

7.0 Site Closure Activities



This section provides information about activities to support Hanford Site cleanup as the U.S. Department of Energy (DOE) moves toward site closure and possible transfer of land to other entities.

7.0.1 Radiological Release of Property from Hanford

W. M. Glines

The principal requirements for the control and release of property at Hanford containing residual radioactivity are given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. These requirements are designed to ensure that:

- Property is evaluated; radiologically characterized; and, where appropriate, decontaminated before release.
- The level of residual radioactivity in property to be released is as near background levels as is reasonably practicable, as determined through DOE's as low as reasonably achievable process requirements, and meets DOE authorized limits.
- All property releases are appropriately certified, verified, documented, and reported; public participation needs are addressed; and processes are in place to appropriately maintain records.

No property with detectable residual radioactivity was released from the Hanford Site in 2004.

7.0.1.1 Radiological Clearance for Release of Selected Hanford Reach National Monument Lands

W. M. Glines

In June 2000, a Presidential Proclamation created the 78,900-hectare (195,000-acre) Hanford Reach National

Monument within the boundaries of the DOE Hanford Site (*Establishment of the Hanford Reach National Monument*, 65 FR 114). Although DOE maintains administrative control and jurisdiction over the land within the Hanford Reach National Monument, the Department of Interior's U.S. Fish and Wildlife Service manages about 84% of the land. In July 2001, the DOE Office of Inspector General issued an audit report (*Administrative Control of the Hanford Reach National Monument*, DOE/IG-0514). This audit concluded that it was not in DOE's best interest to retain administrative control of all land within the Hanford Reach National Monument and identified approximately 57,900 hectares (143,000 acres) of land within the monument that could be transferred to the Department of Interior without adversely affecting DOE operations at the Hanford Site. The lands identified for transfer included (1) the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit (a 311-square-kilometer [120-square-mile] tract in the southwestern portion of the Hanford Site), (2) the combined Saddle Mountain Unit (a 130-square-kilometer [50-square-mile] tract located north-northwest of the Columbia River and generally south and east of State Highway 24) and Wahluke Unit (an 225-square-kilometer [87-square-mile] tract located north and east of both the Columbia River and the Saddle Mountain Unit); the Saddle Mountain Unit and the Wahluke Unit together are referred to as the North Slope, and (3) the McGee Ranch/Riverlands Unit (located on the western portion of the Hanford Site and bordered by State Highway 24, the Columbia River, private land in the Cold Creek Valley, and the Yakima Firing Center).

Subsequently, the DOE Richland Operations Office entered into negotiations with the Department of Interior regarding the release and transfer of these selected portions of the Hanford Reach National Monument from DOE control to the jurisdiction of the U.S. Fish and Wildlife Service. In addition to being consistent with the DOE



Office of Inspector General audit report, transfer of these lands would support the primary DOE environmental management mission to remediate and/or release as much of the Hanford Site as possible.

As part of the radiological clearance process for this property, an historical site assessment was performed and documented in *Historical Site Assessment: Select Hanford Reach National Monument Lands – Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE), McGee Ranch/Riverlands, and North Slope Units* (PNNL-13989). Staff conducting this historical site assessment reviewed historical environmental data collected on and around these lands and developed a contaminant transport conceptual model. Interviews were conducted with people who were knowledgeable of past Hanford Site operations that may have contributed to residual contamination on this property.

The historical site assessment (PNNL-13989) concluded that while some activities using radioactive materials had taken place on the selected lands, “In general, the data available indicate that the Hanford Reach National Monument units of interest have very low concentrations of radionuclides. Radionuclide concentrations are very near the analytical detection levels for most media and locations... Further, the data do not indicate a strong likelihood of transport of significant amounts of long-lived radioactive material from Hanford operating areas to national monument lands ... The median radionuclide concentrations in each media were generally similar at each unit. In addition, the majority of the observed concentrations on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit, McGee/Riverlands and North Slope Units were similar to the concentrations observed at reference locations. This implies that atmospheric fallout from above ground weapons testing contributed significantly to the low levels of manmade radionuclides that were measured in the Hanford Reach National Monument environs.”

Thus, the expected concentrations of residual radionuclides in the soil on the site are very low, i.e., in the range of background concentrations.

Before control of these lands may be transferred from DOE to the Department of Interior, the DOE Richland

Operations Office must verify the presence or absence of residual radioactive contamination on these lands and demonstrate compliance with the requirements of DOE Order 5400.5. For any land with the potential for residual radioactive contamination, DOE Order 5400.5 requires that radiological clearance or release criteria, i.e., authorized limits, be developed and submitted to the applicable DOE Headquarters program office, which for the Hanford Site is the Office of Environmental Management, for approval. Authorized limits are defined as levels of residual radioactivity that shall not be exceeded if the property is to be released without restrictions on use resulting from residual radioactivity. Residual radioactivity is defined as any radioactive material that is in or on soil, air, equipment, or structures as a consequence of past DOE operations or activities. Accordingly, authorized limits control the amount of residual radioactivity on property that is released from DOE radiological controls. Specifically, DOE Order 5400.5 states that: “The authorized limits shall be established to (1) provide that, at a minimum, the basic dose limits... will not be exceeded, or (2) be consistent with applicable generic guidelines.” Since generic guidelines have not been established for residual radioactivity for the radionuclides of concern for these selected Hanford Reach National Monument lands, the authorized limits were established on the basis of ensuring that the DOE public dose limit of 100 mrem (1 mSv) per year would not be exceeded.

Surface soils were identified as the most significant medium for quantifying potential radiation doses resulting from any residual radioactivity on the selected Hanford Reach National Monument lands. Accordingly, authorized limits, in units of picocuries per gram in soil above background, were required that would result in radiation doses less than 100 mrem (1 mSv) per year to any member of the public. To develop these authorized limits, a radiation dose analysis was conducted based on likely and worst-use scenarios and conditions on the selected Hanford Reach National Monument lands. In accordance with the Presidential Proclamation, which created the Hanford Reach National Monument, the expected end-use, i.e., likely use scenario, for these Hanford Reach National Monument lands is recreational use. In accordance with the guidance in DOE G 441.1-XX,^(a) a dose constraint of

(a) DOE G 441.1-XX. Draft. *Implementation Guide. Control and Release of Property with Residual Radioactive Material for Use with DOE 5400.5, Radiation Protection of the Public and the Environment.* U.S. Department of Energy, Washington, D.C.

25 mrem (0.25 mSv) per year was applied to this likely use scenario for developing the authorized limits.

The worst-use scenario was considered to be a subsistence farmer. This scenario represents the situation in which restrictions that control end-use of these Hanford Reach National Monument lands fail or the actual end-use is different from the expected end-use. The DOE public dose limit of 100 mrem (1 mSv) per year was applied to this worst-use scenario. While the Presidential Proclamation and the expected terms and conditions of the transfer of these selected Hanford Reach National Monument lands to the Department of Interior would preclude such a worst-use scenario, it provides a conservative, bounding scenario to assure that the DOE public dose limit will not be exceeded by an unlikely, future agricultural resident on these selected Hanford Reach National Monument lands.

Accordingly, for the radiation dose analyses used to develop these authorized limits, two types of exposed individuals were identified: (1) recreational users of the Hanford Reach National Monument and (2) agricultural residents. Primary data for these exposure scenarios, including the radionuclides selected for analysis and the parameter values and data used as input to the computer models, were obtained from recent literature and from the historical site assessment. The RESRAD Version 6.21 (ANL/EAD-4) computer program was used as the calculational model for translating these dose values into surface soil concentrations. Soil concentrations were developed for each of the radionuclides of concern, for each of the exposure scenarios, and for several geographical units of the selected Hanford Reach National Monument lands. The final authorized limits (Table 7.0.1) were determined as the most limiting (smallest) soil concentrations for each radionuclide across the scenarios and Hanford Reach National Monument locations.

The request for these authorized limits for the selected Hanford Reach National Monument lands with supporting technical documentation was submitted to the Office of Environmental Management on December 22, 2003. The requested authorized limits were approved on March 1, 2004, subject to reconciliation of comments regarding the application of the DOE public dose limit to the agricultural resident scenario. These comments were reconciled in the final authorized limits request (PNNL-14622) and supporting technical basis document (PNNL-14531).

Table 7.0.1. Maximum Levels of Radionuclides (Authorized Limits) Allowed in Soil on the Hanford Reach National Monument

Radionuclide	Authorized Limit (pCi/g)
Cobalt-60	11
Strontium-90	88
Cesium-134	20
Cesium-137	46
Europium-152	24
Uranium-234	2,400
Uranium-235	190
Uranium-238	770
Plutonium-239	480
Plutonium-240	480
Americium-241	420

In order to demonstrate compliance with these approved authorized limits, soil samples must be collected and analyzed in accordance with a DOE-approved sampling and analysis plan. This sampling and analysis plan includes the collection and analyses of soil, assessment of the analytical data against the authorized limits, generation of a final report, and the inclusion of all pertinent data and information into a formal records management system. For purposes of implementing this required sampling, the selected Hanford Reach National Monument lands were divided into two sections: (1) the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit and (2) the remainder of the selected Hanford Reach National Monument lands, i.e., the combined Saddle Mountain Unit and Wahluke Unit and the McGee Ranch/Riverlands Unit. A sampling and analysis plan (PNNL-14633) was developed for the Fitzner/Eberhardt Arid Lands Ecology Reserve unit. The goal and design criteria of this plan were to collect an adequate number of soil samples to determine if the concentrations of radionuclides of concern in Fitzner/Eberhardt Arid Lands Ecology Reserve soil are below the approved authorized limits with a high degree of statistical confidence, i.e., 99%. The collection and analysis of soil samples from the Fitzner/Eberhardt Arid Lands Ecology Reserve was initiated in 2004 (see Section 7.0.1.3).

A sampling and analysis plan (PNNL-14950) for the remainder of the selected Hanford Reach National



Monument lands has been developed and approved. Soil sampling on these remaining Hanford Reach National Monument lands will be conducted in 2005.

7.0.1.2 Assessment of Fitzner/Eberhardt Arid Lands Ecology Reserve Unit Soil for Residual Radioactive Contamination

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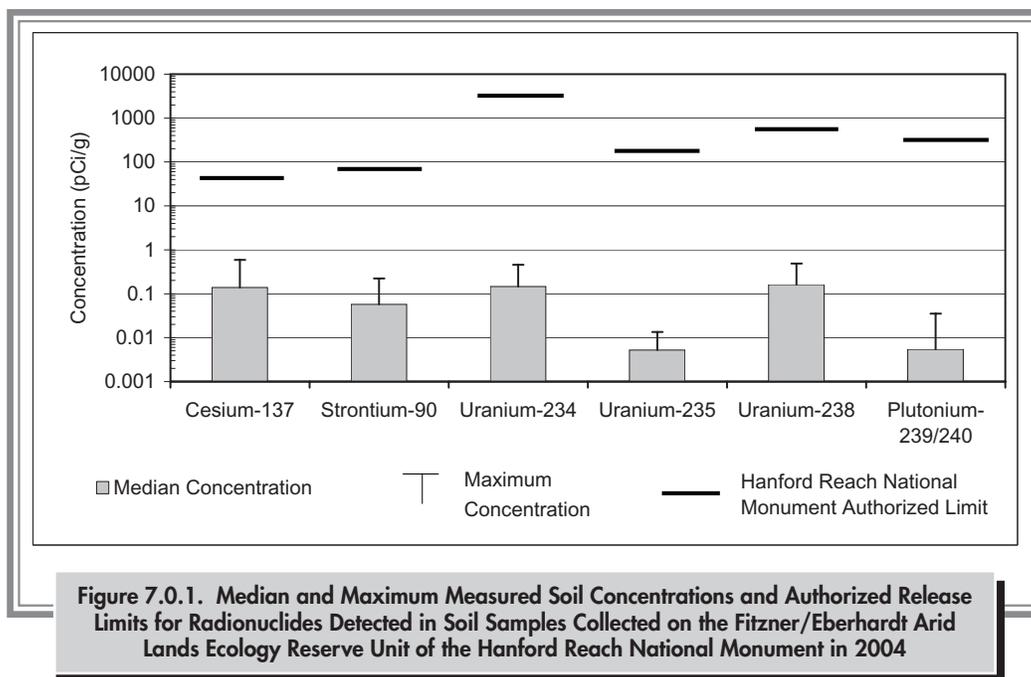
In 2004, soil sampling was conducted on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit to determine if the concentrations of radionuclides in its soil were below the authorized limits for the Hanford Reach National Monument (PNNL-14950).

Fifty soil samples were collected from the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit. The number of samples necessary to decide with a high level of confidence (99%) that the soil concentrations of radionuclides did not exceed the authorized limits was determined through the use of a computer program, Visual Sample Plan. Complete rationale for the determination of the number and location of samples was published in the sampling and analysis plan for this work (PNNL-14633).

The 50 soil samples collected from the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit had concentrations of radionuclides far below the authorized limits for the Hanford Reach National Monument (Figure 7.0.1). Spatial analysis of the results indicated no observable statistically significant differences between radionuclide concentrations across the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit. Furthermore, the maximum observed soil concentrations for the radionuclides included in the authorized limits would result in an annual dose of 0.22 mrem (2.2 μ Sv) for the most likely use scenario (PNNL-14937). This dose is well below the DOE 100 mrem (1 mSv) per year dose limit for a member of the public. Also, the results of the biota dose assessment screen indicated that the levels of radionuclides on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit pose no significant health risk to biota.

7.0.1.3 Emergency Decontamination Facility

In October 1965, the former U.S. Atomic Energy Commission, now DOE, signed a 99-year land lease agreement with the Kadlec Methodist Hospital, now Kadlec Medical Center, for a plot of land adjacent to the hospital. The Hanford Radiosurgery Unit (Building Number 748), later



known as the Emergency Decontamination Facility, was subsequently constructed on this leased property. The only major use of the Emergency Decontamination Facility was in 1976 for the treatment and decontamination of a patient who was injured and significantly contaminated with americium-241. Widespread contamination of the Emergency Decontamination Facility occurred as a result of the treatment of this individual.

In 2002, Kadlec Medical Center and the DOE Richland Operations Office entered into discussions regarding the termination of this lease agreement. Kadlec Medical Center wishes to expand its current medical facilities onto the leased property currently occupied by the Emergency Decontamination Facility. Because of the construction of other decontamination facilities at Kadlec Medical Center and on the Hanford Site, maintaining the Emergency Decontamination Facility is no longer necessary or cost-effective. In 2004, as part of the termination of this lease agreement and return of control of the Emergency Decontamination Facility site to Kadlec Medical Center, the DOE Richland Operations Office initiated development of authorized limits for the Emergency Decontamination Facility site. A request for these authorized limits was submitted to the DOE Office of Environmental Management in January 2005.

7.0.2 Columbia River Corridor Risk Assessment

K. A. Gano

The River Corridor Baseline Risk Assessment Project's objective is to support DOE's cleanup efforts in the Columbia River corridor. The project consists of three components: (1) the 100 Areas and 300 Area Component, (2) the 100-B/C Area Pilot Project, and (3) the Columbia River Component. These assessments address an array of potential human uses, multiple environments, and all of the hazardous substances released from hundreds of waste sites along the Columbia River corridor. The results of the assessments will help determine the level of cleanup required to protect human health and the environment at or around facilities within the Hanford Site's Columbia River corridor.

DOE's Hanford cleanup plan and the project team's work are based on the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA). In 1991, DOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology agreed to pursue interim cleanup of the 100 and 300 Areas to focus on protecting the Columbia River. Typically, risk assessments are done before cleanup begins, but the regulatory agencies granted interim records of decision to initiate cleanup first and postpone conducting risk assessments until a later date.

To perform a risk assessment, the Environmental Restoration Project team uses a multi-step process. The process begins by compiling and summarizing the existing data, then using the data quality objectives process to identify both data gaps and unresolved issues through open workshops with the regulatory agencies, stakeholders, tribes, and the public. Based on these discussions, a sampling and analysis plan is developed to collect the data needed to fill the gaps and address the issues. Once all of the necessary data are collected, the risks to human health and the environment are calculated.

In 2002, DOE and EPA agreed to develop a pilot risk assessment at the 100-B/C Area that could be adapted for use at all the 100 and 300 Areas. This project initiated the process for evaluating site conditions after cleanup and determined the environmental measurements that were needed to assess the cleanup actions. This project pioneered the collection of culturally significant plants for inclusion in the risk assessment by working directly with the Wanapum Band, who want to be sure that traditional uses of plants would not carry unacceptable risks to them or their descendants. The pilot project will be complete in 2006.

The risk assessment for the 100 and 300 Areas has opened the process to the public and to the tribes even more by providing initial working drafts of sections of reports for review and comment. These reviews are taking place well before documents are usually considered ready for regulatory, stakeholder, tribal, or public comment to make this process as transparent as possible to ensure its acceptance. The risk assessment report for the 100 and 300 Areas is expected in 2007.



The third element of the project team's work is the Columbia River Component. This is the first component that will move far outside the Hanford Site boundaries in assessing risk. It will assess 644 kilometers (400 miles) of the river, including both shorelines and islands. It will take a broad view of the river corridor in terms of its length and width and will allow the data to determine where the final study boundaries will be drawn. The Columbia River Component is scheduled for completion in 2009.

Ongoing, open communication among the many parties interested in Hanford Site cleanup is the guiding principle

of the River Corridor Baseline Risk Assessment Project. Team members regularly consult with regulatory agencies, Native American tribes, the Natural Resources Trustees Council, Hanford Advisory Board, and the public about the project. A website has been created to provide an information repository for the project. The site includes the dates of public involvement opportunities, documents available for review and comment, administrative information, and links to related projects. The website can be found at <http://www.bhi-erc.com/Projects/risk/risk.htm>.