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7. Abstract


This document describes the decommissioning work performed on Tank 241-CX-70. In 1979, liquid waste from the tank was pumped to the 101-AY double-shell tank farm. Not all of the waste was removed at that time therefore sluicing and pumping was resumed in the summer of 1987. The waste removal continued until the process of sluicing become too inefficient to continue, April 1988. Waste removal commenced again in September of 1991 which entailed vacuuming the waste from the tank into 16 gallon drums packed inside 90-mil plastic liners inside of 17-C 55 gallon drums. This process continued through December of 1991 when the tank was declared free of waste. The drums were then transported to the Transuranic Waste Storage and Assay Facility (TRUSAF) laocated at 224-T for safe storage.


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# FACILITY DECOMMISSIONING REPORT

# FOR TANK 241-CX-70

T. C. Hasfjord
S. G. Marske

November 1992

Westinghouse Hanford Company
P. O. Box 1970
Richland, Washington 99352

## EXECUTIVE SUMMARY

This document describes the work done on the 241-CX-70 waste tank. In 1979, the decommissioning of tank 241-CX-70 began by pumping the liquid waste to the double-shell tank farms (101-AY targeted for waste). There were 10,300 gal of waste left in the tank until the summer of 1987, when removal of the waste was resumed. A sluicing and pumping system transferred the waste liquid to tank 003-CR. This procedure was carried out from September 1987 through April 1988 at which time progress became inefficient and the operation ceased. At this time, 8 to 9 in. of waste remained (approximately 750 gal). For the remaining waste, addition of an absorbent was to be used to absorb the liquid thus allowing the waste to be removed using a vacuuming technique. However, upon opening the tank for close inspection, it was discovered that the liquid had evaporated to near dryness; therefore, the addition of the absorbent was omitted. The waste was vacuumed into 16-gal drums and packed inside 90-mil plastic liners within galvanized 17-C 55-gal drums. The vacuum operation was initiated in September 1991 and continued through December 1991. The drums were stored locally pending final analytical results, then transported to the Transuranic Waste Storage and Assay Facility (TRUSAF) located at 224-T.

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# FACILITY DECOMMISSIONING REPORT FOR TANK 241-CX-72

## 1. DESCRIPTION, HISTORY, AND LOCATION

Tank 241-CX-70 is a 30,000 gal single-shell storage tank built in 1952 to hold high-level process waste from pilot tests of the reduction-oxidation (REDOX) process. The liquid inventory was pumped out in 1979 leaving approximately 10,300 gal of sludge. The tank decommissioning was started in 1984 as part of the Strontium Semiworks decommissioning project. An Environmental Assessment (EA) (RL 1985) issued by William A. Vaughn, Acting Assistant Secretary for Policy, Safety, and Environment, U.S. Department of Energy (DOE), showed a "Finding of No Significant Impact" for the project in May 1985. The EA listed the tank's contents as bearing 3 curies of alpha and 6,000 curies of beta.

Tank 241-CX-70 is buried approximately 11 ft below grade and is constructed from 1/4-in. stainless steel plate, 15 ft in depth and 20 ft in diameter. It is surrounded by 1-ft thick poured concrete on the top and sides with a concave bottom of thickness varying from 9 in. at the center to 2 ft at the edges. Two filler pipes entering the side of the tank were blanked off prior to the decommissioning of the 201-C Strontium Semiworks Facility (see Figure 1). The tank has nine risers extending above ground, and a manway that is 42 in. in diameter (see Figures 2 and 3). Tank 241-CX-70 is located approximately 128 ft southeast of the 201-C Building site of the Strontium Semiworks area in the 200 East Area. (See Figure 4.)

## 2. WORK SEQUENCE

The waste remaining, following the 1979 removal efforts, was represented by an initial grab sample, taken prior to the sluicing operation. A bottle and string technique was used, and samples were sent to Rockwell's Chemical Laboratory Unit. The results were questionable due to the concentration variance in the tank. They are believed to be roughly 50 percent accurate. Refer to Appendix A of SD-DD-TI-034 Rev. 0 (WHC 1991b) for a summary of the results.

### 2.1. WASTE REMOVAL PART I

#### 2.1.1. Sluicing

Sluicing is a process of breaking up and thinning the sludge waste using a high pressure water spray thus allowing the contents to be pumped. An engineering study was prepared to evaluate several options before deciding on

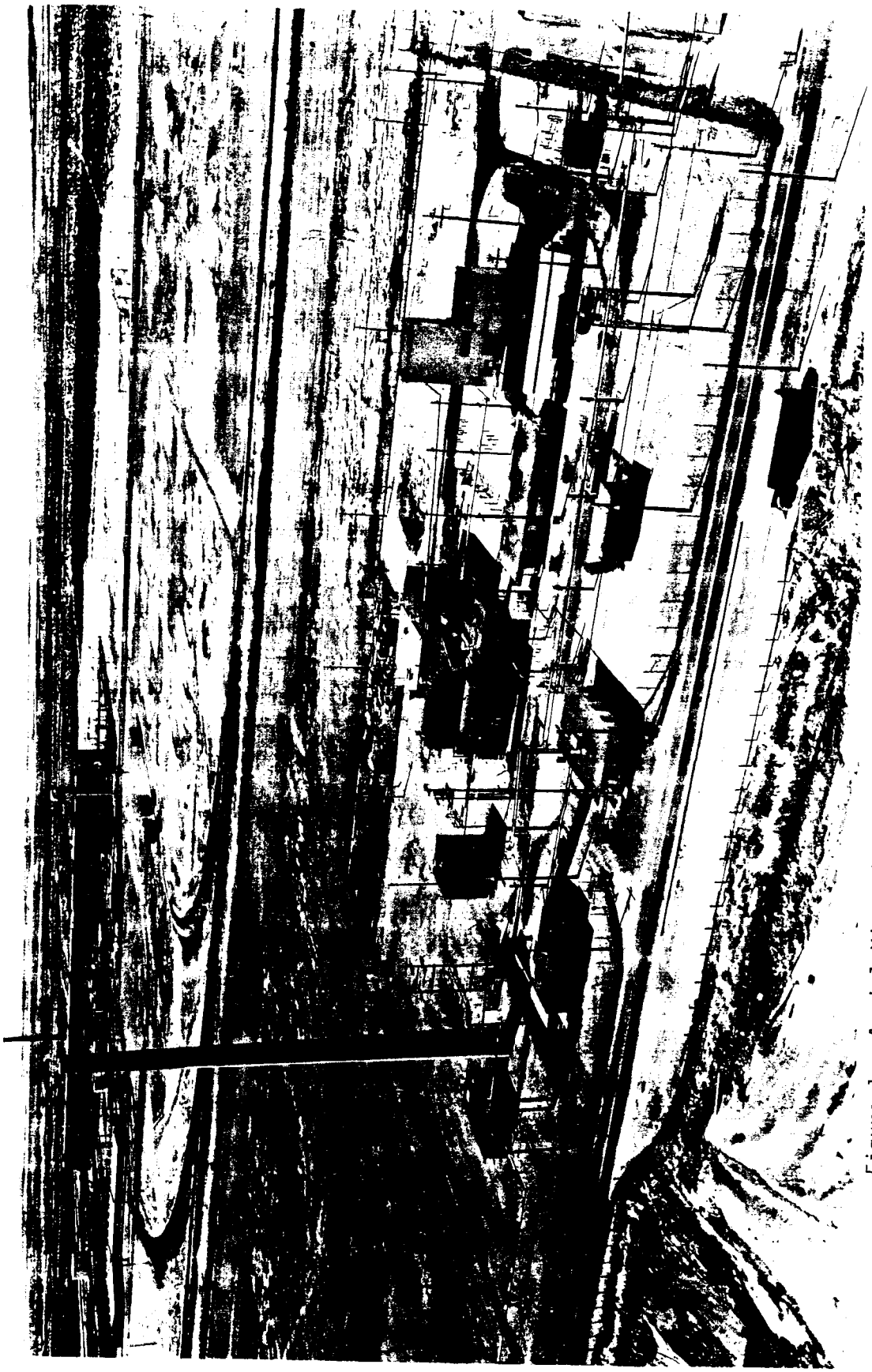

Figure 1. Aerial View of the Strontium Semiworks Facility Before Decommissioning.

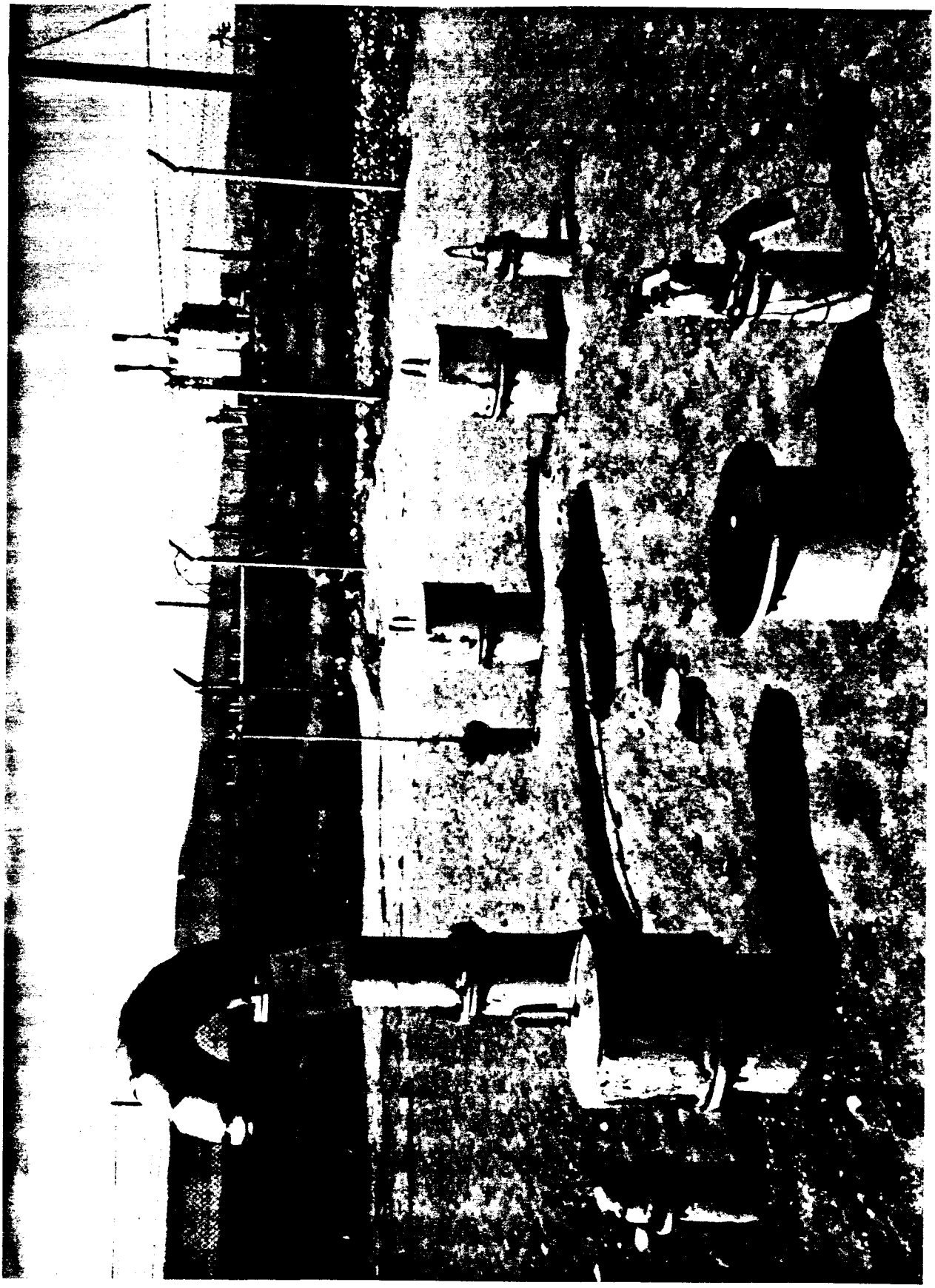

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Figure 2. Risers Coming from Tank 241-CX-70.

Figure 3. Side View of Tank 241-CX-70.

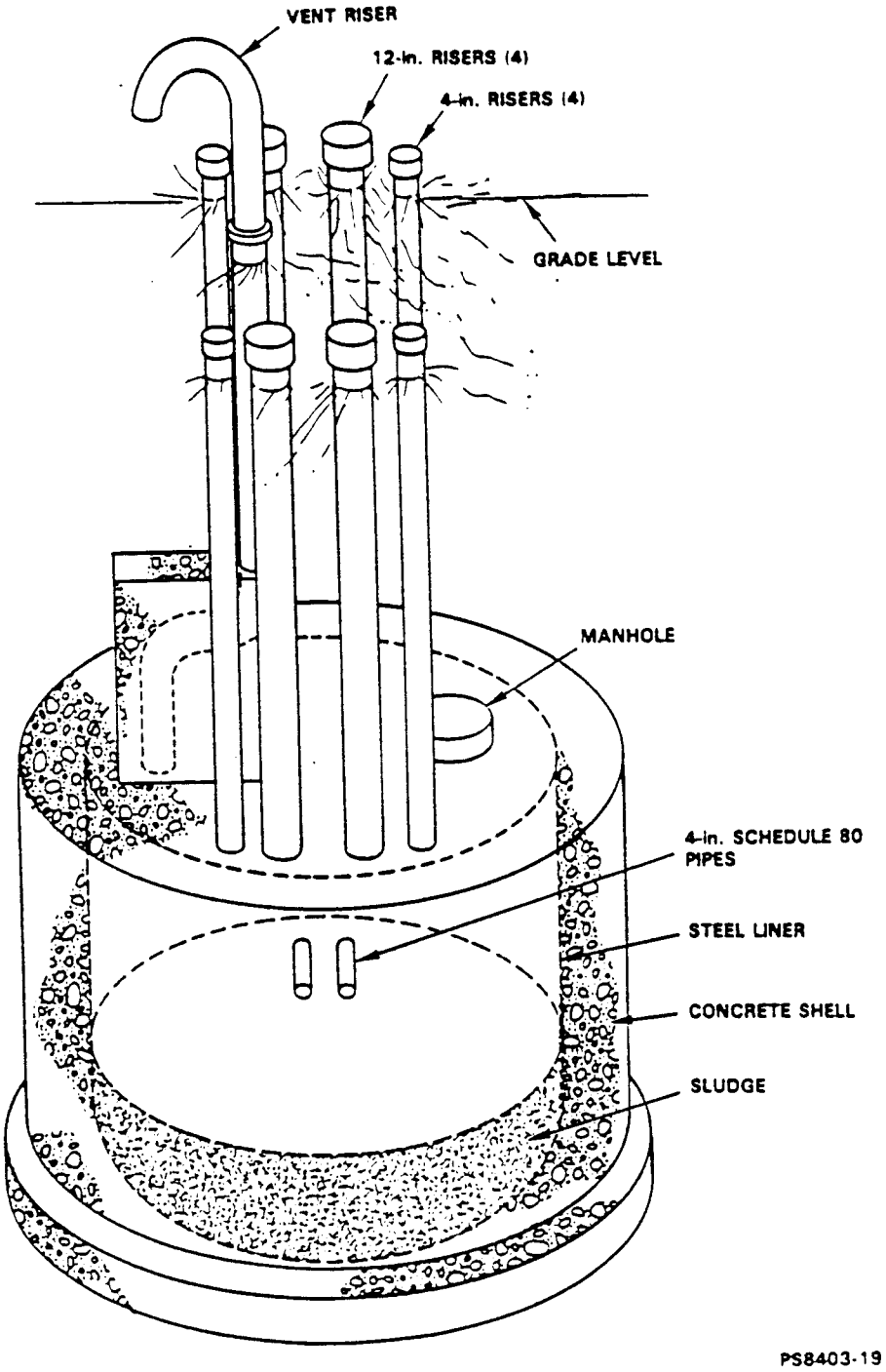


Figure 4. Aerial View of Strontium Semiworks After Decommissioning the Major Buildings.

the lead method. This method utilized a 190-ft over-the-ground pipeline to the 8900 pipeline which prevailed over four other conceptions (SD-DD-TI-008 Rev. 0, Appendix I [RHO 1987]). These concepts were (see Figure 5):

- A 600-ft aboveground transfer line to a railcar
- A 50-ft transfer line to a tanker truck
- A 2,000-ft aboveground pipeline to the 153-ER diversion box, bypassing 244-CR and continuing to 101-AY
- A 2,400-ft aboveground line to the 204-AR slurry pumping system.

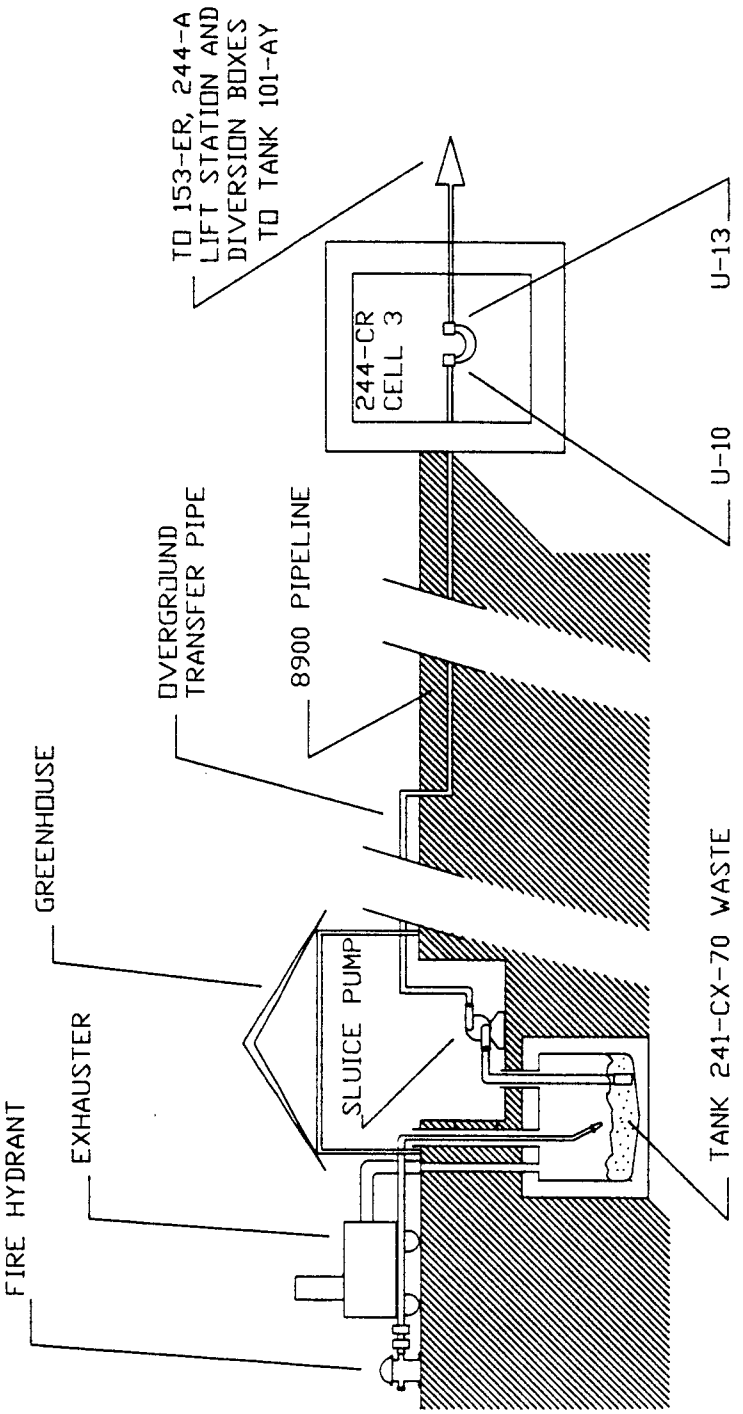
Tank Farm Operations' decision to upgrade and restore the 003-CR system made sluicing the viable and low cost alternative to decontamination and decommissioning (D&D). The 6-ft by 11-ft deep caisson was installed in July 1987 to be used for the sluice pump pit. The equipment was installed thereafter. (See Figure 6.)

A 1,000 cfm exhauster from 200 East Tank Farms was obtained for the sluicing operation. Before it could be engaged, minor repairs were necessary. Pinholes existed in the ductwork, and some insulating of the ductwork was required. The complications were corrected without difficulty, and the exhauster was installed in September 1987. The exhauster was disconnected in September 1989.

The liquid waste was to be sluiced and pumped via a welded, 2-in., carbon steel, over-the-ground transfer pipe constructed exclusively for the project. The transfer pipe connected the slurry pump to the 8900 pipeline 190 ft northeast of the tank. (See Figure 7.) The waste was transferred to tank 003-CR located in the 241-CR vault and simultaneously pumped to 101-AY of the double-shell tank farms, 200 East Area. Sluice water was supplied by a fire hydrant equipped with a water meter and backflow preventer located at coordinates 42150 north and 50295 west as described on drawing H-2-95501. The hydrant was also utilized for testing the over-the-ground pipe for leaks and flushing the 8900 pipeline.

After leak tests were completed, sluicing began September 25, 1987. Initially, a rotary-type sluicing head was utilized; however, the process was not very effective, proven by low transfer rates to tank 003-CR. The rotary head did not generate enough force or concentrate the water in the areas of the tank to produce the highest results. This, compounded with pump intake problems, resulted in the process not functioning as planned. The operation was briefly discontinued to take pictures. It was determined from the photographs that more force was required to break up the waste. A fire hose nozzle replaced the rotary head, and the direct spray amplified the technique by effectively breaking up and mixing the waste. The water flow from the fire nozzle created an opening in the surface of the sludge, and the suction hose, previously lying on top, could now sink into the cavity. Higher transfer rates were reported and sluicing efficiency increased. The tank was pumped down to a level of 26 in. or approximately 2,100 gal (Figure 8). At this level, the strainer-style pickup head, a 6-in. stainless steel pipe with numerous holes, became uncovered and could not be positioned well enough to

Figure 6. Sluicing Diagram.



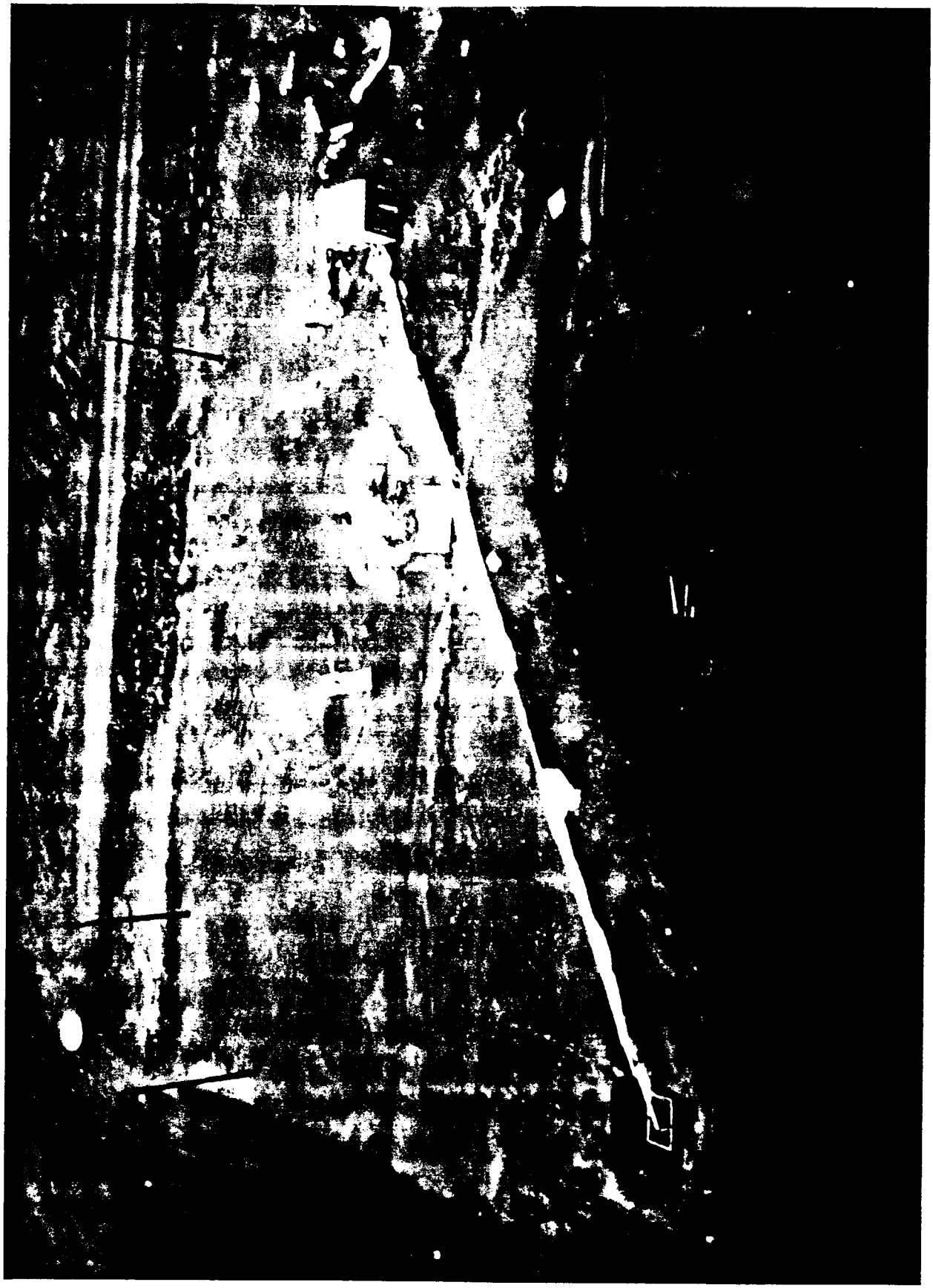


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Figure 7. View of the Pipeline Connecting the Slurry Pump to the 8900 Line.

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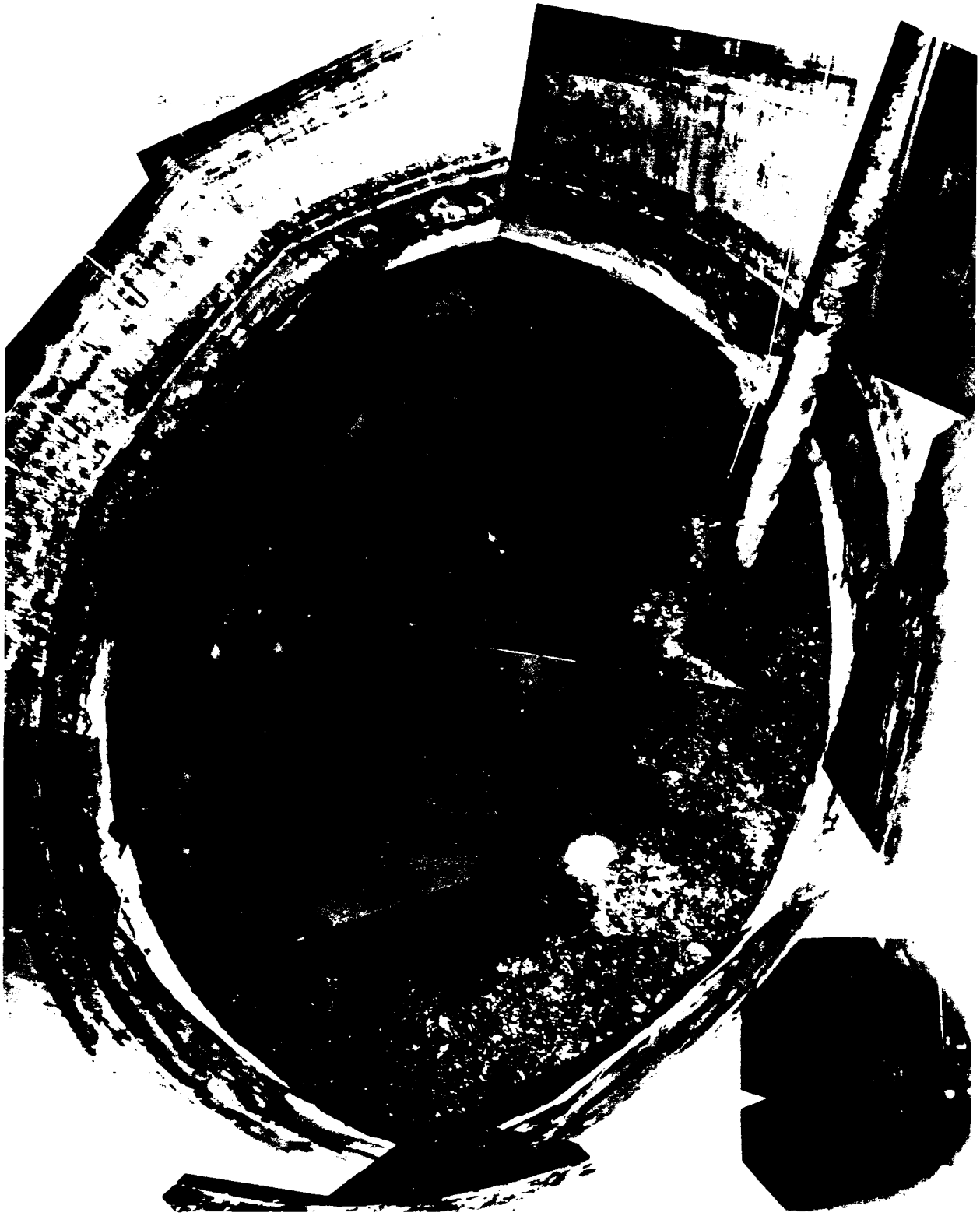

Figure 8. Inside View of Tank 241-CX-70 After Tank Was Pumped Down. (approximately 2,100 gal of waste left in tank)

operate correctly; therefore, a pancake-style head was employed and the tank was pumped down to approximately 8 or 9 in. or approximately 750 gal (see Figures 8 and 9). At this level the pancake-style head could not be positioned properly to continue pumping because of difficulty in maneuvering within the tank. Progress stalled in July 1988, forcing the decision to discontinue in August 1988. Roughly 140,000 gal of water were used to remove about 9,550 gal of waste.

Three composite liquid samples which contained some solid material were taken during the sluicing operation. Sample 1, obtained November 1987, was sent to Westinghouse Analytical Chemistry Services Laboratory at 222-S primarily for pH analysis (pH : 11.46); sample 2, taken March 1988, was sent to Pacific Northwest Laboratories (PNL) 325 Building for composite and analysis; and sample 3, taken in July 1988, was sent to Westinghouse Process Chemistry Laboratory. All sluice samples were accomplished with an in-line Isolok[1] sampler. The sample corollaries are contained in Appendixes B, C, and D of SD-DD-TI-034 (WHC 1991b).

## 2.2. WASTE REMOVAL PART II

After the final sluicing operation in August 1988, three grab samples were obtained again from the remaining sludge in tank 241-CX-70. The samples were sent to Process Chemistry Laboratories. The tank at this time contained approximately 750 gal of waste. The results returned in November 1988 presented the radioactive constituents and a pH of 13.0. Based on elevated concentrations of transuranic radionuclides (see Appendix A), recommendations were made to continue waste cleanup of 241-CX-70. The pH report showed the waste as corrosive; therefore, additional consideration was involved in the waste removal (Herting 1988; WHC 1990; WHC 1991b).

### 2.2.1. Shoring

Shoring was used to facilitate excavation of the manway (Figure 10) in November 1988. It was later necessary, April 1991, to reinforce the shoring with steel angle iron and 2 x 4's fastened with lag screws to guarantee stability. The shoring is approximately 10 ft square and 11 ft deep.

On August 9, 1989, operations to tank 241-CX-70 were put on hold until the activity had been planned, scheduled, and funded. At this time, a period of time elapsed following the sluicing process. The 291-C-1 stack was demolished during this lapse.

Due to the corrosivity of the waste reported (Herting 1988), a Part A permit application was submitted to Washington State Department of Ecology in July 1990 identifying the designation as D002.

An evaluation was done to determine the most cost-effective means to remove the remaining waste. The evaluation indicated the foremost method was to vacuum the absorbed wet waste into containers. This idea prevailed over

[1]Isolok is a trademark of the Bristol Equipment Company.

8802113-2cn

Figure 9. Inside View of Tank 241-CX-70.
(approximately 750 gal of waste left in tank)

Figure 10. Shoring Around Manway Cover of Tank 241-CX-70.

absorbing the liquid waste into pillow absorbent and scooping the waste out using hand-held devices (WHC 1991a) and prevailed over excavating along side the tank and boring a 4-ft by 4-ft opening through the concrete and stainless steel wall.

The remaining 750 gal of liquid waste were treated with concentrated sulfuric acid in January 1991 to lower the pH from roughly 13.1 to approximately 10.5, consequently dismissing it as corrosive waste. The work package and calculations were completed in January 1991, and 27 lb (6.6 liter) of sulfuric acid were added to the 500 gal of sodium hydroxide enriched liquid waste through one of the 12-in. risers. The sample report performed by 222-S Analytical Laboratories following the addition of sulfuric acid is comprised in Appendix B.

### 2.2.2. Exhauster

The original exhauster did not meet the latest required standards for the upcoming operations; therefore, another exhauster was procured. A design by Kaiser Engineers Hanford Company (KEH) and a low bid submitted by Charcoal Services Corporation, secured the D&D variable, portable 3000, 6000, 9000 cfm exhauster to comply with ER 8459-P3 Procurement Specification for Portable Exhauster Unit. The system was equipped with 18 high efficiency particulate air (HEPA) filters that can be blanked to provide variable flow to accommodate particular needs. The new exhauster was attached to one of the 12-in. risers in June 1991, providing air flow through the tank.

Preparations were made in August 1991 to remove the remaining liquid by way of sluicing, but the evaporating effects of the air from the exhauster moving over the waste reduced the liquid inventory to a dry waste as viewed through the manway. The dry contents called for rejection of the sluicing arrangements and examine other alternatives. Below is a tabulation of the best guess figures of the cost for the sluicing preparations that had to be canceled.

| | |
|---|---|
| Readiness Review | 5 K |
| Document Preparation | 35 K |
| TRU Certification | 6 K |
| Site Preparation | 25 K |
| Craft Support | 8 K |
| TOTAL | 79 K |

Resampling was performed on September 13, 1991 to allow waste designation for the remaining contents of tank 241-CX-70 after its removal. The levels of alpha emitting radionuclides were responsible for some requested analysis not performed on the samples (Weiss 1992). (See Appendix C.)

### 2.2.3. Manway

A 42-inch manway cover (see Figure 10) exists on the top of the 241-CX-70 tank and was removed in September 1991. The weight of the manway cover, using a dynamometer, was 2,100 lb. The manway cover was replaced March 11, 1992 after the waste was removed. Photographs were taken of the tank interior, and informal radiological characteristics were recorded.

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Figure 11. Inside of Tank 241-CX-70 Showing the Sludge as a Partially Dry Solid.

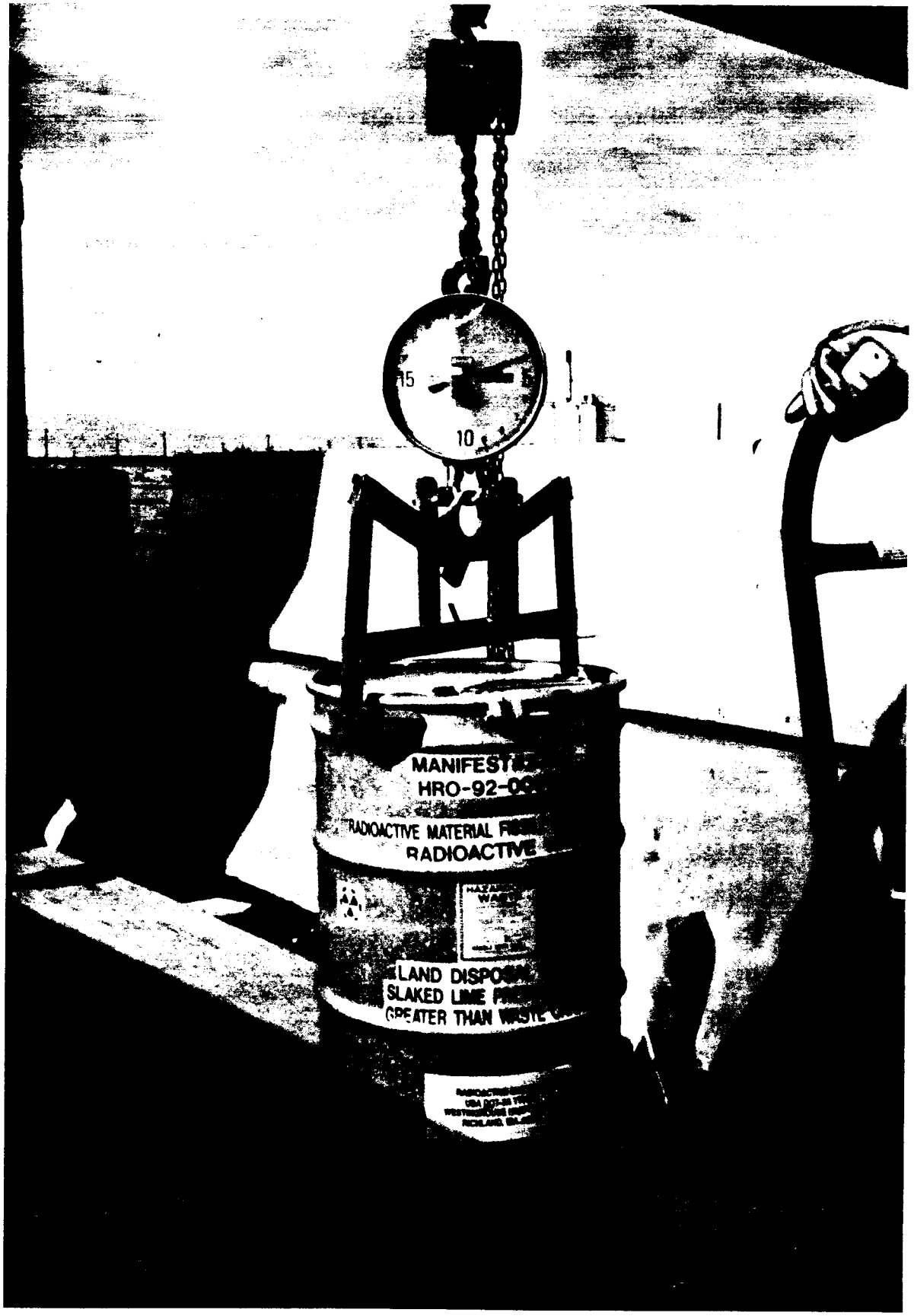


Figure 12. Barrel of Waste Being Weighed
Using a Gantry, Dynamometer, and Chain Hoist.

91100201-2cn

Figure 13. Inside Tank 241-CX-70 Showing Rabbit Carcass.

Figure 14 shows the tank interior after all the waste was removed.

## 3. DOSE SUMMARY OF TANK 241-CX-70

Table 1 summarizes the dose readings from the emptied tank interior, taken in 1- to 1.5-ft intervals (mrads/hr, beta) in February 1992.

Table 1. Dose Readings from Tank 241-CX-70 After All Waste Removed.

| INTERVAL NUMBER | READING (mrad/hr) (Beta) | APPROXIMATE HEIGHT from bottom (ft) |
|---|---|---|
| 1 | 15000 | 0.0 |
| 2 | 6000 | 1.4 |
| 3 | 2500 | 2.7 |
| 4 | 2100 | 4.1 |
| 5 | 2000 | 5.4 |
| 6 | 2000 | 6.8 |
| 7 | 1900 | 8.2 |
| 8 | 1500 | 9.5 |
| 9 | 1300 | 10.9 |
| 10 | 1000 | 12.2 |
| 11 | 600 | 13.6 |
| 12 * | 5 mr | 15.0 |
| * located in work area | | Distance from bottom are based on averages |

92012020-2cn

Figure 14. Interior of Tank 241-CX-70 After Waste Removal.

## 4. STORAGE

The 55-gal drums are stored at TRUSAF, 224-T, in 200 West Area. Transport of the barrels commenced on May 5, 1992 and was extended over a 10-work day period. The last of the barrels were moved on May 18, 1992.

## 5. GREENHOUSES

Greenhouse-I was constructed in September 1987 and decommissioned in November 1988. The C-9 trench was designated for the burial site.

Greenhouse-II was constructed in December 1988 and was decommissioned in November 1992. Its destination was the 200 West burial grounds.

## 6. COST

Table 2 provides the cost breakdown from waste removal to present.

Table 2. Cost Breakdown.

| ITEM | COST (Dollars) | |
|---|---|---|
| Waste Removal | 185,000 | The figures listed are based on logical estimates rounded to the nearest thousand |
| TRU Waste Burial Fee | 135,000 | |
| Misc. Rad. Waste Burial Fee | 150,000 | |
| Greenhouse disassembly | 60,000 | |
| Exhauster<br>Design Fee<br>Unit Cost<br>Stack Monitor Cabinet<br>CAM (alpha, beta and gamma) | <br>60,000<br>107,000<br>70,000<br>10,000 | |
| Tank Monitoring System | 8,000 | |
| Shored Area Covers | 7,500 | |
| TOTAL | 792,500 | |

WHC, 1990, *Safety Evaluation for Interim Waste Management Activities in Tank 241-CX-70, Tank 241-CX-71, and Tank 241-CX-72*, WHC-SD-DD-SAD-001 Rev. 0, Westinghouse Hanford Company, Richland, Washington, September 19, 1990.

WHC, 1991a, *Engineering Study: Recommendations for Interim Waste Removal in Tank 241-CX-70*, WHC-SD-DD-ES-009 Rev. 0, Westinghouse Hanford Company, Richland, Washington, April 30, 1991.

WHC, 1991b, *Tank 241-CX-70 Waste Removal Assessment*, SD-DD-TI-034 Rev. 0, Westinghouse Hanford Company, Richland, Washington, October 31, 1988.

WHC, 1991c, *Plan for Handling and Certifying Transuranic Mixed Wastes from Tank 241-CX-70*, WHC-SD-WM-PAP-054 Rev. 0, Westinghouse Hanford Company, Richland, Washington, May 21, 1991.

# APPENDIX A

# ANALYSIS OF SLUDGE SAMPLES

Table A-1. Analysis of Filtrate Solutions from Sludge Samples. (WHC 1991c)

| | | R-2917 | R-2918 | R-2919 |
|---|---|---|---|---|
| Total Beta | uCi/L | 35.7 | 328 | 320 |
| Total Alpha | uCi/L | 1.7 | <0.07 | 0.05 |
| Pu-239 | uCi/L | 1.4 | | |
| Cs-137 | uCi/L | 4.4 | 238 | 244 |
| | | | | |
| Density | g/mL | 1.04 | | |
| pH | | 13.0 | | |
| TOC | g/L | 0.49 | 0.525 | 0.49 |
| | | | | |
| Cl | M | 0.012 | 0.013 | 0.012 |
| F | M | <0.008 | 0.015 | 0.0175 |
| $NO_3$ | M | 0.024 | <0.002 | 0.023 |
| $PO_4$ | M | 0.0018 | 0.0013 | 0.002 |
| $SO_4$ | M | 0.0039 | 0.0009 | <0.015 |
| OH | M | 0.25 | | |
| | | | | |
| Na | M | 9.1E-01 | 9.9E-01 | 1.1E-00 |
| Al | M | 9.4E-02 | 1.0E-01 | 1.1E-01 |
| Cr | M | 3.0E-03 | 1.6E-03 | 1.7E-03 |
| P | M | 2.3E-03 | 2.3E-03 | 2.6E-03 |
| K | M | 1.5E-03 | | 1.1E-03 |
| Si | M | | 1.0E-03 | 1.6E-03 |
| Ca | M | 4.4E-04 | 4.4E-04 | 3.7E-04 |
| Fe | M | 2.8E-05 | 1.2E-04 | |

# APPENDIX B

# SAMPLE ANALYSIS RESULTS

# HOT SEMI-WORKS SAMPLE ANALYSIS SUMMARY

Tank: CX 70
Serial ID: R 8643
Customer ID: 0122-1

| | LMCS Check Standard | Reagent Blank | Sample | Duplicate of Sample | Spike of Sample | LMCS Check Standard |
|---|---|---|---|---|---|---|
| Laboratory ID: | 5513 | 5613 | 5713 | 5813 | N/A | 5513 |
| pH | * | * | 10.61 | 10.51 | N/A | * |
| 2nd Run | 100.90% | 5.77 | 10.54 | 10.53 | N/A | 100.30% |
| Laboratory ID: | 5597 | 5697 | 5797 | 5897 | 5997 | 5597 |
| Mercury | 102.91% | <2.00E-4 ppm | <2.00E-3 ppm | <2.00E-3 ppm | 116.30% | 107.77% |

* The standard had expired.

Sample Appearance: No observable solids were present in the aqueous sample. The liquid was transparent yellow in color and displayed no organic phasing.

# APPENDIX C

## SAMPLE RESULTS OF RESAMPLING
(Weiss 1992)

| ANALYTE | SAMPLE ID NUMBERS | | | | UNITS | SPIKE[1] |
|---|---|---|---|---|---|---|
| | 913-5 | 913-4 | 913-3 | 913-3[2] | | 913-3 |
| pH | 11.4 | 11.4 | 11.3 | 11.3 | | NA[3] |
| Cyanide | <0.5 | <0.5 | <0.5 | <0.5 | ug/g | 99% |
| Al[4] | 72000 | 57000 | 60000 | 55000 | ug/g | 110% |
| Ca[4] | 1600 | 1500 | 2100 | 1800 | ug/g | NA |
| Cr[4] | 5400 | 4600 | 5100 | 5000 | ug/g | SXS[5] |
| Fe[4] | 3200 | 2800 | 2900 | 2700 | ug/g | SXS |
| Hg[6] | <0.0004 | <0.0005 | <0.0005 | <0.0005 | ug/g | 110% |
| K[4] | 320 | 240 | 240 | 250 | ug/g | NA |
| Mg[4] | 150 | 10 | 180 | 100 | ug/g | NA |
| Mn[4] | 2400 | 1700 | 1900 | 1600 | ug/g | NA |
| Na[4] | 62000 | 59000 | 58000 | 59000 | ug/g | NA |
| Ni[4] | 120 | 96 | 110 | 93 | ug/g | 110% |
| Se[4] | 500 | 390 | 460 | 450 | ug/g | 110% |
| Se[7] | <0.005 | <0.005 | <0.005 | <0.005 | ug/g | 120% |
| U[4] | 18000 | 17000 | 17000 | 19000 | ug/g | 110% |
| Zn[4] | 70 | 49 | 109 | 60 | ug/g | 110% |
| | | | | | | |
| Total Alpha | 0.46 | 0.35 | <0.4 | 0.44 | uCi/g | 110% |
| Total Beta | 96 | 75 | 88 | 84 | uCi/g | 100% |
| Cs-137[8] | 1.2 | 1.3 | 1.2 | 1.2 | uCi/g | 85% |
| Sr-90 | 30 | 24 | 25 | 26 | uCi/g | NA |
| Am-241 | 0.13 | 0.40 | 0.14 | 0.18 | uCi/g | NA |
| Pu-239/240 | <0.6 | <0.7 | <0.8 | <0.8 | uCi/g | NA |

1 Sample of 913-3 spiked with known amount of material. Values represent percent recovery of known addition.
2 Duplicate analysis on sample #913-3.
3 Spike not added to sample.
4 Analysis by Inductively Coupled Plasma Spectroscopy.
5 Sample concentration exceeded four times spike addition, spike recovery calculation is not valid in these cases.
6 Analysis by Cold Vapor Atomic Absorption Spectroscopy.
7 Analysis by Hydride Atomic Absorption Spectroscopy.

# APPENDIX D

# BARREL INVENTORY

| PIN NUMBER | GROSS WEIGHT ( lbs ) | NUCLIDES ( Curies ) | | | | TRU * FISSILE _ Weight ( grams ) | | | | HAZARD MATERIAL Weight ( Kg ) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sr-90 | Y-90 | Cs-137 | Ba-137 | Pu-239 ( 95% ) | Pu-240 ( 5% ) | Am-241 | U-238 | Chromium | Selenium |
| 201C-91-0117 | 350 | 1.158 | 1.158 | 5.018 E-2 | 5.018 E-2 | .0195 | .00209 | .1560 | 7.334 E+2 | .21 | .019 |
| 201C-91-0118 | 330 | .885 | .885 | 3.835 E-2 | 3.835 E-2 | .0149 | .00215 | .1192 | 5.605 E+2 | .16 | .015 |
| 201C-91-0119 | 325 | 1.638 | 1.638 | 7.098 E-2 | 7.098 E-2 | .0138 | .00199 | .1103 | 5.187 E+2 | .15 | .014 |
| 201C-91-0120 | 330 | .885 | .885 | 3.835 E-2 | 3.835 E-2 | .0149 | .00215 | 1.192 E-1 | 5.605 E+2 | .16 | .015 |
| 201C-91-0121 | 350 | 1.158 | 1.158 | 5.018 E-2 | 5.018 E-2 | .0195 | .00209 | .1560 | 7.334 E+2 | .21 | .019 |
| 201C-91-0122 | 350 | 2.316 | 2.316 | .10 | .10 | .0195 | .00209 | .1560 | 7.334 E+2 | .21 | no |
| 201C-91-0123 | 380 | .1359 | .1359 | 3.138 | 3.138 | .0264 | .00381 | .2114 | 9.937 E+2 | .28 | .026 |
| 201C-91-0124 | 360 | 2.592 | 2.592 | .11232 | .11232 | .0218 | .00314 | .1746 | 8.2 E+2 | .23 | .022 |
| 201C-91-0125 | 355 | 1.227 | 1.227 | 5.137 E-2 | 5.137 E-2 | .0207 | .00298 | 1.653 E-1 | 7.771 E+2 | .22 | .02 |
| 201C-91-0126 | 350 | 2.316 | 2.316 | .10 | .10 | no data | no data | no data | 7.334 E+2 | .21 | .019 |
| 201C-91-0127 | 360 | 1.296 | 1.296 | 5.616 E-2 | 5.616 E-2 | .0218 | .00314 | .1746 | 8.208 E+2 | .23 | .022 |
| 201C-91-0128 | 350 | 1.158 | 1.158 | 5.018 E-2 | 5.018 E-2 | .0195 | .00209 | .156 | 7.334 E+2 | .21 | .019 |
| 201C-91-0129 | 320 | 1.50 | 1.50 | 6.5 E-2 | 6.5 E-2 | .0126 | .00182 | .1011 | 4.75 E+2 | .14 | .013 |
| 201C-91-0130 | 350 | 2.316 | 2.316 | .10 | .10 | no data | no data | no data | 7.334 E+2 | .21 | .019 |
| 201C-91-0131 | 340 | 2.184 | 2.184 | 8.866 E-2 | 8.866 E-2 | .0172 | .00248 | .1378 | 6.479 E+2 | .18 | .017 |
| 201C-91-0132 | 350 | 2.316 | 2.316 | .10 | .10 | .0195 | .00209 | .1560 | 7.334 E+2 | .21 | .019 |
| 201C-91-0133 | 345 | 2.184 | 2.184 | 9.464 E-2 | 9.464 E-2 | .0184 | .00265 | .1471 | 6.916 E+2 | .20 | .018 |
| 201C-91-0134 | 345 | 2.184 | 2.184 | 9.464 E-2 | 9.464 E-2 | .0184 | .00265 | .1471 | 6.916 E+2 | .20 | .018 |
| 201C-91-0135 | 330 | 1.77 | 1.77 | 7.67 E-2 | 7.67 E-2 | .0149 | .00215 | .1192 | 5.60 E+2 | .16 | .015 |
| 201C-91-0136 | 360 | 2.592 | 2.592 | .11232 | .11232 | .0218 | .00314 | .1746 | 8.2 E+2 | .23 | .022 |
| 201C-91-0137 | 390 | 3.408 | 3.408 | .1477 | .1477 | .0287 | .00413 | .2296 | 1.079 E+3 | .31 | .028 |
| 201C-91-0138 | 350 | 3.16 | 3.16 | 1.004 | 1.004 | .0195 | .00209 | .1560 | 7.334 | .21 | .019 |
| 201C-91-0139 | 340 | 2.184 | 2.184 | 8.866 E-2 | 8.866 E-2 | .0172 | .00248 | .1378 | 6.479 E+2 | .18 | .017 |

# APPENDIX E

# WASTE DESCRIPTION

## WASTE DESCRIPTION

Table E-1 is a informational summary of the isotopes contained in the 241-CX-70 waste based on the barrel inventories of Appendix D.

TABLE E-1

| ISOTOPE | SYMBOL | HALF-LIFE | DECAY MODE |
|---|---|---|---|
| STRONTIUM | Sr-90 | 28 years | BETA |
| YTTRIUM | Y-90 | 64.2 hours | BETA |
| CESIUM | Cs-137 | 30 years | BETA |
| BARIUM | Ba-137 | | |
| URANIUM | U-238 | 4.51 E9 years | ALPHA, SF |
| PLUTONIUM | Pu-239 | 24,360 years | ALPHA, SF |
| PLUTONIUM | Pu-240 | 6,580 years | ALPHA, SF |
| AMERICIUM | Am-241 | 458 years | |
| | | SF : Spontaneous Fission | |

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