



CRESP

Consortium For Risk Evaluation with Stakeholder Participation

Consortium Universities: **Vanderbilt University**, Georgia Tech, Howard University, New York University, Oregon State University, Rutgers University, University of Arizona, University of Wisconsin - Madison

METHODOLOGY FOR THE HANFORD SITE-WIDE RISK REVIEW PROJECT

Revision 0

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Acknowledgements and Disclaimer

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Executive Summary

In January 2014, the U.S. Department of Energy (DOE) requested that the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) conduct an independent Hanford site-wide evaluation of human health, nuclear safety, environmental, and cultural resource risks associated with current hazards, environmental contamination and remaining cleanup activities (hereinafter referred to as the “Risk Review Project”). The overarching goal of the Risk Review Project is to carry out a screening process for risks and impacts to human health and resources. The results of the Risk Review Project are intended to provide the DOE, regulators, Tribal Nations, and the public with a more comprehensive understanding of the remaining cleanup at the Hanford Site to help inform (1) decisions on sequencing of future cleanup activities, and (2) selection, planning and execution of specific cleanup actions, including which areas at the Hanford Site should be addressed earlier for additional characterization, analysis, and remediation. This document describes the methodology being used to execute the Risk Review Project.

To accomplish the project’s goal, the most recent, available information about hazards (i.e., contaminant inventories, physical chemical forms) and existing environmental contamination within each of the units being evaluated is gathered, described, and analyzed. At certain points in time and under various circumstances, such as facility degradation, seismic activity, accidents, or fire, the identified hazards and environmental contamination may lead to contaminant travel along multiple pathways, creating exposure or impact (referred to as “risk”) to human health and/or resources.

This document details the approach used for evaluating risks and impacts to human health and resources for each of the evaluation units considered. Human health and resources include facility workers, co-located people, the public, groundwater and the Columbia River, and ecological and cultural resources. For each unit evaluated under the Risk Review Project, risks are considered in the context of the evaluated unit’s status currently, during cleanup activities, and after cleanup activities. This includes taking account of current barriers to dispersion of contaminants and resultant adverse consequences to receptors, the mechanisms of barrier failures, and the likelihood and magnitude of adverse consequences.

Hanford Site is located along the Columbia River in Southeast Washington and is comprised of an area 586 square-miles (half the size of the State of Rhode Island). For over 40 years, the Site played a major role in the development and production of plutonium and other defense materials as part of the Manhattan Project during World War II and afterwards during the Cold War.

In 1989, Hanford’s mission shifted from supporting weapons development to environmental cleanup of facilities, soil, and groundwater. Today, Hanford Site consists of waste management and former production areas, active and closed research facilities, waste storage and disposal sites, and huge swaths of natural resources and habitat. Cleanup at the Site has proven to be more costly, has taken longer, and is more technically challenging than expected when cleanup began. DOE’s near term vision calls for reduction of the active cleanup footprint to 75 square miles in the center of the Site, reducing overhead costs, and shifting resources that would allow full scale cleanup of the Central Plateau. To date, considerable progress has been made in achieving this vision. For example, hazards near the Columbia River have been eliminated by completing cleanup of most of the River Corridor and treating contaminated groundwater near the Columbia River. Despite these successes, more than \$100 billion are expected to be spent on cleanup at Hanford during the next 50 years. Additionally, while earlier studies have evaluated portions of the Hanford Site, there has never been a comprehensive, site-wide review of the risks to human health and resources from contamination, waste management, and cleanup activities.

It is also important to be clear regarding what the Risk Review Project is not. The Risk Review Project is neither intended to be a substitute for, nor preempt, any requirement imposed under applicable federal or state laws or treaties. As important, the Risk Review Project is not intended to make or replace any decisions made under the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) and/or 2010 Consent Order, or amendments. Furthermore, the Risk Review Project is neither a Comprehensive Environmental Response, Compensation, and Liability Act risk assessment nor a Natural Resources Damage Assessment evaluation. Finally, the Risk Review Project is not intended to interpret treaty rights that exist between the United States and Native American Tribes.

The Risk Review Project focuses on summary-level risk characterization or description based on existing information. This process includes describing hazards, existing environmental contamination and potential risks in terms of probability and consequence. Risk characterization is a necessary predecessor to risk management, but the characterization that is completed in this Risk Review does not include risk management decisions. Thus, a rank ordered priority list of cleanup actions from the risk characterization effort will not be an outcome of this review.

The development of a final prioritization list of future actions is the sole purview of DOE and its regulators, with consideration of many additional factors. The DOE, the State of Washington, and the U.S. Environmental Protection Agency (EPA) clearly recognize that the results of the Risk Review Project, including evaluations of hazards and risks, are only one of many inputs to prioritization of future cleanup activities at Hanford.

One essential, additional factor that DOE and regulators must consider in setting priorities for cleanup are the values that stakeholders, community members, governmental entities, and Tribal Nations have identified (e.g., access to the Site, gathering roots, berries, and medicines, and hunting), and how various cleanup options would affect these identified values. The Risk Review Project is limited to considering a plausible range of current and future cleanup actions for different types of contaminant sources to provide to DOE and regulators a better understanding of the range of potential risks and impacts to receptors that may be caused by those cleanup actions.

Furthermore, the Risk Review Project will not select cleanup endpoints or cleanup technologies. However, in addition to risks posed by contaminants, such as radionuclides or chromium, cleanup actions themselves can pose risks or impacts to receptors (e.g., worker safety, groundwater, ecological and cultural resources).

This document describes the methodology developed to execute the Risk Review Project and reflects revisions that were incorporated in response to comments received on the draft methodology document made available for public comment in September 2014. The methodology also reflects the lessons learned from the pilot case studies completed in the summer of 2014 to test the draft version of the methodology as well as input received from independent experts. The methodology consists of the following elements:

1. **Identification of Evaluation Units (EU).** The remaining cleanup sites at Hanford as of October 1, 2015 have been divided into approximately 60 evaluation units (EUs), which have been organized into five categories composed of geographically co-located sites to the extent possible, considering the commonality among source types and the overlapping of impacts and

risks to receptors⁷. The five categories are⁸: 1) legacy source sites⁹, such as past practice liquid waste disposal and buried solid waste sites; 2) tank waste and farms and associated legacy contamination sources; 3) groundwater plumes; 4) inactive facilities undergoing decommissioning, deactivation, decontamination, and demolition (D4); and 5) operating facilities used as part of the cleanup process. *See Chapter 3.*

2. **Summary Evaluation Templates.** Each EU will be described in detail using most recent available information, including regulatory documents, maps, and studies¹⁰. Information gathered on each EU includes the unit description and history; an inventory of waste and contamination history; selected or potential range of cleanup approaches; and the ratings of risks to receptors, which are determined by providing rough order of magnitude relative grouping or binning of risks to each type of receptor. The primary groupings are Very High, High, Medium, Low, and Not Discernible. *See Appendix B for the Summary Evaluation Template.*
3. **Risk Ratings.** The receptors being rated or binned are facility workers, co-located people, public, groundwater, and the Columbia River, and ecological resources. The groupings of risk ratings (e.g., “high”, “medium”, etc.) for each type of receptors are determined by application of the specific methodology developed for that receptor. Demarcation between ratings uses recognized regulatory or literature thresholds applicable to the specific receptor, if they exist, as screening levels, as well as other factors. This approach is intended to provide relative risk ratings *within* receptor categories (relative binning of risks to the Columbia River, groundwater, ecology, etc.). Risk ratings for each receptor are then used to inform urgency of addressing specific hazards. An overall risk rating is not being provided for cultural resources; however, information about cultural resources within or near (within 500 m) each EU is gathered, described, and analyzed as a planning guide or tool for future activities. Although the integration across receptor categories is considered inherently driven by individual and collective values, the Risk Review Project will provide examples that illustrate how grouping or binning that integrates the ratings across receptor categories (e.g., integrated risk binning that combines risks to human health with risks to ecology and groundwater) could be carried out.¹¹ *See Chapters 5 through 8 for detailed descriptions of each receptor methodology.*
4. **Temporal Evaluation Periods.** Risks are evaluated based on four distinct periods: 1) current status of the EU, typically prior to cleanup, although cleanup has been initiated for some EUs, 2) active cleanup period (or until 2064), 3) near-term post-cleanup (until 2164, or assuming a 100-year duration for institutional controls associated with areas transferred from federal control), and 4) long-term post-cleanup (or until 3064)¹². Each EU and selected EU components are evaluated as if cleanup were not to occur for 50 years to provide insights into the potential risks of delay to help inform sequencing of cleanup actions. ***However, this is not to infer that delay of cleanup for 50 years is recommended.*** *See Chapter 2.*

⁷ The EU concept was developed by the Risk Review Project to provide a tractable basis for reviewing the myriad of cleanup challenges at the Hanford Site.

⁸ The EU groupings used here were developed for the Risk Review Project to understand potentially overlapping risks and not common practice at the Hanford Site.

⁹ In this context, “legacy” refers to resulting from past practices that are no longer occurring, even though the Hanford Site has been under federal control from the time it was established as part of the Manhattan Project.

¹⁰ The information available for each EU is highly variable, depending on documentation of past site practices, the currently regulatory status, currently planned near-term cleanup activities and other factors.

¹¹ This will be included in the final report but not the interim progress report.

¹² Where information is available that indicates risks that may be present beyond the year, 3064, such information is noted (such as with slow groundwater migration of contaminants).

5. **Initiating Events.** The likelihood of initiating events, both localized and regional in scale that may occur during any or all of the evaluation periods, such as fire, volcanic eruptions, loss of power, and plane crashes, is described. This is to establish a consistent basis for identifying and categorizing phenomena that may remove or degrade barriers, placing receptors at risk from contaminants. Nuclear safety is considered in the context of potential initiating events and risks to receptors. *See Chapter 4.*

The focus of this document is on methodology rather than outcomes. This means the general approach is described in detail with illustrative examples. Project evaluations and results of EUs evaluated will be discussed in both an interim progress report, completed in 2015, and a final report planned to be completed in 2016. These reports also will contain observations made from the work completed and completed EU Evaluation Templates.

The Risk Review Project is led by a team of CRESP researchers in regular dialogue with a Core Team comprised of senior management from DOE, EPA, and the State of Washington Departments of Ecology and Health, which provides through a Core Team that provides advice on the development and execution of the Risk Review Project. Pacific Northwest National Laboratory is providing research, analytical, and other assistance to CRESP.

CRESP is a multi-disciplinary consortium of universities with a mission to advance environmental cleanup by finding ways to improve the scientific and technical basis for management decisions, and to engage stakeholders and the public. CRESP has completed risk-informed characterization projects involving complex issues at DOE Office of Environmental Management sites around the country.