PMI Project of the Year Award

Application
for

THE RIVER CORRIDOR BASE SCOPE PROJECT

(2005 – 2014)

I. INTRODUCTION / SUMMARY:

Figure 1: N Reactor Area in 2005 and today showing remediated and re-vegetated area along with completed safe storage of the reactor

The Hanford Site sits on 586-square-miles of shrub-steppe desert in southeastern Washington State (an area roughly half the size of the state of Rhode Island). For centuries, the Hanford area bordering the Columbia River was home to several tribes of Native Americans. Beginning in 1943, the site was used to produce plutonium for the bomb that brought an end to World War II. Additional production facilities and reactors were built in the late1940's and 1950's to support the Cold War, with the last reactor (N Reactor) being shut down in 1987.

At that point, attention turned to cleanup and the need to protect the environment from the legacy of plutonium production, which created large volumes of waste. Not only did the reactor buildings, support facilities, and auxiliary structures employed during the plutonium production days—many of which are contaminated with an extensive array of hazardous and radioactive materials—need to be removed, but also buried wastes and inadvertently contaminated waste sites needed to be remediated.

In 1989, accords were signed by the U.S. Department of Energy (DOE), the Environmental Protection Agency (EPA) and the Washington State Department of Ecology establishing commitments and milestones for the cleanup of the Hanford site. A major focus of these accords was safeguarding the Columbia River from potential contamination—the fourth-largest river in the United States and the river with the greatest flow of any North American river draining into the Pacific..

The primary strategy for protecting the river was to establish a remediation contract specifically for remediation of facilities and waste sites adjacent to the river. This contract, the River Corridor Cleanup Contract (RCCC), was awarded to Washington Closure Hanford (WCH) in 2005. WCH is a limited liability company owned by AECOM (then URS), Bechtel, and CH2M Hill.

The complete contract scope, which represents the largest DOE remediation contract, calls for cleanup of 220 sq. miles (an area slightly less than half the size of Los Angeles), which includes 46 linear miles of Columbia River shoreline (a stretch approximately equivalent to the entire Mississippi shoreline).

The work scope represents two major projects: 1) Completion of the Base Scope Project, representing $2.0 billion in scope, which is the focus of this nomination; and 2) completion of the $400 – 600 million of remaining scope, most added during the tenure of the contract.

As shown in Figure 2 below, the work on the Base Scope Project, which was validated as complete by the Department of Energy in March 2014, entailed removal of 284 facilities and the remediation of 523 waste sites. In the course of completing the work, WCH maintained a positive, average Schedule Performance Index of 1.10 and a positive, average Cost Performance Index of 1.17—resulting in a savings of approximately $227 million for US taxpayers. At the same time, the project maintained one of the best safety records in the DOE complex, at one point achieving 6 million hours without a lost-time

accident, the most ever achieved on a Department of Energy remediation contract. Currently, the project is in excess of 5 million hours.

As is suggested by this brief summary, the reasons for considering this project as the PMI Project of the Year become evident:

1) Elimination of a Massive Environmental Threat: The elimination of the serious environmental threat to the Columbia River cannot be overstated. Waste sites and contaminated facilities, many within a few hundred yards of the Columbia River, have been eliminated. More than 9 million tons of waste were removed and transported away from the Columbia River to the site disposal facility for low-level and mixed waste (a facility also operated by WCH as part of the RCC contract).

2) Excellent Contract Performance: As noted, this project is the largest DOE remediation project. Previously completed nuclear related remediation projects (the laboratories at Miamisburg, Ohio; the uranium complexes at Fernald, Ohio; and the nuclear production facilities at the Rocky Flats site in Golden, CO) represented remediation of 0.5, 1.6, and 10 sq. miles, respectively—as compared to WCH's 136 square miles.. Moreover, nine years of sustained safety performance complemented by a contract that saved money and completed ahead of schedule is in itself a performance worthy of recognition

3) Maintaining Excellent Stakeholder Relations and Successfully Negotiating Complex Technical Challenges: Although the size of the area and the number of waste sites and facilities remediated provides a strong indication of the challenge, it does not explain the full magnitude of the effort: In addition to meeting the milestones established between customer (U.S. DOE) and regulators, ongoing negotiations were required with three different Indian tribes to ensure operations maintained the integrity and appropriate respect for artifacts and sacred areas. And, on the technical side, numerous challenges existed—from chasing chromium plumes to depths of 85 feet to conducting complex lifts in radiation areas of nuclear reactors and support vaults that weighed more than 1,000 tons each.

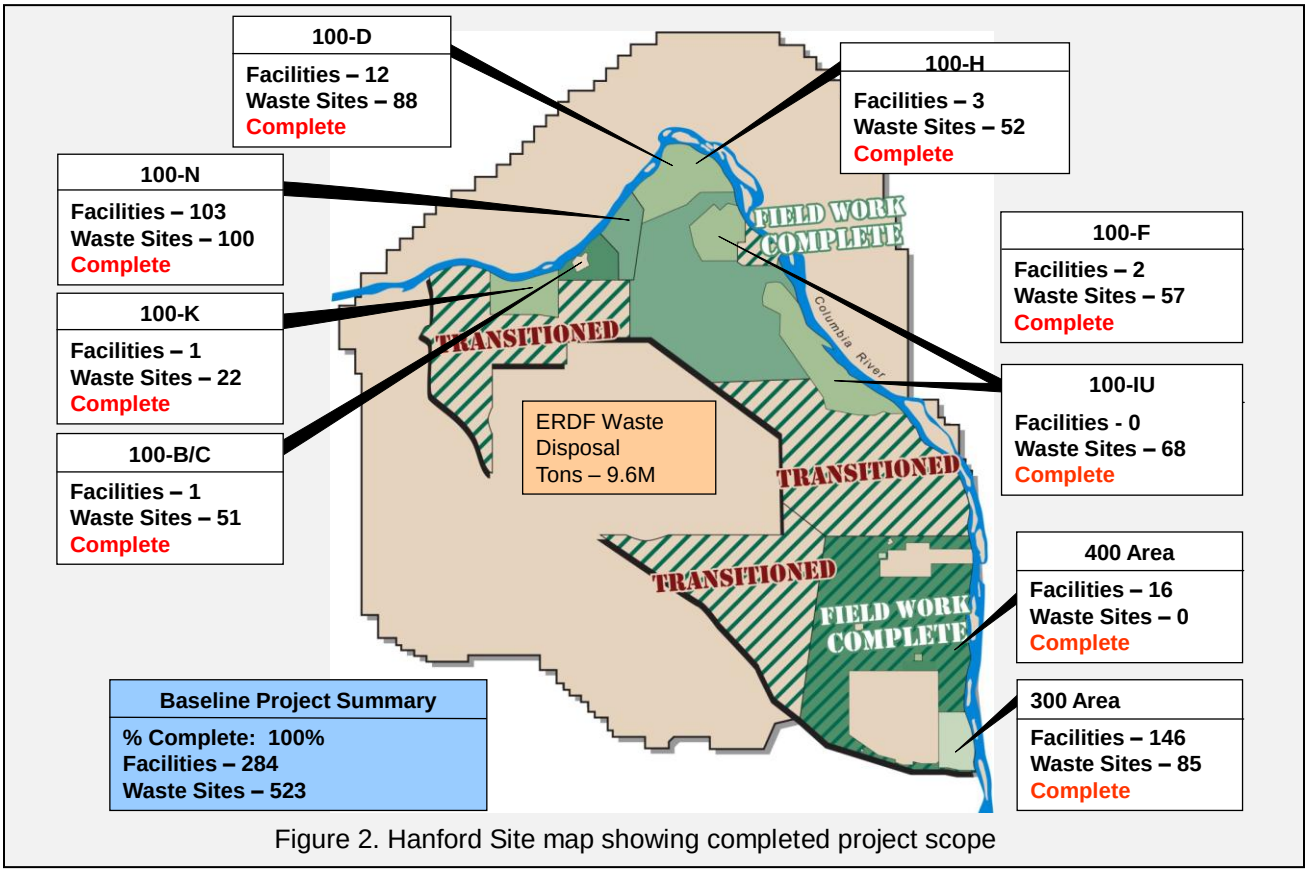


Figure 2. Hanford Site map showing completed project scope

II. SPONSOR LETTER

February 2, 2015

To: PMI Project of the Year Awards Committee:

This letter serves as my endorsement for the River Corridor Closure Project's nomination for PMI Project of the Year.

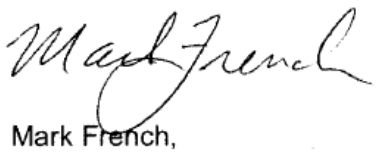
The Hanford Site occupies 586-square-miles in southeastern Washington State. The legacy of Hanford's 40 years of nuclear weapons production for the nation's defense includes buried waste, contaminated soil and groundwater, and contaminated buildings that must undergo cleanup and be torn down. Remediation of the waste sites and demolition of old facilities is required to prevent contamination of the Columbia River due to contaminants leaching from the soils into the groundwater. In 1989, the U. S. Department of Energy (DOE), Environmental Protection Agency (EPA), and Washington State Department of Ecology entered into a legally binding accord, the Tri-Party Agreement (TPA), to clean up the Hanford Site.

The means for cleanup along the Columbia River consistent with these accords was the 2005 award of the River Corridor Cleanup Contract (RCCC) to Washington Closure Hanford (WCH).

Within the RCCC contract, the Department of Energy established a schedule incentive associated with completing $1.8 billion of remediation scope. That milestone, as reflected in the nomination submittal, has been successfully completed—representing cleanup of approximately 136 sq. miles—including removal of approximately 300 facilities and remediation of more than 500 waste sites in former reactor, production, research, and support areas adjacent to the Columbia River.

In completing this milestone WCH also responded to additional scope that has been added to the contract during the course of the nine years, delivering more than $2 billion of scope for just under $1.8 billion. In addition WCH has maintained an excellent safety record and accomplished all TPA accord milestones either on or ahead of schedule.

For these reasons—safely completing work that helps protect the Columbia River, delivering work on schedule while providing substantial savings for the US taxpayers, and meetings its regulatory commitments on the largest DOE environmental cleanup contract—I endorse this nomination.



Mark French,
Federal Project Director
US Department of Energy
Richland Operations Office

III. SCHEDULE:

As described in the section on Cost, the River Corridor Closure Contract (RCCC) *Integrated Performance Baseline* (IPB) provides the life-cycle cost, scope, and schedule baseline. In addition to a cost incentive, the RCC contract also established a schedule incentive associated with completing the baseline scope of work that constitutes the scope represented in this nomination. Maximum schedule incentive—$32.8 million—was tied to completion in November of 2013; our actual completion date was January 31, 2014, which earned a schedule incentive of $30.4 million. Maintaining an accelerated schedule over the course of nine years—negotiating a wide range of technical, cultural, and environmental challenges; completing removal of 284 buildings and remediation of 523 waste sites disbursed across 220 sq. miles—could not have been accomplished without a very well-orchestrated schedule of activities.

Schedule Framework: The RCCC scheduling process supports the integration of the project's cost and schedule objectives in order to meet resource planning, performance measurement, and other project management requirements. The schedule control system ensures that work is planned and scheduled, establishes interfaces between project participants, and provides visibility of work progress and valid schedule information necessary to make timely management decisions.

The project scheduling hierarchy consists of four levels:

Level I Schedule – RCCC Master Schedule
Level II Schedule – IPB Baseline Schedule
Level III Schedule – Contractor Performance Plan (CPP) Execution Schedule
Level IV Schedule – Detailed Project/Functional Schedules.

The Level I master schedule is a graphic summary of the IPB schedule detail used to convey the overall project schedule baseline in a concise, easy to understand format. The Level II IPB baseline schedule (which is under DOE configuration management) is the WCH plan for accomplishing the RCCC scope of work. The Level III CPP execution schedule provides the detailed resource plan and detailed activities to accomplish the requirements of the IPB baseline schedule. The CPP provides a more detailed implementation schedule and forms the basis for determining IPB schedule progress based on earned value. Level IV detailed schedules are developed by projects and functions as required to support work execution.

The critical path method (CPM) is used to develop the IPB and CPP schedules. CPM analysis is used during the development of the baseline schedule and monthly to identify progress against baseline critical path(s). The baseline schedule is prepared at a level sufficient to address and display the scope of work for the project at the work/planning package level of detail for the RCCC period of performance. The execution schedule is prepared at the Code of Account/activity level. The execution schedule shows in detail the integration points between WCH, the DOE operations office (DOE-RL), and the regulators.

The execution and baseline schedules are monitored each reporting period for progress against planned accomplishments. Events not accomplished are reviewed by the Cost Account Manager (CAM) and corrective actions are developed and implemented. The River Corridor Contract Action Team (RCCAT) (discussed in the nomination section on *Cost*) reviews the progress each reporting period and required corrective action plans are approved, initiated, and tracked. Schedule status information is transferred to the cost processor for calculating earned value for the preparation of internal and external schedule performance reports.

Schedule Development: The RCCC scheduling system uses precedence diagramming to plan the work effort in a logic driven sequencing of activities. Predecessor-to-successor relationships tie schedule activities within all project phases, (e.g., engineering, procurement, construction, characterization, decommissioning, demolition, remediation, operations, final closure, etc.). This includes relationships to individual buildings, waste sites, activities, quantities, skills, crafts, and subcontracts required to accomplish the work. Estimates in dollars and/or labor hours are then applied to the schedule to provide time-phased resources. The schedule is resource leveled to achieve an optimum early-start cost/schedule position. In establishing the performance measurement baseline, non-critical path activities are examined in terms of their available float and their start dates may be adjusted to produce a "most-likely" execution schedule.

Schedule Traceability: Upon approval of the IPB and CPP, strict schedule traceability, both vertical and horizontal throughout the schedule hierarchy, is maintained.

Vertical traceability ensures alignment among the IPB, CPP, and detail schedules for effective schedule control. At status updates, changes in current schedules must propagate from the CPP execution schedule to the IPB schedule for appropriate visibility and performance reporting. Conversely, approved changes in scope to the *Project Management Baseline* (PMB) elements of the IPB baseline schedule must also propagate to the CPP execution schedule. The schedule system top-down planning approach, when coupled with the Work Breakdown Structure (WBS), ensures vertical traceability among all levels of schedules.

Horizontal traceability refers to the ability to relate the project time-phased activities in their logical sequence using predecessor-successor relationships and timing, as well as imposed constraints that control the start and completion of scheduled work and milestones. It also enables the determination of critical path(s) and evaluation of the effects of current schedule performance status on activities and milestones scheduled for accomplishment in the future.

The RCCC schedule completion is driven by funding constraints and schedule logic. The resulting longest path reflects the WCH preferred sequence for completing the RCCC scope considering several prioritization factors: 1. Risk reduction, 2. Regulatory compliance, 3. Closure acceleration, 4. Waste disposal efficiency, 5. Subcontracting efficiencies, and 6. Resource optimization. Since the preferred sequence is based on funding constraints, there is a large degree of flexibility in accelerating work on the longest path (critical path) through efficiencies in cost performance. The project management value of float, the amount of time that an activity may be delayed from its early start without delaying the project finish date, is diminished in a funding constrained schedule where work sequence is based on factors other than pure schedule logic. Project Controls assures that horizontal traceability is integral to all RCCC schedules.

Historical traceability provides an audit trail for all revisions to baseline and execution schedules. The Strategic Planning and Baseline Management group within Project Integration archives all changes to the IPB schedule and annual updates to the CPP schedule in order to provide historical traceability.

Schedule Status: The CPP schedule is updated to monitor schedule progress and also for use in analyzing variances and providing schedule information for Estimate-At-Completion (EAC) calculations. The CPP status is used to status the IPB schedule through the vertical traceability maintained in the common scheduling database. The IPB schedule performance data is used to provide the following requirements of the monthly performance report issued to DOE-RL: evaluation of project scope baseline accomplishments and commitment; evaluation of project baseline schedule performance, variances, and critical path; and evaluation of performance against target fee, and schedule.

In addition, the CPP schedule performance data is used by RCCAT to internally manage identification of acceleration initiatives, management actions required from DOE to enable acceleration, and WCH evaluation of performance against acceleration initiatives; estimates to complete and estimates at completion; and 90-day look-ahead forecast for major activities, milestones, and government furnished services and information (GFS/I) needs. Current schedule status against the CPP execution schedule is also directly transferred from the scheduling processor software into the cost processing software to support preparation of performance reports. As noted, the effectiveness of the scheduling process is accurately reflected in the fact that WCH has maintained an average positive Schedule Performance Index (SPI) of 1.10 for the project.

Schedule Change Process: Proposed changes to the CPP schedules may be initiated by any assigned project or functional personnel, and are not restricted to any one individual or group. The CAM, working with Project Controls, conducts an analysis of proposed changes, including identifying the "before" and "after" schedule comparison. As appropriate, RCCAT is responsible for final approval of changes to the CPP execution schedules, and for approving the submittal of IPB schedule changes to DOE for approval.

IV. COST

As in the case of essentially every project with a certified Earned Value Management System (EVMS), cost is recognized as one of the two foremost factors (the other being schedule). (OUR EVMS was certified by the Department of Energy (DOE) Office of Engineering and Construction Management (OECM) in 2007, and revalidated by the DOE Office of Acquisition and Project Management in 2013.) In our project, cost has a heightened importance owing to the structure of the contract. First, our contract is a closure contract: all particulars of the scope (i.e., waste sites to be remediated, buildings to be removed) are established in the contract along with a funding profile for the entire 10 years of the contract. The sequencing of work is at the contractor's (Washington Closure Hanford's—WCH) discretion; there are no annual work plans submitted to or approved by DOE. 2) Our contract includes a cost incentive. For every dollar saved, WCH earns 20 cents. These two factors require WCH to be judicious in all phases of work planning and execution—and, by extension, we must be rigorous in managing costs.

The Framework: A single *Integrated Project Baseline* (IPB) provides the life-cycle scope, schedule and cost baseline for accomplishing the complete River Corridor Closure Contract (RCCC) scope of work. It equals the sum of the target cost, target fee, and incumbent employee pension costs. As such, it provides the basis for detailed scope definition, cost estimate information, budgetary reporting, performance measurement, and performance reporting. More specifically, principal functions of the IPB include:

- Providing an integrated and traceable schedule baseline. This schedule baseline accounts for all milestones and commitments—regulatory, DOE, Congressional, and external;
- Providing an integrated and traceable cost baseline, with project resource plans, detailed resource estimates, budgetary requirements and delineating direct costs, indirect costs, fee, and pension costs;
- Providing a contingency profile that defines total cumulative project contingency utilization against time, with traceable links to the scope, schedule, and cost baselines;
- Providing the basis for calculating interim fee payments;
- Providing the overall project integration logic, integrating with --
    - the Environment, Safety, and Health Management System and associated programs,
    - the financial system to ensure consistent and accurate reporting of information,
    - the risk management plan.

Supporting the IPB, WCH uses a *Contractor Performance Plan* (CPP) as its internal execution plan. This plan, which is updated annually, provides activity-level definition and logic for the current year. Traceability between the IPB and CPP is maintained through the work breakdown structure (WBS), which provides a seven-level hierarchical structure: Level 1: RCCC; Level 2: Project / Function: Level 3: Area / Site (e.g., 100 B/C); Level 4: Operable Unit / Building Category; Level 5: Cost Account; Level 6: Scope of Work; and Level 7: Work Package / Planning Package.

Actual cost data are provided from the financial system to the Performance Management System on a monthly basis. Data is then validated and summarized via the WBS to generate performance and variance metrics. Earned value is determined at the activity level and summarized through all levels of the WBS up to and including total project. This information is then provided to DOE in a *Cost Performance Report (CPR)* that is attached to the RCCC *Monthly Performance Report*. The CPR provides WBS Level 5 detail on 1) current and inception to date Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP), and Actual Cost of Work Performed (ACWP); 2) cost and schedule variances, and 3) Budget at Completion (BAC), Estimate At Completion (EAC), and Variance at Completion (VAC).

Managing Cost**:** Directors are held accountable for maintenance of their cost accounts and for managing within the established budgets and EACs. Projects and functions cannot initiate work prior to approval / authorization by the River Corridor Closure Action Team (RCCAT).

Authority for authorizing work as well as cost performance oversight and integration are administered through the WCH RCCAT. This team, comprised of senior management, helps fulfill the three main objectives in overall WCH portfolio funds management: 1) ensure adequate funding has been allocated to the RCCC before performing work; 2) stay within contractual budget guidance and authority, and 3) ensure 100% (or near) the authorized / anticipated cumulative funding is being effectively utilized.

To achieve these goals, the RCCAT is charged with deciding what work is to be accelerated or deferred (considering the integrated project baseline and RCCC priorities), balance funding with scope; and meet the WCH goals and objectives. Risk and performance are also considered by the RCCAT in prioritizing the work scope. The RCCAT also acts as the contractor change control board for all changes affecting scope, cost, or schedule aspects of the RCCC. RCCAT also makes the decision on critical go/no-go decision points for risk mitigation actions, surface emerging risks to be added to the risk list, and confirm risk closures.

In making decisions, the RCCAT considers: 1) Risk reduction (to workers, the public, and the environment); 2) Regulatory compliance; 3) Closure acceleration; 4) Maximizing efficiency of waste shipments and disposal; 5) Subcontracting efficiencies (e.g., grouping similar work in a particular geographic area); and 6) Resource optimization: enhancing worker / material / equipment availability.

Every other week, RCCAT conducts a comprehensive portfolio management review. At this meeting (attended by senior management along with DOE and WCH project control personnel) each director reviews his / her CPP budgets and EAC's (both for the current fiscal year and lifecycle) and variances at the Cost Account level (Level 5 WBS). (Along with total funding, the EAC through the current fiscal year has the most influence on RCCAT decisions. An accurate EAC is of vital importance in order that funding is fully committed toward performance goals without jeopardizing or exceeding authorized funding.)

This RCCAT discussion is aided by use of a *Portfolio Management Assessment Sheet* that details available and projected funding, current fiscal year forecast, IPB and CPP budget data, the current BCWS, BCWP, contingency utilization, and actual costs. This meeting is also used to discuss and vote on assigning budget to emerging or confirmed scope changes affecting individual EAC's, the CPP, or contingency needs.

However, given the heightened attention on cost warranted by our contract structure, WCH has introduced an additional, more detailed set of cost reviews. On a monthly basis, an individual meeting is held with each project and functional director. These meetings are referred to as "4 on 2's" –attended by the director and his/her senior project control engineer and the WCH Project Manager, his deputy, the Director of Project Integration, and the Manager of Project Control. These meetings focus on and keep track of individual EAC's, headcount, cost variances, savings opportunities, trends, emerging issues, and status of any risk mitigation actions.

Cost Performance: Table 1 makes evident the effectiveness of our tools, management, and oversight of our portfolio management system. Over the course of completing the RCCC Base Scope Project, WCH completed approximately $2 billion in work scope for a cost just under $1.8 billion, maintaining an average Cost Performance Index of 1.17, and providing a taxpayer savings of $227 million.

Table 1. Project Cost Performance

CONTRACT PERFORMANCE REPORT					
WORK BREAKDOWN STRUCTURE					2/24/2014
Work Package.Baseline Scope Project	CUMULATIVE TO DATE				
WBS (2)	BUDGETED COST		ACTUAL	VARIANCE	
ITEM	WORK SCHEDULED	WORK PERFORMED	COST WORK PERFORMED	SCHEDULE	COST
(1)	(7)	(8)	(9)	(10)	(11)
I Baseline Scope	**2,032,185,394**	**2,027,201,827**	**1,799,778,428**	**-4,983,566**	**227,423,399**
1.01 D4-D4 Closure	527,317,912	527,708,805	474,672,266	390,892	53,036,539
1.02 ISS-Reactor ISS Closure	75,172,934	75,172,934	81,502,257	0	-6,329,323
1.03 Fld. Rem.-Field Remediation Closure	501,766,085	496,391,626	475,704,777	-5,374,459	20,686,848
1.04 Waste Ops-Waste Operations	522,734,945	522,734,945	409,114,044	0	113,620,901
1.05 ES/FC-End State/Final Closure	52,685,589	52,685,589	41,400,387	0	11,285,202
1.06 MS/GS-Mission Support/General Support	348,528,783	348,528,783	313,637,502	0	34,891,280
1.10 Transition	3,979,146	3,979,146	3,747,195	0	231,952

V. SCOPE

The RCC contract (DE-AC06-05RL14655) lays out the scope of work in significant detail, identifying each facility to be removed and each waste site to be remediated in Attachment J-1, River Corridor Contract Scope of Work. (Attachment J-1 is app 150 pages long.) Yet, significant effort remained in defining the contract scope.

Defining the Scope and Developing the WBS: As a first step in defining the work scope sufficiently to support effective work planning and execution, WCH initiated comprehensive walk-downs. The result was the identification of $398 million in material differences that were added to the contract as well as a 13-month extension to the contract.

Given the complexity of the work scope, the WBS employs seven levels, with each level of the hierarchy delineated using a reflexive numbering system:

1) Contract level
2) Project / Function (e.g., Field Remediation}
3) Area / Site (e.g., N area)
4) Operable Unit / Building Category (e.g., Building 309)
5) Cost Account (e.g., Confirmatory Sampling sites)
6) Scope of work (essentially J-1 elements)
7) Work Package / Planning Package.

These levels provide the framework for project planning, data collection, performance measurement, and reporting. They also provide the flexibility by which each Director can develop the appropriate level of planning, budget, and control. For example, while a director with a level-of-effort function might only plan and report at Level 5; fieldwork is planned and reported at Level 7.

However, before work could be initiated on the contract, a much more thorough understanding of each of the scope elements was required. Two particular challenges had to be successfully negotiated:

1) A common understanding among WCH, DOE, and the regulators regarding what constituted completion of each scope element. For example, resolutions were needed regarding whether a certain facility was to be removed down to its slab or if below grade removal was expected. Or, in the case of waste site remediation, what additional remediation might be needed in the vicinity of a designated waste site if, for instance, fences or small items not in the contract were found.

2) Given the complex regulatory environment, a complete analysis required both a detailed Work Breakdown Dictionary and a comprehensive analysis of regulatory requirements. The contract, in comparison, contains only general language about adhering to Department of Energy Orders and applicable laws and regulations.

Ensuring common understanding of scope elements was resolved with development of a comprehensive WBS Dictionary. At each WBS level, the dictionary provides a basic description and a narrative detailing the scope involved. For example, the Level 1 dictionary entry for Mission Support / General Support in part explains that "Mission / General Support consists of functional support and business operations necessary to achieve RCCC and field projects objectives. This includes providing trained and qualified staff, performance standards, facilities, services, and office supplies. The project functions are Safety Health and Quality; Regulatory and Environmental Management; Project Integration; Project Services; Engineering Services; and Office of the Project General Manager." Successive levels of the WBS dictionary then detail the substance of each of these functions and their respective components.

Capturing and aligning Department of Energy (DOE), legal, and regulatory requirements to work scope involved extensive analysis by teams of subject matter experts in a variety of disciplines. As an initial step, WCH established who was responsible for fulfilling each of the obligations cited in the contract, followed by issuance of a procedure establishing the methodology for reviewing and assigning responsibility for implementing contract requirements. Pursuant to issuance of the procedure, a variety of requirement-by-requirement reviews were conducted resulting in a *DOE Order Applicability Matrix*, a *Conduct of Operations Implementation Matrix*, and a *Training Implementation Matrix*. However, those documents still left a need to align an array of primary safety and environmental source documents with the particular scope elements.

A team was formed to focus on environmental, safety, and health requirements. An iterative process was completed involving reviews of contractual documents, interviews with subject matter experts, interactions with personnel in the various fields, and comparisons between the WCH-developed source lists and those developed at other Department of Energy sites. The resulting *WCH ESH&QA Source Document and Applicability Matrix* examines: a) Requirements source documents cited in the project's *Integrated Safety Management System Description*; b) environmental requirements documents; and c) other ESH&QA requirements documents. Further amplifying these efforts, WCH subsequently developed a separate *10 CFR 851 (Worker Health and Safety) Compliance Matrix*.

In the ES&H and 10 CFR 851 matrices, each source document is parsed into its individual requirements. Columns in the matrix then indicate whether the requirement applies to WCH-performed and/or subcontracted work; to which projects the requirement applies (i.e., some requirements are applicable to building demolitions, but not to open-air waste site remediation activities); how the requirement is implemented (e.g., reference to a procedure); and who within WCH owns responsibility for the requirement's implementation.

Finally, in support of the WBS, and as means to tie the WBS to costs and budgeting, a *Responsibility Assignment Matrix* (RAM) was developed. For each WBS element, this document identifies the budget at completion (BAC); the BCWP (budgeted cost of work performed); the percent complete; and the percent that is level of effort.

Following approval by DOE, the WBS was placed under configuration control and the process for making changes was documented—including requiring notification to DOE of any changes to Level 6 and higher.

Maintaining Scope Integrity: Over the course of the contract, the disciplined process has allowed WCH to maintain the integrity of its cost and scheduling activities despite significant scope changes: delays in release of some 300-area buildings for demolition; delays in release of the burial ground in the 600 area for remediation; negotiation of more than $100 million in Requests for Equitable Agreement, principally due to identification of additional waste sites; the successful completion of approximately $233 million in American Recovery and Reinvestment Act (ARRA) scope; and a deductive change, which removed approximately $360 million in scope.

This discipline has also been central in gaining customer and regulator agreement on completion of the Tri-Party Agreement milestones developed jointly by the DOE, Environmental Protection Agency, and the Washington State Department of Ecology. In many instances, had there not been the clarity of scope defined in the WBS and the WBS Dictionary, it would have been extremely difficult to come to consensus among the agencies regarding completion of milestones established in the accords.

However, one additional facet of managing the River Corridor scope is worth explaining. This contract has the toughest subcontracting goals of any DOE contract, including requirements to subcontract at least 60% of fieldwork and the requirement to spend at least 65% of subcontracted dollars with small businesses. Careful planning and analysis of the RCCC scope has allowed us to far exceed both those goals. Moreover, development of the aforementioned compliance matrixes has allowed development of an on-line tool that tailors requirements to subcontracted scopes of work. Project managers in conjunction with subject matter experts complete health and safety, environmental, and conduct of operations *Applicability Matrixes* identifying those requirements applicable to the subcontract scope of work. Based on these matrices, the subcontract exhibits delineate the applicable requirements.

The benefits of providing a tailored set of requirements are substantial: 1) Subcontractors are not forced to wade through a mound of controls and requirements in an attempt to determine (sometimes incorrectly) which might apply; 2) Greater degrees of compliance are evidenced, including more straightforward oversight of subcontractor compliance; and 3) Costs are reduced by not having subcontractors expend staff and resources on unwarranted controls, documentation, and reporting.

Overall, the processes and techniques employed in defining and coming to a common understanding of all scope elements have been an essential and direct contributor to the project's continued success—both in terms of actual performance and in maintaining excellent customer and regulator relations.

VI. TEAM

The teaming concept is evident at all levels at Washington Closure Hanford, from the partnering of the three companies that comprise the limited liability company (LLC), to the principal WCH organizations, to the individual work teams, and, ultimately, to the overall WCH team.

LLC Partners: WCH is comprised of three partners whose complementary expertise provides the ideal capabilities for completing the work on the River Corridor contract: AECOM (formerly URS and originally Washington Group International Inc.) is a top environmental project management firm, recognized for its leadership in integrated safety management. Bechtel is a top environmental construction firm, recognized for its project management leadership. CH2M Hill is a top environmental design firm, with strengths in regulatory strategies and risk management.

The LLC is managed daily by a President and Project Manager appointed by AECOM; a Deputy Project Manager appointed by CH2M Hill; and the Planning and Integration Manager appointed by Bechtel. However, all activities are run as an integrated team; there are no scope set-asides for specific parent organizations. Reinforcing this integration is the agreement that all employees (with the exception of personnel on short-term assignments)—whether inherited from the previous contractor or transferred in from the parent companies—become WCH employees. This commitment to an integrated operation is also reflected in bringing in corporate talent based on a "best player" basis—who can best help accomplish the mission, not based on who owns a particular component of the contract scope.

WCH Organization: The WCH organizational structure has directors for each of the four principal projects: a) waste site remediation; b) facility deactivation, decontamination, decommissioning, and demolition (D4); c) placing former plutonium reactors into safe storage (i.e., removing all above and below ground structures and systems up to the reactor shield wall and then constructing a safe storage enclosure around the reactor core); and d) the transport to and disposal of wastes generated by the other three projects at the Environmental Remediation Disposal Facility (ERDF) a centralized CERCLA—*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*—disposal facility operated by WCH as part of the contract. Support organizations include project integration, project services (business, administrative, and facility services), and Environment, Safety, Health and Quality Assurance.

Several factors ensure the projects and support functions operate in an integrated manner. The primary factor is the use of integrated planning. Although numerous remediation activities run concurrently, several factors ensure their alignment. Early on in the project, it became clear that waste transportation and disposal was the critical path to success of day-to-day operations. The timing and availability of disposal cans dictates the pace of remediation. Mutual cooperation is the only means of achieving mutual success. Projects have to integrate efforts—which sites are working on a given day, on what schedule, and with what anticipated waste volumes. Routine planning sessions involving Plan of the Day and Plan of the Week meetings, monthly progress reviews, integrated schedules, and waste forecasting all bind the projects into one integrated operation. (Figure 3 shows a summary level waste transportation forecast.)

This same integrated planning ensures that support personnel are available and in the right places at the right time. To avoid the traditional barriers that often accompany matrix organizations, not only do support personnel (e.g., procurement) participate in all project planning sessions, but there is also dedicated support provided to projects in those functional areas (e., industrial hygiene, rad technicians) where the sustained support is integral to operational success. In each of the various planning meetings, there is also clear identification of any functional support needed beyond the level routinely provided. This cooperation and alignment ensures that planning and project execution—all the way down from the strategic to the work package levels—has a complete and stable project team.

The success of this integrated planning is reflected in several ways: Foremost is the fact that the contract has an average Schedule Performance Index of 1.10. Of the 40 milestones established in the joint accord among the Environmental Protection Agency, the Washington State Department of Ecology, and the Department of Energy due up to the point of completing the Contract Base Scope Project, 35 were completed ahead of schedule, 5 on schedule. Similarly, all performance milestones established in the contract have been met on or ahead of schedule.

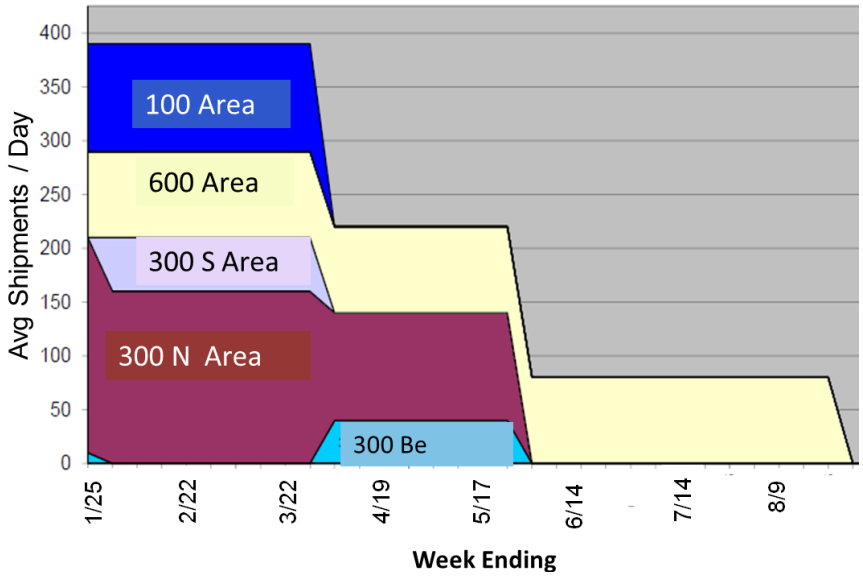


Figure 3. Sample high-level waste disposal projection

Work Teams: Integrated work teams are used on a routine basis and complemented by specialized teams when unique circumstances or operational challenges arise. Over the course of the contract, work has required numerous specialized teams. As examples, specialized teams were developed for (1) discovery of anomalies (including solids, liquids, and high-pressure cylinders.); (2) pipe hot tapping and liquid removal; (3) implosions/explosive demolition; (4) spent nuclear fuel disposition (capture, interim storage, characterization, and packaging); and (5) heavy lifts (some in excess of 1,000 tons). The teams developed the procedures and work packages, and executed the work while supported by dedicated personnel and equipment.

WCH Team Overall: The project mantra is "One Team for the Visible Cleanup of the River Corridor." While many companies speak of employees as their greatest resource, River Corridor lives it. As example, at the project onset, incentives were established for all employees based on cost and schedule performance, allowing each employee to personalize the correspondence between him- or herself and overall contract performance. Yet, a further measure of this one team belief was tangibly demonstrated when several years into the project the DOE changed policy and disapproved these incentives.

Although the company could have simply informed employees that incentives had been disallowed, the parent companies used fee they had earned to pay employees 75% of their incentives the first year incentives were disallowed and 40% the next. In the third year, in keeping with a commitment made at the outset of the contract, the corporations shared (on a 50 – 50 basis) the $30.2 million incentive earned for the timely completion of the Base Scope Project described in this nomination with the WCH workforce.

This effectiveness of this enduring commitment in coalescing all employees into a solid team was most accurately reflected when the Washington, DC headquarters of the Department of Energy administered a *Hanford Organizational Climate and Safety Conscious Work Environment Survey* in 2012. In that survey, WCH scored higher than the Hanford average on all 21 "climate factors". Perhaps most telling about the solidity of the WCH team was announced in the following quotation from the report:

> *"The employees' overall satisfaction with organization was measured indirectly by the level of the respondents' agreement with the statement 'I would recommend my organization as a good place to work.' . . . .Nearly three quarters (73.15%) of (WCH) respondents strongly agreed or somewhat agreed that they would recommend their organization…."*

Teaming—a reality at all levels of the WCH organization—is undeniably the backbone of our success.

VII. STAKEHOLDERS

One of the keys to WCH successes in delivering the RCC project ahead of schedule and under budget has been efforts to engage and establish collaborative relationships with DOE, regulators, other site contractors, state and local elected officials, Tribal Nations, and trustees. Open communication, from routine project status updates to actively soliciting innovative solutions to problem solving, has been utilized with the objective of building trust and aligning stakeholder values toward a common goal of completing the cleanup along the River. There have been many challenges along the way; the successes are a product of various project management techniques.

Regulators: The use of a Cost Plus Incentive Fee (CPIF) contract for the RCCC was a first of its kind at the Hanford site. In the beginning, WCH had to overcome many negative stakeholder perceptions related to how the cost and schedule incentives might affect remediation decisions and strategies. Stakeholders feared the incentivized structure of the contract would drive WCH to cut corners in areas like safety and regulatory compliance in order to maximize profit.

To countermand this perception, WCH held partnering sessions with regulators, conducted information briefings with trustee councils, and traveled to Native American communities early in the contract to share company values and to understand stakeholder interests. Together with continued communications, safe and compliant project delivery helped to build the trust of stakeholders.

As noted, cleanup at the Hanford Site is guided by a consent order among the Environmental Protection Agency (EPA), Washington State Department of Ecology, and DOE – called the Tri-Party Agreement (TPA). The TPA establishes cleanup sequence and schedule via a suite of milestones that are legally enforceable commitments. The success of meeting every milestone on- or ahead of schedule, has been the product of project management techniques to prioritize and drive schedule along with effective change management processes to negotiate milestone adjustments when differing site conditions were encountered. Partnering and trust became most tangibly evident in those instances when milestones had to be negotiated; in every instance, the successful negotiations demonstrated that trust had replaced the skepticism that existed at the onset of the contract.

In building a sustained relationship, WCH has held several week-long sessions with the regulators focused on defining ways to improve activities of interest to them. These sessions employed “lean manufacturing principles,” a tool that had its origins in the auto industry where Toyota developed it to streamline and automate car manufacturing. This approach was ideal for working with the regulators because it not only facilitates identification and implementation of process enhancements, but also was built upon the fundamentals of the power of respect for people. Two representative enhancements worked collaboratively with regulators were the following:

- Closure Documents. More than 500 waste sites have been cleaned up under the RCCC. Sampling designs and closure verification documents are prepared after waste and soil removal to demonstrate that cleanup objectives have been met and to obtain backfill authorization; the approval process involved multiple review cycles with DOE and the regulators. Results from the lean events included dramatic reductions in the number of comments received during review cycles; significantly reduced some forms from as much as 70 pages down to 4 pages; and reduced processing time by 30 - 50%.
- Chromium Remediation Sites. More than 140,000 tons of chromium contaminated soil have been excavated from River Corridor waste sites and disposed of at the Environmental Remediation Disposal Facility; much of the waste required treatment. Results from lean events reduced the need for double-handling of waste, not only simplifying and expediting the process but also enhancing worker safety. In addition, use of dedicated “super-dump” trucks with greater capacity than those trucks previously in use eliminated the need for radiological surveys and allowed direct disposal of the waste from the trucks into ERDF.

These Lean events helped forge greater understanding of the requirements of each party, strengthened communication pathways, and facilitated resolution of critical issues. The positive experience continued to flow through all project and regulatory relations.

Hanford Advisory Board: A broad range of stakeholders is represented by the Hanford Advisory Board (HAB), a non-partisan and broadly representative body consisting of a balanced mix of the diverse interests that are affected by Hanford cleanup issues (including community organizations, and representatives of local and state government agencies from both Washington State and Oregon). The primary mission of the Board is to provide informed recommendations and advice to the Tri-Parties on selected policy issues related to the cleanup of the Hanford site. The Board is also an integral component for some Hanford Tribal and general public involvement activities. During the course of the RCC project, WHC has routinely provided briefings at Board meetings, covering a range of topics from general project status to plans for specific demolition or cleanup activities. In many cases, these efforts have resulted in advice to the Tri-Parties or letters to elected officials that support RCCC project interests.

Cultural Legacy: Another unique challenge is the need to protect the cultural legacy at the Hanford site. The Hanford Site (and especially the River Corridor) has an abundance of diverse cultural resources, ranging from early prehistoric times to the atomic age. The River Corridor landscape is rich with Native American cultural, religious, and subsistence resources. Integrating preservation and protection of the cultural heritage into work planning and execution have been critical to success of the project. Before starting work, WHC conducts a cultural review process to ensure compliance with federal and state regulations that reflect the preservation and protection objectives. The process is an ongoing activity based on mutual respect that relies on interaction and relationships between WHC, DOE, and the Tribal Nations. During field activities in sensitive areas, WCH frequently coordinates with Tribal representatives to observe and monitor excavations for potential artifacts. WCH also conducts monthly cultural resource interface meetings with DOE and Tribal representatives to promote communication and provide status of current and upcoming projects.

Relatedly, access restrictions and protection of the Hanford Site to support its production and cleanup missions has resulted in preservation of the ecological resources and shrub-steppe habitat, especially in the open areas of the River Corridor. Following removal of contaminated waste and soil from waste sites to meet the cleanup objectives, excavations are backfilled with clean soil and re-vegetated with native plants and seed material. (The re-vegetation of N-reactor area shown in the photograph on the first page of this nomination included planting more than 45,000 plants and 1,500 pounds of seeds.) In many areas, WCH has successfully integrated stakeholder interests into the design—re-contouring areas to mimic a natural rolling landscape and create habitat rather than simply backfilling to grade. This has also reduced the amount of imported soil resources needed for backfill. The post cleanup landscape that has been achieved in the areas has received positive recognition from the DOE, Tribal Nations, and the US Department of Fish and Wildlife.

Local Community: WCH has proven itself one of the staunchest supporters of the local community. With full endorsement by WCH's three parent corporations, WCH accepted a contract that has some of the most demanding socio-economic goals of any contract issued by the DOE. WCH is restricted from self-performing more than 40% of the work scope. This translates into a major volume of subcontracting, which also entails rigorous challenges—foremost of which is the amount of work with small businesses. By contract (and subject to penalties), at least 65% of subcontracted dollars must be subcontracted with small businesses.

In response to these goals, WCH developed strategic subcontracting plans (which, among other features, defined small business set asides), helped guide development of several protégé companies, and initiated a broad outreach program—attending local forums, small business conferences, and trade shows.

The result has been an unparalleled demonstration of support for the local communities and economies. At the time that the Baseline Scope Project was completed, WCH had subcontracted more than $1 billion with small businesses, approximately 75% of which was placed in the two counties adjacent to the Hanford site. This value represented 92.5% of all subcontracted dollars, and accounted for 72% of the overall contract scope being assigned to subcontractors.

VIII. RISK

Given the technical, business, environmental, and even political risks associated with the River Corridor scope of work, risk management is an integral and highly visible component of WCH's project management process. Key attributes of the risk management program are ensuring risk is managed throughout the life of the project; involving all members of the management team in the identification, assessment, tracking, and resolution of risks; providing routine communication regarding the status of risks; tracking risks to resolution; and integrating risk information into the management of all related portfolio considerations—such as budgets, variances, schedules, and Estimates at Completion.

Program Initiation: During the project transition phase of the contract, a rigorous risk evaluation was performed. This evaluation resulted in the identification of 60 key risk items valued at $85 million. This initial set included both baseline risks (risks that are associated directly with specific activities in the baseline) and programmatic risks (risks that typically affect many or all aspects of a project, e.g., failure to acquire full project funding on schedule, labor issues, or natural phenomena).

These risks were documented in a 2005 formal report, *WCH-5, River Corridor Closure Project Risk Management Approach and Plan*, which was developed consistent with the requirements in Chapter 14, "Risk Management," of DOE Manual M 413.3-1, *Project Management for the Acquisition of Capital Assets* and the associated DOE Order (DOE O 413.1A). The plan also builds on similar approaches successfully implemented at other closure sites and incorporates applicable best practices cited in a risk management benchmarking study conducted by the Department of Energy that analyzed the practices of nine contractors at seven different DOE sites (DOE Report RPP-10932).

The *River Corridor Closure Project Risk Management Approach and Plan* lays out the process detailing how WCH integrates risk identification and analysis into our planning:

(1) Developing a risk management plan,
(2) Identifying risks,
(3) Assessing and quantifying risk,
(4) Developing risk mitigation plans, and
(5) Tracking risk mitigation measures.

To ensure the Plan was implemented, including the routine repetition of Steps 2 through 5 throughout the project lifetime, WCH appointed a Risk Manager. In addition to assisting in the identification and quantification of risk, the Risk Manager is responsible for maintaining the risk log (the list of all risk numbers), the risk matrix (which identifies the risk score based on the quantification of probability and consequences), and risk mitigation plans.

Risk Management Practice: Risks are identified by soliciting the project and functional directors to identify uncertainties associated with their scope responsibilities. The uncertainties are identified by screening and reviewing the scope, schedule, and cost estimate assumptions of the project activity. For each major element of the work breakdown structure (WBS), the risk manager queries the responsible project and functional directors as well as knowledgeable project team members to capture uncertainties in scope, schedule, or estimate, and to assess possible impacts to ongoing or future scheduled activities.

For each uncertainty identified during the risk screening, the responsible project or functional director forecasts the likelihood of an unacceptable outcome occurring. To assess severity of consequences, the project or functional directors forecast what might go wrong and what effect those occurrences will have on project cost, schedule, or technical performance characteristics. To the extent feasible, the consequences are quantified. For example, if a new technique is being applied that is lower cost with shorter schedule solution, traditional techniques can be used to bound the cost and schedule. Probability or likelihood of an event occurring is more judgmental. WCH project or functional directors, with the input of the risk manager, use their best judgment to assess probability. Probabilities are characterized as very likely, likely, unlikely, and very unlikely. Categories of severity of consequences range from negligible to crisis level (Table 2).

For each identified risk, a *Risk Mitigation Plan Template* is completed. The template identifies the risk, its probability, and its consequence score. The consequence is further delineated by cost and schedule impact for the best, most likely, and worst cases. This data is used to develop the global cost impact of all the risks through a Monte Carlo analysis (a probabilistic statistical evaluation of mathematical functions using random samples).

Area Impact	Table 2. Severity of Consequences				
	Negligible	Marginal	Significant	Critical	Crisis
Schedule	<1 month on a noncritical path item	1-3 months on a noncritical path item	>3 months on a noncritical path item; critical, any time >6 mo.	6-12 months on a critical path item	>12 months on total project completion
Cost	<$1 million	$1 to 5 million	$5 to 10 million	$10 to 50 million	> $50 Million
Technical or Other	Design feature must be changed due to small degradation from baseline performance or interface problem	Redesign of noncritical path item, or increased potential for regulatory intervention	Threat to mission, environment, or people that requires some redesign, repair, or significant additional	A major project goal will not be met, or an outside regulator shuts down the job for an indefinite period	Project cannot be completed

High or medium emerging risks are identified to the River Corridor Contract Action Team (RCCAT). As explained in the section on “Cost”, the RCCAT is the senior management steering committee chartered with deciding what work is to be accelerated or deferred, balancing funding with scope, prioritizing scope, and ensuring WCH is in a position to meet its goals and objectives. Risks that have been closed are also identified at the RCCAT.

The RCCAT reviews safety and compliance performance and project status; resolves any resource or cross-cutting issues in the performance path; identifies opportunities for work acceleration; challenges the status quo; shares lessons learned; and reviews worker concerns and suggestions. Identifying new risk issues and statusing or identifying issues and mitigation actions are also part of the process. The RCCAT reviews mitigation activities by exception, decides whether to deploy mitigation actions, and discusses risk closures to verify that any residual risk is acceptable.

Risk management is also included in the contract *Monthly Performance Report,* which is issued to the Department of Energy. The risk management section of the report includes emerging risks; risks closed during the prior month, risk mitigation activities due in the next 3 months, and unusual activities (unexpected cost or schedule impacts for mitigation activities, go/no-go decisions, or deployment of contingency for risk mitigation).

Overall Risk Program Performance: WCH’s ability to remain below cost and ahead of schedule is due in large part to a successful and well integrated risk management program. Table 3 summarizes the overall program activity:

Table 3: Risk Management Program Summary			
Cumulative to Date Risk Item Status		Cumulative to Date Risk Mitigation Action Status	
Open	31	Actions Planned	20
Closed	136	Actions Initiated	16
		Actions on hold	13
		Complete	278
Total	167	Total	327

IX. CHANGE

The River Corridor Closure Contract (RCCC) is a cost plus incentive fee contract (CPIF) with a specific end date; as such it is a closure contract—when the contract ends, the scope is complete.

Understanding the Nature of Changes: The salient elements of a closure contract (Federal Acquisition Requirement (FAR) based) are much different than the standard Management and Operation (M&O) prime contracts that the U. S. Department of Energy (DOE) has predominantly been using for the past fifty years. Some of the key differences between the RCCC and a standard M&O type contract are shown in Table 4:

Table 4. Comparison of Contract Types

Management & Operations Contract	River Corridor Closure Contract
A cost reimbursable/performance based contract	A cost reimbursable/schedule and cost performance incentive contract
Prime with pre-selected subcontractor	Single purpose Limited Liability Company (LLC)
Funding on yearly basis	Funding Profile for duration of contract
DOE owns much of cost/schedule risk	Risk shifted to contractor
Annual work plans prepared to authorize work	All work authorized by contract at inception
Annual negotiation of fee plan with DOE	CPIF structure – all fee at risk
Changes absorbed in annual work plan	All changes are formal and authorized by DOE Contracting Officer

During the transition and startup of the RCCC, Contracts and Project Integration teams identified key differences relating how added or deleted scope was administered between the RCCC and a standard M&O contract. These provisions govern a wide array of changes:

- Added or deleted scope (i.e., waste sites, facilities to be demolished)
- Material Differences True Up (one time opportunity to make corrections to the statement of work)
- Government Sequestration or shutdown (impacts to funding and/or schedules)
- Impacts to performance as a result of new requirements (e.g., addition of more stringent requirements for Beryllium characterization and disposal)
- Added DOE Orders
- New Clauses added to contract

The unique challenges arise from the fact that the RCCC contains a specific section that details the scope of work for the entire ten-year duration of the contract. Being that the RCCC is a CPIF contract (and therefore structured around contractually-established target cost and target fee), any scope changes identified during the course of the contract must go through a formal contractual process and can only be authorized by the DOE Contracting Officer.

Given these conditions, and given the magnitude of the cleanup area (220 square miles), it was understood that it was highly probable that scope would likely be discovered that was not identified in the initial contract. Accordingly, significant time and resource was expended in ensuring both a well-understood change process and an efficient change process.

Putting the System in Place: The WCH team conducted detailed reviews of all contract provisions central to administering the change process. Among the relevant contractual provisions were the following clauses: Differing Site Conditions, Authorization to Perform Scope, Change Order Accounting, Requirements for Cost and Price Data, and Changes to Target Cost and Fee.

However, the key provision is the clause, "Changes-Cost Reimbursement (Aug 1987) Alternate 1 (Apr 1984)." This is the key clause that allows DOE to add or delete scope to the contract.

> *The contracting officer may at any time, by written order, and without notices to the sureities, if any, make changes within the general scope of this contract….If any change causes an increase or decrease in the estimated cost of, or the time required for, performance of any part of the work under this contract, whether or not changed by the order, or otherwise affects any other terms and conditions, the Contracting Officer shall make an equitable adjustment….*

WCH's key objective therefore became making certain that this process was administered in an equitable manner. The first step was seeking clarification and interpretation of the applicable contract provisions. A series of letters were exchanged between the WCH and DOE Contracting Officers, along with meetings focusing on such matters as the contractual language regarding differing site conditions, determining how changes were to be made to target cost and fee, and establishing the correspondence between the budgeted cost of work performed and Requests for Equitable Adjustment (REA). The result was better understanding by both parties, a success achieved in advance of DOE having to begin exercising use of the changes clause.

Based on these exchanges and the recognition that the "changes" clause was not necessary or very seldom utilized in M&O contracts, the next step was ensuring a broader understanding of its meaning and use among the principals in both WCH and DOE. To this end, WCH developed a "changes" presentation/training tool. Following endorsement by DOE, WCH and DOE-RL conducted several group training sessions to discuss their respective processes for administering changes. The enhanced understanding enabled WCH and DOE to develop complementary procedures and processes.

As the contract progressed, it became evident that WCH's vision had been correct with regard to new scope being identified and the value of building a common understanding. DOE began requesting cost proposals in accordance with the "Changes" provision. However, the initial REAs submitted (which can run to lengths upwards of 100 pages in providing the required cost estimates, schedule, and any pertinent back-up documentation) resulted in numerous questions and a protracted, laborious approval cycle.

Working collaboratively, the issues (principally clarifying exactly what format would provide the most expeditious DOE review and the refinement of certified cost and pricing data) led to steady improvement in the process. Although the need to negotiate the elements contained within the REA remain, the process now allows DOE to perform timely technical and cost reviews and develop negotiation positions. This improved change process also has helped with expediting approval of those REAs (REAs in excess of $25 million) that require DOE Headquarters' approval. Table 5 provides a summary of the number and negotiated values of the REAs processed under the RCCC.

Table 5. REA Negotiated Scope Additions

Value ($ million)	REAs Negotiated	Target Cost Increase
<$1	88	$29,833,783
$1-$9	57	$187,148,189
$10-$25	17	$275,689,850
>$25 million	2	$97,811,609
Subtotal	**164**	**$590,483,431**

X. LESSONS LEARNED:

Over the course of the project, more than 100 formal lessons learned reports have been entered by WCH in *OPEXShare*, an online network of lessons learned and best practices administered by the Department of Energy for use by other DOE contractors, as well as by state and local government and their contractors. To increase dissemination of these lessons, WCH also issued a report, *Washington Closure Hanford Lessons Learned Summary Document,* summarizing lessons addressing a broad spectrum of topical areas: contract transition, the prime contract, human resources, subcontracting, technical issues, equipment, management, and contract closure.

Representing the range of lessons learned, the following five examples suggest how WCH has made effective use of lessons learned elsewhere and also some of the important lessons we have learned.

Putting Lessons Learned Elsewhere to Work:

1. Building a Safety Culture Is An Ongoing Process: An early analysis indicated that our Integrated Safety Management System (the integration of safety, health, quality, and conduct of operation into work planning and execution) was not sufficiently rigorous. Lessons learned at other sites allowed effective rebuilding of our program. However, lessons learned at other sites further identified areas to us requiring ongoing vigilance if safety was to become ingrained in our culture—not just overlaid on operations.

As example, a report issued following a significant accident at another DOE site concluded something as simple as the frequent use of indefinite terminology ("as required," "as needed," and "as necessary") had resulted in individual (and in this case, incorrect) decision-making. In response, WCH re-evaluated all work control documents to ensure that workers were being provided clear and precise direction.

In addition, WCH recognized the need for sharing best practices within WCH. Accordingly, using expertise and a model adapted from another DOE site, WCH created a Performance Oversight and Evaluation Team (POET) comprised of managers, subject matter experts, and operations personnel.

The POET's initial assessment looked at our primary performance assurance systems: corrective action management; internal oversight; integrated work control; and subcontractor oversight. Thereafter, extensive (one- to two-week) reviews have been conducted in each operational area. Each assessment provides a formal out-brief to WCH senior management and a formal report. All corrective actions are tracked to resolution and followed by an effectiveness review to ensure the efficacy of actions taken.

Incorporating externally learned lessons complemented by ensuring internal sharing of best practices has been a prime contributor to WCH sustaining one of the best safety records in the DOE complex. Current performance: > 5 million hours since the last lost workday accident; DART—Days Away Restrictions and Transfers Case rate—of 0.00; TRC—Total Recordable Case—rate of 0.28. (Rates = number of cases x 200,000/ actual hours worked.)

Lessons We Have Learned:

2. Actively Engage With Regulators and Customers: Ongoing and timely engagement with regulators is critical. Ensuring everyone is on the same page with the complexities of the work, hazards, and controls is important for many reasons, not only so the message is consistent when having external discussions, but also when trying to find the most efficient way to get the work done.

Key factors include ensuring everyone has the same end objective in mind; there may be differences in how to achieve a goal, but the major step is in ensuring there is a common goal. Also, step back periodically and look at each challenge from the point of view of the stakeholders to understand their perspective and their needs.

Where technical issues arose, we found that having the regulators meet with us at the work site often facilitated resolution. For example, at one waste site WCH unearthed bottles containing acids. Regulator meetings at the waste site resulted in a change that allowed hundreds of bottles to be disposed of in a single step rather than one-by-one as had been the process. Routine interactions with, and assigning a

full-time individual dedicated to communicating with the regulator, were also key to ensuring that everyone shared a common understanding of deliverables.

Bringing the customer to the field is equally important. Early on, the DOE Contracting Officer was routinely challenging our Change Notices. When we moved the discussion from the office to the field, his entire perspective changed. As it turned out, he had never been to the work site and was not aware of precisely how work was performed. Consequent to this site visit, the change process improved commensurate with his newly gained appreciation of the work. In addition, this added perspective helped him in discussions with his counterparts and DOE-HQ management.

3. Promote an Open Relationship With the Local Media: Time spent with the local newspaper reporters helping them to understand the work scope and how it is executed is time well spent. This engagement fostered many positive articles portraying our safety and technical performance.

However, perhaps more important was the coverage we got when issues arose. When subjects surfaced (most often about issues affecting the overall DOE complex as opposed to our particular project), local reporters came to us to get a better and complete understanding. The confidence they had that our responses were open, candid, and honest was reflected in the stories they published. Our relationship with the media has allowed us to communicate the story from our perspective to the general public.

4. Follow up on Employee-Driven Ideas: Being receptive to worker identified solutions is key to engaging the workforce and to taking advantage of the full breadth of available expertise. At WCH we have made a firm commitment to listen when employees talk. Two examples of how listening and giving latitude to employees to pursue new answers and approaches suggest the success of our efforts.

In one instance, a radiological engineer read a publication that suggested to him that there might be a better way for us to identify pieces of spent nuclear fuel buried in the waste sites. He was given the authority to pursue the concept. Working with other project personnel, he developed procedures for use of a new tool that was more efficient, improved safety, and appreciably improved project schedule. The second example, the change in bottle crushing procedure discussed above, was the result of one worker asking why we couldn't handle bottles as we do other waste: batch them together and then sample the batch. Working with the rest of the team, a process was developed that entailed placing the bottles in a large box, adding grout, using an excavator to crush the bottles, and then sampling the mix. The revised process, once demonstrated and approved by the regulator, was put into effect—resulting in significant improvement in worker safety as well as positive gains in cost and schedule performance.

5. Encourage Broad Understanding of the Contract and Performance Management Principles: As has been noted, the River Corridor Closure Contract is a Cost-Plus Incentive Fee (CPIF) contract. It is also a closure contract, meaning that when our work scope is done, there is no successor contractor. Both these factors are different from most DOE prime subcontracts; most commonly, DOE uses Cost Plus Award Fee contracts using a Management and Operations (M&O) structure—meaning that funding is provided annually and work is likely to continue through a number of successive contractors before all scope is complete.

The challenge in our case is that the limited experience with this contract type—both within WCH and within the DOE—has often resulted in actions contrary to the principles of the contract. Most significant is the fact that our contract is funded for the duration of the contract, meaning there is limited ability to introduce large amounts of additional scope without changing the funding profile. Ensuring both technical and contract personnel understood the reasons for resisting the tendency learned through other contracts of continuously introducing new scope or new initiatives was central to timely completion of the contract
.
At the same time, the contract's use of both cost and schedule incentives means that all levels of management have the potential for affecting not only safety, but also fees that are earned. Therefore, extensive EVMS training was not only required for all senior management and CAMs, but also offered to all management and supervision. Each manager's or supervisor's ability to make judicious decisions that consider all factors has not only contributed to the contract's success but also has enhanced each individual's credentials in preparation for assuming higher level management assignments.