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Interim Remedial Measure Proposed Plan for the 200-ZP-1 Operable Unit Hanford, Washington

United States
Department of Energy

Richland, Washington

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Date

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BHI-DIS 10/7/94

INTERIM REMEDIAL MEASURE PROPOSED PLAN FOR THE 200-ZP-1 OPERABLE UNIT, HANFORD, WASHINGTON

EPA, ECOLOGY, AND DOE ARE SEEKING PUBLIC COMMENTS ON A PROPOSED PLAN FOR INTERIM ACTION AT HANFORD SITE. COMMENTS ARE BEING ACCEPTED FROM OCTOBER 17, 1994 TO NOVEMBER 30, 1994.

INTRODUCTION

This *interim remedial measure*• (IRM) proposed plan describes an interim action that is proposed in the 200-ZP-1 *Operable Unit* (OU) located in the 200 West Area of the U.S. Department of Energy's (DOE) Hanford Site. The Hanford Site is a 560-square mile federal facility located near the city of Richland in Benton County, Washington (Figure 1). The 200-ZP-1 OU addresses groundwater contamination in the northern half of the 200 West Area. The objective of this IRM is to reduce the further degradation of groundwater as a result of elevated concentrations of carbon tetrachloride, chloroform, and trichloroethylene (TCE) in the 200-ZP-1 OU. Monitoring data indicate that the highest concentration of these contaminants are still within the boundary of the 200 West Area. However, relatively low concentrations of these contaminants have migrated beyond the 200 West Area boundary (Figure 2).

This proposed plan has been developed in accordance with the *Hanford Federal Facility Agreement and Consent Order* using information detailed in the 200 West Groundwater Aggregate Area Management Study (AAMS) Report (DOE/RL 92-16), and engineering and characterization documents associated with the 200 West Area Carbon Tetrachloride *Expedited Response Action* (ERA). The AAMS report summarized site conditions and available response options similar to a Remedial Investigation/Feasibility Study (RI/FS) Phase 1 and 2 report. The AAMS report included background information, physical setting, contaminant sources, known and suspected contamination, possible routes of exposure to contaminants, and recommended pathways for addressing groundwater contamination. Comprehensive information regarding the origin, nature, and extent of contamination, and other site characteristics is provided in these documents and the Administrative Record. The information contained in these documents was used to identify and evaluate a preferred alternative to reduce the potential risk and control the spread of groundwater contamination in the 200-ZP-1 OU. The Administrative Record is available at the following locations:

U.S. Department of Energy
Richland Operations Office
Administrative Record Center
2440 Stevens Center Place
Richland, WA 99352

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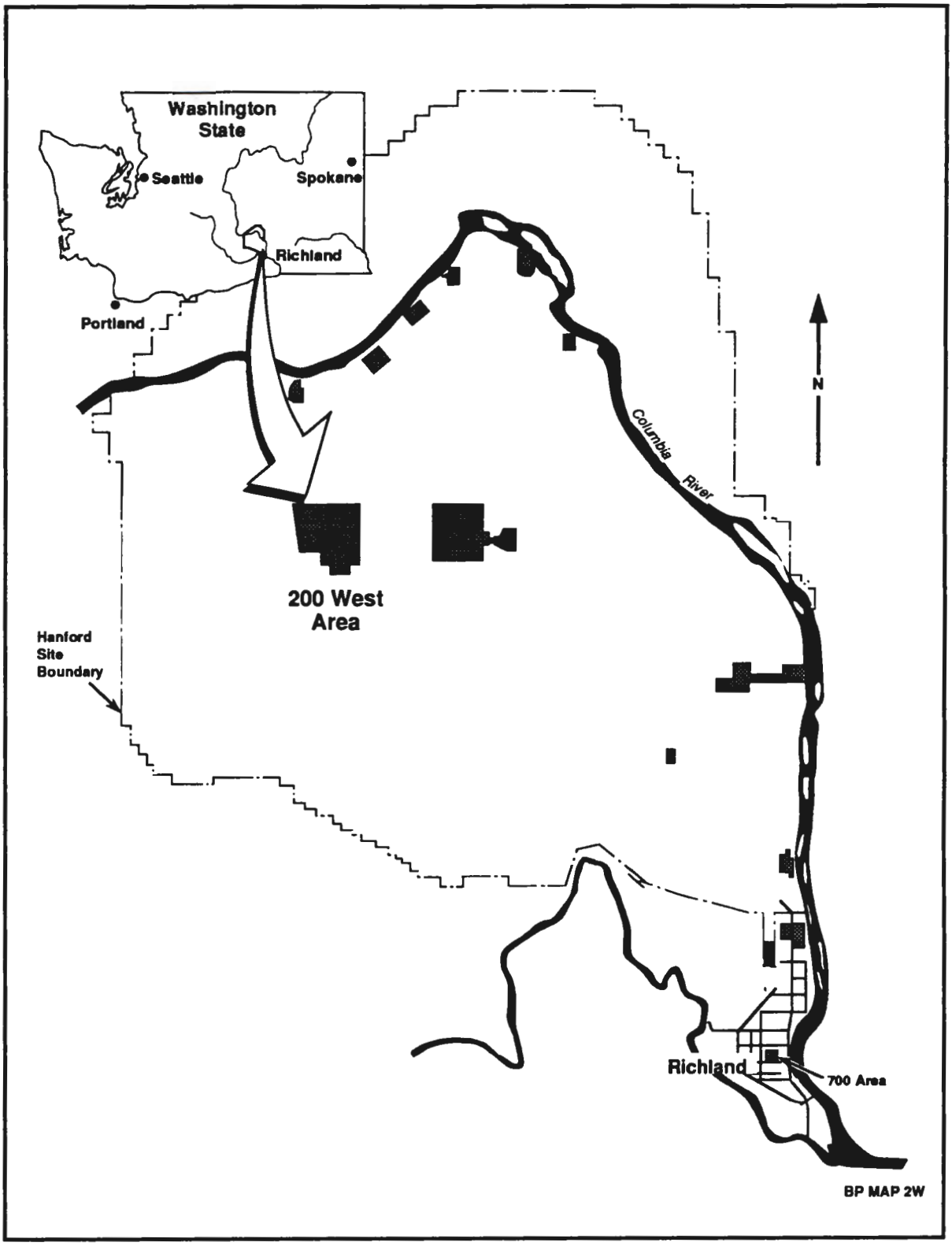
EPA Region 10
Superfund Record Center
1200 Sixth Avenue
Park Place Building, 7th Floor
Mail Stop: HW-074
Seattle, WA 98101

State of Washington Dept. of Ecology
Nuclear Mixed Waste Library
300 Desmond Drive
Lacey, WA 98503

•Terms appearing in the glossary are italicized in their first usage in the text.

Figure 1. Location of Hanford Site and 200 West Area.



In addition, the proposed plan and supporting documents are available at the following public repository locations.

University of Washington
Suzzallo Library
Government Publications Room
Mail Stop FM-25
Seattle, WA 98195
(206) 543-4664
ATTN: Eleanor Chase

Gonzaga University
Foley Center
E. 502 Boone
Spokane, WA 99258
(509) 328-4220 EXT 3125
ATTN: Lewis Miller

Portland State University
Branford Price Millar Library
Science and Engineering Floor
Portland, OR 97207
(503) 725-3690
ATTN: Michael Bowman

U.S. Department of Energy Reading Room
Washington State University, Tri-Cities
100 Sprout Road, Room 130 West
Richland, WA 99352
(509) 376-8583
ATTN: Terri Traub

This proposed plan is issued by the U.S. Environmental Protection Agency (EPA), lead regulatory agency; the Washington State Department of Ecology (Ecology), supporting agency; and the DOE, responsible agency. Issuance of the plan fulfills the requirements of Section 117(a) of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and will support the preparation of an Interim Action Record of Decision (ROD). The purpose of the plan is to summarize relevant information from the aforementioned supporting documents, identify a preferred alternative, and provide members of the community with information on how they can participate in the remedy selection process.

The DOE has recently evaluated activities associated with the preferred alternative under the National Environmental Policy Act (NEPA) and determined that these activities are eligible for categorical exclusion. However, nothing in this plan, or other documents, is intended to present a statement on the legal applicability of NEPA to remedial action at CERCLA sites.

HOW YOU CAN PARTICIPATE

You are encouraged to comment on this plan during the public comment period that will be held from October 17 to November 30, 1994. Comments on any alternative, not just the preferred alternative, are welcome.

At this time, no public meeting is planned for this cleanup proposal. However, if you are interested in a public meeting, please call (509) 376-8631.

Written comments may be submitted anytime during the comment period. Please direct written comments or requests for more information to:

Dennis Faulk
U.S. Environmental Protection Agency
712 Swift Blvd., Suite 5
Richland, Washington 99352

or call (509) 916-8631 between 7:00 am and 4:30 pm Pacific Time, Monday through Friday, except holidays.

The agencies will present their response to all comments received during the comment period in a *Responsiveness Summary*. After considering all comments, DOE, Ecology, and EPA will make a decision on the action for 200-ZP-1. This decision will become a part of the Interim Action ROD for the site. The Responsiveness Summary is part of the Interim Action ROD and will be available for public review at the Administrative Record locations listed above.

SITE BACKGROUND

The Hanford Site was established in 1943 to produce plutonium for nuclear weapons using nuclear reactors and chemical processing plants. Operations at the Hanford Site are now focused on environmental restoration and waste management.

The 200 West Area is an operational area of approximately 3.2 square miles where *spent nuclear fuel* was processed in four main facilities: U Plant (primarily uranium recovery); Z Plant (primarily plutonium separation and recovery); and S and T Plants (primarily uranium and plutonium separation from irradiated fuel rods). The 200-ZP-1 OU is located within the 200 West Area of the Hanford Site and was included on the National Priorities List in July 1989.

Mixtures of carbon tetrachloride containing other organic solvents were used at Z Plant to recover plutonium from the processing waste streams. Spent carbon tetrachloride mixtures were discharged to the ground at the 200-ZP-2 Source OU in the 200 West Area. Approximately 600 to 1,000 metric tons of carbon tetrachloride waste were discharged to the ground between 1955 and 1973, resulting in extensive contamination of the soil and groundwater beneath the 200 West Area. Elevated concentrations of chloroform and TCE were also found generally coincident with the carbon tetrachloride. Although these chemicals are not known to have been used in plutonium recovery processing, the association of the three chemicals suggest some linkage. Chloroform may be a degradation product of carbon tetrachloride, while TCE may have been used as a maintenance chemical.

Some of the carbon tetrachloride, chloroform, and TCE have migrated through the soil column and contaminated the groundwater underlying the 200 West Area. Groundwater occurs about 200 feet below the ground surface and generally flows from west to east beneath the 200 West Area. However, historic discharges of large volumes of waste water have created an artificial groundwater mound that causes groundwater contaminated with carbon tetrachloride, chloroform, and TCE to flow toward the north and northeast in the 200-ZP-1 OU. Carbon tetrachloride is distributed in a *plume* that extends under most of the 200 West Area, although the highest concentration areas of the plume are located within the 200-ZP-1 OU (Figure 2). The maximum concentration of carbon tetrachloride found in the 200-ZP-1 OU groundwater is approximately 7,000 *parts per billion* (ppb). Some of the carbon tetrachloride may be present at the bottom of the aquifer as *dense non-aqueous phase liquids* (DNAPL). Chloroform is generally associated with the carbon tetrachloride in its areal distribution; its greatest measured concentration in the groundwater is currently about 1,600 ppb. TCE is distributed in three smaller plumes that are not as clearly associated with the carbon tetrachloride plume; TCE is found in the groundwater at concentrations up to about 25 ppb.

Since late 1990, DOE has been conducting an ERA at the 200 West Area and removing carbon tetrachloride from the unsaturated soils between the ground surface and water table to minimize or stabilize further movement of the carbon tetrachloride contamination to uncontaminated areas. The ERA is being taken to ensure that the environment and public health are adequately protected, and to reduce the threat of further groundwater contamination. This action has contributed significant information regarding the origin, nature, and extent of carbon tetrachloride, and other site characteristics needed for evaluating remedial alternatives for both source and groundwater OUs in the 200 West Area.

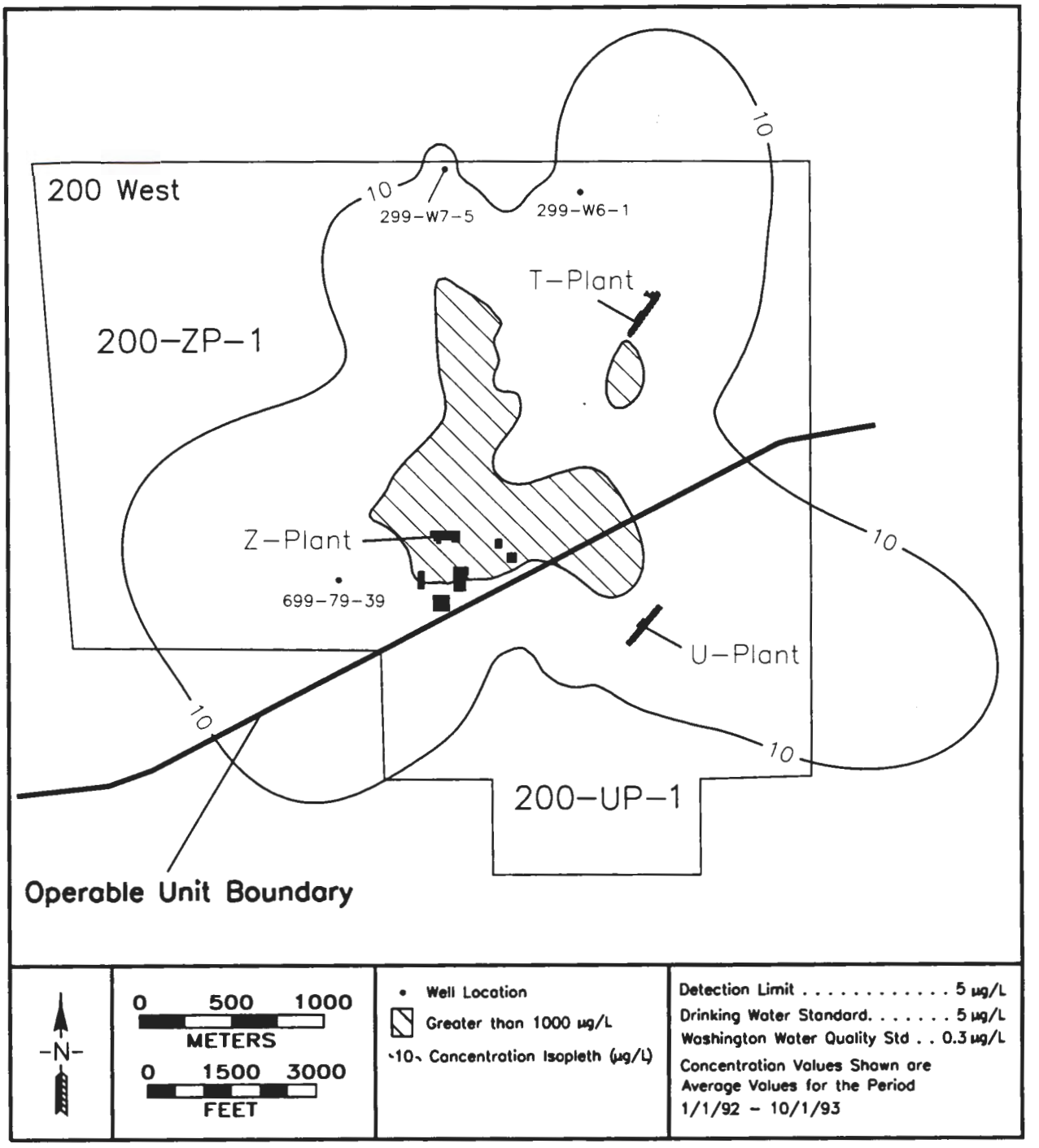
During 1993, DOE completed an AAMS process to compile and evaluate available information about contamination in the 200 West Area. This was done to effectively address both the source and the groundwater contamination in the 200 West Area. Recommendations generated from the AAMS process included using interim actions associated with IRMs and ERAs to accelerate cleanup and limit the potential spread of contamination where enough information is known.

In early 1994, EPA, Ecology, and DOE determined that the information and data gained through the 200 West Groundwater AAMS report and the Carbon Tetrachloride ERA were sufficient to propose an interim *pump and treat* remedial action for the 200-ZP-1 OU.

SUMMARY OF SITE RISKS

During the AAMS process, DOE performed an initial risk-based screening as well as a comparison of known contaminant concentrations in 200-ZP-1 OU groundwater against pertinent federal and state groundwater standards. The risk-based screening was qualitative in nature and was designed to prioritize contaminant plumes. The screening concluded that carbon tetrachloride, chloroform, and TCE present high potential risk for their carcinogenic characteristics, and

Figure 2. 200 West Carbon Tetracholoride Map.



that they had been detected in the groundwater at concentrations that significantly exceeded drinking water standards. It should be noted that the contaminated groundwater in the 200-ZP-1 is not currently used as a drinking water source.

Carbon tetrachloride is acutely toxic and has been reported in toxicological literature to cause nerve and liver damage in humans; animal studies indicate that carbon tetrachloride can cause liver tumors. Carbon tetrachloride has been found to exceed the *Maximum Contaminant Level* (MCL) for drinking water of 5 ppb by more than 1,000 times in 200-ZP-1 OU groundwater. Chloroform is acutely toxic, has been reported in the toxicological literature to be a possible *mutagen* and *teratogen*, and is a suspected *carcinogen*. Chloroform has been found to exceed the MCL of 100 ppb by more than 10 times in 200-ZP-1 OU groundwater. TCE is moderately toxic, has been reported in toxicological literature to damage the liver and other organs, and is a suspected carcinogen. TCE has been found to exceed the MCL of 5 ppb by almost 10 times in 200-ZP-1 OU groundwater.

NEED FOR INTERIM REMEDIAL ACTION

Recent analysis of groundwater samples from wells located near the periphery of the carbon tetrachloride plume (Figure 2) show that carbon tetrachloride concentrations are increasing (Figure 3), indicating that continued migration of this contaminant in the groundwater beyond the 200 West Area boundary is likely. Given the similarities of chloroform and TCE to carbon tetrachloride, it is likely that these compounds are also moving toward the boundary of the 200 West Area and will eventually migrate outside of the 200 West Area. All three contaminants could potentially migrate in the groundwater to the Columbia River over time.

Toxicological risks, high contaminant levels, and continued migration of carbon tetrachloride, chloroform, and TCE in the groundwater provide sufficient grounds for initiating interim remedial action at the 200-ZP-1 OU. Interim remedial action is needed to prevent further degradation of groundwater quality outside of the 200 West Area and reduce the potential for these contaminants to migrate into the Columbia River.

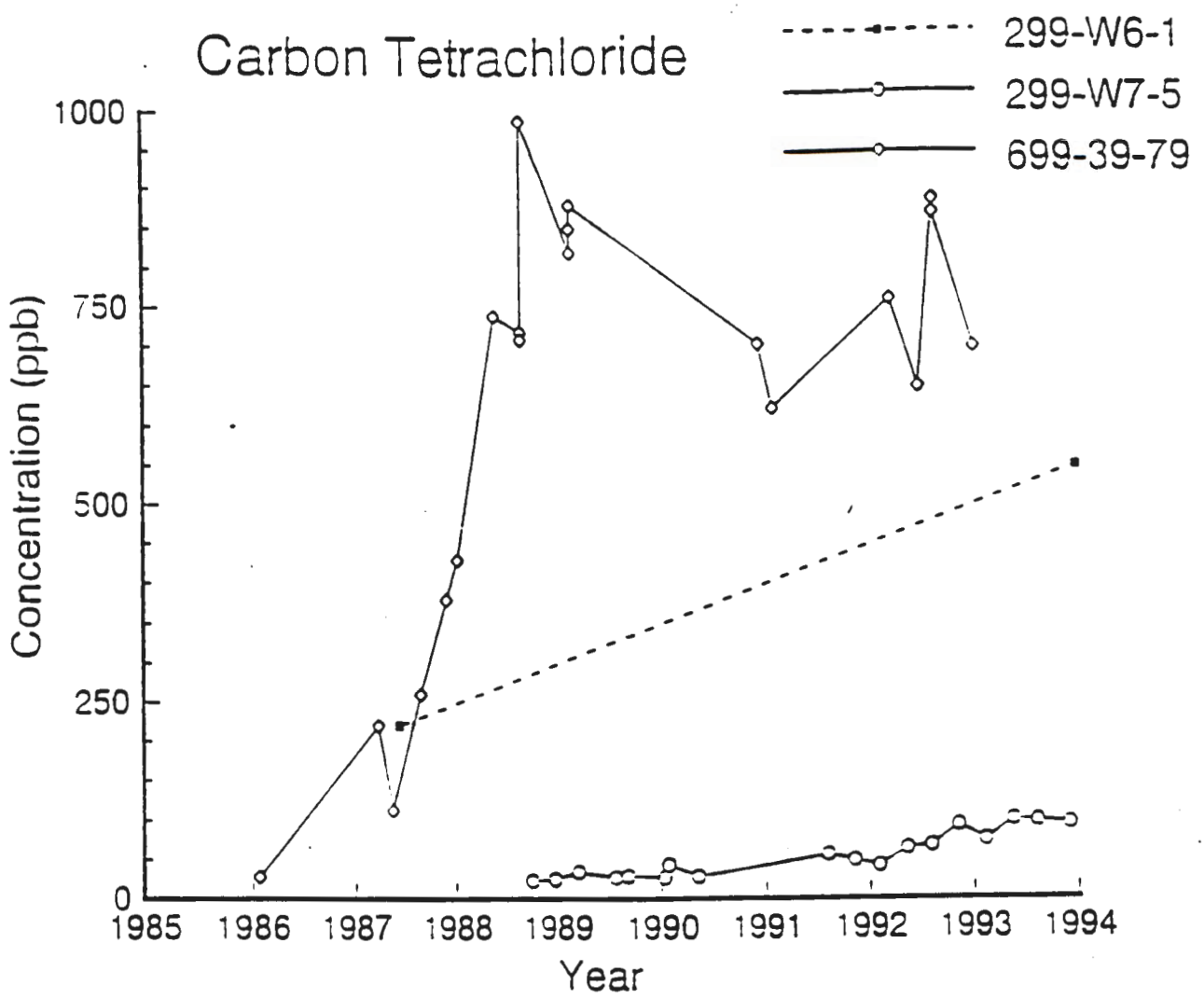
The 200-ZP-1 OU IRM will address that portion of the groundwater in which carbon tetrachloride concentration exceeds 1,000 ppb. The 1,000 ppb contour was chosen for application of this IRM because greater than 65% of the carbon tetrachloride mass dissolved in groundwater is believed to be contained in that region. Concentrating remediation efforts within the 1,000 ppb contour will allow the largest mass of contaminants to be removed per volume of groundwater treated. The greater than 1,000 ppb carbon tetrachloride plume also incorporates a major portion of the chloroform and TCE plumes. Within this area, the primary focus of the IRM will be the portion of the groundwater containing the highest concentrations of carbon tetrachloride, (i.e., greater than 50% of the contaminant mass but only 6% of the total plume area). This corresponds to a carbon tetrachloride concentration contour between about 2,000 and 3,000 ppb.

A successful pump and treat IRM would result in (1) containing the highly contaminated portion of the plume; (2) extracting a significant mass of the contaminants; (3) reducing a source of available contaminants that contributes to ongoing groundwater contamination; and (4) reducing concentrations of contaminants in the groundwater.

To ensure protection of human health and the environment, *points of compliance* will be identified outside of the 200 West Area boundary. The points of compliance will be roughly coincident with the *Hanford Future Site Uses Working Group* recommended buffer zone surrounding the 200 Areas (DOE, EPA, And Ecology, 1992). Points of compliance will represent locations where groundwater concentrations of carbon tetrachloride, chloroform, and TCE should not exceed drinking water standards. Additionally, groundwater quality will be monitored in the high concentration area to determine the effectiveness of the IRM. Existing wells will be used, where possible, to monitor groundwater contaminant concentrations. Proper investigations on the possible existence of carbon tetrachloride and DNAPL will be carried out and, if confirmed, appropriate remedial measure(s) will be taken during the IRM action.

This IRM is not intended to achieve predetermined cleanup limits in the groundwater, nor to fully control potential human health or environmental threats.

Figure 3. Carbon Tetrachloride Concentrations at Wells Near the 200 West Area Boundary.



A detailed quantitative *baseline risk assessment* will be developed during the *final remedy selection* process to evaluate the human health and environmental risk associated with the 200-ZP-1 OU groundwater. This risk assessment will form the basis for establishing final cleanup objectives, and will support the selection of final remedies.

INTERIM REMEDIAL ACTION OBJECTIVES

Interim remedial actions conducted during the IRM would focus on removing the contaminant mass from the unconfined aquifer and controlling movement of these contaminants in the groundwater out of the 200 West Area. Specific objectives of the IRM include:

- Reducing contamination in the area of highest concentrations of carbon tetrachloride.
- Preventing further movement of these contaminants from the highest concentration area.
- Providing information that will lead to development of a final remedy which will be protective of human health and the environment.

DETAILED DESCRIPTION OF ALTERNATIVES

As noted above, pump and treat is the proposed interim action for this OU. Pump and treat is a proven technology that is readily available for use, and it has been used at other sites to address contaminants of this type. Concentrating on a proven readily available technology will allow expedited remediation of groundwater. Therefore, only pump and treat and no action alternatives will be evaluated for this IRM.

Alternative 1: No Action

This alternative would consist of allowing contaminants to migrate, dissipate, and naturally degrade over time until a final remedy is selected and implemented.

Alternative 2: Groundwater Pump and Treat

This alternative would consist of extracting groundwater; treating it to remove carbon tetrachloride, TCE, and chloroform; and then returning the treated water to the aquifer. Treated groundwater would be returned through wells that are situated to help control migration of contaminants from the high concentration area of the plume. This alternative would occur in phases:

- The first phase consists of *pilot-scale operations* (up to a capacity of about 50 gallons per minute) and focused data collection activities (i.e., refinement of the hydraulic properties of the aquifer) to support remedial design. Pilot-scale operations will evaluate the effectiveness of two technologies: granular activated carbon and air stripping. Pilot-scale operations will provide system and engineering data in three key areas: process effectiveness; operating parameters; and resource requirements. Information on these areas will allow optimization of the *treatment system(s)* and will support phased expansion of the pump and treat system (discussed below). The results of the pilot-scale operations, in conjunction with data collection activities, will be used to determine whether to continue the pump and treat operations. In addition, information gained during initial pump and treat operations include optimal groundwater withdrawal and return rates; refined knowledge of contaminant distribution within the aquifer; a network of wells to support the pump and treat; and determination of whether or not ongoing sources of contaminants exist that might not be addressed by pump and treat. It should be noted that a pilot scale treatability test began August 29, 1994, and is expected to last approximately six months.

- Once it has been determined that the IRM can effectively accomplish the objectives, additional phases would be initiated. These subsequent phases would expand the pump and treat system, install additional wells, and monitor the effects of the pump and treat. The degree of expansion will be based on the amount of groundwater extraction and treated water reinjection that is deemed necessary to contain the high concentration area. It is estimated that the first phase of this expansion would upgrade the total pump and treat capacity to about 150 gallons per

minute. This system would be operated to continue gathering data on the effects of pump and treat on plume containment and mass removal. If it is evident that this IRM can be effective in achieving the objectives, a final phase of expansion would be initiated, resulting in a pumping rate in the range of 150 to 500 gallons per minute. Pump and treat operations would continue until selection of a final remedy, or until such time that it is demonstrated that further operations will no longer be beneficial. The actual time required will be determined as the IRM progresses. Additional wells would be installed for extraction and return, and for monitoring progress of the pump and treat activities. In addition to the focused monitoring that will be performed during the data collection activities, ongoing monitoring will occur throughout the IRM activities. Additional information will be collected and/or treatment system optimization to support the expansion will be performed on an as-needed basis.

COMPARATIVE ANALYSIS OF ALTERANTIVES

The EPA has established nine criteria for the evaluation of remedial alternatives, as described in Table 1. The two interim remedial alternatives are evaluated against eight of these to identify a preferred alternative for the 200-ZP-1 OU (Community Acceptance Criterion 9 will be evaluated following the public comment period of this proposed plan). The following presents a brief analysis of each of the alternatives against the evaluation criteria. Only criteria pertinent to the selection of an interim action have been addressed in detail.

1. Overall Protection. The no action alternative does not change the overall protection of human health and the environment. Alternative 2 would remove contaminant mass from the aquifer and contain the high concentration area of the plumes. Therefore, it will improve overall protection of human health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Potential ARARs were identified in the AAMS report, and a refined list of ARARs has been included in the Engineering Evaluation Conceptual Plan, which is available for review in the Administrative Record for this site. Major ARARs include drinking water standards, solid and hazardous waste designation and management standards, and air emission standards (e.g., for venting releases from tanks or piping). An IRM is an interim action designed to reduce risk through contaminant mass reduction, not to meet ARARs that would be applicable to a final remediation. However, ARARs are important for (1) any portion of the interim action that is final; (2) materials that are treated or managed off site; and (3) any release that may occur during implementation. It should be noted that even though this interim measure may not meet all ARARs, it will become part of a total remedial action that will attain the applicable or relevant and appropriate federal or state requirements.

The no action alternative would not invoke any ARARs that would need to be satisfied.

Alternative 2 is not intended, nor will it meet, the drinking water standards, effluent discharge standards, or RCRA hazardous waste management standards of all contaminants before injecting the treated water back into the ground. However, it would reduce the further degradation of groundwater in the 200 West Area. Secondary waste and other materials generated during implementation of Alternative 2, as well as potential air releases, would be managed to satisfy ARARs. This interim action will not meet MCLs, state effluent discharge standards, and/or RCRA hazardous waste management standards at this time. The final remedy selected for this OU will consider and attempt to meet all ARARs at the time the final remedy is selected and put out for public comment.

3. Long-term effectiveness and permanence. The no action alternative provides no long-term effectiveness or permanence. Alternative 2 would not, by itself, achieve long-term effectiveness and permanence. However, contaminant removal and containment through pump and treat would provide a long-term and permanent reduction in risk and in contaminant migration. At the same time, Alternative 2 would improve the potential for future final remedies to be implemented that will achieve long-term effectiveness and permanence.

Table 1

EPA's Nine Evaluation Criteria

1. Overall Protection of Human Health and the Environment - Does the alternative achieve adequate overall elimination, reduction, or control of risks to human health and the environmental posed by each pathway? This is a summary check that takes into account the other criteria and includes an evaluation of short-term and cross-media impacts.

2. Compliance with Federal and State Regulations - Does the alternative meet all of the applicable or relevant and appropriate requirements (ARARs) that have been identified? These are typically established environmental standards, but other, nonenvironmental standards may also be ARARs for a particular alternative.

3. Long-Term Effectiveness and Permanence - Does the alternative leave a risk after the conclusion of remedial activities?

4. Reduction of Toxicity, Mobility, or Volume Through Treatment - Does the alternative permanently and significantly reduce the hazard posed by the site by destroying contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of the contaminants?

5. Short-Term Effectiveness - Does the alternative provide adequate protection to human health and the environment during the remedial action, and how long does it take for the action to achieve the established objectives?

6. Implementability - Is the alternative technically and administratively feasible?

7. Cost - What are the overall capital cost and operations and maintenance costs associated with the alternative?

8. State Acceptance - Does the alternative address the technical and administrative concerns of the state?

9. Community Acceptance - Does the alternative adequately address the concerns of the local community?

4. Reduction of toxicity, mobility, or volume. The no action alternative provides no reduction of toxicity, mobility, or volume through treatment. Alternative 2 would provide treatment of the groundwater contaminants, thereby reducing the volume of contaminants that may migrate and reducing the overall toxicity risk of the groundwater.

5. Short-term effectiveness. The no action alternative has no short-term effect on the contamination. Alternative 2 would offer short-term effectiveness by limiting the migration of the contamination and by reducing the most significant contamination in the areas of highest concentration.

6. Implementability. The no action alternative is easily implemented, because no changes would be made to the site. Alternative 2 could be implemented using available technology. It would be necessary to demonstrate and optimize both the pumping and treatment aspects of Alternative 2 in order to accomplish an efficient and effective implementation.

7. Cost. The no action alternative has essentially no added cost. The cost estimates for Alternative 2 are presented in Table 2. These estimates are based on various assumptions, including (among others), the following:

- Procurement of three air stripping/vapor phase activated carbon adsorption treatment systems, operating at a total capacity of 500 gpm.
- Installation of a total of 19 new extraction, injection, and monitoring wells.
- Focused data collection and monitoring activities.

8. State acceptance. The State of Washington supports Alternative 2.

9. Community acceptance. This action was first proposed as part of the fourth amendment to the Tri-Party Agreement and received favorable public comments. Final community acceptance of the alternatives will be evaluated after the public comment period ends and will be described in the Interim Action ROD.

SUMMARY OF PREFERRED ALTERNATIVE

The preferred alternative is Alternative 2. This alternative would accelerate cleanup of the 200-ZP-1 OU groundwater, providing a reduction in potential risk to human health and the environment by removal of contaminant mass and limiting contaminant spread at the area of greatest contamination. It relies on available technology that can be quickly optimized to allow the pump and treat interim action to begin within the year. Alternative 2 would recover and treat contaminants without limiting future options for containment and remediation of 200-ZP-1 OU groundwater. Actual or threatened release of hazardous substances for this site, if not addressed by the preferred alternative, may present a current or potential threat to public health, welfare, or the environment.

Depending on the results of the pilot-scale operations and focused data collection activities, treatment expansion may need to be accelerated or slowed down, or the preferred alternative may have to be reevaluated for its appropriateness. The three agencies are currently developing specific technical criteria for evaluating the success of this interim action and are interested in receiving public comment on this matter. Uncertainties that would lead to reevaluating this alternative include finding that there is insufficient treatment system effectiveness, insufficient groundwater capacity to support pump and treat at an appropriate scale, inadequate aquifer response to demonstrate desired containment, or that vapor or liquid phase sources dominate the spread of groundwater contamination.

Table 2
200-ZP-1 IRM Cost Estimate

	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000
Capital	860,000	750,000	750,000	0	0	0
Well Installation	900,000	2,700,000	2,700,000	0	0	0
Operations & Maintenance	1,140,000	980,000	980,000	980,000	980,000	980,000
Sampling, Analysis and Monitoring	1,970,000	910,000	910,000	910,000	910,000	910,000
DNAPL Investigation[2]	990,000	0	0	0	0	0
Escalation	0	120,000	250,000	130,000	170,000	220,000
Total[1]	$5,860,000	$5,460,000	$5,590,000	$2,020,000	$2,060,000	$2,110,000

[1] No contingency included
[2] Includes deepening two existing wells for use as IRM monitoring wells

GLOSSARY OF TERMS

baseline risk assessment - The detailed estimation of possible risk to human health or the environment due to hazardous or radioactive wastes at a site. Risk assessment methods can produce numerical scores of risk which allow evaluation.

carcinogen - A cancer causing agent.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - The "Superfund" law which describes how the nation's most contaminated sites are to be cleaned up.

conceptual model - A model which represents the current understanding of the physical aspects (e.g., extent and nature of contamination) of an operable unit.

dense non-aqueous phase liquids (DNAPL) - Liquids which are only slighly soluble in water, and so form a separate phase (like oil on water), but are heavier than water.

expedited response action (ERA) - A path of action where an existing or near-term unacceptable health or environmental risk from a site is determined or suspected, and a rapid response is necessary to mitigate the problem.

final remedy selection - The final remedy selection is the path of action to determine the final remedy for the 200-ZP-1 Operable Unit. This path includes the preparation of the Remedial Investigation/Feasibility Study, Proposed Plan, and Final ROD.

Hanford Future Site Uses Working Group - A working group made up of representatives of interested parties concerned with the cleanup and possible future uses of the Hanford Site. The group was active in 1992 and produced a report identifying possible future site uses and an examination of the cleanup necessary to make those uses possible.

Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) - A legal document between the DOE, EPA, and Ecology covering Hanford Site environmental compliance and cleanup.

Interim Action Record of Decision (ROD) - Document describing the selection of an interim remedial action under CERCLA by technically describing the remedy and providing a consolidated source of information about the site and the selected remedy. Contains the Responsiveness Summary.

interim remedial measure (IRM) - An onsite response initiated at any time prior to the initiation of the final remedial action.

maximum contaminant level (MCL) - The maximum concentration of a particular contaminant allowable in drinking water per the Safe Drinking Water Act of 1974, as amended.

mutagen - A mutation causing agent.

operable unit (OU) - Related geographical areas of contamination at Hanford have been grouped into separate operable units, allowing them to be prioritized and remediation efforts to be focused. 200-ZP-1 is one of two groundwater Operable Units in the 200 West Area of the Hanford Site.

pilot-scale operations - Testing of an engineering system at a small but in-field size to evaluate possible limitations on its ultimate full-scale implementation.

plume - A body of contaminated groundwater.

points of compliance - Points of compliance represent locations where concentrations of contaminants should not exceed established standards for protection of human health and the environment (e.g., drinking water standards for groundwater contaminants).

parts per billion (ppb) - The concentration level of one pound of contaminant in one billion pounds of water, about half a foot over a square mile.

pump and treat - A treatment technology where water is pumped out of the ground and treated using one of a number of possible water treatment systems located aboveground.

Responsiveness Summary - The part of the Interim Action ROD which summarizes significant comments received from the public and provides the agencies an opportunity to comment "on the record."

spent nuclear fuel - Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation.

teratogen - A congenital anomaly or monstrosity causing agent.

treatment systems - A combination of various treatment equipment for cleaning extracted groundwater. This may involve some combination of a wide variety of physical, chemical, or other techniques.