CONTINUING CLEANUP AT OAK RIDGE, PORTSMOUTH, AND PADUCAH—SUCCESSES AND NEAR-TERM PLANS

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ABSTRACT

This paper describes the complexities and challenges associated with the Oak Ridge Environmental Management (EM) cleanup program and the steps that DOE and Bechtel Jacobs Company LLC (the Oak Ridge EM team) have collaboratively taken to make significant physical progress and get the job done.

Maintaining significant environmental cleanup progress is a daunting challenge for the Oak Ridge EM Team. The scale and span of the Oak Ridge Operations (ORO) cleanup is immense—five major half-century-old installations in three states (three installations are complete gaseous diffusion plants), with concurrent cleanup at the fully operational Oak Ridge National Laboratory and Y-12 National Security Complex, and with regulatory oversight from three states and two United States (US) Environmental Protection Agency (EPA) Regions. Potential distractions arising from funding fluctuations and color-of-money constraints, regulatory negotiations, stakeholder issues, or any one of a number of other potential delay phenomena can not reduce the focus on safely achieving project objectives to maintain cleanup momentum.

In its simplest form, the Oak Ridge EM team's philosophy for making progress is to plan the work and work the plan. "The plan" is the Life Cycle Baseline (LCB), which documents the scope, schedule, and budget for each of roughly 200 subprojects which have been sequenced to deliver on closure. The latest LCB cost estimate is roughly $10 billion with a completion date of 2024. Whether it is the use of innovative treatment and disposal strategies on the K-1070 C/D G Pit removal action to save $1.6 million; accelerating the Gunite And Associated Tanks schedule by one year to save $8 million; or shipping unstabilized pond waste a year ahead of schedule, the Oak Ridge EM Team has institutionalized the ideas of getting wastes to disposal facilities quickly, cutting infrastructure to drive accelerated cleanup, and shrinking the EM footprint. The new administration has raised the bar for EM work—and the Oak Ridge EM Team knows how to jump.

INTRODUCTION

Like most sites in the Department of Energy (DOE) complex, the history of Oak Ridge can be traced to Germany and Hungary. Even though radiochemists Otto Hahn and Fritz Strassmann discovered fission as German scientists, it was Hungarian physicists Leo Szilard, Edward Teller, and Eugene Wigner's concerns and urgings over its possible military application that prompted Albert Einstein's letter of August 2, 1939, to alert President Franklin D. Roosevelt. Weeks later, on September 1, 1939, Germany invaded Poland and World War II began. Einstein's letter expressed alarm that Germany might win the race to develop "extremely powerful bombs" and urged government involvement and resources in combating the Nazi

threat. From this letter and President Roosevelt's response, the seeds of the Manhattan Project were sown including the destiny that Oak Ridge was to play as the provider of fuel for America's and the world's first "extremely powerful bomb." (1, 2).

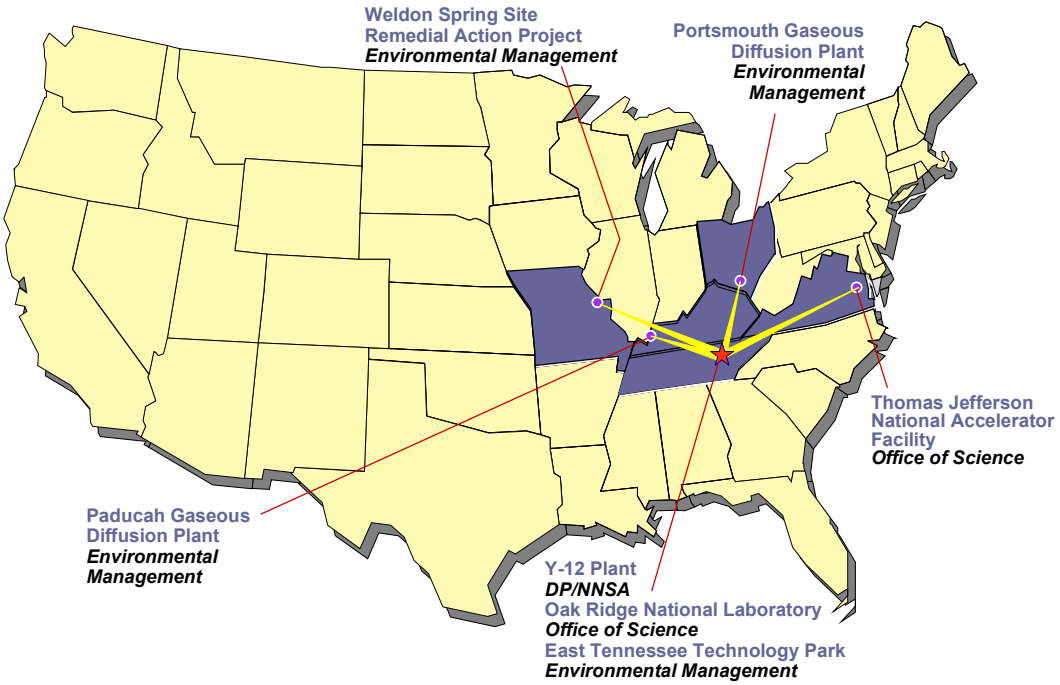

Fig. 1.1. Oak Ridge Operations: seven sites–five states–multiple missions.

The Manhattan Project's official authorization came from President Roosevelt on December 28, 1942. With this authorization came the federal acquisition of 239 km^2 of land for a military reservation just west of Knoxville in East Tennessee. Named the Clinton Engineer Works, housing was established for approximately 13,000 residents. To put the staggering size of this industrial complex in perspective, at the end of the war, the Clinton Engineer Works was consuming one-seventh of *all* the power being produced in the nation (3). The subsequent sections below provide a synopsis of each of the three Clinton Engineer Works installations along with the Paducah and Portsmouth Gaseous Diffusion Plants.

When asked to describe his process for creating remarkable lifelike statutes ("The Thinker," etc.), world-renown French sculptor Francois-Auguste Rodin matter-of-factly said "I choose a block of marble and chop off whatever I don't need." Similarly, the Oak Ridge EM Team, by eliminating the Manhattan Project's widespread contamination legacy, is sculpting an environment of buildings, land, streams, and sediment that no longer poses a threat to the public, the workers, or the environment.

East Tennessee Technology Park (ETTP)

The East Tennessee Technology Park (formerly the Oak Ridge K-25 Site) was built as part of the Manhattan Project during World War II to supply enriched uranium for nuclear weapons production. Construction began in 1943 with the K-25 Building, the first gaseous diffusion facility for large-scale separation of ^{235}U. Additional buildings involved in the enrichment

process were operable by 1956. Through 1964, the site was used primarily for the production of highly enriched uranium for nuclear weapons. In response to the national postwar emphasis on nuclear power, plant operations were modified to include the production of uranium that was compatible with reactors used to generate electric power.

Remediation challenges faced by the Oak Ridge EM Team at this 6.1 million m^2 site include roughly 463 facilities (~650,000 m^2) in deteriorating condition requiring decommissioning/demolition; uranium and volatile organic-contaminated groundwater plumes and surface water; uranium burial grounds; ~7,000 depleted and other UF_6 cylinders; and over 25,000 m^3 of legacy waste to be dispositioned. For ETTP and the other Oak Ridge Reservation sites, the cleanup challenge is complicated by the annual 1.4 meters of rain that make uncontrolled migration of this legacy contamination a recurring threat.

Y-12 National Security Complex

Built in 1943 as part of the Manhattan Project, the original purpose of the Oak Ridge Y-12 National Security Complex was uranium enrichment and nuclear weapons production. Uranium enrichment was discontinued in 1947, but other aspects of weapons production continued until 1993. Y-12's role has matured into supporting highly sophisticated manufacturing; developing engineering associated with producing, fabricating, and dismantling nuclear weapons components; and serving as the national repository for enriched uranium.

Remediation challenges faced by the Oak Ridge EM Team at this ~3.2 million m^2 site include elevated levels of mercury in soils, sediments, and surface water; offsite migration of volatile organic compound-contaminated groundwater, uranium burial grounds, D&D of contaminated buildings, and over 10,000 m^3 of legacy waste to be dispositioned.

Oak Ridge National Laboratory

Weapons research facilities were established at the site of the Oak Ridge National Laboratory (ORNL) in 1943 as part of the Manhattan Project. The Laboratory's original mission was to produce and chemically separate the first gram quantities of plutonium as part of the national effort to produce the atomic bomb. As its role in the development of nuclear weapons decreased over time, the scope of work at ORNL expanded to include the production of isotopes, fundamental research in a variety of sciences, research involving hazardous and radioactive materials, environmental research, and radioactive waste disposal.

Remediation challenges faced by the Oak Ridge EM Team at this ~11.7 million m^2 site include elevated concentrations of cesium, strontium, and tritium in surface water and sediments; five reactors requiring decommissioning; ~567,000 m^2 of burial grounds, seepage pits, trenches, tanks and impoundments containing high activity wastes; ~3.5 million curies in a water-rich environment for migration into the Clinch River; and over 10,000 m^3 of legacy waste to be dispositioned.

Paducah Gaseous Diffusion Plant

The Paducah Gaseous Diffusion Plant began operating in the mid-1950s, supplying enriched uranium for both government and commercial nuclear fuel needs. On October 24, 1992, the President of the United States signed the Energy Policy Act of 1992, establishing a new government corporation, the United States Enrichment Corporation (USEC). Effective July 1, 1993, the USEC was chartered to assume responsibility for uranium enrichment production at the plant. However, the Act required the Department of Energy to retain responsibility for remedial action of environmental releases and for decontamination & decommissioning of facilities.

Remediation challenges faced by the Oak Ridge EM Team at this ~14.2 million m^2 site include 3.8×10^{10} liters of offsite contaminated groundwater; 59 million kg of contaminated scrap metal; 37,000 depleted UF_6 cylinders; and 160 DOE Material Storage Areas.

Portsmouth Gaseous Diffusion Plant

During the Cold War, the Portsmouth Gaseous Diffusion Plant was constructed to enrich uranium in support of both government and private programs. On June 21, 2000, the USEC announced that it would cease uranium enrichment operations at the Portsmouth Plant in June 2001. Currently Portsmouth is in Cold Standby status.

Remediation challenges faced by the Oak Ridge EM Team at this ~15 million m^2 site include volatile organic compounds, Polychlorinated Biphenyls (PCBs), hazardous metals, and radionuclides in both soil and groundwater; 19,000 UF_6 cylinders; and highly enriched uranium.

OAK RIDGE EM CLOSURE PLANNING APPROACH

A significant requirement for closure is that of having and managing to a credible plan–a baseline. For the Oak Ridge EM Team, this requirement is satisfied in the Life Cycle Baseline (4). It is the comprehensive management tool for portraying the realistic, credible plan for the entire EM scope closure. The Oak Ridge simplified approach is to plan the work and work the plan.

Plan the Work

Past approaches

Since 1989, numerous complex-wide programmatic planning efforts have striven to get a handle on the EM Scope life cycle: The Five Year Plan, the Ten Year Plan, Accelerated Cleanup Plan, and Paths to Closure. Today the latest life cycle estimates reside in the Integrated Planning, Accountability, & Budgeting System (IPABS). Table 2.1 below quantifies and sorts the major national cleanup program offices' baselines in Pareto order. The largest five sites account for roughly 80% of the total life cycle budget.

Present approach

Table 2.1 puts the cleanup magnitude in perspective: almost $200 billion of work. Or is it? Numerous operational facilities that are contaminated are beyond the scope of the EM organization for the present. This programmatic ownership issue notwithstanding, they represent a mammoth legal and moral obligation of the federal government.

Table 2.1. Life Cycle Estimates by Site.

IPABS Life Cycle Planning Data		
Operations Office	FY 2001 Estimate of Life Cycle Costs ($Billions)	% Cum. (Pareto)
Savannah River	37.8	20%
Office of River Protection	36.5	39%
Idaho Operations	29.2	54%
Richland Operations	25.6	67%
Oak Ridge	13.4	74%
Program Direction	8.6	79%
Carlsbad	8.4	83%
Rocky Flats	7.7	87%
Ohio Field Office	7.5	91%
Office of Science & Technology	5.1	94%
Albuquerque	3.7	96%
Nevada Operations	3.5	97%
Headquarters Operations	2.9	99%
Oakland	1.3	100%
Chicago	0.5	100%
Uranium/Thorium Reimbursement	0.3	100%
National Programs	0.0	100%
	191.9	

(6)

For example, the Decontamination and Decommissioning (D&D) of the Paducah and Portsmouth Gaseous Diffusion Plants and conversion of depleted UF_6 are huge liabilities (~$7-$8 billion) that currently are beyond EM. The Oak Ridge EM Team believes that the right thing to do is acknowledge and account for this collateral scope in planning and decision making. It is quite possible, and even likely, that Oak Ridge is not alone in having a large gap between the current baseline and future cleanup scope. A key question for policy makers is how to address this gap consistently across the DOE complex. For the Oak Ridge EM Team, repeated closure planning initiatives have driven innovations to the surface–yielding hundreds of millions of dollars in savings.

Major factors accounting for these savings include aggressive fixed-price and fixed-unit-rate contracting, improvements in planned methods of accomplishment, and dedicated, focused efforts to reduce overhead.

To construct the realistic closure plan, the Oak Ridge EM Team has built the LCB assuming target-level funding (most realistic funding). Today, each of the roughly 200 projects that constitute the LCB are reviewed, challenged, and refined as part of formal DOE-contractor evaluations of the planned scope, schedules, and estimates. Each update reflects incorporation of actual subcontracts, field experience and commercial expertise. Striving for continuous improvement is exemplified by reflecting actual cost experience in each year's standard estimating guidance (feedback loop). The responsible managers sign their concurrence with the

LCB. The cleanup scopes are then sequenced assuming target funding consistent with the programmatic strategy, priorities, and the administration's and Congress' goal to reduce costs and time to complete.

Work the Plan

Cleanup work often has many unknowns (e.g. extent of contamination), so changes to the LCB are to be expected. The LCB is kept current by having institutionalized, both within ORO and the contractor, the mandate and processes that support disciplined Baseline Change Control. The Baseline Change Control process ensures that work performed is consistent with the LCB and that responsible managers participate in the change process. Last year alone over 1,000 Baseline Change Proposals (BCPs) were prepared and reconciled. This contrasts with earlier years in the program when work could have been done outside of the official baseline thus circumventing the change control process. Most cleanup work has complexities and uncertainties (100% characterization is unrealistic), funding fluctuations (that cause schedule slippage/acceleration), and regulatory changes. Since Oak Ridge EM projects lack contingency, and since change control thresholds are tight, a large number of BCPs should be expected.

Furthermore, full Integrated Safety Management System (ISMS) implementation starts at baseline development. Scoping statements form the initial basis for hazard assessment and project estimating. The more accurate the scope, the better the initial hazard assessment and the more accurate the estimate. Field conditions do change and must be managed. As an example, the baseline scope of the Corehole 8 project in downtown Oak Ridge National Laboratory late last year was to remove tank W-1A as part of a 40'x50'x20' excavation task. Trained field workers were briefed on the baseline scope which fully described the work. During excavation (work the plan), workers found a sparge line that as-built drawings (more appropriately, as-once-might-have-been-built drawings) indicated was welded when installed (1952). It wasn't. It had been dropped in place and buried. The result was 48 years of leakage resulting in a ribbon of yellowcake. Work immediately stopped since the scope and associated hazards varied from the baseline. An emergency BCP was submitted and approved to address the new work.

FY 2001 PERFORMANCE

The top FY 2001 accomplishments by the Oak Ridge EM Team include:

- Completed waste removal and stabilization of 25 inactive waste storage tanks at ORNL
- Removed waste, decontaminated, and submitted certification of closure letters for approximately 36,000 m^2 of Resource Conservation and Recovery Act (RCRA) permitted waste storage area at ORNL, ETTP, and Y-12
- Demolished 23 contaminated facilities at ORNL, ETTP, and Portsmouth totaling approximately 8,400 m^2
- Completed 15 RCRA, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), maintenance action cleanup projects at ORNL, ETTP, Y-12, Portsmouth, and Paducah
- Reduced the mixed low level waste inventory at Oak Ridge, Paducah, and Portsmouth by approximately 9,000 m^3

- Disposed of approximately 27,500 m^3 of waste generated by remedial action and demolition projects at ORNL, ETTP, Y-12, Portsmouth, and Paducah
- Completed the DOE Order 413.3, "Program And Project Management For The Acquisition Of Capital Assets" Multi-Project Review of the Solid Waste Storage Area/Intermediate Holding Pond with a score of 96%; and
- Received Pollution Prevention Certificate of Achievement from The White House Task Force on Recycling.

Of the fifty-eight enforceable agreement milestones to be met in FY 2001, only one was missed. Given all of the competing initiatives in FY 2001, this is a remarkable achievement.

East Tennessee Technology Park

K-1001 Building Demolition

Built in 1944 as a temporary administrative office, K-1001 was still in use in 1999. Due to extensive structural degradation and associated safety concerns, demolition of the facility was accelerated. Completion of this project eliminates a safety hazard, reduces future maintenance costs, and provides valuable space for future private-sector tenants.

K-1070 C/D G Pit Removal Action

For this project, approximately 176 m^3 of contaminated soil was excavated from a classified burial ground for treatment by low temperature thermal desorption ahead of schedule. Innovative changes to the treatment and disposal strategies for this project resulted in a cost avoidance of approximately $1.6M.

K-25/K-27 Buildings D&D

Accomplishments in FY 2001 on the largest D&D project (building perimeter is one mile) in the DOE complex include completing electrical power redistribution to six facilities and awarding of a hazardous material abatement subcontract. Immediate and sufficient funding for this project is crucial due to aging degradation.

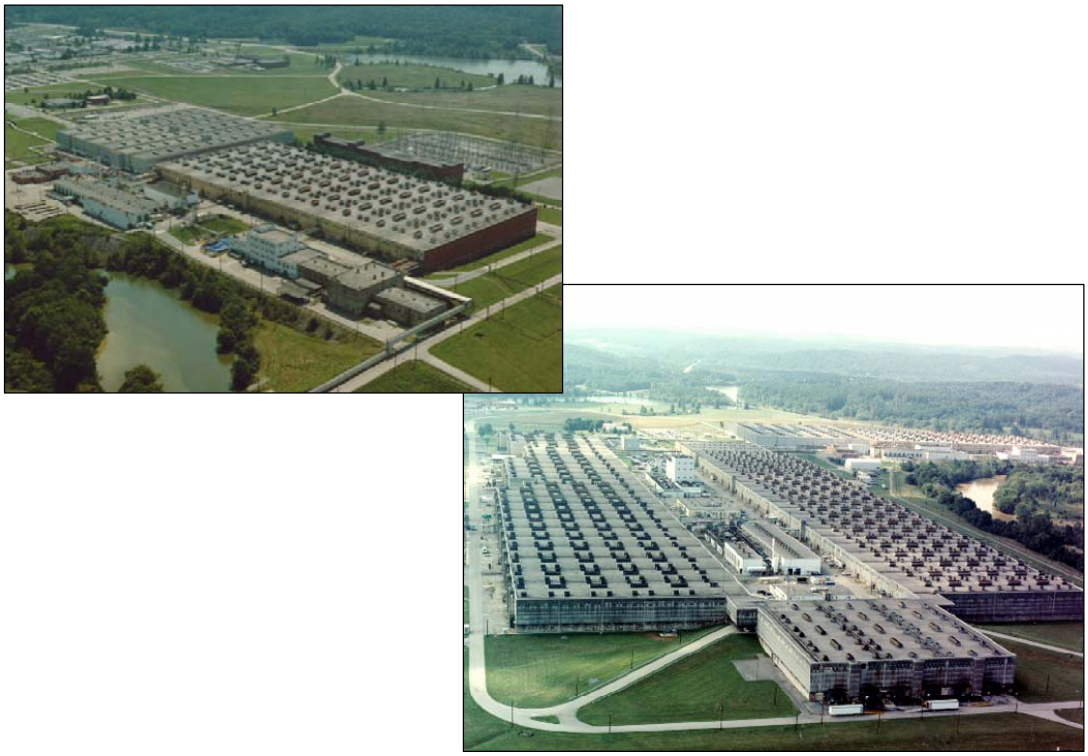

Fig. 3.1. K-25/K-27 Buildings D&D.

Main Plant Area Facilities D&D

Buildings K-1301, K-1404, K-1408, K-1045A, K-1405, and K-1407 were successfully demolished. A Performance Based Incentive (PBI) milestone (fee only for successful performance) to perform demolition, decontamination of subsurface structures and waste packaging of four of these facilities was completed on schedule at the end of FY 2001. Demolition of these facilities (~1,950 m^2) will reduce site Surveillance & Maintenance (S&M) costs and foster site reindustrialization.

Waste Disposition Project - Storage Footprint Reduction

Waste was removed from 36 vaults in the K-25 & K-27 buildings during FY 2001, reducing the waste storage footprint by 57,000 m^2 or the equivalent of thirteen football fields. Roughly 1/4th of the waste was dispositioned, while ¾ths was relocated to other storage facilities. A total of 32 RCRA-permitted waste storage units were closed at ORNL, ETTP and Y-12 eliminating two out of six active RCRA permits and reducing operating costs.

Mixed Low Level Waste Disposition

In FY 2001, remaining Unstabilized Pond Sludge was shipped to meet a FY 2002 milestone one year ahead of schedule. Another four RCRA-enforceable Site Treatment Plan (STP) milestones were achieved with the shipment of 1,500,000 kgs of STP waste and 45,000 kgs of lab packs for treatment and disposal. The final STP milestone will be achieved when shipments impacted by

the waste shipping moratorium are completed. Since the beginning of Bechtel Jacobs Company contract, over 80% of the legacy Mixed Low Level Waste (MLLW) has been disposed offsite. Almost 950,000 kgs were shipped in FY 01 to Broad Spectrum Contractors for treatment.

Low Level Waste Disposition

Leading FY 2001 accomplishments include: received certification to dispose of Low Level Waste (LLW) at the Nevada Test Site (NTS); obtained approval for three waste streams; shipped thirty five monoliths to NTS; and installed a facility to repackage 670 m^3 of legacy and newly generated (NG) LLW into 500 m^3. In addition, disposed of 1,704 m^3 of NG LLW at Envirocare, and provided waste management technical support to environmental restoration projects, Office of Science, and National Nuclear Security Administration (NNSA) for disposal of wastes at Envirocare and NTS.

Y-12 National Security Complex

Boneyard/Burnyard Remediation Project

The Boneyard/Burnyard is approximately 81,000 m^2 in size and is one of the original waste disposal areas resulting from the Manhattan Project. This cleanup is one of the first remedial actions being completed under the Bear Creek Valley Record of Decision (ROD). This area contributes 80% of the uranium that enters Bear Creek. An estimated 26,700 m^3 of material will be excavated and disposed of at the Environmental Management Waste Management Facility (EMWMF), and the remaining 20,600 m^3 of material will be consolidated on site. The action will eliminate a major source of uranium contamination entering Bear Creek.

Environmental Management Waste Management Facility

Key accomplishments include completing 100% design which includes classified facility upgrades and draft gas vent design for the cap. Also secured regulator approval on the Remedial Design Report/Remedial Action Work Plan Explanation of Significant Differences for Classified Waste, and Waste Acceptance Criteria Attainment Plan. Construction is 75% complete with a target opening date of May 2002.

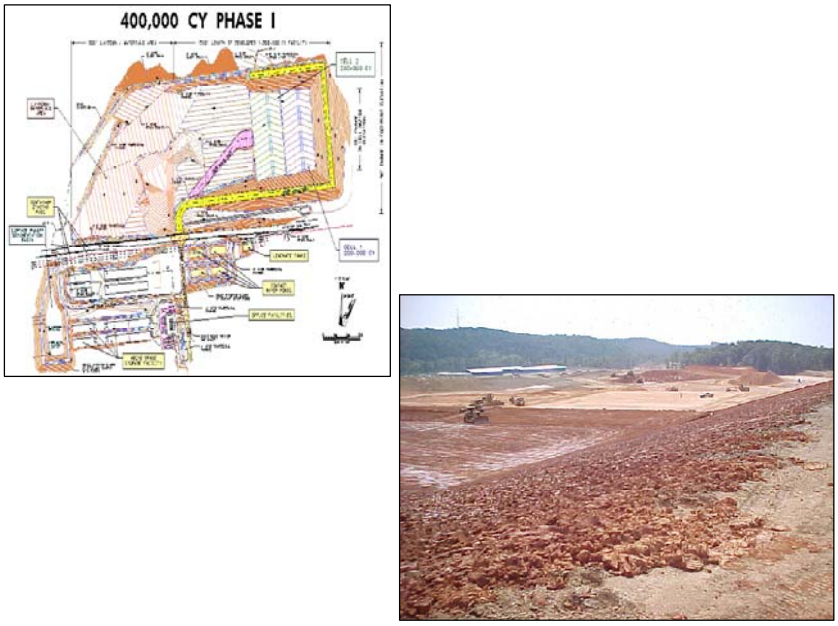

Fig. 3.2. Environmental Management Waste Management Facility.

Oak Ridge National Laboratory

Gunite and Associated Tanks

With sludge removal completed in early FY 2001, the remaining focus of this CERCLA removal action was to stabilize the tanks with grout. Robotic and remotely operated equipment were used to remove 1.6 million liters (82,000 curies) of Transuranic (TRU) mixed waste sludge and supernate from the eight gunite tanks. The sludge and supernate were transferred to the Melton Valley Storage Tanks for eventual treatment at the TRU Waste Remediation Facility. Grouting of all the tanks was completed in FY 2001. The project schedule was accelerated by over a year with a cost avoidance of $8M. The stabilized site is now available for beneficial reuse.

Federal Facility Agreement (FFA) Inactive Tanks Project

Waste removal and grouting of the twenty four FFA inactive tanks formerly containing MLLW, LLW, and Remote Handled (RH)-TRU wastes was completed. Grouting the aged, inactive tank system significantly reduces risks associated with future structural failure and mitigates releases to the environment.

Building 7602 Recovery

In the first major cost-sharing collaboration between Bechtel Jacobs Company LLC and University of Tennessee (UT)-Battelle, the high bay portion of Building 7602 was "recovered" on a fast-track schedule to make this facility available to support the Spallation Neutron Source program. Building recovery was completed in early FY 2001 and included the removal of radioactively contaminated process equipment and decontamination of the entire facility. As

part of the facility stabilization process, roof repairs covering 4,800 m^2, were completed on ten inactive buildings. This action was taken to mitigate contaminant migration pending building D&D.

Cooling Towers Demolition

The demolition of five cooling towers and one heat exchanger at ORNL was completed in FY 2001 nearly five years ahead of schedule. This project was accelerated to eliminate safety hazards associated with the degraded condition of these structures, as well as to reduce site S&M costs. The majority of the demolition debris was placed in an on-site landfill to further reduce costs associated with off-site disposal.

Fig. 3.3. Cooling Towers Demolition.

Bethel Valley 3505 Metal Recovery Facility

As a part of the Disadvantaged Business Subcontracting Plan, Bechtel Jacobs Company subcontracted with a minority educational institution to demolish the 3505 Metal Recovery Facility. The above-grade structure was demolished and the below-grade structures decontaminated and stabilized in FY 2001. This work reduces site overall risk and S&M costs.

Paducah Gaseous Diffusion Plant

Key accomplishments at Paducah included progress on DOE Material Storage Areas, C-410 D&D and Drum Mountain Removal.

DOE Material Storage Areas (DMSAs) Accomplishments

- Characterized 9 of 11 high priority DMSAs
- Performed disassembly, observation and video taping of the C-400-04 Miller's Fluorinated Lubricant System
- Completed initial phase of construction activities for trailer complex

C-410 D&D Accomplishments

- Accomplishments include equipment/materials relocation/removal and cleaning up to 1,400 m^2 of accessible total surface area in C-410;
- Transferred water determined to contain cadmium into permitted storage, and transferred remaining water into tanks for storage
- Broke-up and containerized solidified paint blasting grit and vacuumed 2,800 m^2 of total surface area in the Cylinder Painting Buildings

Drum Mountain Removal Accomplishments

- Shipped Drum Mountain 166 intermodals of "conforming waste" to Envirocare
- Shipped Drum Mountain seven intermodals of "non-conforming waste" to Envirocare

Portsmouth Gaseous Diffusion Plant

Due to the Cold Standby status at the Portsmouth Gaseous Diffusion Plant, installation of a replacement heating system is required for DOE facilities. Winterization of the EM facilities (formerly heated by the recirculating hot water system) included procurement and installation of two dual-fired hot water boilers, three pumps, and a 136,000 liter expansion tank in the X-3002 building, as well as construction of fuel oil storage tanks and a gas line. Workers expended a Herculean effort to get this work done on time.

X-749/120 Barrier Wall & 5 Unit Area Piping Accomplishment

Initiated construction on the Quadrant I X-749/120 Barrier Wall and the 5-Unit Area pipe installation to the X-622 Pump and Treat Facility. Each of these projects will be complete in FY2002.

X-701A Lime House and X-701 C Neutralization Pit Accomplishments

The X-701C Neutralization Pit, the X-701A Lime House, and associated pipelines and utilities were demolished and removed as part of this RCRA Closure.

Waste Disposition Accomplishments

In FY 2001, a total of 3.6 million kgs of waste was shipped offsite
- 0.5 million kgs of MLLW
- 3.1 million kgs of LLW

- 4,200 kgs of Pollution Prevention recycle
- Total container count of 8,469 ctns.

And three STP milestones were met: Stabilization/Initiate shipment of waste; Submit plan for physical chemical treatment; and Submit plan for metal recovery.

FY 2002 PLANS

FY 2002 will be an intense year. The top FY 2002 planned accomplishments by the Oak Ridge EM Team include:

- Initiate operations of the Environmental Management Waste Management Facility (EMWMF). This particular facility is key to the cleanup of Oak Ridge. As a disposal cell, it serves as the primary catalyst for locally disposing of D&D and remedial action waste. The EMWMF is pivotal in that it consolidates residual risks, serves as an enabler for schedule acceleration (and massive cost avoidance), and puts Oak Ridge in control of Oak Ridge waste. Because of EMWMF, Oak Ridge's baseline schedule is less vulnerable to specialized transportation container availability, changes in external waste acceptance criteria, and disposal capacity.
- Ship 1M Kg of Site Treatment Plan waste for treatment.
- Complete 70% of the soil removal activities at the Boneyard/Burnyard.
- Ship the first of five casks of Spent Nuclear Fuel to Idaho.
- Complete remediation of Solid Waste Storage Area 4/Intermediate Holding Pond.
- Sign the Bethel Valley Record of Decision.
- Complete 70% of sludge removal activities on Surface Impoundments Operable Unit.
- Complete D&D on the remaining four buildings as part of ETTP Main Plant.
- Complete 25% of the asbestos removal on K-25 building.
- Initiate D&D of C-410 building at Paducah.
- Initiate remediation on Paducah Scrap Metal and North/South Diversion Ditch.
- Respond to the recent Defense Nuclear Facility Safety Board (DNFSB) concerns on Safety Authorization Bases.
- Weldon Spring Complete Remediation and Turnover to Grand Junction for Long-Term Stewardship.
- Award the Depleted UF_6 Conversion Contract.
- Update Life Cycle Baseline to reflect Budget Profile.
- Sustain a nominal level of activity on key projects to avoid re-procurement costs in FY 2003.
- Assess budgetary impacts on waste volume generation to guide the decision on EMWMF expansion; and
- Pursue disposition of British Nuclear Fuels Limited (BNFL) and Legacy Waste in the EMWMF.

East Tennessee Technology Park

- Excavate K-1070 A Contaminated Burial Ground.
- Continue work on K-25/K-27 Building D&D.

- Install the new Waste Information Network (modified DOE-Idaho Integrated Waste Tracking System).
- Submit largest LLW waste stream profiles to NTS for approval.
- Reduce MLLW by 1,000,000 kgs.
- Eliminate inventory of potentially shock-sensitive chemicals.

Y-12 National Security Complex

- Start operations of the EMWMF.
- Start excavation of the 23,000 m^3 Boneyard/Burnyard.
- Sign the Upper East Fork Poplar Creek Phase 1 Record of Decision.

Oak Ridge National Laboratory

- Complete D&D of Building 3505 Metal Recovery Facility.
- Continue retrieval/treatment of Surface Impoundments Operable Unit-B sediments.
- Complete Old Hydrofracture demolition.
- Approve Melton Valley Land Use Control Implementation Plan.
- Develop 32,000 m^2 of borrow area and stabilize the remaining 89,000 m^2 of Solid Waste Storage Area (SWSA) 4.

Paducah Gaseous Diffusion Plant

- Characterize twelve priority DMSAs.
- Remove all fissile material from C-410 Complex.
- Remove 907,000 kgs of aluminum ingots.
- Ship 500 cubic meters of LLW to NTS.
- Complete radiological surveys on 12,000 cylinders.

Portsmouth Gaseous Diffusion Plant

- Conduct technology demonstration on the X-749/120 Groundwater Plume.
- Start construction of the X-622T Groundwater Treatment Facility Upgrades.

CHALLENGES AND ISSUES

With a cleanup as large and complex as Oak Ridge, clearly challenges and issues exist which must be met head-on. Below are capsules of those receiving immediate management attention.

Environmental, Safety, and Health Challenges

Full implementation of ISMS is a prerequisite for successful closure. Complete and full implementation of Integrated Safety Management is thus a top priority for the Oak Ridge EM Team. Rather than simply a finite destination, ISMS is more complex—it is a daily journey.

Bechtel Jacobs Company and DOE EM are currently in the process of revalidating ISMS implementation. Data from as many sources as possible are being collected to aid in this revalidation effort.

The challenge to achieve the highest level of environmental compliance, worker/public health and safety (including radiological safety), and facility safety requires diligent and coordinated efforts by everyone involved: DOE, prime contractor management and employees, and subcontractor managers and employees.

Traditional indicators of safety in the workplace are important but insufficient to measure overall performance and provide important feedback necessary to drive improvement and prevent unwanted events. Reviews of performance measurements in each of these areas must occur in a disciplined manner on a routine basis to identify trends that may require action to prevent more serious consequences. Radiological safety (dose and contamination issues), releases to the environment (air and water discharges from activities and operations) and appropriate levels of facility management (authorization basis and maintenance) are areas of concern that require measurement and diligent review.

Leading indicators in these areas of vulnerability have been discussed for many years, but meaningful development of such has been elusive. Near misses, for example, are frequently reported, and can be useful in "operations" environments, when the same tasks is repeated in the same facility, time after time. In environmental cleanup work, every facility and every task is unique and near misses are irrelevant as a leading indicator. Lessons learned programs and a robust ISMS are the best prevention tools, but don't qualify as systems that prompt action prior to unwanted outcomes.

The Oak Ridge EM Team has excelled in reducing worker injuries on the job, an important requirement in the environmental cleanup program. Much work remains, however, to achieve excellence in all aspects of ES&H.

Interface Challenges

Primary interface challenges include that of the Oak Ridge EM Team with the United States Enrichment Corporation at Paducah and Portsmouth; the National Nuclear Security Administration at Y-12; and the Oak Ridge National Laboratory. These key interfaces require dedicated efforts and energy, communication and understanding, coordination, and collaboration to ensure that work is performed safely and that each of these major stakeholders' core missions are not derailed, and even enhanced, by the Oak Ridge EM Team's closure work.

Complexities such as ownership of and responsibility for infrastructure, processes for the exchange of goods and services, and disposition of materials have evolved as agency missions have changed. Transition of uranium enrichment to the private sector, with DOE and its contractors retaining responsibility for eventual facility cleanup at the gaseous diffusion plants, requires definition of specific roles and responsibilities, contractual instruments to appropriately allocate liabilities and define compensation terms and conditions, and a willingness to coordinate mutually beneficial activities and schedules. The dissolution of contractor

responsibilities at the Oak Ridge Reservation from one prime contractor to multiple prime contractors is another example.

These interface relationships require time and commitment to mature in order to sustain progress in environmental cleanup.

Technical Challenges

A pervasive technical challenge remains the impracticality of groundwater cleanup. Examples include defining the magnitude of Paducah plume and Dense Non-Aqueous Phase Liquid (DNAPL) sources in the karst geology of Oak Ridge. These problems are widely known, widely studied, and would benefit by development of a "silver bullet" technology.

A second technical challenge involves the need for characterization. Significant quantities of waste have been characterized for storage, but not for disposal. Characterization and disposition of the Paducah DOE Material Storage Areas (roughly a $100 million project) will require resolution of criticality concerns. ORNL subsurface soils is yet another example of characterization challenges (e.g., Corehole 8).

A third immediate technical challenge is that of cleanup of the Molten Salt Reactor Experiment at Oak Ridge National Laboratory. Project remediation work requires managing highly corrosive materials in high radiation fields (500 R/hr) along with fabrication of one-of-a-kind equipment for conversion/D&D. Project reviews by National Science Foundation and the National Academy of Sciences have confirmed the plethora of technical obstacles and the reasonableness of the approach being taken.

Disposition of Gaseous Diffusion Plant process equipment is a fourth major technical challenge given the size and scope.

Regulatory Challenges

As with several other DOE sites experiencing funding decreases, working with regulators to adjust commitments, priorities, and even strategy remains a challenge. Fundamental to any successful relationship is the principle of trust and credibility. Also fundamental is the principle of reasonableness.

Multiply the continuous pressure from changing funding scenarios by three states and two US EPA regions and the challenges become clear. State equity issues with respect to funding have been successfully addressed in recent years, but other concerns remain. Shipment of materials and wastes between sites and states for treatment or other beneficial activities is a key example. Maintaining and prioritizing work pursuant to the Federal Facility Agreement and Site Treatment Plan commitments in the face of declining budgets provides a fertile ground for argument and conflict.

Flexibility, critical thinking, and a sincere interest in getting the work done in accordance with state and federal requirements represent the skills and attitudes necessary to be successful in this

environment. To achieve mutually beneficial objectives, relationships must be developed, nurtured, and maintained between all involved parties. Regulators must truly be partners in this endeavor. This represents a continuous challenge for the Oak Ridge EM Team.

Stakeholder Challenges

Key stakeholder issues include providing meaningful input to key cleanup decisions and seeing the provision for and commitment to long-term stewardship. As with regulators, relationships with key stakeholders, including public interest groups and area public officials must be developed, nurtured, and maintained.

The Oak Ridge EM Team has developed a mature but challenging relationship in the Oak Ridge area. Opinions vary, but in general a mutual respect exists between parties that share a common goal of environmental cleanup. The Oak Ridge Site Specific Advisory Board and Local Oversight Committee have a significant history of participation in and contribution to progress to date.

Similar relationships must continue to be developed in the Paducah, Kentucky, and Portsmouth, Ohio, plant vicinities as environmental cleanup activities have accelerated greatly in the last two years. Change can be difficult and DOE mission evolution greatly impacts such areas as communication of challenges and facilitated problem resolution which are key requirements for successfully completing the environmental cleanup in these areas.

Cleanup Momentum

The continuing emphasis is on increasing the amount of funding that is spent on actual cleanup activities including disposition of legacy waste. As cleanup funding gets pressured downward, critical thinking becomes ever more imperative.

Another potential barrier to cleanup momentum that is difficult to deal with and often not regularly discussed is the issue of unfunded mandates. These best can be described as events and requirements that arise within a year or several years, or as the result of a significant regulatory or policy evolution, which are unplanned for and requirement immediate attention. They are requirements that are imposed to which the popular phrase "Just say no" cannot be applied. Many millions of dollars are consumed across the complex each year as these arise, causing the delay of ongoing work or the delay in startup of new cleanup projects.

A developing unfunded mandate, as an example, is that of legacy workers' compensation claims. In the Oak Ridge Operations area alone, the potential impact could range from the tens of millions to possibly as much as $200 million over the next several years. Obviously, an impact this large would require special legislative attention; however, the point is this: the funds must come from somewhere, and often it is easier to reprogram current legislated funds than to maintain important environmental cleanup activities. Unfunded mandates must be managed to mitigate the impacts to environmental cleanup.

SUMMARY

The creators of the first "extremely powerful bombs" were focused on winning the War, not protecting the environment. Although for the sake of humanity they had no choice but to pursue development, Albert Einstein later remarked that,

> "The release of atom power has changed everything except our way of thinking...the solution to this problem lies in the heart of mankind. If only I had known, I should have become a watchmaker."

Since then, our way of thinking about the environment *has* changed. The environmental damage left by the nuclear weapons industrial complex has to be addressed to properly close this remarkable chapter of our history.

To that end, the Oak Ridge EM Team has made remarkable physical cleanup progress. The momentum is building. DOE Headquarters' goals of improving safety performance, reducing the cost and time to complete, shrinking the EM footprint, getting waste to disposal facilities quickly, and reshaping EM systems and infrastructure to drive accelerated cleanup and closure are recognized and embraced in planning and execution by the Oak Ridge EM Team. With continued stable funding, the best is yet to come.

FOOTNOTES

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