

WASKADA UNIT NO. 15

(Order No. PM58)

WATERFLOOD PROGRESS REPORT

1987-03 through 2010-12

Surge Energy Inc.

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INTRODUCTION

The Waskada Unit No. 15 pressure maintenance project commenced water injection into the Lower Amaranth A Pool in accordance with Manitoba Energy and Mines Order No. PM 54 dated January 29, 1987. This order was then rescinded and replaced by PM 58 dated February 2, 1988.

Unit No. 15 consisted of 34 original producing oil wells, 7 of which were converted to injection wells with nine spot injection patterns. Water injection commenced March 1987 and continued with makeup water through to February 1998 when injection was halted. Scattered injection into two or three wells with only produced water commenced again over 2000 to 2002, and then again 2005 through to February 2010 when all Unit injectors and producing wells were shut-in. A limited number of Unit wells were then brought back on stream over September and October 2010 with all produced fluid being trucked to third party batteries.

It was noted that no previous pressure maintenance reports for this Unit have been found in any files that Surge Energy received when acquiring working interest ownership and Unit Operator status in 2010. Also none have been found through inquiries to the Manitoba Petroleum Branch. Accordingly, this report documents the performance of the Waskada Unit No. 15 pressure maintenance project from initial water injection through to the end of 2010.

CONCLUSIONS & RECOMMENDATIONS

1. Initial water injection commenced March 1987 at 500% to 600% of Unit production to replace pre-waterflood voidage. These initial rates were reduced to 100% to 200% of Unit production over 1989 through to the February 1998 shut-in of injection with makeup water. Scattered injection since 2000 has been through only 2 or 3 injectors with produced water only. Last injection was February 2010 with all produced fluids currently being trucked to third party battery facilities.
2. Injection of water volumes for effective waterflooding ceased in 1998. Overall voidage replacement on a pattern basis has been 1.79 VRR through to the end of 2010.
3. Negligible waterflood response has been noted in Unit production to date. Further discussion in this report investigates the possibility of injection water breaking out of zone into the higher permeability Mission Canyon member of the Mississippian formation located directly below the Lower Amaranth (Spearfish) zone.
4. Infill drilling of the Unit with horizontal wells commenced 2010 with three initial wells being brought on stream in December. Additional horizontal drilling is planned for 2011 after breakup depending on rig availability. In addition a new Unit battery facility has received regulatory approval and will be constructed at 16-3-2-26W1 along with a planned water disposal well.
5. Pressure buildup work will be done on a number of the planned 2011 infill locations and their production will be monitored for waterflood response to previous injection to evaluate if Unit injection should be reinstated when the planned 16-3 battery facility is completed.

DISCUSSION

Production Performance

Appendix A shows Unit No. 15 group production and injection plots. Appendix B documents monthly group production and injection numbers with a calculated voidage replacement ratio (VRR) on a Unit basis. It is noted that total voidage replacement on a pattern basis has also been calculated, and is included in Appendix C and is discussed later in this report.

The plots and monthly data show that Unit oil production peaked at approximately 50 m³/d in 1985 when all 34 original producers were drilled and on stream. Water cuts were +/-60%. Oil production had declined to 20 m³/d by 1987 when 7 wells were converted to injectors for an additional 5 m³/d decrease. Injection commenced 1987-03 at 300 m³/d when total Unit oil production was 15m³/d at +/-70% water cut. Injection was gradually reduced as pre-waterflood voidage was replaced, but after 1989 was still maintained at 100% to 200% of ongoing monthly production.

Despite documented injection volumes, Unit oil production continued to decline through the original injection period of 1987-03 to 1998-02 when injection was temporarily halted, at oil production of less than 1 m³/d. Producing water cuts decreased over this same time period as the higher water cut wells were shut-in. Post 2000 injection has been erratic at reduced rates with produced water only.

No production response has been noted on the group plots or on review of individual wells. Waterflood response has been noted in the more central Waskada Units, where individual well production rates and core data would indicate there is higher reservoir permeability than in Unit No. 15.

It is believed the majority of the injected water may have broken out of zone, most likely into the Mississippian formation located directly below (+/-10m) the injector perf intervals. The Mississippian has been documented on core to have 10 to 20 times the permeability of the target Spearfish zone. This is discussed further in this report with references to Appendices D and E.

Voidage Calculations

Appendix B shows a Unit No. 15 map with cumulative oil and water production and injection volumes for individual wells, and a monthly summary of Unit production and injection with VRR's calculated on a total Unit basis.

Appendix C shows a Unit No. 15 map of the injection patterns and their allocated share of production from each producer. Also documented is a summary of the total cumulative voidage replacement for each injection pattern based on cumulative individual well production to the end of 2010. This was not done for each individual month/year for this report due to time constraints, and as it was felt that such detailed VRR calculations would not alter the conclusions of this report. It is also noted that all voidage calculations are based on an oil formation volume factor of 1.17 based on third party PVT information.

As per Appendix B, overall Unit voidage replacement on a monthly basis was at 5 to 6 VRR with the commencement of injection 1987-03. This was gradually reduced as pre-waterflood voidage was made up, with an ongoing 1 to 2 VRR from 1989 through to 1998-02 when injection was halted. Cumulative Unit VRR was 1.29 at that point. Post 1998 injection has been with produced water only and current cumulative Unit VRR is 1.22 as of 2010-12.

As per Appendix C, VRR calculations on a pattern basis do not involve all of the Unit's wells, and edge wells do not have 100% of their production included in the patterns. The calculated voidage replacement is accordingly greater than that quoted on the more simple Unit basis, and cumulative overall pattern VRR is 1.79 as of 2010-12.

Mission Canyon Breakthrough Analogy

The theory of Unit No. 15 injection water potentially breaking out of zone into the Mission Canyon is based on a comparison to the Waskada Unit No. 18 waterflood. Appendix E shows a Unit No. 18 map of the 11-16-1-25 waterflood pattern, along with pattern VRR calculations, pattern group production plot, injection plots for the two wells involved and an injector log section with core analysis. Appendix D shows comparative data for an example Unit No. 15 injector at 15-33-1-26.

It has been noted in the past that a number of Waskada area Spearfish producers have broken through to the underlying wet Mission Canyon zone on their original frac completions. This was evidenced by the production result of water rates being significantly higher than immediately offsetting wells (ie: +95% water cuts versus expected 10-20%) and the water production being slightly sour (ie: 100's to 1000's PPM H₂S) versus the sweet Spearfish. Area cores showed the Mission Canyon to have 10 to 20 times the average permeability of the Spearfish. Area pressures from DST's also showed the Mission Canyon to be slightly overpressured (10.1 kPa/m) versus the underpressured Spearfish (9.5 kPa/m), indicating the two zones are hydrodynamically separate over the Mississippian subcrop unconformity in the Waskada area, unless joined through a fracture treatment.

The 02/11-16-1-25 well in Unit No. 18 was producing as per area offsets at expected 10% water cuts prior to injection well conversion, indicating it's original frac completion stayed in zone. Injection commenced 1991-10 at initial 40 m³/d rates which were later reduced to an average 20-25 m³/d up to the year 2000 when injection was halted. At that point 75,712 m³ had been injected for a pattern VRR of 4.60, yet no waterflood production response had been noted in either the group production plot (shown in appendix E), or a review of individual well production. The 02/11-16 injector remained shut-in while a replacement was drilled at 03/11-16-1-25. Water injection commenced 2001-03 in the new well at an initial 10 m³/d, which was reduced to keep injection pressures below the levels that caused breakthrough in the original 02/11-16 well. The 03/11-16 injection plot shows rates have averaged only 1.0 – 1.5 m³/d since the start of injection, significantly lower (<5%) than the original 02/11-16 injector. The original 02/11-16 injection interval was also cored showing average 15% porosity with 5.7md K_{max}.

Unit No. 15 initial water injection rates (Appendix A) ranged from 40 to 100 m³/d per injector, which exceed those of the 02/11-16-1-25 injector discussed above which broke out of zone. Comparative information on the example Unit No. 15 injector 15-33-1-26 is shown in Appendix D. The 15-33 well originally produced at expected 40% water cuts (ie: original frac completion was in zone), with initial post-conversion injection rates of 55 m³/d (ie: > 02/11-16) into an interval with offset core averaging 13% porosity with 2.5md K_{max} (ie: < 50% of 02/11-16).

A last comparative point is that the Unit No. 15 producers have averaged less than 2000 m3 EUR, with the best producers in the Unit interior producing up to 5000m3 EUR. The producing wells in the 02/11-16 injection pattern have averaged 8850 m3 primary EUR, with the best wells at 10,000 m3 EUR. This indicates overall higher permeability in the 02/11-16 breakthrough waterflood pattern versus the Unit No. 15 waterflooded area.

Future Unit Development

Surge Energy began Spearfish horizontal drilling in 2010 in the Waskada field, with 3 infill horizontals on stream December in Waskada Unit No. 15. A further 14 horizontal infill locations are planned in the Unit for 2011. Drilling will begin after breakup depending on rig availability. In addition a new Unit battery facility to be located at 16-3-2-26W1 has received regulatory approval, and will be constructed 2011 to handle the expected additional Unit production. Part of the facility will involve a new Mission Canyon disposal well to handle the expected 40- 50% water cuts of the new wells.

These new infill horizontals will be located closer to the Unit injection wells than the previous vertical wells spaced at 16 hectares. Included in the 2011 program will be pressure buildups on a number of the horizontal locations to help determine if the infill areas are seeing any pressure support from the historical water injection, or are under primary recovery only. This information will be used along with production monitoring of the new wells to decide if injection should be reinstated at any of the old injectors, or waterflood modifications done to utilize horizontal well injection or if all produced water should be disposed of into the Mission Canyon formation.

APPENDIX A

Unit No. 15 Production & Injection Plots

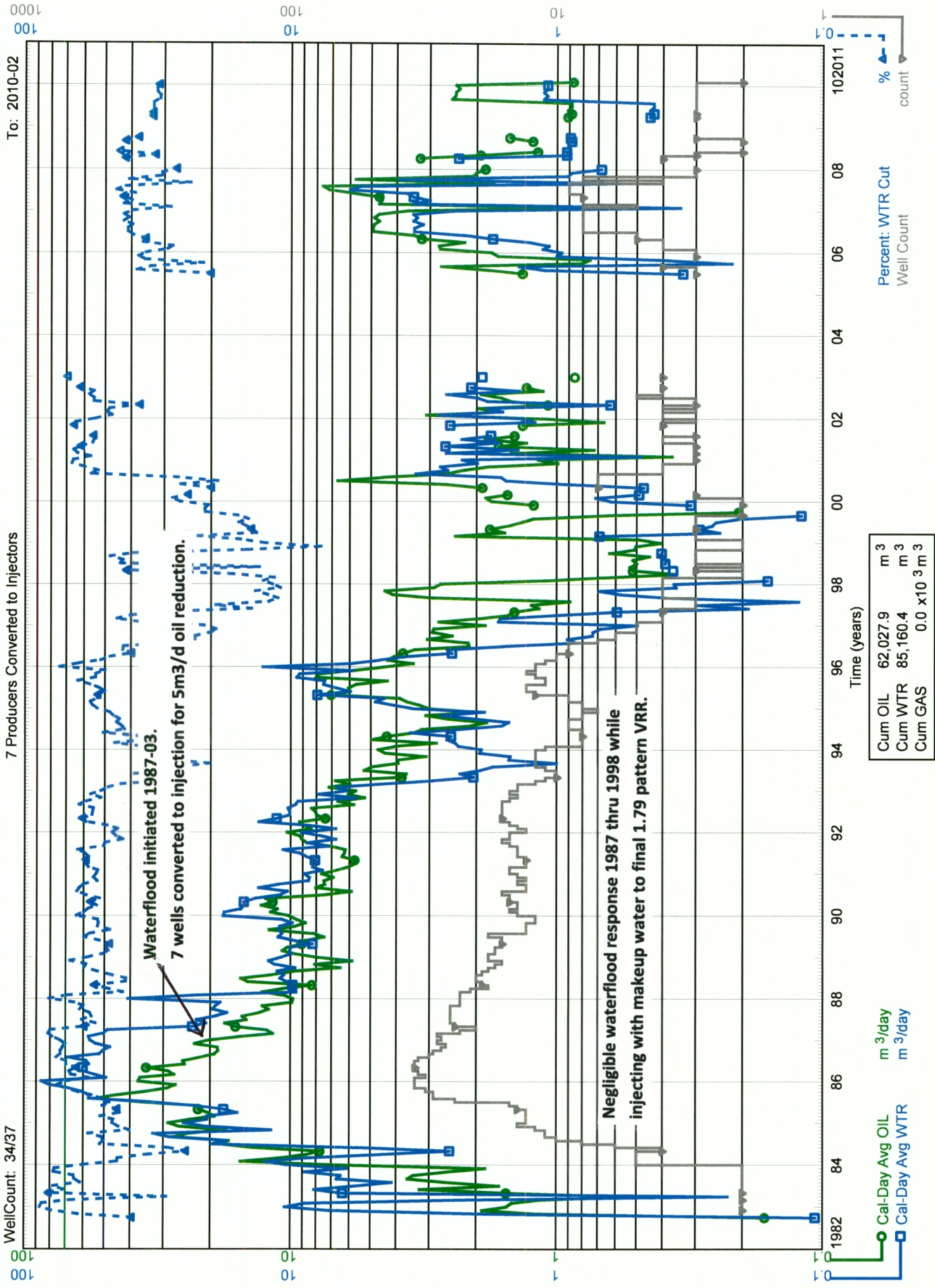
Waskada Unit #15
 On Waterflood 1987-03
 7 Producers Converted to Injectors

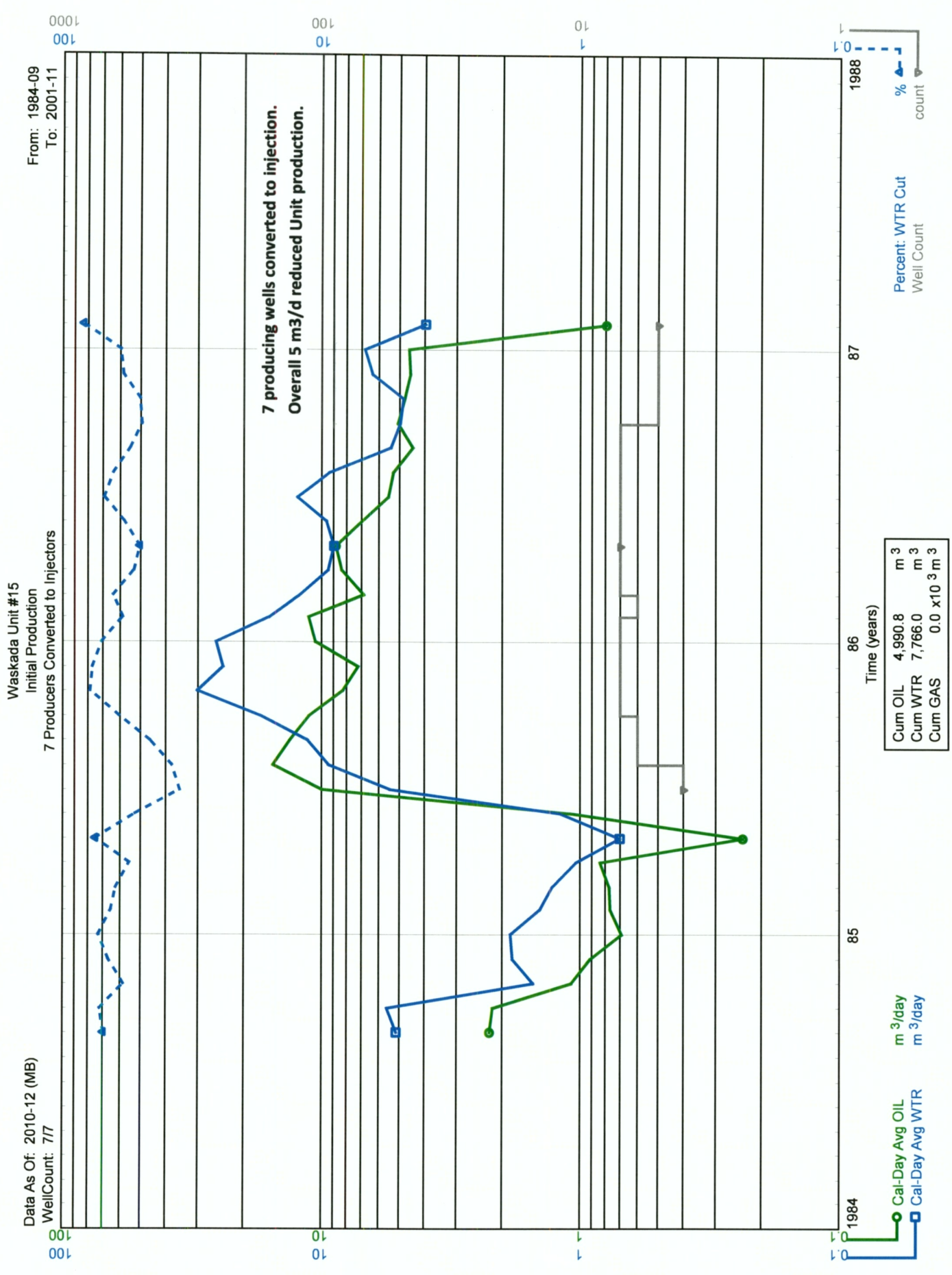
Data As Of: 2010-12 (MB)

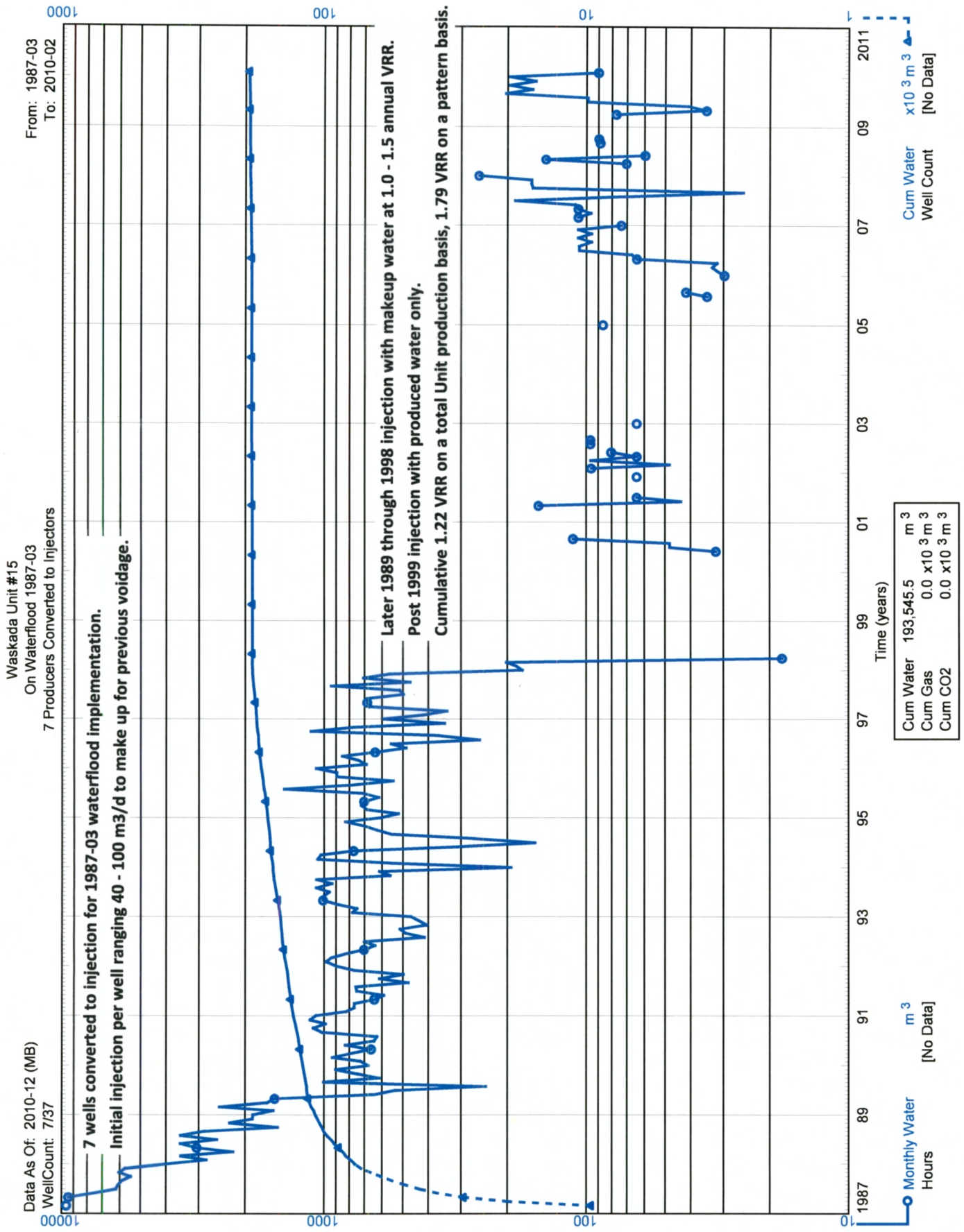
WellCount: 34/37

From: 1982-10

To: 2010-02







APPENDIX B

Unit No. 15 Production & Injection Map Annual Total Unit Voidage Replacement Summary

WASKADA UNIT #15 WATERFLOOD REPORT - UNIT TOTALS

PRODUCTION DATA:

Data As Of: 2010-12 (MB)
WellCount: 34/37

From: 1982-10
To: 2010-02

INJECTION DATA:

Data As Of: 2010-12 (MB)
WellCount: 7/37

From: 1987-03
To: 2010-02

Prod Period (Mon/Yr)	Monthly Well Count	Monthly OIL m3	Cal-Day Avg OIL m3/day	Cum. OIL m3	Monthly WTR m3	Cal-Day Avg WTR m3/day	Cum. WTR m3
Jan-82	0	0	0	0	0	0	0
Feb-82	0	0	0	0	0	0	0
Mar-82	0	0	0	0	0	0	0
Apr-82	0	0	0	0	0	0	0
May-82	0	0	0	0	0	0	0
Jun-82	0	0	0	0	0	0	0
Jul-82	0	0	0	0	0	0	0
Aug-82	0	0	0	0	0	0	0
Sep-82	0	0	0	0	0	0	0
Oct-82	1	5.1	0.2	5.1	3.3	0.1	3.3
Nov-82	1	34.8	1.2	39.9	59.2	2.0	62.5
Dec-82	2	58.7	1.9	98.6	220.3	7.1	282.8
1982		98.6	1.1	98.6	282.8	3.1	282.8

Jan-83	2	47.7	1.5	146.3	323.9	10.5	606.7
Feb-83	2	41.1	1.5	187.4	246.7	8.8	853.4
Mar-83	2	36.1	1.2	223.5	73.5	2.4	926.9
Apr-83	1	16.5	0.6	240.0	6.8	0.2	933.7
May-83	2	47.7	1.5	287.7	196.6	6.3	1130.3
Jun-83	2	97.6	3.3	385.3	243.3	8.1	1373.6
Jul-83	2	50.8	1.6	436.1	177.0	5.7	1550.6
Aug-83	2	79.9	2.6	516.0	128.6	4.2	1679.2
Sep-83	2	108.5	3.6	624.5	199.9	6.7	1879.1
Oct-83	2	106.6	3.4	731.1	200.0	6.5	2079.1
Nov-83	2	76.7	2.6	807.8	264.5	8.8	2343.6
Dec-83	2	57.2	1.9	865.0	189.5	6.1	2533.1
1983		766.4	2.1	865.0	2250.3	6.2	2533.1

Jan-84	5	216.0	7.0	1081.0	321.0	10.4	2854.1
Feb-84	5	445.3	15.4	1526.3	360.3	12.4	3214.4
Mar-84	5	338.5	10.9	1864.8	271.9	8.8	3486.3
Apr-84	5	260.1	8.7	2124.9	136.8	4.6	3623.1
May-84	4	239.0	7.7	2363.9	77.9	2.5	3701.0
Jun-84	6	411.5	13.7	2775.4	167.3	5.6	3868.3
Jul-84	8	566.2	18.3	3341.6	611.6	19.7	4479.9
Aug-84	10	526.8	17.0	3868.4	537.0	17.3	5016.9
Sep-84	11	822.3	27.4	4690.7	857.2	28.6	5874.1
Oct-84	11	754.1	24.3	5444.8	1015.4	32.8	6889.5
Nov-84	12	523.3	17.4	5968.1	353.1	11.8	7242.6
Dec-84	14	808.1	26.1	6776.2	640.6	20.7	7883.2
1984		5911.2	16.2	6776.2	5350.1	14.7	7883.2

Jan-85	13	889.2	28.7	7665.4	778.5	25.1	8661.7
Feb-85	13	666.8	23.8	8332.2	573.4	20.5	9235.1
Mar-85	13	595.4	19.2	8927.6	637.4	20.6	9872.5
Apr-85	13	609.1	20.3	9536.7	472.8	15.8	10345.3
May-85	14	685.6	22.1	10222.3	551.6	17.8	10896.9
Jun-85	15	658.1	21.9	10880.4	678.2	22.6	11575.1
Jul-85	24	1121.4	36.2	12001.8	1029.8	33.2	12604.9
Aug-85	29	1681.4	54.2	13683.2	1772.4	57.2	14377.3
Sep-85	29	1353.1	45.1	15036.3	1710.6	57.0	16087.9

Prod Period (Mon/Yr)	Monthly Water m3	Cum. Water m3	Monthly VRR m3	Cum. VRR m3
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Oct-85	31	1090.7	35.2	16127.0	1884.7	60.8	17972.6				
Nov-85	34	866.2	28.9	16993.2	2051.8	68.4	20024.4				
Dec-85	34	835.4	27.0	17828.6	2496.6	80.5	22521.0				
1985		11052.4	30.3	17828.6	14637.8	40.1	22521.0				
Jan-86	34	1154.4	37.2	18983.0	2673.5	86.2	25194.5				
Feb-86	31	1026.7	36.7	20009.7	1376.5	49.2	26571.0				
Mar-86	33	845.7	27.3	20855.4	1688.8	54.5	28259.8				
Apr-86	34	861.2	28.7	21716.6	1813.2	60.4	30073.0				
May-86	34	1076.5	34.7	22793.1	1864.7	60.2	31937.7				
Jun-86	34	747.8	24.9	23540.9	1711.0	57.0	33648.7				
Jul-86	33	785.3	25.3	24326.2	1814.0	58.5	35462.7				
Aug-86	30	678.7	21.9	25004.9	2125.5	68.6	37588.2				
Sep-86	29	577.3	19.2	25582.2	1566.3	52.2	39154.5				
Oct-86	27	578.2	18.7	26160.4	1566.1	50.5	40720.6				
Nov-86	26	562.8	18.8	26723.2	1427.0	47.6	42147.6				
Dec-86	28	708.3	22.9	27431.5	1670.2	53.9	43817.8				
1986		9602.9	26.3	27431.5	21296.8	58.4	43817.8				
Jan-87	27	630.7	20.4	28062.2	1755.0	56.6	45572.8				
Feb-87	28	436.5	15.6	28498.7	1604.5	57.3	47177.3				
Mar-87	23	359.7	11.6	28858.4	1564.3	50.5	48741.6	Mar-87	9579.3	9579.3	4.83 0.12
Apr-87	20	366.5	12.2	29224.9	1458.5	48.6	50200.1	Apr-87	10328.6	19907.9	5.47 0.24
May-87	24	496.3	16.0	29721.2	722.6	23.3	50922.7	May-87	9397.7	29305.6	7.21 0.34
Jun-87	25	527.6	17.6	30248.8	622.0	20.7	51544.7	Jun-87	7510.6	36816.2	6.06 0.42
Jul-87	25	452.7	14.6	30701.5	697.4	22.5	52242.1	Jul-87	6205.5	43021.7	5.06 0.49
Aug-87	25	469.0	15.1	31170.5	595.2	19.2	52837.3	Aug-87	6074.3	49096.0	5.31 0.55
Sep-87	25	391.8	13.1	31562.3	517.8	17.3	53355.1	Sep-87	5876.7	54972.7	6.02 0.61
Oct-87	25	373.6	12.1	31935.9	606.6	19.6	53961.7	Oct-87	5445.7	60418.4	5.22 0.66
Nov-87	23	381.0	12.7	32316.9	571.5	19.1	54533.2	Nov-87	6031.1	66449.5	5.93 0.72
Dec-87	23	305.7	9.9	32622.6	568.4	18.3	55101.6	Dec-87	5711.0	72160.5	6.17 0.77
1987		5191.1	14.2	32622.6	11283.8	30.9	55101.6	1987	72160.5	72160.5	4.16 0.77
Jan-88	23	302.2	9.8	32924.8	1262.3	40.7	56363.9	Jan-88	4024.3	76184.8	2.49 0.80
Feb-88	23	304.2	10.5	33229.0	674.0	23.2	57037.9	Feb-88	2804.5	78989.3	2.72 0.82
Mar-88	21	395.3	12.8	33624.3	294.8	9.5	57332.7	Mar-88	3507.0	82496.3	4.63 0.85
Apr-88	18	317.9	10.6	33942.2	304.7	10.2	57637.4	Apr-88	2219.4	84715.7	3.28 0.87
May-88	19	256.3	8.3	34198.5	304.2	9.8	57941.6	May-88	3047.8	87763.5	5.05 0.90
Jun-88	20	433.5	14.5	34632.0	309.6	10.3	58251.2	Jun-88	3521.3	91284.8	4.31 0.92
Jul-88	20	475.5	15.3	35107.5	338.1	10.9	58589.3	Jul-88	2560.7	93845.5	2.86 0.94
Aug-88	19	363.8	11.7	35471.3	326.9	10.6	58916.2	Aug-88	3513.3	97358.8	4.67 0.97
Sep-88	18	290.4	9.7	35761.7	335.1	11.2	59251.3	Sep-88	2857.8	100216.6	4.23 0.99
Oct-88	17	200.7	6.5	35962.4	296.8	9.6	59548.1	Oct-88	1497.9	101714.5	2.82 1.00
Nov-88	16	242.1	8.1	36204.5	343.7	11.5	59891.8	Nov-88	2286.9	104001.4	3.65 1.02
Dec-88	18	181.4	5.9	36385.9	373.5	12.1	60265.3	Dec-88	1874.9	105876.3	3.20 1.03
1988		3763.3	10.3	36385.9	5163.7	14.2	60265.3	1988	33715.8	105876.3	3.52 1.03
Jan-89	18	244.5	7.9	36630.4	335.6	10.8	60600.9	Jan-89	1862.5	107738.8	3.00 1.04
Feb-89	17	268.3	9.6	36898.7	277.1	9.9	60878.0	Feb-89	1561.7	109300.5	2.64 1.05
Mar-89	17	331.5	10.7	37230.2	310.8	10.0	61188.8	Mar-89	2500.3	111800.8	3.58 1.07
Apr-89	16	307.1	10.2	37537.3	298.4	10.0	61487.2	Apr-89	1644.6	113445.4	2.50 1.08
May-89	16	280.4	9.1	37817.7	255.7	8.3	61742.9	May-89	1539.9	114985.3	2.64 1.08
Jun-89	16	263.4	8.8	38081.1	289.2	9.6	62032.1	Jun-89	639.8	115625.1	1.07 1.08
Jul-89	18	231.3	7.5	38312.4	344.1	11.1	62376.2	Jul-89	535.3	116160.4	0.87 1.08
Aug-89	13	252.5	8.2	38564.9	332.9	10.7	62709.1	Aug-89	241.6	116402.0	0.38 1.08
Sep-89	13	360.4	12.0	38925.3	330.2	11.0	63039.3	Sep-89	1002.7	117404.7	1.33 1.08
Oct-89	13	298.4	9.6	39223.7	338.7	10.9	63378.0	Oct-89	614.5	118019.2	0.89 1.08
Nov-89	12	263.0	8.8	39486.7	294.5	9.8	63672.5	Nov-89	745.9	118765.1	1.24 1.08
Dec-89	12	294.1	9.5	39780.8	333.6	10.8	64006.1	Dec-89	901.9	119667.0	1.33 1.08
1989		3394.9	9.3	39780.8	3740.8	10.3	64006.1	1989	13790.7	119667.0	1.79 1.08
Jan-90	14	313.2	10.1	40094.0	555.0	17.9	64561.1	Jan-90	677.9	120344.9	0.74 1.08
Feb-90	15	331.9	11.9	40425.9	495.3	17.7	65056.4	Feb-90	724.6	121069.5	0.82 1.08

Mar-90	14	346.6	11.2	40772.5	476.0	15.4	65532.4	Mar-90	928.6	121998.1	1.05	1.08
Apr-90	14	385.4	12.9	41157.9	446.3	14.9	65978.7	Apr-90	785.5	122783.6	0.88	1.08
May-90	15	360.6	11.6	41518.5	463.5	15.0	66442.2	May-90	660.3	123443.9	0.75	1.07
Jun-90	15	370.9	12.4	41889.4	406.3	13.5	66848.5	Jun-90	828.4	124272.3	0.99	1.07
Jul-90	16	232.6	7.5	42122.0	337.7	10.9	67186.2	Jul-90	643.5	124915.8	1.06	1.07
Aug-90	13	182.6	5.9	42304.6	318.2	10.3	67504.4	Aug-90	627.5	125543.3	1.18	1.07
Sep-90	13	240.2	8.0	42544.8	394.6	13.2	67899.0	Sep-90	1017.3	126560.6	1.51	1.08
Oct-90	14	229.9	7.4	42774.7	344.3	11.1	68243.3	Oct-90	1097.9	127658.5	1.79	1.08
Nov-90	13	223.8	7.5	42998.5	256.3	8.5	68499.6	Nov-90	987.8	128646.3	1.91	1.08
Dec-90	14	213.3	6.9	43211.8	262.6	8.5	68762.2	Dec-90	1130.7	129777.0	2.21	1.09
1990		3431.0	9.4	43211.8	4756.1	13.0	68762.2	1990	10110.0	129777.0	1.15	1.09
Jan-91	15	235.9	7.6	43447.7	274.4	8.9	69036.6	Jan-91	1074.0	130851.0	1.95	1.09
Feb-91	15	187.5	6.7	43635.2	212.0	7.6	69248.6	Feb-91	822.8	131673.8	1.91	1.09
Mar-91	13	188.1	6.1	43823.3	255.6	8.3	69504.2	Mar-91	767.2	132441.0	1.61	1.10
Apr-91	13	170.1	5.7	43993.4	245.3	8.2	69749.5	Apr-91	764.5	133205.5	1.72	1.10
May-91	13	177.5	5.7	44170.9	250.3	8.1	69999.8	May-91	642.0	133847.5	1.40	1.10
Jun-91	14	191.8	6.4	44362.7	260.0	8.7	70259.8	Jun-91	591.6	134439.1	1.22	1.10
Jul-91	14	194.1	6.3	44556.8	284.7	9.2	70544.5	Jul-91	749.7	135188.8	1.46	1.10
Aug-91	14	192.3	6.2	44749.1	330.3	10.7	70874.8	Aug-91	755.4	135944.2	1.36	1.10
Sep-91	15	210.8	7.0	44959.9	215.6	7.2	71090.4	Sep-91	476.7	136420.9	1.03	1.10
Oct-91	16	268.1	8.7	45228.0	267.8	8.6	71358.2	Oct-91	614.0	137034.9	1.06	1.10
Nov-91	15	271.5	9.1	45499.5	202.4	6.8	71560.6	Nov-91	497.8	137532.7	0.96	1.10
Dec-91	15	285.0	9.2	45784.5	237.6	7.7	71798.2	Dec-91	766.6	138299.3	1.34	1.10
1991		2572.7	7.1	45784.5	3036.0	8.3	71798.2	1991	8522.3	138299.3	1.41	1.10
Jan-92	13	318.5	10.3	46103.0	281.7	9.1	72079.9	Jan-92	897.7	139197.0	1.37	1.10
Feb-92	14	242.1	8.4	46345.1	195.6	6.7	72275.5	Feb-92	981.9	140178.9	2.05	1.11
Mar-92	15	274.5	8.9	46619.6	263.7	8.5	72539.2	Mar-92	937.1	141116.0	1.60	1.11
Apr-92	16	276.7	9.2	46896.3	394.5	13.2	72933.7	Apr-92	823.1	141939.1	1.15	1.11
May-92	16	228.5	7.4	47124.8	349.0	11.3	73282.7	May-92	702.1	142641.2	1.14	1.11
Jun-92	16	238.6	8.0	47363.4	301.8	10.1	73584.5	Jun-92	638.8	143280.0	1.10	1.11
Jul-92	16	249.1	8.0	47612.5	311.9	10.1	73896.4	Jul-92	700.9	143980.9	1.16	1.11
Aug-92	16	258.1	8.3	47870.6	316.7	10.2	74213.1	Aug-92	414.0	144394.9	0.67	1.11
Sep-92	16	173.2	5.8	48043.8	287.4	9.6	74500.5	Sep-92	488.0	144882.9	1.00	1.11
Oct-92	15	205.1	6.6	48248.9	290.0	9.4	74790.5	Oct-92	511.9	145394.8	0.97	1.11
Nov-92	14	157.8	5.3	48406.7	169.7	5.7	74960.2	Nov-92	405.5	145800.3	1.14	1.11
Dec-92	15	187.6	6.1	48594.3	244.1	7.9	75204.3	Dec-92	432.1	146232.4	0.93	1.11
1992		2809.8	7.7	48594.3	3406.1	9.3	75204.3	1992	7933.1	146232.4	1.19	1.11
Jan-93	14	176.1	5.7	48770.4	188.9	6.1	75393.2	Jan-93	465.3	146697.7	1.18	1.11
Feb-93	14	200.2	7.2	48970.6	188.1	6.7	75581.3	Feb-93	777.1	147474.8	1.84	1.11
Mar-93	12	185.3	6.0	49155.9	142.9	4.6	75724.2	Mar-93	748.7	148223.5	2.08	1.11
Apr-93	11	203.6	6.8	49359.5	87.4	2.9	75811.6	Apr-93	884.5	149108.0	2.72	1.12
May-93	10	118.1	3.8	49477.6	63.6	2.1	75875.2	May-93	1008.0	150116.0	5.00	1.12
Jun-93	10	110.0	3.7	49587.6	69.1	2.3	75944.3	Jun-93	999.8	151115.8	5.05	1.13
Jul-93	11	163.7	5.3	49751.3	60.0	1.9	76004.3	Jul-93	954.0	152069.8	3.79	1.13
Aug-93	12	153.2	4.9	49904.5	53.7	1.7	76058.0	Aug-93	1069.6	153139.4	4.59	1.14
Sep-93	12	117.9	3.9	50022.4	30.0	1.0	76088.0	Sep-93	932.8	154072.2	5.55	1.14
Oct-93	12	122.6	4.0	50145.0	46.8	1.5	76134.8	Oct-93	1067.1	155139.3	5.61	1.15
Nov-93	12	92.7	3.1	50237.7	44.7	1.5	76179.5	Nov-93	558.7	155698.0	3.65	1.15
Dec-93	12	136.9	4.4	50374.6	60.3	2.0	76239.8	Dec-93	613.9	156311.9	2.78	1.16
1993		1780.3	4.9	50374.6	1035.5	2.8	76239.8	1993	10079.5	156311.9	3.23	1.16
Jan-94	11	144.9	4.7	50519.5	59.3	1.9	76299.1	Jan-94	193.4	156505.3	0.85	1.16
Feb-94	8	112.1	4.0	50631.6	65.4	2.3	76364.5	Feb-94	558.6	157063.9	2.84	1.16
Mar-94	8	87.5	2.8	50719.1	74.4	2.4	76438.9	Mar-94	1057.2	158121.1	5.98	1.16
Apr-94	8	148.3	4.9	50867.4	77.3	2.6	76516.2	Apr-94	1027.2	159148.3	4.10	1.17
May-94	8	134.5	4.3	51001.9	77.3	2.5	76593.5	May-94	770.3	159918.6	3.28	1.17
Jun-94	8	103.1	3.4	51105.0	106.0	3.5	76699.5	Jun-94	307.2	160225.8	1.36	1.17
Jul-94	9	99.5	3.2	51204.5	72.5	2.3	76772.0	Jul-94	156.5	160382.3	0.83	1.17
Aug-94	9	65.3	2.1	51269.8	49.8	1.6	76821.8	Aug-94	267.9	160650.2	2.12	1.17
Sep-94	9	54.8	1.8	51324.6	45.3	1.5	76867.1	Sep-94	552.5	161202.7	5.05	1.18
Oct-94	8	79.5	2.6	51404.1	62.6	2.0	76929.7	Oct-94	626.1	161828.8	4.02	1.18

Nov-94	8	93.0	3.1	51497.1	81.5	2.7	77011.2	Nov-94	699.8	162528.6	3.68	1.18
Dec-94	7	62.2	2.0	51559.3	57.8	1.9	77069.0	Dec-94	828.4	163357.0	6.34	1.19
1994		1184.7	3.3	51559.3	829.2	2.3	51559.3	1994	7045.1	163357.0	3.18	1.46
Jan-95	8	93.6	3.0	51652.9	107.6	3.5	77176.6	Jan-95	607.3	163964.3	2.80	1.19
Feb-95	8	91.6	3.3	51744.5	115.8	4.1	77292.4	Feb-95	520.1	164484.4	2.33	1.19
Mar-95	9	112.9	3.6	51857.4	148.5	4.8	77440.9	Mar-95	681.6	165166.0	2.43	1.20
Apr-95	9	116.3	3.9	51973.7	133.0	4.4	77573.9	Apr-95	719.6	165885.6	2.67	1.20
May-95	12	217.8	7.0	52191.5	245.6	7.9	77819.5	May-95	702.1	166587.7	1.40	1.20
Jun-95	13	178.6	6.0	52370.1	178.9	6.0	77998.4	Jun-95	617.8	167205.5	1.59	1.20
Jul-95	13	187.7	6.1	52557.8	208.1	6.7	78206.5	Jul-95	707.7	167913.2	1.65	1.20
Aug-95	11	175.3	5.7	52733.1	232.8	7.5	78439.3	Aug-95	1417.3	169330.5	3.24	1.21
Sep-95	11	129.7	4.3	52862.8	222.9	7.4	78662.2	Sep-95	782.5	170113.0	2.09	1.21
Oct-95	12	248.2	8.0	53111.0	293.7	9.5	78955.9	Oct-95	544.6	170657.6	0.93	1.21
Nov-95	13	234.6	7.8	53345.6	277.2	9.2	79233.1	Nov-95	894.2	171551.8	1.62	1.21
Dec-95	12	180.5	5.8	53526.1	180.8	5.8	79413.9	Dec-95	893.4	172445.2	2.28	1.21
1995		1966.8	5.4	53526.1	2344.9	6.4	79413.9	1995	9088.2	172445.2	1.96	1.21
Jan-96	12	137.7	4.4	53663.8	393.7	12.7	79807.6	Jan-96	1069.8	173515.0	1.93	1.22
Feb-96	11	100.2	3.5	53764.0	171.5	5.9	79979.1	Feb-96	688.6	174203.6	2.38	1.22
Mar-96	10	133.8	4.3	53897.8	144.3	4.7	80123.4	Mar-96	737.6	174941.2	2.45	1.22
Apr-96	10	122.8	4.1	54020.6	112.7	3.8	80236.1	Apr-96	850.6	175791.8	3.32	1.23
May-96	9	116.9	3.8	54137.5	76.6	2.5	80312.7	May-96	636.9	176428.7	2.98	1.23
Jun-96	9	102.7	3.4	54240.2	77.1	2.6	80389.8	Jun-96	486.1	176914.8	2.46	1.23
Jul-96	9	65.9	2.1	54306.1	49.0	1.6	80438.8	Jul-96	552.9	177467.7	4.38	1.23
Aug-96	7	66.6	2.2	54372.7	26.0	0.8	80464.8	Aug-96	254.8	177722.5	2.45	1.23
Sep-96	6	91.8	3.1	54464.5	27.3	0.9	80492.1	Sep-96	365.4	178087.9	2.71	1.23
Oct-96	6	76.4	2.5	54540.9	22.7	0.7	80514.8	Oct-96	1120.7	179208.6	10.00	1.24
Nov-96	5	87.9	2.9	54628.8	21.9	0.7	80536.7	Nov-96	765.0	179973.6	6.13	1.25
Dec-96	5	89.5	2.9	54718.3	21.1	0.7	80557.8	Dec-96	346.4	180320.0	2.75	1.25
1996		1192.2	3.3	54718.3	1143.9	3.1	80557.8	1996	7874.8	180320.0	3.10	1.25
Jan-97	5	57.4	1.9	54775.7	15.4	0.5	80573.2	Jan-97	591.6	180911.6	7.17	1.25
Feb-97	4	77.5	2.8	54853.2	46.3	1.7	80619.5	Feb-97	413.3	181324.9	3.02	1.25
Mar-97	4	61.4	2.0	54914.6	50.5	1.6	80670.0	Mar-97	339.0	181663.9	2.77	1.25
Apr-97	4	45.8	1.5	54960.4	30.3	1.0	80700.3	Apr-97	670.8	182334.7	8.00	1.26
May-97	4	44.6	1.4	55005.0	18.4	0.6	80718.7	May-97	683.3	183018.0	9.68	1.26
Jun-97	3	34.9	1.2	55039.9	5.7	0.2	80724.4	Jun-97	680.6	183698.6	14.63	1.27
Jul-97	3	38.5	1.2	55078.4	9.1	0.3	80733.5	Jul-97	497.2	184195.8	9.18	1.27
Aug-97	3	27.6	0.9	55106.0	3.8	0.1	80737.3	Aug-97	513.7	184709.5	14.23	1.27
Sep-97	4	87.5	2.9	55193.5	11.0	0.4	80748.3	Sep-97	938.3	185647.8	8.28	1.28
Oct-97	4	128.1	4.1	55321.6	17.8	0.6	80766.1	Oct-97	469.5	186117.3	2.80	1.28
Nov-97	4	132.6	4.4	55454.2	20.8	0.7	80786.9	Nov-97	707.0	186824.3	4.02	1.28
Dec-97	4	89.6	2.9	55543.8	11.0	0.4	80797.9	Dec-97	562.2	187386.5	4.85	1.29
1997		825.5	2.3	55543.8	240.1	0.7	80797.9	1997	7066.5	187386.5	5.86	1.29
Jan-98	4	84.4	2.7	55628.2	11.2	0.4	80809.1	Jan-98	175.1	187561.6	1.59	1.29
Feb-98	4	31.0	1.1	55659.2	4.5	0.2	80813.6	Feb-98	184.5	187746.1	4.53	1.29
Mar-98	2	20.7	0.7	55679.9	2.7	0.1	80816.3	Mar-98	201.3	187947.4	7.48	1.29
Apr-98	2	10.6	0.4	55690.5	2.1	0.1	80818.4	Apr-98	17.9	187965.3	1.23	1.29
May-98	3	16.0	0.5	55706.5	11.3	0.4	80829.7	May-98	0.0	187965.3	0.00	1.29
Jun-98	2	15.9	0.5	55722.4	2.4	0.1	80832.1	Jun-98	0.0	187965.3	0.00	1.29
Jul-98	3	15.5	0.5	55737.9	12.1	0.4	80844.2	Jul-98	0.0	187965.3	0.00	1.29
Aug-98	3	16.0	0.5	55753.9	12.0	0.4	80856.2	Aug-98	0.0	187965.3	0.00	1.29
Sep-98	3	13.4	0.5	55767.3	12.3	0.4	80868.5	Sep-98	0.0	187965.3	0.00	1.29
Oct-98	3	19.6	0.6	55786.9	12.5	0.4	80881.0	Oct-98	0.0	187965.3	0.00	1.29
Nov-98	2	15.3	0.5	55802.2	2.6	0.1	80883.6	Nov-98	0.0	187965.3	0.00	1.29
Dec-98	2	15.6	0.5	55817.8	1.3	0.0	80884.9	Dec-98	0.0	187965.3	0.00	1.29
1998		274.0	0.8	55817.8	87.0	0.2	80884.9	1998	578.8	187965.3	1.42	1.29
Jan-99	2	12.6	0.4	55830.4	1.8	0.1	80886.7	Jan-99	0.0	187965.3	0.00	1.29
Feb-99	3	13.7	0.5	55844.1	2.5	0.1	80889.2	Feb-99	0.0	187965.3	0.00	1.29
Mar-99	3	74.4	2.4	55918.5	21.4	0.7	80910.6	Mar-99	0.0	187965.3	0.00	1.28

Apr-99	3	47.0	1.6	55965.5	7.3	0.2	80917.9	Apr-99	0.0	187965.3	0.00	1.28
May-99	3	55.2	1.8	56020.7	9.0	0.3	80926.9	May-99	0.0	187965.3	0.00	1.28
Jun-99	3	45.1	1.5	56065.8	7.8	0.3	80934.7	Jun-99	0.0	187965.3	0.00	1.28
Jul-99	3	41.9	1.4	56107.7	7.8	0.3	80942.5	Jul-99	0.0	187965.3	0.00	1.28
Aug-99	3	37.9	1.2	56145.6	6.4	0.2	80948.9	Aug-99	0.0	187965.3	0.00	1.28
Sep-99	2	19.2	0.6	56164.8	3.6	0.1	80952.5	Sep-99	0.0	187965.3	0.00	1.28
Oct-99	1	6.4	0.2	56171.2	1.7	0.1	80954.2	Oct-99	0.0	187965.3	0.00	1.28
Nov-99	1	3.0	0.1	56174.2	0.8	0.0	80955.0	Nov-99	0.0	187965.3	0.00	1.28
Dec-99	2	37.8	1.2	56212.0	9.7	0.3	80964.7	Dec-99	0.0	187965.3	0.00	1.28
1999		394.2	1.1	56212.0	79.8	0.2	80964.7	1999	0.0	187965.3	0.00	1.28
Jan-00	2	54.5	1.8	56266.5	19.4	0.6	80984.1	Jan-00	0.0	187965.3	0.00	1.28
Feb-00	3	53.5	1.8	56320.0	20.7	0.7	81004.8	Feb-00	0.0	187965.3	0.00	1.28
Mar-00	3	47.4	1.5	56367.4	15.2	0.5	81020.0	Mar-00	0.0	187965.3	0.00	1.28
Apr-00	0	0.0	0.0	56367.4	0.0	0.0	81020.0	Apr-00	0.0	187965.3	0.00	1.28
May-00	7	58.9	1.9	56426.3	14.6	0.5	81034.6	May-00	0.0	187965.3	0.00	1.28
Jun-00	7	79.2	2.6	56505.5	27.8	0.9	81062.4	Jun-00	32.0	187997.3	0.27	1.28
Jul-00	7	206.4	6.7	56711.9	47.9	1.6	81110.3	Jul-00	48.0	188045.3	0.17	1.28
Aug-00	7	139.0	4.5	56850.9	50.2	1.6	81160.5	Aug-00	48.0	188093.3	0.23	1.27
Sep-00	4	78.1	2.6	56929.0	101.4	3.4	81261.9	Sep-00	112.0	188205.3	0.58	1.27
Oct-00	4	70.0	2.3	56999.0	79.5	2.6	81341.4	Oct-00	0.0	188205.3	0.00	1.27
Nov-00	4	54.5	1.8	57053.5	82.0	2.7	81423.4	Nov-00	0.0	188205.3	0.00	1.27
Dec-00	3	30.7	1.0	57084.2	61.6	2.0	81485.0	Dec-00	0.0	188205.3	0.00	1.27
2000		872.2	2.4	57084.2	520.3	1.4	81485.0	2000	240.0	188205.3	0.16	1.27
Jan-01	3	36.3	1.2	57120.5	70.2	2.3	81555.2	Jan-01	0.0	188205.3	0.00	1.27
Feb-01	1	10.3	0.4	57130.8	13.5	0.5	81568.7	Feb-01	0.0	188205.3	0.00	1.27
Mar-01	3	46.1	1.5	57176.9	80.7	2.6	81649.4	Mar-01	0.0	188205.3	0.00	1.27
Apr-01	3	21.7	0.7	57198.6	41.9	1.4	81691.3	Apr-01	0.0	188205.3	0.00	1.27
May-01	3	51.1	1.7	57249.7	81.2	2.6	81772.5	May-01	151.7	188357.0	1.08	1.27
Jun-01	4	39.0	1.3	57288.7	49.3	1.6	81821.8	Jun-01	43.5	188400.5	0.46	1.27
Jul-01	4	57.7	1.9	57346.4	70.5	2.3	81892.3	Jul-01	64.0	188464.5	0.46	1.26
Aug-01	3	44.6	1.4	57391.0	54.8	1.8	81947.1	Aug-01	0.0	188464.5	0.00	1.26
Sep-01	0	0.0	0.0	57391.0	0.0	0.0	81947.1	Sep-01	0.0	188464.5	0.00	1.26
Oct-01	0	0.0	0.0	57391.0	0.0	0.0	81947.1	Oct-01	0.0	188464.5	0.00	1.26
Nov-01	4	40.2	1.3	57431.2	75.5	2.5	82022.6	Nov-01	0.0	188464.5	0.00	1.26
Dec-01	3	20.6	0.7	57451.8	37.4	1.2	82060.0	Dec-01	64.0	188528.5	1.04	1.26
2001		367.6	1.0	57451.8	575.0	1.6	82060.0	2001	323.2	188528.5	0.32	1.26
Jan-02	4	35.1	1.1	57486.9	41.7	1.4	82101.7	Jan-02	0.0	188528.5	0.00	1.26
Feb-02	4	86.5	3.1	57573.4	77.5	2.8	82179.2	Feb-02	95.4	188623.9	0.53	1.26
Mar-02	3	50.9	1.6	57624.3	49.5	1.6	82228.7	Mar-02	48.0	188671.9	0.44	1.26
Apr-02	4	58.9	2.0	57683.2	54.7	1.8	82283.4	Apr-02	96.0	188767.9	0.78	1.26
May-02	3	33.4	1.1	57716.6	19.5	0.6	82302.9	May-02	64.0	188831.9	1.09	1.26
Jun-02	3	44.4	1.5	57761.0	54.6	1.8	82357.5	Jun-02	80.0	188911.9	0.75	1.26
Jul-02	5	49.9	1.6	57810.9	61.4	2.0	82418.9	Jul-02	0.0	188911.9	0.00	1.26
Aug-02	4	59.5	1.9	57870.4	80.5	2.6	82499.4	Aug-02	96.0	189007.9	0.64	1.26
Sep-02	4	33.8	1.1	57904.2	41.4	1.4	82540.8	Sep-02	96.0	189103.9	1.19	1.26
Oct-02	4	40.2	1.3	57944.4	65.0	2.1	82605.8	Oct-02	0.0	189103.9	0.00	1.26
Nov-02	0	0.0	0.0	57944.4	0.0	0.0	82605.8	Nov-02	0.0	189103.9	0.00	1.26
Dec-02	0	0.0	0.0	57944.4	0.0	0.0	82605.8	Dec-02	0.0	189103.9	0.00	1.26
2002		492.6	1.4	57944.4	545.8	1.5	82605.8	2002	575.4	189103.9	0.51	1.26
Jan-03	4	26.5	0.9	57970.9	59.1	1.9	82664.9	Jan-03	64.0	189167.9	0.71	1.26
Feb-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Feb-03	0.0	189167.9	0.00	1.26
Mar-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Mar-03	0.0	189167.9	0.00	1.26
Apr-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Apr-03	0.0	189167.9	0.00	1.26
May-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	May-03	0.0	189167.9	0.00	1.26
Jun-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jun-03	0.0	189167.9	0.00	1.26
Jul-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jul-03	0.0	189167.9	0.00	1.26
Aug-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Aug-03	0.0	189167.9	0.00	1.26
Sep-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Sep-03	0.0	189167.9	0.00	1.26
Oct-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Oct-03	0.0	189167.9	0.00	1.26
Nov-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Nov-03	0.0	189167.9	0.00	1.26

Dec-03	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Dec-03	0.0	189167.9	0.00	1.26
2003		26.5	0.1	57970.9	59.1	0.2	82664.9	2003	64.0	189167.9	0.71	1.26
Jan-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jan-04	0.0	189167.9	0.00	1.26
Feb-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Feb-04	0.0	189167.9	0.00	1.26
Mar-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Mar-04	0.0	189167.9	0.00	1.26
Apr-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Apr-04	0.0	189167.9	0.00	1.26
May-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	May-04	0.0	189167.9	0.00	1.26
Jun-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jun-04	0.0	189167.9	0.00	1.26
Jul-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jul-04	0.0	189167.9	0.00	1.26
Aug-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Aug-04	0.0	189167.9	0.00	1.26
Sep-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Sep-04	0.0	189167.9	0.00	1.26
Oct-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Oct-04	0.0	189167.9	0.00	1.26
Nov-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Nov-04	0.0	189167.9	0.00	1.26
Dec-04	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Dec-04	0.0	189167.9	0.00	1.26
2004		0.0	0.0	57970.9	0.0	0.0	82664.9	2004	0.0	189167.9	0.00	1.26
Jan-05	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jan-05	86.1	189254.0	0.00	1.26
Feb-05	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Feb-05	0.0	189254.0	0.00	1.26
Mar-05	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Mar-05	0.0	189254.0	0.00	1.26
Apr-05	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Apr-05	0.0	189254.0	0.00	1.26
May-05	0	0.0	0.0	57970.9	0.0	0.0	82664.9	May-05	0.0	189254.0	0.00	1.26
Jun-05	0	0.0	0.0	57970.9	0.0	0.0	82664.9	Jun-05	0.0	189254.0	0.00	1.26
Jul-05	3	41.7	1.4	58012.6	10.4	0.3	82675.3	Jul-05	0.0	189254.0	0.00	1.26
Aug-05	3	56.1	1.8	58068.7	34.6	1.1	82709.9	Aug-05	34.6	189288.6	0.35	1.26
Sep-05	4	81.6	2.7	58150.3	41.6	1.4	82751.5	Sep-05	41.6	189330.2	0.30	1.26
Oct-05	1	25.0	0.8	58175.3	6.8	0.2	82758.3	Oct-05	6.8	189337.0	0.19	1.26
Nov-05	1	22.5	0.8	58197.8	12.4	0.4	82770.7	Nov-05	6.8	189343.8	0.18	1.26
Dec-05	3	51.5	1.7	58249.3	31.0	1.0	82801.7	Dec-05	0.0	189343.8	0.00	1.25
2005		278.4	0.8	58249.3	136.8	0.4	82801.7	2005	175.9	189343.8	0.38	1.25
Jan-06	3	54.6	1.8	58303.9	29.7	1.0	82831.4	Jan-06	29.7	189373.5	0.32	1.25
Feb-06	4	76.8	2.7	58380.7	31.6	1.1	82863.0	Feb-06	31.6	189405.1	0.26	1.25
Mar-06	4	85.9	2.8	58466.6	33.2	1.1	82896.2	Mar-06	33.1	189438.2	0.25	1.25
Apr-06	4	66.8	2.2	58533.4	37.7	1.3	82933.9	Apr-06	31.7	189469.9	0.27	1.25
May-06	5	99.8	3.2	58633.2	54.0	1.7	82987.9	May-06	64.0	189533.9	0.37	1.25
Jun-06	5	103.5	3.5	58736.7	66.9	2.2	83054.8	Jun-06	66.9	189600.8	0.36	1.25
Jul-06	8	152.2	4.9	58888.9	106.4	3.4	83161.2	Jul-06	106.3	189707.1	0.37	1.25
Aug-06	8	152.1	4.9	59041.0	106.3	3.4	83267.5	Aug-06	106.3	189813.4	0.37	1.25
Sep-06	8	145.8	4.9	59186.8	95.4	3.2	83362.9	Sep-06	95.4	189908.8	0.36	1.24
Oct-06	8	144.2	4.7	59331.0	107.3	3.5	83470.2	Oct-06	107.3	190016.1	0.39	1.24
Nov-06	8	145.8	4.9	59476.8	100.4	3.4	83570.6	Nov-06	95.4	190111.5	0.35	1.24
Dec-06	8	144.2	4.7	59621.0	107.2	3.5	83677.8	Dec-06	107.3	190218.8	0.39	1.24
2006		1371.7	3.8	59621.0	876.1	2.4	83677.8	2006	875.0	190218.8	0.35	1.24
Jan-07	8	112.2	3.6	59733.2	73.3	2.4	83751.1	Jan-07	73.4	190292.2	0.36	1.24
Feb-07	5	24.2	0.9	59757.4	9.6	0.3	83760.7	Feb-07	9.6	190301.8	0.25	1.24
Mar-07	8	144.2	4.7	59901.6	107.3	3.5	83868.0	Mar-07	107.2	190409.0	0.39	1.24
Apr-07	8	136.3	4.5	60037.9	90.0	3.0	83958.0	Apr-07	96.0	190505.0	0.38	1.24
May-07	8	144.2	4.7	60182.1	107.3	3.5	84065.3	May-07	107.2	190612.2	0.39	1.23
Jun-07	9	173.9	5.8	60356.0	110.0	3.7	84175.3	Jun-07	110.2	190722.4	0.35	1.23
Jul-07	9	222.6	7.2	60578.6	186.1	6.0	84361.4	Jul-07	186.7	190909.1	0.42	1.23
Aug-07	9	235.1	7.6	60813.7	170.0	5.5	84531.4	Aug-07	71.4	190980.5	0.16	1.23
Sep-07	4	51.9	1.7	60865.6	16.3	0.5	84547.7	Sep-07	25.2	191005.7	0.33	1.23
Oct-07	8	176.8	5.7	61042.4	121.7	3.9	84669.4	Oct-07	159.9	191165.6	0.49	1.22
Nov-07	3	62.0	2.1	61104.4	27.3	0.9	84696.7	Nov-07	161.8	191327.4	1.62	1.22
Dec-07	3	62.0	2.0	61166.4	27.3	0.9	84724.0	Dec-07	161.8	191489.2	1.62	1.23
2007		1545.4	4.2	61166.4	1046.2	2.9	84724.0	2007	1270.4	191489.2	0.45	1.23
Jan-08	3	57.5	1.9	61223.9	21.1	0.7	84745.1	Jan-08	256.3	191745.5	2.90	1.23
Feb-08	0	0.0	0.0	61223.9	0.0	0.0	84745.1	Feb-08	0.0	191745.5	0.00	1.23
Mar-08	0	0.0	0.0	61223.9	0.0	0.0	84745.1	Mar-08	0.0	191745.5	0.00	1.23
Apr-08	4	97.8	3.3	61321.7	70.2	2.3	84815.3	Apr-08	70.3	191815.8	0.38	1.23

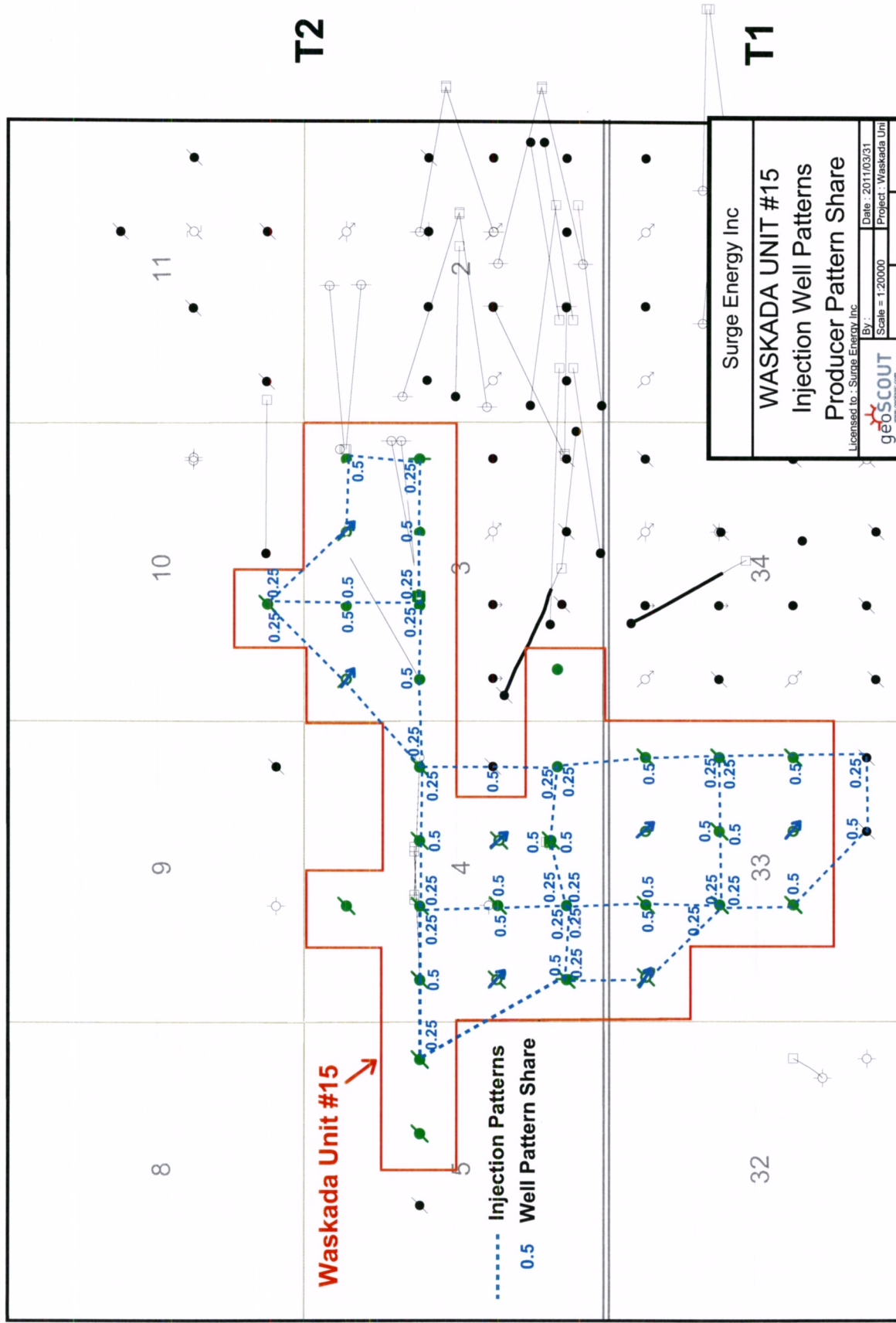
May-08	3	59.9	1.9	61381.6	28.5	0.9	84843.8	May-08	142.5	191958.3	1.45	1.23
Jun-08	2	35.4	1.2	61417.0	27.6	0.9	84871.4	Jun-08	59.6	192017.9	0.86	1.23
Jul-08	0	0.0	0.0	61417.0	0.0	0.0	84871.4	Jul-08	0.0	192017.9	0.00	1.23
Aug-08	0	0.0	0.0	61417.0	0.0	0.0	84871.4	Aug-08	0.0	192017.9	0.00	1.23
Sep-08	2	36.9	1.2	61453.9	26.4	0.9	84897.8	Sep-08	88.3	192106.2	1.27	1.23
Oct-08	3	46.5	1.5	61500.4	27.6	0.9	84925.4	Oct-08	89.4	192195.6	1.09	1.23
Nov-08	0	0.0	0.0	61500.4	0.0	0.0	84925.4	Nov-08	0.0	192195.6	0.00	1.23
Dec-08	0	0.0	0.0	61500.4	0.0	0.0	84925.4	Dec-08	0.0	192195.6	0.00	1.23
2008		334.0	0.9	61500.4	201.4	0.6	84925.4	2008	706.4	192195.6	1.19	1.23
Jan-09	0	0.0	0.0	61500.4	0.0	0.0	84925.4	Jan-09	0.0	192195.6	0.00	1.23
Feb-09	0	0.0	0.0	61500.4	0.0	0.0	84925.4	Feb-09	0.0	192195.6	0.00	1.23
Mar-09	0	0.0	0.0	61500.4	0.0	0.0	84925.4	Mar-09	0.0	192195.6	0.00	1.23
Apr-09	3	27.3	0.9	61527.7	13.4	0.5	84938.8	Apr-09	76.8	192272.4	1.69	1.23
May-09	3	27.3	0.9	61555.0	13.4	0.4	84952.2	May-09	34.8	192307.2	0.77	1.23
Jun-09	3	27.3	0.9	61582.3	13.4	0.5	84965.6	Jun-09	40.6	192347.8	0.90	1.23
Jul-09	3	27.3	0.9	61609.6	13.4	0.4	84979.0	Jul-09	98.3	192446.1	2.17	1.23
Aug-09	3	27.3	0.9	61636.9	13.4	0.4	84992.4	Aug-09	98.7	192544.8	2.18	1.23
Sep-09	3	74.4	2.5	61711.3	33.6	1.1	85026.0	Sep-09	202.5	192747.3	1.68	1.23
Oct-09	3	74.6	2.4	61785.9	33.6	1.1	85059.6	Oct-09	160.4	192907.7	1.33	1.23
Nov-09	3	71.8	2.4	61857.7	33.6	1.1	85093.2	Nov-09	196.0	193103.7	1.67	1.23
Dec-09	3	71.8	2.3	61929.5	33.6	1.1	85126.8	Dec-09	156.0	193259.7	1.33	1.23
2009		429.1	1.2	61929.5	201.4	0.6	85126.8	2009	1064.1	193259.7	1.51	1.23
Jan-10	3	74.1	2.4	62003.6	33.6	1.1	85160.4	Jan-10	196.0	193455.7	1.63	1.23
Feb-10	1	24.3	0.9	62027.9	0.0	0.0	85160.4	Feb-10	89.8	193545.5	3.16	1.23
Mar-10	0	0	0	62027.9	0	0	85160.4	Mar-10	0	193545.5	0	1.23
Apr-10	0	0	0	62027.9	0	0	85160.4	Apr-10	0	193545.5	0	1.23
May-10	0	0	0	62027.9	0	0	85160.4	May-10	0	193545.5	0	1.23
Jun-10	0	0	0	62027.9	0	0	85160.4	Jun-10	0	193545.5	0	1.23
Jul-10	0	0	0	62027.9	0	0	85160.4	Jul-10	0	193545.5	0	1.23
Aug-10	0	0	0	62027.9	0	0	85160.4	Aug-10	0	193545.5	0	1.23
Sep-10	4	61.0	2.0	62088.9	65.4	2.2	85225.8	Sep-10	0	193545.5	0	1.23
Oct-10	3	65.1	2.1	62154.0	39.6	1.3	85265.4	Oct-10	0	193545.5	0	1.23
Nov-10	5	64.8	2.2	62218.8	28.8	1.0	85294.2	Nov-10	0	193545.5	0	1.22
Dec-10	7	352.9	11.4	62571.7	4.2	0.1	85298.4	Dec-10	0	193545.5	0	1.22
2010		642.2	1.67	62571.7	33.6	0.57	85298.4	2010	285.8	193545.5	0.36	1.22

NOTE: Waterflood with makeup water effective 1987-03 through 1998 when injection halted. Erratic injection of produced water only 2000 to 2002, and again 2005 to 2010 when Unit producing wells and injectors shut-in over January/February. Existing vertical wells back on stream 2010-09, with 3 new horizontals on stream 2010-12. All produced fluids being trucked to third party batteries, with injectors remaining shut-in. New 16-3-2-26 Unit battery recently approved for construction. When facilities on stream water injection will be reviewed.

APPENDIX C

Unit No. 15 Waterflood Pattern Map

Pattern Voidage Replacement Summary



R26W1

WASKADA UNIT #15 WATERFLOOD REPORT - PATTERN TOTALS

7-33-1-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
1-33	0.25	977	12472	3404	36029	
2-33	0.50	43	6992	3521		
6-33	0.50	1352	15785	8683		
7-33	1.00	412	231	713		
8-33	0.50	1424	11099	6383		
9-33	0.25	2308	9720	3105		
10-33	0.50	1677	862	1412		
11-33	0.25	200	210	111		
Total		8393	57371	27332	36029	1.32

13-33-1-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
11-33	0.25	200	210	111	18925	
13-33	1.00	709	4177	5007		
14-33	0.50	2182	1472	2012		
3-4	0.25	6202	2108	2341		
4-4	0.25	356	647	266		
Total		9649	8614	9737	18925	1.94

15-33-1-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
9-33	0.25	2308	9720	3105	23387	
10-33	0.50	1677	862	1412		
11-33	0.25	200	210	111		
14-33	0.50	2182	1472	2012		
15-33	1.00	1689	785	2761		
16-33	0.50	2247	8619	5624		
1-4	0.25	4299	6257	2822		
2-4	0.50	2786	1923	2591		
3-4	0.25	6202	2108	2341		
Total		23590	31956	22780	23387	1.03

13-3-2-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
11-3	0.25	3887	1876	1606		
12-3	0.50	6065	1731	4414		
13-3	1.00	824	535	1499		
14-3	0.50	3576	1399	2791		
9-4	0.25	3004	1771	1321	32314	
3-10	0.25	538	441	268		
Total		17894	7753	11899	32314	2.72

15-3-2-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
9-3	0.25	3966	2203	1711		
10-3	0.50	3875	1296	2915		
11-3	0.25	3887	1876	1606		
14-3	0.50	3576	1399	2791		
15-3	1.00	504	501	1091	28386	
16-3	0.50	2661	1704	2409		
3-10	0.25	538	441	268		
Total		19007	9420	12790	28386	2.22

5-4-2-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
3-4	0.25	6202	2108	2341		
4-4	0.50	356	647	532		
5-4	1.00	289	361	699	20650	
6-4	0.50	1246	1096	1277		
11-4	0.25	205	529	192		
12-4	0.50	260	461	383		
9-5	0.25	553	638	321		
Total		9111	5840	5745	20650	3.59

7-4-2-26W1 INJECTION PATTERN

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
1-4	0.25	4299	6257	2822		
2-4	0.50	2786	1923	2591		
3-4	0.25	6202	2108	2341		
6-4	0.50	1246	1096	1277		
7-4	1.00	564	1177	1837	33872	
8-4	0.50	5987	1646	4325		
9-4	0.25	3004	1771	1321		
10-4	0.50	566	1222	942		
11-4	0.25	205	529	192		
Total		24859	17729	17649	33872	1.92

TOTAL PATTERNS UNIT #15

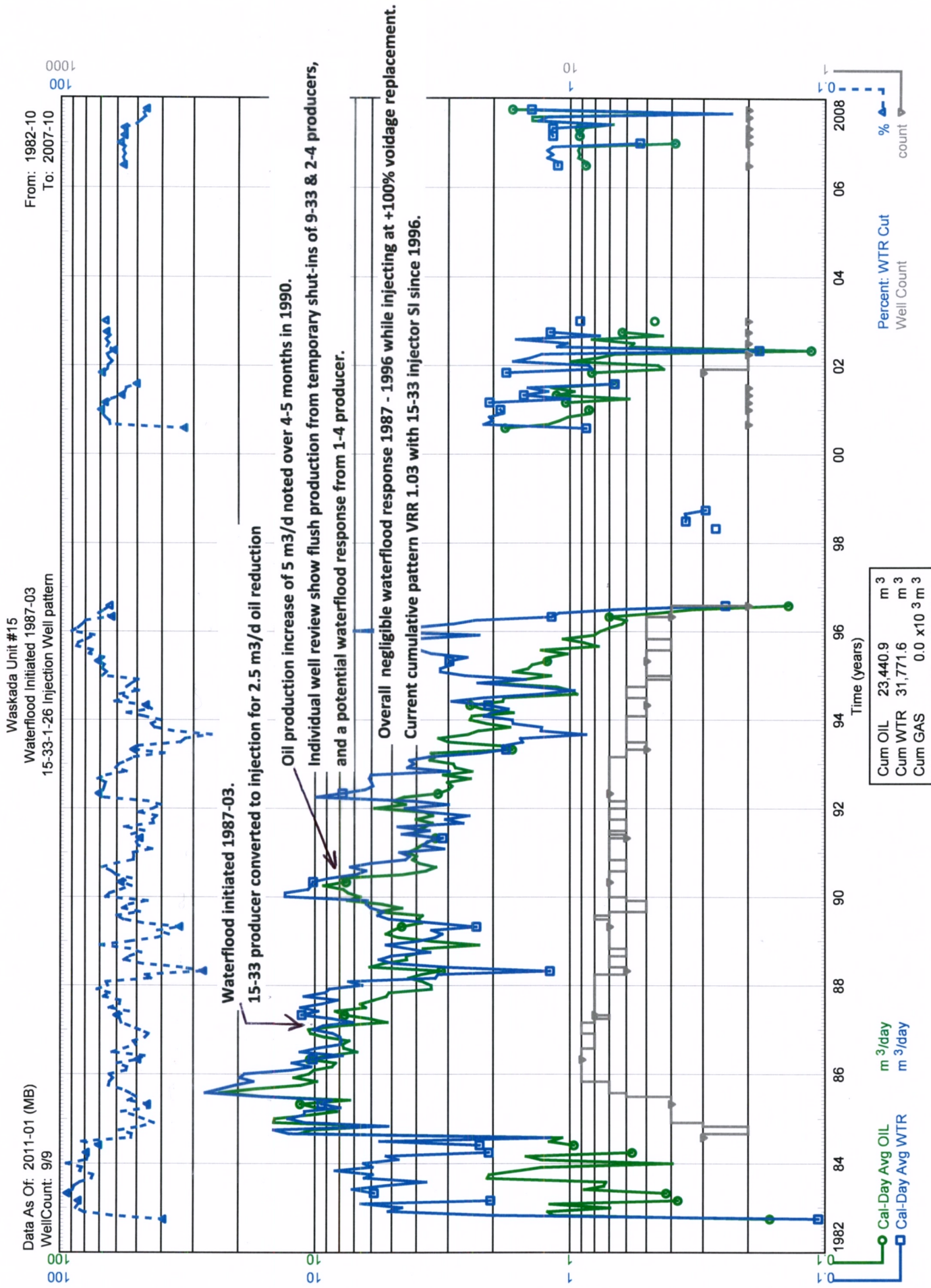
Producers	Patterns	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
34	7	67433	103308	107931.955	193563	1.79

APPENDIX D

Unit No. 15 Example 15-33-1-26 Injection Well

Production & Injection Plots

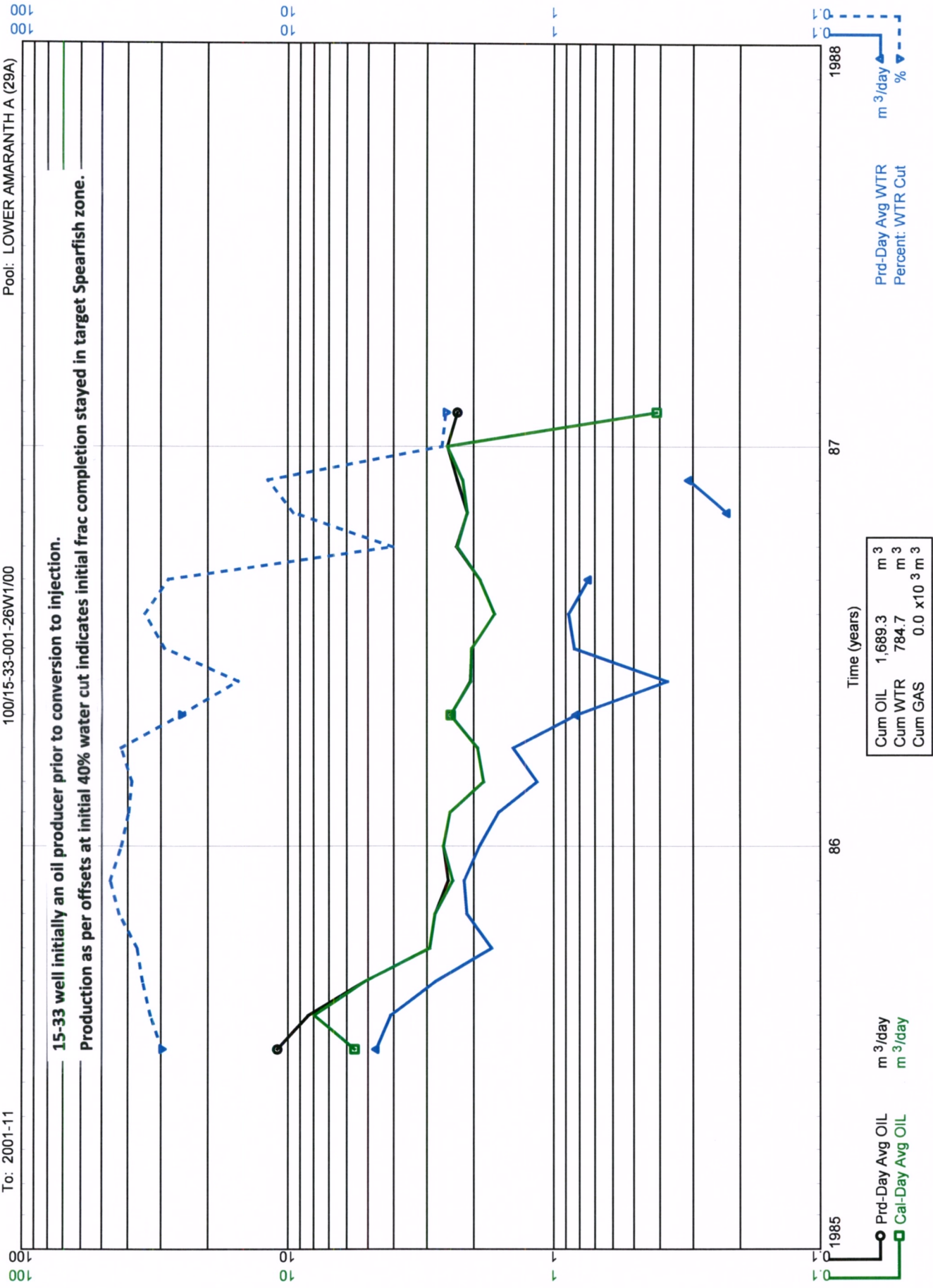
Log Section & Core Porosity-Perm Graph



Data As Of: 2011-01 (MB)
 From: 1985-07
 To: 2001-11

INDIVIDUAL PRODUCTION
 Waskada Unit No. 15 WIW
 100/15-33-001-26W1/00

Status: Resumed WIW
 Field: WASKADA (03)
 Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-01 (MB)

From: 1987-03

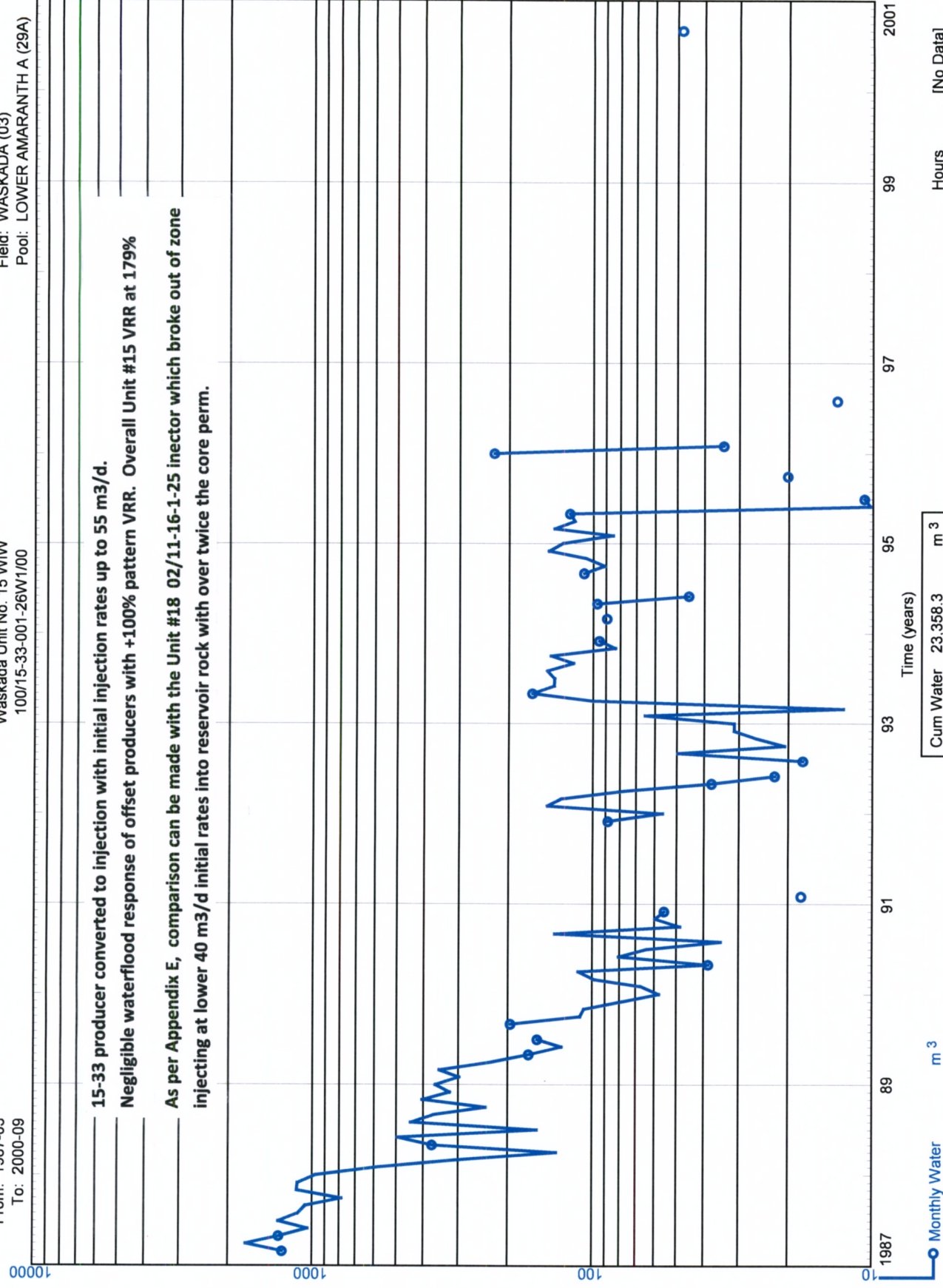
To: 2000-09

INDIVIDUAL INJECTION
Waskada Unit No. 15 WIW
100/15-33-001-26W1/00

Status: Resumed WIW

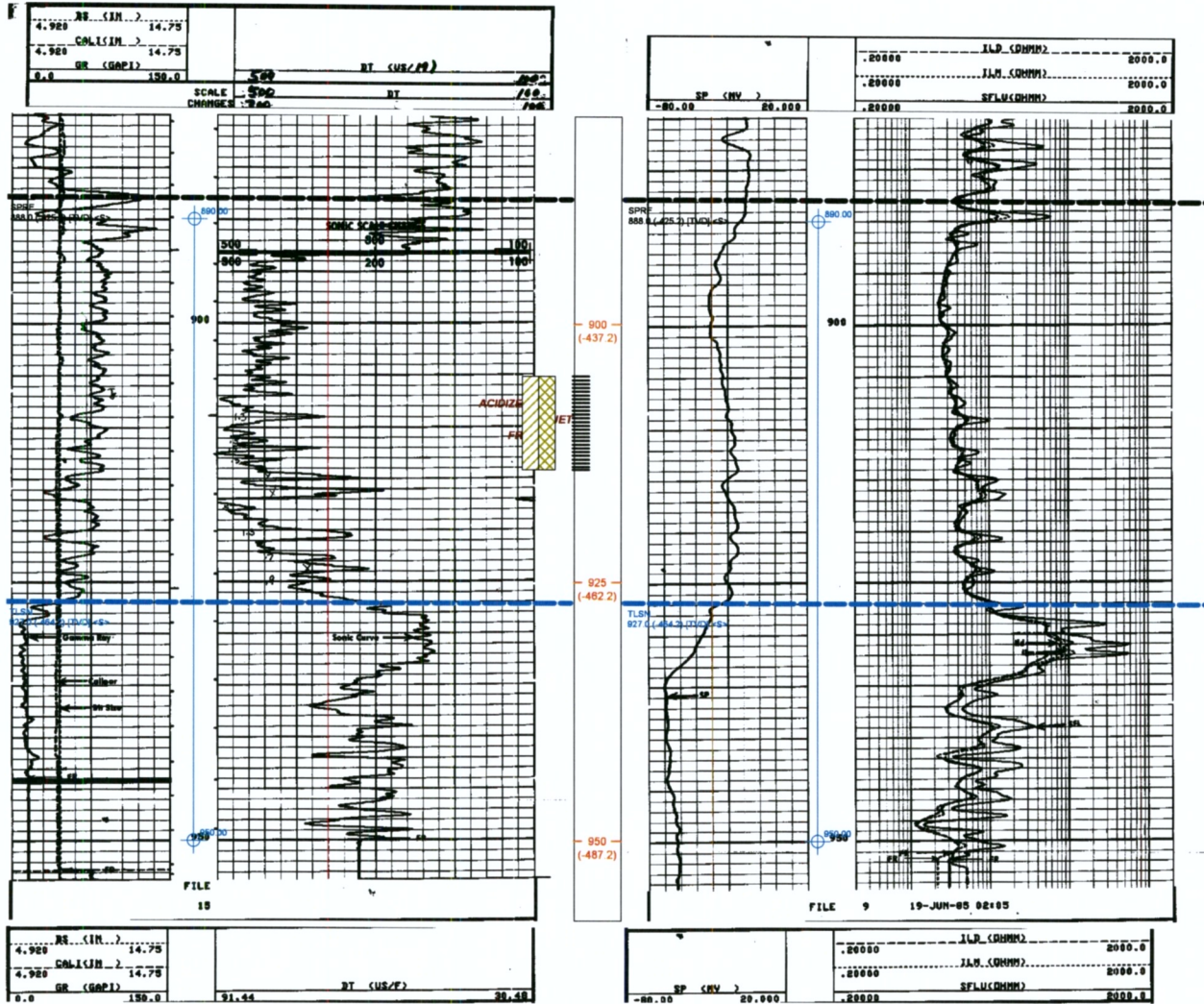
Field: WASKADA (03)

Pool: LOWER AMARANTH A (29A)



00/15-33-001-26W1/0

KB: 462.8 m RR: 1985-06-19
 TD: 953.0 m [TVD] FormTD: TLSN
 Mode: Susp Fluid: Water
 OMEGA SASKAO WASKADA WIW 15-33-1-26



DST Information

Prod	Oil (m3)	Gas (E3m3)	Water (m3)
Cum	1689.3	0.0	784.7
Daily	3.0	0.0	1.4

Waskada Unit #15 Waterflood Injector

7m dense cap at top of Mississippian unconformity between Spearfish pay and wet Mission Canyon.
 Offset 16-33 core indicates Spearfish average 2.5md Kmax, 13% porosity. Peak perms up to 10md.



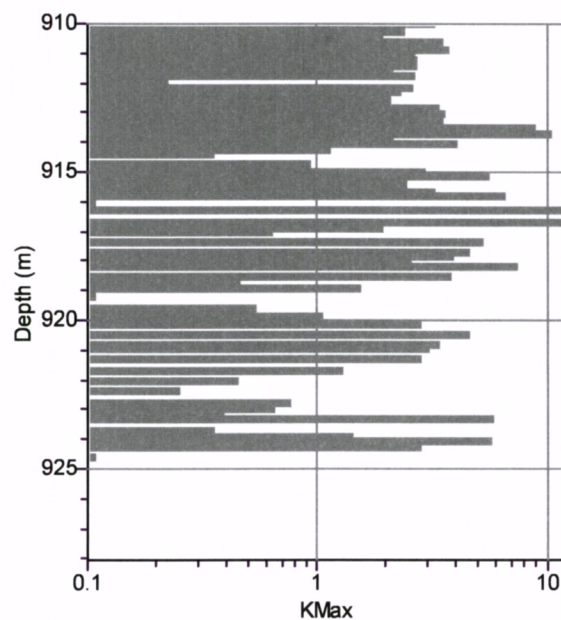
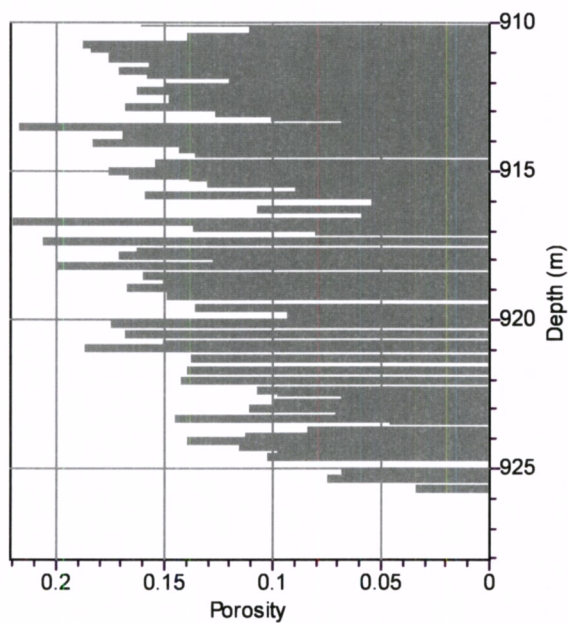
The Source of Information

Core Analysis Report

00/16-33-001-26W1/0

Field:	WASKADA	KB:	464.70 (m)	Rig Rel:	1985-06-23	Core Offset:	0.0 (m)
Pool:	LOWER	Gr Elev:	460.20 (m)	Cores:	1		
Prod Zone:	SPRF	Depth:	959.00 (m)				

Tot Thickness:	18.00 (m)	Avg Km:	2.49	Geo	1.04	Harm	0.14
Phi H:	2.15	Avg Kv:	0.78		0.16		0.04
KMax h:	39.91	Avg Phi:	0.13		0.13		0.11
Cored Forms:	SPRF,TLSN						



APPENDIX E

Mission Canyon Injection Breakthrough Analogy

11-16-1-25 Waterflood Pattern Map

Pattern Voidage Replacement Summary

Production & Injection Plots

Log Section & Core Porosity-Perm Graph

Waskada Unit #18

11-16 Waterflood Pattern
Well Pattern Share Factor 0.5

Well Cum Oil & Water Prod
(Cum oil & water @ 2000-12)

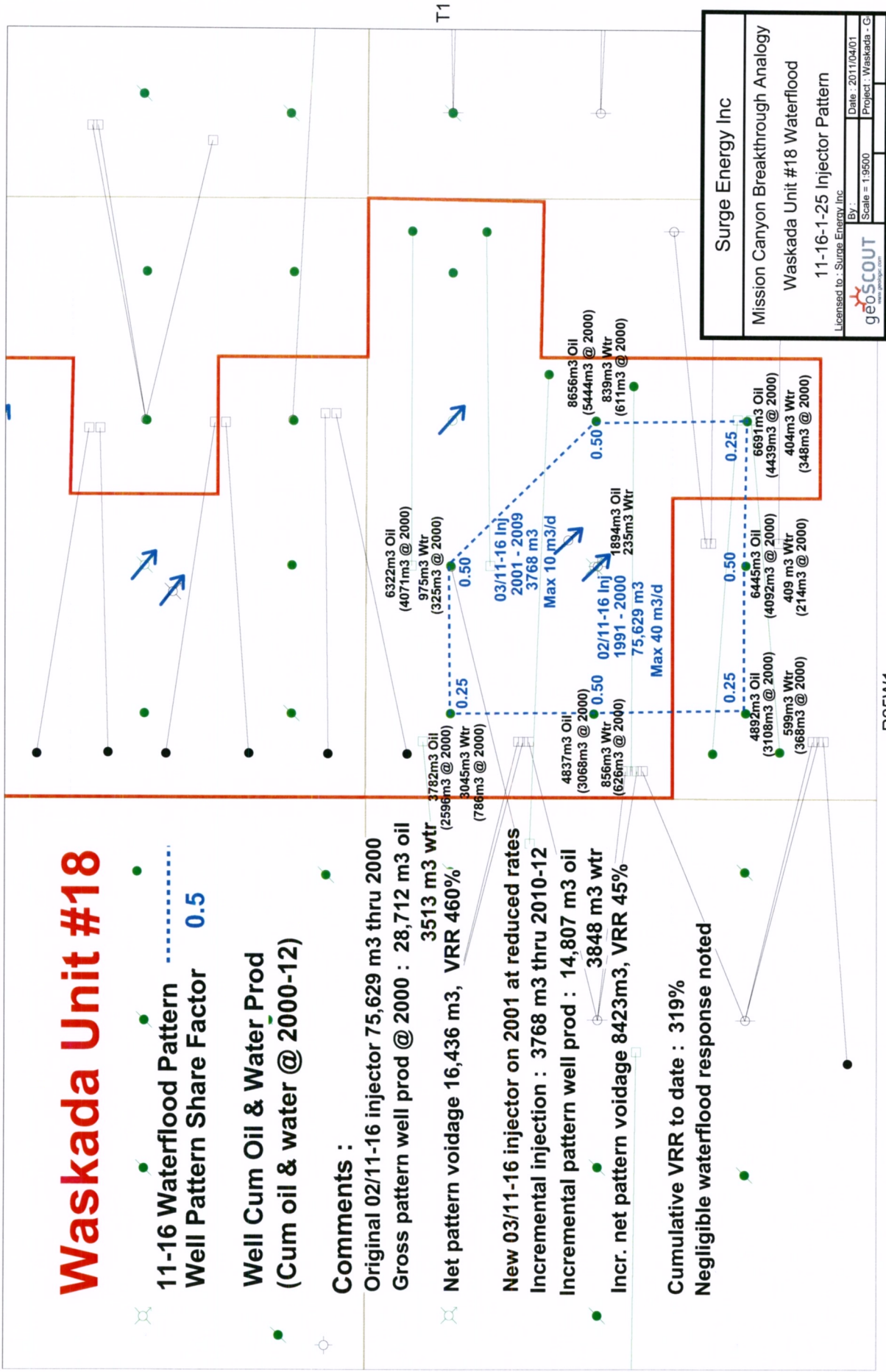
Comments :

Original 02/11-16 injector 75,629 m3 thru 2000
Gross pattern well prod @ 2000 : 28,712 m3 oil
3513 m3 wtr
Net pattern voidage 16,436 m3, VRR 460%

New 03/11-16 injector on 2001 at reduced rates
Incremental injection : 3768 m3 thru 2010-12
Incremental pattern well prod : 14,807 m3 oil
3848 m3 wtr
Incr. net pattern voidage 8423m3, VRR 45%

Cumulative VRR to date : 319%
Negligible waterflood response noted

R25W1



R25W1

T1

WASKADA UNIT #18 WATERFLOOD ANALOGY

11-16-1-25W1 INJECTION PATTERN @ 2000-12

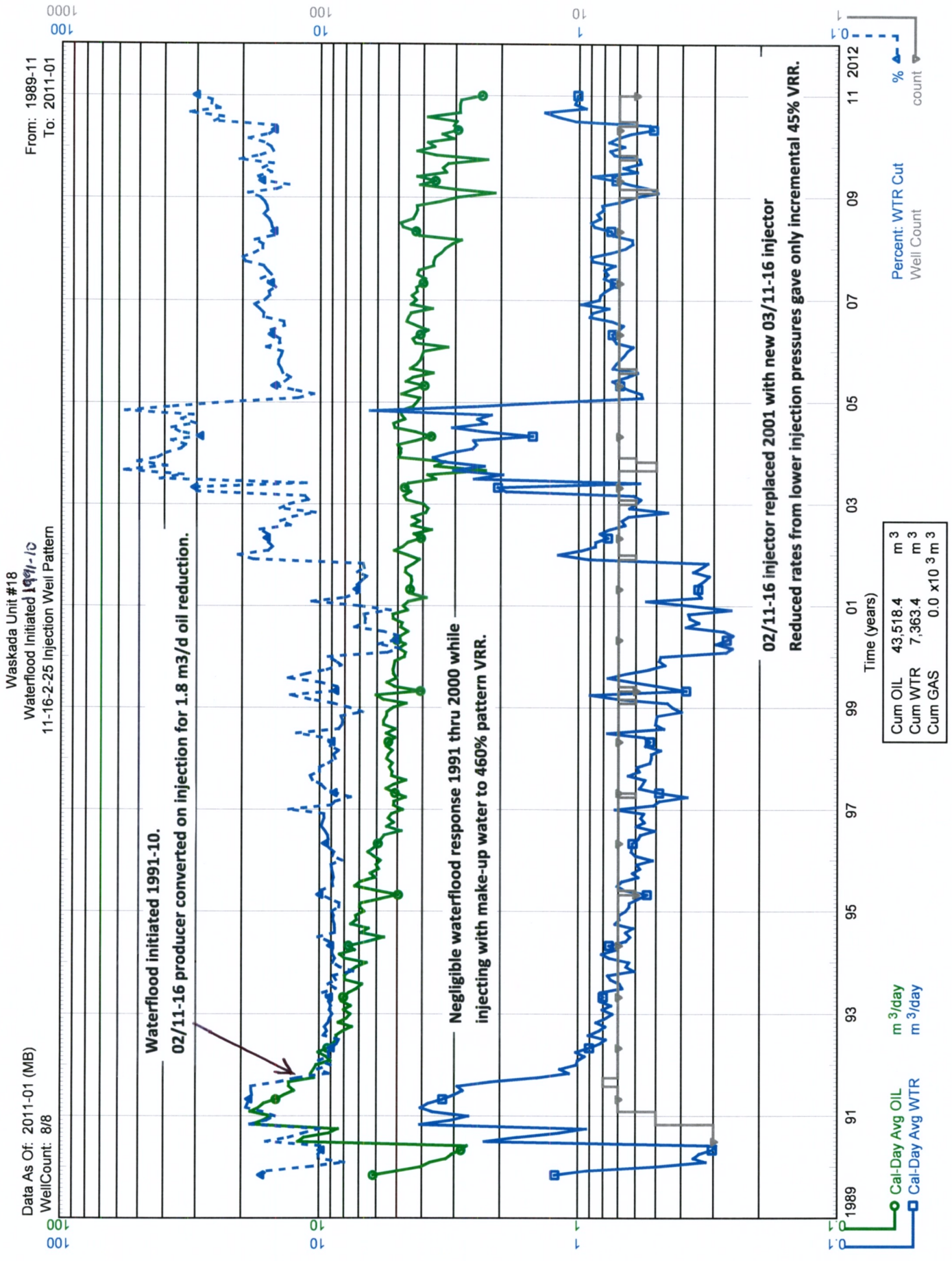
Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
5-16	0.25	3108	368	1001		
6-16	0.50	4092	214	2501		
7-16	0.25	4439	348	1385		
10-16	0.50	5444	611	3490		
02/11-16	1.00	1894	235	2451	75629	
12-16	0.5	3068	626	2108		
13-16	0.25	2596	786	956		
14-16	0.5	4071	325	2544		
Total		28712	3513	16436	75629	4.60

11-16-1-25W1 INJECTION PATTERN 2001-01 to 2010-12

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
5-16	0.25	1784	231	580		
6-16	0.50	2353	195	1474		
7-16	0.25	2252	56	673		
10-16	0.50	3212	228	1993		
02/11-16	1.00	0	0	0		
03/11-16	1.00	0	0	0	3768	
12-16	0.5	1769	230	1150		
13-16	0.25	1186	2259	912		
14-16	0.5	2251	650	1642		
Total		14807	3849	8423	3768	0.45

11-16-1-25W1 INJECTION PATTERN @ 2010-12

Producer	Pattern Share	Oil m3	Water m3	Voidage m3	Injection m3	Cum. VRR
5-16	0.25	4892	599	1581		
6-16	0.50	6445	409	3975		
7-16	0.25	6691	404	2058		
10-16	0.50	8656	839	5483		
02/11-16	1.00	1894	235	2451	75629	
03/11-16	1.00	0	0	0	3768	
12-16	0.5	4837	856	3258		
13-16	0.25	3782	3045	1867		
14-16	0.5	6322	975	4186		
Total		43519	7362	24859	79397	3.19



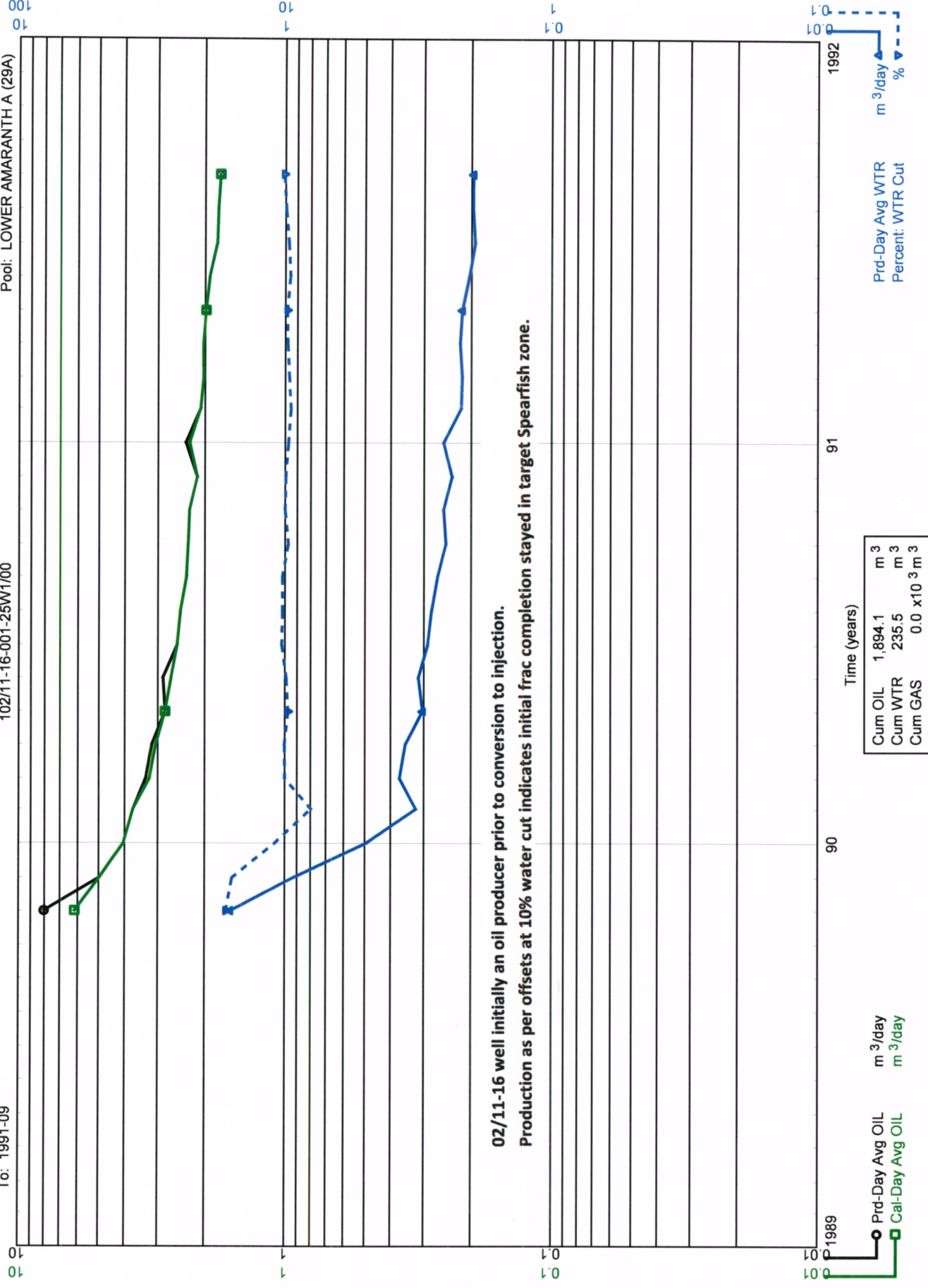
Data As Of: 2011-01 (MB)

From: 1989-11

To: 1991-09

INDIVIDUAL PRODUCTION
Waskada Unit No. 18 Prov. WIW
102/11-16-001-25W1/00

Status: Abandoned Water Inj Well
Field: WASKADA (03)
Pool: LOWER AMARANTH A (29A)



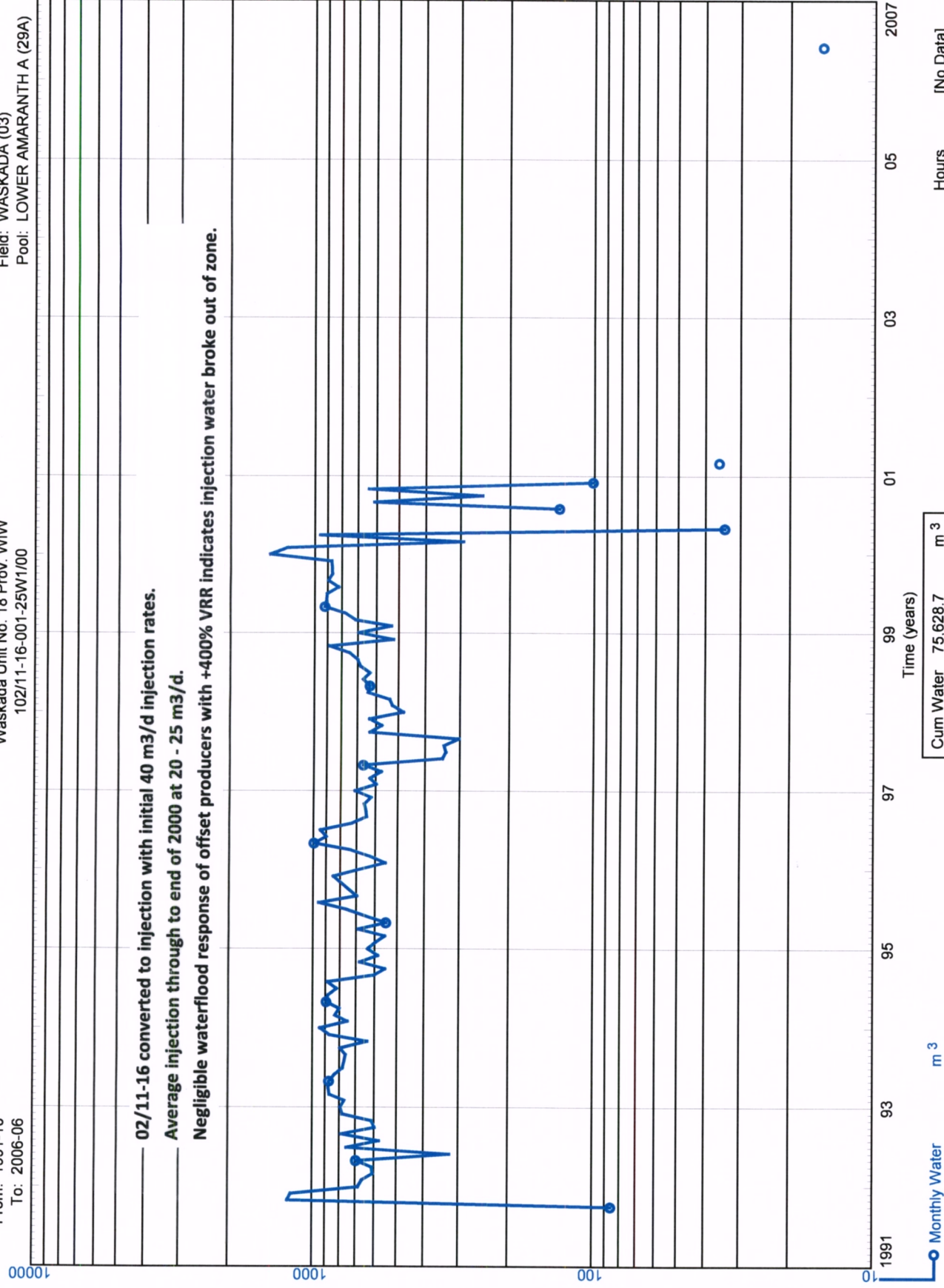
Data As Of: 2011-01 (MB)

From: 1991-10

To: 2006-06

INDIVIDUAL INJECTION
Waskada Unit No. 18 Prov. WIW
102/11-16-001-25W1/00

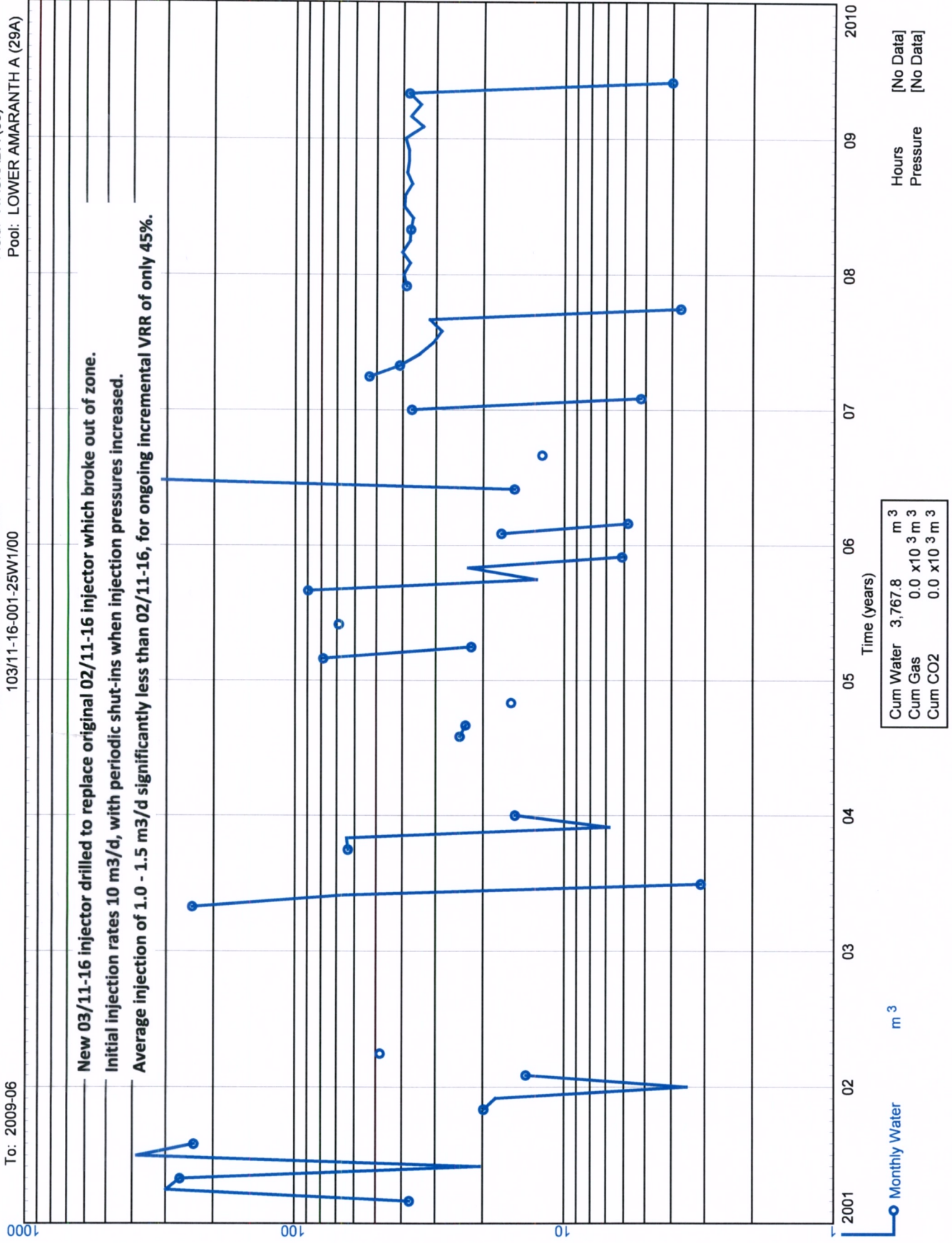
Status: Abandoned Water Inj Well
Field: WASKADA (03)
Pool: LOWER AMARANTH A (29A)



Data As Of: 2011-01 (MB)
From: 2001-03
To: 2009-06

INDIVIDUAL INJECTION
Waskada Unit No. 18 Prov. WIW
103/11-16-001-25W1/00

Status: Water Inj Well
Field: WASKADA (03)
Pool: LOWER AMARANTH A (29A)





The Source

Core Analysis Report

02/11-16-001-25W1/0

Field:	WASKADA	KB:	474.60 (m)	Rig Rel:	1989-11-02	Core Offset:	0.0 (m)
Pool:	LOWER	Gr Elev:	470.30 (m)	Cores:	1		
Prod Zone:	SPRF	Depth:	945.00 (m)				

Tot Thickness:	18.90 (m)	Avg Km:	5.69	Geo	3.80	Harm	2.36
Phi H:	2.02	Avg Kv:	0.90		0.30		0.09
KMax h:	77.33	Avg Phi:	0.15		0.15		0.14
Cored Forms:	SPRF						

