OUTCOME-BASED PLANNING – HANFORD'S SHIFT TOWARDS CLOSURE AND SHRINKING THE HANFORD SITE

W. Wade Ballard, Rich Holten
U.S. Department of Energy, Richland Operations Office
P.O. Box 550, MSIN K8-50, Richland, WA 99352

Wayne Johnson, Barbara Reichmuth, Michael White, Thomas Wood
Pacific Northwest National Laboratory
P.O. Box 999, MSIN K7-97, Richland, WA 99352

ABSTRACT

Over the past two years, the U.S. Department of Energy (DOE) Richland Operations Office (RL) has formulated a focused, outcomes-based vision for accelerated cleanup of the Hanford Site (1). The primary elements, or outcomes, of this vision are to 1) accelerate restoration of the Columbia River Corridor, 2) transition the Central Plateau to long-term waste management, thereby shrinking the footprint of active site cleanup and operations, and 3) prepare for the future. The third outcome includes operation of the Pacific Northwest National Laboratory (PNNL), a key element of the foundation for Hanford's future; leveraging DOE's assets; and working with the community to understand their vision and reflect it as appropriate in the execution of the Hanford 2012 Vision. The purpose of these three outcomes is to provide a near-term focus, aimed at achieving definitive end points over the next decade, while not precluding any long-term end-state associated with the completion of the Environmental Management (EM) mission at Hanford.

The sheer expanse of the Hanford Site, the inherent hazards associated with the significant inventory of nuclear materials and wastes, the large number of aging contaminated facilities, the diverse nature and extent of environmental contamination, and the proximity to the Columbia River make the Hanford Site arguably the world's largest and most complex environmental cleanup project. Current projections are that it will cost over $80 billion and take over four decades to complete the cleanup at Hanford.

Accelerated cleanup of the River Corridor portion of the Site will allow the remediation effort to focus on specific, near-term outcomes. Hanford's success in achieving these outcomes will reduce urgent risk, shrink the Site, remove contamination and wastes from the proximity of the river, and consolidate waste management activities on the Central Plateau.

Hanford has begun implementation of this vision. Performance-based contracts are being realigned to reflect the outcome orientation, including issuing a new River Corridor closure contract. This paper summarizes the outcome-based planning approach for other sites and interested parties. A brief introduction to the Hanford Site, along with detailed descriptions of the three outcomes is provided. This paper also summarizes the analyses and resulting products that were prepared in shifting to an outcome-based approach for closing the Hanford Site.

INTRODUCTION

The Hanford Site is a large and geographically diverse land area (1450 square kilometers) in southeastern Washington State (see Figure 1). The Site is crossed by the last free-flowing stretch of the Columbia River and contains large areas of pristine shrub steppe habitat. While DOE maintains primary responsibility for the Hanford Site, portions of the Site (the Wahluke Slope and the Fitzner-Eberhardt Arid Lands Ecology Reserve) are under the jurisdiction of the U.S. Fish and Wildlife Service.

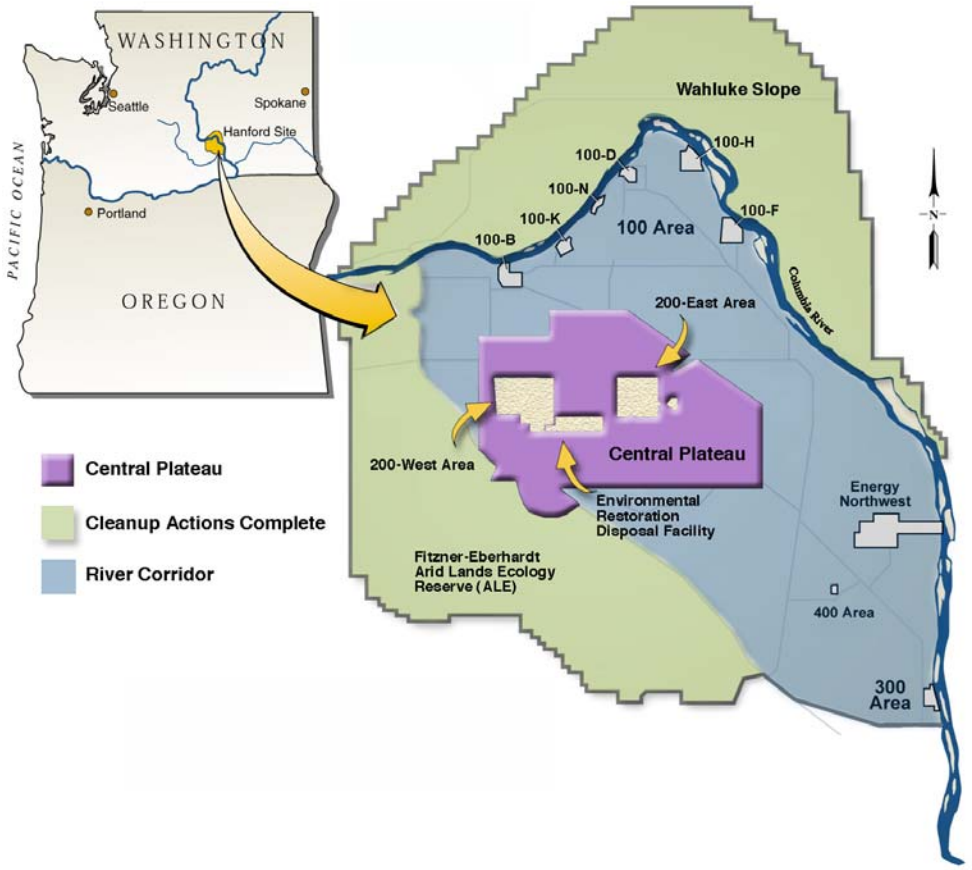


Fig. 1. Geographic Location and Principal Areas of the Hanford Site

Plutonium production activities (see Figure 2) at the Site between 1942 and 1988 left a legacy estimated at over 400 million curies of radioactive wastes and materials, nearly 500,000 tons of chemical wastes, and hundreds of contaminated facilities. Wastes were introduced into the ground and contaminated the vadose zone (the soil above the groundwater), the groundwater, and the Columbia River. The soil and groundwater beneath Hanford are estimated to contain 1 million curies of radioactivity and over 100,000 tons of chemicals. According to the Hanford Comprehensive Land Use Plan Environmental Impact Statement (2), about 4 percent of the Site is surface contaminated and 30 percent of the Site overlays groundwater contaminated from the past production of nuclear materials. The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) National Priorities List (NPL) includes Hanford as a contaminated site requiring cleanup actions.

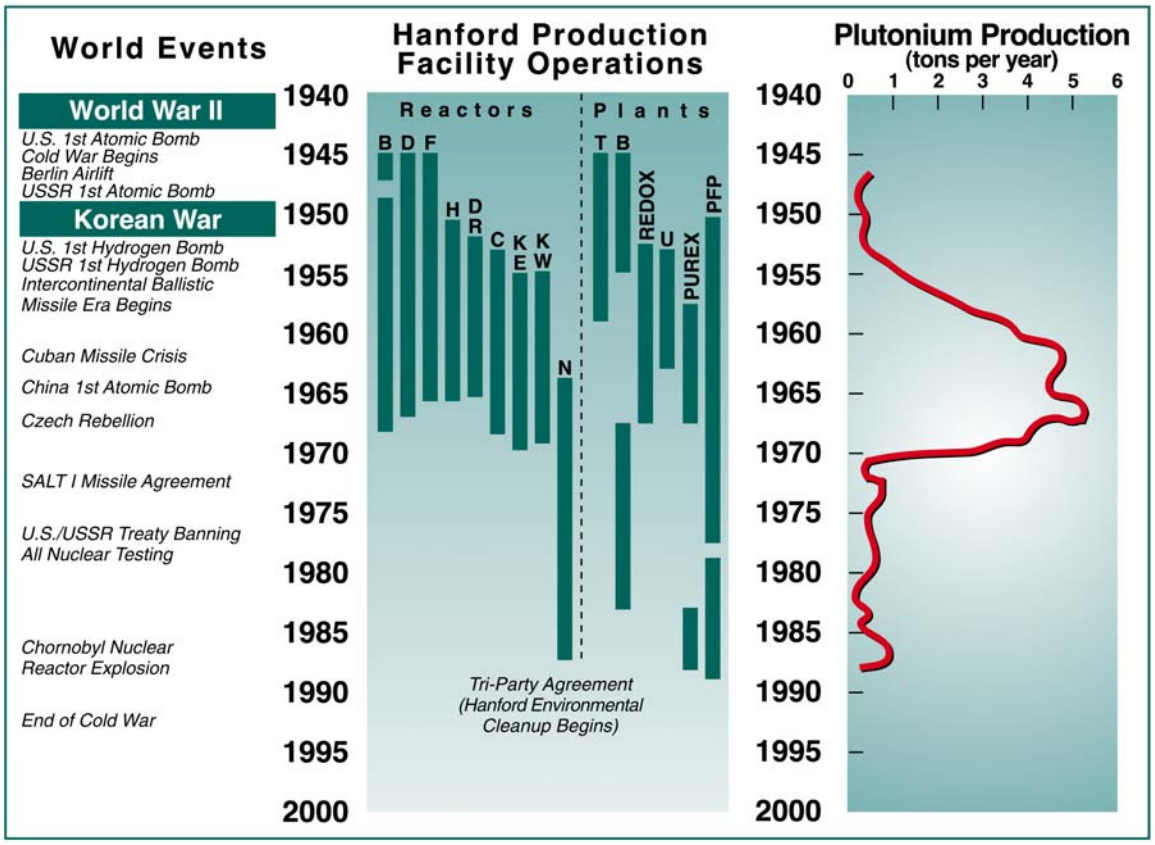


Fig. 2. Hanford Historical Perspective

The Hanford Site is divided into numerically designated areas according to historic general functions. The production reactors are located along the Columbia River in the 100 Areas. The reactor fuel reprocessing units and high-level waste (HLW) storage tanks are in the 200 Areas on a plateau approximately 7 miles from the Columbia River at the closest point. The 300 Area, located adjacent to and north of Richland, contains reactor fuel manufacturing plants and research and development laboratories. The 400 Area, 5 miles northwest of the 300 Area, contains the Fast Flux Test Facility (FFTF), a reactor formerly used to develop new technology for advanced liquid-metal breeder reactors.

The Hanford Site is home to two operations offices for DOE. The missions of these offices are as follows:

1. **RL Operations Office** – manages the "site-wide" portion of the Hanford's Environmental Management (EM) mission. Included within this scope are nuclear materials management, solid and liquid waste management, facility transition and disposition, and environmental restoration. RL also manages Hanford's Science and Technology (S&T) mission (including the Pacific Northwest National Laboratory) supporting both the tank and non-tank missions. RL is not responsible for the HLW tank portion of the EM mission.
2. **Office of River Protection (ORP)** – manages the tank waste portion of Hanford's EM mission, including waste storage, retrieval, treatment, disposition, and final tank farm closure.

Hanford is engaged in the world's largest environmental cleanup project, with many challenges to be resolved in the face of overlapping technical, political, regulatory, and cultural interests. Despite the complex nature of the work, RL is making progress toward restoring the Columbia River Corridor, transitioning Hanford's Central Plateau for long-term waste treatment and storage, and putting Hanford's assets to work for the future. At the same time, ORP, established by Congress in 1998, is safely managing Hanford's tank waste storage, retrieval, treatment, and disposal. The ORP and RL are working together to safely clean up and manage the Site's legacy wastes.

SHIFT TOWARDS AN OUTCOME-ORIENTED VISION

RL faces numerous challenges in performing its missions of environmental management and science and technology in the 21st century. To meet these challenges, a new approach to managing Hanford's activities has been adopted. The approach focuses on three distinct near-term "outcomes":

1. Restore the Columbia River Corridor.
2. Transition the Central Plateau.
3. Prepare for the future.

Success in achieving these outcomes will reduce urgent risk, shrink the Site, remove contamination and wastes away from the river, and consolidate waste management activities on the Central Plateau. This approach is progress-oriented, protects the environment, provides for the safety of workers and the public, maximizes the return on the taxpayers' investment, and demonstrates RL's commitment to the community. An outcome is defined as a collection of specific and well-defined project end points. Major Site objectives will be realized with the completion of these related end points.

RESTORE THE RIVER CORRIDOR

The "Restore the River Corridor" outcome is the best defined of the three outcomes, having clear, near-term objectives. The River Corridor outcome will reduce the footprint of active cleanup operations and free up large areas of land for alternative uses. The River Corridor outcome also has well-established end points with regulatory decision documents in place. This work can be accomplished in a relatively short time period (i.e., by 2012) using a performance-based, closure-type contract. Indeed, the relative straightforwardness of the River Corridor cleanup is the primary driver for its near-term emphasis. In comparison, many of the more difficult and challenging aspects of cleanup are associated with the Central Plateau, and must be addressed over a much longer-term life-cycle context.

The "Restore the River Corridor" outcome is specifically aimed at completing the vast majority of facility transition, environmental restoration, and facility decontamination and decommissioning (D&D) within Hanford's 100 and 300 areas by 2012. Successful cleanup of the River Corridor will allow more than 200 square miles of Hanford land to be released for

other uses, provide opportunities for public access to key recreational areas, protect cultural resources, and shrink the footprint for active Hanford cleanup operations to approximately 75 square miles.

History of Operations within the River Corridor

Hanford's River Corridor consists of approximately 225 square miles beginning on the shores of the Columbia River and extending inland to the "Central Plateau" in the middle of the Hanford Site (see Figure 1). Those familiar with Hanford will recognize the River Corridor as the parts of Hanford commonly referred to as the "100 Area" (where DOE and its predecessor agencies operated plutonium production reactors); the "300 Area" (where production reactor fuel fabrication and associated laboratory operations were conducted); and the "600 Area" (where DOE defined the open areas between these major operational areas). A portion of land that comprises the newly designated Hanford Reach National Monument is also within the boundaries of the River Corridor.

The first eight reactors built at Hanford beginning in the early 1940s as part of the Manhattan Project used cooling water on a once-through basis. To get rid of the unwanted heat from the fission process, water was pumped from the Columbia River, treated, and passed through the reactors' cores and eventually returned to the river. The N Reactor, built in the early 1960s, had a closed-loop coolant system. Besides plutonium, N Reactor produced steam and generated electricity for regional consumption. Changes in national policy in 1964 led to a big drop in plutonium production (see Figure 2) and the original eight reactors were shut down in the late 1960s. However, the N Reactor remained operational through 1987 to produce electricity and to support limited plutonium production needs. During the times when N Reactor was needed only for producing electricity, a byproduct of the operations was a form of plutonium not useful to the U.S. weapons stockpile. This irradiated fuel was stored in the spent fuel pools (basins) at the KE and KW reactors. By the time N Reactor was shut down and its spent fuel moved to the K basins, 2,300 tons of irradiated fuel had been accumulated, much of which has begun to corrode and deteriorate.

Facilities in the 300 Area were also built during the Manhattan Project for uranium fuel fabrication and research and development to improve plutonium production. Production increased nearly every year up to the early 1960s (see Figure 2). These increases were achieved not only by building more reactors and reprocessing capabilities but also by upgrading the existing reactors and processing plants. As a result, some of the original reactors operated at power levels ten times their initial capacity. This was possible only through the testing and development activities conducted within the hot cell facilities in Hanford's 300 Area. Further, improvements devised by this research also led to the replacement of major reactor and reprocessing plant components.

Accelerated Cleanup of the River Corridor - Objectives

Accelerated cleanup of the River Corridor portion of the Site will allow the remediation effort to focus on specific, near-term outcomes. Hanford's success in achieving this outcome will reduce urgent risk, remove contamination and wastes away from the river, and reduce life-cycle costs.

The major cleanup challenges associated with the River Corridor include:

- nine former plutonium production reactors and dozens of associated structures
- over 700 waste sites
- about 150 excess and aging facilities in Hanford ’s 300 Area (including complex radiological hot cell facilities)
- several groundwater contamination plumes.

Completion of the River Corridor cleanup will allow large portions of the Hanford Site to be made available for alternative uses. A report to Congress (3) has been prepared that describes the River Corridor outcome and is available on the DOE-RL web site at http://www.hanford.gov/docs/rl-2000-66/index.html. Figure 3 provides a summary of the objectives, scope, and schedule for the River Corridor outcome.

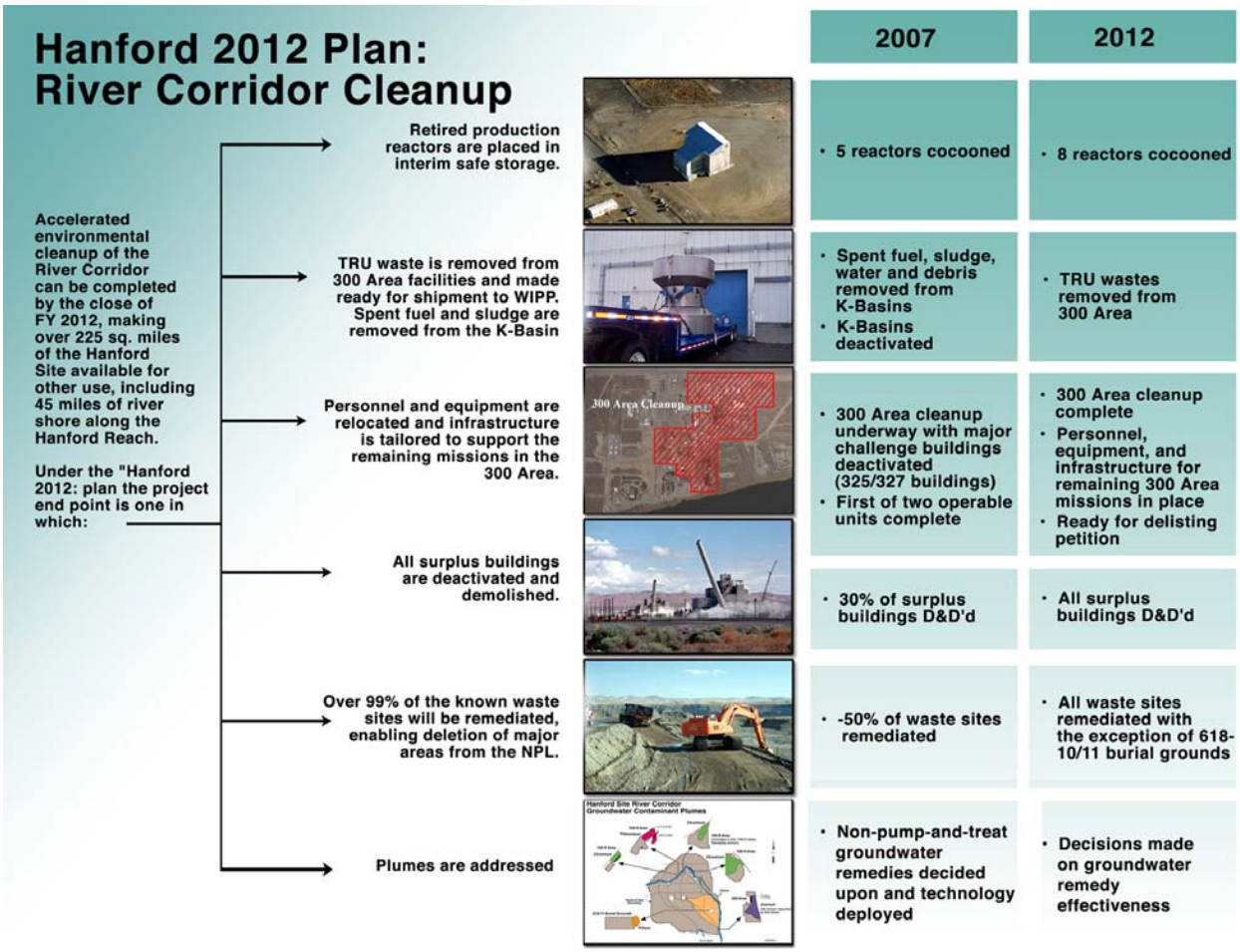


Fig. 3. River Corridor Objectives

The key River Corridor strategies are to:

- Remove radiological and chemical contamination sources from proximity to the Columbia River.
- Plan and execute the work as a continuous integrated project to eliminate the costs and delays associated with the turnover process and surveillance and maintenance.
- Integrate evolving technology by ensuring technology considerations are evaluated as part of review and validation of project baselines.
- Remediate liquid and solid waste sites in accordance with approved operable unit records of decision. In general, this involves removing, handling, transporting, and placing of contaminated media in the Environmental Restoration Disposal Facility on the Central Plateau. Institutional controls are implemented if wastes are left in place above unrestricted use levels.
- Work with EPA and the Washington State Department of Ecology to simplify the regulatory interfaces and documentation required to achieve the desired cleanup goals.

Restructuring the Hanford cleanup to focus on undertaking the River Corridor cleanup as an outcome accelerates cleanup of portions of the 300 Area by more than 30 years and results in significant cost savings (>$1B). In addition, by removing the traditional programmatic “stove pipes” (e.g., waste management, facility transition, environmental restoration), a more streamlined and efficient project will be realized.

Even though the majority of cleanup work in the River Corridor will be accomplished by 2012, a small fraction of cleanup actions will still remain after 2012. These conditions can be characterized as follows:

- Ongoing groundwater monitoring and stewardship activities will be required based on the final groundwater remedies.
- Remediation of the 618-10 and 618-11 Burial Grounds will be accomplished in the future once technologies are developed to allow for the safe and cost-effective removal and handling of the wastes.
- Final D&D and cleanup around the remaining operating facilities within the 300 Area will be accomplished in the future upon completion of their missions.
- The production reactors (with the exception of B Reactor) will be in Interim Safe Storage. Final reactor disposition will be accomplished in the future in accordance with the Hanford Production Reactor environmental impact statement record of decision.
- B Reactor museum, laser interferometer gravitational wave observatory, FFTF, and Energy Northwest facilities will remain until their missions are complete.

Future efforts surrounding these few remaining items must be coordinated with the Central Plateau activities to ensure that a consistent approach is taken towards long-term stewardship, waste management capabilities, protection of the groundwater, and potential future missions.

TRANSITION THE CENTRAL PLATEAU

RL is transitioning the Central Plateau from primarily inactive storage to active waste characterization, treatment, storage, and disposal operations. New, state-of-the-art, environmentally compliant facilities will be used to support completion of the Hanford Site cleanup. Some of these facilities, including the Canister Storage Building, Waste Receiving and Processing Facility, and Environmental Restoration Disposal Facility, have already begun operation. Others, such as ORP’s Waste Treatment Plant, are in the design and construction phase. The near-term aspects and the overriding focus of this outcome are the stabilization and consolidation of nuclear materials, spent nuclear fuel, and environmental restoration wastes on the Central Plateau. Once the River Corridor restoration is completed and the Central Plateau has been transitioned for long-term waste management operations, the focus on the Site becomes the Central Plateau where completion of ORP and environmental restoration activities is integrated into a comprehensive exit strategy.

History of Operations within the Central Plateau

The Central Plateau is approximately 75 square miles near the middle of the Hanford Site and includes the 200 East and 200 West Areas (see Figure 1). The 200 Areas are home to a large number of facilities formerly used for spent nuclear fuel processing and plutonium metal production, and to Hanford’s 177 underground high-level radioactive waste storage tanks, which are managed by the DOE Office of River Protection.

Processing of the irradiated fuel took place on the Central Plateau within five large concrete buildings (referred to as canyons), which used chemical processes to separate usable uranium and plutonium from unwanted or toxic byproducts. These facilities had thick shielding walls and were operated and maintained remotely to protect workers from the intensely radioactive fuel and acid solutions. A number of other major support facilities were constructed to assist in the chemical processing and waste management activities on the Central Plateau.

The highly radioactive wastes were stored in underground tanks. Lower-activity wastes were released underground via a variety of methods, and uncontaminated to slightly contaminated liquids and cooling waters were released to ditches and ponds. Chemicals were used to dissolve spent fuel and extract radionuclides from solutions. Hundreds of tons of acids (e.g., nitric and sulfuric acid); solvents (e.g., hexone or tributyl phosphate); and chemicals such as nitrate, ammonia, carbon tetrachloride, trichloroethylene, and sodium dichromate were used, released to the environment, or pumped into storage tanks.

In the 1940s through the early 1960s, 149 single-shell tanks were constructed in the 200 Areas. These tanks held from 500,000 to 1,000,000 gallons each and had only a single carbon steel liner. Leakage of waste from the tanks was suspected in 1956 and confirmed in 1961. By the late 1980s, 67 of the single-shell tanks were suspected to have released an estimated million gallons of waste to the soil column beneath the 200 Areas. Between 1968 and 1986, 28 double-shell tanks were constructed with two steel liners for improved containment. These tanks have capacities from 1 to 1.6 million gallons each. The double-shell tanks have proven to be reliable and have not leaked.

Over the past 60 years, some 75 solid waste burial grounds have been constructed and used at the Hanford Site to dispose of radioactive and chemical solid wastes; the majority of these burial grounds are located on the Central Plateau. Solid wastes consist of boxes, crates, and drums containing contaminated work clothing, rags, tools, and large equipment, including contaminated railroad cars and locomotives. Most wastes were buried in trenches. The more highly radioactive wastes were dropped directly out of heavily shielded casks through an elbowed pipe into cylindrical caissons buried under 15 feet of soil. The largest pieces of highly radioactive waste are stored in two underground tunnels near the Plutonium-Uranium Extraction (PUREX) Plant.

Transition the Central Plateau - Objectives

The transition of the Central Plateau contains a number of near-term elements surrounding nuclear material stabilization and packaging, waste treatment and processing operations, and environmental cleanup. By 2012, RL will have stabilized nuclear materials in the Plutonium Finishing Plant. RL will also have completed spent nuclear fuel recovery, packaged the fuel, and shipped it to the Canister Storage Building. Once these elements are completed (as well as the bulk of the River Corridor activities), the focus of the Site becomes the Central Plateau. The activities on the Central Plateau during the subsequent years (2012–2028) will largely consist of providing infrastructure and services supporting the ORP mission, shipping nuclear materials off-site, D&D of excess facilities, disposing of on-site and off-site low-level and mixed low-level waste, and completing other environmental restoration activities not directly associated with closure of the tank farms.

The final phase of the EM mission (2028–2046) will be dominated by the completion of the tank waste remediation efforts, the closure of the tank farms and associated waste sites, and the D&D of the remaining facilities. RL will provide the infrastructure (roads, water, sewer, etc.) and services (low-level and mixed waste disposal, transuranic waste packaging and shipment, liquid waste treatment, and analytical laboratory services) necessary to support the tank waste vitrification and closure activities. All off-site shipments of TRU, SNF, and HLW; deactivation and D&D of the treatment and storage facilities; and remediation of the remaining waste sites will be completed. At this point, the national EM mission continues but cleanup is complete, and long-term stewardship will be in full operation at Hanford.

As stated previously, the “Transition the Central Plateau” outcome is primarily intended to provide a near-term focus. It is aimed at achieving definitive end points over the next decade, while remaining open to any long-term end state associated with the completion of the EM mission at Hanford. Complementary planning efforts are currently under way to assess final end points for the Central Plateau and to develop a comprehensive exit strategy for later phases of the mission. This effort is intended to develop viable breakthrough alternatives for further schedule acceleration and reduction of life-cycle costs.

A conceptual list of principal objectives for the Central Plateau outcome is provided below:

- **Support River Corridor** – Perform waste management and other support functions necessary to achieve the River Corridor outcome.

- **Preparation for ORP and Cleanup** – Prepare (by modernizing, upgrading, stabilizing, and constructing) the facilities and infrastructure necessary to support the ORP mission and the Central Plateau cleanup. This includes the waste management treatment, storage, and disposal facilities necessary to safely treat and disposition the liquid and solid wastes arising from the cleanup operations.
- **Support ORP** – Provide waste management and infrastructure support to ORP and Central Plateau cleanup missions.
- **Perform Interim Actions** – Urgent cleanup challenges, such as stabilization of plutonium, interim groundwater and/or source control remedial actions, and disposition of key facilities will be undertaken as necessary.
- **Perform Final Exit Actions** – Final facility D&D, final waste site remedial actions, final groundwater remediation, and tank closure actions will be undertaken to prepare the Central Plateau for stewardship (which may include long-term institutional controls).

Successful accomplishment of these objectives will occur over an extended time-period. The "Transition the Central Plateau" outcome was developed to primarily focus attention on the near-term actions needed on the Central Plateau. Figure 4 provides an illustration of the complexity of the Central Plateau, its many related facilities and operational areas, and how the operations and cleanup actions will change the landscape over time.

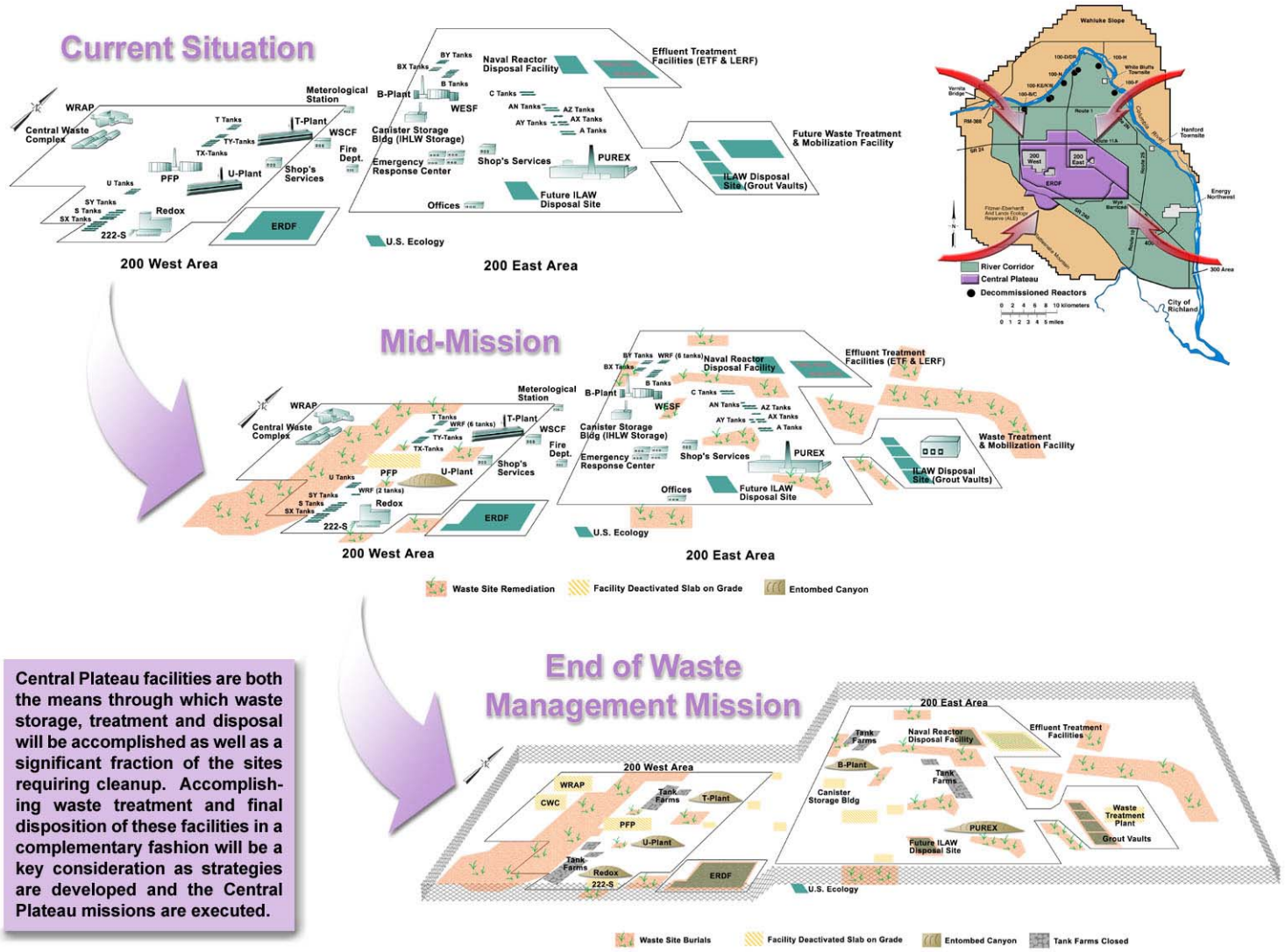
PREPARE FOR THE FUTURE

"Prepare for the Future" (commonly referred to as the "*Future*"), the third outcome described in the Hanford 2012 Plan, complements the first two outcomes ("Restore the River Corridor;" "Transition the Central Plateau") by describing additional factors and objectives that DOE will consider in executing its EM and S&T missions as it pursues the first two outcomes. In contrast to the first two outcomes that have distinct, well-defined end points described, the *Future* is more qualitative. It describes the principles and objectives by which DOE will manage its assets and investments to accomplish and enhance its EM and S&T missions. In the broadest sense, the *Future* outcome is about DOE's responsibility to taxpayers and community stakeholders to maximize the return on the assets and investments deployed for cleanup and S&T purposes.

As used in the conceptual model for planning Hanford's future (see Figure 5), the *Future* does not refer to just the residual conditions after DOE executes its cleanup and S&T missions. Rather, it refers to current and evolving missions and activities that either use or complement DOE assets and investments supporting cleanup and S&T missions.

Several existing missions are already under way and may be sustainable indefinitely. These include:

- U.S. Ecology (waste management)
- Energy Northwest (energy generation)
- Pacific Northwest National Laboratory (science and technology)
- Laser interferometer gravitational wave observatory (fundamental science)
- HAMMER (Hazardous Materials Handling and Emergency Response training)
- National Monument (preservation)



Central Plateau facilities are both the means through which waste storage, treatment and disposal will be accomplished as well as a significant fraction of the sites requiring cleanup. Accomplishing waste treatment and final disposition of these facilities in a complementary fashion will be a key consideration as strategies are developed and the Central Plateau missions are executed.

Fig. 4. Central Plateau Transition over Time

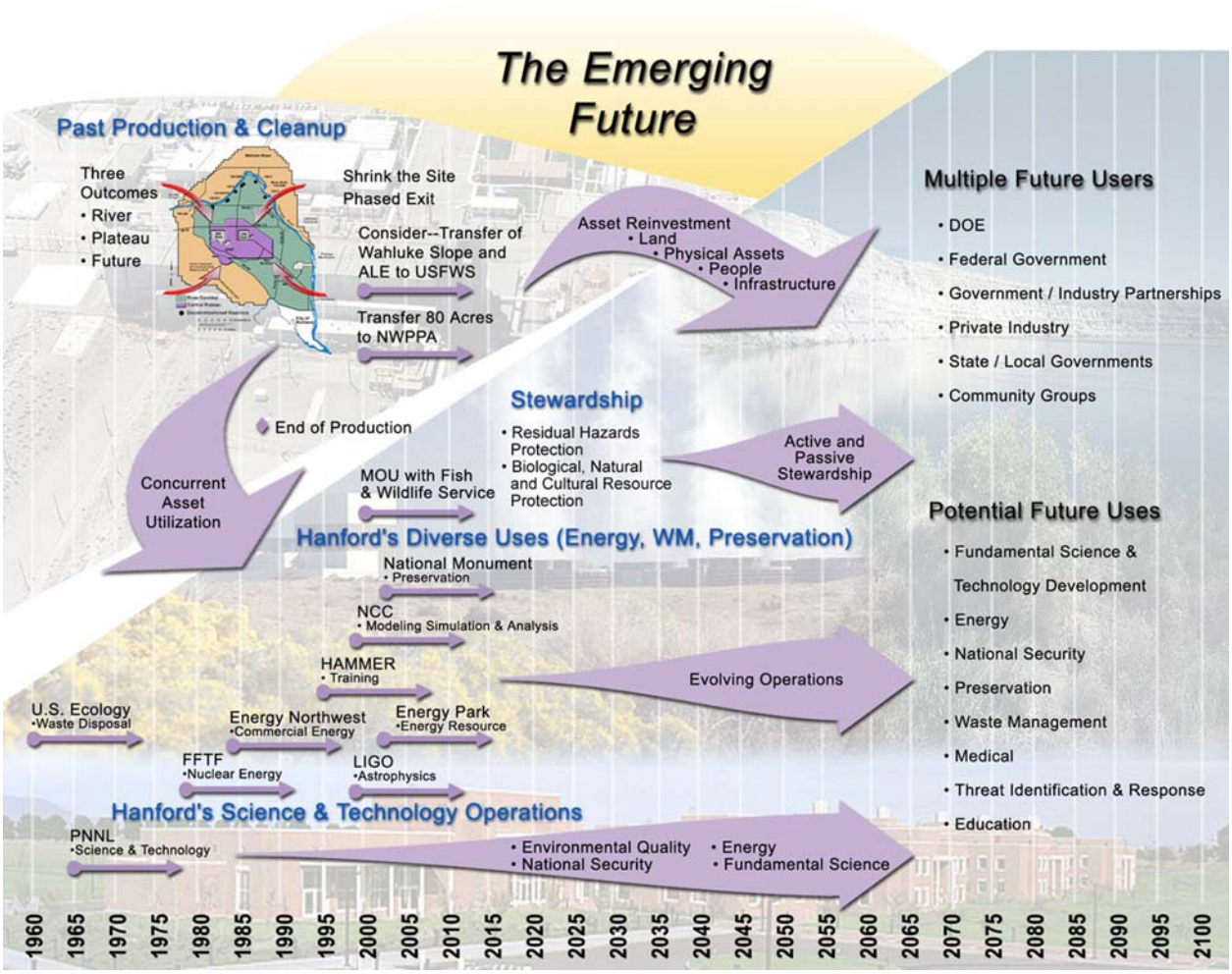


Fig. 5. Preparing for the Future Outcome Conceptual Model

While this list is by no means complete, these activities or missions illustrate some of the key principles for DOE's *Future* planning:

- We are already embarked on our *Future*. These complementary uses of DOE assets and investments have begun concurrently as DOE performs its current cleanup and S&T missions, and will evolve continuously as those missions proceed. Extending, evolving, and expanding these sort of complementary uses of DOE assets and investments is depicted in this conceptual model.
- The current list of complementary uses of DOE assets reflects multiple users and will continue to do so in the *Future*. DOE, Federal Government, government/industry partnerships, private industry, state and local governments, and community groups may all capitalize on these assets.
- The current list of complementary uses of DOE assets reflects a diverse set of activities. Many of these will continue and evolve, and it is anticipated that new activities will

complement these. In addition to continuing to grow and expand the current Hanford S&T mission, the *Future* may well support other DOE or federal missions that capitalize on DOE's assets and investments.

The current DOE assets deployed for Hanford cleanup and S&T are extensive, and will continue to grow as DOE expends billions of dollars more to complete its cleanup vision. This conceptual model for the *Future* involves leveraging these assets in order to enable additional users and activities to capitalize on them. The plan for the future will systematically address redeployment or reuse of the following sorts of assets:

- **Land** – DOE's 2012 Plan strategy involves reducing the active waste management/remediation footprint of the site, thus making land available for other uses prior to the completion of the cleanup mission. The conceptual model for the *Future* involves capitalizing on the unique features of Hanford land to enable its reuse for other DOE missions or for other users.
- **Physical Assets** – DOE currently operates numerous unique facilities, and will continue to develop and deploy additional facilities and equipment as it pursues its cleanup and S&T missions. Consideration of how DOE or other users might deploy these assets in concurrent or subsequent activities is an important aspect of planning the *Future*.
- **Infrastructure** – The anticipated presence of DOE (or some other federal agency) to maintain site security and basic site services during its period of active operations (~50 more years) and during its active stewardship activities (~ additional 100 years) provides a variety of opportunities for either complementary uses or cost sharing in the *Future*.
- **Human Capital** – DOE operations currently maintain a highly skilled workforce with diverse scientific, engineering, construction, and operational expertise in a number of highly technical domains. Systematic consideration of opportunities for segments of this workforce to support complementary activities or to be redeployed is a key element of this conceptual model. Focusing on the unique features of the workforce and specialized expertise will enhance the likelihood of identifying compatible *Future* users and uses of Hanford's manpower asset.

FEASIBILITY OF THE HANFORD 2012 VISION

Before the Hanford 2012 Vision could be actively pursued, it was necessary to confirm the financial and institutional feasibility of the undertaking. To this end, a multi-contractor working team was assembled in the spring of 2000 under RL's Assistant Manager for Integration to perform a comprehensive life-cycle planning exercise. This exercise, referred to as the RL Schedule Options Study, was tasked with determining how fast the River Corridor outcome could be pursued, assess various trade-offs and options, and provide recommendations for briefing various regulatory and stakeholder organizations.

The starting point for this effort was the identification of the shortcomings of the existing baseline schedule, that the existing baseline had an unrealistic funding profile, and that the technical logic and cost estimates were in need of revision. There was an overarching need for an *executable plan*—one that would give regulators and stakeholders an approach that could deliver desirable results in the near future within reasonable funding assumptions. As a result of

this effort, it was concluded that RL could complete cleanup of the River Corridor by 2012, meet basic site needs, and achieve meaningful progress on the Central Plateau – all within reasonable budget assumptions. These results were shared with DOE-HQ, Congress, the site regulatory community, and the Hanford Advisory Board to determine if any fatal flaws or institutional concerns exist that would prevent further implementation of the Hanford 2012 Vision.

IMPLEMENTATION OF THE OUTCOME-BASED VISION

To further develop the outcome-based vision for Hanford and to effectively communicate it to all the stakeholders, a number of strategic activities were recently undertaken after the schedule options study was completed. These activities can be categorized into two primary classes of actions:

- RL Management and Organization Changes:
  - Organizational alignment and management plans
  - Baseline Updates (including Baseline Update Guidance, Project Baseline Summary restructuring, Site Summary Schedules, and Logics)
  - Contracting Strategies.

- "Beyond 2012" – Long-Term Challenges and Issues:
  - Assessment of S&T Challenges and Opportunities
  - Resolution of cleanup challenges and constraints (including requirements analysis, regulatory alignment, and public involvement).

These activities are described briefly below.

RL Management and Organizational Changes

To fully execute a new cleanup strategy, a number of key organizational activities must occur. These activities include developing an organizational structure, adjusting funding mechanisms, and developing contracting approaches that are congruent with the goals and objectives of the new approach. These efforts are specifically discussed in the following paragraphs.

RL Site Organizational Alignment and Management Plans

RL has realigned its organization (adding Assistant Managers for both the River Corridor and the Central Plateau) to directly align to the outcomes. This reorganization replaced a more traditional RL organization that reflected funding "stove-pipes" representing traditional functional areas such as environmental restoration, waste management, and facility transition. In addition to RL, the Hanford Advisory Board (Hanford's citizen advisory board) has also reorganized its committees in a similar manner.

In order to articulate the roles and responsibilities of RL under this new organization structure, management plans for the outcomes have also been drafted. The River Corridor and Central Plateau management plans describe the EM program to be carried out on the River Corridor and Central Plateau, respectively. These plans describe the organization to do the work, the work

breakdown structure, and the technical, cost, and schedule baselines for each outcome. Each also describes how the RL Assistant Manager will manage cleanup and waste management operations and their associated contractor. Thus, performance management, interface management, and risk management are specifically addressed.

Baseline Updates

The preferred life-cycle option from the site schedule options study was translated into the contractor's baselines. The first step was the transformation of the existing Project Baseline Summary (PBS) and Work Breakdown Structure (WBS) to the new structure. This process included mapping the old structure to the new one. The next step consisted of obtaining concurrence and approval within RL and from DOE-HQ. Once these changes were agreed to within DOE, then baseline update guidance was prepared and provided to the contractors for the purpose of updating the cost estimates, schedules, and technical baseline elements. In addition to the baseline updates, site summary schedules and logic diagrams were prepared as a means to communicate the Hanford 2012 Vision.

Concurrent to the above activities, a number of strategic documents were prepared in order to communicate the Hanford 2012 Vision. Primary documents included *Hanford 2012: Accelerating Cleanup and Shrinking the Sit*e (1) and the *Hanford Site Columbia River Corridor Cleanup – Report to Congress* (3). These documents contained high-level descriptions of the outcomes, and described the fundamental elements, challenges, and expected benefits associated with each outcome.

Contracting Strategies

In order to achieve the maximum benefits from the outcome-based planning, changes were also necessary to align the contactors responsible for the work to the outcomes. Contracting changes included:

- Extension and renegotiation of the Fluor Hanford (FH) Management and Integration contract to a performance-based contract for the Central Plateau. This process was completed early in FY 2000. FH is now under contract as the prime Central Plateau contractor until FY 2006. FH also remains responsible for the high priority spent nuclear fuel consolidation and plutonium stabilization projects.
- Development of a closure-type contract for the River Corridor to replace the existing environmental restoration contractor, Bechtel Hanford, Inc. DOE's contracting approach, as evidenced in the draft RFP released in October 2001, includes features to incentivize early completion of closure activities for a significant portion of the Hanford Site. The contract structure also is intended to encourage cost savings throughout the period of performance of the contract, which lasts through the completion of the River Corridor Outcome.

"Beyond 2012" – Long-Term Challenges and Issues

In addition to the efforts undertaken to reorganize and adapt the business climate to the new vision, it was also necessary to specifically address the challenges, constraints, and issues

surrounding the longer-term final completion of the cleanup mission at Hanford. These longer-term issues were addressed in a comprehensive manner using focused workshops. These efforts were undertaken with full involvement of the ORP, the regulators, and stakeholders.

Hanford Site Cleanup Challenges and Opportunities for Science and Technology

In November 2000, RL initiated an effort to produce a single, strategic perspective of RL Site closure challenges and potential S&T opportunities. This assessment was requested by DOE-HQ, Office of Science and Technology, EM-50, as a means to provide a site-level perspective on S&T priorities in the context of the Hanford 2012 Vision. Within the context of an evaluation of the entire cleanup lifecycle, the objectives were to evaluate the entire cleanup lifecycle to identify where the greatest uncertainties exist and to determine where investments in S&T can provide the maximum benefit. The assessment identified, described, and analyzed eleven *strategic closure challenges* associated with the cleanup of the Hanford Site. Each of the challenges constitutes an important driver and opportunity for S&T development to advance the Hanford 2012 Vision through cost savings, schedule acceleration, or worker dose reduction. Near-term S&T investments are needed to resolve both near-term issues and long-term closure objectives. By focusing on a limited number of critical, high-payback activities, alternatives to current baseline technologies can be developed for those very high risk and/or high cost problems.

Full integration of these strategic closure challenges into RL's S&T research and development processes will ensure that investments made will result in the maximum benefits across the Hanford Site and are fully supportive of the Hanford 2012 Vision. The complete assessment (4) is available electronically on the Hanford Site Technology Coordination Group (STCG) website at http://www.pnl.gov/stcg/2238aall.pdf. An integrated S&T program is an essential element of the overall cleanup effort and is needed to provide both step improvements and breakthrough opportunities for accomplishing the cleanup within reasonable costs and schedules.

Cleanup Constraints and Challenges

To complete the transition to the outcome-based planning model, a final and very critical action was needed to focus on the longer-term end state issues and to align regulatory agreements with the outcome-based planning paradigm. To accomplish this action DOE established a Site team (dubbed the Cleanup, Constraints and Challenges Team – C3T) to collect and characterize constraints on Hanford operations, cleanup projects and infrastructure that restrict the Site's ability to capture increasingly valuable efficiencies. The intended outcome was to gain agreement among key Site parties (including DOE-RL, DOE-ORP, EPA, and the Washington State Department of Ecology) on which constraints can and should be resolved, while keeping cleanup on track. The resolution pathway will include the alignment of Site baselines, contracts, and the Tri-Party Agreement. The C3T held a number of successful workshops aimed at identifying and resolving issues that are constraining cleanup success at Hanford. As a result of these workshops, Hanford leadership is now pursuing resolution of four key constraints in parallel. They are:

- A collective and widely accepted vision of the future end state for Hanford will be developed, with specific emphasis on the Central Plateau.

- The Tri-Party Agreement (TPA) will continue as the guiding document for Hanford cleanup, and the contracts and other important cleanup mechanisms will be aligned with the TPA.
- Unnecessary layers of requirements and procedures being applied to cleanup activities will be removed.
- An "investment strategy" to ensure national support for vital Hanford cleanup activities will be developed.

By addressing the above constraints, with effective public involvement, it will be possible to adjust the regulatory framework (as described in the TPA) to align with the Hanford 2012 Vision and support the overall outcome objectives of accelerating cleanup and shrinking the Hanford Site.

CONCLUSIONS

The U.S. Department of Energy (DOE) Richland Operations Office's (RL's) approach to cleanup of the Hanford Site has changed. Today, RL is focused on acceleration of cleanup and specific high-level outcomes. Together, these outcomes represent a progress-oriented approach to cleanup that will protect the environment, maximize the return on the taxpayer's investment, and demonstrate RL's commitment to the community.

Embracing the priorities of Hanford's regulators, stakeholders, and area Tribal Nations—and understanding the absolute necessity to make real, visible progress sooner rather than later—RL has reorganized its work and set its sights on completing key pieces of the Hanford cleanup by 2012. This will enable RL to shrink the Hanford Site from 560 square miles to about 75 square miles.

REFERENCES

1. DOE-RL. *Hanford 2012: Accelerating Cleanup and Shrinking the Sit*e, DOE/RL-2000-62 Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington (2000).

2. DOE. *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, DOE/EIS-0222-F, U.S. Department of Energy, Richland Operations Office, Richland, Washington (1999).

3. DOE-RL. *Hanford Site Columbia River Corridor Cleanup – Report to Congress,* DOE/RL-2000-66, U.S. Department of Energy, Richland Operations Office, Richland, Washington (April 2001).

4. DOE-RL. *Hanford Site Cleanup Challenges and Opportunities for Science and Technology – A Strategic Assessment*, DOE/RL-2001-03, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington (2001).