DRAFT

INTERMOUNTAIN POWER SERVICE CORPORATION
TECHNICAL REPORT- EXECUTIVE SUMMARY

TITLE: Burner Modifications made at the Intermountain Generation Station, Units 1 and 2.

SUMMARY: In November of 1991, flame stabilizers were added to the burners and the register lineup was changed on Unit 2. In April of 1992, new burners with stabilizers were installed on Unit 1. In addition to these modifications, the following was also conducted on both units: extensive secondary air flow testing and balancing, primary air/coal flow balancing and a new burner register setup philosophy adapted. These modifications were required due to mechanical and structural thermal degradation observed on the burners. This was primarily due to an overheating condition caused when burners were in an out-of-service condition.

CONCLUSIONS: Based on windbox and fireside inspections since modifications, the burners are reported to be in excellent condition. The high rate of mechanical and structural degradation due to overheat conditions have been curtailed. This has been accomplished without changes to the operating criteria of the burners or boiler, which would have had adverse impact on performance or emissions.

The new burner setup has functioned well, without overheating or pluggage to the flame stabilizers. LOIs, NO_x levels and flame stability have all proved satisfactory. Modifications made to the burners have been effective and long life of the burners has been renewed.

It is not known, however, if we can expect full life out of Unit 2's burners since they were not replaced. At this time, no foreseeable replacement will be required over the next five to ten years. However, replacement may be inevitable due to pre-existing damage.

Coal nozzle flaring has been observed on some of the burners during outage inspections. This seems to occur randomly and effects 5 to 10 percent of the burners.

RECOMMENDATIONS: Continue to maintain existing burner register setup and flame stabilizer installation. Periodic inspections of the burners will also be continued during major outages.

Additional investigation and testing needs to be conducted to address the nozzle tip overheating, causing some to droop or become out of round. This may be addressed by a materials change or possibly by moving the flame front further out.

More analysis into burner line aerodynamics needs to be conducted to address burner line fires. Coal transport line fires, however, is an unrelated issue to the mechanical degradation observed on the burners.

PREPARED BY: _____ **DATE:** _____

APPROVED BY: _____ **DATE:** _____
Superintendent

APPROVED BY: _____ **DATE:** _____
President and Chief Executive Officer

NO_x Daily Emissions Average (DEA) Summary

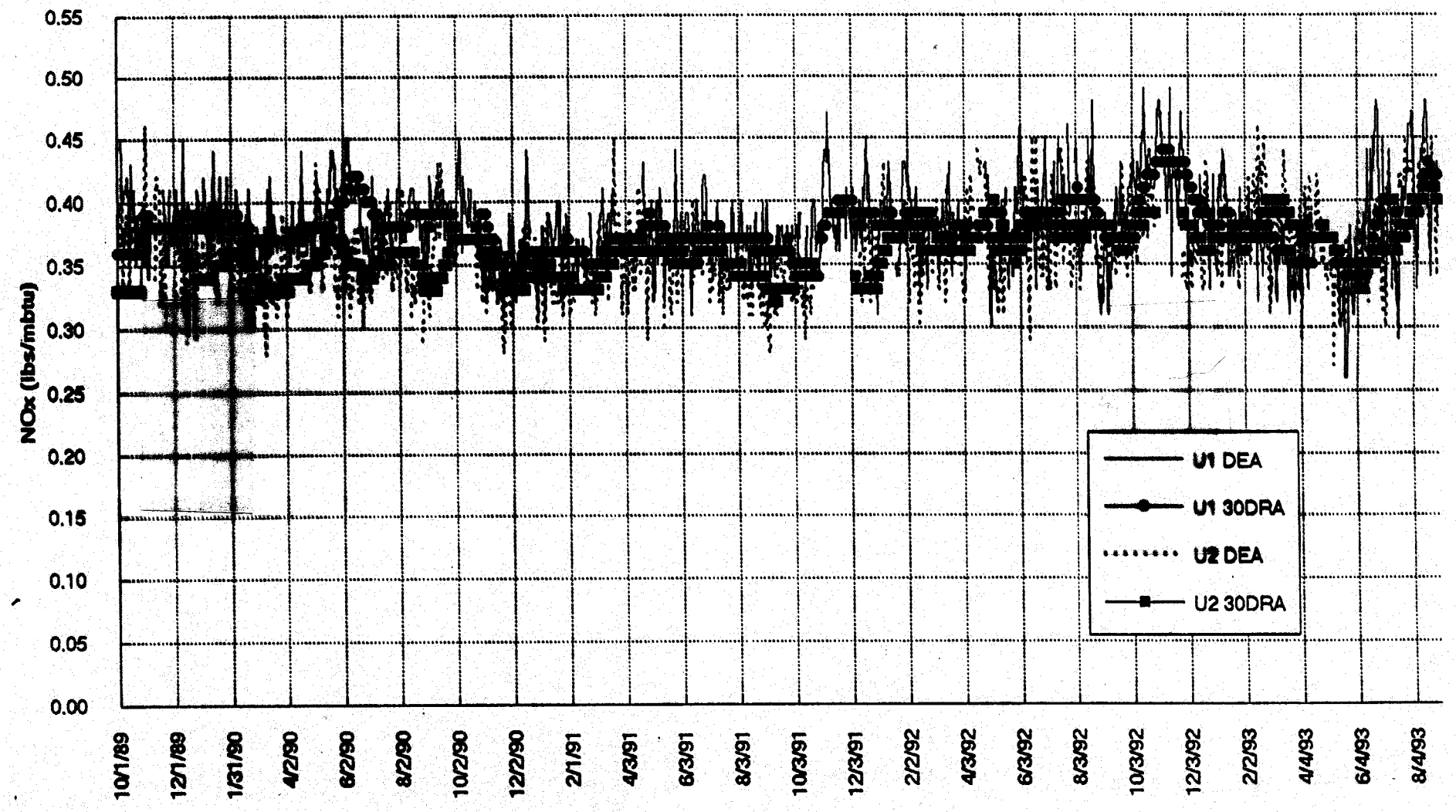
	Unit 1	Unit 2	Station
NO_x average (10/1/89-8/31/93)	0.380 lb/mbtu	0.361 lb/mbtu	0.370 lb/mbtu
NO_x average before modifications	0.377 lb/mbtu	0.350 lb/mbtu	0.364 lb/mbtu
NO_x average after modifications	0.385 lb/mbtu	0.374 lb/mbtu	0.379 lb/mbtu
% Change	2.1%	6.8%	4.4%

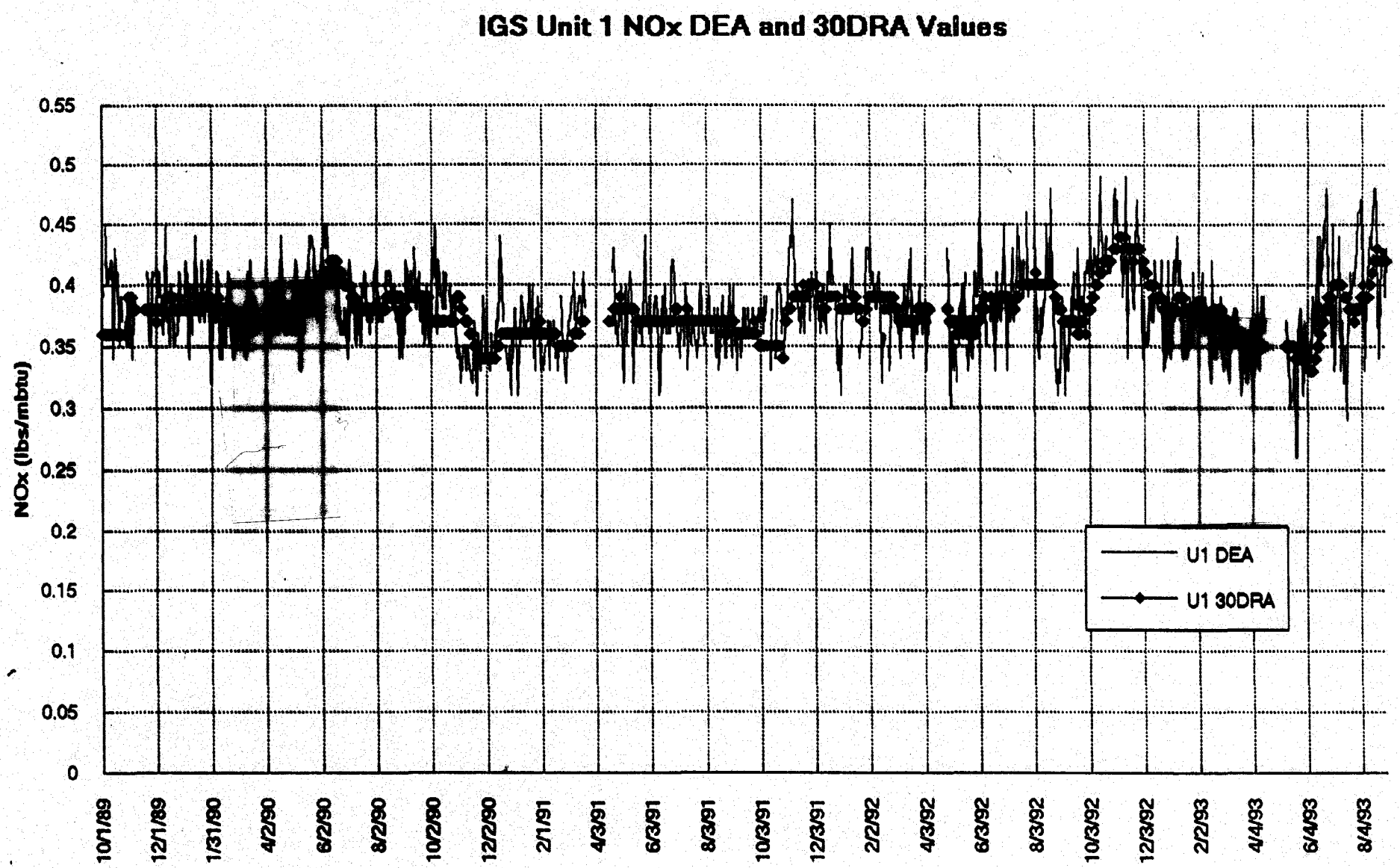
IP7_004100

IGS Unit 1 and 2	CEM NOx Values	Daily Averages and 30 Day Rolling Averages						
For 10/1/89 thru 8/31/93								
		Ave for peri	Months	Pre-outage	Months	Post-Outage	Months	% increase
		10/1/89-8/31	47.7	U1 4/10/92	30.7	U1 4/27/92	16.4	
				U2 10/25/91	25.1	U2 12/7/91	21.1	
NOx DEA	U1	0.380		0.377		0.385		2.1
	U2	0.361		0.350		0.374		6.8
	IGS	0.370		0.364		0.379		4.4
NOx 30DRA	U1	0.378		0.375		0.383		2.2
	U2	0.360		0.349		0.372		6.7
	IGS	0.369		0.362		0.378		4.4
	U1 DEA	U1 30DRA	U2 DEA	U2 30DRA				
10/1/89	0.39	0.36	0.39	0.33				
10/2/89	0.40	0.36	0.37	0.33				
10/3/89	0.39	0.36	0.37	0.33				
10/4/89			0.36	0.33				

IP7_004101

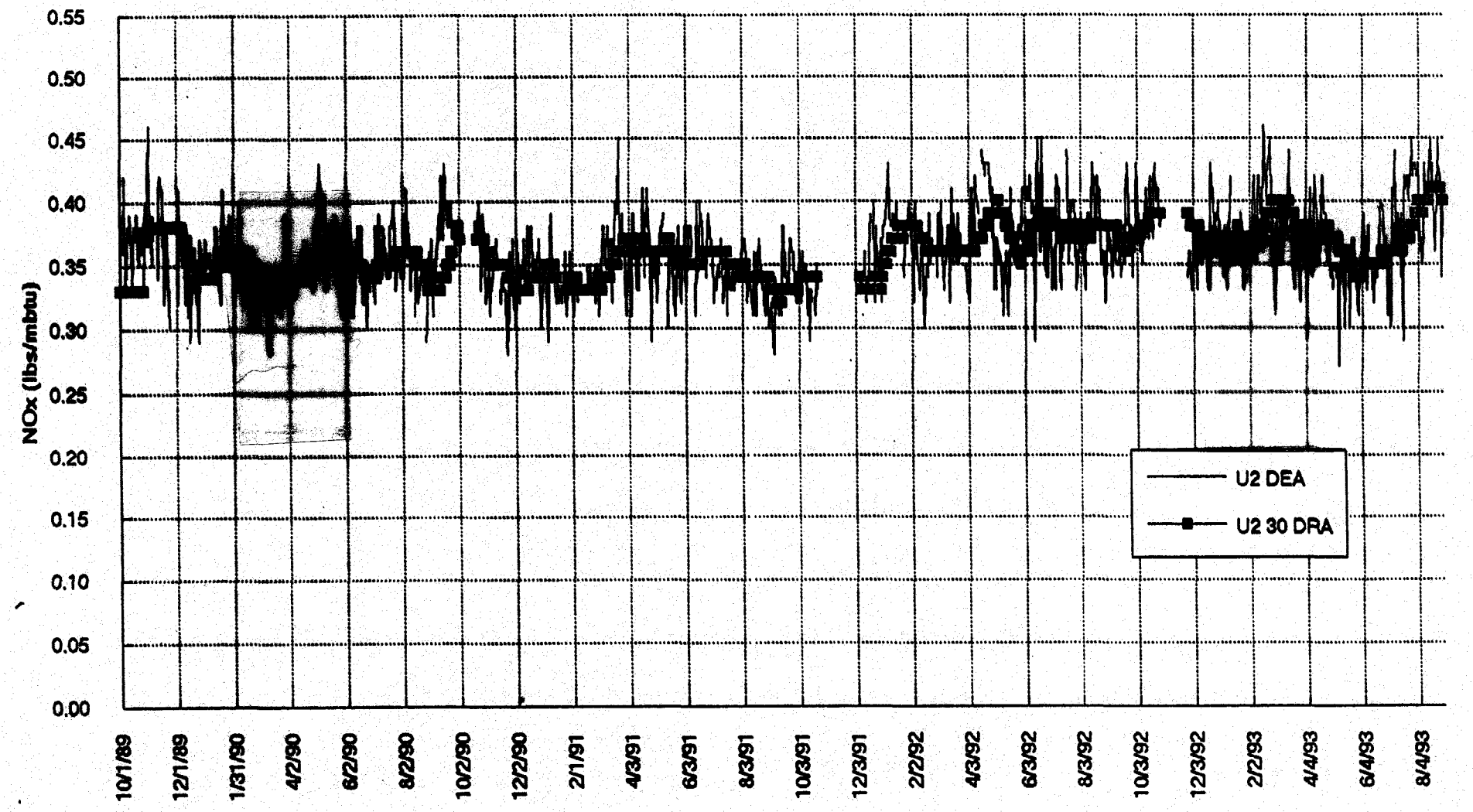
IGS Units 1 and 2 NOX DEA and 30DRA Values



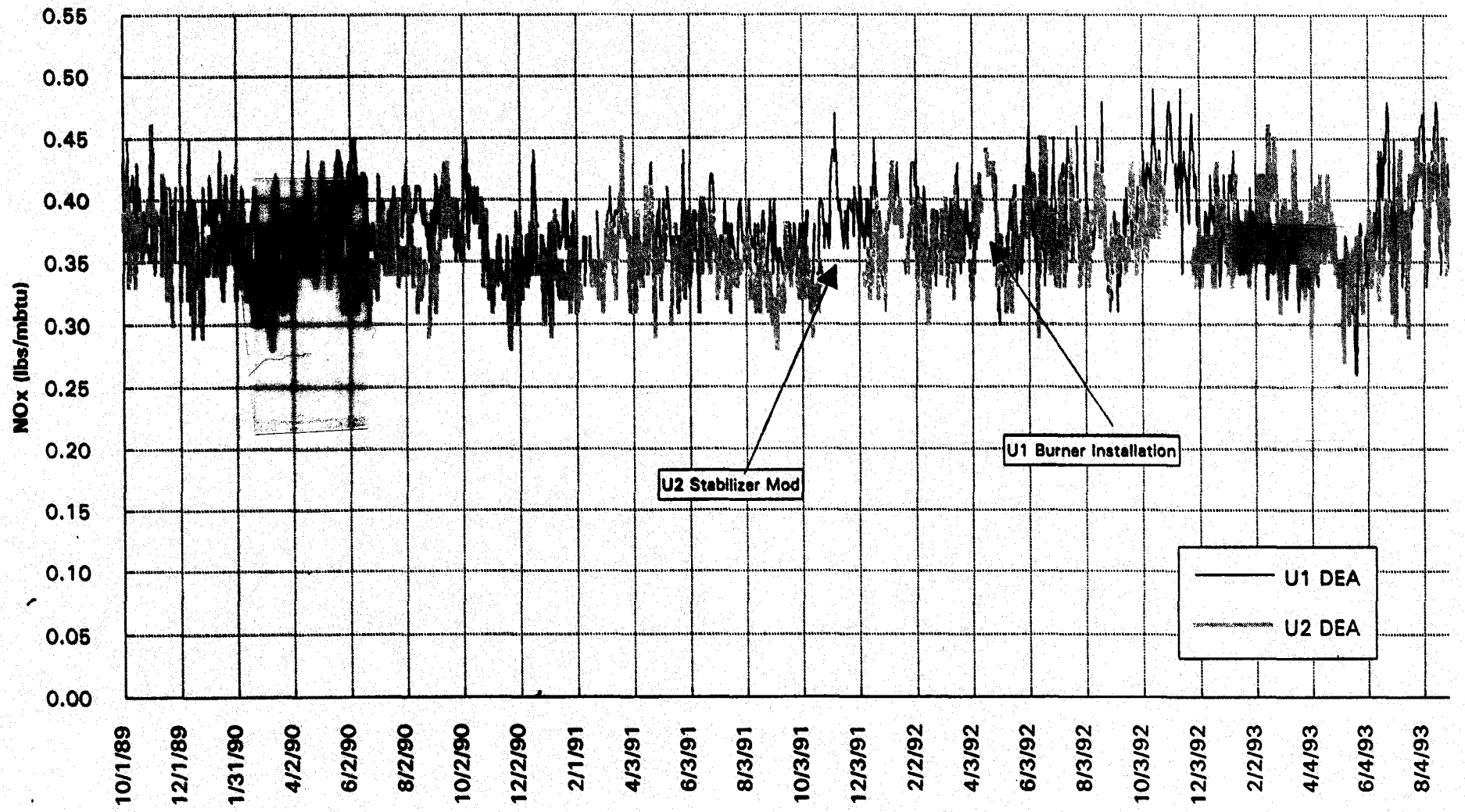

IGS Unit 1 NOx DEA and 30DRA Values
NOx (lbs/mbtu)
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10/1/89
12/1/89
1/31/90
4/2/90
6/2/90
8/2/90
10/2/90
12/2/90
2/1/91
4/3/91
6/3/91
8/3/91
10/3/91
12/3/91
2/2/92
4/3/92
6/3/92
8/3/92
10/3/92
12/3/92
2/2/93
4/4/93
6/4/93
8/4/93
U1 DEA
U1 30DRA

IP7_004103

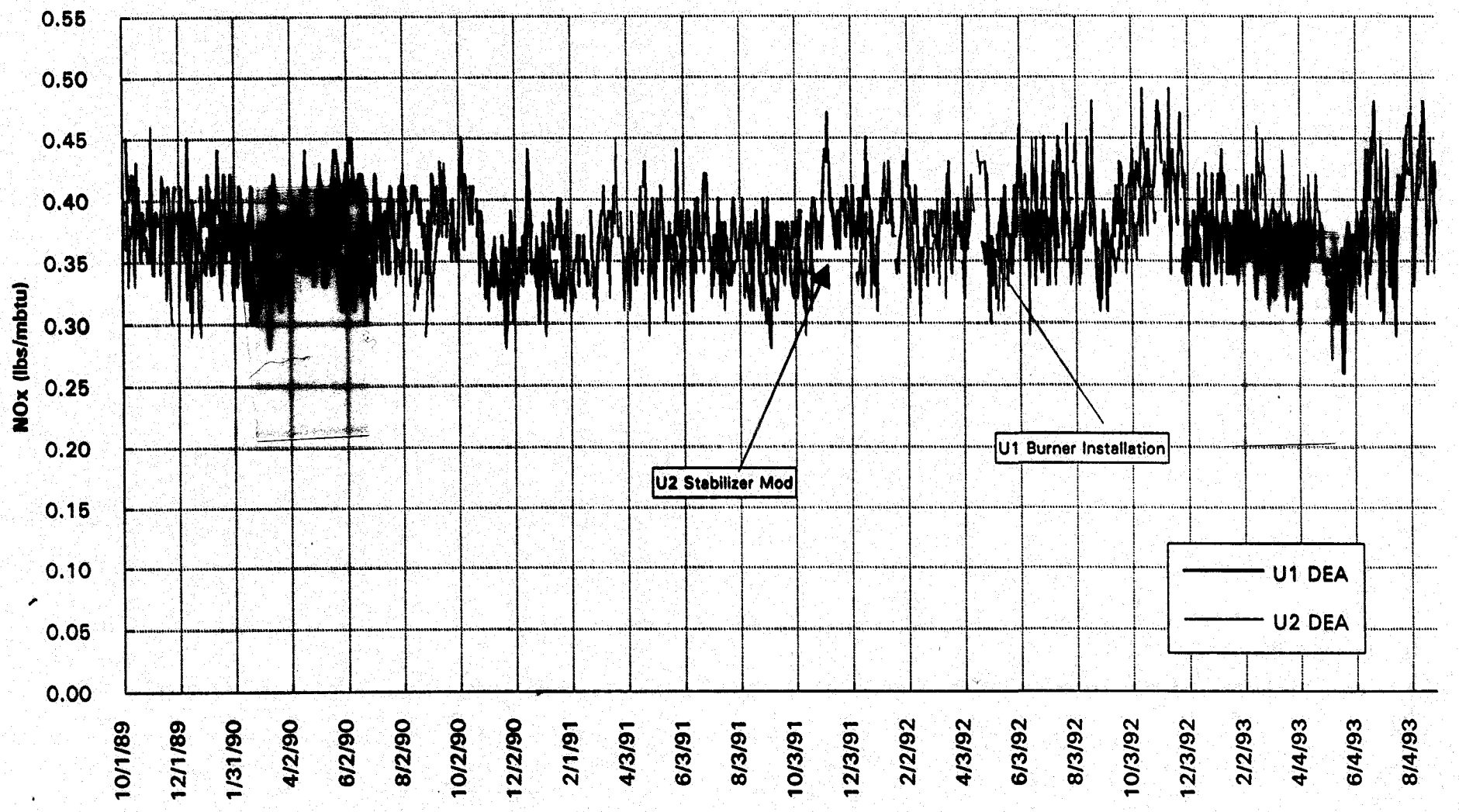
IGS Unit 2 NOx DEA and 30DRA Values

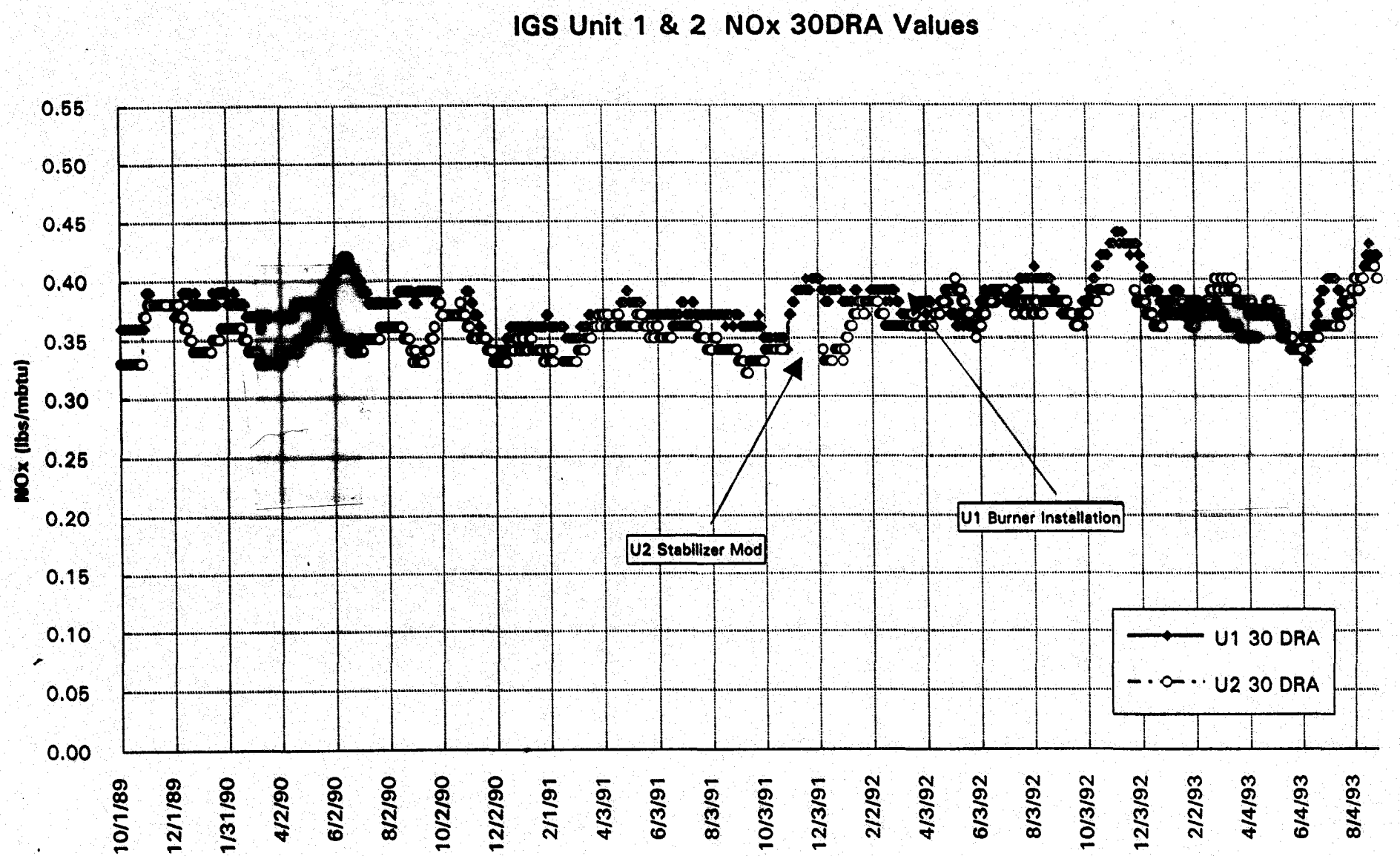


IGS Unit 1 & 2 NOx DEA Values

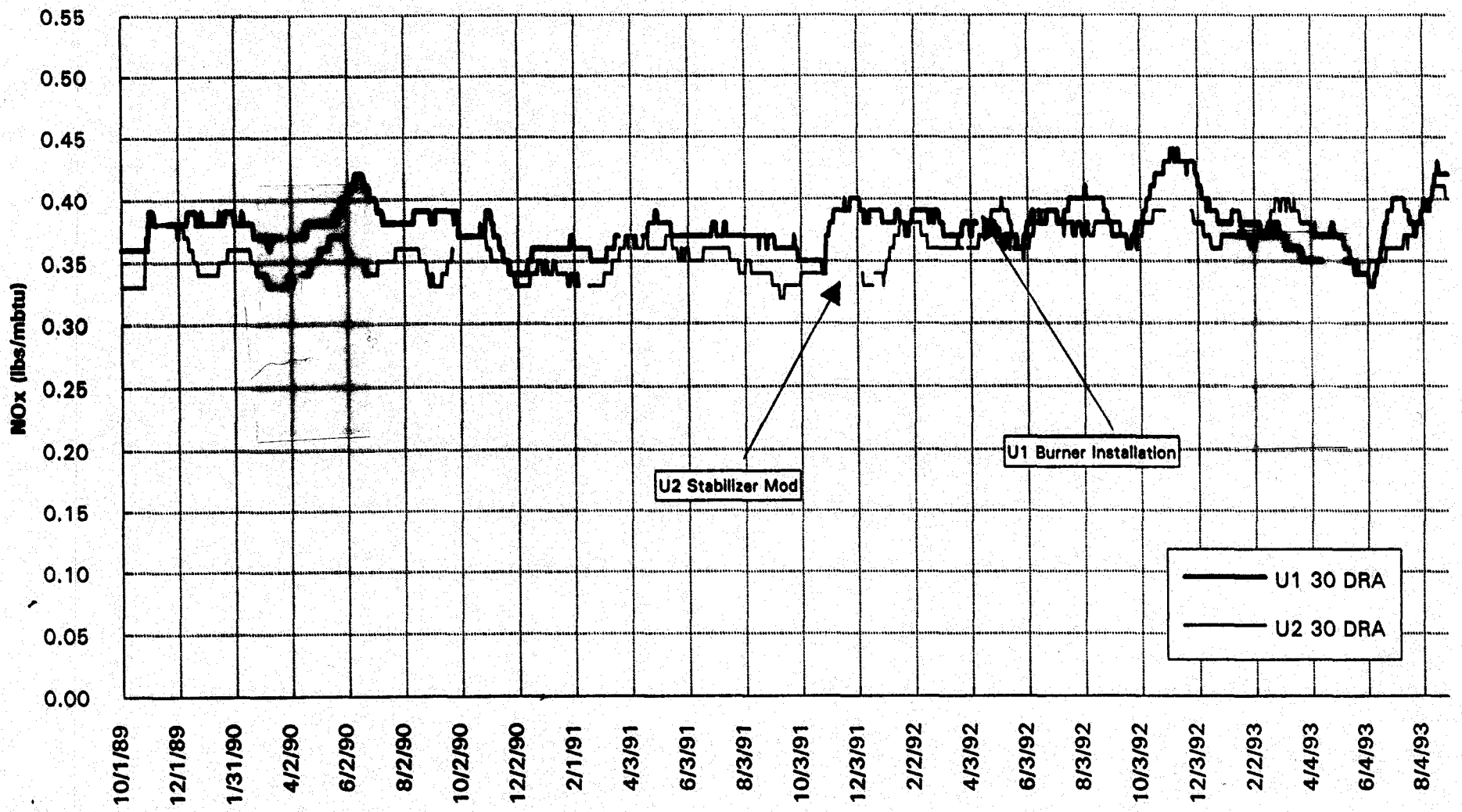


IGS Unit 1 & 2 NOx DEA Values




IGS Unit 1 & 2 NOx 30DRA Values
NOx (lbs/mbtu)
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
10/1/89
12/1/89
1/31/90
4/2/90
6/2/90
8/2/90
10/2/90
12/2/90
2/1/91
4/3/91
6/3/91
8/3/91
10/3/91
12/3/91
2/2/92
4/3/92
6/3/92
8/3/92
10/3/92
12/3/92
2/2/93
4/4/93
6/4/93
8/4/93
U2 Stabilizer Mod
U1 Burner Installation
U1 30 DRA
U2 30 DRA

IGS Unit 1 & 2 NOx 30DRA Values



IGS Unit 1 and 2	CEM NOx Values		Daily Averages and 30 Day Rolling Averages					
For 10/1/89 thru 8/31/93								
		Ave for pe	Months	Pre-outage	Months	Post-Outag	Months	% increase
		10/1/89-8/31	47.7	U1 4/10/92	30.7	U1 4/27/92	16.4	
				U2 10/25/9	25.1	U2 12/7/91	21.1	
NOx DEA	U1	0.380		0.377		0.385		2.1
	U2	0.361		0.350		0.374		6.8
	IGS	0.370		0.364		0.379		4.4
NOx 30DR	U1	0.378		0.375		0.383		2.2
	U2	0.360		0.349		0.372		6.7
	IGS	0.369		0.362		0.378		4.4
	U1 DEA	U1 30DRA	U2 DEA	U2 30DRA				
10/1/89	0.39	0.36	0.39	0.33				
10/2/89	0.40	0.36	0.37	0.33				
10/3/89	0.39	0.36	0.37	0.33				
10/4/89			0.36	0.33				
10/5/89	0.45	0.36	0.37	0.33				
10/6/89	0.43	0.36	0.42	0.33				
10/7/89	0.40	0.36	0.33	0.33				
10/8/89	0.40	0.36	0.35	0.33				
10/9/89	0.41	0.36	0.38	0.33				
10/10/89	0.41	0.36	0.37	0.33				
10/11/89	0.42	0.36	0.39	0.33				
10/12/89	0.42	0.36	0.38	0.33				
10/13/89	0.39	0.36	0.37	0.33				
10/14/89	0.34	0.36	0.33	0.33				
10/15/89	0.39	0.36	0.36	0.33				
10/16/89	0.43	0.36	0.38	0.33				
10/17/89	0.40	0.36	0.37	0.33				
10/18/89	0.39	0.36	0.39	0.33				
10/19/89	0.41	0.36	0.39	0.33				
10/20/89	0.36	0.36	0.36	0.33				
10/21/89	0.35	0.36	0.35	0.33				
10/22/89	0.39	0.36	0.38	0.33				
10/23/89	0.39	0.36	0.36	0.33				
10/24/89	0.37	0.36	0.38	0.33				
10/25/89			0.36	0.33				
10/26/89			0.38	0.33				
10/27/89	0.37	0.36	0.38	0.37				
10/28/89	0.35	0.36	0.40	0.37				
10/29/89	0.35	0.36	0.38	0.37				
10/30/89	0.36	0.39	0.38	0.37				
10/31/89	0.35	0.39	0.42	0.37				
11/1/89	0.39	0.39	0.46	0.38				
11/2/89	0.36	0.39	0.39	0.38				
11/3/89	0.34	0.39	0.39	0.38				
11/4/89	0.34	0.39	0.35	0.38				
11/5/89	0.38	0.38	0.39	0.38				

Fly Ash Loss on Ignition Summary

	Unit 1	Unit 2	Station
LOI average over entire period (9/91-9/93)	0.72%	0.60%	0.66%
LOI average before modifications	0.65%	0.57%	0.61%
LOI average after modifications	0.75%	0.60%	0.68%
% Change	15.6%	5.8%	11.0%

IP7_004110

Fly Ash Loss On Ignition (LOI) Summary (based on Pozzolantic analysis)

For 1/91 thru 9/93 IGS Unit 1 and 2, east and west

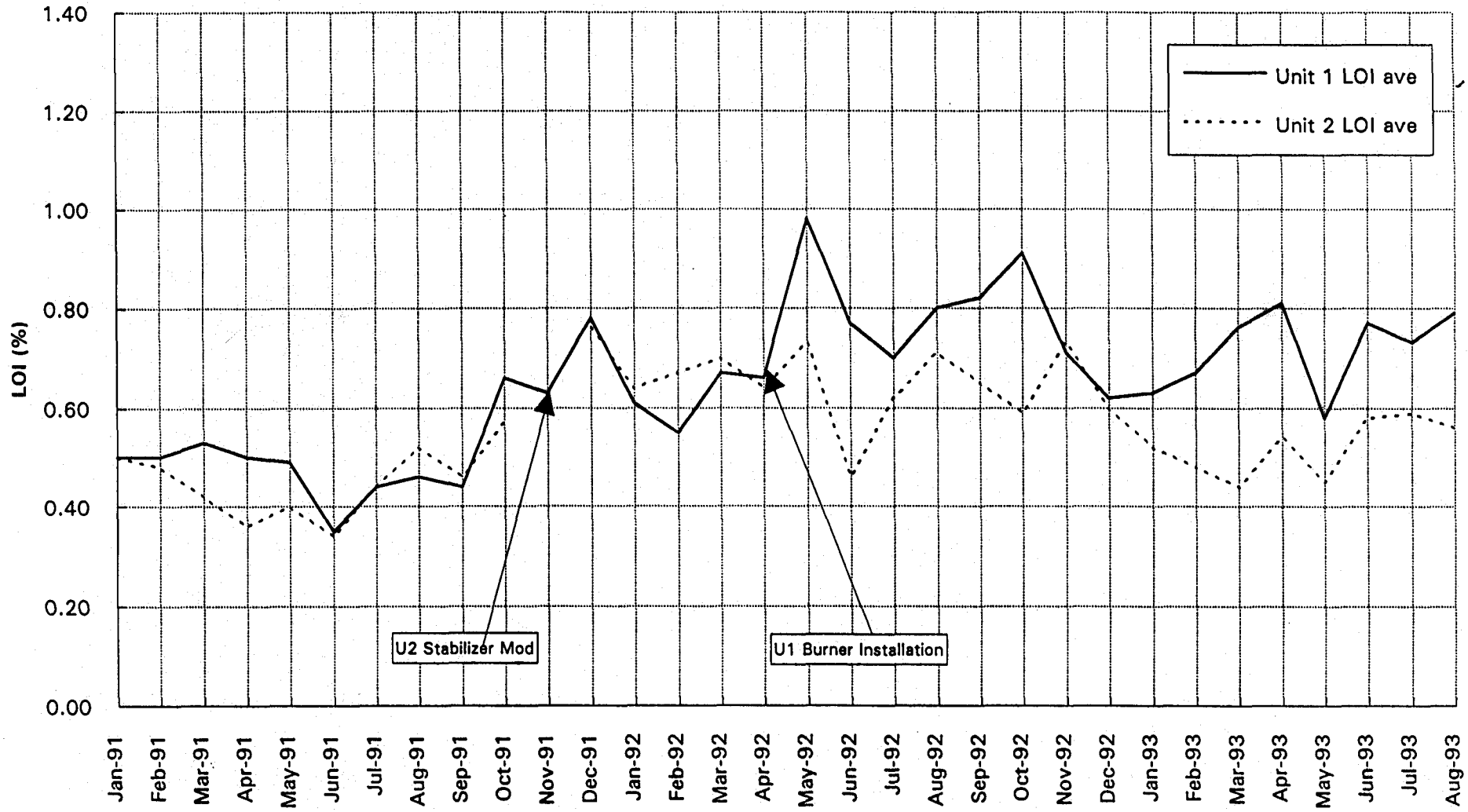
	Ave for per months		Pre-outage	months	Post-Outage	months	% increase
	1/91-9/93	33	U1 4/10/92	16	U1 4/27/92	17	
			U2 10/25/91	10	U2 12/7/91	22	
U1	0.65		0.55		0.75		36.5
U2	0.56		0.45		0.61		34.9
IGS	0.60		0.50		0.68		35.8
New	9/91-9/93	24	U1 4/10/92	7	U1 4/27/92	17	
Baseline			U2 10/25/91	1	U2 12/7/91	22	
U1	0.72		0.65		0.75		14.9
U2	0.60		0.57		0.61		6.3
IGS	0.66		0.61		0.68		10.9

	1/91 - 9/91	last 9 months	7/93-9/93
U1	0.47	U1	0.70
U2	0.44	U2	0.54
IGS	0.45	IGS	0.62

	Unit 1			Unit 2		
	East	West	Total	East	West	Total
Jan-91	0.51	0.51	0.50	0.50	0.50	0.50
Feb-91	0.49	0.51	0.50	0.48	0.48	0.48
Mar-91	0.54	0.51	0.53	0.42	0.42	0.42
Apr-91	0.52	0.47	0.50	0.39	0.34	0.36
May-91	0.47	0.48	0.49	0.40	0.41	0.40
Jun-91	0.34	0.34	0.35	0.33	0.34	0.34
Jul-91	0.45	0.42	0.44	0.42	0.44	0.44
Aug-91	0.45	0.46	0.46	0.52	0.51	0.52
Sep-91	0.44	0.42	0.44	0.45	0.46	0.46
Oct-91	0.66	0.66	0.66	0.55	0.59	0.57
Nov-91	0.62	0.65	0.63			
Dec-91	0.72	0.84	0.78	0.81	0.71	0.76
Jan-92	0.57	0.65	0.61	0.56	0.72	0.64
Feb-92	0.56	0.53	0.55	0.63	0.71	0.67
Mar-92	0.74	0.59	0.67	0.65	0.74	0.70
Apr-92	0.63	0.68	0.66	0.55	0.72	0.64
May-92	1.13	0.84	0.98	0.56	0.92	0.73
Jun-92	0.83	0.72	0.77	0.38	0.54	0.46
Jul-92	0.72	0.67	0.70	0.54	0.69	0.62
Aug-92	0.84	0.75	0.80	0.62	0.80	0.71
Sep-92	0.93	0.70	0.82	0.55	0.75	0.65
Oct-92	0.91	0.91	0.91	0.52	0.65	0.59
Nov-92	0.79	0.64	0.71	0.71	0.74	0.73
Dec-92	0.63	0.62	0.62	0.62	0.59	0.60
Jan-93	0.63	0.62	0.63	0.54	0.50	0.52
Feb-93	0.70	0.64	0.67	0.46	0.50	0.48
Mar-93	0.85	0.66	0.76	0.44	0.43	0.44
Apr-93	0.73	0.88	0.81	0.57	0.51	0.54
May-93	0.57	0.58	0.58	0.48	0.41	0.45
Jun-93	0.78	0.76	0.77	0.53	0.63	0.58
Jul-93	0.72	0.74	0.73	0.53	0.65	0.59
Aug-93	0.74	0.83	0.79	0.50	0.61	0.56
Sep-93	0.65	0.68	0.67	0.68	0.65	0.67

SUM-LOI.XLS

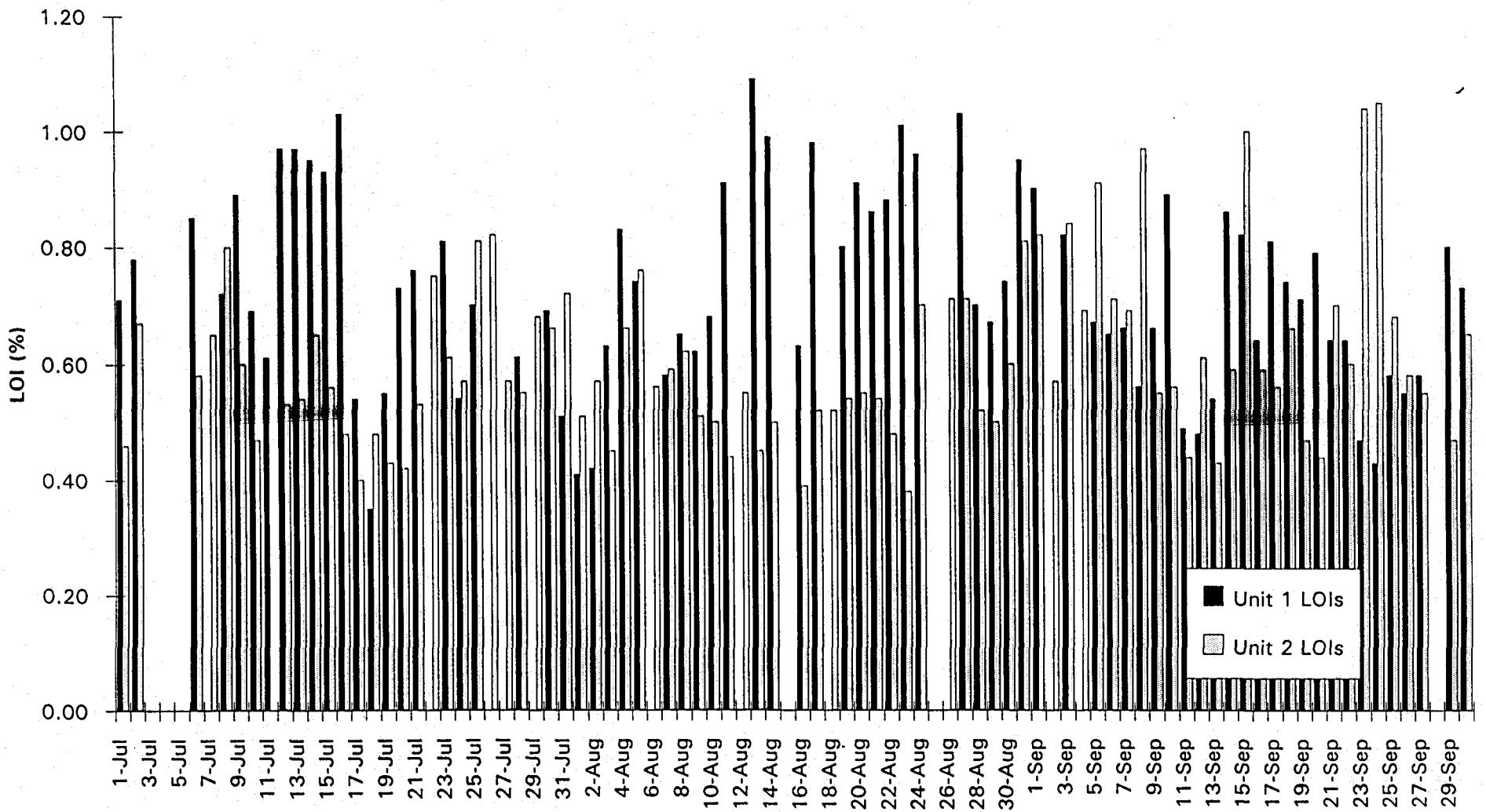
IGS Unit 1 and 2, Historical LOI Average Values



SUM-LOI.XLC

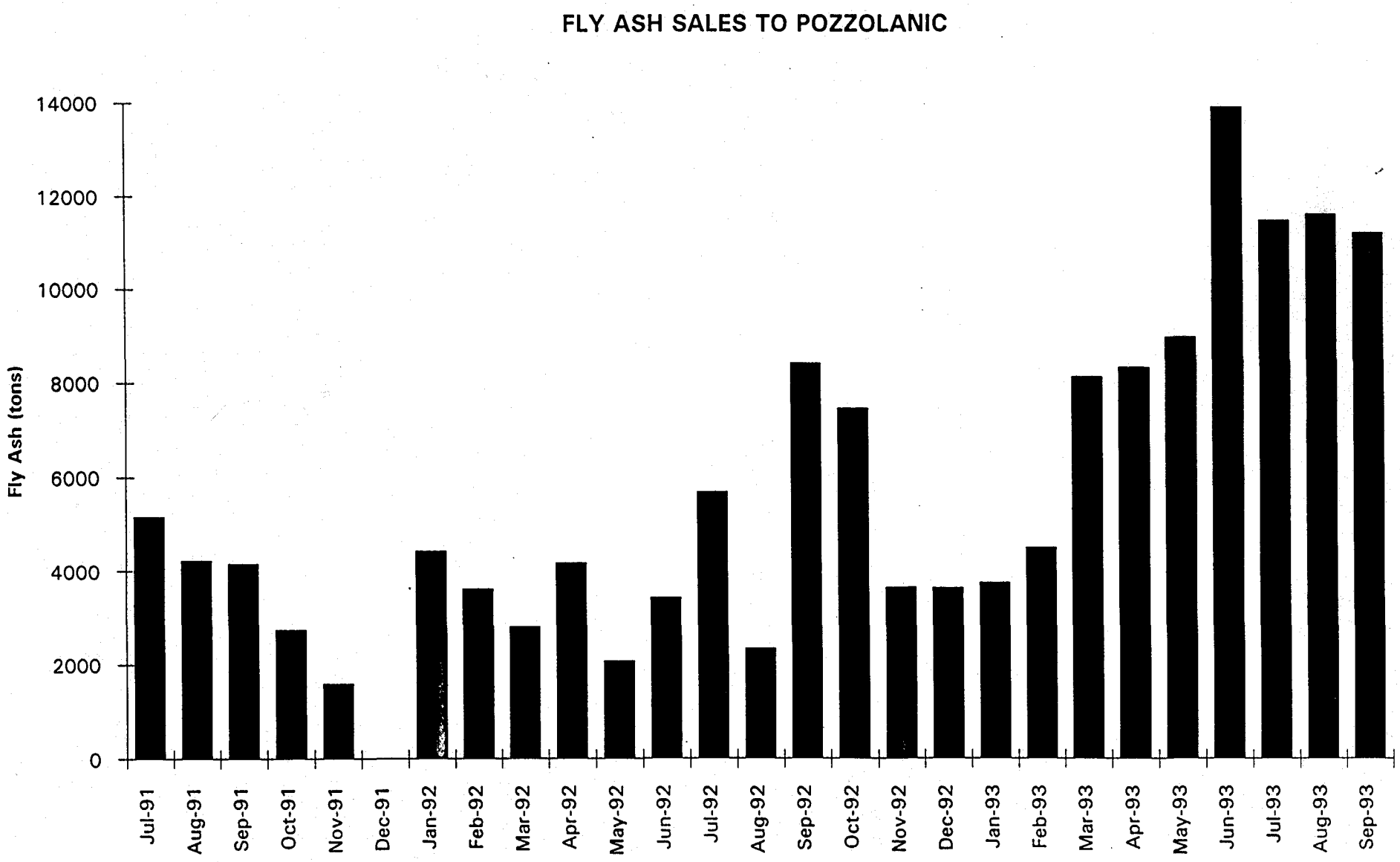
IP7_004112

Daily Fly Ash LOI Values For July, August and September 1993



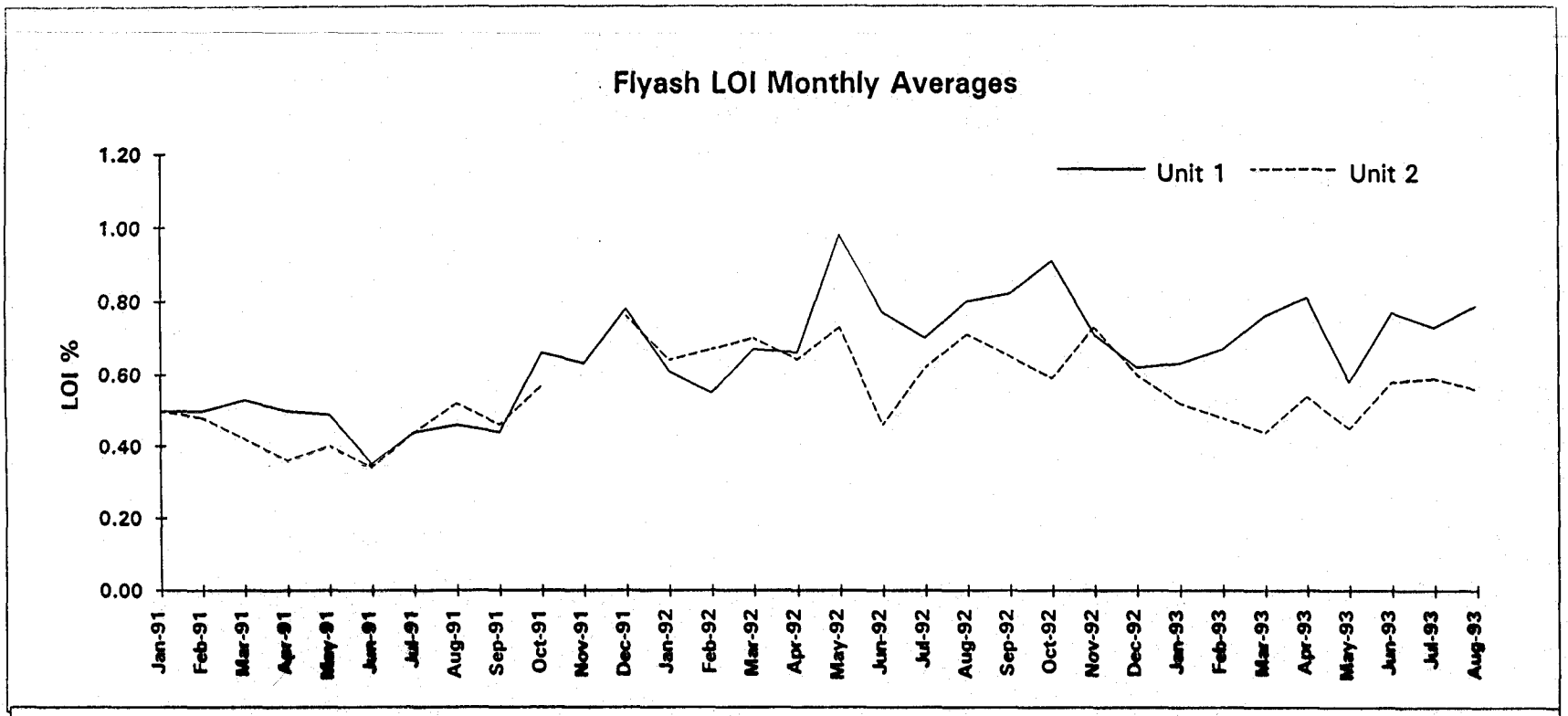
93VALUES.XLC

IP7_004113



FA-SALES.XLC

IP7_004114


Flyash LOI Monthly Averages
Unit 1
Unit 2
LOI %
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Jan-91
Feb-91
Mar-91
Apr-91
May-91
Jun-91
Jul-91
Aug-91
Sep-91
Oct-91
Nov-91
Dec-91
Jan-92
Feb-92
Mar-92
Apr-92
May-92
Jun-92
Jul-92
Aug-92
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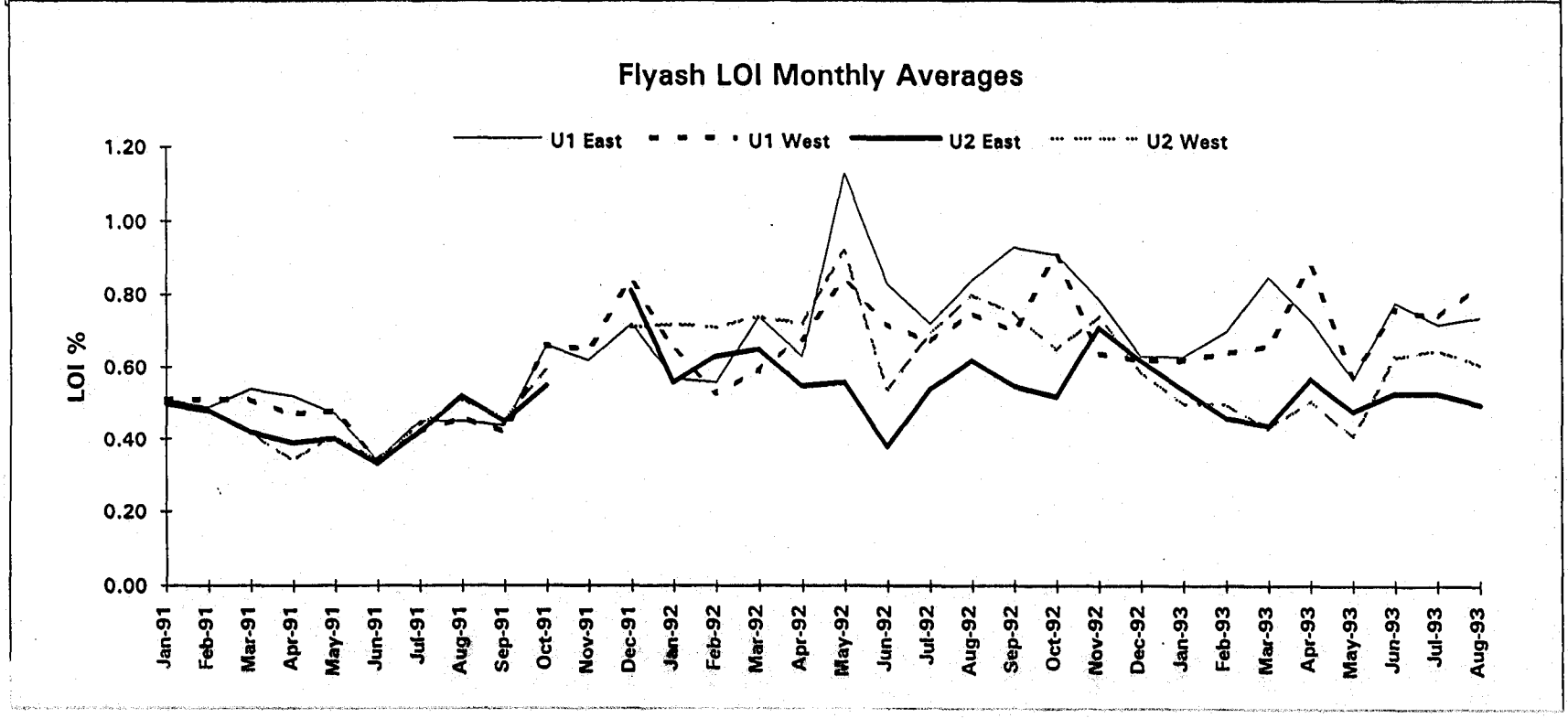
Jan-93
Feb-93
Mar-93
Apr-93
May-93
Jun-93
Jul-93
Aug-93


Flyash LOI Monthly Averages
U1 East
U1 West
U2 East
U2 West
LOI %
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Jan-91
Feb-91
Mar-91
Apr-91
May-91
Jun-91
Jul-91
Aug-91
Sep-91
Oct-91
Nov-91
Dec-91
Jan-92
Feb-92
Mar-92
Apr-92
May-92
Jun-92
Jul-92
Aug-92
Sep-92
Oct-92
Nov-92
Dec-92
Jan-93
Feb-93
Mar-93
Apr-93
May-93
Jun-93
Jul-93
Aug-93

January 1991Flyash LOI Monthly Summary

1991		Unit 1 East	Unit 1 West	Unit 1 Ave	Unit 2 East	Unit 2 West	Unit 2 Ave	Approx tons Saved	Unit 1 Foam Index East	Unit 1 Foam Index West	Unit 1 Foam Index Ave	Unit 2 Foam Index East	Unit 2 Foam Index West	Unit 2 Foam Index Ave	O/S Pulverizer Unit 1	O/S Pulverizer Unit 2
1-Jan	AM															
	PM															
2-Jan	AM	0.54	0.41	0.49	0.49	0.38	0.46									
	PM	0.41	0.63	0.50	0.57	0.40	0.49									
3-Jan	AM	0.61	0.58	0.60												
	PM	0.47	0.61	0.54	0.60	0.57	0.58									
4-Jan	AM	0.40	0.37	0.38	0.56	0.39	0.48									
	PM				0.45	0.30	0.34									
5-Jan	AM		0.42	0.42	0.48	0.47	0.48									
	PM	0.32		0.32	0.42	0.39	0.38									
6-Jan	AM	0.35	0.36	0.36	0.41	0.42	0.42									
	PM															
7-Jan	AM															
	PM	0.27	0.38	0.33	0.33	0.30	0.32									
8-Jan	AM	0.35	0.30	0.32	0.36	0.28	0.32									
	PM	0.62	0.57	0.60	0.41	0.47	0.41									
9-Jan	AM	0.49	0.42	0.44	0.39	0.47	0.46									
	PM	0.23	0.44	0.37	0.30	0.33	0.32									
10-Jan	AM	0.34	0.40	0.38	0.35	0.40	0.37									
	PM	0.32	0.42	0.36	0.44	0.45	0.44									
11-Jan	AM	0.35	0.42	0.39	0.47	0.61	0.55									
	PM	0.47	0.46	0.47	0.45	0.54	0.43									
12-Jan	AM	0.54	0.44	0.49	0.64	0.52	0.53									
	PM	0.54	0.42	0.48	0.57	0.54	0.56									
13-Jan	AM	0.63	0.75	0.63	0.70	0.47	0.58									
	PM	0.67	0.79	0.67	0.48	0.47	0.60									
14-Jan	AM	0.98	0.67	0.77	0.46	0.53	0.49									
	PM	0.57	0.30	0.46	0.39	0.32	0.35									
15-Jan	AM	0.47	0.40	0.39	0.35	0.42	0.37									
	PM	0.60	0.42	0.52	0.39	0.34	0.36									
16-Jan	AM	0.53	0.43	0.48	0.25	0.39	0.32									
	PM	0.49	0.47	0.43	0.34	0.34	0.32									
17-Jan	AM				0.34	0.37	0.33									
	PM				0.32	0.36	0.37									
18-Jan	AM	0.39	0.47	0.43	0.39	0.38	0.39									
	PM	0.36	0.27	0.32	0.36	0.32	0.36									
19-Jan	AM	0.46	0.51	0.44	0.43	0.37	0.41									
	PM	0.31	0.40	0.35	0.38	0.33	0.35									
20-Jan	AM	0.32	0.31	0.31	0.37	0.42	0.38									
	PM															
21-Jan	AM	0.30	0.27	0.27	0.37	0.38	0.36									
	PM	0.32	0.35	0.32	0.36	0.35	0.36									
22-Jan	AM															
	PM	0.39	0.45	0.41	0.48	0.65	0.52									
23-Jan	AM	0.48	0.51	0.49	0.57	0.59	0.59									
	PM	0.69	0.71	0.69	0.90	0.94	0.92									
24-Jan	AM	0.68	0.75	0.71	0.73	0.96	0.85									
	PM	0.47	0.51	0.50	0.68	0.62	0.65									
25-Jan	AM	0.44	0.52	0.47	0.63	0.73	0.68									
	PM	0.64	0.64	0.64	0.48	0.70	0.58									
26-Jan	AM	0.61	0.62	0.60	0.50	0.70	0.58									
	PM	0.52	0.47	0.52	0.57	0.43	0.50									
27-Jan	AM	0.73	0.73	0.73	0.67	0.73	0.70									
	PM															
28-Jan	AM	0.71	0.70	0.71	0.80	0.73	0.81									
	PM	0.74	0.67	0.70	0.80	0.77	0.75									
29-Jan	AM	0.64	0.63	0.64	0.78	0.77	0.78									
	PM	0.65	0.73	0.69	0.67	0.58	0.62									
30-Jan	AM	0.79	0.71	0.75	0.80	0.72	0.76									
	PM	0.71	0.64	0.68	0.56	0.59	0.57									
31-Jan	AM	0.61	0.55	0.58	0.44	0.67	0.56									
	PM				0.51	0.53	0.52									
averages		0.51	0.51	0.50	0.50	0.50	0.50	0	Approx Total Tons Saved							

IP7_004116

DRAFT

INTERMOUNTAIN POWER SERVICE CORPORATION
TECHNICAL REPORT- EXECUTIVE SUMMARY

TITLE: Burner Modifications made at the Intermountain Generation Station, Units 1 and 2.

SUMMARY: In November of 1991, flame stabilizers were added to the burners and the register lineup was changed on Unit 2. In April of 1992, new burners with stabilizers were installed on Unit 1. In addition to these modifications, the following was also conducted on both units: extensive secondary air flow testing and balancing, primary air/coal flow balancing and a new burner register setup philosophy adapted. These modifications were required due to mechanical and structural thermal degradation observed on the burners. This was primarily due to an overheating condition caused when burners were in an out-of-service condition.

CONCLUSIONS: Based on windbox and fireside inspections since modifications, the burners are reported to be in excellent condition. The high rate of mechanical and structural degradation due to overheat conditions have been curtailed. This has been accomplished without changes to the operating criteria of the burners or boiler, which would have had adverse impact on performance or emissions.

The new burner setup has functioned well, without overheating or pluggage to the flame stabilizers. LOIs, NO_x levels and flame stability have all proved satisfactory. Modifications made to the burners have been effective and long life of the burners has been renewed.

It is not known, however, if we can expect full life out of Unit 2's burners since they were not replaced. At this time, no foreseeable replacement will be required over the next five to ten years. However, replacement may be inevitable due to pre-existing damage.

Coal nozzle flaring has been observed on some of the burners during outage inspections. This seems to occur randomly and effects 5 to 10 percent of the burners.

RECOMMENDATIONS: Continue to maintain existing burner register setup and flame stabilizer installation. Periodic inspections of the burners will also be continued during major outages.

Additional investigation and testing needs to be conducted to address the nozzle tip overheating, causing some to droop or become out of round. This may be addressed by a materials change or possibly by moving the flame front further out.

More analysis into burner line aerodynamics needs to be conducted to address burner line fires. Coal transport line fires, however, is an unrelated issue to the mechanical degradation observed on the burners.

PREPARED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____
Superintendent

APPROVED BY: _____ DATE: _____
President and Chief Executive Officer