

5

WRPS-44270-FP  
Revision 0

# Tank Operations Contract Construction Management Methodology

## Utilizing the Agency Method of Construction Management to Safely and Effectively Complete Nuclear Construction Work

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy  
Office of River Protection under Contract DE-AC27-08RV14800



P.O. Box 850  
Richland, Washington 99352

**Approved for Public Release;**  
Further Dissemination Unlimited

# Tank Operations Contract Construction Management Methodology

Utilizing the Agency Method of Construction Management to  
Safely and Effectively Complete Nuclear Construction Work

K. F. Lesko  
Washington River Protection Solutions

H. M. Hamilton  
Washington River Protection Solutions

M. Farner  
T. Heath  
URS

Date Published  
January 2010

To Be Presented at  
Waste Management 2010 Conference

WM Symposia  
Phoenix, Arizona

March 7-11, 2010

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy  
Office of River Protection under Contract DE-AC27-08RV14800



washingtonriver  
protectionsolutions

P.O. Box 850  
Richland, Washington

**Copyright License**

By acceptance of this article, the publisher and/or recipient acknowledges the U.S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper.

*J. D. Arnold*  
Release Approval      01/14/2010  
Date

Approved for Public Release;  
Further Dissemination Unlimited

**LEGAL DISCLAIMER**

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This document is available to the U.S. Department of Energy and its contractors, in paper from the Office of Scientific and Technical Information (OSTI). It is available for sale to the public from the National Technical Information Service (NTIS).

This report has been reproduced from the best available copy. Available in paper copy.

**WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

**TANK OPERATIONS CONTRACT CONSTRUCTION MANAGEMENT METHODOLOGY  
UTILIZING THE AGENCY METHOD OF CONSTRUCTION MANAGEMENT TO SAFELY AND  
EFFECTIVELY COMPLETE NUCLEAR CONSTRUCTION WORK - 10175**

Karen Lesko\*, Peggy Hamilton\*, Tim Heath\*\*, Monte Farner\*\*\*  
\*Washington River Protection Solutions, LLC, Richland, WA 99352  
\*\*URS, Aiken, SC 29803  
\*\*\*URS, Richland, WA 99352

**ABSTRACT**

Washington River Protection Solutions, LLC (WRPS) has faced significant project management challenges in managing Davis-Bacon construction work that meets contractually required small business goals. The unique challenge is to provide contracting opportunities to multiple small business construction subcontractors while performing high hazard work in a safe and productive manner. Previous to the Washington River Protection Solutions, LLC contract, Construction work at the Hanford Tank Farms was contracted to large companies, while current Department of Energy (DOE) Contracts typically emphasize small business awards.

As an integral part of Nuclear Project Management at Hanford Tank Farms, construction involves removal of old equipment and structures and installation of new infrastructure to support waste retrieval and waste feed delivery to the Waste Treatment Plant. Utilizing the optimum construction approach ensures that the contractors responsible for this work are successful in meeting safety, quality, cost and schedule objectives while working in a very hazardous environment.

This paper describes the successful transition from a traditional project delivery method that utilized a large business general contractor and subcontractors to a new project construction management model that is more oriented to small businesses. <sup>1</sup>Construction has selected the Agency Construction Management Method. This method was implemented in the first quarter of Fiscal Year (FY) 2009, where Construction Management is performed by substantially home office resources from the URS Northwest Office in Richland, Washington. The Agency Method has allowed WRPS to provide proven Construction Managers and Field Leads to mentor and direct small business contractors, thus providing expertise and assurance of a successful project.

---

<sup>1</sup> John E, Schaufelberger, Len Holm, "Management of Construction Projects, A Constructor's Perspective", University of Washington, Prentice Hall 2002

## **WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

Construction execution contracts are subcontracted directly by WRPS to small or disadvantaged contractors that are mentored and supported by URS personnel. Each small contractor is mentored and supported utilizing the principles of the Construction Industry Institute (CII) Partnering process. Some of the key mentoring and partnering areas that are explored in this paper are, internal and external safety professional support, subcontractor safety teams and the interface with project and site safety teams, quality assurance program support to facilitate compliance with NQA-1, construction, team roles and responsibilities, work definition for successful fixed price contracts, scheduling and interface with project schedules and cost projection/accruals. The practical application of the CII Partnering principles, with the Construction Management expertise of URS, has led to a highly successful construction model that also meets small business contracting goals.

### **INTRODUCTION**

Washington River Protection Solutions, LLC has faced significant project management challenges in managing Davis-Bacon construction work that meets contractually required small business goals. The unique challenge is to provide contracting opportunities to multiple small business construction subcontractors while performing high hazard work in a safe and productive manner. Previous to the WRPS contract, Construction work at the Hanford Tank Farms was contracted to large companies, while current DOE Contracts typically emphasize small business awards.

Due to the relatively small volume of Construction work in the past, Construction work is subcontracted and there are no direct hire Construction forces within WRPS. Due to the complexities of working in a highly regulated environment with significant radiological hazards, the subcontracts are typically awarded to large companies that have the required expertise that is usually not found in small businesses. Transitioning from large company subcontracts to small business subcontracts means that instead of two subcontractors with multiple lower tier subcontractors, there are now multiple small business subcontractors.

Construction activities at the Hanford Tank Farm consist mainly of Waste Retrieval Activities and Infrastructure Improvement to support Tank Retrieval and Closure and Transfer of Waste to the Waste Treatment Plant for glassification.

### **CONSTRUCTION REQUIREMENTS**

Requirements for Construction activities come from several sources. Unlike some work areas, there is no one DOE Order or Standard that governs Construction. The WRPS Contract requires compliance with Environmental, Safety, Health and Quality Assurance (ESH&QA)

**WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

Requirements that flow down to the Construction Subcontractors through ESH&QA policies, plans and procedures.

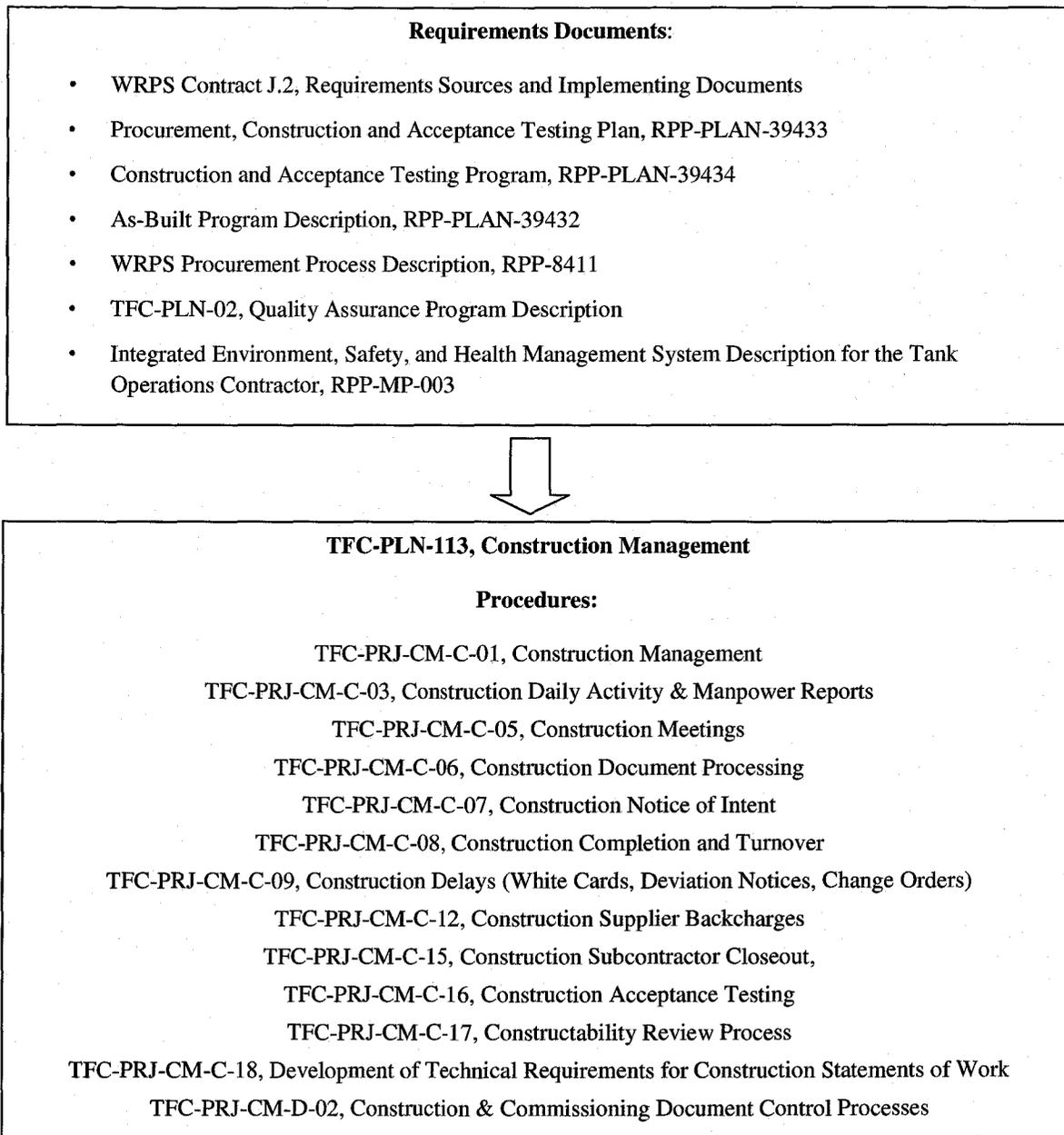
Requirements for Procurement of Construction services, likewise, come from the WRPS Contract and procurement requirements that are also captured in a Purchasing System contract deliverable, approved by DOE.

In addition, the WRPS Contract requires specific items relating to Procurement, Construction, Acceptance Testing, and As-Built. Three contract deliverables, approved by DOE, in this area require that the following items are included:

- Description of procurements, construction bids, and work packages;
- Construction management;
- Construction site management;
- Acceptance testing;
- Descriptive linkage to the *Project Execution Plan and the Integrated Safety Management System Description*;
- Verification and approval of all vendor's shop drawings to assure conformity with the approved design and working drawings and specifications;
- Acceptance test plans and procedures for on-site Contractor/subcontractor inspection of construction workmanship, compliance with design drawings and specifications, management of the design construction changes, and criteria for acceptance of fabricated and constructed items;
- Integrated construction acceptance test plans and inspection of construction to assure adherence to approved working drawings and specifications;
- Description of the as-built process, including the role of DOE-Office of River Protection and the operations contractor;
- Provisions stating that the operations contractor shall participate in acceptance of the as-built design, following construction, and commissioning;
- Drawing series to be as-built;
- Document control process for maintaining as-built; and
- Procedures for modification of the as-built.

**WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

The documents shown in Figure 1 Construction Requirements Flowdown, comprise the Construction Standard for the Tank Farms, and are flowed down to a plan and procedures. In addition, these requirements are flowed down to Construction subcontractors through the Tank Farm procurement system.



**Figure 1 Construction Requirements Flowdown**

## **WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

Construction firms must comply with WRPS ESH&QA Programs as well as Construction Requirements. Requirements are flowed down to the subcontractor through procurement documents and a detailed Construction Scope of Work which includes Quality Assurance and Safety Sections.

Work, even as simple as breaking up and pouring a new concrete pad, involves the flowdown of complicated requirements that many small businesses do not have the expertise or administrative staff to ensure compliance.

Work on Safety components and systems require compliance with and certification to NQA-1 2004. In order to win safety related work, companies must have achieved NQA-1 certification and be on the approved supplier list.

### **CONSTRUCTION MANAGEMENT MODEL**

<sup>2</sup>WRPS selected the Agency Construction Management Delivery Method for its Construction Management (CM) structure. Under this method, the WRPS Project Manager (PM) is the owner's representative directing the project work. The PM has three principle deployments (contracts): the design agency, the general contractor and the construction manager.

Figure 2 Agency Construction Management Delivery Method, depicts the Agency Method as implemented by the Tank Farms.

---

<sup>2</sup> John E, Schaufelberger, Len Holm, "Management of Construction Projects, A Constructor's Perspective", University of Washington, Prentice Hall 2002

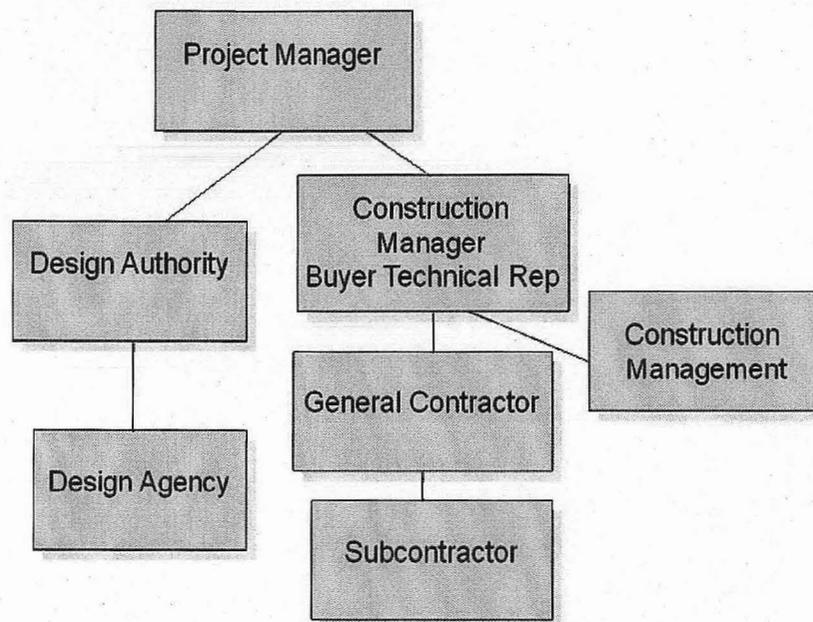


Figure 2 Agency Construction Management Delivery Method

## CONSTRUCTION ACQUISITION PLANNING AND EXECUTION

In the complex environment of the Hanford Tank Farms, Construction is performed inside the tank Farms, in conjunction with the operating facilities. Each element of the work is rigorously planned and released by the Shift Manager daily. Work packages have step by step instructions. The working environment is hazardous and involves chemical, radiation, contamination and industrial hazards, each of which is addressed during the planning process. Many small Construction firms have little or no experience in this environment and it is important to find "starter" jobs for companies where they can experience the rigorous planning and compliance environment with relatively low hazards.

In addition to the workplace hazards and the need for emphasis on safety, the work in the Tank Farms involves a high risk of cost and/or schedule overrun penalties that may be too great for a small business to bear. An increased emphasis on fixed price contracts can place more financial risk on a small company than it can afford to take on. The acquisition planning for each project must take the overall risk into account and include a strategy for overall success.

The Agency Construction Management Delivery Method provides flexible deployment. Construction Management personnel can be assigned to one or multiple projects and the Construction Team can be formed to support Design-then-Build, Design-Build or Phased

## **WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

Construction where the Construction is started when a portion of the design is complete and progresses with design.

Staffing assignments are made based on the hazard level of the work and the complexity of the Construction integration with the operating environment. Just as new or inexperienced Construction subcontractors can be guided to lower hazard and less complex jobs for their first assignments, new and/or inexperienced Construction Managers can be assigned to simpler lower hazard work or teamed with a more experienced Construction Manager. At any given time three to ten Construction Projects are underway in the Tank Farms and the amount of construction work is growing rapidly. Projects vary from very high hazard work with equipment in high level waste tanks, to installing trailer complexes.

CM personnel may be deployed project staff or matrixed personnel. Matrixed Construction Management personnel are assigned to a Construction Project from a central Construction group. Construction Managers may be WRPS employees or are available through Corporate reach back to URS.

The most significant advantages of the Agency Construction Management Delivery Method are:

1. This Construction Management method works well with subcontracted construction forces; and
2. The Construction Management team can focus on Construction Delivery in the field, freeing up Project Management for other priorities.

After determining the procurement approach (time and material, fixed price), Constructability Reviews are initiated. Constructability is an integral part of the way construction management conducts its business to ensure that subcontracted construction activities achieve high value performance expectations and cost expectations. Expectations of constructability include ensuring design is able to be built as intended, contractible, construction risks are eliminated or appropriately mitigated, and that construction schedules and cost estimates will adequately reflect design, procurement, selected contracting methods, and conditions of the site.

As design progresses, the Construction Statement of Work (SOW) is developed. Sufficient detail, including a detailed Work Breakdown Structure (WBS), is critical to the success of fixed price contracts. The detailed SOW and WBS, when issued in a comprehensive Request for Proposal (RFP) provides a clear delineation of responsibility for risk. This process, along with a robust Request for Information (RFI) process, allows small businesses to successfully bid. Pre-award activities are shown in Figure 3 Pre-Award Activities.

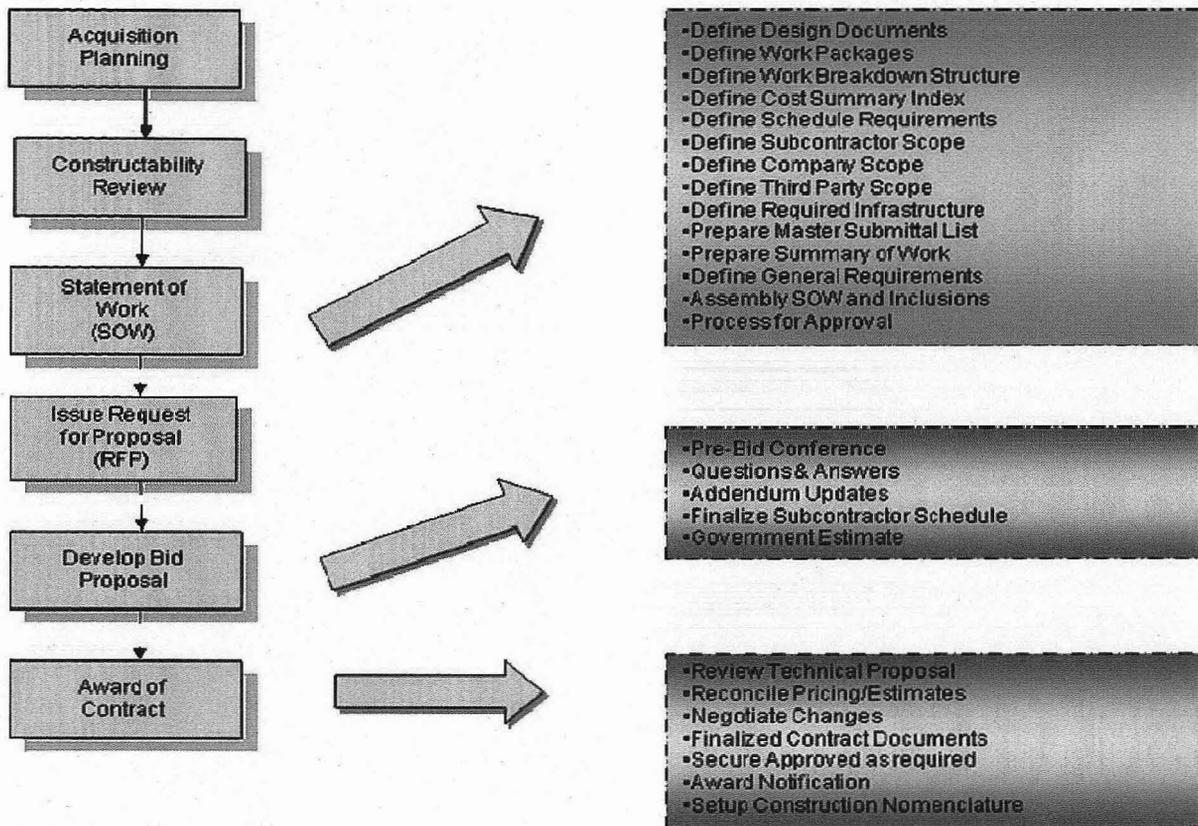


Figure 3 Pre-Award Activities

Figure 4 depicts the post award Construction and Execution Activities. Managing Requests for Information and emerging changes are critical during execution due to the age of the legacy equipment. For example, sometimes it is very difficult to remove contaminated equipment from the tank farm without damaging nearby equipment or the tanks. In addition, subcontractor claims (white cards) can amount to a significant amount of time due to inclement weather and other operational considerations.

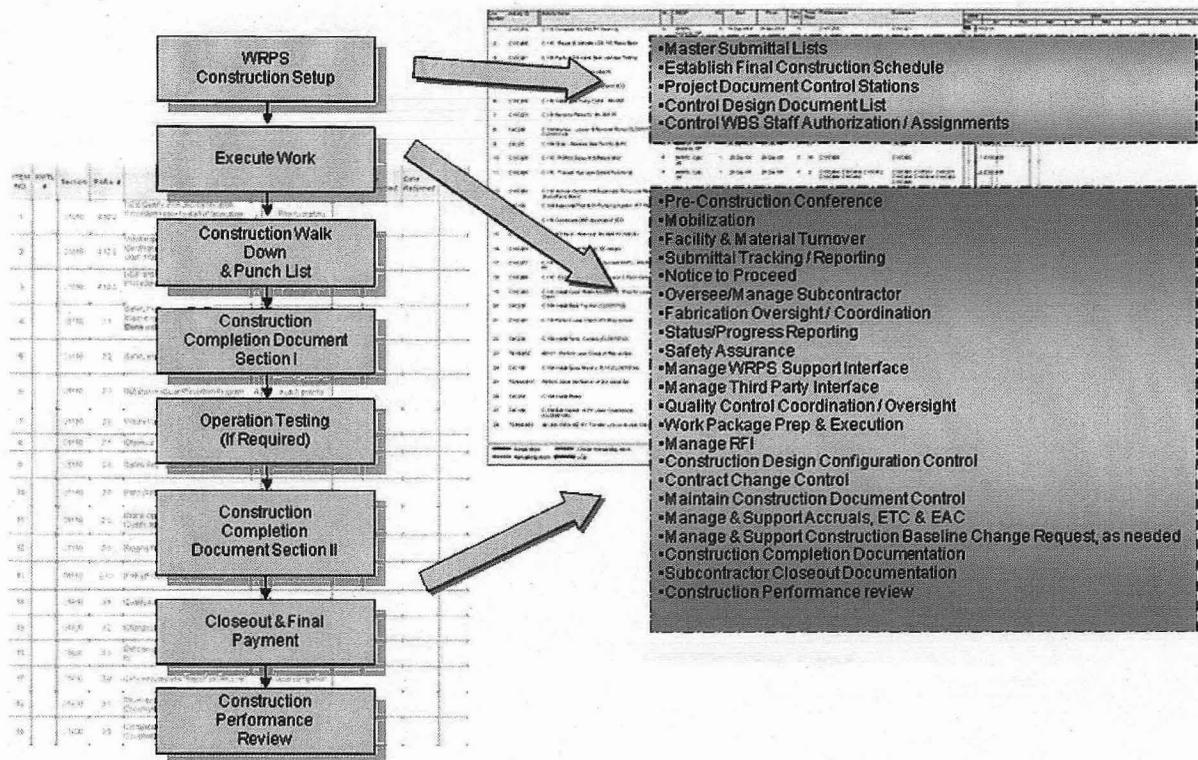


Figure 4 Construction Execution and Close Out

**PARTNERING PRINCIPLES**

Washington River Protection Solutions' parent corporation is URS. URS is a member of the Construction Industry Institute (CII) and has successfully used the CII proven successful Partnering Approach with Construction subcontractors. WRPS is using the CII Partnering Approach to team with subcontractors and find win-win solutions to construction in the Tank Farms.

Partnering addresses unique challenges with small business Construction subcontractors. Adversarial relationships are counter-productive, , therefore WRPS spends significant time and energy mentoring small business Construction subcontractors. Growing subcontractor expertise while working with the subcontractors to assist in weak areas allows WRPS to meet small business contracting goals while successfully completing construction projects.

WRPS is currently mentoring subcontractors in the following areas:

## **WM2010 Conference, March 7-11, 2010, Phoenix, AZ**

- Qualifying Field Work Supervisors so enough supervisors are available for upcoming work;
- Quality Assurance mentoring to have more subs on the approved supplier list;
- Field Document Control to ensure controlled field files are available and kept up to date;
- Billing and accruals; and
- Scheduling field work and integrating the Construction schedule with the operating schedule

As subcontractors acquire experience and qualifications, they likely to be more successful in bidding for more complex, higher hazard work.

### **ASSESSMENT OF AGENCY MODEL SUCCESS**

NOTE: The information below will be updated in the final paper

#### *SAFETY*

As of September 30, 2009, Tank Operations Construction Contractors have worked ~ 108,400 hours or 254 days without a Lost Time Workday Injury or a Recordable Injury.

#### *QUALITY*

Through September 30, 2009, six Construction Projects totaling \$1.6M resulted in only one non-conformance report.

#### *TEAMWORK*

Each Construction project was completed utilizing the Agency Construction Management Delivery Method with qualified Construction Managers, Field Leads and Field Work Supervisors.

#### *COST AND SCHEDULE*

Approximately \$11M of Construction work was completed in FY2009, with Construction work projected to quadruple in FY2010.

**EXAMPLES AND RANGE OF WORK TYPES**

Construction work in the Tank Farms can be categorized into four types:

- Construction supporting waste retrieval and closure including projects involving removal of obsolete equipment from waste tanks and installation of new systems that support waste retrieval;
- Installation of interim barriers to prevent liquid intrusion through the soil (interim barriers prevent waste in known previous leak sites from moving toward the water table until such time as the interim barriers can be replaced with permanent closure barriers in Tank Farms);
- Infrastructure upgrades in tank farms including ventilation, power and waste transfer line upgrades that will allow waste to be transferred to the Waste Treatment Plant for glassification; and
- Infrastructure upgrades outside the tank farm proper including both permanent office and shops and field offices to house the increased number of people needed to complete scheduled projects.

Construction projects include very small (i.e., painting, pouring a concrete pad) in the \$25,000 range and large projects (installing a new waste system) that can be over \$10M.

Small construction subcontractors compete for, and are awarded work, based on both the complexity of the job and need for more sophisticated project control and management techniques and the hazard. WRPS' experience has been that subcontractors are better equipped to bid successfully on jobs with the more experience they receive and that subcontractors do not bid on work that they are not capable of performing. During the bid and award process, an evaluation team supported by Construction Management and the Construction Team that developed the scope of work assists bidders by answering questions in a comprehensive manner to ensure that the subcontractors understand the details of the work being requested. Contracts are evaluated thoroughly in a technical bid evaluation process and are awarded based on best value to the government which is generally, but not always the lowest bid. Unrealistically low bids are compared to the Government Fair Cost Estimate and are approached from the standpoint that the bidder did not understand the work. Low fixed price bids are not unilaterally accepted in the technical bid evaluation process as the goal is a safely executed, high quality completed project and a win-win teaming solution with our small business subcontractors.

**CONCLUSION AND FUTURE CHALLENGES**

In conclusion, working with small business Construction subcontractors in the Hanford Tank Farms is a significant challenge. Success has been achieved by utilizing the Agency Construction Management Delivery Method and mentoring each small contractor utilizing the principles of the Construction Industry Institute (CII) Partnering process for mutual success. As WRPS Construction work increases over time, we expect more small businesses to compete for work. As the CII Partnering process progresses with each small contractor, it is expected that proposals will become more sophisticated and work execution will be more streamlined, providing greater value for all entities involved.

**ACKNOWLEDGMENTS**

I would like to acknowledge my co-authors Monte Farner, Peggy Hamilton and Tim Heath. In addition I would like to acknowledge Edgar Martinen. Each of these individuals has played a significant role in Construction Management success at Washington River Protection Solutions, LLC.

**REFERENCES**

1. John E, Schaufelberger, Len Holm, "Management of Construction Projects, A Constructor's Perspective", University of Washington, Prentice Hall 2002  
John E, Schaufelberger, Len Holm, "Management of Construction Projects, A Constructor's Perspective", University of Washington, Prentice Hall 2002