

PennWest

Waskada Unit No.12

Waterflood Progress Report

January 1st – December 31st, 2014

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INTRODUCTION

The Waskada Unit No. 12 pressure maintenance project commenced water injection into the Mission Canyon designed and in accordance with Manitoba Energy and Mines Approval No. PM 48.

Please refer to Attachment 1 – Area Map.

PRESSURE MAINTENANCE: Governed by Board Order No. PM 48

UNIT INFORMATION

UNITIZED ZONE: Mission Canyon
Original Unit, April 1, 1986 Board Order; Voluntary

POOL: Waskada Mission Canyon 3a A (03 43A)

This report documents the performance of the Waskada Unit No.12 pressure maintenance project for the period of January 1 to December 31, 2014. The Unit had production from 2 well and no injection in 2014.

Unit 12 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 Mission Canyon in the Waskada area produces light density crude (approximately 36° API). Stratigraphically the Mission Canyon can be divided up into various members and marker beds (ie. MC3b, MC3a, MC2, MC1). It is overlain by the Charles Formation or the angular Paleozoic/Mississippian Unconformity, with beds dipping to the southwest. The lithology consists of complex interbedded grainstones, packstones, wackestones, and mudstones with some members consisting of predominantly primary anhydrite (ie. MC2). Porous members typically have porosity of 13-15% and permeabilities of 20-40 mD), although localized alteration due to the truncating Mississippian Unconformity can significantly reduce or eliminate those values in certain areas. Oil accumulation is generally found on isolated structural highs or areas with associated updip permeability degradation.

DISCUSSION

Production and Injection Performance

Board Order No. PM 48 provided for pressure maintenance operations in Waskada Unit No.12. The Unit includes 3 abandoned injection wells and 15 producers. 2 wells produced during 2014. Pressure maintenance by water injection began in April 1986 and ceased in March 1993 and has remained shut in since this date. 5 years of primary production with a rapid decline occurred before water injection. Water injection appears to have accelerated water production while oil production perhaps had reduced decline rates. Hence water injection has not been an effective enhanced recovery mechanism. The previous operator, Omega, abandoned the injectors.

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 is at 0.31 and the Cumulative VRR from injection start is at 0.40. Both have declined gradually since ceasing injection in 1993. The Monthly VRR for the short period of injection in the late 1980s was initially well above 1.0 and could have easily contributed to high water production. Currently there is no active injector in this Unit and PennWest has no plans to reactivate injection.

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

Please refer to Attachment 7 – Individual Injection Well Performance Plots

Pressure Surveys:

No pressure surveys were conducted in 2014.

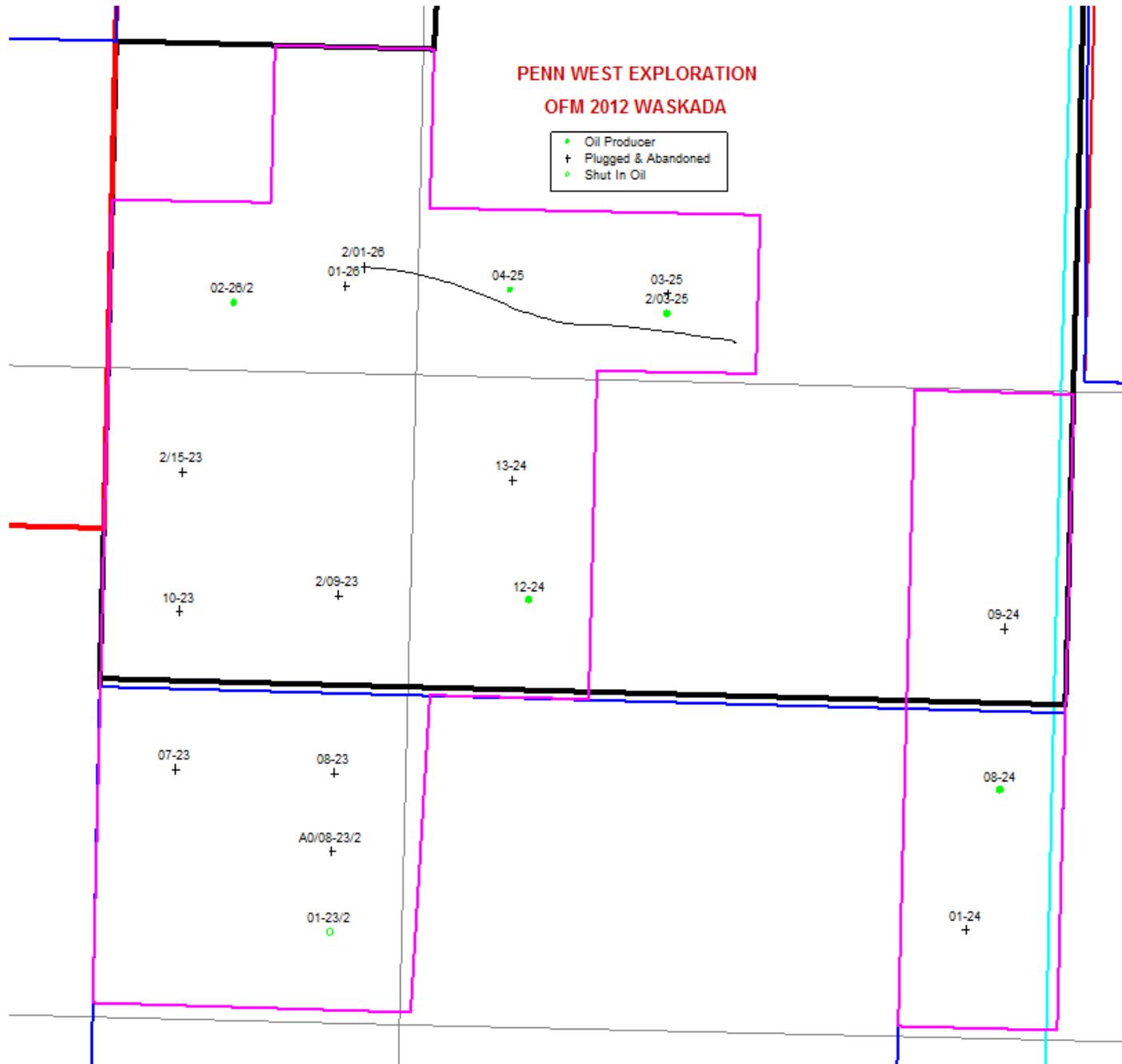
Corrosion and Scale Prevention Program:

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

SUMMARY AND RECOMMENDATIONS

Since there is only one producer and no injection wells in this unit, we do not have any plans for this unit other than monitoring the 2 producers

ATTACHMENT 1 – UNIT AREA MAP



ATTACHMENT 2- UNIT HISTORY

Unit History : Waskada - Unti #12

UWI	Completion Date	Operator	Status	New Drills	Kb Elevation	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	
00/01-23-001-26W1/2	7/2/1982	PENN_WEST	SUS-OIL	<N/A>	470.50	953.00	5/1/1989	403.90	506.80	6/1/2002		0.00	0.00	
00/01-24-001-26W1/0	1/18/1981	PENN_WEST	ABD-OIL	<N/A>	468.00	957.00	2/1/1981	3802.20	473.60	3/1/1986	4/1/1986	24827.80	0.00	11/1/1988
00/01-26-001-26W1/0	9/18/1981	PENN_WEST	ABD-OIL	<N/A>	470.30	960.00	10/1/1981	292.80	1340.80	10/1/1990		0.00	0.00	
00/02-26-001-26W1/2	11/21/1981	PENN_WEST	CMG-OIL	<N/A>	467.30	952.00	7/1/1989	317.90	493.70	8/1/1991		0.00	0.00	
00/03-25-001-26W1/0	7/19/1981	PENN_WEST	ABD-OIL	<N/A>	471.10	956.00	7/1/1981	1690.10	1035.00	12/1/1982		0.00	0.00	
00/04-25-001-26W1/0	8/21/1981	PENN_WEST	CMG-OIL	<N/A>	470.80	963.00	9/1/1981	1985.60	4678.80	2/1/2013		0.00	0.00	
00/07-23-001-26W1/0	9/20/1982	PENN_WEST	ABD-OIL	<N/A>	470.90	950.00	12/1/1982	222.50	2485.80	11/1/1983		0.00	0.00	
00/08-23-001-26W1/0	9/2/1982	PENN_WEST	ABD-OIL	<N/A>	470.40	956.00	12/1/1982	5623.00	44452.30	6/1/1996		0.00	0.00	
00/08-24-001-26W1/0	10/27/1981	PENN_WEST	OIL	<N/A>	472.10	955.00	11/1/1981	11063.90	27129.30	1/1/2015		0.00	0.00	
00/09-24-001-26W1/0	12/3/1981	PENN_WEST	ABD-OIL	<N/A>	473.00	944.00	2/1/1982	839.20	464.90	12/1/1991		0.00	0.00	
00/10-23-001-26W1/0	8/30/1982	PENN_WEST	ABD-OIL	<N/A>	465.40	954.00	1/1/1983	2608.30	3424.30	10/1/1993		0.00	0.00	
00/12-24-001-26W1/0	11/6/1981	PENN_WEST	CMG-OIL	<N/A>	468.10	952.00	11/1/1981	2844.90	6474.70	1/1/2014		0.00	0.00	
00/13-24-001-26W1/0	11/11/1981	PENN_WEST	ABD-OIL	<N/A>	470.00	952.00	4/1/1982	2924.60	12238.10	7/1/1990		0.00	0.00	
02/01-26-001-26W1/0	7/17/1994	PENN_WEST	ABD-OIL	<N/A>	471.60	1811.00	7/1/1994	6784.10	16287.70	1/1/2010		0.00	0.00	
02/03-25-001-26W1/0	9/12/1982	PENN_WEST	PMP-OIL	<N/A>	471.00	956.00	12/1/1982	11102.00	23618.80	8/1/2013		0.00	0.00	
02/09-23-001-26W1/0	7/17/1983	PENN_WEST	ABD-OIL	<N/A>	468.90	952.30	4/1/1984	115.40	1485.00	9/1/1984	6/1/1987	20420.60	0.00	3/1/1993
02/15-23-001-26W1/0	7/14/1983	PENN_WEST	ABD-OIL	<N/A>	468.80	950.00	8/1/1983	312.70	2526.90	8/1/1990	5/1/1986	21000.20	0.00	3/1/1988
A0/08-23-001-26W1/2	2/28/1991	PENN_WEST	ABD-OIL	<N/A>	468.00	963.00	7/1/1992	16.10	78.20	10/1/1992		0.00	0.00	

ATTACHMENT 3 – UNIT PRODUCTION AND INJECTION PLOT

PENN WEST

UNIT: WASKADA_UNIT_NO_12_-_PM_48

Last Prod/Inj Date: 201501

Cumulative Water Prod : 149.19 Mm3

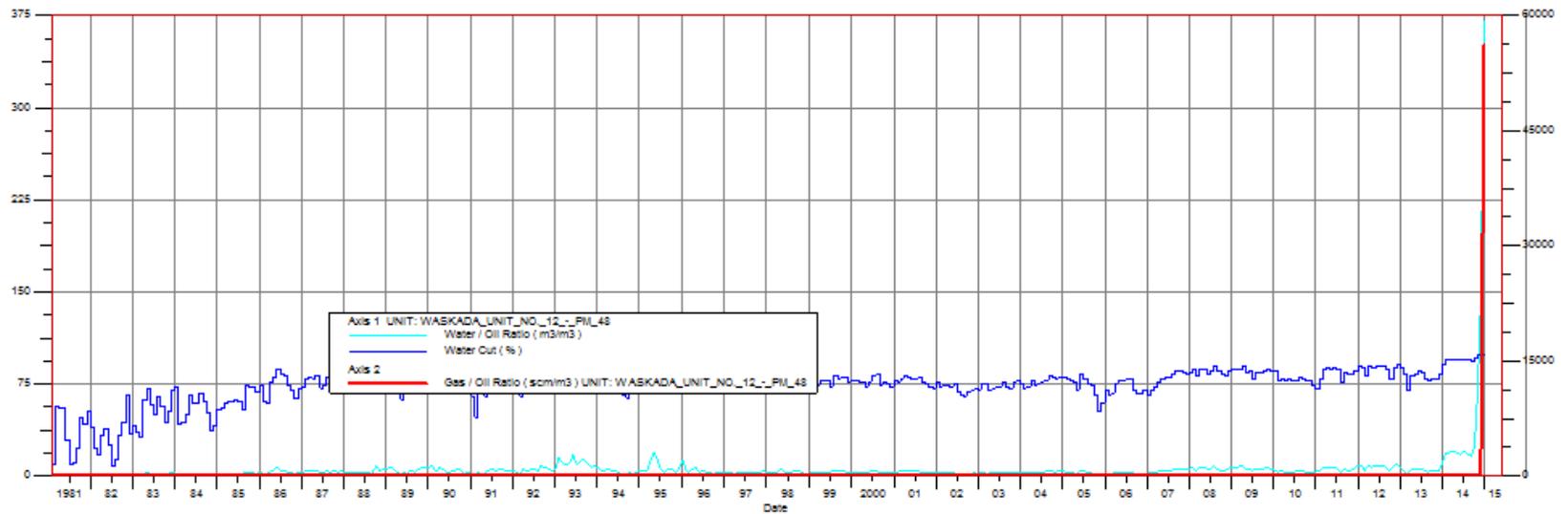
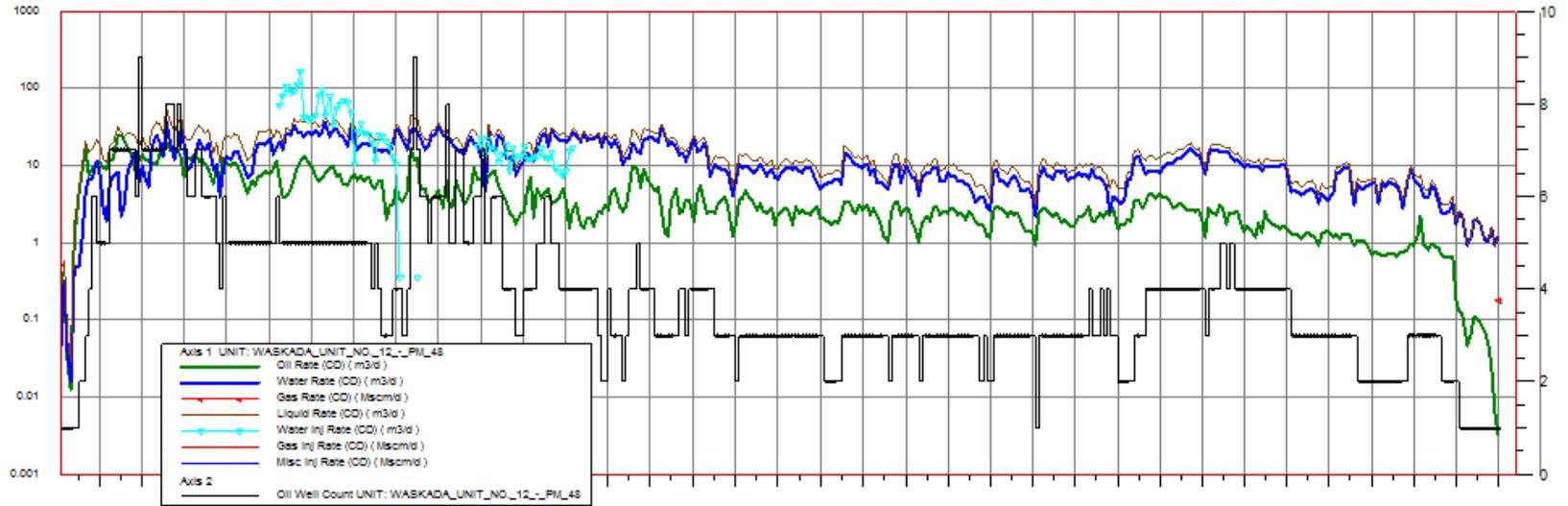
Cumulative Oil Prod : 52.95 Mm3

Cumulative Gas Prod : 0.01 MMscm

Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 66.25 Mm3

Cumulative Misc Inj : 0.00 MMscm



ATTACHMENT 4 –UNIT ANNUAL VOLUMES AND RATES*Unit : Waskada -Unit #12 - PM48**Rates and Volume History*

<i>Date</i>	<i>Annual Oil Prd</i>	<i>Annual Oil Rate</i>	<i>Annual Water Prod</i>	<i>Annual Water Prod Rate</i>	<i>Annual Water Inj</i>	<i>Annual Water Inj Rate</i>	<i>Annual Gas Inj</i>	<i>Annual Gas Inj rate</i>
	<i>m3</i>	<i>m3/d</i>	<i>m3</i>	<i>m3/d</i>	<i>m3</i>	<i>m3/d</i>	<i>Mscm</i>	<i>Mscm/d</i>
1/1/1981	1816.90	4.98	992.90	2.72	0	0.00	0.00	0.00
1/1/1982	5337.40	14.62	2459.90	6.74	0	0.00	0.00	0.00
1/1/1983	5125.60	14.04	6662.10	18.25	0	0.00	0.00	0.00
1/1/1984	3811.40	10.41	4871.80	13.31	0	0.00	0.00	0.00
1/1/1985	2901.40	7.95	5064.80	13.88	0	0.00	0.00	0.00
1/1/1986	3066.80	8.40	8584.00	23.52	24010	65.78	0.00	0.00
1/1/1987	2789.10	7.64	9856.40	27.00	21950	60.14	0.00	0.00
1/1/1988	2054.50	5.61	6596.50	18.02	7842	21.43	0.00	0.00
1/1/1989	2454.30	6.72	8796.70	24.10	346	0.95	0.00	0.00
1/1/1990	1807.30	4.95	7577.10	20.76	554	1.52	0.00	0.00
1/1/1991	1771.50	4.85	5499.90	15.07	5719	15.67	0.00	0.00
1/1/1992	1552.10	4.24	7106.80	19.42	4596	12.56	0.00	0.00
1/1/1993	868.50	2.38	8489.10	23.26	1232	3.38	0.00	0.00
1/1/1994	2015.90	5.52	6303.70	17.27	0	0.00	0.00	0.00
1/1/1995	1279.00	3.50	7183.90	19.68	0	0.00	0.00	0.00
1/1/1996	1162.40	3.18	4551.70	12.44	0	0.00	0.00	0.00
1/1/1997	1125.20	3.08	3227.20	8.84	0	0.00	0.00	0.00
1/1/1998	937.40	2.57	3104.50	8.51	0	0.00	0.00	0.00
1/1/1999	897.10	2.46	3119.10	8.55	0	0.00	0.00	0.00
1/1/2000	898.80	2.46	2895.50	7.91	0	0.00	0.00	0.00
1/1/2001	809.00	2.22	2798.00	7.67	0	0.00	0.00	0.00
1/1/2002	802.10	2.20	2010.00	5.51	0	0.00	0.00	0.00
1/1/2003	806.90	2.21	2221.70	6.09	0	0.00	0.00	0.00
1/1/2004	757.20	2.07	2548.40	6.96	0	0.00	0.00	0.00
1/1/2005	845.50	2.32	2398.50	6.57	0	0.00	0.00	0.00
1/1/2006	1052.10	2.88	2835.50	7.77	0	0.00	0.00	0.00
1/1/2007	1185.50	3.25	4600.30	12.60	0	0.00	0.00	0.00
1/1/2008	847.80	2.32	4866.80	13.30	0	0.00	0.00	0.00

1/1/2009	614.60	1.68	3632.50	9.95	0	0.00	0.00	0.00
1/1/2010	464.20	1.27	1777.20	4.87	0	0.00	0.00	0.00
1/1/2011	433.00	1.19	2362.00	6.47	0	0.00	0.00	0.00
1/1/2012	276.20	0.75	2045.00	5.59	0	0.00	0.00	0.00
1/1/2013	352.60	0.97	1541.50	4.22	0	0.00	0.00	0.00
1/1/2014	29.80	0.08	576.70	1.58	0	0.00	0.00	0.00
Sum	52949.10		149157.70		66249			

ATTACHMENT 5 – UNIT CUMULATIVE PRODUCTION AND INJECTION PLOT

PENNWEST

UNIT: WASKADA_UNIT_NO._12_-_PM_48

Cumulative Water Prod : 149.19 Mm3

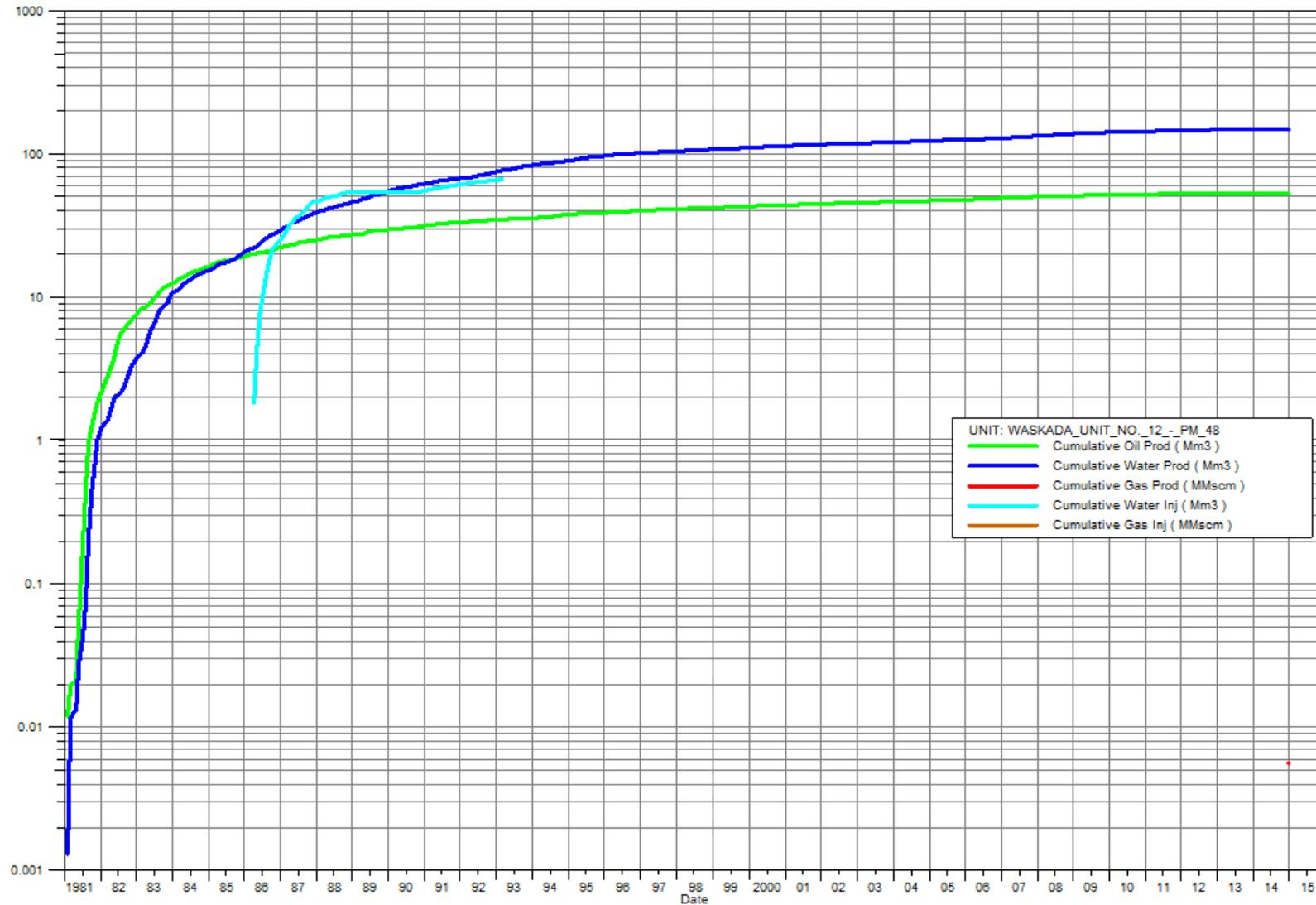
Cumulative Oil Prod : 52.95 Mm3

Cumulative Gas Prod : 0.01 MMscm

Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 66.25 Mm3

Last Prod/Inj Date: 201501



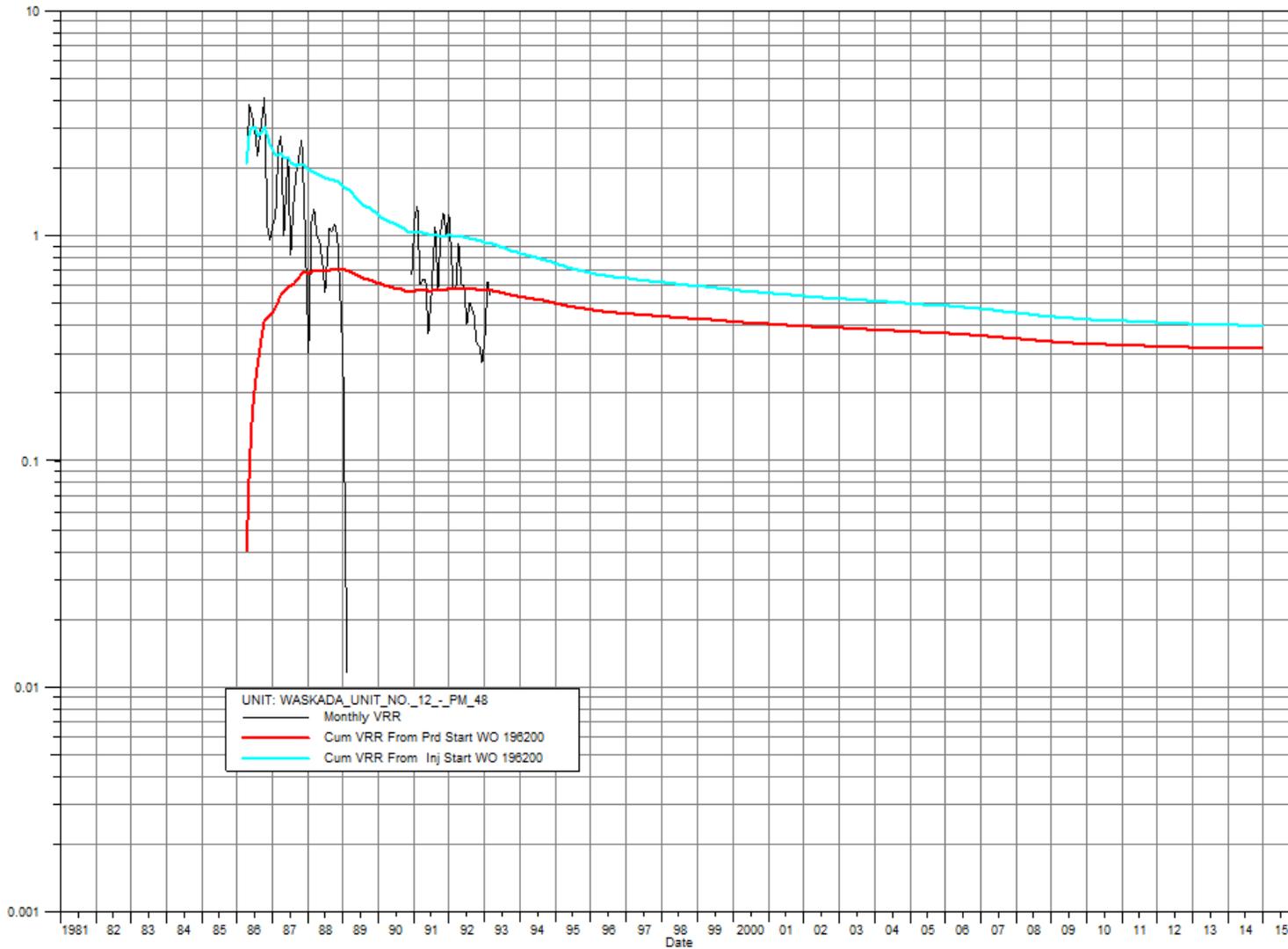
ATTACHMENT 6 – UNIT VOIDAGE REPLACEMENT RATIO PLOT

PENNWEST
UNIT: WASKADA_UNIT_NO._12_-_PM_48

Cumulative Water Prod : 149.19 Mm3
Cumulative Oil Prod : 52.95 Mm3
Cumulative Gas Prod : 0.01 Mm3scm

Cumulative Gas Inj : 0.00 Mm3scm
Cumulative Water Inj : 66.25 Mm3

Last Prod/Inj Date: 201501



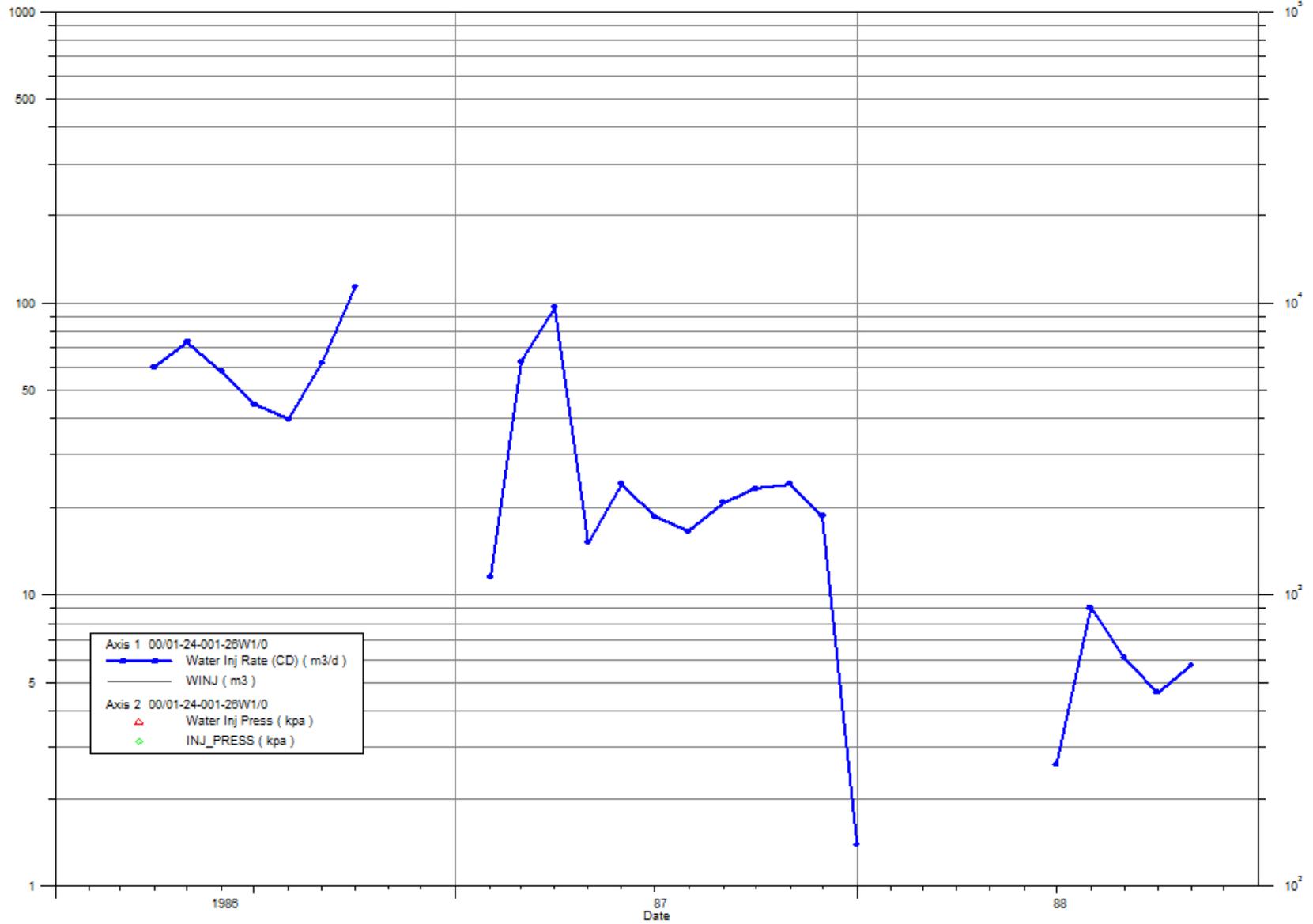
ATTACHMENT 7 – INDIVIDUAL INJECTION WELL PERFORMANCE PLOTS (3 WELL)

Status: ABD-OIL
 Unit: WABKADA_UNIT_NO_12_PW_48
 Zone: MISSION_CANYON_3A_A
 Operator: PENN_WEST Approval: Amaranth

PENNWEST EXPLORATION

00/01-24-001-26W1/0

Cumulative Gas Inj : 0.00 MMscm Cumulative Water Inj : 24.83 Mm3
 Cumulative Water Prod : 0.47 Mm3
 Cumulative Oil Prod : 3.80 Mm3
 Cumulative Gas Prod : 0.00 MMscm



Status: ABD-OIL

Unit: WA 8KADA_UNIT_NO_12_-_PW_48

Zone: MISSION_CANYON_3A_A

Operator: PENN_WEST Approval: Amaranth

PENNWEST EXPLORATION

02/09-23-001-26W1/0

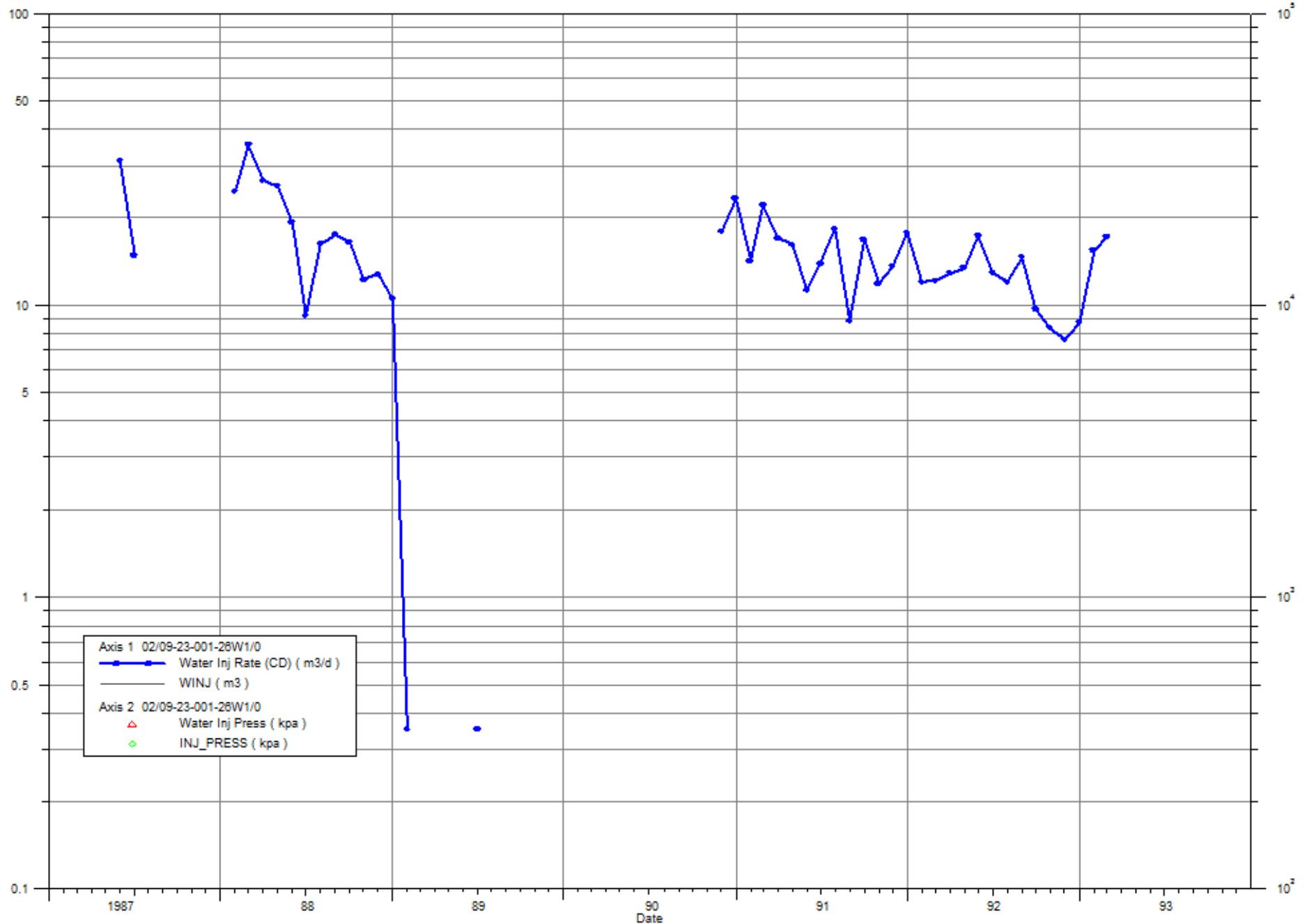
Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 20.42 Mm3

Cumulative Water Prod : 1.49 Mm3

Cumulative Oil Prod : 0.12 Mm3

Cumulative Gas Prod : 0.00 MMscm



Status: ABC-OIL

Unit: WASKADA_UNIT_NO_12_L_PM_48

Zone: MISSION_CANYON_3A_A

Operator: PENN_WEST Approval: Amaranth

PENNWEST EXPLORATION

02/15-23-001-26W1/0

Cumulative Gas Inj : 0.00 MMscm

Cumulative Water Inj : 21.00 Mm3

Cumulative Water Prod : 2.53 Mm3

Cumulative Oil Prod : 0.31 Mm3

Cumulative Gas Prod : 0.00 MMscm

