M-32
PDR/LPDR

Department of Energy
Idaho Operations Office
West Valley Project Office
P.O. Box 191
West Valley, NY 14171

April 19, 1991

Mr. R. Davis Hurt
U S. Nuclear Regulatory Commission
Headquarters
Washington D. C. 20555

SUBJECT: Integrated Radwaste Treatment System (IRTS) Campaign #20 Run Report

Dear Mr. Hurt:

Enclosed for your information is the Run Report for the Integrated Radwaste Treatment System (IRTS) Campaign #20. This report provides details concerning the operational run of the IRTS including: process description, operational details, system performance, lessons learned and the results obtained. Campaign #20 processed 50,700 gallons of supernatant containing 328,000 curies for a cumulative total of 612,000 gallons containing 5,135,000 curies removed from Tank 8D-2.

Campaign #20 was a four column Run in a D-A-B-C configuration. The average Campaign #20 decontamination factor was 62,900.

Sincerely,

J. Alan Yeazel, Manager
Operations, Maintenance,
Engineering and Construction
West Valley Project Office

Enclosure

cc: J. E. Solecki, DOE-ID

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NF13

From IRTS Process Control Engineering
Ext. 4283, MS-W

Letter # DC:91:0019

Date February 20, 1991

Subject IRTS Campaign No. 20 Run Report

To P. J. Valenti - MS-W

cc:

M.N. Baker.....W
S.M. Barnes.....M
M. Boyd.....Z-26
J.J. Buggy.....07
D.E. Carl.....I
J.D. Chamberlain.40
R.W. Dallas.....X
M.W. Damerow.....40
D.G. Feldman.....R
R.J. Fussner.....X
D.H. Garland.....R
R.F. Gessner...201
J.B. Green.....39
A.J. Howell.....W
R.F. Itzo.....Z-18
M.L. Jeffe.....X
P.S. Klanian.....J
R.E. Lawrence...07
D.R. Leap. 42
R.J. Lewandowski.B
L.L. Lincoln.....X
B.W. Liskow.....R
W.F. MacKellar.56A
S.A. MacVean.....W
D.K. Marsh.....X
D.C. Meess....Z-26
B.J. Miller....206
D.F. Pezzimenti..W
D.K. Ploetz....305
W.G. Poulson...307
C.F. Ross.....W
G.J. Robbins.....W
A.F. Russillo....R
K.E. Sanders.....X
D.J. Sawyer....205
H.J. Shaffner....X
D.L. Shugars.....B
G.A. Smith.....W
D.J. Stroud...Z-26
D.L. Wiltse.....R
Original MRC
IRTS PCE LetterLog
DC:91 Letter Log

Transmitted for your information and use is the IRTS Campaign No. 20 Run Report.

If you have any questions regarding the information in this report, please contact the undersigned (Ext. 4283).

AJ Howell for

J. C. Cwynar, Manager
Mail Stop - W
IRTS Process Control Engineering
West Valley Nuclear Services Co., Inc.

JCC:jbc

Attachment: IRTS Campaign No. 20 Run Report

SRC4002

RUN REPORT

INTEGRATED RADIOACTIVE WASTE TREATMENT SYSTEM

CAMPAIGN NO. 20, September 17, 1990 - November 2, 1990

Information Contributed By:

M. N. Baker
G. J. Robbins
C. F. Ross
G. A. Smith

LIST OF TABLES

LIST OF FIGURES

RUN REPORT
IRTS
CAMPAIGN NO. 20

SUMMARY:

Integrated Radwaste Treatment System (IRTS) Campaign #20 was initiated on September 17, 1990 and concluded on November 2, 1990, after processing approximately 50,705 gallons of 8D-2 liquid. The target dilution factor was 3.0:1 water to 39 wt% supernatant (baseline supernatant). Cesium removed from 8D-2 solution was 209 kilocuries for the supernatant processing to the LWTS and 119 kilocuries removed during loading of Column C with cesium (See below). This resulted in a total of 328 Kilocuries of Cesium -137 removed from Tank 8D-2 during Campaign 20.

IRTS procedures were modified to allow an increase in flow rate through the STS ion exchange columns to a maximum of 8 gpm (increased from the previous maximum of 6 gpm). These modifications also allowed continuous operation of the LWTS evaporator without placement of the system in standby during STS to LWTS transfers.

Shortly after commencement of supernatant processing, an abnormally high system effluent cesium concentration was observed. Ion exchange column C, the fourth column in sequence for Campaign 20, showed evidence of containing a heel of cesium-loaded zeolite. Decontaminated supernatant was eluting cesium from this heel, causing high cesium effluent. Following IRTS Campaign 19, a method of dumping Column C was used which emptied all the zeolite out of the column bottom plug. This procedure had been used successfully once following Campaign 17. Due to the cesium in the effluent it was necessary to discontinue supernatant processing, saturate Column C, dump and recharge it with clean zeolite. The IRTS operations prior to saturation of Column C were designated Campaign 20A. Following recharging of Column C, IRTS operations were designed as Campaign 20B. Campaign 20A processed 7,080 gallons of supernatant and

produced 103 drums of CSS cemented waste. Campaign 20B processed 43,625 gallons of supernatant which resulted in a CSS production of 558 drums. Both segments of Campaign 20 were run in STS ion exchange column sequence D-A-B-C. The target dilution factor was 3.0:1 based upon 39 wt% concentration in 8D-2. A total of 328 kilocuries of cesium was removed during Campaign 20. 209 kilocuries was removed during processing of supernatant and 119 kilocuries was removed during saturation of Column C. The weighted average decontamination factor was 64,909 for Campaign 20.

At of the end of Campaign 20, the total volume of supernatant removed from 8D-2 is 612,000 gallons, with approximately 207,500 gallons remaining to process assuming a final level of 32 inches at completion of supernatant processing.

The necessity of dumping two columns of zeolite during Campaign 20 (one following Campaign 20A and one following Campaign 20B) resulted in a usage of 2,766 kg (dry weight) of zeolite. The total zeolite usage to date is 33,393 kg, or approximately 72% of the 46,169 kg total allowable for supernatant processing. This allowable usage is based upon a total usage for supernatant and sludge washing processing of 60,000 kg dry weight and a requirement of 10 column charges (13,831 kg) for sludge washing.

Campaign 20 was not a typical campaign. Therefore, using statistics from this campaign for predictions of total zeolite usage is not appropriate. Assuming a supernatant volume of 45,000 gallons and a zeolite usage of 1,383 kg (one column charge) per campaign is a reasonable assumption. Using these values, a total of 5 campaigns, using 6,915 kg of zeolite are required. This would result in a total zeolite usage of 40,222 kg for supernatant processing. This is approximately 87% of 46,169 kg allowable. See figure 5 for a plot of zeolite usage to date.

During Campaign 20A, the Liquid Waste Treatment System (LWTS) received a total of 2 batch transfers from STS totaling 22,506 gallons of process liquid which was evaporated to produce 4,066 gallons of concentrates. Campaign 20B resulted in 11 batch transfers for 103,510 gallons of process liquid which produced 22,374 gallons of concentrates. The grand total for all of Campaign 20 was 126,017 gallons of process liquid and 26,440 gallons of concentrates.

Cement Solidification System (CSS) processed 26,440 gallons of concentrates and produced 661 drums total for both segments of Campaign 20. The total CSS production at the completion of Campaign 20 was 10,336.

Table 1 shows a summary of run statistics. Process completion status at the end of this campaign is 79.5% based on a total drum production of 13,000 drums.

DISCUSSION:

STS OPERATION

Campaign 20 STS operations commenced on September 17, 1990. A change was made to procedures and technical requirements allowing an increase the STS column solution flow rate from a maximum of 6 gpm to 8 gpm. The STS system was started at this higher rate of 8 gpm. After the system was filled with supernatant, it became apparent that the cesium concentration in the STS system effluent was abnormally high. The proper positioning of all system valves was verified. Valves which isolate raw supernatant from decontaminated supernatant were inspected for seal drainage by check of leakage from the valve cavity bleed. Continuous leakage would indicate faulty valve seals. This could allow cross contamination of the decontaminated supernatant stream by raw supernatant. These checks, which were performed per SOP 50-36, indicated no improper positioning or valve seal leakage and resulted in no improvement in the STS system effluent. To eliminate the increased flow rate as a possible cause for

the abnormal effluent activity, the total flow rate through the columns was decreased to 3 gpm. This reduction in flow rate had no beneficial effects on the system effluent.

The STS system effluent cesium concentration continued to slowly increase. In order to investigate the cause of high activity problem the system was flushed with demineralized water and placed in a standby mode.

A series of actions, performed in parallel, were taken to determine the cause of the increased cesium concentration of system effluent. The first was to perform a pressure test of each individual column. A work order was issued to perform the tests as described in SOP 50-37. No measurable pressure decay was observed during any of the column pressure tests. This eliminated valve leak-through as the cause.

Ion Exchange Column C was the first column to be loaded with zeolite of the newest lot (batch) purchased. Although this new lot of zeolite was certified by the manufacturer, the next action was the performance of testing by Analytical and Process Chemistry (A & PC) which verified the zeolite was acceptable for use. The zeolite used in Column C actually has a higher efficiency than the older lot of zeolite.

Verification of ion exchange column valve integrity and good zeolite efficiency led to the likelihood that a heel of cesium loaded zeolite had remained in the column when it was dumped. The sodium present in the decontaminated supernatant has been shown to elute cesium from a loaded zeolite heel. This elution would cause higher than normal cesium concentration in the column effluent. Note that IX Column C was dumped following Campaign 19 using a method which had been used only once previously. Following Campaign 17, Column A was successfully dumped using this method. This method dewaters the column with all zeolite still contained in the column. Then the bottom plug is removed and the zeolite removed from the column by flushing it out of the open bottom dump valve. This method of dumping the column allows the zeolite to be dumped in four locations, one below each IX column. Utilization of the

J-nozzle results in the zeolite being dumped in one location, near the 8D-1 Tank wall. Dumping in one location is undesireable due to build up of a zeolite pile. The method used, however, does not refill the column with water because the open bottom dump valve drains liquid from the column at a greater rate than the flush flow rate. It is possible that some zeolite may bridge and hang up in the column. There is no assurance that water will fluidize all the zeolite and facilitate it's removal from the column.

In order to confirm the suspicion that a heel of loaded zeolite existed in the column, an elution test was performed. This test entailed passing decontaminated supernatant through Column C while sampling the column influent and effluent to determine if elution was taking place. The column effluent was steadily increasing, which indicated a heel of loaded zeolite was present.

Column C was thus shown to be unacceptable for use due to the high cesium effluent. In order to make the column acceptable for use as a final column, the zeolite had to be removed from the column and fresh zeolite loaded into it. To achieve efficient use of the zeolite, Column C was placed on line with raw undiluted supernatant to saturate the zeolite with cesium. The column was then emptied of zeolite by sluicing via the J-nozzle and the heel was discharged through the bottom dump valve. Following this, Column C performed as expected of a normal final column containing fresh zeolite. The remainder of Campaign 20 (20B) STS operation proceeded without any other notable problems.

Following completion of Campaign 20, the lead column, Column D, was sluiced via the J-nozzle and then sparged per a work order. The sparge should reduce the heel of loaded zeolite to an acceptably small amount that will not significantly effect column effluent cesium activity. Note that sparging of Column D following Campaign 16 allowed acceptable use of Column D as a fourth column. For the start of Campaign 21, two drums of zeolite will be placed in column D to test the effeciveness of the sparge.

During riser work being performed between the second and third operating phases of STS, the hydraulic arm winch cable broke. This allowed the hydraulic arm to slide down the mast, stopping on the toe plate at the bottom of the mast (see also CM 90124). STS personnel were able to place a basket sling around the arm cart to safely secure it shortly after it had dropped. After much planning, the arm was removed from the riser and disposed of. This failure of the hydraulic arm did not cause a delay in operations during Campaign 20.

LWTS OPERATION

To facilitate the increased flow rate of the STS and LWTS, LWTS procedures and Technical Requirements (TRs) were modified to allow operation of the LWTS Evaporator on a continuous basis. This is referred to as "Feed and Bleed" due to the fact the Evaporator Feed Tank 5D-15B is filling from Decontaminated Supernatant Storage Tank 8D-3 and is supplying the evaporator at the same time. Formerly, the evaporator was required to be placed in standby prior to and during transfers from the STS to the LWTS. These transfers are normally of 6-7 hours duration. The operation of the evaporator during the transfers increased the throughput capacity of the LWTS sufficiently to easily keep pace with the increased flow rate of 8 gpm.

A malfunctioning evaporator density transmitter caused a loss of approximately 8 hours of evaporator operation during troubleshooting and replacement of the transmitter. STS was requested to decrease the flow rate for approximately 16 hours.

CSS OPERATION

The High Shear Cement Solidification System (HSCSS) produced a total of 661 drums of low level waste at 40 gallons of waste per drum. A total of 103 drums were produced during the 20A segment of Campaign 20 and 558 drums were produced during the 20B segment of Campaign 20. A total of 442 (66.8% of the total produced) low dose shield drums, suitable for placement in the Drum Cell ninth layer, were produced and segregated in the Drum Cell. All of the low dose shield quality drums were produced during the 20B segment of the campaign.

A gel time of 104 minutes was obtained by lab. analysis for Tank 5D-15A1 concentrates sample log number 9000089. The acceptable gel time is a range of minimum 5 minutes to maximum of 30 minutes per WVNS-PCP-001 (Process Control Plan). A work order was issued to obtain an "in process" gel time of the first drum of cemented waste produced each shift. Prior to producing a second drum, the gel time of the first was verified to be within the 5-30 minute range specified in the PCP. All of the in-process gel times fell within the range specified. Refer also to IRTS Campaign 19 Run Report for information on previous out-of-specification lab. gel times.

CSS processing was interrupted for approximately 12 hours due to electrical and limit switch problems at the Drum Cell.

CSS processing was also interrupted when, during a loadout of CSS drums, the drums were advanced while the drum transporter drawbridge was in the raised (closed) position (see also Cm 90121). Two drums exited the M-45 conveyor and tipped against the back of the drum transporter. The two drums were slightly damaged. After an initial evaluation, the two damaged drums were set aside and operations were resumed with visual verification that the drawbridge was in position to accept drums prior to loadout. The automatic sequence of operations for loadout was changed by IRTS Engineering to lower the drawbridge prior to raising the M-45 lift table. The lift table, prior to this change, raised before the

drawbridge lowered. The drums on the lift table obscured the operator's vision of the drawbridge. CSS operating procedures were modified as required to reflect these changes.

DRUM CELL OPERATION

Operation of the IRTS Drum Cell continued in support of CSS operations.

The Drum Cell experienced problems with an electrical short in the cable from the drum grabber to the cable reel, an electrical short in the control panel, and a limit switch malfunction. These problems caused an approximate 12 hour loss of CSS production time.

Other than the above mentioned problems, the IRTS Drum Cell operated without difficulty.

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.

TANK LEVELS:

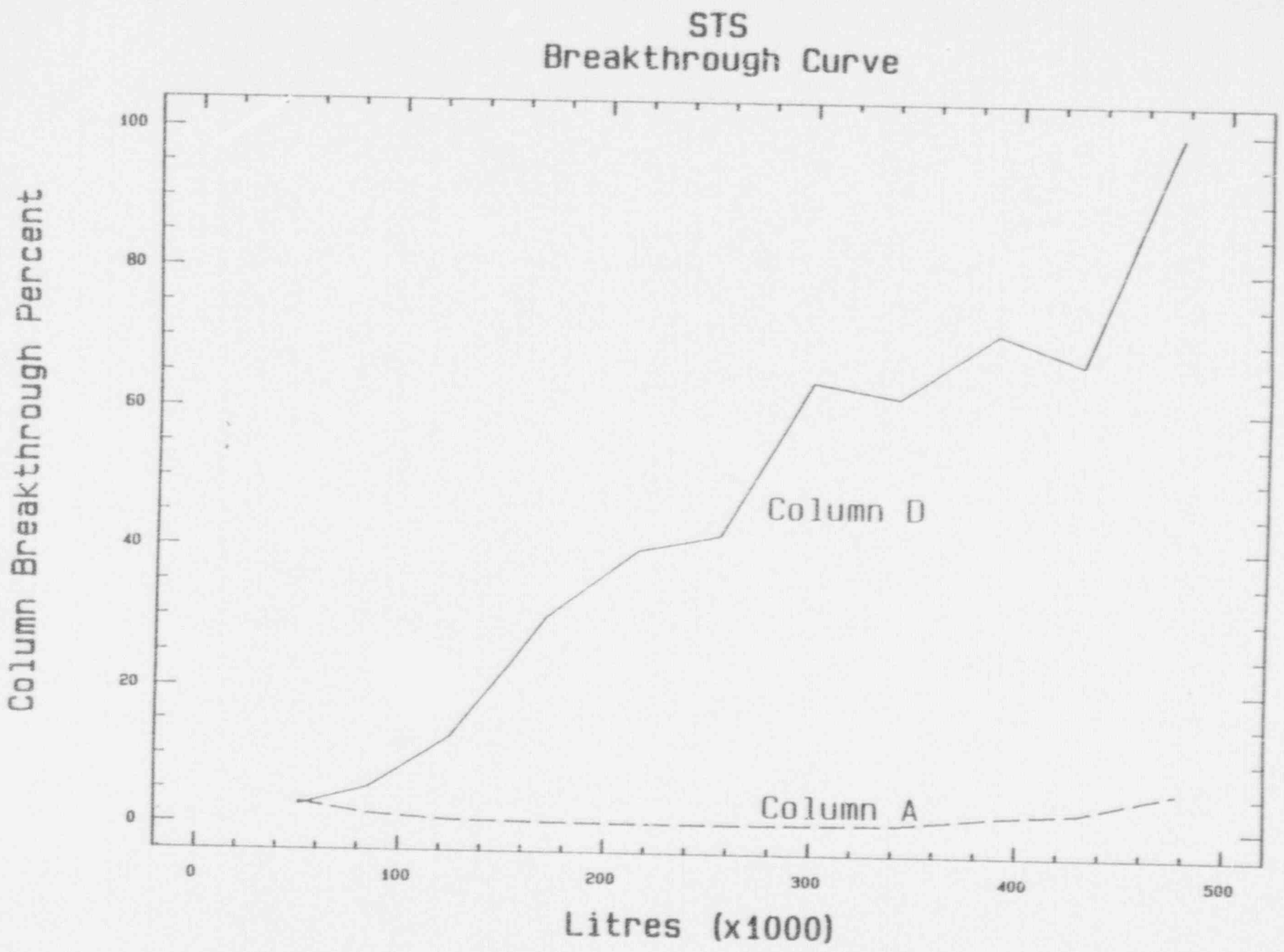
This campaign continued to decrease the level in Tank 8D-2 by processing supernatant. A graph of High Level Waste Tanks 8D-1 and 8D-2 is included for informational purposes, see figure 4. The level in Tank 8D-1 is at or near the level desired. This level is required to limit radiation levels at the M-4 and M-5 risers to desirable levels and maintain coverage of the zeolite pile in 8D-1.

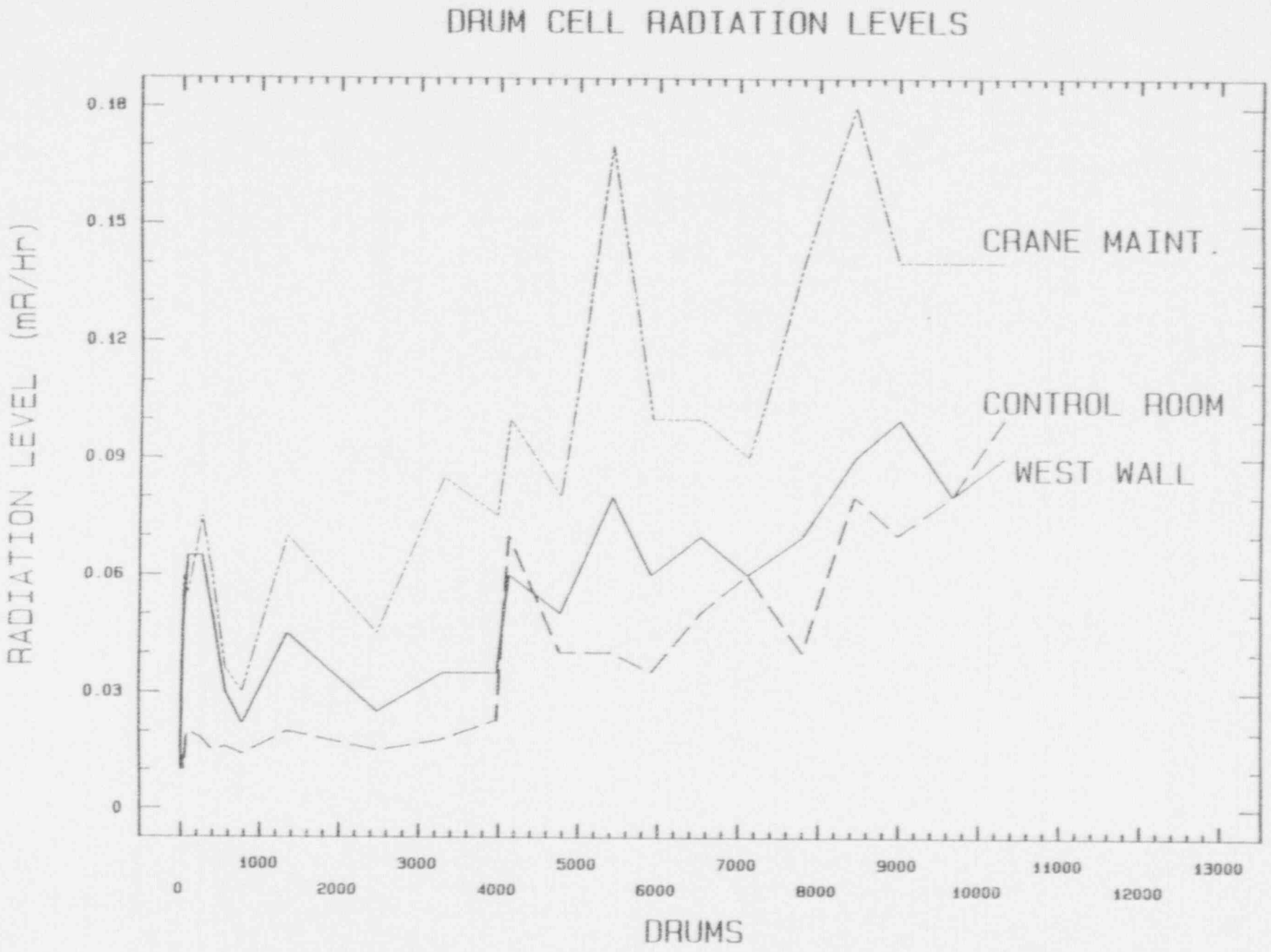
PRODUCT ACCEPTANCE:

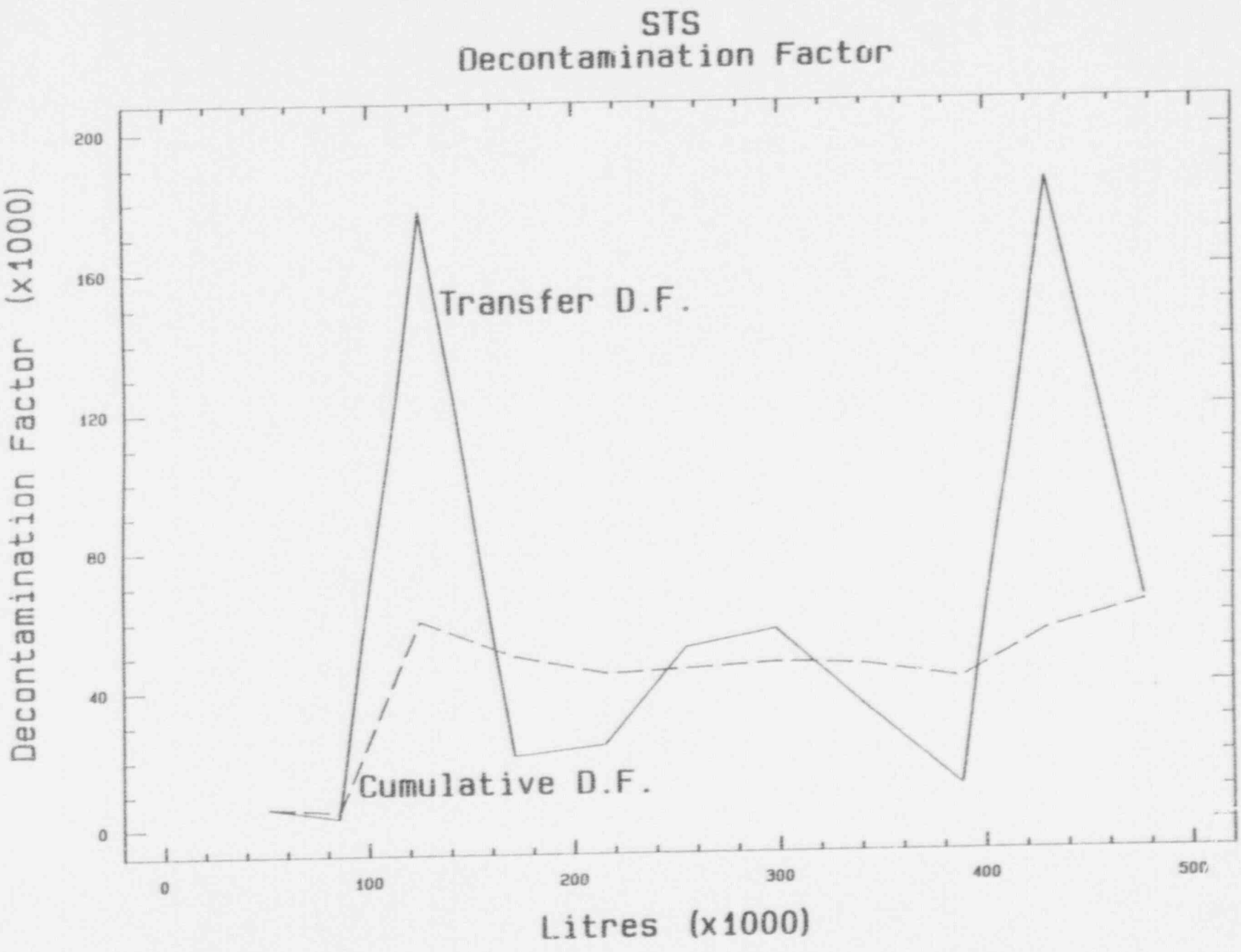
The waste form classification analyses for drums produced is as follows:

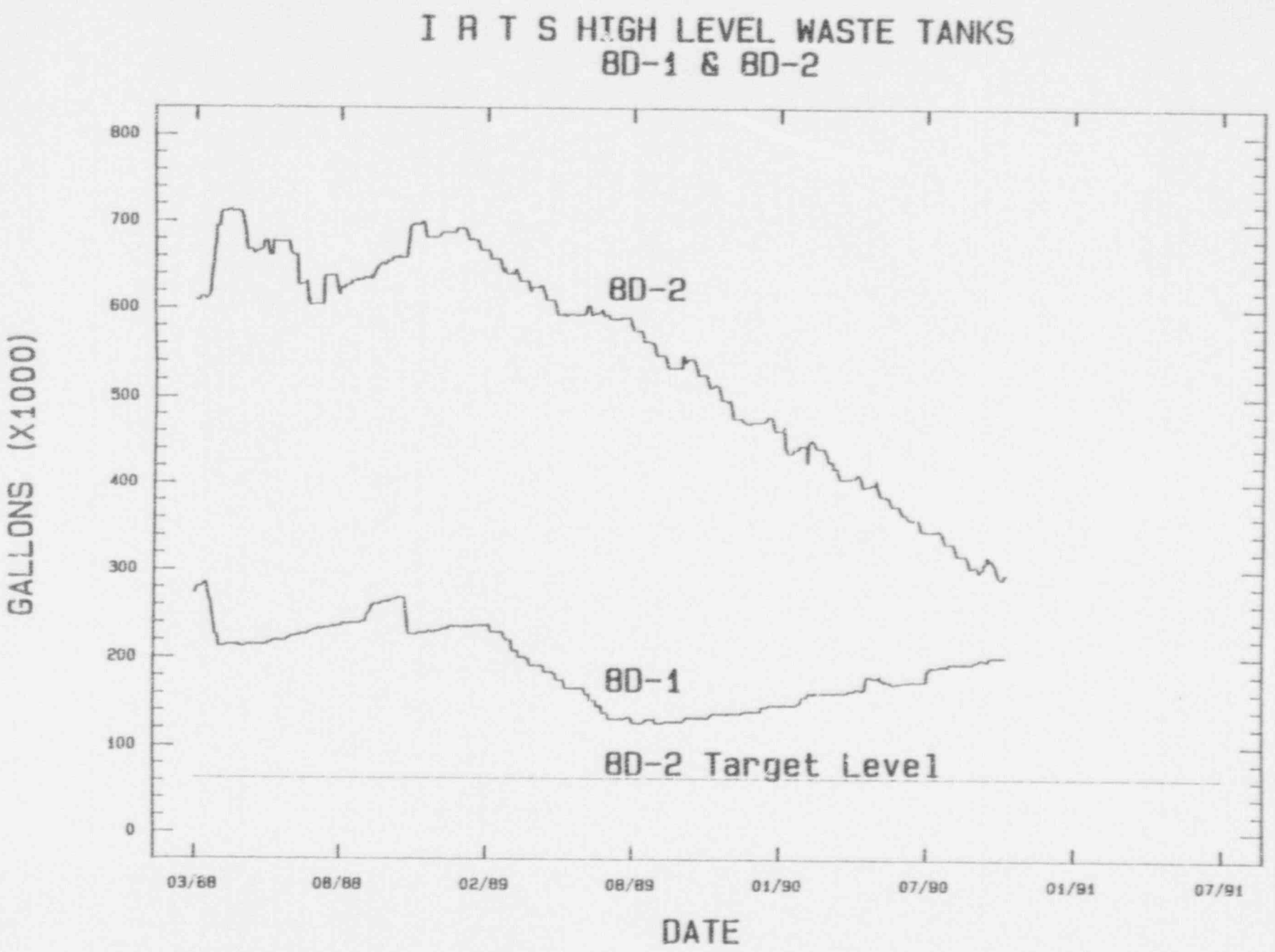
* Campaign 11, Class "C" Low Level Waste; verification complete.
* Campaign 12, Class "C" Low Level Waste; verification complete.
* Campaign 13, Class "C" Low Level Waste; verification complete.
* Campaign 14, Awaiting QA update.
* Campaign 15, Awaiting QA update.
* Campaign 16, Awaiting QA update.
* Campaign 17, Awaiting QA update.
* Campaign 18, 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
Column Breakthrough Percent
100
80
60
40
20
0
Column D
Column A
0
100
200
300
400
500
Litres (x1000)


DRUM CELL RADIATION LEVELS
RADIATION LEVEL (mR/Hr)
0.18
0.15
0.12
0.09
0.06
0.03
0
CRANE MAINT.
CONTROL ROOM
WEST WALL
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
DRUMS


STS
Decontamination Factor
Decontamination Factor (x1000)
200
160
120
80
40
0
Transfer D.F.
Cumulative D.F.
0
100
200
300
400
500
Litres (x1000)


I R T S HIGH LEVEL WASTE TANKS
8D-1 & 8D-2
GALLONS (X1000)
800
700
600
500
400
300
200
100
0
8D-2
8D-1
8D-2 Target Level
03/88
08/88
02/89
08/89
01/90
07/90
01/91
07/91
DATE

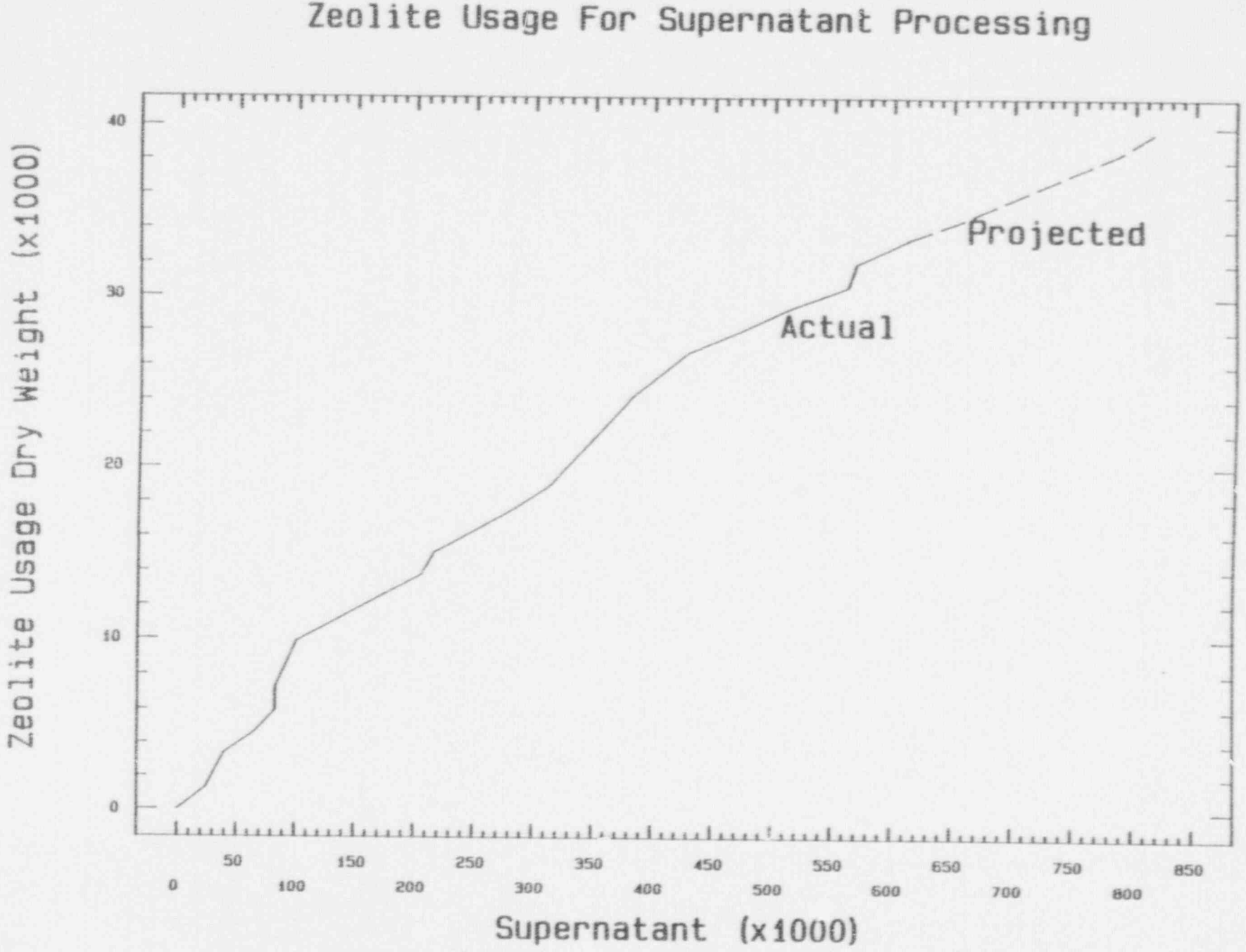

Zeolite Usage For Supernatant Processing
Zeolite Usage Dry Weight (x1000)
40
30
20
10
0
Projected
Actual
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
Supernatant (x1000)

TABLE 1

IRTS CAMPAIGN NO. 20 RUN REPORT

SUMMARY TABLE OF RUN STATISTICS

1.	**TRANSFERS 8D-3 TO 5D-15B**		
	A.Campaign Nos. 1 thru 19	5,704,921 L	1,507,245 gal.
	B.Campaign No. 20	476,973 L	126,003 gal.
	TOTAL TO DATE	**6,181,894 L**	**1,633,248 gal.**
2.	**LWTS PROCESS VOLUMES**		
2.1	Total Feed to Evaporator		
	A.Campaign Nos. 1 thru 19	5,728,604 L	1,513,342 gal.
	B.Campaign No. 20	495,419 L	130,876 gal.
	TOTAL TO DATE	6,224,023 L	1,644,218 gal.
2.2	Total Concentrate		
	A.Campaign Nos. 1 thru 19	1,367,798 L	361,335 gal.
	B.Campaign No. 20	84,765 L	26,440 gal.
	TOTAL TO DATE	1,452,563 L	387,775 gal.
3.	**DRUMS PRODUCED***		
	A.Campaign Nos. 1 thru 19	9,675	
	B.Campaign No. 20	661	
	TOTAL TO DATE	10,336	
4.	**CURIES OF CESIUM 137 REMOVED FROM 8D-2**		
	A.IRTS Campaign Nos. 1 thru 19	4,807 KCi	
	B.IRTS Campaign No. 20	328 KCi	
	TOTAL	5,135 KCi	
5.	**PROCESS COMPLETION**		
	A.Curies Percent Complete:	0.782	
	B.Drums Percent Complete:	0.7951	

* Includes 5 drums removed from pile and core bored (#72847, 72791, 72949, 71004, 72813, 71144, 72835) which are now located in Lag Storage and does not include 1 drum which was left.

TABLE 2

IRTS CAMPAIGN NO. 20 RUN REPORT

COMPARISON OF STATISTICS FROM PREVIOUS CAMPAIGNS TO THIS CAMPAIGN

	CAMPAIGN NO. 18	CAMPAIGN NO. 19	CAMPAIGN NO.20
S T S			
Volume of 8D-2 Supernatant[a] Processed (Gal.)	39,804	49,186	50,705
Total Volume Processed (Includes flush and dilution Water) (Gal.)	112,510	123,048	140,985
Column Breakthrough (%)			
Lead Column	65	97	99.5
2nd Column	1	1.2	5.6
Average System DF	33,642	94,977	62,909
Average Cs-137 in Effluent (uCi/mL)	0.02	.017	.026
L W T S			
Concentrates			
Volume (Gal.)[b]	21,747	27,218	26,440
Average Cs-137 (uCi/mL)	.11	.072	.206
C S S			
Drums Produced	549	675	661
Average Cs-137/Drum (Ci)	.021	.01	.025
Average Drum Contact Dose Rate (mR/hr)	20	12	25

(a) See Table 6 for volume of supernatant recycled.

(b) Tank heels:

	CAMPAIGN 18	CAMPAIGN 19	CAMPAIGN 20
5D-15A1	20 Gallons	20 Gallons	22 Gallons
5D-15A2	2 Gallons	2 Gallons	2 Gallons
70-D-1	50 Gallons	68 Gallons	60 Gallons
TOTAL	72 Gallons	90 Gallons	84 Gallons

TABLE 3
I R T S CAMPAIGN NO. 20 RUN REPORT
DETAILED TABLE OF RUN STATISTICS

COLUMN SEQUENCE: D-A-B-C

1) TRANSFER 8D-3 to 5D-15B	1	2	1	2	3	4	5	6	7	8	9	10	11
A. DATE 1990	9/17	9/18	10/5	10/6	10/8	10/10	10/11	10/12	10/17	10/22	10/23	10/24	10/25
B. STS FLOW RATE (gpm)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	N/A	8.0	8.0	8.0	8.0
C. D-001 SAMPLE NO.	9002592	9002609	9002341	9002793	9002793	9002826	9002854	9002867	N/A	9002966	9002989	9003011	9003062
i. Cs137 (uCi/mL)	454	543	623	381	381	453	404	434	N/A	402	469	392	391
ii. TDS (wt%)	10.55	11.03	11.03	10.75	10.75	9.94	10.43	10.16	N/A	9.70	9.70	9.70	9.46
iii.Density (gr/mL)	1.074	1.078	1.078	1.076	1.076	1.069	1.073	1.071	N/A	1.07	1.07	1.07	1.07
D. CESIUM-137 ACTIVITY (COLUMN EFFLUENTS)													
i. Lead Column D (uCi/mL)	12.00	29.00	79.50	141.00	151.00	190.00	259.0	268.0	N/A	286.00	313.0	390.0	588.0
ii. 2nd Colum. A (uCi/mL)	0.35	0.39	0.40	0.41	0.36	0.45	0.94	1.25	N/A	5.08	7.80	21.80	7.00
E. COLUMN BREAKTHROUGH (%)													
i. Lead Column D	2.6	5.3	12.8	30.0	39.6	41.9	64.1	61.8	N/A	71.1	66.73	99.5	N/A
ii. 2nd Column A	2.9	1.3	0.5	0.3	0.2	0.2	0.4	0.5	N/A	1.8	2.5	5.6	N/A
F. 8D-3 SAMPLE NO.	9002597	9002614	9002346	9002783	9002803	9002828	9002848	9002871	9002893	9002954	9002996	9003053	9003081
i. Cs-137 (uCi/mL)	0.0594	0.1700	0.0035	0.0212	0.0153	0.0088	0.0067	0.0106	0.0106	0.0159	0.0020	0.0041	0.0062
ii. TDS (wt %)	8.26	10.31	11.05	11.03	10.31	9.94	9.82	9.58	8.62	4.40	7.77	9.61	9.58
iii.Density (gr/mL)	1.055	1.072	1.078	1.078	1.072	1.069	1.068	1.066	1.058	1.023	1.051	1.066	1.066
G. STS SYSTEM DF													
i. Transfer DF	5878	2969	177310	20696	23794	51595	56592	38426	N/A	10996	185025	94865	64235
ii. Cumulative DF	5878	4714	59774	49272	44041	45220	46880	45837	45837	41556	55397	59296	62909
H. 5D-15B SAMPLE NO.	9002608	9002630	9002733	9002789	9002814	9002835	9002864	9002883	9002907	9002971	9002980	9003023	9003067
i. Cs-137 (uCi/mL)	0.0777	0.1860	0.0633	0.0199	0.0132	0.0010	0.0081	0.0132	0.0110	0.0780	0.0049	0.0032	0.0043
ii. TDS (wt %)	8.50	10.19	8.50	8.01	9.46	9.58	9.86	9.94	8.62	12.36	7.656	8.38	9.22
iii.Density (gr/mL)	1.057	1.071	1.057	1.053	1.065	1.066	1.068	1.069	1.058	1.089	1.050	1.056	1.063
I. Volume Received (Litres) in 5D-15B	51097	34[illegible]	39906	45974	44195	39823	43582	41998	29824	47723	41470	47116	26831
J. Cumulative Volume	51097	85186	125092	171066	215261	255084	298666	340664	340664	388387	429857	476973	476973

TABLE 4
I R T S CAMPAIGN NO. 20 RUN REPORT
DRUM TESTING RESULTS

CONCENTRATES BATCH	79	80	81	82	83
LWTS TANK	5D-15A1	5D-15A2	5D-15A1	5D-15A2	5D-15A1
LAB ANALYSIS NO.	9002651	9002808	9002882	9002912	9003089
TOTAL SOLIDS %	37.69	37.21	38.66	40.1	40.71
Cs-137 CONCENTRATION (uCi/mL)	5.17E-01	3.64E-01	5.98E-02	5.89E-02	2.84E-02
POUNDS CEMENT +$CaNo_3$	46,968	47,424	87,552	38,760	80,712
NUMBER OF DRUMS	103	104	192	85	177
TOTAL GALLONS	4,120	4,160	7,680	3,400	7,080
CURIES PER DRUM (Average)	0.078	0.055	0.009	0.009	0.004
RADIATION DOSE (mR/hr) Per Drum	70	55	10	10	6
PRESOLIDIFICATION RESULTS >700 PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI
IN-CELL TEST RESULTS	80294	80364	81127	80936	81793
DRUM NO./PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI	>700 PSI

Total Cement	301,416	LBS.
Total Number of Drums	661	
Total Volume Solidified	26,440	Gallons
Total Curies Solidified	17.05	Ci

TABLE 5

I R T S CAMPAIGN NO. 20 RUN REPORT

DRUM PRODUCTION RATES

	DATE	DAILY AVERAGE	WEEKLY TOTAL	CUMULATIVE TOTAL
Campaign #1	06/01 to 06/17	33		401
Campaign #2	06/27 to 07/08	45		783
Campaign #3	07/18 to 08/05	35		1,347
Campaign #4	08/22 to 09/26	30		1,681
Campaign #6	12/05 to 12/13	45		2,009
Campaign #7	01/23 to 02/23	50		2,607
Campaign #8	03/06 to 04/13	60		3,303
Campaign #9	04/24 to 05/26	58		3,988
Campaign #10	06/19 to 06/22	37		4,136
Campaign #11	07/26 to 08/24	58		4,778
Campaign #12	09/05 to 10/13	50		5,421
Campaign #13	10/23 to 11/10	62		5,921
Campaign #14	11/20 to 12/15	67		6,532
Campaign #15	01/22 to 02/14	59		7,124
Campaign #16	03/12 to 04/16	42		7,808
Campaign #17	05/08 to 06/15	60		8,451
Campaign #18	06/28 to 07/25	45		9,000
Campaign #19	08/09 to 09/13	38		9,675
Campaign #20	09/24	39		
	09/25	58		
	09/26	6	103	9,778
	10/10	42		
	10/11	17		
	10/12	45	104	9,882
	10/15	56		
	10/16	47		
	10/17	53		
	10/18	36	192	10,074
	10/19	85	85	10,159
	10/29			
	10/30	47		
	10/31	44		
	11/01	51	177	10,336

TABLE 6
IRTS CAMPAIGN NO. 20 RUN REPORT
STS PROCESS HISTORY

CAMPAIGN	DATE	NOMINAL DILUTION RATIO	COLUMN SEQUENCE	COLUMN(S) DUMPED	SUPERNATANT PROCESSED: Cs-137 CONCENTRATION IN 8D-2 (uCi/mL)	SUPERNATANT PROCESSED: AND TRANSFERRED TO LWTS (Gallons)	SUPERNATANT PROCESSED: Cs-137 REMOVED KCi	SUPERNATANT PROCESSED: AND RECYCLED TO 8D-2 (Gallons)	SUPERNATANT PROCESSED: Cs-137 REMOVED (KCi)	TOTAL Cs-137 REMOVED (KCi)	Cs-137 INVENTORY REMAINING IN 8D-2(a)(b) (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	B	1980	35,342	265	0	0	265	5,544
8	2+3/89	2:1	C-D-A	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	5/89	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	2+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	1,458	7	315	2,764
18	7/3/90	3.0:1	B-C-D-A	B	1790	39,804	270	0	0	270	2,494
19	9/13/90	3.0:1	C-D-A-B	C	1090	49,184	203	0	0	203	2,291
20	11/02/90	3.0:1	D-A-B-C	D,C	1090	50,705	209	32,855	119	328	1,963
						611,996	4,297	150,094	845	5,135	

(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 processe

(b) Includes approximately .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

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

TABLE 7
IRIS CAMPAIGN NO. 20 RUN RESULT
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 89-055	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	
6/29/90	18	79835	CM90077	N/A	
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	78994			
	14	77212			
	14	77228			
	14	77222			
8/27/90	19	80326	CM90106		
	19	80329			
	19	80198			
	19	80199			
	19	80200			
	19	80401			
	19	80404			
	19	80403			
	19	80400			
	19	80405			
	19	80398			
	19	80399			
	19	80203			

TABLE 7
IRIS CAMPAIGN NO. 20 RUN RESULT
SUMMARY OF SUSPECT DRUMS

(CONTINUATION)

DATE HOLLICED	CAMPAIGN NUMBER	DRUM SERIAL NUMBER	CRITIQUE NUMBER	NON-CONFORMANCE REPORT	DESCRIPTION OF SUSPECT CONDITION
	19				
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	