The Hanford 300 Area Cleanup Plan – Insufficient, Dangerous, and Against Best-Known Findings

An analysis to probe the alarming discrepancies between cleanup strategy, legal requirements, and environmental protection

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Overview

Purpose of This Report

This report analyzes the decision to limit the cleanup of the Hanford 300 Area to ***"Industrial Use"*** only. This decision raises legitimate concerns that providing such a minimal cleanup may be insufficient for protecting the Columbia River ecosystem and natural environment surrounding the Hanford site throughout the extraordinarily long life span of the hazardous waste. This report also provides a background on how the cleanup decision was made, the legal drivers, and an analysis of the risk assessment processes used in reaching the decision.

Aerial view of the Hanford 300 Area

Given the multiple regulations, complex issues, and extensive technical data, it may be very difficult for the average person to get their arms around the progress of the current Hanford 300 Area cleanup. It can be even more difficult to understand just what process is used to determine what level of cleanup will be considered adequate. Regulations provide the legal framework to define and determine the various levels of cleanup, and the specific requirements for each level. These regulations however, like most other laws, are often considered open to a variety of interpretations. Choosing to focus on a narrow aspect of regulations while ignoring other key aspects can produce decisions that, in the end, defeat the "spirit" and intent of such regulations.

This report explains the relevant regulations, and discusses the decision to provide such a limited level of cleanup for the Hanford 300 Area. It will also identify the specific environmental health issues that are not covered by the quantitative risk assessment documents.

Can we afford to ignore these issues?

Decide for yourself after reading the following sections:

- **Background**
- **Legal Requirements**
- **How The Decision Was Made**
- **Review of Risk Assessment Documents and Models**
- **Conclusion**
- **Glossary**
- **References**

Background

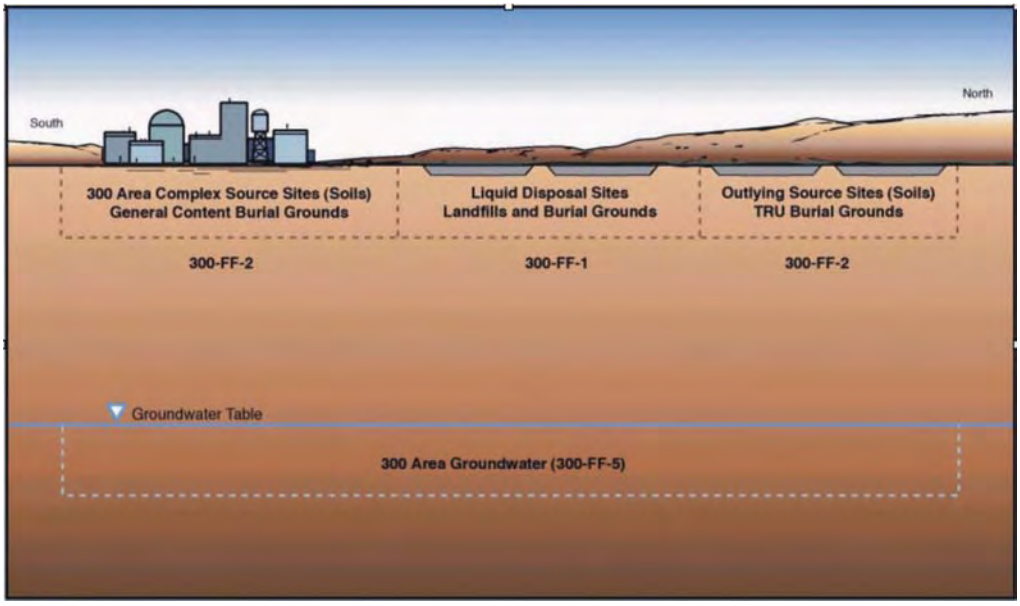
Understanding the limitations of an "Industrial Use" only cleanup of the 300 Area

What and where is the 300 Area?

The Hanford 300 Area is located along the shores of the beautiful wild and scenic Columbia River just north of the Richland city-limits. Construction in this Area began in 1943. It operated as a reactor fuel fabrication and laboratory complex. Over the years, these facilities released radioactive and chemical waste to the surface, soil column, and groundwater. In addition, waste from the Hanford 300 Area operations was disposed of in designated burial grounds and discharged to unlined surface ponds/trenches.

Overview of the 300 FF-2 Operable Unit Waste Site Groups

The Hanford 300 Area is the focus of considerable controversy and is plagued with cleanup difficulties. The 300 Area, where Hanford manufactured fuel rods for its reactors and maintained numerous research laboratories, is heavily contaminated with uranium, transuranic waste (plutonium), lead, toxic metals, benzene, PCB's and a variety of solvents. The primary contaminants of concern are uranium and lead from the fuel fabrication processes. The 300 Area has over 130 contaminated facilities dating back to 1944. Over 32 miles of underground piping have leaked in this area and will continue to impact the soil, eventually driving the contaminants into the groundwater. It has over 70 waste sites including liquid disposal trenches and burial grounds of highly radioactive waste and barrels of plutonium contaminated materials.



Generalized Cross Section of Burial Grounds

In 1989, the Hanford 300 Area was placed on the National Priority List (NPL) under the Superfund law because of the soil and groundwater contamination that have resulted from the past 50+ years of operation.

What does "Industrial Use" cleanup mean?

An "*Industrial Use*" cleanup defines a level of hazardous waste cleanup that would allow future human use of the area for a maximum of 8 hours a day, five days a week (or a total of 2,000 hours per year). A worker onsite for any longer duration would be exposed to legally unallowable radiation levels.

This level of cleanup is based solely on human use of the area and does not take into account the long-term protection of groundwater, the riparian zone, or all other life forms that depend on clean water and clean soil. The question then arises, does it protect fish and wildlife? One cannot assume that it does.

Legal Requirements

What do the laws say about protecting the ecosystem?

Tri-Party Agreement

In 1989, a Tri-Party Agreement (TPA) was signed by the U.S. Department of Energy (USDOE), the Environmental Protection Agency (EPA), and the Washington State Department of Ecology (WADOE). The TPA was written for the purpose of having USDOE agree to clean up the site to comply with Washington State and federal laws, and to have EPA and Ecology as regulatory agencies in the cleanup process. The most important aspect of the Tri-Party Agreement is that it is a legally binding cleanup document that forces the Department of Energy to comply with state and federal laws just like any other business in Washington State.

The major laws governing cleanup are:

- Resource Conservation Recovery Act (RCRA)
- Model Toxics Control Act (MTCA)
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Superfund
- Endangered Species Act (ESA)
- Clean Water Act (CWA)
- National Environmental Policy Act (NEPA)

Resource Conservation Recovery Act (RCRA)

EPA's overall goal for groundwater protection and cleanup as stated in the Groundwater Protection and Cleanup Strategy under RCRA is "to prevent adverse effects to human health and the environment, which includes protecting the integrity of the nation's groundwater resources, both now and in the future. With respect to prevention, we should protect groundwater to (1) ensure that the nation's public and private drinking water supplies, including those currently used as well as those reasonably expected to be used, do not cause adverse health effects both in the short term as well as for future generations; and (2) avoid negative impacts to ecosystems such as those caused by contaminated groundwater flowing into surface water (EPA, 1991b). With respect to cleanup of contaminated groundwater, facilities as well as regulators should generally (1) prioritize cleanup activities to limit the risk to human health first; and then, (2) restore currently used and reasonably expected sources of drinking water and groundwater closely hydraulically connected to surface waters, whenever such restorations are practicable and attainable (EPA, 1991b)."

Model Toxics Control Act (MTCA) and MTCA Implementing Regulations

Washington state regulations implementing MTCA requires "[all cleanup actions shall (i) Protect human health and the environment; (ii)Comply with cleanup standards [designed to protect the environmental resources and human health] and (iii) Comply with applicable state and federal laws [that aim to protect natural resources and human health.] WAC 173-340-360 (2)(a)(i),(ii), (iii). WAC 173-340-702 also requires that cleanup standards "protect human health and the environment for current and potential future site and resource uses." Cleanups must protect surface water based on estimates of "the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions." WAC 173-340-730.

In the limited circumstances where an industrial cleanup standard is allowed, Washington law requires that "after remedial action, the site would not pose a threat to human health or the environment at the site or in adjacent non-industrial areas." WAC 173-340-740(1)(a)(iii). In evaluating cleanup options, a remedial feasibility study must specifically include action alternatives "that protect human health and the environment (including, as appropriate, aquatic and terrestrial ecological receptors) by eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route. WAC 173-340-350(8)(c)(i)(A).

CERCLA General Cleanup Standard

CERCLA requires that the DOE select remedial cleanup actions that are "protective of human health and the environment" and requires compliance with both federal and state cleanup standards resulting from laws intended to protect the natural environment and/or humans, such as the Clean Water Act, Safe Drinking Water Act and Toxics Substances Control Act. 42 U.S.C. § 9621(b)(1), 42 U.S.C. (d)(2)(A)(i). Extensive federal regulations implementing CERCLA provide substantial additional requirements intended to ensure environmental protection and protection of human health. 40 C.F.R. § 302 *et seq*.

The Federal Endangered Species Act

The federal Endangered Species Act (ESA) prohibits the federal government from taking any action that would "jeopardize the continued existence" of a protected species or result in the "destruction or adverse modification" of a protected species' critical habitat. 16 U.S.C. § 7(a)(). (Upper Columbia River steelhead and upper Columbia River spring Chinook salmon are both listed as endangered and bull trout are listed as threatened. DOE's adoption of cleanup decisions that continue to allow the release of radioactive and bioaccumulative pollutants into the Columbia River likely jeopardize these species and their critical habitat in violation of the ESA.)

Additionally, Section 7(a)(1) of the ESA places a more general duty on the DOE and EPA to work for the conservation of endangered and threatened species, but actions that fail to remedy existing contamination problems are inconsistent with this duty.

The Federal Clean Water Act

The federal Clean Water Act (CWA) requires federal agencies to comply with all state water quality standards including the requirement that all existing and designated aquatic uses, such as salmon spawning and migration, be protected and maintained. 33. U.S.C. § 1323. (Because contaminant releases from the Hanford site are causing numeric violations of water quality standards intended to protect fish and other aquatic species the DOE is in violation of Section 1323 of the CWA.)

The National Environmental Policy Act of 1969, as amended

To quote Sec. 2(42 USC 43211), "The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality."

In Sec. 2 (42 USC 4321) the Act lists the following goals: "1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; 2. Assure for all Americans sage, healthful, productive and aesthetically and culturally pleasing surroundings; and 3. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety or other undesirable and unintended consequences."

It is clear from the above citations of law that the Tri-Party Agencies have the legal responsibility to clean up the Hanford Site to be protective of the environment and Columbia River ecosystem in the 300 Area.

> **According to the Merriam-Webster Dictionary, "environment" is defined as: *"the whole complex of factors (as soil, climate, and living things) that influence the form and the ability to survive of a plant or animal or ecological community."***

Native American Trust Responsibility

Another significant legal requirement is the Trust Responsibility that state and federal agencies have to Native American Tribes. This Trust Responsibility was entered into by Congress to authorize the Treaties of 1855 with the Yakama Indian Nation, the Confederated Tribes and Bands of the Umatilla Indian Reservation, and the Nez Perce Tribe. This agreement imposes obligations on the Federal Government, state agencies, and citizens of the United States.

This Trust Responsibility provides a mechanism to hold USDOE, EPA, Ecology and all other agencies working on Hanford, accountable for their actions on behalf of protecting the tribal interests at Hanford. The Treaties of 1855 acknowledged certain Northwest tribe's treaty rights to the lands in and around Hanford. Because of this, **the agencies must protect the cultural and natural resources of the tribes in the cleanup process**. From a tribal perspective, the U.S. government is obligated to protect the land, water, air, fish and wildlife.

Liability

Federal Superfund law, which applies at Hanford, contains a section entitled the Natural Resource Damage Assessment Act that provides for the Native American tribes and the public to hold states and federal agencies accountable for the adequacy of their cleanup and for damages to cultural and natural resources from releases. In the case of Hanford, an ineffective cleanup that is not protective of the ecosystem, cultural and natural resources could lead to millions of dollars in damage claims against the government and become a long-term and expensive liability for the State of Washington.

How the Decision Was Made

If land use was the major consideration for the cleanup plan, where does that leave the environment?

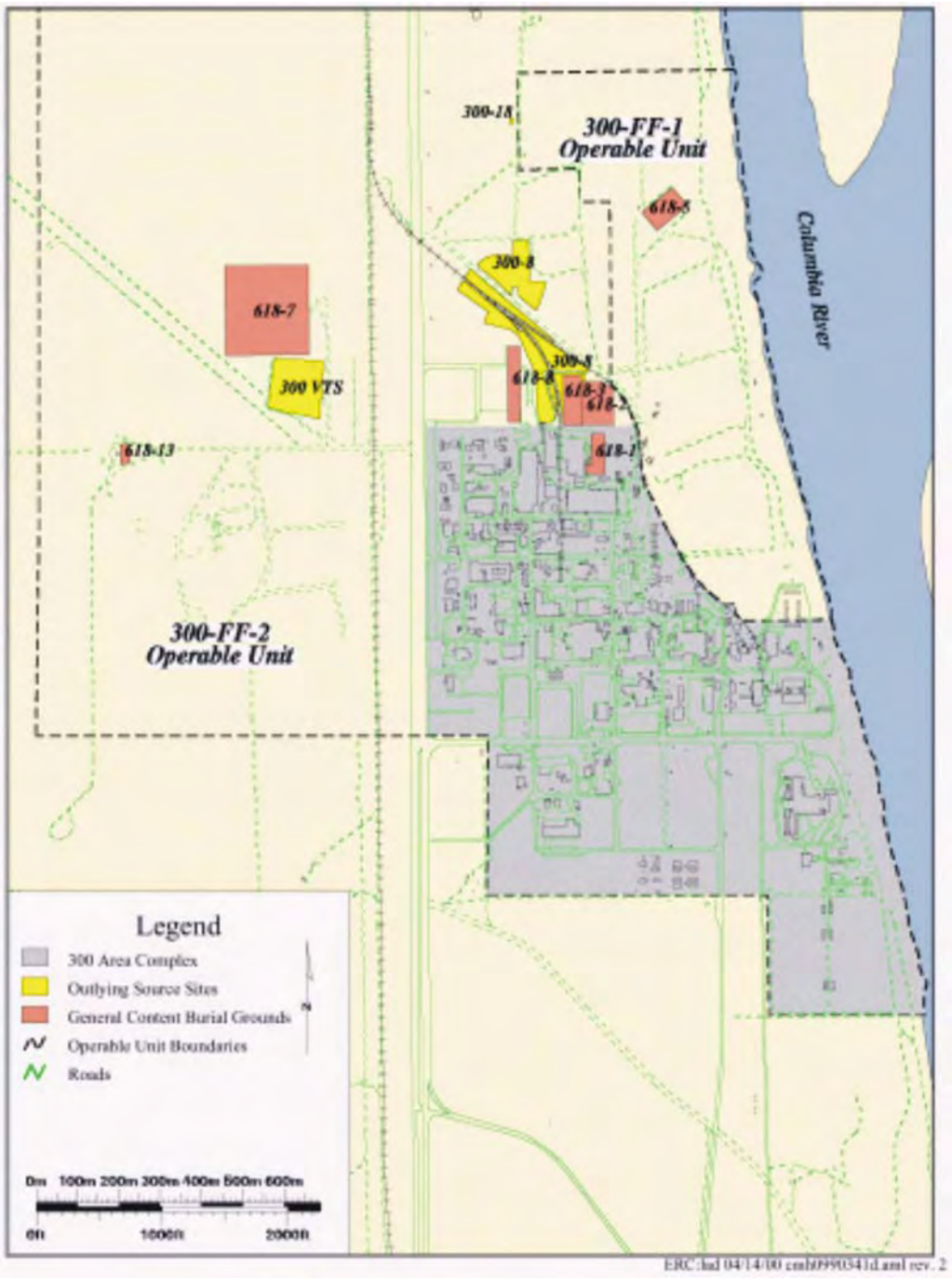
Hazardous waste contamination cleanup "levels" are negotiated through the Tri-Party Agreement by its three agencies: WA State Department of Ecology (WADOE), the Environmental Protection Agency (EPA) and the U.S. Department of Energy. These cleanup levels are based on several factors, two of these being the *reasonably anticipated future land use scenario*, and the *protection of groundwater.* However, for the Hanford 300 Area, the primary driver in decision-making has been land use, with little attention paid to the long-term protection of groundwater.

In 1996, a Record of Decision for the 300 Area FF-1 and FF-5 Operable Units was signed.[9] According to this Decision, the preferred treatment was for the removal, treatment and disposal (RTD), to an "*Industrial Use*" cleanup level. The cleanup level for uranium would be set at approximately 505 mg/kg instead of the 10.5 mg/kg required for an "*unrestricted use*" cleanup level *that would be protective of groundwater*. This decision appears contrary to any reasonable future land use plans, and questions whether it sufficiently protects the surrounding and adjacent environment. Directly adjacent to the City of Richland, this prime piece of Columbia River shoreline property holds extraordinary future value for its potential use as a commercial, recreational, or conceivably even residential use. The Tri-Party Agencies used the USDOE's current difficulties in finding reuse tenants for other areas of the Site as a justification for their selection of the limited "Industrial Use" cleanup level. The primary driving force for this decision seems to have been financial. The primary document used in making this ROD was the Hanford Comprehensive Land Use Plan. The only ecological study reviewed in the ecological risk assessment was the 1993 Biological Uptake of 300-FF-5 Operable Unit Contaminants Study. For the 300-FF-5 groundwater operable unit, monitored "natural attenuation" was selected as the remedy for the uranium contamination. Or in other words, **do nothing, but let the uranium-238 decay over its half-life of 4.3 billion years.**

In 2002, a Record of Decision was made for the 300 Area FF-2 Operable Unit supporting the same cleanup regime and based on the same ecological risk assessments completed previously.

The regulators selected natural attenuation based on a presumption: *that the uranium was bound up in the soil*. The field data clearly shows that in 2000, *the uranium was not bound up in the soil* and the groundwater <u>is</u> already being impacted today.

[9] 300 Area FF-1 and FF-5 Record of Decision Document



Operable Unit Waste Sites Adjacent to the 300 Area Complex

Review of Risk Assessment Documents and Models

Examining the adequacy of the risk assessments

Overview

Minimal ecological risk assessments and modeling have been completed for the 300 Area. The two Records of Decision (RODs) for the 300 Area include reference to the 1993 Biological Uptake of 300-FF-5 Operable Unit Contaminants Study as basis for sufficient ecological risk assessment. In the study cited, reed canary grass, mulberry, and willow were studied, as were Great Basin pocket mice and house mice.

Aquatic biota studied included periphyton and macrophytes. Uranium, aluminum, copper, iron, manganese, and nickel were found in the plants in statistically higher concentrations than upriver sites. The small mammals showed statistically significant elevated levels of uranium, manganese, aluminum, chromium, and nickel from upriver sites. Barium, cadmium, iron, aluminum, manganese and nickel were all above the normal range for domestic animals.

According to USDOE in their two 300 Area Records of Decision (RODs), Ecological Risk Assessments were performed for the 300 Area and these risk assessments showed that impacts were "insignificant", but this limited study from 1993 is clearly inadequate for a basis of such a conclusion. USDOE goes on to state in the 1996 ROD, "For the 300 Area FF-1 the evaluation showed the Great Basin Pocket Mouse may potentially be affected from exposure to onsite contamination."[17] USDOE's unsubstantiated conclusion, however, was that no other predators would be affected from consumption of the pocket mouse.

Incredibly, USDOE continues on in the 2002 ROD, "For the 300 FF-5 Operable Unit[4] (groundwater) individual organisms might receive small doses of contaminants, but there would not be a significant dose to any population, and contaminants are not carried up into the food chain. Therefore, no ecological risks to major species were identified".

In a letter to Mike Goldstein of the U. S. Environmental Protection Agency, the Washington State Department of Fish and Wildlife (WDFW)[2] raises serious concerns about 300 Area ecological risks that have not been adequately addressed. This letter refers to WDFW formal comments requesting ecological exposure/effect (EE/E) assessments to be conducted on federally listed salmonid species to establish clean-

[17] Biological Uptake of 300-FF-5 Operable Unit Contaminants, April 1993, WHC-SD-EN-TI-122

[4] Declaration of the Record of Decision 300 FF-1 & 300 FF-5 Operable Units

[2] Washington State Fish & Wildlife Comments on 300 Area FF-1 & FF-2

up levels protective of these species and for an EE/E assessment on species protected under the Migratory Bird Treaty Act. The letter states, "WDFW has been advocating EE/E assessments for sometime for the site." The issuance of an Explanation of Significant Differences (ESD) is criticized as circumventing the intent and requirements of the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA), National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA). They go on to say, "Because of insufficient biological characterization data, we are unable to support any proposed remedial action until adequate biological characterization occurs for this operable unit and associated ground water that is being contaminated by source units within this operable unit. U.S. Department of Energy, as trustee and steward, would benefit tremendously from using best available science to determine effects of contaminants to biological resources and integrate findings from such work into the remedial decision making process."

WDFW continues in the same letter, "A major concern of ours is the contaminated ground water plume beneath the 300-FF-2 and 300-FF-1 operable units. At least one site is contributing to the uranium ground water plume. Uranium is a major contaminant of concern due to its chemical toxicity and radiological effects and half-life. WDFW believes that the 300-FF-5 ROD should be revisited to address protection of federally listed salmonid species and that ecological EE/E assessments should be conducted to ensure that the selected remedy is not likely to jeopardize the continued existence of any listed species." WDFW also recommends consultation with the National Marine Fisheries and the U.S. Fish and Wildlife Service under Section 7 of the ESA stating the requirements of section 7 are non-discretionary. According to WDFW, "Some source sites within the 300-FF-2 operable unit are surrounded by high quality shrub steppe and inhabited by numerous wildlife species, which have access to the known contaminated sites. Exposure and effects to specific contaminants are unknown at this time since an EE/E assessment has not been conducted. Selected remedies that include institutional controls may not be protective of wildlife species. Appropriate biological characterization needs to occur prior to clean up actions to determine if selected remedial response actions reduce or eliminate contaminant pathways to wildlife. At this time, data remain insufficient to perform a meaningful ecological risk assessment."

In the USDOE's own document *Proposed Plan for the 300-FF-2 Operable Unit DOE/RL-99-53*[22], we find, "There are no empirical data that can be used to validate the exposure estimates in risk assessments performed at the 300-FF-1 and 300-FF5 operable Unit waste sites." Yet, these operable units risk assessments were used for the 300-FF-2 ecological risk analysis.

Review of the Washington State Department of Ecology official comments also question the 300-FF-2 Proposed Plan.[23] Comments in the Ecology Technical Assessment Documents include: "Existing groundwater contaminants are not acknowledged, existing groundwater contamination information is not evaluated, groundwater conclusions made regarding the 316-4 Crib are not substantiated, an explanation of application of MTCA industrial cleanup standards is not included, and

[22] Proposed Plan for the 300-FF-2 Operable Unit DOE/RL-99-53

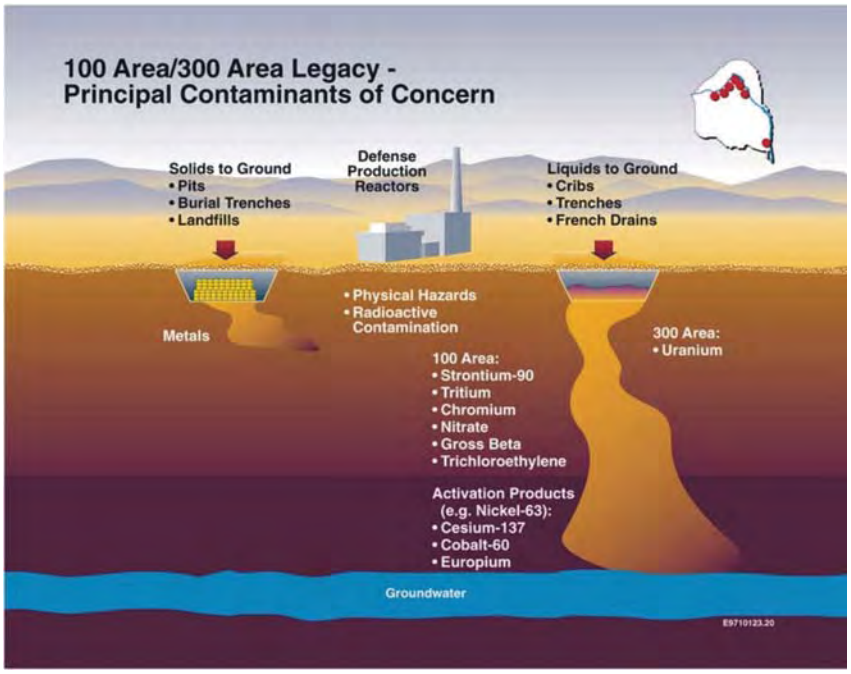
[23] WA State Department of Ecology Administrative Record/Reader File

an identification of deficiencies associated with ecological risk is not included." The scientist reviewing the documents actually recommended that Ecology should not sign the Record of Decision.

A hydro-geologist for the Ecology Nuclear Waste Program raised concerns about the uranium concentrations in the groundwater that have not attenuated as predicted, but have instead continued to increase. He commented, "The evaluation of groundwater contamination has not allowed groundwater impacts from the 300-FF-2 OU source sites to the Columbia River to be understood (i.e., impacts to groundwater quality, impacts to drinking water sources, impacts to ecological receptors, etc.)"[23]

The "Preliminary Remediation Goals" (PRG's) were developed by the regulators for a comprehensive list of contaminants of potential concern (COPCs) to establish residual soil concentrations for individual contaminants that are protective of human health and the environment. The PRG goals are:[4]

- Protection of human or ecological receptors from direct exposure to source materials (including external radiation, dermal contact, ingestion of soil, and inhalation of fugitive dust)
- Protection of groundwater resources
- Protection of surface water resources



Principal Contaminants of Concern

[23] WA State Department of Ecology Administrative Record/Reader File

[4] Declaration of the Record of Decision 300 FF-1 & 300 FF-5 Operable Units

In order to assess if the PRG goals are going to be met, USDOE performed a risk assessment using the RESRAD (RESidualRADioactivity) model. This model has been used for years at Hanford and it has been the center of much controversy. Like any model, the key to determining the model's validity is to test it against known field data. In the 300 Area the field data[23] showed that uranium was impacting groundwater and yet the model showed the uranium bound up in the soil. The prediction was that groundwater uranium levels would attenuate, when in fact field tests show uranium levels are continuing to increase.

RESRAD is a simple linear model. Like many other models, it makes many assumptions about how waste does or does not move in the environment. It treats the subsurface as a uniform homogeneous, isothermal, iso-everything, homo-everything media. It fails to recognize the structured subsurface environment that exists (particularly at Hanford) from the glacial flooding from about 13,500 to 11,000 BCE. This flooding laid down alternating layers of very fine grain and courser grain material. Prior to the flood events, Hanford saw long periods where it was alternately dry and covered by lakes. These two created very structured horizontal sediment layers. All of this is interrupted by a fairly regular polygonal array of clastic dikes that formed in conjunction with the glacial flood events.

The field data evidence from 54 years of Hanford studies on the matter show that when water is moved into the subsurface in non-flooded conditions, that the water moves preferentially on horizontal boundaries and in fingers both laterally and vertically. There is NO model developed that simulates this behavior.

RESRAD does NOT model this behavior. It presumes that waste moves through the bulk of the soil uniformly, contacting all parts of the soil. Even in flooded conditions, the soil does not behave this way. Instead, the evidence is that there is a strong preference of fingering. This greatly reduces the contact volume and shortens the travel time to groundwater.

RESRAD also applies certain set specific parameters. These too are assumed to be uniform. One such is the Kd values. Kd values represent the relative mobility of the various contaminants. Low Kd's are more mobile than higher Kd's. The values used in RESRAD are adjustable and great care is needed to ensure that the correct values are chosen. Kd's greater than about 10 will result in the model saying that there is little movement. (Based on the 100 areas as a template.) This places great emphasis on the Kd as being an accurate and reliable representation for the movement of waste in the subsurface. It isn't. Studies early in Hanford's history showed that the Kd for cesium was highly dependent on the waste form. For high-acid waste, the Kd was quite low. For low-acid waste, the Kd was high. This led researchers to presume that the acidity of the waste determined the Kd. This may be true, but is yet unproven. It may also be that other waste constituents present in the high-acid waste changed the behavior of uranium or other contaminants through any of several mechanisms.

[23] WA State Department of Ecology Administrative Record/Reader File

Under MTCA, impacts to groundwater from soil or source sites require a soil value that would be protective of groundwater. Washington State's protocol dictates that the Method-C soil value for uranium in the plan 10.5 mg/kg is the starting value not 505 mg/kg. A scientifically defensible demonstration is required to justify the protectiveness of using a higher cleanup value. The regulators have not performed the necessary tests. Also recommended was a leaching study to determine the mobility of uranium. As of this writing the leach test has not been completed, but first initial results have shown what has been seen in the field observations – that **uranium is impacting groundwater and is not bound up in the soil**.[23]

Uranium, however, is not the only contaminant of concern that should be cleaned up for long term protection of the groundwater and the ecosystem. The other 300 Area contaminants that could significantly impact the ecosystem and groundwater are lead, mercury, benzene, TCE, nitrate, chromium, cesium-137, cobalt-60, europium-154, technetium-99, uranium-234, plutonium, and Iodine-129. Considering the toxicity of these contaminants, all of these contaminants are of concern. Models to date have failed to assess the possible combined or synergistic effects.

Another problem with the current ecological risk evaluations is that the USDOE tends to only assess one site at a time. With a single site assessment, risk models might show that cleanup is protective. However, such an approach does not take into account waste migration, interaction, additive or cumulative effects. USDOE models show the waste moving very little from one site and therefore not impacting another. In many cases, the field data tells a much different story. The models exclude major features of the subsurface, such as the many layers of fine sand and dust that rapidly move water sideways in thin layers, and the massive vertical clastic dikes that divert water directly downward to groundwater. USDOE is assuming that the soil acts as a large ion exchange column that tightly binds materials like cesium to the soil. They ignore the huge amounts of salt and caustic in the wastes that acts much like the salt used to regenerate a home water softener, driving the cesium, technetium and other wastes off the soil and down through the soils. A result of this approach is we see uranium that was not supposed to move, contaminating groundwater in the 300 Area.

It may be argued that Monitored Natural Attenuation (MNA) chosen for site remediation was not even an appropriate remedy to consider, given that the long lived nature of contamination and the inadequate level of characterization. The 300 Area should not have been considered as a candidate for monitored natural attenuation. EPA's 5-year ROD review indicated that the selection of monitored natural attenuation for the uranium contamination occurring within the 300-FF-5 groundwater operable unit was definitely not supported by a technical basis. Conclusions were reached, and objectives were established to address the gross deficiencies associated with the 300-FF-5 groundwater operable unit "remedy", prior to the next 5-year ROD review.[23]

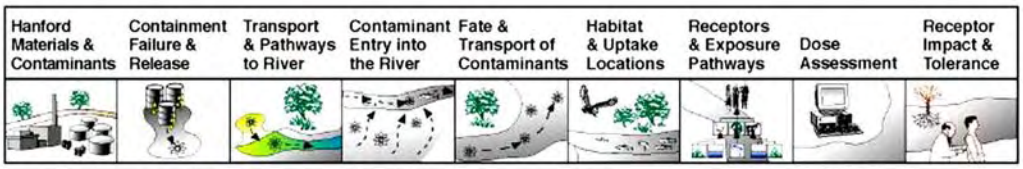
[23] WA State Department of Ecology Administrative Record/Reader File

Problematic as well is the modeling being done at Hanford has very little transparency in its development or review. The affected parties, including the tribes, major stakeholders and other agencies are not engaged in the modeling or risk assessment process. Since the mid 90's many commitments have been made to better involve those stakeholders outside of the USDOE system in these processes. Little progress has been made towards this. In 2001, USDOE, EPA and Ecology agreed to create an open process in the development of the BC Reactor Area Pilot ecological risk assessment. The BC Pilot project was supposed to be a template for doing other ecological risk assessments in a more open manner to achieve a more accurate end product. To date, there is little progress in creating an ongoing, open and two-way dialogue. Recently, CRK learned that the Tri-Parties are doing their own ecological risk assessments for the N-Area and the 200 Area now, ahead of the BC Pilot assessment process and without the involvement of the stakeholders.

Discrepancies Demonstrated By Applying The CRCIA Modules

In 1995, the Tri-Parties assisted with the formation of the Columbia River Comprehensive Impact Assessment (CRCIA) Team. The Team was formed to define for USDOE what would be required to perform a comprehensive risk assessment of the Hanford Site. The CRCIA modules offer a way to comprehensively evaluate the ecological risk assessment status for the 300 Area. The Team was formed with support from USDOE, after the Columbia River Impact Evaluation Plan failed miserably, and the stakeholders around the Northwest totally rejected it for its unjustifiably poor quality of work.

The CRCIA Team consisted of representatives from the State of Washington Department of Ecology, the Oregon Office of Energy, the EPA, Yakama Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla, and Hanford Advisory Board. All supported the need for adequate risk assessments that would be comprehensive as the only way to assure adequate cleanup. For two and a half years, the CRCIA Team met weekly and discussed openly what was wrong with past assessments of Hanford, and what would be needed to do a valid assessment. Cooperatively, they produced the document titled " Requirements for a Columbia River Comprehensive Impact Assessment." The document was peer reviewed and has been well received by many experts. USDOE headquarters agreed that this type of approach was a benchmark in performing valid risk assessments. In 1989 USDOE stated that it would use the CRCIA Requirements as a "template" for all future Hanford assessments.



Minimum Assessment Modules as Determined By CRCIA Team

Discrepancies identified using the "CRCIA Requirements" as the "template" are briefly addressed for each module below:

HANFORD MATERIALS & CONTAMINANTS: USDOE has failed to adequately characterize the massive contamination that exists in the 300 Area. Under CERCLA they are required to do a baseline risk assessment to determine the remedial action.

CONTAINMENT FAILURE & RELEASE: Only marginal information is currently available about the extent of containment failure and release into the environment including the Columbia River.

TRANSPORT & PATHWAYS TO THE RIVER: The 300 Area sits on the shores of the Columbia River and releases to the river are well documented. Because of USDOE's inadequate characterization and monitoring one cannot realistically create a model that represents the transport of contaminants through the vadose zone (soil column) into the groundwater over time for as long as the waste remains hazardous.

CONTAMINANT ENTRY INTO THE RIVER: Because of inadequate characterization, and monitoring, it is very difficult to predict the movement of waste from the vadose zone to groundwater and then to the river. The long-term contaminant release to the river directly and from groundwater is one of the key factors that is being ignored. One must consider the half-life of uranium-238 (4.3 billion years) and other long-lived contaminants. There has not been adequate consideration of the changes in river flow, and possible catastrophic flooding.

FATE & TRANSPORT OF CONTAMINANTS: Hanford has historically used a one-dimensional model for contaminant transport and this is severely flawed. There is a lot of work needed in model development if we want to realistically predict the behavior of contaminants over time.

HABITAT & UPTAKE LOCATIONS: A holistic ecological assessment has not been performed that addresses the soil, groundwater, riparian zone, river and river bottom. One example of a species they failed to assess is fresh water clams used by Native Americans.

RECEPTORS & EXPOSURE PATHWAYS: Only a few species have been addressed in current risk assessment work and in a limited way. For example, the pocket mouse was not considered as a part of the food chain and therefore the exposure of anything eating this common food of prey was not considered. They also constantly fail to assess multiple exposures to any one species.

DOSE ASSESSMENT: Modeling dose has inherent problems when it tries to assess multiple pathways. Considering the massive amounts of contaminants in the 300 Area, USDOE's assessment fails to provide accurate dose estimates.

RECEPTOR IMPACT & TOLERANCE: Current risk assessments do not provide for synergistic or combined effects from contaminants. They fail to consider the existing body burden, off site exposure or multiple doses over time. They fail to consider the weaker most vulnerable of any population like the developing embryo, young or very old. The ecological assessments don't assess for immune suppression, genetic damage or cellular abnormalities. They fail to access the persistent bioaccumulative effects to the ecological environment differently from non-persistent and non-bioaccumulative effects.

Conclusion

The proposed 300 Area cleanup has not been shown to be protective against long-term negative effects to groundwater, fish, and wildlife

Primary Finding

Findings from extensive research, including agency personnel interviews, and review of the sources listed at the end of this report, indicate that the decision to limit the cleanup of the 300 Area to an "*Industrial Use*" cleanup level was based primarily on land use and short-term funding concerns.

With this approach, there is an inherent assumption that this land will *always* be used for industrial purposes. Considering the location of the 300 Area to the City of Richland, it is short-sighted to assume that no other future use might occur in this area, such as commercial, recreational, or even residential.

Furthermore, the *"Industrial Use*" cleanup scenario:

- Does not assure the protection of the ecosystem as required by law.
- Was created to only assess impacts of human use of this site, and only to protect human health for limited use of up to 2,000 hours per year.
- Is not protective of the fish and wildlife that depend on the groundwater, riparian zone, river shoreline, or river bottom.
- Is not protective of groundwater for as long as the waste remains hazardous

Fish and wildlife will not limit their use of the water based on a human-regulated hourly exposure rate.

The regulators have failed to:

- Perform a comprehensive ecological risk assessment for the 300 Area.
- To assess the long-term impacts that are likely to occur for as long as the waste remains hazardous.
- To provide a cleanup plan that reflects the goals of state and federal laws.

Final Observations and Recommendations:

The need for an adequate ecological assessment and appropriate cleanup decisions for the 300 Area appears obvious. It is difficult to fathom the Tri-Parties' stance in choosing a low-cost, shortsighted plan instead of considering the long-term needs of future generations, fish, and wildlife. It is understandable that regulators, including the EPA and WADOE, would be anxious to find a way to get on with cleanup. However, their desire for expedience has led them to accept conclusions drawn from faulty assumptions, models unsupported by facts, an outright disregard for best-known scientific findings and a disregard for the long-term protection of groundwater.

It is recommended that adequate in-field characterization be done, and a "independent, comprehensive assessment" of the Hanford 300 Area be performed. The "Industrial Use" cleanup scenario must be revisited and be changed to a "Unrestricted Use" cleanup scenario. The current piecemeal approach to cleaning up the 300 Area would result in an inadequate cleanup that has not been shown to be protective of fish and wildlife. It must not move forward.

In order to have a valid ecological risk assessment for the 300 Area, the Tri-Parties should abide by their commitment that the BC Pilot ecological risk assessment be developed in an open transparent process. This process should allow any interested parties to be involved in the full development and review of this ecological risk assessment. The Tri-Parties should stop any work being done on any other ecological risk assessments until the BC Pilot risk assessment is completed, as promised with full stakeholder involvement and model transparency. There should be full transparency and involvement by all interested parties in the development of future risk assessments.

Without an open transparent process, USDOE can manipulate the risk assessment models to defend the decisions they have made. Sound objective science with an open process must prevail if we are ever going to have a cleanup that is truly protective for the long-term.

Glossary

Terms and Definitions

CERCLA	Comprehensive Environmental Response, the Compensation and Liability Act
CRCIA	Columbia River Comprehensive Impact Assessment
COPCs	Contaminants of potential concern
CWA	Clean Water Act
EE/E	Ecological exposure/effect
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESD	Explanation of Significant Differences
FF-1 OU	Designation for the 300 Area liquid waste disposal sites and some burial grounds just outside the main complex area.
FF-2 OU	Designation for the 300 Area complex of buildings, soils, and general content burial grounds, and the outlying burial ground which includes the transuranic burial ground of 618-10/11.
FF-5 OU	Designation for the contaminated groundwater beneath FF-1 and FF-2.
MTCA	Model Toxics Control Act
NEPA	National Environmental Policy Act
NPL	National Priority List
OU	Operating Unit (a sub-region of the cleanup area)
PRGs	Preliminary Remediation Goals
RCRA	Resource Conservation Recovery Act
RESRAD	RESidualRADioactivity
ROD	Records of Decision
RTD	Removal, treatment, and disposal
TPA	Tri-Party Agreement
USDOE	U.S. Department of Energy
WADOE	WA State Department of Ecology
WDFD	Washington State Department of Fish and Wildlife

References

Documents

This report is based on extensive reviews of the 300 Area Record's of Decisions, interviews with agency staff and the following supporting documents:

1. 300 Area FF-2 Comment and Response Document
2. Washington State Fish & Wildlife Comments on 300 Area FF-1 & FF-2
3. Ecological Investigation Technical Report for the 300 FF-2 Operable Unit
4. Declaration of the Record of Decision 300 FF-1 & 300 FF-5 Operable Units
5. 100 Risk Workshop Summary Document
6. RESRAD In put Parameter Values USDOE doc. RL-96-17 Rev.1
7. Guidelines for Ecological Risk Assessment – EPA- Risk Assessment Forum EPA/630/R-95/002F April 1998 Final
8. A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota-USDOE Draft
9. 300 Area FF-1 and FF-5 Record of Decision Document
10. 300 Area FF-2 Washington State Department of Ecology Technical Assessment Documents
11. 300 Area FF-2 Record of Decision Document
12. Looking at Risk: Hanford's Site Wide Approach – Bechtel Hanford Draft BHI-01386
13. Site Wide Institutional Controls Plan for Hanford CERCLA Response Actions – USDOE /RL-2001-41 Draft A
14. Ecotoxicity of River and Springs Sediment Along the Hanford Reach
15. Washington State Fish & Wildlife Comments on 300 Area FF-1 & FF-2
16. Comprehensive Land Use Plan
17. Biological Uptake of 300-FF-5 Operable Unit Contaminants, April 1993, WHC-SD-EN-TI-122
18. Letter from the Washington State Department of Fish and Wildlife to Mike Goldstein of the U. S. Environmental Protection Agency
19. Looking at Risk: Hanford's Site-Wide Approach BHI-01386 Decisional Draft
20. Screening Assessment and Requirements for a Comprehensive Assessment, March 1998, DOE/RL-96-16 Rev 1, UC 630
21. Requirements for a Columbia River Comprehensive Impact Assessment, Part II DOE/RL-96-16
22. Proposed Plan for the 300-FF-2 Operable Unit DOE/RL-99-53
23. WA State Department of Ecology Administrative Record/Reader File