

OIL CONSERVATION DIVISION

CF-10103
R-9359

August 21, 1995

Sage Energy Company
P.O. Drawer 3068
Midland, Texas 79702-3068

Attn: Mr. Jay H. Hardy

**RE: Injection Pressure Increase North Vacuum (Abo) North
Unit Waterflood Project Lea County, New Mexico**

Dear Mr. Hardy:

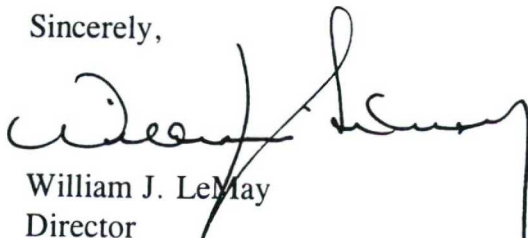
Reference is made to your request dated August 11, 1995 to increase the surface injection pressure on four wells in the above referenced waterflood project. This request is based on a step rate tests conducted between August 1 and 4, 1994. The results of the test have been reviewed by my staff and we feel an increase in injection pressure on these wells is justified at this time.

You are therefore authorized to increase the surface injection pressure on the following wells:

Well and Location	Maximum Injection Surface Pressure
NVANU 6C Well No.1, Unit B, Section 1 of Township 17 South	2740 PSIG
NVANU 7C Well No.2, Unit H, Section 1 of Township 17 South	2610 PSIG
NVANU 21A Well No.1, Unit F, Section 2 of Township 17 South	3480 PSIG
NVANU 15 Well No.1, Unit N, Section 36 of Township 16 South	3120 PSIG
All located in Range 34 East, Lea County, New Mexico.	

The Division Director may rescind this injection pressure increase if it becomes apparent that the injected water is not being confined to the injection zone or is endangering any fresh water aquifers.

Sincerely,



William J. LeMay
Director

Injection Pressure Increase
Sage Energy Company
August 21, 1995
Page 2

WJL/BES

cc: Oil Conservation Division - Hobbs
File: Case File No.10103; PSI-X 3rd QTR 95

lat

SAGE ENERGY COMPANY

P. O. DRAWER 3068

MIDLAND, TEXAS 79702

915/683-5271

PSI-X N/R
OIL CONSERVATION DIVISION
RECEIVED
'95 AUG 11 PM 8 52

August 8, 1995

State of New Mexico
Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87504

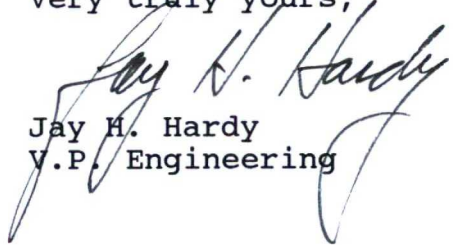
Attention: Mr. David Catanach, Petroleum Engineer

Re: Injection Pressure Increase on Four Water Injection Wells
North Vacuum (Abo) North Unit (NVANU) (Order No. R-9359)
Lea County, New Mexico

Dear Mr. Catanach:

Sage Energy Company respectfully requests permission from the OCD to increase the allowable surface injection pressures in the subject wells (see attachment) from 1723 psig to the pressures as shown. This request is based on step rate tests which were run on the injection wells from August 1 - 4, 1995, by John West Engineering Company (copies attached).

Very truly yours,


Jay H. Hardy
V.P. Engineering

JHH/tjs
Attachments
cc: OCD - Hobbs, Bonnie Pritchard
Well Files

Sage Energy Company
North Vacuum (Abo) North Unit
Lea County, New Mexico

REQUESTED SURFACE INJECTION PRESSURES

<u>WELL AND LOCATION</u>	<u>MAXIMUM INJECTION SURFACE PRESSURE</u>
Section 1, Township 17 South <u>Range 34 East, NMPM</u>	
NVANU 6C No. 1, Unit B	2740 — 2790 PSIG
NVANU 7C No. 2, Unit H	2610 — 2660 PSIG
Section 2, Township 17 South <u>Range 34 East, NMPM</u>	
NVANU 21A No. 1, Unit F	3480 — 3530 PSIG
Section 36, Township 16 South <u>Range 34 East, NMPM</u>	
NVANU 15 No. 1, Unit N	3120 — 3180 PSIG

WEST - TEST, INC.
A SUBSIDIARY OF JOHN WEST ENGINEERING COMPANY
Hobbs, New Mexico

STEP RATE INJECTION TEST

CLIENT: SAGE ENERGY COMPANY

DATE: AUGUST 3, 1995

WELL NAME: NORTH VACUUM ABO NORTH UNIT W/W NO.1 6C NO.1
LEA COUNTY, NEW MEXICO

WO#: 95-14-1081

PERFS = 8792-8846

PACKER DEPTH = 8694

BHP GAUGE DEPTH = 8819

SURFACE ONLY

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1)-(4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
1	1:20	97.0				97.0		
	1:25	156.0	2.8	806.4	51.096	104.9	23.52	
	1:30	214.0	5.5	777.6	47.771	166.2	22.68	
	1:35	305.0	8.4	835.2	54.523	250.5	24.36	
2				806.4				
	1:40	580.0	12.2	1094.4	89.896	490.1	31.92	
	1:45	667.0	16.0	1094.4	89.896	577.1	31.92	
	1:50	751.0	19.9	1123.2	94.321	656.7	32.76	
3				1104.0				
	1:55	1037.0	24.8	1411.2	143.881	893.1	41.16	
	2:00	1189.0	29.6	1382.4	138.496	1050.5	40.32	
	2:05	1303.0	34.5	1411.2	143.881	1159.1	41.16	
4				1401.6				
	2:10	1671.0	40.8	1814.4	229.045	1442.0	52.92	
	2:15	1862.0	46.9	1756.8	215.775	1646.2	51.24	
	2:20	1993.0	53.2	1814.4	229.045	1764.0	52.92	
5				1795.2				
	2:25	2360.0	60.9	2217.6	332.008	2028.0	64.68	
	2:30	2509.0	68.6	2217.6	332.008	2177.0	64.68	
	2:35	2666.0	76.5	2275.2	348.137	2317.9	66.36	
6				2236.8				
	2:40	2992.0	85.9	2707.2	480.205	2511.8	78.96	
	2:45	3133.0	96.0	2908.8	548.447	2584.6	84.84	
	2:50	3188.0	104.9	2563.2	434.022	2754.0	74.76	
7				2726.4				
	2:55	3472.0	115.9	3168.0	642.269	2829.7	92.40	
	3:00	3540.0	126.8	3139.2	631.509	2908.5	91.56	
	3:05	3599.0	138.0	3225.6	664.039	2935.0	94.08	
				3177.6				

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1) - (4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
FALLOFF	3:10 OUT	3742.0 OF WATER	150.1	3484.8	766.114	2975.9	101.64	
	3:14	3032.0				3032.0		
	3:15	2948.0				2948.0		
	3:16	2904.0				2904.0		
	3:17	2876.0				2876.0		
	3:18	2844.0				2844.0		
	3:23	2719.0				2719.0		
	3:28	2575.0				2575.0		

△ RECORDED WELLHEAD PRESSURE
○ CORRECTED WELLHEAD PRESSURE BASED ON 2-3/8" TUBING

SAGE ENERGY COMPANY
NORTH VACUUM ABO NORTH UNIT W/W NO.1, 6C NO.1
LEA COUNTY, NEW MEXICO
STEP RATE INJECTION TEST
AUGUST 3, 1995

WELLHEAD PRESSURE PSIG

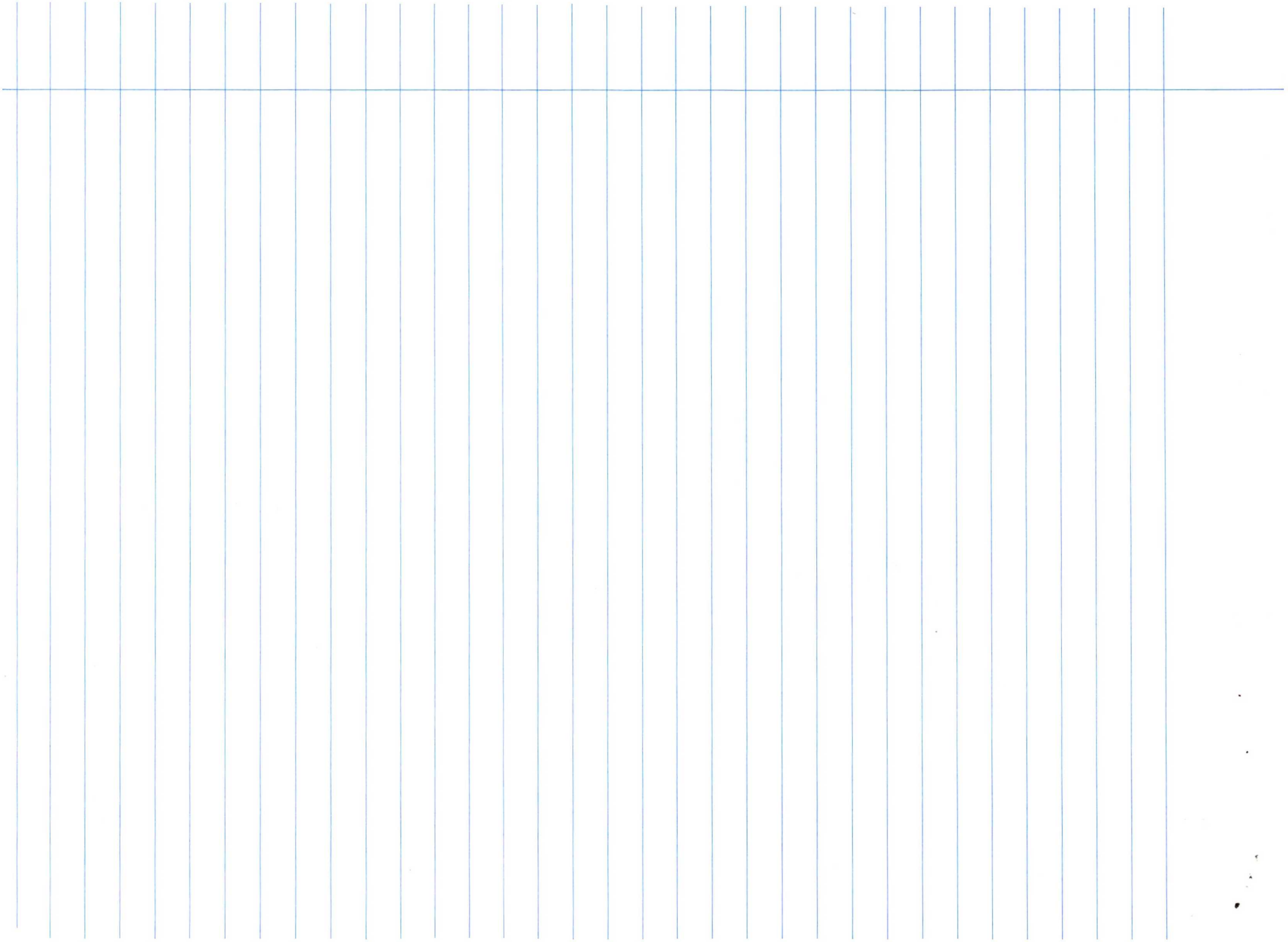
WELLHEAD PRESSURE PSIG

B W P D

3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0

3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0

800 1100 1400 1700 2000 2300 2600 2900 3200



WEST-TEST, INC.
A SUBSIDIARY OF JOHN WEST ENGINEERING COMPANY
Hobbs, New Mexico

STEP RATE INJECTION TEST

CLIENT: SAGE ENERGY COMPANY

DATE: AUGUST 4, 1995

WELL NAME: NORTH VACUUM ABO NORTH UNIT W/W NO.2 7C NO.2
LEA COUNTY, NEW MEXICO

WO#: 95-14-1082

PERFS = 8738-8851

PACKER DEPTH = 8620

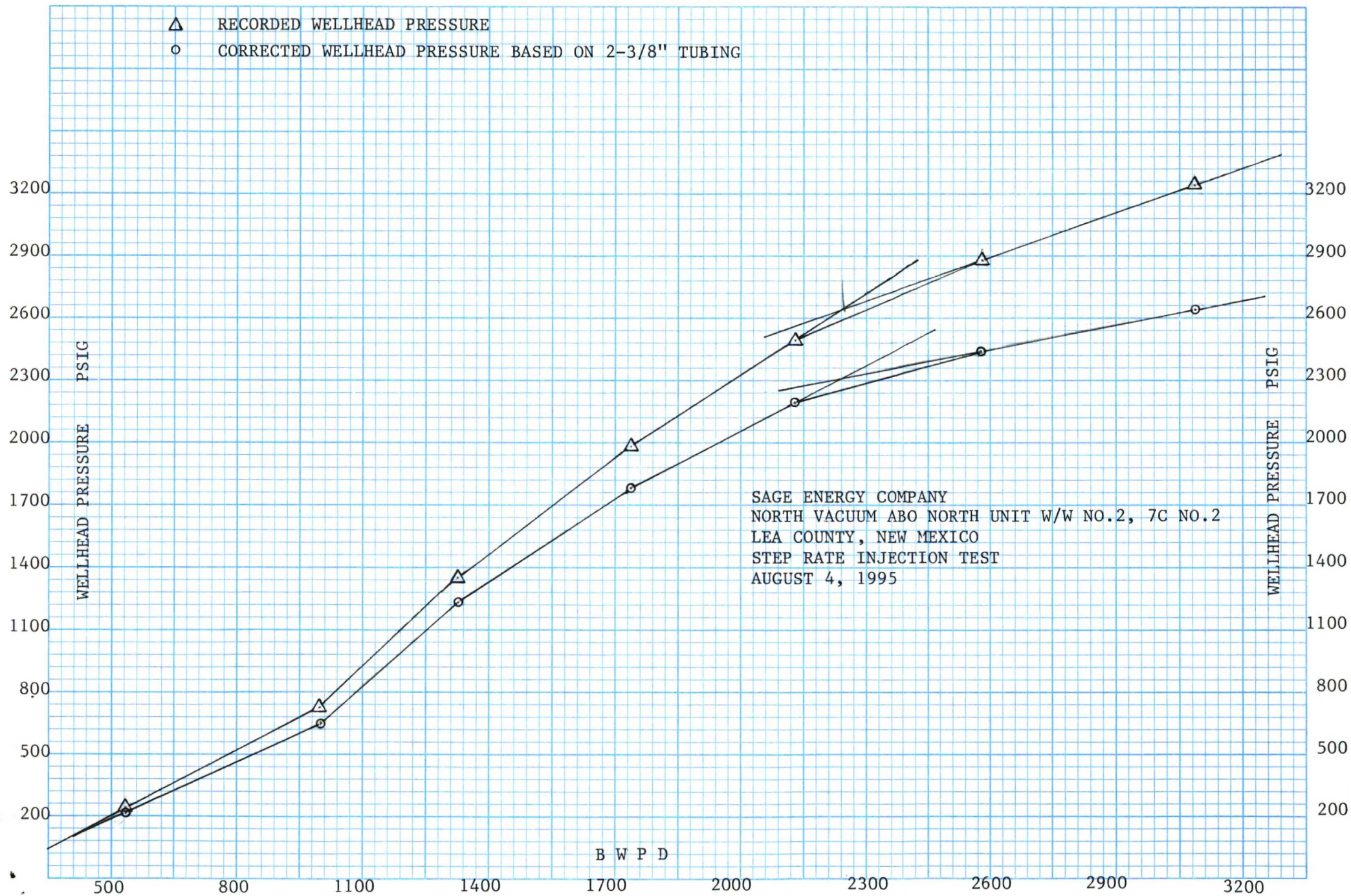
BHP GAUGE DEPTH = 8794

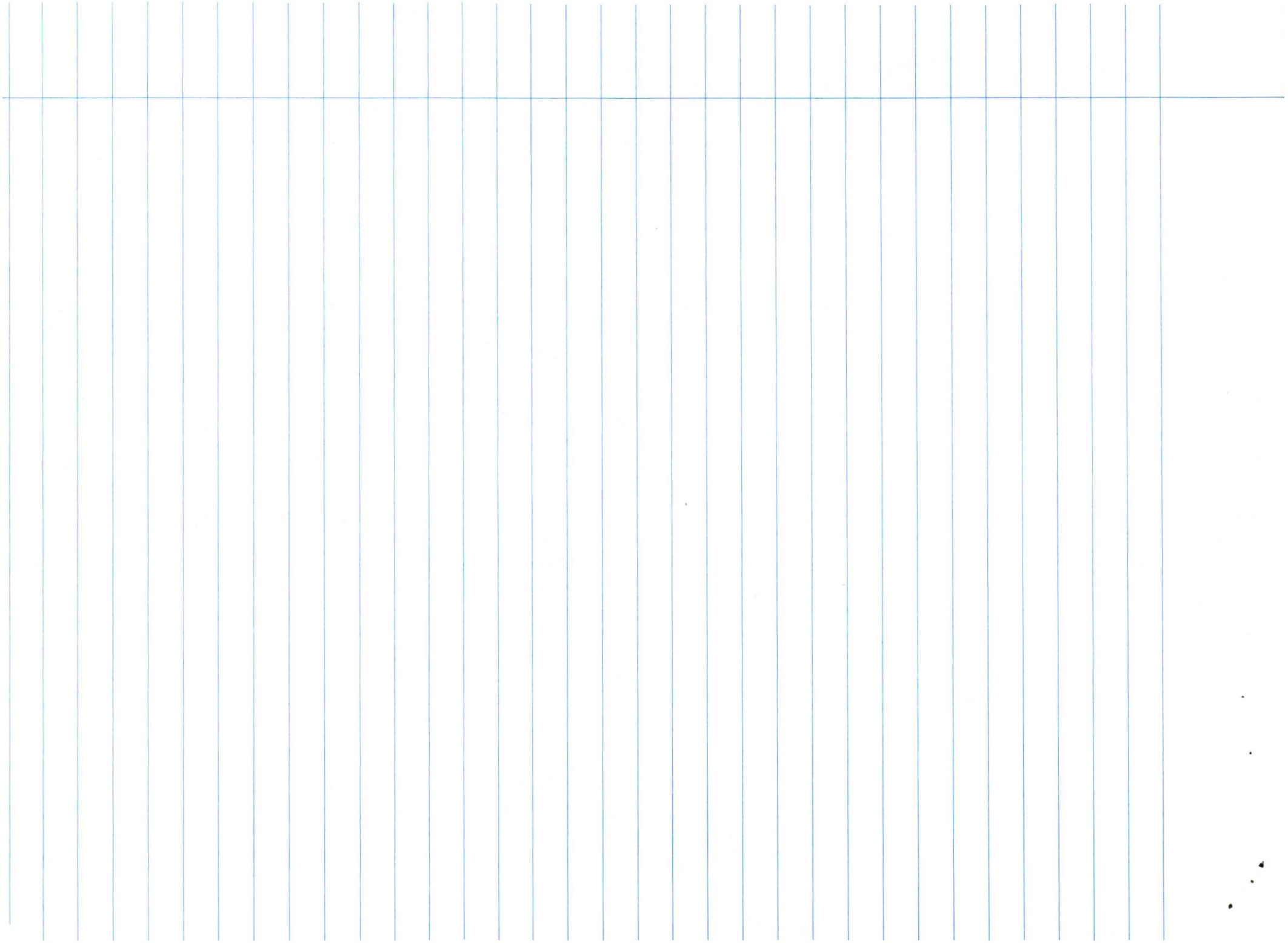
SURFACE ONLY

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1)-(4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
1	10:15	20.0				20.0		
	10:20	186.0	1.6	460.8	18.094	167.9	13.44	
	10:25	213.0	3.3	489.6	20.241	192.8	14.28	
	10:30	244.0	5.6	662.4	35.408	208.6	19.32	
				537.6				
2	10:35	516.0	9.1	1008.0	76.990	439.0	29.40	
	10:40	635.0	12.6	1008.0	76.990	558.0	29.40	
	10:45	732.0	16.0	979.2	72.970	659.0	28.56	
3				998.4				
	10:50	1051.0	20.6	1324.8	127.647	923.4	38.64	
	10:55	1222.0	25.3	1353.6	132.828	1089.2	39.48	
	11:00	1349.0	29.8	1296.0	122.561	1226.4	37.80	
4				1324.8				
	11:05	1700.0	35.9	1756.8	215.163	1484.8	51.24	
	11:10	1862.0	41.9	1728.0	208.683	1653.3	50.40	
	11:15	1987.0	47.9	1728.0	208.683	1778.3	50.40	
5				1737.6				
	11:20	2372.0	55.3	2131.2	307.600	2064.4	62.16	
	11:25	2433.0	62.7	2131.2	307.600	2125.4	62.16	
	11:30	2495.0	70.1	2131.2	307.600	2187.4	62.16	
6				2131.2				
	11:35	2725.0	79.0	2563.2	432.792	2292.2	74.76	
	11:40	2829.0	88.0	2592.0	441.831	2387.2	75.60	
	11:45	2878.0	97.0	2592.0	441.831	2436.2	75.60	
7				2582.4				
	11:50	3157.0	107.8	3110.4	619.072	2537.9	90.72	
	11:55	3227.0	118.4	3052.8	598.030	2629.0	89.04	
	12:00	3248.0	129.1	3081.6	608.510	2639.5	89.88	
				3081.6				

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1) - (4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
FALLOFF	12:01	2577.0				2577.0		
	12:02	2568.0				2568.0		
	12:03	2522.0				2522.0		
	12:04	2490.0				2490.0		
	12:05	2458.0				2458.0		
	12:10	2317.0				2317.0		
	12:15	2190.0				2190.0		

- △ RECORDED WELLHEAD PRESSURE
○ CORRECTED WELLHEAD PRESSURE BASED ON 2-3/8" TUBING





WEST-TEST, INC.

A SUBSIDIARY OF JOHN WEST ENGINEERING COMPANY
Hobbs, New Mexico

STEP RATE INJECTION TEST

CLIENT: SAGE ENERGY COMPANY

DATE: AUGUST 1, 1995

WELL NAME: NORTH VACUUM ABO NORTH UNIT W/W NO.4 21 A NO.1
LEA COUNTY, NEW MEXICO

WO#: 95-14-1084

PERFS = 8688-8732

PACKER DEPTH = 8568

BHP GAUGE DEPTH = 8710

SURFACE ONLY

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1)-(4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
1	9:15							
	9:20	60.0	1.0	288.0	7.512	52.5	8.40	
	9:25	79.0	1.7	201.6	3.883	75.1	5.88	
	9:30	87.0	2.4	201.6	3.883	83.1	5.88	
				230.4				
2	9:35	195.0	3.5	316.8	8.960	186.0	9.24	
	9:40	338.0	4.5	288.0	7.512	330.5	8.40	
	9:45	520.0	6.0	432.0	15.904	504.1	12.60	
3				345.6				
	9:50	884.0	8.0	576.0	27.080	856.9	16.80	
	9:55	1108.0	10.2	633.6	32.301	1075.7	18.48	
	10:00	1265.0	12.3	604.8	29.638	1235.4	17.64	
4				604.8				
	10:05	1601.0	15.3	864.0	57.334	1543.7	25.20	
	10:10	1786.0	18.3	864.0	57.334	1728.7	25.20	
	10:15	1992.0	21.3	864.0	57.334	1934.7	25.20	
5				864.0				
	10:20	2352.0	25.4	1180.8	102.185	2249.8	34.44	
	10:25	2555.0	29.4	1152.0	97.623	2457.4	33.60	
	10:30	2692.0	33.4	1152.0	97.623	2594.4	33.60	
				1161.6				
6	10:35	2925.0	38.2	1382.4	136.784	2788.2	40.32	
	10:40	3030.0	42.9	1353.6	131.559	2898.4	39.48	
	10:45	3134.0	47.5	1324.8	126.427	3007.6	38.64	
				1353.6				
7	10:50	3308.0	53.1	1612.8	181.923	3126.1	47.04	
	10:55	3380.0	58.7	1612.8	181.923	3198.1	47.04	
	11:00	3432.0	64.2	1584.0	175.958	3256.0	46.20	
				1603.2				

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1) - (4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
8	11:05	3597.0	70.8	1900.8	246.545	3350.5	55.44	
	11:10	3627.0	77.4	1900.8	246.545	3380.5	55.44	
	11:15	3653.0	83.9	1872.0	239.678	3413.3	54.60	
				1891.2				
	11:20	3756.0	91.6	2217.6	327.904	3428.1	64.68	
9	11:25	3764.0	99.3	2217.6	327.904	3436.1	64.68	
	11:30	3779.0	107.1	2419.2	385.173	3393.8	70.56	
				2284.8				
FALLOFF	11:31	3354.0				3354.0		
	11:32	3335.0				3335.0		
	11:33	3303.0				3303.0		
	11:34	3278.0				3278.0		
	11:35	3252.0				3252.0		
	11:40	3134.0				3134.0		
	11:45	3029.0				3029.0		

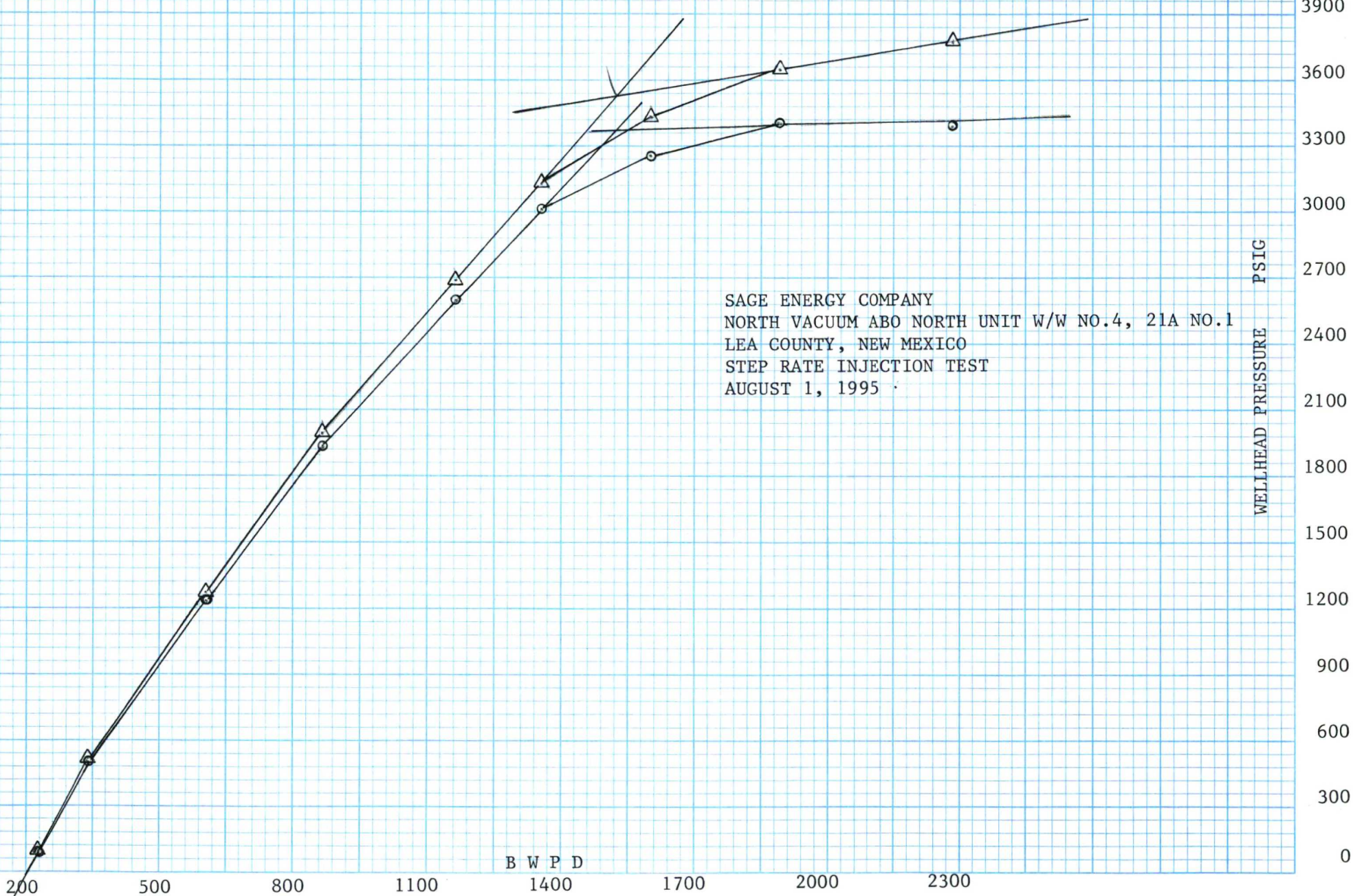
△ RECORDED WELLHEAD PRESSURE
○ CORRECTED WELLHEAD PRESSURE BASED ON 2-3/8" TUBING

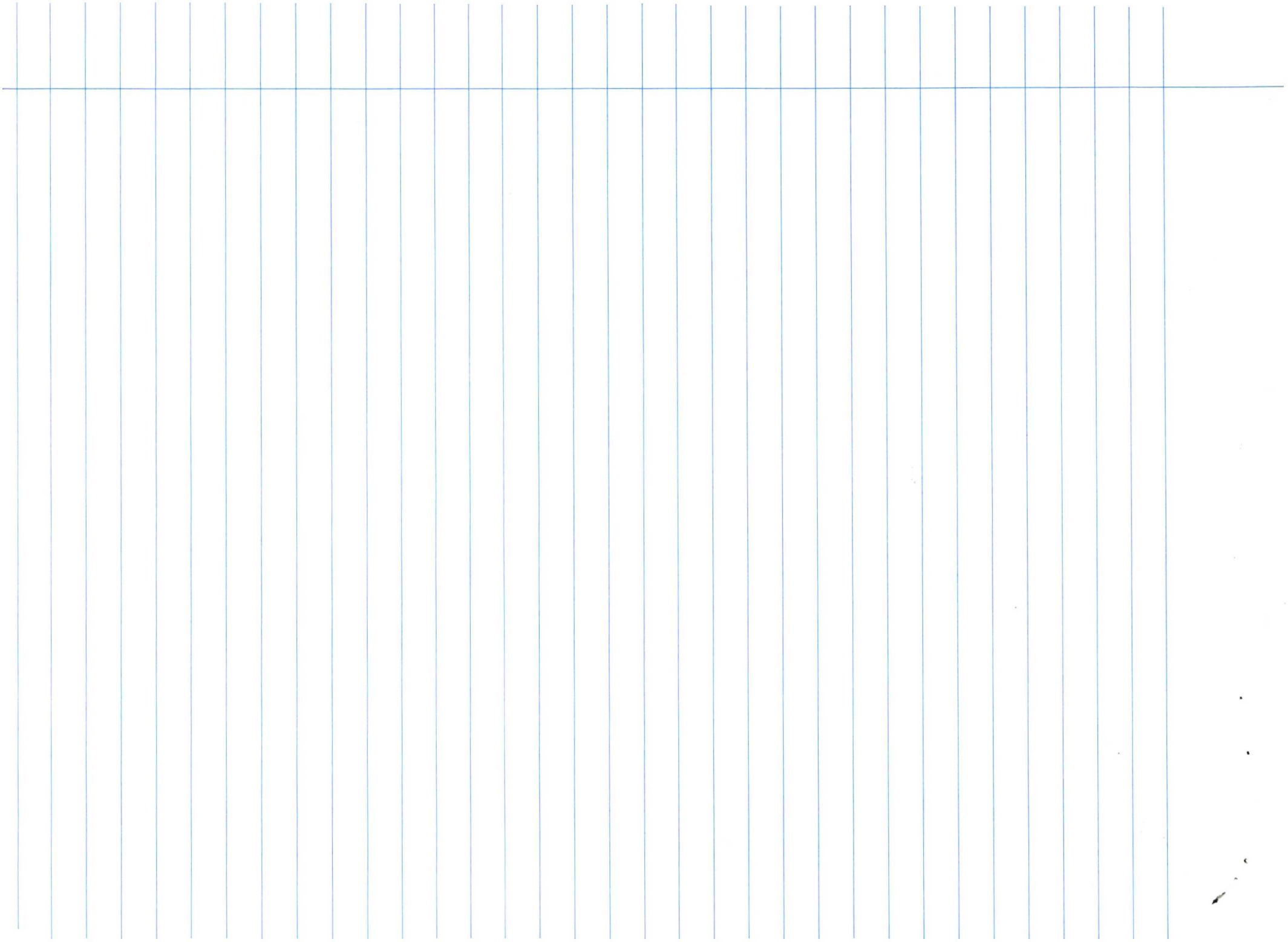
SAGE ENERGY COMPANY
NORTH VACUUM ABO NORTH UNIT W/W NO.4, 21A NO.1
LEA COUNTY, NEW MEXICO
STEP RATE INJECTION TEST
AUGUST 1, 1995

WELLHEAD PRESSURE
PSIG

WELLHEAD PRESSURE
PSIG

B W P D





WEST-TEST, INC.
A SUBSIDIARY OF JOHN WEST ENGINEERING COMPANY
Hobbs, New Mexico

STEP RATE INJECTION TEST

CLIENT: SAGE ENERGY COMPANY

DATE: AUGUST 3, 1995

WELL NAME: NORTH VACUUM ABO NORTH UNIT W/W NO.3 NO.15-1
LEA COUNTY, NEW MEXICO

WO#: 95-14-1083

PERFS = 8806-8828

PACKER DEPTH = 8656

BHP GAUGE DEPTH = 8817

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1)-(4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
1	8:55	3.0				3.0		
	9:00	3.0				3.0		
	9:05	18.0	3.0	518.2	22.542	-4.5	15.11	
	9:10	21.0	4.9	547.2	24.931	-3.9	15.96	
	9:15	34.0	6.7	518.4	22.558	11.4	15.12	
2				527.9				
	9:20	231.0	9.4	777.6	47.760	183.2	22.68	
	9:25	318.0	12.0	748.8	44.539	273.5	21.84	
	9:30	426.0	14.7	777.6	47.760	378.2	22.68	
				768.0				
3	9:35	659.0	18.2	1008.0	77.191	581.8	29.40	
	9:40	779.0	21.5	950.4	69.230	709.8	27.72	
	9:45	899.0	25.0	1008.0	77.191	821.8	29.40	
				988.8				
	9:50	1169.0	29.3	1238.4	112.969	1056.0	36.12	
4	9:55	1326.0	33.6	1238.4	112.969	1213.0	36.12	
	10:00	1483.0	37.9	1238.4	112.969	1370.0	36.12	
				1238.4				
	10:05	1800.0	43.6	1641.6	190.288	1609.7	47.88	
	10:10	1969.0	48.6	1440.0	149.326	1819.7	42.00	
5	10:15	2124.0	54.0	1555.2	172.175	1951.8	45.36	
				1545.6				
	10:20	2424.0	60.1	1756.8	215.726	2208.3	51.24	
	10:25	2584.0	66.4	1814.1	228.923	2355.1	52.91	
	10:30	2733.0	72.6	1785.6	222.314	2510.7	52.08	
6				1785.6				

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1) - (4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
7	10:35	2999.0	80.0	2131.2	308.404	2690.6	62.16	
	10:40	3125.0	87.4	2131.2	308.404	2816.6	62.16	
	10:45	3213.0	94.8	2131.2	308.404	2904.6	62.16	
				2131.2				
8	10:50	3455.0	103.5	2505.6	416.057	3038.9	73.08	
	10:55	3540.0	112.4	2563.2	433.924	3106.1	74.76	
	11:00	3601.0	121.2	2534.4	424.947	3176.1	73.92	
				2534.4				
9	11:05	3831.0	131.8	3052.8	599.595	3231.4	89.04	
	11:10	3952.0	141.8	2880.0	538.322	3413.7	84.00	
	11:15	3986.0	152.7	3139.9	631.626	3354.4	91.58	
				3024.2				
FALLOFF	11:16	3319.0				3319.0		
	11:17	3317.0				3317.0		
	11:18	3280.0				3280.0		
	11:19	3245.0				3245.0		
	11:20	3212.0				3212.0		
	11:25	3061.0				3061.0		
	11:30	2910.0				2910.0		

△ RECORDED WELLHEAD PRESSURE
○ CORRECTED WELLHEAD PRESSURE BASED ON 2-3/8" TUBING

WELLHEAD PRESSURE PSIG

WELLHEAD PRESSURE PSIG

SAGE ENERGY COMPANY
NORTH VACUUM ABO NORTH UNIT W/W NO.3, NO. 15-1
LEA COUNTY, NEW MEXICO
STEP RATE INJECTION TEST
AUGUST 3, 1995

B W P D

