

# **WASKADA UNIT NO. 4**

## **WATERFLOOD PROGRESS REPORT**

**January 1, through December 31, 2012**

### **PennWest Exploration**

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## **INTRODUCTION**

The WASKADA UNIT NO.4 pressure maintenance project commenced water injection into the Lower Amaranth designed and in accordance with Manitoba Energy and Mines Approval No. PM 58.

PRESSURE MAINTENANCE: Governed by Board Order No. PM 58

### UNIT INFORMATION:

UNITIZED ZONE: Lower Amaranth

Original Unit, Jan.1, 1984 Board Order; Unitization Order No. 31

POOL: Waskada Lower Amaranth A (03 29A)

This report documents the performance of the Waskada Lower Amaranth pressure maintenance project for the period of January 1 to December 31, 2012.

Unit # 4 is part of main Waskada. 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 (W1PM).

The Waskada Fields produce light density crude (approximately 36° API), predominantly from the Lower Amaranth formation. The 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 founded 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 meters 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.

### **UNIT HISTORY**

#### **Waskada Unit #4 (Unit History)**

<b>CPA Pretty Well ID</b>	<b>Date Well Spudded</b>	<b>On Prod YYYY/MM/DD</b>	<b>Org Operator Name</b>	<b>Ground Elevation (m)</b>	<b>TVD (m)</b>
100/16-11-001-26W1/00	7/11/1982	8/1/1982	Omega Hydcbns Ltd	462.3	946
100/14-12-001-26W1/00	3/6/1982	7/1/1982	Omega Hydcbns Ltd	465.6	935
100/01-13-001-26W1/00	12/9/1981	3/1/1982	Omega Hydcbns Ltd	466.2	945
100/02-13-001-26W1/00	8/9/1982	10/1/1982	Omega Hydcbns Ltd	466	953
100/03-13-001-26W1/00	8/13/1982	10/1/1982	Omega Hydcbns Ltd	464.3	949
100/04-13-001-26W1/00	7/24/1982	9/1/1982	Omega Hydcbns Ltd	465.3	955
100/05-13-001-26W1/00	7/20/1982	9/1/1982	Omega Hydcbns Ltd	465.8	953.5
100/06-13-001-26W1/00	6/15/1982	7/1/1982	Omega Hydcbns Ltd	465.8	951
100/07-13-001-26W1/00	8/5/1982	9/1/1982	Omega Hydcbns Ltd	466.5	946
100/08-13-001-26W1/00	7/31/1982	11/1/1982	Omega Hydcbns Ltd	466.7	952
100/10-13-001-26W1/00	6/22/1982	8/1/1982	Omega Hydcbns Ltd	465.7	952
100/11-13-001-26W1/00	6/19/1982	11/1/1982	Omega Hydcbns Ltd	464.2	952
100/12-13-001-26W1/00	7/28/1982	9/1/1982	Omega Hydcbns Ltd	465.6	953
100/13-13-001-26W1/00	6/26/1982	7/1/1982	Omega Hydcbns Ltd	467.8	953
100/14-13-001-26W1/00	11/22/1981	4/1/1982	Omega Hydcbns Ltd	464.5	950
100/15-13-001-26W1/00	7/8/1981	11/1/1981	Omega Hydcbns Ltd	465.9	954
100/08-14-001-26W1/00	6/10/1982	8/1/1982	Omega Hydcbns Ltd	466	944.6
100/09-14-001-26W1/00	8/16/1982	11/1/1982	Omega Hydcbns Ltd	464.5	948
100/10-14-001-26W1/00	9/6/1982	12/1/1982	Omega Hydcbns Ltd	464.6	953
100/15-14-001-26W1/00	8/21/1982	11/1/1982	Omega Hydcbns Ltd	465.2	950
100/16-14-001-26W1/00	2/17/1982	4/1/1982	Omega Hydcbns Ltd	462.9	942
100/01-23-001-26W1/00	6/29/1982	8/1/1982	Omega Hydcbns Ltd	466.3	953
100/02-23-001-26W1/00	10/21/1982	12/1/1982	Omega Hydcbns Ltd	463.8	953
100/07-23-001-26W1/02	9/18/1982		NCE Petrofund Corp	466.4	947

102/08-23-001-26W1/00	5/25/1983	6/1/1983	Omega Hydcbns Ltd	465.9	950
1A0/08-23-001-26W1/00	2/25/1991	3/1/1991	Omega Hydcbns Ltd	463.8	963
102/01-24-001-26W1/00	5/30/1983	6/1/1983	Omega Hydcbns Ltd	464.5	947
100/02-24-001-26W1/00	6/29/1982	12/1/1982	Omega Hydcbns Ltd	464.4	953
1B0/02-24-001-26W1/00	10/29/1997	12/1/1997	NCE Rsrcs	465.5	960
100/03-24-001-26W1/00	6/20/1983	7/1/1983	Omega Hydcbns Ltd	467.1	950
102/03-24-001-26W1/00	10/13/2011	12/1/2011	Penn West Expl Ltd	465.6	911.4
1C0/03-24-001-26W1/00	4/5/1991	4/1/1991	Omega Hydcbns Ltd	467.9	965
100/04-24-001-26W1/00	6/24/1983	7/1/1983	Omega Hydcbns Ltd	469	950
1C0/04-24-001-26W1/00	3/2/1991	3/1/1991	Omega Hydcbns Ltd	465.7	960.5
100/05-24-001-26W1/00	6/14/1983	7/1/1983	Omega Hydcbns Ltd	465.1	957
100/06-24-001-26W1/00	6/28/1983	7/1/1983	Omega Hydcbns Ltd	467.1	948
102/06-24-001-26W1/00	10/20/2011	12/1/2011		465.8	909.6
1A0/06-24-001-26W1/00	4/1/1991	4/1/1991	Omega Hydcbns Ltd	467.9	960
100/07-24-001-26W1/00	9/24/1981	11/1/1981	Omega Hydcbns Ltd	466.1	961
102/08-24-001-26W1/00	7/30/1983	8/1/1983	Omega Hydcbns Ltd	468.3	930

## Waskada Unit #4 (Production & Injection History)

CPA Pretty Well ID	First Prod YYYY/MM	On Inject. YYYY/MM/DD	Last Prod. YYYY/MM	Cumulative OIL Prod. (m3)	Cumulative WTR Prod. (m3)	Last Inject. YYYY/MM
100/16-11-001-26W1/00	1982/08	12/1/1985	1985/12	474	3864	1989/04
100/14-12-001-26W1/00	1982/07		1989/07	1010	913	
100/01-13-001-26W1/00	1982/03		2012/05	13000	11791	
100/02-13-001-26W1/00	1982/10		2012/01	11943	1613	
100/03-13-001-26W1/00	1982/10		1997/01	2982	1142	
100/04-13-001-26W1/00	1982/09		1990/03	1842	1023	
100/05-13-001-26W1/00	1982/09	6/1/1984	1984/05	792	415	2006/11
100/06-13-001-26W1/00	1982/07		1990/04	6436	33350	
100/07-13-001-26W1/00	1982/09	12/1/1985	1985/11	2006	376	2011/02
100/08-13-001-26W1/00	1982/11		1989/09	2456	461	
100/10-13-001-26W1/00	1982/08		2012/10	11100	1694	
100/11-13-001-26W1/00	1982/11		2011/07	5212	3569	
100/12-13-001-26W1/00	1982/09		1997/09	4217	2102	
100/13-13-001-26W1/00	1982/07	6/1/1984	1984/05	2754	1905	2005/10
100/14-13-001-26W1/00	1982/04		2012/10	11787	6700	
100/15-13-001-26W1/00	1981/11	6/1/1984	1984/05	3663	633	2006/10
100/08-14-001-26W1/00	1982/08		2000/06	7315	12918	
100/09-14-001-26W1/00	1982/11		1989/12	3892	12526	

100/10-14-001-26W1/00	1982/12		1986/06	636	10533	
100/15-14-001-26W1/00	1982/11	6/1/1984	1984/05	612	4790	2000/06
100/16-14-001-26W1/00	1982/04		1991/01	5246	1745	
100/01-23-001-26W1/00	1982/08		2012/10	15444	11854	
100/02-23-001-26W1/00	1982/12		1990/03	2263	34836	
100/07-23-001-26W1/02		8/1/1984				2001/09
102/08-23-001-26W1/00	1983/06		1996/06	6276	27059	
1A0/08-23-001-26W1/00	1991/03		2012/10	4934	1473	
102/01-24-001-26W1/00	1983/06		1996/05	5263	3369	
100/02-24-001-26W1/00	1982/12		2012/05	15971	14768	
1B0/02-24-001-26W1/00	1997/12		2012/02	4789	311	
100/03-24-001-26W1/00	1983/07		2012/10	19639	62574	
102/03-24-001-26W1/00	2011/12		2012/10	2122	350	
1C0/03-24-001-26W1/00	1991/04		2012/03	2621	1077	
100/04-24-001-26W1/00	1983/07		2012/10	30127	78804	
1C0/04-24-001-26W1/00	1991/03		2012/02	3587	5265	
100/05-24-001-26W1/00	1983/07	6/1/1984	1984/05	2593	2027	1993/04
100/06-24-001-26W1/00	1983/07		2012/10	12545	2590	
102/06-24-001-26W1/00	2011/12		2012/10	2779	1200	
1A0/06-24-001-26W1/00	1991/04		2011/04	2659	3284	
100/07-24-001-26W1/00	1981/11	6/1/1984	1984/05	3040	290	2009/06
102/08-24-001-26W1/00	1983/08		2012/02	14105	10833	

## **DISCUSSION:**

### **Production Performance**

Production Response versus Injection: Since injection began, mid 1985, injection rates fluctuated to some degree amongst the injectors; it is difficult to link any production responses to any specific injector. Water breakthrough of certain producers could not be directly correlated with over injection in associated injectors. Some wells showed no change in oil rate when injection was ceased in 1989-90.

### **Voidage Replacement Ratio Calculation**

What could be described as very limited success, the waterflood was not maintained properly and injection rate dropped year after year in most cases. The cumulative VRR in

the pool is about 1.08 and the current monthly VRR is zero (No active injector).

PennWest has no plans to re-activate the old injectors (see Appendix C).

To understand the past performance of the Lower Amaranth waterflood, we are doing some reservoir engineering work to come up with potential solutions. One of our plans is to do a pilot program in section 2: The objective of the pilot is to:

1. See if we can continuously inject water into the Lower Amaranth Formation
  - i. Particle size less than 1 micron
  - ii. Total Suspended Solid (TSS) less than 10 ppm
  - iii. Oil less than 10 ppm
2. Inject below the frac pressure
3. Test the simulation model that we have built.

#### 2012 Waskada Lower Amaranth Waterflood Pilot Location

The pilot producer is 102/12-01-02-26W1/00 (the existing horizontal well) and the injectors are two vertical wells; 100/12-01-02-26W1 and 100/11-01-02-26 (converted to injectors). The pilot started late 2012, but because of some technical issues and cold weather the operation suspended, and it was postponed until spring 2013.

#### **Corrosion and Scale Prevention Program**

We currently inject ScalCor down all the new horizontal wells. In addition to that, PennWest will be installing cathodic protection on the wells. Also, the new gathering system is Fiberglass and as such is not susceptible to corrosion.

#### **SUMMARY AND RECOMMENDATIONS**

##### **[Producers]**

##### Current Producing Wells

100/10-13-001-26W1/00  
100/14-13-001-26W1/00  
100/01-23-001-26W1/00 (Commingled)  
1A0/08-23-001-26W1/00 (Resumed COOP)  
100/03-24-001-26W1/00

102/03-24-001-26W1/00  
100/04-24-001-26W1/00  
100/06-24-001-26W1/00  
102/06-24-001-26W1/00

### **Current Suspended Wells**

100/01-13-001-26W1/00  
100/02-13-001-26W1/00  
100/11-13-001-26W1/00  
100/02-24-001-26W1/00  
1B0/02-24-001-26W1/00  
1C0/03-24-001-26W1/00  
1C0/04-24-001-26W1/00  
1A0/06-24-001-26W1/00  
102/08-24-001-26W1/00

### **Abandoned Wells**

100/14-12-001-26W1/00  
100/03-13-001-26W1/00  
100/04-13-001-26W1/00  
100/06-13-001-26W1/00  
100/08-13-001-26W1/00  
100/12-13-001-26W1/00  
100/08-14-001-26W1/00  
100/09-14-001-26W1/00  
100/10-14-001-26W1/00  
100/16-14-001-26W1/00  
100/02-23-001-26W1/00  
102/08-23-001-26W1/00  
102/01-24-001-26W1/00

### **[Injectors]**

### **Current Injecting Wells**

None



### Current Suspended Wells

5-13-001-26W1/0 (since 2006/11)

7-13-001-26W1/0 (since 2011/02)

3-13-001-26W1/0 (since 2005/10)

5-13-001-26W1/0 (since 2006/10)

### Abandoned Wells

00/16-11-001-26W1/0 (since 1989/04)

00/15-14-001-26W1/0 (since 2000/06)

00/07-23-001-26W1/2 (since 2001/09)

00/05-24-001-26W1/0 (since 1993/04)

00/07-24-001-26W1/0 (since 2009/06)

The behavior of a Waskada Unit 4 producers are indicated by examining the oil rate versus time plots (see Appendix B). Waskada Unit 4 exhibited relatively high initial oil productivity (most of the wells drilled in the past are verticals), rapidly declining to flat/low decline rates, with almost no discernible water flood response. This behavior can be explained by drop in the reservoir pressure from initial (approximately 8700 kPag) to above in some wells or below in others bubble point pressure (about 4200 kPag) followed by solution gas breakout which adversely affected the relative permeability to oil. (see Table # 2)

Also, it is believed that fracture stimulation treatments, performed on these wells prior to initiation of water injection, “broke” through into the higher productivity Mississippian zone and that 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.

## **TABLES**

### **Waskada Unit #4**

**Table 1: Rates History**

Production Data						
Date	Oil		Water		Injection Water	
Year	m3/year	m3/day	m3/year	m3/day	m3/year	m3/day
1981	891	2.44	154	0.42	0	0.00
1982	14,701	40.28	7,215	19.77	0	0.00
1983	37,397	102.46	34,057	93.31	0	0.00
1984	26,933	73.79	33,400	91.51	0	0.00
1985	19,314	52.91	34,523	94.58	73,162	200.44
1986	12,945	35.46	43,742	119.84	134,971	369.78
1987	15,258	41.80	28,894	79.16	86,108	235.91
1988	10,751	29.45	23,051	63.15	43,873	120.20
1989	7,954	21.79	22,723	62.26	4,701	12.88
1990	5,812	15.92	11,723	32.12	10,613	29.08
1991	8,956	24.54	10,018	27.45	36,491	99.97
1992	7,311	20.03	16,486	45.17	66,196	181.36
1993	7,060	19.34	18,650	51.10	56,746	155.47
1994	6,296	17.25	15,906	43.58	30,651	83.98
1995	7,691	21.07	15,621	42.80	22,900	62.74
1996	6,364	17.44	10,418	28.54	28,328	77.61
1997	5,288	14.49	6,833	18.72	21,899	60.00
1998	5,366	14.70	5,577	15.28	16,369	44.85
1999	4,174	11.44	4,629	12.68	18,559	50.85
2000	3,484	9.54	3,487	9.55	10,759	29.48
2001	3,016	8.26	2,747	7.53	9,240	25.32
2002	2,981	8.17	1,890	5.18	6,490	17.78
2003	2,536	6.95	1,517	4.15	7,229	19.81
2004	2,269	6.22	3,251	8.91	8,263	22.64
2005	1,789	4.90	2,915	7.99	9,895	27.11
2006	2,588	7.09	1,213	3.32	5,897	16.16
2007	2,395	6.56	1,809	4.96	1,296	3.55
2008	3,357	9.20	2,920	8.00	1,513	4.14
2009	3,676	10.07	2,132	5.84	4,100	11.23
2010	3,505	9.60	2,692	7.38	5,562	15.24
2011	2,762	7.57	3,543	9.71	71	0.19
2012	5,316	14.57	2,288	6.27	0	0.00

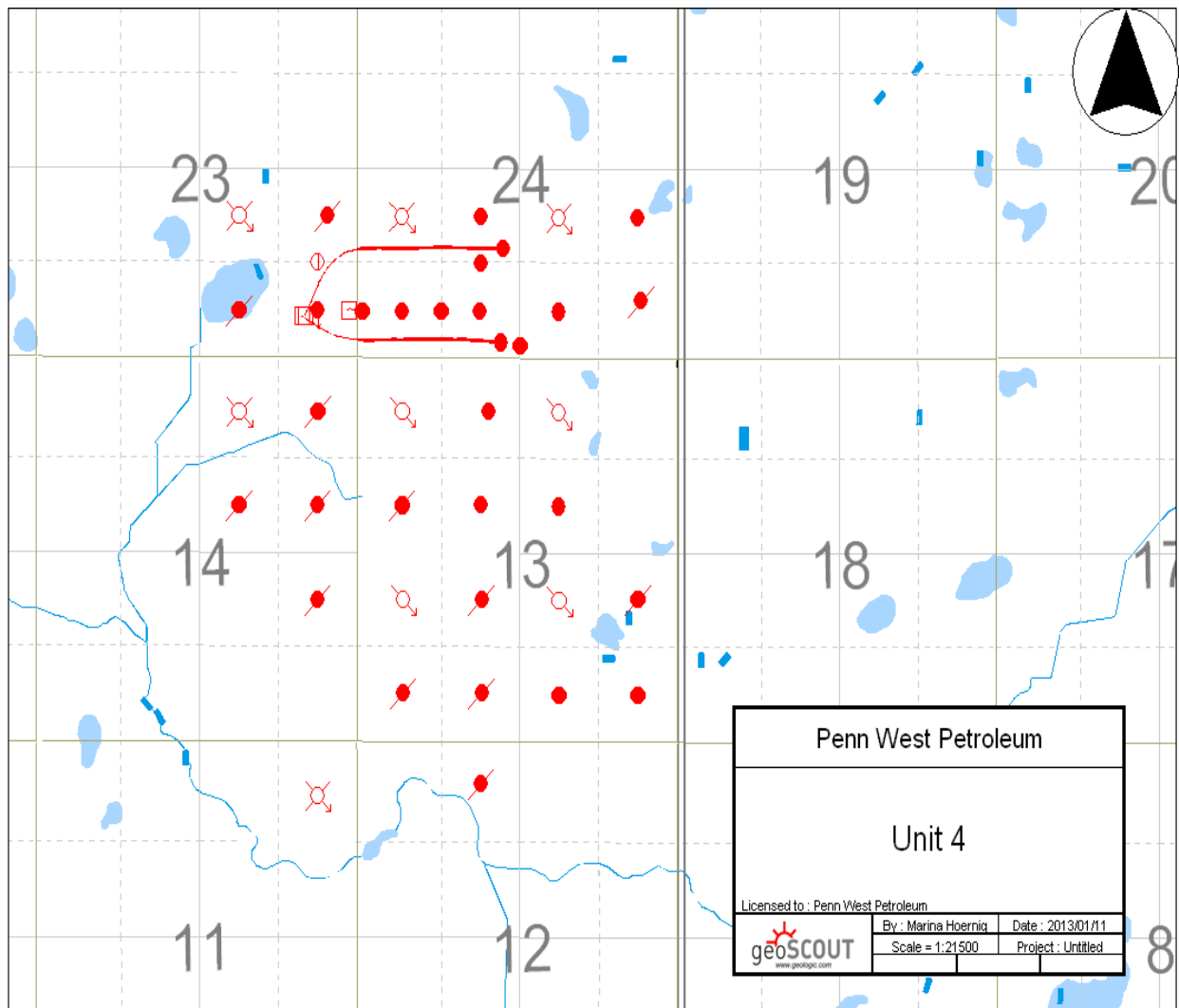
## Waskada Unit #4

**Table 2: Pressure Survey**

<b>Location</b>	<b>Shut In Date</b>	<b>Date of Survey</b>	<b>Type of Survey</b>	<b>Pressure @ Datum Depth (kPa)</b>
00/11-13-001-26W1/0		2008	BHP, Assuming WC from Last Prod'n	7150
00/13-13-001-26W1/0	Dec-89	(469 days)	Static Gradient	9046
00/15-13-001-26W1/0	Dec-89	(103 days)	Static Gradient	13899
00/15-14-001-26W1/0	Dec-89	(39 days)	Static Gradient	10120
B0/02-24-001-26W1/0		2008	BHP, Assuming WC from Last Prod'n	1472
00/03-24-001-26W1/0	May-91	(7 days)	Static Gradient	4281
00/04-24-001-26W1/0		2008	BHP, Assuming WC from Last Prod'n	2104
00/06-24-001-26W1/0	May-91	(7 days)	Static Gradient	3994
A0/06-24-001-26W1/0		2008	BHP, Assuming WC from Last Prod'n	8993

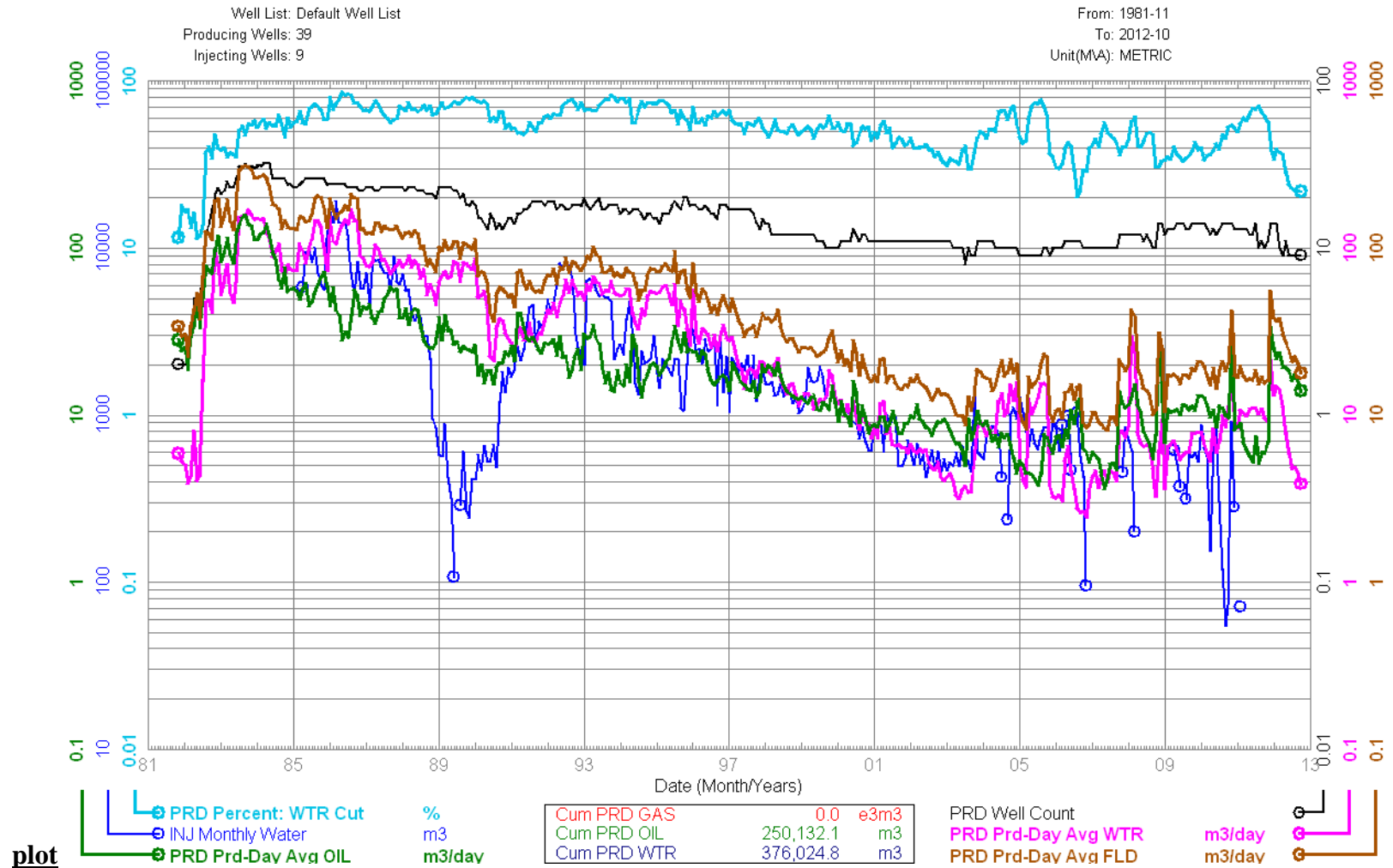
## **APPENDIX A**

## Appendix A – Area Map



## **APPENDIX B**

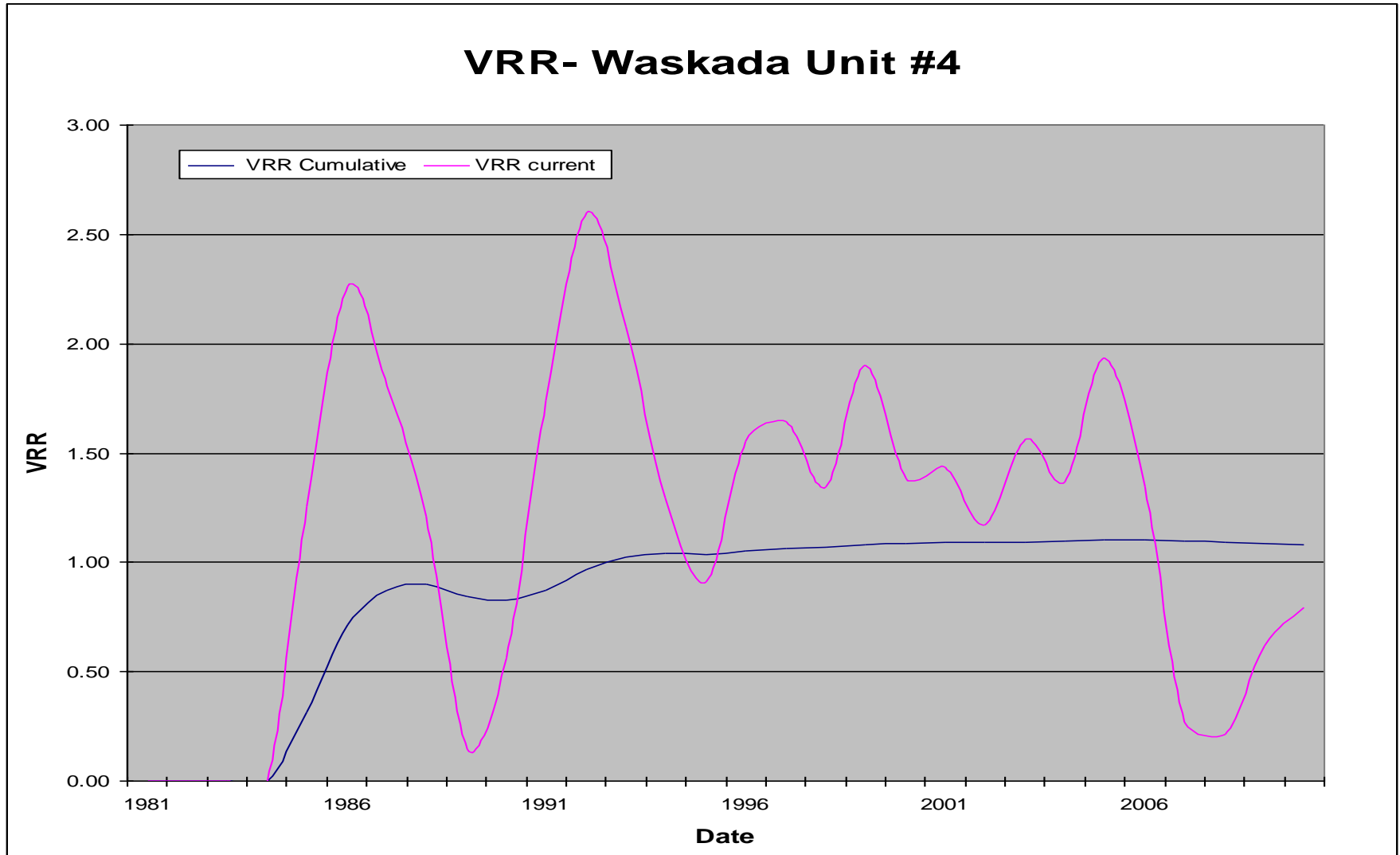
## Appendix B – Production and Injection History



## **APPENDIX C**

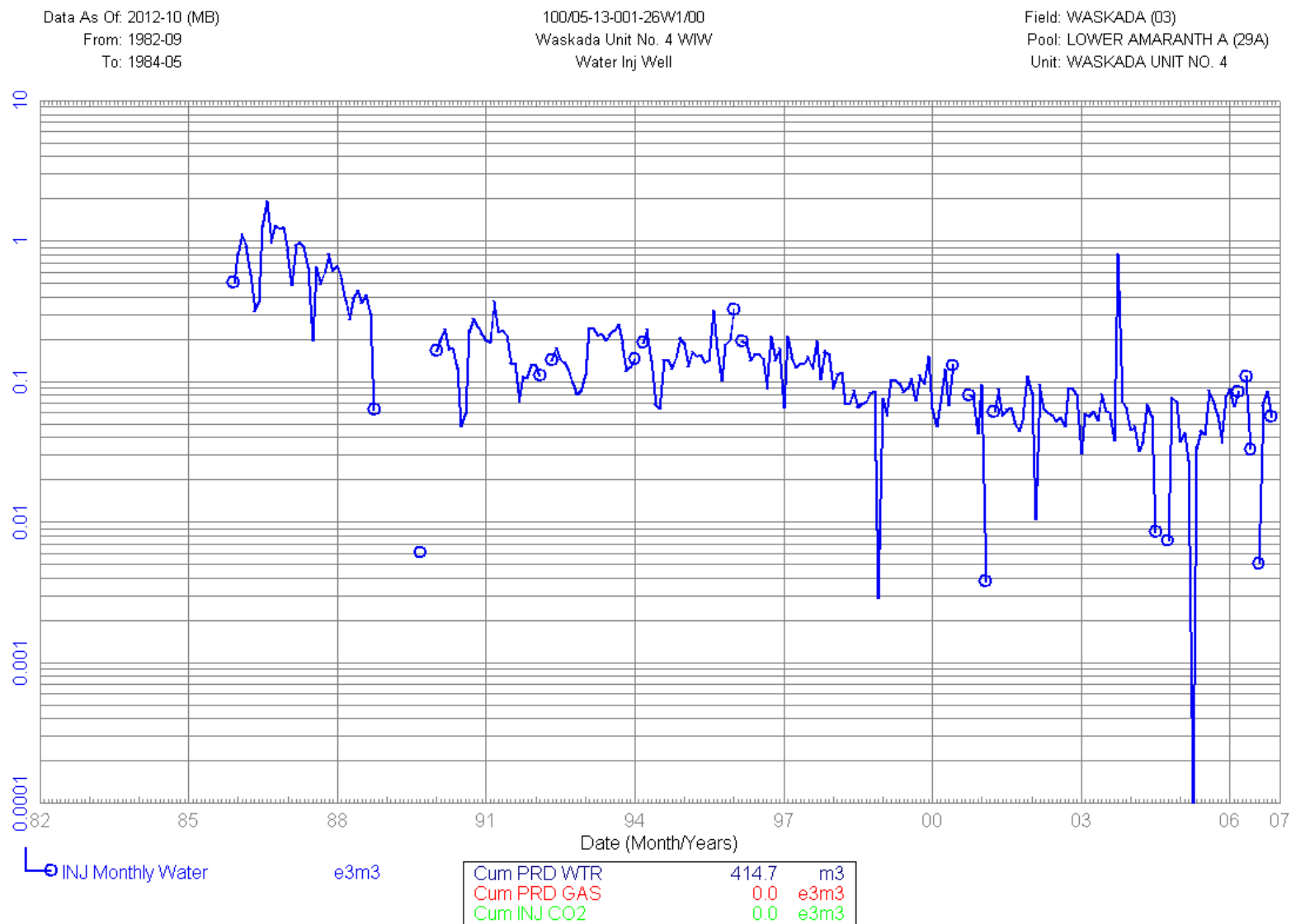


**Appendix C – Voidage Replacement Ratio VRR**



## **APPENDIX D**

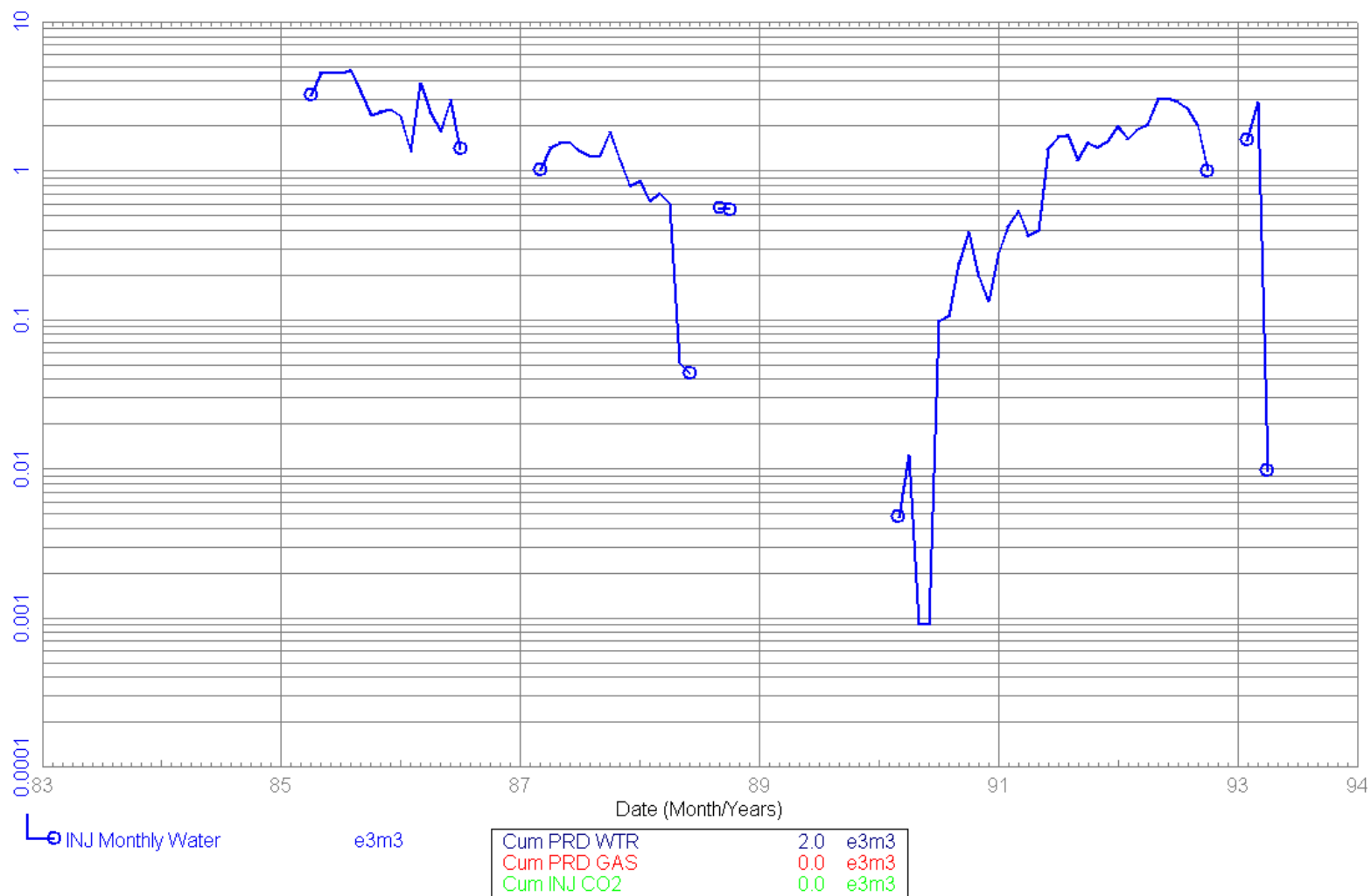
## Appendix D – Production and Injection Profiles (Individual wells)



Data As Of: 2012-10 (MB)  
From: 1983-07  
To: 1984-05

100/05-24-001-26W1/00  
Waskada Unit No. 4 WIW  
Abandoned Water Inj Well

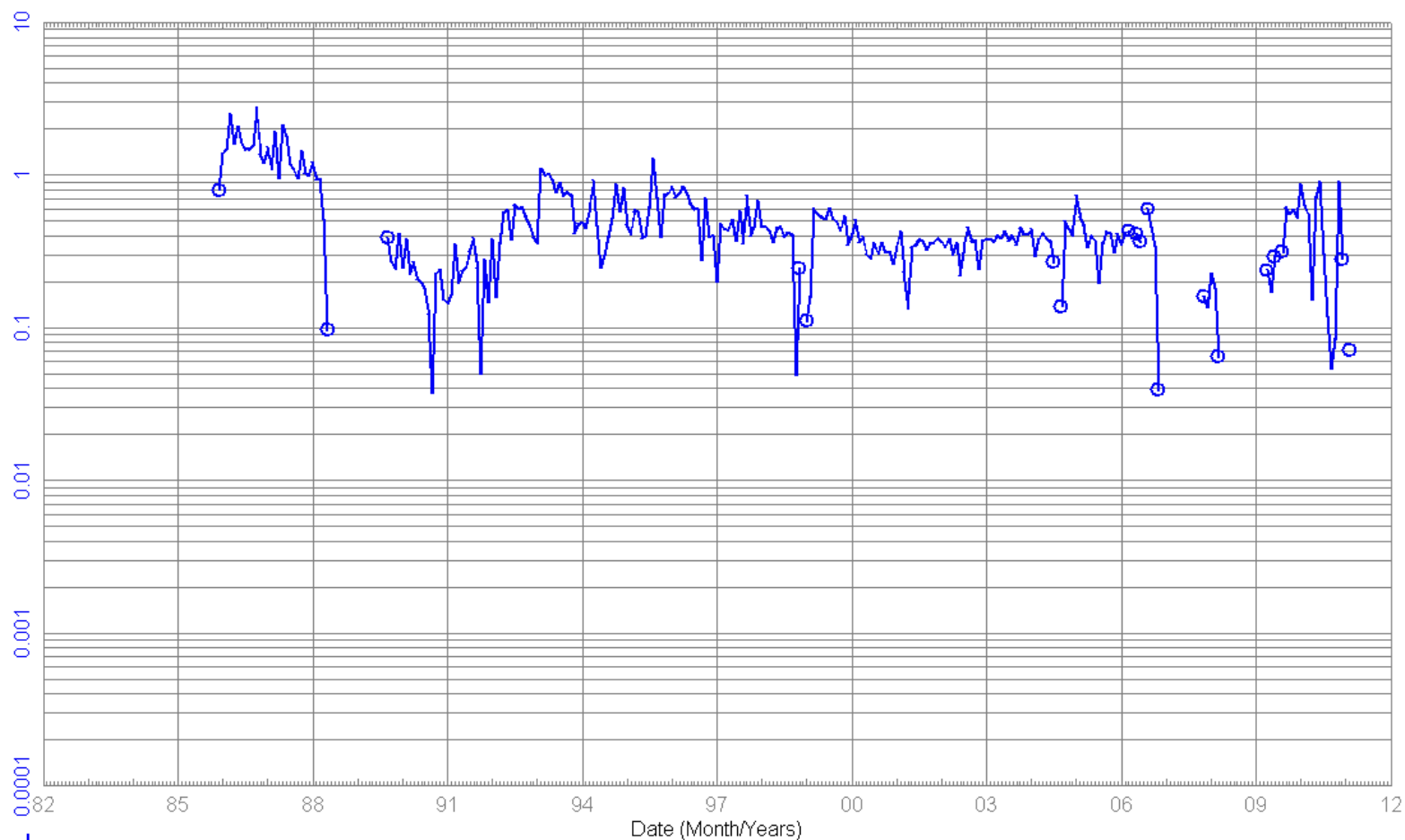
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Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1982-09  
To: 1985-11

100/07-13-001-26W1/00  
Waskada Unit No. 4 WIW  
Water Inj Well

Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



INJ Monthly Water

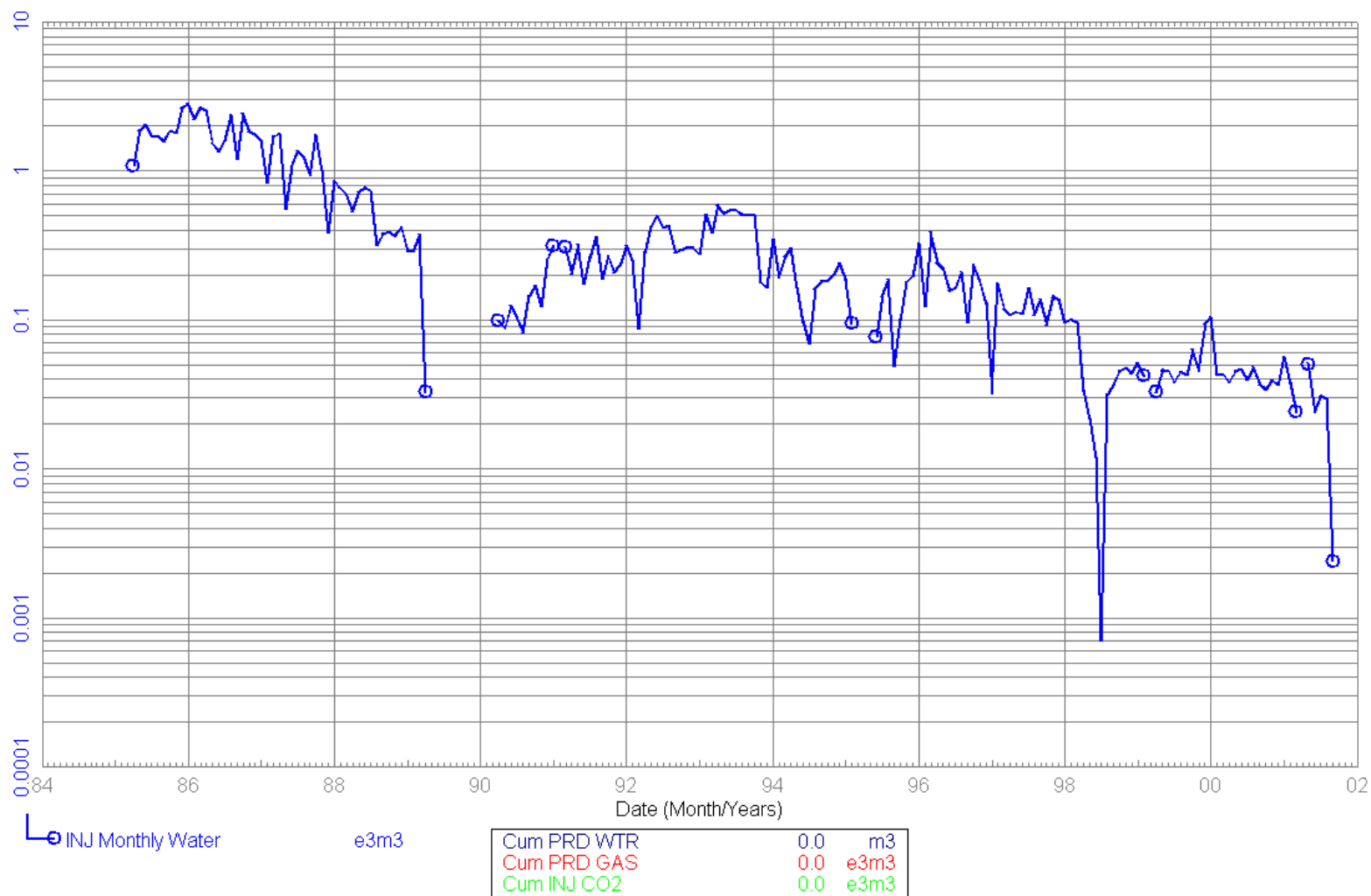
e3m3

Cum PRD WTR	375.5	m3
Cum PRD GAS	0.0	e3m3
Cum INJ CO2	0.0	e3m3

Data As Of: 2012-10 (MB)  
From: 1984-08  
To: 2001-09

100/07-23-001-26W1/02  
Waskada Unit No. 4 WIW  
Abandoned Water Inj Well

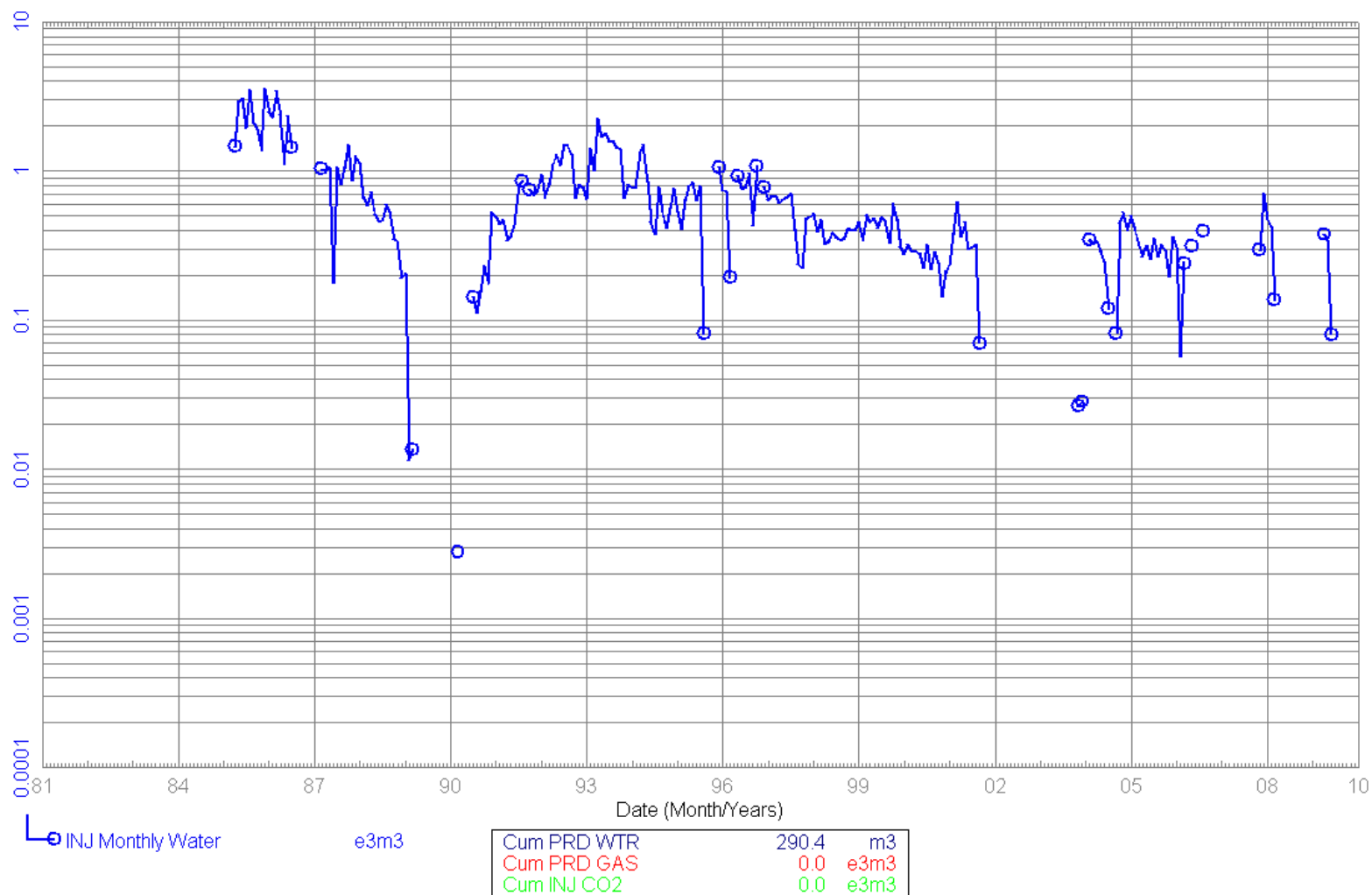
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Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1981-11  
To: 1984-05

100/07-24-001-26W1/00  
Waskada Unit No. 4 Prov. WIW  
Abandoned Water Inj Well

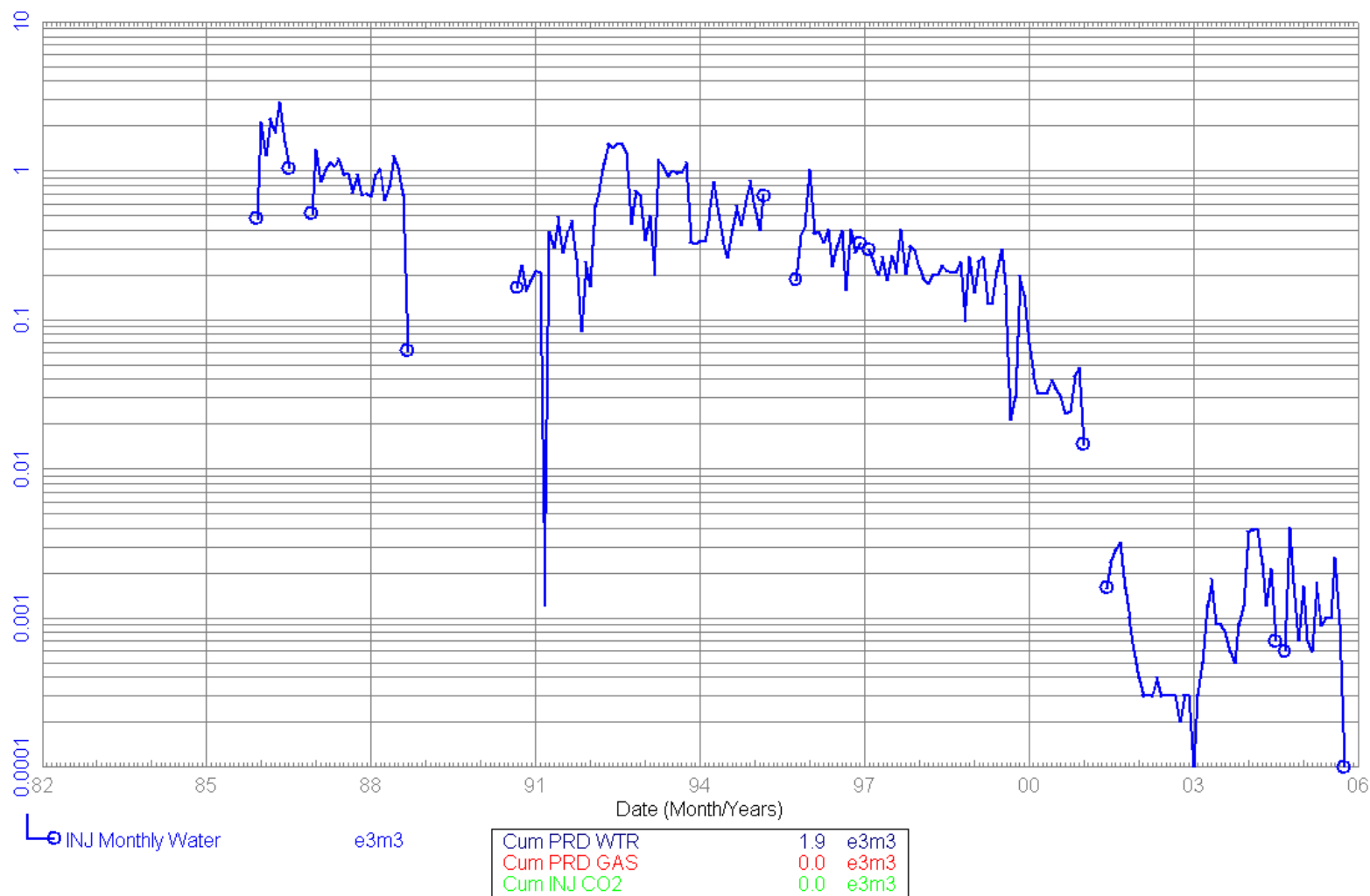
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1982-07  
To: 1984-05

100/13-13-001-26W1/00  
Waskada Unit No. 4 WIW  
Water Inj Well

Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4

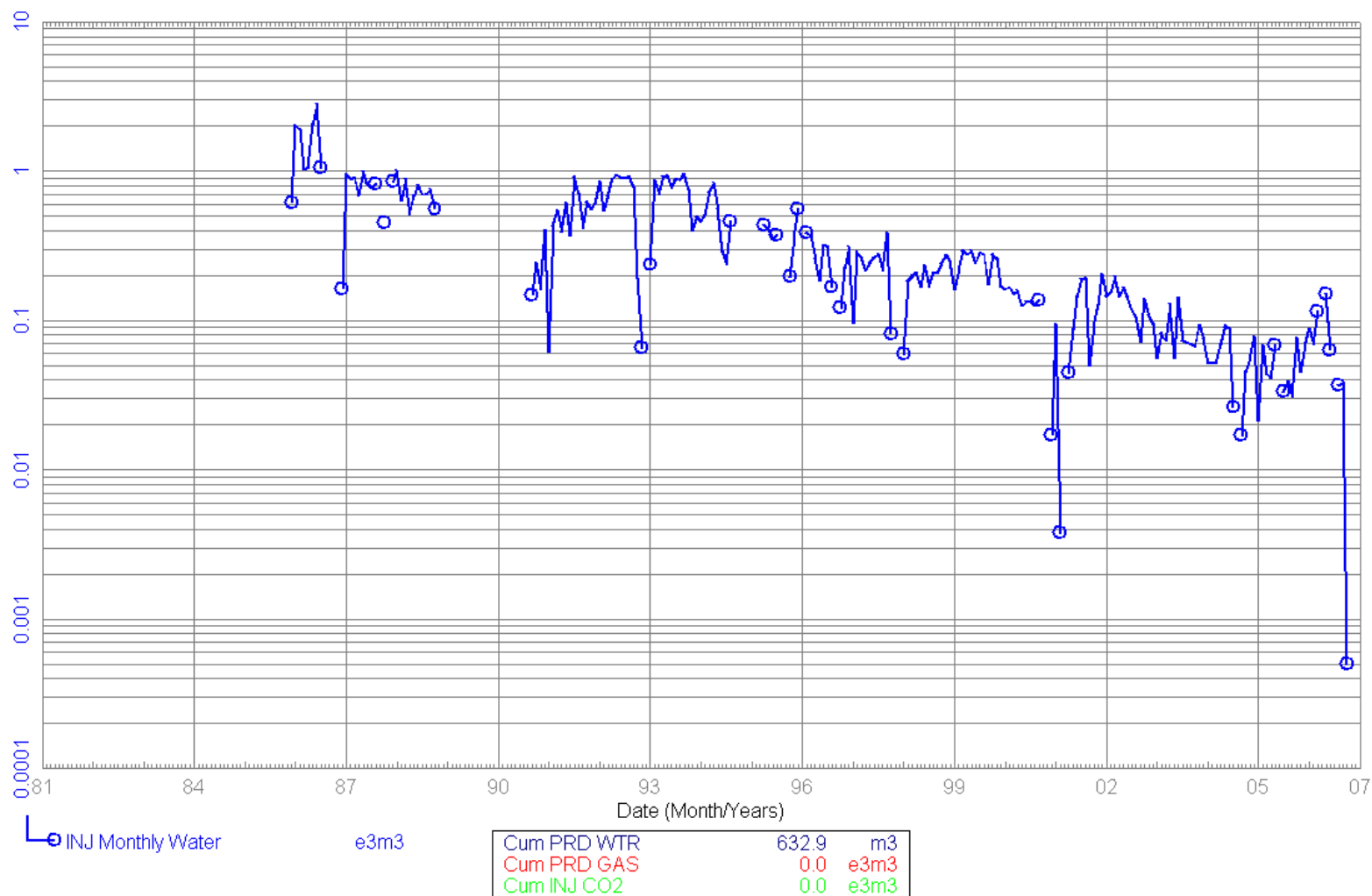




Data As Of: 2012-10 (MB)  
From: 1981-11  
To: 1984-05

100/15-13-001-26W1/00  
Waskada Unit No. 4 WIW  
Water Inj Well

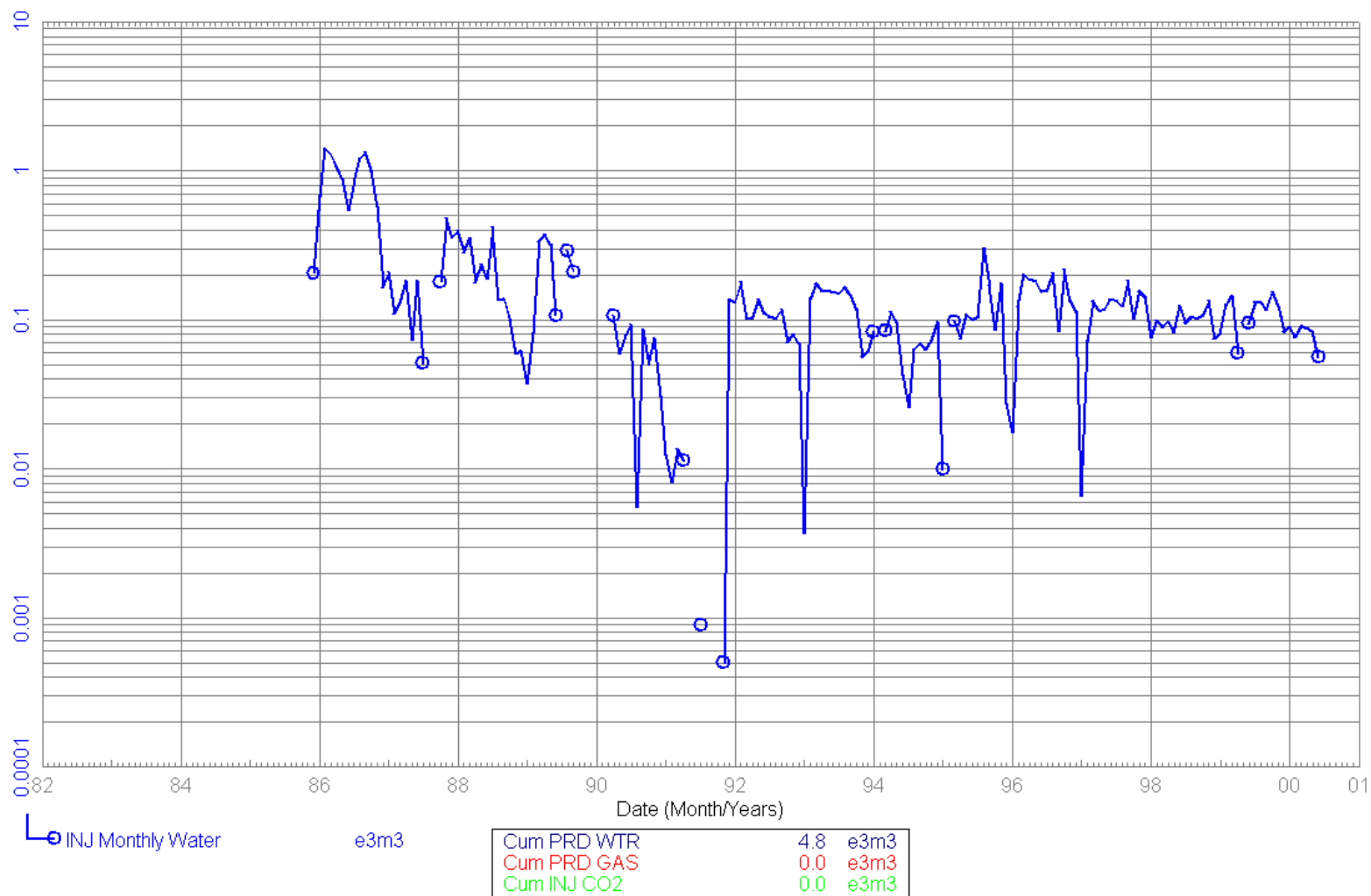
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1982-11  
To: 1984-05

100/15-14-001-26W1/00  
Waskada Unit No. 4 WIW/  
Abandoned Water Inj Well

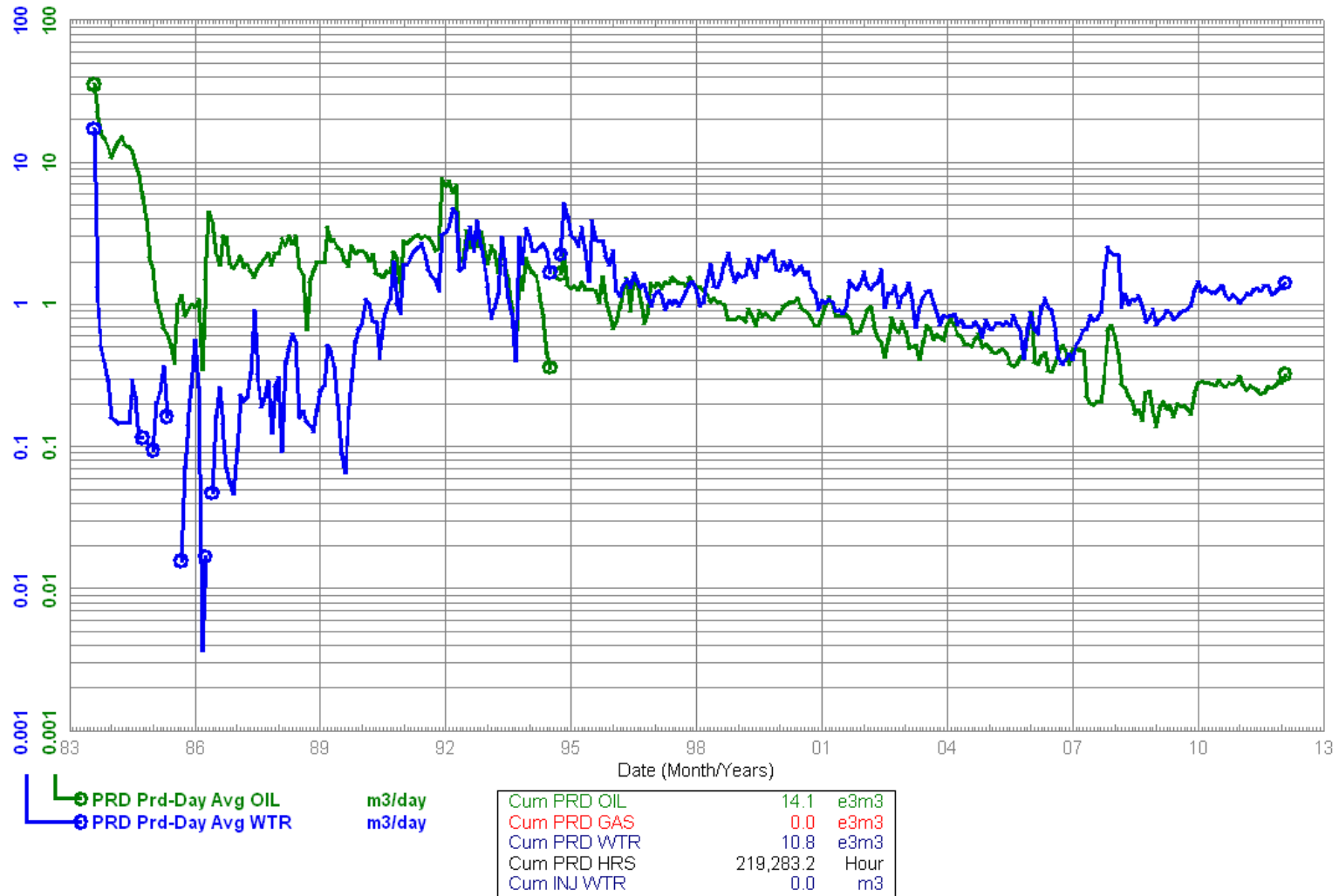
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1983-08  
 To: 2012-02

102/08-24-001-26W1/00  
 Waskada Unit No. 4 Prov.  
 Capable Of Oil Prod

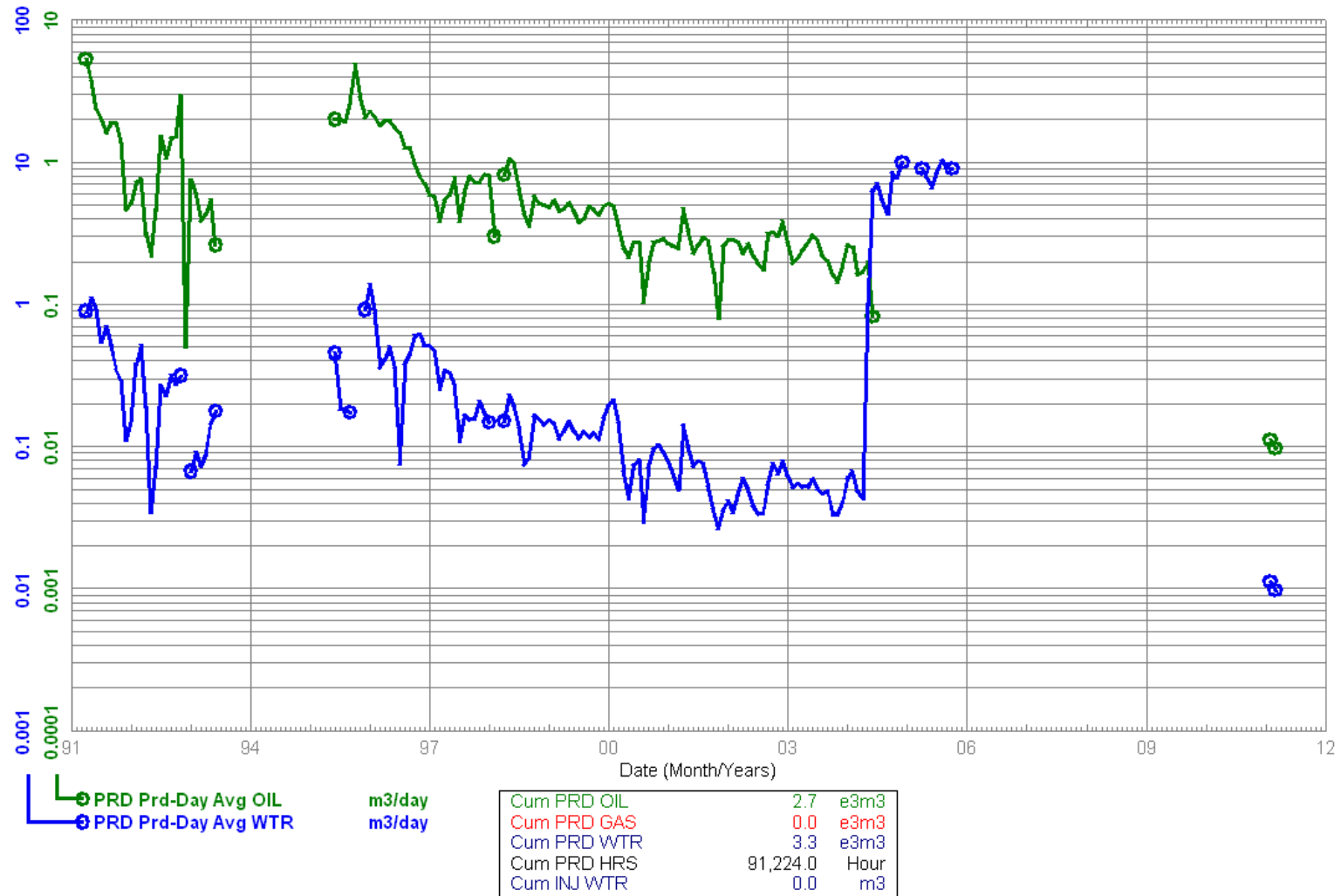
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1991-04  
 To: 2011-04

1A0/06-24-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

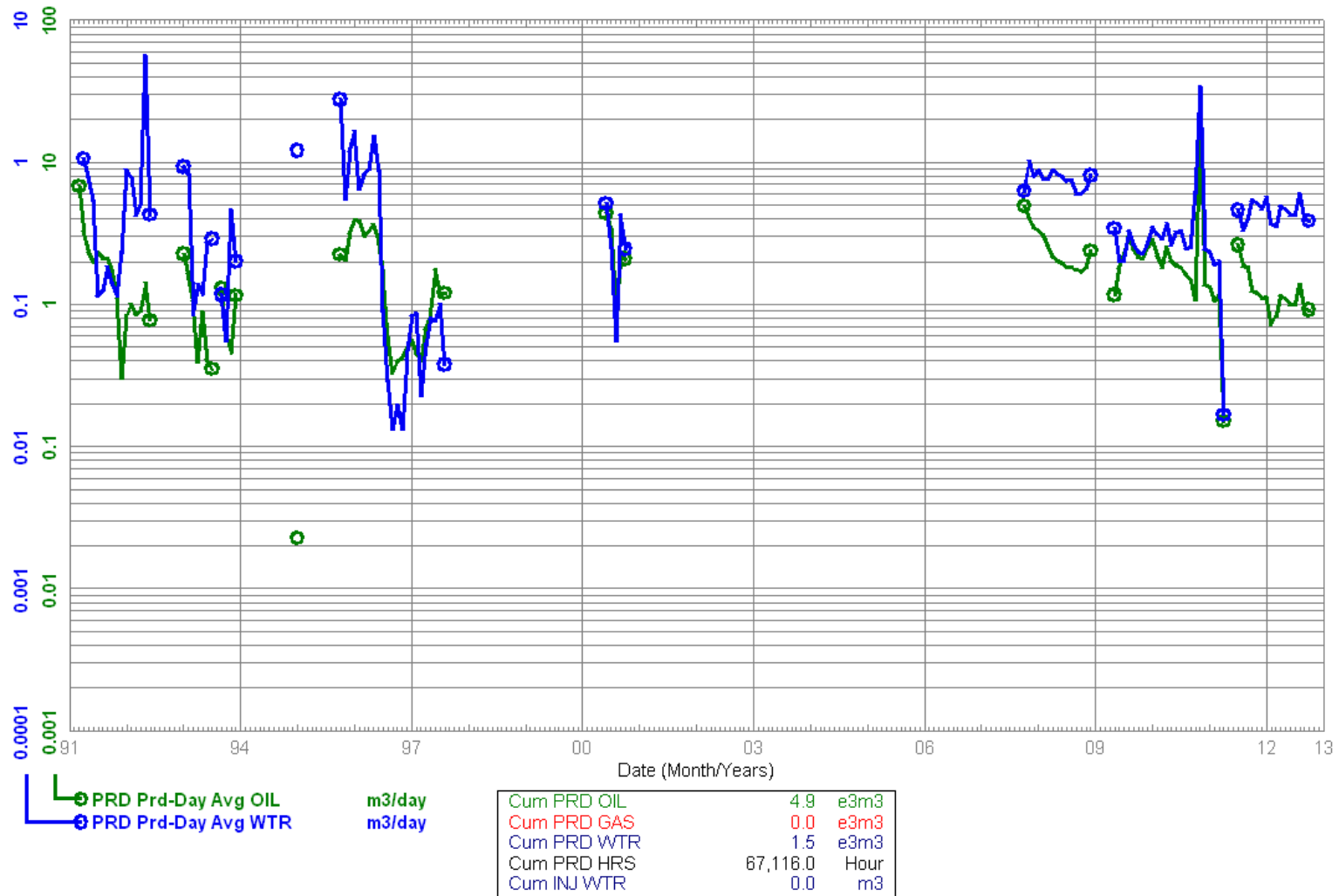
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1991-03  
 To: 2012-10

1A0/08-23-001-26W1/00  
 Waskada Unit No. 4

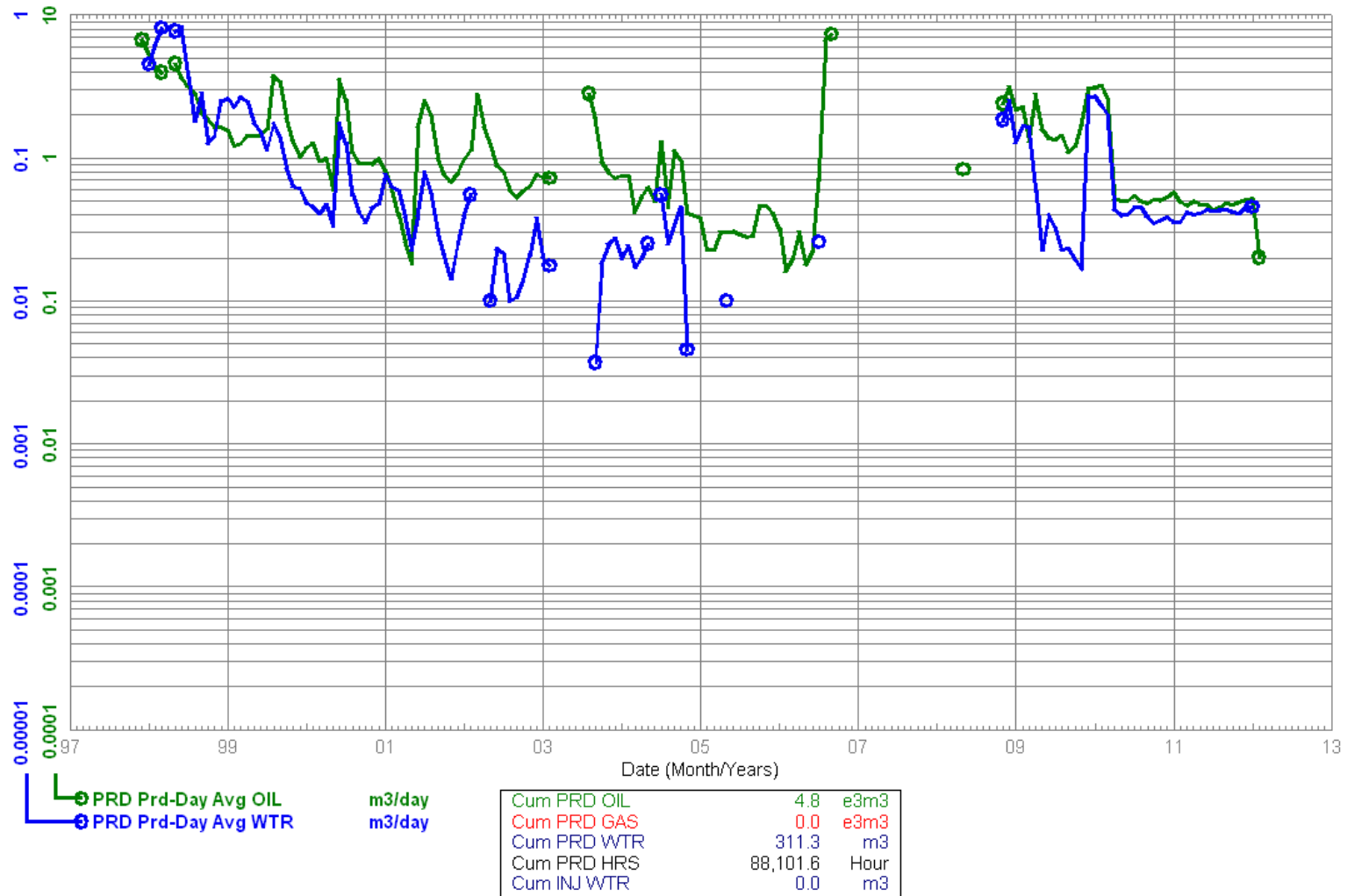
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1997-12  
 To: 2012-02

1B0/02-24-001-26W1/00  
 Waskada Unit No. 4 Prov.  
 Capable Of Oil Prod

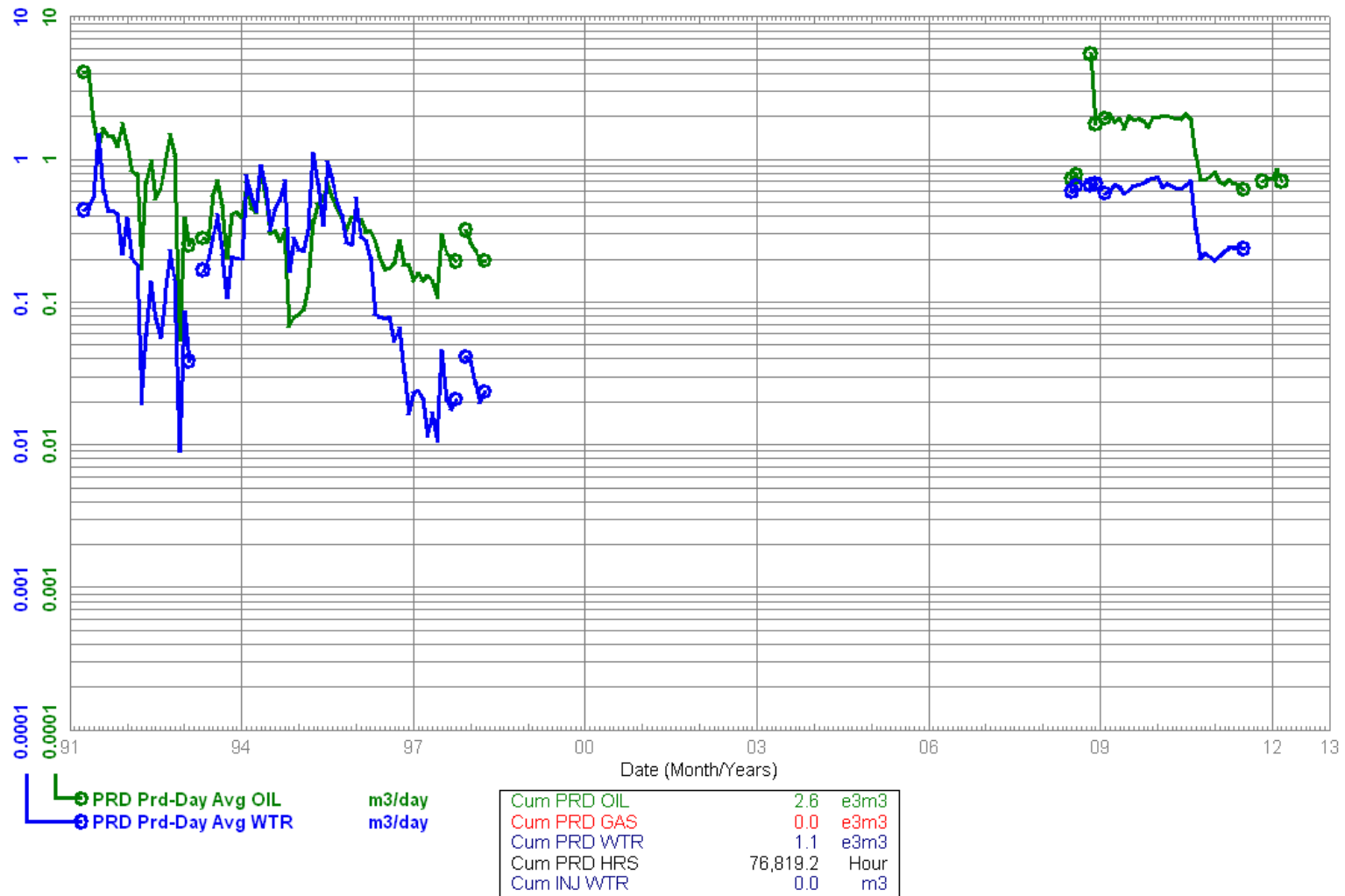
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1991-04  
 To: 2012-03

1C0/03-24-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

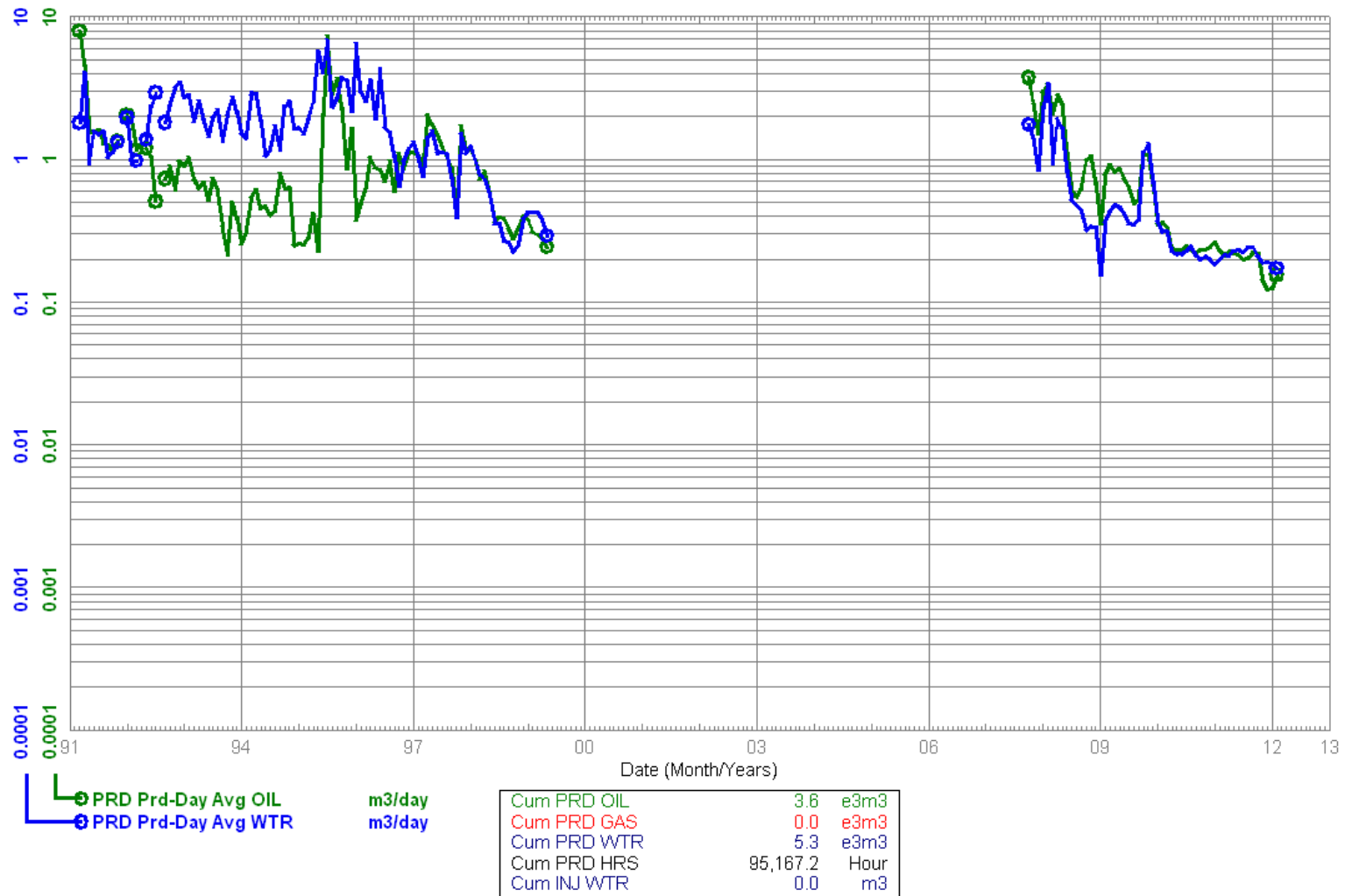
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1991-03  
 To: 2012-02

1C0/04-24-001-26W1/00  
 Waskada Unit No. 4 DIR  
 Capable Of Oil Prod

Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4

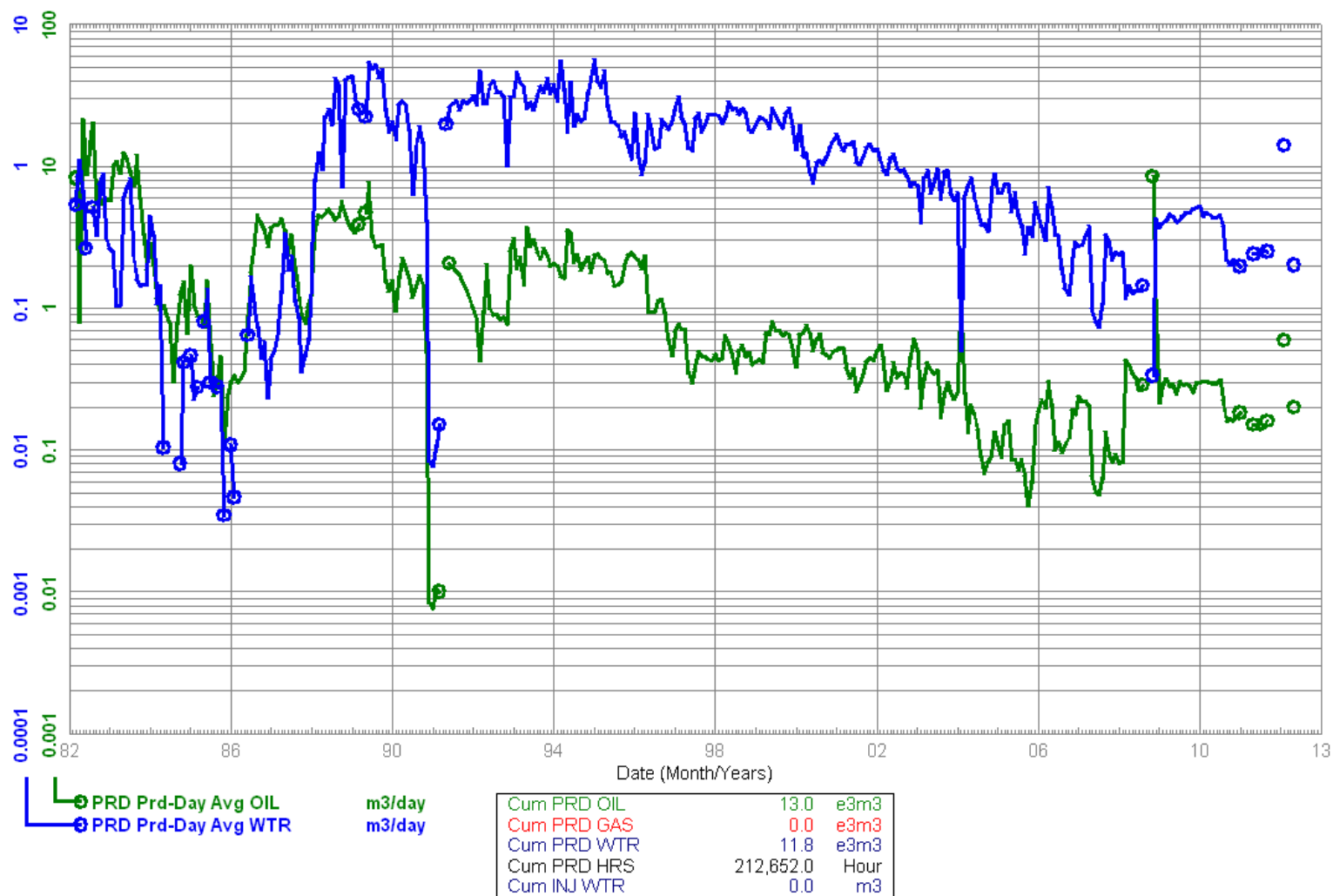




Data As Of: 2012-10 (MB)  
 From: 1982-03  
 To: 2012-05

100/01-13-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

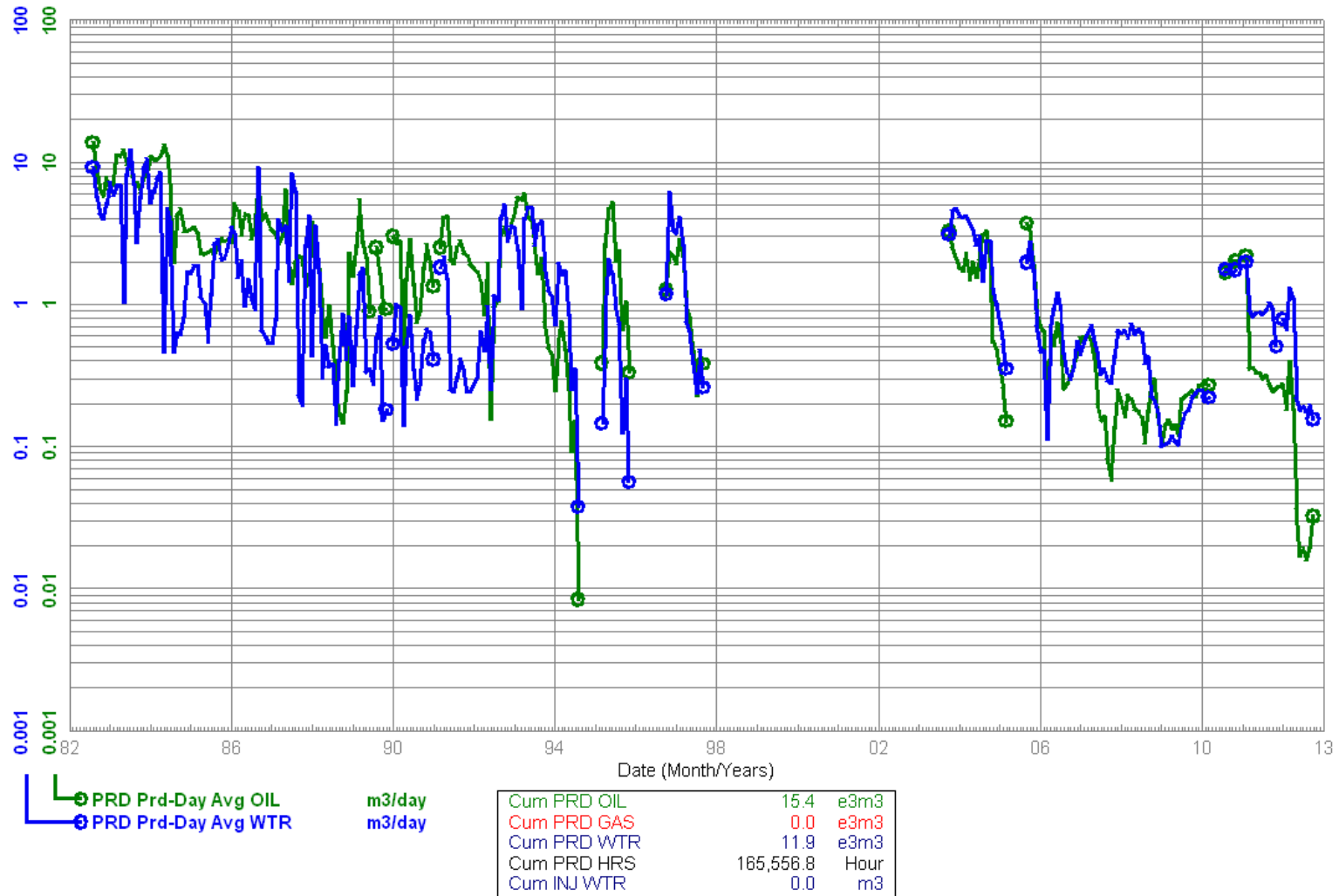
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-08  
 To: 2012-10

100/01-23-001-26W1/00  
 Waskada Unit No. 4 COM  
 Comingled

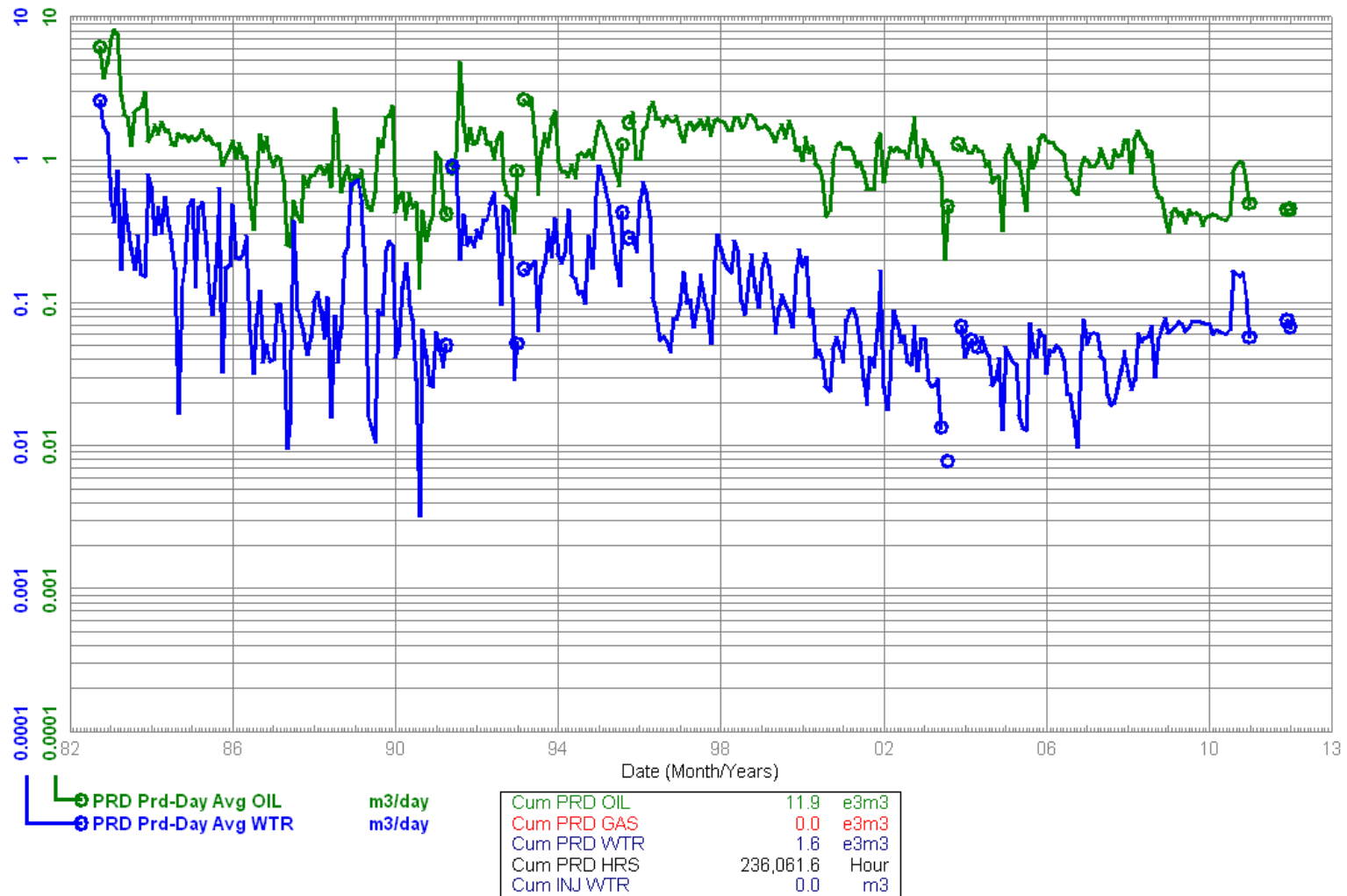
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-10  
 To: 2012-01

100/02-13-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

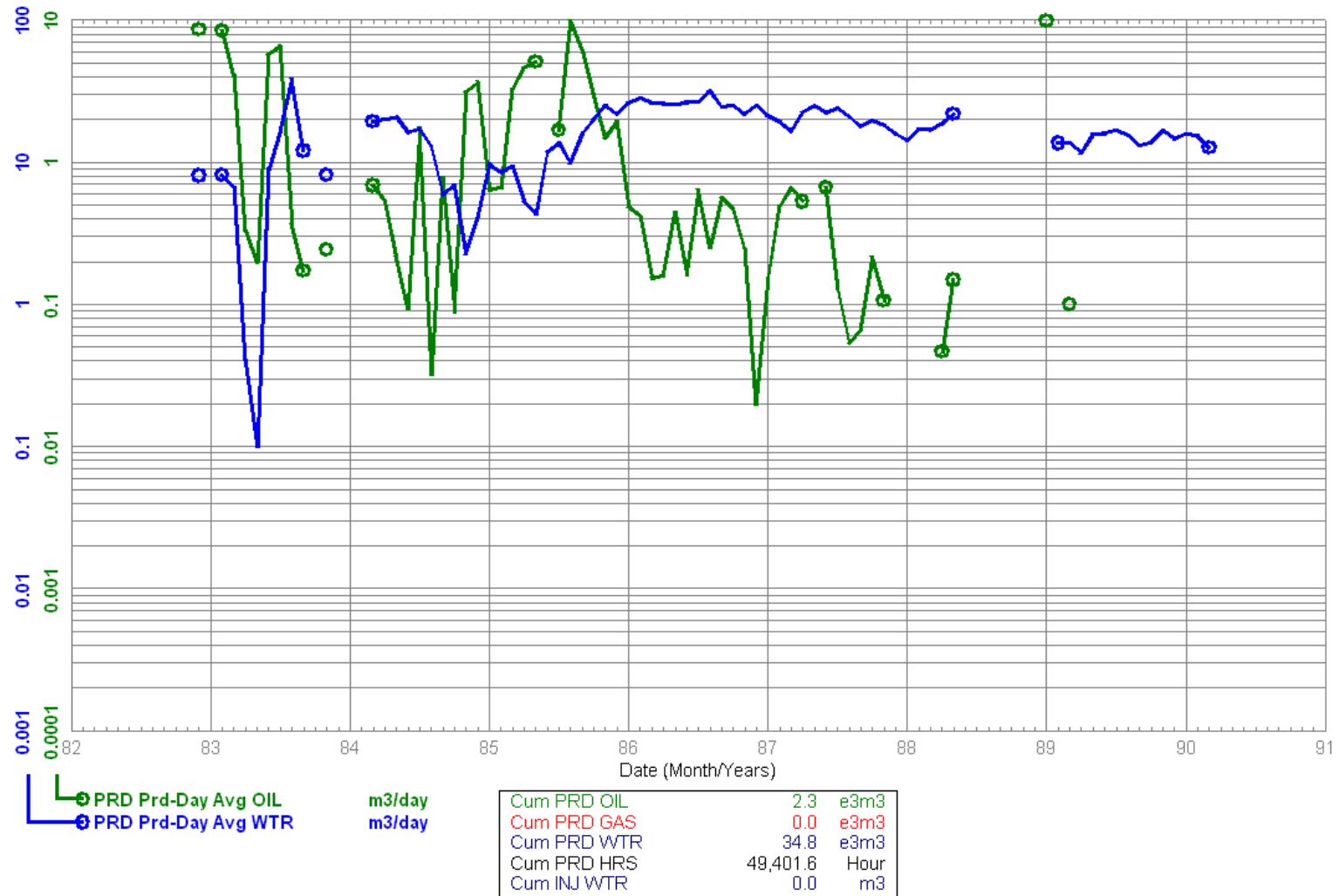
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-12  
 To: 1990-03

100/02-23-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

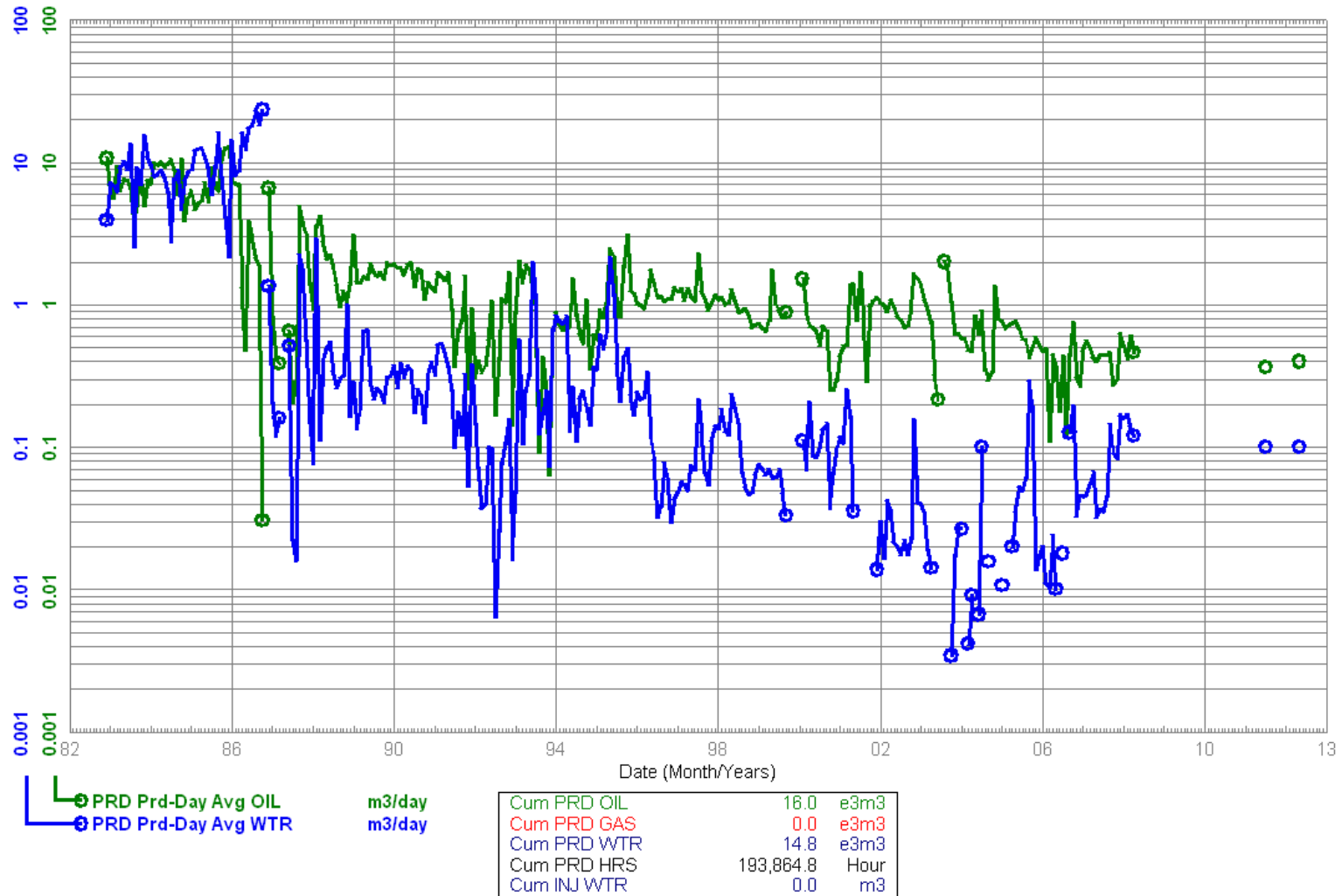
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-12  
 To: 2012-05

100/02-24-001-26W1/00  
 Waskada Unit No. 4 Prov.  
 Capable Of Oil Prod

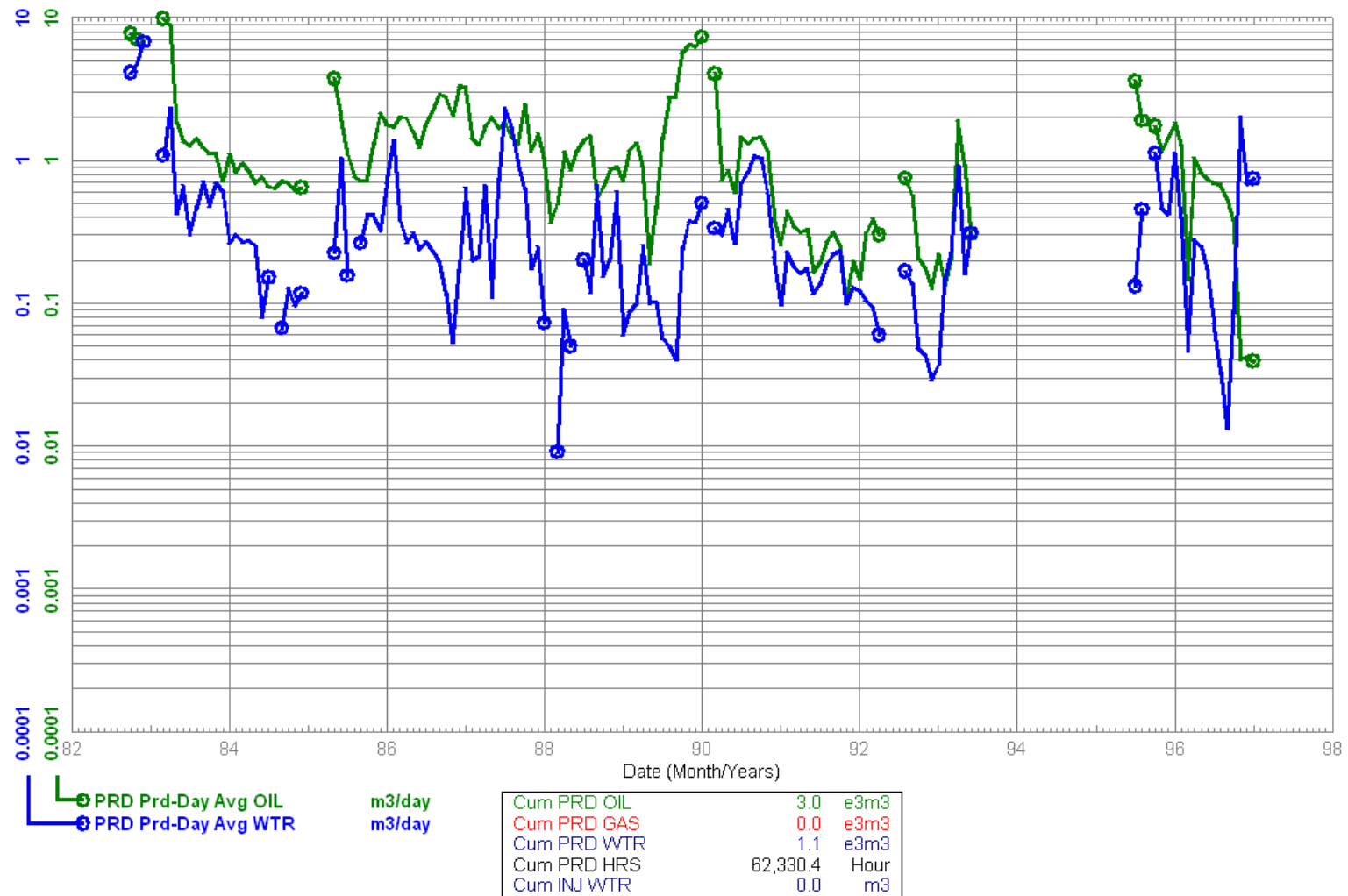
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-10  
 To: 1997-01

100/03-13-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

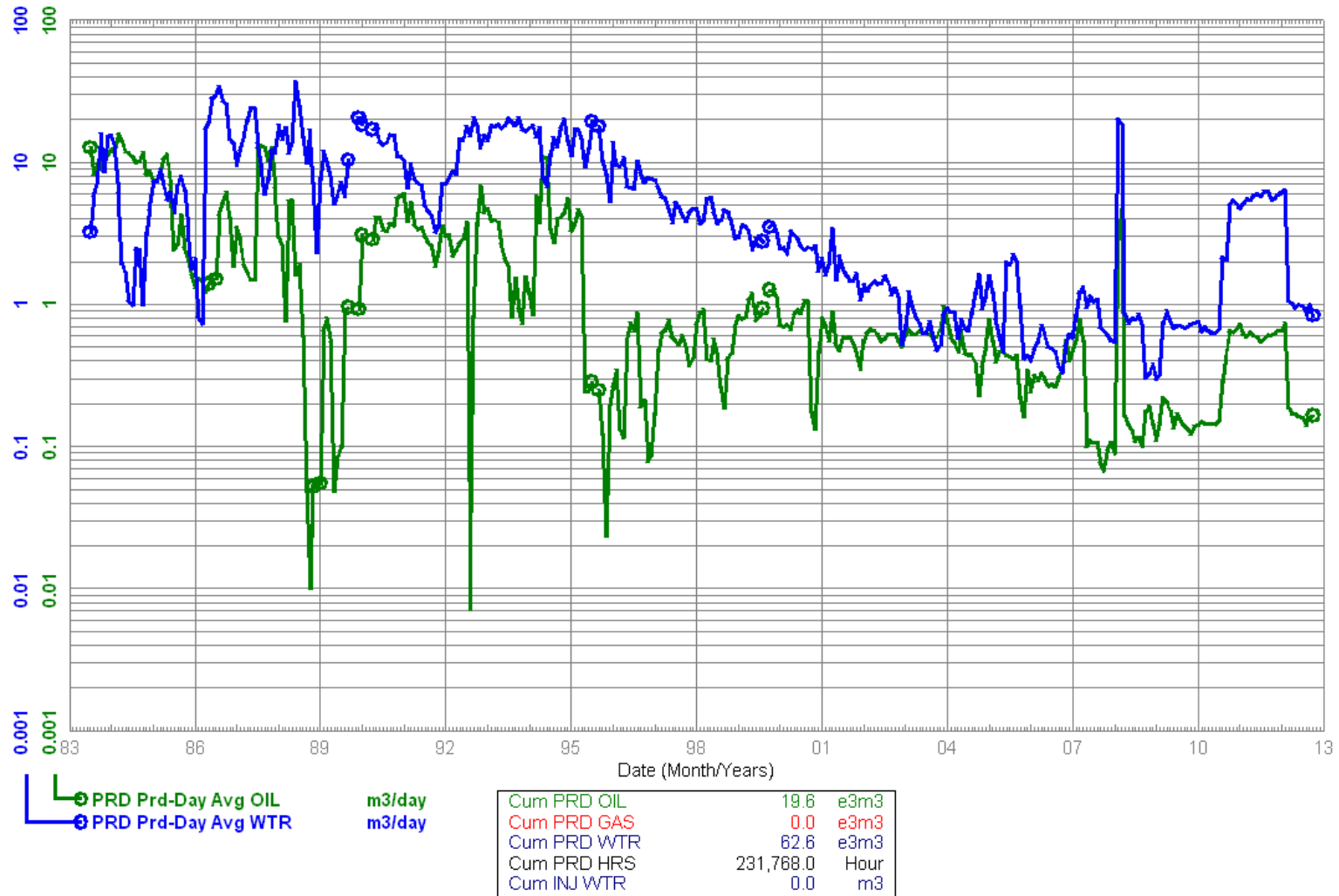
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1983-07  
 To: 2012-10

100/03-24-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

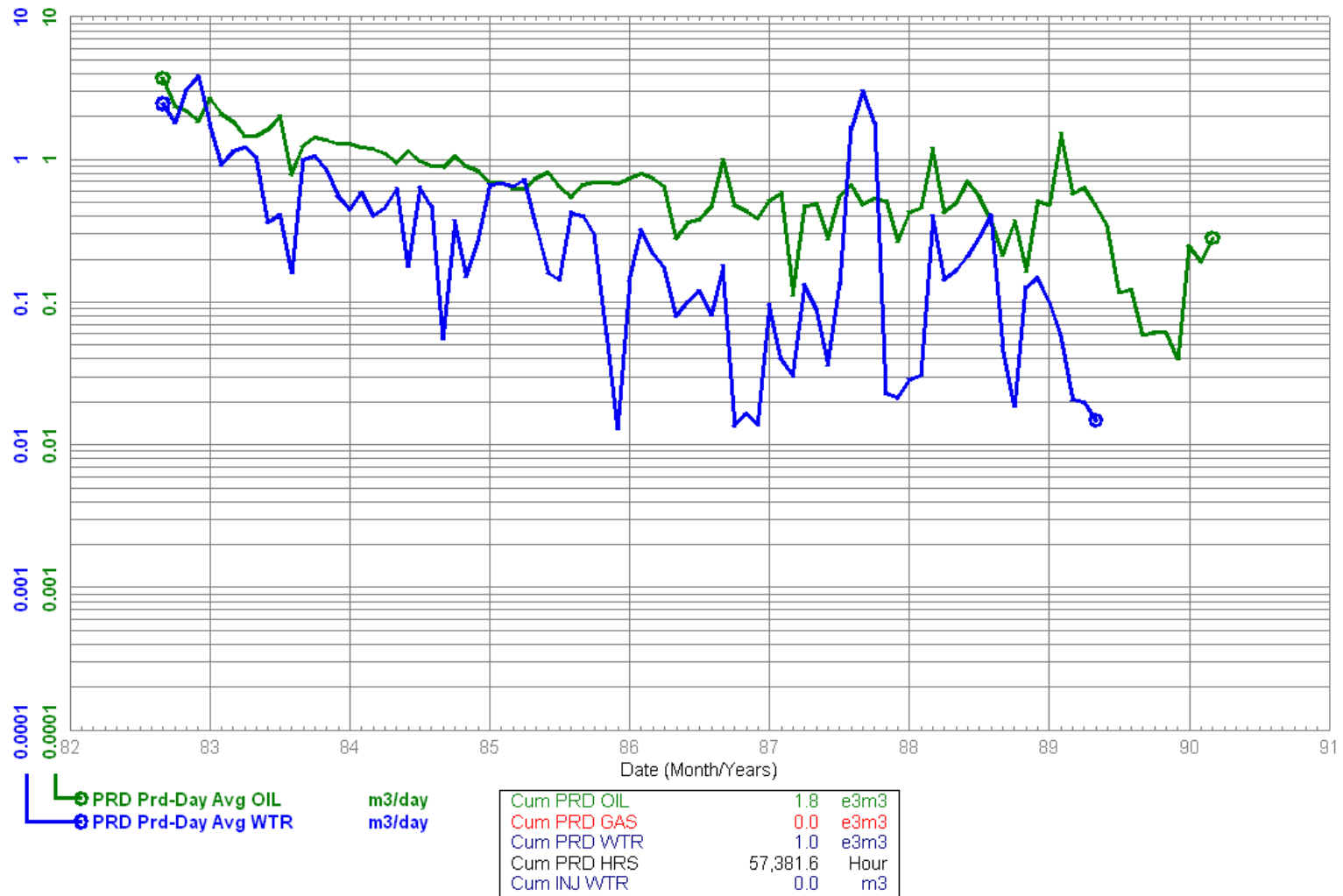
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-09  
 To: 1990-03

100/04-13-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4

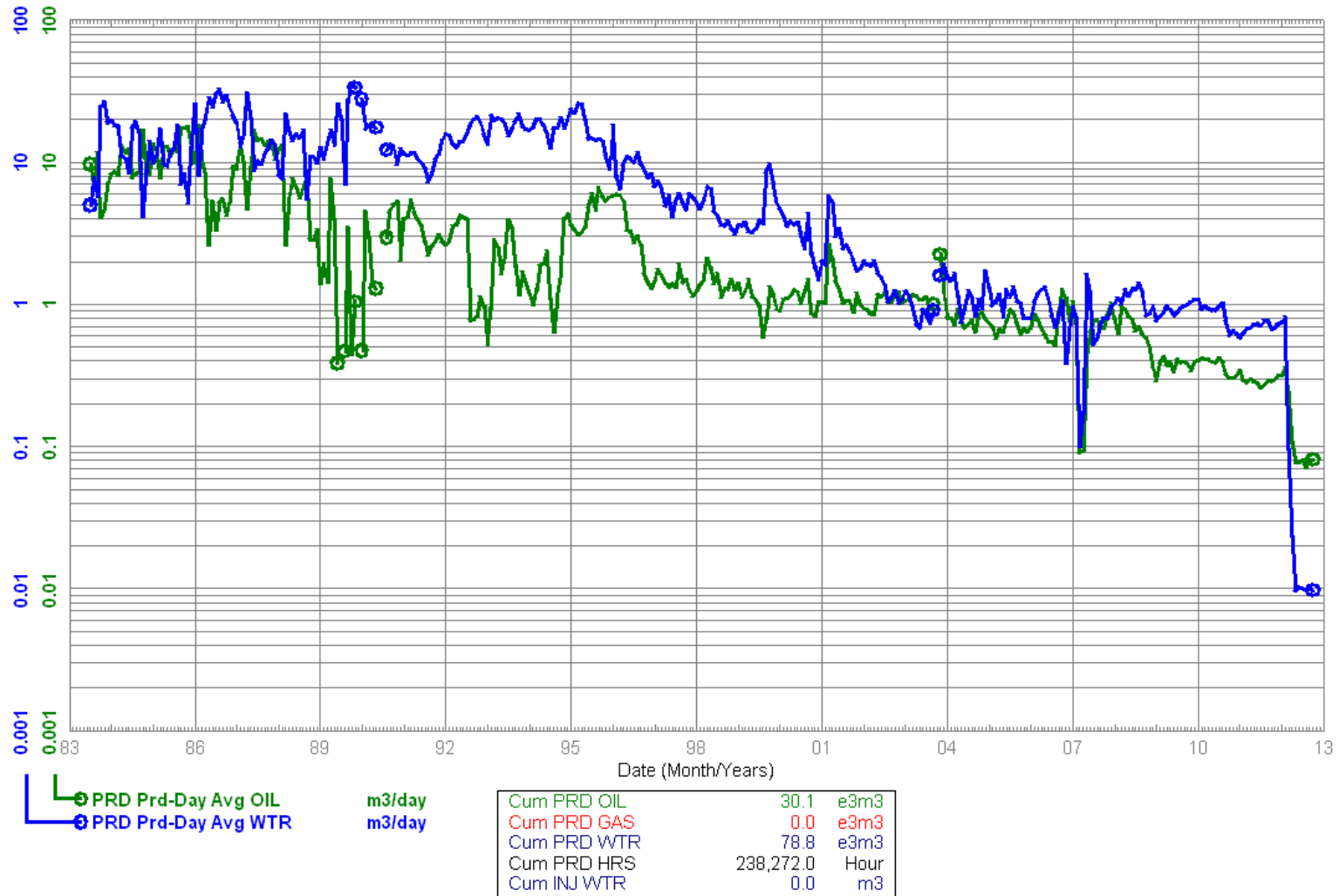




Data As Of: 2012-10 (MB)  
 From: 1983-07  
 To: 2012-10

100/04-24-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

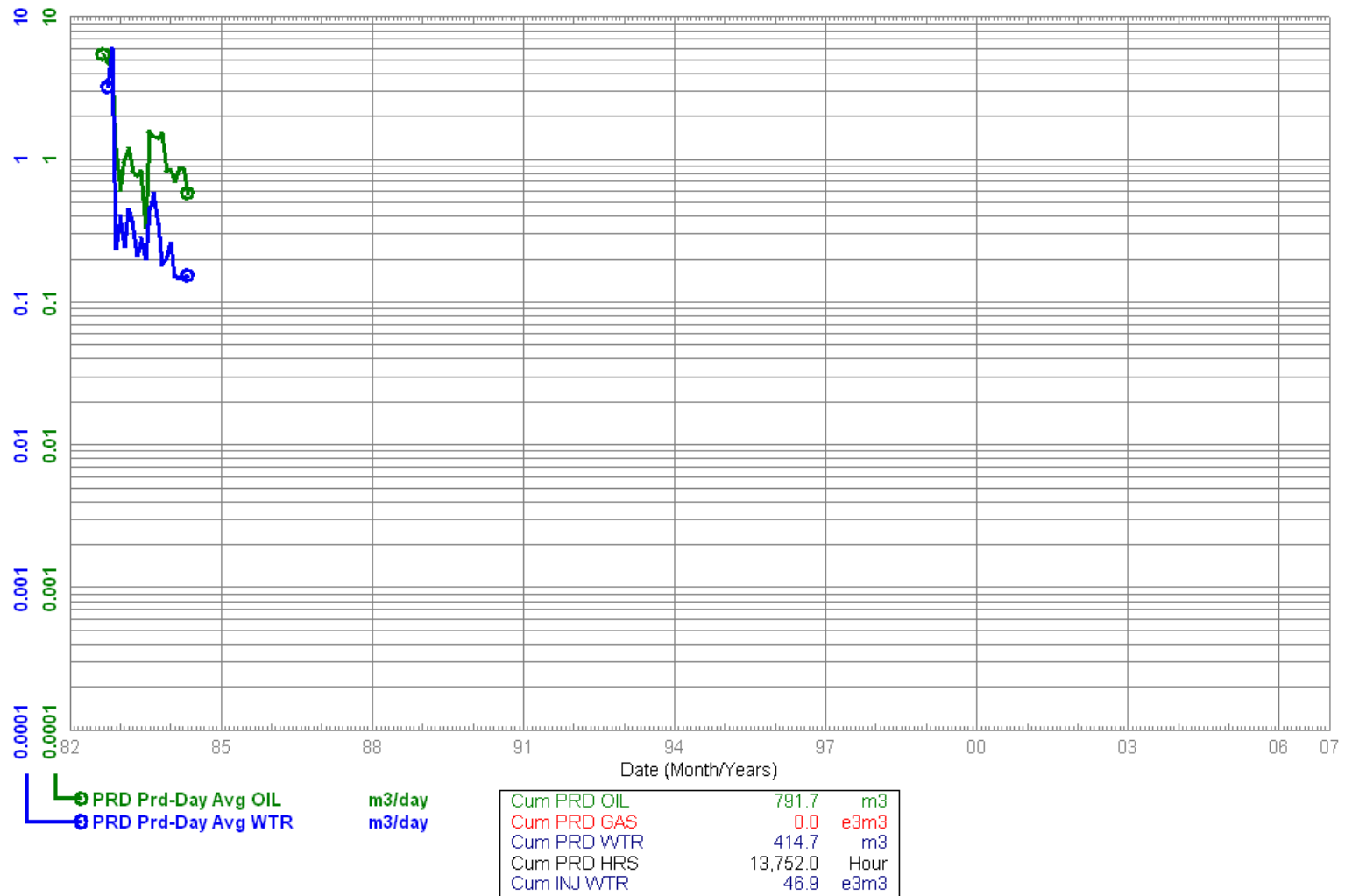
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1982-09  
To: 1984-05

100/05-13-001-26W1/00  
Waskada Unit No. 4 WIW/  
Water Inj Well

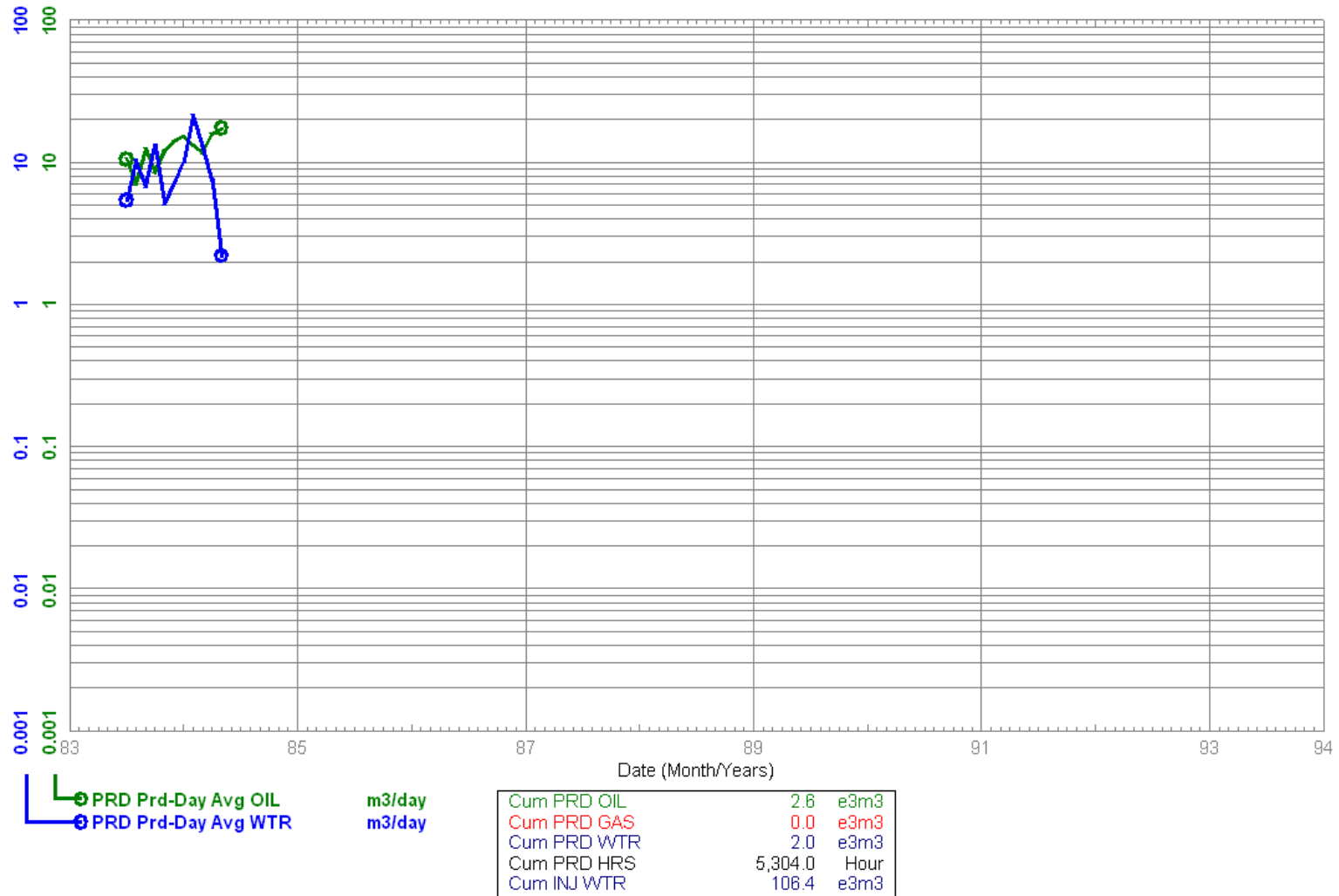
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1983-07  
 To: 1984-05

100/05-24-001-26W1/00  
 Waskada Unit No. 4 WW/WW  
 Abandoned Water Inj Well

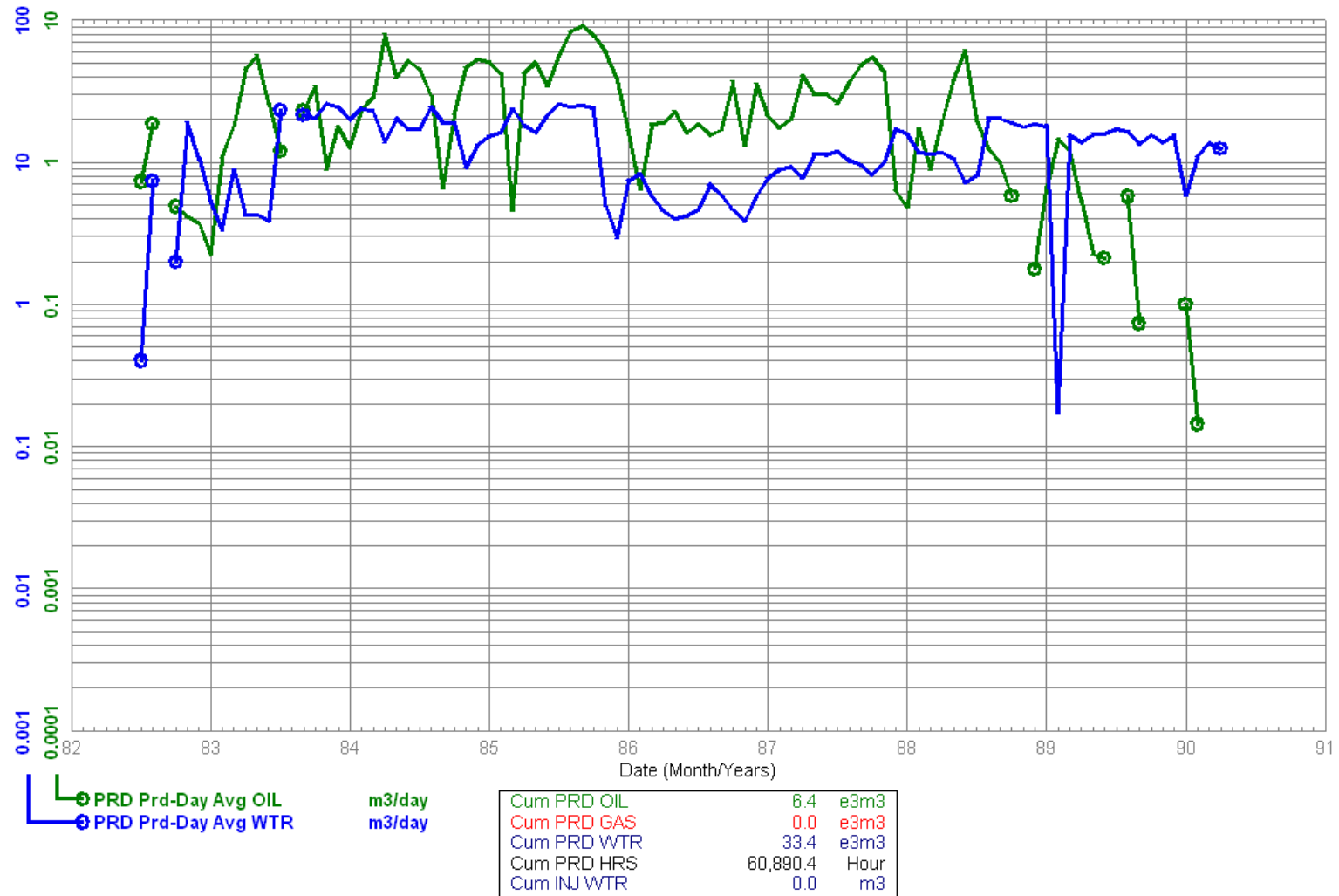
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-07  
 To: 1990-04

100/06-13-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

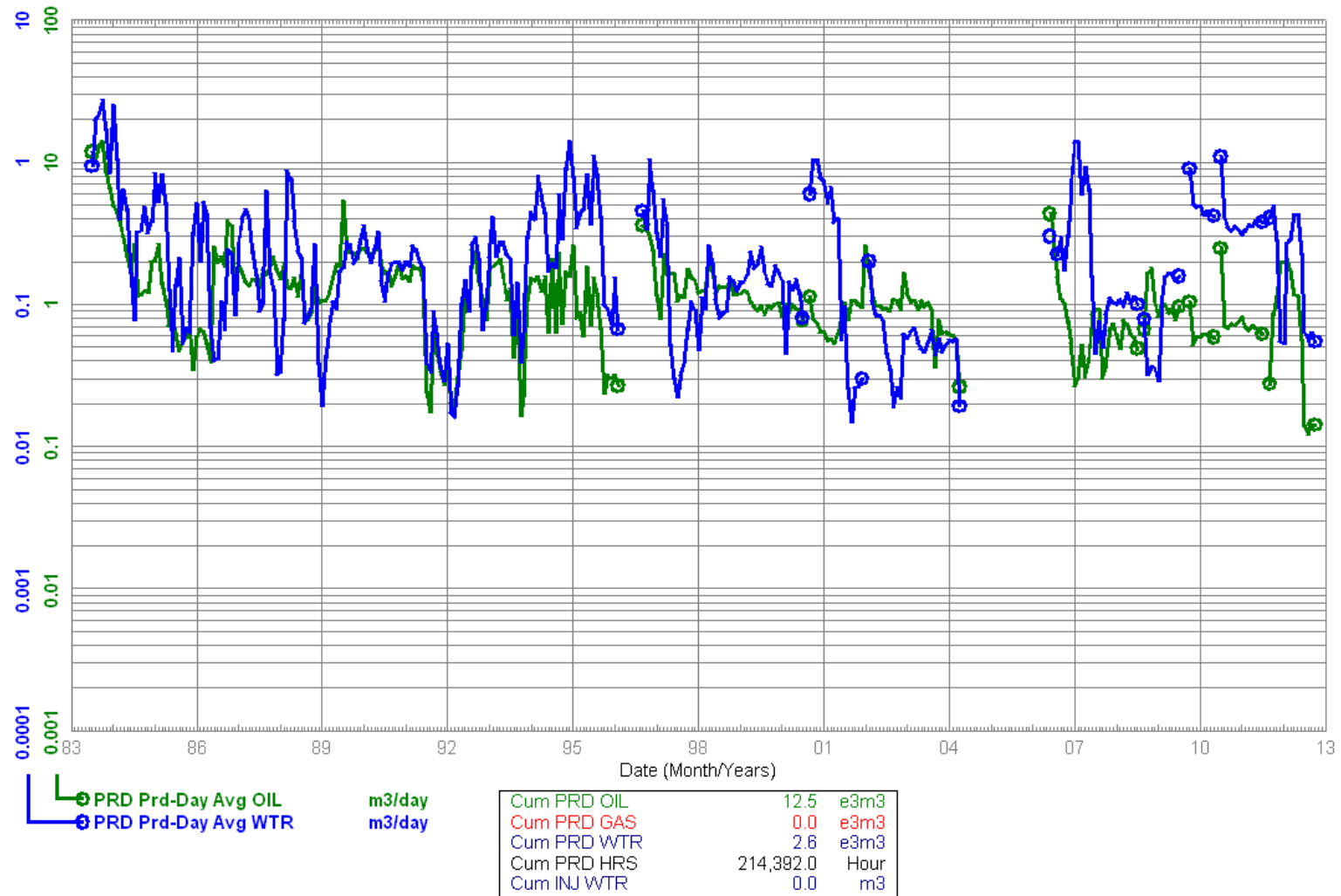
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1983-07  
To: 2012-10

100/06-24-001-26W1/00  
Waskada Unit No. 4  
Capable Of Oil Prod

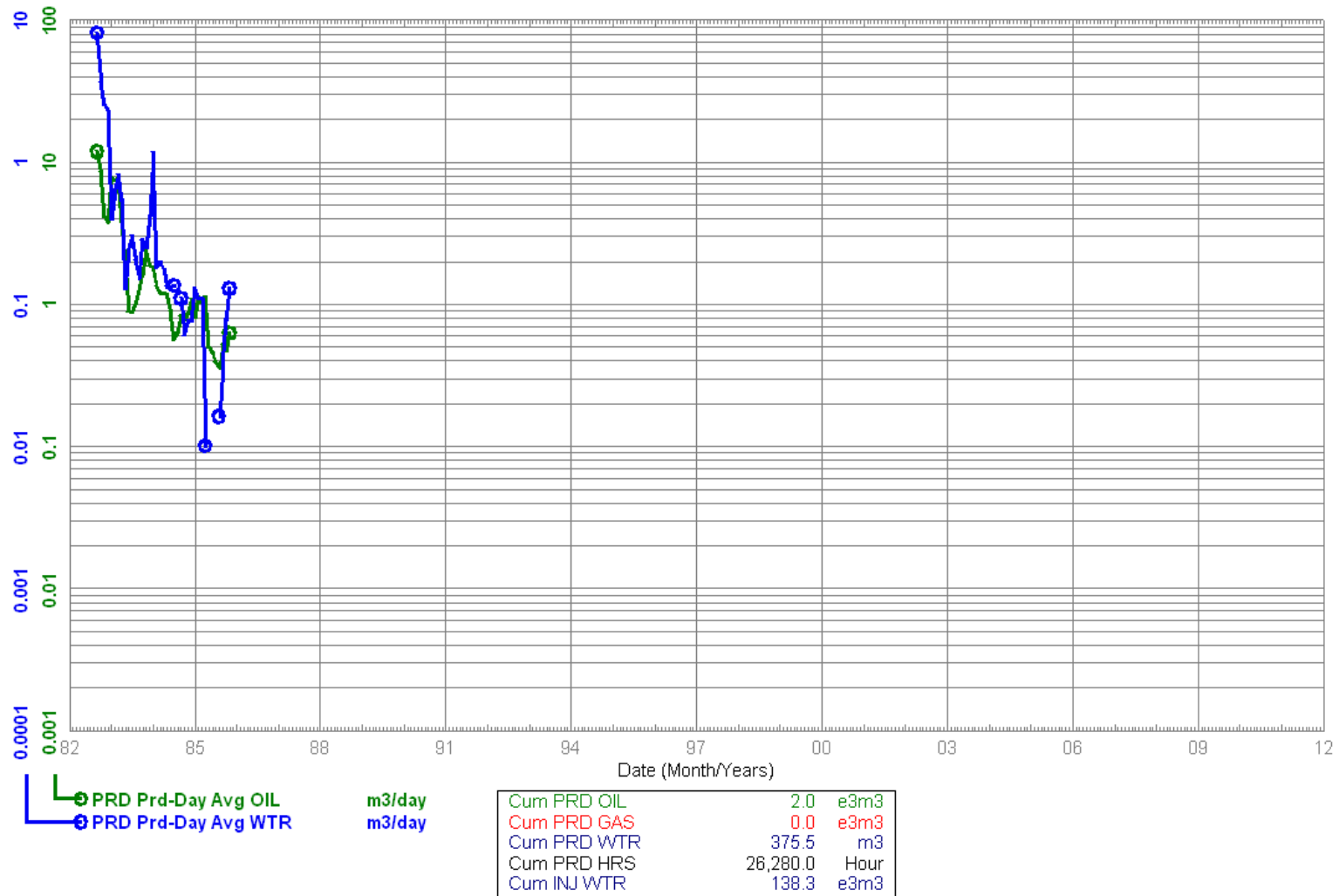
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-09  
 To: 1985-11

100/07-13-001-26W1/00  
 Waskada Unit No. 4 WIW/  
 Water Inj Well

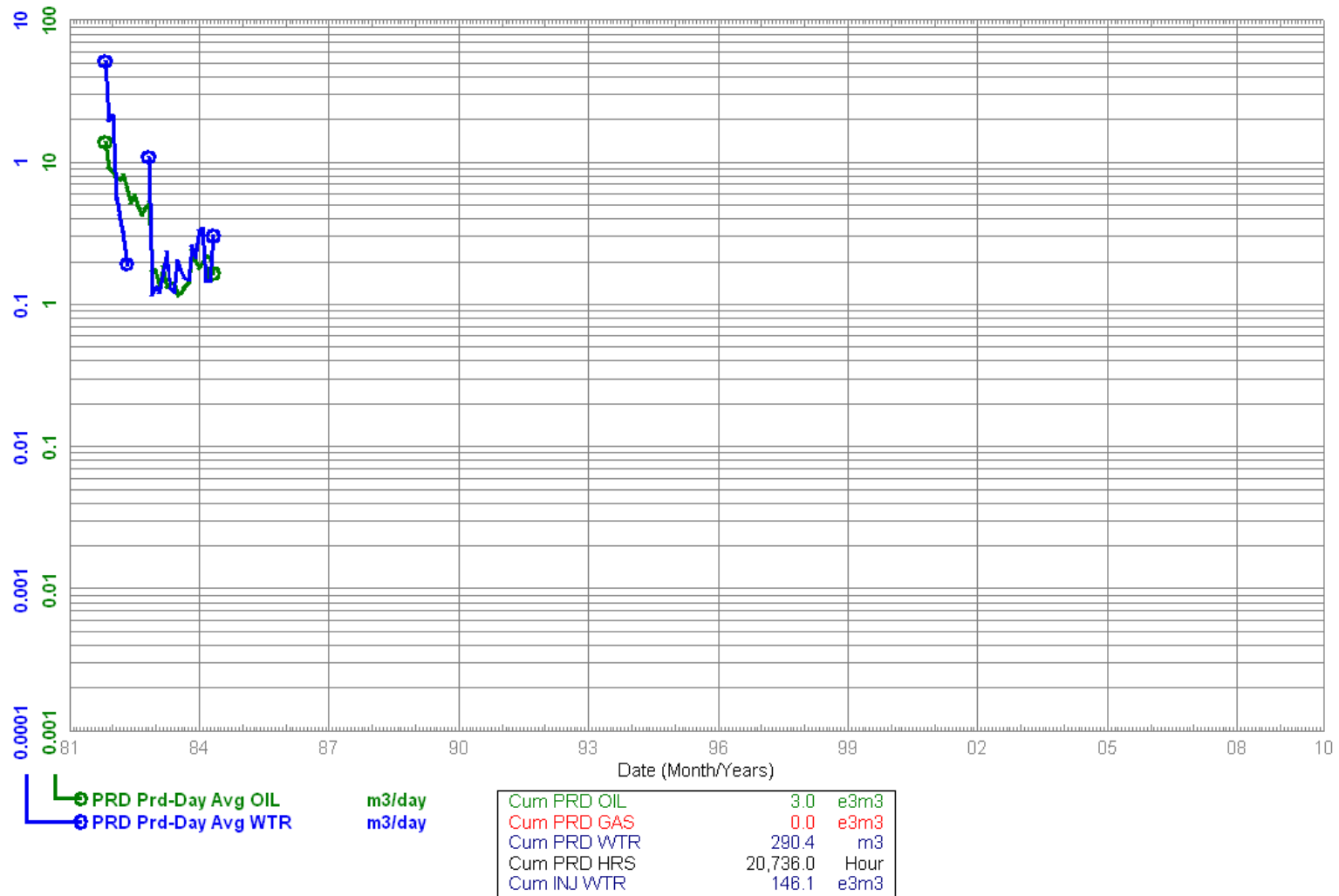
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1981-11  
 To: 1984-05

100/07-24-001-26W1/00  
 Waskada Unit No. 4 Prov. WW  
 Abandoned Water Inj Well

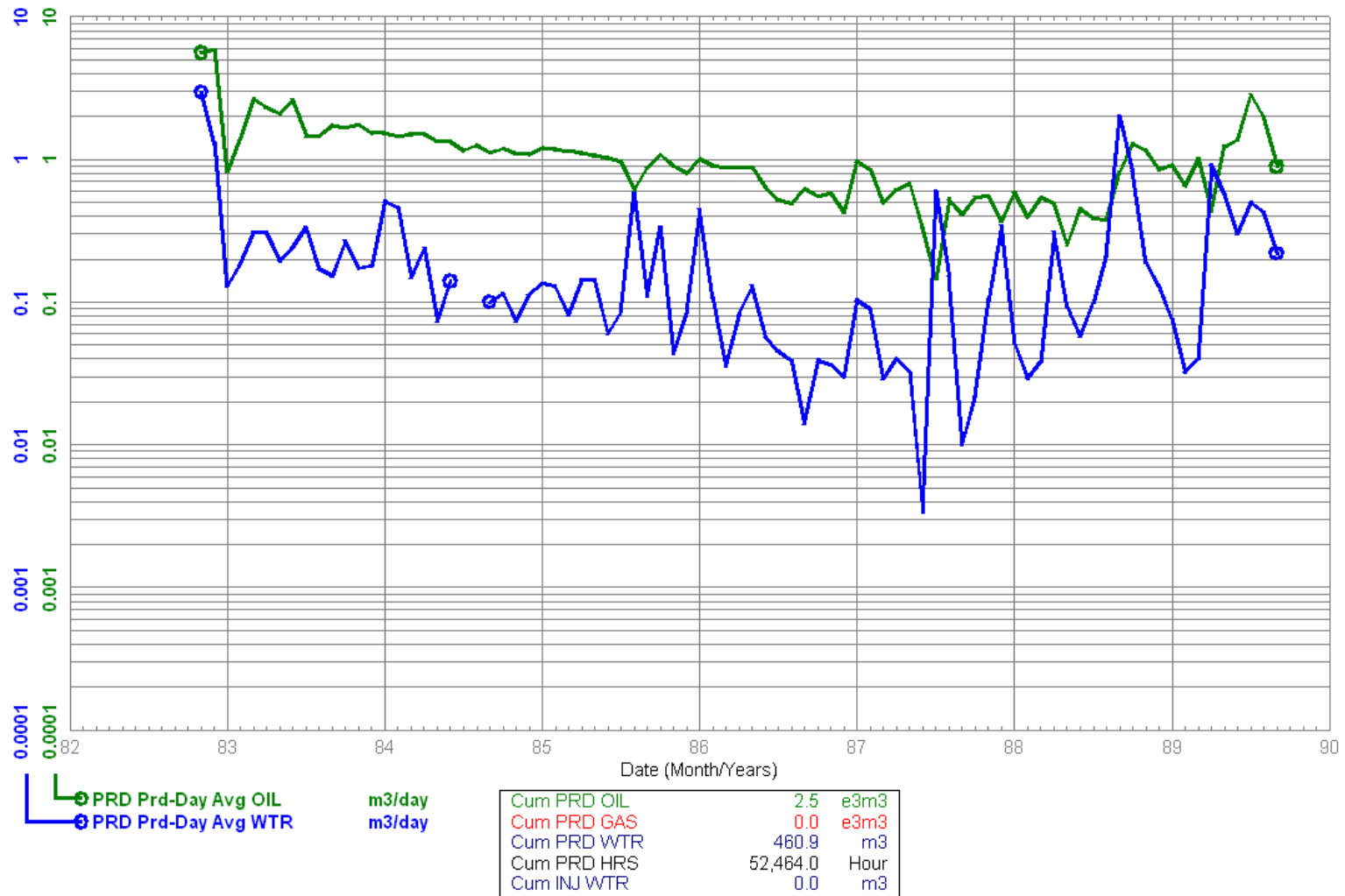
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-11  
 To: 1989-09

100/08-13-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4

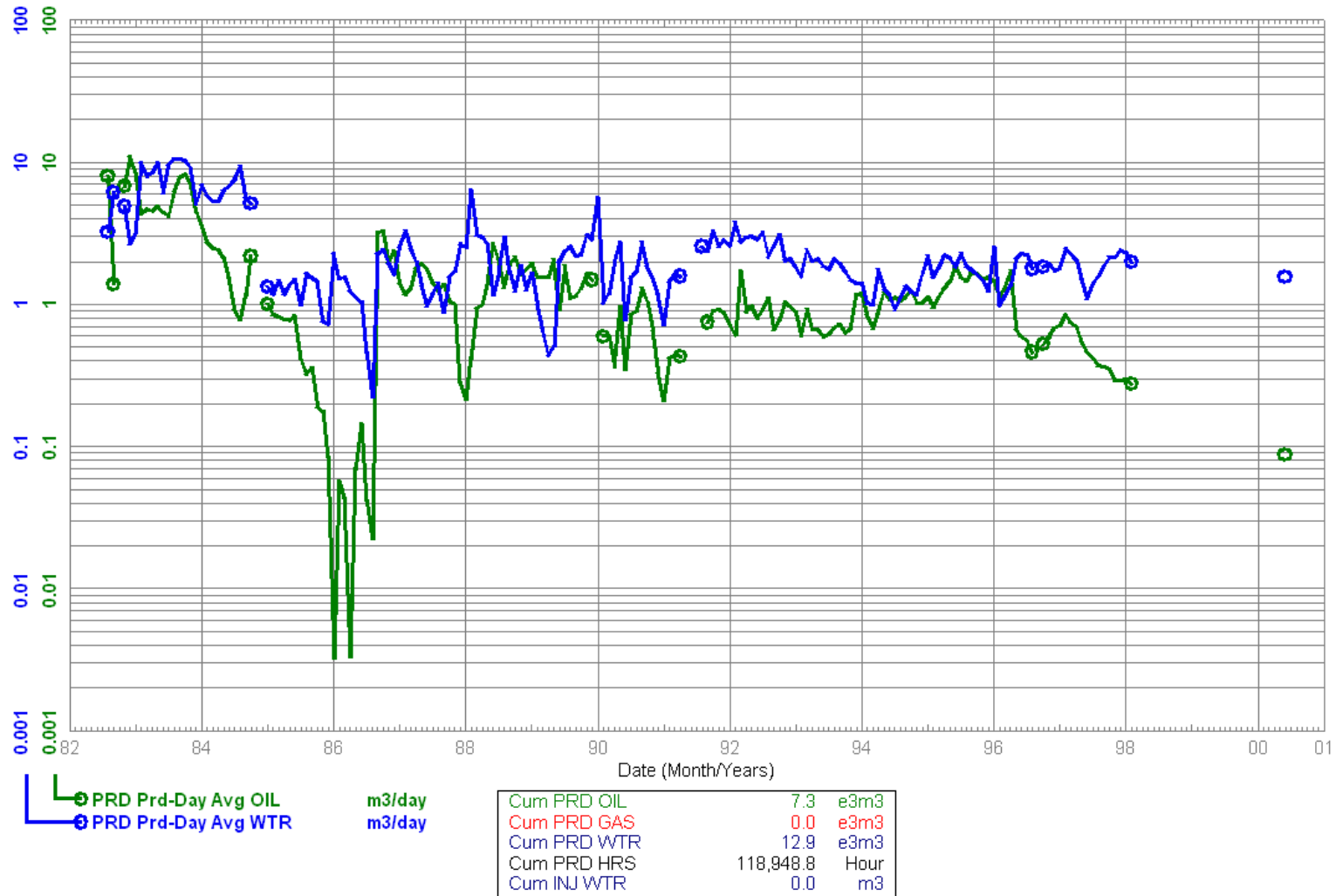




Data As Of: 2012-10 (MB)  
 From: 1982-08  
 To: 2000-06

100/08-14-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

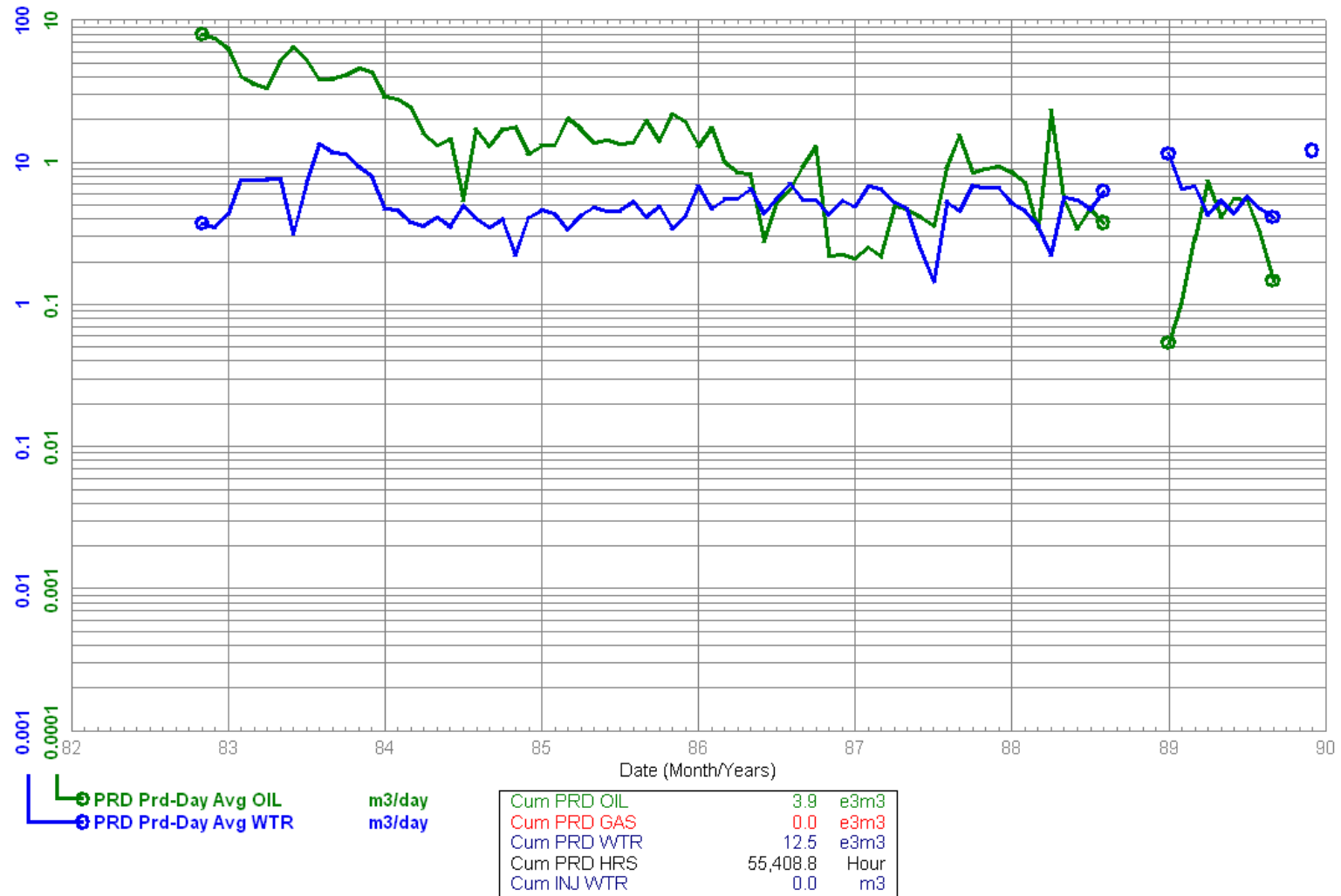
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-11  
 To: 1989-12

100/09-14-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

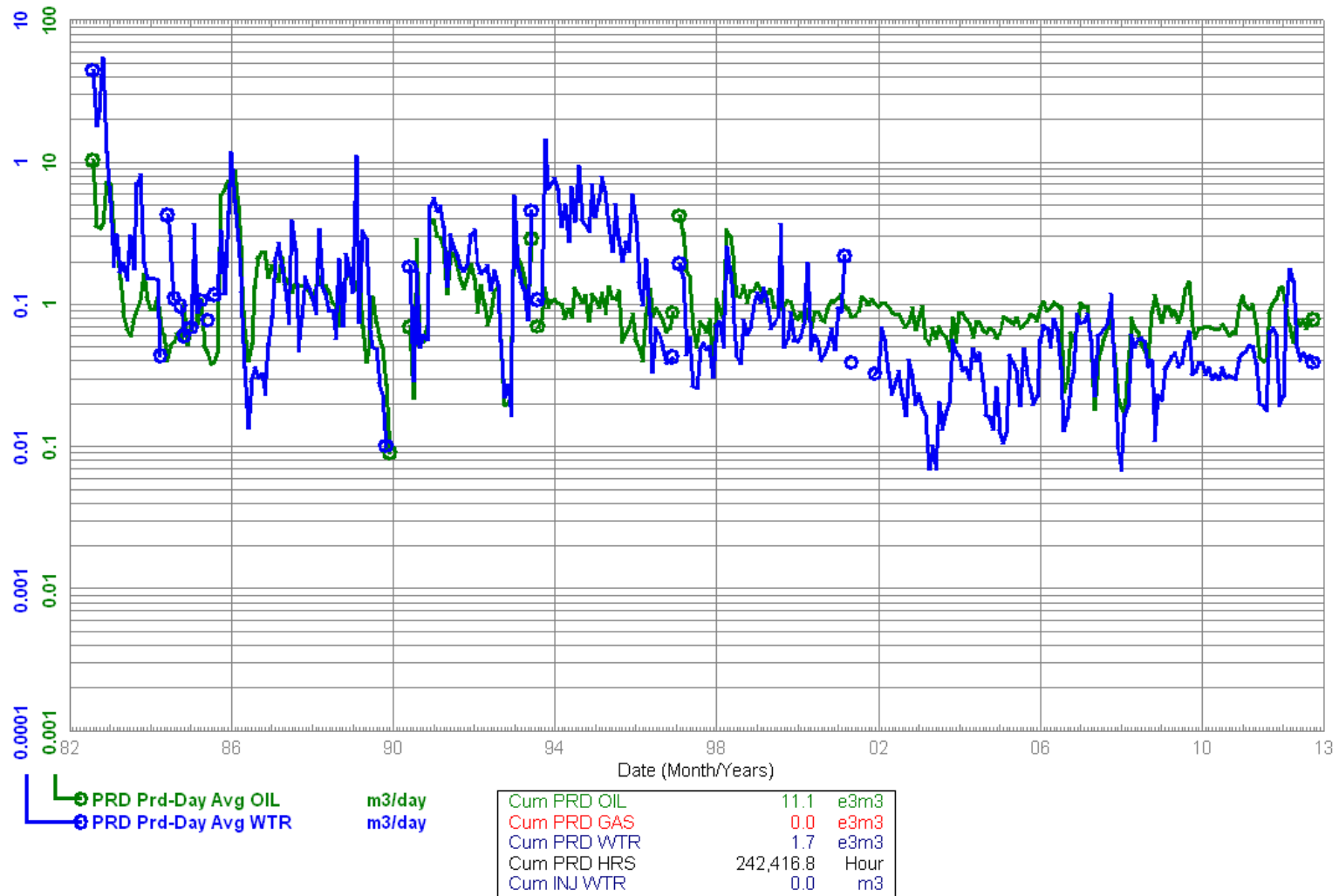
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-08  
 To: 2012-10

100/10-13-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

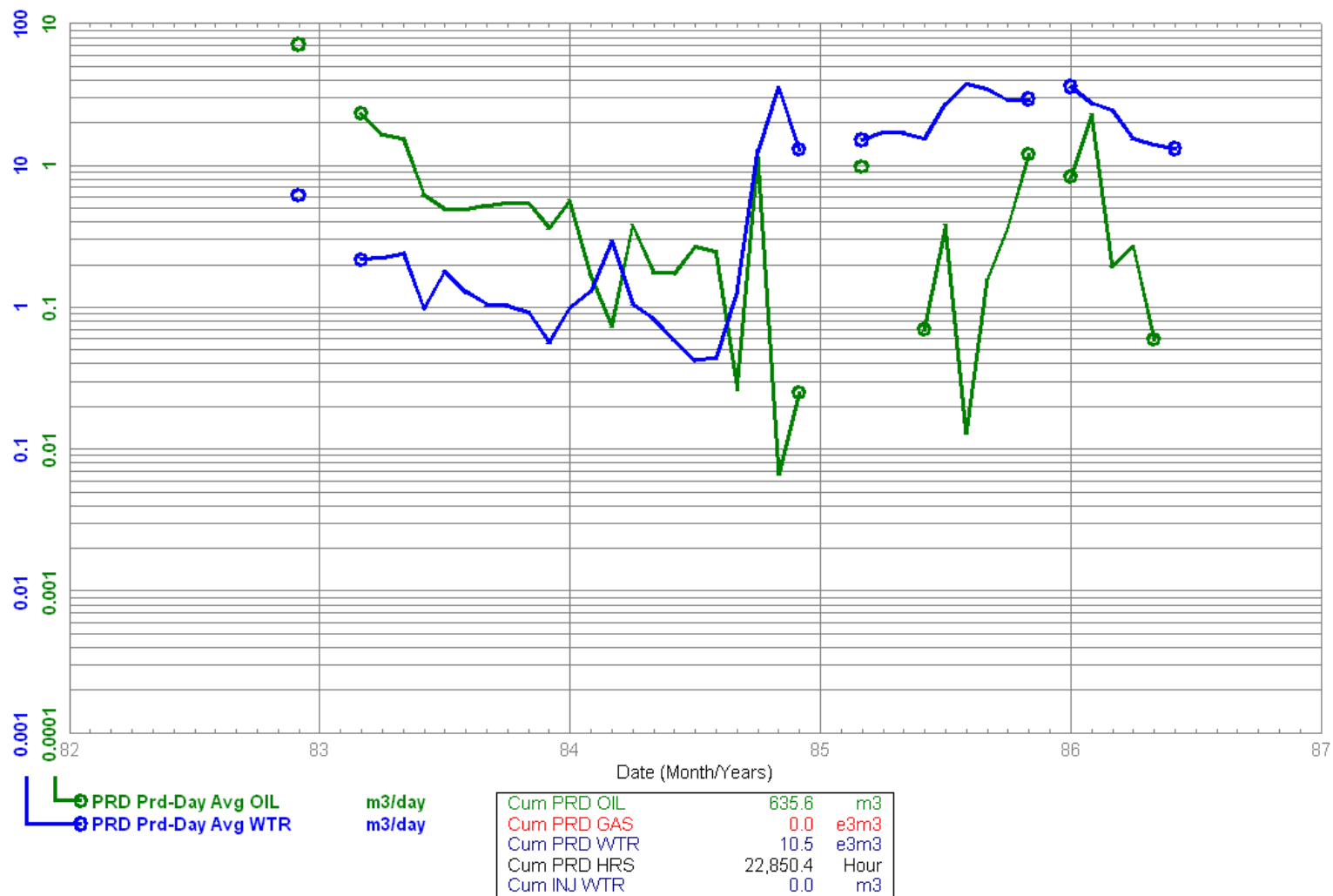
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-12  
 To: 1986-06

100/10-14-001-26W1/00  
 Omega Waskada  
 Abandoned Producer

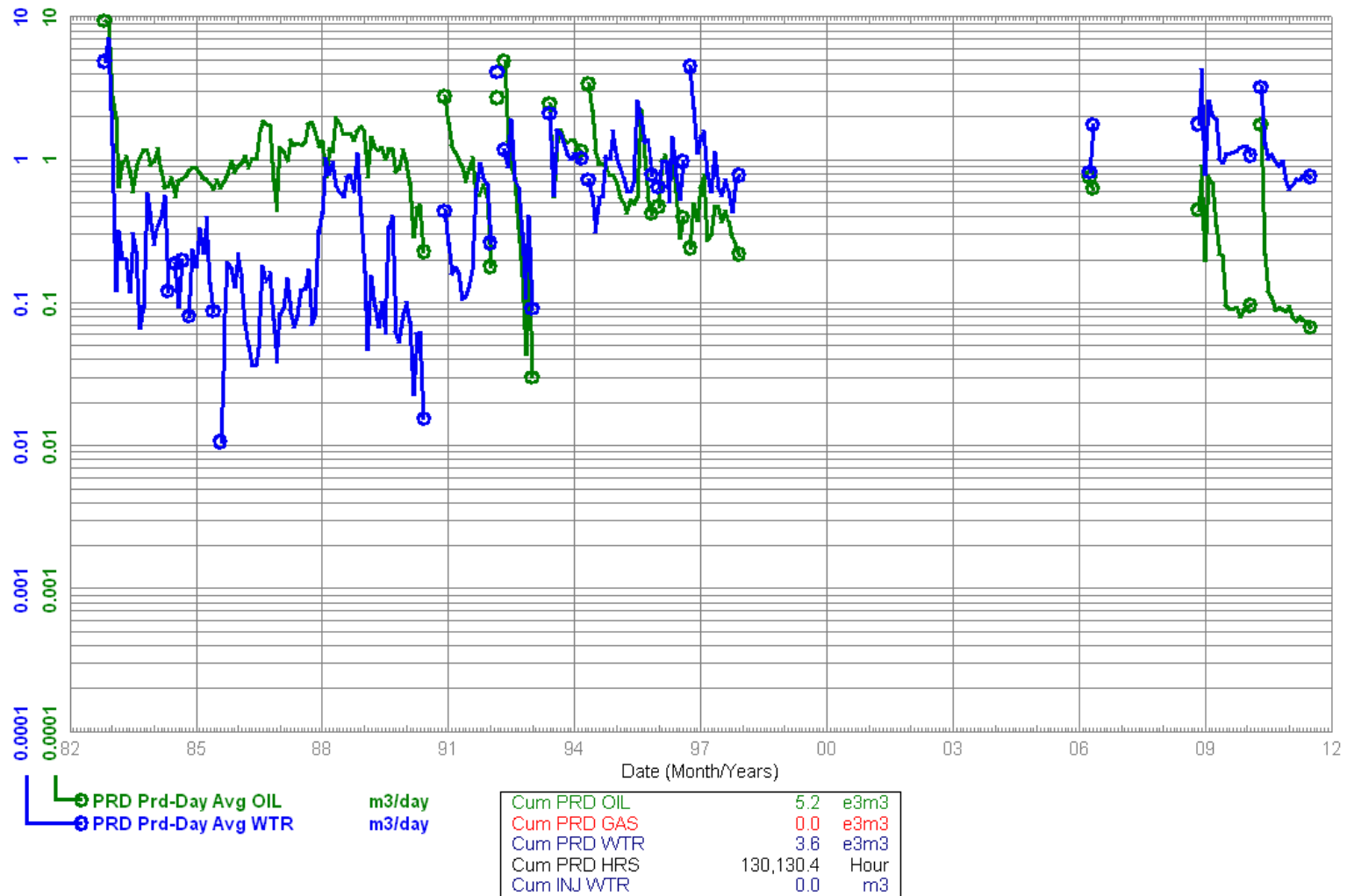
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-11  
 To: 2011-07

100/11-13-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

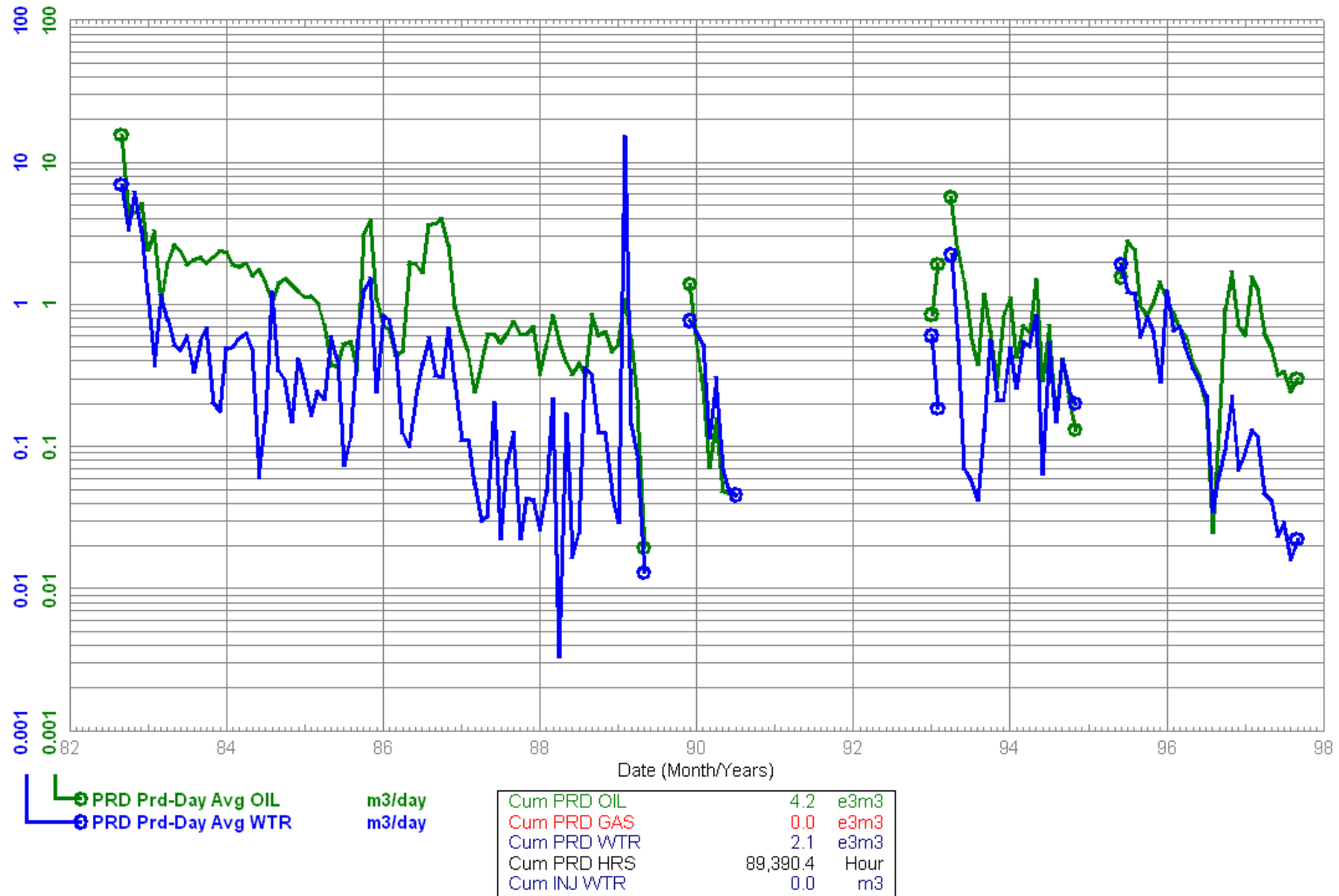
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-09  
 To: 1997-09

100/12-13-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

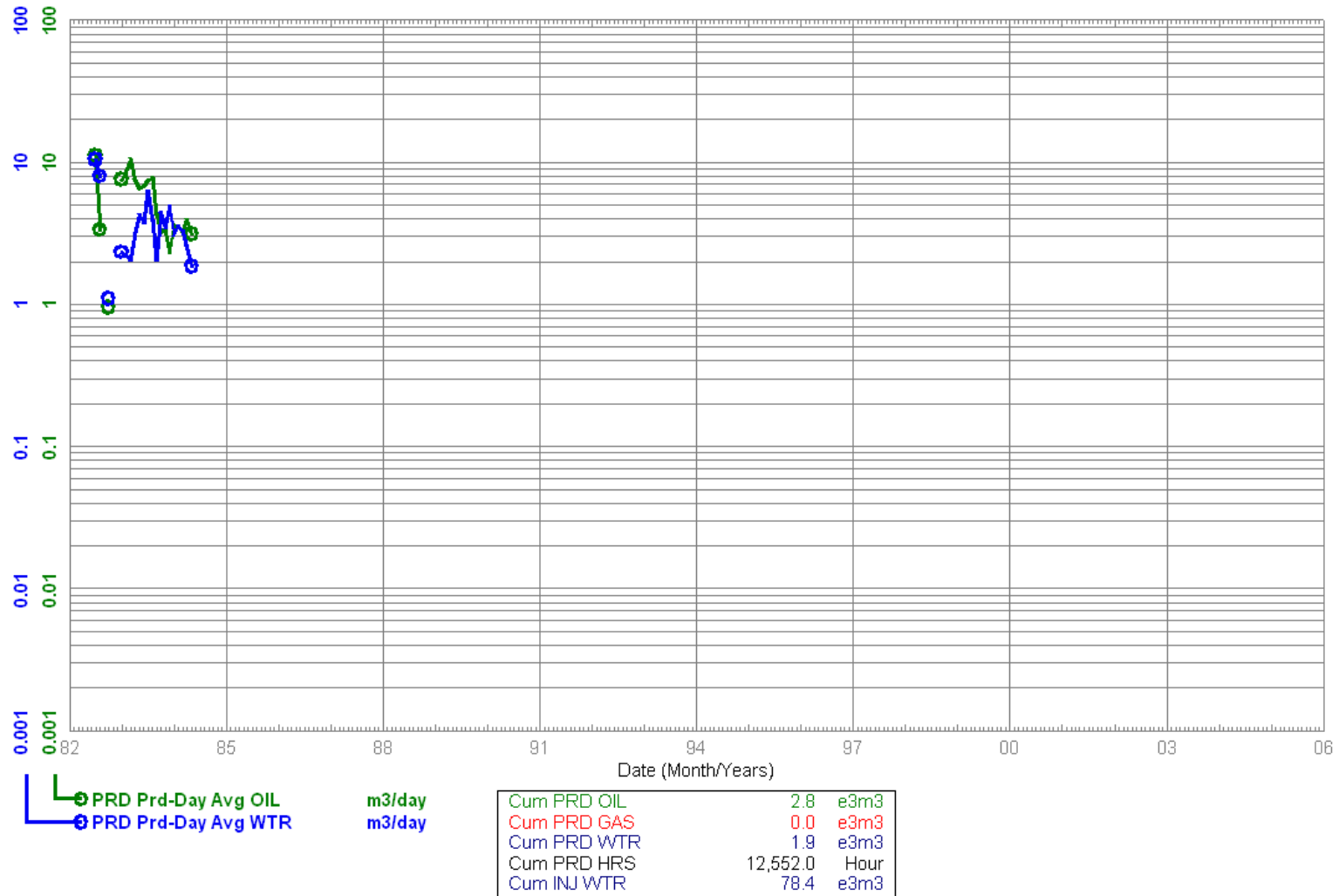
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1982-07  
To: 1984-05

100/13-13-001-26W1/00  
Waskada Unit No. 4 WIW/  
Water Inj Well

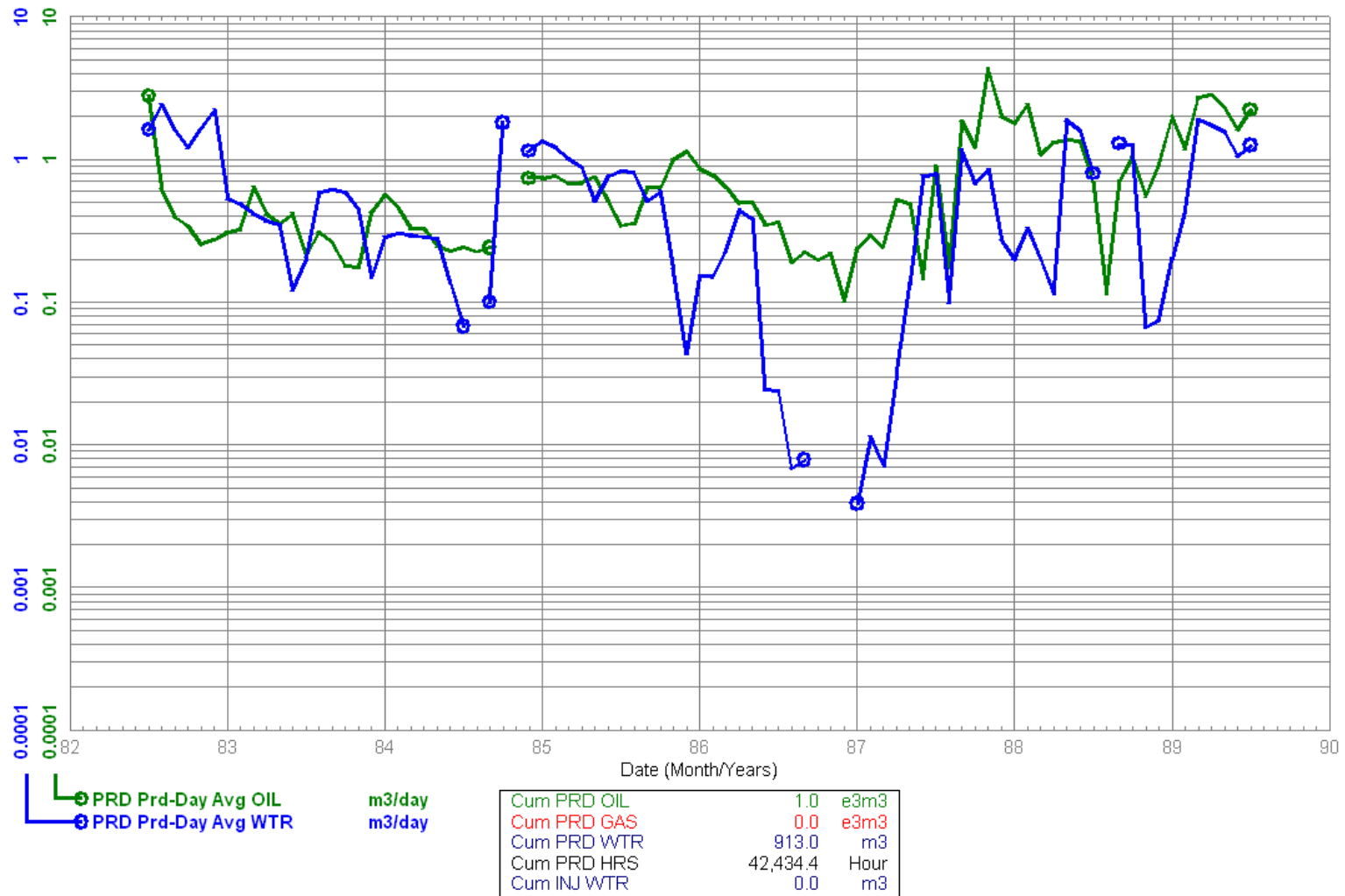
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-07  
 To: 1989-07

100/14-12-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4

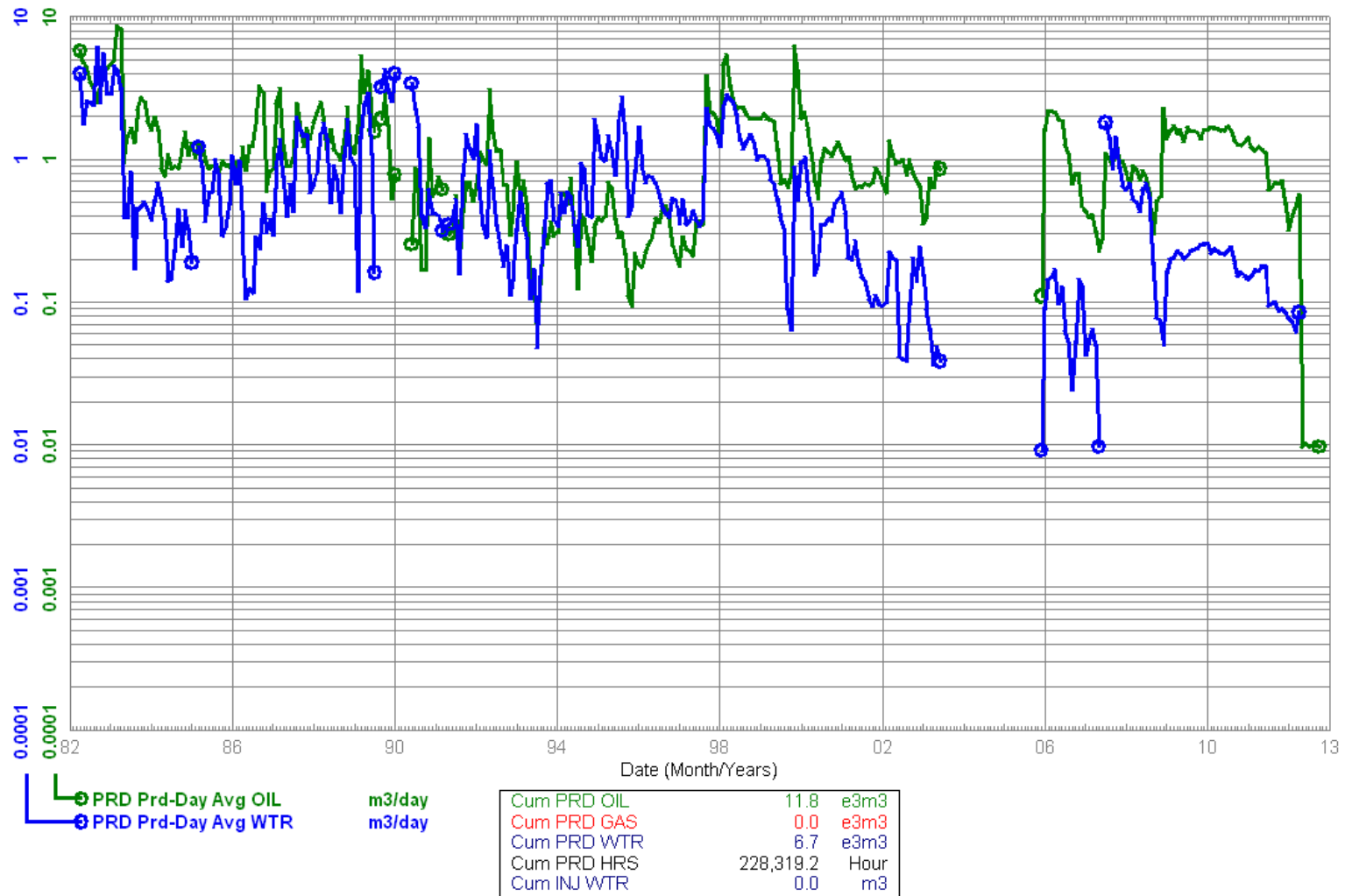




Data As Of: 2012-10 (MB)  
 From: 1982-04  
 To: 2012-10

100/14-13-001-26W1/00  
 Waskada Unit No. 4  
 Capable Of Oil Prod

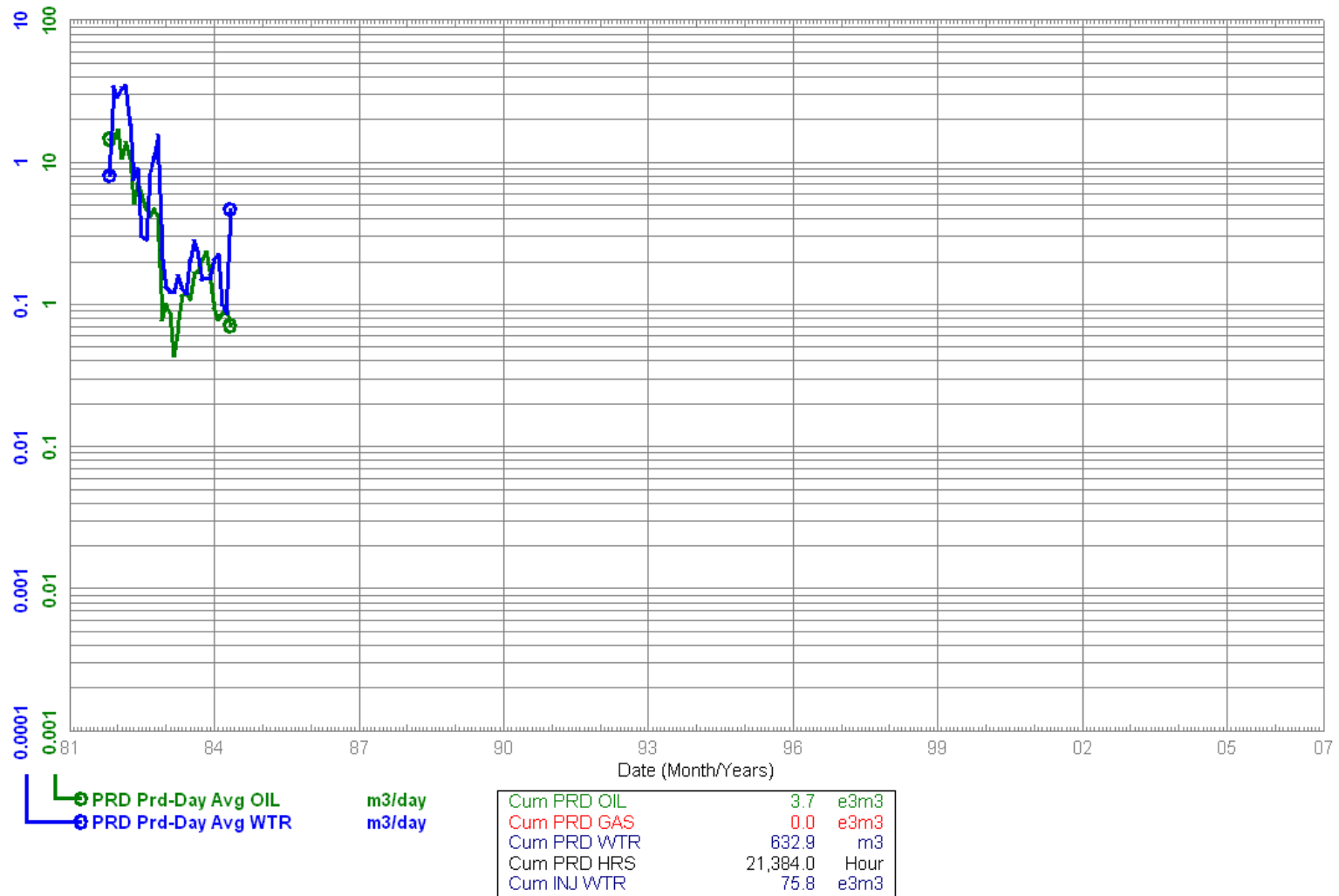
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1981-11  
To: 1984-05

100/15-13-001-26W1/00  
Waskada Unit No. 4 WIW/  
Water Inj Well

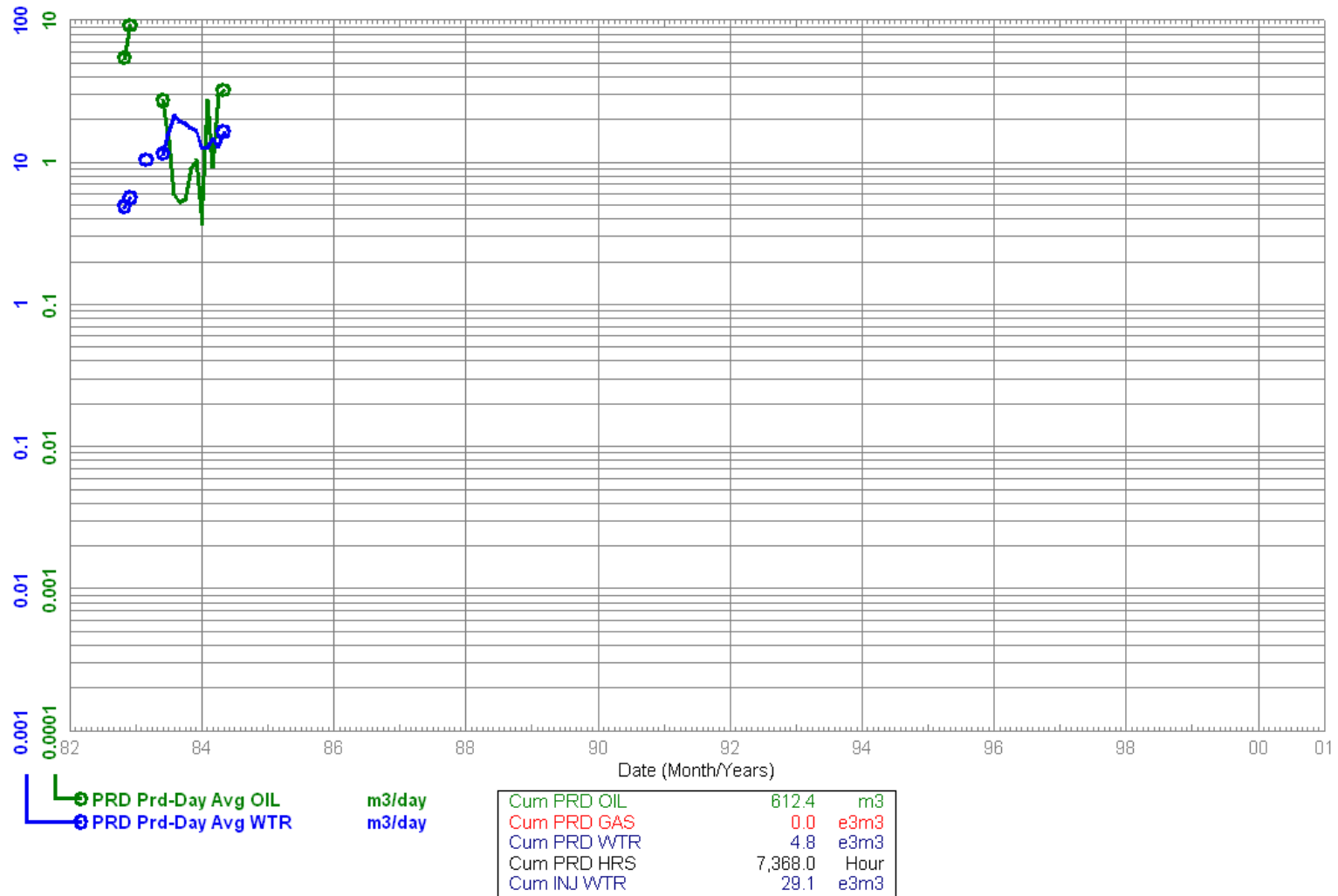
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
From: 1982-11  
To: 1984-05

100/15-14-001-26W1/00  
Waskada Unit No. 4 WIW/  
Abandoned Water Inj Well

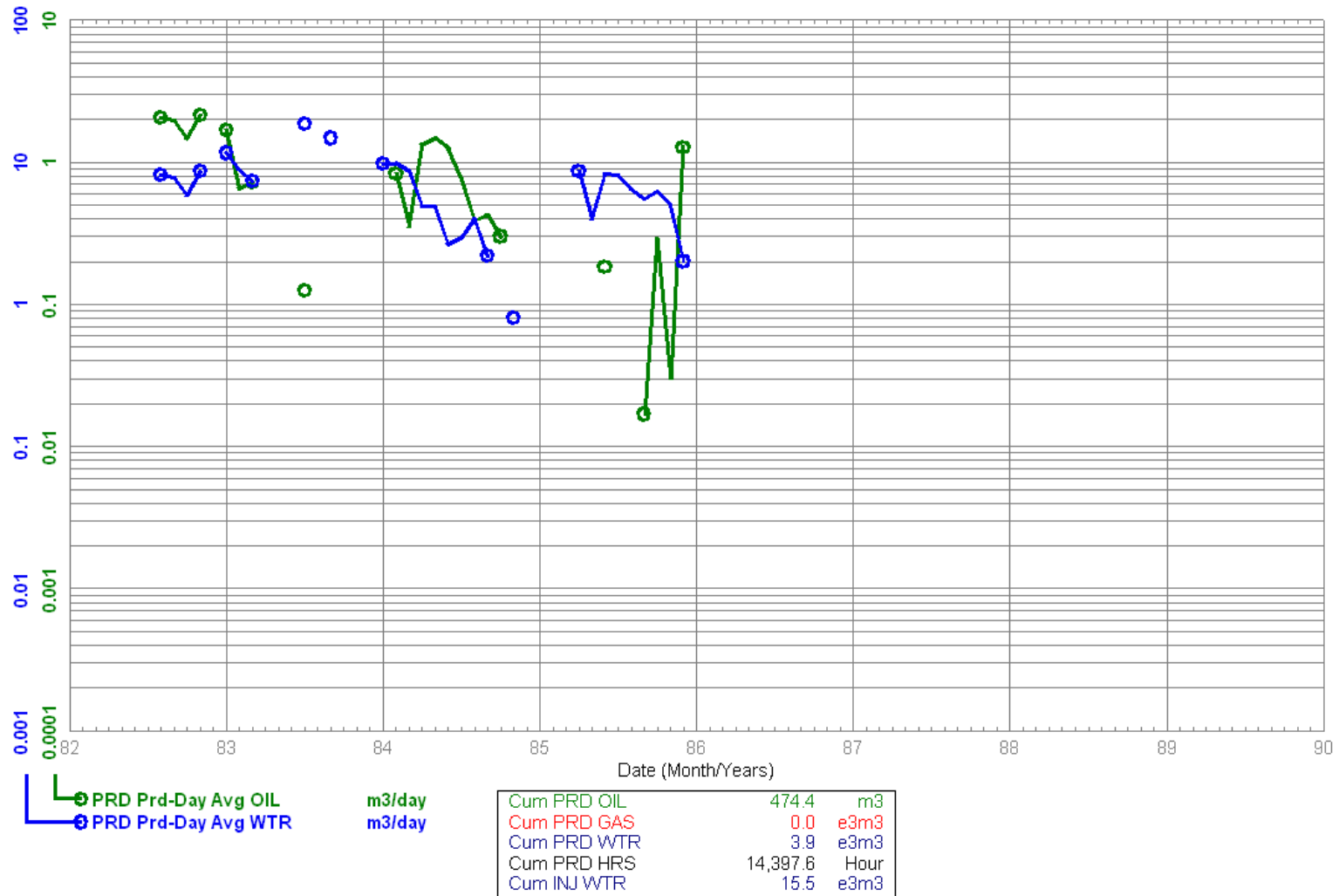
Field: WASKADA (03)  
Pool: LOWER AMARANTH A (29A)  
Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-08  
 To: 1985-12

100/16-11-001-26W1/00  
 Omega Waskada Prov. WW  
 Abandoned Water Inj Well

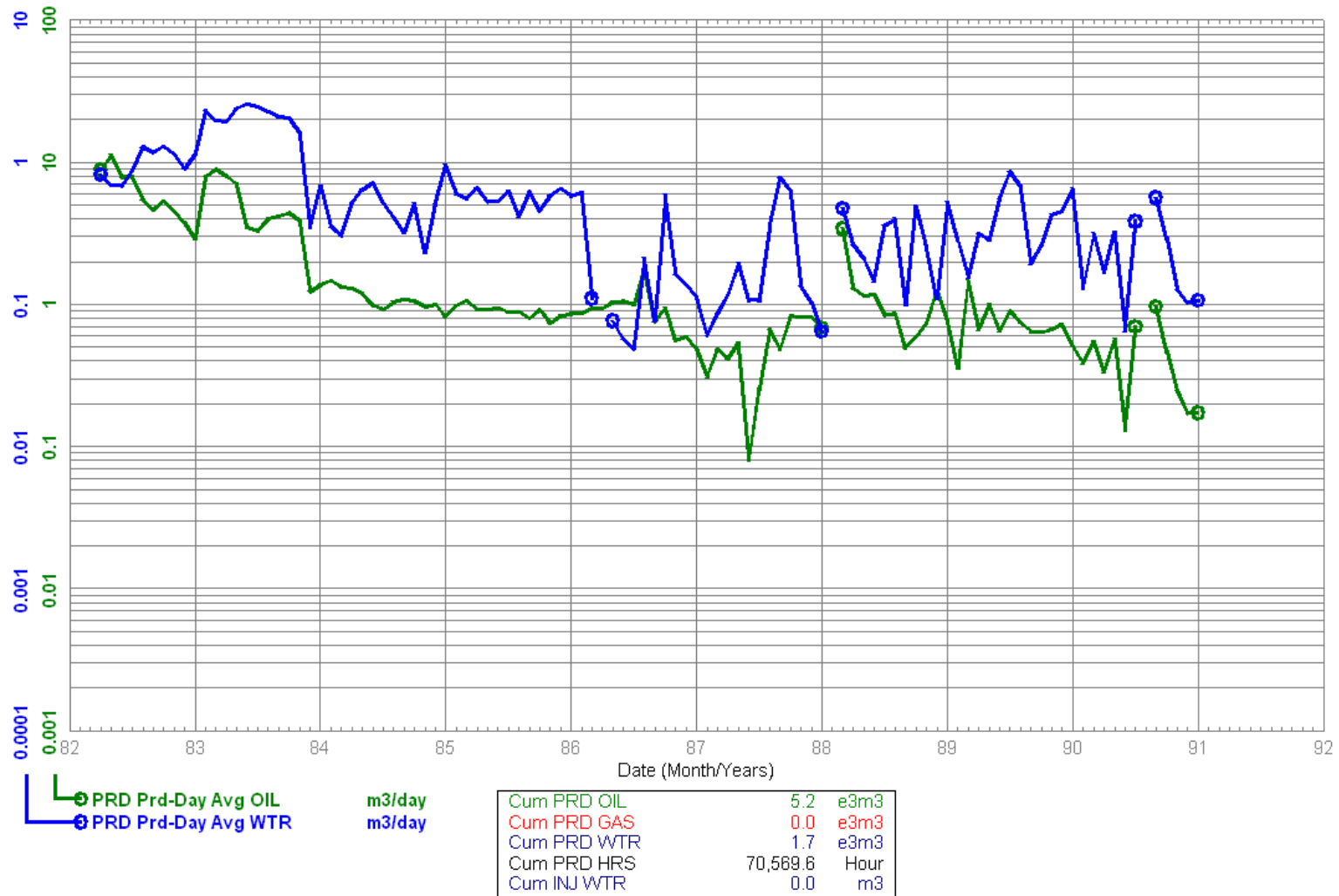
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1982-04  
 To: 1991-01

100/16-14-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

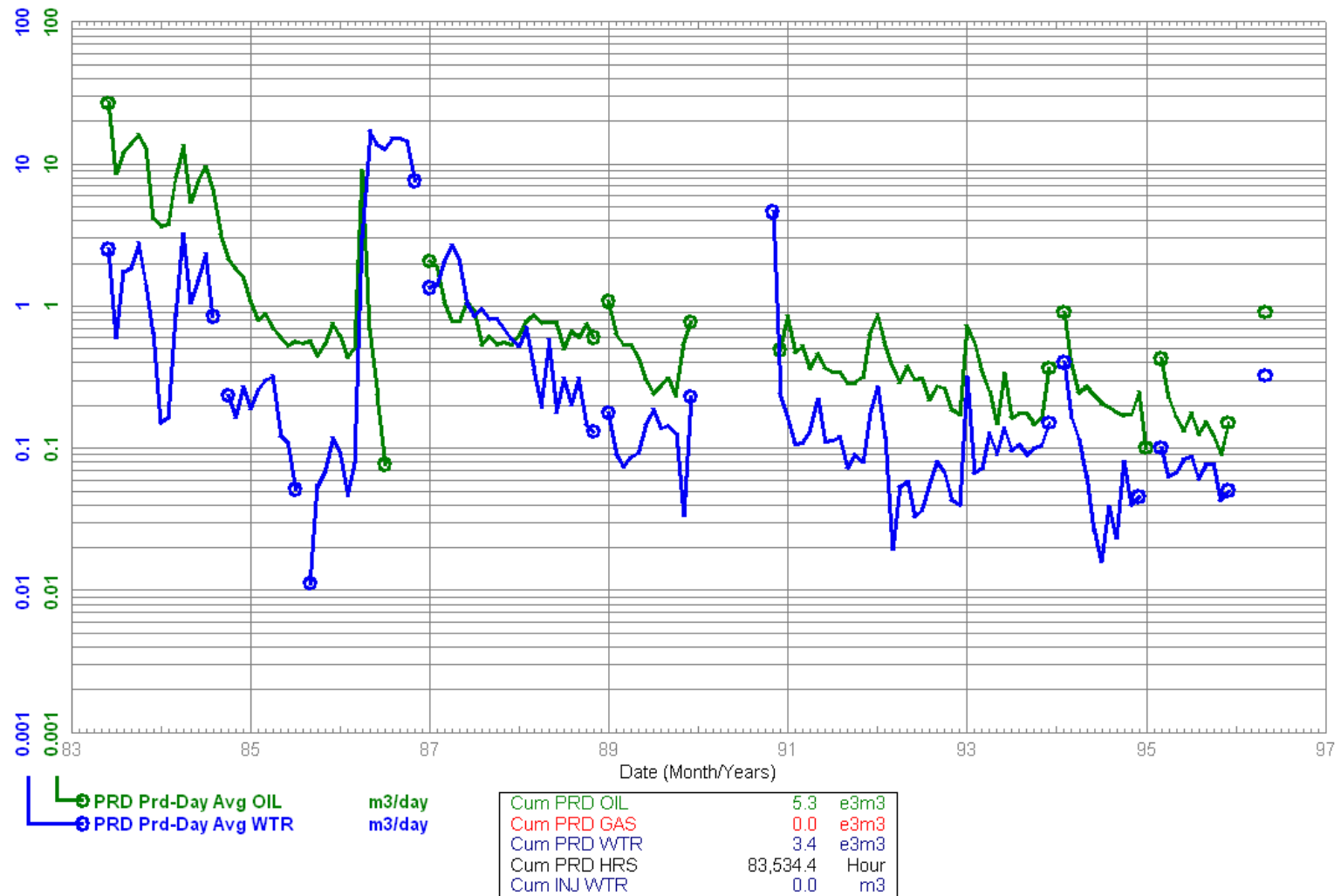
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 1983-06  
 To: 1996-05

102/01-24-001-26W1/00  
 Waskada Unit No. 4 Prov.  
 Abandoned Producer

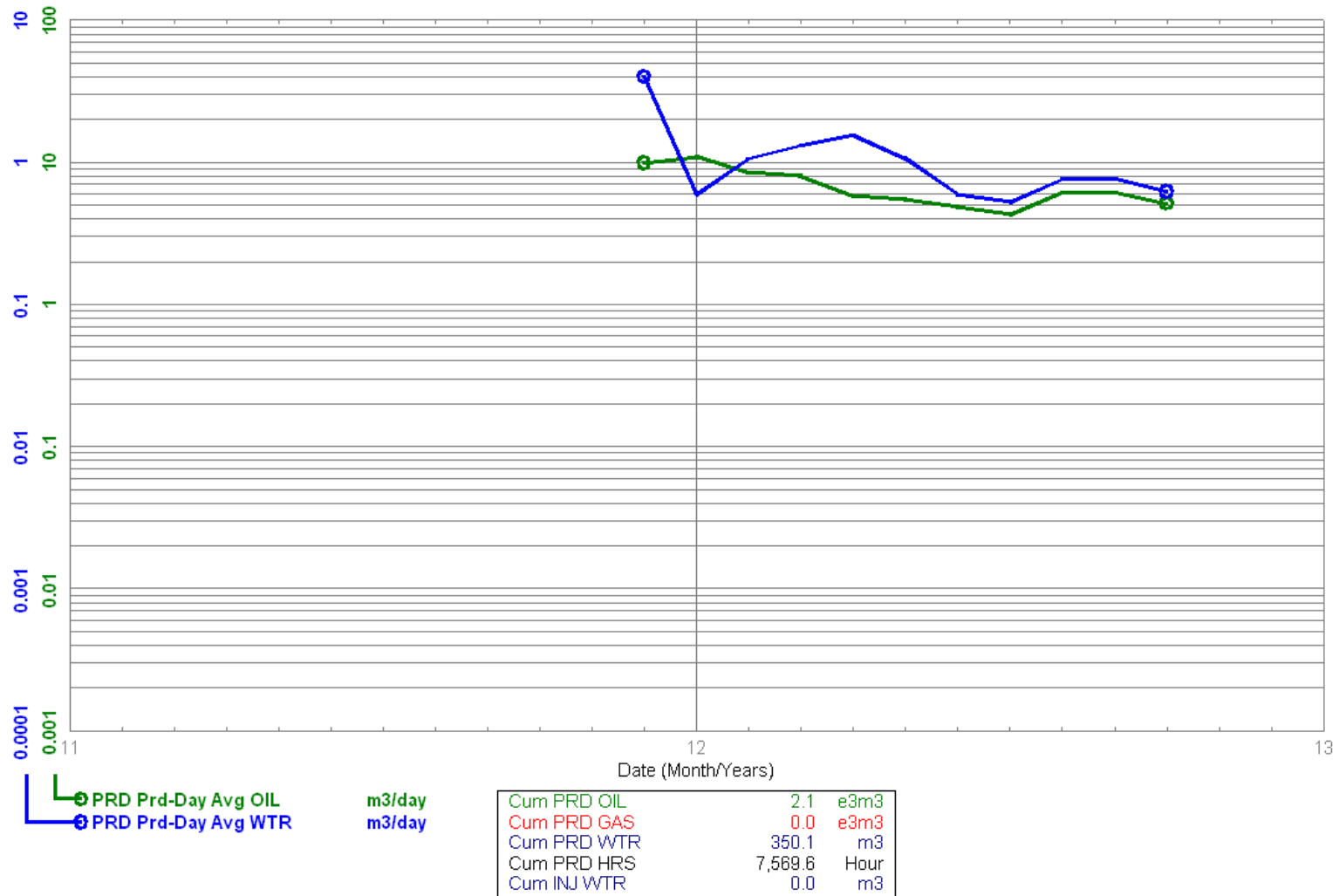
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 2011-12  
 To: 2012-10

102/03-24-001-26W1/00  
 Waskada Unit No. 4 HZNTL  
 Capable Of Oil Prod

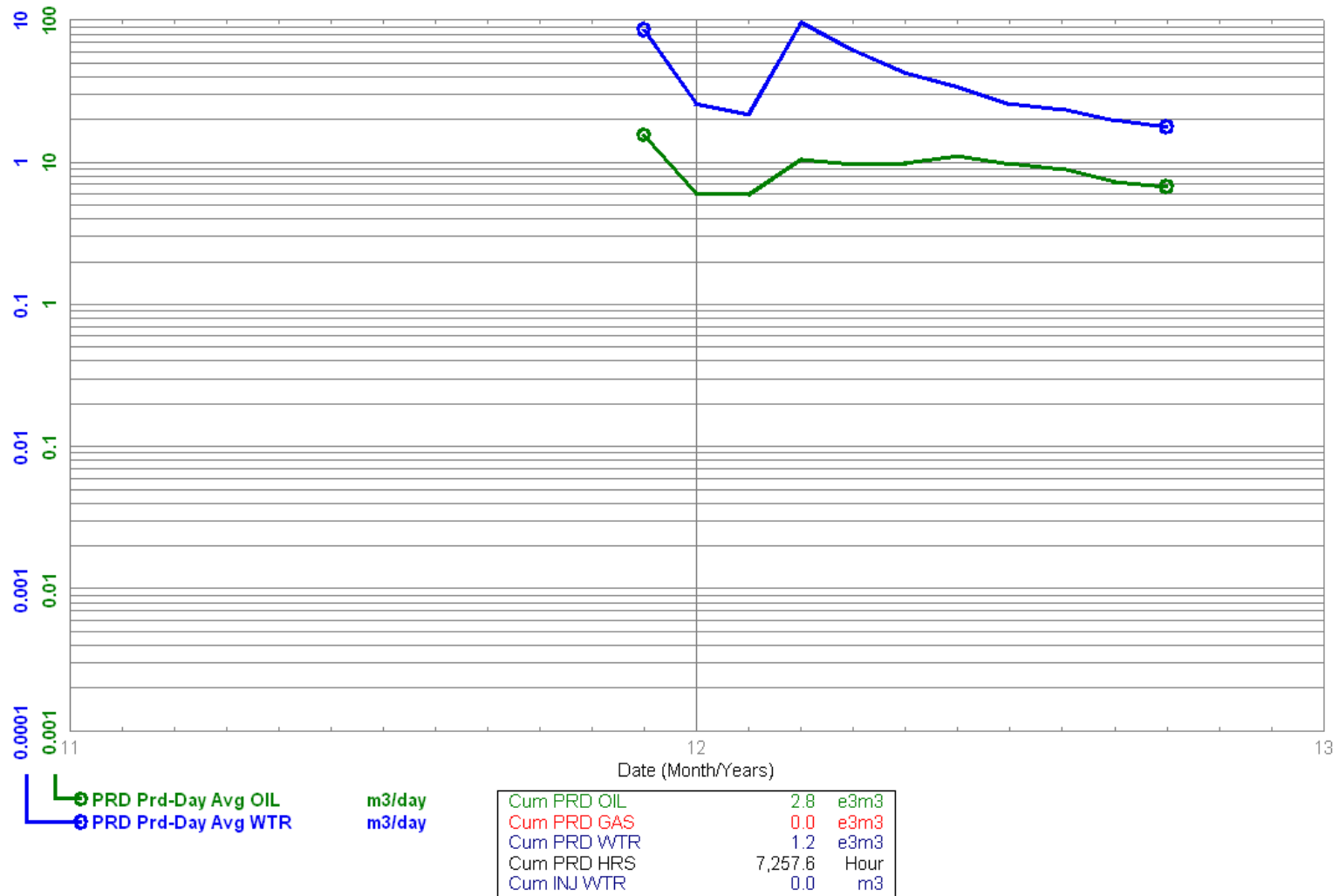
Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4



Data As Of: 2012-10 (MB)  
 From: 2011-12  
 To: 2012-10

102/06-24-001-26W1/00  
 Waskada Unit No. 4 HZNTL  
 Capable Of Oil Prod

Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4





Data As Of: 2012-10 (MB)  
 From: 1983-06  
 To: 1996-06

102/08-23-001-26W1/00  
 Waskada Unit No. 4  
 Abandoned Producer

Field: WASKADA (03)  
 Pool: LOWER AMARANTH A (29A)  
 Unit: WASKADA UNIT NO. 4

