

August 3, 1990

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R U N R E P O R T

INTEGRATED RADIOACTIVE WASTE TREATMENT SYSTEM

CAMPAIGN NO. 17, April 30, 1990 - June 15, 1990

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RUN REPORT
IRTS
CAMPAIGN NO. 17

SUMMARY:

Integrated Radwaste Treatment System (IRTS) Campaign No. 17 was initiated on April 30, 1990 and concluded on June 15, 1990 after processing approximately 45,236 gallons of 8D-2 liquid. An additional 1,485 gallons of 8D-2 liquid was processed but returned to 8D-2 during column D testing. Column D was returned to service during campaign 17. The target dilution ratio was 3.6:1 with a nominal system flow rate of 6 GPM. This dilution ratio is based on the original 39 wt% concentration of 8D-2 supernatant. The average Campaign No. 17 Decontamination Factor for STS was 26,927.

The total volume of supernatant removed from 8D-2 is now at 472,303 gallons which is equivalent to 62 percent of the total supernatant to be processed. As of the end of Campaign 17, approximately 290,000 gallons remain to reduce the 8D-2 tank level down to a 32-inch heel.

Liquid Waste Treatment System (LWTS) received a total of 14 batch transfers from STS totaling 146,009 gallons of process liquid.

Cement Solidification System (CSS) processed 25,720 gallons of concentrates and produced 643 drums at 40 gallons of waste per drum. Average drum dose rate was 32 mR/hr. The total CSS production, at the completion of Campaign No. 17 was 8,451 drums

Table 1 shows a summary of run statistics. Process completion status at the end of this campaign is 65% based on a total drum production of 13,000 drums.

DISCUSSION:STS OPERATION

Campaign 17 STS Operations commenced on April 30, 1990 and consisted of four STS operating weeks, with a total supernatant throughput of 46,721 gallons. One criteria for campaign 17 was a dilution ratio of 3.6:1 water to supernatant (referenced to 39 weight percent supernatant).

At the start of campaign 17, column D was unavailable for use. The sparge was installed in column D and had been pressure tested prior to the start of campaign 17. However, sparging of column D to remove the spent zeolite heel had not taken place. Therefore the first week of supernatant processing was accomplished using a three column configuration in sequence A-B-C with column D off line and vented.

Following completion of the first STS processing week for campaign 17, column D was sparged, sluiced and loaded with two drums of zeolite. Two drums of zeolite was the quantity selected for performance testing of column D. The test entailed placing the column in the final column position, initiating supernatant processing, and monitoring influent and effluent cesium concentration via sampling and radiation monitor readings. Thus, the second week of STS operations was a test of column D's serviceability. Thirty hours of supernatant processing, while taking samples of columns C and D effluents every four hours, indicated that the sparge had been successful in rendering column D acceptable as a fourth column. Supernatant feed was then shut off, the system flushed, and the remaining 10 drums of zeolite required to make a full charge of zeolite in column D were batched and sluiced into the column.

Two additional weeks of STS supernatant processing occurred in order to bring campaign 17 to a completion. The lead column achieved a breakthrough of 72% which equates to an approximate loading of 91%. The lead column, thus, was nearly fully loaded at the time of termination of the campaign. Lead column loading was not however the reason for termination of campaign 17 at 46,721 gallons. Campaign 17 was terminated because the effluent cesium concentration of the decontaminated supernatant had reached the point where the CSS product drums produced from this material would have exceeded 100 mR/hr. Column D effluent cesium concentration for the third week of STS operations reached normally low levels. During the fourth week of STS operations however, the effluent cesium concentration of column D increased until at termination of the campaign, it had reached the desired cutoff of 0.17 uCi/mL which corresponds to 100 mR/hr CSS product drums. The DF across column D steadily decreased to nearly 1:1. Due to this increase in effluent concentration, the average weighted DF for campaign 17 was 26,927, lower than the previous campaign's DF of 34,000.

Following termination of campaign 17, column A was dumped in a way not previously used. The column was dewatered, then the bottom plug was removed from the column using the remote hydraulic arm installed in the M-4 riser. All of the zeolite was then washed from the column through the open bottom dump valve.

LWTS OPERATION

Operation of the High TDS System, specifically Evaporator 31017 and its associated subsystems, was satisfactory throughout campaign 17. Processing was interrupted temporarily when Level Transmitter 71-LT-111A, for Concentrates Storage Tank 5D-15A1, malfunctioned. The transmitter was replaced. During the time of the repair, concentrates were routed to 5D-15A2. There was no significant impact on the processing schedule, and no compromise in product quality.

Progress was made in identifying and isolating the source of "valve reset alarms". Two (2) input/output racks were replaced in remote I/O cabinets in the Upper Extraction Aisle and Lower Extraction Aisle. The number and frequency of alarms was measurably reduced by replacing these faulty racks.

CSS OPERATION

Prior to the start of campaign 17, the motor for mixer #2 (bad bearings) was replaced. The campaign was completed utilizing both mixers, one at a time. Mixer #1 was used for 1 week, then mixer #2, then mixer #1, etc.

Processing was interrupted for a short period on May 8, 1990 to repair a loose connection at the mixer #1 tachometer.

During the campaign, the Loadout Shield Door Hydraulic Unit was moved from the 01-14 Building stairwell area to the loadout garage. This work (tubing, wiring, and checkout) was completed between CSS run weeks, a superior job of scheduling and performance by the Maintenance Department.

Cement "blowby" was closely monitored during campaign 17. Due in part to increased attention by the operators, no instances of blowby were encountered. A significant amount of unhydrated (dry) cement was discovered in the cement feed hose to mixer #2 during inspections between drums. The exact cause of this cement buildup was not identified.

On May 31, 1990, the ACRISON cement feeder microprocessor memory was lost. The exact cause of this memory loss is unknown. All feed parameters, such as motor speed (the auger speed during feeding), dribbler point (the percent of the preset weight when the feeder switches to "dribble"), and the dribble speed (auger speed during "dribble" to the

exact preset weight) were reprogrammed into the microprocessor by the shift supervisor as directed by the shift engineer. No abnormalities were discovered by the electrician or IRTS Engineering.

The annual DOP test of 01-14 building ventilation exhaust system was successfully completed on May 25, 1990.

DRUM CELL

Operation of the Drum Cell crane was temporarily out of service requiring a serviceman to repair during campaign 17. This down time did not affect CSS production. All drum placements occurred without incident.

DECONTAMINATION FACTORS:

A graph of the Decontamination Factors (DF) obtained in STS is shown in figure 3. Transfer DF is the instantaneous factor, calculated for each transfer from STS to LWTS. Cumulative DF is the weighted average of the transfer DF's. The shape of the lines shown in figure 3 is typical of previous campaigns.

TANK LEVELS:

This campaign continued to reduce the volumes in tank 8D-2 by processing supernatant. A graph of 8D-1 and 8D-2 levels since January 1988 is included for information, see figure 4. The level in 8D-1 will be maintained at a minimum of 50 inches for ballast and shielding purposes. A target level of 32 inches for completion of supernatant processing is shown for 8D-2.

PRODUCT ACCEPTANCE:

The waste form classification analyses for drums produced is as follows:

- Campaign 11, Class "C" Low Level Waste; Verification complete.
- Campaign 12, Class "C" Low Level Waste; Verification complete.
- Campaign 13, Class "C" Low Level Waste; Verification in progress.
- Campaign 14, QA update in progress.
- Campaign 15, Awaiting QA update.
- Campaign 16, Awaiting QA update.
- Campaign 17, Awaiting QA update.

Table 7, "Summary of Suspect Drums and Test Results" contains a list of all drums that have not been produced in accordance with the Process Control Plan (PCP).

STS BREAKTHROUGH CURVE

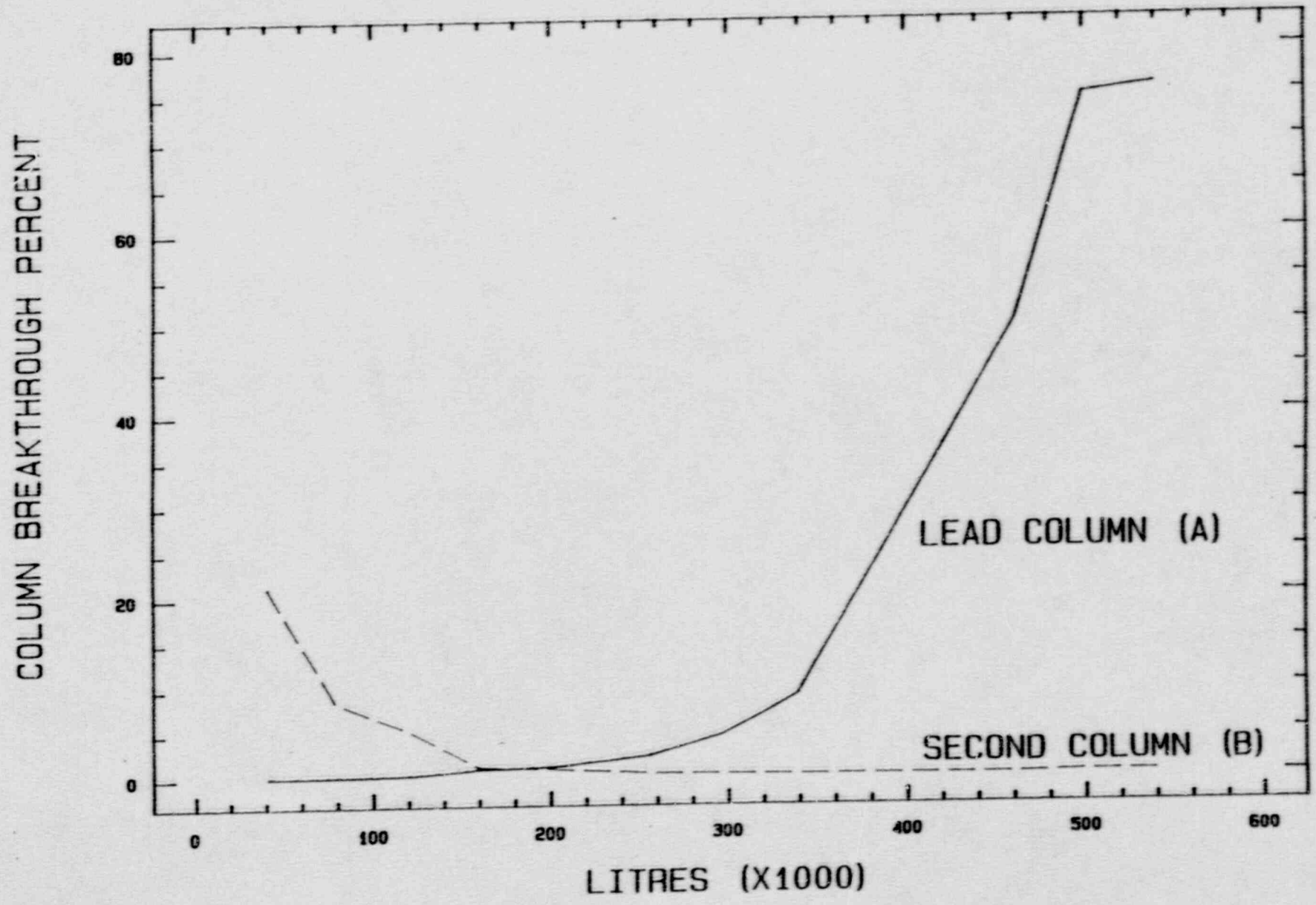
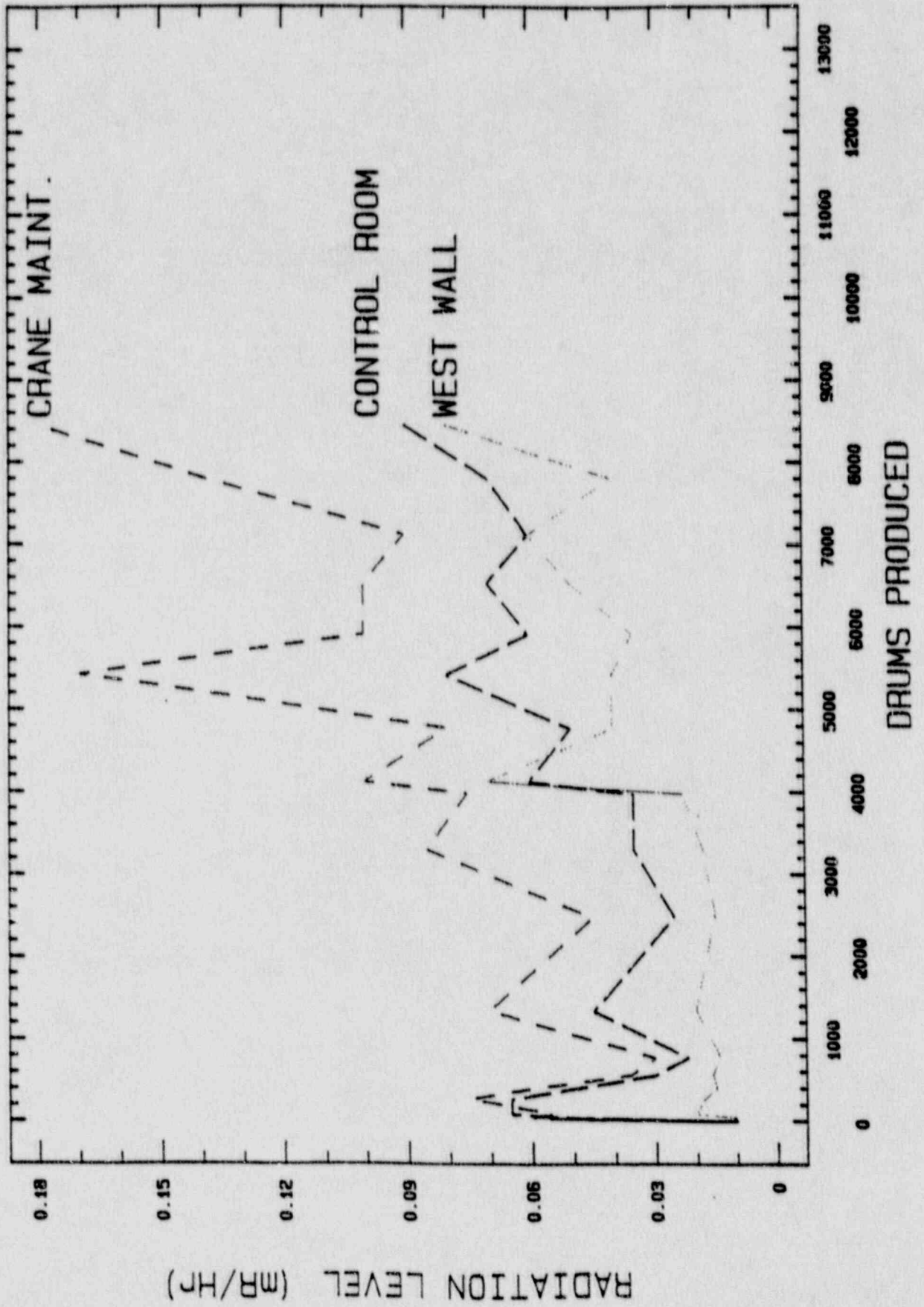


FIGURE 2

DRUM CELL RADIATION LEVELS



S T S DECONTAMINATION FACTOR

DECONTAMINATION FACTOR (X1000)

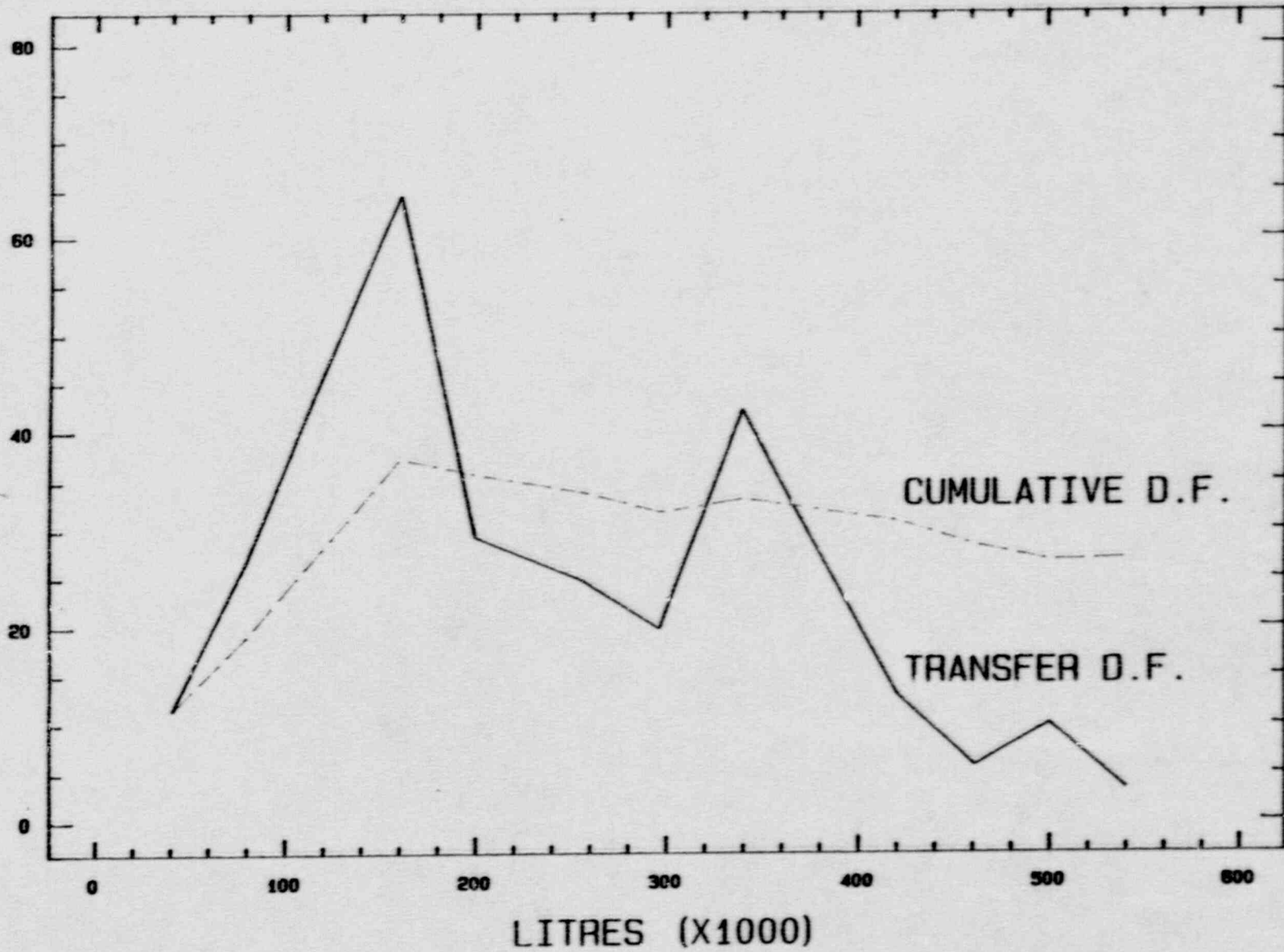


FIGURE 4

IRTS HIGH LEVEL WASTE TANKS 8D-1 & 8D-2

GALLONS (X1000)

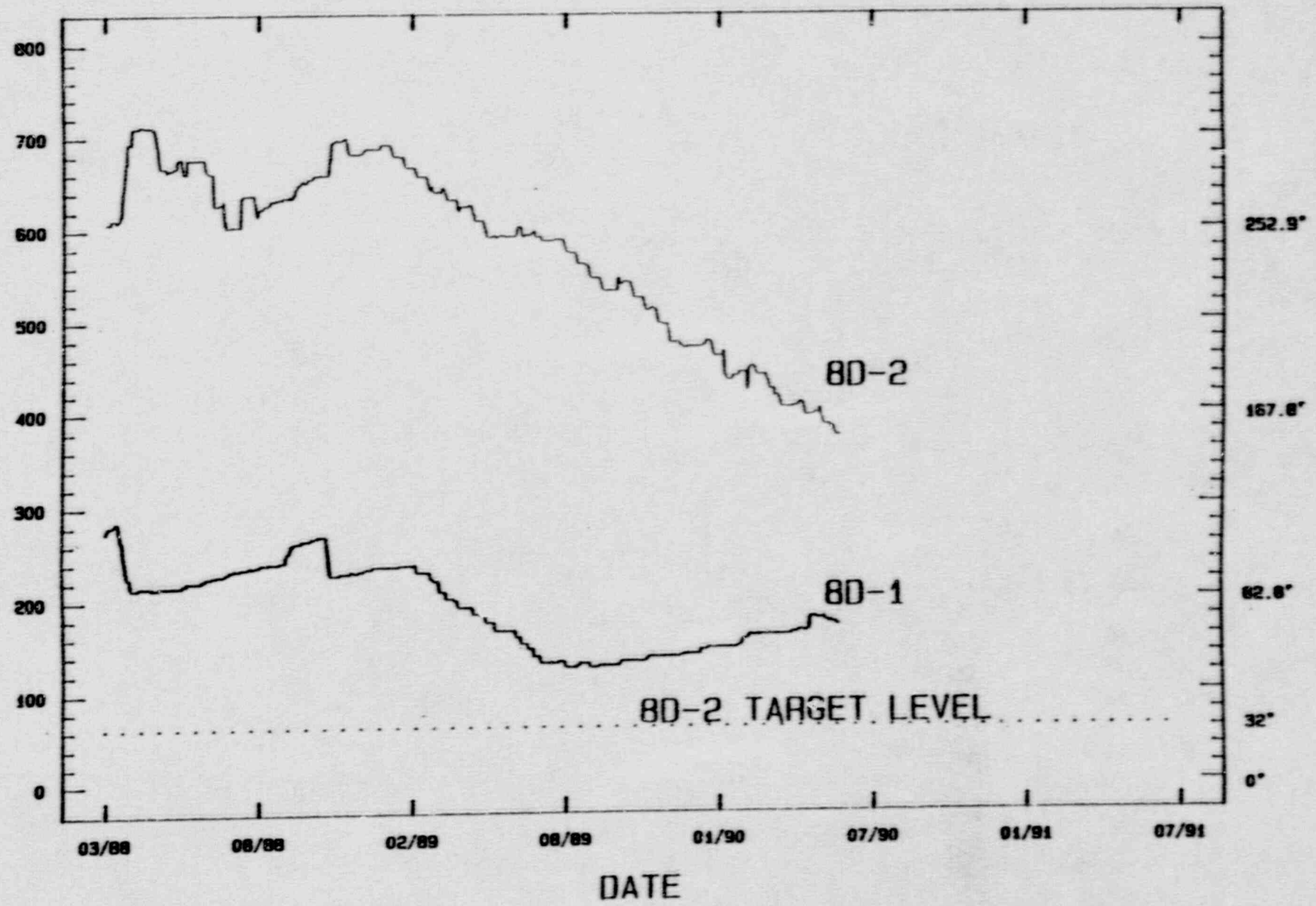


TABLE 1
IRTS CAMPAIGN NO. 17 RUN REPORT
SUMMARY TABLE OF RUN STATISTICS

1. TRANSFERS 8D-3 TO 5D-15B			
A.	Campaign Nos. 1 thru 16	4,273,380 L	1,129,030 G
B.	Campaign No. 17 Total	<u>539,857 L</u>	<u>142,616 G</u>
	TOTAL TO DATE	4,813,237 L	1,271,646 G
2. LWTS PROCESS VOLUMES			
2.1 Total Feed to Evaporator			
A.	Campaign Nos. 1 thru 16	4,285,206 L	1,132,035 G
B.	Campaign No. 17	<u>540,169 L</u>	<u>142,698 G</u>
	TOTAL TO DATE	4,825,375 L	1,274,733 G
2.2 Total Concentrate			
A.	Campaign Nos. 1 thru 16	1,083,518 L	286,236 G
B.	Campaign No. 17	<u>98,919 L</u>	<u>26,134 G</u>
	TOTAL TO DATE	1,182,437 L	312,370 G
3. DRUMS PRODUCED*			
A.	Campaign Nos. 1 thru 16	7,808	
B.	Campaign No. 17	<u>643</u>	
	TOTAL TO DATE	8,451	
4. CURIES OF CESIUM 137 REMOVED FROM 8D-2			
A.	IRTS Campaign Nos. 1 thru 16		4,019 K Ci
B.	IRTS Campaign No. 17		<u>315 K Ci</u>
	TOTAL		4,334 K Ci
5. PROCESS COMPLETION			
A.	Curies Percent Complete:		
	$\frac{4335}{7,089-489}$	= 0.660 or 66 percent	
B.	Drums Percent Complete:		
	$\frac{8,451}{13,000}$	= 0.65 or 65 percent	

* Includes 7 drums removed from pile and core bored (#72847, 72791, 72949, 71004, 72813, 71144, 72835) which are now located in Lag Storage.

TABLE 2
IRTS CAMPAIGN NO. 17 RUN REPORT
COMPARISON OF STATISTICS FROM PREVIOUS CAMPAIGNS TO THIS CAMPAIGN

	<u>CAMPAIGN NO. 15</u>	<u>CAMPAIGN NO. 16</u>	<u>CAMPAIGN NO. 17</u>
<u>S T S</u>			
Volume of 8D-2 Supernatant ^(a) Processed (Gal.)	33,300	46,578	45,236
Total Volume Processed (Includes flush and dilution Water) (Gal.)	88,071	141,446	142,616
Column Breakthrough (%)			
- Lead Column	33.5	87	75
- 2nd Column	6.3	.098	0.2
Average System DF	27,900	34,401	26,927
Average Cs-137 in Effluent (uCi/mL)	0.072	0.040	.032
<u>L W T S</u>			
Concentrates			
- Volume (Gal.) ^(b)	23,504	27,486	26,134
- Average Cs-137 (uCi/mL)	.21	.16	.22
<u>C S S</u>			
Drums Produced	592	684	643
Average Cs-137/Drum (Ci)	0.041	0.024	.028
Average Drum Contact Dose Rate (mR/hr)	33	26	32
(a) See Table 6 for volume of supernatant recycled.			
(b) Tank heels:			
	<u>CAMPAIGN 15</u>	<u>CAMPAIGN 16</u>	<u>CAMPAIGN 17</u>
5D-15A1 -	40 Gallons	20 Gallons	20 Gallons
5D-15A2 -	2 Gallons	2 Gallons	2 Gallons
70-D-1 -	50 Gallons	150 Gallons	40 Gallons
TOTAL	92 Gallons	172 Gallons	62 Gallons

TABLE 3
I R T S CAMPAIGN NO. 17 RUN REPORT
DETAILED TABLE OF RUN STATISTICS

COLUMN SEQUENCE: A-B-C-D

Transfer 8D-3 to 5D-15B	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A. Date	4/30/90	5/02/90	5/03/90	5/14/90	5/16/90	5/18/90	5/21/90	5/22/90	5/24/90	5/25/90	6/04/90	6/05/90	6/07/90	6/08/90
B. STS Flow Rate (gpm)	6.0	6.0	6.0	6.0	5.9	Flush	6.0	6.0	6.0	Flush	6.0	6.0	6.0	Flush
C. D-001 Sample No.	9001387	9001403	9001424	9001443	9001542	0	9001589	9001636	9001662	0	9001767	9001779	9001799	9001835
i. Cs-137 (uCi/mL)	525	580	504	490.0	497	0	436	478	480	0	499	509.0	481.0	501.0
ii. TDS (wt %)	11.31	11.34	11.34	11.23	10.77	0.00	10.89	11.34	11.23	0.00	11.12	11.3	11.0	11.0
iii. Density (gr/mL)	1.076	1.076	1.076	1.075	1.071	0.00	1.072	1.076	1.075	0.00	1.074	1.076	1.073	1.100
D. Cesium-137 Activity (Column Effluents) (uCi/mL)														
i. Lead Column A	0.4240	0.8790	1.350	4.230	5.70	0.00	9.8950	22.1	43.8	0.00	180.9	255	360	380
ii. 2nd Column B	0.0898	0.0745	0.071	0.045	0.043	0.00	0.0298	0.033	0.032	0.00	0.079	0.12	1.20	0.82
E. Column Breakthrough (%)														
i. Lead Column A	0.1	0.2	0.3	0.9	1.1	N/A	2.3	4.6	9.1	N/A	36.3	50.1	74.8	75.8
ii. 2nd Column B	21.1	8.5	5.3	1.1	0.8	N/A	0.3	0.2	0.1	N/A	0.044	0.047	0.3	0.2
F. 8D-3 Sample No.	9001392	9001410	9001431	9001450	9001546	9001579	9001604	9001645	9001691	9001728	9001773	9001793	9001799	9001845
i. Cs-137 (uCi/mL)	0.0291	0.0201	0.0108	0.0076	0.0111	0.0143	0.0097	0.0227	0.0113	0.0198	0.0139	0.0827	0.0481	0.1466
ii. TDS (wt %)	7.42	10.54	11.23	11.23	7.22	6.53	6.19	10.66	11.12	11.23	4.15	10.4300	11.0000	10.7700
iii. Density (gr/mL)	1.042	1.069	1.075	1.075	1.040	1.034	1.031	1.070	1.074	1.075	1.026	1.0680	1.0730	1.0710
G. STS System DF														
i. Transfer DF	11,460	26,641	46,043	64,474	29,147	0	24,623	19,684	42,023	0	12,799	5,619	10,000	3,340
ii. Cumulative DF	11,460	18,822	28,036	37,149	35,545	35,545	33,702	31,676	33,048	33,048	30,709	28,235	26,627	26,927
H. 5D-15B Sample No.	9001400	9001417	9001442	9001460	9001568	9001586	9001611	9001682	9001720	9001744	9001778	9001806	9001834	9001855
i. Cs-137 (uCi/mL)	0.0301	0.0176	0.0103	0.0075	0.0175	0.0156	0.0147	0.0186	0.0143	0.0222	0.0321	0.0583	0.0958	0.1180
ii. TDS (wt %)	8.93	10.54	11.00	10.43	9.05	7.34	8.14	10.54	11.00	10.29	8.37	9.74	10.43	9.51
iii. Density (gr/mL)	1.055	1.069	1.073	1.068	1.056	1.041	1.048	1.069	1.073	1.067	1.050	1.062	1.068	1.060
I. Volume Received (Litres) in 5D-15B	40,753	38,367	40,489	39,889	40,000	15,849	40,489	40,542	42,899	39,219	42,253	40,000	39,219	39,889
J. Cumulative Volume* for Campaign (Litres)	40,753	79,120	119,609	159,498	199,498	199,498	239,987	280,529	323,428	323,428	365,681	405,681	444,900	444,900

* Does not include flush (see Row "B") transfers.

TABLE 4
I R T S CAMPAIGN NO. 17 FILM REPORT
DRUM TESTING RESULTS

CONCENTRATES BATCH	60	61	62	63	64	65	66
LWTS TANK	5D-15A1	5D-15A2	5D-15A1	5D-15A1	5D-15A2	5D-15A1	5D-15A2
LAB ANALYSIS NO.	9001313	9001452	9001472	9001721	9001750	9001852	9001863
TOTAL SOLIDS %	40.89	40.55	40.24	40.32	40.78	40.44	39.98
Cs-137 CONCENTRATION (uCi/mL)	2.78 E-01	1.50 E-01	8.78 E-02	1.02 E-01	8.87 E-02	3.00 E-01	5.84 E-01
POUNDS CEMENT +CaNo ₃	912	48,336	39,216	69,312	43,776	69,768	21,888
NUMBER OF DRUMS	2	106	86	152	96	153	48
TOTAL GALLONS	80	4,240	3,440	6,080	3,840	6,120	1,920
CURIES PER DRUM (AVERAGE)	0.042	0.023	0.013	0.015	0.013	0.046	0.088
RADIATION DOSE (mR/hr) PER DRUM	50	24	15	17	16	43	80
PRESOLIDIFICATION RESULTS	>700 PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI
IN-CELL TEST RESULTS DRUM NO./PSI	78935 >700 PSI	78913 >700 PSI	79180 >700 PSI	79183 >700 PSI	79115 >700 PSI	79569 >700 PSI	79638 >700 PSI
Total Cement & CaNo ₃	293,208	LBS.					
Total Number of Drums	643						
Total Volume Solidified	25,720	Gallons					
Total Curies Solidified	18.49	Ci					

TABLE 5

I R T S CAMPAIGN NO. 17 RUN REPORT
DRUM PRODUCTION RATES

	<u>DATE</u>	<u>DAILY AVERAGE</u>	<u>WEEKLY TOTAL</u>	<u>CUMULATIVE TOTAL</u>
Campaign #1	6/1 to 6/17	33		401
Campaign #2	6/27 to 7/8	45		783
Campaign #3	7/18 to 8/5	35		1347
Campaign #4	8/22 to 9/26	30		1681
Campaign #6	12/5 to 12/13	45		2009
Campaign #7	1/23 to 2/23	50		2607
Campaign #8	3/6 to 4/13	60		3303
Campaign #9	4/24 to 5/26	58		3988
Campaign #10	6/19 to 6/22	37		4136
Campaign #11	7/26 to 8/24	58		4778
Campaign #12	9/5 to 10/13	50		5421
Campaign #13	10/23 to 11/10	62		5921
Campaign #14	11/20 to 12/15	67		6532
Campaign #15	1/22 to 2/14	59		7124
Campaign #16	3/12 to 4/16	42		7808
Campaign #17	5/08	66		
	5/09	65		
	5/10	63	194	8002
	5/30	53		
	5/31	65		
	6/01	45	163	8165
	6/04	35		
	6/05	60	95	8260
	6/12	57		
	6/13	54		
	6/14	63		
	6/15	17	191	8451

TABLE 6
IRTS CAMPAIGN NO. 17 RUN REPORT
STS PROCESS HISTORY

C/CAMPAIGN	DATE	NOMINAL DILUTION RATIO	COLUMN SEQUENCE	COLUMN(S) DUMPED	Cs-137 CONCENTRATION IN 8D-2 (uCi/mL)	SUPERNATANT PROCESSED				TOTAL Cs-137 REMOVED KCi	Cs-137 INVENTORY REMAINING IN 8D-2(a)(b) KCi
						AND TRANSFERRED TO LWTS GALLONS	Cs-137 REMOVED KCi	AND RECYCLED TO 8D-2 GALLONS	Cs-137 REMOVED KCi		
1	5/88	no dilute	B-C-D-A	B	2860	24,185	262	0	0	262	6,836
2	6/88	no dilute	C-D-A-B	C	2600	15,800	155	0	0	155	6,681
3	7/88	no dilute	D-A-B-C	D	2600	26,356	259	0	0	259	6,422
4	8/88	no dilute	A-B-C	A	2600	17,000	167	4,000	39	206	6,215
5	9-10/88	no dilute	N/A	B&C	2400	0	0	30,200	274	274	5,942
6	12/88	no dilute	A-B-C-D	A	1980	17,800	133	0	0	133	5,809
7	1-2/89	2:1	B-C-D-A	B	1980	35,342	265	0	0	265	5,544
8	2-3/89	2:1	C-D-A-B	C	1980	34,040	255	0	0	255	5,289
9	4-5/89	2:1	D-A-B-C	D	1980	35,101	263	0	0	263	5,026
10	6/89	2:1	A-B-C	A	1885	10,900	78	13,200	31	109	4,917
11	8/89	2:1	B-C-A	B	1885	35,096	250	0	0	250	4,667
12	10/89	2:1	C-D-A-B	C	1885	33,363	238	0	02	238	4,429
13	10-11/89	2:1	D-A-B-C	D&A	1855	28,333	199	14,767	42	241	4,188
14	12/89	2:1	B-C-A	B&C	1810	33,873	232	19,180	131	363	3,825
15	1-2/90	2:1	D-A-C	D&A	1810	33,300	228	34,434	202	430	3,395
16	3-4/90	3.6:1	C-A-B	C	1790	46,578	316	0	0	316	3,079
17	6/90	3.6:1	A-B-C-D	A	1790	45,236	315	1,456	7	315	2,764
						472,303	3,615	117,239	726	4,334	

(a) Total curies of Cesium-137 reported in Safety Analysis Report (SAR) report decayed to 7-21-88 = 7,098 KCi minus curies of Cesium-137 processed.

(b) Includes approximately 0.489 kCi Cesium-137 left in 32-inch heel in Tank 8D-2 at the end of supernatant processing estimated as follows:

Volume of 32 inch heel = 80,464 gallons
 Volume of solids in heel = 7,548 gallons
 (Ref.: DOE/NE-44139-14, Page A2)
 Volume of supernatant in heel = 72,916 gallons
 Curies of CS-137 in heel = 489 KCi

$$\frac{[(7.29 \text{ E}+04 \text{ gal})(3.785 \text{ E}+03 \text{ mL/gal})(1.79 \text{ E}+03 \text{ uCi/mL})]}{10^6 \text{ uCi/Ci}}$$

TABLE 7
IRTS CAMPAIGN NO. 17 RUN REPORT
SUMMARY OF SUSPECT DRUMS

DATE PRODUCED	CAMPAIGN NUMBER	DRUM SERIAL NUMBER	CRITIQUE NUMBER	NON-CONFORMANCE REPORT	DESCRIPTION OF SUSPECT CONDITION
7/29/88	3	72847	CM88083	NR 88-055	One batch in drum produced without sodium silicate.
2/06/89	7	73033	CM89013	NR 89-011	
5/10/89	9	74014	CM89056	N/A	
4/12/90	16	78922	CM90049	NR 90-017	
8/11/89	11	75903	CM89101	NR 89-066	One gallon of raw waste added on top of finished product.
1/23/89	7	71397	N/A	NR 89-015	Low water-to-cement ratio (i.e. 0.526). Acceptable range is 0.54 to 0.70.
11/20/89	14	77074	CM89135	NR 89-148	Incomplete antifoam addition to mixer.
14	77073				
14	77314				
14	77305				
14	77304				
14	77405				
14	77331				
14	77401				
14	77330				
14	77333				
14	77344				
14	77345				
14	77402				
14	77404				
14	77403				
14	77328				
14	77303				
14	77399				
14	76994				
14	77212				
14	77228				
14	77222				
7/05/88	2	71542	CM90042	N/A	Low water-to-cement ratio.
7/24/88	3	72539	CM90042	N/A	
8/23/88	4	72331	CM90042	N/A	
10/10/89	12	76392	CM90042	N/A	
11/20/89	14	77401	CM90042	N/A	
11/20/89	14	77213	CM90042	N/A	
12/15/89	14	77829	CM90042	N/A	
12/14/89	14	77523	CM90042	N/A	
3/26/90	16	78091	CM90042	N/A	
4/19/90	16	76671	N/A	NR 90-019	