HNF-34751-FP
Revision 0

Improvements in Container Management of Transuranic and Low-Level Radioactive Waste Stored at the Central Waste Complex at Hanford

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

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

FLUOR®
P.O. Box 1000
Richland, Washington

Approved for Public Release;
Further Dissemination Unlimited

Improvements in Container Management of Transuranic and Low-Level Radioactive Waste Stored at the Central Waste Complex at Hanford

E. M. Uytioco
Fluor Government Group

P. A. Baynes
K. B. Bailey
D. E. McKenney
Fluor Hanford, Inc.

Date Published
November 2008

To Be Presented at
Waste Management 2008

Waste Management Symposia, Inc.
Phoenix, Arizona

February 24-28, 2008

Published in
Waste Management Symposia 2008

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

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

FLUOR®
P.O. Box 1000
Richland, Washington

Approved for Public Release;
Further Dissemination Unlimited

R. D. Aardal 11/14/2007
Release Approval Date

Improvements in Container Management of Transuranic and Low-Level Radioactive Waste Stored at the Central Waste Complex at Hanford - 8060

E. Uytioco
Fluor Government Group
P.O. Box 1000, Richland, WA 99352

P.A. Baynes, K.B. Bailey, D.E. McKenney
Fluor Hanford, Inc.
P.O. Box 1000, Richland WA 99352

ABSTRACT

The Central Waste Complex (CWC) is the interim storage facility for Resource Conservation & Recovery Act (RCRA) mixed waste, transuranic waste, transuranic mixed waste, low-level and low-level mixed radioactive waste at the Department of Energy's (DOE's) Hanford Site. The majority of the waste stored at the facility is retrieved from the low-level burial grounds in the 200 West Area at the Site, with minor quantities of newly generated waste from on-site and off-site waste generators. The CWC comprises 18 storage buildings that house 13,000 containers. Each waste container within the facility is scanned into its location by building, module, tier and position and the information is stored in a site-wide database.

As waste is retrieved from the burial grounds, a preliminary non-destructive assay is performed to determine if the waste is transuranic (TRU) or low-level waste (LLW) and subsequently shipped to the CWC. In general, the TRU and LLW waste containers are stored in separate locations within the CWC, but the final disposition of each waste container is not known upon receipt. The final disposition of each waste container is determined by the appropriate program as process knowledge is applied and characterization data becomes available. Waste containers are stored within the CWC based on their physical chemical and radiological hazards. Further segregation within each building is done by container size (55-gallon, 85-gallon, Standard Waste Box) and waste stream.

Due to this waste storage scheme, assembling waste containers for shipment out of the CWC has been time consuming and labor intensive. Qualitatively, the ratio of containers moved to containers in the outgoing shipment has been excessively high, which correlates to additional worker exposure, shipment delays, and operational inefficiencies. These inefficiencies impacted the LLW Program's ability to meet commitments established by the Tri-Party Agreement, an agreement between the State of Washington, the Department of Energy, and the Environmental Protection Agency. These commitments require waste containers to be shipped off site for disposal and/or treatment within a certain time frame. Because the program was struggling to meet production demands, the Production and Planning group was tasked with developing a method to assist the LLW Program in fulfilling its requirements.

Using existing databases for container management, a single electronic spreadsheet was created to visually map every waste container within the CWC. The file displays the exact location (e.g., building, module, tier, position) of each container in a format that replicates the actual layout in the facility. In addition, each container was placed into a queue defined by the LLW and TRU waste management programs. The queues were developed based on characterization requirements, treatment type and location, and potential final disposition.

This visual aid allows the user to select containers from similar queues and view their location within the facility. The user selects containers in a centralized location, rather than random locations, to expedite shipments out of the facility. This increases efficiency for generating the shipments, as well as decreasing worker exposure and container handling time when gathering containers for shipment by reducing movements of waste container. As the containers are collected for shipment, the remaining containers are segregated by queue, which further reduces future container movements.

INTRODUCTION

Storing waste containers and retrieving those containers within the CWC can be complicated and unsystematic due to the sheer quantity of containers. This waste storage scheme was inefficient, causing delays that affected both the LLW and TRU programs in preparing shipments out of the facility.

The TRU Program ships containers out of the CWC for characterization and remediation. Containers are also shipped to the CWC from the characterization and remediation facilities for interim storage. The TRU Program typically makes four shipments a week (into and out of the CWC): 80 waste containers to the characterization facility, one shipment of 50 waste containers to the remediation facility, and two shipments of 80 each into the CWC.

The LLW Program typically sends two shipments of containers – 80 containers each – out of the CWC for remediation or disposal. Generally, the LLW Program does not ship containers into the CWC for storage after remediation.

Assembling the containers and making the shipments are labor intensive processes that involve extensive container handling, which in turn increases the potential for worker exposure. To minimize moving containers and maximize efficiency, the Production and Planning group developed a new storage scheme for the CWC using input from the LLW and TRU Programs and CWC personnel. In addition, they developed a visual layout of the CWC including a map identifying the location of each waste container within the facility. This paper describes the methods used to develop the new storage scheme and the visual map, as well as the successes of the new system.

CONSOLIDATING DATA

The Waste Stabilization and Disposition (WSD) Project includes the low-level burial grounds, the CWC, characterization and repackaging facilities, a LLW management program, and a TRU management program. Each program and facility within the WSD uses a separate container data

management system customized to its needs. Combining the data from each of these three databases was the key to creating the map:

- Solid Waste Inventory Tracking System (SWITS)
- Data Management System (DMS)
- TRU Electronic Data Management Tracking (TRU EDMT).

SWITS is used throughout WSD to track and manage all waste containers. DMS is used by the characterization facility to track and manage the waste containers within their facility. The TRU Program office uses TRU EDMT to track containers through the characterization, certification, and shipping processes. Each database contains unique and valuable information, and together they provide a broad picture for each container.

Extracting relevant data from each database was critical to generating a file that would meet the needs of each program. The Production and Planning group consulted with representatives from the LLW and TRU Programs, and CWC operations to determine the data necessary to perform their functions, with respect to shipping. The primary information that each program required was the container's identification number, and its TRU/LLW status, location and waste designation (i.e., waste stream or treatability group). Secondary information included fissile gram equivalent, plutonium-equivalent curies, weight, source facility, vent type, and container size.

Microsoft® Access was the main platform used to consolidate the relevant data. Tables from each database (SWITS, DMS and EDMT) were linked and imported using Access. These tables were then queried for the data requested by each program. Once the queries were developed, the data was exported into Microsoft® Excel. This Excel file became the consolidated source of data for users creating inter-facility shipments and is referred to as the SWOC Facility Map File.

DEVELOPING A QUEUE SYSTEM

Once the data had been consolidated, it became clear that the data and the containers should be sorted into queues. Developing a queue system played a key role in creating a usable map. This system forced each program to clearly identify the current path for each waste container and update that path as the container progressed through the characterization or designation process.

The TRU Program developed a queue system based on container size, characterization needs, waste stream status and repackaging needs. The LLW Program developed a queue system based on treatability group, treatment location, physical state, and regulatory requirements (i.e., Toxic Substance Control Act [TSCA], Comprehensive Environment Response, Compensation, and Liability Act [CERCLA]).

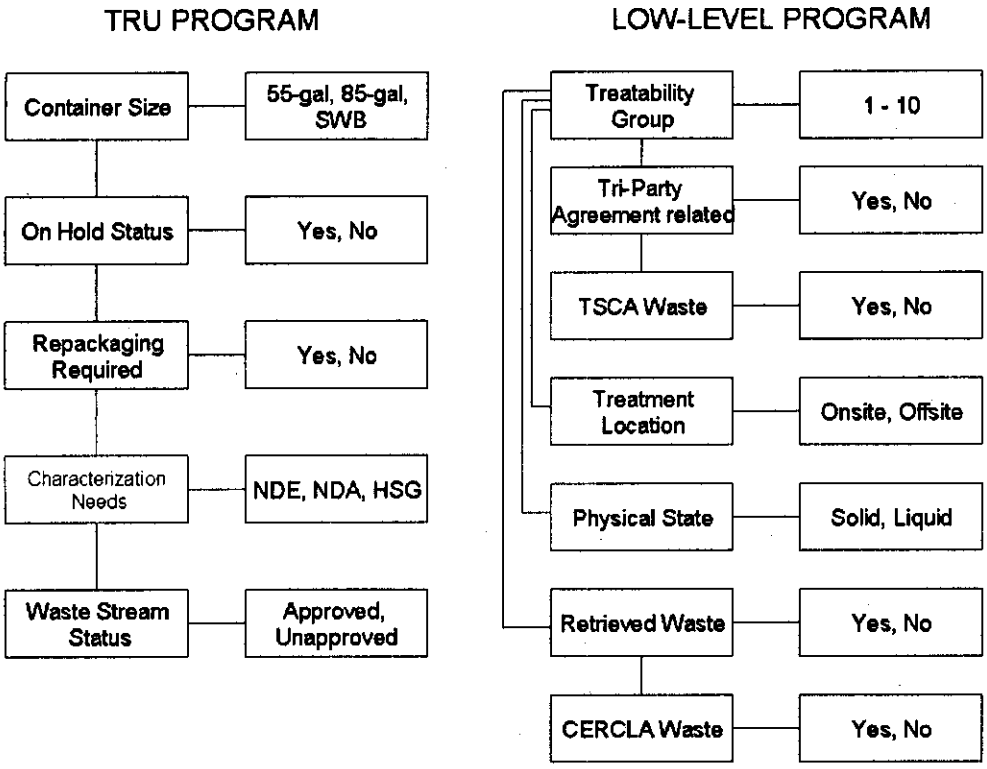


Fig. 1. This diagram shows the logic for establishing queues for each program.

Categorizing the data using these guidelines created 22 queues for the LLW Program and 24 queues for the TRU Program. Using Microsoft® Access queries, these criteria were applied to assign a queue number to each waste container within the CWC. This additional data was exported to the SWOC Facility Map File for incorporation into the visual map.

CREATING THE VISUAL LAYOUT

After the SWOC Facility Map File was created and the queues were integrated, the visual layout of the facility was generated. The waste containers are stored within each building at the CWC in modules that are two containers wide and three tiers high. The visual layout had to represent this three-dimensional scheme in a two-dimensional arrangement (See Figure 2).

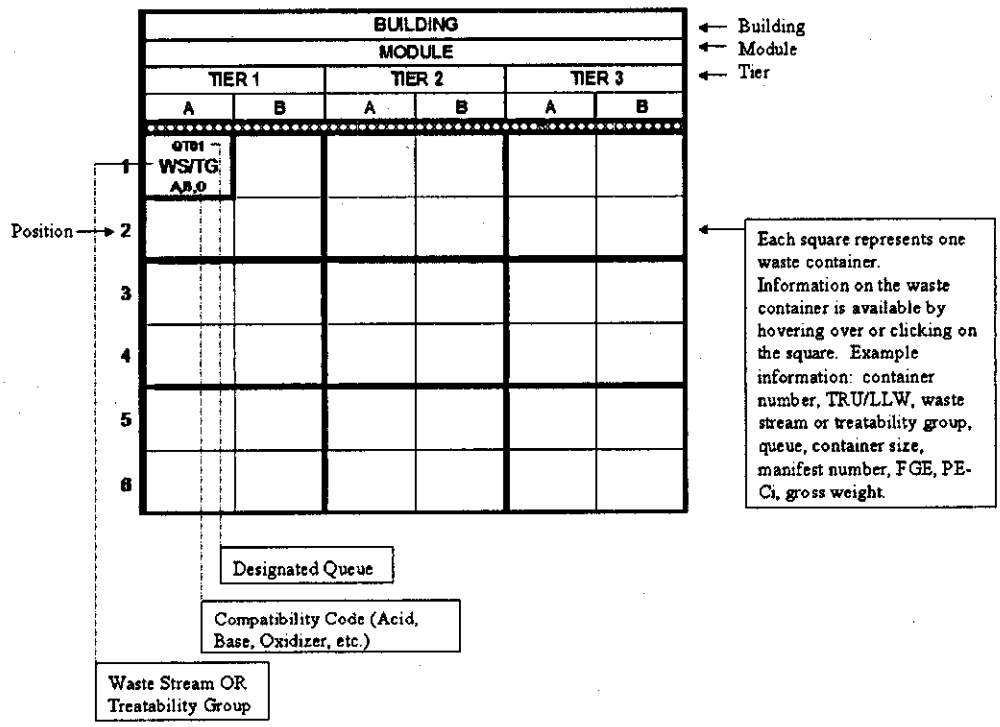


Fig. 2. This graphic shows the visual layout incorporated in the map file.

Once the layout was developed, macros and hyperlinks were used in Excel to link each square with a worksheet that contains the data for the waste container represented by that square. Each square on the map diagram represents one waste container. Within each square is a limited amount of information about the waste container, such as waste stream or treatability group, queue, and compatibility codes. Additional information not immediately shown can be accessed for each container by hovering over or clicking on the square.

USING THE SWOC FACILITY MAP FILE

The SWOC Facility Map File is stored on a shared drive to allow access by all programs and facilities within the SWOC. Users can view all containers within the CWC facility, all containers within a specific building, or only containers within a particular category. The categories available are manifest number, queue, waste stream, treatability group, waste type, location, compatilibility code, vent type and container list. The containers in the selected category will highlight on the map allowing the user to choose containers for shipment based on centralized locations (see Figure 3).

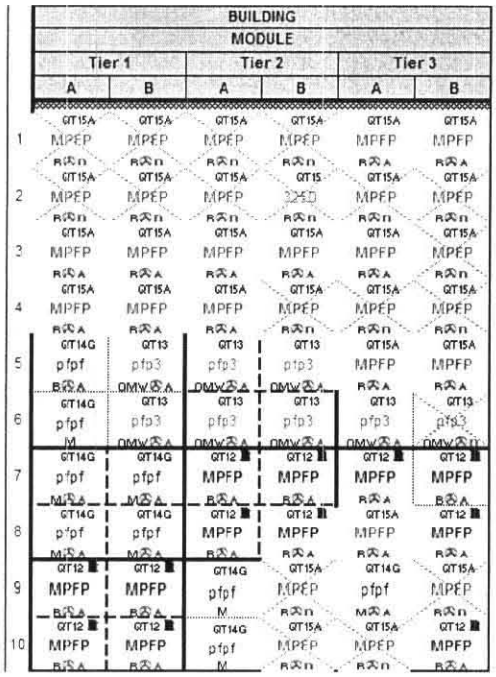


Fig. 3. Waste containers from a specific category are highlighted to assist with assembling shipments.

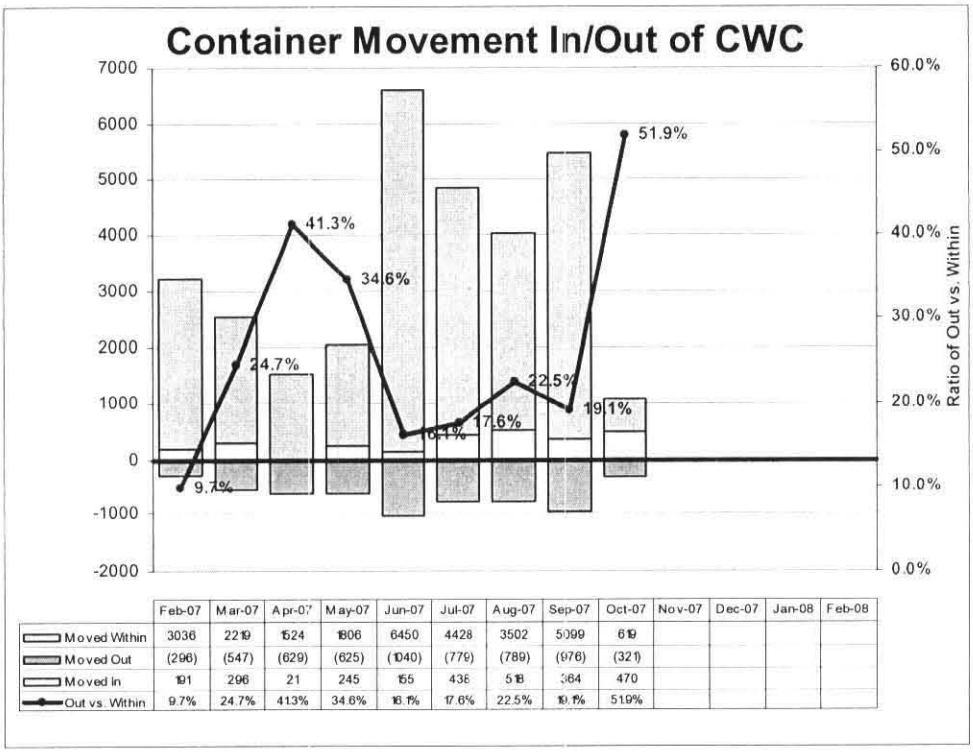
As shown in Figure 3, the boxes highlighted in yellow represent the containers of interest. The user would select the containers that are grouped together and would require minimal repositioning. Keeping in mind that position 1 is at the back of the module, or closest to the wall, the highlighted containers in positions 8 through 10 would be most easily accessible. Selecting these containers would minimize the number of times containers would have to be moved, maintain the principles of ALARA, and make the process for sorting containers for shipment more efficient. Selecting containers in positions 1 through 5 would require all the containers in position 6 through 10 to be moved which, in turn, increases container movements and decreases efficiency.

The primary use of the file is to build shipments for transfer out of the facility. Its secondary use is to assist the CWC in sorting and organizing the building by queues to further increase efficiency when preparing future shipments. As waste containers are retrieved from modules for shipments, the remaining containers within the module are typically sorted by queue into separate modules.

TRACKING THE SUCCESSES

The Production and Planning group monitors and measures the ratio of containers moved within the CWC to containers on a shipment manifest. This quantifies the improvements made since the map file was implemented. Before the visual aid was developed, the ratio was 10:1 – indicating the workers were moving ten containers for every one container on the shipment. Within two months of adopting the new visual aid, this ratio dropped to 2.5:1: a four-fold reduction in the potential for worker exposure, container handling, and shipment assembly time.

After this initial success, the ratio started to increase up to 5:1 (see Figure 4). The Production and Planning group investigated the possible scenarios and determined that many times shipments are prepared and staged months in advance of shipment out of the CWC. Further, containers are sorted into modules as these shipments are prepared. This correlates to more container movements inside the facility but minimal container movements out of the facility. Until all modules are sorted, the ratio will likely remain at 5:1.



	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08
Moved Within	3036	2219	1524	1806	6450	4428	3502	5099	619				
Moved Out	(296)	(547)	(629)	(625)	(1040)	(779)	(789)	(976)	(321)				
Moved In	191	296	21	245	155	438	518	364	470				
Out vs. Within	9.7%	24.7%	413%	34.6%	16.1%	17.6%	22.5%	19.1%	519%				

Fig. 4. As this chart shows, more containers are moved inside the CWC than are shipped out.

The LLW Program had great success from the time of implementation. One example was in preparing a shipment under severe time constraints with few containers available. In this instance, the map was used to pick the most accessible containers in the most centralized locations. The shipment was made on time with a maximum number of containers.

CONCLUSION

Consolidating available waste container data, developing a system of binning similar containers, and generating a visual layout can create efficiencies in many aspects of container management. In this case, successes were observed in planning and assembling shipments, reducing potential worker exposure, and meeting production goals. In addition, it is likely that further efficiencies will be experienced once the CWC is completely segregated and sorted into modules by queue. Often times, a visual aid is more functional. Mapping each waste container within the facility allows all users, from management to operators, to plan their work in a more practical manner.