

Progress on Footprint Reduction at the Hanford Site - 12406

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ABSTRACT

The Department of Energy (DOE) Office of Environmental Management (EM) continues to reduce the footprint of legacy sites throughout the EM complex. Footprint reduction is being accomplished by focusing cleanup activities on decontamination and demolition of excess contaminated facilities, soil and groundwater remediation, and solid waste disposition. All of these initiatives are being accomplished with established technologies in proven regulatory frameworks. Ultimately, completion of these environmental cleanup activities will reduce the monitoring and maintenance costs associated with managing large federal facilities, allowing EM to place more focus on other high priority cleanup efforts and facilitate a successful transition to land-term stewardship of these sites. Through the American Recovery and Reinvestment Act (ARRA) investment, the Department's cleanup footprint has been reduced by 45 percent to date, from 2411 km² (931 mi²) to 1336 km² (516 mi²s). With this significant progress on footprint reduction, the Department is on track towards their goal to reduce its overall footprint by approximately 90 percent by 2015. In addition, some areas cleaned up may become available for alternate uses (i.e. recreation, conservation, preservation, industrialization or development). Much of the work to reduce the complex's footprint occurred at the Savannah River Site in South Carolina and the Hanford Site in Washington, but cleanup continues across the complex. Footprint reduction is progressing well at the Hanford Site, supported predominantly through ARRA investment. To date, 994 km² (384 mi²) (65%) of footprint reduction have been achieved at Hanford, with a goal to achieve a 90% reduction by Fiscal Year 2015.

INTRODUCTION

The Department of Energy (DOE) Office of Environmental Management (EM) manages federal facilities in 11 states. The EM mission is to complete the safe cleanup of the facilities and environmental legacy waste generated during 5 decades of nuclear weapons development, production, and government-sponsored nuclear energy research. The optimization of the EM program through their Strategic Planning Initiative has identified footprint reduction as a focus area. Footprint reduction through environmental cleanup activities will reduce the management costs associated with the monitoring and maintenance of these federal facilities, ultimately reducing the EM life cycle cost and supporting transition to the long-term stewardship (LTS) program. The three EM federal facilities that have the largest footprint reduction opportunities are Hanford, Savannah River, and the Idaho National Engineering and Environmental Laboratory.

HANFORD SITE FOOTPRINT REDUCTION EFFORT

The original Hanford Site footprint is 1518 km² (586 mi²) (Figure 1). One of the major objectives of the Hanford Site cleanup effort is to shrink this footprint by completing cleanup actions that will protect the Columbia River, reduce site management costs, make some lands available for asset revitalization such as Energy Park development, and to demonstrate steady, measurable cleanup progress.



Figure 1. Hanford Site

Active cleanup footprint reduction can consist of a number of activities, dependent on the anticipated use of the land area. First and foremost, it involves completion of any cleanup actions required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). For areas where CERCLA cleanups are complete, it can also include activities consistent with the anticipated land use or other designation (e.g. the Hanford Reach National Monument) or to reduce safety/liability concerns. Examples of these types of activities can include such things as the removal of excess facilities, infrastructure, and debris. Groundwater

restoration/cleanup actions (e.g. pump and treat activities), although critical to eventual cleanup of the Hanford Site, do not factor in to footprint reduction determinations.

Reducing the footprint with active cleanup does not necessarily mean that DOE will physically reduce the site boundaries or excess the land. DOE will continue as the federal agency responsible for implementation of the Comprehensive Land-Use Plan for the Hanford Site and will continue site management through its LTS program. In its role as the responsible federal agency DOE has the ability to authorize use of some areas available for DOE’s reuse consistent with the Hanford Comprehensive Land-Use Plan. Most of the Site has a land use designation of “preservation” or “conservation (mining)”, with other smaller areas identified for “recreation”, “industrial” or “industrial (exclusive)” use (Figure 2.) [1]. DOE anticipates that the vast majority of the Hanford Site will remain under Federal management and control for the foreseeable future.

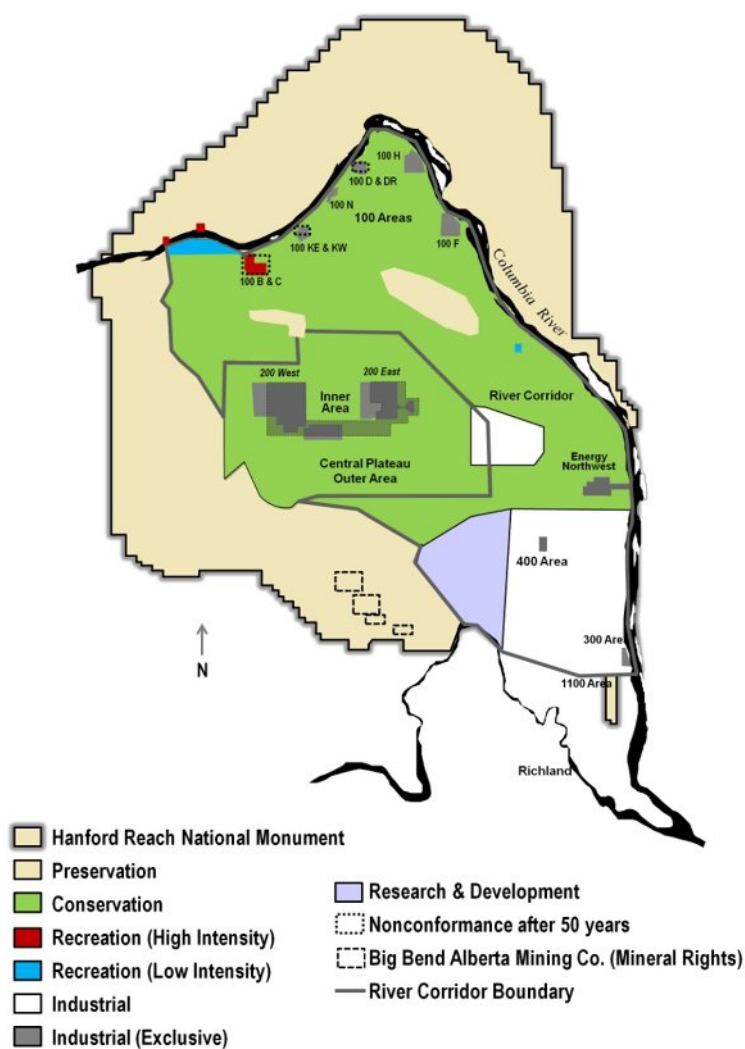


Figure 2. Land Use Designations for the Hanford Site.

Cleanup of the Hanford Site, and subsequent footprint reduction, is taking a generalized “outside-in” approach. The Site has been subdivided in to the following principal components for active cleanup footprint reduction:

- Hanford Reach National Monument,
- River Corridor,
- Central Plateau - Outer Area, and
- Central Plateau - Inner Area (including tank waste)(Figure 3.).

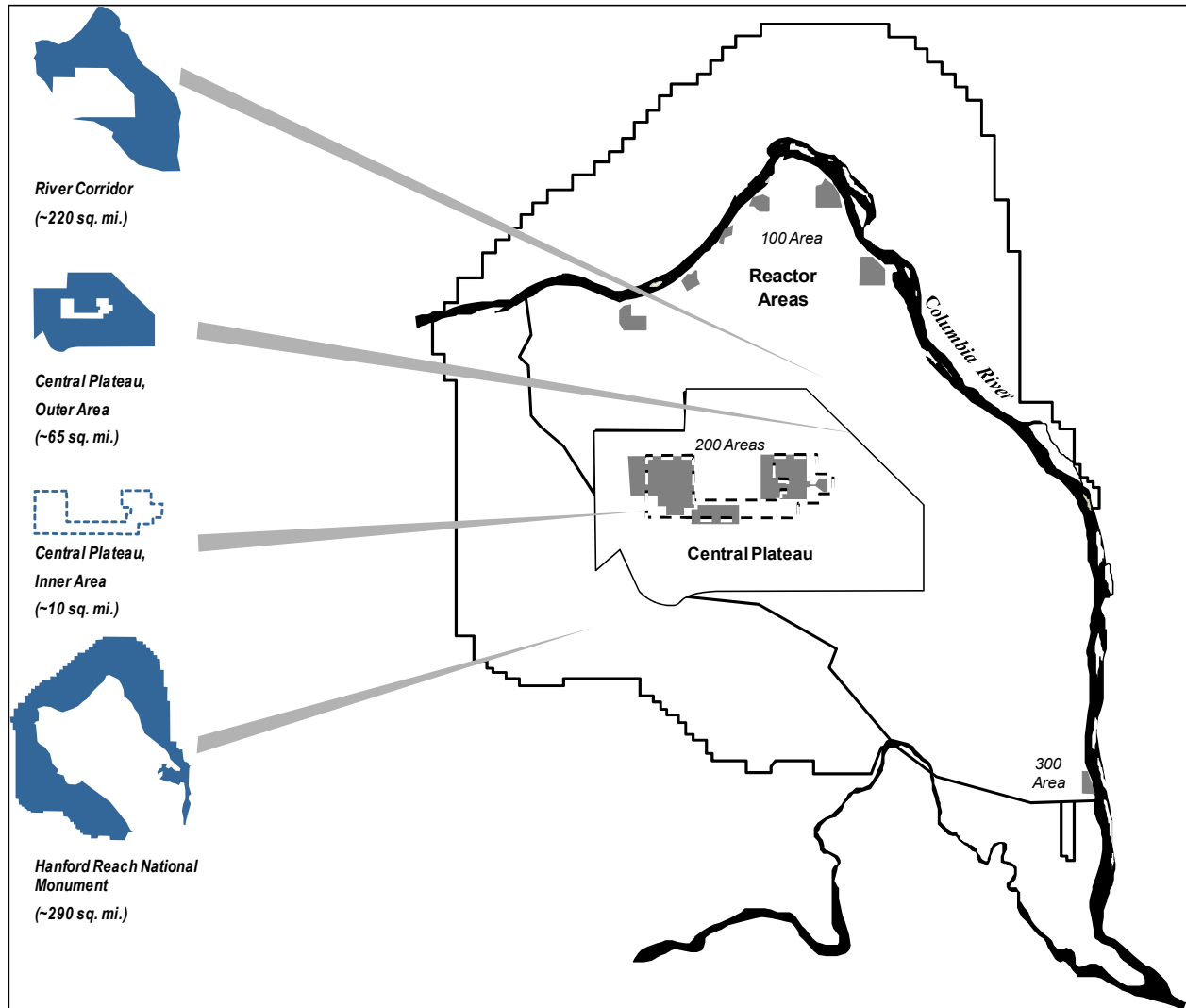


Figure 3. Principle Components of the Hanford Site Cleanup and footprint Reduction

The successive stages of Hanford Site footprint reduction will focus on these principal components [2, 3].

- Hanford Reach National Monument (~751 km² (290 mi²)). The Hanford Reach National Monument is an area located north of the Columbia River and in the southwestern portion of the Site. The National Monument is a biologically diverse landscape with both a natural and historic legacy. The area was historically used for defensive installations for the Site and later as a buffer zone for the ongoing nuclear operations.

CERCLA cleanup actions for the Hanford Reach National Monument were previously completed. Subsequent clean-up activities involved removal of dated support and research facilities, infrastructure removal, and removal of miscellaneous debris. Items required to be left by cultural laws/requirements, on-going DOE programs, and U.S. Fish and Wildlife programs were not removed.

- River Corridor (~570 km² (220 mi²)). Area located along the Columbia River, primarily the production reactor areas and associated waste sites (known as the 100 Areas) and the area north of the city of Richland, used for fuel fabrication activities, nuclear research and development facilities, along with associated waste sites (known as the 300 Area). Groundwater in the River Corridor was also impacted by the production and research activities conducted there. The River Corridor also includes the contiguous areas that extend from the 100/300 Areas to the Central Plateau area of the site.

Cleanup activities involve interim safe storage of reactor buildings, removal of ancillary support buildings, waste site remediation (i.e. burial grounds, liquid disposal facilities, miscellaneous releases) and ongoing remediation of groundwater (e.g. pump and treat). Cleanup of the River Corridor is being conducted predominantly under CERCLA. Interim record of decisions (RODs) were developed to guide expedited cleanup with a “bias for action” in order to protect the Columbia River. Cleanup under these interim RODs, including actions to remediate groundwater, have been going on for some time.

Development of CERCLA final RODs for the River Corridor is underway. The adequacy of the interim cleanup actions will be judged against the criteria in the final RODs, and although not anticipated in most cases, it may be determined that additional cleanup actions are required beyond those carried out under the interim RODs.

- Central Plateau Outer Area (~168 km² (65 mi²)). The Central Plateau Outer Areas is located in the central portion of the Hanford Site. Most of the waste sites in the Outer Area are small near-surface sites that will be removed for treatment as needed for onsite disposal or sampled to confirm that no additional action is required, except for implementation of appropriate institutional controls. The largest components of the Outer Area are the ponds where cooling water and other effluents were discharged, and the B/C control area, where surface contamination was spread because of wildlife intrusion into a waste site. The Outer Area also includes impacted groundwater.

The plan is for cleanup of the Central Plateau Outer Area involves the removal of miscellaneous buildings and pipelines, remediation of waste sites (i.e. liquid disposal sites and miscellaneous releases), and ongoing remediation of groundwater, conducted

primarily under CERCLA. The approach will be to remediate the area to unrestricted surface levels, comparable to those for the adjacent River Corridor.

- Central Plateau Inner Area (~26 km² (10 mi²)). Located within the most central portion of the Site, this was the primary area for production/waste management operations. Because of the concentration of waste management operations facilities (burial grounds, storage complexes, etc.) and former production facilities (large canyon buildings, evaporators, etc.), tank farms, pipelines, and facilities necessary to Site cleanup (laboratories, Waste Treatment Plant, etc.); cleanup of the Inner Area represents a considerable challenge and will take some time to complete. Even after cleanup to ensure protection of the public and the environment, this area will continue be used for waste management and containment of residual contamination for the foreseeable future.

An important component of Hanford Site footprint reduction is the evaluation of “non-operational property (NP)”. Non-operational property refers to regions of land that exist within, and between, the production facilities and identified waste sites. In many cases, the impact of site production operations might be absent from these areas, or be below levels of environmental concern. These regions are undergoing evaluation to determine if additional cleanup actions are required.

An approach for NP evaluation at the Hanford Site has been established to determine if an area is available for footprint reduction [4]. Information gathered from the NP evaluation will be considered in the CERCLA remedial investigation/feasibility study. The process uses a weight-of-evidence approach, based on the application of a number of different methods to determine whether areas have been significantly impacted by site operations. The activities conducted as part of a NP evaluation can be summarized as follows:

- Review and summarize information from existing Hanford Site programs, environmental surveillance efforts, and data that monitor and analyze the nature and extent of contamination outside the boundaries of the operational facilities and identified waste sites.
- Review and evaluate information sources such as aerial photography, geographic information system (GIS), and Light Detection and Ranging (LiDAR).
- A statistical analysis is a key part of the footprint reduction evaluation. The statistical approach considers locations of known waste sites and contaminant sources that may have the potential to impact the NP. This process facilitates the potential discovery of new waste sites, as well as areas of the NP that may have been impacted by site operations.
- Evaluate the potential for contaminant migration via the credible pathways of overland transport (e.g. wind and water), facility emissions, human activities, and animal or plant biointrusion.
- Quantify the confidence level that undiscovered waste sites do not exist.

- Provide recommendations, if needed, for potential future environmental surveillance, data collection and analysis, or cleanup investigations based on the findings of the NP effort.

FOOTPRINT REDUCTION GOALS AND STATUS

The DOE EM has established footprint reduction goals for the Hanford Site. Achieving footprint reduction at Hanford has involved the development of completion subareas within the principle cleanup area components and are illustrated on Figure 4. These completion areas allow progress to be planned and credited in discrete, measureable steps.

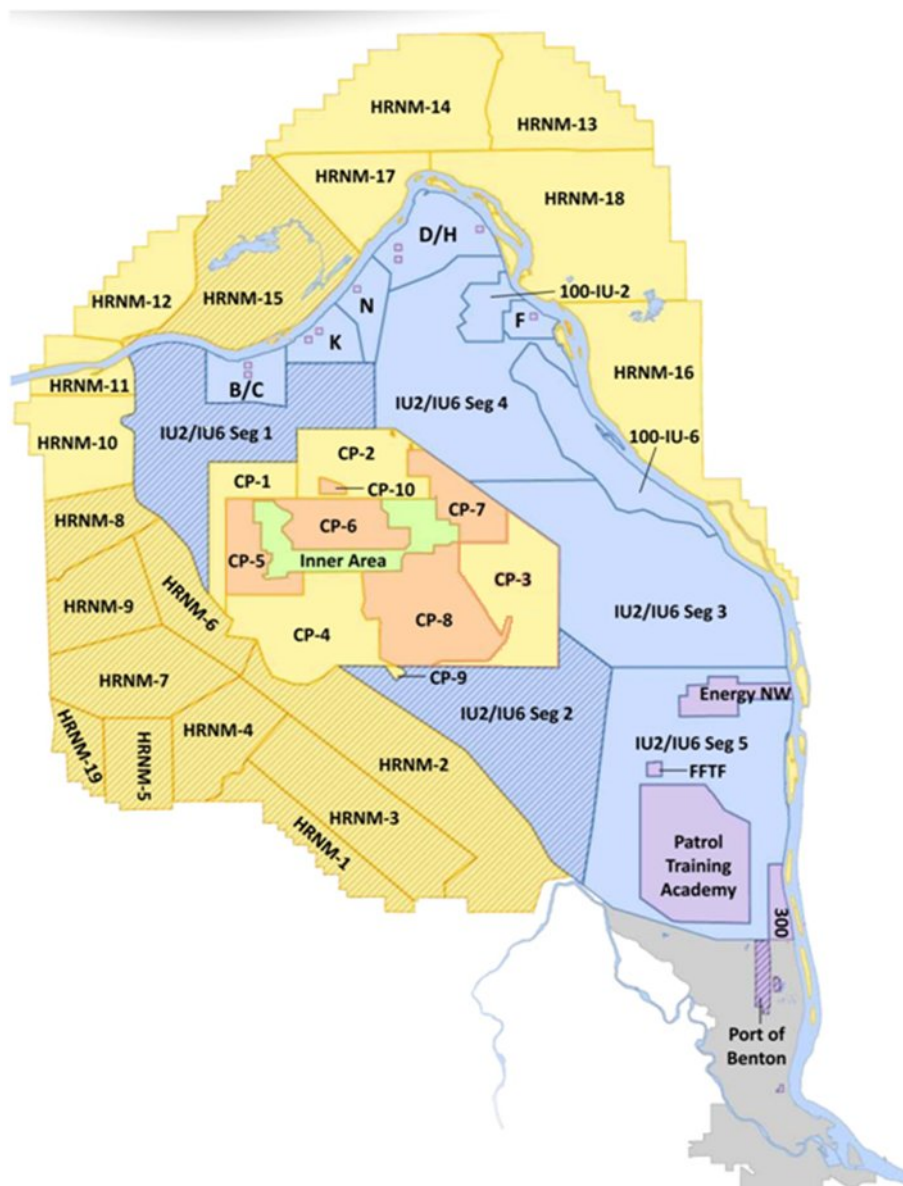


Figure 4. Principle Component Completion Subareas.

As of the beginning of this fiscal year (FY-12) the following accomplishments have contributed to the Hanford cleanup footprint reduction:

North Slope: DOE contractor CH2M HILL Plateau Remediation Company partnered with Sealaska, a Native American-owned small business, to clean up debris in the 438 km² (169 mi²) area near Hanford’s main facilities. The North Slope is located northeast of those facilities, across the Columbia River (~453 km² (175 mi²)).

Central Plateau: CERCLA cleanup activities (mostly near surface waste sites) and building demolitions allowed cleanup of several segments of the Central Plateau Outer Area (~91 km² (35 mi²)).

Arid Lands Ecology Reserve: Once a buffer area for the U.S. Army, the Arid Lands Ecology Reserve is where workers removed more than 20 facilities and hundreds of debris sites and completed the first footprint reduction for the Hanford Site (~298 km² (115 mi²)).

River Corridor: The Richland Operations Office River Corridor contractor, Washington Closure Hanford, has completed footprint reduction activities in two inland areas of the River Corridor (~155 km² (60 mi²)).

To date, the Hanford Site has completed ~997 km² (385 mi²) of footprint reduction (~65%), exceeding the EM goal. Relative to the original Hanford Site footprint of 1518 km² (586 mi²), the goals and progress to date are shown in Table 1.

Table 1. Hanford Site Footprint Reduction Goals and Status

	Square Miles Completed	Percent Footprint Reduction
Fiscal Year 2011 Goal	290	49%
Fiscal Year 2011 Achieved	385	65%
Fiscal Year 2015 Goal	527	90%
Fiscal Year 2015 Projected	~539	92%
Fiscal Year 2020 Projected	~576	98%

CONCLUSIONS

The DOE EM and DOE Richland Operations Office, continue to make great progress to reduce the legacy footprint of the Hanford Site. Footprint reduction is being accomplished by focusing cleanup activities on decontamination and demolition of excess facilities, both contaminated and

uncontaminated, waste site cleanup activities, and debris pile removal. All of these activities can be accomplished with proven technologies and within established regulatory frameworks. Footprint reduction goals for Fiscal Year 2011 were exceeded, largely with the help of ARRA funding.

As cleanup projects are completed and the total area requiring cleanup shrinks, overall costs for surveillance and maintenance operations and infrastructure services decrease. This work completion and decrease in funding requirements to maintain waste sites and antiquated facilities allows more focus on high priority site missions (i.e. groundwater remediation, tank waste disposition, etc.) and moves Site areas closer to transition from EM to the Legacy Management program. The progress in the Hanford footprint reduction effort will help achieve success in these other important mission areas.

REFERENCES

1. 64 FR61615, 1999, “Record of Decision for Hanford Comprehensive Land-Use Plan Environmental Impact Statement,” *Federal Register*, Vol. 73, Number 188, pp.55824-55826 (November 12, 1999). [need to also include the supplemental analysis and updated ROD]
2. “Hanford Site Cleanup Completion Framework”, DOE/RL-2009-10, Revision 0, July 2010.
3. “Hanford Site Active Cleanup Footprint Reduction”, DOE/RL-2010-18, Revision 1, March 2011.
4. “Zone 1 Footprint Reduction Evaluation in the Hanford Site Central Plateau Outer Area,” HNF-49277, Revision 1, August 2011.