the released substances are sufficient to potentially cause injury to those natural resources;

4. Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost; and

5. Response actions, carried out or planned, do not and will not sufficiently remedy the injury to natural resources without further action.

As described at 42 U.S.C. § 9607, certain natural resource damages are excluded from liability under CERCLA. The damage assessment regulations, at 43 CFR § 11.24 (b)&(c), provide that an assessment under the rules should not be continued for potential injuries meeting one or more of the statutory exceptions under CERCLA and the CWA.

Damages excluded from liability under CERCLA include:

1. Results from the discharge or release were specifically identified as an irreversible and irretrievable commitment of natural resources in an environmental impact statement or other comparable analysis ..... in the case of an Indian tribe occurring pursuant to a Federal permit or license, the issuance of that permit or license was not inconsistent with the fiduciary duty of the United States with respect to such tribe; or

2. The release of a hazardous substance from which the release and all resulting damages occurred wholly before enactment of CERCLA; or

3. Resulted from the application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act; or

4. Resulted from any other federally permitted release, as defined in section 101(10) of CERCLA; or

5. Resulting from the release or threatened release of recycled oil from a service station dealer described in section 107(a)(3) or (4) of CERCLA; or

Damages excluded from liability under the CWA include:

1. Discharges in compliance with a permit under section 402 or resulting from circumstances identified and reviewed and made a part of the public record with respect to a permit issued or modified under section 402 or continuous or anticipated intermittent discharges from a point source, identified in a permit or permit application under section 402; or

2. Discharges of oil into the waters of the contiguous zone ore which may affect natural resources belonging to, appertaining to, or under exclusive management authority of the United States, where permitted under the International Convention for the Prevention of Pollution of the Sea by Oil; or

3. Discharges of oil where permitted in quantities and at time and locations or under such circumstances or conditions as the President may, by regulation, determine not to be harmful.

I.A. Scope of 1100 Area Preassessment Screen

This 1100 Area PAS follows the requirements for conducting a PAS and only addresses Operable Units (OUs) and potentially affected adjacent areas within the 1100 Area National Priorities (NPL) List Site of the Hanford Site. Natural resource issues and concerns about other Superfund sites at or adjacent to Hanford will not be addressed in this document. The scope of the 1100 Area PAS was agreed upon by the Hanford Natural Resource Trustee Council. Department of Energy (DOE) and U.S. Fish and Wildlife Service (USFWS) entered into an Interagency Agreement (IAG) with concurrence from all natural resource trustee agencies to conduct the 1100 Area PAS.

Two CERCLA remediation ~~PAS-related~~ documents have been previously written for the 1100 Area to be considered as PAS's; 1) the Remedial Investigation/Feasibility Study (RI/FS) for the 1100- EM-1 OU and 2) the Hanford Arid Lands Ecology Reserve (ALE) PAS. These documents were not produced by the entire natural resource trustee council nor did they contain the necessary information as required by 43 CFR 11 to be treated as official PAS's. However, relevant information from these documents has been incorporated into this current 1100 Area PAS.

I.B. Site History

The DOE's Hanford Site (Site) was listed on the National Priorities List (NPL) in July 1989 under authorities granted by CERCLA of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The Hanford Site is a 560-square mile federal facility

located along the Columbia River in southeastern Washington, situated north and west of the cities of Richland, Kennewick, and Pasco, an area commonly known as the Tri-Cities.

The Hanford Site was established during World War II as part of the Army's "Manhattan Project" to produce plutonium for nuclear weapons. Hanford Site operations began in 1943, and DOE facilities are located throughout the Site and the City of Richland. Certain portions of the Site are know to have cultural significance. Some sites are eligible for listing or have been listed in the National Register of Historical Places. ~~and may be eligible for listing in the National Register of Historical Places (EPA 1993).~~

The land surrounding Hanford is used primarily for agriculture and livestock grazing. The major population center near Hanford is the Tri-Cities, with a combined population of over 100,000. The southwestern area of Hanford, covering 120 square miles, is designated as the Arid Lands Ecology Reserve (ALE) and is currently managed by the USFWS.

The Hanford Site is divided into designated areas and OUs. Designated locations for identification include the 100, 200, 300, 400, 600, 700, 1100, and 3000 Areas. In 1988, the Hanford Site was scored using the Environmental Protection Agency's (EPA) Hazard Ranking System. As a result of the scoring, the Hanford Site was added to the National Priorities List as four sites (1100 Area, 100 Area, 200 Area, and 300 Area). The 1100 Area includes portions of the 600, 700, and 3000 Areas and ALE. Each of the 1100 areas ~~were~~ have been further divided

into OUs (a grouping of individual waste management units based primarily on geographic area and common waste sources).

In anticipation of the NPL listing, DOE, EPA, and Washington Department of Ecology (Ecology), entered into a Federal Facility Agreement and Consent Order (commonly referred to as the Tri-Party Agreement or TPA) in May 1989. The TPA ~~agreement~~ established a procedural framework and schedule for developing, implementing, and monitoring remedial response actions at Hanford. The agreement also addresses Resource Conservation and Recovery Act (RCRA) compliance and permitting.

II. Discharge or Release of Hazardous Substances

~~**H. A. Site History and Relevant Operations**~~

~~**H.A.1. General**~~

II.A. Relevant Operations, Duration and Quantity of Release

II.A.1. 1100 Area

The 1100 Area NPL site is located in the southern portion of the Hanford Site (Figure 1) ~~(EPA 1993)~~. The 1100 Area consists of four OUs; the 1100 EM-1, 1100 EM-2, 1100 EM-3, and 1100 IU-1. Each unit is designated with a three-part code: the first part indicates the NPL site affiliation; the second part provides a shorthand description of the OU type (EM indicates

"equipment maintenance" and IU indicates "isolated unit"); and the third part indicates the actual OU. The 1100 Area was listed on the NPL based on the proximity of the 1100 EM-1, 1100 EM-2, and 1100 EM-3 OUs to groundwater wells used by the City of Richland to supply drinking water and a maximum of 15, 000 gallons of waste battery acid were disposed in a sand pit in the 1100-EM-1 unit (DOE, 1995b).

OU

~~Operable Units~~ 1100 EM-1, 1100 EM-2, and 1100 EM-3 are located in the southernmost portion of the Site and contain the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford Site. OU ~~Operable Unit~~ 1100 IU-1 is located on ALE on the northeastern slope of the Rattlesnake Hills, approximately 24 kilometers west from the rest of the 1100 Area (Figure ~~1~~ 2)(EPA 1993). The 1100 Area NPL includes portions of the 600, 700, and 3000 Areas. The 600 Area is mostly undeveloped land and contains some relatively remote facilities. The 700 Area consists primarily of administrative buildings located around the Federal Building in downtown Richland. The 3000 Area, located adjacent to the Hanford Site, consists mainly of administrative buildings.

OUs

The closest surface water bodies to the 1100 Area are the Columbia and Yakima Rivers. These rivers are approximately 1200 m and 6500 m, respectively, from the main 1100 Area. Available floodplain information indicated that the 1100 EM-2, 1100 EM-3, and 1100 IU-1 are not located within the limits of the Columbia and Yakima River flood events having return periods of less than 500 years (DOE 1992c).

OU

~~The~~ 1100- EM-1 has been assigned the highest priority among the Hanford 1100 Area OUs due to its proximity ~~to~~ the North Richland well field. Remedial Investigation /Feasibility Study (RI/FS) activities at ~~the~~ OU 1100 EM-1 were initiated in 1989, and a Phase I RI/FS was completed in August 1990. In the fall of 1992, EPA, DOE, and Ecology decided to accelerate the study and evaluation of the three other OUs so that all remedial actions in the 1100 Area could proceed as a single project. In place of extensive field investigations, a streamlined approach for ~~the~~ OU 1100 EM-2, 1100 EM-3, and 1100 IU-1 is contained in an addendum to the 1100 EM-1 RI/FS referred to as the Limited Feasibility Investigation/Focused Feasibility Study (LFI/FFS), April 1993. The Record of Decision (ROD) for the Hanford 1100 Area NPL site was published in September 1993. A baseline risk assessment comprised of a human health assessment and an ecological risk assessment was conducted as part of the Phase I RI/FS to evaluate current and potential effects of only ~~the~~ OU 1100-EM-1 contaminants on human health and the environment. The LFI/FFS for the three remaining ~~units~~ OUs (1100 EM-2, 1100 EM-3, and 1100 IU-1), characterized the nature and extent of contamination in groundwater and soils near these units. A qualitative baseline risk assessment (an evaluation of overall potential risk from these OUs made by comparing possible waste contaminant levels with existing State and Federal health-based guidelines), was conducted as part of the LFI/FFS to evaluate potential effects of contaminants on human health and the environment (EPA 1993).

As part of the investigations of the 1100 Area, Remedial Action Objectives (RAOs) were established and ~~are~~ site specific goals to define the extent of cleanup necessary to achieve the

reword

specified level of remediation at the site. These goals are formulated to meet the overall goal of CERCLA, which is to provide protection to overall human health and the environment. Contaminants of potential concern were identified based on a statistical and risk-based screening process in site~~d~~-affected media. The Phase I RI Report, the Baseline Residential Scenario Risk Assessment (BRSRA), and a Baseline Industrial Scenario Risk Assessment (BISRA) concluded that "there are no contaminants that pose risks to ecological receptors" (EPA 1993). No documents reviewed as part of this PAS investigated ~~conducted~~ or discussed natural resource injury as defined in 43 CFR 11.

Because the investigations for the 1100 EM-2 and 1100 EM-3 were not exhaustive, the risk assessment approach was not as specific as the approach used for the 1100 EM-1 and the RAOs ~~remedial action objectives~~ were more broadly defined. A qualitative evaluation of overall potential risk from the 1100 EM-2 and 1100 EM-3 was made by comparing possible waste site contaminant concentrations with existing state and federal health-based guidelines (principally, the State of Washington *Model Toxics Control Act* (MCTA)). The guidelines from the qualitative evaluation form the basis of the cleanup goals for the 1100 EM-2 and 1100 EM-3 OUs (DOE 1995b). The ROD specified that contamination found in the IU area would also be cleaned up to Washington State's MCTA (DOE 1994d).

A summary of existing RI/FS, LFI/FFS, and ROD data for all 1100 Area OUs is presented in Table 1. The following subsections will describe existing data for each OU in more detail.

II.A.2. 1100- EM-1

~~The 1100 EM-1 has been divided into several subunits based on the nature of previous use and potential contaminants (Figure 2)(DOE 1994b). These subunits are discussed in more detail in Section III.B.1.~~. The 1100 EM-1 is the largest of the three OUs in the main portion of the 1100 Area (Figure 2). The 1100 EM-1 is part of the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford site. Previous activities at the OU included landfill operations at the Horn Rapids Landfill (HRL), offices, warehousing, and transportation-related operations. Current activities include offices and transportation-related facilities (DOE 1995b). The 1100 EM-1 has been divided into several subunits based on the nature of previous use and potential contaminants (Figure 3).

see comment 7

Evaluation of human health and environmental risks for the 1100 Area was conducted for the 1100 EM-1 site only. The assessment consisted of evaluating the results of the remedial investigations to develop an initial list of Contaminants of Potential Concern (COPC). The COPC list was further evaluated and screened in accordance with the Hanford Site Baseline Risk Assessment Methodology (HSBRAM) and in consultation with EPA Region 10. HSBRAM is based on EPA's *Risk Assessment Guidance for Superfund* (RAGS) and other EPA guidance (both national and Region 10). A BRSRA and a BISRA were conducted in accordance with the HSBRAM.

what are these?

The objective of the Ecological Risk Assessment for 1100 EM-1 was to provide an evaluation of the site specific ecological risks. Given the uncertainty in information available, risk calculations were not performed for the evaluation (EPA 1993). Ecological risk was estimated by comparing exposure to contaminant toxicity. Potentially sensitive habitats chosen for the 1100 EM-1 site included habitats known to be frequented by designated or proposed, endangered or threatened species. In determining ecosystems potentially at risk at 1100 EM-1, only terrestrial organisms were considered. No toxicological studies were performed on species inhabiting the 1100 EM-1 for the Phase I or II Remedial Investigations (EPA 1993).

The 1100 EM-1 characterization investigations started in 1989, and a Phase I Remedial Investigation Report was produced in 1990. These activities were followed with a Phase I and II Feasibility Study Report in 1990. The phase II remedial investigations began in 1991, and a Draft Phase II Remedial Investigation Report/Phase III Feasibility Study was submitted in 1992 (DOE 1995b).

Operations at 1100 EM-1 have included the use of solvents, fuels, oils, and PCBs. Based on past practices and anecdotal information from the 1100 EM-1, ten sites were identified for investigation: the battery acid pit, the paint and solvent pit, the antifreeze and degreaser pit, the antifreeze tank site, ~~the radiation contamination incident site at~~ the discolored soil site, the Horn Rapids Landfill (HRL), ephemeral pool, pit #1, UN-1100-5- Radiation Contaminant Incident, and the Hanford Patrol Academy. ~~and the south pit~~. The antifreeze tank site was part of the 1100 EM-1 OU, but was investigated and remediated during the 1100 EM-1 investigation work. Eliminated

2

from further consideration for remediation during the Phase I Remedial Investigations was pit #1 and UN-1100-5- Radiation Contaminant Incident site because of a lack of substantive contamination detected. The Hanford Patrol Academy was also not addressed further during the remedial investigations because of the anticipation that it would be addressed separately (DOE 1992a).

add more info

Investigations of the 1100 EM-1 included radiological surveys, geophysical surveys, soil-gas surveys, intrusive trenching activities to explore subsurface conditions, surface and subsurface soil sampling and laboratory analyses, groundwater level monitoring, and groundwater sampling and laboratory analysis. Surface radiation surveys were conducted at all 1100 EM-1 subunits. All radiation surveys were negative. These subunits were not further investigated for surface radiation (DOE 1992a).

The following 1100 EM-1 ~~contains the several~~ waste sites ~~that~~ were investigated.

II.A.2.a. 1100-1- The Battery Acid Pit

The Battery Acid Pit is an unlined, sand-filled sump, or french drain approximately 30 m from the southwest corner of the 1171 Building, used for disposal of waste acid from vehicle batteries. During its use, the pit was approximately 1.8 m in diameter and 1.8 m deep. The pit is no longer visible because it was filled and graded to match the surrounding surface when it was removed from service. Historical documents record an estimated 57, 000 liters of battery acid wastes may have been disposed of during its operating years (1954 - 1977) (DOE 1992a).

9480-8782

Information gathered through interviews with former site workers suggest that other substances including waste oil, waste antifreeze, and spent solvents were also deposited in the pit. No documentation exists to support these claims. Periodically, during the operation of this facility, the acid-laden sand fill ~~lining~~ was removed and deposited at an undetermined location and fresh sand fill installed (DOE 1992a).

unknown

A geophysical survey was conducted over the area to find the exact location of the pit. Five soil gas probes were installed as part of the first phase, no contamination was detected. A single soil boring was made, yielding one sample from the surface and seven from the subsurface strata. Inorganic contaminants were found in surface and subsurface samples. No organic contaminants were detected at this site. Contaminants detected are listed in Section II.B.. Concentrations of contaminants are listed in Table 2. No additional work was performed during the second phase of investigations (EPA 1993). Nothing exceeded action levels (check ROD)

II.A.2.b. 1100-2 - The Paint and Solvent Pit ok, area already disturbed.

The Paint and Solvent Pit is a semicircular depression located approximately 1.6 km north of the 1171 Building. The pit has an approximate diameter of 108 m and a depth of 1.2 m to 1.8 m. Originally a sand and gravel pit, the site was used during the period between 1954 through 1985 for the disposal of construction debris generated during demolition of Hanford Site facilities. Principal components of the waste include concrete rubble, asphalt, and wood debris. Undocumented disposal of waste paint, solvent, and paint thinner is also reported to have occurred at this site (DOE 1992a).

A geophysical survey was conducted over the floor of the pit. Rubble and other construction debris were found. During phase I of the investigations soil gas samples were collected and analyzed. Relatively high readings of tetrachloroethene (PCE) were found in the southwest corner of the site. Peak concentrations of PCE were as high as 727 parts per billion by volume (ppbv) ~~µg/L~~ with values decreasing in all directions away from the maximum concentration. Areal distribution of the positive soil-gas readings suggested the potential for an isolated, shallow accumulation or small surface spill within the pit. No other volatile contaminants were detected during the soil-gas survey (EPA 1993).

Four boreholes drilled at this site yielded 4 surface samples and 29 subsurface soil samples. In addition, soil samples were obtained at 20 surface locations within the pit area. Inorganic, organic and pesticide contamination was detected in surface and subsurface soil samples. Contaminants detected are listed in Section II.B.. Concentrations of contaminants are listed in Table 2. No additional work was performed during phase II of the investigations (EPA 1993).

Not likely exceeds action levels.

II.A.2.c. 1100-3 - The Antifreeze and Degreaser Pit

The Antifreeze Degreaser Pit is a shallow, roughly circular depression located approximately 1.6 km north of the 1171 Building on the west side of the Hanford Rail Line. Originally a sand and gravel source for construction activities on the Site, it was used during the period of 1979 to 1985 as a disposal site for waste construction material, principally roofing and concrete rubble. The pit is approximately 76 m in diameter and 1.8 to 2.4 m deep. Occasional disposal of waste antifreeze

and degreasing solutions from the 1171 Building was suspected, but not documented, at this location (DOE 1992a).

A geophysical survey was conducted over the floor of the pit. Rubble and other construction debris were found. Forty-three soil gas samples were collected and no contaminants were detected. Twenty-three surface samples were collected and twenty-four subsurface samples were obtained from four boreholes. Inorganic contaminants were found in surface and subsurface samples. No organic contaminants were detected at the Antifreeze and Degreaser Pit. Contaminants detected are listed in Section II.B.. Concentrations of contaminants are listed in Table 2. No additional work was performed during phase II of the investigations (EPA 1993). Nothing exceeded action levels

II.A.2.d. 1100- 4- The Antifreeze Tank ok in bldg.

The Antifreeze Tank was a former 19,000 L steel, underground storage tank used for waste vehicle antifreeze. The tank was located beneath the floor of the northern-most portion of the 1171 Building. The tank was installed in 1976 and emptied, cleaned, and removed in 1986 due to suspected leakage. No evidence of leakage was detected when the tank was removed (DOE 1992a).

During tank removal, three soil samples were collected from the base of the excavation. No detectable levels of antifreeze were identified. In November 1989, thirteen vadose zone samples

were collected from beneath the building where the waste site is located. A single sample detected ethylene glycol at a concentration of 2.6 parts per million ~~(ppm)~~ (DOE 1992a). Inorganics contaminants detected at the site are listed in Section II.B.. Concentrations of contaminants are listed in Table 2. No additional work was performed during phase II of the investigations (EPA 1993).

II.A.2.e. UN-1100-6- The Discolored Soil Site

The Discolored Soil Site consisted of a patch of oily dark stained soil located in the eastern end of an elongate east-west oriented depression approximately 610 m northwest of the 1171 Building on the west side of the Hanford Rail Line. The depression extended over an area of approximately 0.2 ha; the actual area of discolored soil covered an area of about 1.8 m by 3.1 m. The source of the soil discoloration appeared to be the isolated, unauthorized disposal of contents of one or more containers of liquid material to the ground surface. No record exists that identifies the nature or origin of the waste material deposited at the site (DOE 1992a).

Fifteen surface soil samples were obtained from this site during the phase I remedial investigation. Contaminants identified in surface soil samples collected during the Phase I investigation included inorganic, organic, and pesticide compounds. Contaminants detected at the site are listed in Section II.B.. Concentrations of contaminants are listed in Table 2. After a thorough review of analytical results from the surface soil sampling and a field examination of the site, it was deemed to be a inefficient use of time, given the project schedules, and not cost effective to perform sampling of subsurface soils (DOE 1992a).

During the phase II investigation fourteen soil-gas probes were installed at the site and samples did not identify any contaminants. No other soil-gas work was performed during the second phase of investigations (EPA 1993).

Remediation of the discolored soil site began in February 1995, with the excavation and stockpiling of 70 m^3 of waste material (principally, bis (2-ethylhexyl) phthalate (BEHP)). Confirmation sampling indicated that the removal action met the cleanup level of 71 mg/kg for BEHP established in the ROD. The site was regraded to a smooth, uniform surface. The contaminated soil was excavated and stockpiled and the waste was transported in April 1995. The BEHP-contaminated soil was disposed of by incineration (DOE 1995b).

II.A.2. f. The Horn Rapids Landfill Site

No discussion of C
(see page 75

The Horn Rapids Landfill (HRL) is located north of Horn Rapids Road near its intersection with Stevens Drive, the HRL site extends over approximately 20 hectares within the 600 Area. It was operated from the 1940's into the 1970's as an uncontrolled landfill. Originally a borrow pit for sand and gravel, it was used as a landfill primarily for office and construction waste, asbestos, sewage sludge, fly ash, and reportedly, numerous drums of unidentified organic liquids. The landfill site is situated in a generally flat terrain. Five disposal trenches have been identified at the site through a study of historical aerial photographs, onsite investigations, and geophysical surveys. Surface debris consisting of auto truck tires, wood, metal shavings, soft drink cans and bottles, and other small pieces of refuse were scattered across the site. A single trench, the

western-most of the identified waste disposal trenches, was posted with signs warning that the trench contained asbestos (DOE 1992a).

During the phase I investigations geophysical surveys were performed and did not detect accumulated waste outside of the five identified waste disposal trenches. Soil-gas surveys were performed a the HRL and in surrounding areas to assist in vadose zone sampling. Two hundred and eleven temporary soil-gas extraction points were installed in the landfill area. Samples collected from these points detected trichloroethene (TCE); 1,1,1-trichloroethane (TCA); and PCE within the HRL. Trichloroethene was detected at 17 of the 36 permanent soil-gas extraction points installed within the limit of the HRL with concentrations ranging from 3 to 233 ~~parts per billion by volume~~ ppbv. Contaminants detected in the 50 surface soil samples and 55 subsurface soil samples are listed in Section II.B.. Concentrations of contaminants are listed in Table 2. It should be noted that during the phase I investigations, boreholes were intentionally sited to avoid drilling through known and suspected waste deposits. This placed substantial limitations on the representativeness of the soil quality results of the phase I data (DOE 1992a).

During the phase II investigation, additional soil-gas surveys, geophysical surveys, surface and subsurface soil sampling were performed. Second phase soil-gas surveys detected TCE at concentrations from 2 to 255 ppbv in 36 of the 53 probes. The highest TCE concentrations were obtained just outside the disturbed portions at the eastern limits of the HRL. Additional geophysical surveys were conducted to further identify accumulation of drums containing organic solvents said to have buried at the HRL. Areas that might represent an accumulation of drums

were further investigated with test pits. During excavation of the test pits various types of debris and two small deposits of chemicals were discovered. One (white crystalline powder) was identified as sodium bisulfate and the other (bright purple stained soil) was identified as potassium permanganate. Thirteen subsurface soil samples were taken from the test pits that detected manganese and Dieldrin, neither had been detected during phase I sampling. Eight surface soil samples were taken to identify the areal extent of PCB contamination in the HRL. Fifteen additional surface soil samples were taken from the surface to further characterize two surface depressions in the HRL. Endosulfan II and Endrin were additional contaminants detected in the surface soil samples during the phase II investigations (EPA 1993).

Remedial actions began in January 1995, with the clearing and road pioneering work at the HRL. Excavation of the PCB-contaminated soil in the HRL also began in January 1995. The PCB-contaminated soil was excavated until field observance and field screening indicated that the soil did not exceed the 5 mg/kg cleanup criterion established in the ROD. The results of the confirmation sampling indicated that there was some contamination remaining that exceeded the cleanup criteria for PCBs and additional removal was performed. The additional removal was accomplished in March 1995. A total of 1,224 m^3 of PCB-contaminated soil (principally, the PCB Aroclor-1248) was excavated and stockpiled for eventual disposal. The construction of the closure cap for the HRL began in January 1995, and was constructed of material from a nearby borrow area. The cap was completed in April 1995. Five groundwater-monitoring wells were installed in August 1995, downgradient of the landfill to facilitate compliance evaluation and the remedial action objectives. Compliance with Maximum Contamination Levels (MCLs) is

anticipated by the year 2018. The PCB-contaminated soil was transported in March and April 1995. Revegetation of the site was conducted ~~began and was completed~~ in November 1995 (DOE 1995b). To stabilize the topsoil and protect the landfill cap, the area was revegetated with crested wheatgrass and Siberian wheatgrass. These species were selected because the main objective for revegetation was stabilization rather than to reestablish a native community. Five different planting treatments were evaluated to determine the best technique and provide information that will be used in planning future restoration projects. In June, the vegetation growing on the landfill was measured for percent canopy cover and percent frequency. At this time, the revegetation efforts appear to have been successful.

ok, sources unknown surrounding habitat non-existent (all developed)

II.A.2.g. The Ephemeral Pool

The Ephemeral Pool site is a long narrow, manmade depression located along the western edge of the asphalt-paved 1171 Building parking area. The depression acted as a drainage collection point for precipitation runoff flowing from the parking area surface. Overall dimensions are approximately 6.1 m wide (east-west) by 183-213 m in length (north-south). The Ephemeral Pool was designed to collect runoff from the parking area and direct it to a central culvert approximately at the lengthwise mid-point of the depression. Settlement and/or poor grading of the depression floor results in the formation of a series of linked pools after rainfall events that temporarily holds a portion of the collected moisture within the drainage way until it evaporates or infiltrates into the ground. A pervious gravel lining encourages infiltration of the collected runoff into the vadose zone beneath this site (DOE 1992a).

During the Phase I investigations two surface soil samples were taken within the Ephemeral Pool. Results of the analyses indicated the presence of PCBs in low to moderate concentrations (300 to 4700μg/kg). Surface soil samples collected identified the presence of inorganic and organic contaminants (DOE 1992a). Contaminants detected at the site are listed in Section II.B.. Concentrations of contaminants are listed in Table 2.

Six surface soil samples were collected during the Phase II investigations and submitted for PCB and pesticide analyses. Laboratory results confirmed the presence of alpha (210 μg/kg) and gamma (1100 μg/kg) chlordane. Two of the seven samples detected concentrations of PCBs (Aroclor 1260) at 11,000 and 42,000μg/kg (DOE 1992a).

Ephemeral pool remediation began in February 1995, with an initial phase of sampling. In March 1995, excavation and stockpiling of waste (principally, the PCB Aroclor-1260) began. Approximately 70 m^3 of contaminated soil was excavated, with a large volume of remaining contaminated soil having PCB-contamination concentrations of between 0.5 and 2 mg/ kg when work was halted for consultation with the regulatory agencies and DOE. Following consultation, the final phase of the excavation and stockpiling resumed, and 115 m^3 of waste material was removed. Confirmatory sampling indicated that the removal action met the requirements based on the cleanup level of 1 mg/kg for PCB's as established in the ROD. The site was regraded to a smooth, uniform surface. The contaminated soil was excavated and stockpiled. The PCB-contaminated soil was disposed of at a RCRA, Class C/TSCA (Toxic Substances Control Act)

— no backfill

off-site hazardous waste landfill. The PCB-contaminated soil was transported in April 1995 (DOE 1995b).

~~II.A.2.b. 1100-EM-2~~

II.A.3. 1100-EM-2

The 1100 EM-2 is located in the southwest corner of the Hanford site near the border of the City of Richland and lies within the southern portion of 1100 EM-1 (Figure ~~2~~ 3)(DOE 1994b). Prior to 1950, a few small farms occupied what is now the 1100 EM-2 area. The main feature is the 1171 Building which was constructed in the early 1950's as a vehicle service maintenance and repair facility. The site also served as a warehousing and transportation distribution center. Today, most of these activities ~~along with gas station services and support of the Hanford Site bus transportation system~~ still occur in the 1100 EM-2 area (DOE 1992c). During the LFI/FFS principal sites were identified for investigation, these subunits are further discussed later ~~in more detail in III.B.2..~~

Remedial investigations at the 1100 EM-2 site were conducted during the LFI/FFS process between October 1992 and January 1993. Initially, the Hanford waste information data system was reviewed for data on waste types handling practices, or known soil or groundwater contamination at the 1100 EM-2. Historical information including aerial photographs and as-

built construction drawings were also reviewed. All of the sites were inspected and, whenever possible, knowledgeable personnel were interviewed (EPA 1993).

The main waste management sites in 1100 EM-2 consist of used oil tanks, steam pad and hoist ram storage tanks, and hazardous waste staging area. Operations in 1100 EM-2 potentially included the use of solvents, fuels, oils, and polychlorinated biphenols (PCB's). The principal sites investigated during the LFI/FFS were the tar flow area, stained sands area, Neptune's potato and separator tank, several used oil tanks (#4 to #6), steam pads (#1 and #2), the bus shop underground hoist ram, the 700 Areas, waste solvent tank, bus lot dry wells, and a hazardous waste staging area (DOE 1992c). Many sites were currently under regulation (under a statute other than CERCLA or Washington State Model Toxics Control Act (MCTA)) by the state of Washington, EPA, or candidates for regulation under other programs (DOE 1992c).

~~During the remedial investigations of waste management sites in the 1100 EM-2 it was determined that all but three of the sites did not require further investigation or had already been remediated. The potential for contaminant migration was not rigorously investigated at any of the sites in 1100 EM-2 (DOE 1992c).~~

~~The principal sites investigated during the LFI/FFS were the tar flow area, stained sands area, Neptune's potato and separator tank, several used oil tanks (#4 to #6), steam pads (#1 and #2), the bus shop underground hoist ram, the 700 Areas, waste solvent tank, bus lot dry wells, and a~~

~~hazardous waste staging area (DOE 1992c). Many sites were currently under regulation (under a statute other than CERCLA or Washington State Model Toxics Control Act (MCTA)) by the state of Washington, EPA, or candidates for regulation under other programs (DOE 1992c).~~ However, the tar flow, stained sands, and Neptune's Potato and Separator Tank areas were designated for further examination. These sites were investigated by geophysical surveys, soil gas sampling, and soil sampling conducted in 1994 during the remediation investigations. After further investigations only the tar flow and stained sands were identified for remediation (DOE 1995b). ~~The potential for contaminant migration was not rigorously investigated at any of the sites in 1100 EM-2 (DOE 1992c).~~ The potential contaminants of concern that were identified through review of historical information, previous site investigations, and site reconnaissance activities (DOE 1992c) are listed in Section II.B..

The following sites ~~subunits~~ were identified for further remediation ~~investigation~~ during the LFI/FFS:

II.A.3.a. Tar Flow Area- ok, borrow area high level a disturbance no valuable habitat.

The Tar Flow Area is located about 320 m north of the northwest corner of Building 1171. A soft tar-like substance was observed to cover a ground surface covering an irregular area of approximately 61 m x 20 m. The source of tar-like material is unknown. Based on the results from the 1994 investigations and the cleanup goals for 1100 EM-2 , the tar flow area was identified for remedial action (the stained sands area was combined with the tar flow area for

remedial action). Surface soil samples collected at this site detected the presence of total petroleum hydrocarbons (TPH) and lead. Maximum concentrations of TPH (80,000 mg/kg) and lead (404 mg/kg) were detected to be above cleanup goals. As identified in the ROD, the remedial objective for this site was to excavate all soil with TPH exceeding 200 mg/kg and lead concentrations exceeding 250 mg/kg (DOE 1995a).

The remediation of the tar flow area began in June 1995, the waste transportation and disposal was completed in September 1995. The volume of petroleum contaminated soil excavated, 1,224m^3, was more significant than initially estimated. Following excavation, confirmatory sampling indicated that the removal actions met the requirements based on cleanup levels established in the ROD (DOE 1995b). The excavated sand was not replaced and more sand may have been borrowed from this site.

~~The same~~ The site also appears to have been utilized as a borrow site. ~~Furthermore~~ the use of the borrow material is unknown.

II.A.3.b. Stained Sands Area- ok

The Stained Sands Area is located approximately 274 m north of the northwest corner of Building 1171, an area of visibly stained sands of the east slope of a sand dune were identified. The stained soils were observed to cover an area of approximately 6m x 6m and an estimated 41 m^2 of contaminated soil. The stained sands area was included in the tar flow area for remedial actions.

- confirmatory sampling unknown
- excavated soil volume unknown

~~II.A.2.c. 1100-EM-3~~

II.A.4. 1100-EM-3

The 1100 EM-3 is located about 600 meters northeast of 1100 EM-2 (Figure 3). The 1100 EM-3 area contains approximately 20 permanent structures, some of which date back to 1951 (DOE 1994b). These buildings form the Hanford 3000 Area. Prior to 1943, the 1100 EM-3 was primarily used for agricultural activities. In 1943, new construction of temporary office buildings supporting construction and engineering at the newly formed Hanford site began on the 1100 EM-3. Throughout the 1940's the 1100 EM-3 and surrounding areas were used for office space and as an off-loading and warehousing area for construction supplies brought on the Atomic Energy Commission Hanford Works Railroad. By 1951, most of the temporary buildings were removed or demolished and replaced by permanent structures. The 1100 EM-3 was part of a larger military camp, "Camp Hanford", and contained automotive repair and maintenance shops, gasoline storage and dispensing stations, an artillery repair and maintenance shop, a laundry, a dry cleaner, a cold storage, warehouses, a bakery, troop barracks, and administrative offices. During the last 25 to 30 years, the 1100 EM-3 was used for office and warehouse facilities in support of Hanford construction activities. Past ~~Current~~ activities at the OU included paint and sandblast operations, vehicle maintenance and repair, hazardous material storage, RCRA waste accumulation areas, warehousing, fabrication shops radio maintenance, and radiography and research administrative

offices (DOE 1992c). Based on past practices at the 1100 EM-3, approximately 22 waste management units have been identified for detailed investigations. These subunits are further discussed later.

Investigations at the 1100 EM-3 site were conducted during the LFI/FFS process between October 1992 and January 1993. Initially, the Hanford waste information data system was reviewed for data on waste types, handling practices, or known soil or groundwater contamination at the 1100 EM-3. Historical information including aerial photographs and as-built construction drawings were also reviewed. All of the sites were inspected and, whenever possible, knowledgeable personnel were interviewed (EPA 1993).

Key waste sites in 1100 EM-3 include several hazardous waste storage and staging areas, a used oil underground storage tank (UST), and contaminated soil from a previously removed UST (Figure 4).

Based on past practices at the 1100 EM-3, approximately 22 waste management units were identified during the LFI/FFS (DOE 1992c). The potential contaminants of concern that were identified through review of historical information, previous site investigations, and site reconnaissance activities (DOE 1992c) are listed in Section II.B.. Many sites were currently under regulation (under a statute other than CERCLA or MTCA) by the state of Washington, EPA, or candidates for regulation under other programs. These sites were removed from further consideration for remedial action during the LFI/FFS. Sites remaining in the CERCLA

investigation for 1100 EM-3 were the 1240 Suspect Spill Area, 1240 French Drain, 1226 Suspect Waste Oil Disposal Area, 1212/1217 Suspect Battery Acid Disposal Area, 1218 Service Station, 1262 Solvent Tanks, 1262 Transformer Pad, JA Jones Oil Storage Tanks, and JA Jones Steam Plant Drain Pad. These remaining sites were further investigated by geophysical surveys, soil gas sampling and soil sampling conducted as part of the 1994 remediation investigation. The potential for contaminant migration was not rigorously investigated at any of the sites in 1100 EM-3 (DOE 1992c). Based on the remediation investigation results and the cleanup goals for 1100 EM-3, the French Drain, 1240 Suspect Spill Area, and the 1262 Solvent tanks were identified for remedial action (DOE 1995b).

Detailed discussion on the sites identified for ~~further investigation~~ remediation during the LFI/FFS ~~and remedial action~~ are to follow:

II.A.4.a. 1240 French Drain - ok, no issues, no vegetation

The 1240 French Drain is located on the west side of Building 1240. There is no documented evidence of spills into the drain that might have discharged into the surrounding soils, however, a polychlorinated biphenyl (PCB) collection area was located adjacent to the drain. Analyses identified lead, TPH, chromium, and PCB's present in the soil at the French Drain. Concentrations of lead, TPH, and chromium exceeded the ROD cleanup goals. Maximum detected concentrations included the following: lead (619 mg/kg), TPH (80,000 mg/kg), and chromium (949 mg/kg). Analyses for PCB's were done on sight indicating concentrations greater

than 1 mg/kg, but less than 10 mg/kg, exceeding the ROD cleanup goal . However, offsite analysis of the samples determined that PCB's in the drain were less than 1 mg/kg (DOE 1995a).

Remediation of the French Drain began in July 1995. A total of 62 m^3 of soil contaminated with lead, TPH, and chromium was excavated and stockpiled. Confirmatory sampling indicated that the removal action met the ROD cleanup level requirements of 240 mg/kg for lead, 200 mg/kg for TPH, and 400 mg/kg for chromium. The site was regraded and base materials were spread over the disturbed area. The soil was transported and disposed of in September 1995 (DOE 1995b).

II.A.4.b. 1240 Suspect Spill Area - ok, no issues, no vegetation

south - ?

The 1240 Suspect Spill Area is located at the ~~north~~ end of Building 1240. The area consisted of visibly stained soil as a result of spilled pliable adhesive mixed with metal fragments and floor sweepings. Concentrations of lead exceeding the ROD cleanup goals was determined present in the surface soils of the area. The maximum detected concentration of lead was 44,200 mg/kg (DOE 1995a).

Remediation of the spill area began in July 1995, with excavation and stockpiling of 54 m^3 of lead-contaminated soil. Confirmation sampling indicated that the removal action met the cleanup requirements for lead (250 mg/kg) identified in the ROD. The site was regraded and base

materials were spread over the disturbed area. The soil was stabilized, transported, and disposed of in September 1995 (DOE 1995b).

II.A.4.c. 1262 Solvent Tanks -

The underground storage tanks (USTs) were located west of the 1262 Building at the interface of the grass and the asphalt parking lot. The USTs were suspected to have contained solvent, potentially carbon tetrachloride, from dry-cleaning operations during Hanford's military era.

Upon excavation of the tanks in June 1995, it was discovered that one tank was filled with fluid and the other tank had only residual fluid. The tanks were sampled, indicating that the contents were nonhazardous water (DOE 1995b). The fluids were removed and discharged to the Richland sanitary sewer. The tanks were cleaned and removed in July 1995. Confirmation sampling from the soil below the tanks and the sides of the excavation detected no hazardous materials (DOE 1995b).

~~II.A.2.d. 1100-IU-1~~

II.A.5. 1100-IU-1

The 1100 IU-1 is located within the area known as the Arid Lands Ecology Reserve (ALE) (Figure 4). The ALE is approximately 195 square kilometers and is located on the northeastern slope of the Rattlesnake Hills, approximately 24 kilometers from the rest of the 1100 Area. The

land which comprises ALE was set aside as a Natural Research Area in 1967 by the Atomic Energy Commission to preserve shrub-steppe vegetation in Washington State and allow research in such habitat. The site consists of a former NIKE Missile Base consisting of structures which supported missile launch, control, and maintenance functions, living quarters for base personnel, and storage buildings for hazardous substances used in the maintenance of the physical plan and missile operations ~~(Figure 4)~~(USFWS 1996). ~~All base facilities are abandoned with the exception of the former barracks which are used for the Arid Lands Ecology Reserve (ALE) Headquarters.~~

Investigations at the 1100 IU-1 site were conducted during the LFI/FFS process between October 1992 and January 1993. Initially, the Hanford waste information data system was reviewed for data on waste types, handling practices, or known soil or groundwater contamination at the 1100 IU-1. Historical information including aerial photographs and as-built construction drawings were also reviewed. All of the sites were inspected and, whenever possible, knowledgeable personnel were interviewed (EPA 1993). Investigations identified 32 ~~areas~~ sites within 1100 IU-1 that required detailed investigation and/or remediation. These ~~subunits~~ sites are discussed later in more detail. ~~in Section III.B.4..~~

Operable Unit 1100 IU-1 consists of two main areas. One area is located at the top of Rattlesnake Mountain, north of the main missile launch facility, known as the Nike Missile Control Center. It is a compound with a pumphouse, small support structures, and launch control facilities. The second area, known as the NIKE Missile Launch Site ~~Area~~, is located on the southeast slope of the Rattlesnake Hills and includes a number of permanent structures used in the maintenance of the

missile site and housing operations personnel (Figure 5). The ~~majority of the~~ Launch Site ~~Missile Area~~ facilities have been abandoned ~~with the exception of a barracks building at the main site which houses the Arid Lands Ecology (ALE) Reserve Headquarters.~~

In the late 1960's, the buildings at the southwest end of the 1100 IU-1 were converted into the headquarters of the ALE Laboratory. The laboratory facilities were abandoned in 1995. The buildings and missile facility at the northeast end of the 1100 IU-1 have not been known to be used for any significant waste-producing activities since the ending of NIKE operations in the late 1960's and are intact, but abandoned, today .

~~The NIKE missile site consisted of two separate and distinct operating units: the launch area, located on the northeast slope of Rattlesnake Mountain, and the Integrated Fire Center (IFC) area, located on the top of the mountain.~~ Activities at the 1100 IU-1 included maintenance of the missile batteries in combat-ready status requiring the storage, handling, and disposal of missile components as well as solvents, fuels, hydraulic fluids, paints, and other materials. Typical chemicals used at the 1100 IU-1 ~~site~~ include aniline, petroleum distillates, chlorinated solvents such as carbon tetrachloride (CCl_4), TCE, TCA, and PCE, chromium oxides, acetone, paints containing chromium and lead, tricesyl phosphate, ethylene glycol, pesticides, herbicides, PCBs, and hydraulic fluid (DOE 1992b). Areas of concern at 1100 IU-1 include former septic fields that may have been used for solvent disposal, storage tanks, disposal sites, and landfills.

rewrite

The following 30 ~~The 32~~ ~~areas~~ sites within 1100 IU-1 that required detailed investigation and/or remediation ~~are discussed in the following subsections~~ are to follow. Work plans for remedial actions were carefully reviewed by Ecology, EPA, DOE, and USACE (U.S. Army Corp of Engineers) for compliance with all EPA, DOE, and USACE quality assurance/quality control (QA/QC) procedures and protocol.

II.A.5.a. 6652-C SSL Active Septic System- ok, but tank not sampled

Discharge from this septic system has been observed over a slope northeast of the administrative building. The estimated area covered by the septic system field is approximately 11 m by 2 m. In addition, a 2500-gallon septic tank is associated with this septic system. Solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal; therefore, potential contaminants may include chlorinated and nonchlorinated solvents (DOE 1994d).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any volatile organic compounds (VOCs) were present in the soils at the end of the septic system discharge pipe. On-site laboratory equipment was used to analyze the samples collected for selected VOCs. ~~Results for VOCs are listed in Table 1-1 in DOE 1994c.~~ No VOCs were detected in the soil samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994a) no remedial action was taken ~~needed~~ at this waste management unit (DOE 1994d).

II.A.5.b. 6652-C SSL Inactive Septic System

? could find

Due to the possibility that solvents and other wastes were disposed of in septic systems, this area required additional investigation. The estimated area covered by the septic system field is 9 m by 92 m. In addition, a 9375 L septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal; therefore, potential contaminants include chlorinated and nonchlorinated solvents (DOE 1994d).

II.A.5.c. Radar Berm and Pads

Large amounts of hydraulic fluid were used in these areas to rotate radar tracking equipment. There are three pads, each of which is 5m by 5m. Visible contamination has not been observed on the pads or surrounding berms. Potential contaminants include petroleum hydrocarbons, specifically hydraulic fluid (DOE 1994d).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any petroleum hydrocarbons were in the soils. Only two of the three pads were sampled, due to large cobble to boulder size fill material at the third pad. TPH tests were performed in July 1994 by immunoassay analysis using a field test kit. ~~Results for TPHs are listed in Table 3-1 in (DOE 1994c).~~ No petroleum hydrocarbons were detected in the soil samples;

therefore, according to the sampling program decision process outlined in DOE-RL (1994b) no remedial action was taken ~~needed~~ at this waste management unit (DOE 1994d).

T52C-6

II.A.5.d. H-52-C Surface Gas Tank Area

Investigations have identified two 475-gallon surface gasoline tanks in this area. Interviews with former site personnel have indicated that this area was also used for cleanup of paintbrushes and other items. No containment was provided during paintbrush cleanup. No visible staining was observed during investigations. The estimated area covered by the tanks and used for cleanup purposes is 6 m by 6 m. Potential contaminants at this site include petroleum hydrocarbons (gasoline) from the gas storage tanks, solvent (chlorinated and nonchlorinated) and metals from cleanup of painting materials (DOE 1994d).

No geophysical or soil gas surveys were performed at this site. Subsurface soil samples were collected in July 1994 to determine if any VOCs, metals, or petroleum hydrocarbons were present in the soil in the former storage tank area. On-site laboratory equipment was used to analyze the samples for various VOCs. Additional total petroleum hydrocarbon tests were performed using an immunoassay field test kit. ~~Results for VOCs and TPHs are listed in Tables 4-1 and 4-2 in DOE 1994c.~~ No VOCs, metals, or petroleum hydrocarbons were detected in the soil samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994b) no remedial action was ~~needed~~ taken at this waste management unit (DOE 1994d).

II.A.5.e. Control Center ~~Disposal~~ Burn Pits

ok, nothing else can be done

This waste management unit is composed of five individual pits that appear to have been used to burn refuse. Each pit is approximately 1 m by 2 m in diameter. The pits contained debris which consisted of glass, metal, ashes and pieces of wood. Soil samples were only taken from four pits due to rosy balsam root *(Balsamorhiza rosea)* growing in the fifth. No geophysical or soil gas surveys were performed at this site. Potential contaminants in this area may include chlorinated solvents, petroleum hydrocarbons, acids, and metals (DOE 1994d).

Subsurface soil sampling was conducted in July 1994 to determine if any semivolatile organic compounds (SVOCs), VOCs, metals or PCBs were present in the pits. One sample from the center of each of the four pits was collected. An on-site laboratory was used for VOC analysis and PCB screening and analyses for SVOCs and metals were analyzed at an off-site laboratory. Additional PCB analysis was performed on-site using an immunoassay field test kit. ~~Results for VOCs and PCBs are listed in Tables 5-1 and 5-2 in (DOE 1994c).~~ Lead was the only contaminant detected in the soil samples above the ROD soil clean-up goals. Lead was detected in pits #1 (1450 mg/kg) and #3 (1240 mg/kg) (DOE 1994d). ~~It was determined that remedial action was needed at this waste management unit~~ Because of concern for cultural and ecological resources at this site, DOE proposed that a concrete cap be placed over the two burn pits. Ecology and EPA concurred with this proposal (DOE 1994c). Concrete caps were poured over the two pits.

II.A.5.f. Building 6652-C Abandoned USTs

Six underground storage tanks (USTs) have been associated with this site. Four 1000-gallon fuel oil USTs (labeled as 6B) have been identified in the building, one UST (labeled as 6A) on the northeast corner of the building (reportedly removed), and one UST (labeled as 6C) on the southeast corner. Potential contaminants at this site include petroleum hydrocarbons, fuel oil or diesel (DOE 1994d).

Geophysical surveys detected one UST-like (site 6C) object adjacent to the south side of the Building 6652-C. Geophysical surveys also suggested that there were never USTs present at the UST site 6B. A soil gas survey was conducted in July 1994 to determine if any VOCs were present at the 6A UST site. Soil gas samples were analyzed for select VOCs using on-site laboratory equipment. ~~Results for VOCs are listed in Table 6-1 in DOE 1994c.~~ No VOCs were detected therefore no soil sampling was conducted at this location. Because no VOCs were detected at the soil gas survey at the 6A site according to the sampling program decision process no remedial action was ~~needed~~ taken. Because the UST was confirmed to be present at site 6C, the decision process ~~described in~~ DOE-RL (1994b) indicated that the tank and ancillary piping should be removed (DOE 1994d).

needed

II.A.5.g. Pumphouse Disposal Slope

Investigations have identified dumping of solid waste on a slope by the pumphouse. A small pile of debris was observed at the top, and piles of concrete were observed on the slope. The estimated volumes of the debris piles are 1.5 m by 1.5 m by .6 m and 26 m by 3 m by .3 m.

Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available (DOE 1994d).

II.A.5.h. Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank

The Pumphouse Latrine storage tank ~~was known to have been above ground, and~~ has been removed. Two concrete saddle supports still exist in this location. Potential contaminants at this site include petroleum hydrocarbons (fuel or oil diesel) from the storage tank (DOE 1994d).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any VOCs or petroleum hydrocarbons were present in the soils. On-site laboratory equipment was used to analyze the samples collected for select VOCs. Additional TPH analyses were performed using an immunoassay field test kit. Results ~~for VOCs and~~ TPHs are listed in Table ~~8-1 and~~ 8-2 in (DOE 1994d). TPH was detected in the surface soil at 420 mg/kg, which exceeds the ROD cleanup goals for TPH. The sampling program decision process described in DOE\RL (1994b) indicated that the soil with TPH above ROD clean-up goals (250 mg/kg) should be removed (DOE 1994d). Excavation was guided by field screening methods specific to pertroleum hydrocarbons and was stopped when field screening indicated that ROD levels were met. Because soil was removed down to bedrock, offsite confirmatory sampling was not performed (DOE 1994c).

II.A.5.i. Pumphouse Latrine 275-Gallon Fuel Oil Storage Tank

This waste management unit is known to have been an above ground fuel oil storage tank, that has been removed. Two concrete saddle supports still exist in this location. Potential contaminants at this site include petroleum hydrocarbons (fuel or oil diesel) from the storage tank (DOE 1994d).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any VOCs or petroleum hydrocarbon were present in the soils. On-site laboratory equipment was used to analyze the samples collected for select VOCs. Additional TPH analyses were performed using an immunoassay field test kit. ~~Results for VOCs and TPHs are listed in Tables 9-1 and 9-2 in DOE 1994c.~~ No VOCs or TPHs were detected in the soil samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994b) no remedial action was ~~needed~~ taken at this waste management unit (DOE 1994d).

II.A.5.j. ALE Field Storage Building Septic System

This septic system has been identified as a waste management unit due to the possibility that solvents and other wastes were disposed of in septic systems. The estimated area covered by the septic system field is 61 m by 12 m. In addition a 4000-gallon septic tank is associated with this septic system. Potential contaminants may include chlorinated and nonchlorinated solvents that may have been discharged into the septic system for disposal (DOE 1994d).

A geophysical survey was conducted in June 1994 to assist in locating the edges of the septic tank. The tank was located at a depth of approximately 30 cm below ground surface. A soil gas survey

was conducted in June 1994 to determine if any VOCs were in the soil. A total of nine samples were collected at a depth of 1 m around the perimeter of the tank. Samples were analyzed for select VOCs at an on-site laboratory. ~~Results for VOCs are listed in Table 10-1 in DOE 1994c.~~ Because VOCs were not detected from the soil gas survey no soil sampling was conducted at this site and it was determined no remedial action is ~~needed~~ taken (DOE 1994d).

needed

II.A.5.k. Mound Site Northwest of Building 6652-G

ok, no problem

This waste management unit is of unknown origin, but appears to be a windbreak or the location of a soil research project near the ALE laboratory. The site could be better described as a berm, approximately 55 m long by 3 m wide. The potential contaminants at this site are unknown (DOE 1994d).

A geophysical survey was conducted in July 1994 to assist in identifying any concentrations of debris in or around the mound. No debris was found. No soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at the mound site. Four soil samples were collected at two depths below ground surface. On-site laboratory facilities were used for select VOC analysis and PCB screening. Additional PCB tests were performed using a immunoassay field test kit. ~~Analytical results are summarized in Table 11-1 and 11-2 in DOE 1994c~~. Because no VOCs, SVOCs, metals, or PCBs were detected above ROD clean-up goals it was determined that no remedial action was ~~needed~~ taken at this waste management unit (DOE 1994d).

II.A.5.l. 6652-I ALE Headquarters Septic System

no apparent problem (couldn't find system)

The septic field for this system includes three separate drainfields and a 22,710 L septic tank. Of the three septic fields one measures 4.6 m by 46 m and two measure 21 m by 30 m. Potential contaminants may include chlorinated and nonchlorinated solvents that may have been discharged into the septic system for disposal (DOE 1994d).

A geophysical survey was conducted in June 1994 to assist in locating the edges of the septic tank and the drainfields. A soil gas survey was conducted in June 1994 to determine if VOCs were present in the soil. A total of seventeen soil gas samples were collected. Samples were taken at each end of the septic tank and throughout each of the drainfields. Samples were analyzed for select VOCs with on-site laboratory equipment. ~~Results for VOCs are listed in Table 12-1 in (DOE 1994c).~~ Because no VOCs were detected from the soil gas survey, no soil sampling was conducted at the site and no remedial action was ~~needed~~ taken at this site.(DOE 1994d)

II.A.5.m. Abandoned Underground Storage Tanks

This waste management unit is comprised of six USTs, ranging in size from 275-gallons to 2000-gallons. The tanks are located at the ALE Headquarters and associated buildings. Some or all of the tanks may still contain fuel. Potential contaminants at this site include petroleum hydrocarbons (fuel oil) from the storage tanks (DOE 1994d).

A geophysical survey was conducted in July 1994 to assist in locating the suspected USTs. Underground Storage Tank-like objects were detected at two of the six sites. Soil gas surveys were conducted in July 1994 to determine if any VOCs were present at the four sites where USTs were not detected. No soil sampling was performed at this waste management unit. Soil gas samples were analyzed for VOCs using on-site laboratory equipment. ~~Results for VOCs are listed in Table 13-1 in (DOE 1994c).~~ No VOCs were detected from the soil gas samples taken at the four tank sites and no remedial action was ~~needed~~ taken. Because the geophysical survey identified tanks present at two sites, these tanks and ancillary piping should be removed (DOE 1994d).

II.A.5.n. Missile Bunker Sump ok, but need clean-up info in writing

This management unit is in an underground facility and is comprised of two areas, the north and the south missile bunker sump area. These sump areas were originally used to store missiles when the NIKE base was active from approximately 1952-1962. The original descriptions of this site indicated debris (batteries, transformers and asbestos) existed in this area. The sump area was found to be clear of this debris, therefore no sampling was conducted for asbestos. No geophysical or soil gas surveys were conducted at this site. Polychlorinated biphenyl (PCB) wipe samples of the missile bunker sumps, the hydraulic lift "wells", and the north missile bunker sump hydraulic jacks were collected in July 1994. These samples were submitted to an on-site laboratory for PCB screening. PCB results are listed in Table 14-1 (DOE 1994d). PCBs were detected from the samples on the auxiliary jacks and on the north and south missile bunker sumps.

The PCB Aroclor 1254 was detected at 32 $\mu g/100cm^2$ wipe for the auxiliary jacks and 34 and 150μg/wipe for the north and south missile bunker sumps, respectively. Because the investigations were conducted in accordance with approved plans and procedures remedial action was needed at this waste management unit. Remedial action ~~should include~~ decontaminated ~~ing~~ all PCB contaminated surfaces to less than the EPA recommended clean-up level of 10$\mu g/100cm^2$ wipe (DOE 1994d).

need info from Glenn, not in reports

II.A.5.o. Missile Bunker Landfill

Debris site to north (partitions)

This waste management unit is an inactive landfill located approximately 100 yards northwest of the missile bunker area. Interviews with former site personnel have indicated that this landfill was used for disposal of construction and demolition debris (DOE 1994d).

A geophysical survey was conducted in July 1994 to identify the extent of the landfill and locate concentrations of debris. The surveys indicated little metallic debris was present. A soil gas survey was also conducted in July 1994 to determine if any VOCs were present in the soil at the landfill. Soil gas samples were analyzed for selected VOCs using on-site laboratory equipment. No VOCs were detected from the soil gas survey, therefore no soil samples were taken. ~~Results for VOCs are listed in Table 15-1 in (DOE 1994c)~~. Because no VOCs were detected from the soil gas survey the sampling program decision process indicates that no remedial action was ~~needed~~ taken at this waste management unit (DOE 1994d).

II.A.5.p. Missile Refueling Area Berm ok

The missile refueling area consists of two berms. Potential historical use of herbicide and/or defoliant on these berms has been identified. The estimated total volume of the berms is 600 cubic yards.

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in June 1994 to determine if any pesticides or herbicide were present in the missile fueling area berm. Two composite soil samples, one from each berm, were collected. The composite samples consisted of six sample locations on each berm, for a total of twelve samples collected. Soil samples were sent to an off-site laboratory for analysis. No pesticides or herbicides were detected in the soils, therefore no remedial action was taken at this site (DOE 1994d).

II.A.5.q. Acid Neutralization Pit - with refueling area - ok, no missile

This pit is a concrete drainage pit filled with soil, gravel, and covered with vegetation. The pit is approximately 12 m by 1.5 m in size. JP-4 from a nearby refueling area is thought to have drained into the pit (DOE 1994d).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in June 1994 to determine if any metals or petroleum hydrocarbons were present in the soils at the site. Samples were screened for TPH using an on-site laboratory and metal analyses were done

off-site. ~~Results for TPH are listed in Table 17-1 and~~ Metal analysis results are included in Section 17.0 Appendix A in DOE 1994d. No petroleum hydrocarbons were detected from the soil samples and no metals were detected at levels to cause concern, therefore no remedial action has taken place at this site (DOE 1994d).

II.A.5.r. Missile Assembly and Test Building Inactive Septic System

Building 6652-O, which is connected to the septic system, was determined through interviews to be the location of the electrical parts cleaning operation. The estimated area covered by the septic system field is 30 m by 3 m. A 3,785 L septic tank is associated with this system (DOE 1994d).

A geophysical survey was conducted in June 1994 to assist in locating the septic tank and associated drain field. A utility location survey was also conducted to assist in determining the location of an underground cable northwest of the tank-like object. The interpreted locations of the septic tank, drainfield and detected utilities were used to guide the location of soil gas probes. A soil gas survey was conducted in June 1994 to determine if any VOCs were present in the soil at the site. Samples were submitted to an on-site laboratory for VOC analyses. Results for VOCs are listed in Tables 19-1 and 19-2 in DOE 1994d. Because only trace amounts of VOCs were detected from the soil gas survey no remedial action has been taken at this site (DOE 1994d).

add to table on page 60

II.A.5.s. Missile Maintenance and Assembly Area Acid Storage Shed

ok

should this be the paint shed?

Investigations identified discolored soil and stressed vegetation in the area of this shed. In addition, a drainage ditch that runs near the shed was observed to contain discolored soil. The estimated size of the shed is 5 m by 5 m.

No geophysical or soil gas surveys were conducted at this site. Soil sampling was conducted in June 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at this site. One sample was collected from the eastside of the storage site. The sample was submitted to an on-site laboratory for VOC analysis and PCB screening, and to an off-site laboratory for SVOC and metals analyses. ~~PCB and VOC results are listed in Tables 20-1 and 20-2, metals and SVOC results can be found in Appendix A in (DOE 1994c).~~ Because no VOCs, SVOC, metals or PCBs were found in the soil sampling no remedial action has been taken at this site (DOE 1994d).

II.A.5.t. JP-4 Fuel Pad

ok

This waste management unit was identified as a ~~3~~ 2 m by ~~3~~ 2 m concrete pad where fueling operations took place. No evidence of spills or staining has been observed on the pad. Based on past use of the pad potential contaminants include petroleum hydrocarbons (DOE 1994d).

No geophysical or soil gas surveys were conducted at this site. Soil sampling was conducted in June 1994 to determine if any petroleum hydrocarbons were present in the soils at this site. Two soil samples were collected, one on the northwest and the other on the southeast side of the fuel pad. The samples were submitted to an on-site laboratory for TPH screening. ~~Results for TPH~~

~~are listed in Table 21-1 in (DOE 1994c).~~ Because no TPH was detected in the soil samples no remedial action has been taken at this site (DOE 1994d).

II.A.5.u. **Missile Bunker Drainfield** Southeast of bunker? If so, ok

The estimated area covered by this drainfield is approximately 5 m by 15 m. Potential contaminants include chlorinated and nonchlorinated solvents that may have been discharged into the septic system disposal (1994b).

A geophysical survey was conducted in June 1994 to assist in locating the septic tank and associated drain field. A utility location survey was also conducted to assist in determining the location of an underground cable. The interpreted locations of the septic tank, drainfield, and detected utilities were used to determine locations of soil gas sampling. A soil gas sampling survey was conducted in June 1994 to determine if any VOCs were in the soil at the site. Two soil gas samples were collected and submitted to any on-site laboratory for an analyses. ~~Results for VOCs are listed in Table 21-1 in DOE 1994c.~~ Because no VOCs were detected in soil gas samples no soil samples were collected and no remedial action has been taken at this site (DOE 1994d).

II.A.5.v. **Missile Bunker Discharge Ditch**

This waste management unit is comprised of three areas where three discharge pipes originate from the missile bunkers. Two of these discharge pipes are thought to emanate from the missile bunker sumps and are buried. The third pipe has been seen discharging and is thought to emanate from a water tank located on the south bunker berm.

A geophysical survey was conducted in June 1994 to locate two discharge ditches at the end points of two clay discharge pipes east of the missile bunker. A utility location survey was also performed to determine the location of underground utilities. No soil gas survey was performed at this waste management unit. Soil sampling was conducted in July 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at the location where the discharge pipes are present. Four soil samples were collected, one from each discharge pipe area and one from the northern discharge pipe. The samples were submitted to an on-site laboratory for VOC analysis and PCB screening, and to an off-site laboratory for SVOC and metals analyses. Results for VOCs and PCBs are in Tables 23-1 and 23-2 in DOE 1994c, additional results for SVOCs, metal, and PCBs analyses are included in Section 23 Appendix A in (DOE 1994d). VOCs, SVOCs and metals were not detected at levels high enough to initiate remedial action. PCBs were detected in the soil samples analyzed by the on-site laboratory. Since confirmatory soil samples analyzed by the off-site laboratory did not detect PCBs in the additional samples collected, no remedial action was taken (DOE 1994d).

II.A.5.w. **H-52-L Surface Gas Tank Storage Area**

Investigations identified two 475-gallon surface gasoline tanks in this area. Interviews with former site employees indicated that this area was also used for clean-up of paint brushes and other items (DOE 1994b).

A geophysical survey was conducted in July 1994 to assist in locating any underground utilities before intrusive sampling. No underground utilities were detected at this site. Soil gas surveys were conducted in June and July 1994 to determine if any VOCs were present in the soil at this storage area. A total of three soil gas samples were collected and submitted to an on-site laboratory for analysis of select VOCs. ~~Results for VOCs are listed in Table 25-1 in (DOE 1994c).~~ Because no VOCs were detected from the soil gas surveys, no soil samples were collected and no remedial action has been taken (DOE 1994d).

II.A.5.x. Horseshoe Landfill Site

This waste management unit is an inactive landfill located 183 m northwest of the missile bunker area beyond the missile bunker landfill (Figure 6). This site was identified as a possible waste management unit because of debris observed at the surface. The site is approximately 3 ha in size.

A geophysical survey was conducted in July 1994 to identify the extent of the landfill and locate concentrations of debris. The results from the geophysical surveys were used to determine location of soil gas sampling and geophysical anomalies. A soil gas survey was conducted in July 1994 to determine if VOCs were present at the site. A total of 52 soil gas samples were collected

were VOCs detected, it so state so

and submitted to an on-site laboratory for analysis of select VOCs (DOE 1994d). ~~Results for VOCs are listed in Table 27-1 in (DOE 1994c). Because no VOCs were detected from the soil gas surveys, no soil samples were collected and no remedial action has been taken at this site~~ Based on findings from similar landfills on the North Slope of the Hanford Site, EPA and Ecology required limited characterization of the landfill. Activities conducted consisted of geophysical investigations, excavation and field screening of buried waste, sampling and analysis of suspect waste, and segregation of confirmed hazardous or contaminated materials. Waste was field screened using several criteria, including visual observation, direct-reading instruments, and analyte-specific field analysis kits. Suspect waste was sampled and characterized by on offsite laboratory. Soil samples taken from excavation trenches detected levels of DDT, DDD, and DDE at concentrations of 945 ppm, 360 ppm, 27.2 ppm, respectively. These levels exceeded the Washington Department of Ecology's established action levels of 1.0 ppm for removal of DDT contaminated soil. Approximately 1, 912m^3 of soil contaminated with the pesticide DDT and its breakdown products were discovered at the site. Removal of the DDT contaminated soil was completed on September 30, 1994. The soils were shipped off-site to a hazardous waste landfill (DOE 1994d). After removal of soil and debris from the site, four composite soil samples were taken. DDT concentrations were less than 1.0 ppm in all four samples (DOE 1994d). Excavations were backfilled and compacted using clean fill and graded to original conditions.

The site was revegetated by transplanting bunchgrasses beginning in November 1995 to December 1995. The revegetated area of the landfill measures approximately 35 by 70 m. The exceptionally wet year of 1995 allowed the seeds to grow and become established. Vegetation

growth on the landfill was measured for percent canopy cover and percent frequency in June 1996. The Vegetation Monitoring Report for the Horn Rapids Landfill, Horseshoe Landfill, and the NIKE Landfill for 1996 reports that the survival of transplanted bunchgrasses has been good with a survival rate of 79.3%.

II.A.5.y. Elevator Doors ok, need documentation

This waste management unit consists of elevator doors at the north and south missile bunkers. Included in this area are two 4 m by 10 m launch pads and the elevator doors. A tar-like sealant that may contain PCBs was observed around the launch pads and elevator doors (DOE 1994d).

No geophysical or soil gas surveys were conducted at this site. PCB wipe samples of the northern elevator door concrete firing area sealant and the northern elevator door hydraulic line were conducted in July 1994. Samples were submitted to an on-site laboratory for PCB screening. PCB results are listed in Tables 28-1 and 28-2 and in Section 28 Appendix A of (DOE 1994d). PCBs were detected from the wipe samples at the missile bunker elevator door hydraulic line. The PCB Aroclor 1254 was present at a concentration of 330 μg/wipe. Following approved plans and procedures the elevated PCB concentrations determined remedial action was needed. Remedial action ~~should include~~ decontaminated ~~of~~ all PCB contaminated surfaces to less than the EPA recommended clean-up level of 10μg/100cm^2 wipe (DOE 1994d).

need documentation from Glen/Corp

II.A.5.z. Flammable Storage Block Shed

stressed veg (bare spots around shed)

The storage block shed is located where the former Missile Maintenance and Assembly Area Paint Shed was located. Discolored soil and stressed vegetation have been observed around this shed. A utility location survey was conducted in June 1994 to identify the location of any underground utilities prior to sampling. No underground cables or pipes were detected at the site. No soil gas survey was performed at this waste management unit. Soil sampling was conducted in June 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at or around the shed. Four soils samples were collected from two hand augered borings. Soil samples were submitted to an on-site laboratory for VOC analysis and PCB screening, and to off-site laboratory for SVOC and metals analysis. PCB and VOC results are listed in Tables 29-1 and 29-2 and SVOC and metals results are in Section 29 Appendix A of (DOE 1994d). Because no VOC, VOC, metals or PCBs were found in the sampling above ROD clean-up levels, no remedial action has been taken at this site (DOE 1994d).

II.A.5.a.a. Missile Maintenance and Assembly Area Paint Shed

This shed has been removed and may have been replaced with the Flammable Storage Block Shed. No visible stains were observed in the area, which is an estimated 3 m by 3 m (DOE 1994b).

II.A.5.a.b. Missile Maintenance and Assemble Area Dry Well Drum

A 55-gallon drum was observed buried in the ground in this area. Another 55-gallon drum, labeled "Dry Cleaning Solution" was observed laying on its side near the buried drum. This area is an estimated 1.5 m by 1.5 m, with scarce vegetation.

surface or subsurface?

No geophysical or soil gas sampling was conducted at this site. Soil sampling was conducted in June 1994 and July to determine if any VOCs were present at this site. Three samples were collected, one inside and two outside the dry well drum. Soil samples were submitted to an on-site laboratory for VOC analysis. Results for VOC are listed in Table 30-1 in (DOE 1994d). Because no VOCs were found in the sampling above ROD clean-up levels, no remedial action has been taken (DOE 1994d).

we need to look at results

II.A.5.a.c. H-52-L NIKE Base Landfill

This waste management unit is an inactive landfill located approximately 100 yards southeast of the main missile base (Figure 6). Interviews with former site personnel have indicated that everything used in base operations was disposed of in a landfill close to the base. Various types of debris were observed at the surface. Areas of discolored soil and stressed vegetation have also been observed on the surface of the landfill. The site is approximately 4.6 acres in size. Potential contaminants may include solvents (both chlorinated and non chlorinated), discarded missile fuel

(which contains re fuming nitric acid, aniline, furfuryl alcohol, JP-3/JP-4, and hydrazine), petroleum hydrocarbons (fuels, waste oil, hydraulic fluid), acids, and metals (DOE 1994d).

A geophysical survey was conducted in July 1994 to identify the extent of the landfill and locate concentrations of debris. The results of the geophysical surveys were used to guide the location of soil gas sampling. A soil gas survey was conducted in July 1994 to determine if VOCs were present at the site. A total of 33 soil gas samples were submitted to an on-site laboratory for VOC analysis. ~~Because~~ No VOCs were found in the soil gas samples.~~, no soil samples were collected and no remedial action has been taken~~ (DOE 1994d). The three geophysical anomaly sites detected were excavated in August 1994 from the landfill. The waste inventory removed from the site included; concrete blocks, bottles, wood, and metal debris.

Revegetation work at the landfill was conducted in November and December 1995. The revegetated area of the Nike Base Landfill consists of three small sites measuring approximately 6 x 9 m, 4 x 9 m, and 4 x 23 m. The sites were revegetated with bunchgrasses. In June 1996, the survival of the bunchgrasses was measured by examining them for green plant material in the crown area. The survival rate of transplanted bunchgrasses ranges from 61.4% to 88.2%, according to the Vegetation Monitoring Report for the Horn Rapids Landfill, Horseshoe Landfill, and the NIKE Landfill for 1996.

II.A.5.a.d. Gravel Driveway Area

This site was identified during investigations at the H-52-C Surface Gas Tank Area. Asphalt like material was observed mixed with limestone gravel in this area. This site is approximately 76 m south of building 6652. Potential contaminants include total petroleum hydrocarbons.

No geophysical or soil gas surveys were conducted. A surface sample of degrading asphalt was collected in July 1994 to determine if any petroleum hydrocarbons were present in the asphalt. The sample was analyzed using an immunoassay field test kit. Results for TPH are listed in Table 63-1 in (DOE 1994d). Because no significant level of TPHs were detected no remedial action has been taken (DOE 1994d).

~~II.B. Duration and Quantity of Release~~

~~A summary of existing RI/FS, LFI/FFS, and ROD data for all 1100 Area OU's is presented in Table 1. The following subsections will describe existing data for each OU in more detail.~~

~~Because the investigations for the EM-2 and EM-3 were not exhaustive, the risk assessment approach was not as specific as the approach used for the EM-1 and the remedial action objectives were more broadly defined. A qualitative evaluation of overall potential risk from the EM-2 and EM-3 was made by comparing possible waste site contaminant concentrations with existing state~~

~~and federal health-based guidelines (principally, the State of Washington *Model Toxics Control Act* (MCTA)). The guidelines from the qualitative evaluation form the basis of the cleanup goals for the EM-2 and EM-3 OU's (DOE 1995b). The ROD specified that contamination found in the IU area would also be cleaned up to Washington State's MCTA (DOE 1994c).~~

~~**H.B.1. 1100-EM-1**~~
~~H.B.1.a. 1100-1- The Battery Acid Pit~~
~~H.B.1.b. 1100-2 - The Paint and Solvent Pit~~
~~H.B.1.d. 1100- 4- The Antifreeze Tank~~
~~H.B.1.e. UN-1100-6- The Discolored Soil Site~~
~~H.B.1.f. The Horn Rapids Landfill Site~~
~~H.B.1.g. The Ephemeral Pool~~
~~**H.B.2. 1100-EM-2**~~
~~H.B.2.a. Tar Flow Area-~~
~~H.B.2.b. Stained Sands Area-~~
~~**H.B.3. 1100-EM-3**~~
~~**H.B.3.a.** 1240 French Drain -~~
~~H.B.3.b. 1240 Suspect Spill Area -~~
~~H.B.3.c. 1262 Solvent Tanks -~~
~~**H.B.4. 1100-IU-1**~~
~~6652-C SSL Active Septic System~~
~~H.B.4.a. H.B.4.b. 6652-C SSL Inactive Septic System~~
~~H.B.4.c. Radar Berm and Pads~~
~~H.B.4.d. H-52-C Surface Gas Tank Area~~
~~H.B.4.e. Control Center Disposal Pits~~
~~H.B.4.f. Building 6652-C Abandoned USTs~~
~~H.B.4.g. Pumphouse Disposal Slope~~
~~H.B.4.h. Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank~~
~~H.B.4.i. Pumphouse Latrine 275-Gallon Fuel Oil Storage Tank~~
~~H.B.4.j. ALE Field Storage Building Septic System~~
~~H.B.4.k. Mound Site Northwest of Building 6652-G~~
~~H.B.4.l. 6652-I ALE Headquarters Septic System~~
~~H.B.4.m. Abandoned Underground Storage Tanks~~
~~H.B.4.n. Missile Bunker Sump~~
~~H.B.4.o. Missile Bunker Landfill~~
~~H.B.4.p. Missile Refueling Area Berm~~
~~H.B.4.q. Acid Neutralization Pit~~
~~H.B.4.r. Missile Assembly and Test Building Inactive Septic System~~
~~H.B.4.s. Missile Maintenance and Assembly Area Acid Storage Shed~~
~~H.B.4.t. JP-4 Fuel Pad~~
~~H.B.4.u. Missile Bunker Drainfield~~
~~H.B.4.v. Missile Bunker Discharge Ditch~~
~~H.B.4.w. H-52-L Surface Gas Tank Storage Area~~
~~H.B.4.x. Horseshoe Site~~
~~H.B.4.y. Elevator Doors~~
~~H.B.4.z. Flammable Storage Block Shed~~
~~H.B.4.a.a. Missile Maintenance and Assembly Area Paint Shed~~

~~II.B.4.a.b. Missile Maintenance and Assemble Area Dry Well Drum~~
~~II.B.4.a.c. II-52-L NIKE Base Landfill~~
~~II.B.4.a.d. Gravel Driveway Area~~

II.B. Names of Hazardous Substances - reformat

1100-EM-1-

~~Battery Acid Pit~~

~~copper~~	~~lead~~	~~sodium~~
~~mercury~~	~~nickel~~	
~~magnesium~~	~~zinc~~	

Paint and Solvent Pit

chromium	copper	tetrachloroethene
sodium	thallium	manganese
lead	chlorobenzene	4,4'-DDE
xylene	1,1-dichloroethene	
~~magnesium~~	zinc	
4,4'-DDT		

Antifreeze and Degreaser Pit

chromium	~~iron~~	thallium
lead	sodium	manganese
copper	cobalt	
zinc	~~magnesium~~	

Antifreeze Tank

arsenic	copper	lead
silver	sodium	thallium
zinc	ethylene glycol	

~~Discolored Soils Site~~

~~lead~~	~~alpha-chlordane~~	~~4,4'-DDE~~
~~heptachlor~~	~~di-n-octyl phthalate~~	~~BEHP~~
~~zinc~~	~~1,1,1-trichloroethane(TCA)~~	
~~gamma-chlordane~~	~~2-hexanone~~	

~~Ephemeral Pool~~

~~lead~~	~~zinc~~	~~aroclor-1260~~
~~Endosulfan II~~	~~Endrin~~	~~heptachlor~~
~~alpha-chlordane~~	~~gamma-chlordane~~	

Horn Rapids Landfill

~~arsenic~~	~~barium~~	~~iron~~
~~cadmium~~	chromium	~~nickel~~
~~copper~~	~~cyanide~~	~~thallium~~
~~magnesium~~	~~mercury~~	lead
~~silver~~	~~sodium~~	alpha chlordane
~~beryllium~~	~~cobalt~~	heptachlor
~~zinc~~	~~antimony~~	PCE
total PCBs	Endrin	4,4'-DDE
aroclor-1248	TCE	4,4'-DDT
aroclor-1254	2-methylnaphthalene	naphthalene
~~manganese~~	Endosulfan II	Dieldrin
TCA		

1100-EM-2-

~~700 Area - Waste Solvent Tank~~

~~TCA~~	~~chlordane~~

~~1100 Area Bus Shop~~

~~PCB's~~

Tar Flow and Stained Sands Area

PH's	lead

1100-EM-3-

1240 French Drain

Lead	Chromium
TPH	PCBs

1240 Suspect Spill Area

- lead

~~1262 Solvent Tanks~~

~~CCl_4~~

~~1262 Transformer Pad~~

~~PCBs~~

~~1234 Storage Yard~~

~~No detection of contaminants reported~~

~~3000 Area Jones Yard HWSA~~

~~Lead~~

1100-IU-1

6652-C SSL Active Septic System

?

6652-C SSL Inactive Septic System

?

Control Center Disposal Pits

- Lead

Building 6652-C Abandoned USTs

- PAHs

Pumphouse Disposal Slope

- Unknown

?

Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank

- TPH

6652-I ALE Headquarters Septic System

- Solvents

Abandoned Underground Storage Tanks

- PAHs

Missile Bunker Sump

- PCBs

Acid Neutralization Pit

-Metals - PCBs

Missile Maintenance Assembly Area Acid Storage Shed

- Unknown

Missile Bunker Discharge Ditch

- PCBs

Horshoe Landfill Site

- DDT

Flammable Storage Block Shed

- Unknown

Elevator Doors

- PCBs

H-52-L NIKE Base Landfill

- Unknown

II.C. Potentially Responsible Parties

As defined in 42 U.S.C. § 9607 (107(a)) of CERCLA a potentially responsible party is any individual or company (such as owner, operator, transporter, or generator) potentially responsible for, or contributing to, the contamination problems at a Superfund site.

The current Hanford Site operations began in 1943, and DOE facilities are located throughout the Site. From 1950 to 1961 the Department of Defense (DOD) established Camp Hanford to provide air defense for the Hanford Works. In 1963, a large military maneuver took place over parts of the ALE Reserve. Potentially responsible parties could include DOD, DOE, and possibly their contractors.

Siemans

~~IV. Damages Excluded from Liability Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Clean Water Act (CWA)~~

III. Natural Resources for Which the State, Federal, and Tribal Government May Assert Trusteeship Under CERCLA and Which Have or May Have Been Affected

III.A. Preliminary Identification of Pathways

Soils and groundwater can be affected by discharges from point and non-point sources. Principal forms of exposure are possible through direct discharge from disposal of waste in landfills and spills in and around maintenance and fueling facililities. Soils can provide a pathway to other resources such as groundwater, surface water, vegetation, fish, wildlife, and air. Potential pathways of hazardous substances from sites within the 1100 Area are outlined below by OU.

1. 1100 EM-1 -Groundwater, surface water (Columbia River) , vegetation, soil, wildlife, fish

2. 1100 EM-2 Groundwater, soil, vegetation, wildlife

3. 1100 EM-3 - Groundwater, soil, vegetation, wildlife

4. 1100 IU-1 - Groundwater (springs), surface water, soil, vegetation, wildlife

III.B. Exposed Water Estimates

wrong

Groundwater information is available for the 1100 Area OU's 1100 EM-1, 1100 EM-2, and 1100 EM-3, but not for 1100 IU-1. Groundwater collection results are discussed in the following sections. There is a potential for surface water contamination in the Columbia River. TCE, PCE, and chromium could be released into the river through groundwater discharge. Additionally, soil contaminants transported via fugitive dust or by surface run-off have the potential to be deposited in the river (DOE 1990a). No known water samples have been taken in the Columbia River identifying the 1100 Area as the source of contamination.

III.B.1. 1100 EM-1

~~During the first and second phases of the 1100 EM-1 investigation, a total of 24 wells for groundwater sampling were drilled between 1989 and 1991. With the addition of existing wells, 30 - 35 wells were sampled each quarter from early 1990 through October 1992. Initially, the scope of groundwater investigation was broad and the first two rounds of samples were analyzed for compounds on the Target Analyte List (TAL), Target Compound List (TCL), RCRA, primary and secondary drinking water parameters. After the first two rounds, the scope was adjusted to reflect refinements in the conceptual site model (EPA 1993).~~

~~All groundwater data were compared with 1100 EM-1-wide groundwater Upper Tolerance Limits (UTLs). Maximum values of all analytes exceeding these "background" values are presented in Table 3.~~

outdated

Trichloroethene (TCE) contaminated groundwater was found up and downgradient of the Horn Rapids Landfill Site. The TCE plume is approximately 1.6 km long and 0.3 km wide and is moving in the northeasterly direction. Additionally, Technetium-99 has been detected through the groundwater monitoring network, but no further information has been provided. During the environmental evaluation of the Phase I RI the exposure of aquatic biota to TCE in groundwater could not be quantitatively assessed due to a lack of data on the magnitude and extent of contamination (DOE 1990a). The characterization and analysis performed for the phase II remedial investigation indicated that groundwater contamination has moved to the 1100 EM-1, near HRL (DOE 1995b). An adjacent facility is investigating soil and groundwater contamination as an independent action in accordance with the MTCA (EPA 1993). No known groundwater remediation has taken place.

III.B.2. 1100 EM-2

Groundwater data from the two monitoring wells in 1100 EM-2 has been summarized in the LFI/FFS. Nine rounds of sampling were conducted between January 1990 and March 1992. Groundwater samples were analyzed for primary and relevant secondary drinking water, Washington Administrative Code (WAC) 173-304, RCRA groundwater monitoring parameters,

general chemistry parameters, Contract Laboratory Program (CLP) TCL parameters, CLP TAL parameters, coliform bacteria, and radiochemical parameters (DOE 1992c). Groundwater analytical results for the 1100 EM-2 are listed in Table 4. Complete analytical data is presented in the Appendix to the LFI/FFS and is tabulated according to monitoring well number, well identification tag, round number, and sample identifier where applicable and available.

No wetlands, surface water impoundments, or obvious drainage channels exist within the 1100 EM-2. (DOE 1992c)

III.B.3. 1100 EM-3

Groundwater data from seven monitoring wells in 1100 EM-3 has been summarized in the LFI/FFS. Nine rounds of sampling were conducted between January 1990 and March 1992. Groundwater samples were analyzed for primary and relevant secondary drinking water, Washington Administrative Code (WAC) 173-304, RCRA groundwater monitoring parameters, general chemistry parameters, Contract Laboratory Program (CLP) TCL parameters, CLP TAL parameters, coliform bacteria, and radiochemical parameters (DOE 1992c). Groundwater analytical results for the 1100 EM-3 are listed in Table 5. Complete analytical data is presented in the appendix to the LFI/FFS and is tabulated according to monitoring well number, well identification tag, round number, and sample identifier where applicable and available. Groundwater analytical results were reviewed during the LFI/FFS and no contaminants of concern were identified at the 1100 EM-3 OU (DOE 1995b).

III.B.4. 1100 IU-1

Minimal to no groundwater sampling information exists for the 1100 IU-1. None of the documents reviewed for this PAS included groundwater data for the 1100 IU-1. The Preliminary Assessment Screening (PAS) Report for the Arid Lands Ecology (ALE) Reserve (DOE 1994a) mentions eight groundwater monitoring wells on ALE. Data collected from these wells demonstrated that "no significant amounts of contamination was present". No groundwater data was included in the PAS. Apparently, the eight monitoring wells did not meet the current state standards for groundwater monitoring well construction. Because less rigorous standards were used during construction, there is a potential for cross aquifer contamination (DOE 1994a). No groundwater information has been reported in the LFI\FFS or the ROD for 1100 IU-1.

IV. Quantities and Concentrations of Released Substances Which are Sufficient to Potentially Cause Injury to Natural Resoources

IV.A. Estimates of Concentrations

IV.A.1. 1100 EM-1

Summary of the soil contaminants detected at the subunits in 1100 EM-1 are presented in Table 2 and maximum concentrations in groundwater for contaminants of concern or analytes exceeding maximum contaminant levels in Table 3.

IV.A.2. 1100 EM-2

No analytical data was available for soil contamination and groundwater analytes detected are listed in Table 4.

IV.A.3. 1100 EM-3

No analytical data was available for soil contamination and groundwater analytes detected are listed in Table 5.

IV.A.4. 1100 IU-1

Results from soil and soil gas sampling are presented in DOE 1994d. No groundwater sampling results are available.

IV.B. Potentially Affected Resources

IV.B.1. Natural Resources

The habitat available or suitable for any particular species is a complex association of abiotic and biotic factors including the climate and microclimate; topography, slope, and aspect; soil type and depth; and associated vegetation. Distribution and abundance of terrestrial plants on the Hanford

Site is determined in part by local landscape feature such as topography, altitude, slope and aspect and steepness, soil, surface water, and in some cases groundwater. These same landscape features are important to wildlife, but the vegetative cover is especially important because it provides food, concealment, and protective cover, as well as nesting sites for some species of birds. Aquatic habitats associated with the Columbia River, permanent springs, and streams are also products of the geology, soil, topography, vegetation, climate and hydrology of the watershed (PNL 1993). A biodiversity inventory by The Nature Conservancy described Hanford as "an irreplaceable natural legacy," and concluded that "Hanford is a vital, and perhaps the single most important, link in preserving and sustaining the biodiversity of this region"(The Nature Conservancy 1995).

No toxicological studies were performed on species inhabiting the 1100 Area for the Phase I or II RI's or the LFI/FFS. An Ecological Risk Assessment was conducted only for the 1100-EM-1 to evaluate site specific ecological risks. The Risk Assessment is presented in its entirety in Appendix L of DOE 1992b. ~~Further discussion about the Ecological Risk Assessment for 1100 EM-1 is to follow.~~ Data gathered under the wildlife ecological investigation for the Phase I 1100 EM-1 RI included the compilation of existing biological information and a reconnaissance survey of the 1100 EM-1. Existing biological information was collected to develop a general understanding of the wildlife ecology of the 1100 EM-1 and vicinity. A reconnaissance biological survey of the 1100 EM-1 was conducted to locate and evaluate any evidence of, or potential for, uptake of toxic substances by plants or animals. The studies were conducted in the spring (before May) of 1989 which was too early to observe many migratory species and/or nesting birds that may be utilizing the site. Many of the sites in the 1100 EM-1 are disturbed and consist of large

paved and cobble areas. ~~A list of the species observed at the 1100 EM-1 subunits is in Table 8.~~ Although, the study concluded that there was no visible evidence of plant or wildlife stress at any of the subunits several of the subunits, were devoid of vegetation and it was stated that the HRL site should support burrowing owls, yet none were observed. Complete results of the survey are in a memo from Landeen to Adams (1989) in Appendix A of the Phase I RI Report (DOE 1990a).

An Ecological Risk Assessment was conducted for the 1100 EM-1 to evaluate environmental exposures, toxicities, and overall risks that are attributable to contaminant releases at the 1100 EM-1. As part of the exposure assessment two sensitive bird species were regarded as indicators for evaluating potential adverse terrestrial ecosystem impacts. The Swainson's hawk and long-billed curlew were known to nest in the vicinity of the 1100 EM-1 and chosen by the Washington Department of Wildlife as indicator species. In the past, a Swainson's hawk has nested 1.5 km west of the Horn Rapids Landfill, and curlews are known to have nested within the landfill boundaries. The Columbia River supports populations of anadromous and residential salmonids. This cold-water fishery was used as an indicator, by means of comparison with water quality criteria established to protect freshwater aquatic life, to assess the potential for degradation of the aquatic environment. The terrestrial and aquatic environmental exposures were conducted under the assumption of no significant alteration of current land and water use conditions (DOE 1990a).

The assessment focused on the exposure of terrestrial biota to HRL soil contamination and exposure of aquatic biota to groundwater contaminants known to exist in the vicinity of the HRL. The exposure of aquatic biota to TCE in groundwater near The Paint and Solvent Pit could not be

quantitatively assessed due to the lack of data on the magnitude and extent of contamination (DOE 1990a).

not all have trusteeship

The U.S. Department of the Interior, U.S. Department of Commerce, U.S. Department of Energy, the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and the State's of Oregon and Washington have trusteeship over natural resources that have been exposed to hazardous substances in the Hanford 1100 Area. Natural Resources affected or potentially affected include but are not limited to the partial list set forth below. The listed natural resources fall within the jurisdiction of one or more of the natural resource trustees.

space

Migratory birds

Threatened and Endangered Species

repeat

Natural resources for which the U.S. Department of the Interior, U.S. Department of Commerce, U.S. Department of Energy, the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and the State's of Oregon and Washington may assert trusteeship under CERCLA, and which are federally recognized or protected under right or entitlement of the Tribes, include but not are limited to:

not true for all

Mammals, including big game species, species of small mammals that are prey to other mammalian and avian species

Resident and migratory fish species

Aquatic and terrestrial invertebrates

Riparian and aquatic habitats

Amphibian and reptile species

Upland habitats

Herbs and berries

Surface and ground waters

Sediments

Air

~~Due to the lack of OU-specific fish, wildlife, an plant inventories the following discussion addresses all species that are known to inhabit the Hanford 1100 Site. If specific information is known about a particular OU or subunit the following OU discussions will include the information.~~

~~The habitat types within the 1100 Area greatly vary at the four OU's. Habitat types~~ Land cover ~~ranges from shrub-steppe and bunchgrasses to agricultural areas and industrial facilities. Table 6 lists the mammals, birds, reptiles and insects that may inhabit the 1100 Area. Table 7 addresses species of fish that may occur in the Hanford Reach of the Columbia River.~~

~~III.D.1.a. 1100 EM-1~~

~~III.D.1.b. 1100 EM-2~~

~~III.D.1.c. 1100 EM-3~~

~~III.D.1.d. 1100 IU-1~~

Cr. in EM-2

why, justification > opinion, speculation

IV.B.1.a. Known Injuries to Natural Resources

The only known injury is to groundwater, based on an exceedence of the MCL for TCE (110 ppb.) at the Horn Rapids Landfill. ~~At this time, there are no known injuries to natural resources as defined in 43 CFR §11.62 for surface water, groundwater, air, geologic and biologic resources.~~ Further investigations may be required to detect specific injuries to other natural resources ~~plants and animal species. Known releases of hazardous substances to groundwater and soil have been documented in the 1100 Area. Chromium in soil and groundwater and TCE in the groundwater at~~

~~the HRL currently exist above cleanup levels identified in the ROD. The potential for contaminants to reach the Columbia River via groundwater from the HRL is possible, but unknown at this time.~~

IV.B.1.b. Potential Injuries to Natural Resources

Of the sites investigated and sampled in the 1100 Area there are several hazardous substances that could potentially cause injury to natural resources. Concentrations of chromium, lead, PCB's, and DDT have been detected at levels high enough to cause injury to soil, terrestrial biota, groundwater, surface water, and/or potentially aquatic resources.

The U.S. Department of the Interior, U.S. Department of Commerce, U.S. Department of Energy, the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and the State's of Oregon and Washington have trusteeship over natural resources that may have been exposed to hazardous substances at the Hanford 1100 Area NPL Site. All of the natural resources discussed in Section IV. ~~and listed in Tables 6-9 5 and 6~~ have the potential for exposure to soil, surface water, and groundwater contamination. The natural resources potentially affected fall within the jurisdiction of one or more of the natural resource trustees.

Sampling during the remedial investigation process or confirmatory sampling after remediation determined that the majority of sites in the OUs have low to no-detectable levels of most of the

opinion!

says who?

contaminants of concern. However, these sampling efforts were extremely limited. In addition, a few sites remain questionable as to the current extent of contamination. In many instances, past injuries can not be fully evaluated due to lack of baseline information.

what injuries

Groundwater contamination has been documented at the 1100 EM-1 and the potential for contaminant discharge into the Columbia River is possible (DOE 1992a). Levels of chromium detected in the groundwater at the HRL could potentially affect geologic or biologic resources such as soil, aquatic invertebrates, or fish species. At this time, the potential for chromium to reach the Columbia River via groundwater from the HRL is ~~undetermined~~ unlikely ~~unknown~~. The apparent lack of vegetative growth at the Discolored Soils Site could suggest that the potential for exposure of contaminants to vegetation existed (DOE 1992a). Additional information regarding levels of contamination in the soil and groundwater that are residual from remedial actions, or remain due to no action taken, would be helpful in identifying the current and future potential injuries to natural resources. Identifying past injuries to geologic and biologic resources is more difficult since toxicological information and species specific data is lacking. Several hazardous substances identified below have the potential to cause adverse affects to trust resources.

reword, unlikely

Chromium

add: no known complete exposure pathways are known to exist.

not at the concentration detected

Chromium (Cr), under laboratory conditions is mutagenic, carcinogenic, and teratogenic to a wide variety of organisms. Chromium toxicity to aquatic biota is significantly influenced by biotic factors such as hardness, temperature, pH, and salinity of water; and biological factors such as

species, life stage, and potential differences in sensitivities of local populations (Ecological Analysts 1981).

It is assumed, for the purpose of evaluating potential injuries at the 1100 Area, that the reported quantities of chromium are of the hexavalent Cr form. Reported levels of Cr in soil at the Horn Rapids Landfill has shown maximum levels of 1250 ppm. This concentration of Cr is approaching toxic effect levels (e.g. 2000 ppm) for birds and mammals (Finley, pers. comm.).

Lead

Ingestion and inhalation are the most important exposure routes of lead to terrestrial animals. Maximum lead levels detected in soil at several sites in the 1100-EM-1 are high enough to cause concern as to potential adverse effects to terrestrial vertebrates and soil. Soil samples from the Horn Rapids Landfill and the Paint and Solvent Pit have detected lead levels of 854 ppm and 94.6 ppm, respectively. The levels of lead detected at the Horn Rapids Landfill are of concern regarding adverse effects to geologic and biologic resources. Biota inhabiting or ingesting soil are at greatest risk of injury. The concentration of lead present at the HRL is at a level associated with with physiological impairment to mammals and migratory birds (Audet, pers. comm.).

Polychlorinated Biphenyls PCBs

In mammals, PCBs are readily absorbed through the gut, respiratory system and skin. Initially, PCBs concentrate in liver, blood, and muscle; eventually, accumulations are highest in adipose tissue and skin (Eisler 1986b).

Dietary exposure as low as 5 ppm in some bird species have resulted in reproductive impairment. Eisler recommends <3.0 ppm for dietary exposure to birds as a protective level of PCB concentrations and <5.0 ppb body weight for rats. During the remedial investigation, levels of PCB's in soil at the HRL were as high as 100 ppm. Concentrations of PCB's in soil at this level could pose a threat to small mammals and birds that have utilized the site in the past. One set of soil samples collected at the Missile Bunker Dishcharge Ditch indicated levels of PCBs just below 10 ppb. Confirmatory soil samples did not detect any PCBs. Since PCBs have been detected at levels up to 10 ppb small mammals may have been exposed to concentrations that are suggestive of injury.

Dichlorodiphenyltrichloroehane DDT

Concentrations of DDT have been known to increase as much as 10 million times from water to seabirds as DDT made its way through the food chain. Effects from accumulated levels of DDT include death due to pesticide poisoning and reproductive problems such as egg shell thining.

Prior to removal of contaminated soils at the Horseshoe Landfill, soil samples taken from excavation trenches detected levels of DDT, DDD, and DDE at concentrations of 945 ppm, 360 ppm, 27.2 ppm, respectively. These levels exceeded the Washington Department of Ecology's established action levels of 1.0 ppm for removal of DDT contaminated soil. In addition, these levels of DDT and its breakdown products were high enough to expose small mammals and many avian species to toxic levels of contamination. Given the potential for accumulation of DDT, adverse affects to trust resources may exist.

IV.B.2. Services

IV.B.2.a. Services Provided by Natural Resources

Services provided by the above mentioned natural resources include, but are not limited to the following:

Habitat for trust species, including food, shelter, breeding and rearing areas, and other factors essential for long-term survival

Resource Use

Consumptive and non-consumptive outdoor recreation including fishing, wildlife viewing/photography, and other activities

Primary and secondary contact recreation (swimming, boating), and other activities

Cultural, spiritual, religious use ~~(requires tribal discussion)~~

Sacred places and ceremonies ~~(requires tribal discussion)~~

Option and existence values

Traditional foods

~~**V.D.5. Potential Injury to Natural Resource Services**~~

~~If there has been any injury to vegetative communities in the ALE Reserve or other sites in the 1100 Area this could reduce the overall diversity and abundance of species present on the site. This would decrease the potential for sightseeing and photography now shared by a limited number of individuals at the site. If contaminants identified in the groundwater at the HRL reach or have reached the Columbia River the potential for a less productive fishery exists.~~

which one? explain

V. May a Damage Assessment be Undertaken at a Reasonable Cost?

opinion, where?

Some of the sites within the OU's require additional information to determine the extent of contamination or if remediation is needed. Additional data collection and analyses can (can not) be obtained at a reasonable cost. (Section will need to be completed by trustees)

VI. Will Response Action Alone Restore Natural Resources?

makes no sense

Individual sites within the OU's were selected for remediation during the remedial investigation process. In some cases the remediation was sufficient to clean up contamination and in others residual contamination is likely to exist. Restoration of the remediated sites has been limited, revegetation has occurred at three of the landfills within the 1100 Area. No mitigation has occurred for any adverse affects to natural resources from the release of hazardous substances or the clean up process itself.

revegetation!

VII. Evaluation and Conclusions

VII.A. Evaluation of Criteria Addressed by the Preassessment Phase

As noted earlier, 43 CFR Part 11 defines criteria by which the decision to proceed past the preassessment phase to a full assessment must be based. These criteria, and the corresponding conclusions based on this preassessment phase screen, are presented below.

VII.A.1. A discharge or release of a hazardous substance has occurred.

Releases of listed hazardous substances are documented at sites within the 1100 Area OU's.

VII.A.2. Natural resources for which the Federal or State agencies or Tribes may assert trusteeship have been, or are likely to be, adversely affected by the release.

Natural resources over which the federal and state agencies and tribes may assert trusteeship have been adversely impacted (groundwater, soil, vegetation) or likely to be affected.

VII.A.3. The quantity and concentration of the released substances are sufficient to potentially cause injury to those natural resources.

Hazardous substances have been measured at injury-associated concentrations in the groundwater and soils.

VII.A.4. Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost.

opinion, whose?

Some of the sites within the OU's require additional information to determine the extent of contamination or if remediation is needed. Additional data collection and analyses can (can not) be obtained at a reasonable cost. (Section will need to be completed by trustees)

VII.A.5. Response actions (i.e., remedial response activities at the site) will not sufficiently remedy the injury to natural resources.

Individual sites within the OU's were selected for remediation during the remedial investigation process. In some cases the remediation was sufficient to clean up contamination and in others residual contamination is likely to exist. Restoration of the remediated sites has been limited, revegetation has occurred at three of the landfills within the 1100 Area. Limited restoration has occurred for any adverse affects to natural resources from the release of hazardous substances or the clean up process itself.

VII.B. Conclusions

Current information summarized within this Preassessment Screen ..... (This section needs to be completed by trustees for the final PAS)

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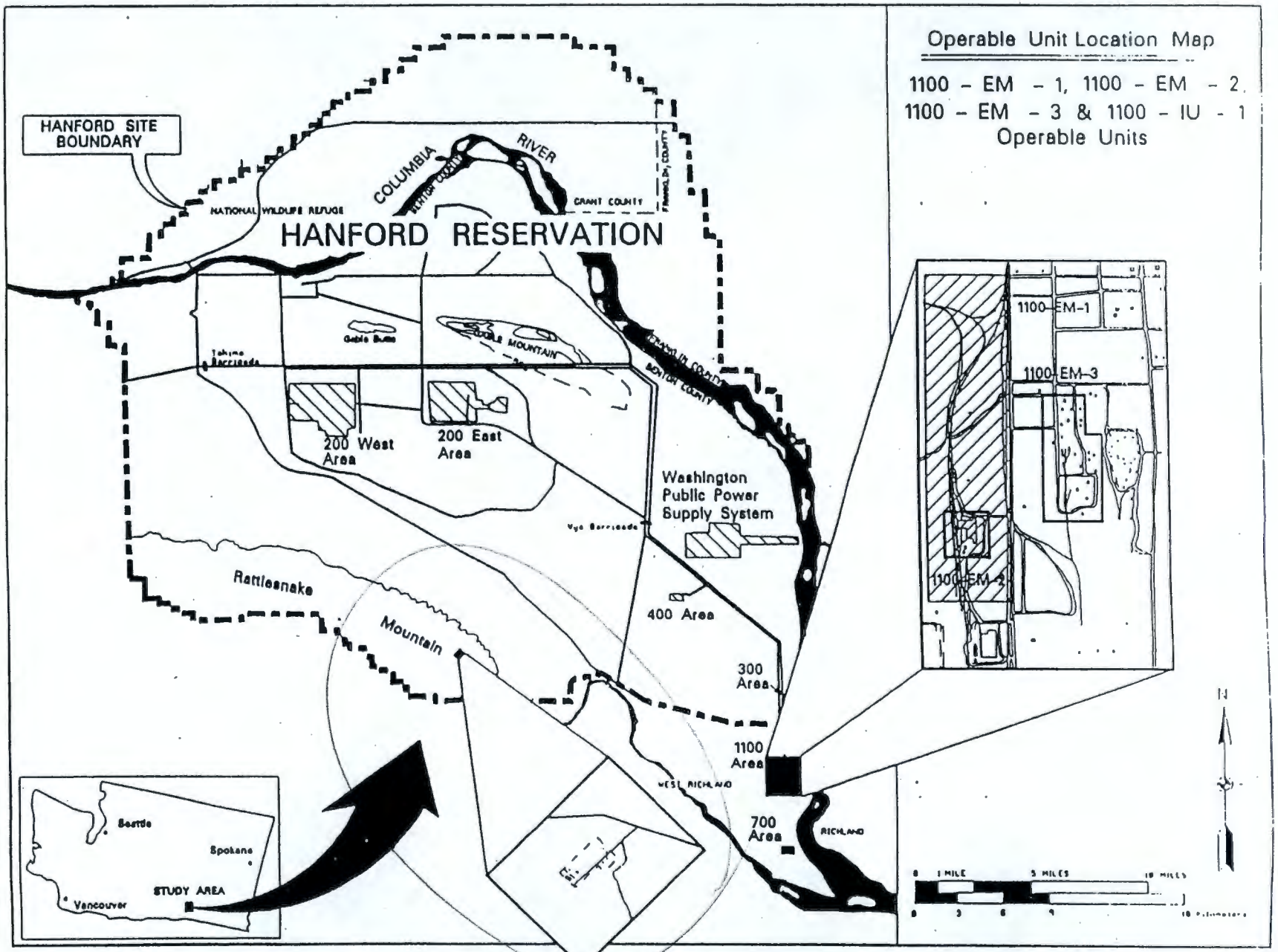


1100 - IU - 1 Operable Unit

Figure 1

Hanford Site
1100 Area - National Priorities List Site
Figure 1

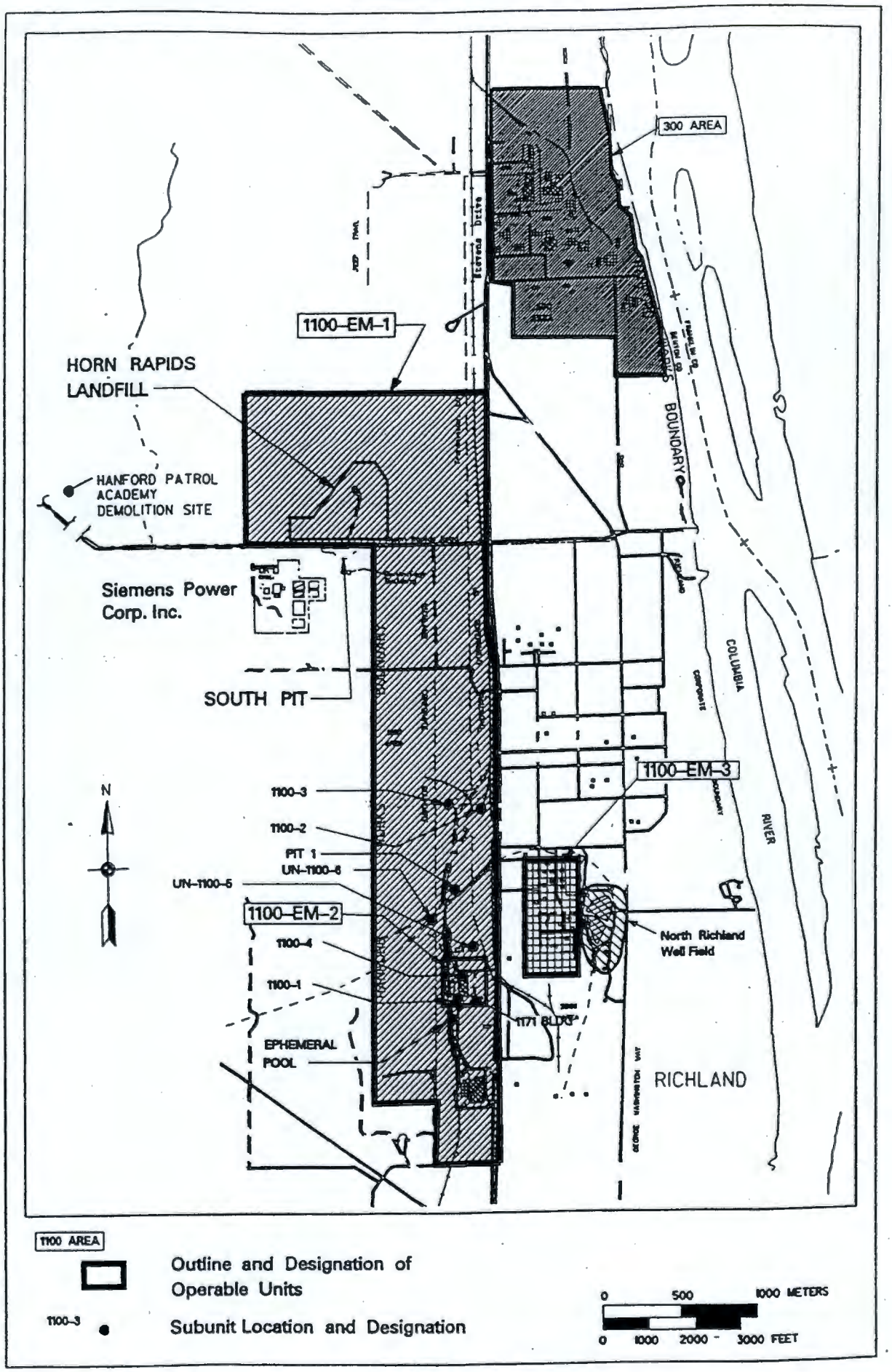


Figure 2. 1100 Area Operable Units
Location of EM-1, Em-2, and EM-3

Figure 3. EM-3 Location of Sites

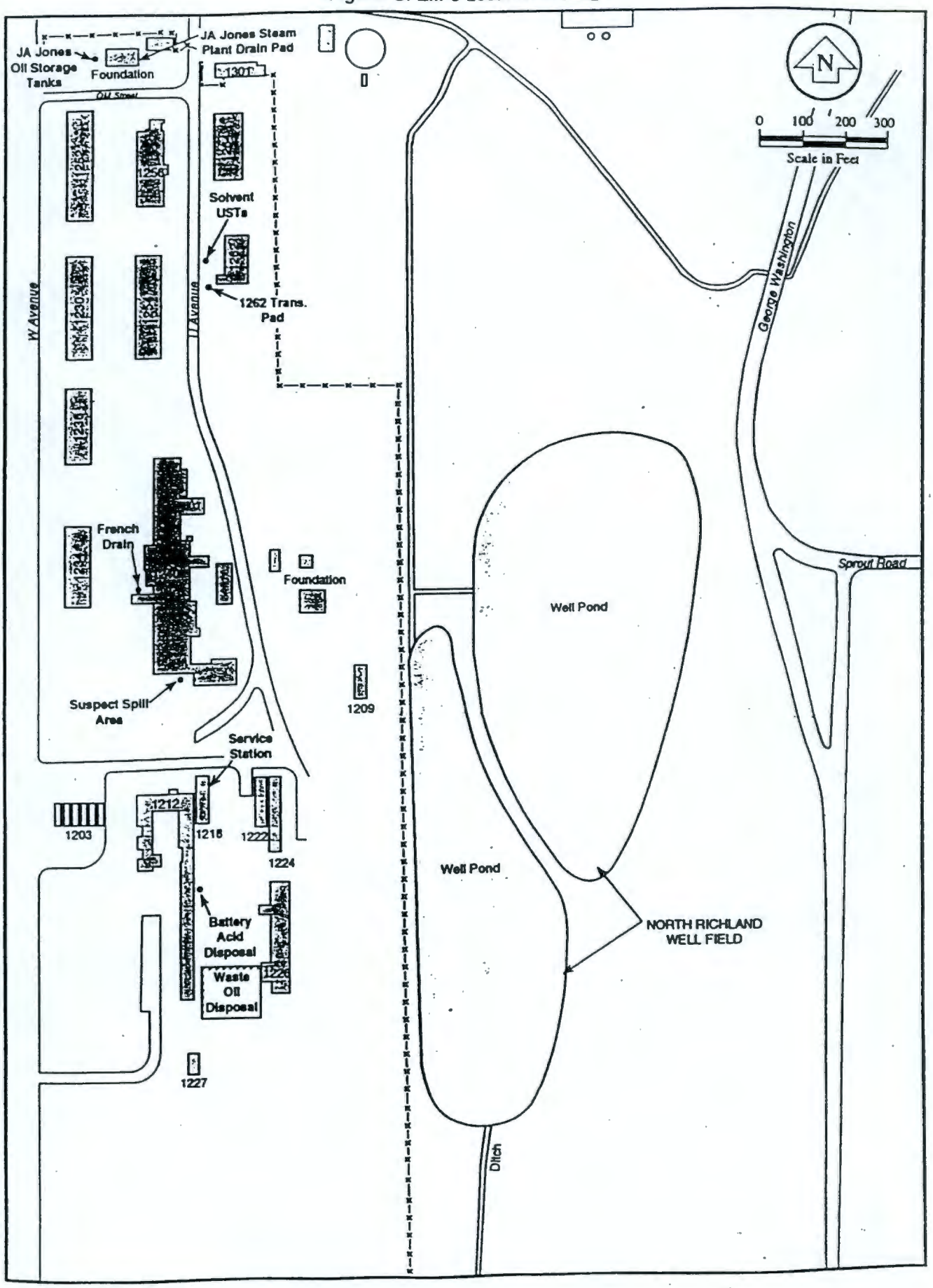
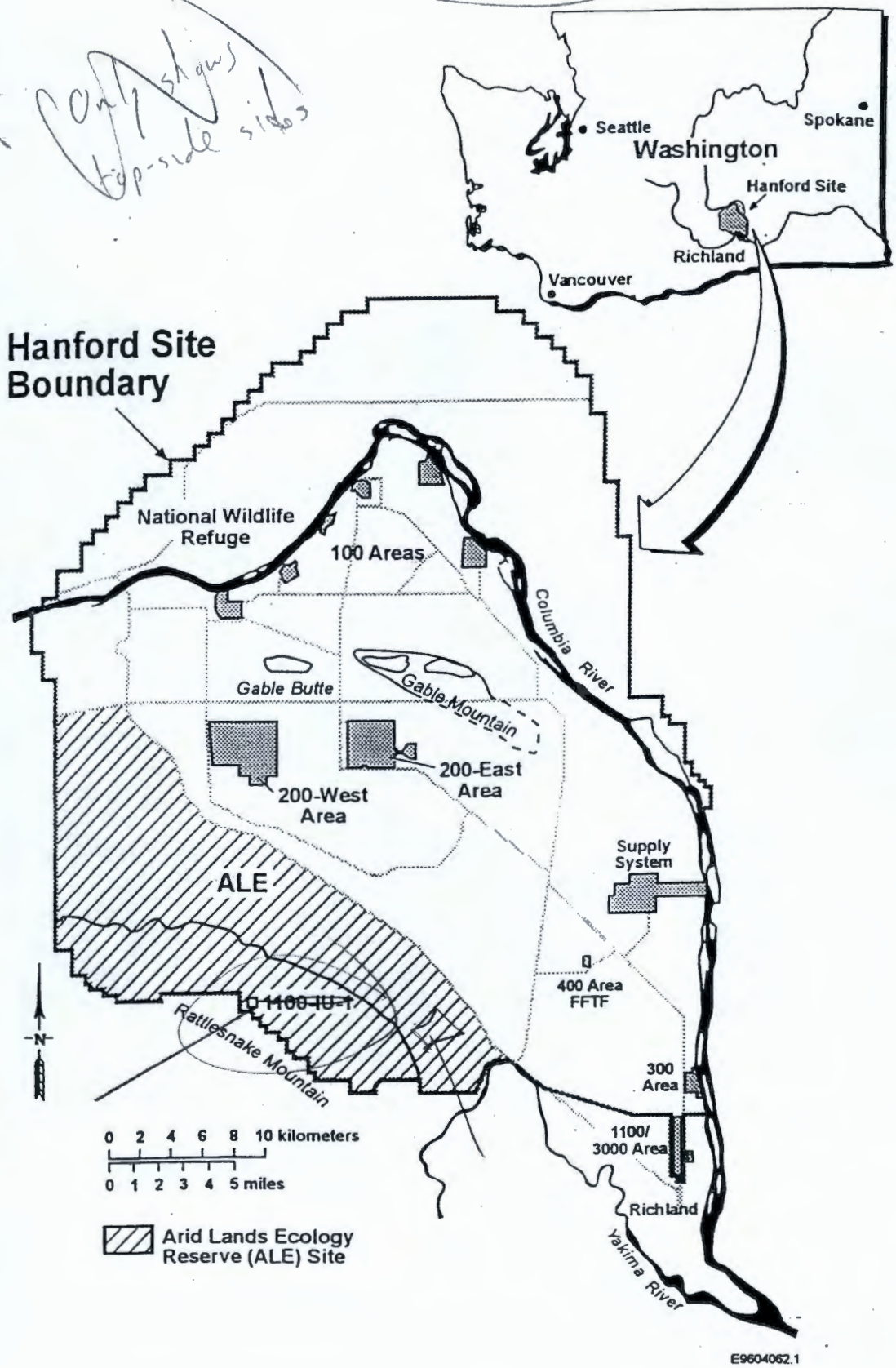


Figure 4. Location of 1100-IU-1 Within ALE



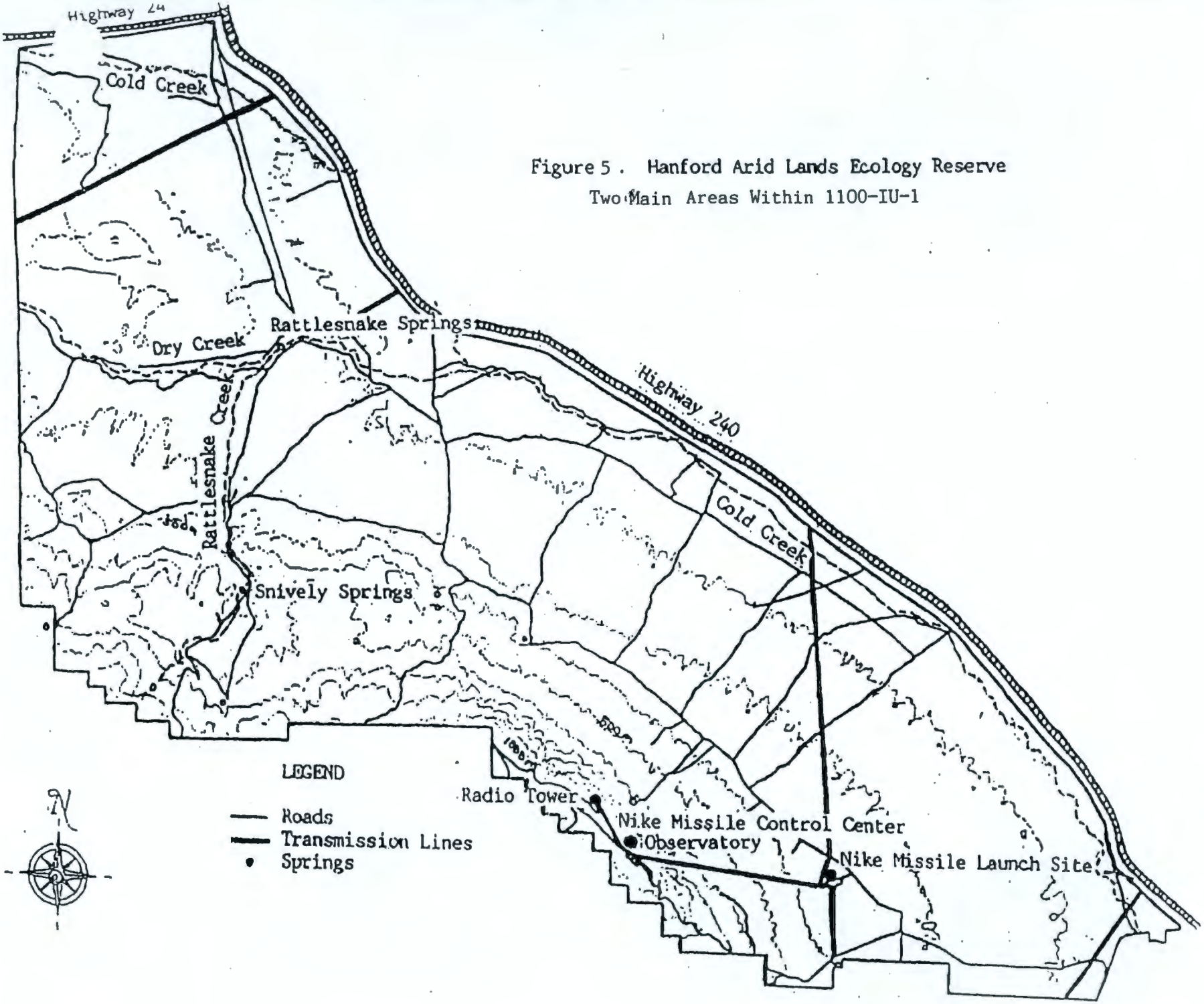
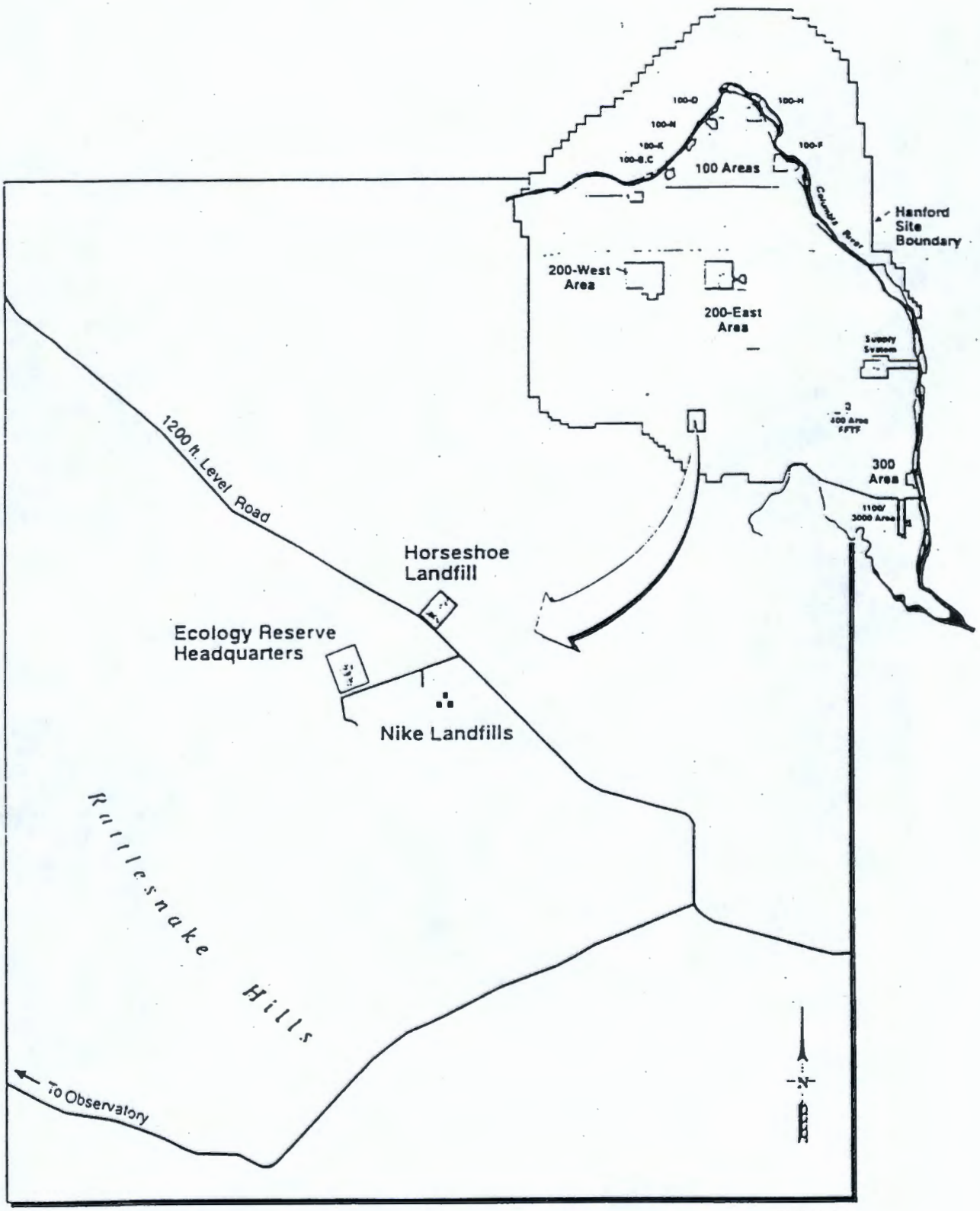


Figure 5. Hanford Arid Lands Ecology Reserve
Two Main Areas Within 1100-IU-1

Figure 6. Horseshoe and Nike Landfills.



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HANFORD 1100 AREA PREASSESSMENT SCREEN (PAS)

Working Draft
Draft 1 PAS

Terms
- subunits
- units
- sites
- areas

Prepared for: Hanford Natural Resource Trustees

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August 1, 1997

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I. Introduction

The purpose of a Preassessment Screen (PAS) is to determine whether a discharge or release of hazardous substances warrants proceeding with a Natural Resource Damage Assessment (NRDA). By definition, a PAS is "a rapid review of readily available information...[to] ensure that there is a reasonable probability of making a successful claim" and, therefore, whether to proceed with the damage assessment itself. (43 CFR § 11.23(b))

The criteria on which the decision to proceed past the preassessment phase to a full assessment must be based on:

1. A release of a hazardous substance has occurred;

2. Natural resources for which a Federal or State agency or Indian Tribe may assert trusteeship under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) have been, or are likely to have been, adversely affected by the release;

3. The quantity and concentration of the released substances are sufficient to potentially cause injury to those natural resources;

4. Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost; and

5. Response actions, carried out or planned, do not and will not sufficiently remedy the injury to natural resources without further action.

II. Scope of 1100 Area Preassessment Screen

This 1100 Area PAS follows the requirements for conducting a PAS and only addresses Operable Units (OU) and potentially affected adjacent areas within the 1100 Area National Priorities (NPL) Site of the Hanford Site. Natural resource issues and concerns about other Superfund sites at or adjacent to Hanford will not be addressed in this document. The scope of the 1100 Area PAS was agreed upon by the Hanford Natural Resource Trustee Council. Department of Energy (DOE) and U.S. Fish and Wildlife Service (USFWS) entered into an Interagency Agreement (IAG) with concurrence from all natural resource trustee agencies to conduct the 1100 Area PAS. Two PAS-related documents have been previously written for the 1100 Area; 1) the Remedial Investigation/Feasibility Study (RI/FS) for the 1100- EM-1 OU and 2) Hanford ~~and the~~ the Arid Lands Ecology Reserve (ALE) PAS. These documents were not produced by the entire natural resource trustee council nor did they contain the necessary information as required by 43 CFR 11 to be a PAS. However, relevant information from these documents has been incorporated into this current 1100 Area PAS.

III. Discharge ~~or Release~~ of Hazardous Substances

Add narrative

III. A. Site ~~History and~~ Relevant Operations

Add narrative

III.A.1. General

The DOE's Hanford Site (Site) was listed on the National Priorities List (NPL) in July 1989 under authorities granted by CERCLA of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The Hanford Site is a 560-square mile federal facility located along the Columbia River in southeastern Washington, situated north and west of the cities of Richland, Kennewick, and Pasco, an area commonly known as the Tri-Cities.

The Hanford Site was established during World War II as part of the Army's "Manhattan Project" to produce plutonium for nuclear weapons. Hanford Site operations began in 1943, and DOE facilities are located throughout the Site and the City of Richland. Certain portions of the Site are know to have cultural significance and may be eligible for listing in the National Register of Historical Places (EPA 1993).

pe word

~~are~~ have been listed or

The land surrounding Hanford is used primarily for agriculture and livestock grazing. The major population center near Hanford is the Tri-Cities, with a combined population of over 100,000. The southwestern area of Hanford, covering 120 square miles, is designated as the Arid Lands

Ecology Reserve (ALE) and is currently managed by the USFWS.

The Hanford Site is divided into designated areas and operable units. Designated locations for identification include the 100, 200, 300, 400, 600, 700, 1100, and 3000 Areas. In 1988, the Hanford Site was scored using the Environmental Protection Agency's (EPA) Hazard Ranking System. As a result of the scoring, the Hanford Site was added to the National Priorities List as four sites (1100 Area, 100 Area, 200 Area, and 300 Area). The 1100 Area includes portions of the 600, 700, and 3000 Areas and ALE. Each of the areas were further divided into Operable Units (a grouping of individual waste management units based primarily on geographic area and common waste sources).

yes! Do it!, and Consent Order (commonly referred to as the Tri-Party Agreement or TPA)

In anticipation of the NPL listing, DOE, EPA, and Washington Department of Ecology (Ecology), entered into a Federal Facility Agreement in May 1989. The ~~agreement~~ TPA established a procedural framework and schedule for developing, implementing, and monitoring remedial response actions at Hanford. The ~~agreement~~ TPA also addresses Resource Conservation and Recovery Act (RCRA) compliance and permitting.

III.A.2. 1100 Area

operable units (OU) global

The 1100 Area NPL site is located in the southern portion of the Hanford Site (Figure 1) (EPA 1993). The 1100 Area consists of four operable units; the 1100-EM-1, 1100-EM-2, 1100-EM-3, and 1100-IU-1. Each unit is designated with a three-part code: the first part indicates the NPL site affiliation; the second part provides a shorthand description of the operable unit type (EM indicates "equipment maintenance" and IU indicates "isolated unit"). The 1100 Area was listed on the NPL based on the proximity of the 1100-EM-1, 1100-EM-2, and 1100-EM-3 OU's to groundwater wells used by the City of Richland to supply drinking water and that up to 15, 000 gallons of waste battery acid were disposed in a sand pit in the 1100-EM-1 unit (DOE, 1995b).

Operable Units 1100-EM-1, 1100-EM-2, and 1100-EM-3 are located in the southernmost portion of the Site and contain the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford Site. Operable Unit 1100-IU-1 is located on the northeastern slope of the Rattlesnake Hills, approximately 24 kilometers west from the rest of the 1100 Area (Figure 1)(EPA 1993). The 1100 Area NPL includes portions of the 600, 700, and 3000 Areas. The 600 Area is mostly undeveloped land and contains some relatively remote facilities. The 700 Area consists primarily of administrative buildings located around the Federal Building in downtown Richland. The 3000 Area, located adjacent to the Hanford Site, consists mainly of administrative buildings.

OUs EM-1?

The closest surface water bodies to the 1100 Area are the Columbia and Yakima Rivers. These rivers are approximately 1200 m and 6500 m, respectively, from the main 1100 Area. Available floodplain information indicated that ~~the~~ EM-2, EM-3, and IU-1 are not located within the limits of the Columbia and Yakima River flood events having return periods of less than 500 years (DOE 1992c).

OU EM-3 closest revised

~~The 1100-~~ EM-1 has been assigned the highest priority among the Hanford 1100 Area Operable Units due to ~~its proximity to the North Richland well field~~. Remedial Investigation /Feasibility Study (RI/FS) activities at the EM-1 OU were initiated in 1989, and a Phase I RI/FS was completed in August 1990. In the fall of 1992, EPA, DOE, and Ecology decided to accelerate the study and evaluation of the three other operable units so that all remedial actions in the 1100 Area could proceed as a single project. In place of extensive field investigations, a streamlined approach for ~~the~~ OUs EM-2, EM-3, and IU-1 is contained in an addendum to the EM-1 RI/FS referred to as the Limited Feasibility Investigation/Focused Feasibility Study (LFI/FFS), April 1993. The Record of Decision (ROD) for the Hanford 1100 Area NPL site was published in September 1993. A baseline risk assessment comprised of a human health assessment and an ecological risk assessment was conducted as part of the Phase I RI/FS to evaluate current and potential effects of only the 1100-EM-1 contaminants on human health and the environment. The LFI/FFS for the three remaining units (EM-2, EM-3, and IU-1), characterized the nature and extent of contamination in groundwater and soils near these units. A qualitative baseline risk assessment (an evaluation of overall potential risk from these operable units made by comparing possible waste contaminant levels with existing State and Federal health-based guidelines), was

no ecol

conducted as part of the LFI/FFS to evaluate potential effects of contaminants on human health and the environment (EPA 1993).

Eco risk or just human health?

As part of the investigations of the 1100 Area, Remedial Action Objectives (RAOs) were established ~~and are~~ site specific goals to define the extent of cleanup necessary to achieve the specified level of remediation at the site. These goals are formulated to meet the overall goal of CERCLA, which is to provide protection to overall human health and the environment. Contaminants of potential concern were identified based on a statistical and risk-based screening process in sited-affected media. The Phase I RI Report, the Baseline Residential Scenario Risk Assessment (BRSRA), and a Baseline Industrial Scenario Risk Assessment (BISRA) concluded that "there are no contaminants that pose risks ~~to ecological~~ receptors" (EPA 1993). No documents reviewed as part of this PAS ~~conducted~~ investigated or discussed natural resource injury as defined in 43 CFR 11.

no true, just

III.A.2.a. 1100 -EM-1

sites, not units discussed in section III.B.1.

OU

The EM-1 has been divided into several subunits based on the nature of previous use and potential contaminants (Figure 2)(DOE 1994b). These subunits are discussed in more detail in Section III.B.1. The EM-1 ~~Operable Unit is~~ OU the largest of the three OUs in the main portion of the 1100 Area. The EM-1 OU is part of the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford site. Previous activities at the ~~operable unit~~ OU included landfill operations at the Horn Rapids Landfill (HRL), offices, warehousing, and

transportation-related operations. Current activities include offices and transportation-related facilities (DOE 1995b).

reword

Evaluation of human health and environmental risks for the 1100 Area was conducted for the EM-1 site only. The assessment consisted of evaluating the results of the remedial investigations to develop an initial list of Contaminants of Potential Concern (COPC). The COPC list was further evaluated and screened in accordance with the Hanford Site Baseline Risk Assessment Methodology (HSBRAM) and in consultation with EPA Region 10. HSBRAM is based on EPA's *Risk Assessment Guidance for Superfund* (RAGS) and other EPA guidance (both national and Region 10). A BRSRA and a BISRA were conducted in accordance with the HSBRAM.

?

?

The objective of the Ecological Risk Assessment for EM-1 was to provide an evaluation of the site specific ecological risks. Given the uncertainty in information available, risk calculations were not performed for the evaluation (EPA 1993). Ecological risk was estimated by comparing exposure to contaminant toxicity. Potentially sensitive habitats chosen for the EM-1 site included habitats known to be frequented by designated or proposed, endangered or threatened species. In determining ecosystems potentially at risk at EM-1, only terrestrial organisms were considered. No toxicological studies were performed on species inhabiting the EM-1 OU for the Phase I or II Remedial Investigations (EPA 1993).

EM-1 OU characterization investigations started in 1989, and a Phase I Remedial Investigation Report was produced in 1990. These activities were followed with a Phase I and II Feasibility

Study Report in 1990. The phase II remedial investigations began in 1991, and a Draft Phase II Remedial Investigation Report/Phase III Feasibility Study was submitted in 1992 (DOE 1995b).

Investigations of the 1100-EM-1 OU included radiological surveys, geophysical surveys, soil-gas surveys, intrusive trenching activities to explore subsurface conditions, surface and subsurface soil sampling and laboratory analyses, groundwater level monitoring, and groundwater sampling and laboratory analysis.

Surface radiation surveys were conducted at all 1100-EM-1 OU subunits. All radiation surveys were negative. These subunits were not further investigated for surface radiation (DOE 1992a).

or 9? within the subunits?

Operations at EM-1 have included the use of solvents, fuels, oils, and PCBs. Based on past practices and anecdotal information from the EM-1, ten sites were identified for investigation: the battery acid pit, the paint and solvent pit, the antifreeze and degreaser pit, the antifreeze tank site, the radiation contamination incident site at the discolored soil site, the Horn Rapids Landfill (HRL), the ephemeral pool, pit #1, and the south pit. The antifreeze tank site was part of the EM-2 OU, but was investigated and remediated during the EM-1 investigation work. Eliminated from further consideration for remediation during the Phase I Remedial Investigations was the UN-1100-5- Radiation Contaminant Incident site because of a lack of substantive contamination detected. The Hanford Patrol Academy was also not addressed further during the remedial investigations because of the anticipation that it would be addressed separately (DOE 1992a).

not listed above

III.A.2.b. 1100-EM-2

The EM-2 ~~Operable Unit~~ OU is located in the southwest corner of the Hanford site near the border of the City of Richland and lies within the southern portion of EM-1 (Figure 2)(DOE 1994b). Prior to 1950, a few small farms occupied what is now the EM-2 OU area. The main feature is the 1171 Building which was constructed in the early 1950's as a vehicle service maintenance and repair facility. The site also served as a warehousing and transportation distribution center. Today, most of these activities along with gas station services ~~and support of the Hanford Site bus transportation system~~ still occur in the EM-2 OU area (DOE 1992c). During the LFI/FFS principal sites were identified for investigation, these subunits or sites are discussed in more detail in Section III.B.2..

~~Pre~~remedial investigations at the EM-2 site were conducted during the LFI/FFS process between October 1992 and January 1993. Initially, the Hanford waste information data system was reviewed for data on waste types handling practices, or known soil or groundwater contamination at the EM-2 OU. Historical information including aerial photographs and as-built construction drawings were also reviewed. All of the sites were inspected and, whenever possible, knowledgeable personnel were interviewed (EPA 1993).

The main waste management sites in EM-2 consist of used oil tanks, steam pad and hoist ram storage tanks, and hazardous waste staging area. Operations in EM-2 potentially included the use of solvents, fuels, oils, and polychlorinated biphenols (PCB's). During the ~~pre-~~remedial

investigations of management waste sites in the EM-2 OU it was determined that all but three of the sites did not require further investigation or had already been remediated. The potential for contaminant migration was not rigorously investigated at any of the sites in EM-2 OU (DOE 1992c).

The principal sites investigated during the LFI/FFS were the tar flow area, stained sands area, Neptune's potato and separator tank, several used oil tanks (#4 to #6), steam pads (#1 and #2), the bus shop underground hoist ram, the 700 Areas waste solvent tank, bus lot dry wells, and a hazardous waste staging area (DOE 1992c). Many sites were currently under regulation (under a statute other than CERCLA or Washington State Model Toxics Control Act (MCTA)) by the state of Washington, EPA, or candidates for regulation under other programs (DOE 1992c). However, the tar flow, stained sands, and Neptune's Potato and Separator Tank areas were designated for further examination. These sites were investigated by geophysical surveys, soil gas sampling, and soil sampling conducted in 1994 during the preremediation investigations. After further investigations only the tar flow and stained sands were identified for remediation (DOE 1995b). The potential contaminants of concern that were identified through review of historical information, previous site investigations, and site reconnaissance activities (DOE 1992c) are listed in Section III.C..

III.A.2.c. 1100-EM-3

The EM-3 Operable Unit is located about 600 meters northeast of 1100-EM-2. The EM-3 area

contains approximately 20 permanent structures, some of which date back to 1951 (Figure 3) (DOE 1994b). These buildings form the Hanford 3000 Area. Prior to 1943, the EM-3 OU was primarily used for agricultural activities. In 1943, new construction of temporary office buildings supporting construction and engineering at the newly formed Hanford site began on the EM-3 OU. Throughout the 1940's the OU and surrounding areas were used for office space and as an off-loading and warehousing area for construction supplies brought on the Atomic Energy Commission Hanford Works Railroad. By 1951, most of the temporary buildings were removed or demolished and replaced by permanent structures. The EM-3 OU was part of a larger military camp, "Camp Hanford", and contained automotive repair and maintenance shops, gasoline storage and dispensing stations, an artillery repair and maintenance shop, a laundry, a dry cleaner, a cold storage, warehouses, a bakery, troop barracks, and administrative offices. During the last 25 to 30 years, the EM-3 OU was used for office and warehouse facilities in support of Hanford construction activities. Current activities at the OU include paint and sandblast operations, vehicle maintenance and repair, hazardous material storage, RCRA waste accumulation areas, warehousing, fabrication shops radio maintenance, and radiography and research administrative offices (DOE 1992c). Based on past practices at the EM-3 OU, approximately 22 waste management units have been identified for detailed investigations. These subunits are discussed in Section III.B.3..

Investigations at the EM-3 site were conducted during the LFI/FFS process between October 1992 and January 1993. Initially, the Hanford waste information data system was reviewed for data on waste types, handling practices, or known soil or groundwater contamination at the EM-3

OU. Historical information including aerial photographs and as-built construction drawings were also reviewed. All of the sites were inspected and, whenever possible, knowledgeable personnel were interviewed (EPA 1993).

Key waste sites in EM-3 include several hazardous waste storage and staging areas, a used oil underground storage tank (UST), and contaminated soil from a previously removed UST. Based on past practices at the EM-3 OU, approximately 22 waste management units were identified during the LFI/FFS (DOE 1992c). The potential contaminants of concern that were identified through review of historical information, previous site investigations, and site reconnaissance activities (DOE 1992c) are listed in Section III.C.. Many sites were currently under regulation (under a statute other than CERCLA or MTCA) by the state of Washington, EPA, or candidates for regulation under other programs. These sites were removed from further consideration for remedial action during the LFI/FFS. Sites remaining in the CERCLA investigation for EM-3 were the 1240 Suspect Spill Area, 1240 French Drain, 1226 Suspect Waste Oil Disposal Area, 1212/1217 Suspect Battery Acid Disposal Area, 1218 Service Station, 1262 Solvent Tanks, 1262 Transformer Pad, JA Jones Oil Storage Tanks, and JA Jones Steam Plant Drain Pad. These remaining sites were further investigated by geophysical surveys, soil gas sampling and soil sampling conducted as part of the 1994 ~~pre~~remediation investigation. The potential for contaminant migration was not rigorously investigated at any of the sites in EM-3 OU (DOE 1992c). Based on the ~~pre~~remediation investigation results and the cleanup goals for EM-3, the French Drain, 1240 Suspect Spill Area, and the 1262 Solvent tanks were identified for remedial action (DOE 1995b).

III.A.2.d. 1100-IU-1

located within an area

The IU-1 OU is known as the Arid Lands Ecology Reserve (ALE). The ALE is approximately 195 square kilometers and is located on the northeastern slope of the Rattlesnake Hills, approximately 24 kilometers from the rest of the 1100 Area. The land which comprises ALE was set aside as a natural research area in 1967 by the Atomic Energy Commission to preserve shrub-steppe vegetation in Washington State. The site consists of a former NIKE missile base consisting of structures which supported missile launch, control, and maintenance functions, living quarters for base personnel, and storage buildings for hazardous substances used in the maintenance of the physical plan and missile operations (Figure 4)(USFWS 1996). All base facilities are currently abandoned, ~~with the exception of the former barracks which are used for the Arid Lands Ecology Reserve (ALE) Headquarters~~.

Investigations at the IU-1 site were conducted during the LFI/FFS process between October 1992 and January 1993. Initially, the Hanford waste information data system was reviewed for data on waste types, handling practices, or known soil or groundwater contamination at the IU-1 OU. Historical information including aerial photographs and as-built construction drawings were also reviewed. All of the sites were inspected and, whenever possible, knowledgeable personnel were interviewed (EPA 1993). Investigations identified 32 areas within IU-1 that required detailed investigation and/or remediation. These subunits are discussed in more detail in Section III.B.4..

Nike missile site?

Operable Unit IU-1 consists of two areas. One area is ~~located at the top~~ of Rattlesnake

confusing! see Fig 4

vs northeastern, pages 7 + 16

Mountain, ~~north~~ west of the main missile launch facility. It is a compound with a pumphouse, small support structures, and launch control facilities. The second area, known as the Missile Launch Area, is located on the southeast slope of the Rattlesnake Hills and includes a number of permanent structures used in the maintenance of the missile site and housing operations personnel. The ~~majority of the~~ Missile launch Area facilities have been abandoned~~, with the exception of a barracks building at the main site which houses the Arid Lands Ecology (ALE) Reserve Headquarters~~.

In the late 1960's, some of the buildings ~~at the southwest end of the OU~~ in the Missile Launch Area ~~were~~ wrong converted in the Missile Launch Area into the headquarters of the ALE Laboratory abandoned in 1995. The remaining buildings and missile facility ~~at the northeast end of the OU~~ wrong have not been known to be used for any significant waste-producing activities since the ending of NIKE operations in the late 1960's and are intact, but abandoned, today .

The NIKE missile site consisted of two separate and distinct operating units: the Nike missile launch area, located on the northeast slope of Rattlesnake Mountain, and the Nike missile Integrated Fire Center (IFC) area, located on the top of the mountain. Maintenance of the missile batteries in combat-ready new para status required the storage, handling, and disposal of missile components as well as solvents, fuels, hydraulic fluids, paints, and other materials. Typical chemicals used at NIKE site include aniline, petroleum distillates, chlorinated solvents such as carbon tetrachloride (CCl_4), TCE, TCA, and PCE, chromium oxides, acetone, paints containing chromium and lead, tricesyl phosphate, ethylene glycol, pesticides, herbicides, PCBs, and hydraulic fluid (DOE 1992b). Areas of concern at IU-1 include former septic fields that may have been used for solvent disposal, storage tanks, disposal sites, and landfills.

No discussion of ~~# sites~~ ~~investigation~~ # requiring remediation,

III.B. Duration and Quantity of Release

A summary of existing RI/FS, LFI/FFS, and ROD data for all 1100 Area OU's is presented in Table 1. The following subsections will describe existing data for each OU in more detail.

Because the investigations for the EM-2 and EM-3 were not exhaustive, the risk assessment approach was not as specific as the approach used for the EM-1 and the remedial action objectives were more broadly defined. A qualitative evaluation of overall potential risk from the EM-2 and EM-3 was made by comparing possible waste site contaminant concentrations with existing state and federal health-based guidelines (principally, the State of Washington *Model Toxics Control Act* (MCTA)). The guidelines from the qualitative evaluation form the basis of the cleanup goals for the EM-2 and EM-3 OU's (DOE 1995b). The ROD specified that contamination found in the IU area would also be cleaned up to Washington State's MCTA (DOE 1994c).

No site map!

III.B.1. 1100-EM-1

7, nonwaste Pit 1 + South pit missing!

The EM-1 Operable Unit contains several waste sites that were investigated.

III.B.1.a. 1100-1- The Battery Acid Pit

The Battery Acid Pit is an unlined, sand-filled sump, or french drain approximately 30 m from the southwest corner of the 1171 Building, used for disposal of waste acid from vehicle batteries. During its use, the pit was approximately 1.8 m in diameter and 1.8 m deep. The pit is no longer visible because it was filled and graded to match the surrounding surface when it was removed from service. Historical documents record an estimated 57, 000 liters of battery acid wastes may have been disposed of during its operating years (1954 - 1977) (DOE 1992a).

Information gathered through interviews with former site workers suggest that other substances including waste oil, waste antifreeze, and spent solvents were also deposited in the pit. No documentation exists to support these claims. Periodically, during the operation of this facility, the acid-laden sand ~~lining~~ was removed and deposited at an undetermined location and fresh sand fill installed (DOE 1992a).

A geophysical survey was conducted over the area to find the exact location of the pit. Five soil gas probes were installed as part of the first phase, no contamination was detected. A single boring was made, yielding one sample from the surface and seven from the subsurface strata. Inorganic contaminants were found in surface and subsurface samples. No organic contaminants were detected at this site. Contaminants detected are listed in Section III.C.. Concentrations of contaminants are listed in Table 2. No additional work was performed during the second phase of investigations (EPA 1993).

Table 3 G.W also?

III.B.1.b. 1100-2 - The Paint and Solvent Pit (2)

The Paint and Solvent Pit is a semicircular depression located approximately 1.6 km north of the 1171 Building. The pit has an approximate diameter of 108 m and a depth of 1.2 m to 1.8 m. Originally a sand and gravel pit, the site was used during the period between 1954 through 1985 for the disposal of construction debris generated during demolition of Hanford Site facilities. Principal components of the waste include concrete rubble, asphalt, and wood debris. Undocumented disposal of waste paint, solvent, and paint thinner is also reported to have occurred at this site (DOE 1992a).

A geophysical survey was conducted over the floor of the pit. Rubble and other construction debris were found. During phase I of the investigations soil gas samples were collected and analyzed. Relatively high readings of tetrachloroethene (PCE) were found in the southwest corner of the site. Peak concentrations of PCE were as high as 727μg/L with values decreasing in all directions away from the maximum concentration. Areal distribution of the positive soil-gas readings suggested the potential for an isolated, shallow accumulation or small surface spill within the pit. No other volatile contaminants were detected during the soil-gas survey (EPA 1993).

Four boreholes drilled at this site yielded 4 surface samples and 29 subsurface soil samples. In addition, soil samples were obtained at 20 surface locations within the pit area. Inorganic, organic and pesticide contamination was detected in surface and subsurface soil samples.

Contaminants detected are listed in Section III.C.. Concentrations of contaminants are listed in Table 2. No additional work was performed during phase II of the investigations (EPA 1993).

III.B.1.c. 1100-3 - The Antifreeze and Degreaser Pit (3)

The Antifreeze Degreaser Pit is a shallow, roughly circular depression located approximately 1.6 km north of the 1171 Building on the west side of the Hanford Rail Line. Originally a sand and gravel source for construction activities on the Site, it was used during the period of 1979 to 1985 as a disposal site for waste construction material, principally roofing and concrete rubble. The pit is approximately 76 m in diameter and 1.8 to 2.4 m deep. Occasional disposal of waste antifreeze and degreasing solutions from the 1171 Building was suspected, but not documented, at this location (DOE 1992a).

A geophysical survey was conducted over the floor of the pit. Rubble and other construction debris were found. Forty-three soil gas samples were collected and no contaminants were detected. Twenty-three surface samples were collected and twenty-four subsurface samples were obtained from four boreholes. Inorganic contaminants were found in surface and subsurface samples. No organic contaminants were detected at the Antifreeze and Degreaser Pit. Contaminants detected are listed in Section III.C.. Concentrations of contaminants are listed in Table 2. No additional work was performed during phase II of the investigations (EPA 1993).

III.B.1.d. 1100- 4- The Antifreeze Tank (4)

The Antifreeze Tank was a former 19,000 L steel, underground storage tank used for waste vehicle antifreeze. The tank was located beneath the floor of the northern-most portion of the 1171 Building. The tank was installed in 1976 and emptied, cleaned, and removed in 1986 due to suspected leakage. No evidence of leakage was detected when the tank was removed (DOE 1992a).

During tank removal, three soil samples were collected from the base of the excavation. No detectable levels of antifreeze were identified. In November 1989, thirteen vadose zone samples were collected from beneath the building where the waste site is located. A single sample detected ethylene glycol at a concentration of 2.6 parts per million (ppm) (DOE 1992a). Inorganics contaminants detected at the site are listed in Section III.C.. Concentrations of contaminants are listed in Table 2. No additional work was performed during phase II of the investigations (EPA 1993).

III.B.1.e. UN-1100-6- The Discolored Soil Site (5)

The Discolored Soil Site consisted of a patch of oily dark stained soil located in the eastern end of an elongate east-west oriented depression approximately 610 m northwest of the 1171 Building on the west side of the Hanford Rail Line. The depression extended over an area of approximately 0.2 ha; the actual area of discolored soil covered an area of about 1.8 m by 3.1 m.

The source of the soil discoloration appeared to be the isolated, unauthorized disposal of contents of one or more containers of liquid material to the ground surface. No record exists that identifies the nature or origin of the waste material deposited at the site (DOE 1992a).

Fifteen surface soil samples were obtained from this site during the phase I remedial investigation. Contaminants identified in surface soil samples collected during the Phase I investigation included inorganic, organic, and pesticide compounds. Contaminants detected at the site are listed in Section III.C.. Concentrations of contaminants are listed in Table 2. After a thorough review of analytical results from the surface soil sampling and a field examination of the site, it was deemed to be a inefficient use of time, given the project schedules, and not cost effective to perform sampling of subsurface soils (DOE 1992a).

During the phase II investigation fourteen soil-gas probes were installed at the site and samples did not identify any contaminants. No other soil-gas work was performed during the second phase of investigations (EPA 1993).

Remediation of the discolored soil site began in February 1995, with the excavation and stockpiling of 70 m^3 of waste material (principally, bis (2-ethylhexyl) phthalate (BEHP)). Confirmation sampling indicated that the removal action met the cleanup level of 71 mg/kg for BEHP established in the ROD. The site was regraded to a smooth, uniform surface. The contaminated soil was excavated and stockpiled and the waste was transported in April 1995. The BEHP-contaminated soil was disposed of by incineration (DOE 1995b).

III.B.1.f. The Horn Rapids Landfill Site (b)

The Horn Rapids Landfill (HRL) is located north of Horn Rapids Road near its intersection with Stevens Drive, the HRL site extends over approximately 20 hectares within the 600 Area. It was operated from the 1940's into the 1970's as an uncontrolled landfill. Originally a borrow pit for sand and gravel, it was used as a landfill primarily for office and construction waste, asbestos, sewage sludge, fly ash, and reportedly, numerous drums of unidentified organic liquids. The landfill site is situated in a generally flat terrain. Five disposal trenches have been identified at the site through a study of historical aerial photographs, onsite investigations, and geophysical surveys. Surface debris consisting of auto truck tires, wood, metal shavings, soft drink cans and bottles, and other small pieces of refuse were scattered across the site. A single trench, the western-most of the identified waste disposal trenches, was posted with signs warning that the trench contained asbestos (DOE 1992a).

During the phase I investigations geophysical surveys were performed and did not detect accumulated waste outside of the five identified waste disposal trenches. Soil-gas surveys were performed a the HRL and in surrounding areas to assist in vadose zone sampling. Two hundred and eleven temporary soil-gas extraction points were installed in the landfill area. Samples collected from these points detected trichloroethene (TCE); 1,1,1-trichloroethane (TCA); and PCE within the HRL. Trichloroethene was detected at 17 of the 36 permanent soil-gas extraction points installed within the limit of the HRL with concentrations ranging from 3 to 233 parts per billion by volume (ppbv). Contaminants detected in the 50 surface soil samples and 55

different units used elsewhere

subsurface soil samples are listed in Section III.C.. Concentrations of contaminants are listed in Table 2. It should be noted that during the phase I investigations, boreholes were intentionally sited to avoid drilling through known and suspected waste deposits. This placed substantial limitations on the representativeness of the soil quality results of the phase I data (DOE 1992a).

During the phase II investigation, additional soil-gas surveys, geophysical surveys, surface soil sampling, and subsurface soil sampling were performed. Second phase soil-gas surveys detected TCE at concentrations from 2 to 255 ppbv in 36 of the 53 probes. The highest TCE concentrations were obtained just outside the disturbed portions at the eastern limits of the HRL. Additional geophysical surveys were conducted to further identify accumulation of drums containing organic solvents said to have been buried at the HRL. Areas that might represent an accumulation of drums were further investigated with test pits. During excavation of the test pits various types of debris and two small deposits of chemicals were discovered. One (white crystalline powder) was identified as sodium bisulfate and the other (bright purple stained soil) was identified as potassium permanganate. Thirteen subsurface soil samples were taken from the test pits that detected manganese and Dieldrin, neither had been detected during phase I sampling. Eight surface soil samples were taken to identify the areal extent of PCB contamination in the HRL. Fifteen additional surface soil samples were taken from the surface to further characterize two surface depressions in the HRL. Endosulfan II and Endrin were additional contaminants detected in the surface soil samples during the phase II investigations (EPA 1993).

Remedial actions began in January 1995, with the clearing and road pioneering work at the HRL. Excavation of the PCB-contaminated soil in the HRL also began in January 1995. The PCB-contaminated soil was excavated until field observance and field screening indicated that the soil did not exceed the 5mg/kg cleanup criterion established in the ROD. The results of the confirmation sampling indicated that there was some contamination remaining that exceeded the cleanup criteria for PCBs and additional removal was performed. The additional removal was accomplished in March 1995. A total of 1,224 m^3 of PCB-contaminated soil (principally, the PCB Aroclor-1248) was excavated and stockpiled for eventual disposal. The construction of the closure cap for the HRL began in January 1995, and was constructed of material from a nearby borrow area. The cap was completed in April 1995. Five groundwater-monitoring wells were installed in August 1995, downgradient of the landfill to facilitate compliance evaluation and the remedial action objectives. Compliance with Maximum Contamination Levels (MCLs) is anticipated by the year 2018. The PCB-contaminated soil was transported in March and April 1995. Revegetation of the site began and was completed in November 1995 (DOE 1995b).

exceedance ?

III.B.1.g. The Ephemeral Pool (7)

The Ephemeral Pool site is a long narrow, manmade depression located along the western edge of the asphalt-paved 1171 Building parking area. The depression acted as a drainage collection point for precipitation runoff flowing from the parking area surface. Overall dimensions are approximately 6.1 m wide (east-west) by 183-213 m in length (north-south). The Ephemeral Pool was designed to collect runoff from the parking area and direct it to a central culvert

approximately at the lengthwise mid-point of the depression. Settlement and/or poor grading of the depression floor results in the formation of a series of linked pools after rainfall events that temporarily holds a portion of the collected moisture within the drainage way until it evaporates or infiltrates into the ground. A pervious gravel lining encourages infiltration of the collected runoff into the vadose zone beneath this site (DOE 1992a).

During the Phase I investigations two surface samples were taken within the Ephemeral Pool. Results of the analyses indicated the presence of PCBs in low to moderate concentrations (300 to 4700μg/kg). Surface soil samples collected identified the presence of inorganic and organic contaminants (DOE 1992a). Contaminants detected at the site are listed in Section III.C.. Concentrations of contaminants are listed in Table 1.

Six surface soil samples were collected during the Phase II investigations and submitted for PCB and pesticide analyses. Laboratory results confirmed the presence of alpha (210 μg/kg) and gamma (1 100 μg/kg) chlordane. Two of the seven samples detected concentrations of PCBs (Aroclor 1260) at 11,000 and 42,000μg/kg (DOE 1992a).

Ephemeral pool remediation began in February 1995, with an initial phase of sampling. In March 1995, excavation and stockpiling of waste (principally, the PCB Aroclor-1260) began. Approximately 70 m^3 of contaminated soil was excavated, with a large volume of remaining contaminated soil having PCB-contamination concentrations of between 0.5 and 2 mg\kg when work was halted for consultation with the regulatory agencies and DOE. Following consultation,

the final phase of the excavation and stockpiling resumed, and 115 m^3 of waste material was removed. Confirmatory sampling indicated that the removal action met the requirements based on the cleanup level of 1 mg/kg for PCB's as established in the ROD. The site was regraded to a smooth, uniform surface. The contaminated soil was excavated and stockpiled. The PCB-contaminated soil was disposed of at a RCRA, Class C/TSCA off-site hazardous waste landfill. The PCB-contaminated soil was transported in April 1995 (DOE 1995b).

III.B.2. 1100-EM-2 Neptunes Potation + Separator Tank missing, 2 included were Id. for remediation, not further invest.

The following ~~subunits~~ site were identified for ~~further investigation~~ remediation action. during the LFI/FFS:

III.B.2.a. Tar Flow Area- (1)

The Tar Flow Area is located about 320 m north of the northwest corner of Building 1171. A soft tar-like substance was observed to cover a ground surface covering an irregular area of approximately 61 m x 20 m. The source of tar-like material is unknown. Based on the results from the 1994 investigations and the cleanup goals for EM-2 OU, the tar flow area was identified for remedial action (the stained sands area was combined with the tar flow area for remedial action). Surface soil samples collected at this site detected the presence of total petroleum hydrocarbons (TPH) and lead. Maximum concentrations of TPH (80,000 mg/kg) and lead (404 mg/kg) were detected to be above cleanup goals. As identified in the ROD, the remedial objective for this site was to excavate all soil with TPH exceeding 200 mg/kg and lead

concentrations exceeding 250 mg/kg (DOE 1995a).

The remediation of the tar flow area began in June 1995, the waste transportation and disposal was completed in September 1995. The volume of petroleum contaminated soil excavated, 1,224m^3, was more significant than initially estimated. Following excavation, confirmatory sampling indicated that the removal actions met the requirements based on cleanup levels established in the ROD (DOE 1995b).

III.B.2.b. Stained Sands Area- (2)

The Stained Sands Area is located approximately 274 m north of the northwest corner of Building 1171, an area of visibly stained sands of the east slope of a sand dune were identified. The stained soils were observed to cover an area of approximately 6m x 6m and an estimated 41 m^2 of contaminated soil. The stained sands area was included in the tar flow area for remedial actions.

III.B.3. 1100-EM-3

Detailed discussion on the sites identified for ~~further investigation~~ remediation during the LFI/FFS ~~and remedial action~~ are to follow:

no bold

III.B.3.a. 1240 French Drain - (1)

The 1240 French Drain is located on the west side of Building 1240. There is no documented evidence of spills into the drain that might have discharged into the surrounding soils, however, a polychlorinated biphenyl (PCB) collection area was located adjacent to the drain. Analyses identified lead, TPH, chromium, and PCB's present in the soil at the French Drain. Concentrations of lead, TPH, and chromium exceeded the ROD cleanup goals. Maximum detected concentrations included the following: lead (619 mg/kg), TPH (80,000 mg/kg), and chromium (949 mg/kg). Analyses for PCB's were done on sight indicating concentrations greater than 1 mg/kg, but less than 10 mg/kg, exceeding the ROD cleanup goal . However, offsite analysis of the samples determined that PCB's in the drain were less than 1 mg/kg (DOE 1995a).

Remediation of the French Drain began in July 1995. A total of 62 m^3 of soil contaminated with lead, TPH, and chromium was excavated and stockpiled. Confirmatory sampling indicated that the removal action met the ROD cleanup level requirements of 240 mg/kg for lead, 200 mg/kg for TPH, and 400 mg/kg for chromium. The site was regraded and base materials were spread over the disturbed area. The soil was transported and disposed of in September 1995 (DOE 1995b).

III.B.3.b. 1240 Suspect Spill Area - (2)

The 1240 Suspect Spill Area is located at the north end of Building 1240. The area consisted of visibly stained soil as a result of spilled pliable adhesive mixed with metal fragments and floor

sweepings. Concentrations of lead exceeding the ROD cleanup goals was determined present in the surface soils of the area. The maximum detected concentration of lead was 44,200 mg/kg (DOE 1995a).

Remediation of the spill area began in July 1995, with excavation and stockpiling of 54 m^3 of lead-contaminated soil. Confirmation sampling indicated that the removal action met the cleanup requirements for lead (250 mg/kg) identified in the ROD. The site was regraded and base materials were spread over the disturbed area. The soil was stabilized, transported, and disposed of in September 1995 (DOE 1995b).

III.B.3.c. 1262 Solvent Tanks - (3)

The underground storage tanks (USTs) were located west of the 1262 Building at the interface of the grass and the asphalt parking lot. The USTs were suspected to have contained solvent, potentially carbon tetrachloride, from dry-cleaning operations during Hanford's military era.

Upon excavation of the tanks in June 1995, it was discovered that one tank was filled with fluid and the other tank had only residual fluid. The tanks were sampled, indicating that the contents were nonhazardous water (DOE 1995b). The fluids were removed and discharged to the Richland sanitary sewer. The tanks were cleaned and removed in July 1995. Confirmation sampling from the soil below the tanks and the sides of the excavation detected no hazardous materials (DOE 1995b).

III.B.4. 1100-IU-1

only 30

The 32 areas within IU-1 that required detailed investigation and/or remediation are discussed in the following subsections:

III.B.4.a. 6652-C SSL Active Septic System 1

Discharge from this septic system has been observed over a slope northeast of the administrative building. The estimated area covered by the septic system field is approximately 11 m by 2 m. In addition, a 2500-gallon septic tank is associated with this septic system. Solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal; therefore, potential contaminants may include chlorinated and nonchlorinated solvents (DOE 1994c).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any volatile organic compounds (VOCs) were present in the soils at the end of the septic system discharge pipe. On-site laboratory equipment was used to analyze the samples collected for selected VOCs. Results for VOCs are listed in Table 1-1 in DOE 1994c. No VOCs were detected in the soil samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994a) no remedial action was needed at this waste management unit (DOE 1994c).

III.B.4.b. 6652-C SSL Inactive Septic System (2)

Due to the possibility that solvents and other wastes were disposed of in septic systems, this area required additional investigation. The estimated area covered by the septic system field is 9 m by 92 m. In addition, a 9375 L septic tank is associated with this septic system. Sampling has not been conducted at this site, so no information regarding the type and extent of contamination is available. However, solvents were regularly used in site processes and are thought to have been discharged into the septic systems for disposal; therefore, potential contaminants include chlorinated and nonchlorinated solvents (DOE 1994c).

III.B.4.c. Radar Berm and Pads (3)

Large amounts of hydraulic fluid were used in these areas to rotate radar tracking equipment. There are three pads, each of which is 5 m by 5m. Visible contamination has not been observed on the pads or surrounding berms. Potential contaminants include petroleum hydrocarbons, specifically hydraulic fluid (DOE 1994c).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any petroleum hydrocarbons were in the soils. Only two of the three pads were sampled, due to large cobble to boulder size fill material at the third pad. TPH tests were performed in July 1994 by immunoassay analysis using a field test kit. Results for TPHs are listed in Table 3-1 in (DOE 1994c). No petroleum hydrocarbons were detected in the soil

samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994b) no remedial action was needed at this waste management unit (DOE 1994c).

III.B.4.d. H-52-C Surface Gas Tank Area (4)

Investigations have identified two 475-gallon surface gasoline tanks in this area. Interviews with former site personnel have indicated that this area was also used for cleanup of paintbrushes and other items. No containment was provided during paintbrush cleanup. No visible staining was observed during investigations. The estimated area covered by the tanks and used for cleanup purposes is 6 m by 6 m. Potential contaminants at this site include petroleum hydrocarbons (gasoline) from the gas storage tanks, solvent (chlorinated and nonchlorinated) and metals from cleanup of painting materials (DOE 1994c).

No geophysical or soil gas surveys were performed at this site. Subsurface soil samples were collected in July 1994 to determine if any VOCs, metals, or petroleum hydrocarbons were present in the soil in the former storage tank area. On-site laboratory equipment was used to analyze the samples for various VOCs. Additional total petroleum hydrocarbon tests were performed using an immunoassay field test kit. Results for VOCs and TPHs are listed in Tables 4-1 and 4-2 in DOE 1994c. No VOCs, metals, or petroleum hydrocarbons were detected in the soil samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994b) no remedial action was needed at this waste management unit (DOE 1994c).

III.B.4.e. Control Center Disposal Pits

This waste management unit is composed of five individual pits that appear to have been used to burn refuse. Each pit is approximately 1 m by 2 m in diameter. The pits contained debris which consisted of glass, metal, ashes and pieces of wood. Soil samples were only taken from four pits due to rosy balsam root *(Balsamorhiza rosea)* growing in the fifth. No geophysical or soil gas surveys were performed at this site. Potential contaminants in this area may include chlorinated solvents, petroleum hydrocarbons, acids, and metals (DOE 1994c).

Subsurface soil sampling was conducted in July 1994 to determine if any semivolatile organic compounds (SVOCs), VOCs, metals or PCBs were present in the pits. One sample from the center of each of the four pits was collected. An on-site laboratory was used for VOC analysis and PCB screening and analyses for SVOCs and metals were analyzed at an off-site laboratory. Additional PCB analysis was performed on-site using an immunoassay field test kit. Results for VOCs and PCBs are listed in Tables 5-1 and 5-2 in (DOE 1994c). Lead was the only contaminant detected in the soil samples above the ROD soil clean-up goals. Lead was detected in pits #1 (1450 mg/kg) and #3 (1240 mg/kg). It was determined that remedial action was needed at this waste management unit (DOE 1994c).

III.B.4.f. Building 6652-C Abandoned USTs

Six underground storage tanks (USTs) have been associated with this site. Four 1000-gallon

fuel oil USTs (labeled as 6B) have been identified in the building, one UST (labeled as 6A) on the northeast corner of the building (reportedly removed), and one UST (labeled as 6C) on the southeast corner. Potential contaminants at this site include petroleum hydrocarbons, fuel oil or diesel (DOE 1994c).

Geophysical surveys detected one UST-like (site 6C) object adjacent to the south side of the Building 6652-C. Geophysical surveys also suggested that there were never USTs present at the UST site 6B. A soil gas survey was conducted in July 1994 to determine if any VOCs were present at the 6A UST site. Soil gas samples were analyzed for select VOCs using on-site laboratory equipment. Results for VOCs are listed in Table 6-1 in DOE 1994c. No VOCs were detected therefore no soil sampling was conducted at this location. Because no VOCs were detected at the soil gas survey at the 6A site according to the sampling program decision process no remedial action was needed. Because the UST was confirmed to be present at site 6C, the decision process described in DOE-RL (1994b) indicated that the tank and ancillary piping should be removed (DOE 1994c).

III.B.4.g. Pumphouse Disposal Slope (7)

Investigations have identified dumping of solid waste on a slope by the pumphouse. A small pile of debris was observed at the top, and piles of concrete were observed on the slope. The estimated volumes of the debris piles are 1.5 m by 1.5 m by .6 m and 26 m by 3 m by .3 m. Sampling has not been conducted at this site, so no information regarding the type and extent of

contamination is available (DOE 1994c).

III.B.4.h. Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank

The Pumphouse Latrine storage tank was known to have been above ground, and has been removed. Two concrete saddle supports still exist in this location. Potential contaminants at this site include petroleum hydrocarbons (fuel or oil diesel) from the storage tank (DOE 1994c).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any VOCs or petroleum hydrocarbons were present in the soils. On-site laboratory equipment was used to analyze the samples collected for select VOCs. Additional TPH analyses were performed using an immunoassay field test kit. Results for VOCs and TPHs are listed in Tables 8-1 and 8-2 in (DOE 1994c). TPH was detected in the surface soil at 420 mg/kg, which exceeds the ROD cleanup goals for TPH. The sampling program decision process described in DOE\RL (1994b) indicated that the soil with TPH above ROD clean-up goals (250 mg/kg) should be removed (DOE 1994c).

III.B.4.i. Pumphouse Latrine 275-Gallon Fuel Oil Storage Tank

This waste management unit is known to have been an above ground fuel oil storage tank, that has been removed. Two concrete saddle supports still exist in this location. Potential contaminants at this site include petroleum hydrocarbons (fuel or oil diesel) from the storage tank

(DOE 1994c).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any VOCs or petroleum hydrocarbon were present in the soils. On-site laboratory equipment was used to analyze the samples collected for select VOCs. Additional TPH analyses were performed using an immunoassay field test kit. Results for VOCs and TPHs are listed in Tables 9-1 and 9-2 in DOE 1994c. No VOCs or TPHs were detected in the soil samples; therefore, according to the sampling program decision process outlined in DOE-RL (1994b) no remedial action was needed at this waste management unit (DOE 1994c).

III.B.4.j. ALE Field Storage Building Septic System

This septic system has been identified as a waste management unit due to the possibility that solvents and other wastes were disposed of in septic systems. The estimated area covered by the septic system field is 61 m by 12 m. In addition a 4000-gallon septic tank is associated with this septic system. Potential contaminants may include chlorinated and nonchlorinated solvents that may have been discharged into the septic system for disposal (DOE 1994c).

A geophysical survey was conducted in June 1994 to assist in locating the edges of the septic tank. The tank was located at a depth of approximately 30 cm below ground surface. A soil gas survey was conducted in June 1994 to determine if any VOCs were in the soil. A total of nine samples were collected at a depth of 1 m around the perimeter of the tank. Samples were

analyzed for select VOCs at an on-site laboratory. Results for VOCs are listed in Table 10-1 in DOE 1994c. Because VOCs were not detected from the soil gas survey no soil sampling was conducted at this site and it was determined no remedial action is needed (DOE 1994c).

(11)

III.B.4.k. Mound Site Northwest of Building 6652-G

This waste management unit is of unknown origin, but appears to be a windbreak or the location of a soil research project near the ALE laboratory. The site could be better described as a berm, approximately 55 m long by 3 m wide. The potential contaminants at this site are unknown (DOE 1994c).

A geophysical survey was conducted in July 1994 to assist in identifying any concentrations of debris in or around the mound. No debris was found. No soil gas surveys were performed at this site. Soil sampling was conducted in July 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at the mound site. Four soil samples were collected at two depths below ground surface. On-site laboratory facilities were used for select VOC analysis and PCB screening. Additional PCB tests were performed using a immunoassay field test kit. Analytical results are summarized in Table 11-1 and 11-2 in DOE 1994c. Because no VOCs, SVOCs, metals, or PCBs were detected above ROD clean-up goals it was determined that no remedial action was needed at this waste management unit (DOE 1994c).

(12)

III.B.4.l. 6652-I ALE Headquarters Septic System

The septic field for this system includes three separate drainfields and a 22,710 L septic tank. Of the three septic fields one measures 4.6 m by 46 m and two measure 21 m by 30 m. Potential contaminants may include chlorinated and nonchlorinated solvents that may have been discharged into the septic system for disposal (DOE 1994c).

A geophysical survey was conducted in June 1994 to assist in locating the edges of the septic tank and the drainfields. A soil gas survey was conducted in June 1994 to determine if VOCs were present in the soil. A total of seventeen soil gas samples were collected. Samples were taken at each end of the septic tank and throughout each of the drainfields. Samples were analyzed for select VOCs with on-site laboratory equipment. Results for VOCs are listed in Table 12-1 in (DOE 1994c). Because noVOCs were detected from the soil gas survey, no soil sampling was conducted at the site and no remedial action was needed at this site.(DOE 1994c)

(13)

III.B.4.m. Abandoned Underground Storage Tanks

This waste management unit is comprised of six USTs, ranging in size from 275-gallons to 2000-gallons. The tanks are located at the ALE Headquarters and associated buildings. Some or all of the tanks may still contain fuel. Potential contaminants at this site include petroleum hydrocarbons (fuel oil) from the storage tanks (DOE 1994c).

A geophysical survey was conducted in July 1994 to assist in locating the suspected USTs. Underground Storage Tank-like objects were detected at two of the six sites. Soil gas surveys

were conducted in July 1994 to determine if any VOCs were present at the four sites where USTs were not detected. No soil sampling was performed at this waste management unit. Soil gas samples were analyzed for VOCs using on-site laboratory equipment. Results for VOCs are listed in Table 13-1 in (DOE 1994c). No VOCs were detected from the soil samples taken at the four tank sites and no remedial action was needed. Because the geophysical survey identified tanks present at two other sites, these tanks and ancillary piping should be removed (DOE 1994c).

(4)

III.B.4.n. Missile Bunker Sump

This management unit is in an underground facility and is comprised of two areas, the north and the south missile bunker sump area. These sump areas were originally used to store missiles when the NIKE base was active from approximately 1952-1962. The original descriptions of this site indicated debris (batteries, transformers and asbestos) existed in this area. The sump area was found to be clear of this debris, therefore no sampling was conducted for asbestos. No geophysical or soil gas surveys were conducted at this site. Polychloriniated biphenyl (PCB) wipe samples of the missile bunker sumps, the hydraulic lift "wells", and the north missile bunker sump hydraulic jacks were collected in July 1994. These samples were submitted to an on-site laboratory for PCB screening. PCB results are listed in Table 14-1 (DOE 1994c). PCBs were detected from the samples on the auxiliary jacks and on the north and south missile bunker sumps. The PCB Aroclor 1254 was detected at 32 $\mu^g/100cm^2$ wipe for the auxiliary jacks and 34 and 150μg/wipe for the north and south missile bunker sumps, respectively. Because the

investigations were conducted in accordance with approved plans and procedures remedial action was needed at this waste management unit. Remedial action should include decontaminating all PCB contaminated surfaces to less than the EPA recommended clean-up level of $10\mu g/100cm^2$ wipe (DOE 1994c).

(15)

III.B.4.o. Missile Bunker Landfill

This waste management unit is an inactive landfill located approximately 100 yards northwest of the missile bunker area. Interviews with former site personnel have indicated that this landfill was used for disposal of construction and demolition debris (DOE 1994c).

A geophysical survey was conducted in July 1994 to identify the extent of the landfill and locate concentrations of debris. The surveys indicated little metallic debris was present. A soil gas survey was also conducted in July 1994 to determine if any VOCs were present in the soil at the landfill. Soil gas samples were analyzed for selected VOCs using on-site laboratory equipment. No VOCs were detected from the soil gas survey, therefore no soil samples were taken. Results for VOCs are listed in Table 15-1 in (DOE 1994c). Because no VOCs were detected from the soil gas survey the sampling program decision process indicates that no remedial action was needed at this waste management unit (DOE 1994c).

?

Horseshoe

III.B.4.p. Missile Refueling Area Berm

The missile refueling area consists of two berms. Potential historical use of herbicide and/or defoliant on these berms has been identified. The estimated total volume of the berms is 600 cubic yards.

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in June 1994 to determine if any pesticides or herbicide were present in the missile fueling area berm. Two composite soil samples, one from each berm, were collected. The composite samples consisted of six sample locations on each berm, for a total of twelve samples collected. Soil samples were sent to an off-site laboratory for analysis. No pesticides or herbicides were detected in the soils, therefore no remedial action was taken at this site (DOE 1994c).

III.B.4.q. Acid Neutralization Pit

This pit is a concrete drainage pit filled with soil, gravel, and covered with vegetation. The pit is approximately 12 m by 1.5 m in size. JP-4 from a nearby refueling area is thought to have drained into the pit (DOE 1994c).

No geophysical or soil gas surveys were performed at this site. Soil sampling was conducted in June 1994 to determine if any metals or petroleum hydrocarbons were present in the soils at the site. Samples were screened for TPH using an on-site laboratory and metal analyses were done

off-site. Results for TPH are listed in Table 17-1 and metal analysis results are included in Appendix A in DOE 1994c. No petroleum hydrocarbons were detected from the soil samples, therefore no remedial action has taken place at this site (DOE 1994c).

(18)

III.B.4.r. Missile Assembly and Test Building Inactive Septic System

Building 6652-O, which is connected to the septic system, was determined through interviews to be the location of the electrical parts cleaning operation. The estimated area covered by the septic system field is 30 m by 3 m feet. A 3,785 L septic tank is associated with this system (DOE 1994c).

A geophysical survey was conducted in June 1994 to assist in locating the septic tank and associated drain field. A utility location survey was also conducted to assist in determining the location of an underground cable northwest of the tank-like object. The interpeted locations of the septic tank, drainfield and detected utilities were used to guide the location of soil gas probes. A soil gas survey was conducted in June 1994 to determine if any VOCs were present in the soil at the site. Samples were submitted to an on-site laboratory for VOC analyses. Results for VOCs are listed in Tables 19-1 and 19-2 in DOE 1994c. Because only trace amounts of VOC were detected from the soil gas survey no remedial action has been taken at this site (DOE 1994c).

(19)

III.B.4.s. Missile Maintenance and Assembly Area Acid Storage Shed

Investigations identified discolored soil and stressed vegetation in the area of this shed. In addition, a drainage ditch that runs near the shed was observed to contain discolored soil. The estimated size of the shed is 5 m by 5 m.

No geophysical or soil gas surveys were conducted at this site. Soil sampling was conducted in June 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at this site. One sample was collected from the eastside of the storage site. The sample was submitted to an on-site laboratory for VOC analysis and PCB screening, and to an off-site laboratory for SVOC and metals analyses. PCB and VOC results are listed in Tables 20-1 and 20-2, metals and SVOC results can be found in Appendix A in (DOE 1994c). Because no VOCs, SVOC, metals or PCBs were found in the soil sampling no remedial action has been taken at this site (DOE 1994c).

20

III.B.4.t. JP-4 Fuel Pad

This waste management unit was identified as a 3 m by 3 m concrete pad where fueling operations took place. No evidence of spills or staining has been observed on the pad. Based on past use of the pad potential contaminants include petroleum hydrocarbons (DOE 1994c).

No geophysical or soil gas surveys were conducted at this site. Soil sampling was conducted in June 1994 to determine if any petroleum hydrocarbons were present in the soils at this site. Two soil samples were collected, one on the northwest and the other on the southeast side of the fuel

pad. The samples were submitted to an on-site laboratory for TPH screening. Results for TPH are listed in Table 21-1 in (DOE 1994c). Because no TPH was detected in the soil samples no remedial action has been taken at this site (DOE 1994c).

21

III.B.4.u. Missile Bunker Drainfield

The estimated area covered by this drainfield is approximately 5 m by 15 m. Potential contaminants include chlorinated and nonchlorinated solvents that may have been discharged into the septic system disposal (1994b).

A geophysical survey was conducted in June 1994 to assist in locating the septic tank and associated drain field. A utility location survey was also conducted to assist in determining the location of an underground cable. The interpreted locations of the septic tank, drainfield, and detected utilities were used to determine locations of soil gas sampling. A soil gas sampling survey was conducted in June 1994 to determine if any VOCs were in the soil at the site. Two soil gas samples were collected and submitted to any on-site laboratory for an analyses. Results for VOCs are listed in Table 21-1 in DOE 1994c. Because no VOCs were detected in soil gas samples no soil samples were collected and no remedial action has been taken at this site (DOE 1994c).

22

III.B.4.v. Missile Bunker Discharge Ditch

This waste management unit is comprised of three areas where three discharge pipes originate from the missile bunkers. Two of these discharge pipes are thought to emanate from the missile bunker sumps and are buried. The third pipe has been seen discharging and is thought to emanate from a water tank located on the south bunker berm.

A geophysical survey was conducted in June 1994 to locate two discharge ditches at the end points of two clay discharge pipes east of the missile bunker. A utility location survey was also performed to determine the location of underground utilities. No soil gas survey was performed at this waste management unit. Soil sampling was conducted in July 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at the location where the discharge pipes are present. Four soil samples were collected, one from each discharge pipe area and one from the northern discharge pipe. The samples were submitted to an on-site laboratory for VOC analysis and PCB screening, and to an off-site laboratory for SVOC and metals analyses. Results for VOCs and PCBs are in Tables 23-1 and 23-2, additional results for SVOCs, metal, and PCBs analyses are included in Appendix A in (DOE 1994c). VOCs, SVOCs and metals were not detected at levels high enough to initiate remedial action. PCBs were detected in the soil samples analyzed by the on-site laboratory. Since confirmatory soil samples analyzed by the off-site laboratory did not detect PCBs in the additional samples collected, no remedial action was taken (DOE 1994c).

23

III.B.4.w. H-52-L Surface Gas Tank Storage Area

Investigations identified two 475-gallon surface gasoline tanks in this area. Interviews with former site employees indicated that this area was also used for clean-up of paint brushes and other items (DOE 1994b).

A geophysical survey was conducted in July 1994 to assist in locating any underground utilities before intrusive sampling. No underground utilities were detected at this site. Soil gas surveys were conducted in June and July 1994 to determine if any VOCs were present in the soil at this storage area. A total of three soil gas samples were collected and submitted to an on-siste laboratory for analysis of select VOCs. Results for VOCs are listed in Table 25-1 in (DOE 1994c). Because no VOCs were detected from the soil gas surveys, no soil samples were collected and no remedial action has been taken (DOE 1994c).

24

III.B.4.x. Horseshoe Site

This waste management unit is an inactive landfill located 183 m northwest of the missile bunker area beyond the missile bunker landfill. This site was identified as a possible waste management unit because of debris observed at the surface. The site is approximately 3 ha in size.

A geophysical survey was conducted in July 1994 to identify the extent of the landfill and locate concentrations of debris. The results from the geophysical surveys were used to determine location of soil gas sampling. A soil gas survey was conducted in July 1994 to determine if VOCs were present at the site. A total of 52 soil gas samples were collected and submitted to an

on-site laboratory for analysis of select VOCs. Results for VOCs are listed in Table 27-1 in (DOE 1994c). Because no VOCs were detected from the soil gas surveys, no soil samples were collected and no remedial action has been taken at this site (DOE 1994c).

55 yes

III.B.4.y. Elevator Doors

This waste management unit consists of elevator doors at the north and south missile bunkers. Included in this area are two 4 m by 10 m launch pads and the elevator doors. A tar-like sealant that may contain PCBs was observed around the launch pads and elevator doors (DOE 1994c).

No geophysical or soil gas surveys were conducted at this site. PCB wipe samples of the northern elevator door concrete firing area sealant and the northern elevator door hydraulic line were conducted in July 1994. Samples were submitted to an on-site laboratory for PCB screening. PCB results are listed in Tables 28-1 and 28-2 and in Appendix A of (DOE 1994c). PCBs were detected from the wipe samples at the missile bunker elevator door hydraulic line. The PCB Aroclor 1254 was present at a concentration of 300 μg/wipe. Following approved plans and procedures the elevated PCB concentrations determined remedial action was needed. Remedial action should include decontamination of all PCB contaminated surfaces to less than the EPA recommended clean-up level of 10μg/100cm^2 wipe (DOE 1994c).

26

III.B.4.z. Flammable Storage Block Shed

The storage block shed is located where the former Missile Maintenance and Assembly Area Paint Shed was located. Discolored soil and stressed vegetation have been observed around this shed. A utility location survey was conducted in June 1994 to identify the location of any underground utilities prior to sampling. No underground cables or pipes were detected at the site. No soil gas survey was performed at this waste management unit. Soil sampling was conducted in June 1994 to determine if any SVOCs, VOCs, metals, or PCBs were present in the soils at or around the shed. Four soils samples were collected from two hand augered borings. Soil samples were submitted to an on-site laboratory for VOC analysis and PCB screening, and to off-site laboratory for SVOC and metals analysis. PCB and VOC results are listed in Tables 29-1 and 29-2 and SVOC and metals results are in Appendix A of (DOE 1994c). Because no VOC, SVOC,metals or PCBs were found in the sampling above ROD clean-up levels, no remedial action has been taken at this site (DOE 1994c).

27

III.B.4.a.a. Missile Maintenance and Assembly Area Paint Shed

This shed has been removed and may have been replaced with the Flammable Storage Block Shed. No visible stains were observed in the area, which is an estimated 3 m by 3 m (DOE 1994b).

28

III.B.4.a.b. Missile Maintenance and Assemble Area Dry Well Drum

A 55-gallon drum was observed buried in the ground in this area. Another 55-gallon drum,

labeled "Dry Cleaning Solution" was observed laying on its side near the buried drum. This area is an estimated 1.5 m by 1.5 m, with scarce vegetation.

No geophysical or soil gas sampling was conducted at this site. Soil sampling was conducted in June 1994 and July to determine if any VOCs were present at this site. Three samples were collected, one inside and two outside the dry well drum. Soil samples were submitted to an on-site laboratory for VOC analysis. Results for VOC are listed in Table 30-1 in (DOE 1994c). Because no VOCs were found in the sampling above ROD clean-up levels, no remedial action has been taken (DOE 1994c).

29

III.B.4.a.c. H-52-L NIKE Base Landfill

This waste management unit is an inactive landfill located approximately 100 yards southeast of the main missile base. Interviews with former site personnel have indicated that everything used in base operations was disposed of in a landfill close to the base. Various types of debris were observed at the surface. Areas of discolored soil and stressed vegetation have also been observed on the surface of the landfill. The site is approximately 4.6 acres in size. Potential contaminants may include solvents (both chlorinated and non chlorinated), discarded missile fuel (which contains re fuming nitric acid, aniline, furfuryl alcohol, JP-3/JP-4, and hydrazine), petroleum hydrocarbons (fuels, waste oil, hydraulic fluid), acids, and metals (DOE 1994c).

A geophysical survey was conducted in July 1994 to identify the extent of the landfill and locate

concentrations of debris. The results of the geophysical surveys were used to guide the location of soil gas sampling. A soil gas survey was conducted in July 1994 to determine if VOCs were present at the site. A total of 33 soil gas samples were submitted to an on-site laboratory for VOC analysis. Results for VOCs are listed in Table 31-1 in (DOE 1994c). Because no VOCs were found in the soil gas samples, no soil samples were collected and no remedial action has been taken (DOE 1994c).

see Close-out report

30

III.B.4.a.d. Gravel Driveway Area

This site was identified during investigations at the H-52-C Surface Gas Tank Area. Asphalt like material was observed mixed with limestone gravel in this area. This site is approximately 76 m south of building 6652. Potential contaminants include total petroleum hydrocarbons.

No geophysical or soil gas surveys were conducted. A surface sample of degrading asphalt was collected in July 1994 to determine if any petroleum hydrocarbons were present in the asphalt. The sample was analyzed using an immunoassay field test kit. Results for TPH are listed in Table 63-1 in (DOE 1994c). Because no significant level of TPHs were detected no remedial action has been taken (DOE 1994c).

C. Names of Hazardous Substances

1100-EM-1-

~~COC~~ detected !!

List doesn't match sites described sections III.A.2 or III.B.

Battery Acid Pit

copper	lead	sodium
mercury	nickel	
magnesium	zinc	

Paint and Solvent Pit

chromium	copper	tetrachloroethene
sodium	thallium	manganese
lead	chlorobenzene	4,4'-DDE
xylene	1,1-dichloroethene	
magnesium	zinc	
4,4'-DDT		

Antifreeze and Degreaser Pit

chromium	iron	thallium
lead	sodium	manganese
copper	cobalt	
zinc	magnesium	

Antifreeze Tank

arsenic	copper	lead
silver	sodium	thallium
zinc	ethylene glycol	

Discolored Soils Site

lead	alpha-chlordane	4,4'-DDE
heptachlor	di-n-octyl phthalate	BEHP
zinc	1,1,1-trichloroethane(TCA)	
gamma-chlordane	2-hexanone	

Ephemeral Pool

lead	zinc	aroclor-1260
Endosulfan II	Endrin	heptachlor

alpha-chlordane gamma-chlordane

Horn Rapids Landfill

arsenic	barium	iron
cadmium	chromium	nickel
copper	cyanide	thallium
magnesium	mercury	lead
silver	sodium	alpha chlordane
beryllium	cobalt	heptachlor
zinc	antimony	PCE
aroclor-1248	aroclor-1254	Endrin
4,4'-DDE	4,4'-DDT	TCE
2-methylnaphthalene	naphthalene	
manganese	Endosulfan II	
Dieldrin	total PCBs	
TCA		

1100-EM-2-

700 Area - Waste Solvent Tank

TCA chlordane

1100 Area Bus Shop

PCB's

not haz

Tar Flow and Stained Sands Area

PH's lead

1100-EM-3-

1240 French Drain

Lead Chromium
TPH PCBs

1240 Suspect Spill Area
- lead

1262 Solvent Tanks

CCl_4

1262 Transformer Pad

PCBs

1234 Storage Yard

No detection of contaminants reported

3000 Area Jones Yard HWSA

Lead

IN-12

Siemans

D. Potentially Responsible Parties

As defined in 42 U.S.C. § 9607 (107(a)) of CERCLA a potentially responsible party is any individual or company (such as owner, operator, transporter, or generator) potentially responsible for, or contributing to, the contamination problems at a Superfund site.

The current Hanford Site operations began in 1943, and DOE facilities are located throughout the Site. From 1950 to 1961 the Department of Defense (DOD) established Camp Hanford to provide air defense for the Hanford Works. In 1963, a large military maneuver took place over parts of the ALE Reserve. Potentially responsible parties could include DOD, DOE, and possibly their contractors. ? legal

Move to intro (NRCC decision)

IV. Damages Excluded from Liability Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Clean Water Act (CWA)

missing words!

As described at, certain natural resource damages are excluded from liability under

CERCLA. The damage assessment regulations, at 43 CFR § 11.24 (b)&(c), provide that an assessment under the rules should not be continued for potential injuries meeting one or more of the statutory exceptions under CERCLA and the CWA.

Damages excluded from liability under CERCLA include:

1. Results from the discharge or release were specifically identified as an irreversible and irretrievable commitment of natural resources in an environmental impact statement or other comparable analysis ..... in the case of an Indian tribe occurring pursuant to a Federal permit or license, the issuance of that permit or license was not inconsistent with the fiduciary duty of the United States with respect to such tribe; or

2. The release of a hazardous substance from which such damages resulted have occurred wholly before enactment of CERCLA; or

3. Resulted from the application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act; or

4. Resulted from any other federally permitted release, as defined in section 101(10) of CERCLA; or

5. Resulting from the release or threatened release of recycled oil from a service station dealer described in section 107(a)(3) or (4) of CERCLA; or

Damages excluded from liability under the CWA include:

1. Discharges in compliance with a permit under section 402 or resulting from circumstances identified and reviewed and made a part of the public record with respect to a permit issued or modified under section 402 or continuous or anticipated intermittent discharges from a point source, identified in a permit or permit application under section 402; or

2. Discharges of oil into the waters of the contiguous zone ore which may affect natural resources belonging to, appertaining to, or under exclusive management authority of the United States, where permitted under the International Convention for the Prevention of Pollution of the Sea by Oil; or

3. Discharges of oil where permitted in quantities an at time and locations or under such circumstances or conditions as the President may, by regulation, determine not to be harmful.

potential

Upon review of available information, there are no known natural resource damages that are excluded from liability at the Hanford 1100 Area NPL site.

V. Natural Resources for Which the State, Federal, and Tribal Government May Assert Trusteeship Under CERCLA and Which Have or May Have Been Affected

V.A. Preliminary Identification of Pathways

?

V.A.1. EM-1 -Groundwater, surface water (Columbia River), vegetation, soil, wildlife, fish

V.A. 2. EM-2-Groundwater, vegetation, soil, wildlife

V.A 3. EM-3 - Groundwater, vegetation, soil, wildlife

V.A 4. IU-1 - Groundwater (springs), surface water, vegetation, wildlife

V.B. Exposed Water Estimates

probability?

DOE document?

Groundwater information is available for the 1100 Area OU's EM-1, EM-2, and EM-3 but not for IU-1. Groundwater collection results are discussed in the following sections. There is a potential for surface water contamination in the Columbia River. TCE, PCE, and chromium could be released into the river through groundwater discharge. Additionally, soil contaminants transported via fugitive dust or by surface run-off have the potential to be deposited in the river (DOE 1990a). No known water samples have been taken in the Columbia River identifying the

1100 Area as the source of contamination.

V.B.1. EM-1

During the first and second phases of the EM-1 investigation, a total of 24 wells for groundwater sampling were drilled between 1989 and 1991. With the addition of existing wells, 30 - 35 wells were sampled each quarter from early 1990 through October 1992. Initially, the scope of groundwater investigation was broad and the first two rounds of samples were analyzed for compounds on the Target Analyte List (TAL), Target Compound List (TCL), RCRA, primary and secondary drinking water parameters. After the first two rounds, the scope was adjusted to reflect refinements in the conceptual site model (EPA 1993).

All groundwater data were compared with operable unit-wide groundwater Upper Tolerance Limits (UTLs). Maximum values of all analytes exceeding these "background" values are presented in Table 3.

Trichloroethene (TCE) contaminated groundwater was found up and downgradient of the Horn Rapids Landfill Site. The TCE plume is approximately 1.6 km long and 0.3 km wide and is moving in the northeasterly direction. Additionally, Technetium-99 has been detected through the groundwater monitoring network, but no further information has been provided. During the environmental evaluation of the Phase I RI the exposure of aquatic biota to TCE in groundwater could not be quantitatively assessed due to a lack of data on the magnitude and extent of

upgradient Siemens? migrated into ~~to or from~~?

contamination (DOE 1990a). The characterization and analysis performed for the phase II remedial investigation indicated that groundwater contamination has ~~moved~~ to the EM-1, near HRL (DOE 1995b). An adjacent facility is investigating soil and groundwater contamination as an independent action in accordance with the MTCA (EPA 1993). No known groundwater remediation has taken place.

V.B.2. EM-2

Groundwater data from the two monitoring wells in EM-2 has been summarized in the LFI/FFS. Nine rounds of sampling were conducted between January 1990 and March 1992. Groundwater samples were analyzed for primary and relevant secondary drinking water, Washington Administrative Code (WAC) 173-304, RCRA groundwater monitoring parameters, general chemistry parameters, Contract Laboratory Program (CLP) TCL parameters, CLP TAL parameters, coliform bacteria, and radiochemical parameters (DOE 1992c). Groundwater analytical results for the EM-2 are listed in Table 4. Complete analytical data is presented in the appendix to the LFI/FFS and is tabulated according to monitoring well number, well identification tag, round number, and sample identifier where applicable and available.

No wetlands, surface water impoundments, or obvious drainage channels exist within the EM-2. (DOE 1992c)

V.B.3. EM-3

Groundwater data from seven monitoring wells in EM-3 has been summarized in the LFI/FFS. Nine rounds of sampling were conducted between January 1990 and March 1992. Groundwater samples were analyzed for primary and relevant secondary drinking water, Washington Administrative Code (WAC) 173-304, RCRA groundwater monitoring parameters, general chemistry parameters, Contract Laboratory Program (CLP) TCL parameters, CLP TAL parameters, coliform bacteria, and radiochemical parameters (DOE 1992c). Groundwater analytical results for the EM-3 are listed in Table 5. Complete analytical data is presented in the appendix to the LFI/FFS and is tabulated according to monitoring well number, well identification tag, round number, and sample identifier where applicable and available. Groundwater analytical results were reviewed during the LFI/FFS and no contaminants of concern were identified at the EM-3 OU (DOE 1995b).

V.B.4. IU-1

explain

Minimal to no groundwater sampling information exists for the IU-1. None of the documents reviewed for this PAS included groundwater data for the IU-1 OU. The Preliminary Assessment Screening (PAS) Report for the Arid Lands Ecology (ALE) Reserve (DOE 1994a) mentions eight groundwater monitoring wells on ALE. Data collected from these wells demonstrated that "no significant amounts of contamination was present". No groundwater data was included in the ~~DOE (1994~~a). Apparently, the eight monitoring wells did not meet the current state standards for groundwater monitoring well construction. Because less rigorous standards were used during construction, there is a potential for cross aquifer contamination (DOE 1994a). No groundwater

incorporate ~~section~~ ~~PAS~~

information has been reported in the LFI\FFS or the ROD for IU-1.

V.C. Estimates of Concentrations

V.C.1. EM-1

Summary of the soil contaminants detected at the subunits in OU EM-1 are presented in Table 3 and groundwater analytes exceeding maximum contaminant levels in Table 4.

V.C.2. EM-2

No analytical data was available for soil contamination and groundwater analytes detected are listed in Table 4.

V.C.3. EM-3

No analytical data was available for soil contamination and groundwater analytes detected are listed in Table 4.

put in Table

V.C.4. IU-1

Results from soil and soil gas sampling are presented in DOE 1994c. No groundwater sampling

results are available.

V.D. Potentially Affected Resources

V.D.1. Natural Resources

Due to the lack of Operable Unit-specific fish, wildlife, ~~an~~ or plant inventories the following discussion addresses all species that are known to inhabit the Hanford 1100 Site. If specific information is known about a particular Operable Unit or subunit the following Operable Unit discussions will include the information.

The habitat available or suitable for any particular species is a complex association of abiotic and biotic factors including the climate and microclimate; topography, slope, and aspect; soil type and depth; and associated vegetation. Distribution and abundance of terrestrial plants on the Hanford Site is determined in part by local landscape feature such as topography, altitude, slope and aspect and steepness, soil, surface water, and in some cases groundwater. These same landscape features are important to wildlife, but the vegetative cover is especially important because it provides food, concealment, and protective cover, as well as nesting sites for some species of birds. Aquatic habitats associated with the Columbia River, permanent springs, and streams are also products of the geology, soil, topography, vegetation, climate and hydrology of the watershed (PNL 1993). A biodiversity inventory by The Nature Conservancy described Hanford as "an irreplaceable natural legacy," and concluded that "Hanford is a vital, and perhaps

the single most important, link in preserving and sustaining the biodiversity of this region"(The Nature Conservancy 1995).

The habitat types within the 1100 Area greatly vary at the four OU's. Habitat types range from shrub-steppe and bunchgrasses to agricultural areas and industrial facilities. Table 6 lists the mammals, birds, reptiles and insects that may inhabit the 1100 Area. Table 7 addresses species of fish that may occur in the Hanford Reach of the Columbia River.

typo (LFI/FFS)

No toxicological studies were performed on species inhabiting the 1100 Area for the Phase I or II RI's or the ~~L.I./F'S~~. An Ecological Risk Assessment was conducted only for the 1100-EM-1 Operable Unit to evaluate site specific ecological risks. The Risk Assessment is presented in its entirety in Appendix L of DOE 1992b. Further discussion about the Ecological Risk Assessment for EM-1 is to follow.

~~V~~.D.1.a. EM-1

Data gathered under the wildlife ecological investigation for the Phase I 1100 EM-1 RI included the compilation of existing biological information and a reconnaissance survey of the operable unit. Existing biological information was collected to develop a general understanding of the wildlife ecology of the OU and vicinity. A reconnaissance biological survey of the OU was conducted to locate and evaluate any evidence of, or potential for, uptake of toxic substances by plants or animals. The studies were conducted in the spring (before May) of 1989 which was too

early to observe many migratory species and/or nesting birds that may be utilizing the site. Many of the sites in the EM-1 are disturbed and consist of large paved and cobble areas. A list of the species observed at the EM-1 subunits is in Table 8. Although, the study concluded that there was no visible evidence of plant or wildlife stress at any of the subunits, several of the subunits were devoid of vegetation and it was stated that the HRL site should support burrowing owls, yet none were observed. Complete results of the survey are in a memo from Landeen to Adams (1989) in Appendix A of the Phase I RI Report (DOE 1990a).

An Ecological Risk Assessment was conducted for the EM-1 to evaluate environmental exposures, toxicities, and overall risks that are attributable to contaminant releases at the EM-1 OU. As part of the exposure assessment two sensitive bird species were regarded as indicators for evaluating potential adverse terrestrial ecosystem impacts. The Swainson's hawk and long-billed curlew were known to nest in the vicinity of the EM-1 and chosen by the Washington Department of Wildlife as indicator species. In the past, a Swainson's hawk has nested 1.5 km west of the Horn Rapids Landfill, and curlews are known to have nested within the landfill boundaries. The Columbia River supports populations of anadromous and residential salmonids. This cold-water fishery was used as an indicator, by means of comparison with water quality criteria established to protect freshwater aquatic life, to assess the potential for degradation of the aquatic environment. The terrestrial and aquatic environmental exposures were conducted under the assumption of no significant alteration of current land and water use conditions (DOE 1990a).

Something similar needed to intro river.

The assessment focused on the exposure of terrestrial biota to HRL soil contamination and exposure of aquatic biota to groundwater contaminants known to exist in the vicinity of the HRL. The exposure of aquatic biota to TCE in groundwater near The Paint and Solvent Pit could not be quantitatively assessed due to the lack of data on the magnitude and extent of contamination (DOE 1990a).

Legal comment

No permanent surface waters or season streams are within EM-1 OU (ASTDR 1995).

V.D.1.b. EM-2

Terrestrial vegetation of the area includes the presence of some sagebrush and bunchgrass communities. Due to the extensive alteration of habitat in this OU, little wildlife habitat remains (DOE 1992c). No permanent surface waters or season streams are within EM-2 OU (ASTDR 1995).

V.D.1.c. EM-3

Terrestrial vegetation of the area includes the presence of some sagebrush and bunchgrass communities. Due to the extensive alteration of habitat in this OU, little wildlife habitat remains. (DOE 1992c). No permanent surface waters or season streams are within EM-3 OU (ASTDR 1995).

V.D.1.d. IU-1

Although many of the sites identified as potential areas of concern for contamination to natural resources are located in the southeastern portion of ALE, the following discussion will include all natural resources on the reserve.

The shrub-steppe habitat which characterizes most of the Hanford site is also prominent on ALE. The habitat on ALE is unique and is one of the best examples in the state of once vast expanses of the shrub-steppe community. Extensive wildfires have removed much of the sagebrush and the area now supports stands of perennial bunchgrasses at the upper elevation, and cheatgrass and bluegrass on the lower elevations. There are wetlands and springs at the ALE. ~~Two~~ Three permanent springs are located on ALE: one in Snively Canyon and the other at Rattlesnake Springs. A large number of springs with intermittent of ephemeral stream flow are also scattered across ALE. The riparian areas along the permanent springs are narrow corridors by provide important nesting habitat for a number of bird species (DOE 1994). Table 9 lists wildlife and plant species known to occur on ALE.

Some erosion channels, active during heavy rainfall or snowmelt events, exist on the slopes of Rattlesnake Mountain but do not pass directly through IU-1. The occurrence and nature of flow of the groundwater at the IU-1 is complex due to the steep hydraulic gradient and complex lithology at the site. A scarcity of reliable data points in the Rattlesnake Mountain area further complicates the development of an accurate representation of the local groundwater flow regime.

Groundwater flow beneath the crest of Rattlesnake Mountain occurs entirely within basalt bedrock.

Cultural resources include a few Native American artifact sites.(need more information)

V.D.2. Known Injuries to Natural Resources

TCE; otherwise unsubstantiated

At this time, there are no known injuries to natural resources as defined in 43 CFR §11.62 for surface water, groundwater, air, geologic and biologic resources. Further investigations may be required to detect injuries to plants and animal species. Known releases of hazardous substances to groundwater and soil have been documented in the 1100 Area. Chromium in soil and groundwater and TCE in the groundwater at the HRL currently exist above cleanup levels identified in the ROD. The potential for contaminants to reach the Columbia River via groundwater from the HRL is possible, but unknown at this time.

see page 21

limits for Cr

expand!

V.D.3. Potential Injuries to Natural Resources

The U.S. Department of the Interior, U.S. Department of Commerce, U.S. Department of Energy, the Yakima Nation, Umatilla Tribe, Nez Perce Tribe, and the State's of Oregon and Washington have trusteeship over natural resources that have been exposed to hazardous substances at the Hanford 1100 Area NPL Site. All of the natural resources discussed in Section V.D.1. and listed

wrong table for resources (6-9)

in Tables 5 and 6 have the potential for exposure to soil, surface, or groundwater contamination. The natural resources potentially affected fall within the jurisdiction of one or more of the natural resource trustees.

low conc.

Groundwater contamination has been documented at the EM-1 OU and the potential for contaminant discharge into the Columbia River is possible (DOE 1992a). At this time, the potential for chromium to reach the Columbia River via groundwater from the HRL is unknown. Levels of chromium detected in the groundwater at the HRL could potentially affect aquatic invertebrates or fish species. The apparent lack of vegetative growth at the Discolored Soils Site could suggest that the potential for exposure of contaminants to vegetation exists (DOE 1992a). Additional information regarding levels of contamination in the soil and groundwater that are residual from remedial actions, or remain due to no action taken, would be helpful in identifying the potential injuries to natural resources.

DOE 1992?

available?

?

V.D.4. Services Provided by Natural Resources

Services provided by the above mentioned natural resources include, but are not limited to the following:

Habitat for trustee species, including food, shelter, breeding and rearing areas, and other factors essential for long-term survival

Resource Use

Consumptive and non-consumptive outdoor recreation including fishing, wildlife viewing/photography, and other activities

Primary and secondary contact recreation (swimming, boating), and other activities

Cultural, spiritual, religious use (requires tribal discussion)

Sacred places and ceremonies (requires tribal discussion)

Option and existence values

V.D.5. Potential Injury to Natural Resource Services

- PAS should answer

If there has been any injury to vegetative communities in the ALE Reserve or other sites in the 1100 Area this could reduce the overall diversity and abundance of species present on the site. This would decrease the potential for sightseeing and photography now shared by a limited number of individuals at the site. If contaminants identified in the groundwater at the HRL reach or have reached the Columbia River the potential for a less productive fishery exists.

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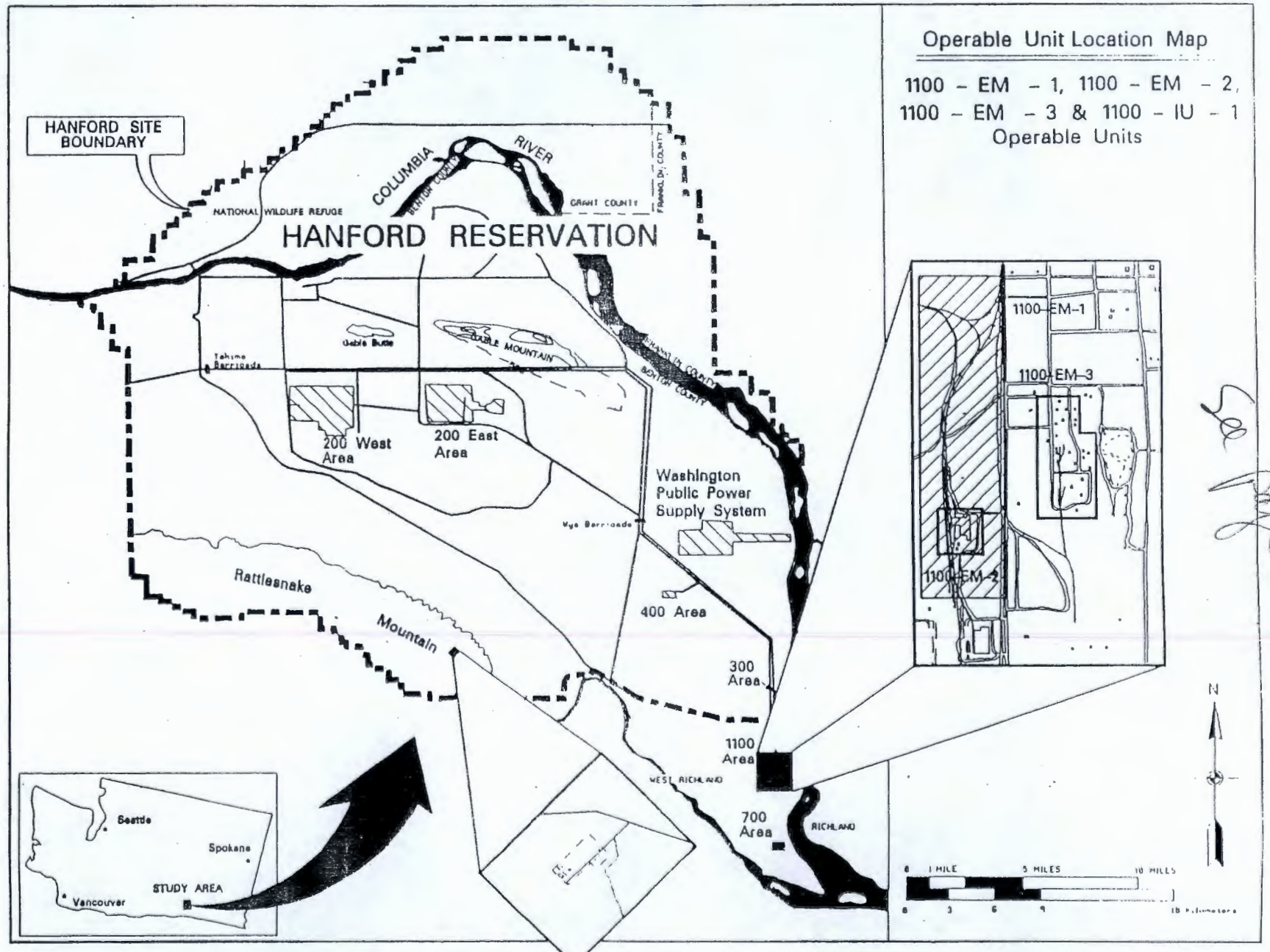


1100 - IU - 1 Operable Unit

Figure 1

Figure 1

Figure 2. EM Sites.

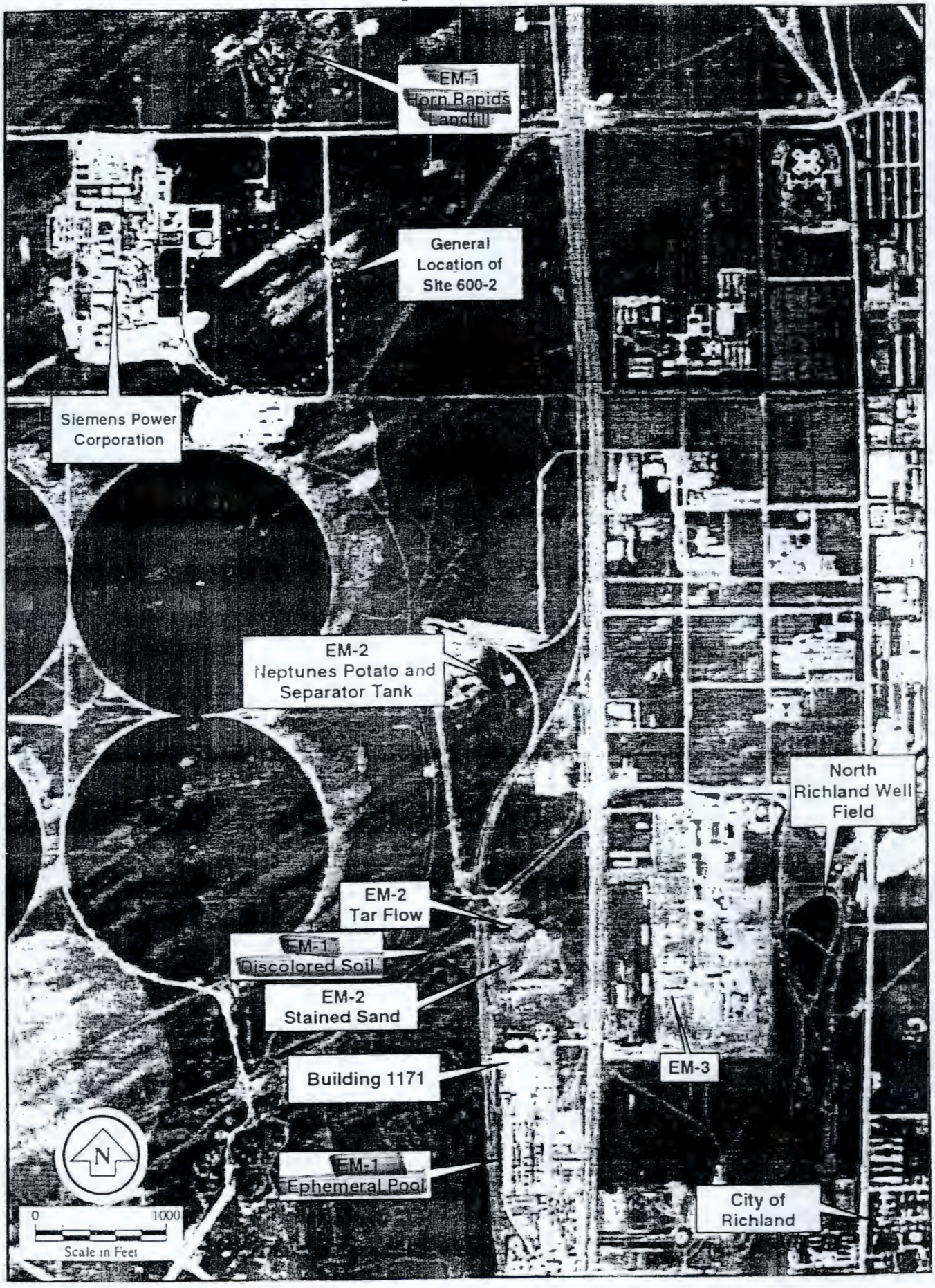
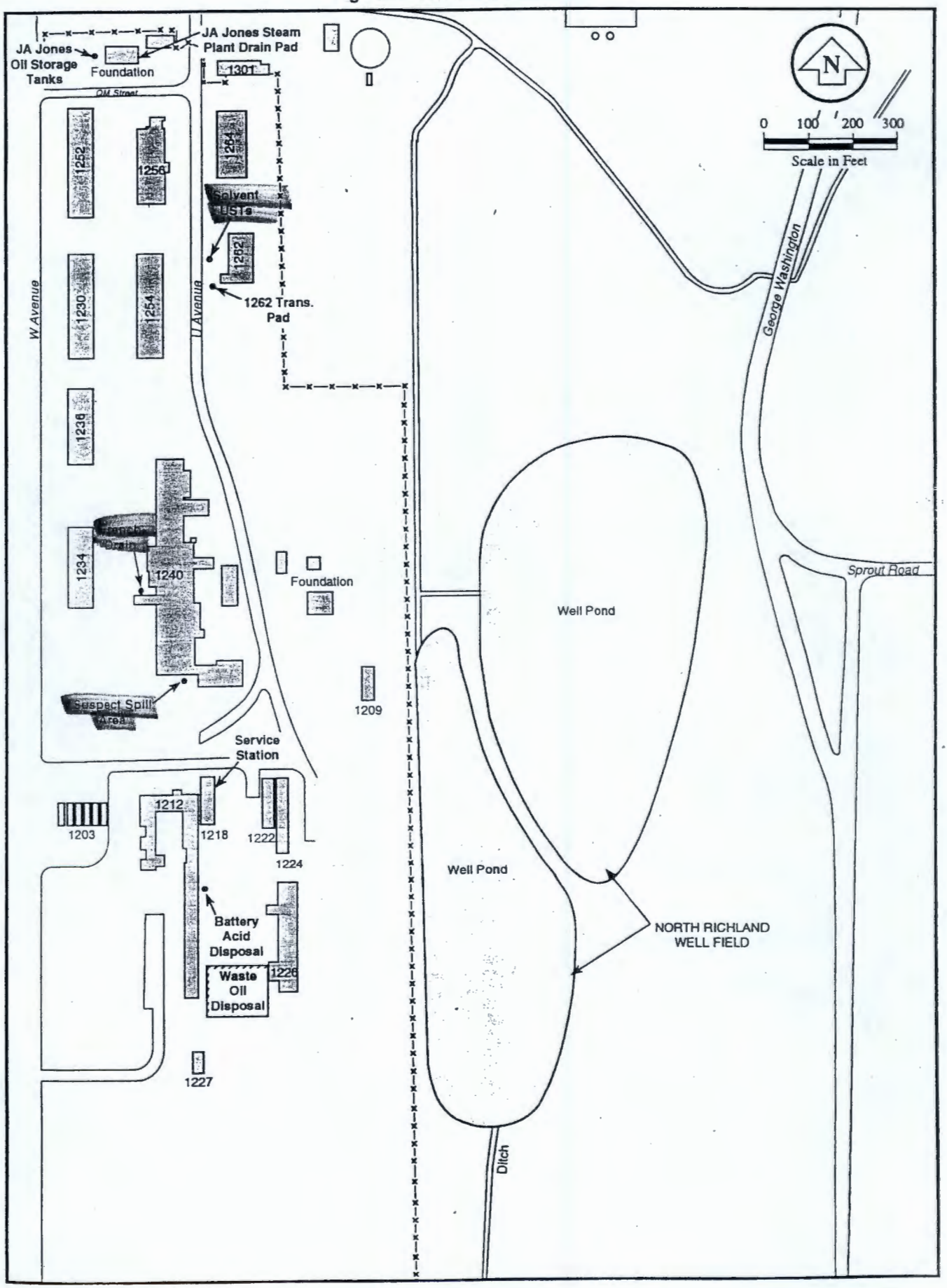


Figure 3. EM-3 Location of Site.



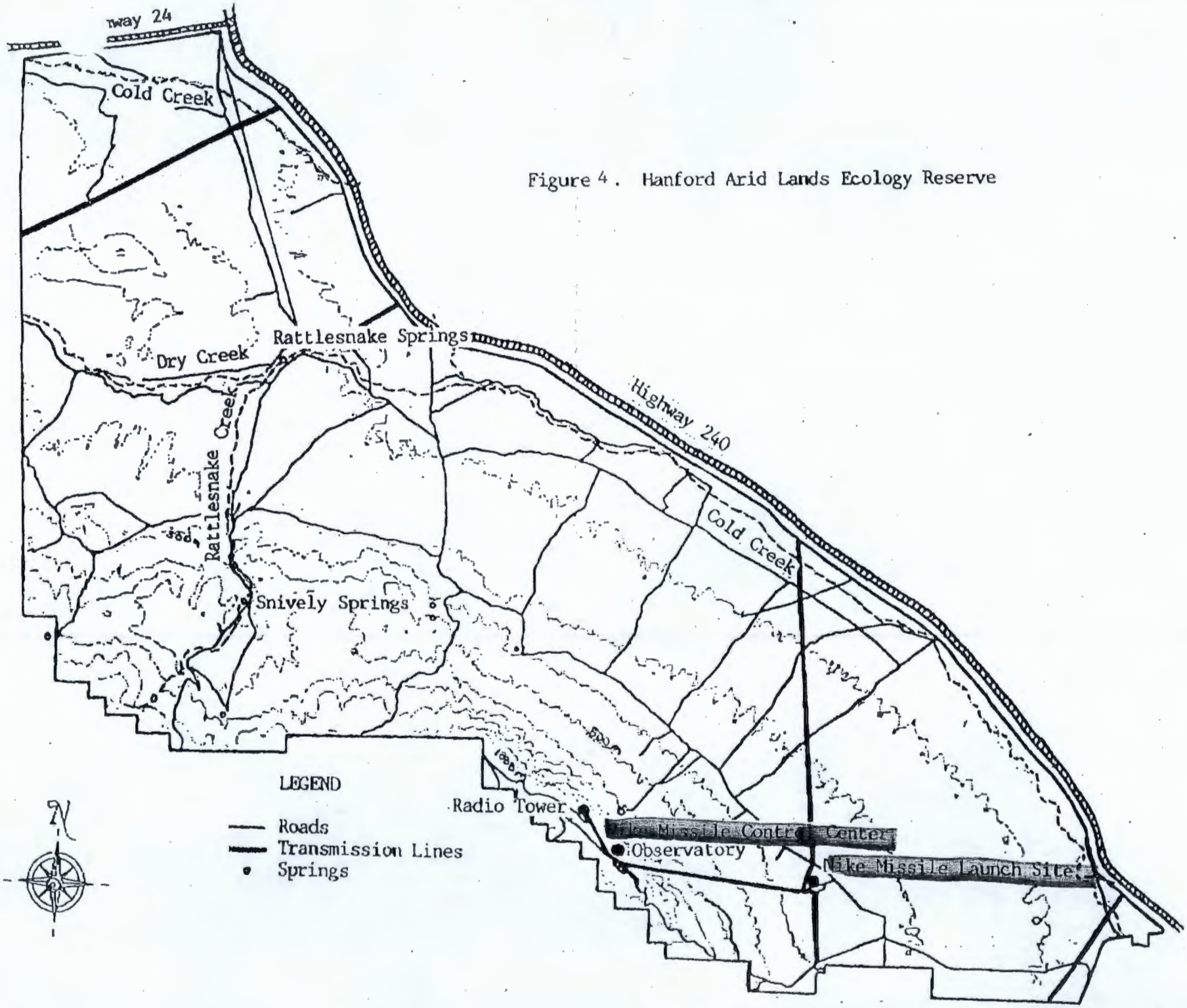


Figure 4. Hanford Arid Lands Ecology Reserve

Table 1.
Summary of Available Analytical Data for All 1100 Area OUs

Operable Unit- Subunit	Soil	Soil Gas	Groundwater	Surface Water	Biota
EM-1					
1100-1 The Battery Acid Pit	X	X	X	ND	ND
1100-2 The Paint and Solvent Pit	X	X	X	ND	ND
1100-3 The Antifreeze Degreaser Pit	X	X	X	ND	ND
1100-4 The Antifreeze Tank	X	NA	X	ND	ND
UN-1100-6 The Discolored Soil Site	X	X	X	ND	ND
The Horn Rapids Landfill Site	X	X	X	ND	ND
The Ephemeral Pool	X	X	X	ND	ND
EM-2					
Tar Flow Area	X	ND	ND	NA	NA
Stained Sands Area	X	ND	ND	NA	ND
EM-3					
1240 French Drain	X	ND	ND	NA	ND
1240 Suspect Spill Area	X	ND	ND	NA	ND
1262 Solvent Tanks	X	ND	ND	NA	ND
IU-1					
6652-C SSL Active Septic System	X	ND	O	ND	ND
6652-C SSL Inactive Septic System	ND	ND	ND	ND	ND
Radar Berm and Pads	X	ND	O	ND	ND

Table 1. -- Continued
Summary of Available Analytical Data for All 1100 Area OUs

Operable Unit- Subunit	Soil	Soil Gas	Groundwater	Surface Water	Biota
H-52-C Surface Gas Tank Area	X	ND	O	ND	ND
Control Center Disposal Pits	X	ND	O	ND	ND
Building 6652-C Abandoned USTs	ND	X	O	ND	ND
Pumphouse Disposal Slope	ND	ND	O	ND	ND
Pumphouse Latrine 1500-Gallon Fuel Oil Storage Tank	X	ND	O	ND	ND
Pumphouse Latrine 275-Gallon Fuel Oil Storage Tank	X	ND	O	ND	ND
ALE Field Storage Building Septic System	ND	X	O	ND	ND
Mound Site Northwest of Building 6652-G	X	ND	O	ND	ND
6652-I ALE Headquarters Septic System	ND	X	O	ND	ND
Abandoned Underground Storage Tanks	ND	X	O	ND	ND
Missile Bunker Sump	ND	ND	O	ND	ND
Missile Bunker Landfill	ND	X	O	ND	ND
Missile Refueling Area Berm	X	ND	O	ND	ND
Acid Neutralization Pit	X	ND	O	ND	ND
Missile Assembly and Test Building Inactive Septic System	ND	X	O	ND	ND

Table 1. -- Continued
Summary of Available Analytical Data for All 1100 Area OUs

Operable Unit- Subunit	Soil	Soil Gas	Groundwater	Surface Water	Biota
Missile Maintenance and Assembly Area Acid Storage Shed	X	ND	O	ND	ND
JP-4 Fuel Pad	X	ND	O	ND	ND
Missile Bunker Drainfield	ND	X	O	ND	ND
XMissile Bunker Discharge Ditch	X	ND	O	ND	ND
H-52-L Surface Gas Tank Storage Area	ND	X	O	ND	ND
Horseshoe Site	X	X	O	ND	ND
Elevator Doors	ND	ND	O	ND	ND
Flammable Storage Block Shed	X	ND	O	ND	ND
NDMissile Maintenance and Assembly Area Paint Shed	ND	ND	O	ND	ND
Missile Maintenance and Assembly Area Dry Well Drum	X	ND	O	ND	ND
H-52-L NIKE Base Landfill	ND	X	O	ND	ND
Gravel Driveway Area	ND	ND	O	ND	ND

X = Data received.
NA = Not applicable.
O = Data not provided for PAS review.
ND = Data not collected.

Table 2. Summary of 1100-EM-1 Operable Unit Soil Contaminants and Maximum Contaminant Concentrations. (sheet 1 of 2)

Contaminant	Battery Acid Pit (1100-1) (mg/kg)	Paint and Solvent Pit (1100-2) (mg/kg)	Antifreeze and Degreaser Pit (1100-3) (mg/kg)	Antifreeze Tank Site (1100-4) (mg/kg)	Discolored Soil Site (UN-1100-6) (mg/kg)	Horn Rapids Landfill (mg/kg)	Ephemeral Pool (mg/kg)
Antimony	--	--	--	--	--	15.6	--
Arsenic	3.2	--	--	5.8	--	6.6	--
Barium	--	--	--	--	--	1,320	--
Beryllium	--	--	--	0.93	--	1.3	--
Cadmium	--	--	--	--	--	2.4	--
Chromium	--	16.8	14	--	--	1,250	--
Cobalt	--	--	17.8	--	--	42.5	--
Copper	37.9	24.4	31.7	19.8	--	1,280	--
Cyanide	--	--	--	--	--	0.56	--
Lead	266	94.6	26.4	5.7	22.1	854	54.2
Manganese	--	366	436	--	--	501	--
Mercury	0.39	--	--	--	--	1.3	--
Nickel	20.9	--	--	--	--	557	--
Selenium	--	--	--	--	--	0.97	--
Silver	--	--	--	2	--	7.7	--
Thallium	--	0.48	0.4	0.48	--	3.1	--
Vanadium	118	--	--	--	--	101	--
Zinc	100	56.6	60	63.8	111	3,160	67.5

where the data for other OU soil samples?

Table 2. Summary of 1100-EM-1 Operable Unit Soil Contaminants and Maximum Contaminant Concentrations. (continued)

Contaminant	Battery Acid Pit (1100-1) (mg/kg)	Paint and Solvent Pit (1100-2) (mg/kg)	Antifreeze and Degreaser Pit (1100-3) (mg/kg)	Antifreeze Tank Site (1100-4) (mg/kg)	Discolored Soil Site (UN-1100-6) (mg/kg)	Horn Rapids Landfill (mg/kg)	Ephemeral Pool (mg/kg)
BEHP	--	--	--	--	25,000	--	--
Beta-HCH	--	--	--	--	--	0.094	--
Chlordane	--	--	--	--	1.86	--	2.8
Chlorobenzene	--	0.006	--	--	--	--	--
DDT	--	0.16	--	--	0.17	1.98	--
Endosulfan II	--	--	--	--	--	0.11	0.16
Endrin	--	--	--	--	--	0.42	0.039
Heptachlor	--	--	--	--	0.065	0.02	0.029
2-Hexanone	--	--	--	--	0.053	--	--
Naphthalene	--	--	--	--	--	8.2	--
PCB's	--	--	--	--	--	100	42
Tetrachloroethene	--	0.035	--	--	--	0.006	--
Trichloroethene	--	0.006	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	0.035	--	--

-- Indicates not a contaminant at this unit

Table 3.
Maximum Concentrations of Groundwater Analytes Observed
for Operable Unit EM-1

Analytes	**Maximum Concentration Observed**
Inorganic (ppb)	
Chromium	57.5
Copper	71.9
Lead	25.3
Manganese	352
Nickel	140[j]
Silver	11.7
Zinc	223
Wet Chemistry (ppm)	
Ammonia	.087
Fluoride	3.7
Chloride	110
Phosphate	1.9
Sulfate	89.6

Table 3 continued.
Maximum Concentrations of Groundwater Analytes Observed
for Operable Unit EM-1

Analytes	**Maximum Concentration Observed**
Organic, Pesticide, and Herbicide (ppb)	
Methylene Chloride	13
Acetone	31
Chloroform	5
1,1,1-Trichloroethane	3
Tetrachloroethene	4 J
Toluene	2 J
C_{12} Hydrocarbon	100 J[e]
Diethylphalate	34
Radionuclides ($_p$Ci/L)	
Gross Alpha	11 + 5
Gross Beta	87 7
Radium	2.36

rounds detected?

[e]J = estimated value
B = means analyte was also found in the blank, the concentration reported is uncertain.
[j] = Issues not yet resolved for suspicious values: additional data is being obtained for further evaluation.

Table 4.
Maximum Concentrations of Groundwater Analytes Observed
for Operable Unit EM-2

Analytes	**# Rounds Detected**	**Maximum Concentration Observed**
Inorganic (ppb)		
Chromium	4/6	170
Copper	1/6	30
Lead	3/6	2.4 B
Manganese	6/6	352
Nickel	5/6	137
Silver	--	NA
Zinc	--	NA
Radionuclides ($_p$Ci/L)		
Alpha	5/6	17
Beta	6/6	24

Table 5.
Maximum Concentrations of Groundwater Analytes Observed
for Operable Unit EM-3

Analytes	# Rounds Detected	Maximum Concentration Observed
Inorganic (ppb)		
Chromium	4/6	38.8
Cyanide	1/6	0.01
Lead	3/6	3.8 J
Manganese	6/6	114
Nickel	--	NA
Silver	--	NA
Zinc	--	NA
Organic, Pesticide, and Herbicide (ppb)		
Phenol	1/6	5 J
Bis(2-ethylhexyl) phthalate (BEHP)	2/6	6 J
Tetrachloroethene	1/6	2 J
C_{12} Hydrocarbon	1/6	100 J

where is IU-1 G.W. data!

J = analyte present, concentration is uncertain

Table 6.

Threatened, Endangered, Candidate, and Monitor Birds on the Hanford Site

what's this mean to us?

Common Name	Association Habitat[a]	Federal Status	State Status
Aleutian Canada goose[b]	Riparian/wetland	Endangered	Endangered
American white pelican	Riverine	–	Endangered
Arctic tern[b]	Riverine	–	Monitor
Ash-throated flycatcher	Riparian	–	Monitor
Bald eagle	Riverine	Threatened	Threatened
Barred owl[b]	Riparian/shrub-steppe	–	Monitor
Black tern[b]	Riverine	Candidate	Monitor
Black-crowned night heron	Riverine	–	Monitor
Black-necked stilt[b]	Riverine	–	Monitor
Burrowing owl	Shrub-steppe	–	Candidate
Caspian tern	Riverine	–	Monitor
Clark's grebe[b]	Riverine	–	Monitor
Common loon	Riverine	–	Candidate
Ferruginous hawk	Shrub-steppe	Candidate	Threatened
Flammulated owl[b]	Shrub-steppe	–	Candidate
Forster's tern	Riverine	–	Monitor
Golden eagle	Shrub-steppe	–	Candidate
Grasshopper sparrow	Shrub-steppe	–	Monitor
Great blue heron	Riverine	–	Monitor
Great egret[b]	Riverine	–	Monitor
Gyrfalcon[b]	Riparian/shrub-steppe	–	Monitor
Horned grebe	Riverine	–	Monitor
Lewis' woodpecker[b]	Riparian/shrub-steppe	–	Candidate
Loggerhead shrike	Shrub-steppe	Candidate	Candidate
Long-billed curlew	Shrub-steppe	Candidate	Monitor
Merlin[b]	Riparian/shrub-steppe	–	Monitor
Northern goshawk	Shrub-steppe	–	Candidate
Osprey	Riverine/riparian	–	Monitor
Peregrine falcon[b]	Riparian/shrub-steppe	Endangered	Endangered
Prairie falcon	Riparian/shrub-steppe	–	Monitor
Red-necked grebe[b]	Riverine	–	Monitor
Sage grouse	Shrub-steppe	Candidate	Candidate

Table 6 continued.

Common Name	Association Habitat[a]	Federal Status	State Status
Sage sparrow	Shrub-steppe	–	Candidate
Sage thrasher	Shrub-steppe	–	Candidate
Sandhill crane	Riparian/shrub-steppe	–	Endangered
Snowy owl	Riparian/shrub-steppe	–	Monitor
Swainson's hawk	Shrub-steppe	–	Candidate
Trumpeter swan[b]	Riverine	Candidate	–
Turkey vulture[b]	Riparian/shrub-steppe	–	Monitor
Western bluebird[b]	Riparian/shrub-steppe	–	Candidate
Western grebe	Riverine	–	Monitor

(a) Habitat usage from Fitzner and Gray (1991).
(b) Rare migrant or accidental presence occurrence on the Hanford Site (Fitzner and Gray 1991; Landeen et al. 1992).

Table 6 continued.

Status of Plant Species of Concern on the Hanford Site

Family	Common Name	Latin Name	Habitat Association	Status[a]
Brassicaceae	Columbia yellowcress	*Rorippa columbiae*	Riparian, shoreline	FC, SE
	Northern wormwood	*Artemisia campestris* spp. *borealis* var *wormskioldii*	Riparian, cobble/gravel bars	FC, SE
Fabiaceae	Columbia milkvetch	*Astragalus columbianus*	Sagebrush-steppe, basalt outcrops	FC, ST
Apiaceae	Hoover's desert parsley	*Lomatium tuberosum*	Basalt outcrops, scree slopes	FC, ST
Boraginaceae	Gray cryptantha	*Cryptantha leucophaea*	Sagebrush-steppe sandy soils	SS
Boraginaceae	Bristly cryptantha	*Cryptantha interrupta*	Sagebrush-steppe	SS
Cyperaceae	Dense sedge	*Carex densa*	Riparian, wetlands	SS
Cyperaceae	Shining flatsedge	*Cyperus rivularis*	Riparian, wetlands	SS
Asteraceae	Piper's daisy	*Erigeron piperianus*	Sagebrush-steppe	SS
Scrophulariaceae	Southern mudwort	*Limosella acaulis*	Riparian, wetlands	SS
Scrophulariaceae	False pimpernel	*Lindernia anagallidea*	Riparian, wetlands	SS
Onagraceae	Dwarf evening primrose	*Oenothera pygmaea*	Sagebrush-steppe	SS

(a) FC = Federal candidate.
SE = State endangered.
ST = State threatened.
SS = State sensitive.

Common Reptiles and Amphibians of Shrub-Steppe Habitats on the Hanford Site

Common Name	Scientific Name
Western yellow-bellied racer	*Coluber constrictor*
Great Basin gopher snake	*Pituophis melanoleucus*
Northern Pacific rattlesnake	*Crotalus viridis*
Northern sagebrush lizard	*Sceloporus graciosus*
Side-blotched lizard	*Uta stansburiana*
Great Basin spadefoot toad	*Scaphiopus intermontanus*
Woodhouse's toad	*Bufo woodhouseii*
Pacific treefrog	*Hyla regilla*

Table 6 continued.

Mammals Existing on the Hanford Site

Family	Common Name	Latin Name	Abundance	Habitat Association
Soricidae	Vagrant shrew	*Sorex vagrans*	Uncommon	Riparian
	Merriam's shrew	*Sorex merriami*	Rare	
Vespertilionidae	Pallid bat	*Antrozous pallidus*	Common - summer	Buildings/riparian
	Little brown myotis	*Myotis lucifugus*	Common - summer	Buildings/riparian
	Yuma myotis	*Myotis yumanensis*	Common - summer	Buildings/riparian
	Silver-haired bat	*Lasionycteris noctivagans*	Unknown	Buildings/riparian
	Hoary bat	*Lasiurus cinereus*	Unknown	Buildings/riparian
	Townsend's big-eared bat	*Plecotus townsendii*	Unknown	Buildings
Leporidae	Black-tailed jackrabbit	*Lepus californicus*	Common	Shrublands/grasslands
	Nuttall's cottontail	*Sylvilagus nuttallii*	Common	Buildings
	White-tailed jackrabbit	*Lepus townsendi*	Uncommon	Shrublands/grasslands
Sciuridae	Townsend ground squirrel	*Spermophilus townsendii*	Common	Shrublands/grasslands
	Least chipmunk	*Eutamias minimum*	Uncommon	High elevation shrublands
	Yellow-bellied marmot	*Marmota flaviventris*	Rare	Basalt outcrops
	Sagebrush vole	*Lagurus curtatus*	Uncommon	Shrublands/grasslands
Geomyidae	Northern pocket gopher	*Thomomys talpoides*	Common	Shrublands/grasslands
Heteromyidae	Great Basin pocket mouse	*Perognathus parvus*	Common	Shrublands/grasslands
Castoridae	Beaver	*Castor canadensis*	Common	Riverine/riparian
Cricetidae	Western harvest mouse	*Reithrodontomys megalotis*	Rare	Shrublands/riparian
	Deer mouse	*Peromyscus maniculatus*	Common	Entire site
	Northern grasshopper mouse	*Onychomys leucogaster*	Rare	Riparian
	Bushy-tailed wood rat	*Neotoma cinerea*	Common	Entire site
	Montane vole	*Microtus montanus*	Rare	Riparian
	Muskrat	*Ondatra zibethica*	Rare	Riverine/riparian
Muridae	Norway rat	*Rattus norvegicus*	Common	Buildings
	House mouse	*Mus musculus*	Common	Buildings/riparian
Erethizontidae	Porcupine	*Erithizon dorsatum*	Uncommon	Entire site
Canidae	Coyote	*Canis latrans*	Uncommon	Entire site
Procyonidae	Raccoon	*Procyon lotor*	Uncommon	Riparian
Mustelidae	Mink	*Mustela vison*	Rare	Riverine/riparian
	Long-tailed weasel	*Mustela frenata*	Uncommon	Riparian
	Short-tailed weasel	*Mustela erminea*	Rare	Riparian
	Otter	*Lutra canadensis*	Rare	Riverine/riparian
	Badger	*Taxidea taxus*	Uncommon	Entire site
	Striped skunk	*Mephitis mephitis*	Uncommon	Riparian
Felidae	Bobcat	*Lynx rufus*	Rare	Entire site
Cervidae	Mule deer	*Odocoileus hemionus*	Common	Entire site
	Elk	*Cervus elaphus*	Common	Shrublands/grasslands
	White-tailed deer	*Odocoileus virginianus*	Rare	Riparian

Table 7.
Fishes of Importance Known to Occur in the Hanford Reach of the Columbia River
(Taken from Pacific Northwest Laboratory 1993)

Fall chinook salmon	*Oncorhynchus tshawytscha*
Steelhead trout	*O. mykiss*
Mountain whitefish	*Prosopium williamsoni*
White sturgeon	*Acipenser transmontanus*
Sandroller	*Percopis transmontana*
Paiute sculpin	*Cottus beldingi*
Mountaian sucker	*Catostomus platyrhynchus*
Coho salmon	*O. kisutch*
Sockeye salmon	*O. nerka*
Smallmouth bass	*Miropterus dolomieui*
Largemouth bass	*M. salmoides*
Walleye	*Stizostedion vitreum*

--- Over 43 species of fish of have been documented in the Hanford Reach since 1943 (Gray and Dauble 1977).

Table 8.
Species Observed During the 1989 EM-1 Biological Survey

Plants

Rabbitbrush
Cheatgrass
Sandberg's blue grass
Sage brush
Plantain
Phlox
Prickly pear cactus
Bitterbrush
Yarrow
Goatsbeard
Tansy mustard
Tumble mustard
Aster
Wheatgrass

Mammals

Townsend's ground squirrel	*Citellus towsendi*
Pocket mice	*Perognathus spp.*
Nuttall's Cottontail t	*Sylvilagus nuttalli*
Coyote	*Canis latrans*
Mule deer	*Odocoileus hemionus*
Badger	*Taxidea taxus*

Birds

Horned lark	*Eremophilia alpestris*
Meadowlark	*Sturnella neglecta*
Ring billed gull	*Larus Delawrensis*
Killdeer	*Charadrius vociferus*
Raven	*Corvus corax*
Marsh hawk	*Circus cyaneus*
Long-billed curlew	*Numenius americanus*

Table 9.
Wildlife and Plant Species Known to Occur on ALE

Vegetation : (includes but not limited to)

Cheatgrass	*Bromus tectorum*
Sandberg's blue grass	*Poa sandbergii*
Sage brush	*Artemisia tridentata*
Bunch grass	*Aropyron spicatum*
Thruber needlegrass	*Stipa thurberiana*
Cusick's bluegrass	*Poa cusickii*
Shrubwillow	*Salix sp.*
Cottonwood	*Populus sp.*
Common Chokecherry	*Prunus virginianus*
Blue elderberry	*Sambucus caerulea*
Lewis mockorange	*Philadelphis lewisii*
Wild rose	*Rosa sp.*
Saskatoon seviceberry	*Amerlanchier alnifolia*
White poplar tree	*Populus alba*
Black locust tree	*Robina psuedacacia*

Mammals

Great Basin pocket mouse	*Perognatnus parvus*
Deer mouse	*Peromyscus maniculatus*
Grasshopper mouse	*Onychomys leucogaster*
Sagebrush vole	*Lagurus curtatus*
Northern pocket gopher	*Thomomys talpoides*
Townsend's ground squirrel	*Citellus towsendi*
Nuttall's Cottontail	*Sylvilagus nuttalli*
Pygmy rabbit	*Sylvilagus idahoensis*
Black-tailed hare	*Lepus colifornicus*
Coyote	*Canis latrans*
Mule deer	*Odocoileus hemionus*
Badger	*Taxidea taxus*
Elk	*Cervus elaphus*

Reptiles

Yellow-bellied racer	*Caliber constrictor mormon*
Rattlesnake	*Crotalus viridis*
Gopher snake	*Pituophis melaneucus*

Table 9 continued.
Wildlife and Plant Species Known to Occur on ALE

Reptiles continued

Common garter snake	*Thamnophis sirtalis*
Side-blotched lizard	*Uta stansburiana*
Desert night snake	*Hypsiglena torquata deserticola*
Striped whipsnake	*Masticophis taeniatus*
Short-horned lizard	*Phrynofoma douglassi*
Sagebrush lizard	*Sceloporus graciosus*

Birds

Horned lark	*Eremophilia alpestris*
Meadowlark	*Sturnella neglecta*
Sage sparrow	*Amphispiza belli*
Brewer's sparrow	*Spizella pallida*
Vesper sparrow	*Pooecetes gramineus*
Song sparrow	*Melospiza melodia*
Northern oriole	*Icterus galbula*
European Starling	*Sturnus vulgaris*
Lazuli bunting	*Passerina amoena*
Black-billed magpie	*Pica Pica*
Dark-eyed juncos	*Junco hyemalis*
Yellow-rumped warblers	*Dendroica coronata*
American robin	*Turdus migratorius*
Ring billed gull	*Larus Delawrensis*
Killdeer	*Charadrius vociferus*
Raven	*Corvus corax*
Marsh hawk	*Circus cyaneus*
Long-billed curlew	*Numenius americanus*
Swainson's hawk	*Buteo swainsonii*
Red-tailed hawk	*Buteo jamaicensis*
Great-horned owl	*Bubo virginianus*
Long-eared owl	*Asio otus*
Short-eared owl	*Asio flammeus*
Barn owl	*Tyto alba*
Burrowing owl	*Athene cunicularia*
California quail	*Lophortyx californicus*
Ring-necked pheasant	*Phasianus colchicus*
Chukar partridge	*Alectoris chukar*
Gray partridge	*Perdix perdix*
Mourning dove	*Zenaida macroura*
Wintering bald eagle	*Haliacetus leucocephalus*
Ferruginous hawk	*Buteo regalis*