

## Safety Alert

# Radioactive Liquid Release from Drums

June 2011

### Summary

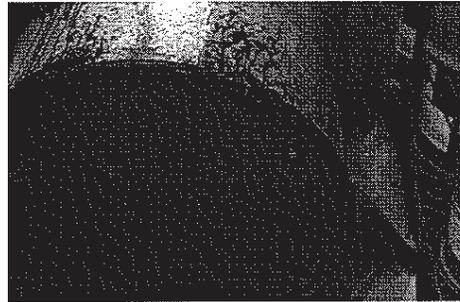
During the past year, transuranic (TRU) waste drums at two Environmental Management (EM) sites have failed, releasing acidic and highly radioactive liquid wastes. In both cases, the failed waste drums were relatively new and had corroded from the inside, thus providing no indication of their imminent failure. The resulting high contamination and airborne radioactivity levels severely hindered the ability of facility personnel at both sites to reenter the areas and contain the release in a timely fashion.

#### Savannah River Site

(EM-SR--SRNS-CPWM-2010-0010)

During drum retrieval activities, a severely corroded 55 gallon drum was recovered from a water filled culvert. Real Time Radiography (RTR) showed the drum to have free liquid inside, but the composition of the liquid was unknown. Per site practice, the drum was overpacked into a new 85- gallon DOT Type 7A liquid-rated container and stored at TRU Pad 16. The overpack did not have a plastic liner.

Approximately 2 years later, on July 27, 2010, the overpacked drum was rolled off a pallet in preparation for movement. An approximately 1 inch diameter piece of the overpack bottom failed and liquid began running out.



The hole developed in an otherwise solid looking drum. The blue material is a fixative applied to reduce the spread of contamination

#### Hanford Site

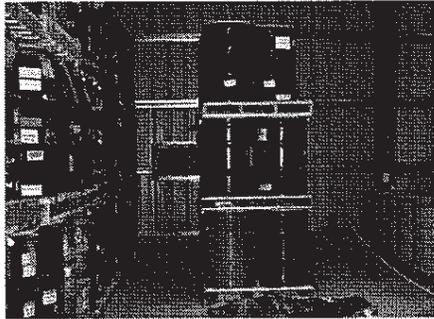
(EM-RL—CPRC-WRAP-2011-0002)

A 55 gallon drum that had been retrievably buried in 1979 was recovered in 2006 and placed in the queue for remediation for shipment to Waste Isolation Pilot Plant. RTR showed an inner liner, an absence of debris and a mass consistent with absorbed liquid. The drum was transferred to Waste Receiving and Processing Facility (WRAP) for remediation. Efforts to prepare the drum for disposal consisted of pouring the drum contents onto a sorting table and testing the contents. The absorbed liquid was found to have a pH of 2 or less. Baking Soda was added to neutralize the liquid; however no pH testing was performed after the addition to determine if the treatment was effective. The contents were repacked into 2 daughter drums without liners. These drums had an acrylic paint coating on the inside. Approximately 2 months later, one of the daughter drums was found leaking during a routine inspection.

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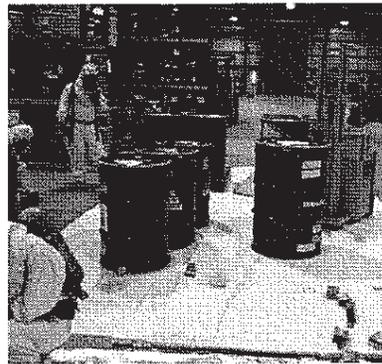


Cramped operating conditions in the drum aisle impacts the response

### Response

Follow-up radiological surveys at the TRU Pad 16 and WRAP facilities indicated transuranic radioactive contamination levels up to 58 million and 73 million disintegrations per minute per 100 square centimeters (DPM/100 cm<sup>2</sup>) respectively. These extremely high contamination levels also created the potential for airborne radioactivity concentrations that exceeded the protection factors of the powered air purifying respirators (PAPR) routinely used by both facilities. After initial immediate actions to contain the leaks, both facilities opted to prescribe respiratory protection devices with higher protection factors (airfed suits and self-contained breathing apparatus) to support entries for decontamination of the spill areas; however facility personnel were not currently trained on the more protective respiratory protection devices. Consequently, each facility required a minimum of five days to obtain

the necessary equipment, train personnel, and plan and conduct a re-entry to the facility and overpack the leaking drums. Surface contamination levels were significant and hampered operations while the cleanup was undertaken.



Drum pallet dethatched and leaking drum overpacked.

### Observations

The Office of Safety Operations Assurance (EM-22) review of the events and discussion with Department of Energy and contractor personnel identified the following:

- The sudden failure of the drums, without any external indications of failure is troubling. Without any obvious signs that a drum is structurally under attack, actions to prevent or mitigate such failures are difficult to plan.
- Any drum containing free liquid or damp materials has the potential for failure.
- Of particular concern is the possibility of a drum failure while in transit. At both sites, drums are moved using forklifts and any spill during these movements

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would be uncontained, with the potential for release onto the ground.

- Waste drums known to contain liquids were not routinely segregated or stored in a manner different from other waste drums. No special treatment or precautions were taken when moving known liquid-containing drums.
- Facility procedures for leaking drum spill response had generic guidance (i.e., “use the SWIMS procedure”) and did not address potential chemical concerns.
- Spill response may require special PPE to protect workers from strong acids and bases. Radioactive response to these events will require high levels of personnel protection.

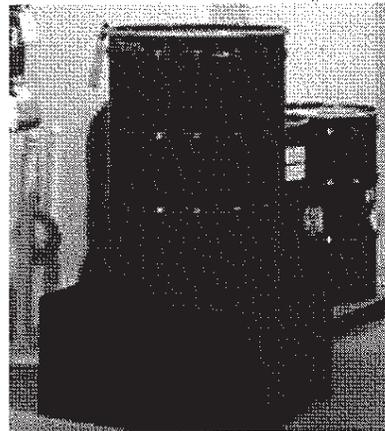
Imposing requirements to treat all drums as a potential release of the magnitude experienced from the two events would be prohibitively expensive and the mitigative actions would rapidly grind drum movements to a halt.

Screening to identify potentially high risk drums, actions to mitigate the failure of those drums and advanced planning to respond to such drum failures are necessary.

### Recommended Actions

EM facilities currently handling and storing radioactive waste drums should review this Safety Alert and evaluate its applicability to their own operations. In particular, such facilities should take actions to ensure they meet the following objectives:

1. Sites should develop a process to identify those drums with higher potential for leakage. Drums that may contain free liquids and/or damp materials should have the threat to the integrity of the drum assessed.
2. Each site should develop the capability to mitigate a leak from the drums identified as having higher potential risk. This should include drums in storage and in transit.



Overpacked drum stored on a spill pallet

3. Sites should ensure they have an effective capability in place to respond to leaking drums in a timely fashion regardless of where they occur. To meet this objective, facility response procedures should provide appropriate detail, PPE should be readily available and appropriate for event conditions, and individuals should be currently trained for all levels of required PPE and in event response procedures.

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4. Each site should conduct training with realistic drill scenarios to test its ability to respond to an unexpected release of radioactive liquid from a drum. This should have the facility response integrated with site emergency services.

Questions concerning this EM Safety Alert should be directed to Terry Tracy (301) 903-7964 or Ed Westbrook (303) 236-3673 of EM-22.

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