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**Proposed Plan for Interim
Remedial Measure at the
100-HR-3 Operable Unit**
Hanford Site
Richland, Washington

9413293.3811

Date Published
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**United States
Department of Energy**

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Approved for Public Release

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PROPOSED PLAN FOR INTERIM REMEDIAL MEASURE AT THE 100-HR-3 OPERABLE UNIT

HANFORD SITE, RICHLAND, WASHINGTON

DOE, EPA, AND ECOLOGY ANNOUNCE PROPOSED PLAN

This proposed plan introduces the interim remedial measure for addressing groundwater contamination at the 100-HR-3 Operable Unit, located at the Hanford Site, along the Columbia River. In addition, this plan includes a summary of other alternatives analyzed for the 100-HR-3 Operable Unit. This document is issued by the Washington State Department of Ecology (Ecology) as a lead agency, the U.S. Environmental Protection Agency (EPA) as the support agency, and the U.S. Department of Energy (DOE) as the responsible agency.

In order to protect human health and the environment, the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) enables the EPA to respond to potential threats of contamination at sites identified on the *Superfund National Priorities List* (NPL). The 100 Areas of the Hanford Site were placed on the NPL on November 3, 1989, because of soil and groundwater contamination resulting from the past operation of nuclear facilities.

This proposed plan should be read as a fact sheet that summarizes, for public review, the comparison analysis of different remedial alternatives. This plan summarizes information that can be found in greater detail in the *Focused Feasibility Study for the 100-HR-3 Operable Unit* (FFS), as well as other documents listed below. The public is encouraged to review the following documents to gain a comprehensive understanding of the 100-HR-3 Operable Unit:

- *RCRA Facility Investigation / Corrective Measurement Study Work Plan for the 100-HR-3 Operable Unit*, Hanford Site, Richland, Washington (DOE/RL-88-36)

The preferred alternative described here is Institutional Control/Continued Current Actions. This alternative includes continued operation and evaluation of the Pilot-Scale Treatability Study located in the 100 D/DR Area, further evaluation of ecological risks through the *Columbia River Comprehensive Impact Assessment* (CRCIA), continued application of institutional controls and groundwater monitoring.

- *Limited Field Investigation for the 100-HR-3 Operable Unit, Hanford Site, Richland, Washington* (DOE/RL-93-43)
- *Qualitative Risk Assessment for the 100-HR-3 Groundwater Operable Unit* (WHC-SD-EN-RA-007)
- *100 Area Feasibility Study Phases 1 and 2* (DOE/RL-92-11)
- *Focused Feasibility Study for the 100-HR-3 Operable Unit* (DOE/RL-94-67)

These documents are available at the following locations:

- U.S. DOE, Richland Operations
Public Reading Room
2440 Stevens Center Place
Richland, Washington 99352
- EPA Region 10
Superfund Record Center
Park Place Building, 7th Floor
Seattle, Washington 98101

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- Washington State Department of Ecology
Nuclear Waste Library
719 Sleater-Kinney Road S.E.
Capital Finance Building, Suite 200
Lacey, Washington 98503

OPERABLE UNIT BACKGROUND

As shown in Figure 1, the 100-HR-3 Operable Unit is located in the north-central portion of the Hanford Site, along the shoreline of the Columbia River.

Three areas make up the 100-HR-3 Operable Unit: 100 H Reactor Area; the 100 D/DR Reactor Area; and the area between the H and D/DR reactors (as shown in Figure 2). The operable unit is one of seven operable units associated with the 100 D/DR and 100 H Areas. Operable Units 100-DR-1, 100-DR-2, 100-DR-3, 100-HR-1, 100-HR-2, and 100-IU-4 address contaminated soil and solid waste disposal sites, while the 100-HR-3 Operable Unit addresses contamination in the underlying groundwater.

SITE HISTORY

The H Area and D/DR Area were the sites for water-cooled, graphite-moderated plutonium production reactors. The H Reactor operated from 1949 to 1965. The 100 D/DR Area was the site of two reactors. The D Reactor operated from 1944 to 1967, and the DR Reactor operated from 1950 to 1965.

The operation of these reactors and support facilities resulted in the disposal of large quantities of waste. Liquid waste disposal is the primary concern in the 100-HR-3 Operable Unit, because it is believed to have created two plumes of contamination in groundwater: one in the H Area, and one in the D/DR Area. Liquids were discharged into unlined cribs, basins, and drains, resulting in migration to groundwater. The plumes are believed to have originated mainly from the retention basins located in the 100 H and D/DR Area.

Chromium is the main contaminant of concern in these groundwater plumes, and is thought to be causing possible adverse impacts to the Columbia River and surrounding habitat. While decisions regarding future use of the river and surrounding areas are still pending, potential uses include agriculture, wildlife, and recreation. The Columbia River is currently being considered for wild and scenic river designation by the United States Congress. Chromium generally

exists in two forms in the environment, chromium III and chromium VI. It is believed that most of the chromium in the groundwater is chromium VI, which is potentially toxic to aquatic life and very mobile in water. The concentrations of chromium are shown in Figure 3 (D/DR Area) and Figure 4 (H Area).

A sodium dichromate barrel disposal landfill located in the 600 Area was remediated in April 1992, through an expedited response action. No impacts to groundwater were discovered. Therefore, groundwater in the 600 Area has not been addressed in this proposed plan.

SUMMARY OF ONGOING CHARACTERIZATION EFFORTS

The two projects described below are currently in progress and will provide more information on the impact of contaminants in groundwater to the Columbia River and the treatability of the chromium in groundwater.

1. *Columbia River Comprehensive Impact Assessment:*

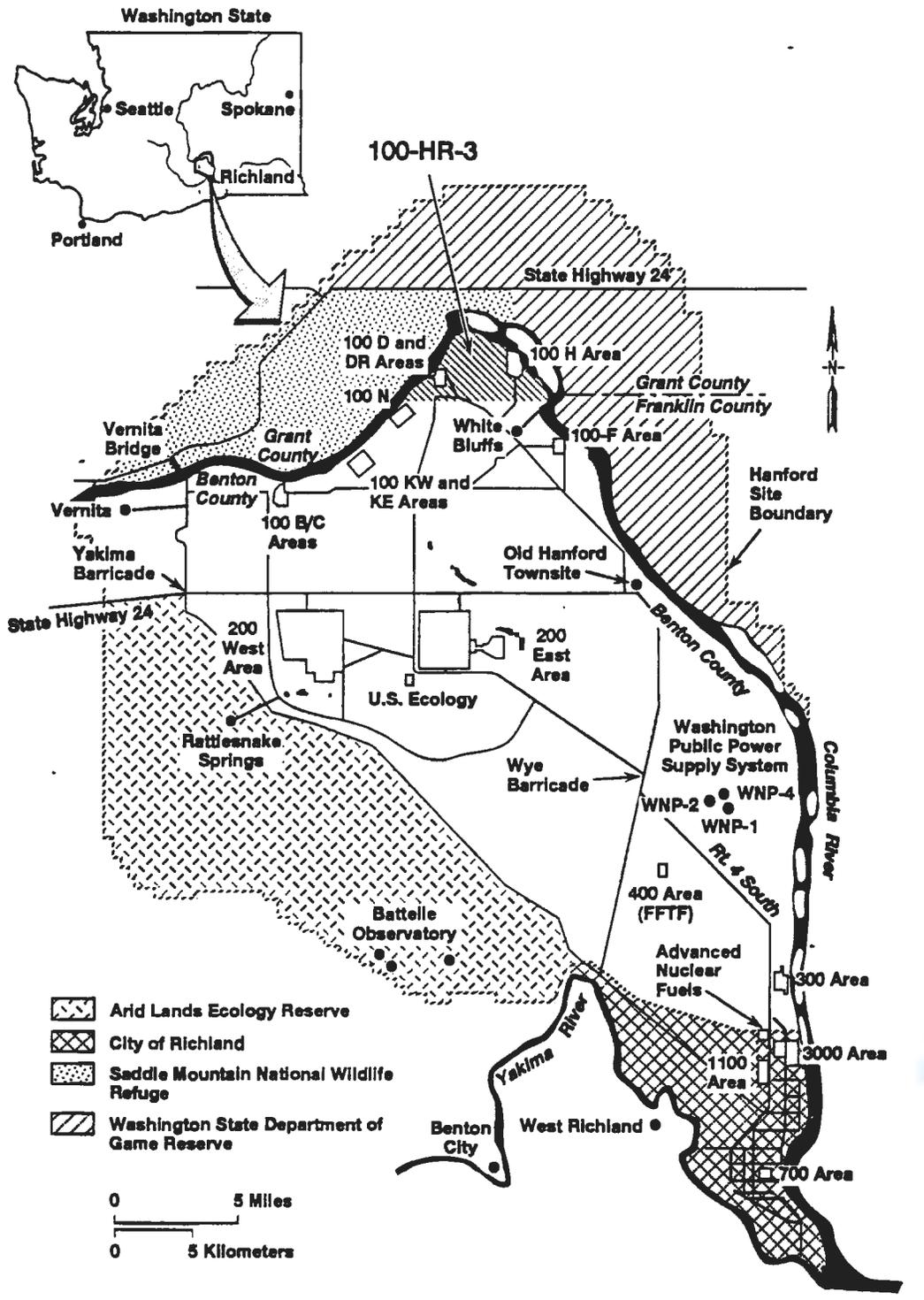
The *Columbia River Comprehensive Impact Assessment* will evaluate the potential human and ecological risks associated with the Columbia River that result from past and present activities on the Hanford Site. Human risk from exposure to radioactive and hazardous materials will be addressed for a range of river use options. Ecological risk will be evaluated relative to the condition of the current river environment.

2. *Pilot-Scale Treatability Test Plan for the 100-HR-3 Operable Unit:*

The *Pilot-Scale Treatability Test Plan for the 100-HR-3 Operable Unit* will assess the effectiveness of an ion exchange treatment system in removing chromium VI from groundwater. The *Test Plan* will also assess the ability of the pump-and-treat system to reduce the mass of chromium in the chromium VI plume associated with the D Reactor.

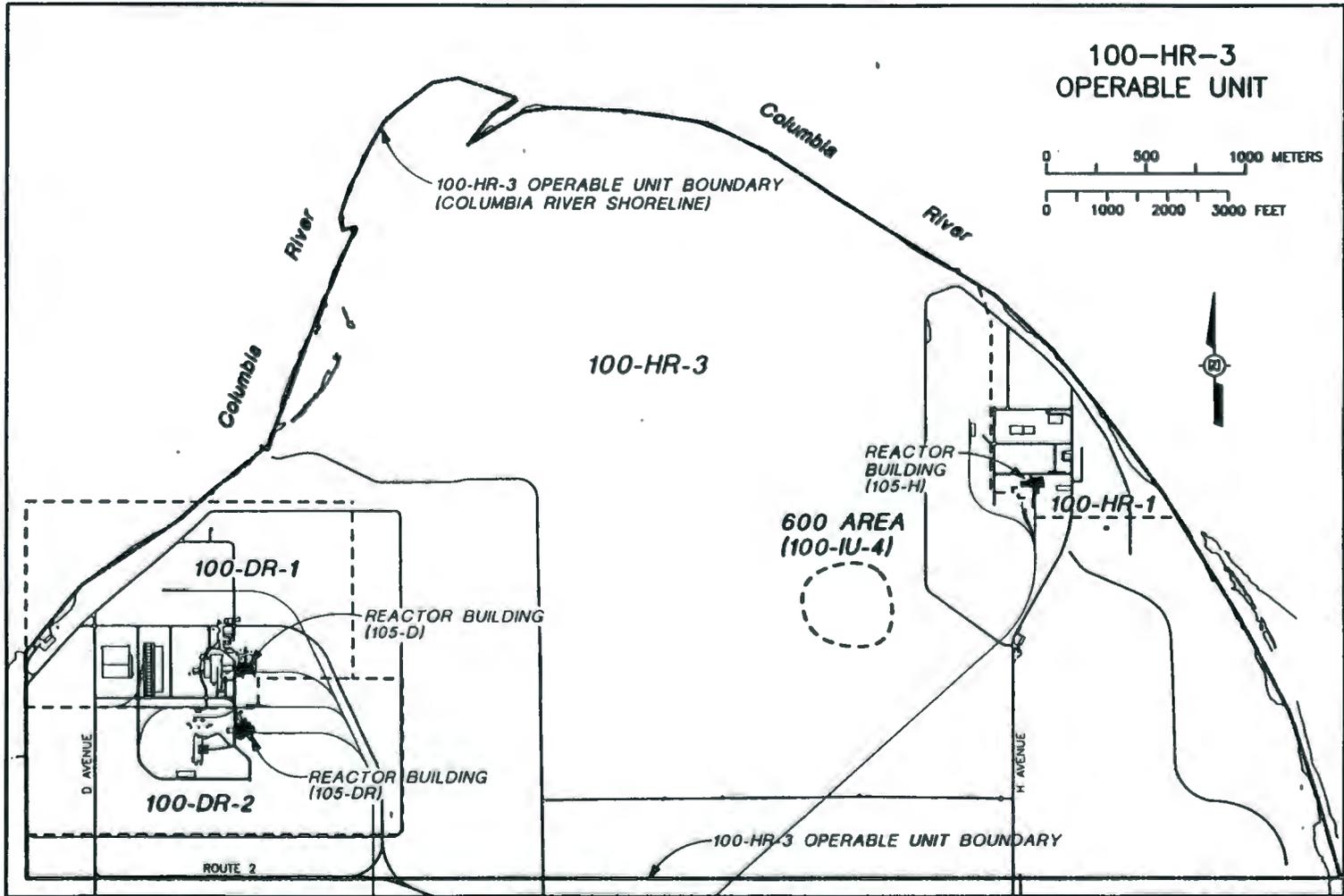
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Figure 1. Hanford Site Map



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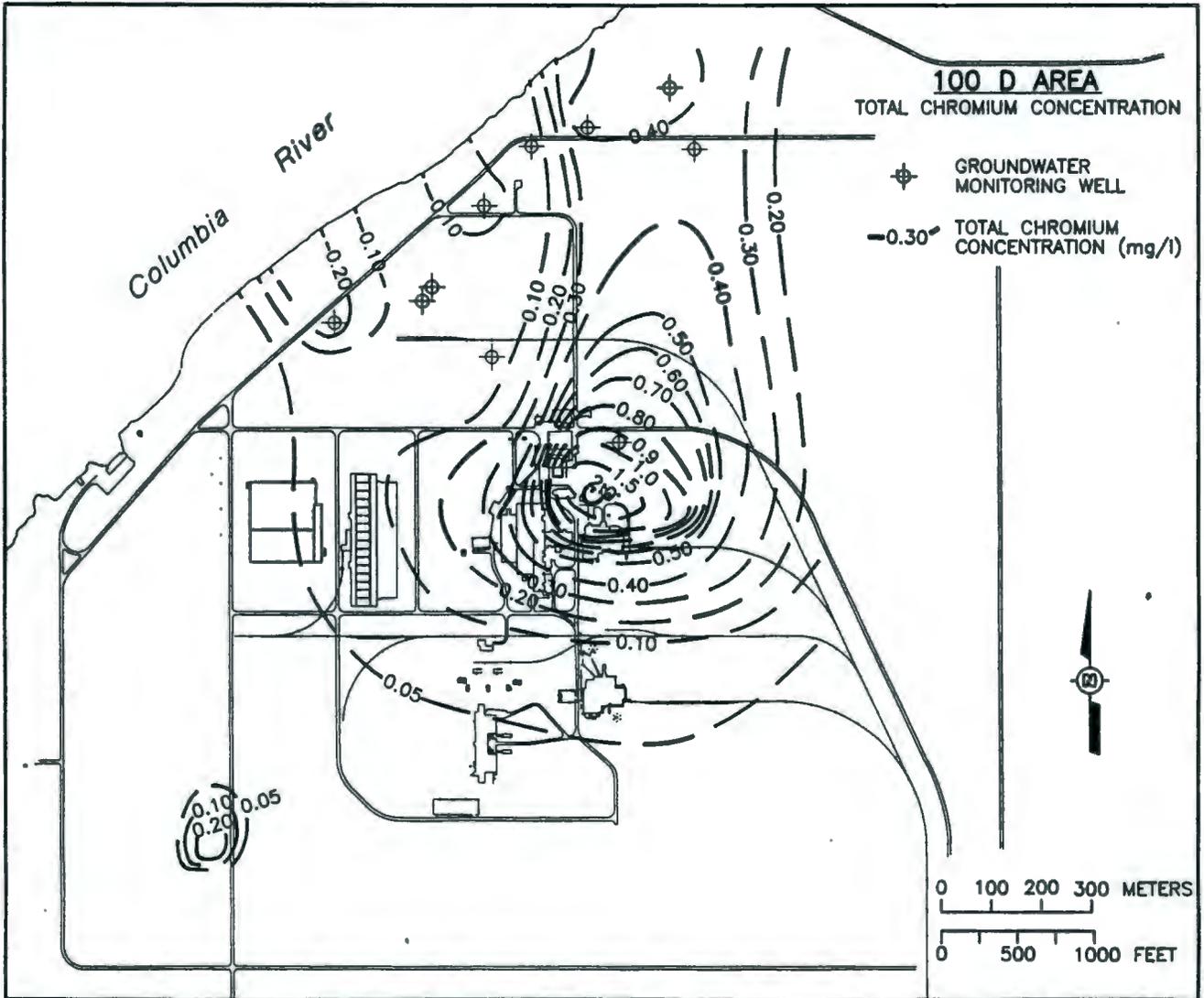


SOURCE: DOE/RL 94-67

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Figure 2. D/DR Area and H Area Location in the 100-HR-3 Operable Unit.

Figure 3. D/DR Area Total Chromium Concentrations.

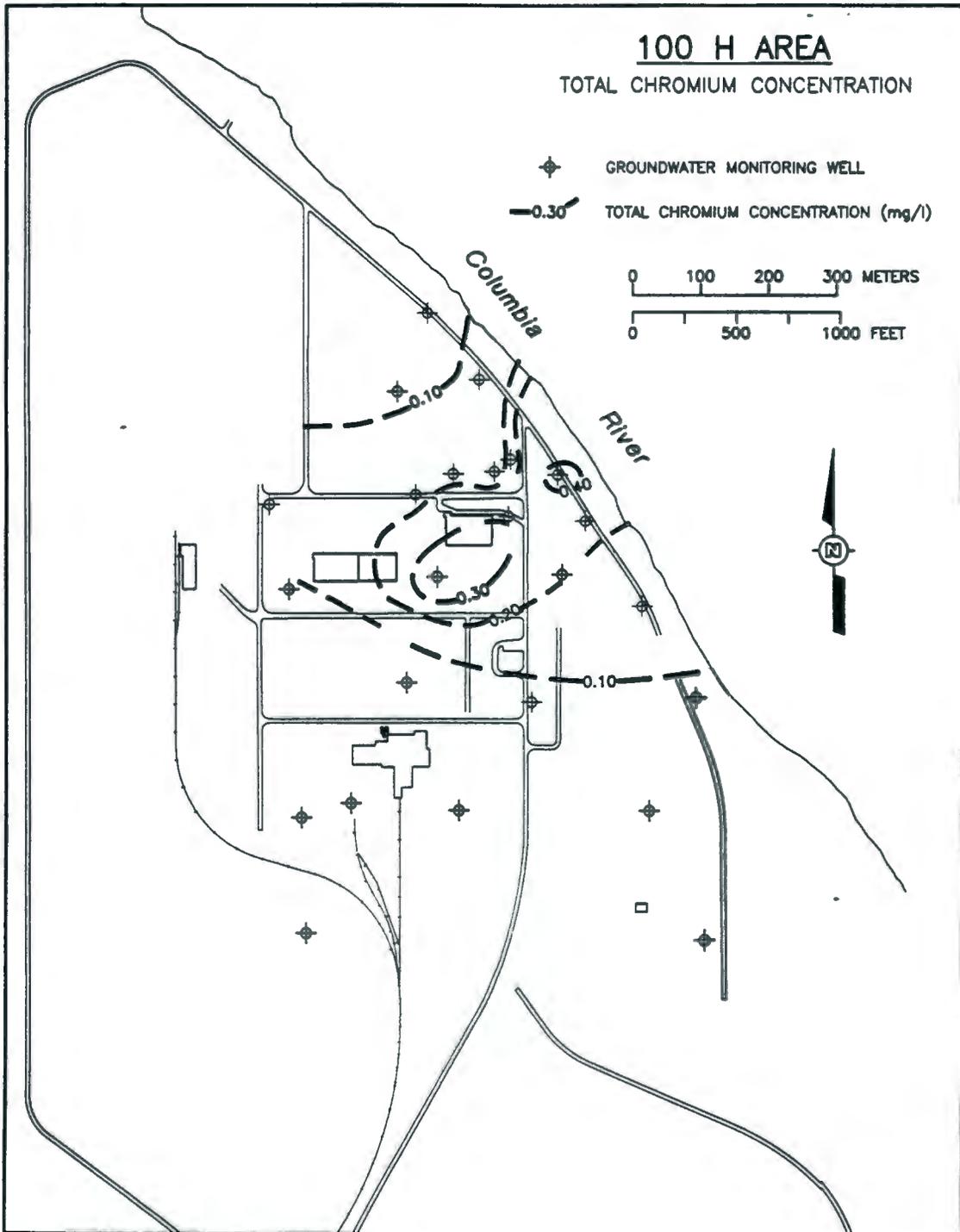


SOURCE: DOE/RL 94-67

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Figure 4. H Area Total Chromium Concentrations.



SOURCE: DOE/RL 94-67

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SUMMARY OF RISK

A Qualitative Risk Assessment (QRA) was conducted to evaluate the human health and environmental potential risks associated with the 100-HR-3 Operable Unit. Currently, there are no residential or recreational users in the operable unit due to access restriction. Thus, the risks estimated in the QRA are not actual risks but, instead, provide estimates of potential risks. In preparing the QRA, conservative assumptions were employed that weigh in favor of protecting public health. The results of the risk assessment help determine if any remedial actions are necessary to protect human health or the environment.

Human Health Risk- The QRA evaluated two exposure scenarios: current occasional-use and future frequent-use. The selection of land use is based on the use of the Hanford Site. The occasional-use scenario assumed a person trespassed onto the site while DOE operates the Hanford Site and attempted to drink water from seeps flowing into the Columbia River for 7 days a year for 30 years. The seeps are accessible when the Columbia River water level is low and the seeps from groundwater are exposed along the shoreline. The result of this assessment gives current potential risks to site trespassers, which is the most likely current exposure pathway. The second exposure scenario evaluated was frequent-use of the 100-HR-3 Operable Unit at a time when DOE releases the site and the public or other parties are allowed to reside in the operable unit. This type of exposure assumed a person drinks groundwater, bathes in it, washes dishes with it (etc.) for 365 days a year for 70 years. The result of this assessment gives potential hypothetical risks to future persons residing in the operable unit. The regulators use the occasional-use scenario to make decisions about interim remedial measures. Therefore, potential current risks resulting from that scenario are discussed in this proposed plan.

The EPA uses an excess lifetime cancer range of one in ten thousand to one in one million to manage risk as a part of CERCLA action. Risks that fall within or below this range are generally regarded as being acceptable, and generally do not warrant remedial action.

On this basis, the *Focused Feasibility Study for the 100-HR-3 Operable Unit* concluded that there was no

unacceptable human health risk from groundwater contaminants at the 100-HR-3 Operable Unit from the most likely exposure scenario, which is occasional-use. In D/DR Area, the highest occasional-use risk value estimated was for tritium (two in one-million), which is a very mobile radionuclide. The highest occasional-use risk value estimated for the H Area was from both uranium-238 and tritium (both two in ten million). All these risk values are within acceptable levels.

For non-cancer causing contaminants such as chromium, a hazard quotient greater than one indicates that an adverse toxic effect in humans could occur. There were no contaminants detected in groundwater that resulted in a hazard quotient above one in the occasional-use scenario.

Ecological Risk - To provide estimates of potential risk to ecological receptors, hypothetical ecological scenarios were evaluated using selected biological receptors (i.e., fish and other wildlife) that live in or near the Columbia River. It was determined that chromium poses a potential risk to aquatic life and organisms that live along the shore. In particular, salmon eggs deposited in the river gravels and young fish hatched during the fall salmon spawning season are perceived to be at greatest risk. Potential risk to aquatic life was evaluated by comparing the maximum detected concentration of a contaminant in the 100-HR-3 Operable Unit groundwater nearest the river with regulatory standards for river waters, as shown in Table 1. Note that concentrations of chromium in the Columbia River could not be detected. Even though chromium has not been detected in the river water near the 100-HR-3 Operable Unit there is some probability, albeit low, that chromium could be discharging among the sediments and gravels used by spawning salmon.

In addition to determining potential ecological risk from chemical contaminants in groundwater, the effects from radioactive contaminants were examined. It was calculated that no associated aquatic organism or riparian organism will receive a dose from radionuclides in excess of the DOE Order 5400.5 limit of one rad per day. This dose was assumed to be protective of the ecosystem.

**Table 1: Summary of Ecological Contaminants of Concern
100-HR-3 Operable Unit**

Groundwater Area	Contaminant	Maximum Unfiltered Concentration, mg/L		Remediation Goal ^a , mg/l		
		100-HR-3 plume center (groundwater)	In a well near the river, used in QRA (groundwater)	Remediation goal (groundwater/river water)	Seep 1993 (Groundwater)	Columbia River 1991 (river water)
D/DR	Chromium	2.09	0.44	0.050/0.011	0.176	ND ^b
H	Chromium	0.36	0.49	0.050/0.011	0.021	ND ^c

QRA - qualitative risk assessment

^aThe Ecological Standard and Remediation goal is for chromium VI. The maximum unfiltered concentrations are for total chromium (both chromium III and IV).

^bThe concentrations were less than the 0.0088 mg/l detection limit.

^cThe concentrations were less than the 0.0060 mg/l detection limit.

SCOPE AND ROLE OF ACTION

This proposed plan for the 100-HR-3 Operable Unit is a Tri-Party Agreement Milestone in the interim remedial measure process described in the *Hanford Past-Practices Strategy* (see shaded box on next page). This interim action is to take place after the Interim Record of Decision is issued and would continue for a period not to extend beyond 2008. After this time, groundwater would be subject to the final remedy selection process for the entire 100 Area to determine what additional actions, if any, are necessary to remove the 100 Area from the NPL. It is anticipated that the selected interim measure will also serve as the final remedy; however, this determination cannot be completed without additional analysis to assess the effectiveness of the interim measures. Like the interim Records of Decision, the final site remedies for the entire 100 Area would be selected only after taking public comment into consideration.

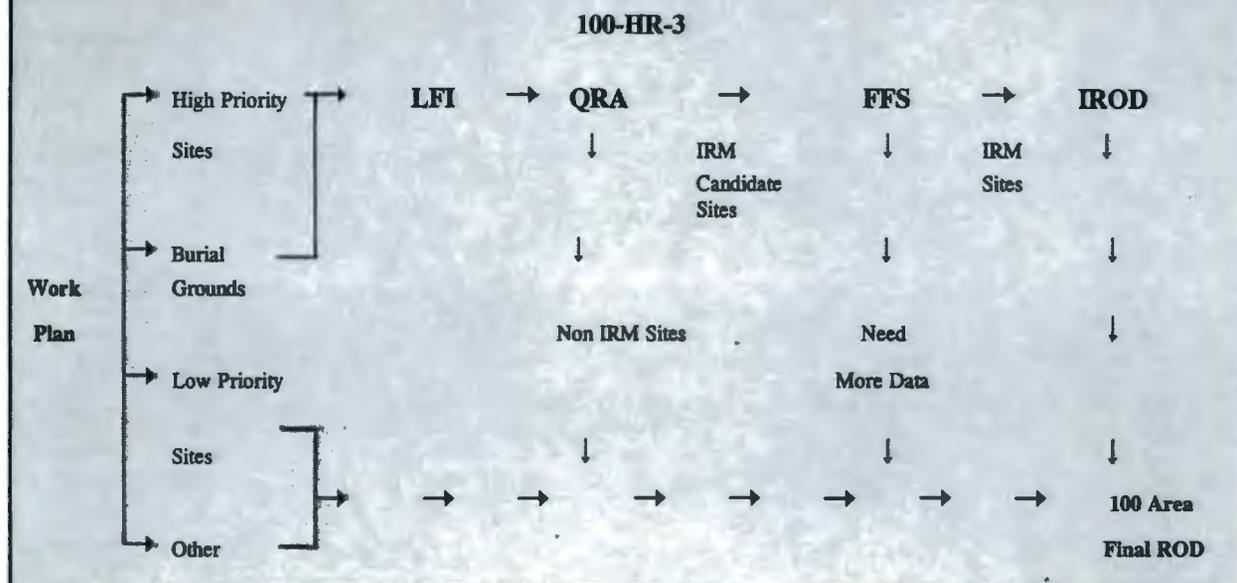
The DOE, EPA, and Ecology encourage you to comment during the public comment period on all of the interim remedial alternatives described in this proposed plan. The DOE, EPA and Ecology may modify the preferred alternative or select another response action presented in this plan and the 100-HR-3 *Focused Feasibility Study*, based on new information or public comments.

Contaminants are present in the groundwater at concentrations that do not pose a potential threat to occasional users of the 100 H and D/DR Area. Cleanup of the groundwater based on a potential threat to ecological receptors in the Columbia River would be expensive (starting at \$15 million). The high costs, the generation of wastes, and the potential for ecosystem damage do not appear to be warranted by the potential risks posed by chromium. The basis for proposing any interim action for groundwater would be based solely on the potential risk to the ecosystem in the Columbia River. The risk is being quantified in the CRCIA.

Therefore, Ecology, DOE, and EPA and have selected Institutional Control/Continue Current Actions (GW-2) as their preferred interim remedial alternative. This alternative includes the following actions that are described in further detail in the Summary of Considered Alternatives section:

- Continue operation and evaluation of the existing chromium treatment facilities at the 100 D/DR Area to determine the effectiveness and costs for chromium VI contaminated groundwater removal and treatment, for a period not to extend beyond 2008.

Groundwater investigations and planning activities were conducted in accordance with the *Hanford Past-Practices Strategy*. The goal of the *Hanford Past-Practices Strategy* is to streamline the remedial action process, while emphasizing action at high priority sites through expedited response actions and interim remedial measures. Streamlining of the entire process is achieved by limiting data collection and placing high-priority sites on the interim remedial measure pathway. Actions for low priority sites were deferred and will be addressed in the final 100 Area Aggregate final Record of Decision. Interim Records of Decisions will be issued for the high priority sites. Further action beyond the interim period will be addressed in the 100 Area Aggregate Study.



- Further evaluation of the current and estimated future human and ecological risks posed by the 100-HR-3 contaminants through the *Columbia River Comprehensive Impact Assessment*.
- Continue application of institutional controls to limit potential human risk through year 2008.
- Continue groundwater monitoring activities in the D/DR and H Area.

The preferred alternative would not require a capital investment because the pilot scale treatability study, *Columbia River Assessment*, access restrictions, and a groundwater monitoring program are already in place. However, this alternative would require more than \$3 million every year for operation and maintenance costs. The potential risks to future site users would not be reduced by this alternative, but would remain within acceptable levels.

The preliminary remediation goals for 100-HR-3 were selected as the Ambient Water Quality Criteria for

chromium VI (0.011 mg/l) in the river bottom substrate environment, and 0.05 mg/l for chromium VI in near river wells. Concentrations in the seeps that flow into the Columbia River exceed the 0.011 mg/l standard. Whether seeps in the Columbia River are located where the most sensitive ecological receptors (the salmon eggs and young fish) are present is not known. It is also not known if the concentrations of chrome detected in the seeps along the bank of the Columbia River are representative of the concentrations within the salmon redds (nests). It is anticipated that these issues could be answered when the CRCIA results are available. This information could then be incorporated into the final recommended action for the 100-HR-3 Operable Unit.

A contribution to the overall groundwater strategy in the 100-HR-3 Operable Unit will be made by addressing the source(s) of groundwater contamination in the 100-DR-1, 100-HR-1, and 100-HR-2 Operable Units. Plans are currently being developed to clean up soil and solid waste sites overlying the 100-HR-3 Operable Unit that have contributed to groundwater contamination.

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SUMMARY OF CONSIDERED ALTERNATIVES

The 100 Area Feasibility Study Phase 1 and 2 provided a list of six generic groundwater alternatives that could be applied to the groundwater operable units in the 100 Areas. Of the six alternatives, only five were applicable to groundwater remediation at the 100-HR-3 Operable Unit, as follows:

- No Interim Action (GW-1)
- Institutional Control/Continue Current Actions (GW-2)

- Containment (GW-3)
- Removal/Ion Exchange Treatment/Disposal (GW-5)
- Removal/Reverse Osmosis Treatment/Disposal (GW-6)

The label GW after the alternative name stands for groundwater (GW) alternative. Arabic numbers (1, 2, etc.) indicate different GW alternatives. Elements of the alternatives are shown in Table 2.

Table 2: Summary of Considered Alternative Components for 100-HR-3 Operable Unit

	No Interim Action GW-1	Institutional Control/ Continue Current Actions GW-2	Containment GW-3	Removal/Ion Exchange Treatment/Disposal GW-5	Removal/Reverse Osmosis Treatment/Disposal GW-6
Monitoring	X ^a	X	X	X	X
Institutional Controls	X ^a	X	X	X	X
Treatability Test Plan		X			
Columbia River Assessment		X			
Groundwater Containment			X		
Groundwater Extraction			X	X	X
Groundwater Treatment				X	X

^a only ongoing activities would be continued through the interim remedial measure period

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Common Elements. All five alternatives applicable to the 100-HR-3 Operable Unit include controls to prevent access to groundwater and require groundwater monitoring to observe groundwater concentrations (deed- and water-right restrictions would be components of the controls that prevent future access to groundwater). In addition to continuing access restrictions, the present network of groundwater monitoring wells would be maintained, and samples would be collected to monitor concentrations in groundwater. Monitoring would also aid in determining when these controls were no longer necessary.

No Interim Action (GW-1)- Evaluation of this alternative is required by the CERCLA Program to serve as a baseline for evaluating remedial actions. Under this alternative existing access controls and groundwater monitoring would continue through the interim remedial measure period (year 2008). Additional monitoring and restrictions would not be implemented, and contamination in the groundwater would dissipate through natural processes.

Capital Cost: D/DR: \$0
H: \$0*

Lifetime Operation and Maintenance (O&M) Cost:
D/DR: \$1,300,000*
H: \$1,300,000*

Present Worth(PW):
D/DR: \$960,000*
H: \$960,000*

Time to implement: 0*

Institutional Control/Continue Current Actions (GW-2)- This alternative involves continuing current actions in the 100-HR-3 Operable Unit. The chromium treatment facility at the 100 D/DR Area would continue to be operated and evaluated to determine the effectiveness and costs for chromium VI contaminated groundwater removal and treatment. In addition, data from the *Columbia River Comprehensive Impact Assessment*, when available, would be assessed to determine potential human health and ecological risks of 100-HR-3 contaminants. This action would be implemented until the year 2008.

* Estimated costs and times. O&M costs are for the entire IRM period (12 years).

Capital Cost: D/DR: \$0*
H: \$0*

Annual O&M Cost: D/DR: \$1,300,000*
H: \$1,300,000*

First Year PW: D/DR: \$960,000*
H: \$960,000*

Time to Implement: 0*

Containment (GW-3) - Cutoff walls would be installed next to the Columbia River to isolate the existing groundwater chromium plume. A cutoff wall is a subsurface vertical barrier designed to prevent the migration of contaminants, divert uncontaminated groundwater around contaminant plumes, or completely surround contaminant plumes. A network of extraction and injection wells, termed hydraulic control, would be installed to intercept and control the contaminated groundwater plume and enhance the effectiveness of the cutoff wall. The objective of the containment alternative would be to eliminate receptor pathways by preventing migration of contaminated groundwater to environmental receptors, such as those in the Columbia River. The potential risks to human health would remain the same.

Capital Cost: D/DR: \$11,100,000*
H: \$3,900,000*

Lifetime O&M Cost: D/DR: \$16,600,000*
H: \$8,200,000*

PW: D/DR: \$23,300,000*
H: \$90,000,000*

Time to Implement: 15 Months

In Situ Treatment (GW-4) - The treatment of groundwater contaminants in situ (in place) was not selected from the *100 Area Feasibility Study, Phase 1 and 2*, as an appropriate alternative for the 100-HR-3 Operable Unit.

Removal/Ion Exchange Treatment/Disposal (GW-5) - Groundwater would be removed through a series of extraction wells placed within the groundwater plume. Chromium VI would then be removed by ion exchange treatment. Treatment residuals from the ion exchange process would be disposed of at the proposed Environmental Restoration Disposal Facility, or at another appropriate disposal facility. The treated

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groundwater effluent would be either injected back into the groundwater or discharged to the Columbia River. The objectives of this option would be to 1) prevent migration of groundwater containing chromium into the Columbia River; 2) prevent migration outside the 100-HR-3 Operable Unit into another operable unit; and 3) minimize source to receptor pathways by removing, treating, and disposing of contaminated groundwater.

Capital Cost: D/DR: \$3,400,000*
H: \$5,900,000*

Lifetime O&M Cost: D/DR: \$15,300,000*
H: \$23,700,000*

PW: D/DR: \$14,700,000*
H: \$23,400,000*

Time to Implement: 15 Months*

Removal/Reverse Osmosis Treatment/Disposal (GW-6) - This alternative is the same as GW-5, except that chromium VI would be removed from the extracted groundwater by reverse osmosis. Reverse osmosis uses a membrane that allows water to pass, but will not pass chromium. In this way the chromium would be removed from groundwater and disposed in an appropriate facility. Operation and

maintenance of reverse osmosis would be expensive.

Capital Cost: D/DR: \$3,300,000*
H: \$7,200,000*

Lifetime O&M Cost: D/DR: \$20,500,000*
H: \$28,500,000*

PW: D/DR: \$18,400,000*
H: \$28,200,000*

Time to Implement: 15 Months*

*Estimated costs and times. O&M costs are for the entire IRM period (12 years).

EVALUATION OF CONSIDERED ALTERNATIVES

Because the qualitative risk assessment has demonstrated that hypothetical human health risks are within EPA's acceptable risk levels, and because actual ecological risks have not, as yet, been defined, the preferred alternative (Institutional Control/Continue Current Actions GW-2) would appear to provide the best balance with respect to the nine criteria EPA uses to evaluate alternatives. These criteria are listed on this page. This section of the proposed plan also profiles

EXPLANATION OF CERCLA EVALUATION CRITERIA

1. *Overall Protection of Human Health and the Environment* addresses whether or not a remedial action provides adequate protection and describes how potential risks posed through each exposure route are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
2. *Compliance with Applicable or Relevant and Appropriate Requirements* addresses whether or not a remedial action will meet all of the applicable or relevant and appropriate requirements and other federal and state environmental statutes or provide grounds for invoking a waiver of the requirements.
3. *Long-Term Effectiveness and Permanence* refers to the magnitude of residual risk and the ability of a remedial action to maintain reliable protection of human health and the environment after remedial goals have been met.
4. *Reduction of Toxicity, Mobility, or Volume Through Treatment* evaluates the anticipated performance of the treatment technologies that may be employed in a remedy.
5. *Short-Term Effectiveness* refers to the speed with which the remedial action achieves protection, as well as the

remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

6. *Implementability* refers to the technical and administrative feasibility of a remedial action, including the availability of materials and services needed to implement the selected solution.

7. *Cost* evaluates capital, operation and maintenance costs for each alternative by performing present worth cost analyses.

8. *State Acceptance* based on its review of the remedial investigation and focused feasibility study reports, and proposed plan, indicates whether the state concurs with, opposes, or has no comment on the preferred interim alternative.

9. *Community Acceptance* is an assessment of the general public response to the proposed plan following a review of the public comments received on the remedial investigation, focused feasibility study, and proposed plan during the public comment period and open community meetings.

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the performance of the preferred alternative against seven of the nine EPA criteria, noting how the preferred alternative compares to the other alternatives under consideration. The two remaining criteria (state acceptance and community acceptance) will be evaluated following public comment on this proposed plan and the Interim Record of Decision. A summary of this analysis is presented in Table 3.

Overall Protection of Human Health and the Environment - All remedial alternatives would protect human health since groundwater concentrations detected at 100-HR-3 are within acceptable levels for the occasional use scenario. The preferred alternative would provide the best protection of the environment. The containment and treatment alternatives would disrupt the environment.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) - None of the alternatives reduce groundwater concentrations to below the chronic fresh water quality criteria (the ARAR for protection of aquatic life). However, a basis for an ARAR waiver exists due to the technical difficulty of achieving ARARs within a reasonable timeframe through treatment. The results of the chromium VI removal system could be used to determine if achieving ARARs through treatment would be feasible.

Long-Term Effectiveness and Permanence - The treatment alternatives would be the most effective in reducing long term risk; however, remediation goals for achieving river water criteria in groundwater are quite difficult. The containment alternative would provide protection of the river by limiting the migration of contaminant, but there would be no reduction in concentrations, except by natural processes. The preferred alternative (Institutional Control/Continued Current Actions GW-2) and no action, do not provide

significant further risk reduction, except by natural processes.

Reduction of Toxicity, Mobility, or Volume Through Treatment-The treatment alternatives would provide the most reduction in toxicity, mobility, and volume of contaminants in the groundwater through treatment. The containment alternative would decrease the mobility, but does not affect volume or toxicity due to persistence of chromium VI in the environment. The no interim action and institutional control/continued current actions alternatives would show reduction only through natural attenuation processes.

Short-Term Effectiveness- The no interim action and institutional control/continued current actions alternatives would provide the best short-term protection because these alternatives would be easy to implement and would not create adverse impacts to human health or the environment. Installing a cutoff wall or constructing a treatment facility would pose the most risk to workers. These alternatives would also be disruptive to the environment.

Implementability- The no interim action and institutional control/controlled current actions alternatives are already in place and do not involve implementation. The treatment alternatives would also be implementable; however, the effectiveness of these alternatives would be uncertain.

Costs-Continued monitoring and institutional control/controlled current actions would not require capital investment. The other alternatives would require large initial capital investments as well as high operation and maintenance costs. The capital, operation and maintenance, and present worth costs of each alternative are presented in the alternative descriptions.

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Table 3. Comparative Analysis Summary 100-HR-3 Operable Unit

Evaluation Criteria	Alternatives ^a				
	GW-1	GW-2	GW-3	GW-5	GW-6
Overall Protection of Human Health and Environment					
Compliance with ARAR ^a					
Long-Term Effectiveness and Permanence					
Reduction of Toxicity, Mobility, and Volume					
Short-Term Effectiveness					
Implementability					
Present Worth - H Area (\$ millions)	1.0	1.0	10	23.4	28.2
Present Worth - D/DR Area (\$ millions)	1.0	1.0	23.3	14.7	18.4

Key:

	Best
	Better
	Good
	Fair
	Poor

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ARAR - applicable or relevant and appropriate requirement

GW-4 (In Situ Treatment) was not evaluated in the *Focused Feasibility Study*.^aAlternatives are as follows:

- GW-1 No Interim Action
- GW-2 Institutional Control/Continue Current Actions
- GW-3 Containment
- GW-5 Removal/Ion Exchange Treatment/Disposal
- GW-6 Removal/Reverse Osmosis Treatment/Disposal

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INFORMATION REPOSITORIES

POINTS OF CONTACT

Final Reports

U. S. Department of Energy - Richland Operations
Public Reading Room
2440 Stevens Center Place
Richland, Washington 99352
509/376-7411
Hrs: Mon-Fri 8-12am and 1-4:30pm

Final Reports

EPA Region 10
Superfund Record Center
1200 Sixth Avenue
Park Place Building, 7th Floor
Mail Stop: HW-074
Seattle, Washington 98101
206/553-4493
Hrs: 8am - 4:30pm

Final Reports

Washington State Department of Ecology
Nuclear Waste Library
719 Sleater-Kinney Road SE
Capital Financial Building, Suite 200
Lacey, Washington 98503
206/407-7097
Hrs: Mon-Fri 8am - 5pm

Washington State Department of Ecology

Representative
Wayne Soper
Hydrogeologist
509/735-7581

DOE Representative

Mike Thompson
Program Manager
509/373-0750

Regulatory Representative

EPA (Region 10)
Paul Beaver
Unit Manager, Environmental Engineering
509/376-8665

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OPPORTUNITIES FOR COMMUNITY INVOLVEMENT

Community Meeting Announcement

You are invited to attend an upcoming meeting regarding the *Ecology's Proposed Plan for 100-HR-3 Operable Unit* at the Hanford Site. The Ecology, EPA, and DOE representatives will report on the remedial alternatives, including the preferred alternative, and will answer your questions.

DATE: ?

TIME: ?

PLACE: ?

You will have an opportunity at the meeting to direct questions to Ecology and the regulatory representatives and comment on the remedial alternatives. If you have any questions regarding the meeting, you should contact Wayne Soper at 509/735-7581.

Public Comment Period Announcement

A 30-day public comment period will begin on ?. The Ecology, EPA, and DOE request your written comments on the *Proposed Plan for the 100-HR-3 Operable Unit*. Written comments should be postmarked no later than ?, and sent to: Wayne Soper at the Washington Department of Ecology.

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GLOSSARY

Applicable or Relevant and Appropriate Requirements (ARARs) - These assure compliance with all substantive elements of environmental federal laws and more stringent state laws that apply or are determined to be relevant and appropriate.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - A federal law that established a program which enables the United States Environmental Protection Agency to 1) identify abandoned hazardous waste sites; 2) ensure that they are cleaned up; and 3) enable other government entities to evaluate damages to natural resources. It is also known as the "Superfund Law." The Comprehensive Environmental Response, Compensation, and Liability Act applies to the 100-HR3 Operable Unit.

Contaminants of Potential Concern - Chemical and radioactive constituents that must be addressed by remedial action to reduce human or environmental risk to acceptable levels.

Environmental Restoration Disposal Facility (ERDF) - A waste disposal facility for contaminated soils and solid waste located at the Hanford Site.

Expedited Response Action (EPA) - An action that could be taken to address contamination problems that pose time-critical risks.

Focused Feasibility Study (FFS) - An engineering study on a waste site that evaluates a limited number of remedial alternatives for cleaning up environmental contaminants.

Groundwater - Underground water that fills the spaces between particles of soil, sand, gravel, or fractures in rocks.

Hazard Quotient - The ratio of exposure to toxicity for receptors of contaminants. When the hazard quotient exceeds 1.0, a possible human health risk or environmental risk is assumed to exist.

In Situ - This refers to a study or an activity being conducted "in place."

Interim Record of Decision (IROD) - The formal document in which the lead regulatory agency sets forth the selected remedy for interim action, and the reasons for its selection.

Interim Remedial Alternative - A group of actions--for instance, deed restriction, alternative water supply, and groundwater contaminant--that address the contamination issues for an operable unit or site.

Interim Remedial Measure (IRM) - A remedial action that is taken at a site to address one or more of the contamination problems, but not necessarily all of the contamination problems. The remedial action is based on a remedial investigation/feasibility study and is selected in a record of decision.

Limited Field Investigation (LFI) - This is part of the interim remedial measure process that assesses the applicability of interim remedial measures for reducing human health and environmental risks.

Operable Unit (OU) - A subset of a larger comprehensive Environmental Response, Compensation, and Liability Act site, which is typically the subject of OU-specific investigations and remedial actions.

Qualitative Risk Assessment (QRA) - An evaluation of risk for a predefined set of human and environmental exposure scenarios that assists Tri-Party Agreement signatories in making defensible decisions on the necessity of interim remedial measures.

Receptor Pathway - A series of hypothetical events by which a contaminant can migrate to and be taken up by a human or environmental receptor.

Remedial Investigation (RI) - An in-depth study gathering data necessary to determine the nature and extent of contamination. The purpose of a remedial investigation is to provide sufficient information to identify feasible engineering solutions and evaluate potential human health and environmental risks.

Superfund National Priorities List (NPL) - A list of top-priority hazardous waste sites in the United States that are eligible for investigation and cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act.

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