Attachment 1

REVISED STUCK OPEN

RELIEF VALVE BASE CASE

AUGUST, 1985

Gulf States Utilities
River Bend Station - Unit 1

INTRODUCTION

Two base case analyses performed to determine the River Bend Station (RBS) containment pressure and temperature response to hydrogen release and subsequent deflagration burning have been perviously submitted to the NRC (Ref. 1). These base cases were the stuck open relief valve case (SORV) and the drywell break case (DWB). A revised DWB base case analysis to evaluate the effect of reducing the steam flow, revising the drywell/ADS sparger flow split, modifying the radiant heat transfer beam length, and reducing the drywell bypass leakage has also been submitted (Ref. 2).

As requested by the NRC staff during the August 12, 1985, meeting with Gulf States Utilities (GSU), a revised SORV base case analysis to quantify the number of hydrogen burns which may occur in the intermediate containment volume has been performed. This revised analysis used two intermediate volumes, reduced hydrogen burn criteria for areas outside the wetwell, and revised hydrogen release rates. Except as noted herein all other CLASIX-3 input was unchanged.

HYDROGEN/STEAM RELEASE

The hydrogen and steam releases used in the revised SORV base case were the same as the original SORV base except for reduction of the non-mechanistic tail to reflect the RBS core size. As in the previous SORV base case, the initial blowdown was obtained from a River Bend

SORV base case, the initial blowdown was obtained from a River Bend Station specific analysis using the MAAP computer code. Blowdown without core makeup was continued in this analysis for 2000 sec. at which time the core was approximately 3/4 uncovered. At this point, the BWRCHUC, which employs a mechanistic core model, was used to predict the hydrogen and steam releases with a 5000 gpm reflood timed to produce a 30% clad melt. This reflood occurred at 3400 seconds and the BWRCHUC analysis was continued until 3645 seconds. During this boildown and reflood phase of the analysis, 436 lbm of hydrogen had been produced. Although the hydrogen release rate predicted by the BWRCHUC are above the threshold for diffusive type burning, we have conservatively assumed that these releases only produce deflagrations. At 3645 seconds a non-mechanistic model was used to obtain the remaining 60% zirconium-water reaction. This model developed by HCOG, uses an energy balance between the heat removal capability for a highly blocked debris bed and the core decay power, the heat of oxidation and the stored heat in the core material. The non-mechanistic release rates were continued until a hydrogen release equivalent to 75% of the active core zirconium was reached as required by 10CFR50.44. The HCOG non-mechanistic release rate of 0.1 lbm/sec was based on the Grand Gulf core size. For this analysis, this release rate was reduced by a factor of 0.78 based on the number of fuel rods in the RBS core relative to the Grand Gulf core. During this portion of the transient, the hydrogen release rate of 0.078 lbm/sec. produced a total of 1792.2 lbm of hydrogen. The total hydrogen production used in this analysis was 2228 lbm which is actually equivalent to 81.3% of the active core zirconium. The hydrogen release time history is given in Table 1.

The mechanistically calculated steam releases used for this analysis were the same as the original SORV base case. For the non-mechanistic portion of the transient, the steam flow was assumed to be equivalent to 36.3 Mw which is consistent with the steam release rates used in the revised DWB base case analysis (Ref. 2). The steam temperature used in this analysis was the same as in previous analysis and corresponds to the prevailing RPV pressure. The steam release rates are given in Table 2.

CONTAINMENT MODEL

The previous SORV base case analysis used a four node containment model (drywell, wetwell, intermediate volume and upper containment). The revised analysis uses a similar model except that the intermediate volume has been split into a lower intermediate volume and an upper intermediate volume. A schematic diagram of the five volume model used in this analysis is shown in Figure 1. The arrows in Figure 1 represent flow paths between compartments with the arrowhead pointing in the direction of allowed flow. As in the previous SORV analysis, the wetwell volume is defined to be the volume between the suppression pool surface and the HCU floor (El. 114 ft). The lower intermediate volume is defined to be the volume between the HCU floor and the next floor (El. 141 ft.). The upper intermediate volume is defined to be the volume between the 141 foot floor and the refueling floor (El. 186 ft 3 in.). The upper containment is defined to be the volume above the refueling floor.

OTHER INPUT

The compartment initial conditions are given in Table 3. The flow path parameters for the revised SORV base case are given in Table 4. Passive heat sink data for the lower intermediate volume and the upper intermediate volume are given in Table 5 and Table 6 respectively. As in the revised DWB base case, the beam length used in radiant heat transfer have been revised based on the formulation given in reference 3. The revised beam length are given in Table 7.

The hydrogen ignition criteria used for the wetwell was 8 v/o hydrogen with a combustion completeness of 85%. To allow propagation of wetwell burns into the lower intermediate volume, the upward flame propagation criteria was set at 6 v/o hydrogen. The hydrogen ignition criteria for all volumes above the wetwell was set at a more realistic value of 6 v/o hydrogen to allow hydrogen burns to occur in these volumes. The combustion completeness for these nodes was reduced from 85% to 65% to correspond to the more realistic burn initiation criteria. The minimum oxygen volume fraction required for ignition and the volume fraction required to support combustion were 0.05 and 0.0, respectively which is the same as previous analysis. Heat removal due to operation of the containment unit coolers is conservatively assumed to be from the upper intermediate volume only.

RESULTS & CONCLUSIONS

A summary of the results of the two SORV analyses is given in Table 8. Plots of the revised SORV base case temperatures and pressures for each containment volume are given in Figures 2 through 11. Plots of the volume fractions of oxygen, hydrogen, nitrogen and steam are shown in Figures 12 through 31 for the revised SORV case.

During the period of hydrogen release, 39 burns occurred in the wetwell volume for the revised base case compared to 42 burns in the original analysis. In addition, there were 29 burns in the lower intermediate volume compared to no burns in the original analysis. The first four burns were initiated in the wetwell and propagated into the lower intermediate volume. The existence of burns in the lower intermediate volume is due to the lower upward flame propagation and hydrogen ignition criterion used for this volume. Another effect of burns initiating in the lower intermediate volume was to force oxygen into the wetwell to support wetwell combustion. The total hydrogen burned in the revised analysis increased by 270 lbm which may also be attributed to a lower hydrogen ignition criteria. The peak temperatures in the drywell, wetwell and lower intermediate volume increased for the revised analysis while the upper intermediate volume and upper containment temperatures decreased. All pressures in the revised analysis increased slightly. Since this re-analysis was performed to assess equipment survivability, a burn was not forced after the end of hydrogen release due to the hydrogen concentration in each volume being below the ignition criteria. Inclusion of condensation, as suggested by the NRC staff, was not included in this analysis. Consideration of condensation would further reduce the severity of the deflagration thermal environment.

This analysis provides a conservative estimate of the containment pressure and temperature response to deflagration type hydrogen burning. The Hydrogen Control Owners Group Quarter Scale testing performed to date (reported in Reference 4) confirms the conservative nature of the CLASIX-3 computer code. In all testing performed to date the only deflagration burns observed have been the initial light-off burn for each test. In no instance have serial deflagration burns, as would be predicted by CLASIX-3, been observed. However, in two tests, (S.08 and S.10), some marginal deflagration was observed. This type of combustion was characterized by weak flames burning through marginally combustible gas mixtures and was effective in maintaining the global hydrogen concentration below 5%. These tests indicate that the serial global deflagrations at high hydrogen concentrations predicted by CLASIX-3 do not occur. The extent of the conservative nature of CLASIX-3 will be examined as part of task 12 of the HCOG Program Plan.

REFERENCES

1. RBG-21,218 dated June 7, 1985 from GSU (J.E. Booker) to NRC (H.R. Denton).

2. RBG-21,454 dated July 5, 1985 from GSU (J.E. Booker) to NRC (H.R. Denton).

3. Perry, H. H. and Chilton, C. H., Chemical Engineer's Handbook, 5th Edition, 1973 p. 10-56.

4. HGN-053 dated August 1, 1985 from HCOG (S.H. Hobbs) to NRC (Robert Bernero).

TABLE 1

River Bend CLASIX-3 Input

SORV Base Case

Hydrogen Release to the Suppression Pool

TIME (SECONDS)	FLOW RATE (LB/SEC)	TEMPERATURE (F)
2000.	0.	249.
2460.	0.022	269.
2560.	0.0434	277.
2675.	0.09	287.
2780.	0.177	294.
2900.	0.3313	303.
2985.	0.374	310.
3120.	0.3924	322.
3400.	0.357	346.
3405.	5.125	352.
3415.	2.9	383.
3420.	2.54	403.
3430.	2.08	449.
3440.	2.266	501.
3445.	2.225	529.
3495.	0.225	751.
3510.	0.13	781.
3520.	0.05	792.
3555.	0.0	797.
3644.999	0.0	250.34
3645.	0.078	250.34
26624.5	0.078	250.34
26624.501	0.0	250.34

TABLE 2

River Bend CLASIX-3 Input

SORV Base Case

Steam Release to Suppression Pool

Time (seconds)	Stean Release Rate (lbm/sec)	Energy Release Rate (Btu/sec)
0.	257.9	307200.
8.51	291.6	347800.
78.1	246.0	294600.
146.54	214.7	258800.
230.4	194.7	235000.
241.	1476.	1779000.
245.8	1370.	1652000.
266.	947.3	1149000.
273.1	865.7	1053000.
306.3	578.	702000.
361.26	356.8	434000.
367.22	342.2	416100.
540.17	145.	177800.
630.61	101.7	131200.
720.02	76.32	96200.
899.7	39.98	49720.
1085.63	4.26	2851.
2000.	.2324	233.27
2000.001	9.25	10768.4
3400.	0.004	4.85
3410.	172.2	209069.
3420.	333.	412720.
3425.	319.8	399670.
3430.	314.8	397064.
3435.	412.8	525626.
3460.	424.4	526040.
3470.	414.8	565538.
3475.	421.2	578667.
3485.	411.9	573900.
3495.	413.4	582109.
3520.	402.6	575114.
3540.	345.8	495186.
3555.	291.9	417709.
3565.	105.6	151061.
3625.	82.9	118257.
3645.	100.8	143690.
3645.001	36.3	42257.
26624.5	36.3	42257.
26624.501	0.0	0.0

TABLE 3

River Bend CLASIX-3 Input

Compartment Initial Conditions

	Drywell	Wetwell	Lower Intermediate	Upper Intermediate	Upper Containment
Volume (ft^3)	236,196	153,792	147,050	220,575	670,181
Temperature (^oF)	135	90	90	90	90
O_2 Pressure (psia)	2.98	3.06	3.06	3.06	3.06
N_2 Pressure (psia)	11.22	11.50	11.50	11.50	11.50
H_2O Pressure (psia)	.494	.140	.140	.140	.140

TABLE 4

River Bend CLASIX-3 Input

Flow Path Parameters

	WW-LIV	LIV-UIV	UIV-CT
Maximum Flow Area (ft^2)	2481	1582	689
Flow Loss Coefficient	5.0	5.0	5.0
Burn Propagation Delay Time (sec)*	1.0	1.0	6.02

*Base on flame speed of 6 ft/sec.

Wetwell volume, lower intermediate volume, upper intermediate volume and upper containment are abbreviated as WW, LIV, UIV, and CT, respectively.

TABLE 5

River Bend CLASIX-3 Input

Lower Intermediate Volume Passive Heat Sinks

Description	Surface Area (ft^2)	Layer Number	Layer Material	Layer Thickness (ft)
Freestanding Steel Containment	10,637	1	Coating	0.001333
		2	Steel	0.125
Drywell Wall	2,981	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	1.0
		4	Concrete	1.0
Thin Steel	76,092	1	Coating	0.001333
		2	Steel	0.0166
Concrete 1 ft Thick	1,594	1	Coating	0.001333
		2	Concrete	0.5
Concrete 1.5 ft	537	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	0.25
Concrete 2 ft Thick	7,758	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	0.5
Concrete 2 ft Thick	7,370	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	1.0

TABLE 6

River Bend CLASIX-3 Input

Upper Intermediate Volume Passive Heat Sinks

Description	Surface Area (ft^2)	Layer Number	Layer Material	Layer Thickness (ft)
Freestanding Steel Containment	15,956	1	Coating	0.001333
		2	Steel	0.125
Drywell Wall	4,472	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	1.0
		4	Concrete	1.0
Thin Steel	114,139	1	Coating	0.001333
		2	Steel	0.0166
Concrete 1 ft Thick	2,391	1	Coating	0.001333
		2	Concrete	0.5
Concrete 1.5 ft Thick	806	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	0.25
Concrete 2 ft Thick	11,638	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	0.5
Concrete 2 ft Thick	11,055	1	Coating	0.001333
		2	Concrete	0.5
		3	Concrete	1.0

TABLE 7

River Bend CLASIX-3 Input

Compartment Dependent Passive Heat Sink Parameters

Parameter	Compartment	Value
Temperature	Drywell	135°F
	Wetwell	90°F
	Lower Intermediate	90°F
	Upper Intermediate	90°F
	Upper Containment	90°F
Radiant Heat Transfer Beam Length	Drywell	11.5 ft
	Wetwell	21.6 ft
	Lower Intermediate	4.8 ft
	Upper Intermediate	4.8 ft
	Upper Containment	27.4 ft

Beam Length = 3.5 V/A

Where V = Compartment Volume
A = Area of Compartment

TABLE 8

SUMMARY OF CLASIX-3 RESULTS

		Original SORV		Revised SORV
Number Burns	DW*	0 (0)	DW	0
	WW	42 (0)	WW	39
	IV	0 (1)	LIV	29
			UIV	0
	CT	0 (1)	CT	0
Total Burned (lb)	DW	0 (0)	DW	0
	WW	1590 (1627)	WW	1311
	IV	0 (127)	LIV	557
			UIV	0
	CT	0 (232)	CT	0
H2 Remaining (lb)	DW	36 (38)	DW	30.3
	WW	59 (17)	WW	44.7
	IV	130 (24)	LIV	33.7
			UIV	60.9
	CT	239 (6)	CT	190.6
Peak Temp. (F)	DW	231 (283)	DW	243
	WW	2135 (1320)	WW	2320
	IV	422 (1084)	LIV	997
			UIV	330
	CT	201 (1154)	CT	139
Peak Press. (psig)	DW	3.3 (12.3)	DW	3.7
	WW	7.3 (24.3)	WW	11.3
	IV	6.3 (24.3)	LIV	8.4
			UIV	7.1
	CT	6.3 (24.3)	CT	7.0

*Drywell, wetwell, intermediate volume, lower intermediate volume, upper intermediate volume and upper containment are abbreviated as DW, WW, IV, LIV, UIV, and CT, respectively.

( ) - Values due to extension of transient past end of hydrogen release. These values result from a hydrogen burn which was forced to occur in multiple containment volumes simultaneously.

FIGURE 1

RIVER BEND STATION
REVISED SORV
CLASIX-3 MODEL

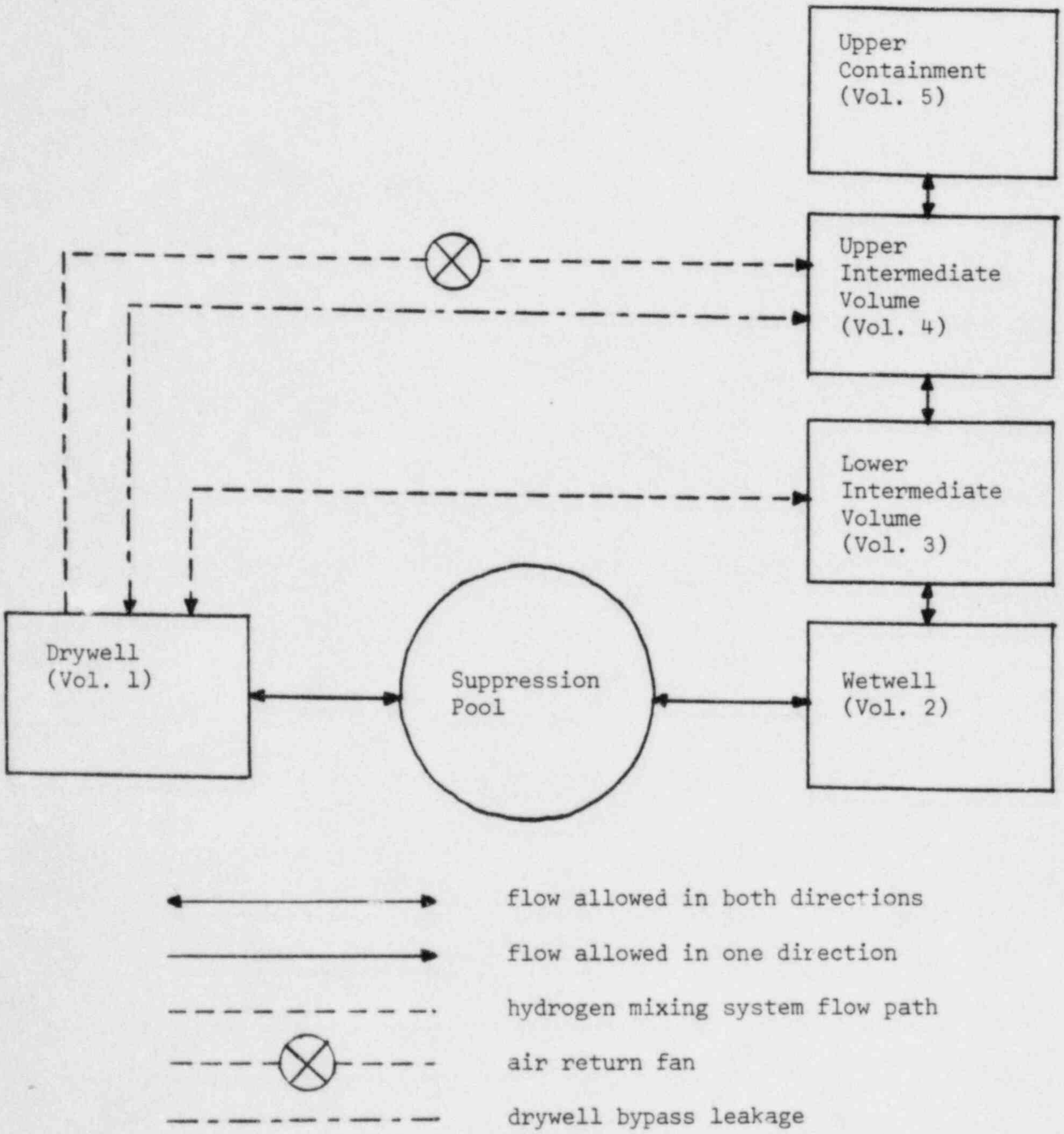


FIGURE 2

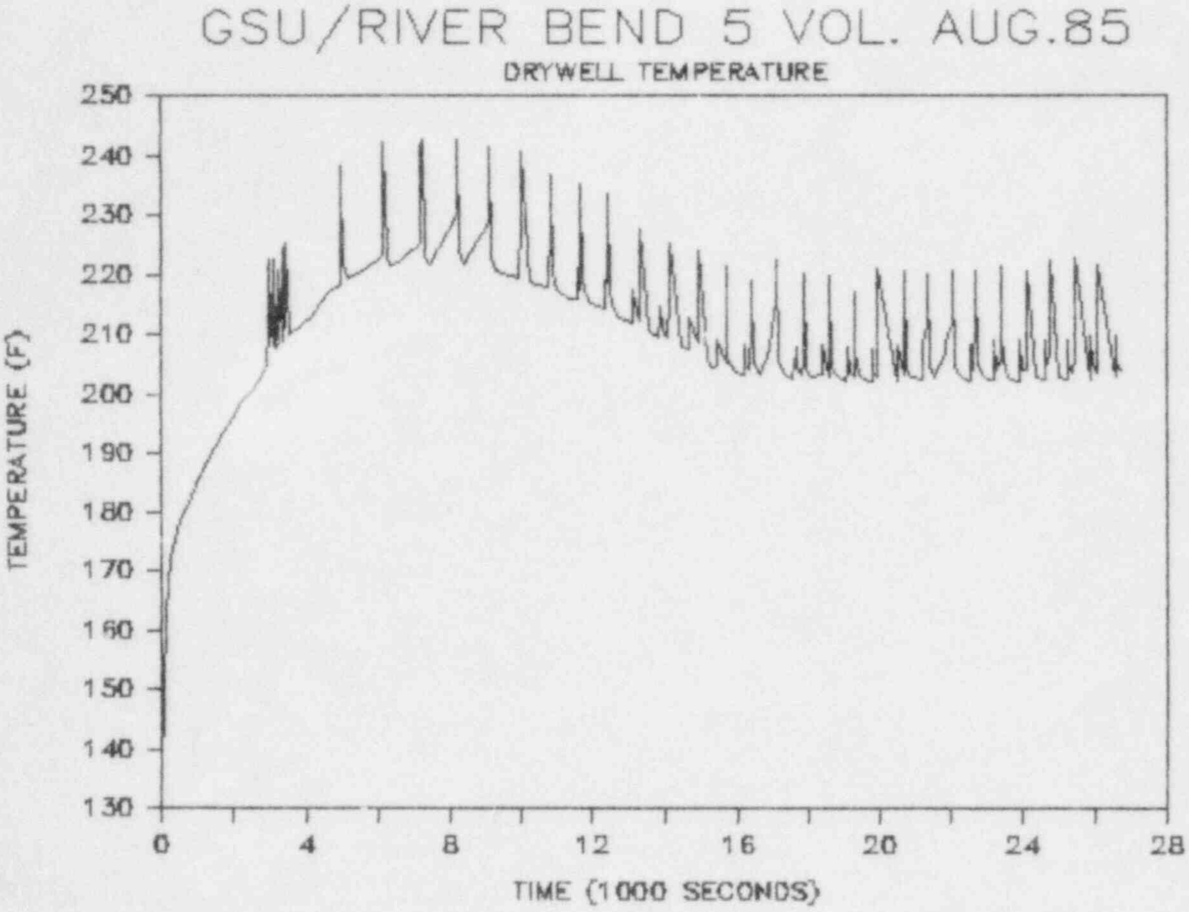

GSU/RIVER BEND 5 VOL. AUG.85
DRYWELL TEMPERATURE
TEMPERATURE (F)
250
240
230
220
210
200
190
180
170
160
150
140
130
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 3

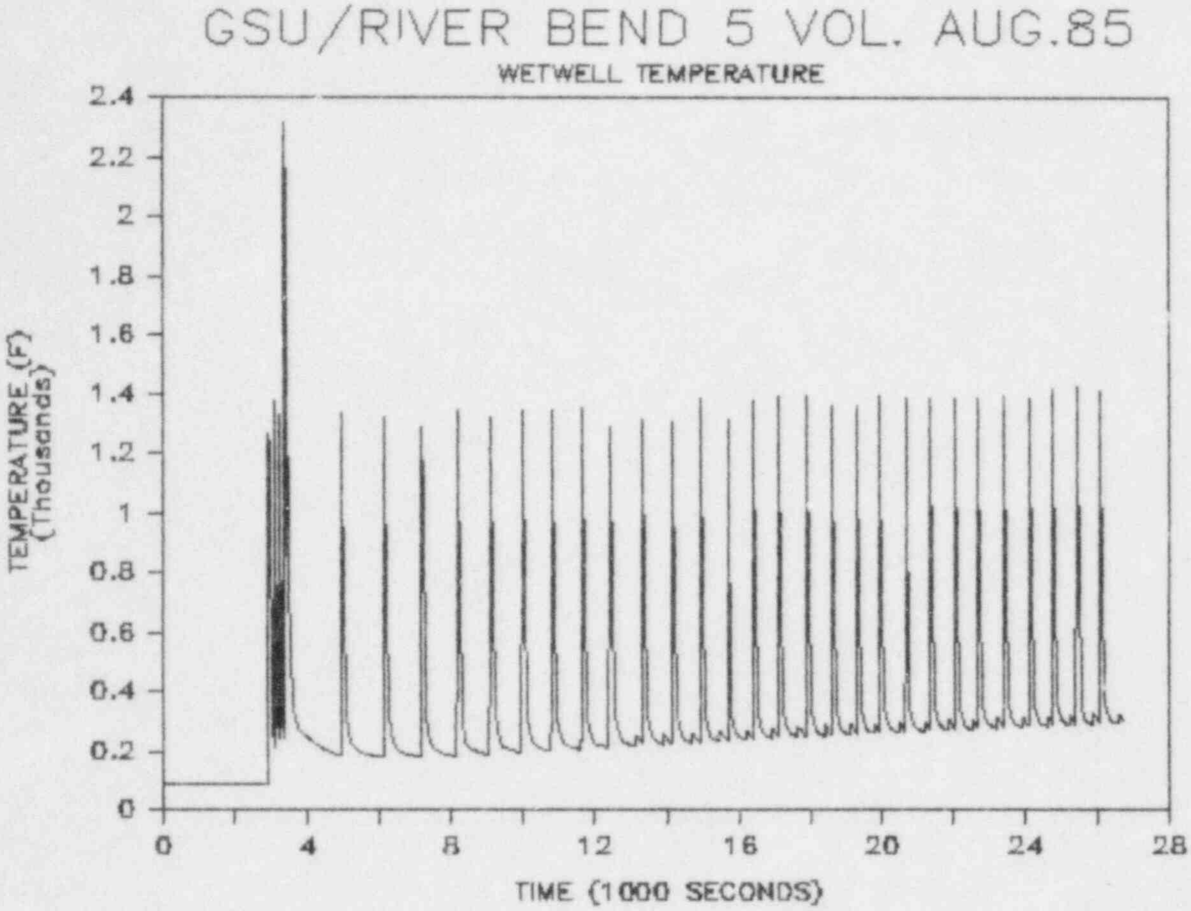

GSU/RIVER BEND 5 VOL. AUG.85
WETWELL TEMPERATURE
TEMPERATURE (F)
(Thousands)
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 4

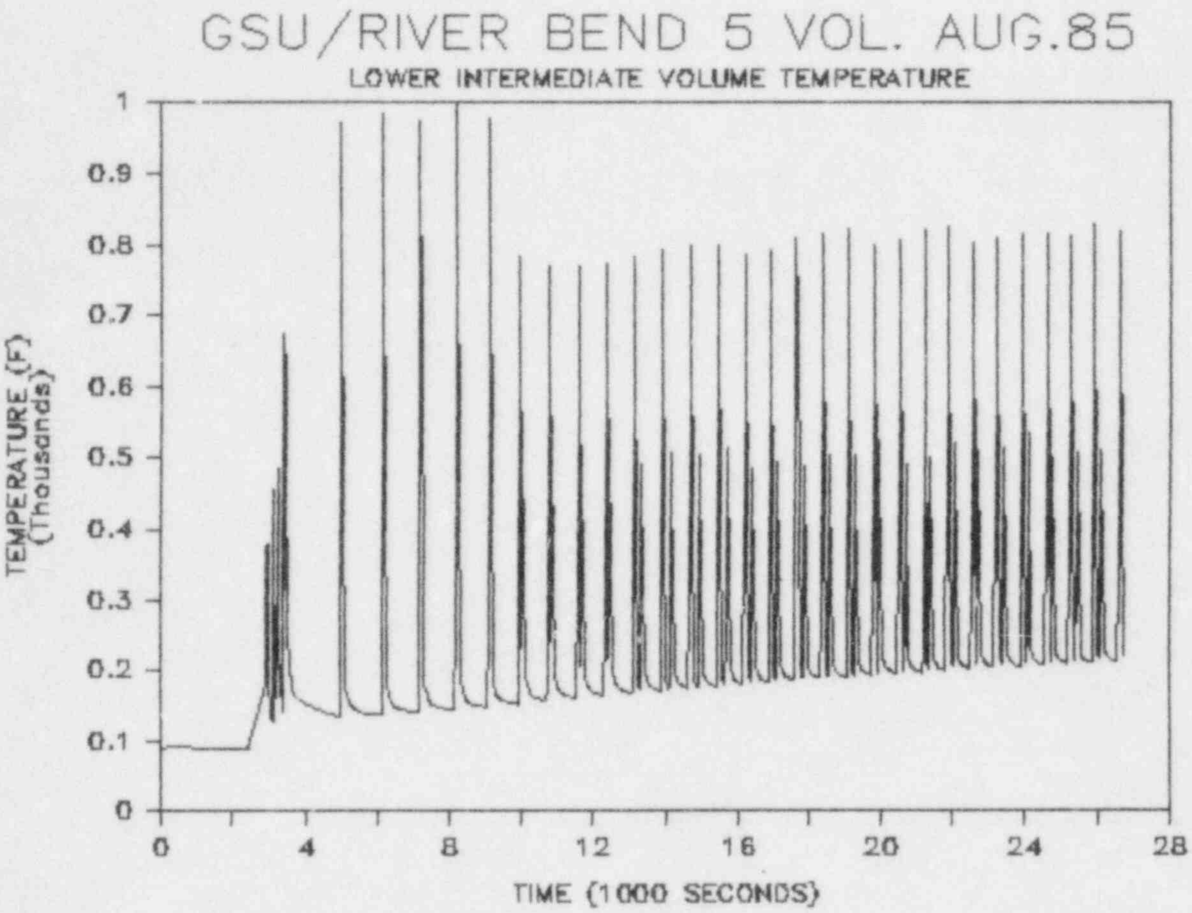
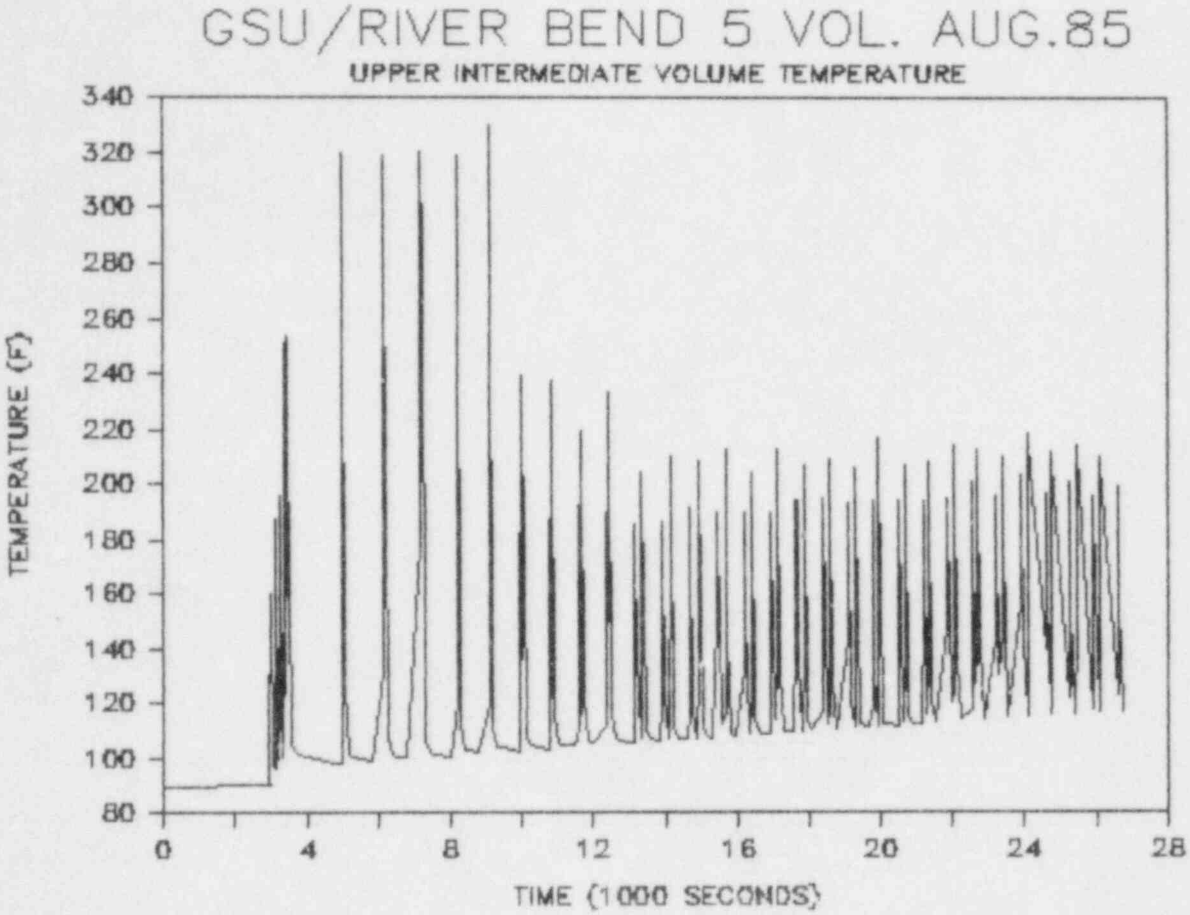
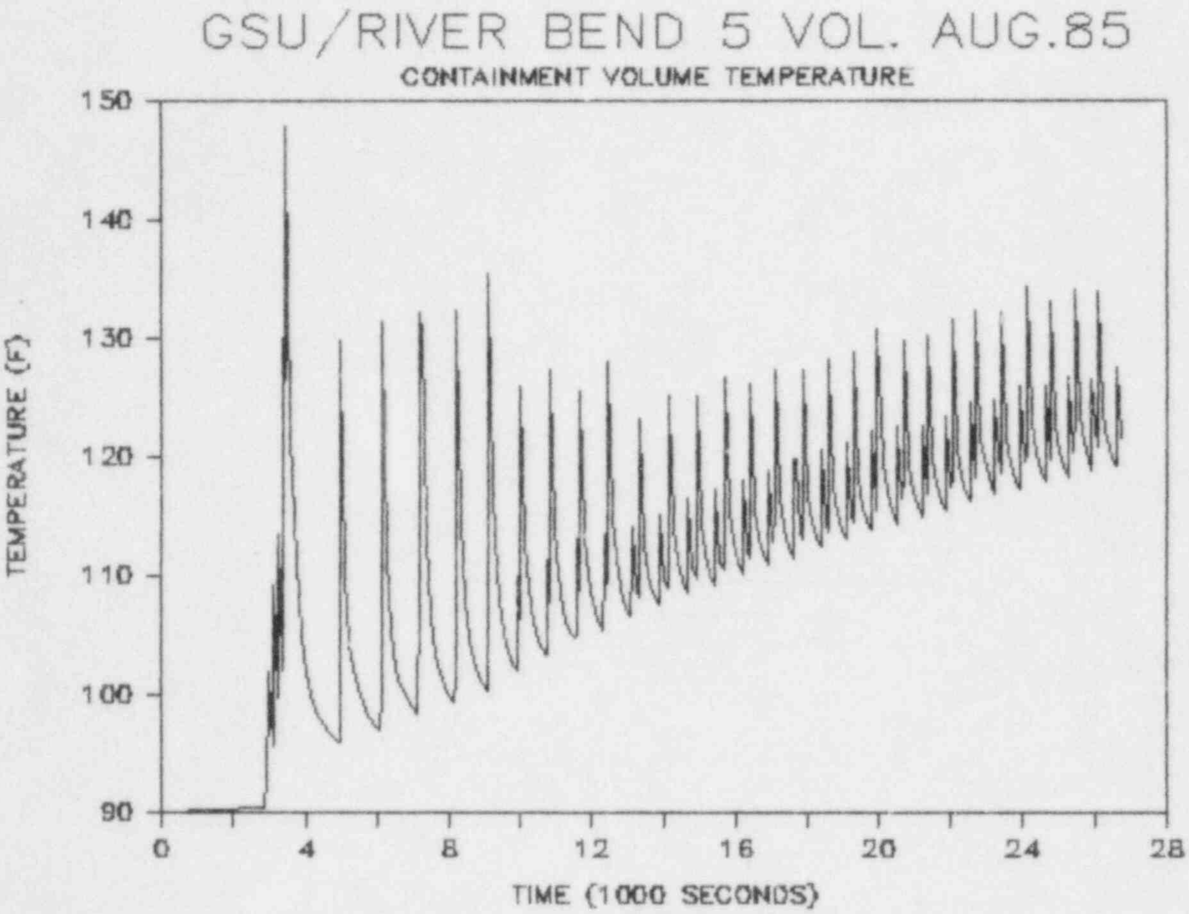

GSU/RIVER BEND 5 VOL. AUG.85
LOWER INTERMEDIATE VOLUME TEMPERATURE
TEMPERATURE (F)
(Thousands)
TIME (1000 SECONDS)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
4
8
12
16
20
24
28

FIGURE 5



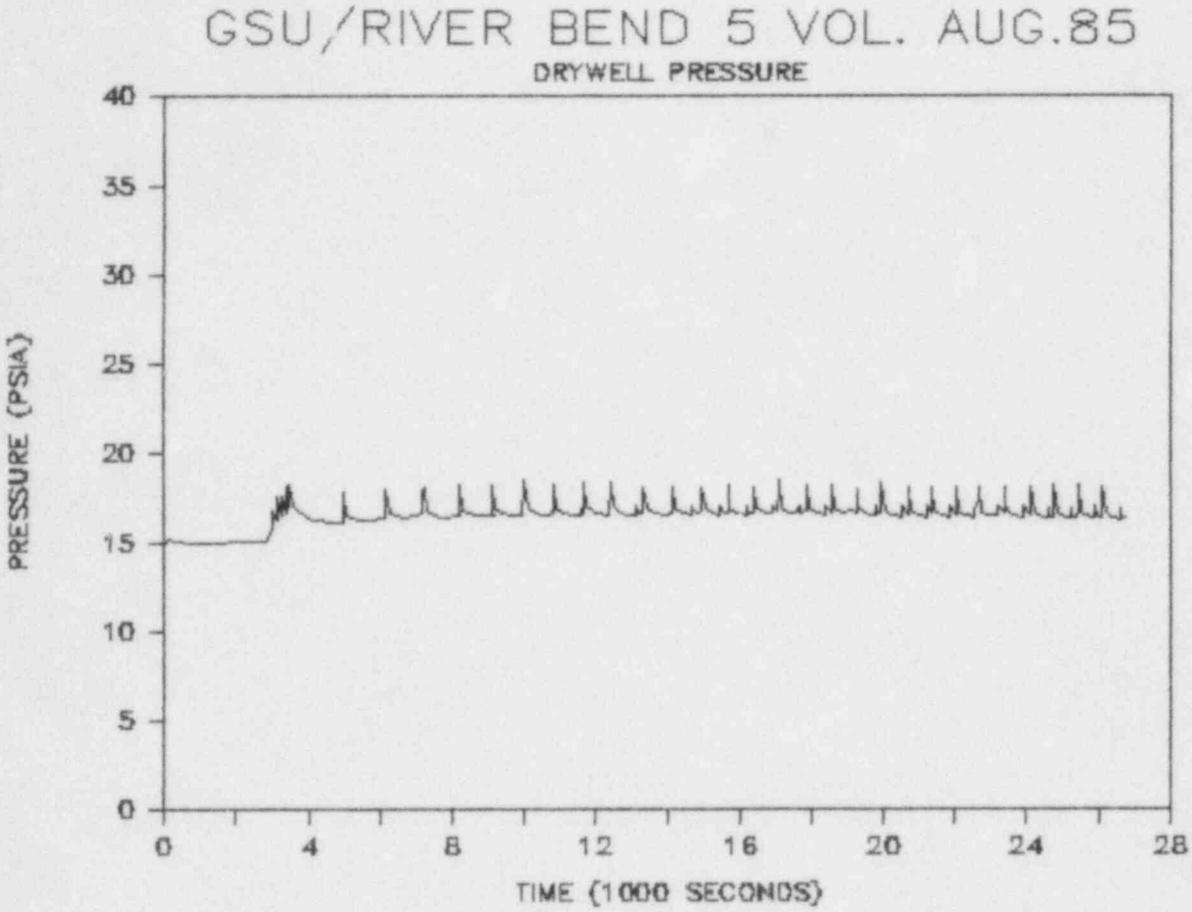
GSU/RIVER BEND 5 VOL. AUG.85
UPPER INTERMEDIATE VOLUME TEMPERATURE
340
320
300
280
260
240
220
200
180
160
140
120
100
80
TEMPERATURE (F)
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 6



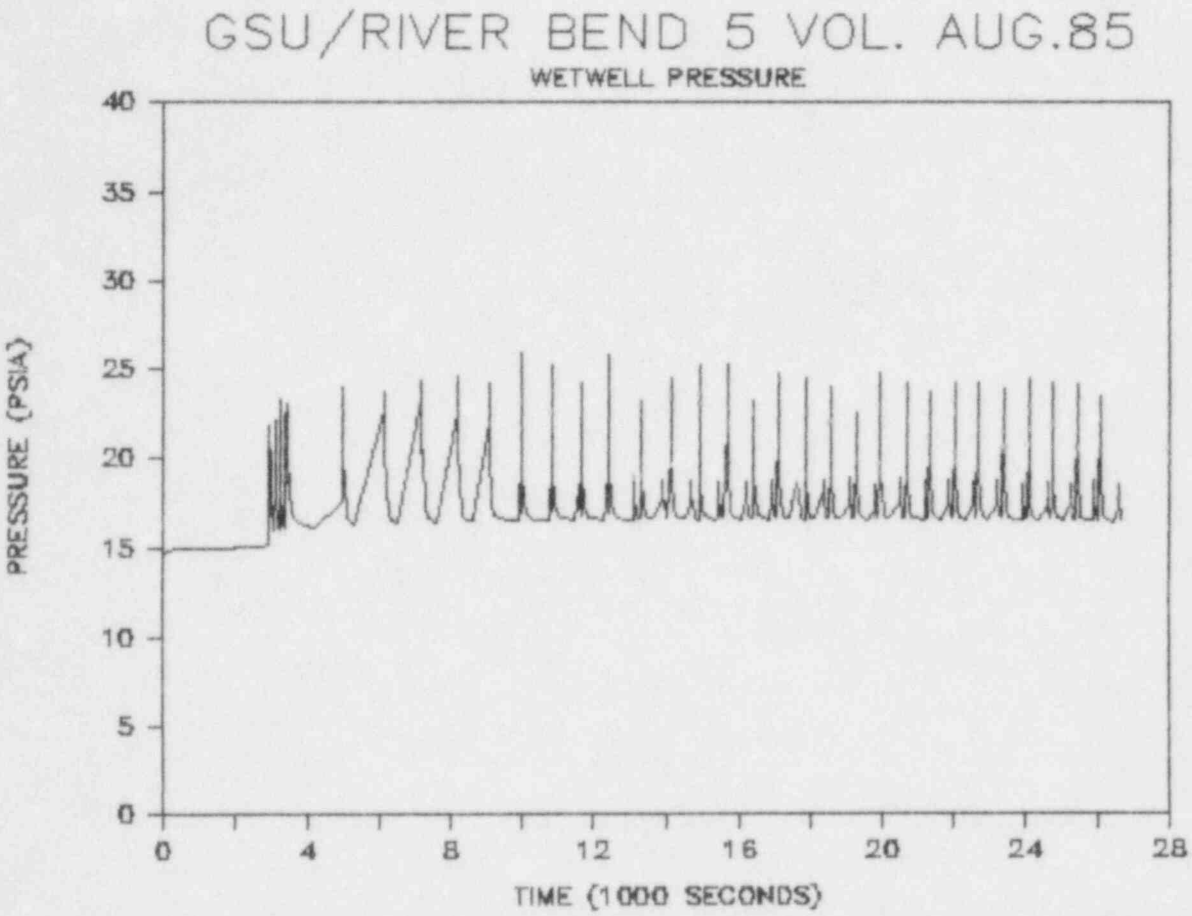
GSU/RIVER BEND 5 VOL. AUG.85
CONTAINMENT VOLUME TEMPERATURE
TEMPERATURE (F)
150
140
130
120
110
100
90
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 7



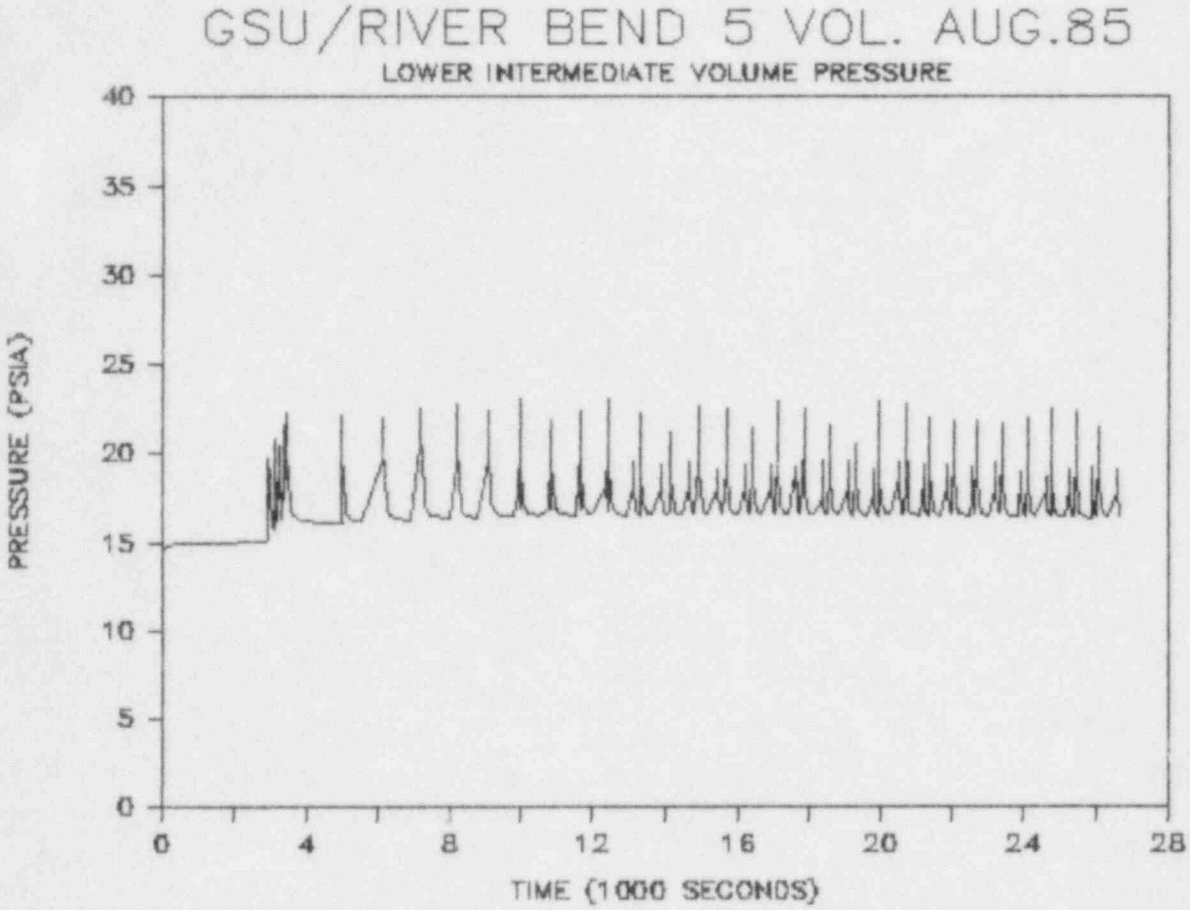
GSU/RIVER BEND 5 VOL. AUG.85
DRYWELL PRESSURE
PRESSURE (PSIA)
40
35
30
25
20
15
10
5
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 8



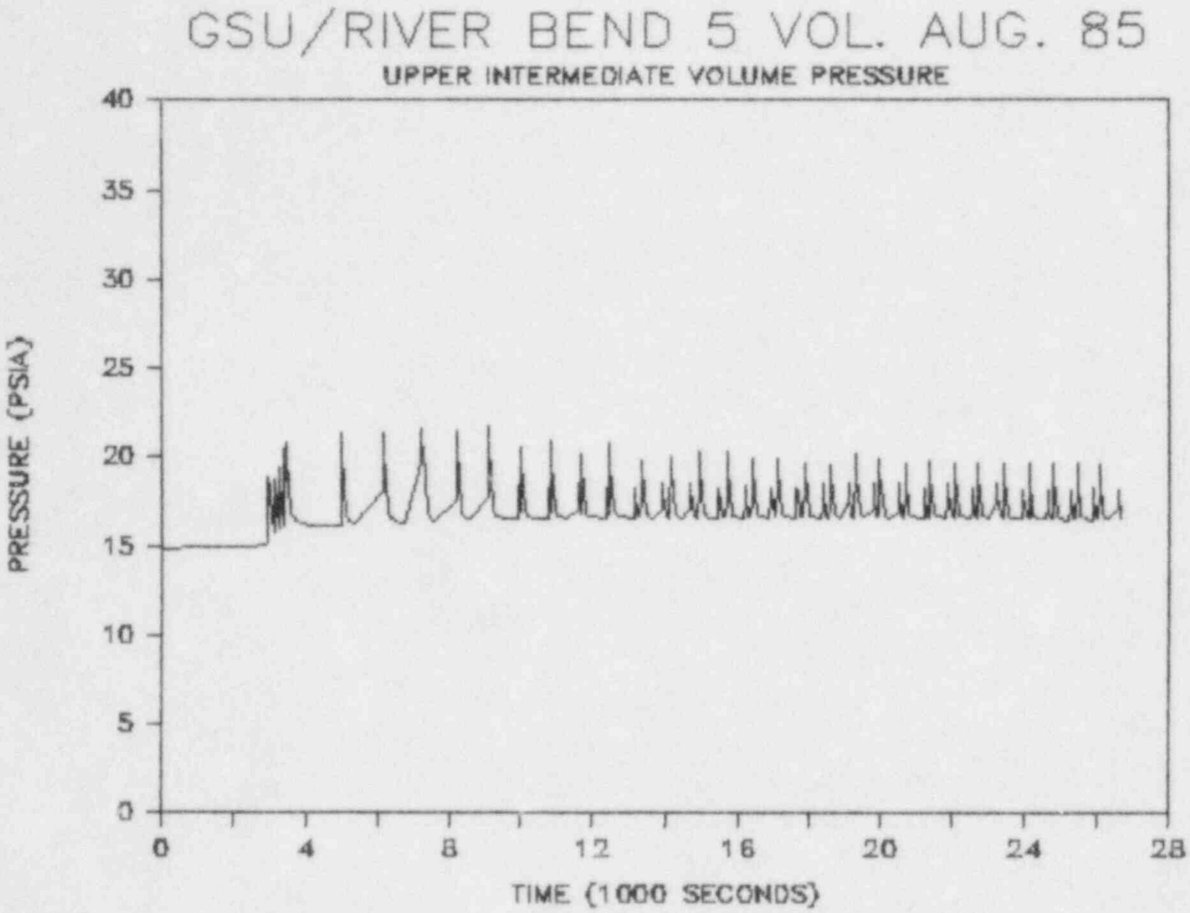
GSU/RIVER BEND 5 VOL. AUG.85
WETWELL PRESSURE
PRESSURE (PSIA)
40
35
30
25
20
15
10
5
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 9



GSU/RIVER BEND 5 VOL. AUG.85
LOWER INTERMEDIATE VOLUME PRESSURE
PRESSURE (PSIA)
40
35
30
25
20
15
10
5
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 10



GSU/RIVER BEND 5 VOL. AUG. 85
UPPER INTERMEDIATE VOLUME PRESSURE
PRESSURE (PSIA)
40
35
30
25
20
15
10
5
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 11

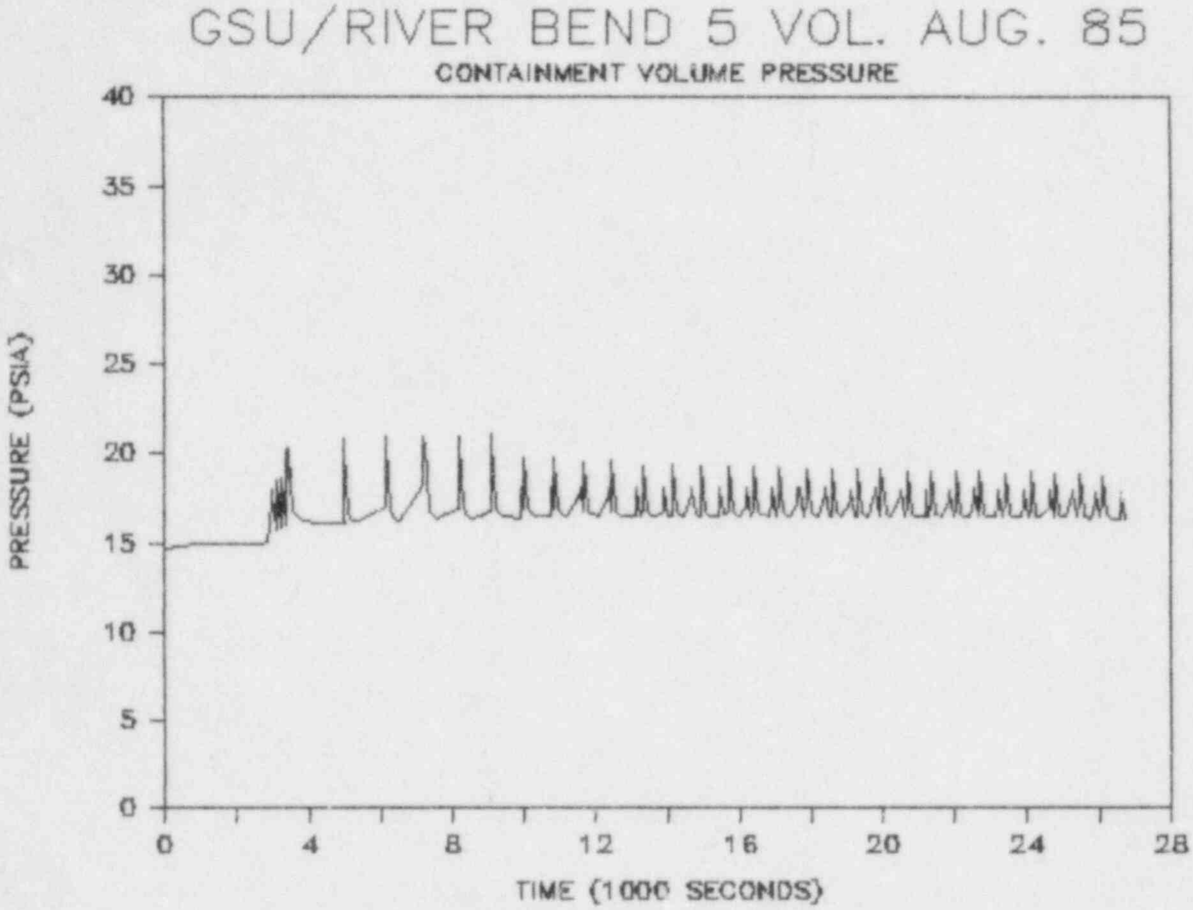

GSU/RIVER BEND 5 VOL. AUG. 85
CONTAINMENT VOLUME PRESSURE
PRESSURE (PSIA)
40
35
30
25
20
15
10
5
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 12

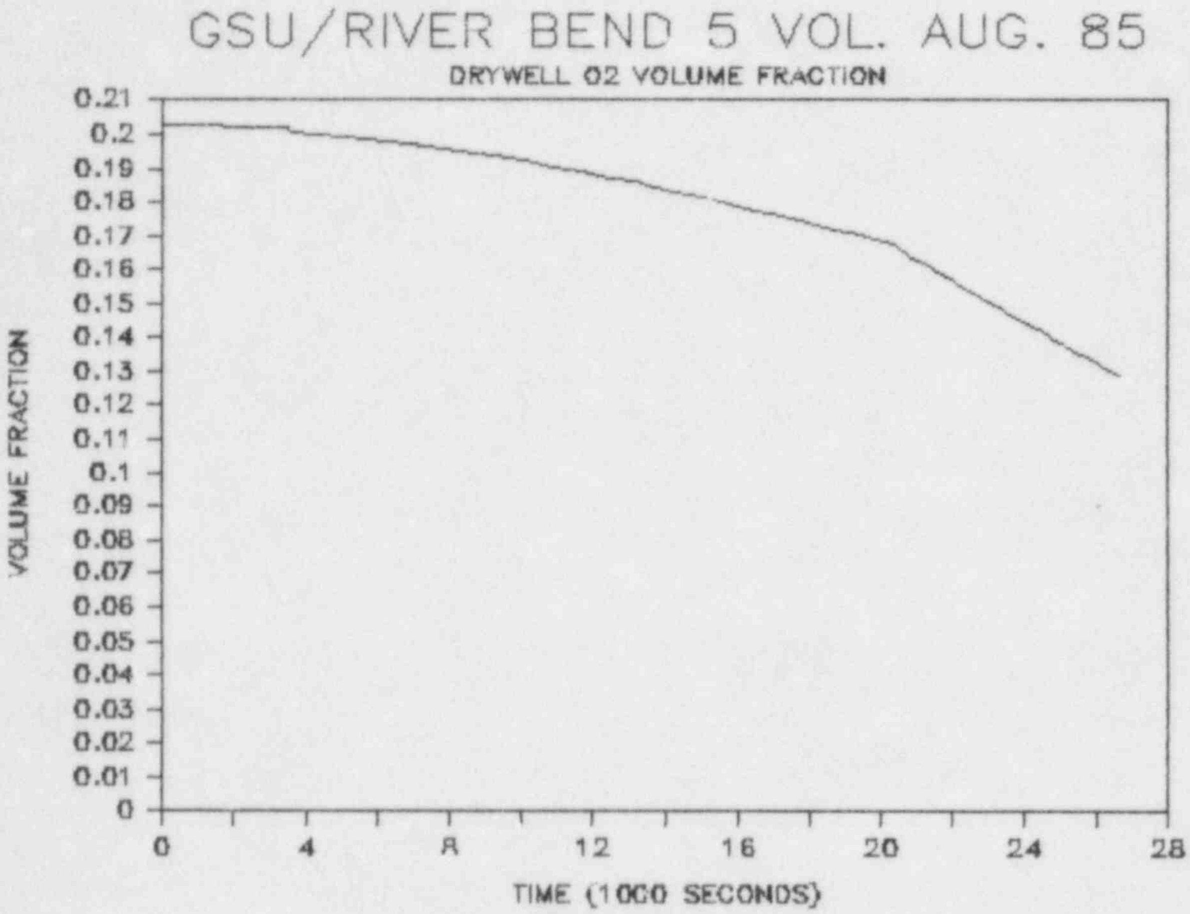
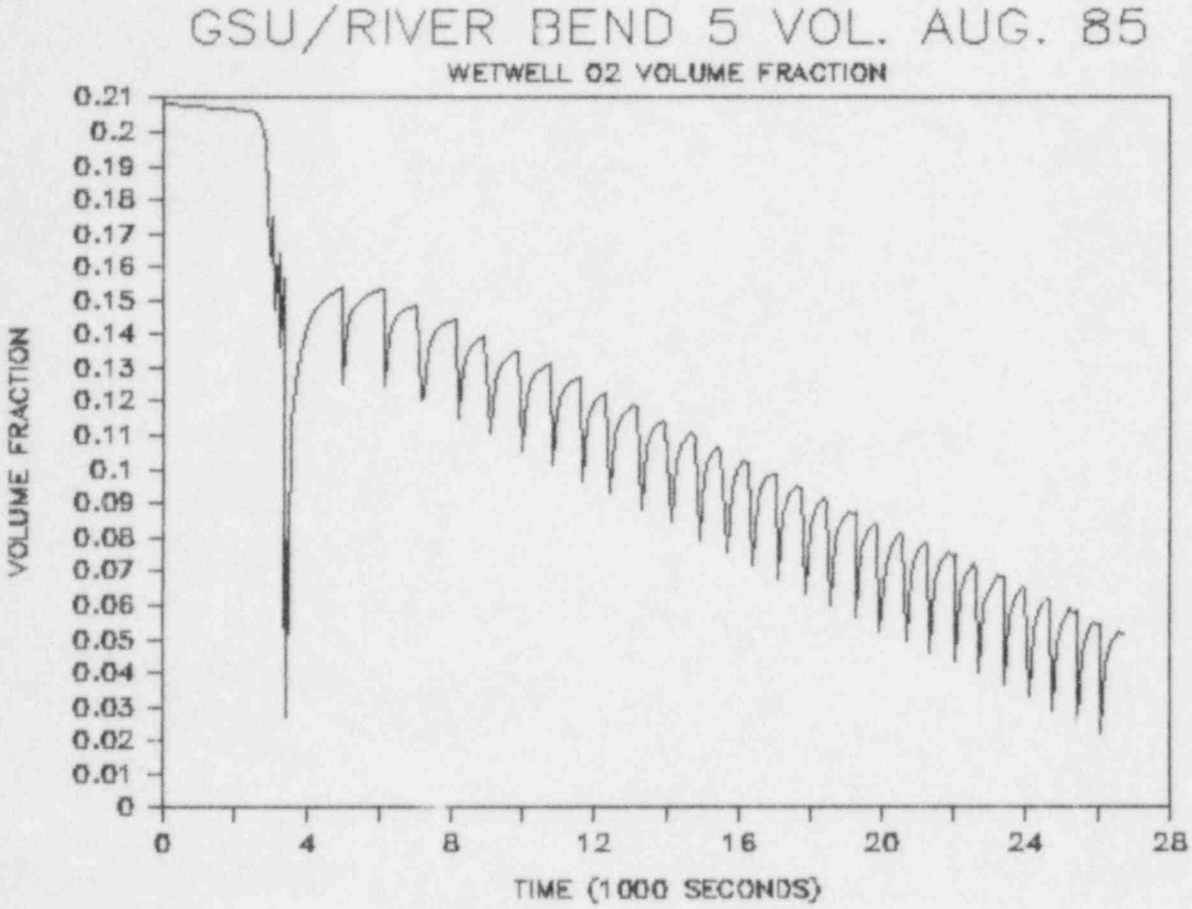

GSU/RIVER BEND 5 VOL. AUG. 85
DRYWELL O2 VOLUME FRACTION
VOLUME FRACTION
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 13



GSU/RIVER BEND 5 VOL. AUG. 85
WETWELL O2 VOLUME FRACTION
VOLUME FRACTION
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 14

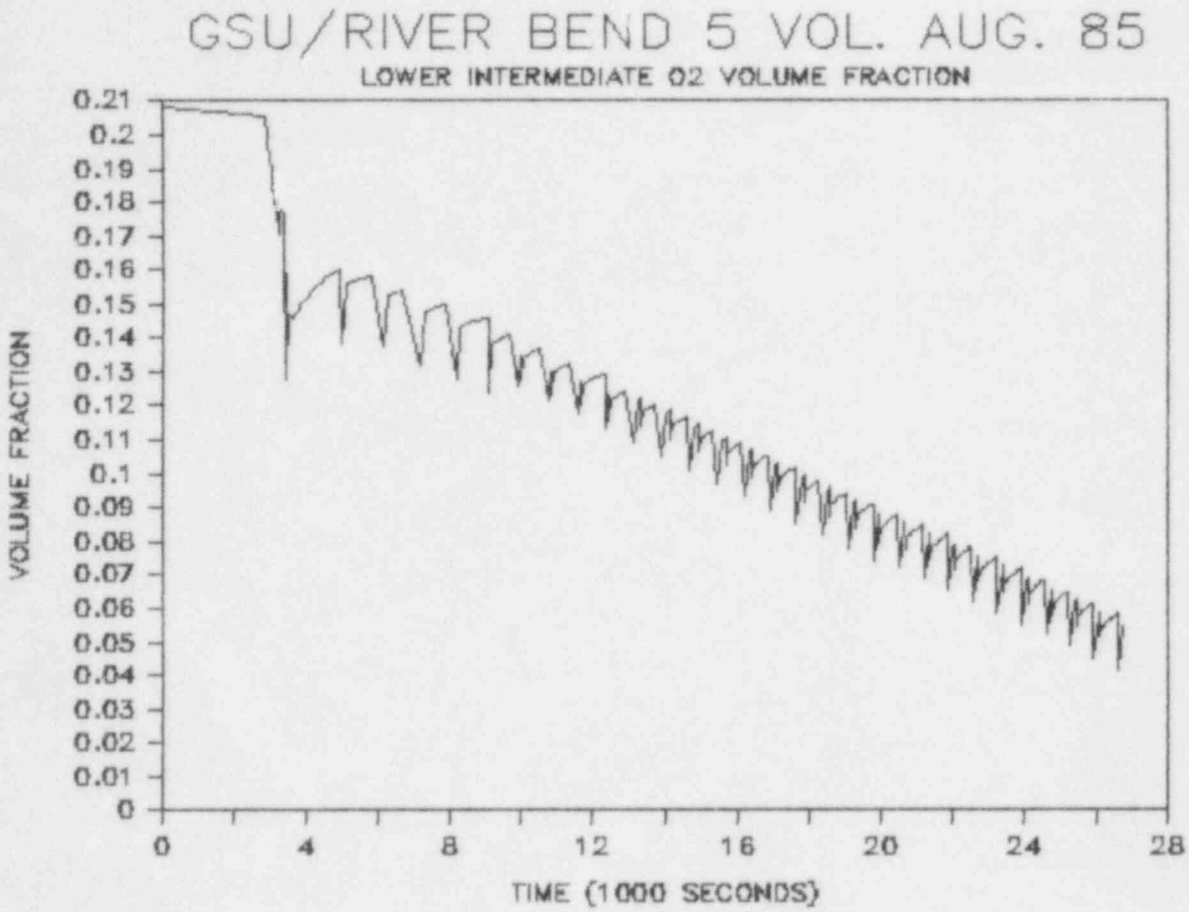
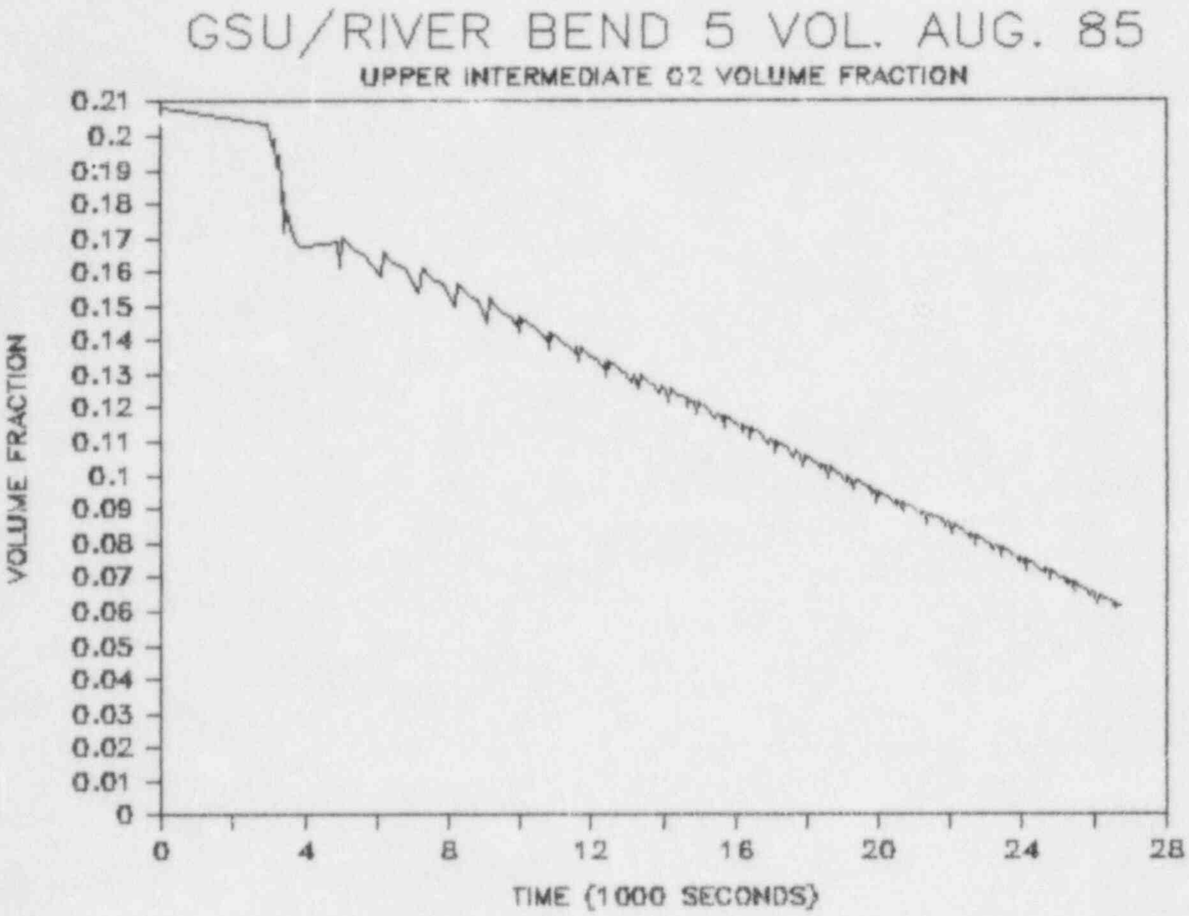

GSU/RIVER BEND 5 VOL. AUG. 85
LOWER INTERMEDIATE O2 VOLUME FRACTION
VOLUME FRACTION
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 15



GSU/RIVER BEND 5 VOL. AUG. 85
UPPER INTERMEDIATE O2 VOLUME FRACTION
VOLUME FRACTION
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 16

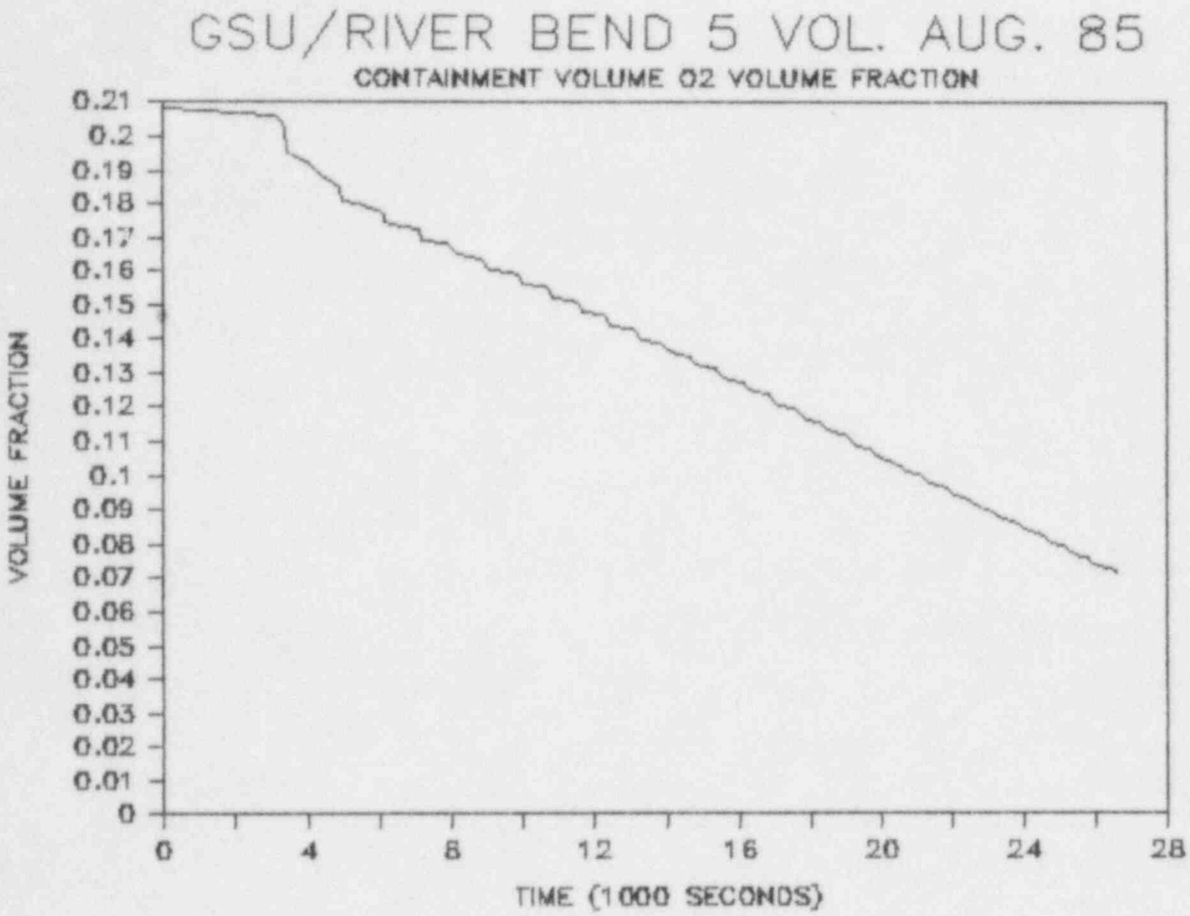

GSU/RIVER BEND 5 VOL. AUG. 85
CONTAINMENT VOLUME O2 VOLUME FRACTION
VOLUME FRACTION
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 17

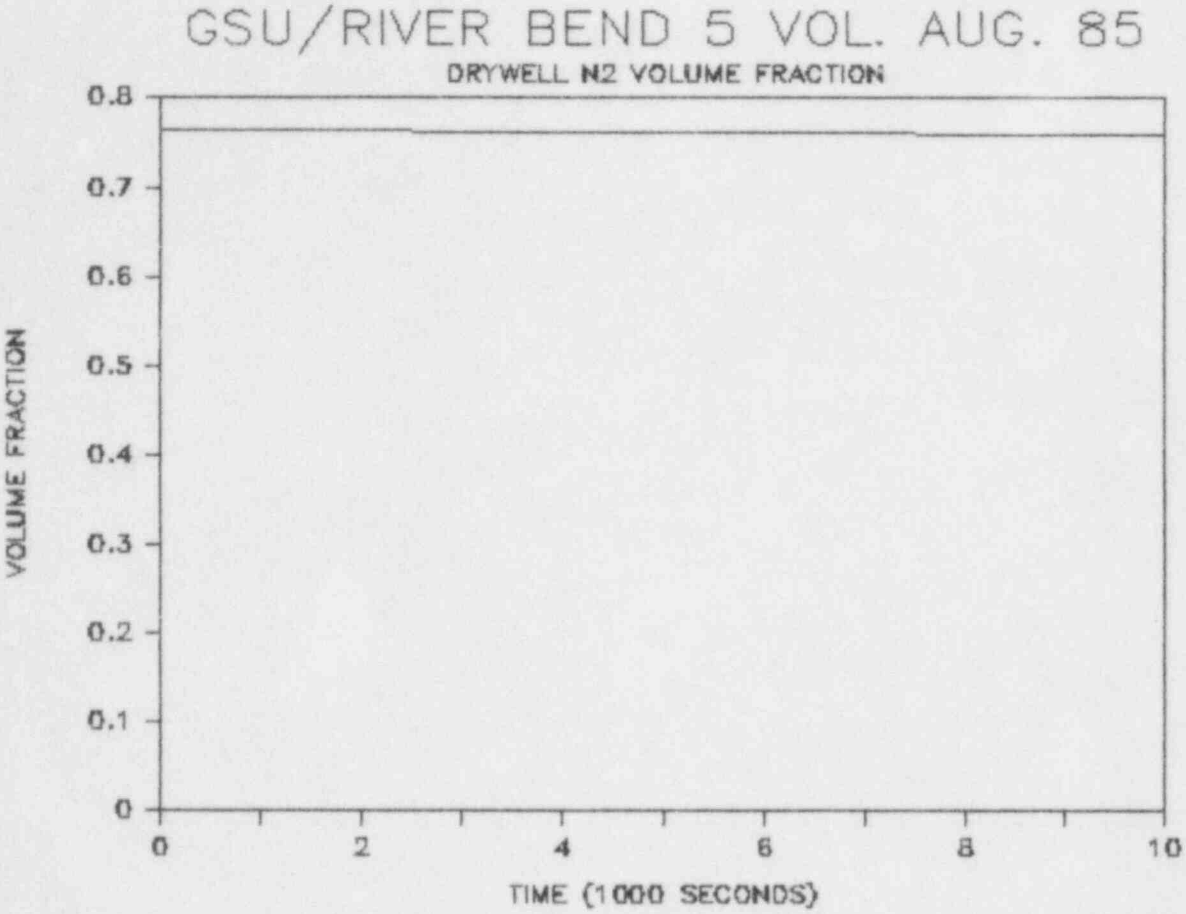

GSU/RIVER BEND 5 VOL. AUG. 85
DRYWELL N2 VOLUME FRACTION
VOLUME FRACTION
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
TIME (1000 SECONDS)

FIGURE 18

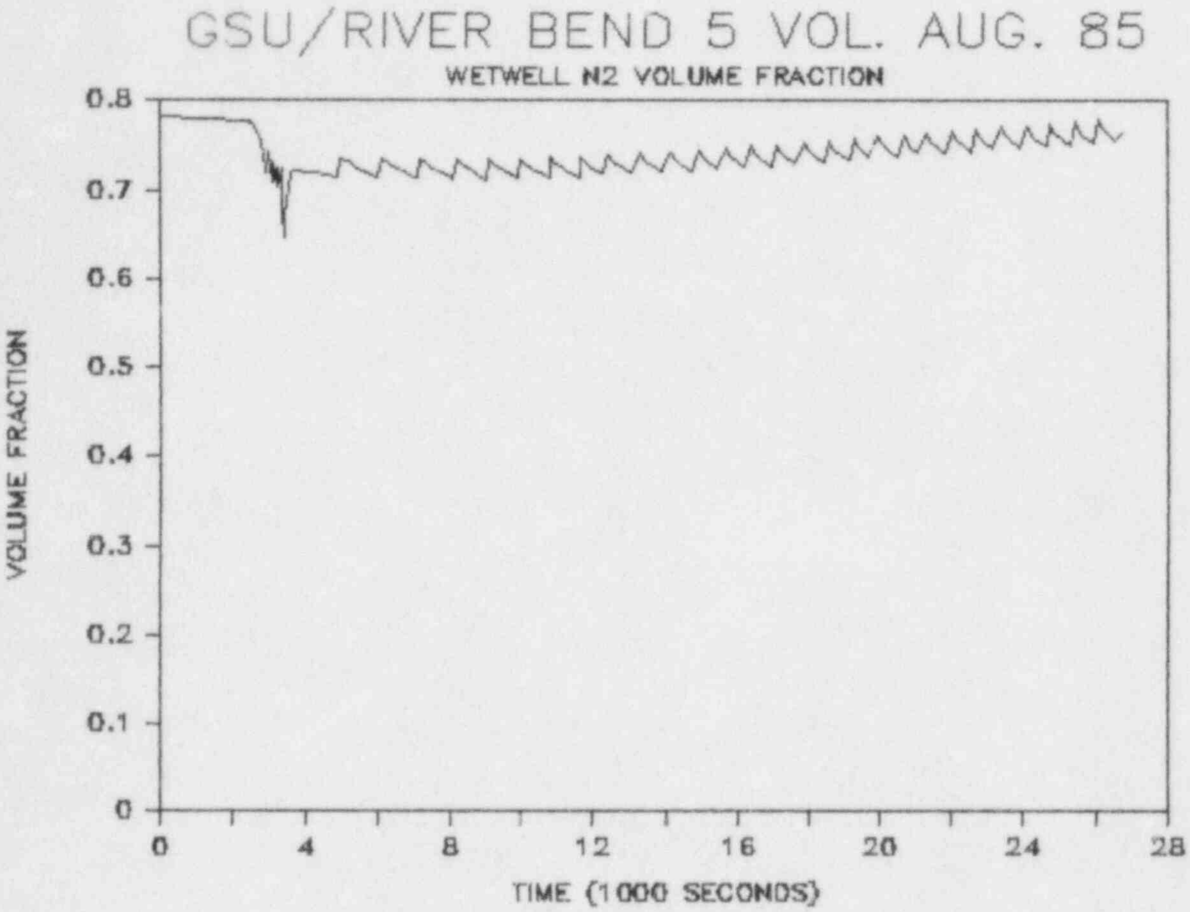

GSU/RIVER BEND 5 VOL. AUG. 85
WETWELL N2 VOLUME FRACTION
VOLUME FRACTION
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 19

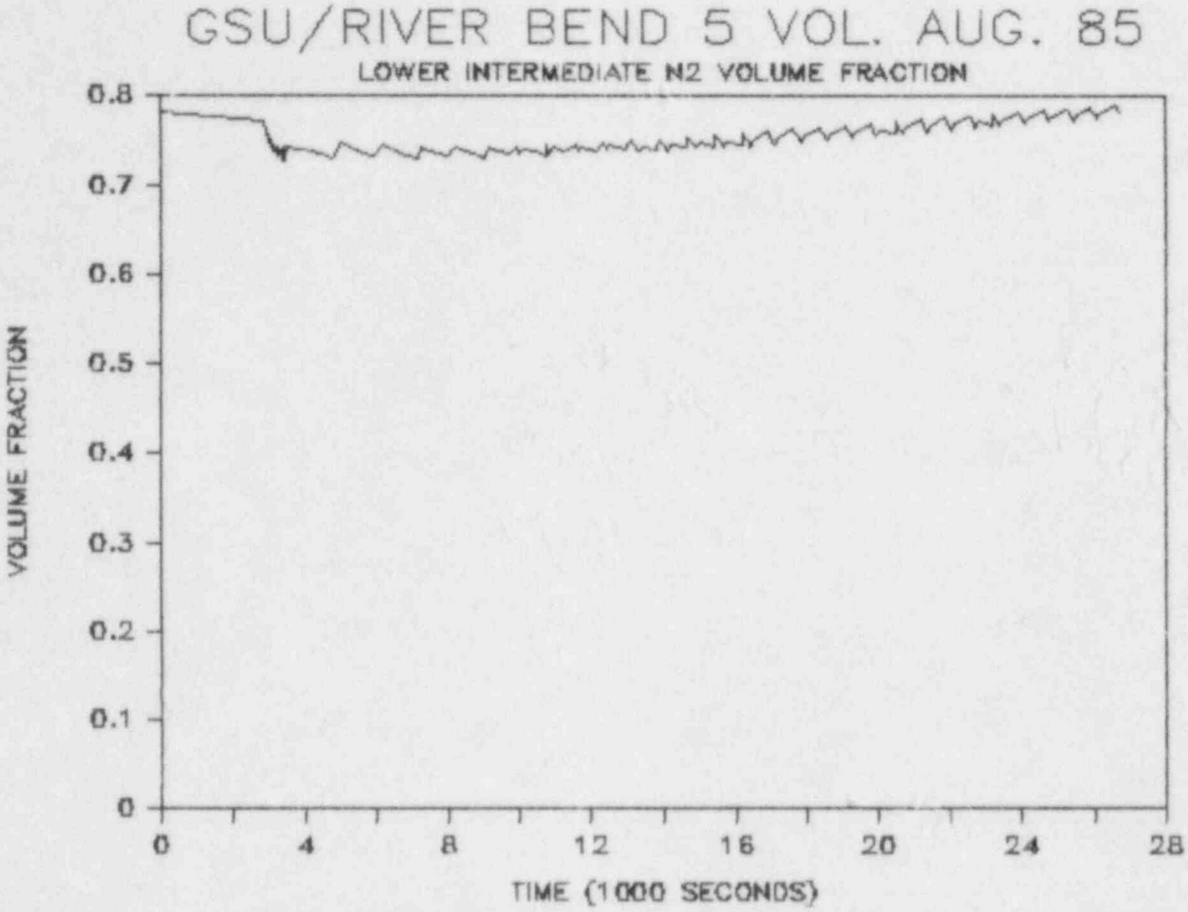
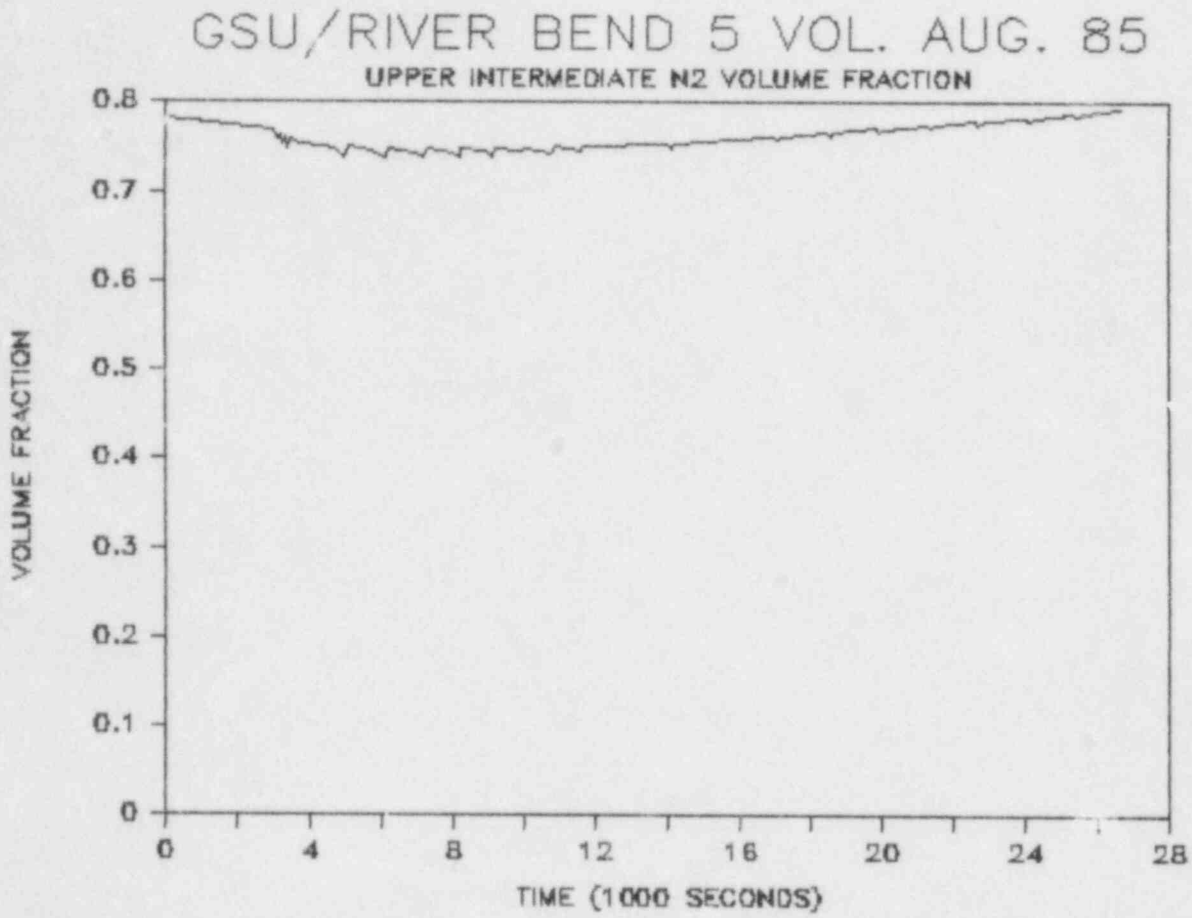
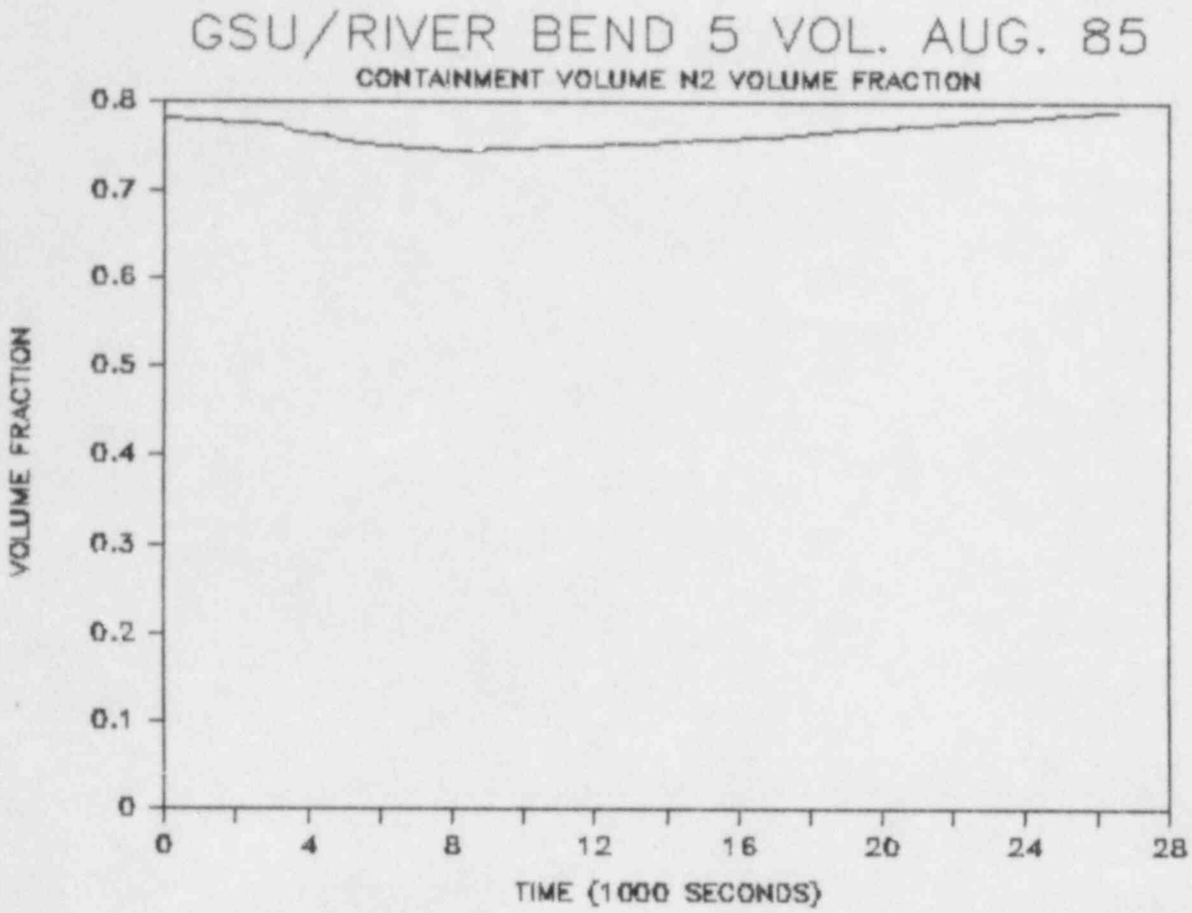

GSU/RIVER BEND 5 VOL. AUG. 85
LOWER INTERMEDIATE N2 VOLUME FRACTION
VOLUME FRACTION
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 20



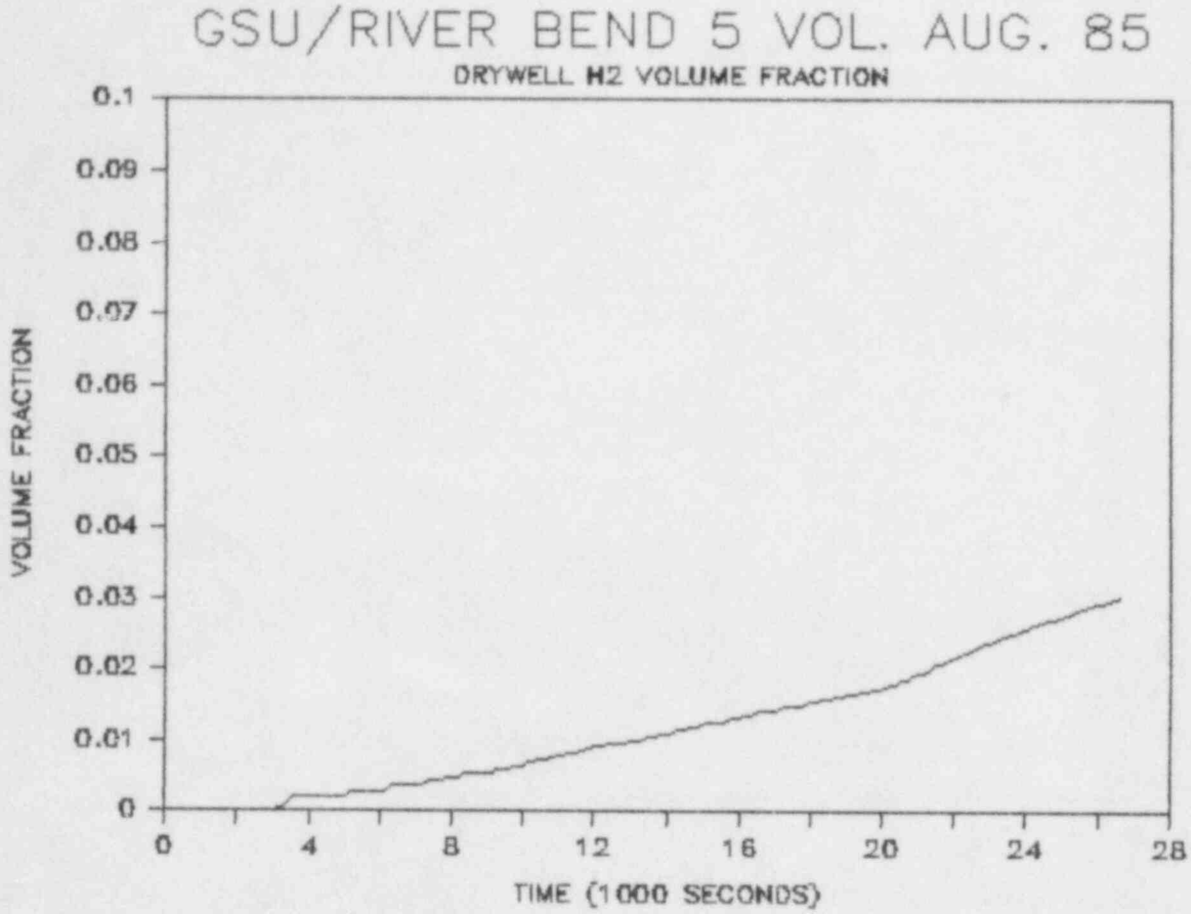
GSU/RIVER BEND 5 VOL. AUG. 85
UPPER INTERMEDIATE N2 VOLUME FRACTION
VOLUME FRACTION
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 21



GSU/RIVER BEND 5 VOL. AUG. 85
CONTAINMENT VOLUME N2 VOLUME FRACTION
VOLUME FRACTION
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 22



GSU/RIVER BEND 5 VOL. AUG. 85
DRYWELL H2 VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
VOLUME FRACTION
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 23

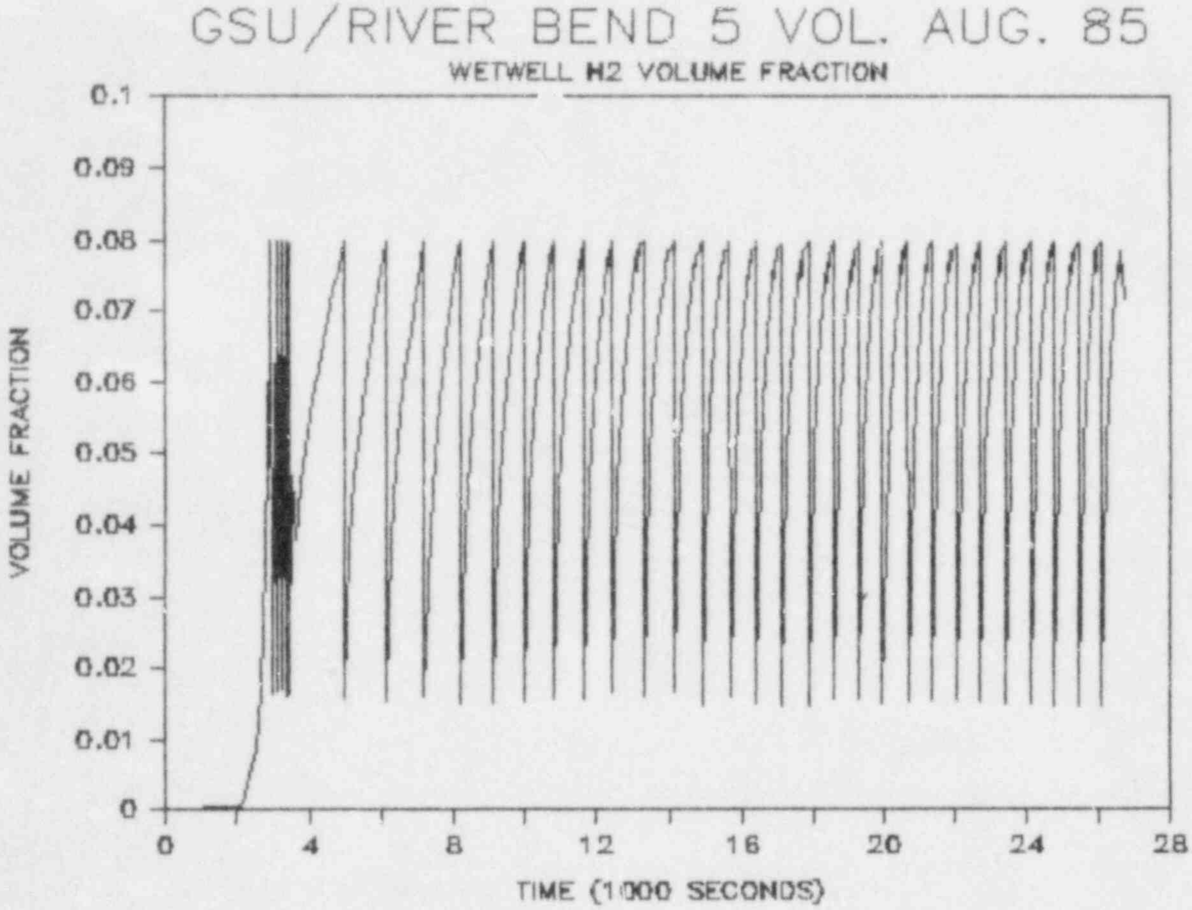

GSU/RIVER BEND 5 VOL. AUG. 85
WETWELL H2 VOLUME FRACTION
VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 24

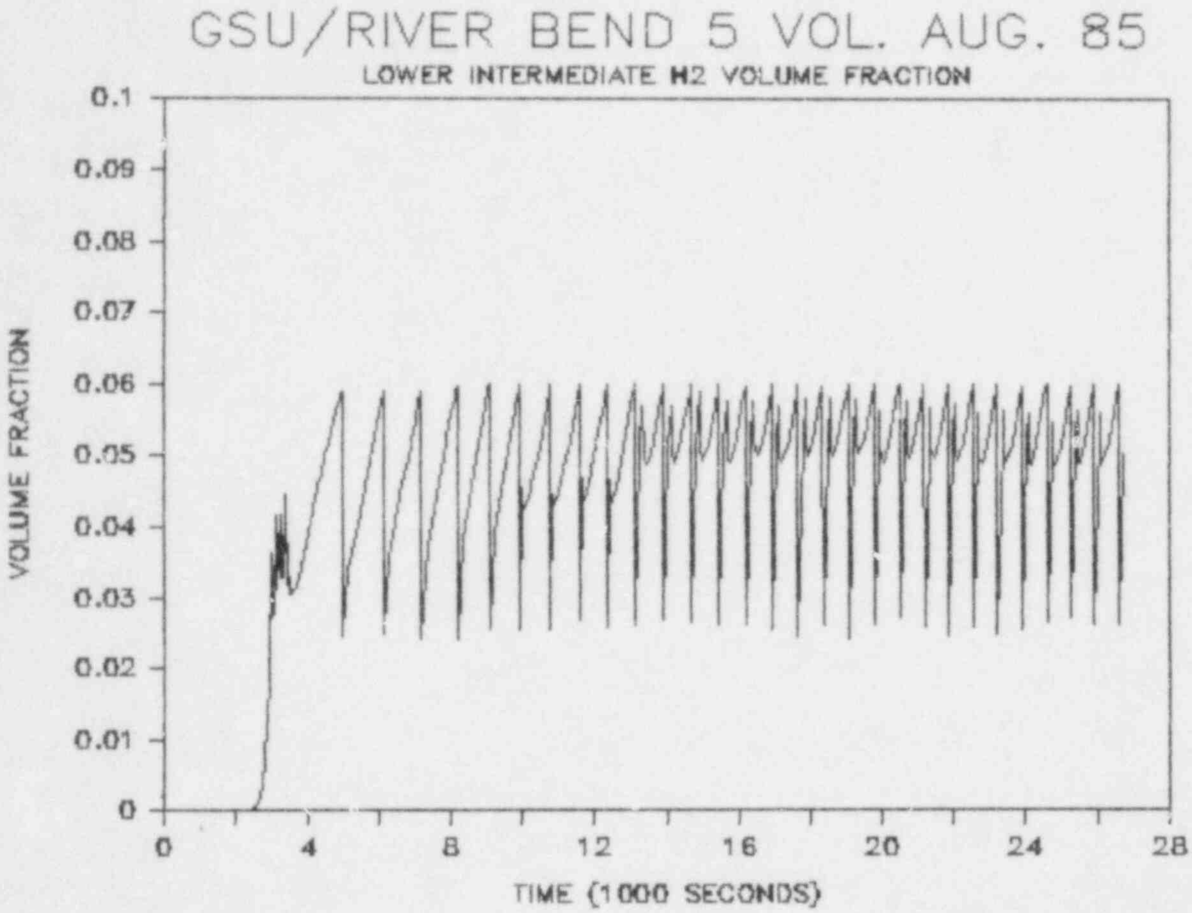
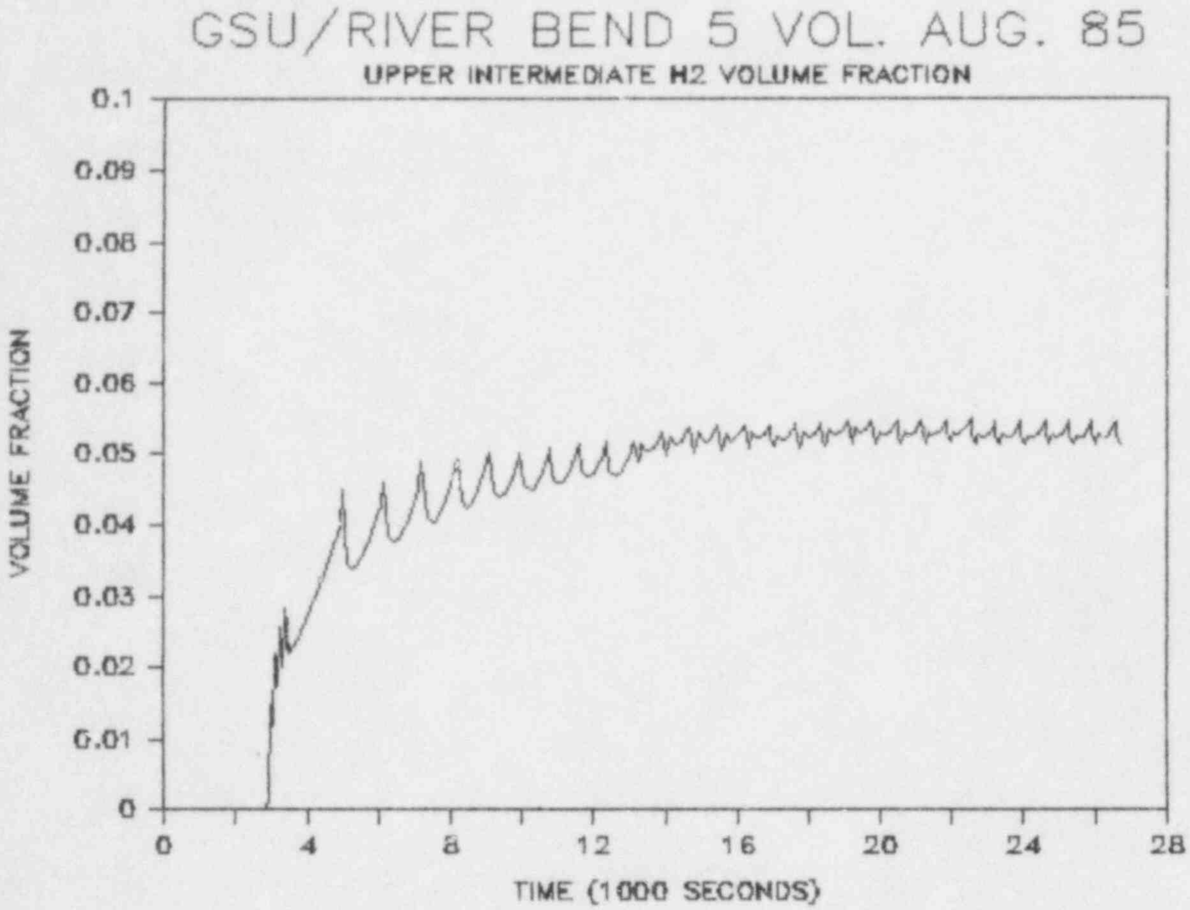
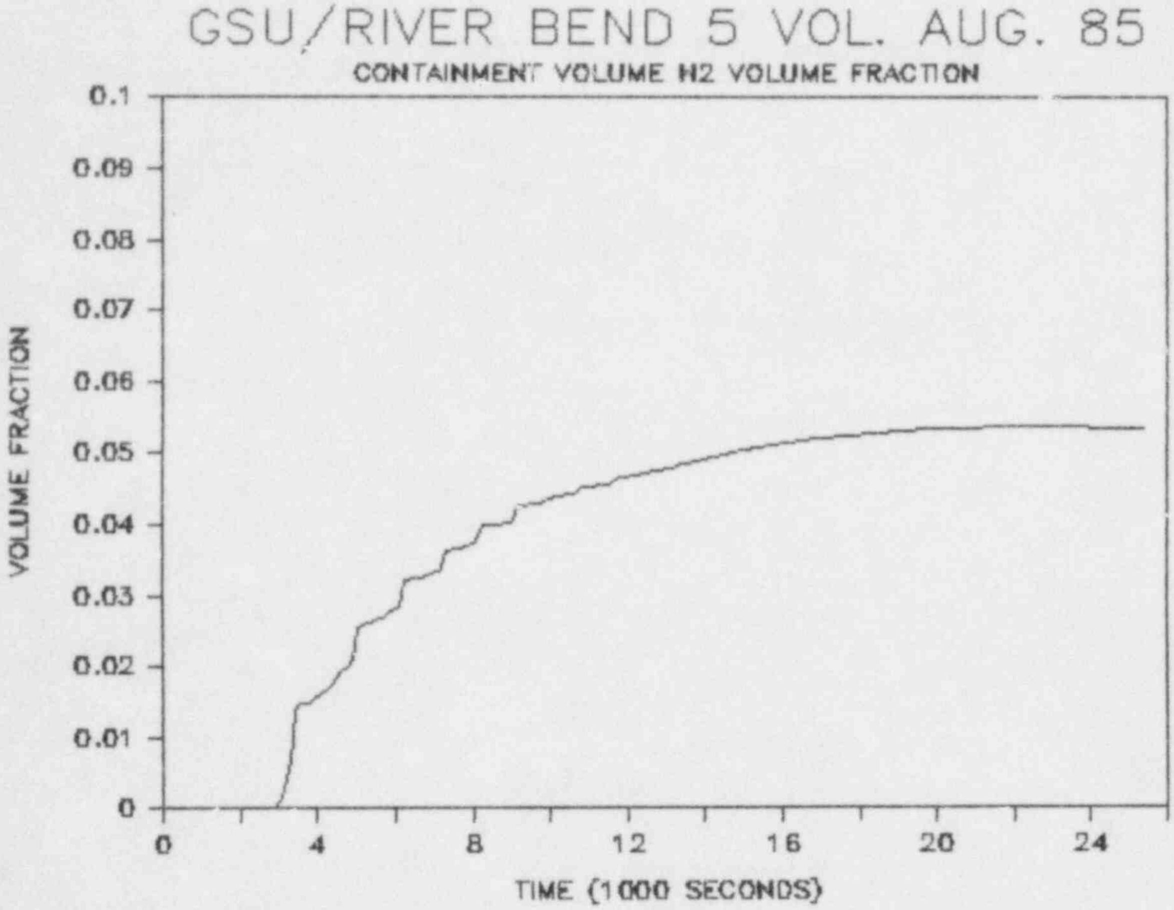

GSU/RIVER BEND 5 VOL. AUG. 85
LOWER INTERMEDIATE H2 VOLUME FRACTION
VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 25



GSU/RIVER BEND 5 VOL. AUG. 85
UPPER INTERMEDIATE H2 VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
VOLUME FRACTION
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 26



GSU/RIVER BEND 5 VOL. AUG. 85
CONTAINMENT VOLUME H2 VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
VOLUME FRACTION
0
4
8
12
16
20
24
TIME (1000 SECONDS)

FIGURE 27

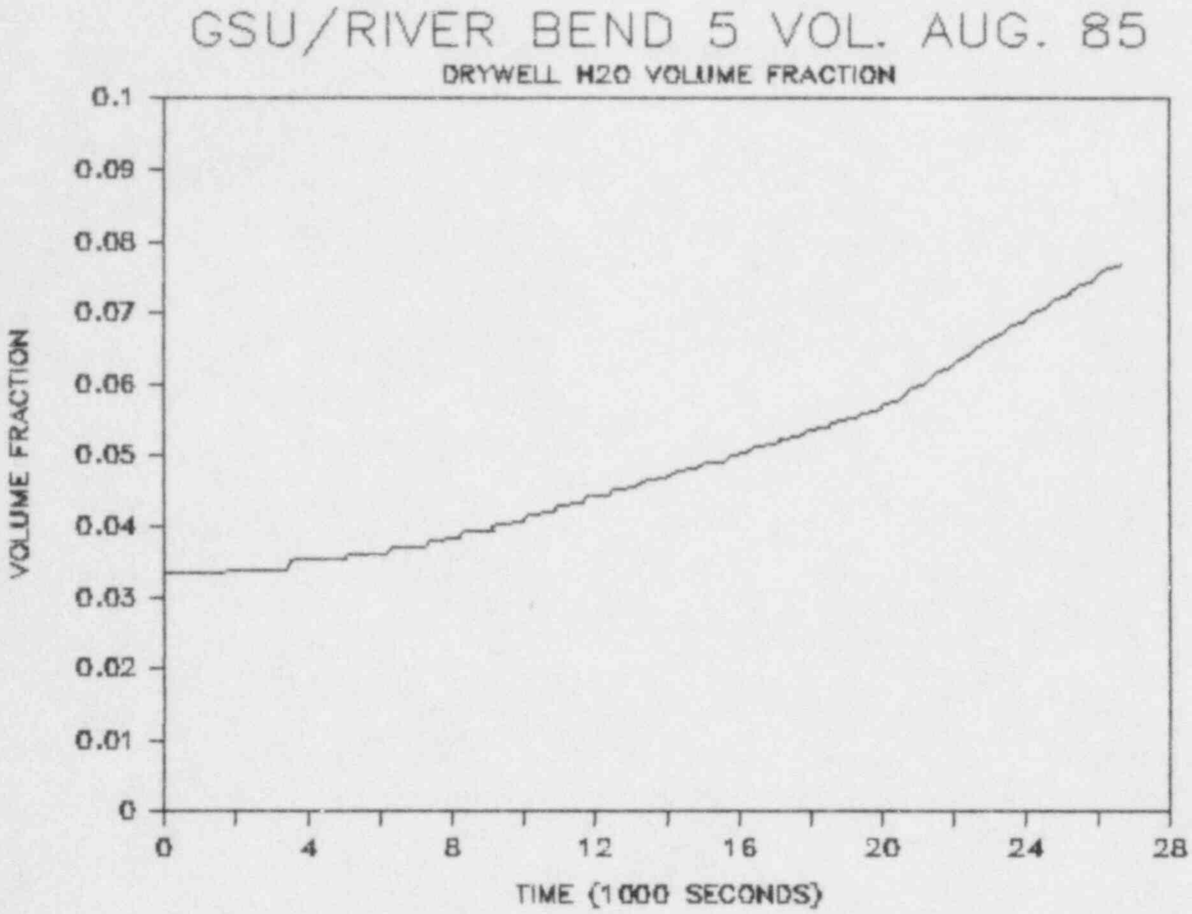

GSU/RIVER BEND 5 VOL. AUG. 85
DRYWELL H2O VOLUME FRACTION
VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 28

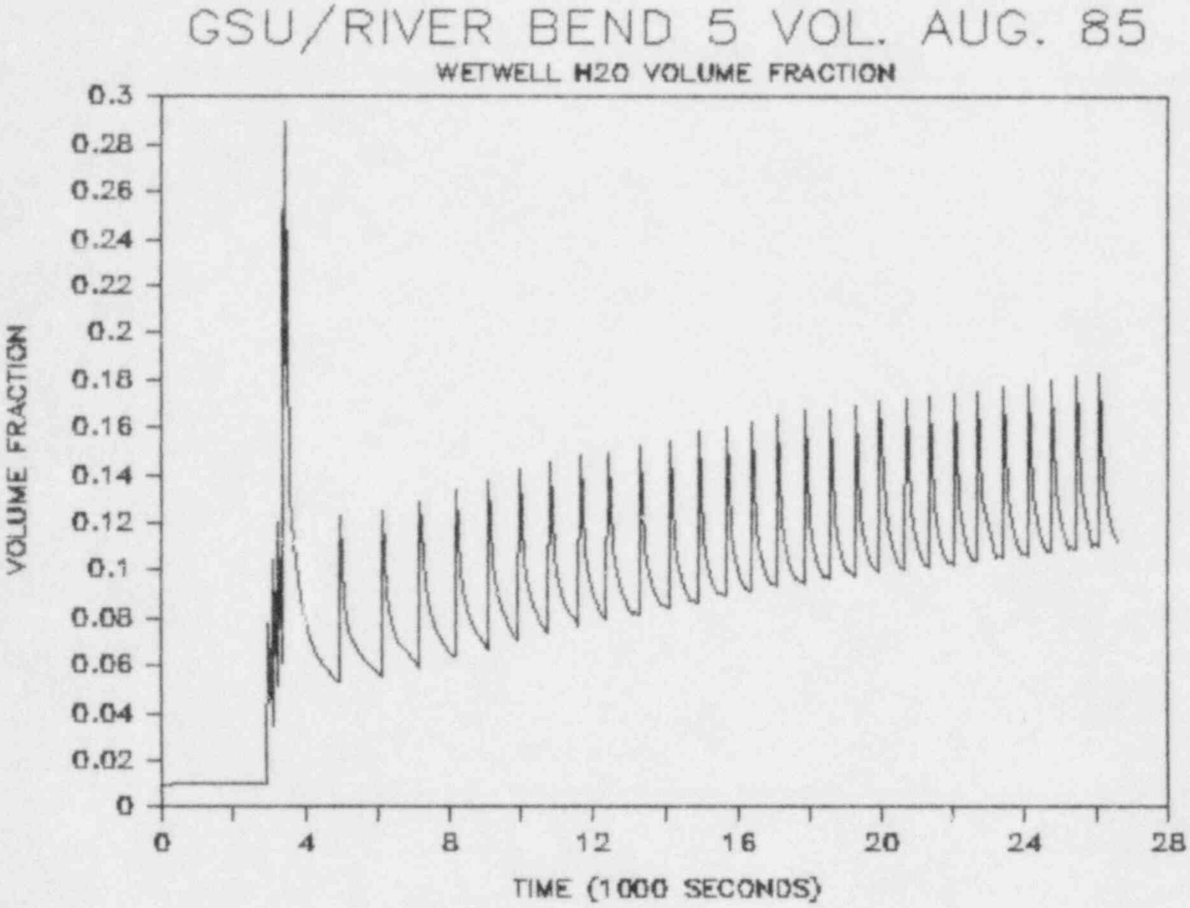

GSU/RIVER BEND 5 VOL. AUG. 85
WETWELL H2O VOLUME FRACTION
VOLUME FRACTION
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 29

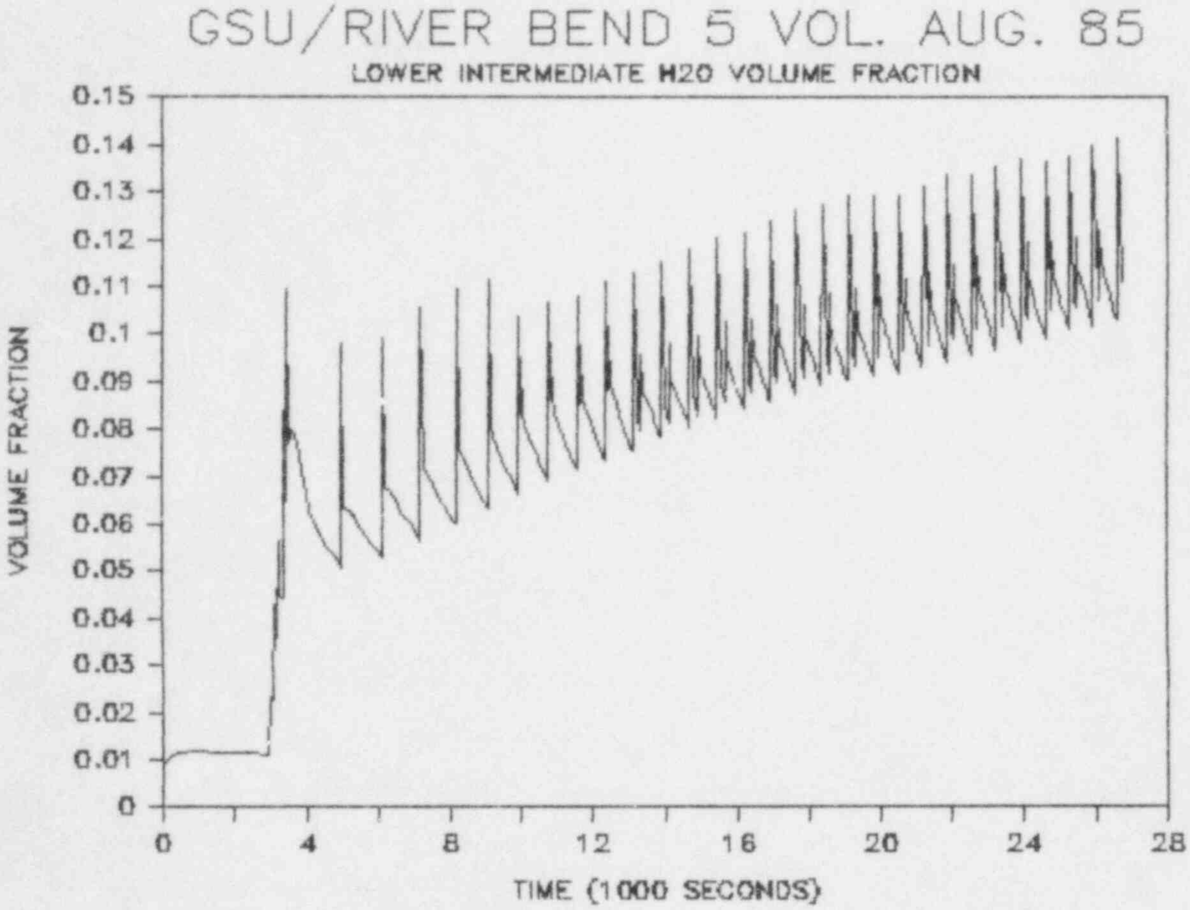
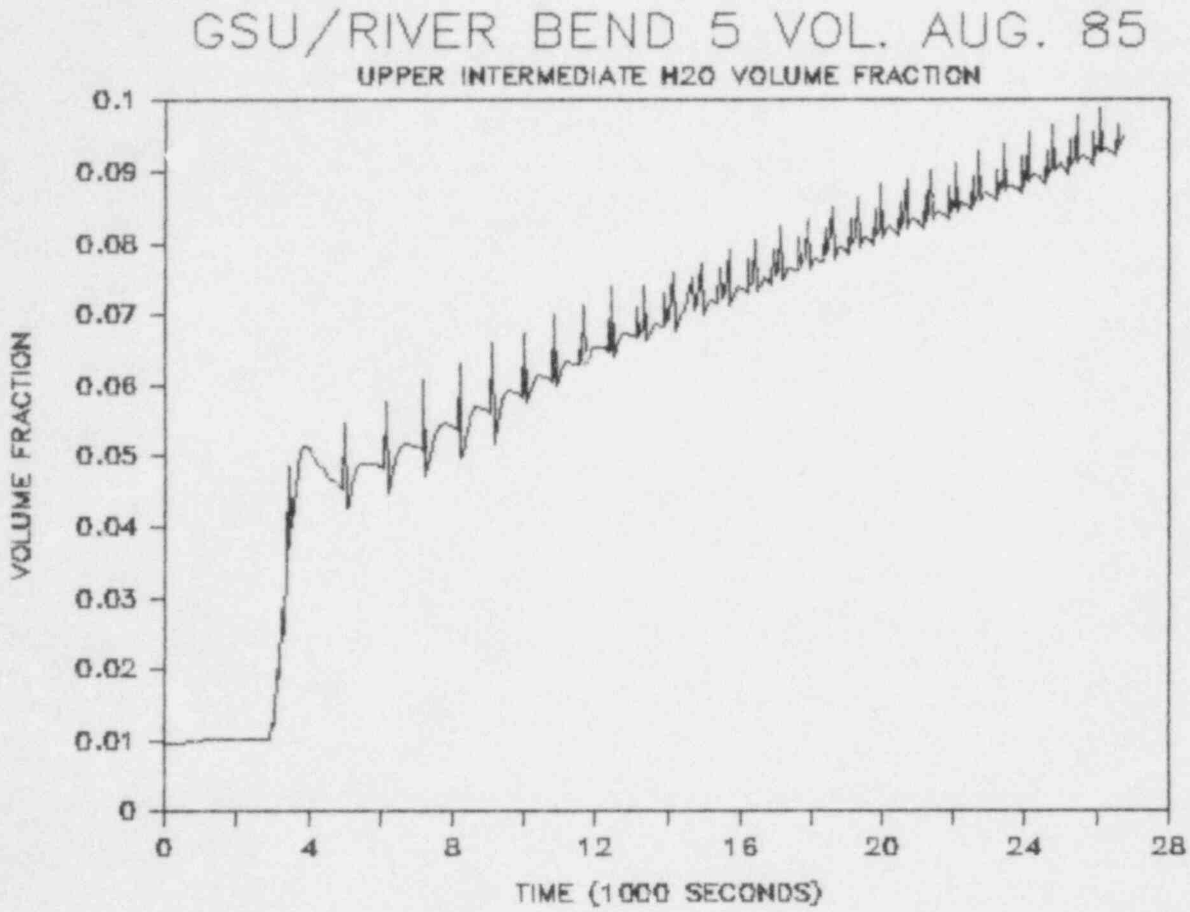
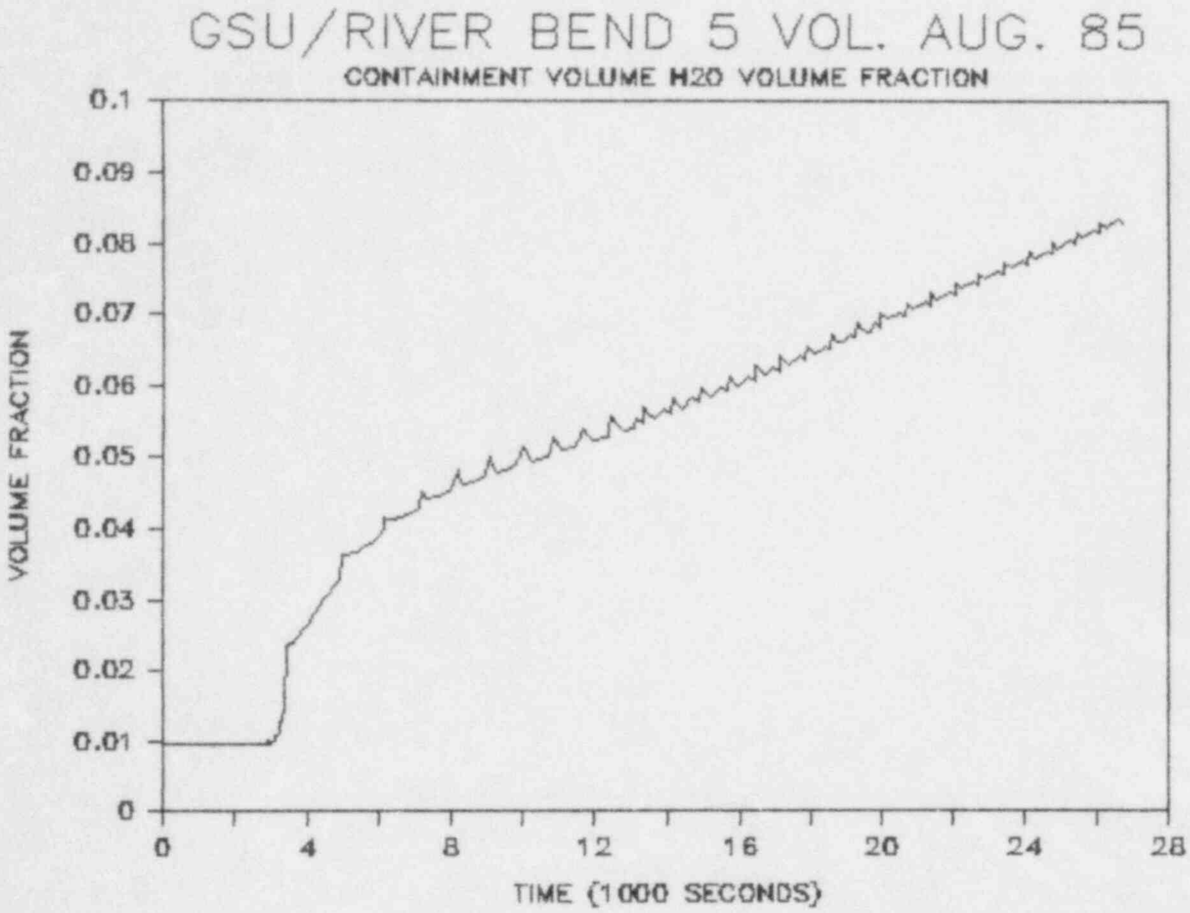

GSU/RIVER BEND 5 VOL. AUG. 85
LOWER INTERMEDIATE H2O VOLUME FRACTION
VOLUME FRACTION
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 30



GSU/RIVER BEND 5 VOL. AUG. 85
UPPER INTERMEDIATE H2O VOLUME FRACTION
VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)

FIGURE 31



GSU/RIVER BEND 5 VOL. AUG. 85
CONTAINMENT VOLUME H2O VOLUME FRACTION
VOLUME FRACTION
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
4
8
12
16
20
24
28
TIME (1000 SECONDS)