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16. KEY

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1		Cog. Mgr. M. A. Mihalic	M A Mihalic		R2-77			7/1/93			
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D. L. Smith D L Smith 6/30/93 Signature of EDT Originator / Date	Authorized Representative for Receiving Organization / Date	M. A. Mihalic M A Mihalic 7.1.93 Cognizant/Project Engineer's Manager / Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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7. Abstract

The risk and consequences of interim stabilization of radioactive surface contamination at the 241-WR vault and 216-U-5 and 216-U-6 cribs are compared to similar activities analyzed at the 216-A-24 crib. The risk was found to be acceptable, and the safety evaluation for 216-A-24 crib is applicable.

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SAFETY EVALUATION FOR THE INTERIM STABILIZATION OF RADIOACTIVE SURFACE CONTAMINATION AT 241-WR VAULT, AND 216-U-5 AND 216-U-6 WASTE SITES

D. L. Smith

July 1993

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SAFETY EVALUATION FOR THE INTERIM STABILIZATION OF RADIOACTIVE SURFACE CONTAMINATION AT 241-WR VAULT, AND 216-U-5 AND 216-U-6 WASTE SITES

1. INTRODUCTION

In the near future, Environmental Restoration Operations intends to interim stabilize radioactive soil contamination associated with the 241-WR vault, and the 216-U-5 and 216-U-6 cribs. These waste sites are located in the 200 West area, northeast of U-Plant. The planned actions are described in WHC-SD-DD-TI-074, *Interim Stabilization Plan and For 241-WR Vault, and 216-Z-12, 216-T-3, 216-T-6, and 241-T-361 Waste Sites* (WHC 1993), and are necessary in order to prevent the further spread of radioactive surface contamination until a record of decision is made for final remediation. The work consists of consolidation of contaminated soil from the vicinity of the 241-WR vault over the nearby 216-U-5 and 216-U-6 cribs. Consolidated soil will be interim stabilized with 18 to 24 inches of uncontaminated soil. Areas around the vault will be posted as underground radioactive material. Site preparation will include debris, power pole, fence, and steam line removal. Other site preparation may include radiological and civil surveys.

In 1988, a safety evaluation, WHC-SD-DD-TI-032, *Safety Evaluation of Stabilization of 216-A-24 Crib* (WHC 1988), was prepared for the stabilization of the 216-A-24 crib (A-24 for the rest of the document), which is located just outside the east fence of 200 East Area. After analyzing explosion, resuspension of contaminated soils, and resuspension of excavated soils scenarios, it was concluded that the consequences of these scenarios were well within the radiological and toxicological risk acceptance guidelines. These scenarios, with the exception of the explosion, are applicable in regards to the 216-U-5 and 216-U-6 cribs. This is because the cribs never received explosive material. However, the scenarios may only partially apply to the 241-WR vault because the vault is not directly comparable to the A-24 crib.

The 241-WR Vault is also a belowgrade reinforced concrete structure. There are nine individual cells (vaults) within the structure arranged in two rows. One row has four cells and the other five. Facility dimensions are 125 ft by 63 ft by 45 ft deep. Each cell contains a 50,000 gal tank. The row of five cells is overlain by a pump pit. The pump pit is covered by concrete cover blocks, which function as the roof of the 241-WR vault. A pipe gallery runs the length of the four cells and can be accessed through a ground level door and staircase. All aboveground utilities to the vault (e.g., steam, electricity) have been removed or disconnected. Belowgrade exhaust lines from the individual cells were cut and plugged with concrete. Essentially all abovegrade support facilities have been removed, so that only the vault structure and belowgrade ducts remain. All nine tanks have had the majority of their contents removed. It is estimated that a 2-ft tank heel remains in each tank. The contents of the tank have been sampled (WHC 1991b). During pumping operations, it was noted that one tank was damaged and would not hold liquid, and that two other tanks were leaking (RHO 1984). The surface of the vault has been covered with polyurethane or similar material, presumably to limit water infiltration and stabilize radioactive contamination.

Because of the self-contained nature of the vault, there is little possibility that interim stabilization activities will expose workers to the contents of the vault. There are several reasons for this. First, interim stabilization activities will focus on contaminated soil found around the perimeter of the vault. This contamination is mainly due to biological transport and past spills at the site. Contamination levels are low and present little difficulty to interim stabilization activities. Second, heavy equipment will not be allowed to drive on the vault surface. This will minimize the chance for exposure by limiting the probability that the concrete structure might fail. Even though there are no indications that the vault structure is unsound, only pedestrian access will be allowed on the vault surface. This will be necessary for radiological surveys and possible decontamination or interim stabilization efforts. Finally, the vaults interior has been sealed from the surface. Abovegrade structures and ventilation ducts have been removed and isolated from the environment. Interim stabilization activities will, in no way, deal with the interior of the vault. Therefore, radiological hazards at the vault are mainly due to contamination found in the surface soils.

The proposed work at 241-WR vault and 216-U-5 and 216-U-6 cribs is similar to work conducted at the A-24, i.e., removal and interim stabilization of contaminated soil with heavy equipment. Distances to onsite structures are similar. Discounting structural differences, the two resuspension scenarios are appropriate for work at the 241-WR vault, and 216-U-5 and 216-U-6 cribs. Provided there are no differences between the facilities which cause the results of the evaluation to exceed the risk guidelines, the safety evaluation is applicable to both. Excavated soil at the A-24 crib was contaminated with radioactive material at levels in excess of those found in the vicinity of 241-WR vault and 216-U-5 and 216-U-6 cribs. The hazards associated with work at A-24 crib were found to be within the risk acceptance guidelines. Therefore, the hazards associated with excavating and interim stabilizing soil at 241-WR vault and 216-U-5 and 216-U-6 cribs are also be within the risk acceptance guidelines.

2. COMPARISON OF RADIONUCLIDES INVENTORIES AND RISK

Table 1 presents the radionuclides inventories for the A-24 crib and 241-WR vault, and the 216-U-5 and 216-U-6 cribs. The data for A-24 was taken from the safety evaluation (WHC 1988), the data for 216-U-5 and 216-U-6 was taken from the Waste Inventory Data Sheets (WIDS) (WHC 1991c). Data for the 241-WR vault was taken from WIDS. The inventories are decayed to 1986 for A-24 crib and 1989 for 216-U-5 and 216-U-6 cribs. No decayed values are available for the inventory of the 241-WR vault. To establish a reasonable basis for comparison, the quantities of the major dose contributing isotopes for each waste site were added together. This value was then divided by the value for the A-24 crib. The results are shown in the bottom row of Table 1. The waste site 241-WR vault had the highest ratio at 0.073 times that of A-24. Using this number as a multiplier for the doses from the A-24 evaluation should provide a reasonable estimation of the consequences from similar events at the 216-U-5 and 216-U-6 cribs. Table 2 presents the results of this calculation and a comparison of radiological risk. The radiological risk for these waste sites is below the risk acceptance guidelines.

Table 1. Radionuclides for the A-24 Crib, 216-U-5, 216-U-6, and 241-WR Vault.

CURIES DECAYED TO 1986 (A-24) AND 1989 (216-U-5 and 216-U-6)

RADIONUCLIDES	A-24	U-5	U-6	241-WR
H-3[1]	3680	-	-	-
Co-60	.0575	-	-	-
Sr-90	52.8	1.95 E-2	1.95 E-2	60.0[4]
Ru-106	.00005	1.74 E-13	1.74 E-13	-
Cs-137	767	2.07 E-2	2.07 E-2	-
Pu-239[2]	.76	3.07 E-3	3.07 E-3	-
Pu-240	.204	-	-	-
U-238[3]	.441	-	-	-
TOTAL	820.56	0.0432	0.0432	60.0
RATIO UX/A24	1.00	5.27 E-5	5.27 E-5	0.073

1. Major dose contributing radionuclides only, tritium not included to avoid overstatement.
2. Reported only as plutonium in WIDS (WHC 1991c).
3. Reported as "U-gross" in WIDS.
4. Reported only as 60 Ci beta. Assumed to be Sr-90 for the purposes of this evaluation.

Table 2. 216-A-24 Crib and 216-T-X Radiological Risk Comparison.

RECEPTOR	RESUSPENSION OF SURFACE SOIL EDE[1] (rem)	RESUSPENSION OF EXCAVATED SOIL EDE (rem)
Onsite Individual A-24 Crib	4.50 E-6	4.30 E-4
Onsite Individual U-X	3.28 E-7	3.13 E-5
Risk Acceptance Guidelines	5.00 E-1	5.00 E-1
Offsite Individual A-24	4.30 E-6	1.80 E-5
Offsite Individual U-X	3.14 E-7	1.31 E-6
Risk Acceptance Guidelines	1.00 E-1	1.00 E-1

[1]EDE is Estimated Dose Equivalent.

3. CRITICALITY

There are no criticality concerns at the 241-WR Vault, 216-U-5 or 216-U-6 cribs (WHC 1991a).

4. COMPARISON OF CHEMICAL INVENTORIES AND RISK

Table 3 presents the reported chemical inventories for the A-24 crib and the 216-U-5 and 216-U-6 cribs. There is no chemical inventory reported for the 241-WR vault. However, the vault was used to store uranyl nitrate hexahydrate (UNH) and waste nitric acid. UNH is a severe fire and explosion risk when heated, shocked, or combined with organic materials. None of these conditions will exist during interim stabilization activities. The A-24 crib received the most hazardous chemical inventory due to the explosive potential of the chemicals. The explosion scenario generated the worst case release of hazardous chemicals at A-24, and this was shown to be within the acceptance guidelines. Because the 216-U-5 and 216-U-6 received highly soluble material, with the exception of metals, it is not likely that dangerous concentrations of these chemicals have accumulated. These waste sites also did not receive any volatile organic material, further reducing the risk associated with the chemical inventory. Interim stabilization activities will not involve the interior of the vault.

Table 3. Comparison of Chemical Inventories (in metric tons).

CHEMICALS	A-24	U-5	U-6	241-WR
Paraffin Hydrocarbon	79	-	-	-
Butyl Phosphates	236	-	-	-
Ammonium Carbonate	525	-	-	-
Nitrate	-	2	2	-

Since the results of the explosion scenario was shown to be within the risk acceptance guidelines for A-24, and since the risk associated with the waste disposed of at these facilities is less than at A-24, the risk for similar work at these waste sites is also within the risk acceptance guidelines.

5. INDUSTRIAL SAFETY HAZARDS

Industrial safety hazards will be addressed in a Job Safety Analysis (JSA). A JSA will be prepared specifically for this interim stabilization and decontamination job and will be reviewed with the workers at the prejob safety meeting. Radiological hazards will be documented in the Radiation Work Permit (RWP). Postulated hazards associated with working around or on the surface of the 241-WR vault will be examined.

6. CONCLUSION

Based on the above comparison, the Safety Evaluation for 216-A-24 Crib (WHC 1988) is applicable to the work planned near 216-U-5 and 216-U-6 cribs. By virtue of the isolated nature of the 241-WR vault and the scope of planned activities, additional risk associated with the contents of the vault are minimized. Radiological hazards are due mainly to the resuspension of radioactive material due to earth moving activities. Because levels of radioactive surface contamination are low, and because higher levels of contamination were found to be within the risk acceptance guidelines at A-24,

no further safety analysis is required. All work will be driven by an approved procedure and other operating level documents. All field personnel will have been trained in (as a minimum) to the 24-hour Hazardous Waste Site Basic training and radiation worker training. In addition, a prejob safety meeting will be conducted and documented. All equipment used on this job will be inspected to ensure it is in safe operating condition.

7. REFERENCES

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