

**PennWest**

# Waskada Unit No.3

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## Waterflood Progress Report

**January 1<sup>st</sup> – December 31<sup>st</sup>, 2014**

Prepared by: Prabhakar Guriro

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## **INTRODUCTION:**

The Waskada Unit No.3 pressure maintenance project commenced water injection into the Lower Amaranth designed and in accordance with Manitoba Energy and Mines Approval No. PM 58.

Please refer to Attachment 1 – Area Map.

PRESSURE MAINTENANCE: Governed by Board Order No. PM 58

## **UNIT INFORMATION**

UNITIZED ZONE: Lower Amaranth

Original Unit, May 1, 1984 Board Order – Voluntary

First Enlargement, September 1, 1984 Board Order - Voluntary

Second Enlargement, August 1, 1985 Board Order – Voluntary

Third Enlargement, July 1, 1986 Board Order – Voluntary

Fourth Enlargement, November 1, 1986 - Voluntary

POOL: Waskada Lower Amaranth A (03 29A)

This report documents the performance of the Waskada Unit No.3 pressure maintenance project for the period of January 1 to December 31, 2014. The Unit had 62 active producers and no active injectors at the end of 2014. There were no new drills in 2014.

Please refer to Attachment 1A – Area Map of Unit

Unit No. 3 is part of the main Waskada field. The Waskada field is situated on the northeast rim of the Williston Basin in southern Manitoba. It comprises a large portion of Township 1 and 2, Ranges 25 and 26 W1.

## **GEOLOGY**

The Waskada Fields produce light density crude (approximately 36° API), predominantly from the Lower Amaranth formation. This is an interlaminated, shallow marine to subtidal succession of sandstones, siltstones, and shale progressively onlaps the Mississippian unconformity surface from basin center, up dip to the north and eastern basin limits in Saskatchewan and Manitoba. The fine grained reservoir rock has a complex reservoir characterization with 13 to 16 % porosity and permeability on the order of 0.5 to 15 md. The Lower Amaranth, the oldest Mesozoic unit, is a clastic red bed sequence lying directly on the Paleozoic erosional surface. It consists of a series of dolomitic siltstones and sandstones interbedded with argillaceous siltstones and shales. The section is usually subdivided into a lower sandy unit and an overlying shale unit. The lower sequence is the oil production zone. The bulk of pay is found in the laminated sandstone/siltstone facies.

The Lower Amaranth has been classified into four general lithological types:

1. Interbedded shale/siltstone/sandstone by grain size, color and texture
2. Siltstone – This lithology occurs in distinct intervals up to two or three metres in thickness. It is generally light green in color and dolomitic.
3. Laminated sandstone – This occurs in distinct sandy intervals with a wide range of grain sizes and primary sedimentary structures.
4. Massive sandstone – This lithology occurs in thin intervals and usually associated with the laminated sandstones facies. Beds are usually light grey to reddish grey in color and coarse to medium – grained.

## **DISCUSSION**

### **Production and Injection Performance**

Board Order No. PM 58 provided for pressure maintenance operations in Waskada Unit No.3. From the startup of injection in June 1984, injection rates fluctuated to the same degree in each injector, making it difficult to link any production responses to any injector. The Unit includes 15 injection wells, at the end of 2014 none are currently active, and 62 active producers. Injector 14-30 had 5 months of injection but this ceased at the end of December 2013. This is believed to be incorrectly assigned disposal water. We are investigating this with our Production Accounting team. 21 wells were drilled in 2013, all horizontal, and helping to maintain Unit production.

Please refer to Attachment 2 – A Summary of the Unit Well List and History

Please refer to Attachment 3 – A Production and Injection plot of the Unit.

Please refer to Attachment 4 – A Summary of Unit Annual Volumes and Rates.

Please refer to Attachment 5 – A Cumulative Production and Injection plot of the Unit.

### **Voidage Replacement Ratio Calculation:**

The Cumulative VRR from production start stabilized at 1 for many years and has declined in 2013 to approximately 0.5. After a slight increase to 0.55 in mid-2013 it has declined below 0.55 in last year. The Cumulative VRR from injection start stabilized at approximately 1.2 dropping to 0.55 from 2010 to 2013. It went up to 0.6 but has declined to 0.6 in last year. The decline in both Cumulative VRR's in the last 3 years is coincident with essentially no injection from 2007 onwards and the startup of new producers from 2010 to 2013. Currently there are no active injectors in this Unit and PennWest has no plans to reactivate at this time any of the old injectors.

Please refer to Attachment 6 – A Unit Voidage Replacement Ratio Plot.

Please refer to Attachment 7 – Individual Injection Well Performance Plots (15).

**Pressure Surveys:**

Pressure survey was conducted in 2014 on one well (103/04-36-00126W1/0). Initial reservoir pressure was approximately 8700 kPa with bubble point at about 4200 kPa.

Please refer to Attachment 1B - Area Map of 2013 Pressure Surveys with Values Posted.

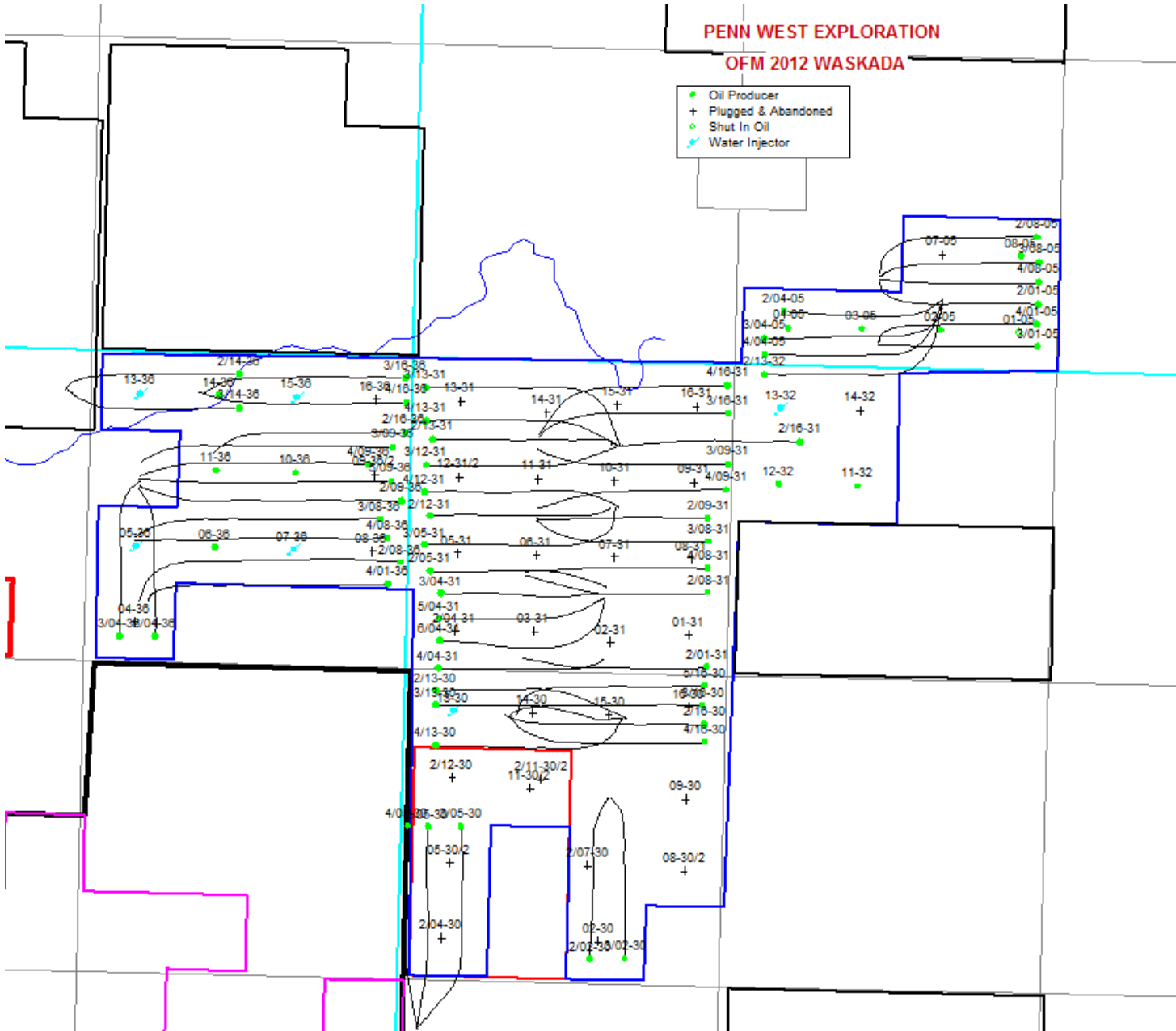
**Corrosion and Scale Prevention Program:**

Scale corrosion programs are implemented throughout the field. Wells and pipelines have mitigation measures in place.

**SUMMARY AND RECOMMENDATIONS**

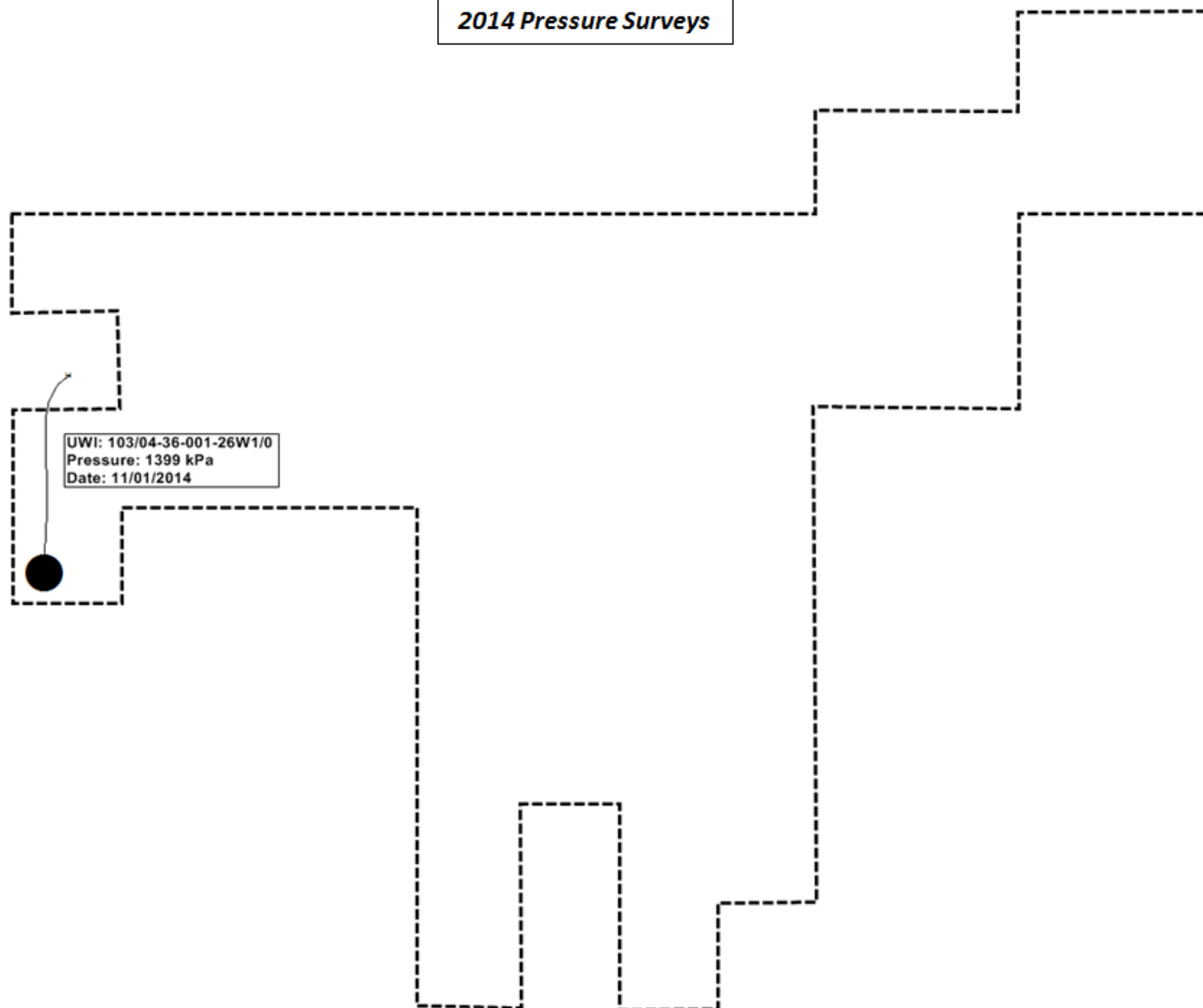
The behavior of Waskada Unit 3 producers are indicated by good initial oil productivity, rapidly declining to low rates, with almost no discernible water flood response. It is also believed that fracture stimulation treatments, performed on these wells prior to initiation of water injection, “broke through” into the higher productivity Mississippian and that the majority of injected water to date has entered this zone. This is one of the major explanations for lack of waterflood response to date and the continued decline in oil productivities.

## **ATTACHMENT 1A – UNIT AREA MAP**



**ATTACHMENT 1B– AREA MAP OF UNIT WITH 2014 PRESSURE SURVEYS**

*PennWest Exploration  
Accumap 2012  
Waskada Unit # 3  
2014 Pressure Surveys*



## ATTACHMENT 2- UNIT HISTORY

Unit Histroy : Waskada Unit # 3														
UWI	Completion Date	Operator	Status	New Drills	Kb Elevat ion	Total Depth	First Prd Date	Cum Oil Prd	Cum Water Prd	Last Prd Date	First Inj Date	Cum Water Inj	Cum Gas Inj	Last Inj Date
					m	m		m3	m3			m3	scm	
00/01-05-002-25W1/0	11/9/1984	PENN_ WEST	SUS-OIL	<N/A>	475.20	935.00	1/1/1985	7128.20	14931.80	10/1/2009		0.00	0.00	
00/01-31-001-25W1/0	6/14/1983	OMEGA_HYDROC	ABD-OIL	<N/A>	476.00	951.00	7/1/1983	5057.00	33880.40	9/1/1990		0.00	0.00	
00/02-05-002-25W1/0	11/12/1984	PENN_ WEST	OIL	<N/A>	476.10	935.00	1/1/1985	9137.30	1696.20	9/1/2011		0.00	0.00	
00/02-30-001-25W1/0	8/19/1982	PENN_ WEST	ABD-OIL	<N/A>	472.80	955.00	10/1/1982	1324.20	2664.20	7/1/1989		0.00	0.00	
00/02-31-001-25W1/0	7/7/1982	OMEGA_HYDROC	ABD-OIL	<N/A>	473.10	953.00	10/1/1982	3540.00	18477.50	10/1/1990		0.00	0.00	
00/03-05-002-25W1/0	11/14/1982	PENN_ WEST	OIL	<N/A>	475.30	917.20	11/1/1982	5966.00	2217.30	1/1/2012		0.00	0.00	
00/03-31-001-25W1/0	10/8/1981	OMEGA_HYDROC	ABD-OIL	<N/A>	472.90	950.00	3/1/1982	2827.50	2333.90	8/1/1990		0.00	0.00	
00/04-05-002-25W1/0	9/26/1985	PENN_ WEST	OIL	<N/A>	475.00	925.00	10/1/1985	7484.80	13819.80	1/1/2012		0.00	0.00	
00/04-36-001-26W1/0	1/9/1986	PENN_ WEST	ABD-OIL	<N/A>	472.40	972.00	2/1/1986	2429.80	697.60	2/1/1996		0.00	0.00	
00/05-30-001-25W1/2	3/21/1967	PENN_ WEST	ABD-OIL	<N/A>	472.40	973.80	12/1/1980	570.40	1304.80	6/1/1984	8/1/1984	97111.10	0.00	10/1/1998
00/05-31-001-25W1/0	2/22/1983	PENN_ WEST	ABD-OIL	<N/A>	471.40	950.00	6/1/1983	778.00	321.20	5/1/1984	6/1/1984	57646.50	0.00	2/1/1998
00/05-36-001-26W1/0	9/7/1983	PENN_ WEST	WTR-INJ	<N/A>	471.80	947.00	10/1/1983	3814.40	520.60	11/1/1986	12/1/1986	22659.90	0.00	6/1/2005
00/06-31-001-25W1/0	7/14/1982	PENN_ WEST	ABD-OIL	<N/A>	474.40	950.00	9/1/1982	3196.60	13522.00	8/1/1990		0.00	0.00	
00/06-36-001-26W1/0	6/4/1985	PENN_ WEST	OIL	<N/A>	471.80	992.00	7/1/1985	5583.30	1470.10	7/1/2013		0.00	0.00	
00/07-05-002-25W1/0	11/5/1984	PENN_ WEST	ABD-WINJ	<N/A>	475.70	932.00	12/1/1984	1193.60	1193.10	7/1/1986	7/1/1986	35948.80	0.00	3/1/1994
00/07-31-001-25W1/0	6/10/1983	OMEGA_HYDROC	ABD-OIL	<N/A>	473.50	952.80	7/1/1983	1360.50	1280.30	5/1/1984	6/1/1984	59195.50	0.00	4/1/1992
00/07-36-001-26W1/0	11/29/1985	PENN_ WEST	WTR-INJ	<N/A>	470.90	940.00	12/1/1985	839.30	137.40	10/1/1986	11/1/1986	51991.80	0.00	5/1/2004
00/08-05-002-25W1/0	11/16/1984	PENN_ WEST	OIL	<N/A>	477.30	934.00	12/1/1984	19191.40	3373.20	1/1/2015		0.00	0.00	
00/08-30-001-25W1/2	8/1/1982	PENN_ WEST	ABD-OIL	<N/A>	473.20	952.00	9/1/1983	4571.00	14854.70	6/1/1996		0.00	0.00	
00/08-31-001-25W1/0	6/17/1983	OMEGA_HYDROC	ABD-OIL	<N/A>	476.10	948.00	7/1/1983	5573.30	22602.90	7/1/1990		0.00	0.00	
00/08-36-001-26W1/0	6/15/1984	PENN_ WEST	ABD-OIL	<N/A>	472.40	950.00	7/1/1984	4915.40	17331.80	3/1/2003		0.00	0.00	
00/09-30-001-25W1/0	12/9/1981	PENN_ WEST	ABDZ-OIL	<N/A>	473.00	944.00	3/1/1982	1144.40	1518.00	4/1/1989		0.00	0.00	
00/09-31-001-25W1/0	8/19/1984	OMEGA_HYDROC	ABD-OIL	<N/A>	475.10	945.00	9/1/1984	9678.60	29078.60	7/1/1990		0.00	0.00	
00/09-36-001-26W1/2	11/4/1982	PENN_ WEST	ABD-OIL	<N/A>	473.60	942.50	2/1/1984	6635.90	31124.00	11/1/1995		0.00	0.00	
00/10-31-001-25W1/0	8/19/1984	PENN_ WEST	ABD-OIL	<N/A>	475.20	940.00	11/1/1984	565.90	1946.50	10/1/1990		0.00	0.00	



00/10-36-001-26W1/0	6/20/1984	PENN_WEST	OIL	<N/A>	474.20	950.00	7/1/1984	6738.80	1141.50	3/1/2011		0.00	0.00	
00/11-30-001-25W1/2	1/3/1967	PENN_WEST	ABD-OIL	<N/A>	472.40	960.10	6/1/1980	2181.80	5444.40	11/1/1984		0.00	0.00	
00/11-31-001-25W1/0	9/26/1982	OMEGA_HYDROC	ABD-OIL	<N/A>	473.10	944.00	12/1/1982	2393.30	4836.20	6/1/1990		0.00	0.00	
00/11-32-001-25W1/0	8/28/1984	PENN_WEST	OIL	<N/A>	475.00	930.00	9/1/1984	7782.30	21560.80	6/1/2013		0.00	0.00	
00/11-36-001-26W1/0	8/29/1983	PENN_WEST	OIL	<N/A>	470.30	949.00	9/1/1983	7082.90	1420.60	11/1/2013		0.00	0.00	
00/12-31-001-25W1/2	6/24/1983	PENN_WEST	ABD-OIL	<N/A>	471.50	949.10	7/1/1984	4256.00	16750.50	9/1/1991		0.00	0.00	
00/12-32-001-25W1/0	8/21/1984	PENN_WEST	OIL	<N/A>	475.20	941.00	11/1/1984	5623.90	2942.80	6/1/2013		0.00	0.00	
00/13-30-001-25W1/0	7/17/1982	PENN_WEST	WTR-INJ	<N/A>	471.90	954.00	8/1/1982	771.50	1351.50	5/1/1984	6/1/1984	62196.90	0.00	10/1/2006
00/13-31-001-25W1/0	3/5/1983	PENN_WEST	ABD-OIL	<N/A>	472.10	951.00	3/1/1983	513.00	572.00	8/1/1985	10/1/1985	41892.50	0.00	2/1/1998
00/13-32-001-25W1/0	8/31/1984	PENN_WEST	WTR-INJ	<N/A>	475.00	936.00	11/1/1984	695.10	697.40	9/1/1985	10/1/1985	60098.70	0.00	4/1/1999
00/13-36-001-26W1/0	9/30/1983	PENN_WEST	WTR-INJ	<N/A>	469.30	950.00	10/1/1983	2604.70	445.00	9/1/1985	10/1/1985	33783.40	0.00	11/1/2005
00/14-30-001-25W1/0	7/21/1982	PENN_WEST	ABD-OIL	<N/A>	474.70	952.30	9/1/1982	2876.90	6788.70	8/1/1990	8/1/2013	154077.5 0	0.00	12/1/2013
00/14-31-001-25W1/0	8/10/1983	OMEGA_HYDROC	ABD-OIL	<N/A>	474.20	936.80	9/1/1983	827.30	3049.60	5/1/1990		0.00	0.00	
00/14-32-001-25W1/0	9/6/1982	PENN_WEST	ABD-OIL	<N/A>	474.40	947.00	10/1/1982	4594.80	13367.40	9/1/1997		0.00	0.00	
00/14-36-001-26W1/0	10/12/1983	PENN_WEST	OIL	<N/A>	468.30	955.10	11/1/1983	6251.50	1198.90	3/1/2012		0.00	0.00	
00/15-30-001-25W1/0	7/29/1982	PENN_WEST	ABD-WINJ	<N/A>	474.70	953.00	9/1/1982	1773.30	7389.70	5/1/1984	6/1/1984	86517.90	0.00	11/1/2006
00/15-31-001-25W1/0	8/23/1984	PENN_WEST	ABD-WINJ	<N/A>	474.00	940.00	11/1/1984	1028.40	1661.50	9/1/1985	1/1/1986	20126.30	0.00	2/1/1998
00/15-36-001-26W1/0	6/24/1984	PENN_WEST	WTR-INJ	<N/A>	473.40	950.00	7/1/1984	1272.10	355.80	9/1/1985	10/1/1985	51994.30	0.00	1/1/2006
00/16-30-001-25W1/0	7/25/1982	PENN_WEST	ABD-OIL	<N/A>	473.40	956.70	9/1/1982	3054.30	3615.00	12/1/1991		0.00	0.00	
00/16-31-001-25W1/0	8/24/1984	PENN_WEST	ABD-OIL	<N/A>	475.60	940.00	10/1/1984	1739.60	2802.20	5/1/1989		0.00	0.00	
00/16-36-001-26W1/0	7/15/1985	OMEGA_HYDROC	ABD-OIL	<N/A>	471.40	959.00	8/1/1985	613.30	511.20	1/1/1989		0.00	0.00	
02/01-05-002-25W1/0	12/18/2010	PENN_WEST	OIL	<N/A>	475.10	1613.0 0	2/1/2011	289.30	13412.60	6/1/2012		0.00	0.00	
02/01-31-001-25W1/0	6/20/2010	PENN_WEST	OIL	<N/A>	475.10	1717.0 0	7/1/2010	3791.20	46377.20	1/1/2015		0.00	0.00	
02/02-30-001-25W1/0	10/29/2011	PENN_WEST	OIL	<N/A>	475.80	1648.0 0	12/1/2011	4936.50	12168.40	1/1/2015		0.00	0.00	
02/04-05-002-25W1/0	12/8/2011	PENN_WEST	OIL	<N/A>	476.90	1619.0 0	2/1/2012	5362.30	7085.20	1/1/2015		0.00	0.00	
02/04-30-001-25W1/0	9/19/1982	OMEGA_HYDROC	ABD-OIL	<N/A>	473.50	950.00	12/1/1982	6964.40	34069.50	6/1/1990		0.00	0.00	
02/04-31-001-25W1/0	7/11/1982	PENN_WEST	ABD-OIL	<N/A>	471.80	948.00	8/1/1982	1960.20	2800.50	10/1/1989		0.00	0.00	
02/04-36-001-26W1/0	7/5/2010	PENN_WEST	OIL	<N/A>	469.90	1609.0 0	9/1/2010	9595.20	4180.30	11/1/2014		0.00	0.00	
02/05-30-001-25W1/0	2/23/2013	PENN_WEST	OIL	2013	473.50	1807.0 0	9/1/2013	3305.70	5145.30	1/1/2015		0.00	0.00	
02/05-31-001-25W1/0	2/6/2013	PENN_WEST	OIL	2013	474.10	1695.0	3/1/2013	2372.10	5857.40	1/1/2015		0.00	0.00	

						0								
02/07-30-001-25W1/0	12/7/1985	PENN_WEST	ABD-WINJ	<N/A>	472.60	947.00	12/1/1985	4182.20	2452.30	11/1/1987	12/1/1987	20475.20	0.00	7/1/2003
02/08-05-002-25W1/0	12/2/2010	PENN_WEST	OIL	<N/A>	474.90	1641.0 0	2/1/2011	6337.50	44124.80	1/1/2015		0.00	0.00	
02/08-31-001-25W1/0	7/4/2010	PENN_WEST	OIL	<N/A>	474.30	1710.0 0	8/1/2010	5927.20	37772.40	1/1/2015		0.00	0.00	
02/08-36-001-26W1/0	6/21/2010	PENN_WEST	OIL	<N/A>	472.70	2186.0 0	7/1/2010	8223.20	8996.50	1/1/2015		0.00	0.00	
02/09-31-001-25W1/0	7/10/2010	PENN_WEST	OIL	<N/A>	473.60	1660.0 0	8/1/2010	5724.40	24503.20	1/1/2015		0.00	0.00	
02/09-36-001-26W1/0	7/10/2010	PENN_WEST	OIL	<N/A>	470.00	2127.0 0	9/1/2010	9244.50	6520.20	1/1/2015		0.00	0.00	
02/11-30-001-25W1/2	8/26/1985	PENN_WEST	ABD-OIL	<N/A>	472.20	937.00	11/1/1985	5783.00	37156.90	10/1/1997		0.00	0.00	
02/12-30-001-25W1/0	11/4/1983	PENN_WEST	ABD-OIL	<N/A>	472.10	925.00	12/1/1983	8747.20	10697.90	7/1/1994		0.00	0.00	
02/12-31-001-25W1/0	7/24/2010	PENN_WEST	OIL	<N/A>	474.90	1713.0 0	9/1/2010	7170.70	22700.70	1/1/2015		0.00	0.00	
02/13-30-001-25W1/0	2/23/2013	PENN_WEST	OIL	2013	475.20	1755.0 0	9/1/2013	513.70	3095.40	1/1/2015		0.00	0.00	
02/13-31-001-25W1/0	8/23/2010	PENN_WEST	OIL	<N/A>	476.20	1708.0 0	10/1/2010	2305.90	13683.70	1/1/2015		0.00	0.00	
02/13-32-001-25W1/0	11/23/2011	PENN_WEST	OIL	<N/A>	476.10	1820.0 0	2/1/2012	6621.40	29126.40	1/1/2015		0.00	0.00	
02/14-36-001-26W1/0	9/18/2010	PENN_WEST	OIL	<N/A>	471.40	1683.0 0	11/1/2010	10570.4 0	3453.30	12/1/2014		0.00	0.00	
02/16-30-001-25W1/0	3/6/2012	PENN_WEST	OIL	<N/A>	475.10	1762.0 0	10/1/2012	1633.20	30096.80	1/1/2015		0.00	0.00	
02/16-31-001-25W1/0	7/17/2010	PENN_WEST	OIL	<N/A>	474.80	1719.0 0	9/1/2010	4759.40	16235.70	4/1/2014		0.00	0.00	
02/16-36-001-26W1/0	2/2/2010	PENN_WEST	OIL	<N/A>	469.70	1769.0 0	5/1/2010	5741.50	12108.10	6/1/2013		0.00	0.00	
03/01-05-002-25W1/0	12/7/2010	PENN_WEST	OIL	<N/A>	476.40	1602.0 0	2/1/2011	12185.1 0	62494.90	1/1/2015		0.00	0.00	
03/01-27-001-26W1/0	7/20/2010	PENN_WEST	OIL	<N/A>	464.70	1751.0 0	9/1/2010	5814.60	22004.10	12/1/2014		0.00	0.00	
03/02-30-001-25W1/0	10/23/2011	PENN_WEST	OIL	<N/A>	475.80	1643.0 0	1/1/2012	50.20	13617.30	12/1/2014		0.00	0.00	
03/04-05-002-25W1/0	12/3/2011	PENN_WEST	OIL	<N/A>	476.10	1751.0 0	2/1/2012	7478.70	33916.80	1/1/2015		0.00	0.00	
03/04-31-001-25W1/0	9/15/2009	PENN_WEST	OIL	<N/A>	474.30	1658.0 0	12/1/2009	12002.7 0	10215.70	1/1/2015		0.00	0.00	
03/04-36-001-26W1/0	1/7/2011	PENN_WEST	OIL	<N/A>	470.10	1635.0 0	3/1/2011	7407.50	3072.30	9/1/2014		0.00	0.00	
03/05-30-001-25W1/0	2/28/2013	PENN_WEST	OIL	2013	473.60	1881.0 0	9/1/2013	2719.60	5258.00	1/1/2015		0.00	0.00	
03/05-31-001-25W1/0	2/18/2013	PENN_WEST	OIL	2013	474.50	1812.0 0	3/1/2013	1649.30	3643.80	1/1/2015		0.00	0.00	
03/08-05-002-25W1/0	12/7/2010	PENN_WEST	OIL	<N/A>	475.00	1597.0 0	2/1/2011	7164.80	35230.80	1/1/2015		0.00	0.00	

03/08-31-001-25W1/0	11/29/2012	PENN_WEST	OIL	2013	473.10	1680.0 0	1/1/2013	949.80	6380.30	1/1/2015		0.00	0.00	
03/08-36-001-26W1/0	1/21/2011	PENN_WEST	OIL	<N/A>	471.40	2026.0 0	3/1/2011	1319.00	5733.90	1/1/2015		0.00	0.00	
03/09-31-001-25W1/0	12/16/2012	PENN_WEST	OIL	2013	475.40	1771.0 0	2/1/2013	1507.80	5771.50	1/1/2015		0.00	0.00	
03/09-36-001-26W1/0	1/28/2011	PENN_WEST	OIL	<N/A>	470.20	2073.0 0	3/1/2011	2796.50	4549.50	4/1/2014		0.00	0.00	
03/12-31-001-25W1/0	2/19/2013	PENN_WEST	OIL	2013	476.50	1805.0 0	8/1/2013	179.70	2803.50	1/1/2015		0.00	0.00	
03/13-30-001-25W1/0	3/5/2013	PENN_WEST	OIL	2013	475.20	1722.0 0	9/1/2013	1301.00	6194.40	1/1/2015		0.00	0.00	
03/13-31-001-25W1/0	2/25/2013	PENN_WEST	OIL	2013	475.10	1899.0 0	8/1/2013	1014.90	1672.30	1/1/2015		0.00	0.00	
03/14-36-001-26W1/0	9/23/2010	PENN_WEST	OIL	<N/A>	471.50	1676.0 0	10/1/2010	6983.60	3393.20	1/1/2015		0.00	0.00	
03/16-30-001-25W1/0	7/21/2012	PENN_WEST	OIL	<N/A>	474.30	1731.0 0	10/1/2012	609.80	43101.50	1/1/2015		0.00	0.00	
03/16-31-001-25W1/0	1/5/2013	PENN_WEST	OIL	2013	475.40	1779.0 0	2/1/2013	2354.80	7397.40	1/1/2015		0.00	0.00	
03/16-36-001-26W1/0	10/1/2010	PENN_WEST	OIL	<N/A>	469.90	1813.0 0	11/1/2010	9685.90	4206.10	1/1/2015		0.00	0.00	
04/01-05-002-25W1/0	11/29/2010	PENN_WEST	OIL	<N/A>	476.40	1616.0 0	2/1/2011	7816.60	34365.40	1/1/2015		0.00	0.00	
04/01-36-001-26W1/0	7/26/2012	PENN_WEST	OIL	<N/A>	472.50	2038.0 0	10/1/2012	3188.90	4856.60	1/1/2015		0.00	0.00	
04/04-05-002-25W1/0	11/27/2011	PENN_WEST	OIL	<N/A>	476.10	1750.0 0	2/1/2012	6187.80	25580.30	1/1/2015		0.00	0.00	
04/04-31-001-25W1/0	9/20/2009	PENN_WEST	OIL	<N/A>	473.60	1652.0 0	12/1/2009	1948.00	13785.60	1/1/2015		0.00	0.00	
04/05-30-001-25W1/0	3/6/2013	PENN_WEST	OIL	2013	473.70	1824.0 0	9/1/2013	3674.50	2648.20	1/1/2015		0.00	0.00	
04/08-05-002-25W1/0	12/12/2010	PENN_WEST	OIL	<N/A>	475.00	1597.0 0	2/1/2011	10524.8 0	41162.60	1/1/2015		0.00	0.00	
04/08-31-001-25W1/0	12/8/2012	PENN_WEST	OIL	2013	474.90	1702.0 0	1/1/2013	1080.20	11396.30	1/1/2015		0.00	0.00	
04/08-36-001-26W1/0	2/3/2011	PENN_WEST	OIL	<N/A>	471.40	2080.0 0	3/1/2011	887.60	4874.10	1/1/2015		0.00	0.00	
04/09-31-001-25W1/0	12/6/2012	PENN_WEST	OIL	2013	473.30	1750.0 0	1/1/2013	1522.50	7932.90	1/1/2015		0.00	0.00	
04/09-36-001-26W1/0	1/20/2011	PENN_WEST	OIL	<N/A>	470.00	1953.0 0	3/1/2011	3003.70	8227.80	1/1/2015		0.00	0.00	
04/12-31-001-25W1/0	2/11/2013	PENN_WEST	OIL	2013	474.50	1786.0 0	3/1/2013	710.40	2006.10	1/1/2015		0.00	0.00	
04/13-30-001-25W1/0	2/27/2013	PENN_WEST	OIL	2013	475.30	1727.0 0	9/1/2013	3551.80	8887.20	1/1/2015		0.00	0.00	
04/13-31-001-25W1/0	3/3/2013	PENN_WEST	OIL	2013	476.40	1782.0 0	8/1/2013	682.50	2115.60	1/1/2015		0.00	0.00	
04/16-30-001-25W1/0	7/16/2012	PENN_WEST	OIL	<N/A>	474.30	1771.0 0	10/1/2012	1715.70	21127.30	1/1/2015		0.00	0.00	

04/16-31-001-25W1/0	1/8/2013	PENN_WEST	OIL	2013	475.40	1849.0 0	2/1/2013	1318.20	8218.50	1/1/2015		0.00	0.00	
04/16-36-001-26W1/0	1/10/2013	PENN_WEST	OIL	2013	469.50	1831.0 0	2/1/2013	2863.10	1464.70	12/1/2014		0.00	0.00	
05/04-31-001-25W1/0	2/1/2013	PENN_WEST	OIL	2013	473.90	1656.0 0	3/1/2013	3562.70	5000.30	1/1/2015		0.00	0.00	
05/09-36-001-26W1/0	1/13/2011	PENN_WEST	OIL	<N/A>	470.00	2057.0 0	3/1/2011	3455.00	3930.80	2/1/2014		0.00	0.00	
05/16-30-001-25W1/0	7/26/2012	PENN_WEST	OIL	<N/A>	474.30	1758.0 0	11/1/2012	1095.60	18876.60	1/1/2015		0.00	0.00	
06/04-31-001-25W1/0	1/26/2013	PENN_WEST	OIL	2013	474.00	1725.0 0	3/1/2013	1649.10	6278.00	1/1/2015		0.00	0.00	

# ATTACHMENT 3 – UNIT PRODUCTION AND INJECTION PLOT

PENN WEST

UNIT: WASKADA\_UNIT\_NO\_3\_-\_PM\_58

Last Prod/Inj Date: 201501

Cumulative Gas Inj : 0.00 MMscm

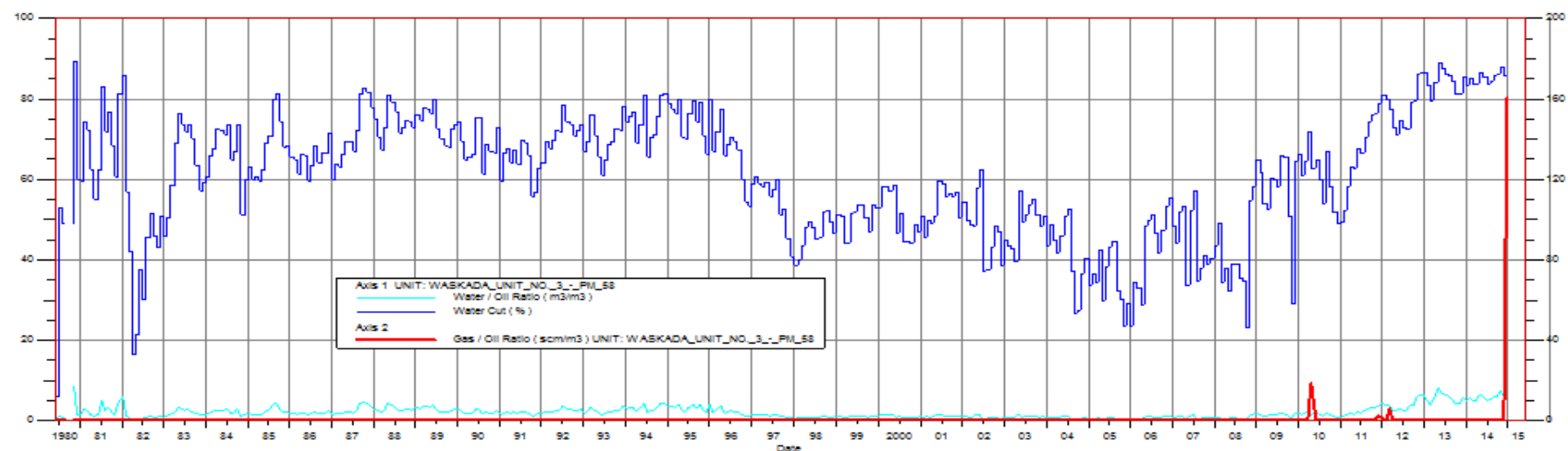
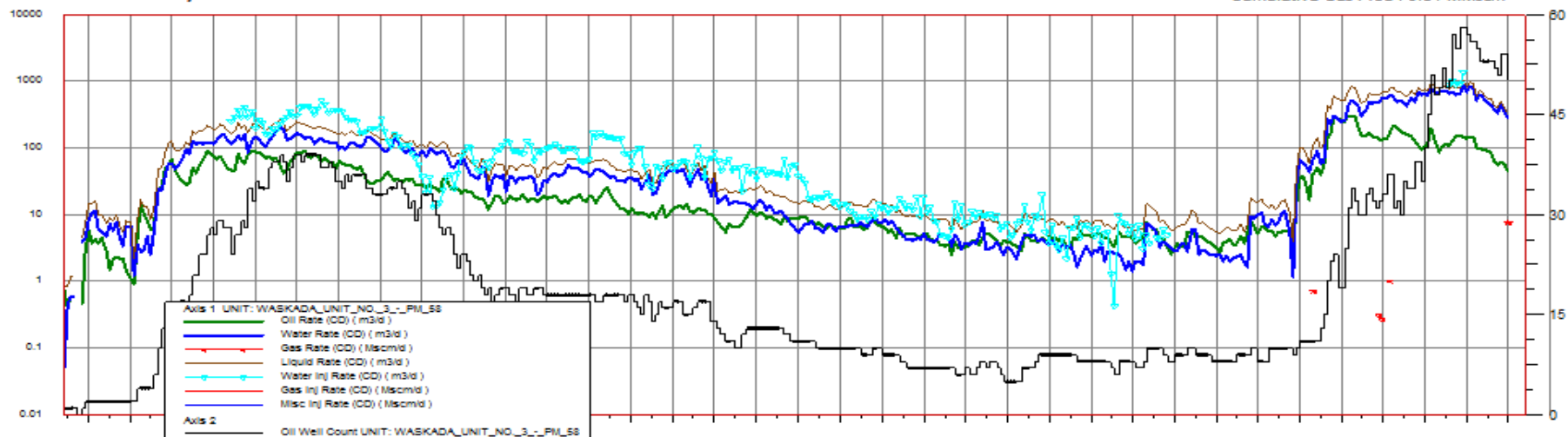
Cumulative Water Inj : 855.72 Mm3

Cumulative Misc Inj : 0.00 MMscm

Cumulative Water Prod : 1277.41 Mm3

Cumulative Oil Prod : 456.86 Mm3

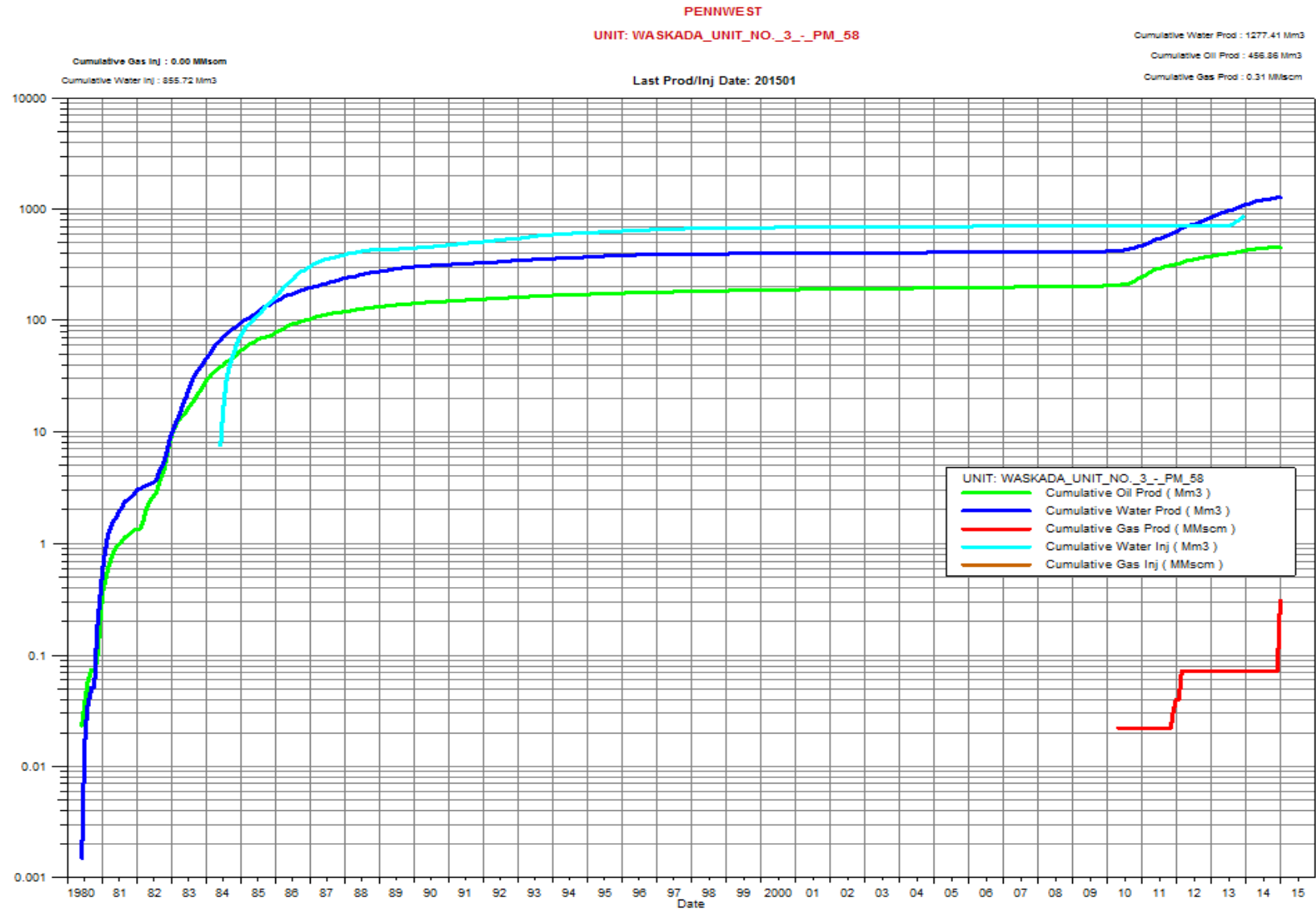
Cumulative Gas Prod : 0.31 MMscm



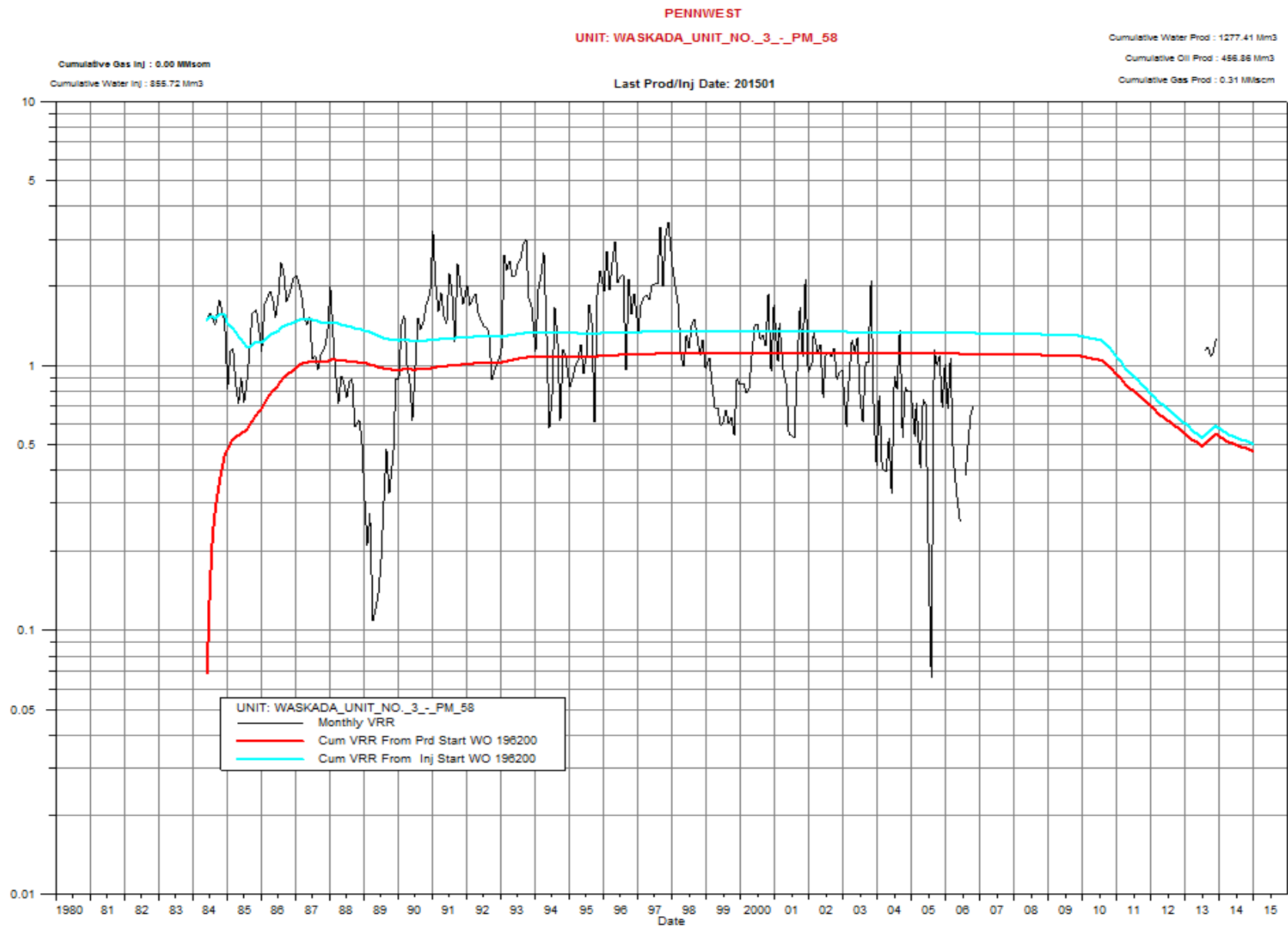
## ATTACHMENT 4 –UNIT ANNUAL VOLUMES AND RATES

Unit : Waskada Unit No 3 -- PM58								
Rates and Volume History								
Date	Annual Oil Prod	Annual Oil Rate	Annual Water Prod	Annual Water Rate	Annual Water Inj	Annual Water Inj Rate	Annual Gas Inj	Annual Gas Inj Rate
	m3	m3/d	m3	m3/d	m3	m3/d	Mscm	Mscm/d
1/1/1981	1123.60	3.08	2500.00	6.85	0	0.00	0.00	0.00
1/1/1982	6378.60	17.48	5322.20	14.58	0	0.00	0.00	0.00
1/1/1983	19166.60	52.51	34598.40	94.79	0	0.00	0.00	0.00
1/1/1984	24582.20	67.16	49131.00	134.24	68953	188.40	0.00	0.00
1/1/1985	24638.10	67.50	53585.20	146.81	85890	235.32	0.00	0.00
1/1/1986	26265.40	71.96	49174.90	134.73	143288	392.57	0.00	0.00
1/1/1987	17020.40	46.63	42395.40	116.15	88310	241.95	0.00	0.00
1/1/1988	12534.60	34.25	36320.00	99.23	46449	126.91	0.00	0.00
1/1/1989	9712.80	26.61	28004.50	76.72	11519	31.56	0.00	0.00
1/1/1990	6630.30	18.17	15180.20	41.59	27898	76.43	0.00	0.00
1/1/1991	6383.80	17.49	11631.20	31.87	35537	97.36	0.00	0.00
1/1/1992	6335.00	17.31	16070.90	43.91	33244	90.83	0.00	0.00
1/1/1993	6307.70	17.28	14199.10	38.90	48126	131.85	0.00	0.00
1/1/1994	3921.50	10.74	11965.30	32.78	21512	58.94	0.00	0.00
1/1/1995	4424.30	12.12	13839.00	37.92	22294	61.08	0.00	0.00
1/1/1996	2925.10	7.99	6174.00	16.87	19503	53.29	0.00	0.00
1/1/1997	3315.30	9.08	4164.70	11.41	16774	45.96	0.00	0.00
1/1/1998	2782.20	7.62	2405.60	6.59	7958	21.80	0.00	0.00
1/1/1999	2628.00	7.20	2651.40	7.26	4079	11.18	0.00	0.00
1/1/2000	1996.10	5.45	2140.00	5.85	4886	13.35	0.00	0.00
1/1/2001	1400.30	3.84	1588.50	4.35	3538	9.69	0.00	0.00
1/1/2002	1511.20	4.14	1418.80	3.89	3284	9.00	0.00	0.00
1/1/2003	1476.10	4.04	1445.20	3.96	3172	8.69	0.00	0.00
1/1/2004	1619.80	4.43	1144.70	3.13	1967	5.37	0.00	0.00
1/1/2005	1716.90	4.70	921.20	2.52	1944	5.33	0.00	0.00
1/1/2006	1787.50	4.90	1441.80	3.95	1515	4.15	0.00	0.00
1/1/2007	1540.70	4.22	1267.80	3.47	0	0.00	0.00	0.00
1/1/2008	1635.60	4.47	1245.10	3.40	0	0.00	0.00	0.00
1/1/2009	2290.20	6.27	3460.80	9.48	0	0.00	0.00	0.00
1/1/2010	34788.80	95.31	46757.90	128.10	0	0.00	0.00	0.00
1/1/2011	73878.80	202.41	145265.80	397.99	0	0.00	0.00	0.00
1/1/2012	56607.50	154.67	196711.30	537.46	0	0.00	0.00	0.00
1/1/2013	46354.10	127.00	250795.80	687.11	154078	422.13	0.00	0.00
1/1/2014	33719.40	92.38	191367.90	524.30	0	0.00	0.00	0.00
Sum	449398.50		1246285.60		855716			

## ATTACHMENT 5 – UNIT CUMULATIVE PRODUCTION AND INJECTION PLOT



## ATTACHMENT 6 – UNIT VOIDAGE REPLACEMENT RATIO PLOT





## ATTACHMENT 7 – INDIVIDUAL INJECTION WELL PERFORMANCE PLOTS (15 WELLS)

Status: ABO-OIL

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

PENNWEST EXPLORATION

00/05-30-001-25W1/2

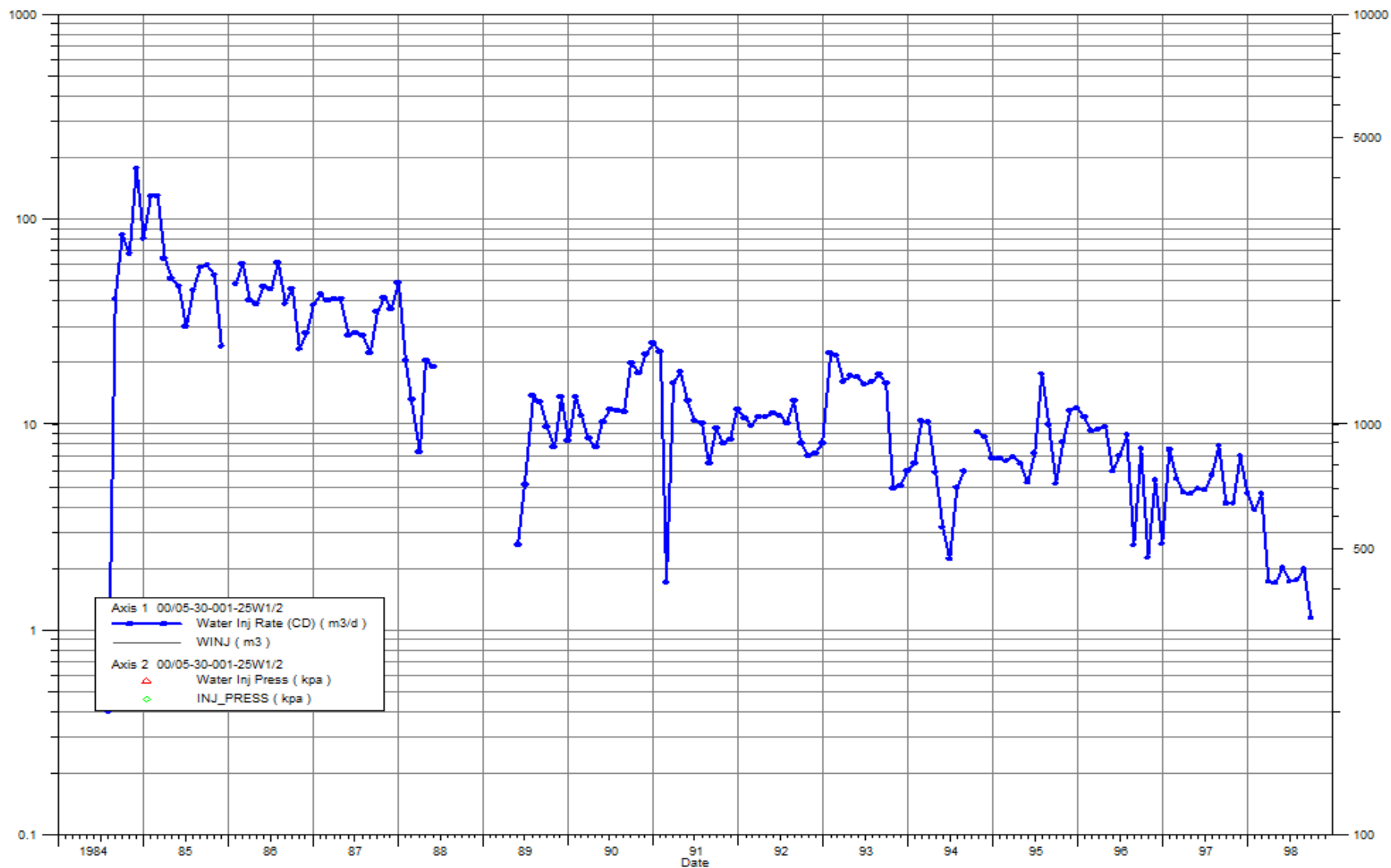
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 97.11 Mm3

Cumulative Water Prod : 1.30 Mm3

Cumulative Oil Prod : 0.57 Mm3

Cumulative Gas Prod : 0.00 MMscm



Status: ASD-OIL

Unit: WASKADA\_UNIT\_NO\_3\_-PM\_68

Zone: LOWER\_AMARANTHA

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/05-31-001-25W1/0

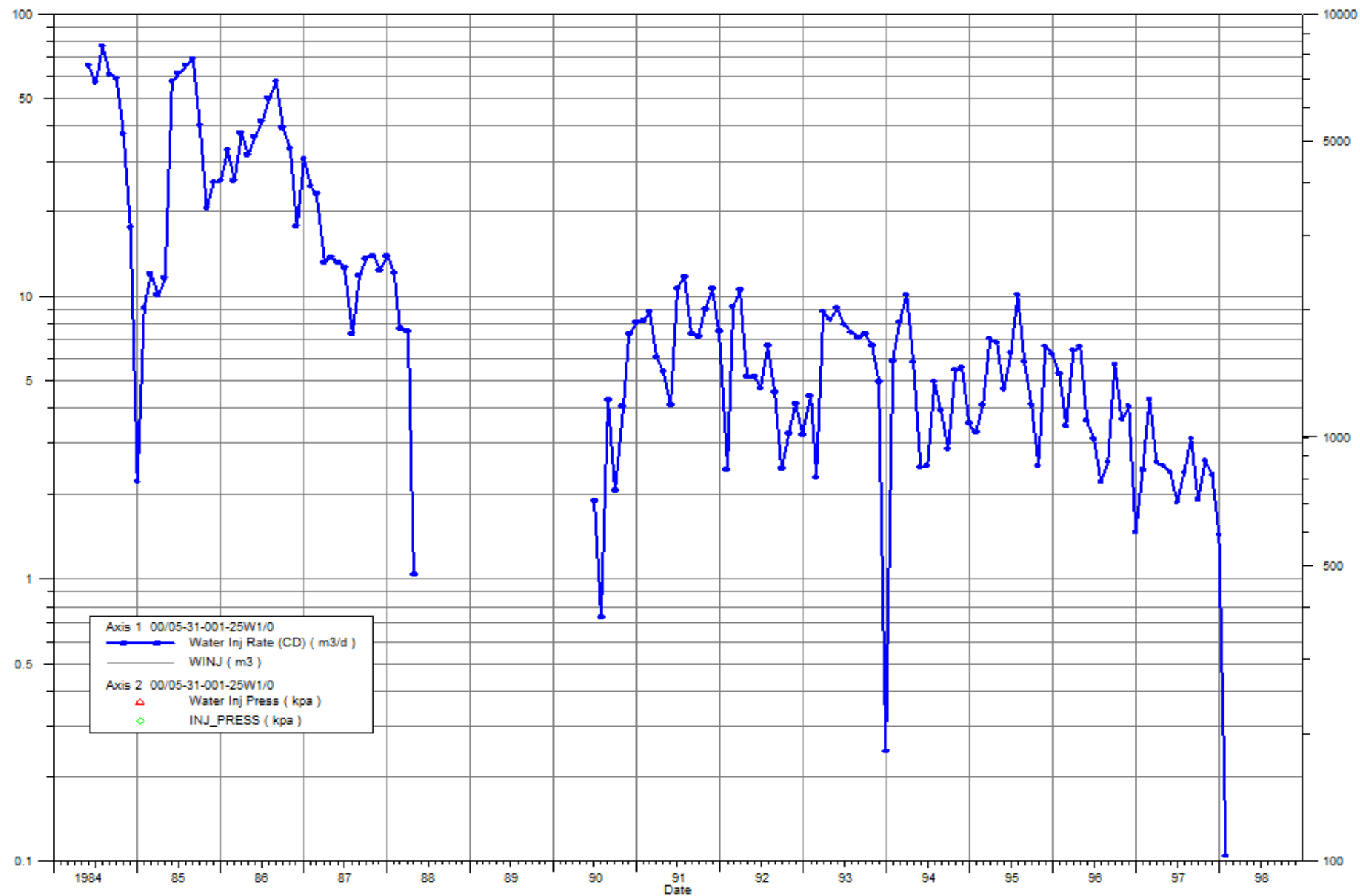
Cumulative Gas Inj : 0.00 MMscf

Cumulative Water Inj : 57.65 Mm3

Cumulative Water Prod : 0.32 Mm3

Cumulative Oil Prod : 0.78 Mm3

Cumulative Gas Prod : 0.00 MMscf



Status: ASD-WINJ

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/07-05-002-25W1/0

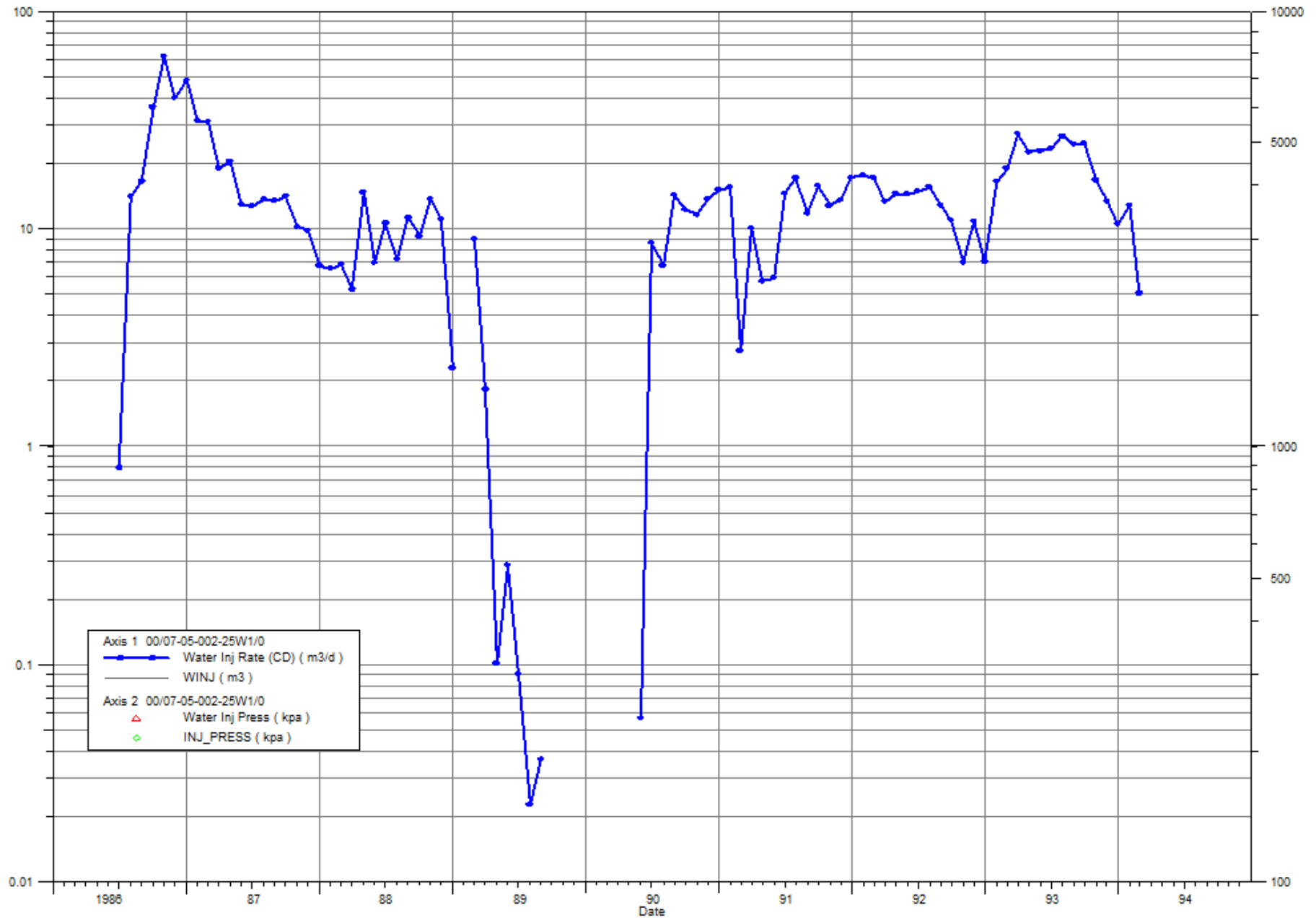
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 35.95 Mm3

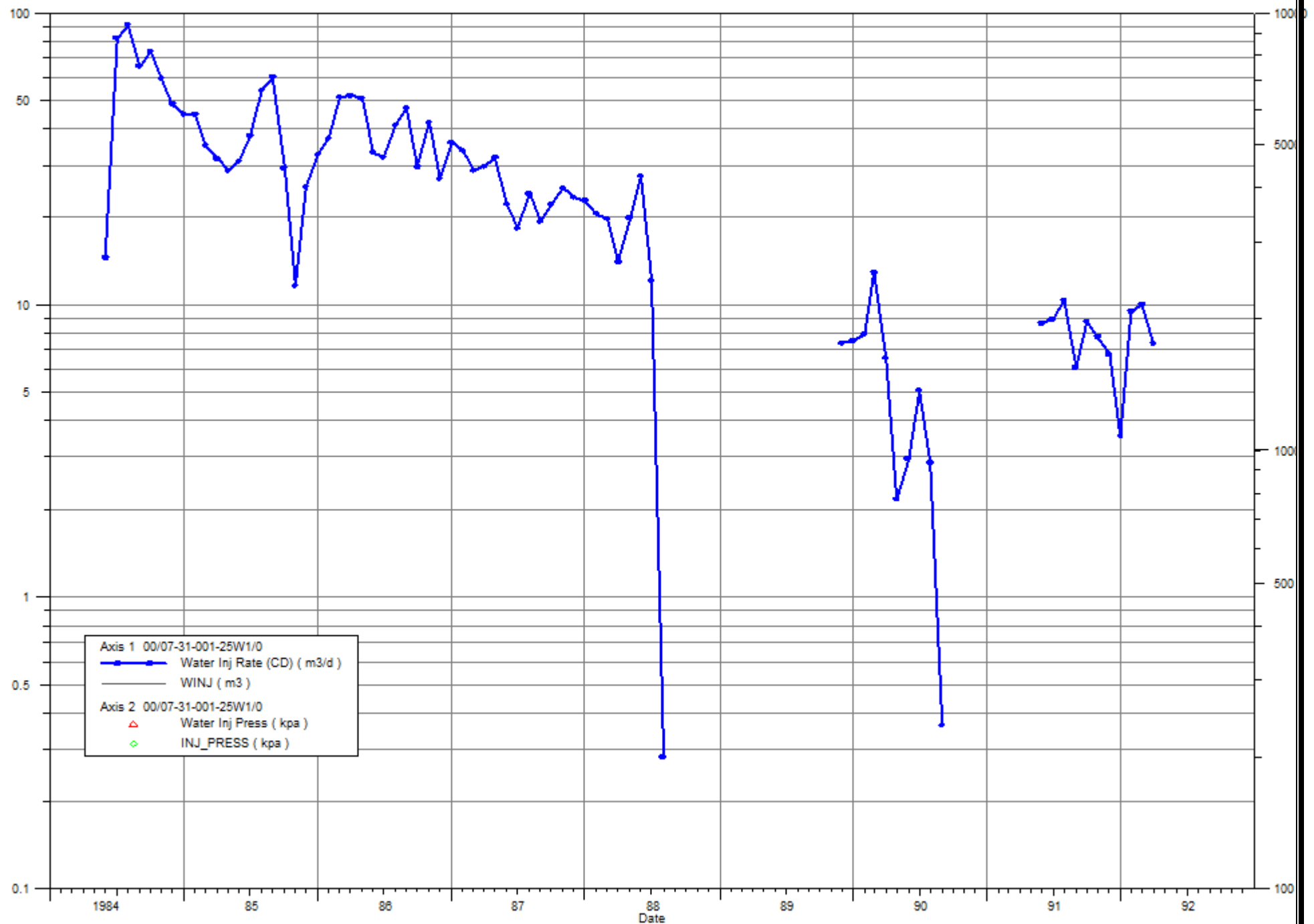
Cumulative Water Prod : 1.19 Mm3

Cumulative Oil Prod : 1.19 Mm3

Cumulative Gas Prod : 0.00 MMscm



Cumulative Gas Prod : 0.00 NmLscm



Status: WTR-INJ

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/13-30-001-25W1/0

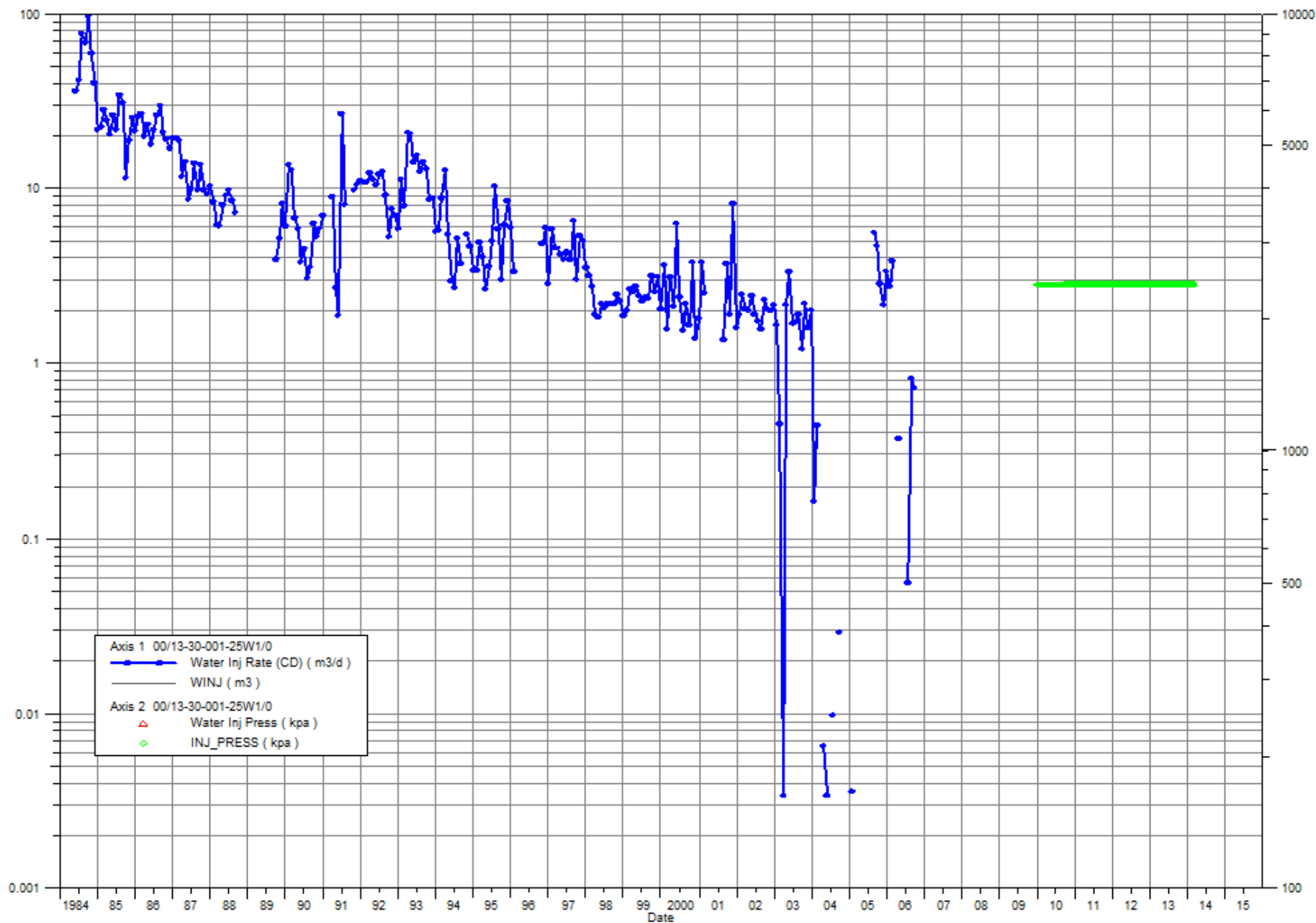
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 62.20 Mm3

Cumulative Water Prod : 1.35 Mm3

Cumulative Oil Prod : 0.77 Mm3

Cumulative Gas Prod : 0.00 MMscm



Zone: LOWER\_AMARANTH\_A

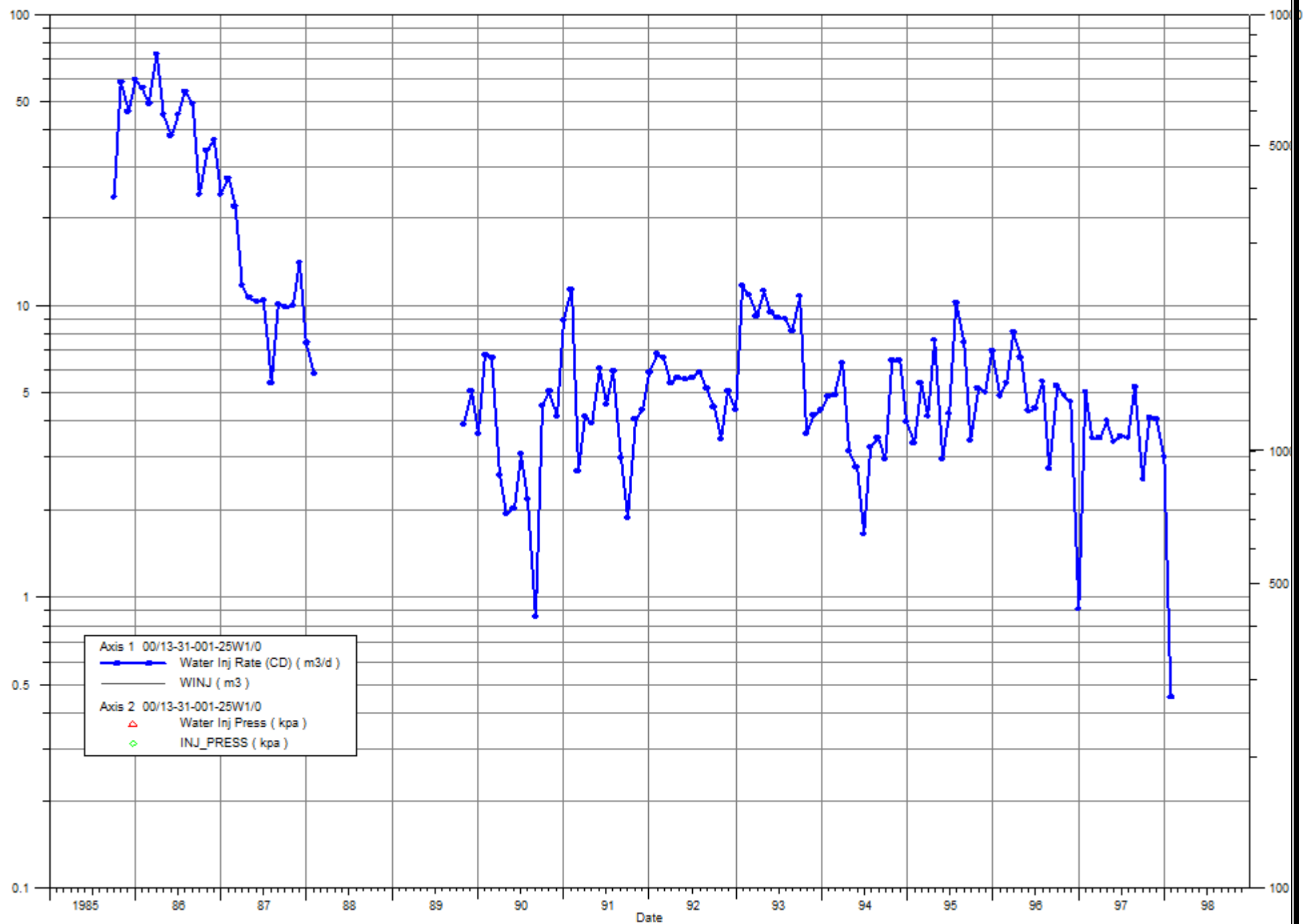
00/13-31-001-25W1/0

Cumulative Water Prod : 0.57 Mm3

Cumulative Oil Prod : 0.51 Mm3

Operator: PENN\_WEST Approval: Amaranth

Cumulative Gas Prod : 0.00 MMscm



Status: WTR-INJ

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTHA

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/13-32-001-25W1/0

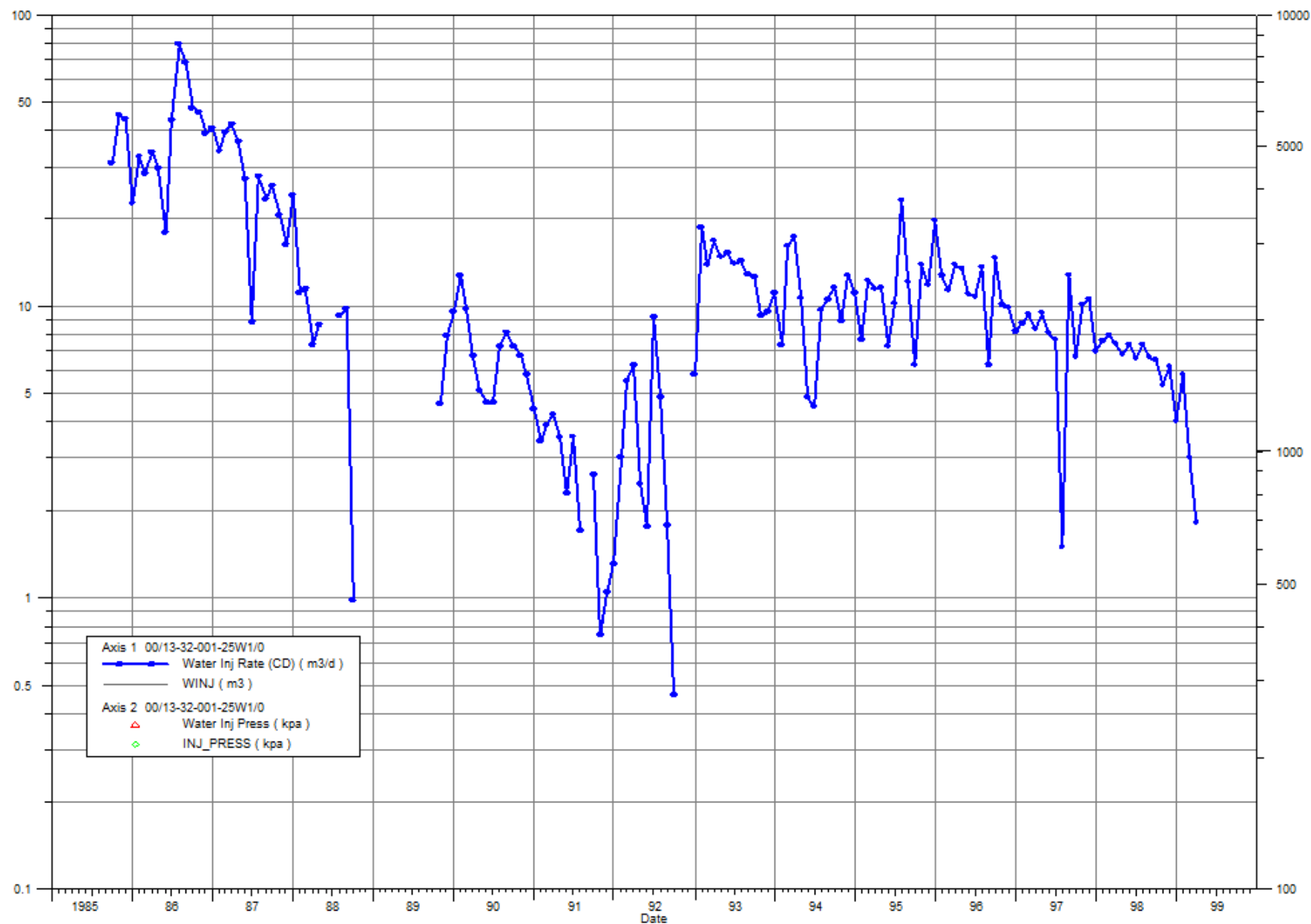
Cumulative Gas Inj : 0.00 MMsm

Cumulative Water Inj : 60.10 Mm3

Cumulative Water Prod : 0.70 Mm3

Cumulative Oil Prod : 0.70 Mm3

Cumulative Gas Prod : 0.00 Mmsm



Status: WTR-INJ

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_58

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/13-36-001-26W1/0

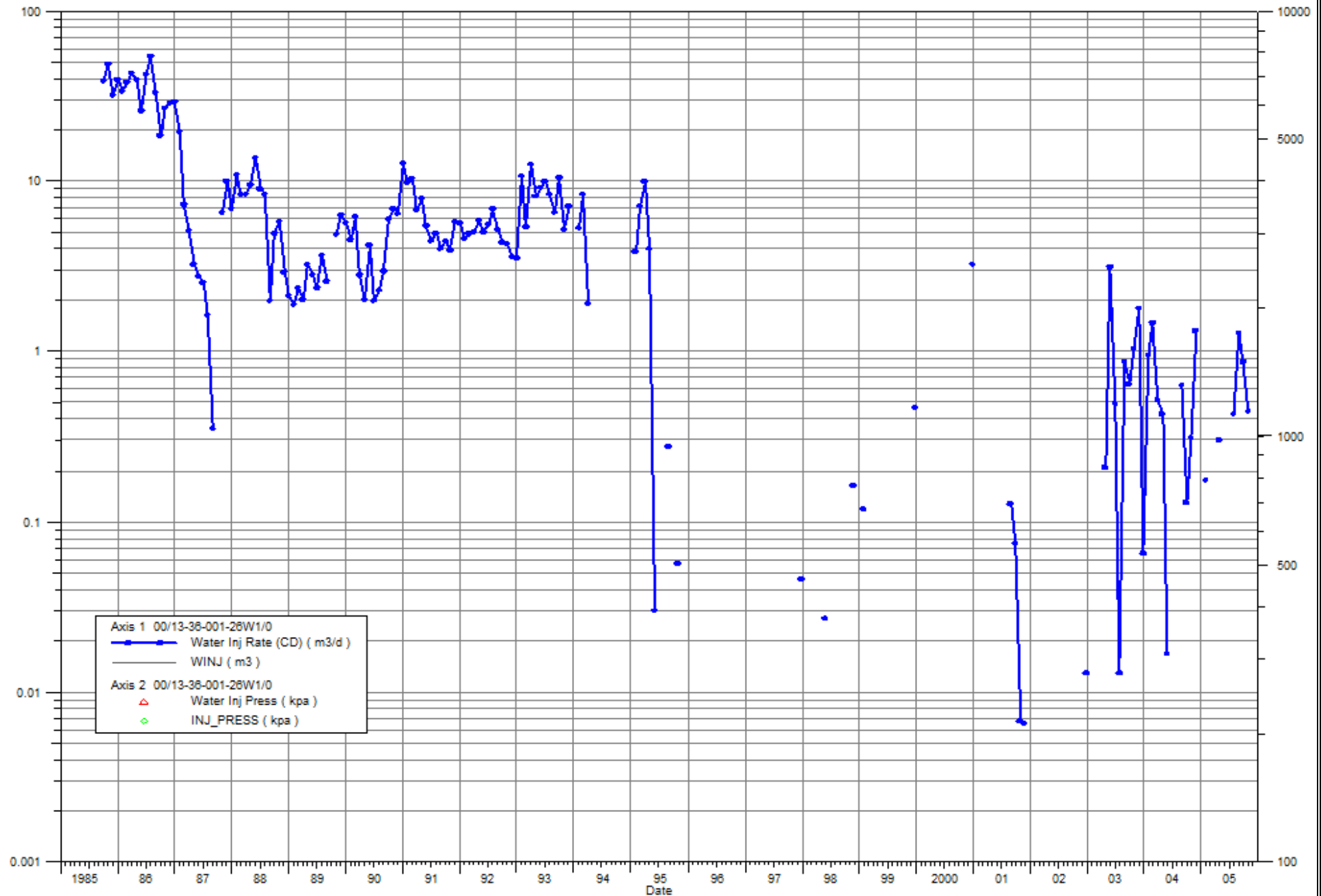
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 33.78 Mm3

Cumulative Water Prod : 0.45 Mm3

Cumulative Oil Prod : 2.60 Mm3

Cumulative Gas Prod : 0.00 MMscm





Status: ABD-OIL

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

PENNWEST EXPLORATION

00/14-30-001-25W1/0

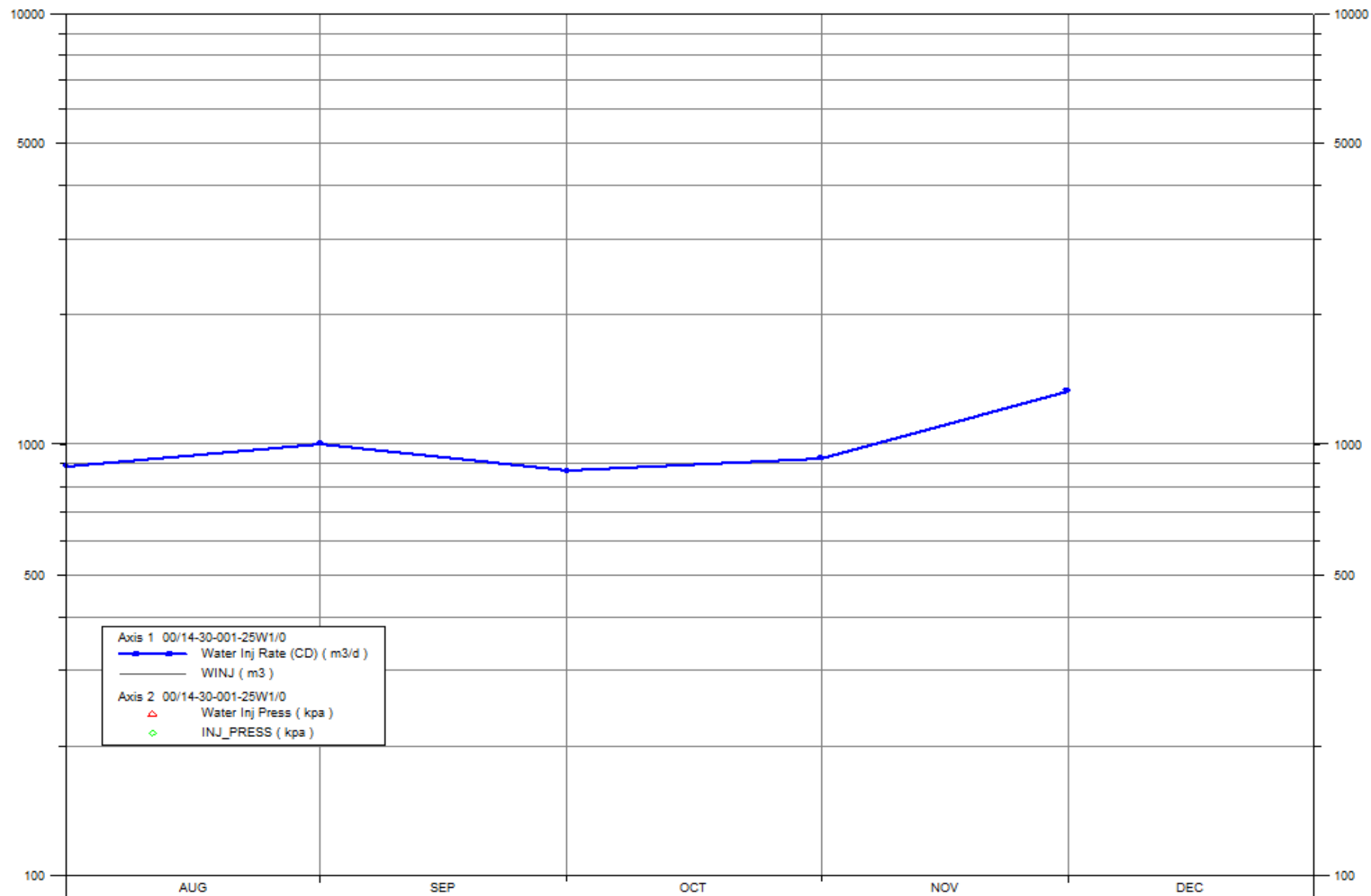
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 154.08 Mm3

Cumulative Water Prod : 6.79 Mm3

Cumulative Oil Prod : 2.88 Mm3

Cumulative Gas Prod : 0.00 MMscm



2013  
Date

Status: ASD-WINJ

Unit: WASKADA\_UNIT\_NO\_5\_-PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/15-30-001-25W1/0

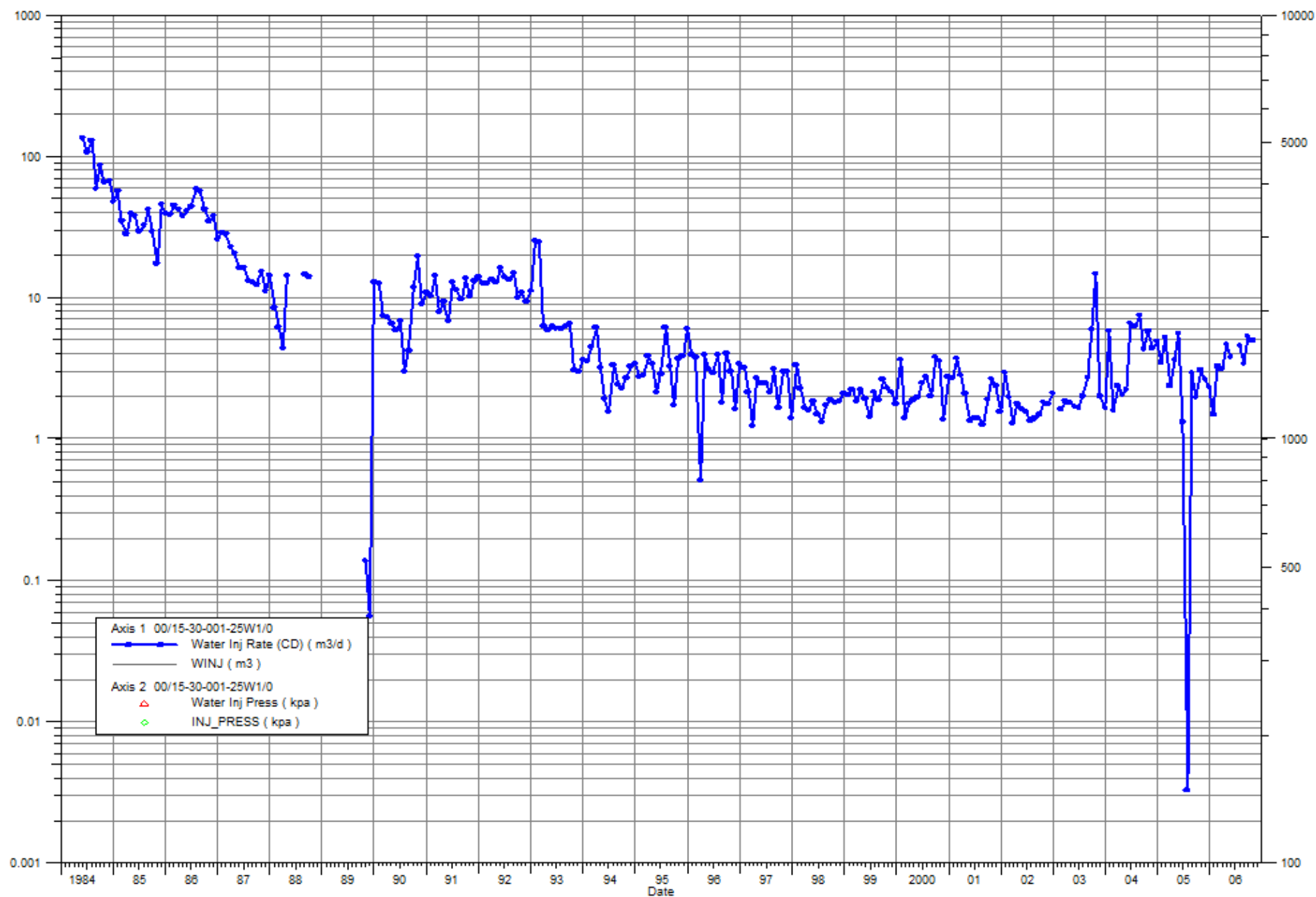
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 86.52 Mm3

Cumulative Water Prod : 7.39 Mm3

Cumulative Oil Prod : 1.77 Mm3

Cumulative Gas Prod : 0.00 MMscm



Status: ASD-WINJ

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/15-31-001-25W1/0

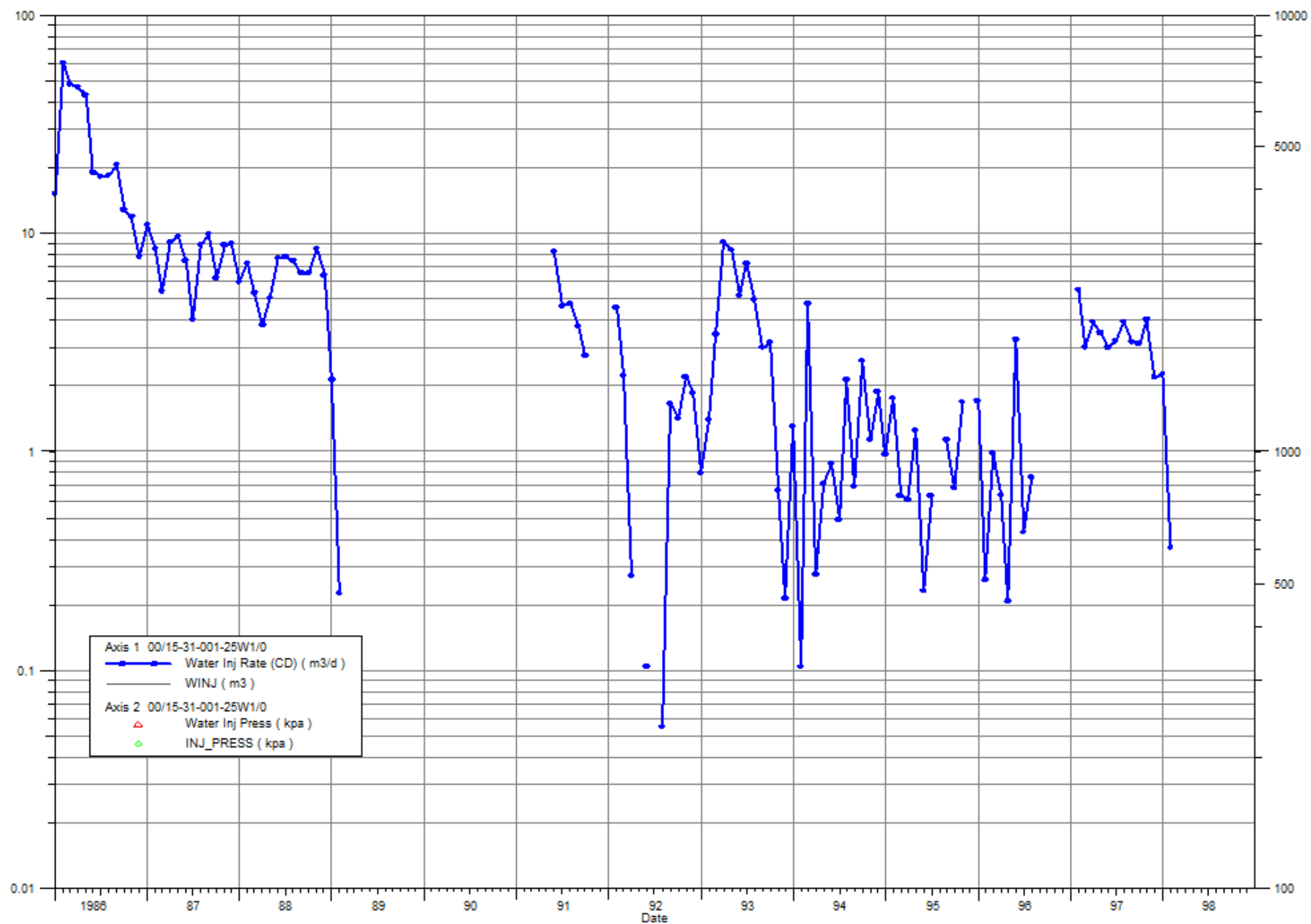
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 20.13 Mm3

Cumulative Water Prod : 1.66 Mm3

Cumulative Oil Prod : 1.03 Mm3

Cumulative Gas Prod : 0.00 MMscm



Status: WTR-INJ

Unit: WASKADA\_UNIT\_NO\_8\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

00/15-36-001-26W1/0

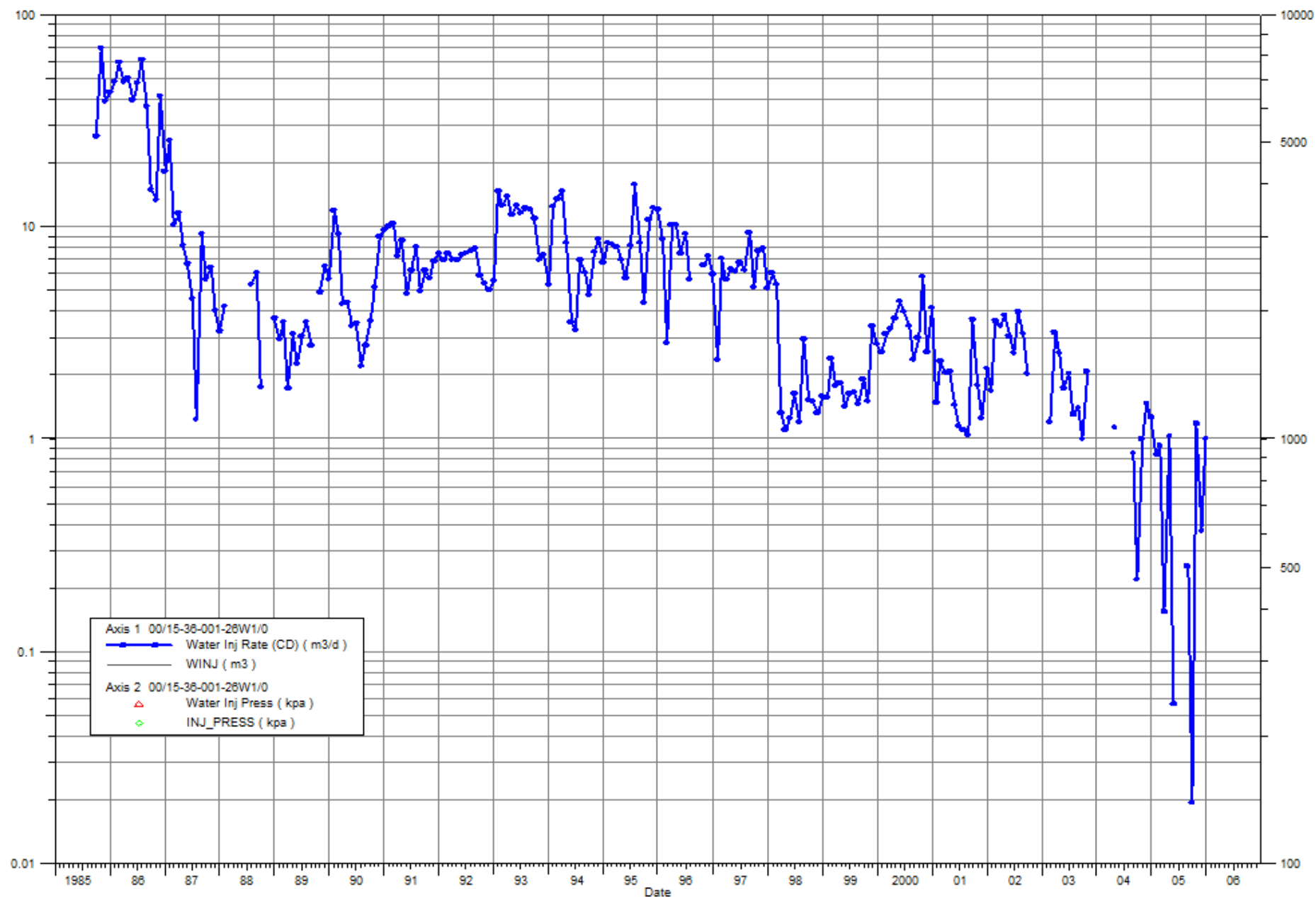
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 51.99 Mm3

Cumulative Water Prod : 0.36 Mm3

Cumulative Oil Prod : 1.27 Mm3

Cumulative Gas Prod : 0.00 MMscm



Status: ABD-WINJ

Unit: WASKADA\_UNIT\_NO\_3\_-\_PM\_68

Zone: LOWER\_AMARANTH\_A

Operator: PENN\_WEST Approval: Amaranth

# PENNWEST EXPLORATION

02/07-30-001-25W1/0

Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 20.48 Mm3

Cumulative Water Prod : 2.45 Mm3

Cumulative Oil Prod : 4.18 Mm3

Cumulative Gas Prod : 0.00 MMscm

