

CLOSING ROCKY FLATS BY 2006

Nancy R. Tuor, Vice President Remediation, Industrial Building D&D and Site Services
and Strategic Planning and Integration

Allen L. Schubert, Director Strategic Planning

CLOSURE PROJECT BACKGROUND

The story of Rocky Flats reflects the story of the Cold War itself – from the buildup of nuclear arsenals and the demise of the Soviet Union to addressing the environmental problems left behind. From 1952 to 1989, the Rocky Flats site produced components for the nation's nuclear weapons arsenal. Rocky Flats received plutonium that was manufactured elsewhere in the DOE weapons complex and produced plutonium 'triggers' used to detonate nuclear weapons. The site also produced components made from enriched and depleted uranium, beryllium, and stainless steel. In 1989, production at Rocky Flats was abruptly halted to address environmental and safety concerns. From 1989 to 1994 Rocky Flats was faced with a great deal of uncertainty regarding future operations at the site.

As a result of fires and operational problems during the site's history and its abrupt shutdown, thousands of chemicals were left in untoward places, substantial undocumented plutonium and beryllium contamination of facilities occurred, plutonium liquids were left in process piping and tanks in unknown quantities and chemical configurations, and classified materials were left where they were being used or processed.

For the past five years, Kaiser-Hill has been setting the stage for accelerated cleanup and closure of Rocky Flats. Beginning in 1995, the Accelerated Site Action and Interim End State strategies were developed, defining a new vision for Rocky Flats. Then in July 1996, DOE, EPA and the State of Colorado signed the Rocky Flats Cleanup Agreement. This agreement defined the regulatory framework for the ultimate cleanup and closure of the site. In August 1997, Rocky Flats was designated as the first, large-scale, accelerated closure pilot project in the nation, giving top priority to reducing risks at Rocky Flats. In May 1999, Kaiser-Hill submitted the first 2006 closure project baseline, a seven-year work plan to complete the Rocky Flats Closure Project by the end of 2006. Figure 1 illustrates the closure project's end state.



Fig. 1. Closure Project End State

With a feasible plan, regulatory framework, stakeholder support, and congressional and executive branch commitment to the project, many of the success factors necessary to enable acceleration of the project were in place. However, the Kaiser-Hill integrating management contract was slated to expire on June 30, 2000. Recognizing the many accomplishments of Kaiser-Hill during its management of the site and its track record for performance and safety results, DOE invited Kaiser-Hill to negotiate a contract that would take the Rocky Flats site closer to the desired final vision.

On January 24, 2000, the DOE and Kaiser-Hill signed a first-of-its-kind closure contract to complete the Rocky Flats Closure Project by a target date of December 15, 2006, at a target cost of \$3.963 billion. This contract provides one more enabler to achieving the overall goal – return of the Rocky Flats site, possibly as an open space asset, for use by the citizens of Colorado and the elimination of a significant taxpayer liability.

The new contract improved on the previous contract in many ways by incorporating defined contract completion criteria that provide a clear end point for project activities, providing that the government will deliver certain services and items, and making a commitment to a continuous annual funding level of \$657 million per year through the term of the contract.

The contract completion criteria are:

- All buildings are demolished, except continuing water treatment facilities or other structures with a DOE-declared continuing mission
- All Individual Hazardous Substance Sites are remediated or dispositioned per the Rocky Flats Cleanup Agreement (as amended October 1, 1999)
- All wastes are removed except for some materials that can be left in place, recycled, or used as fill materials in accordance with regulatory requirements
- Closure caps are used for the remediation of two old landfills, the 700-Area, and the solar ponds or these areas are otherwise remediated in accordance with the Rocky Flats Cleanup Agreement (as amended October 1, 1999)

- Building foundations, utilities, or other remaining structures, paved roads and/or parking lots are covered by a minimum of three feet of fill after final grade
- Surface water onsite will meet health-based standards based on open space use calculated using methodology and toxicity assumptions utilized for the July 19, 1996 surface water action level
- Water leaving the site in Woman and Walnut Creeks meets the water quality standards established (as of October 1, 1999) by the Colorado Water Quality Control Commission

Kaiser-Hill aligned its strategic and technical approach in a revised closure project baseline published in June 2000, with the goals of the closure contract. The closure work can be categorized into four major areas: special nuclear material stabilization and packaging; facility deactivation, decommissioning, and demolition (D&D); offsite shipment of special nuclear material and waste; and environmental remediation (ER). The magnitude of the work ahead is perhaps best expressed by the numbers:

- **Special Nuclear Material Management** - stabilization, processing, and repackaging of more than 20 tons of plutonium and uranium and more than 28,000 kilograms of plutonium residues
- **Facility Deactivation and Decommissioning** - cleaning up and demolishing approximately 700 facilities totaling more than 3.3 million square feet of area, including more than 900,000 square feet of thick, reinforced-concrete plutonium buildings, more than half of which are expected to be contaminated
- **Offsite Shipment** – shipping nearly 11,000 truckloads of waste and nuclear material, as well as dispositioning thousands of containers of chemicals, items of government property, and classified documents
- **Environmental Restoration** - cleaning up and/or containing approximately 100 areas of contamination

To accomplish this massive undertaking, Kaiser-Hill developed an approach that achieves clean up of the site on an accelerated schedule. Key elements of Kaiser-Hill's approach include:

- emphasizing safety in all activities and in all areas
- eliminating the highest risks first
- reducing the site's mortgage costs to make more funds available for mission activities
- focusing the highest attention on the activities on the critical path (i.e., those activities which, if they slip, will significantly impact the schedules of other activities)
- maximizing workforce efficiency
- employing proven, innovative technologies and approaches to increase efficiency and safety.

CLOSURE PROJECT ACCOMPLISHMENTS

Since arriving at the site in 1995, Kaiser-Hill has delivered significant results to fulfill the scope of work for the Performance Based Integrating Management Contract – Kaiser-Hill's original Rocky Flats contract. While delivering these results for the Rocky Flats stakeholders, Kaiser-Hill was taking actions that would permanently change the face of Rocky Flats and the operation of the site. Beginning in 1995, Kaiser-Hill aggressively looked to resolve the most threatening risks to the workers and the surrounding community as the highest priority. The firm also

worked to achieve the most value for every dollar spent at the site by implementing strategies to improve efficiency and cost effectiveness. Kaiser-Hill affected a culture change across the site population, shifting the thinking from an operational mentality to a closure-focused mentality. Table I below lists special nuclear material management, decommissioning and demolition, waste management, and environmental restoration accomplishments to date. Following Table I, several other key accomplishments are highlighted.

Table I. Accomplishments to Date

Special Nuclear Material Management ▪ Drained, packaged and shipped 6 metric tons of highly-enriched uranium liquids ▪ Decontaminated, packaged, and shipped more than 30 shipments of highly-enriched uranium weapons parts and completed all shipments planned to Y-12 ▪ Size-reduced or disassembled more than 200 plutonium, highly-enriched uranium, and composite weapons parts and shapes ▪ Thermally stabilized hundreds of kilograms of plutonium oxide ▪ Completed all scrub alloy shipments to Savannah River ▪ Chemically processed more than 20,000 liters with 95 kilograms of plutonium and 5 kilograms of enriched uranium liquids ▪ Drained more than 450 plutonium and enriched uranium liquid tanks and 50 kilometers of process piping ▪ Identified and removed 34 kilograms of special nuclear material holdup in building ductwork and process systems ▪ Shipped 100 percent of plutonium pit inventory to U.S. DOE sites
Decommissioning and Demolition ▪ Demolished 94 facilities or 200,000 square feet of facility space ▪ Demolished first large plutonium handling facility in the U.S. -- 1 hectare of building space or 13 structures; 133 gloveboxes; 7,800 cubic meters of waste
Waste Management ▪ Processed 78,000 of 106,000 kilograms of plutonium residue waste ▪ Shipped more than 37,000 cubic meters of low-level and low-level mixed waste ▪ Lead the U.S. in transuranic waste shipped (76 shipments as of January 2001)
Environmental Restoration ▪ Cleaned up 7 of the top-10 environmental sites ▪ Completed 28 remedial actions ▪ Secured 96 no further action regulatory decisions

Protected Area Reduction

At Rocky Flats, special nuclear material is processed and stored in the site's Protected Area, a 150 acre area where four major former nuclear weapons production buildings still stand – Buildings 707, 771, 776/776, and 371. The majority of the nuclear weapons components were produced in the Protected Area between 1952 and 1989.

Special nuclear material project activities must take place with strict security, under the close watch of a large, highly trained security force. The site's security systems, personnel, and containment systems must remain in place until all special nuclear material has been accounted for and removed from Rocky Flats.

Entry to the Protected Area is limited to authorized personnel and/or material. The area is further controlled through one of three highly guarded and specifically designed security entrances called Personnel Access Control Systems. The Protected Area is a costly operation at the Rocky Flats site due to safeguards and security requirements. Therefore, the sooner the special nuclear material is removed from the site, the greater risk is reduced and the sooner the

Protected Area can be shut down at Rocky Flats. The absence of the Protected Area will allow freer access to buildings inside for the performance of facility decommissioning activities.

A key strategy to achieve project completion by 2006 is to close the Protected Area as soon as possible, but no later than September 2003. The earliest possible termination of safeguards is necessary to make resources available to perform facility decommissioning and demolition.

A recent strategy to shrink the size of the Protected Area by consolidating special nuclear materials in one building was implemented during 2000. As illustrated in Figure 2, the plan calls for nearly all special nuclear material to be consolidated into Building 371 by March of 2001. This will reduce the size of the Protected Area by approximately 125 acres, allowing more efficient access to the 700 Area for decommissioning activities. A number of Limited Areas where quantities of special nuclear material or classified material may reside will be required outside of Building 371. These areas are staffed with appropriate security personnel and protected by safeguards and security systems. As special nuclear material and classified materials are removed, the Limited Areas are removed.

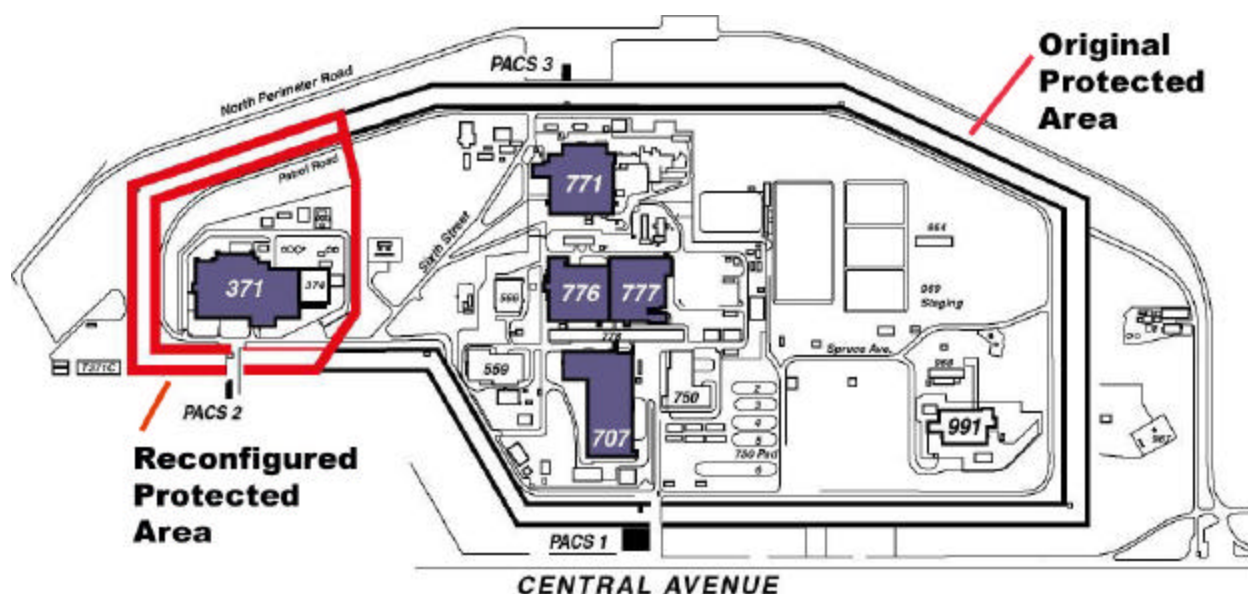


Fig. 2. Site Schematic Illustrating Protected Area Reduction

Decommissioning and Demolition (D&D)

Facility D&D includes all the activities necessary to take a facility out of operation and can involve deactivation, decommissioning, decontamination, dismantlement, and demolition activities. The strategy for D&D on the Rocky Flats Closure Project entails:

- Focusing on plutonium facility D&D first
- Deferring much of the uranium and non-radiologically contaminated facility D&D to the end of the project
- Implementing proven technologies and improvements to the D&D process

Early focus on plutonium facility D&D is based on two primary considerations. In some cases, D&D of a single building is estimated to take up to five years due to the presence of hundreds of gloveboxes containing large quantities of plutonium contamination, contaminated piping and ducting that extend for tens of miles, and contamination spread throughout some of the facilities from past plutonium fires and other releases. The second consideration is to identify and remove significant plutonium holdup from untoward places, thus enabling the closure of the Protected Area. Tens of kilograms of various forms of plutonium are believed to be dispersed in ducts, pipes, and equipment.

Kaiser-Hill expands and enhances its nuclear facility decommissioning capabilities every day by successfully performing decommissioning activities that have not been previously attempted in the DOE complex. The experience gained from these accomplishments is continually fed into Kaiser-Hill's strategy to improve decommissioning efficiency across the Rocky Flats Closure Project. With more than 3.5 million square feet of facilities to be decommissioned and demolished, significant cost and schedule savings can be achieved through economies of scale on a closure project that involves the massive amount of facility decommissioning required at Rocky Flats. In addition, safety enhancements are continuously incorporated to ensure worker and public safety and to enable achievement of Kaiser-Hill's goal to attain best-in-class safety excellence on the project.

Current decommissioning activities in former plutonium processing buildings are proving invaluable to the decommissioning strategy for Rocky Flats. Much was learned from the demolition of Building 779 in 1999-2000, the first plutonium building demolished at Rocky Flats. The next, and perhaps most significant, learning experience will be Building 771. Because of the chemical recovery operations that occurred in Building 771 from 1951 to 1989, the building could be the most contaminated facility at Rocky Flats. The building contains plutonium, uranium, asbestos, beryllium, PCBs, nitric and hydrochloric acids, caustics, and lead. In addition, an ancillary building within the Building 771 cluster houses approximately 40,000 liters of contaminated sludge. Together, these hazards present complexities that make the Building 771 decommissioning and demolition the most complex, difficult, and largest nuclear facility decommissioning ever attempted. Lessons learned from this decommissioning project will be applied across the remaining decommissioning work to yield safety improvement, cost savings, and process efficiency. Table II summarizes recent accomplishments on the Building 771 closure project.

Table II.
Recent Building 771 Accomplishments

102 gloveboxes removed
60 tanks removed
29 of 38 liquid systems drained
25 of 38 liquid systems removed
8 actinide systems drained – 3 months ahead of DNFSB milestone requirement
9,400 gallons of PCB-contaminated oils transferred to the Oak Ridge Site

Perhaps the most important strategy for the Building 771 closure project is improving safety, specifically in the Integrated Safety Management function of hazard identification and the development of controls. Key to this strategy is ensuring front-line supervisors have the

resources to determine when unforeseen hazards arise so that work can be stopped and appropriate controls implemented. The Building 771 closure project team also developed an effective way to deploy union resources during the accelerated closure effort. Kaiser-Hill's strategy for acceleration of the project calls for simultaneous performance of nuclear deactivation and decommissioning activities by members of the Steelworkers union and non-nuclear decommissioning activities by members of the Building and Construction Trades union. Kaiser-Hill is coordinating the work of the steelworkers and the building trades by dividing Building 771 in half. Steelworkers will complete deactivation activities on the west side of Building 771, then move to the east side. While steelworkers are completing deactivation activities on the east side, building trades will be working on the west side.

Size Reduction

Accelerating nuclear facility decommissioning requires deployment of several proven technologies. One technological advance is the use of remote arms to handle heavy-duty industrial tooling (nibblers, saws, and grinders). Remote arms ease the strain on workers handling heavy tools for extended periods of time, distances the workers from the cutting surfaces, and most importantly, reduces worker radiation exposure.

To improve worker radiation protection, Inner Tent Chambers were installed in late 1999. Additionally, during 2000, Kaiser-Hill initiated the use of plasma-arc cutting technology for component size reduction. Fully automated robotics capable of operating the tools mentioned above is also being investigated for use at the site. Use of robotics will enable efficient size reduction of metal and other materials, but more importantly, will provide additional safety for D&D workers.

Waste Shipping

The Rocky Flats Closure Project entails the movement of tremendous quantities of radioactive wastes. Significant progress has been made in the offsite shipment of these materials. Although only a fraction of radioactive wastes have been removed to date (about 13%) when compared to the estimated total amount that will be generated during the entire project, Kaiser-Hill has demonstrated the ability to rapidly increase the amount of waste shipped each year since assuming management operations at Rocky Flats in 1995. From 1990 to 1995, the Site shipped less than a thousand cubic meters of radioactive waste. From 1995 to January 1, 2001, Kaiser-Hill has shipped 37,000 cubic meters of radioactive waste.

Much of this progress was due to the following changes:

- A focused management effort to increase radioactive waste shipment consistent with the change in the mission of the Site to one of accelerated closure
- Implementation of a program to ship directly from the point of generation rather than from interim storage locations
- A move from 55-gallon drums to large, bulk type waste containers
- Use of DOT's regulations for shipping "surface contaminated objects" for the shipment of large quantities of the Site's low-level wastes

Additionally, Kaiser-Hill has continually sought to reduce waste disposal costs on the closure project. Low-level waste represents the largest waste volume to be disposed – over 175,000 cubic meters remaining. Due to the quantity of low-level waste to be disposed, this waste category offered tremendous potential for cost savings.

During 2000, Kaiser-Hill, working with the Nevada Test Site, initiated a new type of low-level waste disposal contract. Under this pilot contract, instead of paying a per-cubic-meter disposed charge for low-level waste, Kaiser-Hill will pay the Nevada Test Site an annual disposal fee. Under this arrangement, the Nevada Test Site will accept all low-level waste generated from Rocky Flats. This approach helps both the Nevada Test Site contractor by improving their management of their human resources at the Test Site as well as help Kaiser-Hill save \$10s of millions in projected future disposal costs.

Residue Processing

At Rocky Flats, plutonium residues are by products of plutonium production and are in the form of salts, ash, wet combustibles, dry combustibles, dry inorganics, sand, slag and crucible, and fluorides. In 1995, there was an estimated 3 metric tons of plutonium contained in 106 metric tons of residue matrix needing to be processed. Because of the varying characteristics of the residues, each residue type requires some type of processing and repackaging to meet WIPP waste acceptance criteria and safeguards requirements. For example:

- High-risk salts were pyro-oxidized then repackaged into pipe overpack containers (POCs). High-risk salts were completely repackaged in July 1999
- Lower-risk salts were blended as necessary to meet safeguards requirements and then repackaged into POCs. Lower-risk salts were completely repackaged in November 2000
- Ash residues are blended as necessary to meet safeguards requirements and then repackaged into POCs
- Wet combustibles, one of the most challenging residue streams to process, are repackaged with an absorbent and neutralizer and then placed in 55-gallon drums. Some wet combustible sludges will be blended and then placed in POCs
- Dry inorganics were size-reduced as necessary, and then packaged in either POCs or 55-gallon drums
- Sand, slag and crucible are either repackaged directly in POCs or blended and then placed in POCs
- Fluorides will be blended and then repackaged in POCs

Originally, residues were processed and repackaged in Buildings 776, 707 and 371. To support PA reduction and closure, all remaining residue repackaging operations have been consolidated into Building 371.

As of January 1, 2001, 73 percent of the residues have been repackaged for transport to WIPP. The plan is to complete all residue processing and repackaging by May 2002.

Project Management

The massive technical scope of the closure contract demands an effective, coordinated management approach. The project requires a strong, well-thought-out integrating management structure, and a foundation of systems for planning, safely executing, and controlling the thousands of individual and interrelated work activities in accordance with the closure project baseline. Because increased efficiency is critical to funding schedule acceleration, a constant focus on performance improvement and increased productivity is required. The project must also be managed in accordance with union collective bargaining agreements and in a manner that engages and satisfies the many stakeholder groups that are actively involved in the project. Finally, the project demands forward thinking and action to anticipate and resolve problems that could negatively impact the project's cost and schedule.

Kaiser-Hill's contract with DOE provides the basic underpinning of the project management structure and organization. Except for those services and items provided by the DOE, Kaiser-Hill is responsible for delivering all of the services and supplies necessary to complete the closure contract through a network of subcontractors.

Key to effective management of any project is a well-defined project organization with clear roles, responsibilities, and reporting relationships. For Kaiser-Hill, the company's organizational structure was realigned to match project responsibilities. Kaiser-Hill's primary project management responsibilities are:

- Develop a life-cycle project plan, including technical and budget resource requirements
- Assemble the requisite resources from within Kaiser-Hill, its subcontractors and/or other offsite resources
- Ensure that all cross-site interfaces are managed and executed properly
- Assign work scope and allocate a balanced, prioritized budget with agreed-upon performance criteria and incentives to the subcontractors
- Provide oversight of the subcontractors' performance, ensuring safety, work quality, budget control, and adherence to scope and schedule
- Serve as the point of contact for all internal and external interfaces, and manage those interfaces to ensure efficient and effective project execution

To fulfill these responsibilities, Kaiser-Hill has developed an efficient organizational structure with the following key components:

- Four plutonium building projects – Buildings 371, 707, 776/777, and 771 – responsible for delivering the special nuclear material stabilization, processing, removal, and packaging tasks and building D&D elements of the project
- A waste management and offsite shipping project – Material Stewardship– responsible for streamlining and accelerating waste and special nuclear material shipment in a manner that ensures safety, compliance, and cost efficiency
- A facility D&D, operations and maintenance, and environmental remediation project – Remediation, Industrial D&D, and Site Services – responsible for delivering all site operations services including: utilities, transportation, maintenance, and security; the

decontamination and decommissioning of uranium and non-contaminated buildings; and all environmental remediation activities across the site

- Support organizations – responsible for ensuring site-wide integration and delivery of safety, environmental compliance, human resources, communication, planning and project controls, and finance and administration

All activities of the closure contract scope of work are assigned to these organizations. A Kaiser-Hill Project Manager directs each organization's activities. These Project Managers lead integrated teams of Kaiser-Hill technical experts, appropriate support staff, and subcontractors to accomplish each of the work activities. Kaiser-Hill's organization for the closure project is illustrated in Figure 3.

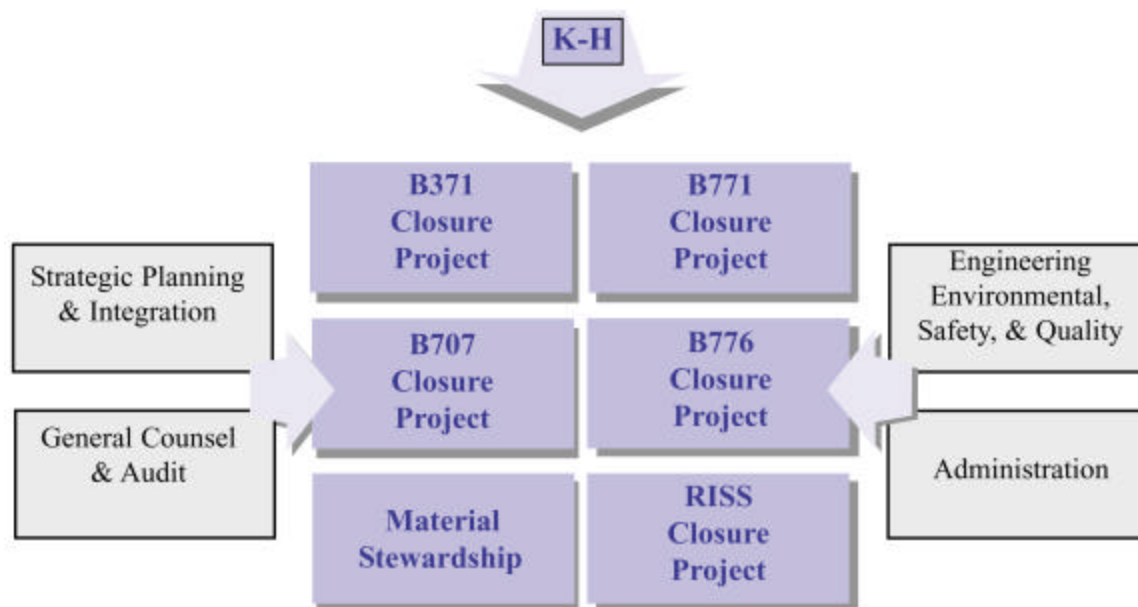


Fig. 3. Kaiser-Hill Project Organization

During 2000, Kaiser-Hill successfully implemented a project-focused organizational structure that streamlined project activities into key closure projects, eliminated three management layers, and continued shifting employees out of administrative jobs and into mission work. Projectization of the accelerated site closure project has improved overall delivery of the project and efficiency across all project areas.

CLOSURE PROJECT CHALLENGES

Achieving the physical completion criteria in the closure contract will be immensely challenging under any timeframe. Kaiser-Hill and the Rocky Flats employees will be performing work the size and complexity of which has never been done anywhere in the world. Developing the technical approach for the closure project baseline required taking a different look at the entire

project – including work scope, critical path, activity sequencing, resource utilization, efficiency improvement, technology deployment, and fund availability – to formulate a plan that could get the job done safely by December 2006.

Table III details performance on the project since 1995 and the significant amount of work to be completed between now and project completion.

Table III. Closure Project Metrics

Key Closure Activities	Completed as of January 2001	Work to be Completed
Special Nuclear Material Stabilization and Packaging		
Pu Stabilization and Processing	0 containers	2,000 containers
Pu Residue Processing/ Packaging	78,000 kgs	28,000 kgs
Facility Deactivation and Decommissioning		
Type 1 Facilities (free from contamination)	93,851 sq. ft. (82 facilities)	1,270,848 sq. ft.* (529 facilities)
Type 2 Facilities (without significant contamination or hazards)	40,630 sq. ft. (11 facilities)	1,172,787 sq. ft.* (176 facilities)
Type 3 Facilities (significant contamination/hazards)	64,790 sq. ft. (1 facility)	925,002 sq. ft.* (6 facilities)
Offsite Shipment of Special Nuclear Material, Waste, and Other Materials		
Pit shipment	100% of inventory	COMPLETED
eU parts destined for Oak Ridge	100% of inventory	COMPLETED
eU parts destined for other DOE sites	0% of inventory	100% of inventory
Pu parts destined for LANL	85% of inventory	15% of inventory
Pu parts destined for SRS	90% of inventory	10% of inventory
Pu Metals and Oxides	0% of inventory	100% of inventory
LLW shipment	20,000 m ³	176,000 m ³
LLMW shipment	17,000 m ³	45,000 m ³
TRU/TRM shipment	500 m ³	14,300 m ³
Environmental Restoration	28 sites	174 sites of which 100 are projected to require remediation

*based on anticipated facility typing

Key challenges of the Rocky Flats Closure Project arise from: the sheer volume of work to be accomplished in a short period of time; the fact that nuclear D&D of this complexity has yet to be performed anywhere in the United States; the waste shipping rate planned for the project has never been attempted in the DOE complex; and Kaiser-Hill's commitment to maintain the highest safety standards while dramatically increasing work activity and facing increased hazards.

Emphasis on safety and efficiency are critical to overcoming the numerous technical challenges of the closure project. Kaiser-Hill's specific goals to improve project efficiency include:

- Maintaining the rate of stabilizing and/or repackaging plutonium residues achieved during 1999 and 2000

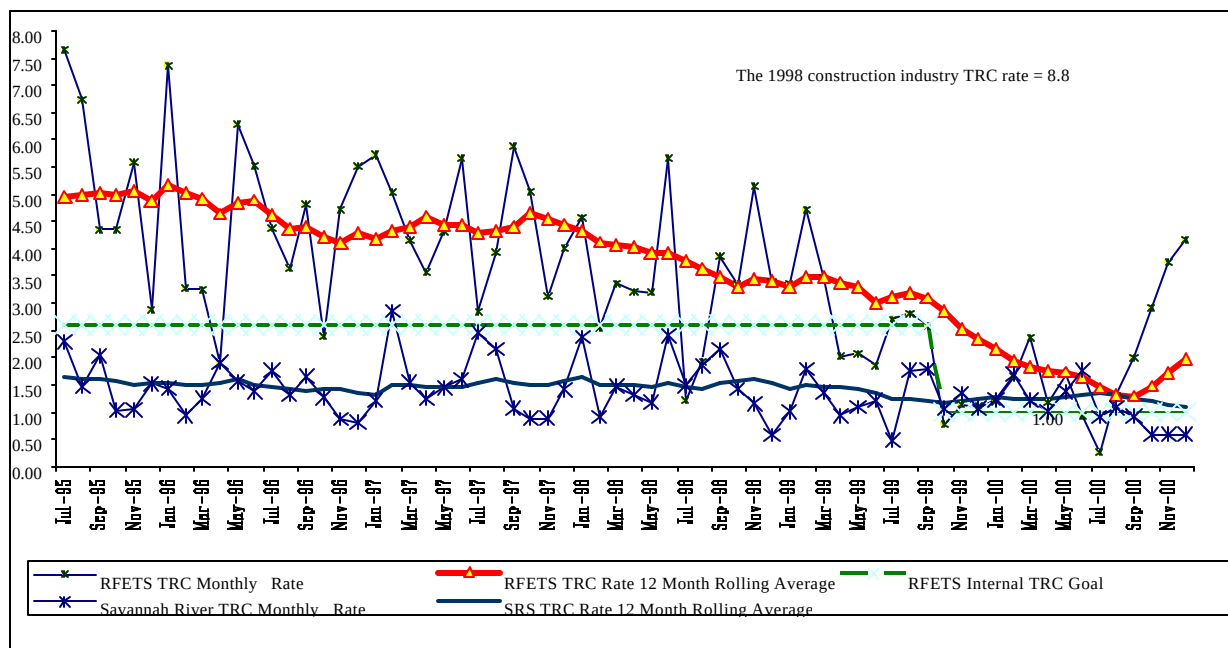
- Doubling the rates of plutonium packaging planned one year ago, while using a first-of-its-kind system
- Achieving a 25 percent increase in D&D rates by 2003
- Developing and implementing, in a timely manner, a plan for administrative and physical termination of safeguards and security – a process never done at a DOE facility
- Effectively addressing the uncertainties regarding the extent of under-building contamination
- Remediating the 903 Pad, a large area of soil contamination (radionuclides and solvents) that was used for drum storage on bare ground in the 1950s and 60s
- More than doubling the shipments of low-level and low-level mixed waste off site, representing a shipping rate greater than has ever been achieved consistently in the DOE complex
- Dealing with delays in receiver site availability or the unavailability of sites to accept certain materials

The paragraphs below provide details on five significant challenges facing Kaiser-Hill on the project.

Safety Excellence

In every year since 1995, Kaiser-Hill has improved safety at Rocky Flats by decreasing worker injuries and injury-related time away from work, decreasing the number of safety violations, and decreasing worker exposure to radioactivity. Rocky Flats operates well below construction industry averages for worker injuries. However, as the amount of work conducted each year continues to increase and there is a major shift toward deconstruction and massive size-reduction work, the statistical likelihood of injuries will increase. And, as more materials are packaged and more highly contaminated areas are remediated, the likelihood of worker exposure increases. Table IV illustrates Kaiser-Hill's past safety performance and its goal to attain best-in-class safety status.

Table IV. Kaiser-Hill Total Recordable Case Safety Trends and Goal



In the U.S. commercial industry, projects of this size would typically incur several occupational fatalities. At Rocky Flats, such an incident would be devastating. This project, more so than most others, hangs its future success on the safety of the work to be completed. A key challenge is to continue to improve safety performance across the board while dramatically increasing productivity in an increasingly hazardous work environment.

To achieve safety excellence, Kaiser-Hill must incorporate a robust safety program into all closure activities at the site. Initiatives under way to heighten safety performance include: improving and increasing safety communications to and from the workers; making the integrated work control program more user friendly; shifting from classroom to on-the-job training; integrating hundreds of safety planning and work documents into a single set of safety manuals; increasing expectations of subcontractor safety performance; and simplifying and clarifying the Authorization Basis process. Rocky Flats workers are using the integrated safety management system to foresee unsafe situations, halt activities, and address the hazard to ensure safe performance of the work.

Plutonium Stabilization and Packaging System

To package plutonium metals and oxides into 3013 containers for shipment to DOE's Savannah River Site, Rocky Flats is installing a remote plutonium packaging system. This will be the first time materials are processed to the new DOE standards for the 3013, in a system never before used in the DOE complex. Due to delays in the delivery of the system, as well as subsequent construction problems, packaging rates must double from those originally planned in order to meet the 2003 offsite shipping schedule. About 2,000 containers must be packaged in just two years.

The schedule for preparing all plutonium metals and oxides for offsite shipment calls for packaging to be completed by November 2002. The following steps are planned to meet the schedule:

- Complete the installation and startup of the packaging system under an accelerated schedule
- Conduct performance testing of the packaging system to demonstrate production-level capabilities
- Make system modifications to address problems and enhance operating time and throughput
- Employ multiple work shifts

Nuclear Materials and Waste Shipping

Throughout the Rocky Flats Closure Project, more than 20 tons of nuclear material and nearly 300,000 cubic meters of radioactive waste will be packaged and shipped offsite. Nuclear materials to be shipped offsite include plutonium pit assemblies, plutonium metals and oxides, and highly enriched uranium. Wastes to be shipped offsite include transuranic, low-level, low-level mixed, hazardous, and sanitary wastes. Wastes to be generated will include contaminated building debris, contaminated soils from environmental cleanup, and repackaged residue wastes. In total, nearly 11,000 truckloads of waste and nuclear materials are expected to leave Rocky Flats between February 1, 2000 and December 15, 2006. In addition to waste and special nuclear materials, Rocky Flats must also disposition hundreds of thousands of pieces of government property, classified documents, and containers of chemicals.

Between now and 2006, about 40 trucks per week will be headed from Rocky Flats to receiver sites in at least six states. The logistical coordination of these shipments requires a complex degree of planning, integration, and coordination at a sitewide, statewide and national level. Each of the many receiver sites must be made available and remain open to receive Rocky Flats' nuclear materials and waste.

Key shipping challenges facing Rocky Flats include:

Special Nuclear Materials

Rocky Flats continues to store significant quantities of special nuclear materials consisting mostly of plutonium and enriched uranium. These materials must still be packaged in DOE-prescribed packaging and then shipped to DOE receiver sites. A key closure strategy developed by Kaiser-Hill relies on the special nuclear materials being removed from the Site no later than March 2003. Removal of these materials allows the closure of the Site's Protected Area to occur with a concomitant reduction in safeguards and security costs. Kaiser-Hill has estimated that closure of the Protected Area will result in subsequent savings in excess of \$30 million per year. These savings have already been accounted for in Kaiser-Hill's closure project baseline and will be used to accelerate nuclear facility D&D, as well as waste shipping.

The Site faces two major challenges to the timely removal of special nuclear material. The first is the availability of certified 9975 shipping containers for the transport of the containerized plutonium metal and oxide that will be produced from the Site's Plutonium Stabilization and Packaging System. Additionally, certified DT-22 containers will be needed to ship some of the other special nuclear materials stored at the Site. The second major challenge is the timely availability of DOE receiver sites for Rocky Flats' special nuclear materials. Although DOE has designated receiver sites for a majority of Rocky Flats' materials, the readiness of these facilities to receive the materials is out of synch with Rocky Flats' schedules.

Several actions are underway to address these challenges.

- DOE EM and DP are jointly working to accelerate the certification of the shipping containers. DOE has stated that the 9975 container should be certified by January 2001 for plutonium metals and April 2001 for plutonium oxides, and the DT-22 container some time later.
- DOE and Kaiser-Hill are jointly developing detailed, integrated project plans ("Integrated Closure Project Baseline") so that containers and receiver sites needs are understood. These plans will also enable the development of alternate plans, if needed, and enable future decision-making.

Transuranic Waste

The designated receiver site for DOE's transuranic waste is the Waste Isolation Pilot Plant (WIPP), located near Carlsbad, New Mexico. Kaiser-Hill completed the first shipment of Rocky Flat's transuranic waste to WIPP in June 1999. As of January 1, 2001, Kaiser-Hill has made 76 shipments of TRU waste to WIPP.

The closure project is generating transuranic waste through its residue repackaging program and its facility D&D activities at rates faster than it can be shipped to WIPP. More than 2,000

truckloads of transuranic waste must be shipped to WIPP; this means Rocky Flats must ship an average of over one shipment a day, every day, between mid-2000 and 2005. Currently, the site and DOE cannot support this shipping schedule. This is due to: (1) limited shipping capabilities at Rocky Flats and (2) limited availability of TRUPACT-II vessels. Kaiser-Hill is limited in its ability to ship transuranic waste to WIPP by a lack of onsite TRUPACT loading facilities, as well as a lack of capability to prepare waste that meets WIPP's new waste acceptance requirements at a rate sufficient to support 2006 closure. Additionally, there are not enough TRUPACT-II vessels to ship Rocky Flats transuranic waste to WIPP at the rates necessary to achieve 2006 project completion.

To address these challenges, a number of actions are underway.

- Kaiser-Hill is increasing its capacity to ship by expanding the shipping infrastructure. New TRUPACT loading stations are being built to meet the transuranic waste volume forecasted for the project. In addition, the expansion of waste certification capability through the procurement of additional NDA units, head-space gas sampling equipment, and real-time radiography units will ensure that transuranic waste containers can be certified accurately and at the pace in which transuranic waste is generated on the project.
- DOE Rocky Flats Field Office, the DOE Carlsbad Office, and Kaiser-Hill are working together to identify cost-effective ways to meet the new WIPP waste acceptance criteria, many of which arose from the recently issued RCRA permit.
- DOE has additional TRUPACTs on order via two suppliers.
- High-volume, bulk shipping options are being investigated to meet the transuranic waste shipping forecast.

Low-Level Mixed Waste

Kaiser-Hill estimates that approximately 55,000 cubic meters of low-level mixed waste will be generated from February 1, 2000 until closure. Much of this waste will come from environmental remediation activities (contaminated soils) and nuclear facility D&D activities. Currently, there are no DOE or commercial facilities for disposal of low-level mixed wastes above 10 nanocuries per gram from Rocky Flats. Further, before these wastes can be disposed, they must be treated to meet the requirements of the Resource Conservation and Recovery Act. Only a few low-level mixed waste streams can be treated by DOE or commercial facilities, leaving a large amount of waste that has no treatment option.

These challenges are being addressed by:

- DOE, in accordance with the Waste Management Record of Decision, is pursuing low-level mixed waste disposal options at the Nevada Test Site and the Hanford Site
- DOE and Kaiser-Hill are jointly developing detailed, integrated project plans ("Integrated Closure Project Baseline") for low-level mixed waste treatment so that the future actions can be defined, costed and scheduled
- Kaiser-Hill is continuing to search for (and utilize) commercial capacity to treat some of the Site's low-level mixed wastes

Large Equipment Size Reduction and Decontamination

While Kaiser-Hill has developed several effective approaches to deal with the size reduction of gloveboxes, tanks, piping, and ducting during decommissioning operations, there are several unique pieces of equipment for which size reduction strategies still need to be developed. These components include very large pieces of equipment such as gloveboxes, tanks, and lathes that cannot be size reduced inside Inner Tent Chambers or moved to a central, robotic size reduction facility, due to the massive size of the components. Kaiser-Hill is working to develop safe alternatives for the size reduction of these items.

Kaiser-Hill is deploying a number of decontamination technologies designed to reduce the plutonium levels in certain gloveboxes and equipment so that they can be shipped in large crates and cargo containers as Surface Contaminated Object (SCO) waste. Two of the methods are Cerium rinse and carbon dioxide (CO₂) blasting. A Cerium Nitrate solution will initially be applied to rashig ring tanks after the rings are removed. In general, this process is suitable to process lines that historically involved wet chemistry operations. The CO₂ blasting technique will initially be used on gloveboxes wherein the production work was thermal/mechanical. Early indications are that a sufficient amount of contamination can be removed from the surfaces of large objects so that they qualify as SCO waste for disposal at NTS, rather than having to size reduce the objects for disposal as TRU waste at WIPP.

Resource Management and Deployment

Success in 2006 requires careful planning and deployment of the site's workforce to ensure that the right skills are available to each project in a timely manner. This effort begins with development of an accurate closure project baseline that identifies the specific numbers of people and skills needed to complete each of the approximately 11,000 project tasks. Rolling up the needs of each project into annual resource requirements provides Kaiser-Hill managers with an estimate of the total number of employees and the requisite skills needed each year. Managers must then ensure that the right number of employees with the appropriate skill sets, clearances, and training are available to meet the needs of each project. Kaiser-Hill manages the deployment of these staff resources on an annual, monthly, and weekly basis among and within the Kaiser-Hill subcontractors. Kaiser-Hill has implemented a program which allocates Steelworker members among the projects, proving to be a major tool in effectively staffing the multiple, ongoing projects at the site. All of these activities are conducted with attention to maintaining a diverse workforce.

The site also faces a significant challenge in maintaining core competencies and critical skills to accelerate the project schedule while, at the same time, transitioning the workforce to 'life after Rocky Flats.' Kaiser-Hill is implementing a plan that assists in attracting and retaining employees with critical skills, while assisting all employees to prepare for and obtain employment elsewhere (or prepare for retirement), as the site continues to downsize and ultimately close. Additionally, Kaiser-Hill is aggressively pursuing retention incentives to encourage key members of the workforce to remain at the site until their portion of the project has been completed.

THE OUTLOOK FOR SUCCESS IN 2006

As noted in the DOE management plan for 2010 closure and a recent General Accounting Office report, successfully accomplishing closure in 2006 will stress the decision-making and physical apparatus of the DOE complex. Kaiser-Hill continues to be concerned about and focused on several issues, including the need for continuous improvement in its safety performance, the availability of receiver sites for special nuclear materials, transuranic and low-level mixed wastes and the future operability of its plutonium packaging system.

Despite the present and future challenges facing the project, Kaiser-Hill remains optimistic about the probability for success in 2006. This optimism is based on the substantial progress safely achieved to date; the continued resourcefulness of the workforce; and the proven ability of DOE, Kaiser-Hill, and other involved parties to cooperate and innovate to overcome obstacles. This confidence is bolstered by recent successes in turning around plutonium residue processing, completing the Building 779 demolition, significantly increasing the amount of radioactive waste being shipped offsite, and successful performance in pipe draining and strip-out in Building 771. By building on this solid base of experience and success, Kaiser-Hill will continue moving forward to turn the vision of a safe closure by 2006 into a reality.