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HANFORD SITE-WIDE RISK REVIEW PROJECT

INTERIM PROGRESS REPORT

REVISION 0

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Acknowledgements and Disclaimer

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Executive Summary

PROJECT GOAL

In January 2014, the Department of Energy (DOE) asked the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) to conduct an independent Hanford Site-wide evaluation of human health, nuclear safety, environmental and cultural resource risks (hereinafter referred to as the "Risk Review Project") associated with existing hazards, environmental contamination and remaining cleanup activities. The overarching goal of the Risk Review Project is to carry out a screening process for risks and impacts to human health and resources.[7] 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[8].

BACKGROUND

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. A map (Figure ES-1) showing Hanford Site may be found at the end of the Executive Summary. 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. While significant cleanup progress has been achieved, more than $100 billion are expected to be spent on cleanup at Hanford during the next 50 years.

OVERVIEW

Approximately 60 units, referred to as "evaluation units" (EUs) and composed primarily of geographically co-located areas of existing facilities, waste storage and environmental contamination, are to be evaluated and rated during the execution of the Risk Review Project. These units consist of remaining cleanup sites at Hanford Site as of October 1, 2015. The Risk Review Project will also provide a description of the remaining inventories of radionuclides and chemicals, including their forms, spatial

[7] In this Risk Review Project, human health and resources evaluated include groundwater and the Columbia River, facility workers, co-located people, the public, and ecological and cultural resources. Collectively, humans and these resources also are referred to as "receptors".

[8] 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.

distribution and barriers to future environmental contamination at the Hanford Site at the conclusion of cleanup based on current agreements and decisions. For example, several decisions have been made that necessitate that some areas of the Hanford Site will be dedicated to long-term waste management.

This interim progress report presents both the results for the first set of 25 EUs and the interim observations from the Risk Review Project to date.

For this report, the most recent, available information about hazards (i.e., contaminant inventories, physical chemical forms) and existing environmental contamination within each of the 25 EUs being reviewed has been 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 the movement of radionuclides and chemical contaminants along multiple pathways, thereby potentially creating exposure or impact (referred to as "risk") to human health and resources. This is the "risk" that is to be evaluated and rated for the Risk Review Project, which is discussed in this report.

The screening process used, along with uncertainties and information gaps, necessarily focus the evaluation on order of magnitude factors that distinguish risks between EUs and receptors. Risks are considered in the context of each EU's current status, during cleanup activities and after cleanup activities. This includes taking account of current barriers to dispersion of contaminants, including engineered systems, natural systems and institutional controls, the mechanisms of barrier failures, and the likelihood and magnitude of adverse consequences to receptors. A map (Figure ES-1) showing the locations at Hanford Site of all EUs evaluated except groundwater EUs for this interim progress report may be found at the end of the Executive Summary; a separate map (Figure ES-2) provides an overview of the existing groundwater contamination and groundwater EUs.

WHAT THE PROJECT IS AND IS NOT

DOE, the State of Washington, and the Environmental Protection Agency (EPA) clearly recognize that the Risk Review Project results, including evaluations of hazards, current environmental contamination, and risks, are only one of many inputs to prioritization of future cleanup activities at Hanford.

The Risk Review Project focuses on risk characterization based on analysis and integration of existing information. Risk characterization is a necessary predecessor to risk management, but does ***not*** dictate risk management decisions. This review does not provide a rank ordered priority list of cleanup actions but rather provides groupings of relative risk (e.g., "high", "medium", etc.). The development of a prioritized list of future actions is the sole purview of DOE and its regulators, with consideration of many additional factors. Instead, the Risk Review Project is limited to considering a plausible range of current and future cleanup actions for different types of contaminant sources to better understand the range of potential risks and impacts to receptors that those cleanup actions may cause.

It is also important to be clear 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 CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) risk assessment nor a Natural Resources Damage Assessment evaluation. The Risk Review Project is not intended to interpret treaty rights that exist between the United States and Native American Tribes.

APPROACH USED

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 advice and guidance on the development and execution of the Risk Review Project. Pacific Northwest National Laboratory provides research, analytical, and other assistance to CRESP as part of the Risk Review Project.

For the first several months of the project, the focus was on developing an evaluation approach that would accomplish the Risk Review Project's goal of providing the DOE, regulators, and the public with a more comprehensive understanding of the current and future risks to receptors and to help inform decisions on sequencing of future cleanup activities, as well as associated selection, planning, and execution elements of the process. The draft methodology was made available for agency and public comment in September 2014 and then revised in response to the comments received. The methodology used to evaluate the 25 EUs discussed in this report, reflects the revisions made in response to input received on the draft methodology. 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[9]:

1. **Identification of Evaluation Units.** The remaining cleanup sites at Hanford as of October 1, 2015, have been divided into approximately 60 EUs, which are composed of geographically co-located sites to the extent possible, considering commonality among source types and the overlapping of impacts and risks to receptors[10]. There are five categories[11]: (1) legacy source sites, 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 2 for a complete list of all EUs and maps of their locations, including the 25 evaluated for this report; also Chapter 3 of the methodology (CRESP 2015).*

2. **Summary Evaluation Templates.** Each EU is described in detail using existing information as of January 2014, including regulatory documents, maps, and studies.[12] Information gathered on each EU includes the unit description and history; an inventory of waste and contamination history; selected or the potential range of cleanup approaches; and the ratings of risks to human resource and environmental receptors, by providing rough order of magnitude relative grouping or binning of risks to each different type of receptor. The primary groupings are Very High, High, Medium, Low, and Not Discernible. *See Chapter 3 and Appendices D-I for the completed*

[9] The entire methodology document may be found on CRESP's website: www.cresp.org

[10] 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. Groupings of facilities, wastes and existing environmental contamination within each EU is based primarily on geographic location because the potential to impact receptors is fundamentally based on geographic location and spatial relations that may lead to exposure of receptors to hazards from specific sources. Thus, EU groupings are not based on, and may not correspond with, either the process history that produced the wastes or environmental contamination, nor the groupings used for regulatory purposes (e.g., operable units).

[11] The EU groupings used here were developed by the Risk Review Project to understand potentially overlapping risks and are not common practice at the Hanford Site.

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

summary evaluation templates for each of the 25 EUs discussed in this report; Appendix B of the methodology (CRESP 2015) 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 receptor 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 (i.e., relative binning of risks to the Columbia River, groundwater, ecology, etc.). Risk ratings for each receptor are then used to inform the urgency of addressing specific hazards. An overall risk rating is not provided for cultural resources; however, information about cultural resources within each EU and near (within 500 m) each EU is gathered, described, and analyzed as a planning guide or tool for future cleanup activities.

   Although the integration across receptor categories is assumed to be inherently driven by individual and collective values, the Risk Review Project will provide examples illustrating 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.[13] *See Chapter 2 for summaries of each receptor methodology; Chapters 5 through 8 of the methodology (CRESP 2015) for detailed descriptions of each receptor methodology.*

4. **Temporal Evaluation Periods.** Risks are evaluated based on distinct time periods: the current status of the EU, typically prior to cleanup although cleanup has been initiated for some EUs; active cleanup period (or until 2064); near-term post-cleanup (until 2164, or assuming a 100 year duration for institutional controls associated with areas transferred from federal control); and long-term post-cleanup (or until 3064).[14] 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, which will help inform sequencing of cleanup actions. However, this is not to infer that delay of cleanup for 50 years is recommended. *See Chapter 2 for a more detailed description of the evaluation periods.*

5. **Initiating Events.** The likelihood of initiating events, both localized and regional in scale, which may occur during any or all of the evaluation periods, such as fire, volcanic eruptions, loss of power, and loss of cooling water, are described. This is to establish a consistent basis for identifying and categorizing phenomena that may remove or degrade barriers thus placing receptors at risk from contaminants. Nuclear safety is considered in the context of potential initiating events and risks to receptors. *See Chapter 2 for a summary of initiating events; Chapter 4 of the methodology (CRESP 2015) for a detailed analysis.*

RESULTS AND INTERIM OBSERVATIONS

The Risk Review Project relies primarily on previously obtained primary data, safety analyses, risk analyses, environmental impact assessments, remedial investigations, and other sources of information. Tens of thousands of pages of information and electronic databases have been reviewed and integrated to form the basis for this report. The methodology used reflects input from state and federal regulatory agencies, Tribal Nations, non-governmental agencies, the public, and independent experts (CRESP 2015).

[13] This will be included in the final report but is not in the interim progress report.

[14] 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).

Still, important uncertainties and data gaps remain that required assumptions to carry out the project and are indicated in the detailed analysis provided in the main body of this report and its appendices.

The major current risks that have been identified within the EUs considered in this report are as follows:

The current risks that are in the highest risk rating group are at specific EUs from (1) loss of nuclear safety controls from major natural hazards (e.g., from seismic events, volcanic ashfall, or wildfire) or other external events (e.g., prolonged loss of power or water), or operational accidents (including facility fires) that can effect human health and a broad range of receptors; and (2) contamination of groundwater from further spread of existing groundwater contamination, migration of contaminants from legacy surface disposal sites and the vadose zone, or unplanned release of contaminants from engineered facilities (e.g., waste tanks).

Current significant threats to the Columbia River from contaminants in the River Corridor are being treated, and significant threats from groundwater contaminants to the Columbia River from the Central Plateau are either being treated, or would not be realized for a long time and only if they are not treated during the active cleanup period (i.e., over the next 50 years).

The highest rated risks during cleanup are (1) to workers, co-located people, and controlled access groups from operational accidents; and (2) to ecological and cultural resources from physical disruption or introduction of invasive species, either because of insufficient planning, selected cleanup methods, or lack of a prior knowledge.

The major risks remaining after cleanup are from potential failure of institutional or engineered controls, which may impact human health, water resources, and ecological resources. In addition, ***safety of consumptive practices*** (such as those associated with some Tribal Nation cultural practices and some recreational activities) cannot be assured without both risk assessment and appropriate biomonitoring.

Several interim observations can be made from the work completed to date. Observations fall into one of three categories that are offered to inform management considerations surrounding (1) sequencing of cleanup, (2) planning for and activities associated with cleanup, and (3) key information gaps that have affected the completion of evaluations. These observations must be regarded as preliminary because they may be altered for the final report after all EUs have been evaluated for risks and impacts to human resources, groundwater and the Columbia River, and ecological and cultural resources. However, they have been carefully formulated from the evaluations completed for this interim progress report, and therefore may be considered in conjunction with the full range of other factors that affect cleanup decisions at the Hanford Site. *See Chapter 5 for detailed results and observations for the first set of 25 units evaluated.*

In addition to specific observations, five general interim observations can be made at this point in the Risk Review Project.

GENERAL OBSERVATIONS

1. At the Hanford Site, current hazard and risk conditions reflect the inventory, site access controls that are in place, and cleanup actions already completed. These controls and completed actions have greatly reduced threats to human health and ecological resources, as well as addressing some of the groundwater contamination. When considering future cleanup, different hazard and risk considerations are important for different decisions as follow:
    a. **To inform sequencing of cleanup activities –** *nuclear, chemical, and physical safety* (i.e., hazards, initiating events and accident scenarios) *and the threats to groundwater* and the Columbia River *are the primary risk considerations*.

b. **To inform selection, planning and execution of specific cleanup actions –** potential *risks and impacts to worker safety, ecological resources, and cultural resources are the primary risk considerations*.
c. **To inform cleanup criteria** (i.e., cleanup levels to meet regulatory standards) **–** *future land use, protection of water resources, land ownership and control, durability of institutional and engineered controls, and legal/regulatory requirements are the primary considerations that influence future human health risk estimates*. Risks to human health should be considered in combination with risks to environmental and ecological resources for establishing cleanup criteria. The establishment of end-state cleanup criteria is not the focus of the Risk Review Project.

2. Currently, members of the public, whether located at the official Hanford Site boundary or at the controlled access boundary (river and highways), usually have Low to ND (non–discernible) risks, even if postulated radioactive contaminant releases are realized.

3. Timing of cleanup of a specific EU **may reduce** worker risk (e.g., by radioactive decay) **or may increase worker risk** (e.g., by facility deterioration, workforce availability with institutional knowledge, repetitive or chronic exposures due to maintenance, potential for complacency).
    a. Worker risk varies with respect to the nature of hazards, complexity, duration of project, technical approaches, and controls or mitigation measures in-place to ensure worker health and safety.
    b. DOE and its contractors have accident rates approximately two-thirds less than comparable non-DOE work. Ongoing vigilance is needed to maintain this excellent record.

4. The ecological resources on the Hanford Site are very important to the Columbia River Basin Ecoregion, where the shrub-steppe habitat has decreased at a far greater rate region-wide than on the Hanford Site. Stewardship by the DOE has helped protect these resources.

5. The historical and cultural significance of the Hanford Site to Tribal Nations stretches over 10,000 years. The Hanford Site also is considered to have important historical significance to western settlement, which began in the early 1800s and only ended at the site to make way for the Manhattan Project. Finally, the site played a major role during the Manhattan Project Era and after World War II during the Cold War Era. DOE's stewardship helps assure that the site's historical and cultural significance will continue to be recognized.

INFORMING CLEANUP SEQUENCING

The following is a list of interim observations related to sequencing of cleanup only, with additional details provided in Chapters 3 and 4. All other observations may be found in Chapter 5 of this report. Detailed discussions of each EU are provided in appendices as noted. However, with regard to planning for and activities associated with cleanup, observations cover a wide range of issues from identifying the greatest risks to workers to the most important pathways and mechanisms for impacts to ecological resources and cultural resources (e.g., by contaminants and physical disruption).

1. **Address parts of specific EUs earlier.** For several EUs, specific activities, hazards, or risk characteristics warrant being addressed before the EU as a whole.
2. **Highest priority group based on evaluation of potential risks to human health and the environment.** For the facilities and activities evaluated under the Risk Review Project to date,

the major cleanup activities that are in the highest priority group based on evaluation of potential risks to human health and the environment are as follows (*not in any specific order*):

a. **Reduction of threats posed by tank wastes.** (Appendix E) Hydrogen gas generation[15] poses a threat to nuclear safety and human health through hydrogen flammability events that may result in atmospheric or subsurface release of waste or contaminants from containment (worker risk from tank vapors are discussed below). Tc-99 and I-129, both being persistent and highly mobile in the subsurface, pose threats to groundwater through potential leakage from tanks[16]. Risks posed by hydrogen gas generation can be somewhat reduced through removal of water soluble Cs-137. Groundwater threats can be substantially reduced by removal of water-soluble constituents from a selected set of tanks[17]. This interim observation is consistent with the priority given by the agencies to treat LAW at WTP as early as possible if Cs-137, Tc-99 and I-129 separated from the waste are not returned to the tanks. However, the risk profile will not be reduced significantly nor increased if Cs-137, Tc-99 and I-129 are returned to the tanks during LAW treatment.

b. **Reduction or elimination of risks associated with external events and natural phenomena (severe seismic events, fires, loss of power for long duration).** Facilities affected are the Waste Encapsulation and Storage Facility (WESF) (cesium and strontium capsules), Central Waste Complex, and Plutonium Uranium Extraction Plant (PUREX) waste storage tunnels.

   i. **For WESF** (Appendix H.4)**:**

      The primary scenario that causes release of radionuclides from capsules stored in the WESF pool cells is an accident that results in the loss of all water from the pools cells, which provides cooling and radiation shielding. The design basis seismic event alone cannot cause the loss of all pool cell water by itself: release of significant quantities of radionuclides can only be caused if multiple root causes occur (some in sequence, some in parallel) that include man-made errors, natural events, and external events. The storage pool structures have been exposed to high radiation fields for an extended period of time. An initial assessment completed indicates that the storage pools currently are safe, although the long-term integrity of the structures is uncertain.[18] DOE proposes to over-pack and then transfer cesium and strontium capsules to onsite dry storage.[19]

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[15] Hydrogen generation rate is primarily related to Cs-137 and Sr-90 content of the waste.

[16] The threat to groundwater from tank leakage has been mitigated in the near-term through interim stabilization of single shell tanks (SSTs) by removal of pumpable liquids.

[17] For hydrogen generation – 200 East DSTs, 200 West DST SY-103 and single shell tanks East B-202, B-203, B-204, and West T-201 have times to 25% of the lower flammability limit of less than 6 months under unventilated conditions. Cs-137 removal would most significantly increase time to 25 percent of the lower flammability limit for tanks AZ-101, AN-102, AN-107, AP-101, AP-103 and AP-105. For groundwater threat, greater than 70% of the GTM is from – 200 East DSTs, SY-101 and SY-103 (200 West DSTs) and single shell tanks, AX-101, S-105, S-106, S-108, S-109, SX-106, TX-105*, TX-113*, TX-115*, U-109, U-105 (* indicates assumed SST leaker).

[18] A separate DOE-initiated review of the condition of the WESF concrete structure and the reliability of the initial DOE estimate is in progress.

[19] The capsules may experience significantly higher temperatures in dry storage than in pool storage. The elevated temperatures, combined with the variable and uncertain chemical composition of some capsules, could raise concerns about the integrity of the capsules over time as storage is likely for at least decades (see Appendix H.4). This concern would be addressed as part of the safety analysis associated with the dry storage design process.

ii. **For Central Waste Complex** (Appendix H.3)**:**
Estimated unmitigated doses from incident scenarios to the co-located person exposed to the worst design basis event at the Central Waste Complex is from a large fire involving more than eight drums or 82.5 Ci (dose equivalent) of material with 770 rem. The risk may increase because the Central Waste Complex continues to receive wastes, but currently is unable to ship wastes to off-site disposal, due to WIPP being closed and also because budgets have been insufficient to support repackaging wastes into standard containers. Localized accumulation of material at risk without a disposition pathway can increase overall risk. Consideration also should include reductions in the amount of material at risk for similar facilities that require interaction with other offsite facilities that may not be available.

iii. **For PUREX** (Appendix D.4)**:**
1. A design basis seismic event could lead to a total structural failure of the 202-A building and both tunnels, causing an estimated unmitigated combined 250 rem dose to the co-located person.
2. The wood ceiling and wall structure of Tunnel #1 are vulnerable to collapse in about 30 years[20] due to ongoing degradation occurring from continued exposure to the gamma radiation from equipment being stored, or due to a fire. These events could release a large fraction of the 21,200 Ci radiological inventory to the environment.[21]

c. **Dependence on active controls (e.g., reliance on power, cooling water, active ventilation) to maintain safety for additional facilities with large inventories of radionuclides.** These conditions are (1) air handling ducts at WESF, and (2) sludge at K-Basins (sludge treatment project; Appendix H.2).

i. During the design basis event earthquake, contaminants from WESF's hot cell and ventilation system are the hazard sources that produce doses to the co-located person [Co-located person: 21 rem].

ii. Current safe storage relies on maintaining the K-Basin sludge submerged under water to reduce radiation exposure to workers and prevent fires of reactive metal fragments. Safe processing of K-Basin sludge also requires keeping it wet during retrieval, transfer, interim storage, and processing to prevent pyrophoric constituents from igniting.

3. **Cleanup actions that could cause substantial human health risks.** The following cleanup activities themselves could cause substantial risks to human health and therefore warrant consideration of interim actions, and different cleanup approaches and timing (recognizing that mitigation measures would be both necessary and implemented before and during remedial actions):

a. **Retrieval, treatment, and disposal of contaminated soils underlying Building 324 and disposal of the building after grouting the contaminated soils in the building** (Appendix F.2)**.** Currently, no migration of soil contamination to groundwater has been indicated, suggesting that required cleanup is not urgent. In addition, the excavation and transfer of the soils through the B-Cell floor may not be technically feasible and/or may present

[20] The time estimate of 30 years has large uncertainty, and can be shorter or longer.
[21] The documented safety analysis for this facility provides a detailed analysis of potential upset events (see Appendix F.4).

challenging risk scenarios. As a result, approaches that allow for immobilization and in situ decay of the soil contaminants (Cs-137, Sr-90) warrant further consideration.

b. **Retrieval, treatment, and disposal of materials from 618-11 within caissons, vertical pipe units, and burial grounds** (Appendix D.2) because of the characteristics of wastes (high activity, pyrophoric, poorly characterized) to be retrieved. The possible event of a fire and/or release from 618-11, jeopardizes continued operations and worker safety at the Columbia Northwest Generating Station because of the proximity of the two facilities. The current cover over the buried wastes, but not present over the caissons and vertical pipe units, is effective in limiting water infiltration to the wastes where the cover is present. These conditions warrant consideration of instituting interim mitigation measures and delaying waste retrieval until closure of the generating station.

4. **Groundwater threats** (Appendix G)**.** Many of the threats and current impacts to groundwater are being interdicted and/or treated. The greatest threats and impacts to groundwater that are not currently being addressed are from:

   a. **Groundwater plumes not currently being actively addressed.** Tc-99 and I-129 are already in groundwater in 200 East Area (200-BP-5; EU CP-GW-1). The 200-BP-5 I-129 plume extends to the southeast (200-PO-1; EU CP-GW-1), but may be too dispersed for effective remediation other than natural attenuation.

   b. **Vadose zone threats to groundwater not currently being addressed.** Tc-99, I-129, and Cr(VI) are in the vadose zone associated with BC Cribs and Trenches (EU CP-LS-1; Appendix D.4) and the legacy sites associated with B-BX-BY tank farms (EU CP-TF-6; Appendix E.7), both located in the 200 East Area. Sr-90 results in a very high rating in B-BX-BY because of the large inventory but also is relatively immobile and will naturally decay. Infiltration control (e.g., capping) and other approaches may reduce the flux of these contaminants from the vadose zone into groundwater. Uranium currently is being extracted from perched water in B-Complex.

   c. **324 Building, where relatively modest interim actions could reduce threat.** The largest risk for migration of Cs-137 and Sr-90 from the soils until cleanup can be completed (through a combination of D4, soil treatment and/or removal and natural attenuation) is from breakage of a main water pipe and infiltration of precipitation and run off in close vicinity of the building. Building 324 is currently being maintained in a safe surveillance and maintenance mode pending completion and evaluation of a pilot project and assurances that resources are available to complete a multi-year soil remediation and D4 activities. Current risks from potential water infiltration and resultant contaminant migration may be mitigated through water supply modifications, infiltration controls, and additional groundwater monitoring[22].

   d. **618-11 waste site, where relatively modest interim actions could reduce threat**. At 618-11, the potential for release of additional contaminants to groundwater can be mitigated by providing a cover that prevents infiltration but maintains gas venting over the caissons and vertical pipe units (currently gravel covered area).

5. **Operating facilities have a time-dependent risk, which create additional challenges.** Unplanned changes in inventory can occur over time, with delays in planned processing resulting in increased risk. The hazard and risk profiles change as funding is available to

[22] While groundwater monitoring does not prevent infiltration or contaminant migration, it does mitigate risks by providing early warning of a change in the subsurface contaminant spatial distribution.

implement identified plans. For example, with processing delays along with aging infrastructure and without sufficient maintenance, waste storage conditions will deteriorate and/or additional waste may accumulate. In addition, operating facilities rely on interfaces with existing facilities (e.g., WIPP, T Plant, off-site processing and disposition facilities) and planned facilities (e.g., dry capsule storage for cesium and strontium capsules, Phase 2 K-Basin Sludge Processing). Outages or delays in availability of interfacing facilities will likely result in processing disruptions.

WHY THE RISK REVIEW PROJECT IS UNIQUE

For the Hanford Site, the overall Risk Review Project provides DOE and its regulators with risk evaluations on EUs awaiting remediation gathered from existing information and using a new approach. Not only are sources, inventories, pathways, and receptors documented and evaluated for each EU using this approach, but the results provided by the Risk Review Project include integrated analyses of the quantity and location of contamination sources, present state of containment, potential releases, and risks to receptors. Receptors evaluated include groundwater and the Columbia River, facility workers, co-located people, the public, and ecological and cultural resources. Specifically, the Risk Review Project should be considered unique because it provides for the remaining cleanup areas within the Hanford Site on a consistent basis:

1. An in-depth examination of diverse EU categories (legacy waste sites, facilities for decontamination and decommissioning, tank waste and farms, operating units, and groundwater plumes), with comparisons within EU categories (e.g., tank waste and farms) provided, where practical.
2. The first compilation of potential risks to a broad range of receptors in their current conditions, during cleanup (to 2064), and in the 100 years following cleanup (to 2164).
3. The potential effects of different initiating events and releases on risks to receptors.
4. A compilation of the range of cleanup options and methods being considered (or selected) for each EU.
5. Consideration of groundwater movement and the potential risk from groundwater plumes to the riparian zone and benthic organisms in the Columbia River (benthic organisms are more sensitive than other biota or humans to chemicals and radionuclides).
6. Evaluation of the potential risk to humans in different categories (facility workers, co-located individuals, and the public outside the controlled access boundary).
7. A list of functional effects of remediation on biota and ecosystems and cultural resources.
8. A field evaluation and compilation of the percent of each ecological resource level in both the EUs and the surrounding buffer for all 25 EUs considered in this interim progress report.
9. A review by a professional archaeologist of information in existing records about cultural resources within an EU and the buffer area of up to 500 m from the EU boundary that is compiled in a publicly available report for that EU.
10. A comparison of the risks (current, during active cleanup, near-term post-cleanup) for each EU for the range of receptor groups.
11. Summary tables that allow quick comparison of contamination sources and receptor risk ratings.

PROJECT CONSULTATION AND EXTERNAL REVIEW

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.

Written comments on this interim report will be solicited from Tribal Nations, governmental entities, stakeholders, and interested members of the public. Independent experts also will provide review of this report. Comments received are expected to inform the final report prepared on the Risk Review Project. The final report is planned to include evaluations and results of all remaining units not evaluated for this report as well as final observations. Written public comments will be solicited on the draft final report. All three major products of this Risk Review Project (the methodology report, interim progress report, and the final report) will be public documents.

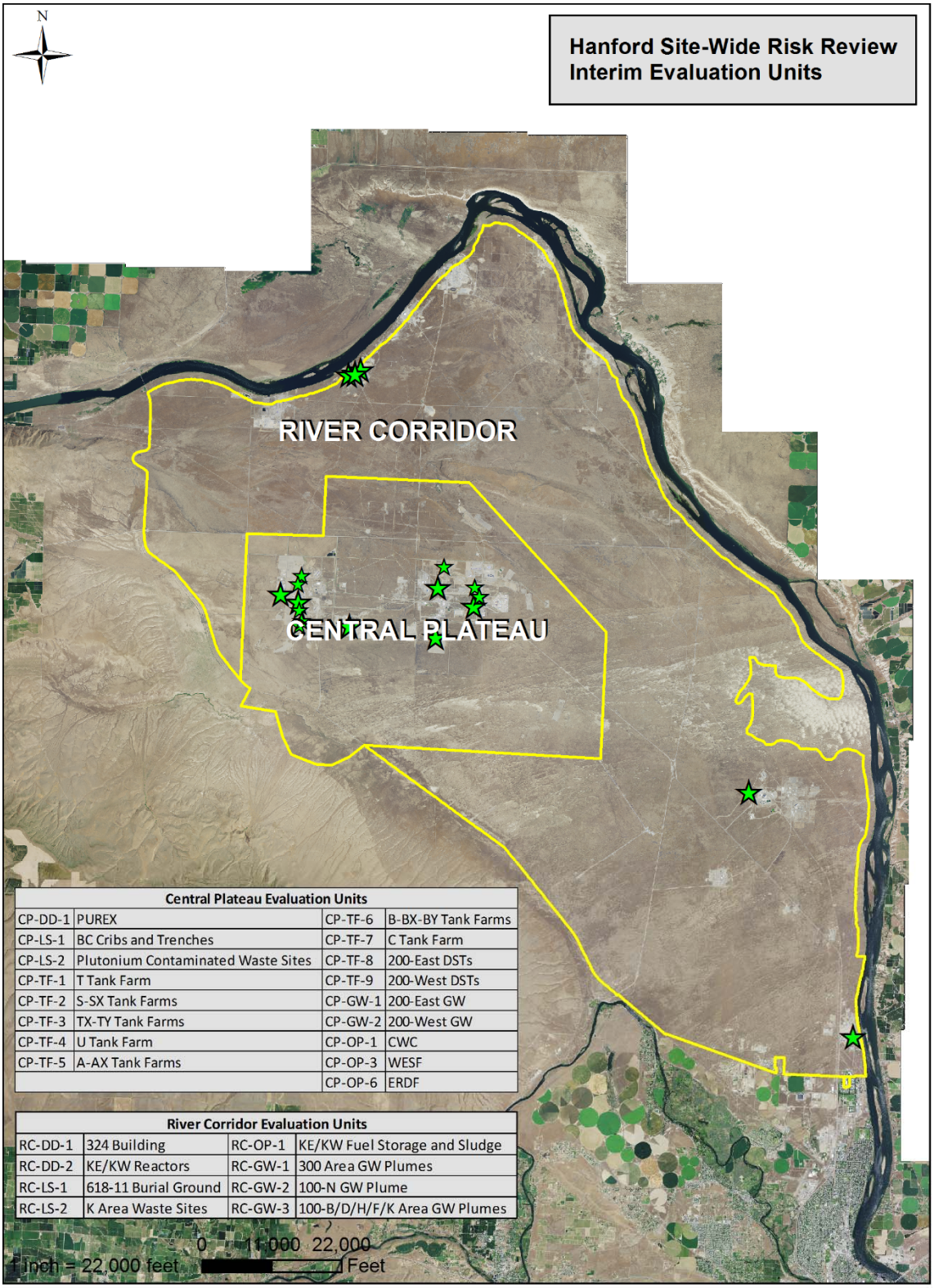

Figure ES-1. General location all evaluation units included in this interim report except groundwater EUs.

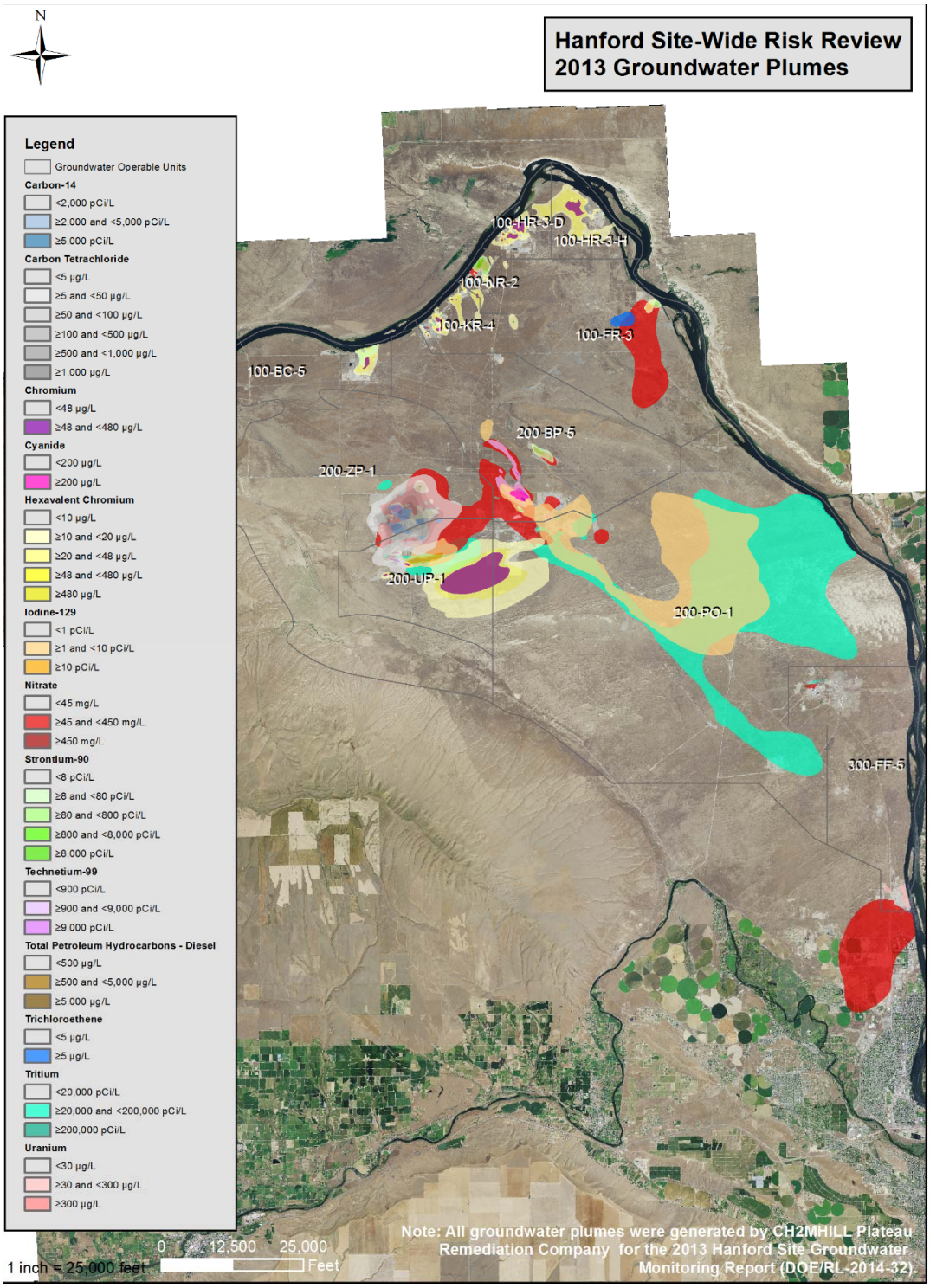

Figure 1-2. Hanford Site-Wide Risk Review 2013 Groundwater Plumes