The Success of the River Corridor Closure Project – A Look at the Last 10 Years – 16105

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ABSTRACT

Washington Closure Hanford (WCH) was selected by the U.S. Department of Energy, Richland Operations Office (DOE-RL) to manage the River Corridor Closure Project (RCCP), a 10-year contract in which WCH will clean up 572 km^2 (220 mi^2) of contaminated land at the Hanford Site in Richland, Washington. Since 2005, WCH has safely and efficiently performed field remediation and building demolition activities along the Columbia River corridor. To date, 99% of the buildings have been demolished and field remediation is 88% complete. These numbers represent work on 323 buildings and 571 waste sites, respectively. From a safety perspective, WCH has experienced an outstanding safety record with a total of 230 first aid cases, 47 recordable only cases, 2 restricted work day cases, and 7 lost work day cases. WCH exceeded 6 million hours worked without a lost time injury on September 30, 2015, for the second time in the contract period. The project has worked a total of 23,217,840 hours.

WCH has experienced extensive successes over the last 10 years. These successes include, but are not limited to, explosive demolition, technological applications, and creative land restoration techniques. Efficiencies in work planning, execution, and subcontracting will also be shared. The photographs showing how the landscape has changed are impressive, as is some of the video captured during explosive demolition of a reactor stack in the 100-N Area of the Hanford Site.

INTRODUCTION

WCH, a limited liability company owned by AECOM, Bechtel, and CH2M HILL, was selected in August 2005 to manage the $2.7 billion, 10-year RCCP for the DOE-RL. The RCCP is the first closure project at the Hanford Site. The Hanford Site is comprised of 1,524 km^2 (586 mi^2) in southeastern Washington State. The 572-km^2 (220-mi^2) River Corridor comprises the outer edge of the Hanford Site including major portions of the Hanford Reach National Monument. The RCCP mission is to remove the environmental risk and hazards near the Columbia River corridor through efficient, safe, and compliant procedures while safeguarding people and the environment.

The River Corridor is located between the Columbia River and the Hanford Site's Central Plateau. Within the Central Plateau, cleanup projects are located in:

- The 100 Area, where plutonium was produced in nine nuclear reactors. (Fig. 1)

- The 300 Area, where uranium was fabricated, manufacturing and waste disposal processes were developed, and research was conducted.

- The 400 Area.

- The 600 Area, where two challenging and highly radioactive burial grounds (618-10 and 618-11) are located. (Fig. 2)

The scope of work for WCH is to implement applicable *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* [1] documents to demolish buildings, remediate waste sites and burial grounds, place reactors into interim safe storage, and operate and expand, as necessary, the Environmental Restoration Disposal Facility. The contract included removing hundreds of excess nuclear facilities, placing two plutonium production reactors in interim safe storage, remediating waste sites and burial grounds, and managing the Hanford Site waste disposal facility. Twelve years of contract scope was completed in 10 years, marking a huge success across the U.S. Department of Energy (DOE) complex.

Fig. 1. Cocooned 100-N Reactor, September 2014.

Fig. 2. Waste is Excavated, Placed in Drums, and Processed at a 618-10 Burial Ground Trench, March 2015.

PROJECT PERFORMANCE HIGHLIGHTS

WCH boasts many accomplishments including:

- An excellent safety record totaling more than 6 million safe hours
- 110% of original contract scope completed
- 323 facilities decontaminated and demolished
- 571 waste sites are remediated (Fig. 3)
- Transportation and disposal of 11.6 million tons of hazardous waste to the disposal facility
- 463 of 572 km^2 (177.9 of 220 mi^2) cleaned up and transferred back to stakeholders (Fig. 4)
- 100% of regulatory milestones completed on or ahead of schedule
- More than $1.1 billion in small business subcontract awards – the most challenging goals in the DOE complex

- $302 million saved through efficiencies and reinvested back into the project
- Runner-up for 2015 International Project of the Year from the Project Management Institute
- $100 million *American Recovery and Reinvestment Act of 2009* (ARRA) [2] expansion of the Environmental Restoration Disposal Facility (ERDF) completed without injury
- Over 16 million miles driven by Waste Operations drivers since 2005.

Fig. 3. Backfill Activities at the 100-D-100 Chromium Contamination Waste Site, March 2015.

Fig. 4. Cleanup and Revegetation at the 100-N Area, March 2015.

TECHNOLOGY ACCOMPLISHMENTS

WCH has implemented a proactive approach to deployment of technology in the field that is safe, efficient, and cost effective. The innovative work of scientists and engineers on the project has led to successfully utilized technologies including:

- The Drum Penetration Facility at the 618-7 and 618-10 Burial Grounds integrated several off-the-shelf technologies to remotely monitor and examine contents of drums in a contaminated environment, providing a safer environment for workers than the traditional method of opening drums to characterize. (Fig. 5)

- Gamma Array at the 100-B/C Burial Grounds reduced worker exposure by remotely screening large quantities of excavated materials for spent nuclear fuel, in order to segregate it from low-level waste.

- Rust Doctor was applied to the interior of the 1310-N Emergency Dump Tank, preventing environmental release and improving worker safety using an off-the-shelf product for an innovative solution.

- Remotely controlled explosive demolitions were implemented across the project, successfully bringing down massive buildings and support structures without the need for manual or heavy equipment. (Fig. 6)

Fig. 5. Drum Opener Used at the 618-7 Burial Ground to Characterize During Remediation, April 2007.

Fig. 6. The 309 Stack is Brought Down by Explosive Demolition in the 300 Area, October 2010.

- A borescope system for remote inspections allowed visual observation of problem areas in building ductwork and increased the effectiveness of controls implemented before demolition. Borescopes were also successfully used for anomaly container resolution at several burial grounds.

- Technologies at the ERDF included global positioning system data for compaction reports, construction of simplified Super Cells, and 3-dimensional landfill models to obtain accurate volumes and forecast waste placement. These technologies led to reduced complexity of the systems and cost savings of $1.5 million per super cell in construction, operation, and maintenance.

- A Trident Probe was used to rapidly produce maps of groundwater discharge zones entering the Columbia River, eliminating the need for workers to enter the river to obtain needed samples. (Fig. 7)

- The 324 Building B-Cell Remote Tooling was performed using commercially available tools, safely and efficiently removing approximately 20,000 curies from the hot cell trench and sump. (Fig 8)

- A soft epoxy product was developed for radioactive liquid waste system piping, minimizing worker dose and contamination spread during pipe cutting.

- A diamond wire saw facilitated the removal of several structures due to its accurate cutting action and ability to cut through composite materials, while minimizing the spread of airborne radioactive contamination. (Fig. 9)

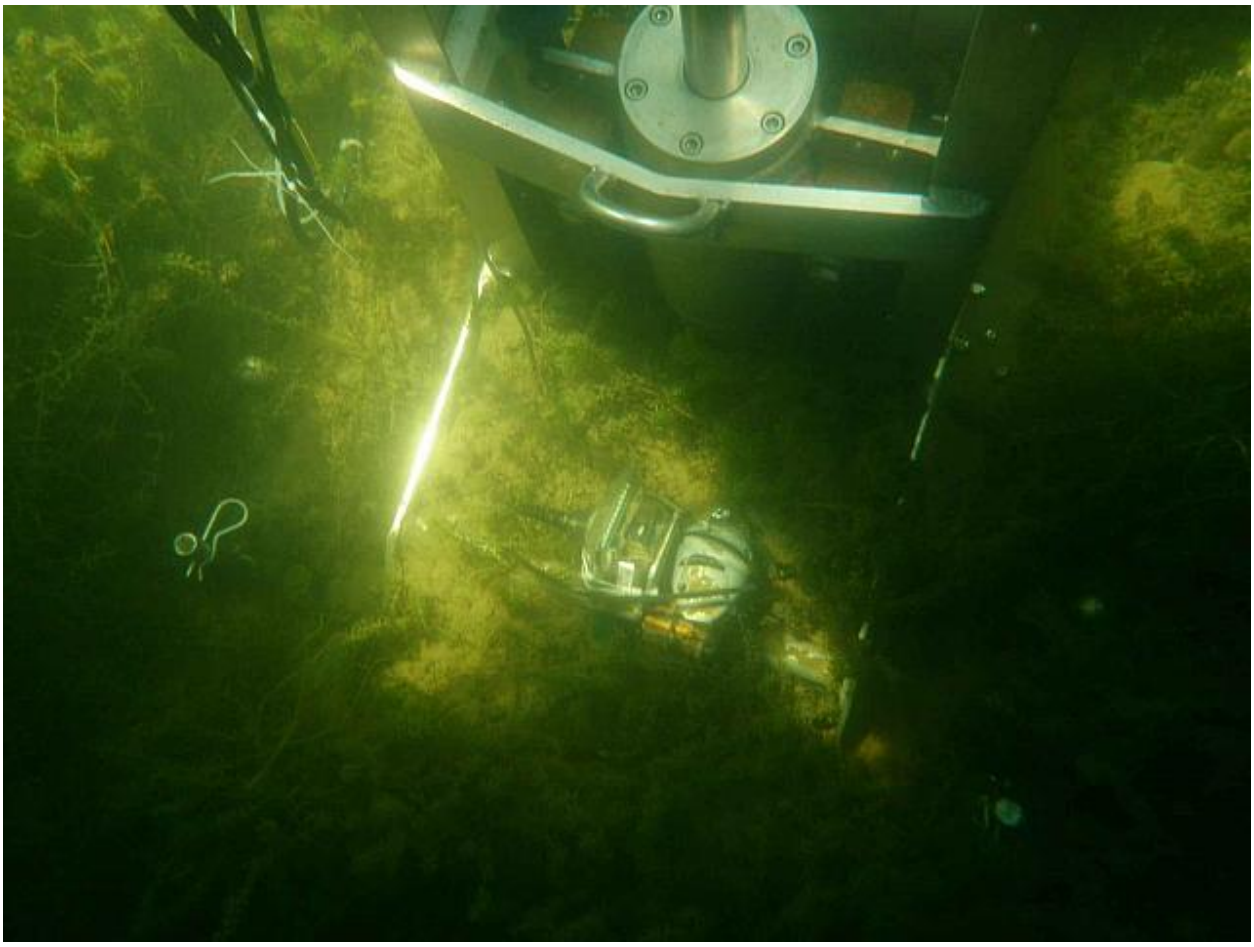

Fig. 7. A Frame Holds the Trident Probe on the Riverbed to Measure Water Temperature and Conductivity, September 2009.

Fig. 8. Geoprobe Tubes Placed for Investigation of West Side of 324 Building B-Cell, October 2014.

Fig. 9. A Diamond Wire Saw Being Used in the 327 Building H Cell, May 2009. It was Useful for Cutting Dissimilar Materials Including Concrete, Steel, and Heavy and Light Gauge Materials.

REVEGETATION AND WETLANDS RESTORATION

Since 2012, more than 446 ha (1,100 ac) along the River Corridor have been restored, including 12 ha (30 ac) of wetland restoration. One of the most notable restoration efforts performed by WCH is the exhumed area of a gravel pit near the Columbia River. As the pits across the site used for backfill and construction were depleted, DOE and WCH partnered with regulatory agencies to restore the viability of the habitat through contouring and revegetation. In the case of Pit 24, near the 100-B/C Area, the restoration was performed to contain a wetland, so as to better serve the native species in the area (Fig. 10). The native plant species were chosen to help regulate water temperatures, compete with undesirable species, and provide a healthy ecosystem for wildlife.

Fig. 10. 100-B/C Wetlands Restoration, July 2015.

THE ENVIRONMENTAL RESTORATION DISPOSAL FACILITY

More than 17 million tons of contaminated material has been disposed of at the ERDF; most of it is from the Columbia River corridor. The engineered and regulated disposal facility's capacity is 18 million tons and the disposal cells cover an area equivalent to 52 football fields (Fig. 11). A $100 million ARRA expansion project was completed with $29 million in cost savings by using a vertical expansion plan. The key to this success was active engagement of project personnel and encouraging the creative ideas of the workforce.

Fig. 11. The Environmental Restoration Disposal Facility, July 2015.

STRONG SAFETY CULTURE

The RCCP had the honor of being the first project-wide Voluntary Protection Program Star Site at Hanford (fiscal year 2008). The award is particularly remarkable considering the accomplishments, accelerations, and high-risk working conditions. Radiological, chemical, and contamination hazards including chromium, asbestos, beryllium, mercury, and tritium face WCH workers routinely. There are frequent surprises encountered at waste sites when it comes to content and quantity of waste discovered. In addition, industrial and construction hazards, high-dose fuel elements, unexploded ordnance, and pyrophoric uranium oxide drums are among the most challenging hazards encountered in our business (Fig. 12). Often, areas that were originally thought to have little or no radioactive material were found to have considerable high-dose elements and other nuclear reactor parts.

Fig. 12. The 340 Vault is Prepared to be Lifted and Transported to ERDF for Disposal, January 2014. The Vault had a Lift Weight of 2.3 Million Pounds and a Transport Weight of 3 Million Pounds.

CONCLUSIONS

The success of the RCCP has relied heavily on innovative technology, skilled and knowledgeable staff, and a strong safety culture. Among these broad areas, several key lessons learned have been identified.

- Implement the Integrated Safety Management System across all aspects of safety culture, from planning and execution to closeout.

- Plan for the costs and implementation of DOE sitewide programs that may not be geared towards a closure contract focus on schedules and budgets.

- For nonradiologically contaminated waste, the use of large-capacity, over-the-road dump trucks (Superdumps) is very cost effective as compared to containers for waste transport.

- Partnering with the DOE client and state/federal regulators was key to maintaining efficient project schedules and increasing communication and trust.

This includes knowing what the end looks like before starting a project.

- Break down project vs. functional interactions. Do not incentivize staff to be independent from either group as it will only lead to discontent and hinder the company's overall goals.

- Utilize LEAN and other process improvement strategies. Not all LEAN processes are well received or fruitful, but some saved upwards of 70% in cost and schedule.

REFERENCES

1. *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 U.S.C. 9601, et seq.

2. *American Recovery and Reinvestment Act of 2009,* 26 U.S.C. 1, et seq.