Innovative Energies Technology Program

Round 5

East Bodo Associative Polymer Flood Pilot

Upper Mannville (Lloyd) A Pool

2011 Annual Report

Pengrowth Corporation

July 2012

TABLE OF CONTENTS

REPORT ABSTRACT

An Associated Polymer Flood pilot is being conducted at the East Bodo Upper Mannville "A" pool sandstone heavy oil reservoir. The pilot pattern consists of three vertical injectors and six vertical producers.

Polymer Injection in this section began in March 2011. Associative polymer DPRG 2169 with fresh water was injected. By Jan 2012, approximately 15,300 m3 of water had been injected in the reservoir corresponding to a HCPV of approximately 2.8%. Polymer Injection concentrations have been held stable at 1750 ppm with injection fluid viscosities ranging from 30 to 80 cp. Polymer injection and production response monitoring continues through the end of the report period.

Overall, pilot performance data indicates good results. Production rates increased from 14 m3/d initially when the injection started and peaked at 18.5 m3/d. Water cut increased initially from 70 to 78% but then declined to 64%. Polymer breakthrough was achieved within three months of injection.

By the end of the year, the pilot area had produced 5,000 m3 (31,450 STB) of oil corresponding to a recovery factor of 0.9%. This is using an Original Oil in Place (OOIP) of 3,383,141 STB as reported in the IETP application.

A field trial was conducted to test the compatibility of associative polymer with produced water. The polymer solution with produced water generated high viscosities which were confirmed by higher well head injection pressures. Based on these results, the associative polymer with produced water solution was implemented in the commercial development of polymer flooding in East Bodo.

SUMMARY

TEAM MEMBERS

Current Team Members:

- **Larry Stewart**, P.Geol – General Manager Western Canada Unconventional
- **Gord Robinson**, P.Engg. – Exploitation and Production Engineering Manager
- **Darcy Ries**, P.Engg. – Chief Reservoir Engineer
- **Darlene Loeffel**, P.Engg. – Senior Production Engineer
- **Kurt Chase**, P.Geol – Senior Geologist
- **Marie Hong**, P.Geoph., P.Geol. Senior Geophysicist
- **Dennis Reschny** – Operations Foreman
- **Nicole Filewich**, P.Engg. – Facility Project Engineer
- **Imad Brohi** – Reservoir Engineering Specialist

Former Team Members

- **Diane Shirra,** P.Eng. MBA – Manager, Exploitation Engineering
- **Anh Nguyen,** P.Eng. - Senior Exploitation Engineer
- **Tim Veenstra,** P.Eng. – Consultant, Exploitation Engineering
- **Kurt Chase,** CET – Senior Geologist
- **Darlene Loeffel,** P.Eng. – Senior Production Engineer
- **Matt Blaschuk,** P.Eng. – Production Engineer
- **Andrew Seto,** P.Eng. – Manager, Reservoir Studies
- **Suzy Chen,** P.Eng. – Senior Reservoir Engineer
- **Jeff Butlin,** – Reservoir Modeller
- **Dr. Fred Wassmuth,** – Senior Research Chemist (AITF)
- **Dennis Reschny,** – Operations Foreman
- **Marie Hong,** P.Geoph., P.Geol Senior Geophysicist
- **David Kidger,** P.Engg. – Facility Project Engineer

ACTIVITY SUMMARY

Following is a summary of key activities associated with the Associated Polymer pilot in East Bodo Upper Mannville "A" Pool.

Q1 2010

Jan – Mar:	Drilled, completed and tied in the following wells:	
	Water Source Well:	1F1/9-12-37-1W4
	Producer:	100/9-12-37-1W4
	Injector:	102/10-12-37-1W4
	Producer:	103/10-12-37-1W4
	Producer:	104/10-12-37-1W4
	Producer:	102/15-12-37-1W4
	Producer:	102/16-12-37-1W4
	Producer:	103/16-12-37-1W4
Feb – Mar:	Workovers	
	104/10-12-037-01W4:	Downsize pump
	103/16-12-037-01W4:	Downsize pump
	103/10-12-037-01W4:	Downsize pump
Feb:	Converted 100/10-12-37-1W4 from Producer to Injector	
Feb:	Static Pressure Surveys	
Mar:	ERCB D51 & D65 Approval (10529D / 10529E) – can inject Polymer and/or Water	

Q2 2010

May:	Produced Water injection began	
Apr – Jun:	Workovers	
	103/10-12-037-01W4:	Downsize pump

Q3 2010

Sept:	Received Alberta Environment Licence for fresh water source production from the Ribstone Creek Water Source wells: 1F1/9-12 (Lic # 00267180-00-00)	
Jul – Sept:	Workovers	
	104/10-12-037-01W4:	Downsize pump
	100/10-12-037-01W4:	Pressure build up survey
	103/16-12-037-01W4:	Tubing repair
	103/10-12-037-01W4:	Pump change

Q4 2010

Oct – Dec:	Workovers	
	103/16-12-037-01W4:	Tubing repair

Q1 2011

Jan-Feb:	Installation of Polymer Injection Skid	
Mar:	Associative Polymer injection began	
Jan – Mar:	Workovers	
	104/10-12-037-01W4:	Rod repair

Q2 2011

Apr – Jun:	Workovers	
	104/10-12-037-01W4:	Rod repair and Pump change
	102/15-12-037-01W4:	Pump change
	102/16-12-037-01W4:	Pump change

Q3 2011

Jul – Sept:	No Activity in Pilot Area.

Q4 2011

Oct – Dec:	Workovers	
	103/10-12-037-01W4:	Pump change

Q1 2012

Jan – Mar:	Workovers	
	104/10-12-037-01W4:	Upsize pump

Q2 2012

Apri – Jun:	Workovers	
	102/16-12-037-01W4:	Downsize pump

PRODUCTION SUMMARY

Production summary for the pilot area is given in Table 1. Detailed production history for individual wells is given in Appendix A. There is some electricity consumed which is also given in the same appendix.

Date	Monthly Oil	Monthly Gas	Monthy Water	Monthly Injection	Cum Oil	Cum Gas	Cum Water	Cum Injection
	m3	e3m3	m3	m3	m3	e3m3	m3	m3
Jan-10	38.4		23.66	0	0.04	0	0.01	0
Feb-10	111.6	0	65.22	0	0.15	0	0.22	0
Mar-10	231.4	0	330.1	452	0.38	0	0.55	14.58
Apr-10	293.4	0	637.9	1240	0.67	0	1.19	41.33
May-10	312.2	0	551.5	1884	0.99	0	1.74	60.77
Jun-10	281.4	0	1197.1	2990	1.27	0	2.94	99.67
Jul-10	301.7	0	1257.4	2769	1.57	0	4.2	89.32
Aug-10	237.1	0	1013.2	1913	1.81	0	5.21	61.71
Sep-10	275.2	0	1264.7	2609	2.08	0	6.47	86.97
Oct-10	287	0	1067.5	2260	2.37	0	7.54	72.9
Nov-10	323.3	0	990.8	2365	2.69	0	8.53	78.83
Dec-10	407.6	0	1100.2	2738	3.1	0	9.63	88.32
Jan-11	404.2	0	1011.7	2806	3.5	0	10.64	90.52
Feb-11	382.4	0	899.5	1894	3.89	0	11.54	67.64
Mar-11	440.2	0	1028.4	1910	4.33	0	12.57	61.61
Apr-11	455	0	1242.3	1841	4.78	0	13.81	61.37
May-11	465.9	0	1691.1	1878	5.25	0	15.5	60.58
Jun-11	387.9	0.5	1355.8	1690	5.64	0.5	16.86	56.33
Jul-11	511.6	1.7	1806.1	1623	6.15	2.2	18.67	52.35
Aug-11	564	2.4	1544.1	1293	6.71	4.6	20.21	41.71
Sep-11	524.8	2.4	1159.3	1317	7.24	7	21.37	43.9
Oct-11	573.4	1.4	1072.3	1465	7.81	8.4	22.44	47.26
Nov-11	514.4	2.1	889.8	1249	8.32	10.5	23.33	41.63
Dec-11	558.2	2.5	997.4	1133	8.88	13	24.33	36.55
Jan-12	579.3	3.1	1007.6	971	9.46	16.1	25.34	31.32
Feb-12	529.3	2.6	896.4	1513	9.99	18.7	26.23	52.17
Mar-12	498.9	0.8	1555.2	2297	10.49	19.5	27.79	74.1
Apr-12	461.2	0.8	1018.7	1395	10.95	20.3	28.81	46.5

Table 1 – Monthly Production Volumes

Further to this, the pilot area is injecting fresh water being produced from the well 1F1/9-12-37-1W4. This well's production is given in Appendix A.

The polymer skid and injection pumps in the pilot area are run by electricity. The electricity is bought from Fortis, Alberta. Detailed electricity consumption is also given in Appendix A.

Production well pumps are run by gas which is used from one of Pengrowth's properties. The gas consumption for running the pumps is also given in Appendix A.

The plot showing estimated pilot production is also given in Appendix ABC. The estimated production is higher than what has been observed from the pilot. A plot of oil rate vs. cumulative production is given in Figure 1. This shows the oil rate is increasing with production with the rates peaking at 120 STB/D from base rates of 90 STB/D when the pilot started in March 2011.

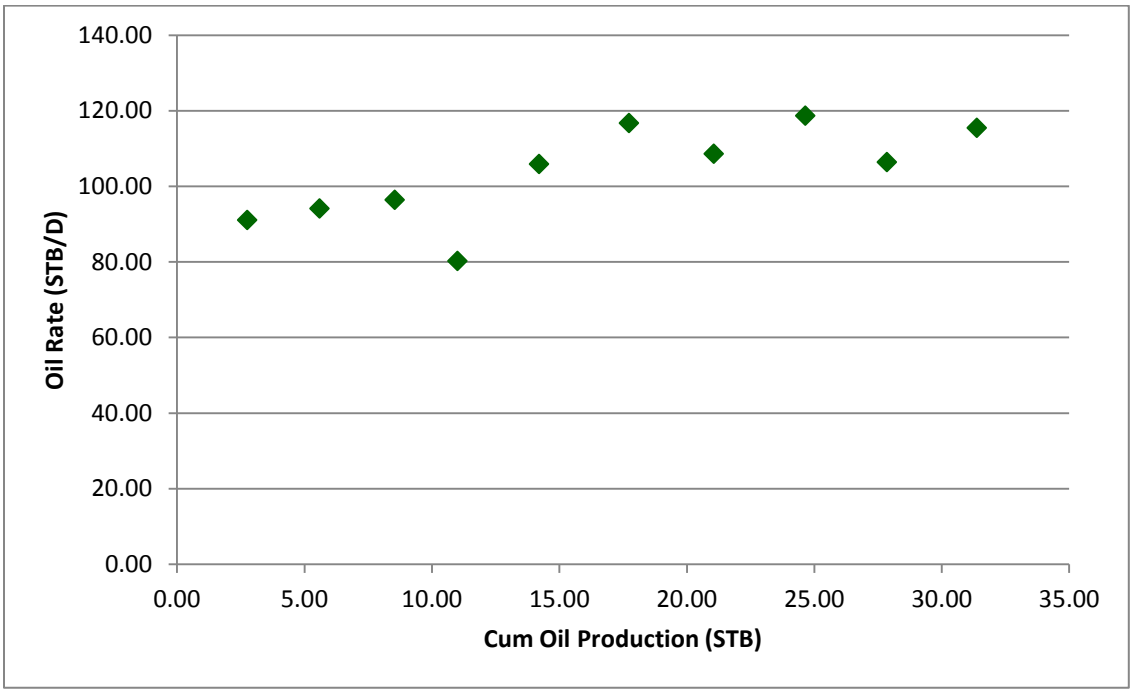


Figure 1 – Oil Rate (STB/D) vs. Cum Production (STB)

RESERVES SUMMARY

The reserves plot is given in figure 2.1 and 2.2. The reserves have been adjusted based on the performance of the pilot flood. Based on this, the total ultimate recoverable oil from the pilot area is 49,740 m3 (312,855 STB).

The reserve estimate presented at project approval is given in Appendix B. The forecast shows peak rate of 280 STB/D achieved after approximately 18 months of production and then the decline. The total ultimate recoverable volume was 642,797 STB which corresponded to approximately 19% recovery factor from the OOIP of 3383141 STB.

The new resource shows ultimate recoverable reserves of 312,855 STB, which corresponds to a recovery factor of 9.3 %. This is comparatively lower but since the peak rate is unknown, it is safe to assume the peak rates that are currently achieved.

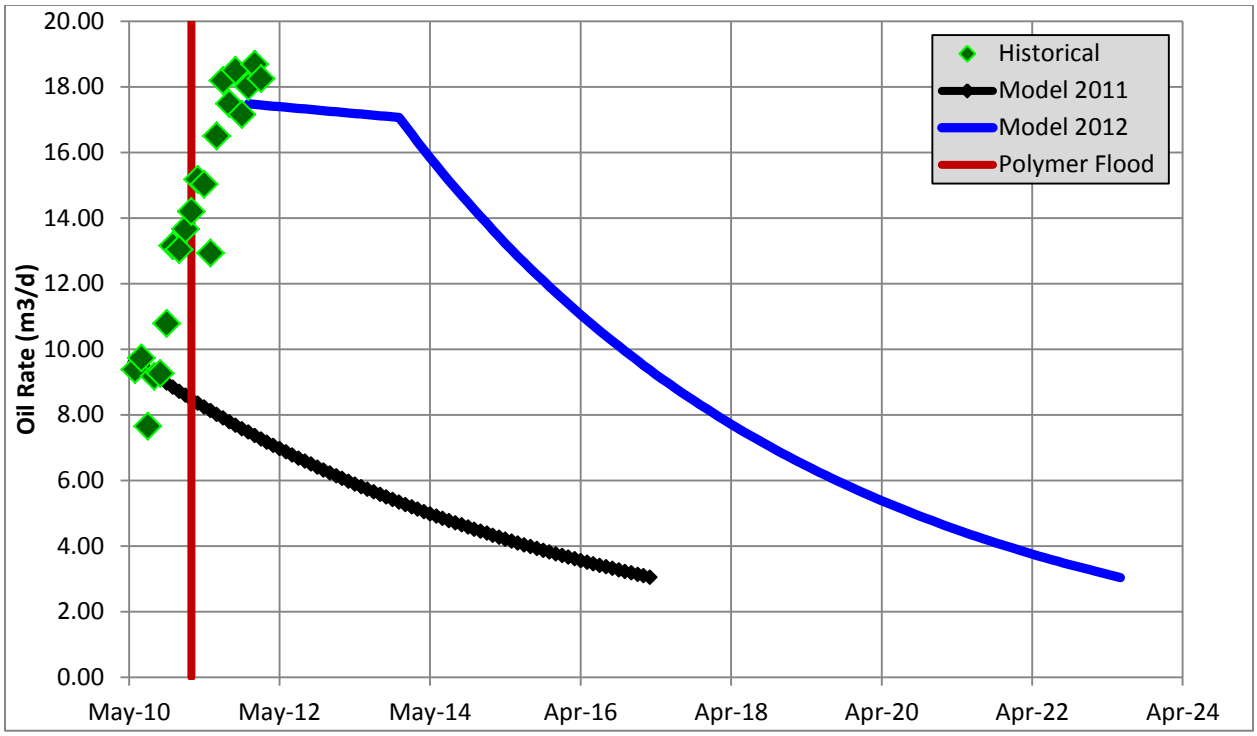


Figure 2 – Forecasted Oil Rates with baseline

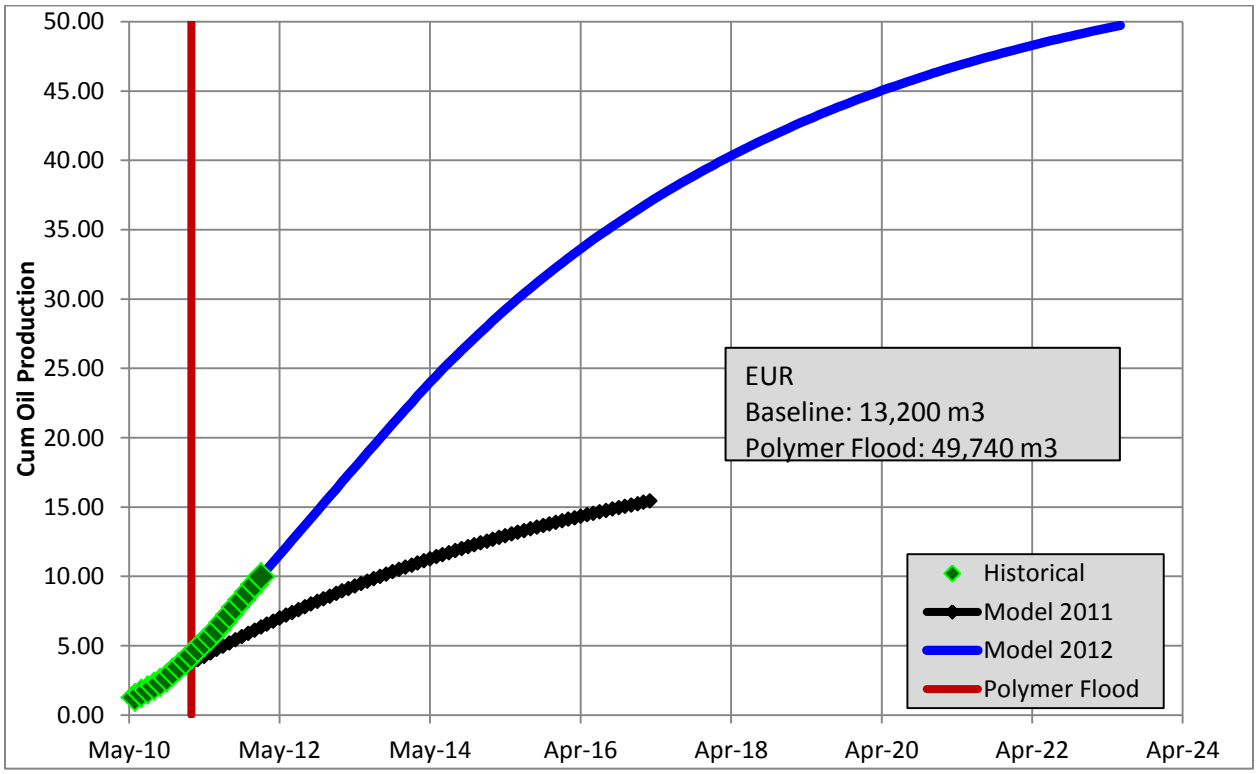


Figure 3 –Forecasted Cumulative Production (Reserves) with baseline

WELL INFORMATION

WELL LAYOUT MAP

Well layout map is given in Figure 4 along with the log cross sections of the three patterns.

DRILLING, COMPLETIONS AND WORK-OVER OPERATIONS SUMMARY

No new wells were drilled in the pilot area in the year 2011.

Most of the operations done in the pilot area were related to pump failures and replacement. A detail of all the pump changes and replacement is given in Activity Summary in Section 2.2.

WELL OPERATION

Most of the well operations conducted during the pilot period in 2011 were with pumps in production wells. For the entire operation history, please refer to Section 2.2.

WELL LIST AND STATUS

Following is the list of wells and their status:

Pattern 100/10-12-037/01W4/0

100/10-12-037/01W4/0	Injecting polymer solution
103/10-12-037/01W4/0	Producing with a Progressive Cavity Pump (PCP)
104/10-12-037/01W4/0	Producing with a Progressive Cavity Pump (PCP)

Pattern 102/10-12-037/01W4/0

102/10-12-037/01W4/0	Injecting polymer solution
102/15-12-037/01W4/0	Producing with a Progressive Cavity Pump (PCP)
100/09-12-037/01W4/0	Producing with a Progressive Cavity Pump (PCP)

Pattern 100/16-12-037-01W4/0

100/16-12-037/01W4/0	Injecting polymer solution
102/16-12-037/01W4/0	Producing with a Progressive Cavity Pump (PCP)
103/16-12-037/01W4/0	Producing with a Progressive Cavity Pump (PCP)

WELLBORE SCHEMATICS

See Appendix C for wellbore schematics.

SPACING AND PATTERN

The pilot is located in a total area of 100 acres within the East Bodo Upper Mannville (Lloyd) A Pool (Figure 5). The pool spans in the township of 037-01W4, and it is a sandstone reservoir of Cretaceous age, located at a depth of approximately 800 m.

The flood pattern is producer-injector-producer line drive – with well spacing of approximately 200 m.

The pattern is centered around three injectors: 100/10-12-037-01W4/0, 102/10-12-037-01W4/0 and 100/16-12-037-01W4/0 and includes a total of six producing wells, three on each side. Historically, this pattern has been on production since 1970's, with the well 100/10-12-037-01W4/0. First water injection in this pattern started in January 2004 with the well 100/16-12-037-01W4/0. Remaining wells in this pattern were drilled in 2010 and the pattern was on waterflood from March 2010 to March 2011.

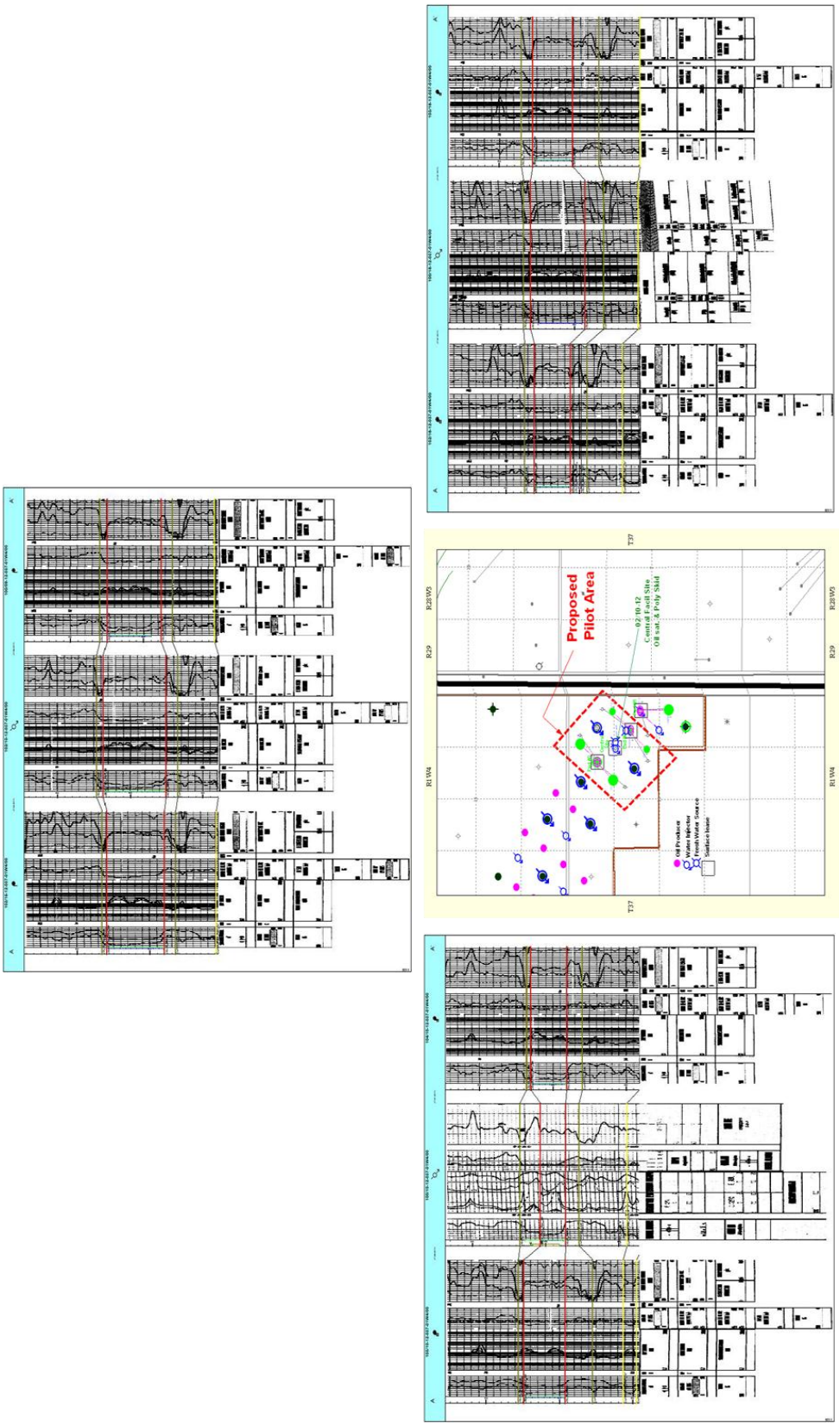


Figure 4 – Well Layout Map

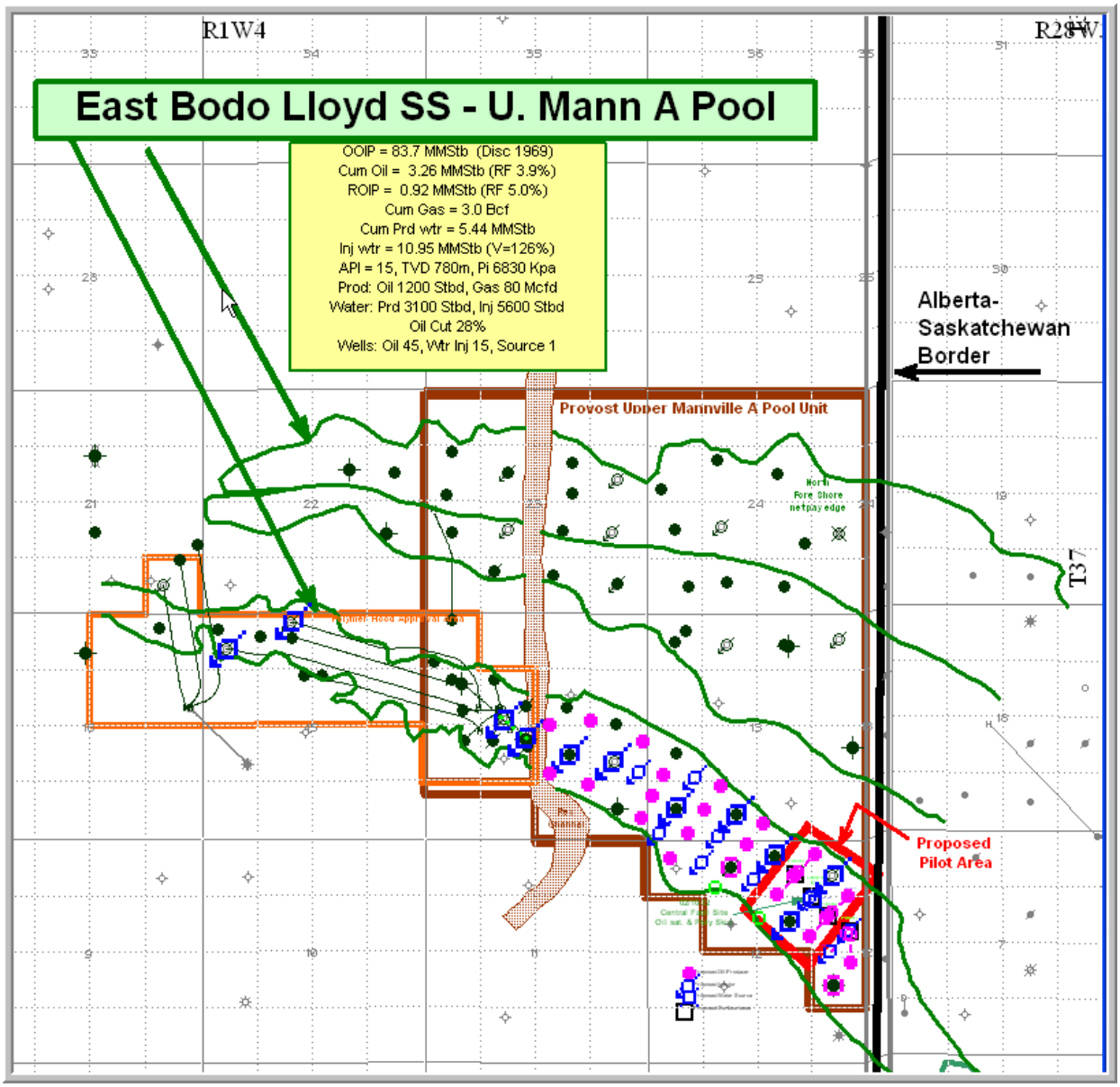


Figure 5 – Map of East Bodo with pilot boundaries highlighted

PRODUCTION PERFORMANCE

INJECTION AND PRODUCTION HISTORY

As mentioned in the presentation on Feb 04, 2010, there are three injectors and six producers in the proposed pilot area. The injectors are:

- 100/10-12-037-01W4/0
- 102/10-12-037-01W4/0
- 100/16-12-037-01W4/0

The producing wells in this pilot area are:

- 103/10-12-037-01W4/0
- 102/15-12-037-01W4/0
- 102/16-12-037-01W4/0
- 104/10-12-037-01W4/0
- 100/09-12-037-01W4/0
- 103/16-12-037-01W4/0

Based on the injector/producer well configuration, the following flood scheme patterns have been defined.

- 100/10-12-037-01W4/0
  - 103/10-12-037-01W4/0
  - 104/10-12-037-01W4/0 (also getting influence from Injector 103/08-12-037-01W4/0)
- 102/10-12-037-01W4/0
  - 102/15-12-037-01W4/0
  - 100/09-12-037-01W4/0 (also getting influence from injector 102/09-12-12-037-01W4/0 outside the proposed area)
- 100/16-12-037-01W4/0
  - 102/16-12-037-01W4/0
  - 103/16-12-037-01W4/0 (also getting influence from injector 102/09-12-12-037-01W4/0 outside the proposed area)

These patterns and their individual responses are given below.

Pattern 100/10-12-037-01W4/0

Water injection in pattern 100/10-12-037-01W4/0 started in May 2010 and it was changed to polymer injection in March 2011. The production performance in this pattern shows an increase in water cut in February 2010 (prior to the start of waterflood in this pattern) which was possibly due to water injection from the well 100/16-12-037-01W4/0. The producer 103/10-12-037-01W4/0 had been put on production in the same month and it started production at a high water cut of 80 –

90 %. Polymer Injection on this well started in March 2011. At the onset of the polymer flood, the oil rate was 4.4 m3/d with a water cut of 75%. The oil rate has increased and the water cut decreased due to polymer flooding in the pattern. Oil rates have increased to 7 m3/d and water cut had dropped down to 50% although water breakthrough may have occurred in the well 104/10-12-037-01W4/0 which is why the water cut is seen increasing again.

Injection in this pattern has varied from 20 – 30 m3/d based on the maintenance of Voidage Replacement Ratio (VRR). The injection was optimized to keep the VRR at or around 1.2 until a cumulative VRR of 1.0 is achieved. So far, the cumulative VRR achieved for this pattern is 0.16.

The pattern production plot is given in Figure 6.

Injector 100/10-12-037-01W4/0

Injector 100/10-12-037-01W4/0 was a producer until Jan 2010 and was converted to water injector in May 2010. The well had produced 22,360 m3 of oil from 1973 to 2010. The well was initially a water injector from May 2010 to March 2011 after which it was put on polymer solution injection. The well has been injecting at 20-30 m3/d at a wellhead injection pressure of 3500 – 5500 kPa. By March 2012, this cumulative injection achieved in this well was 19,790 m3 (water + polymer).

The injector performance plot is given in Figure 7.

Producer 103/10-12-037-01W4/0

This well was drilled and put on production in February 2010. The well started off at rates approximately 1 m3/d and stayed consistent until polymer injection started. Note that this means that water injection did not have a significant effect on the production in this well. This well has responded well to polymer flood. Polymer injection was started in March 2011 and the well showed increase in oil rates from 1 m3/d to 4 m3/d and drop in water cut from 75% to 30%.

The well performance is given in Figure 8.

Producer 104/10-12-037-01W4/0

This well lies to the S.E. of the injector 100/10-12-037-01W4/0 and was put on production in March 2010. Initial production rates were low (less than 1 m3/d) and increasing water cut was noticed almost immediately. However, oil production rates continued to increase showing effective waterflood sweep and peak rates were observed in July 2011 after the polymer flood was initiated. A gel conformance treatment was performed for water shut-off last year to reduce water channeling after which the water cut dropped. However, recent months of performance shows oil rates dropping and water cut increasing, suggesting that injected polymer solution may be channeling through this producer.

The well performance is given in Figure 9.

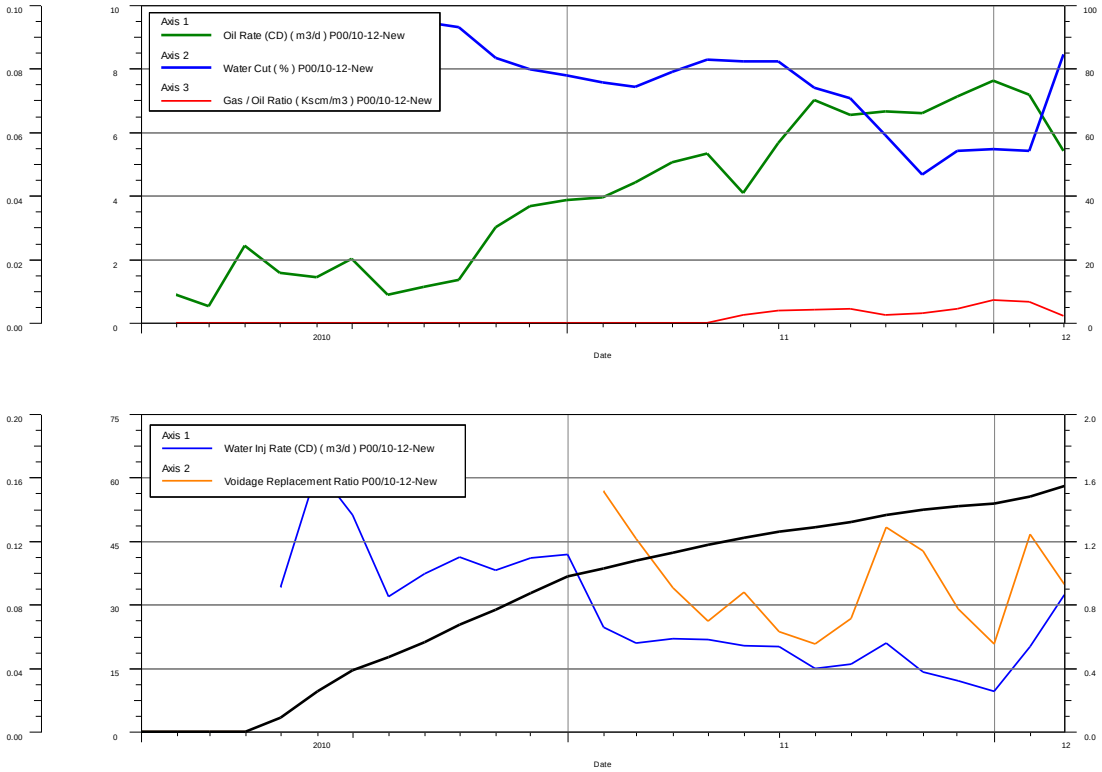


Figure 6– Pattern 100/10-12 Production and Injection Plots.

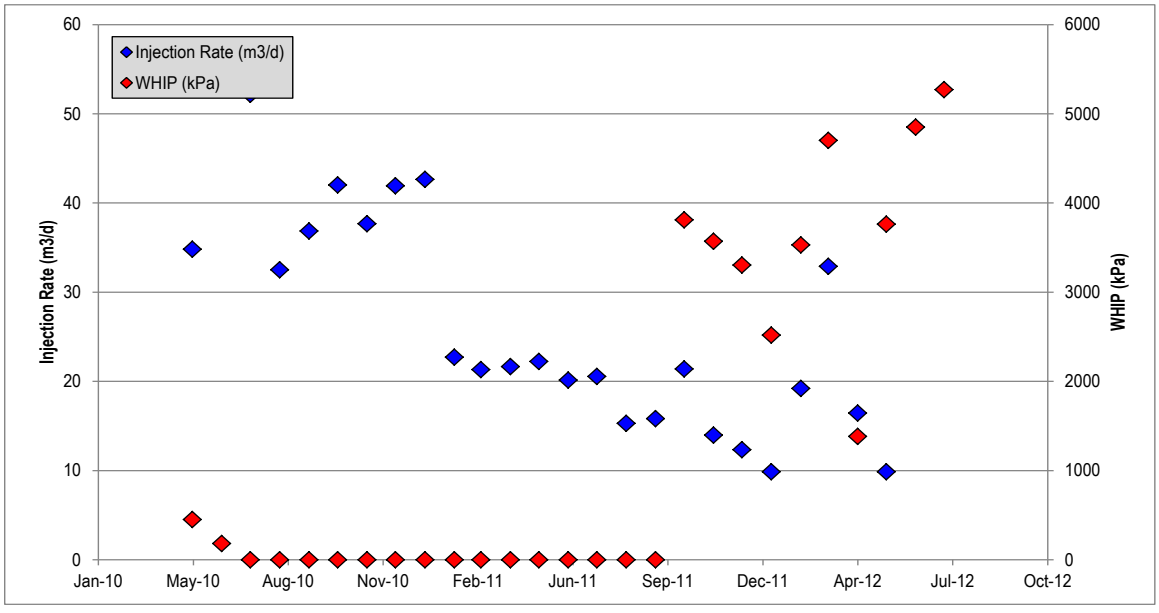


Figure 7 – Injector 100/10-12-037-01W4/0 Performance

Figure 8 – Producer 103/10-12-037-01W4/0 Performance

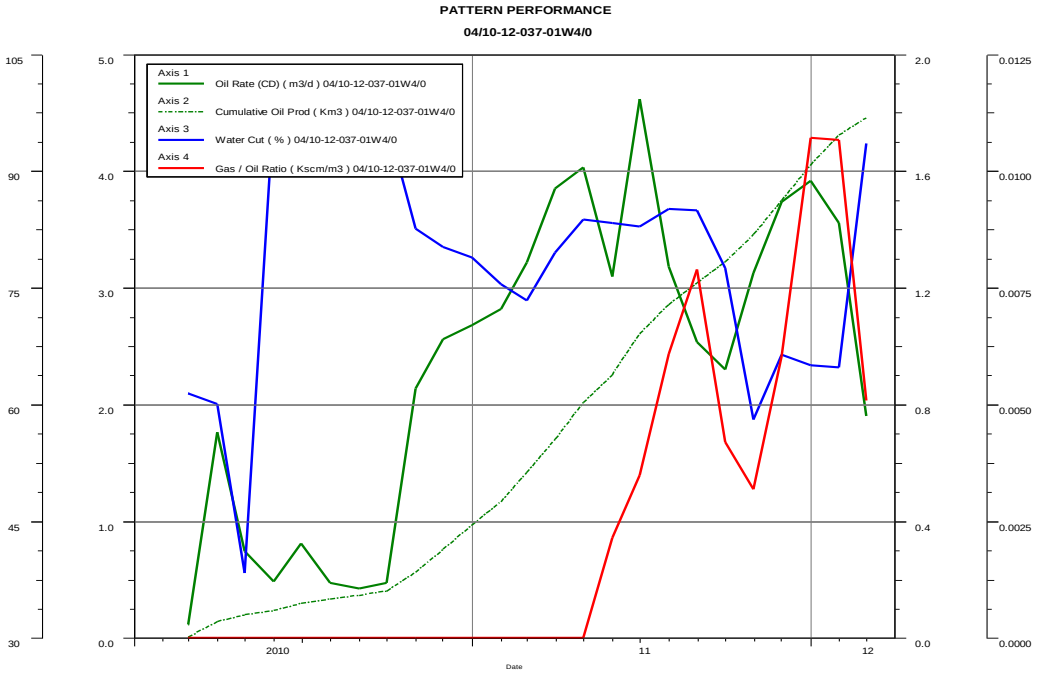


Figure 9 – 104/10-12 Performance

Pattern 102/10-12-037-01W4/0

This pattern was put on production/water injection in March 2010 and converted to polymer injection in March 2011. The pattern has one injector and two producers. Oil production rate has held stable since polymer injection started in March 2011 while the water cut has fluctuated from 55 – 65%.

Voidage Replacement Ratio (VRR) was high initially at 2 but has been set at 1.0 in the recent months.

Pattern Performance Plots are given in Figure 10.

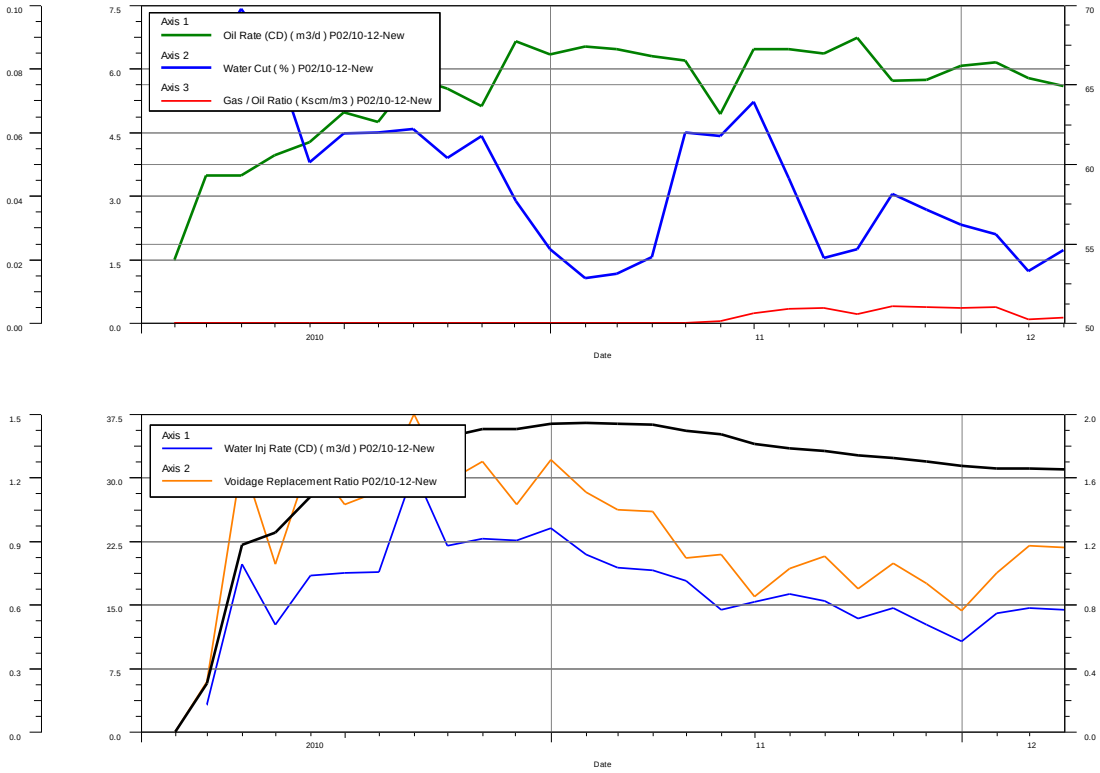


Figure 10 – Pattern 102/10-12 Performance

Injector 102/10-12 -037-01W4/0

Injector 102/10-12 was drilled as an injector and commenced water injection from March 2010. The well was converted into a polymer injector in March 2011. The well has injected at ~ 20 m3/d at a wellhead injection pressure of 7000 – 8900 kPa. The well injection performance is given in Figure 11.

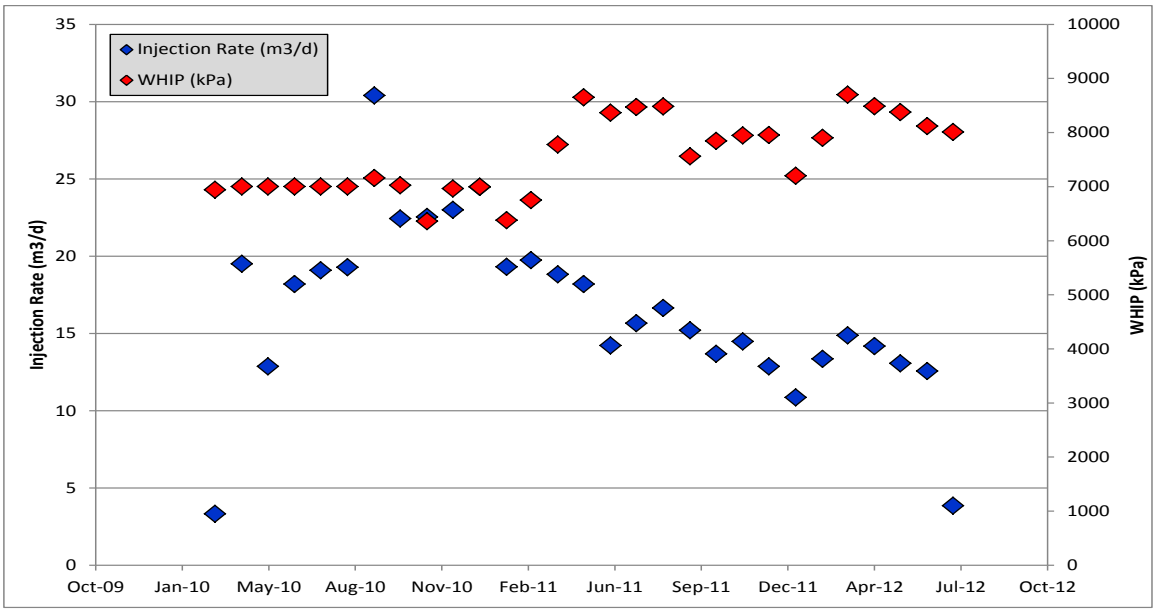


Figure 11 – Injector 102/10-12-037-01W4/0

Producer 102/15-12-037-01W4/0

The producer 102/15-12-037-01W4/0 has been on production since February 2010. Production increased from initial oil rates of 1.5 m3/d to over 4 m3/d in response to waterflood. Production has held stable after the injection of polymer. Water cut increased in May 2011, possibly the injection water breakthrough, but it has been declining since then. Production plots are given in Figure 12.

Producer 100/09-12-037-01W4/0

Well 100/09-12-037-01W4/0 started production in March 2010. This well is shared between two patterns, one being out of the IETP project area. The well has shown excellent response to waterflood and polymer flood. Oil production rates kept increasing from initial rates of 1 m3/d to 2 m3/d at the time the polymer flood started. Since March 2011, oil production rates have increased by 0.5 m3/d and water cut has decreased from 55 to 35 %. Production plots are given in Figure 13.

Pattern 100/16-12-037-01W4/0

Pattern 100/16-12-037-01W4/0 has one injector and two producing wells, 102/16-12-037-01W4/0 and 103/16-12-037-01W4/0. The other well 103/16-12-037-01W4/0 which is towards the southeast of the injector is also being supported by injector 102/09-12-037-01W4/0 which is outside the pattern boundaries.

The well 100/16-12-037-01W4/0 has been the oldest injector in the area with injection from January 2004. The pattern started production at 4/5 m3/d but the production dropped and water cut increased shortly showing signs of water breakthrough. Production has been consistently

increasing since then with slight decrease in water cut, including after the polymer flood. Oil production rates from the pattern are at 5 m3/d and water cut around 75%.

Injection rates are maintained to a VRR of 1 – 1.2. The following plots show the complete pattern injection and production performance.

Pattern performance is given in Figure 14.

Injector 100/16-12-037-01W4/0

Injector 100/16-12-037-01W4/0 was drilled as an injector and started injection in January 2004. Injection rates have varied and it injected between 10 – 20 m3/d. Until March 2011, it had injected a total of 37,720 m3 of water. The well was put on polymer skid in March 2011 and has been injecting 10 – 20 m3/d at a wellhead injection pressure of 5 – 6,000 kPa.

The injection performance plot is given in Figure 15.

Producer 102/16-12-037-01W4/0

This producer is not showing a significant impact of polymer flood. Production has been decreasing from 2.25 – 1.5 m3/d with water cut increasing from 40% to 60%. The well performance plots are given below. Production performance is given in Figure 16.

Producer 103/16-12-037-01W4/0

103/16-12-037-01W4/0 is showing signs of improvement in production from the polymer flood pilot. Oil rates have increased from 1 m3/d in March 2011 to 3/6 m3 in March 2012 and the water cut has dropped from 92% to 78%. Production performance is given in Figure 17.

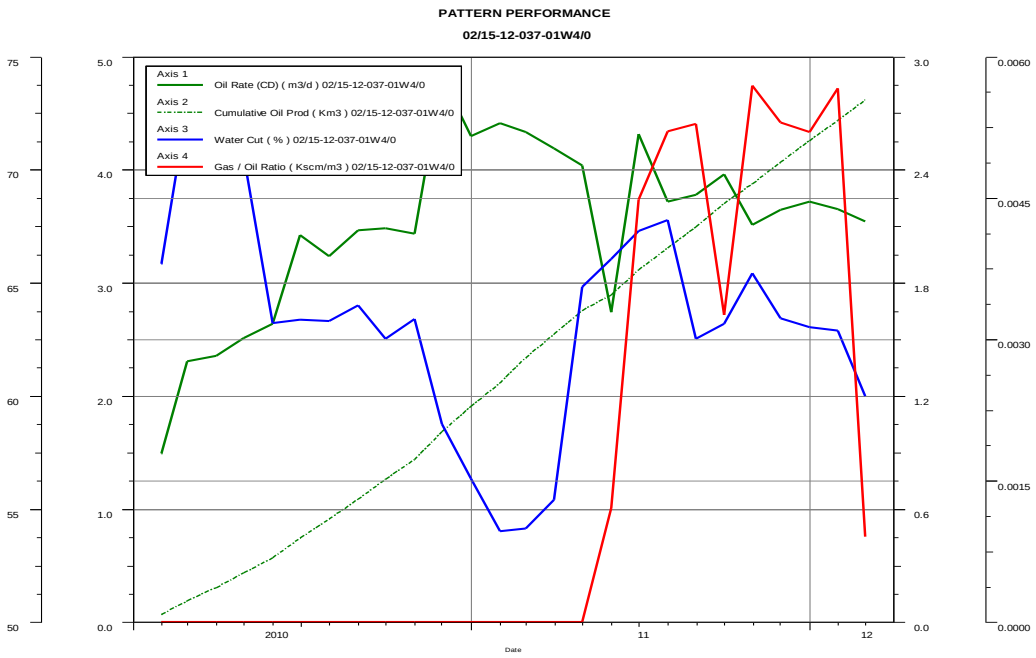


Figure 12 – Producer 102/15-12-037-01W4/0

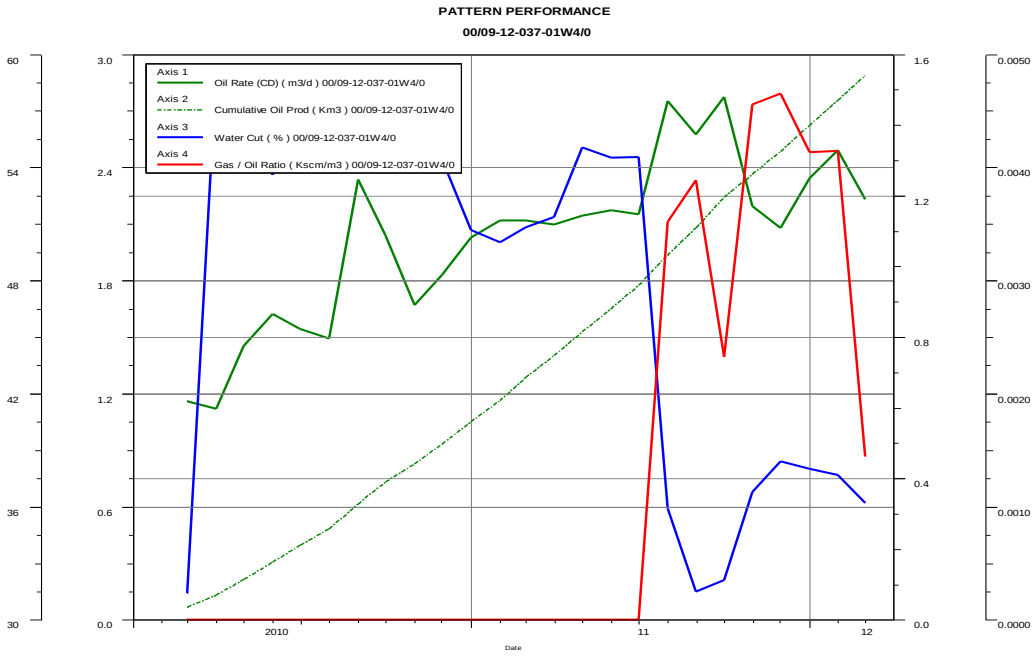


Figure 13 – Producer 100/09-12-037-01W4/0

Figure 14 – Pattern 100/16-12-037-01W4/0 Performance

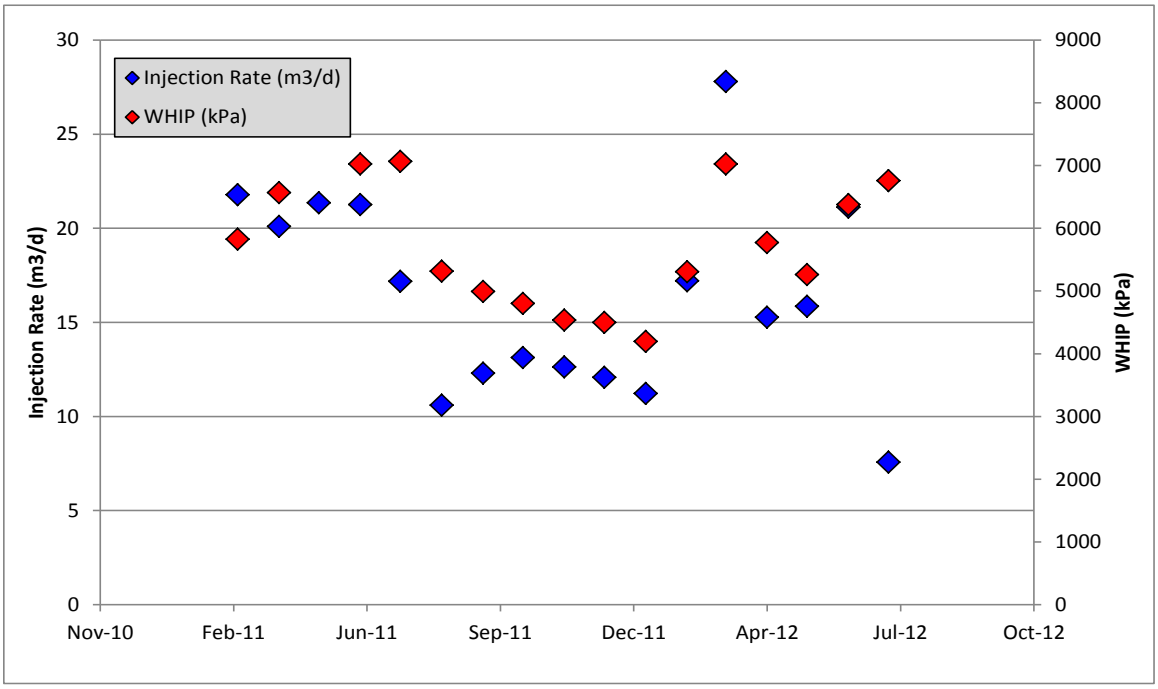


Figure 15 – Injector 100/16-12-037-01W4/0 Performance

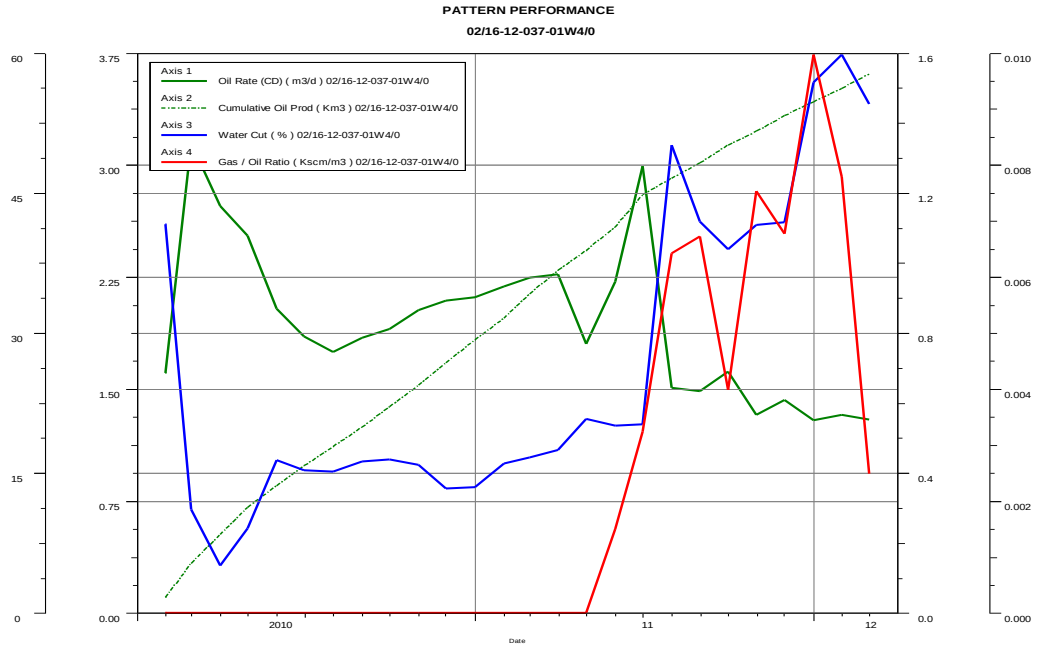


Figure 16 – Producer 102/16-12-037-01W4/0 Performance

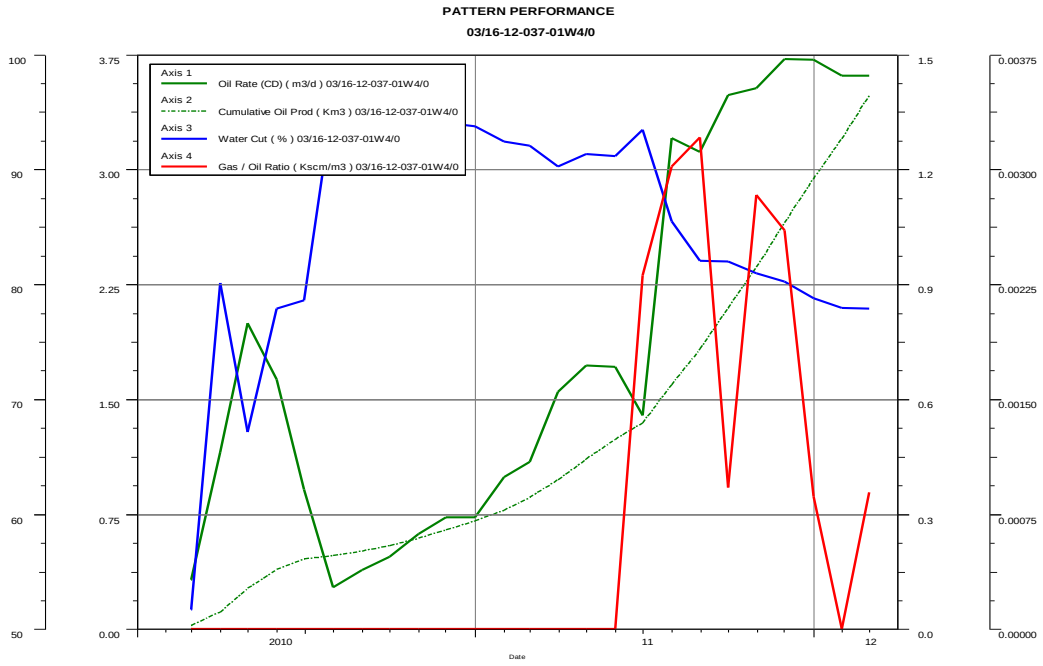


Figure 17 – Producer 103/16-12-037-01W4/0

COMPOSITION OF PRODUCED / INJECTED FLUIDS

Detailed composition of production and injection fluids was not tested. However, the produced oil, gas and water fluid analysis along with injected fresh water analysis and polymer information is given in Appendix D.

COMPARISON OF PREDICTED VS. ACTUAL WELL / PILOT PERFORMANCE

Comparison of the predicted vs. actual pilot performance is given in Table 2. The actual production is lower than what was initially forecasted for this area. Oil production rates have increased from the baseline due to polymer flood, but they have not increased by the margin which was initially expected.

	Actual								Predicted		
Date	Daily Oil	Daily Gas	Daily Water	Daily Injection	Cumulative Oil	Cumulative Gas	Cumulative Water	Cumulative Injection	Daily Oil	Daily Gas	Daily Water
	STB	SCF	STB	STB	MSTB	MSCF	MSTB	MSTB	STB	SCF	STB
Mar-11	89.32	0	208.66	387.53	2.72	0.00	6.34	11.78	79.00	3972.00	-
Apr-11	95.4	0	260.46	385.99	5.62	0.00	14.26	23.52	89.00	4459.00	-
May-11	94.53	0	343.12	381.04	8.49	0.00	24.69	35.10	100.00	5007.00	-
Jun-11	81.33	0.59	284.26	354.33	10.96	0.02	33.33	45.87	112.00	5621.00	-
Jul-11	103.8	1.94	366.45	329.3	14.12	0.08	44.47	55.88	126.00	6323.00	-
Aug-11	114.43	2.73	313.29	262.35	17.60	0.16	54.00	63.86	140.00	7005.00	-
Sep-11	110.03	2.83	243.06	276.12	20.94	0.25	61.39	72.25	149.00	4669.00	-
Oct-11	116.34	1.59	217.57	297.24	24.48	0.29	68.00	81.29	162.00	4861.00	-
Nov-11	107.85	2.47	186.56	261.87	27.76	0.37	73.67	89.25	171.00	5122.00	-
Dec-11	113.26	2.85	202.37	229.88	31.20	0.46	79.82	96.24	180.00	4501.00	-
Jan-12	117.54	3.53	204.44	197.01	34.77	0.56	86.04	102.22	189.00	4735.00	-

Table 2 – Comparison of the Predicted vs. Actual Pilot Performance

One major reason for this difference is because of the complex reservoir geology. The reservoir has several clay layers due to which the sweep efficiency may be restricted. One of the wells, 104/10-12-37-01W4/0 was taking most of the injection water and showed a quick response in decrease in water cut after the conformance treatment.

Operationally, it has been a challenge to operate the directional production wells. Complex well structure causes frequent well downtime due to damages to production pumps/tubing.

PRESSURE DATA

For pressure data for injection wells, please refer to 4.1 where individual well injection rates and pressure have been presented.

Flowing pressure data for producing wells was acquired using fluid shots on a monthly basis. The following wells and their fluid shots were acquired.

00/09-12-037-01W4/0	Monthly bottomhole fluid shots
02/15-12-037-01W4/0	Monthly bottomhole fluid shots
02/16-12-037-01W4/0	Monthly bottomhole fluid shots
03/10-12-037-01W4/0	Monthly bottomhole fluid shots
03/16-12-037-01W4/0	Monthly bottomhole fluid shots
04/10-12-037-01W4/0	Monthly bottomhole fluid shots

Pressure data calculated from these fluid shots is given in Figures 18 through 23.

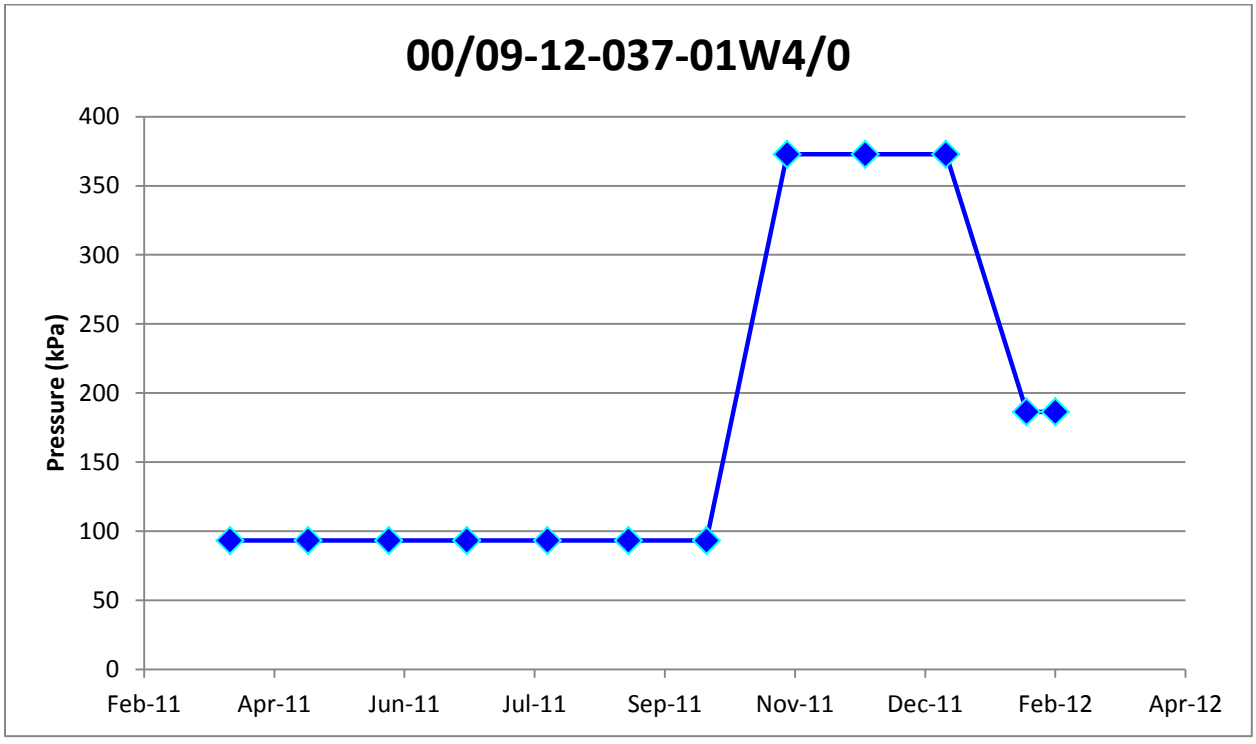


Figure 18 – 100/09-12-37-1W4/0 Bottomhole Flowing Pressure

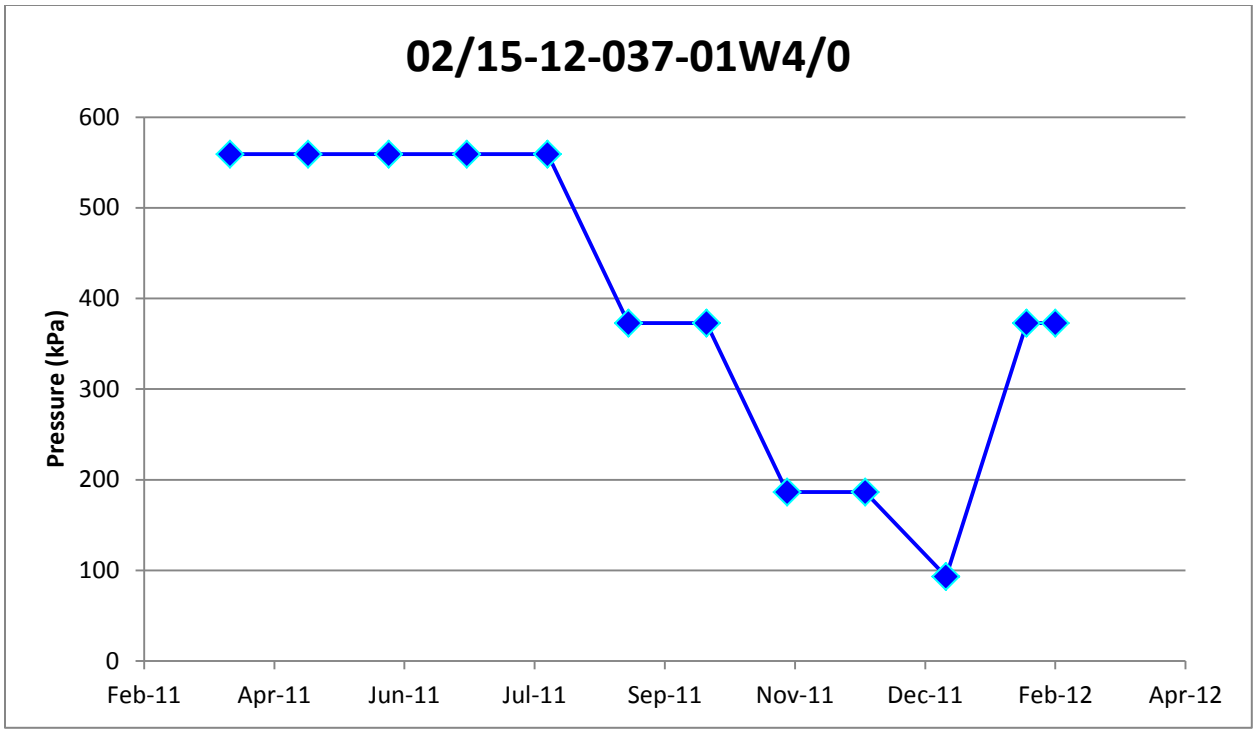


Figure 19 – 102/15-12-37-1W4/0 Bottomhole Flowing Pressure

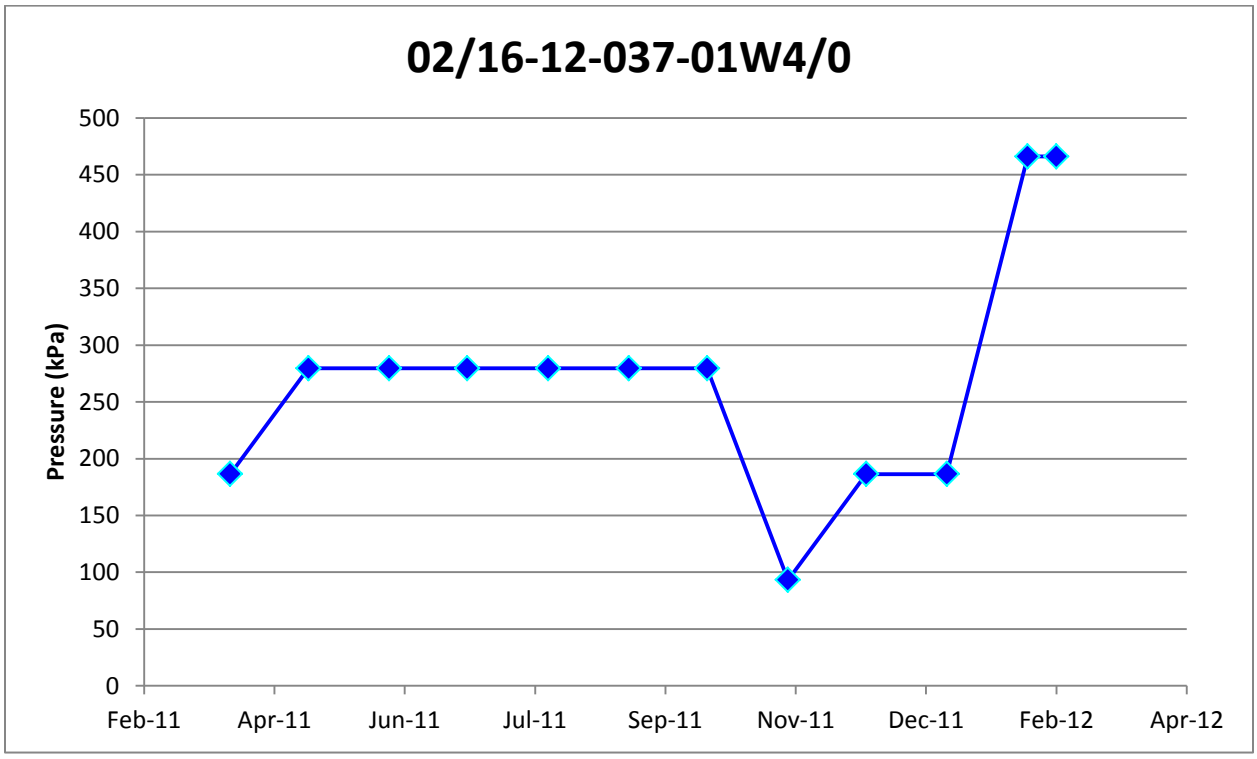


Figure 20 – 102/16-12-37-1W4/0 Bottomhole Flowing Pressure

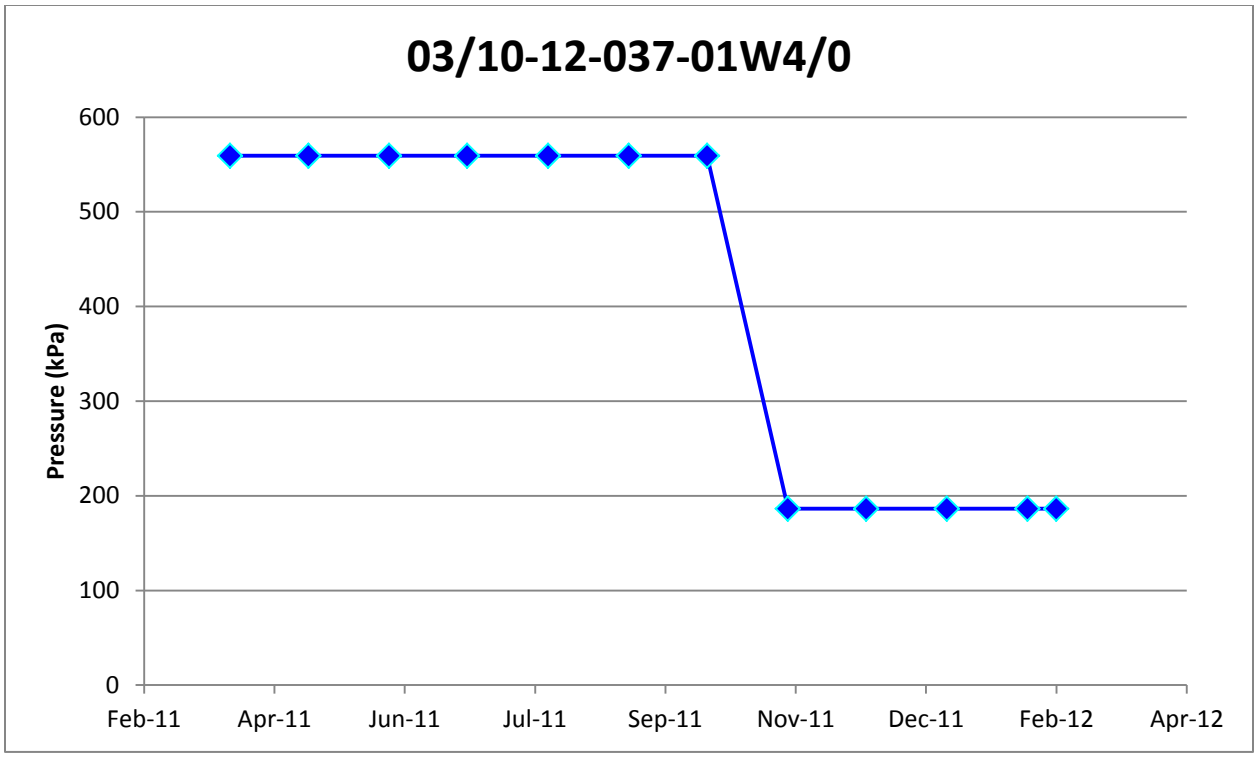


Figure 21 – 103/10-12-37-1W4/0 Bottomhole Flowing Pressure

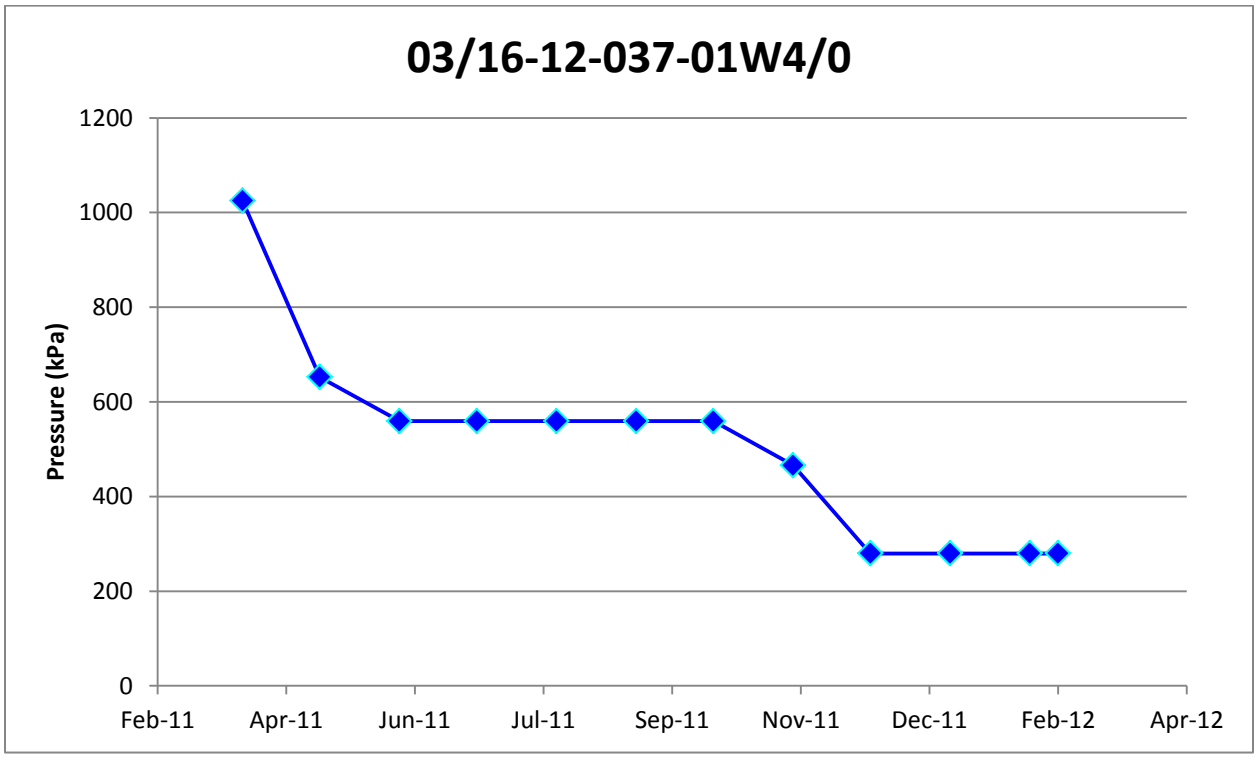


Figure 22 – 103/16-12-37-1W4/0 Bottomhole Flowing Pressure

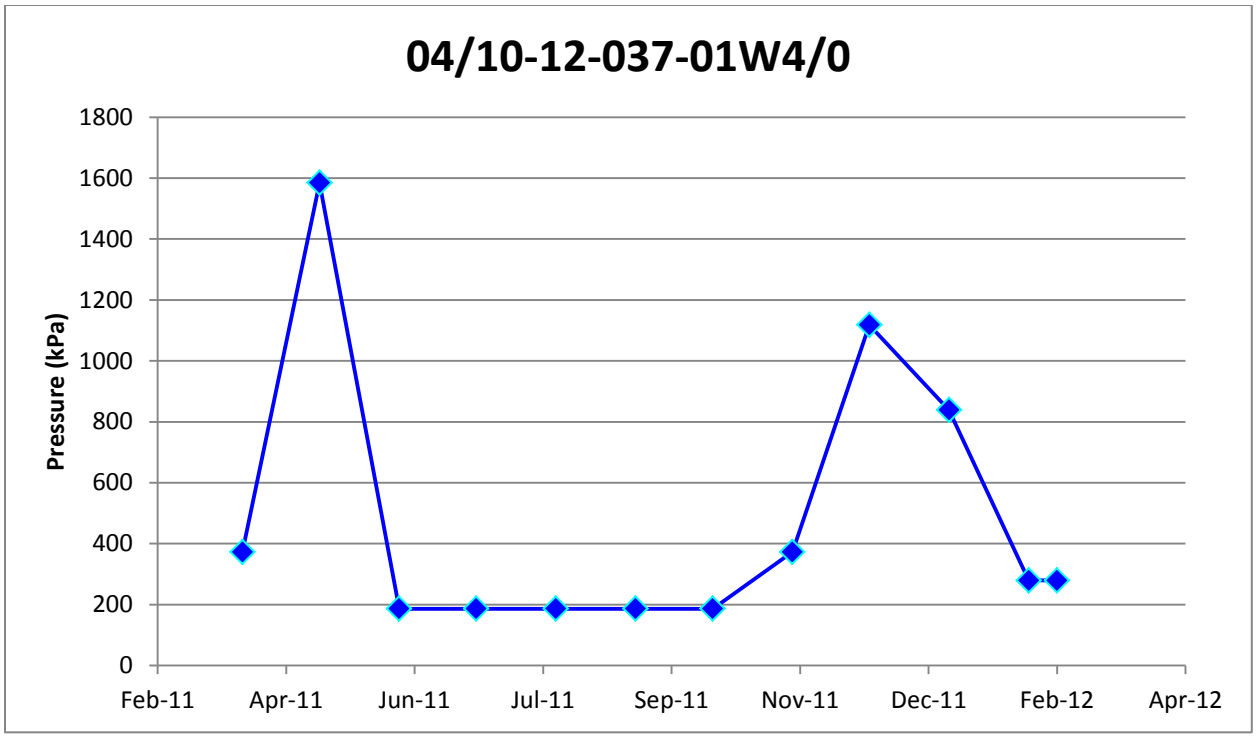


Figure 23 – 104/10-12-37-1W4/0 Bottomhole Flowing Pressure

Pressures were acquired in the pilot area for the new drills in 2010. All the historical pressures for the pilot area are given in Table 3.

UWI	Date	MPP (mKB)	Pressure (kPaa)
100/09-12-037-01W4/00	6-Mar-10	788	7095
100/10-12-037-01W4/00	1-Dec-72	780.9	5705
100/10-12-037-01W4/00	7-May-74	780.9	5409
100/10-12-037-01W4/00	28-Apr-08	780.9	616
100/16-12-037-01W4/00	3-Feb-10	788	9731
102/09-12-037-01W4/00	3-Mar-10	783.5	2319
102/10-12-037-01W4/00	30-Jan-10	790.8	8068
102/15-12-037-01W4/00	11-Feb-10	787.9	7244
102/16/12-037-01W4/00	11-Feb-10	786.3	8597
103/10-12-037-01W4/00	11-Feb-10	787.33	5652
103/16-12-037-01W4/00	5-Mar-10	787.33	6954
104/10-12-037-01W4/00	5-Mar-10	789.3	6893

Table 3 – Shut In Pressures

PILOT DATA

ACTIVITIES CONDUCTED (GEOLOGY, GEOPHYSICS, LABORATORY STUDIES, SIMULATIONS, PRESSURE AND TEMPERATURE, ETC.)

POLYMER BREAKTHROUGH TESTS

Clay tests are qualitative indicators of determining if polymer is in the produced fluid stream. It is based upon the principle of flocculation. Flopaam polymer products are typical anionic copolymers which can promote flocculation or the bridging of solids together to help promote settling in static environments or in dynamic environments found in mechanical devices that are designed to eliminate solids like centrifuges and belt presses.

Clay tests do not provide the amount of polymer present in the fluid stream but it is an indicator if it is present at all. These tests were done every Tuesday after polymer injection started in the pilot area in East Bodo. The tests started showing positive results for polymer in the liquid stream April 2011, the well 104/10-12 was the first production well to show polymer breakthrough on 14th April 2011. Figure 24 shows the breakthrough times of polymer based on Clay tests.

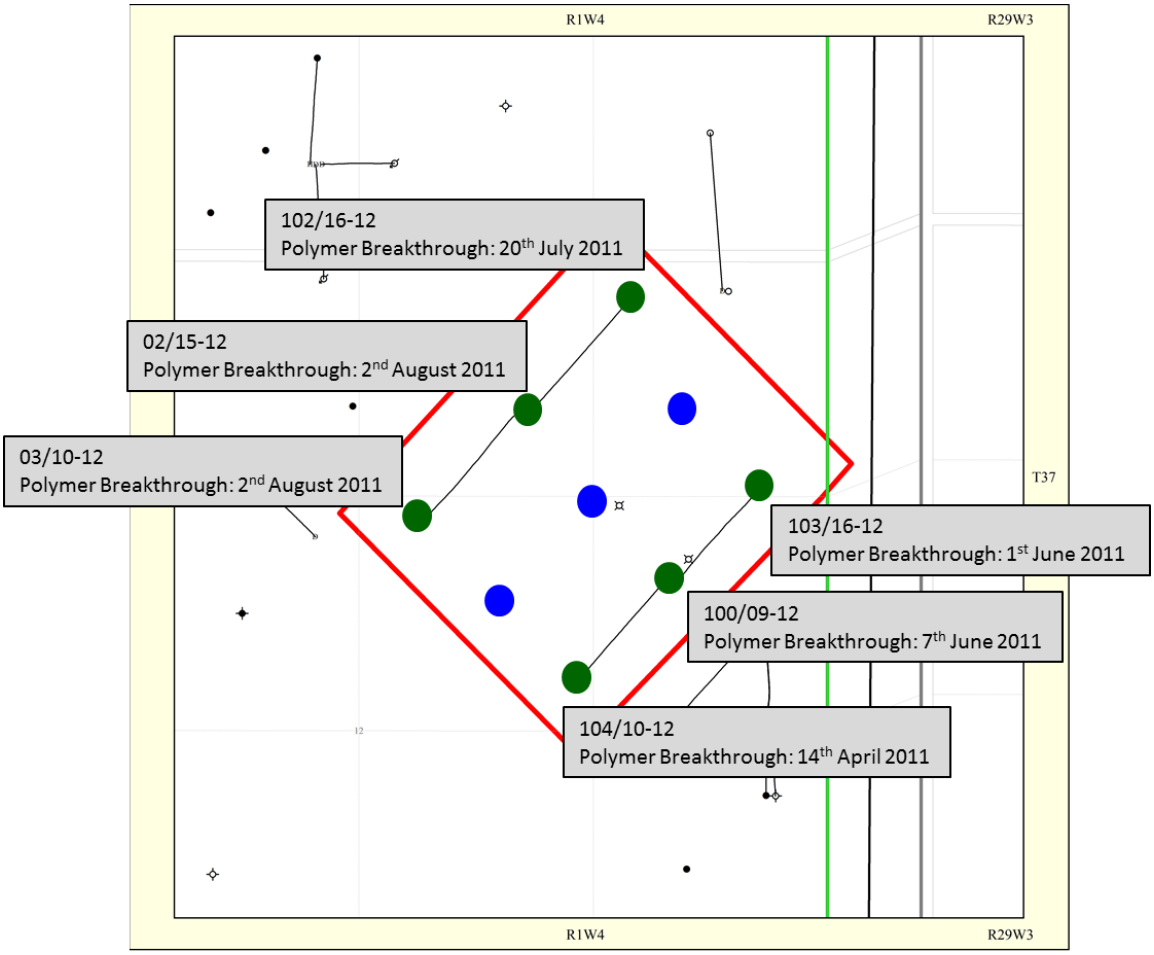


Figure 24 – Positive Results on Clay Tests

More quantitative starch iodide tests were also conducted in the pattern by Alberta Innovates Technology Futures (AITF). This technique uses a colorimetric method where the color is produced in a sequence of reactions. Sixteen of produced oilfield water samples were provided by Pengrowth to AITF, which included produced water samples from wells beyond the pattern. Polymer was detected in only one sample from a well outside the pattern. This was contradictory to the clay tests which had shown polymer breakthrough in these wells already. A repeat analysis was performed which showed polymer concentrations in produced water in concentrations as shown in Table 4.

Sample Name	Sample Received	Sample Dated	Concentration HPAM ppm
SOURCE IFI/9-12-37-1W4	Sep 12 2011	Aug 11 2011	0
100/8-12-37-1W4	Sep 12 2011	Aug 11 2011	12
B1 102/16-12-37-1W4	Sep 12 2011	Aug 11 2011	12
B2 102/16-12-37-1W4	Sep 12 2011	Aug 11 2011	12
102/8-12-37-1W4	Sep 26 2011	Sep 16 2011	13
102/15-12-37-1W4	Sep 26 2011	Sep 16 2011	10
103/10-12-37-1W4	Sep 26 2011	Sep 16 2011	10
B1 100/16-16-37-1W4	Oct 14 2011	Oct 06 2011	7
B2 100/16-16-37-1W4	Oct 14 2011	Oct 06 2011	8
103/1-21-37-1W4	Oct 14 2011	Oct 06 2011	0
100/6-22-37-1W4	Oct 14 2011	Oct 06 2011	11
100/8-21-37-1W4	Oct 14 2011	Oct 06 2011	9
9-22-37-1W4	Oct 14 2011	Oct 06 2011	6
11-22-37-1W4	Oct 14 2011	Oct 06 2011	10
B1 100/14-15-37-1W4	Oct 14 2011	Oct 06 2011	8
B2 100/14-15-37-1W4	Oct 14 2011	Oct 06 2011	6

Table 4 – Polymer Concentrations from Starch Iodide Tests

Tracer Tests

Tracer Tests were run in the field to determine possible communication between the injectors. These tests included mixing a dye with the injection water. However, the injected dye was not observed in the production fluids. It is difficult to understand the reason for this test failure. The dye may have absorbed on to the water or lost its color to the rock. It may also have mixed up with the oil and water losing its concentration thus yielding no results. The test failure was not investigated in detail.

Associated Polymer With Produced Water – Field Trial

A field trial was conducted to test the application of associative polymer with the produced water. The objective of this test was to confirm if associative polymer can be used with produced water for a full field polymer flood application. Details of this trial are given below.

Field trial parameters and results are discussed below.

June 22 – Baseline prior to field test

- Mother Solution:
  - Concentration : 4000 ppm
  - Measured viscosity: 1300 – 1330 cp
- Injection Well
  - Concentration: 1750 ppm
  - Measured viscosity: 48 – 58 cp

After the above baseline measurements, the water was switched to produced water.

June 23 (24 hrs) – 2.15 hrs Polymer Resident Time

- Mother Solution:
  - Concentration: 4000 ppm
  - Measured Viscosity: 35 cp
- Injection Well
  - Concentration: 1750 ppm
  - Measured Viscosity: 8 cp

June 24 – Increase Mother Solution concentration (24 hrs)

- Mother Solution:
  - Concentration: 8000 ppm
  - Measured Viscosity: 855 cp
- Injection Well:
  - Concentration: 1750 ppm
  - Measured Viscosity: 11 cp

June 26 – Back to fresh water

Post this trial, a second trial was also conducted. The tests show the following results.

Day 1:

- Mother Solution: 697.5 cp
- Injection Solution: 18.5 cp

Day 2:

- Mother Solution: 168.3 cp
- Injection Solution: 14.1 cp

Day 3:

- Mother Solution: 117.5 cp
- Injection Solution: 11.0 cp

Day 4:

- Mother Solution: 140.0 cp
- Injection Solution: 14.8 cp

Table 5 shows the injection pressures on the injection wells which shows that the injection pressures were high and this confirms that the associative polymer was generating a high effective in-situ reservoir viscosity.

	Day 1	Day 2	Day 3	Day 4
	Pressures (kPa)			
102/10-12-37-1W4/0	7320	7300	7540	7540
102/9-12-37-1W4/0	8500	8500	8637	8634
100/16-12-37-1W4/0	4990	4900	4907	5044
100/10-12-37-1W4/0	0	0	0	0

Table 5 – Injection Pressures during field trial

Based on this field tests, the following observations were drawn.

1. The result in terms of apparent viscosity are significantly reduced compared to that of the lab
2. The WHIP during the test show higher pressures for the same rate thus confirming that the polymer solution was generating high in-situ viscosity in the reservoir

The field trial concluded that the associative polymer is compatible with the produced water and it generates a high in-situ reservoir viscosity (based on the injection pressures). This test was an important step in implementing associative polymer flood with produced water in the commercial application of polymer flood in East Bodo.

EAST BODO ASSOCIATIVE POLYMER LAB STUDY

This study was undertaken to investigate the chemical flood potential of associative polymers in East Bodo heavy oil pools using saline water sources. Several polymer samples were tested which included hydrolyzed polyacrylamide (HPAM) and associating HPAM mixed in Ribstone Creek (fresh water). Associative polymer in combination with Ribstone Creek brine showed favorable results.

The following materials were used to conduct the laboratory evaluations:

Core: Reservoir core plugs were frozen to maintain reservoir fluids (3.75 cm diameter)

Brines: 100/9-14-37-1W4 Injection Brine

102/12-14-37-1W4 Sparky Water

100/09-12-37-1WM (Ribstone Creek Water)

Oil: 100/4-24-37-1W4

Polymers: Flopaam 3630 (HPAM)

Commercial DPRG 2169 (associating HPAM)

Several scenarios were tested. These are given below:

1. Coreflood 1: Optimum Associative Polymer Formulation (oil absent)
2. Coreflood 2: Associative Polymer Flood (with dead oil)

These tests were compared to the tests which were previously acquired in a Joint Industry Project with AITF and several different industry companies. In historical order, the following experiments were conducted:

1. HPAM Flood, 1500 ppm Flopaam 3630 mixed in saline battery injection water
2. Associative Polymer Flood, 1500 ppm DPRG 2169, mixed in Ribstone Creek water
3. Associative Polymer Flood, 1500 DPRG 2169 mixed in saline battery injection water

Several observations were made from the production profiles of these tests.

1. The lowest polymer flood recovery was made with partially hydrolyzed polyacrylamide (HPAM) mixed in battery injection brine
2. Associative polymer DPRG 2169 mixed in battery injection brine achieved a higher oil recovery in comparison to the recovery of the HPAM mixed in battery injection brine.
3. Associative polymer DPRG 2169 mixed in Ribstone Creek water achieved the highest oil recovery. The synergistic effects of fresh water and polymer can lead to significantly higher oil recoveries.

Figure 25 shows the results of the core-flood recoveries for partially hydrolyzed polyacrylamide (HPAM) in injection brine and associative polymer DPRG 2169 in injection brine and Ribstone Creek fresh water.

Following conclusions were drawn from this study.

1. Using the more saline water has more detrimental results on the effective viscosity of Flopaam 3630 (partially hydrolyzed polyacrylamide) in comparison to the associative polymer DPRG 2169.
2. The associative polymer 1500 ppm DPRG mixed in battery brine recovered a total of 68% OOIP, 32% incremental over waterflood. The associating polymer DPRG 2169 generated an effective viscosity just over 100 mPa.s mixed in battery injection brine.
3. In comparison, the associative polymer DPRG 2169 in Ribstone Creek fresh water achieved an incremental recovery of 34%.
4. The higher effective viscosity of the associating polymer is generated in part by the higher polymer retention.
5. The combination of associative polymer DPRG 2169 and fresh Ribstone Creek water achieved the highest ultimate recovery due to the synergy of mobility control and the low salinity effect on oil recovery.

In addition to these tests, the associative polymer DPRG 2234 with a greater degree of association was also tested into the core. Essentially, the DPRG 2234 generated more than twice the effective in

situ viscosity as DPRG 2169. The viscosities for the three polymers (partially hydrolyzed polyacrylamide HPAM, associative HPAM DPRG 2169 and higher associating HPAM DPRG 2234) in injection brine are shown in Figure 26.

Based on these tests, for the East Bodo Upper Mannville "A" pool polymer flood pilot, decision was made to use the associating polymer DPRG 2169 in fresh water brine. However, for the full field commercialization, the higher associating polymer DPRG 2234 is being used with battery injection brine.

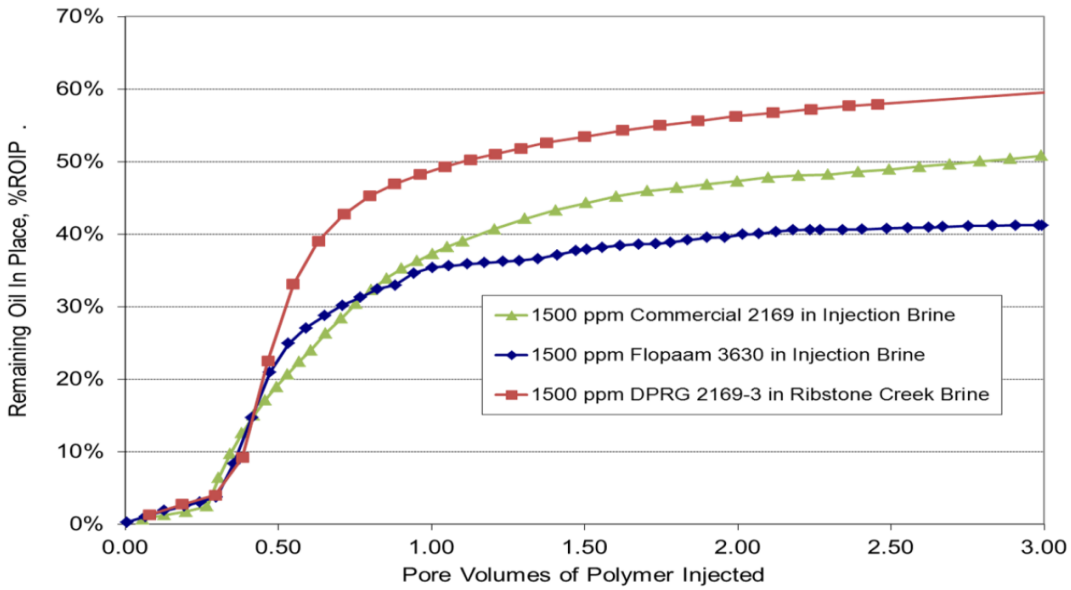


Figure 25 – Core-flood Recoveries

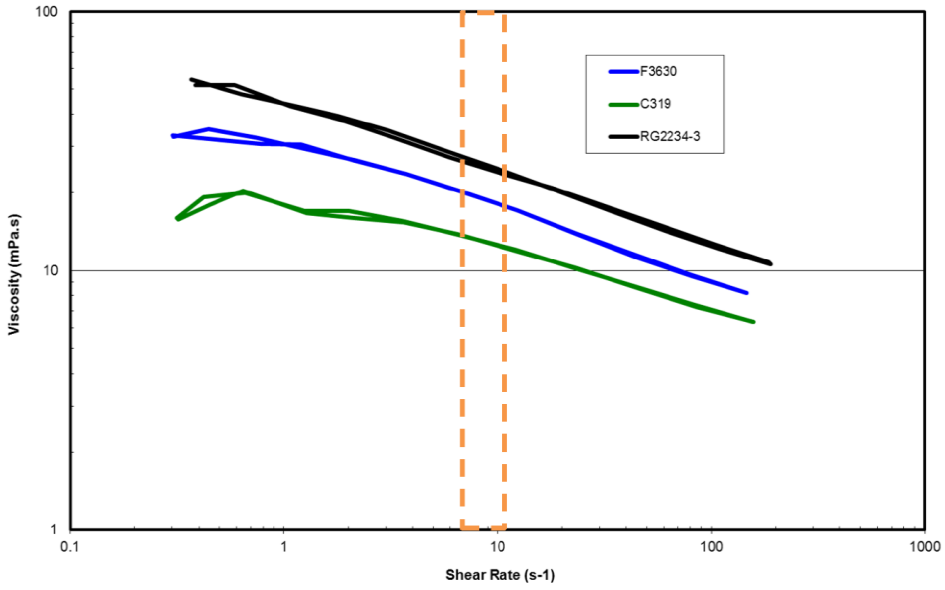


Figure 26 – Viscosity of three polymers in Injection Brine

WATER CONFORMANCE TREATMENT

A water conformance treatment was performed on the well 104/10-12-037-01W4/0 in October 2011. This well had started at a high water cut and maintained at 75-80%. It was believed that highly permeable channels existed between the injector 100/10-12-037-01W5 and 104/10-12-037-01W4/0. The purpose of the project was to preferentially place cross-linked polymer gel deep in to only the rock strata that has already been swept in the area affected by this injector.

A total of 420 m3 of cross-linked polymer solution was injected in the reservoir. An additional 30 m3 of solution was planned to be injected but injection was terminated because the maximum pressure limit was reached. It was believed that a large enough volume of sufficiently strong gel was placed and that a satisfactory level of resistance (as dictated by pressure response) was achieved to improve conformance and sweep efficiency around this well. The treatment parameters and plot are given in Table 6 and Figure 27.

Stage No.	Begin Date	Begin Time	End Date	End Time	BG-1210 Polymer		XL-100 Cross-linker		Gel	WHP (kPag)		BHP (kPa)		Rate (m^3PM)		Comments
					Ppm	Kg	Ratio	Kg	m^3	Begin	End	Begin	End	Begin	End	
1	10/5/2011	12:50 PM	10/6/2011	7:46 AM	6000	375	40	81	62.6	0	2263	NA	9910	0.055	0.055	
2	10/6/2011	7:46 AM	10/10/2011	4:00 AM	4000	1205	40	262	301.9	2263	7444	9910	15091	0.055	0.055	
3	10/10/2011	4:00 AM	10/10/2011	9:18 PM	6000	39	40	9	55.7	7444	8518	15091	16165	0.055	0.055	
4	10/10/2011	9:42 PM	10/11/2011	12:11 AM	0	0		0	0	8403	8553	16050	16200	0.055	0.055	8.2 m^3 water
Totals						1619		352	420							

Table 6 – Gel Treatment Parameters

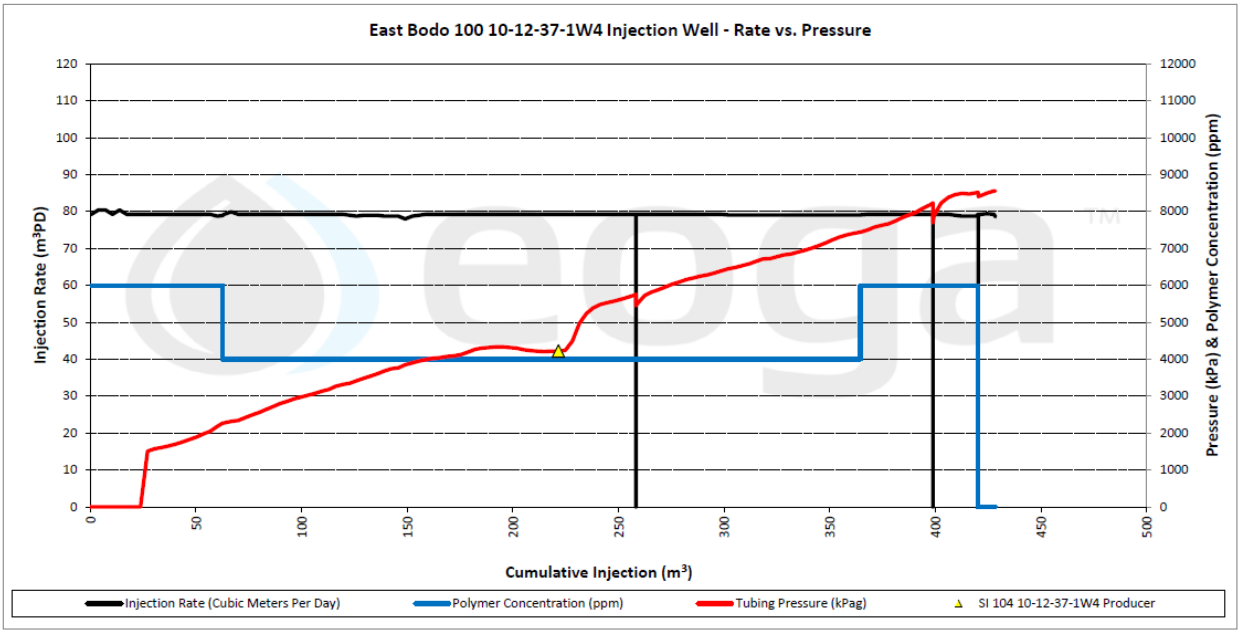


Figure 27 – Gel Conformance Treatment Plot

After the treatment job, the well 104/10-12-037-01W4/0 was put back on production. The well showed improvement in oil rates from 2 to 3.5 m3/d and decrease in water cut from 80% to 60%. The injection pressure on the well 100/10-12-037-01W4/0 also increased confirming a successful treatment.

INTERPRETATION OF PILOT DATA

Production response has been observed to some degree in all the wells in the pilot area. Differences in polymer breakthrough between the wells indicate that the reservoir is heterogeneous and sweep efficiency varies between the wells.

A discussion on the performance of each of the pattern wells follows.

Producer 100/09-12-37-1W4/0 was drilled in 2010. The well started off at initial oil production rates of 0.5 m3/d but the rates improved with response to the water flood. The wells oil rates peaked at 1.4 m3/d and water cut dropped from 55% to 35% in response to the polymer flooding. Oil rates and water cut have remained stable throughout much of 2011. Polymer breakthrough in this well was achieved on 7th June 2011, approximately 3 months after the polymer injection started.

Producer 102/15-12-37-1W4/0 is a new well drilled in 2010. Well production increased from 1.5 m3/d to 4.8 m3/d in December 2011, in response to waterflooding. After polymer injection began in March 2011, the oil production has declined only slightly from 4 m3/d to 3 m/d and water cut has remained stable around 60%.

Producer 102/16-12-37-1W4/0 has not shown strong response to the polymer flood pattern. Oil production rates have dropped from 2.2 m3/d to 1.2 m3/d and water cut have increased from 15% to 40%. Although well performance does not indicate strong response to polymer flooding, polymer breakthrough was achieved in the well on 20th July 2011.

Producer 103/10-12-37-1W4/0 has shown the one of the strongest response to polymer flooding. Oil Production rates had increased from 0.9 m3/d to 1.2 m3/d and water cut had decreased from 88% to 76% in response to water flooding. After polymer injection, the oil rates have increased from 1.2 m3.d and peaked at 4 m3/d and water cut decreased from 76% to 25% in September 2011. Since then, the oil production rates have decreased slightly and water cut increased only slightly. Polymer breakthrough in this well was achieved in 2nd August 2011.

Producer 103/16-12-37-1W4/0 has also shown good response to polymer flooding. Increase in oil rates were observed from 1.1 m3/d to 3.7 m3/d and water cut has decreased from 92% to 78%. Oil production rates and water cut have been stable for the past six months. Polymer breakthrough was observed in 1st June 2011.

Producer 104/10-12-37-1W4/0 showed good response to water flooding with oil rates increasing from 0.4 m3/d to 1.6 m3/d. After polymer injection began, oil production rates peaked at 2.3 m3/d in July 2011. This well showed possible channeling of water as oil production rates decreased in the end of 2011. A water conformance treatment was performed after which the oil production rates increased to 2 m3/d and water cut decreased to 65%.

Injector 100/10-12-37-1W4/0 had an average water injection rate of 40 m3/d at a tubing pressure of 0 kPa WHIP. Post polymer injection the average water injection has been stable at 20 m3/d. Wellhead Injection Pressure was measured post October 2011. Hall plot for the injector is given in Figure 28.

Injector 100/16-12-37-1W4/0 has been on injection since 2004. Until March 2011 when polymer injection began in this well, the well had injected a cumulative volume of 38,400 m3. The well has injected at approximately 16-17 m3/d at a WHIP of approximately 5000-6000 kPa. The injector shows a strong influence on the producer 103/16-12-37-1W4/0. The Hall Plot for this injector is given in Figure 29.

Injector 102/10-12-37-1W5 shows average injection rates of 21 m3/d at an average WHIP of 6,900 kPa. Post polymer injection, the average injection rates of 15 m3/d at a WHIP of 8,000 kPa. The hall plot shows a slight change of slope post polymer injection which is expected due to higher injection viscosity but there is no indication of skin or injection damage on the well.

Overall, the pilot shows reasonable response to the polymer injection in East Bodo Upper Mannville "A" pool. Oil production rates have increased from 11 m3/d to 15 m3/d and water cut has decreased from 70% to 65%. Last month's production data shows rates dropping and water cut increasing which is due to the channeling of injected fluid with the well 104/10-12. Figure 31 shows the entire pilot performance.

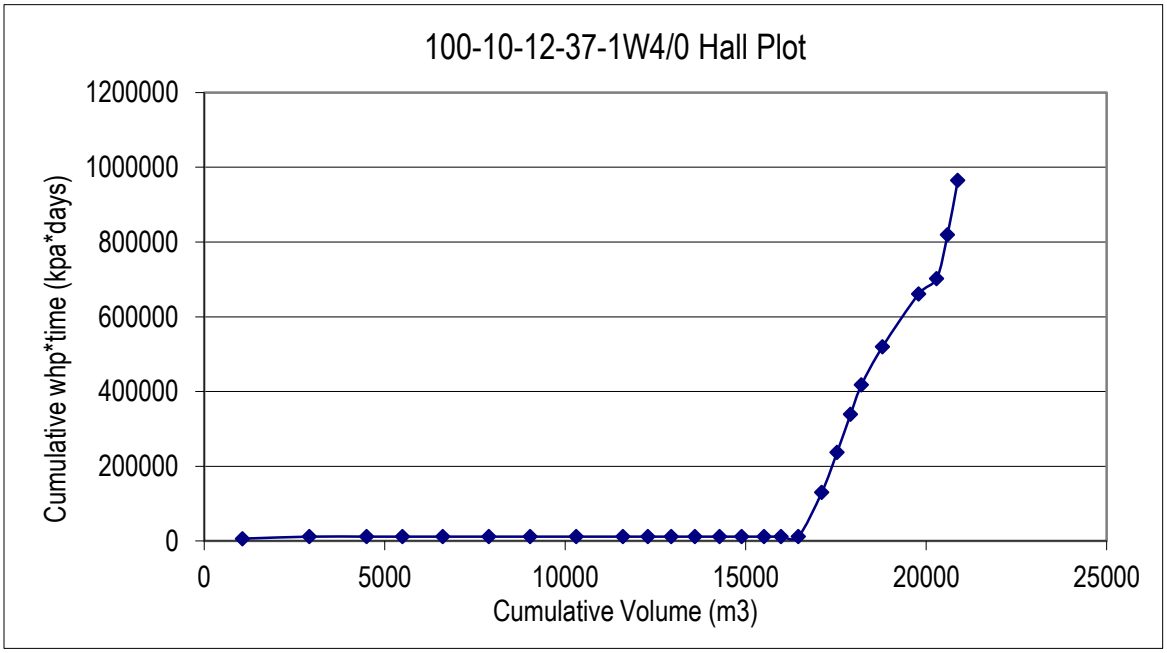


Figure 28 – 100/10-12-37-1W4/0 Hall Plot

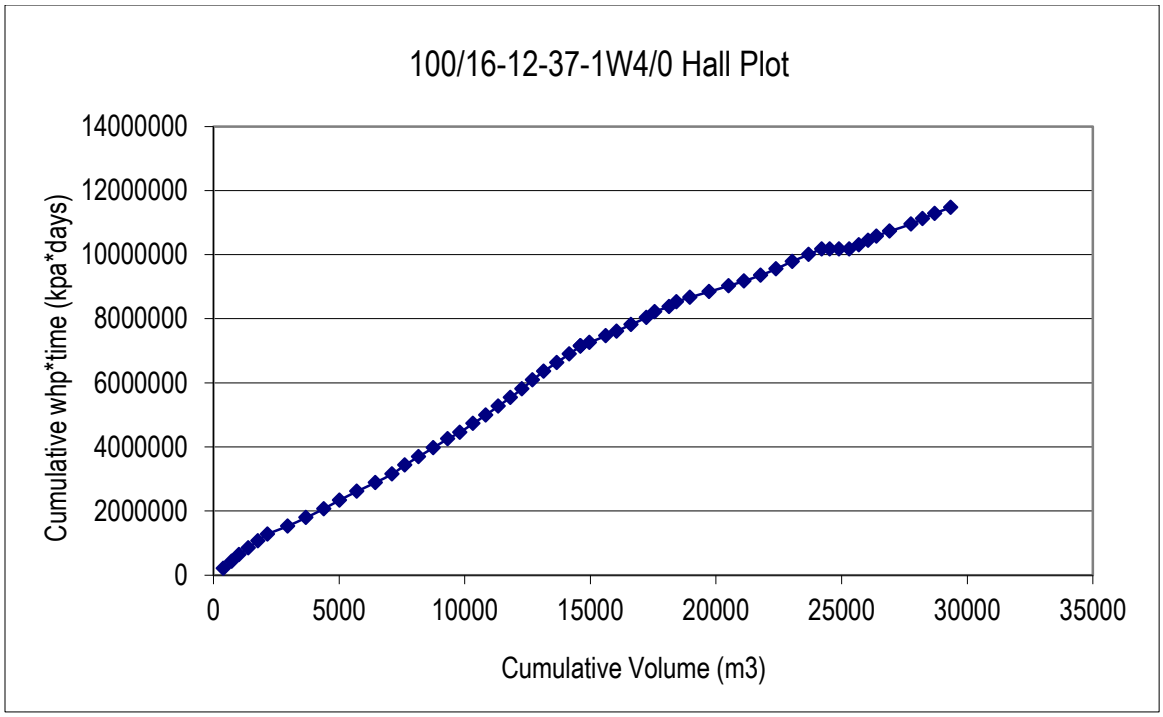


Figure 29 – 100/16-12-37-1W4/0 Hall Plot

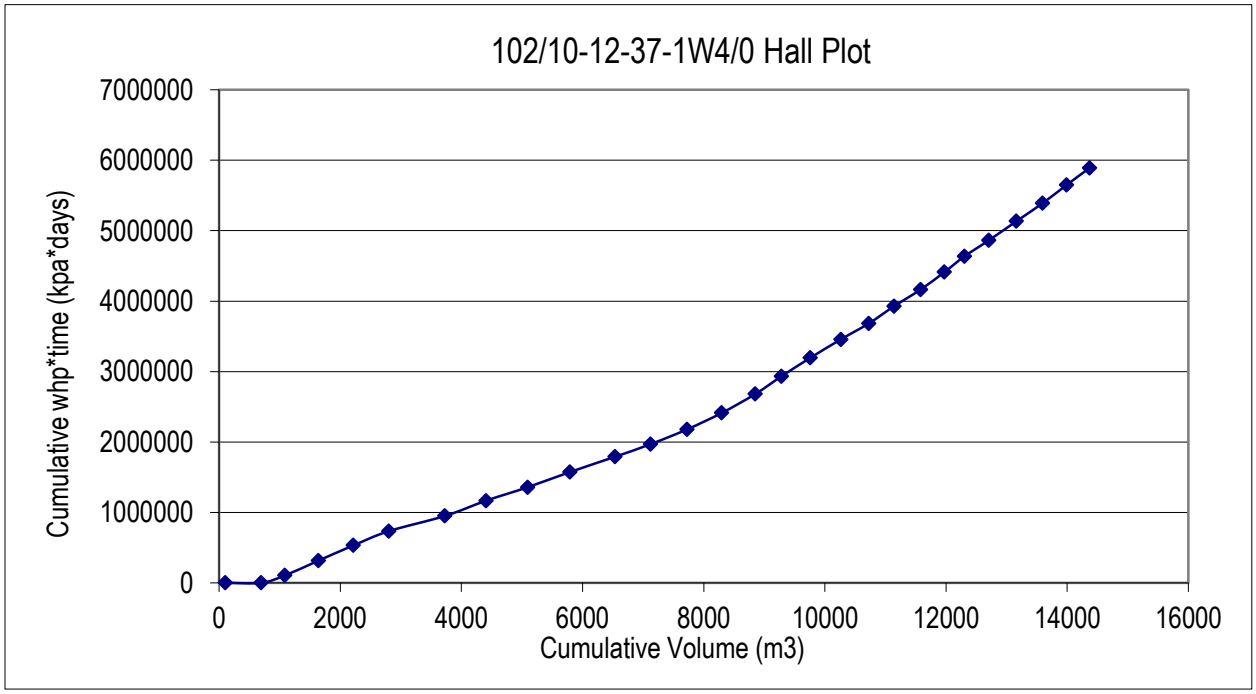


Figure 30 – 102/10-12-37-1W4/0 Hall Plot

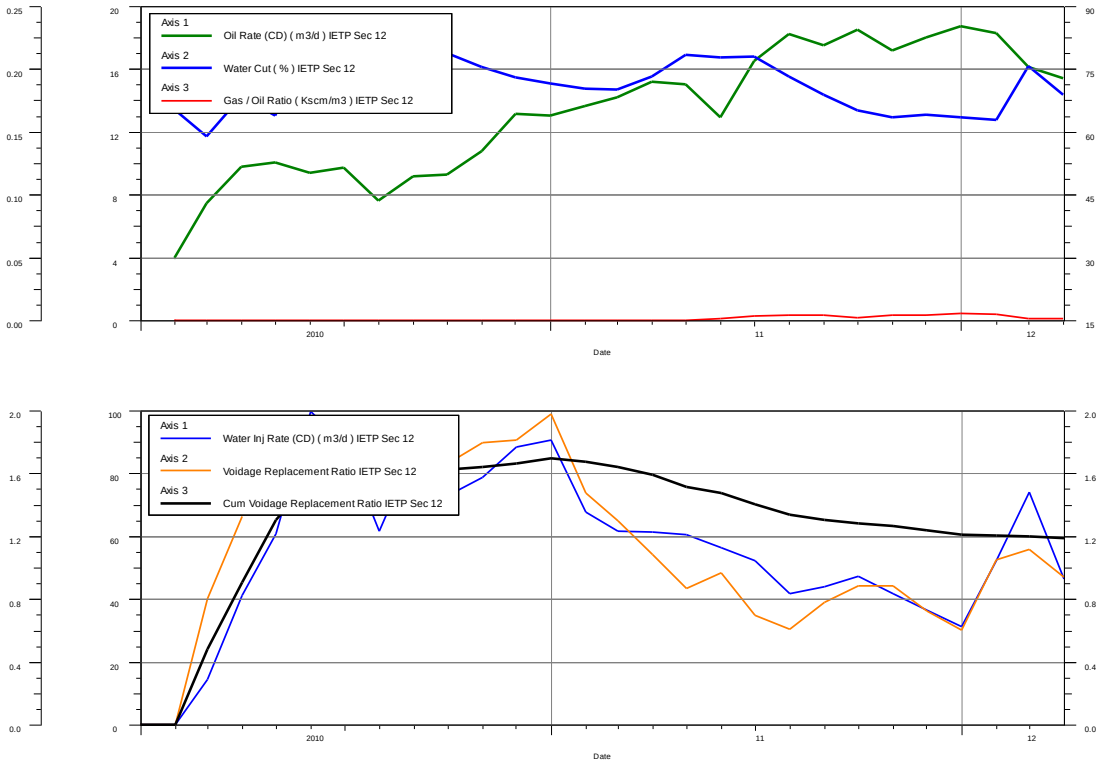


Figure 31 – East Bodo Upper Mannville "A" Pool Associative Polymer Pilot Performance

PILOT ECONOMICS

SALES VOLUMES OF NATURAL GAS AND BY PRODUCTS

Natural gas from East Bodo is not being sold. There are very low volumes of gas production from the pilot area and all of the gas from this property is being used as an energy source for running production well pumps.

REVENUE

Please refer to Appendix E.

CAPITAL COSTS

Table 7 shows the expenditures since the inception of the project.

	IETP ($M)	2010 ($M)	2011 ($M)	**Total ($M)**
Polymer Skid & Polymer Purchase	3,481.2	-	3,481.2	**3481.2**
Drilling	3,860.9	3,860.9	-	**3,860.9**
Completion	2,623.4	2,623.4	-	**2,623.4**
Pipeline & Surface Pipeline	2,178.1	2,178.1	-	**2,178.1**
Lab Testing / Core Work	150.0	-	150.0	**150.0**
Conformance Treatment	-	-	113.5	**113.5**
Downhole Work	-	294.7	204.0	**498.7**
Totals	**12,293.6**	**8,957.1**	**3,948.7**	**12,905.8**

Table 7 – Capital Expenditures to data

DIRECT AND INDIRECT OPERATING COSTS

Please refer to Appendix E.

CROWN ROYALTIES, APPLICABLE FREEHOLD ROYALTIES AND TAXES

Please refer to Appendix E.

CASH FLOW

Please refer to Appendix E.

CUMULATIVE PROJECT COST AND NET REVENUE

Please refer to Appendix E.

EXPLANATION OF MATERIAL DEVIATIONS

The only major deviation in the cost is for the water conformance treatment ($ 113.5M) and the down-hole work that was done on the wells to repair completion/broken pumps ($ 498.7M).

FACILITIES

MAJOR CAPITAL ITEMS INCURRED

As noted in section 6.3, key capital expenses were associated with the Polymer Skid, polymer purchase, and the drilling/completion/tie-in of the wells in the pilot ($12,143.6M).

CAPACITY LIMITATION, OPERATIONAL ISSUES AND EQUIPMENT INTEGRITY

POLYMER INJECTION SKID

The polymer injection skid has a capacity of 450 m3/d polymer & water injection mixture. This is more than sufficient capacity for the polymer pilot area. No modifications were required once the skid was operational. The integrity and reliability of the polymer injection skid has been satisfactory over the review period.

POLYMER MIXTURE

The polymer mixture consists of a dry polymer powder that arrives onsite in 750kg bags. The bags are hoisted over a hopper system that measures and feeds the dry polymer thru a slicer to provide more surface area. Once sliced, it is put through the wetting unit and results in the Mother Solution. This high concentration polymer is then added to a baffled tank where more water is added for mixing and hydration time. Once fully hydrated, the polymer is diluted to the injection ppm and pumped to the injectors.

PROCESS FLOW AND SITE DIAGRAMS

Please refer to Appendix F.

EQUIPMENT, CONNECTED PIPELINES, GATHERING AND COMPRESSION FACILITIES

Please refer to Appendix F.

ENVIRONMENTAL/REGULATORY COMPLIANCE

SUMMARY OF PROJECT REGULATORY REQUIREMENTS & COMPLIANCE

REGULATORY COMPLIANCE

The East Bodo Pilot is governed under ERCB EOR approval number 10529I. The pilot is operating with 100% compliance to the requirements of this approval. Highlights of these requirements include:

ERCB EOR Approval is given in Appendix G. Highlights of the ERCB EOR Approval 10529I are :

- Monitor produced water to determine polymer breakthrough.
- Complete 2 part annual reporting process (annual presentation to ERCB and data submission)

The East Bodo Pilot required utilization of the Ribstone Creek fresh water source and this water is governed by Government of Alberta Environment Water Acts. The source water well 9-12-37-1W4 is licensed to divert water under the Province of Alberta Water Act - License No. 00267180-00-00. The pilot is operating within 100% compliance to the requirements of this approval. Highlights of these requirements include:

- The License is given in Appendix G. Highlights of the license are:
- Maximum rate of Diversion = 450 m3/d
- Maximum Annual Diversion = 164250 m3
- Production well and Observation well are both equipped with measuring devices
- Submission of Conservation Plan
- Submission of Annual Monitoring Report

Pengrowth is in full compliance with the above mentioned requirements.

ENVIRONMENTAL PROCEDURES

Emergency Response Procedures

If a spill should occur Pengrowth would implement the Corporate Emergency Response Plan (ERP), if required. These operating procedures (OP) are discussed below.

Environmental Procedures

Pengrowth is committed to minimizing environmental impacts and fully complying with provincial and federal legislation and other requirements within the jurisdictions operated. This commitment is demonstrated through involvement at all levels of the Environmental Management System (EMS). The EMS contains Pengrowth's Environmental Policy and six Operating Practices (OP). These Ops outline Pengrowth's expectation of employees and contractors and ensure compliance with applicable legislation. The six Ops are listed as follows with a brief explanation.

Environmental Incident Reporting
This OP outlines the process followed to identify reporting requirements (Internal vs. regulatory office notification) for environmental incidents. All releases or environmental incidents are reported to the Field Environmental Coordinator to assist with determining the reporting requirements.

Spill Prevention and Clean-up
This OP outlines Pengrowth's expectation and standard for preventing releases to the environment. If a release should occur this practice guides in the clean-up and control of the release event. Depending on the severity of the release, this practice is used in conjunction with the ERP.

General Housekeeping
This OP outlines Pengrowth's expectation to keep worksites clean and free of hazards or pollution.

Surface Water Run-Off Management
This OP outlines Pengrowth's expectation to minimize pollution or damage caused by surface water from rainfall or snow melt. Within this practice the regulatory release limits are outlined.

Production Waste Management
This OP provides guidance in minimizing, effectively managing & properly disposing of wastes generated from production operations. All waste generated by Pengrowth is the responsibility of Pengrowth and is handled according to provincial and federal regulations.

Vegetation Management
This OP outlines Pengrowth's expectation to effectively manage vegetation and minimize problem or noxious weeds. Within this practice various control methods and a restricted pesticide list are identified

FUTURE OPERATING PLAN

PROJECT SCHEDULE

Currently the project is running as planned. Pengrowth is in the process of applying for an extension of fresh water license for supplying injection water for this project.

A polymer flood on commercial scale is being implemented in East Bodo Upper Mannville "A" Pool. This pool consists of two bars, North and South respectively. All the injectors in the South bar have been converted to inject polymer. The rest of the field will be converted to polymer injection shortly. A central skid has been put in place for the commercial scale operation. The commercial scale operation is using produced water with associative polymer DPRG 2234.

OPERATIONAL CHANGES

Pengrowth is not planning any operational changes in the pilot area at the moment. Pengrowth will continue to monitor the flood response and maintain VRR's.

OPTIMIZATION STRATEGIES

Well optimization consists of monitoring fluid levels and adjusting pump parameters to produce at the maximum possible rate. Pengrowth field staff will continue to monitor the fluid levels and pump speeds will be adjusted based on any increase in fluid levels. Pump sizes will be changed as required.

Injection rates are maintained to keep the VRR between 1 – 1.2 to avoid water channeling. Injection pressure is monitored to observe any response of polymer flood.

An annual pressure survey is planned in 2012 to observe changes in reservoir pressure in different parts of the pool in response to polymer flood.

SALVAGE UPDATE

Inasmuch as the pilot injectors and producers will continue operation after conclusion of the pilot, salvage opportunities are limited to polymer injection facilities. The following items will occur at the end of polymer injection pilot:

- Polymer skid will be decommissioned and removed to a new location
- Water source wells will be suspended
- Injectors will be tied to central skid which is currently in operation

INTERPRETATIONS AND CONCLUSIONS

OVERALL PILOT PERFORMANCE

The associative polymer flood pilot in East Bodo Upper Mannville "A" pool is in its second year now. The injection in the pilot area has been stable and increase in oil rates and decreasing water cut has been observed. The pilot continues and Pengrowth will continue to monitor the pilot performance.

LESSONS LEARNED

Based on the field trial conducted for the associative polymer with produced water, one important lesson learned is that water quality is a prime factor in the polymer flood operation. Water properties will have a significant effect in the viscosity of the final injection solution.

DIFFICULTIES ENCOUNTERED

Some of the producing wells are deviated and have caused significant production operation issues. These are long directional wells with dog-legs. These dog-legs cause significant issues to the tubing and rod ware. Bottom-hole equipment was re-designed to work with the complex directional wellbore environment.

TECHNICAL AND ECONOMIC VIABILITY

It is difficult to put a final word on the technical and economic viability of the Associative Polymer Flood Pilot in East Bodo Upper Mannville "A" Pool as it is currently ongoing. It has been established with this pilot that injection of a polymer solution is possible in this reservoir with vertical wells. Increases in oil rates have been observed which is a positive indicator of the pilot performance.

Economically, the pilot is still in stress of the capital expenditure. It is not yet established whether this pilot will generate positive economics, but it has shown way for the design and forecast on commercial scale development.

OVERALL EFFECT ON RECOVERY

Currently, the polymer flood has recovered just over 5,000 m3 which corresponds to a recovery factor of 0.9 %. Target recoveries for the pilot area (based on results so far) are 7.9%.

COMMERCIAL FIELD APPLICATION

Commercial field development of polymer injection in East Bodo Upper Mannville "A" pool is in progress. Apart from the three injection wells in pilot area, thirteen other injectors are currently injecting polymer solution. A central skid has been installed for polymer mixing and injection to these wells.

Thirteen other wells will be put on polymer flooding in the next few months. This will be followed up by additional drilling of injectors and producers which are being drilled to develop a line pattern in the field.

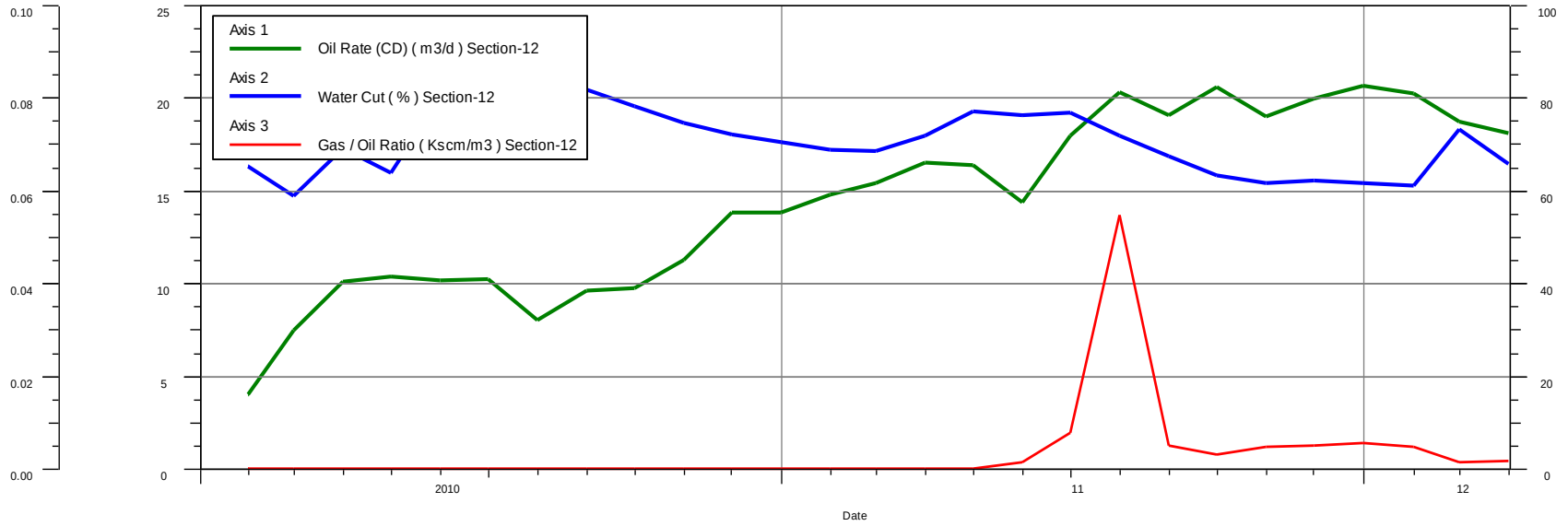
Associative polymer solution with produced water is being injected in the commercial development of the project.

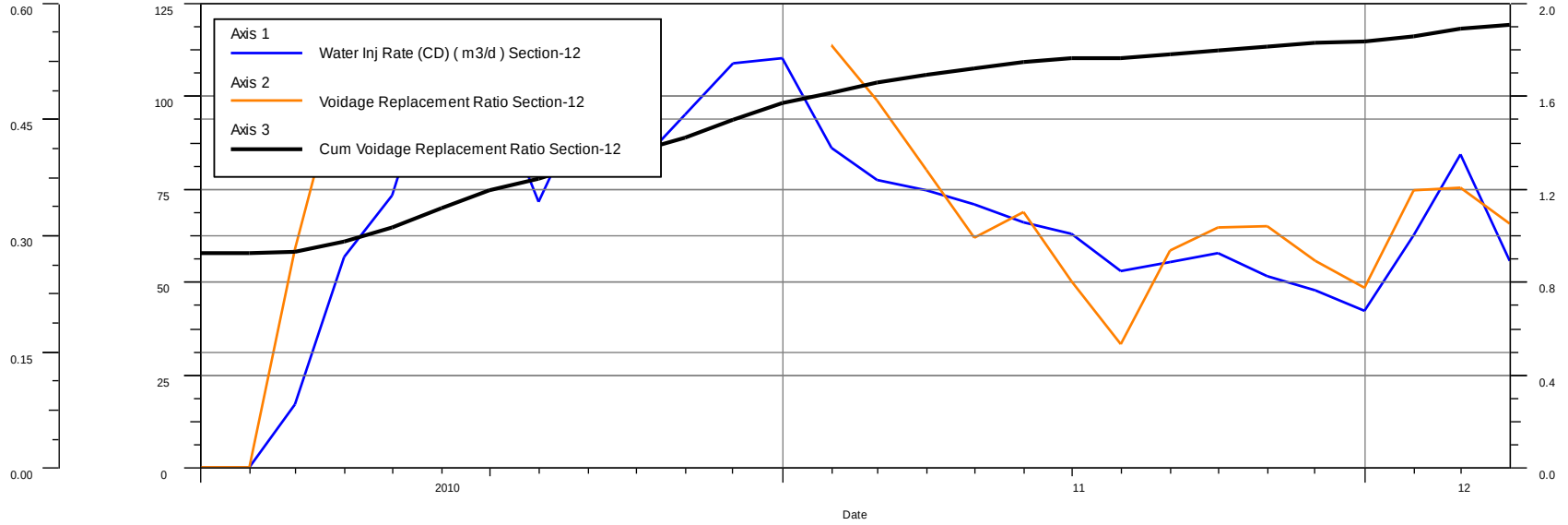
Appendix A

IETP Production Data and Energy Consumption

Date	Monthly Oil	Monthly Gas	Monthy Water	Monthly Injection	Cumulative Oil	Cumulative Gas	Cumulative Water	Cumulative Injection	Energy Consumption	Gas Consumption	Monthly Fresh Water Prod
	m3	e3m3	m3	m3	Mm3	e3m3	Mm3	Mm3	KWH	e3m3	m3
Mar-11	440.2	0	1028.4	1910	4.33	0	12.57	61.61	16557.75	60.19	1668
Apr-11	455	0	1242.3	1841	4.78	0	13.81	61.37	29202.08	60.19	2471
May-11	465.9	0	1691.1	1878	5.25	0	15.5	60.58	30136.23	60.19	2116
Jun-11	387.9	0.5	1355.8	1690	5.64	0.5	16.86	56.33	27840.18	60.19	2007
Jul-11	511.6	1.7	1806.1	1623	6.15	2.2	18.67	52.35	23921.40	60.19	1860
Aug-11	564	2.4	1544.1	1293	6.71	4.6	20.21	41.71	26470.63	60.19	1399
Sep-11	524.8	2.4	1159.3	1317	7.24	7	21.37	43.9	21062.76	60.19	689
Oct-11	573.4	1.4	1072.3	1465	7.81	8.4	22.44	47.26	23213.93	60.19	1371
Nov-11	514.4	2.1	889.8	1249	8.32	10.5	23.33	41.63	24466.55	60.19	1376
Dec-11	558.2	2.5	997.4	1133	8.88	13	24.33	36.55	32153.38	60.19	1165
Jan-12	579.3	3.1	1007.6	971	9.46	16.1	25.34	31.32	36526.67	60.19	1102

Section 12 Production Data





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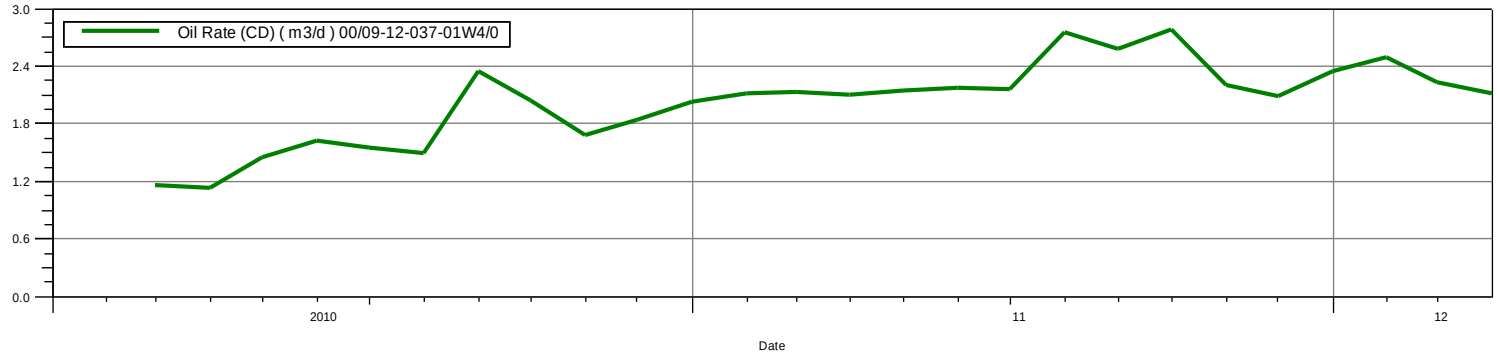

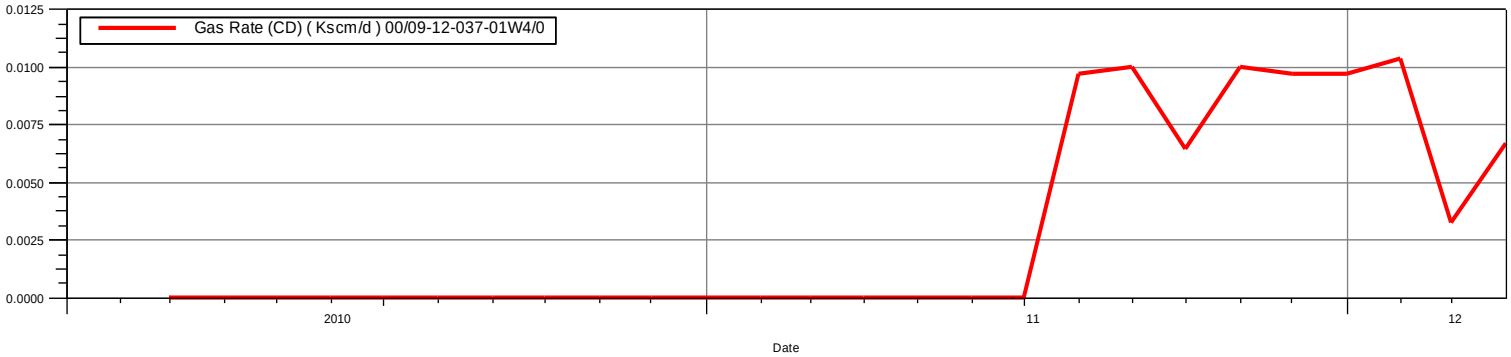

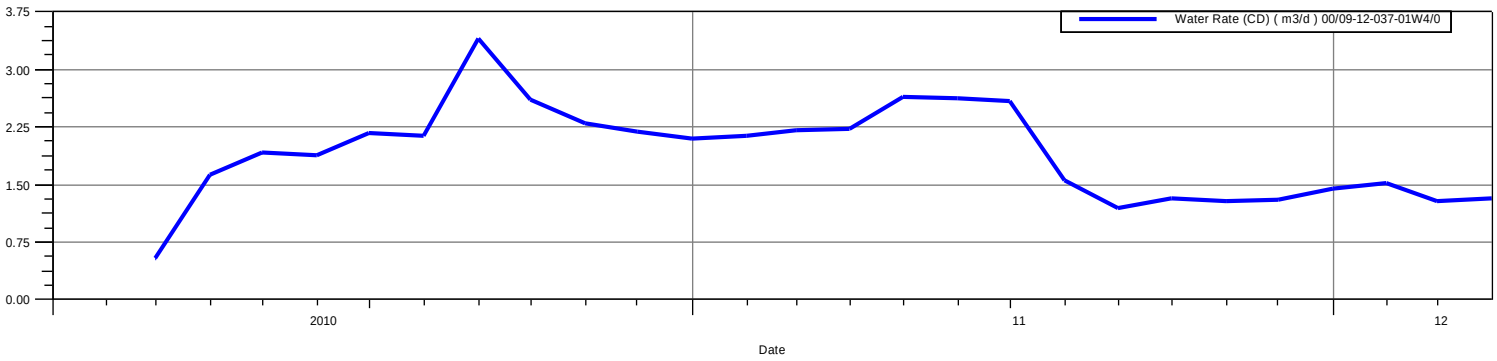

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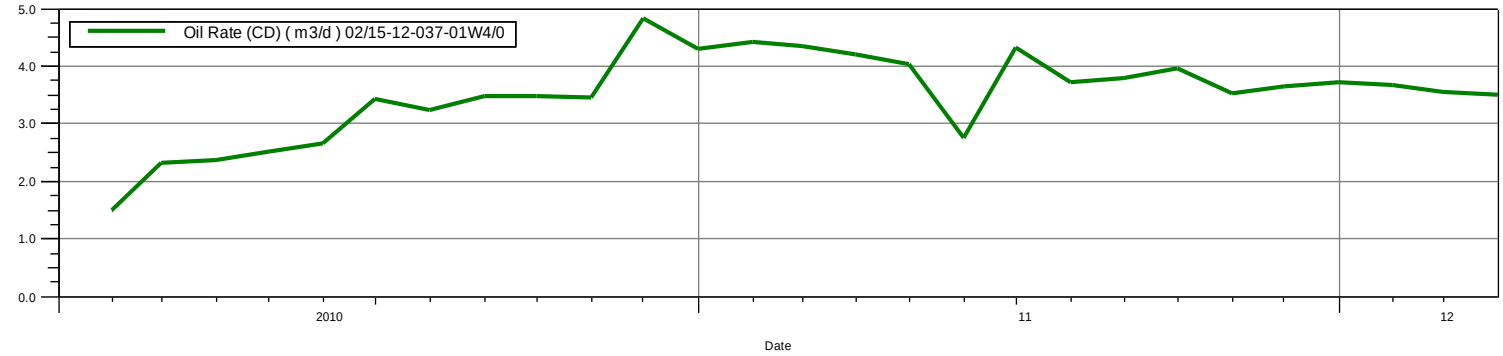

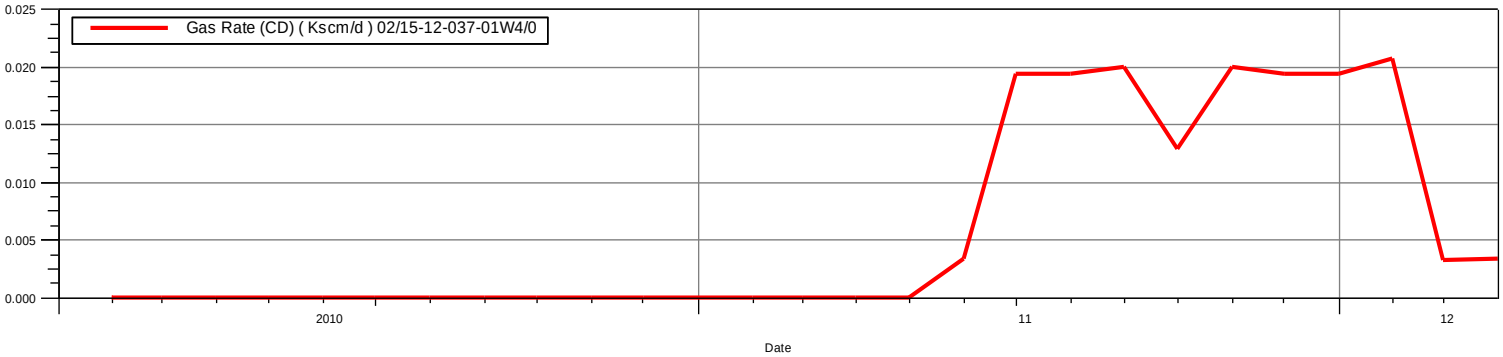

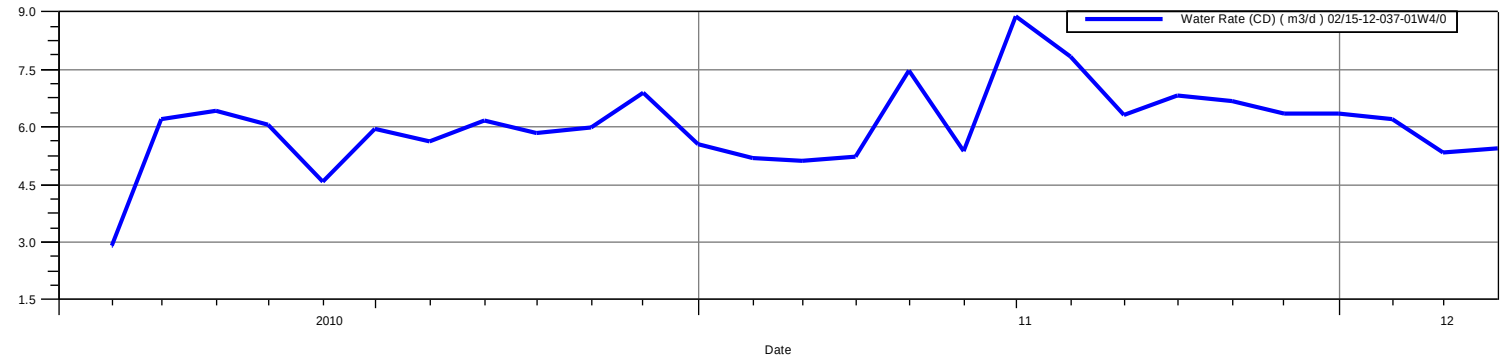

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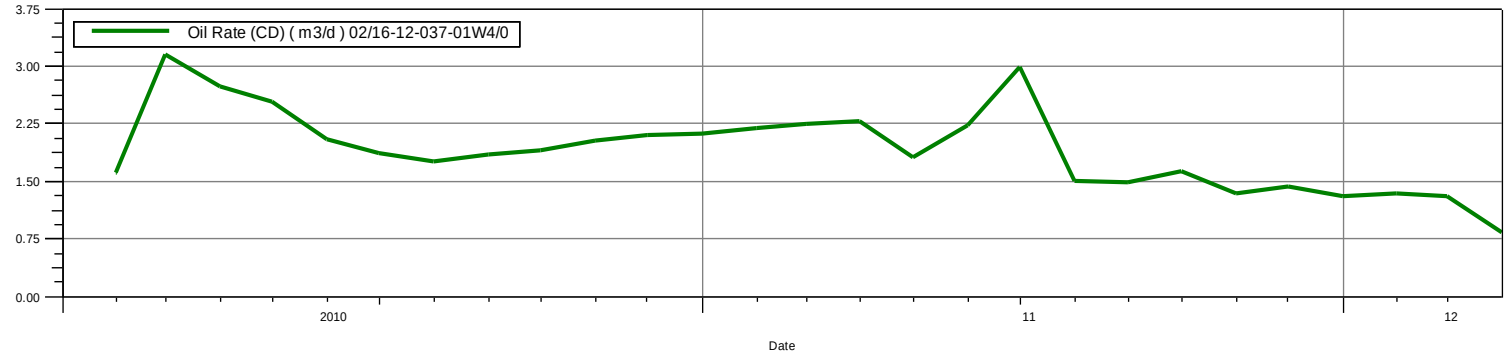

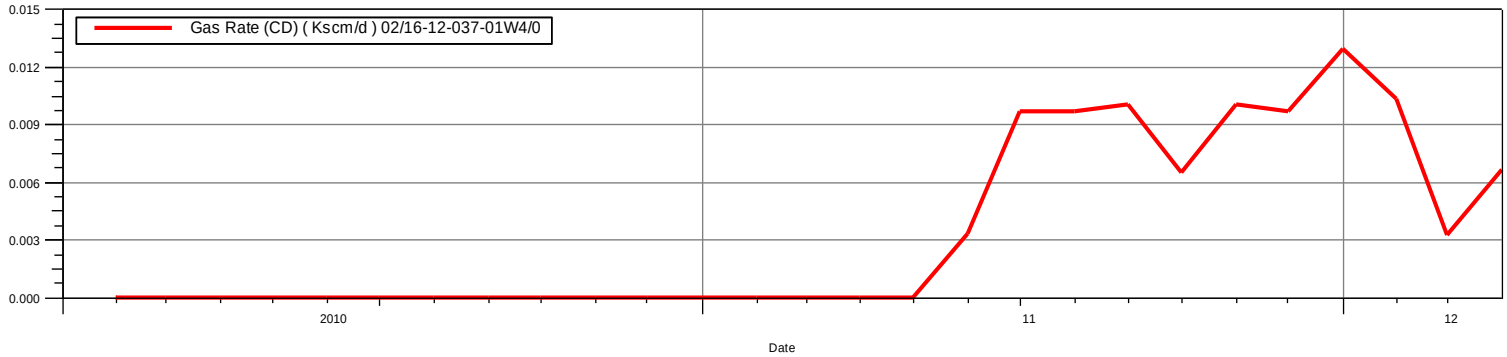

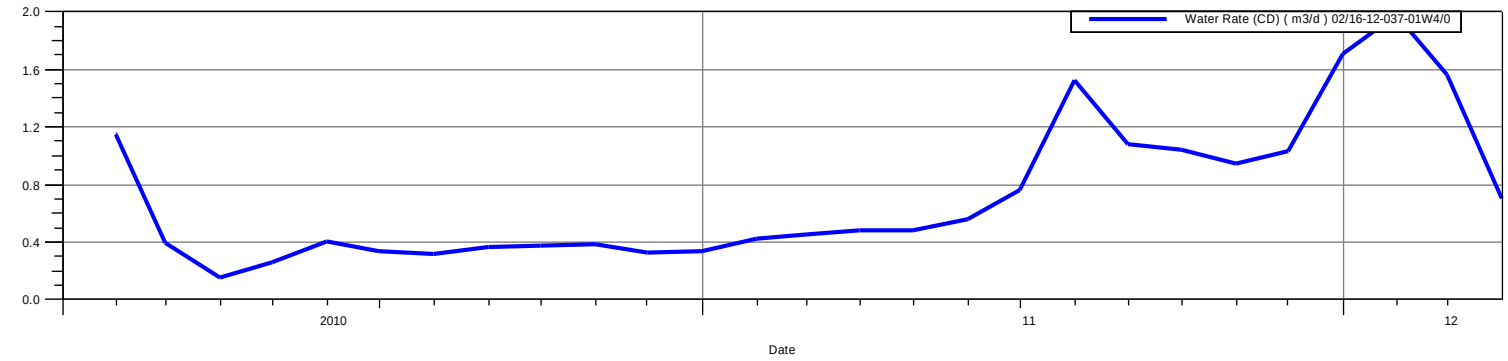

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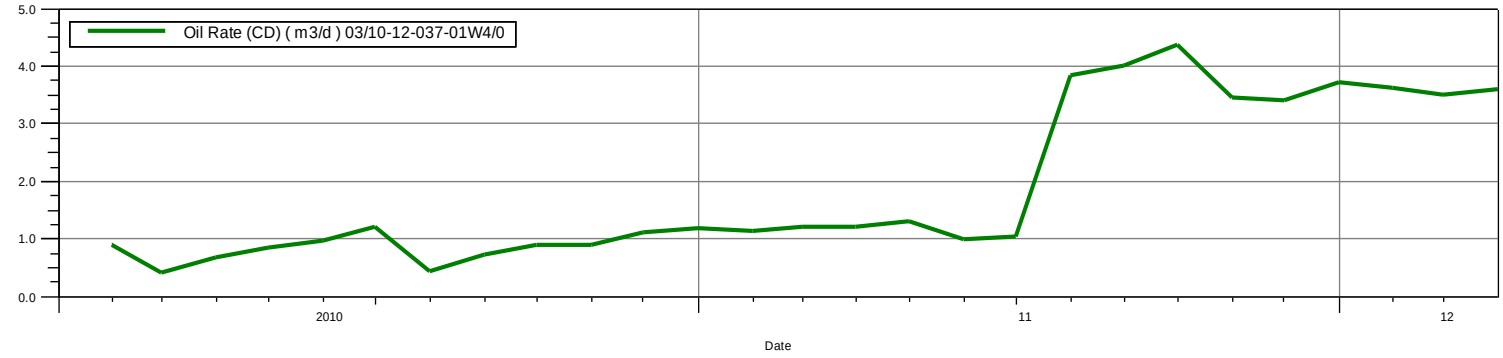

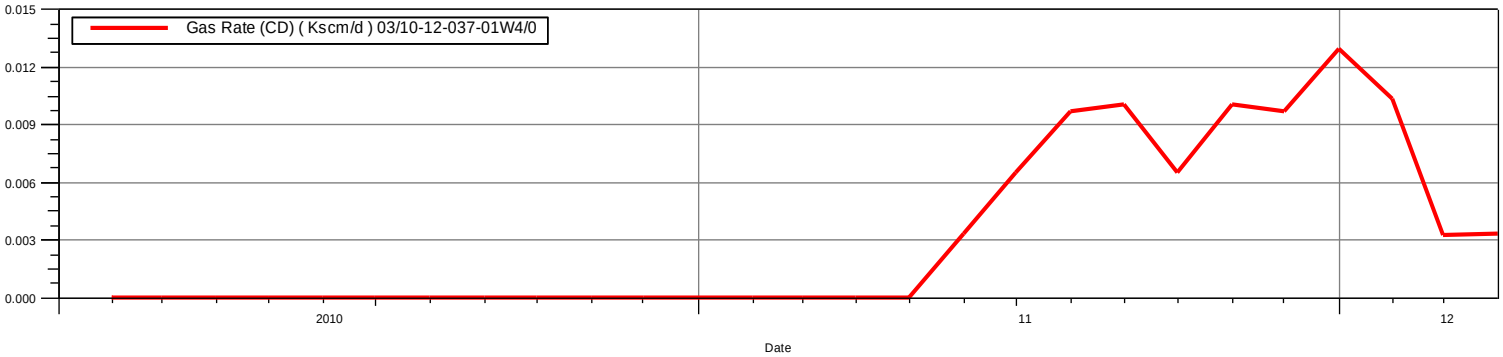

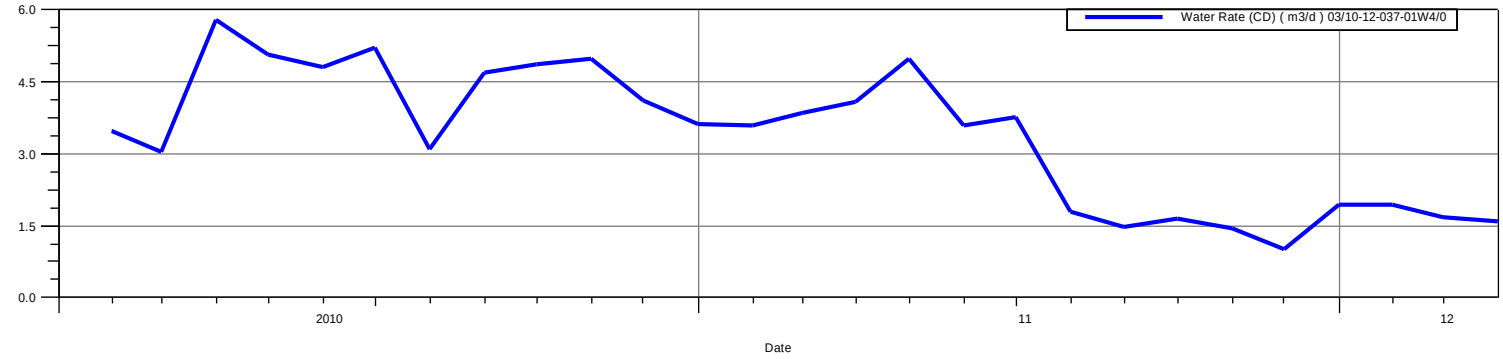

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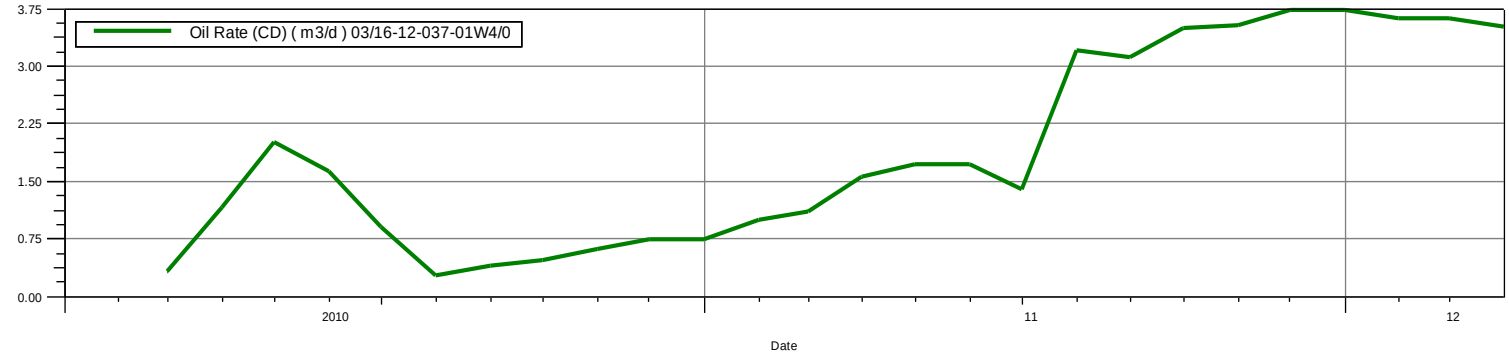

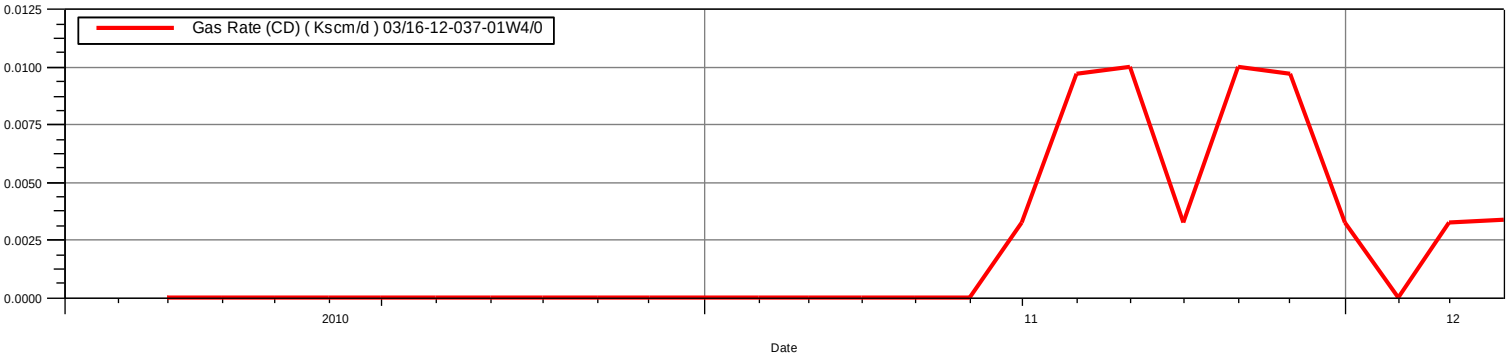

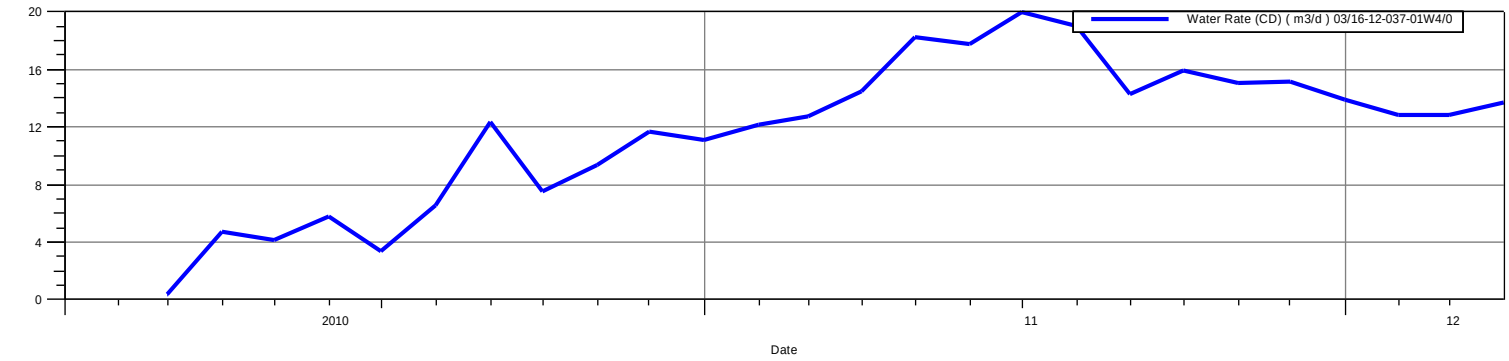

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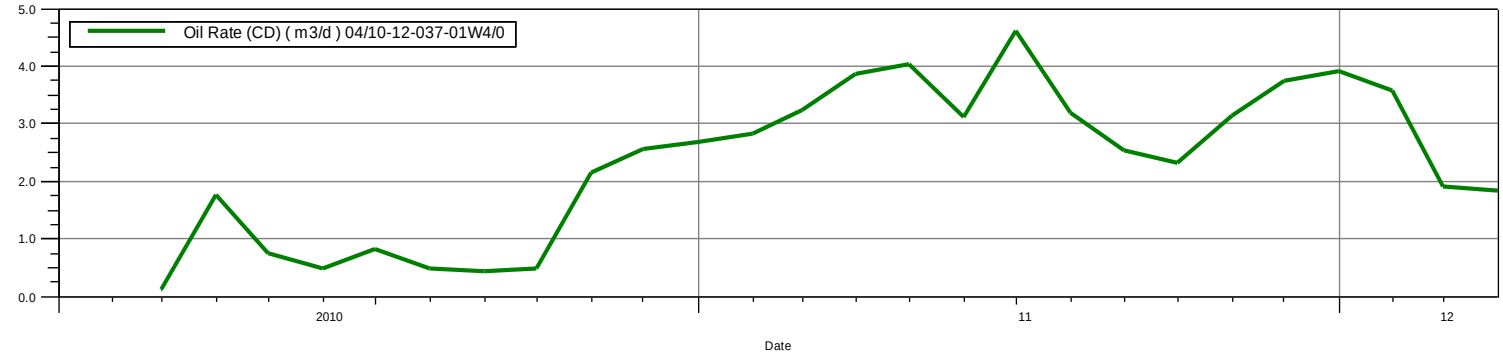

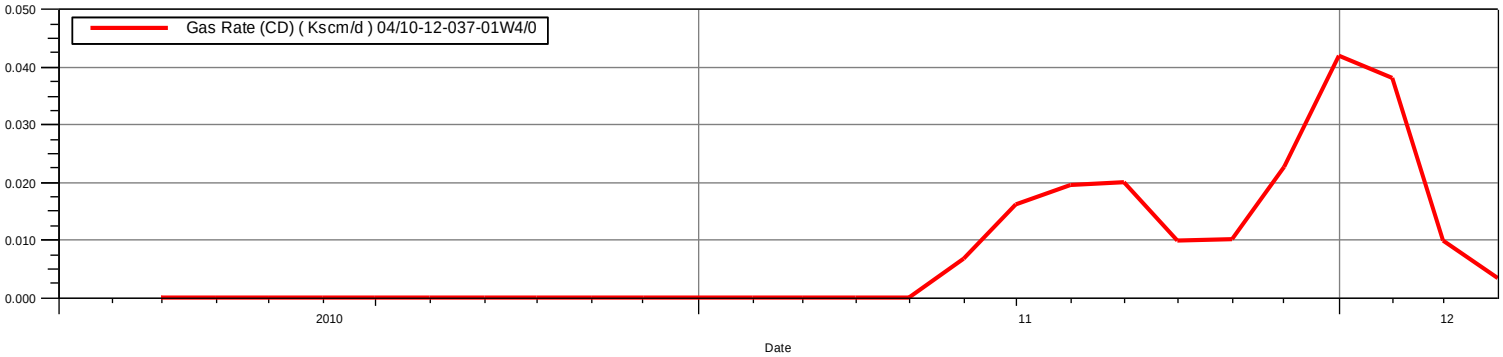

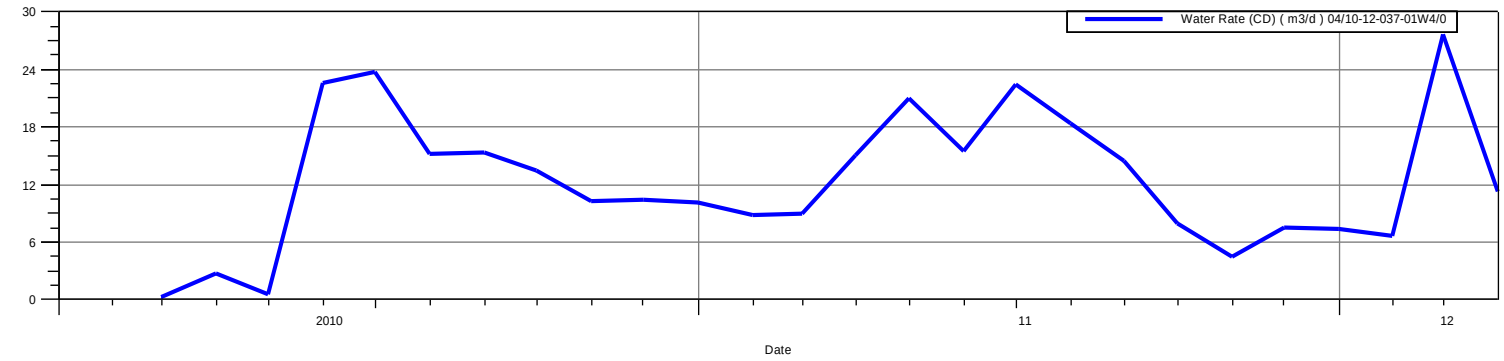

Section 12 Production Data

Date	Monthly Oil	Monthly Gas	Monthy Water	Monthly Injection	Cumulative Oil	Cumulative Gas	Cumulative Water	Cumulative Injection
	m3	e3m3	m3	m3	m3	e3m3	m3	m3
1/1/2010	38.4		23.66	0	0.04	0	0.01	0
2/1/2010	111.6	0	65.22	0	0.15	0	0.22	0
3/1/2010	231.4	0	330.1	452	0.38	0	0.55	14.58
4/1/2010	293.4	0	637.9	1240	0.67	0	1.19	41.33
5/1/2010	312.2	0	551.5	1884	0.99	0	1.74	60.77
6/1/2010	281.4	0	1197.1	2990	1.27	0	2.94	99.67
7/1/2010	301.7	0	1257.4	2769	1.57	0	4.2	89.32
8/1/2010	237.1	0	1013.2	1913	1.81	0	5.21	61.71
9/1/2010	275.2	0	1264.7	2609	2.08	0	6.47	86.97
10/1/2010	287	0	1067.5	2260	2.37	0	7.54	72.9
11/1/2010	323.3	0	990.8	2365	2.69	0	8.53	78.83
12/1/2010	407.6	0	1100.2	2738	3.1	0	9.63	88.32
1/1/2011	404.2	0	1011.7	2806	3.5	0	10.64	90.52
2/1/2011	382.4	0	899.5	1894	3.89	0	11.54	67.64
3/1/2011	440.2	0	1028.4	1910	4.33	0	12.57	61.61
4/1/2011	455	0	1242.3	1841	4.78	0	13.81	61.37
5/1/2011	465.9	0	1691.1	1878	5.25	0	15.5	60.58
6/1/2011	387.9	0.5	1355.8	1690	5.64	0.5	16.86	56.33
7/1/2011	511.6	1.7	1806.1	1623	6.15	2.2	18.67	52.35
8/1/2011	564	2.4	1544.1	1293	6.71	4.6	20.21	41.71
9/1/2011	524.8	2.4	1159.3	1317	7.24	7	21.37	43.9
10/1/2011	573.4	1.4	1072.3	1465	7.81	8.4	22.44	47.26
11/1/2011	514.4	2.1	889.8	1249	8.32	10.5	23.33	41.63
12/1/2011	558.2	2.5	997.4	1133	8.88	13	24.33	36.55
1/1/2012	579.3	3.1	1007.6	971	9.46	16.1	25.34	31.32
2/1/2012	529.3	2.6	896.4	1513	9.99	18.7	26.23	52.17
3/1/2012	498.9	0.8	1555.2	2297	10.49	19.5	27.79	74.1
4/1/2012	461.2	0.8	1018.7	1395	10.95	20.3	28.81	46.5

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Date	Monthly Oil	Monthly Gas	Monthy Water	Cumulative Oil	Cumulative Gas	Cumulative Water
	m3	e3m3	m3	m3	e3m3	m3
1/1/2010						
2/1/2010						
3/1/2010	36.0	0	16.5	0.04	0	0.02
4/1/2010	33.6	0	48.5	0.07	0	0.07
5/1/2010	45.0	0	58.9	0.11	0	0.12
6/1/2010	48.7	0	56.3	0.16	0	0.18
7/1/2010	47.8	0	66.9	0.21	0	0.25
8/1/2010	46.3	0	66	0.26	0	0.31
9/1/2010	70.1	0	101.5	0.33	0	0.41
10/1/2010	63.2	0	80.5	0.39	0	0.5
11/1/2010	50.1	0	68.6	0.44	0	0.56
12/1/2010	56.7	0	67.8	0.5	0	0.63
1/1/2011	62.9	0	64.6	0.56	0	0.7
2/1/2011	59.3	0	59.4	0.62	0	0.76
3/1/2011	65.7	0	67.9	0.69	0	0.82
4/1/2011	62.9	0	66.4	0.75	0	0.89
5/1/2011	66.5	0	81.5	0.81	0	0.97
6/1/2011	65.2	0	78.2	0.88	0	1.05
7/1/2011	66.7	0	80.1	0.95	0	1.13
8/1/2011	85.3	0.3	47.8	1.03	0.3	1.18
9/1/2011	77.2	0.3	35.5	1.11	0.6	1.21
10/1/2011	86.0	0.2	40.7	1.2	0.8	1.25
11/1/2011	65.8	0.3	38.3	1.26	1.1	1.29
12/1/2011	64.5	0.3	40.2	1.33	1.4	1.33
1/1/2012	72.6	0.3	44.5	1.4	1.7	1.38
2/1/2012	72.3	0.3	43.7	1.47	2	1.42
3/1/2012	69.2	0.1	39.3	1.54	2.1	1.46
4/1/2012	63.40	0.2	39.5	1.6	2.3	1.5

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Date	Monthly Oil	Monthly Gas	Monthy Water	Cumulative Oil	Cumulative Gas	Cumulative Water
	m3	e3m3	m3	m3	e3m3	m3
1/1/2010						
2/1/2010	41.8	0	80.6	0.04	0	0.08
3/1/2010	71.6	0	191.4	0.11	0	0.27
4/1/2010	70.6	0	192	0.18	0	0.46
5/1/2010	77.8	0	187.3	0.26	0	0.65
6/1/2010	79.2	0	136.2	0.34	0	0.79
7/1/2010	106.1	0	183.5	0.45	0	0.97
8/1/2010	100.4	0	173.2	0.55	0	1.14
9/1/2010	103.9	0	184.8	0.65	0	1.33
10/1/2010	107.9	0	180.1	0.76	0	1.51
11/1/2010	103.1	0	178.6	0.86	0	1.69
12/1/2010	149.5	0	212.9	1.01	0	1.9
1/1/2011	133.3	0	172	1.15	0	2.07
2/1/2011	123.5	0	145.1	1.27	0	2.22
3/1/2011	134.3	0	158.5	1.4	0	2.38
4/1/2011	125.7	0	156.3	1.53	0	2.53
5/1/2011	125.1	0	230.6	1.65	0	2.76
6/1/2011	82.3	0.1	160.1	1.74	0.1	2.92
7/1/2011	133.7	0.6	275.2	1.87	0.7	3.2
8/1/2011	115.2	0.6	242.3	1.98	1.3	3.44
9/1/2011	113.4	0.6	189.2	2.1	1.9	3.63
10/1/2011	122.8	0.4	210.9	2.22	2.3	3.84
11/1/2011	105.4	0.6	199.5	2.33	2.9	4.04
12/1/2011	113.1	0.6	196.3	2.44	3.5	4.24
1/1/2012	115.3	0.6	196.7	2.56	4.1	4.43
2/1/2012	105.9	0.6	179.4	2.66	4.7	4.61
3/1/2012	109.9	0.1	164.9	2.77	4.8	4.78
4/1/2012	104.5	0.1	162.5	2.88	4.9	4.94

102/16-12-036-28W1/0

Date	Monthly Oil	Monthly Gas	Monthy Water	Cumulative Oil	Cumulative Gas	Cumulative Water
	m3	e3m3	m3	m3	e3m3	m3
1/1/2010						
2/1/2010	45.0	0	32.1	0.04	0	0.03
3/1/2010	97.6	0	12.2	0.14	0	0.04
4/1/2010	81.8	0	4.4	0.22	0	0.05
5/1/2010	78.3	0	7.8	0.3	0	0.06
6/1/2010	61.2	0	12	0.36	0	0.07
7/1/2010	57.4	0	10.4	0.42	0	0.08
8/1/2010	54.2	0	9.7	0.48	0	0.09
9/1/2010	55.3	0	10.7	0.53	0	0.1
10/1/2010	59.0	0	11.6	0.59	0	0.11
11/1/2010	60.9	0	11.5	0.65	0	0.12
12/1/2010	64.8	0	10	0.72	0	0.13
1/1/2011	65.5	0	10.2	0.78	0	0.14
2/1/2011	61.3	0	11.7	0.84	0	0.15
3/1/2011	69.6	0	13.9	0.91	0	0.17
4/1/2011	68.1	0	14.4	0.98	0	0.18
5/1/2011	55.9	0	14.7	1.04	0	0.2
6/1/2011	66.6	0.1	16.7	1.1	0.1	0.21
7/1/2011	92.7	0.3	23.5	1.2	0.4	0.24
8/1/2011	46.7	0.3	47	1.24	0.7	0.28
9/1/2011	44.6	0.3	32.2	1.29	1	0.32
10/1/2011	50.2	0.2	32.1	1.34	1.2	0.35
11/1/2011	39.8	0.3	28.3	1.38	1.5	0.38
12/1/2011	44.3	0.3	31.9	1.42	1.8	0.41
1/1/2012	40.1	0.4	52.8	1.46	2.2	0.46
2/1/2012	38.5	0.3	57.3	1.5	2.5	0.52
3/1/2012	40.2	0.1	48.3	1.54	2.6	0.57
4/1/2012	25.1	0.2	21	1.56	2.8	0.59

103/10-12-036-28W1/0

Date	Monthly Oil	Monthly Gas	Monthy Water	Cumulative Oil	Cumulative Gas	Cumulative Water
	m3	e3m3	m3	m3	e3m3	m3
1/1/2010						
2/1/2010	24.8	0	96.6	0.02	0	0.1
3/1/2010	12.5	0	93.4	0.04	0	0.19
4/1/2010	19.8	0	173.5	0.06	0	0.36
5/1/2010	26.2	0	156.5	0.08	0	0.52
6/1/2010	28.9	0	143.6	0.11	0	0.66
7/1/2010	37.0	0	160.6	0.15	0	0.82
8/1/2010	13.0	0	95.5	0.16	0	0.92
9/1/2010	21.5	0	140	0.18	0	1.06
10/1/2010	27.7	0	149.9	0.21	0	1.21
11/1/2010	26.5	0	148.6	0.24	0	1.36
12/1/2010	34.5	0	126.8	0.27	0	1.49
1/1/2011	36.6	0	111.4	0.31	0	1.6
2/1/2011	31.5	0	100.1	0.34	0	1.7
3/1/2011	36.9	0	119	0.38	0	1.82
4/1/2011	36.2	0	122.3	0.41	0	1.94
5/1/2011	40.0	0	153.6	0.45	0	2.09
6/1/2011	29.6	0.1	107.4	0.48	0.1	2.2
7/1/2011	32.1	0.2	116.6	0.52	0.3	2.32
8/1/2011	118.9	0.3	55	0.63	0.6	2.37
9/1/2011	120.2	0.3	43.9	0.75	0.9	2.41
10/1/2011	135.0	0.2	50.8	0.89	1.1	2.47
11/1/2011	103.6	0.3	43	0.99	1.4	2.51
12/1/2011	105.1	0.3	31.2	1.1	1.7	2.54
1/1/2012	114.7	0.4	59.5	1.21	2.1	2.6
2/1/2012	104.8	0.3	55.9	1.32	2.4	2.65
3/1/2012	108.6	0.1	51.3	1.43	2.5	2.71
4/1/2012	107.9	0.1	47	1.53	2.6	2.75

103/16-12-036-28W1/0

Date	Monthly Oil	Monthly Gas	Monthy Water	Cumulative Oil	Cumulative Gas	Cumulative Water
	m3	e3m3	m3	m3	e3m3	m3
1/1/2010						
2/1/2010						
3/1/2010	10.0	0	10.7	0.01	0	0.01
4/1/2010	34.7	0	139.9	0.04	0	0.15
5/1/2010	61.9	0	126.7	0.11	0	0.28
6/1/2010	48.9	0	172.6	0.16	0	0.45
7/1/2010	28.2	0	103.8	0.18	0	0.55
8/1/2010	8.5	0	200.9	0.19	0	0.75
9/1/2010	11.6	0	369	0.2	0	1.12
10/1/2010	14.6	0	231.8	0.22	0	1.36
11/1/2010	18.6	0	279.5	0.24	0	1.63
12/1/2010	22.7	0	360.7	0.26	0	2
1/1/2011	22.7	0	342	0.28	0	2.34
2/1/2011	27.8	0	339.8	0.31	0	2.68
3/1/2011	33.9	0	393.7	0.34	0	3.07
4/1/2011	46.5	0	432.5	0.39	0	3.5
5/1/2011	53.4	0	564.5	0.44	0	4.07
6/1/2011	51.3	0	530	0.5	0	4.6
7/1/2011	43.3	0.1	618.1	0.54	0.1	5.22
8/1/2011	99.3	0.3	586.8	0.64	0.4	5.8
9/1/2011	93.4	0.3	427.9	0.73	0.7	6.23
10/1/2011	108.0	0.1	491.5	0.84	0.8	6.72
11/1/2011	105.9	0.3	450.7	0.95	1.1	7.17
12/1/2011	115.3	0.3	468.6	1.06	1.4	7.64
1/1/2012	115.2	0.1	428	1.18	1.5	8.07
2/1/2012	104.7	0	370.2	1.28	1.5	8.44
3/1/2012	112.0	0.1	394.7	1.39	1.6	8.83
4/1/2012	105.3	0.1	410.9	1.5	1.7	9.25

104/10-12-036-28W1/0

Date	Monthly Oil	Monthly Gas	Monthy Water	Cumulative Oil	Cumulative Gas	Cumulative Water
	m3	e3m3	m3	m3	e3m3	m3
1/1/2010						
2/1/2010						
3/1/2010	3.7	0	5.9	0	0	0.01
4/1/2010	52.9	0	79.6	0.06	0	0.09
5/1/2010	23.0	0	14.3	0.08	0	0.1
6/1/2010	14.5	0	676.4	0.09	0	0.78
7/1/2010	25.2	0	732.2	0.12	0	1.51
8/1/2010	14.7	0	467.9	0.13	0	1.98
9/1/2010	12.8	0	458.7	0.15	0	2.44
10/1/2010	14.6	0	413.6	0.16	0	2.85
11/1/2010	64.1	0	304	0.23	0	3.15
12/1/2010	79.4	0	322	0.3	0	3.47
1/1/2011	83.2	0	311.5	0.39	0	3.79
2/1/2011	79.0	0	243.4	0.47	0	4.03
3/1/2011	99.8	0	275.4	0.57	0	4.3
4/1/2011	115.6	0	450.4	0.68	0	4.76
5/1/2011	125.0	0	646.2	0.81	0	5.4
6/1/2011	92.9	0.2	463.4	0.9	0.2	5.86
7/1/2011	143.1	0.5	692.6	1.04	0.7	6.56
8/1/2011	98.6	0.6	565.2	1.14	1.3	7.12
9/1/2011	76.0	0.6	430.6	1.22	1.9	7.55
10/1/2011	71.4	0.3	246.3	1.29	2.2	7.8
11/1/2011	93.9	0.3	130	1.38	2.5	7.93
12/1/2011	115.9	0.7	229.2	1.5	3.2	8.16
1/1/2012	121.4	1.3	226.1	1.62	4.5	8.38
2/1/2012	103.1	1.1	189.9	1.72	5.6	8.57
3/1/2012	59.0	0.3	856.7	1.78	5.9	9.43
4/1/2012	55.0	0.1	337.8	1.84	6	9.77

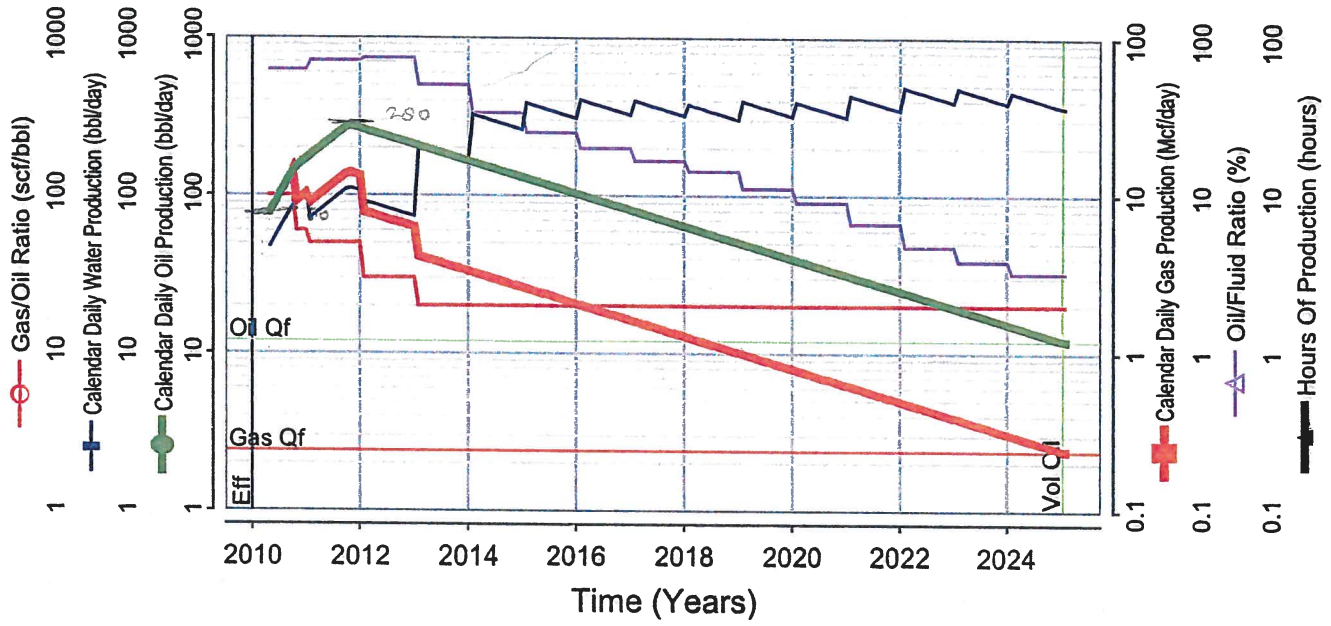
Appendix B

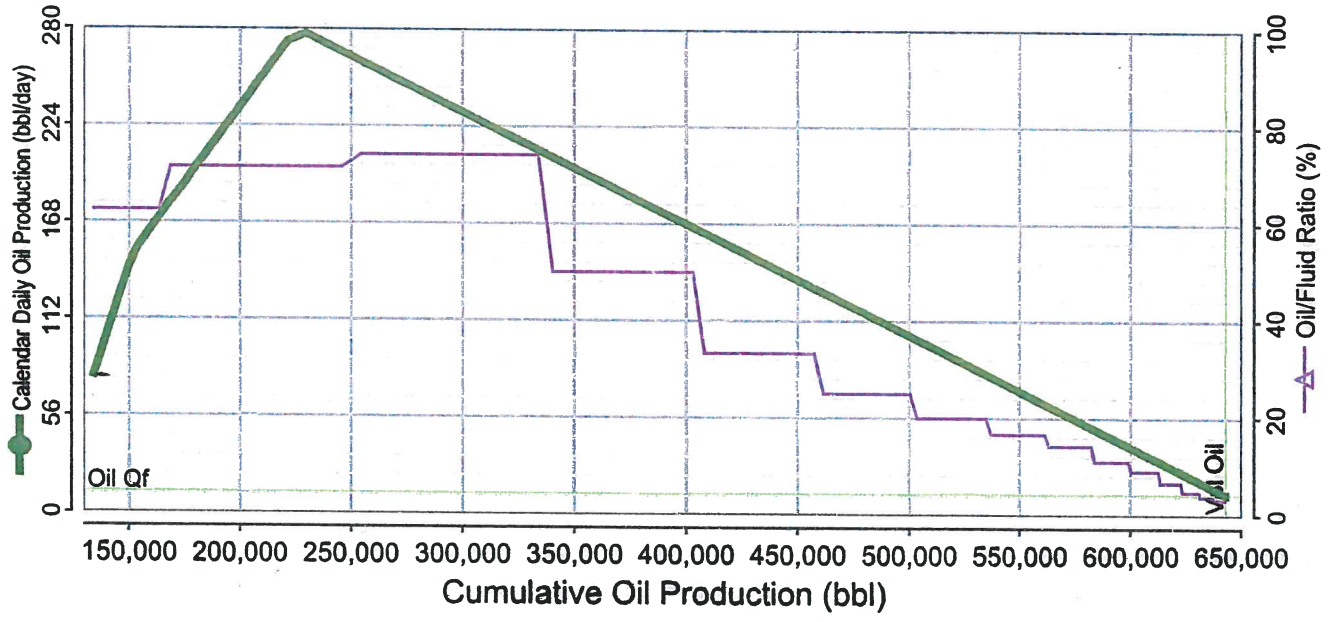
Pengrowth Corporation
GLJ July 1, 2009 Forecast
CHART - PRODUCTION AND FORECAST

Effective January 01, 2010

Operator: Pengrowth
Province: Alberta
Field:
Pool:
Unit:
Status:

Bodo East Polymer Pilot
East Bodo Polymer Pilot group
PDP





Cum Oil (bbl)	0	Cum Gas (Mcf)	0	Cum Water (bbl)	0	Cum Cond (bbl)	0		
Forecast Start	04/01/2010	Calculation Type	Volumetric	Est. Cum Prod (bbl)	134,267	Decline Exponent	0.000		
Forecast End	01/16/2025	OVIP (bbl)	3,383,141	Remaining (bbl)	508,530	Intial Decline (%/yr)	-300.0		
Initial Rate (bbl/day)	75.0	Recovery Factor	0.190	Surface Loss	0.5	Reserve Life Index	9.86		
Final Rate (bbl/day)	12.0	Ult. Recoverable (bbl)	642,797	Total Sales (Mcf)	7,885	Reserve Half Life (yrs)	1.93		

APPENDIX C

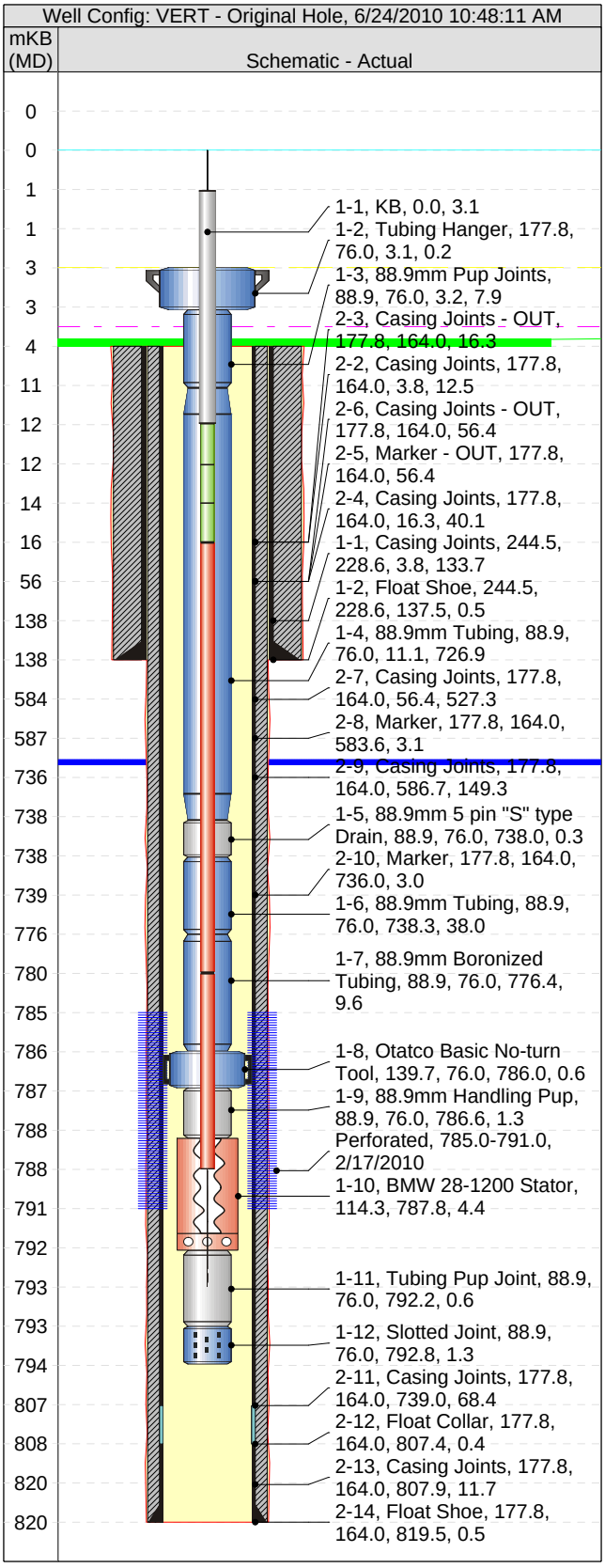
Downhole Schematic

Well Name: PENGROWTH 9C PROVOST 9-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
100/09-12-037-01W4/0	09-12-037-01 W4M	0415633	VERT	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
686.87	683.07	3.50	3.09	820.00	7/2/2010	9/2/2010

Well Config: VERT - Original Hole, 6/24/2010 10:48:11 AM



PBTDs

Date	Depth (mKB)

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	244.5	48.068	H-40	138.00
Production	177.8	29.763	J-55	820.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Production Casing Cement	casing	3.80	820.00	3.00	3	3.00
Surface Casing Cement	casing	3.80	138.00			4.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Lloydminster, Original Hole	785.00	791.00	

Tubing Strings

Tubing - Production set at 794.15mKB on 2/18/2010 17:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Tubing - Production	88.9	13.840	J-55	794.15

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	KB			3.09	0.00	3.09
1-2	1	Tubing Hanger	177.8	76.0	0.15	3.09	3.24
1-3	3	88.9mm Pup Joints	88.9	76.0	7.88	3.24	11.12
1-4	76	88.9mm Tubing	88.9	76.0	726.91	11.12	738.03
1-5	1	88.9mm 5 pin "S" type Drain	88.9	76.0	0.29	738.03	738.32
1-6	4	88.9mm Tubing	88.9	76.0	38.04	738.32	776.36
1-7	1	88.9mm Boronized Tubing	88.9	76.0	9.63	776.36	785.99
1-8	1	Otatco Basic No-turn Tool	139.7	76.0	0.56	785.99	786.55
1-9	1	88.9mm Handling Pup	88.9	76.0	1.27	786.55	787.82
1-10	1	BMW 28-1200 Stator	114.3		4.40	787.82	792.22
1-11	1	Tubing Pup Joint	88.9	76.0	0.59	792.22	792.81
1-12	1	Slotted Joint	88.9	76.0	1.34	792.81	794.15

Rods

Rod String on 3/7/2010 12:30

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rod String	25.4	4.316	D	792.50

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	Polished Rod	31.7	10.97	0.52	11.49
1-2	1	25.4mm Pony Rod	25.4	0.45	11.49	11.94
1-3	1	25.4mm Pony Rod	25.4	1.86	11.94	13.80
1-4	1	25.4mm Pony Rod	25.4	2.48	13.80	16.28
1-5	100	25.4mm Gr D75 Sucker Rods	25.4	764.00	16.28	780.28
1-6	1	25.4mm "EL" Rod	25.4	7.62	780.28	787.90
1-7	1	PCP Rotor		4.60	787.90	792.50

Daily Completion and Workover (schematic)

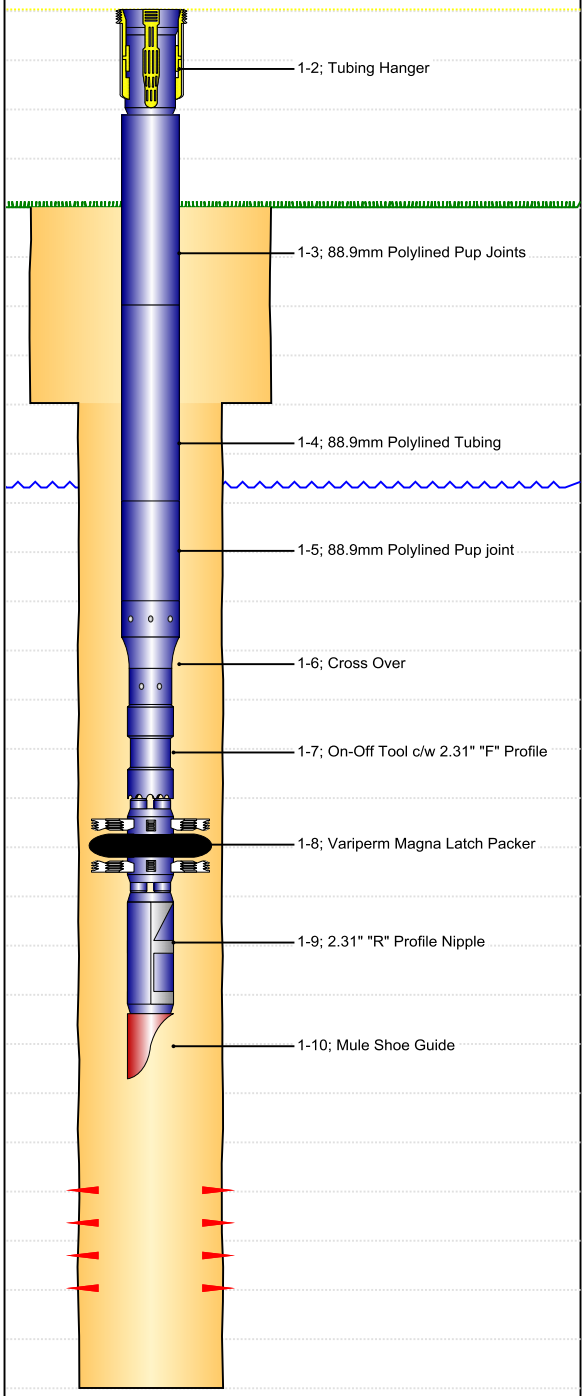
Well Name: PENGROWTH PROVO 10-12-37-1

Report # 2.0, Report Date: 9/2/2010

Btm Hole UWI	Surface Legal Location	Field Name	License #	State/Province	Well Configuration Type
00/10-12-037-01W4/0	00/10-12-037-01W4/0	Provost	0044007	Alberta	
KB Elevation (m)	**KB - Tubing Head Flange (m)**	**Spud Date**	**Rig Release Date**	**PBTD (All) (mKB)**	**Total Depth All (TVD) (mKB)**
677.90	2.90	11/25/1972 00:00		ORIGINAL HOLE - 0.00	

ORIGINAL HOLE, 9/2/2010 10:30:00 AM

Vertical schematic (actual)



Primary Job Type	Secondary Job Type	DDS Sub. #	Grs Comp Intvl
Workover	Pressure Build-up/Survey		

Objective

Run pressure recorders in well for pressure build.

Contractor	Rig Number
	Lonkar Services

AFE #	AFE+Supp Amt (Cost)	Daily Field Est Total (Cost)	Cum Field Est To Date (Cost)
11878-9800-302		2,917.50	4,175.00

Daily Readings

Daily Man Hours (hr)	Weather	T (°C)	Road Condition	Drill Pipe Pr…	P Cas (kPa)	Rig Time (hr)
	Sunny	22	Good	0	0	

Daily Contacts

Job Contact	Title	Phone Number
Terry Gramlich	Consultant	306-753-7730
Chuck Doetzel		306-753-7777

Time Log

Start Time	End Time	Dur (hr)	Code	Activity	Com
09:30	09:45	0.25	SMT G	Safety Meeting	Hold safety meeting and issue work permit.
09:45	09:45	0.00	WL WK	Wireline	Rig up Lonkar. Pick up drop spool and pull pressure recorders. Rig out Lonkar.

Report Fluids Summary

Fluid	To well (m³)	From well (m³)	To lease (m³)	From lease (m³)

Safety Checks

Time	Des	Type	Com

Logs

Time	Type	Top (mKB)	Btm (mKB)	Cased?

Perforations

Time	Zone	Top (mKB)	Btm (mKB)	Current Status

Stimulations & Treatments

Time	Zone	Type	Delivery Mode	Stim/Treat Company

Stg #	Stage Type	Top (mKB)	Btm (mKB)	Vol Clean Pump (m³)

Tubing Run

Run Time	Tubing Description	Set Depth (mKB)	String Max Nomina…	Wt (kg/m)	String Grade

Tubing Pulled

Pull Time	Tubing Description	Set Depth (mKB)	String Max Nomina…	Wt (kg/m)	String Grade

Other in Hole Run (Bridge Plugs, etc)

Run Time	Des	OD (mm)	Top (mKB)	Btm (mKB)

Other in Hole Pulled (Bridge Plugs, etc)

Pull Time	Des	Top (mKB)	Btm (mKB)	OD (mm)
10:00	Pressure Sensor	777.00	778.00	38.1

Cement

Start Time	Des	Type	String	Cement Comp

PENGROWTH PROVO 16-12-37-1
Downhole Summary

License #: 289498 Date Prepared: October 11, 2006 By: Josh McEwen

GL Elevation	682.7	m	Status: Water, Inj
KB Elevation	686.6	m	
KB-CF	3.75	m	
PBTD	805.78	mKB	
TD	818	mKB	

Surface Location 100/16-12-037-01W4/00
Bottom Hole Location 100/16-12-037-01W4/00

Surface Casing
10 jts
244.5 mm – 48.06 kg/m – H-40 – ST&C Landed at 137 mKB
Cemented w/12 Tonnes TSC + 3% CaCl2
4 m3 Good Returns

Intermediate Casing
10 jts
177.8 mm – 29.76 kg/m – J-55 – ST&C (131.04 m)
50 jts
177.8 mm – 25.3 kg/m – H-40 – ST&C (664.21 m)
2 jts
177.8 mm – 29.76 kg/m – J-55 – ST&C (23.54 m) Landed at 818 mKB
Cemented w/20 Tonnes T-Mix TS + 0.5% CaCl2 + 0.4% CFL-2
4.5 m3 Good Returns

Perforations
785 – 791 mKB – October 20, 2003
127 mm ERHSC Gun w/30 g BH charges, 26 SPM

Stimulation History

WellHead

Tubing String
1 x 73 mm x 0.12 m wireline re-entry tool
1 x 73 mm x 1.88 m Pup
1 x 73 mm x 177.8 mm Double Grip Packer c/w 50,000 Pull Shear Release
1 x 73 mm on-off tool c/w 58.7 XN Profile slick joint & 57 No-Go
1 x 73 mm x 88.9 mm X-over
1 x 88.9 mm x 1.88 m TK99 Pup
79 x 88.9 mm TK99 TBG jts
1 x 88.9 mm x 3.07 m Pup
1 x 88.9 mm x 1.86 m Pup
1 x 88.9 mm x 9.53 TBG jt

Bottom of Tubing landed at 782.95 mKB

Rod String

Bottom Hole Tools Center of Packer at 780.57 mKB

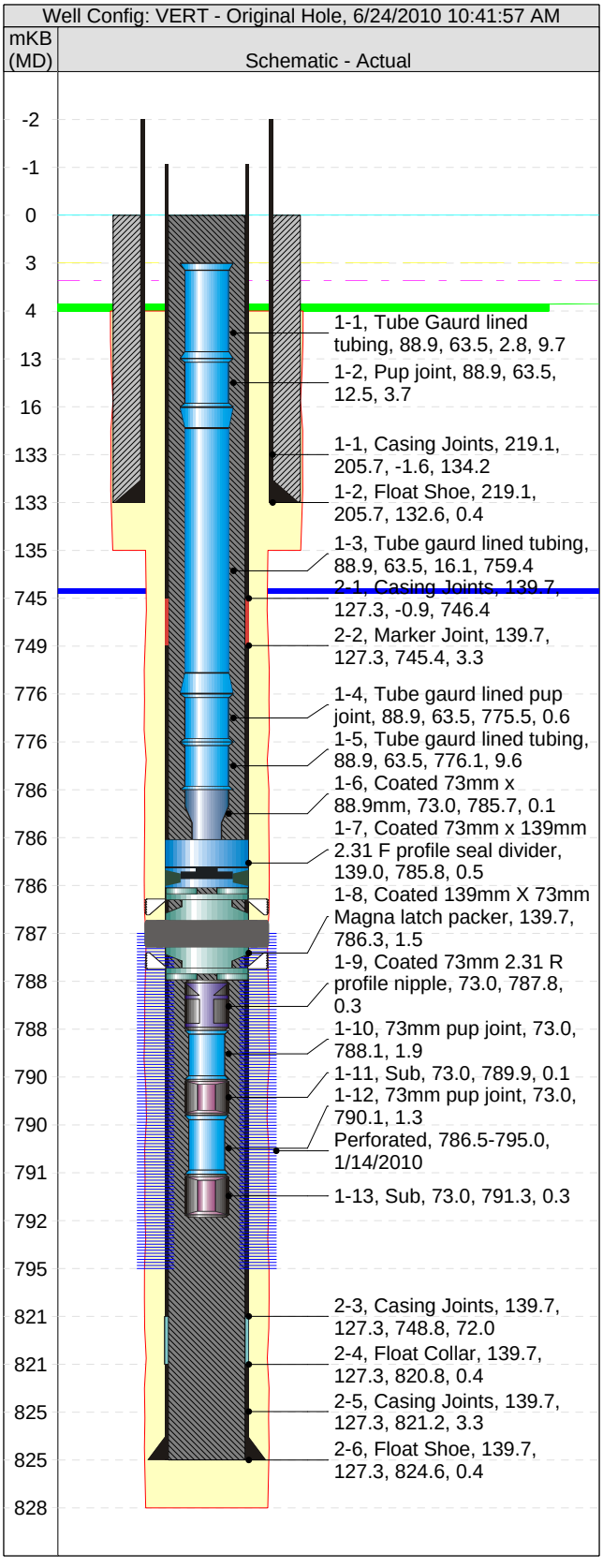
Downhole Schematic

Well Name: PENGROWTH 10D PROVOST 10-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
102/10-12-037-01W4/00	10-12-037-01 W4M	0415626	VERT	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
688.72	685.22	3.05	2.80	828.00	1/9/2010	1/11/2010

Well Config: VERT - Original Hole, 6/24/2010 10:41:57 AM



PBTDs

Date	Depth (mKB)

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	219.1	35.716	J-55	133.00
Production	139.7	20.834	J-55	825.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Surface	casing	0.00	133.00	1.00		3.00
Production Casing Cement		0.00	825.00	2.00		2.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
	786.50	795.00	(786.5 - 795)

Tubing Strings

88.9mm Tube Gaurd new lined tubing set at 791.58mKB on 1/14/2010 11:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
88.9mm Tube Gaurd new lined tubing	88.9	13.840	J55	791.58

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	Tube Gaurd lined tubing	88.9	63.5	9.66	2.80	12.46
1-2	2	Pup joint	88.9	63.5	3.67	12.46	16.13
1-3	79	Tube gaurd lined tubing	88.9	63.5	759.36	16.13	775.49
1-4	1	Tube gaurd lined pup joint	88.9	63.5	0.62	775.49	776.11
1-5	1	Tube gaurd lined tubing	88.9	63.5	9.57	776.11	785.68
1-6	1	Coated 73mm x 88.9mm	73.0		0.14	785.68	785.82
1-7	1	Coated 73mm x 139mm 2.31 F profile seal divider	139.0		0.49	785.82	786.31
1-8	1	Coated 139mm X 73mm Magna latch packer	139.7		1.45	786.31	787.76
1-9	1	Coated 73mm 2.31 R profile nipple	73.0		0.29	787.76	788.05
1-10	1	73mm pup joint	73.0		1.86	788.05	789.91
1-11	1	Sub	73.0		0.15	789.91	790.06
1-12	1	73mm pup joint	73.0		1.25	790.06	791.31
1-13	1	Sub	73.0		0.27	791.31	791.58

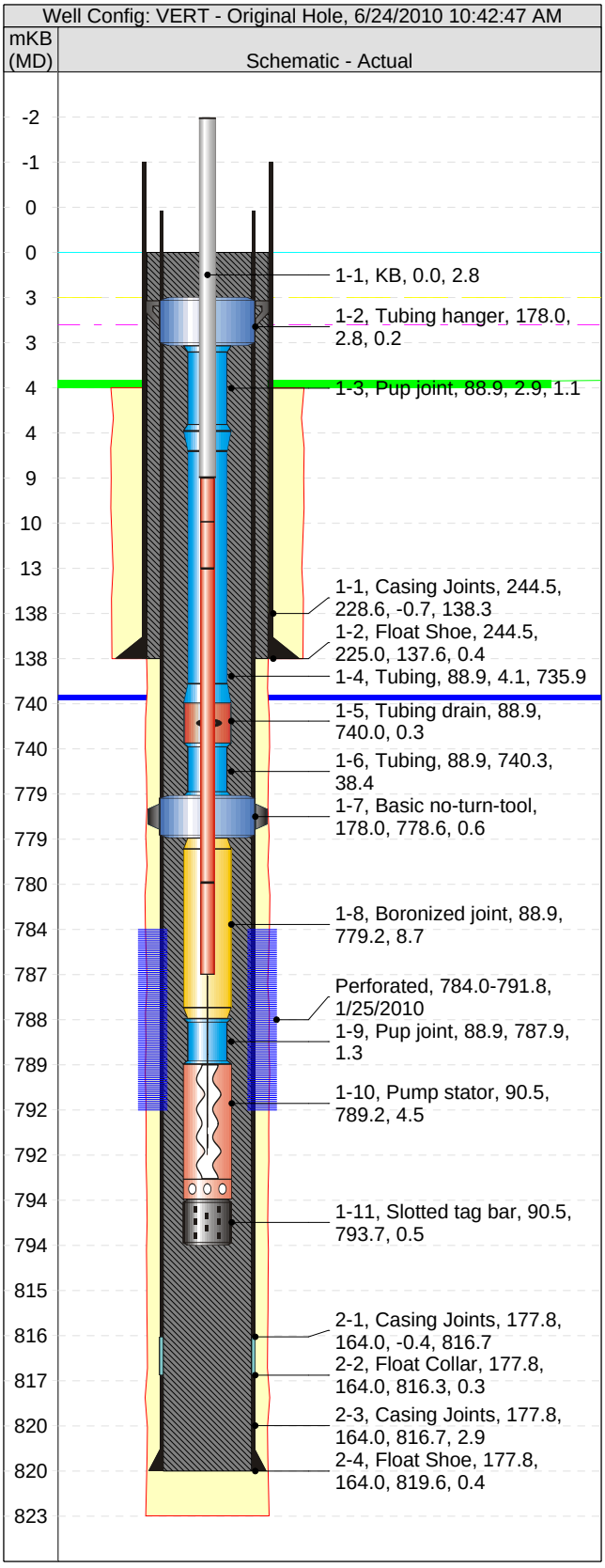
Downhole Schematic

Well Name: PENGROWTH 15A PROVOST 15-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
102/15-12-037-01W4/0	15-12-037-01 W4M	0415629	VERT	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
686.00	682.50	2.86	2.79	822.48	1/16/2010	1/18/2010

Well Config: VERT - Original Hole, 6/24/2010 10:42:47 AM



PBTDs

Date	Depth (mKB)
1/25/2010	815.00

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	244.5	48.068	H-40	138.00
Production	177.8	29.763	J-55	820.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Production Casing Cement		0.00	820.00	1.00		4.00
Surface Casing Cement		0.00	138.00	1.20		3.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Lloydminster, Original Hole	784.00	791.80	(784 - 791)

Tubing Strings

88.9mm tubing set at 794.22mKB on 1/27/2010 08:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
88.9mm tubing	88.9	13.840	J55	794.22

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	KB			2.79	0.00	2.79
1-2	1	Tubing hanger	178.0		0.15	2.79	2.94
1-3	1	Pup joint	88.9		1.13	2.94	4.07
1-4	77	Tubing	88.9		735.90	4.07	739.97
1-5	1	Tubing drain	88.9		0.29	739.97	740.26
1-6	4	Tubing	88.9		38.36	740.26	778.62
1-7	1	Basic no-turn-tool	178.0		0.56	778.62	779.18
1-8	1	Boronized joint	88.9		8.71	779.18	787.89
1-9	1	Pup joint	88.9		1.28	787.89	789.17
1-10	1	Pump stator	90.5		4.50	789.17	793.67
1-11	1	Slotted tag bar	90.5		0.55	793.67	794.22

Rods

Rod on 2/13/2010 11:00

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rod	25.4	4.316	D	792.00

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	Polished Rod	31.7	10.97	-1.89	9.08
1-2	1	Pony Rod	25.4	0.60	9.08	9.68
1-3	1	Sucker Rod	25.4	3.10	9.68	12.78
1-4	100	Sucker Rod	25.4	767.00	12.78	779.78
1-5	1	Sucker Rod	25.4	7.62	779.78	787.40
1-6	1	PCP Rotor		4.60	787.40	792.00

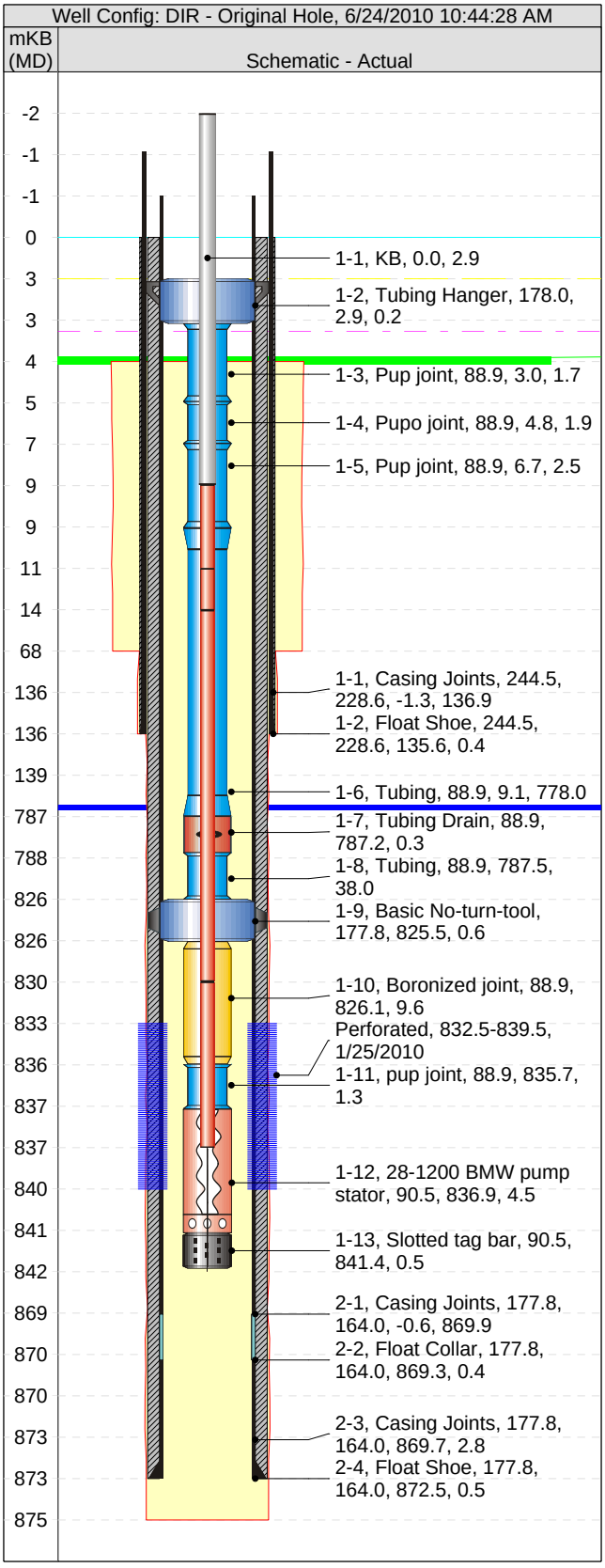
Downhole Schematic

Well Name: PENGROWTH 16C PROVOST 16-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
102/16-12-037-01W4/0	15-12-037-01 W4M	0415630	DIR	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
686.00	682.41	3.14	2.89	875.00	12/1/2010	1/15/2010

Well Config: DIR - Original Hole, 6/24/2010 10:44:28 AM



PBTDs

Date	Depth (mKB)
1/25/2010	870.00

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	244.5	48.068	H-40	136.00
Production	177.8	29.763	J-55	873.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Production	casing	0.00	873.00	2.00		4.00
Surface	casing	0.00	136.00	1.00		3.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Lloydminster, Original Hole	832.50	839.50	

Tubing Strings

88.9mm tubing set at 841.95mKB on 1/26/2010 12:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
88.9mm tubing	88.9	13.840	J.55	841.95

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	KB			2.89	0.00	2.89
1-2	1	Tubing Hanger	178.0		0.15	2.89	3.04
1-3	1	Pup joint	88.9		1.72	3.04	4.76
1-4	1	Pupo joint	88.9		1.90	4.76	6.66
1-5	1	Pup joint	88.9		2.48	6.66	9.14
1-6	81	Tubing	88.9		778.03	9.14	787.17
1-7	1	Tubing Drain	88.9		0.29	787.17	787.46
1-8	4	Tubing	88.9		38.02	787.46	825.48
1-9	1	Basic No-turn-tool	177.8		0.57	825.48	826.05
1-10	1	Boronized joint	88.9		9.60	826.05	835.65
1-11	1	pup joint	88.9		1.28	835.65	836.93
1-12	1	28-1200 BMW pump stator	90.5		4.51	836.93	841.44
1-13	1	Slotted tag bar	90.5		0.51	841.44	841.95

Rods

Rod string on 2/13/2010 16:00

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rod string	25.4	4.316	D	842.00

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	Polished Rod	31.7	10.97	-2.01	8.96
1-2	1	Pony Rod	25.4	2.38	8.96	11.34
1-3	1	Pony Rod	25.4	3.10	11.34	14.44
1-4	107	Sucker Rods	25.4	815.34	14.44	829.78
1-5	1	Sucker Rod	25.4	7.62	829.78	837.40
1-6	1	PCP Rotor		4.60	837.40	842.00

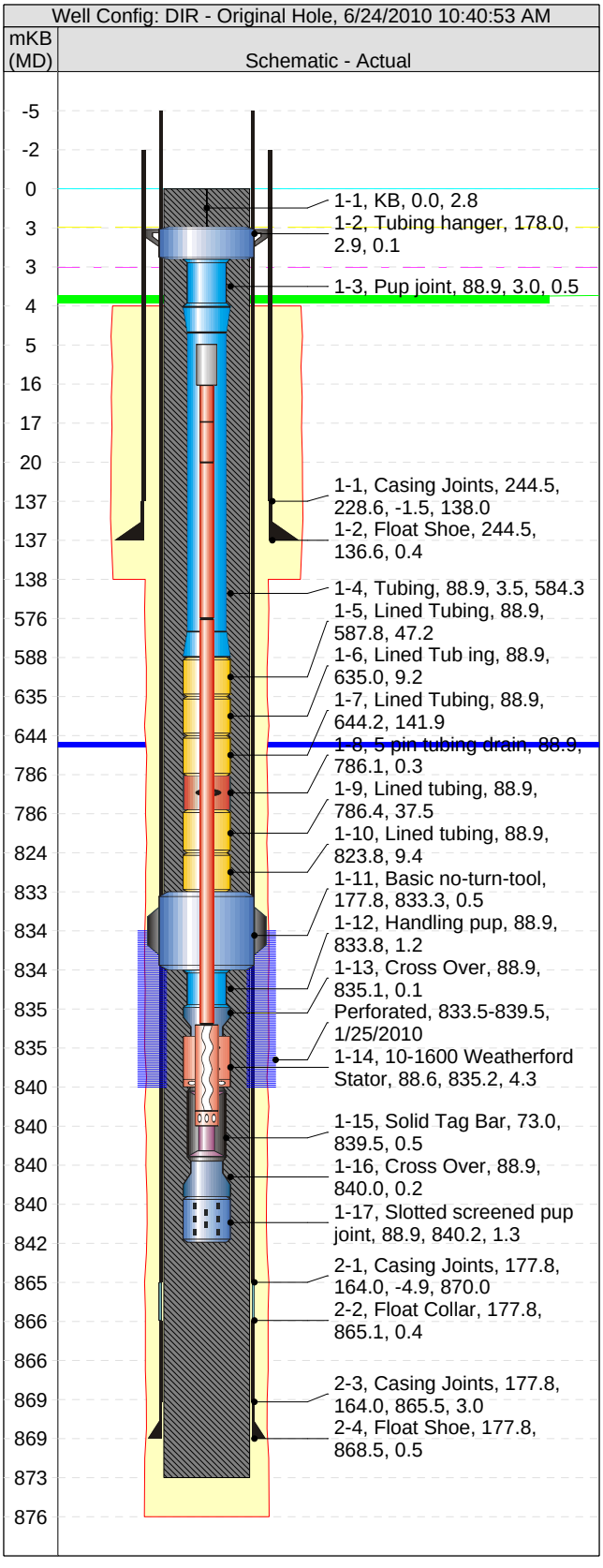
Downhole Schematic

Well Name: PENGROWTH 10C PROVOST 10-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
103/10-12-037-01W4/0	15-12-037-01 W4M	0415628	DIR	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
686.00	682.54	3.01	2.85	876.00	1/18/2010	1/21/2010

Well Config: DIR - Original Hole, 6/24/2010 10:40:53 AM



PBTDs

Date	Depth (mKB)
1/25/2010	866.00

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	244.5	48.068	H-40	137.00
Production	177.8	29.763	J-55	869.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Surface Casing Cement		0.00	137.00	1.00		3.00
Production Casing Cement		0.00	873.00	2.00		4.50

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Lloydminster, Original Hole	833.50	839.50	

Tubing Strings

88.9mm tubing set at 841.46mKB on 3/25/2010 10:30

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
88.9mm tubing	88.9	13.840	J55	841.46

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	KB			2.85	0.00	2.85
1-2	1	Tubing hanger	178.0		0.13	2.85	2.98
1-3	1	Pup joint	88.9		0.54	2.98	3.52
1-4	61	Tubing	88.9		584.26	3.52	587.78
1-5	5	Lined Tubing	88.9		47.22	587.78	635.00
1-6	1	Lined Tub ing	88.9		9.24	635.00	644.24
1-7	15	Lined Tubing	88.9		141.87	644.24	786.11
1-8	1	5 pin tubing drain	88.9		0.26	786.11	786.37
1-9	4	Lined tubing	88.9		37.45	786.37	823.82
1-10	1	Lined tubing	88.9		9.44	823.82	833.26
1-11	1	Basic no-turn-tool	177.8		0.55	833.26	833.81
1-12	1	Handling pup	88.9		1.24	833.81	835.05
1-13	1	Cross Over	88.9		0.12	835.05	835.17
1-14	1	10-1600 Weatherford Stator	88.6		4.31	835.17	839.48
1-15	1	Solid Tag Bar	73.0		0.48	839.48	839.96
1-16	1	Cross Over	88.9		0.20	839.96	840.16
1-17	1	Slotted screened pup joint	88.9		1.30	840.16	841.46

Rods

Rod on 3/25/2010 13:30

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rod	25.4	4.316	D	839.60

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	Polished Rod	38.1	10.97	5.17	16.14
1-2	1	pony rod	25.4	1.22	16.14	17.36
1-3	1	pony rod	25.4	2.44	17.36	19.80
1-4	73	Sucker Rod	25.4	556.26	19.80	576.06
1-5	34	Sucker Rod 1" with 7/8" pins	25.4	259.08	576.06	835.14
1-6	1	PCP Rotor Weatherford 10-1600	43.0	4.46	835.14	839.60

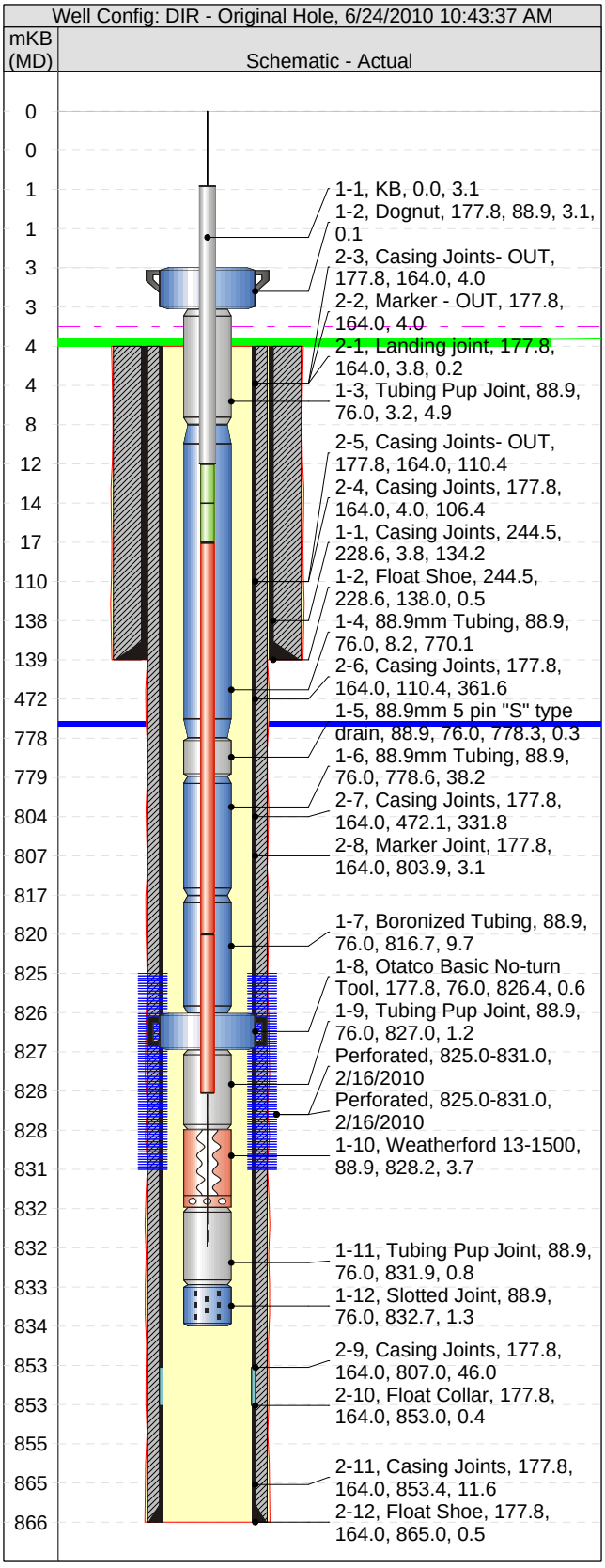
Downhole Schematic

Well Name: PENGROWTH 16A PROVOST 16-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
103/16-12-037-01W4/0	09-12-037-01 W4M	0415632	DIR	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
686.82	683.02	3.50	3.09	865.50	2/4/2010	2/6/2010

Well Config: DIR - Original Hole, 6/24/2010 10:43:37 AM



PBTDs

Date	Depth (mKB)
2/16/2010	855.10

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	244.5	48.068	H-40	138.50
Production	177.8	29.763	J-55	865.50

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m^3)
Production Casing Cement	casing	3.80	865.50	3.00	3	3.00
Surface Casing Cement	casing	3.80	138.50			4.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
	825.00	831.00	
Lloydminster, Original Hole	825.00	831.00	

Tubing Strings

Production String set at 833.99mKB on 3/28/2010 12:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Production String	88.9	13.840	J-55	833.99

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	KB			3.09	0.00	3.09
1-2	1	Dognut	177.8	88.9	0.14	3.09	3.23
1-3	2	Tubing Pup Joint	88.9	76.0	4.94	3.23	8.17
1-4	80	88.9mm Tubing	88.9	76.0	770.13	8.17	778.30
1-5	1	88.9mm 5 pin "S" type drain	88.9	76.0	0.29	778.30	778.59
1-6	4	88.9mm Tubing	88.9	76.0	38.15	778.59	816.74
1-7	1	Boronized Tubing	88.9	76.0	9.67	816.74	826.41
1-8	1	Otatco Basic No-turn Tool	177.8	76.0	0.56	826.41	826.97
1-9	1	Tubing Pup Joint	88.9	76.0	1.22	826.97	828.19
1-10	1	Weatherford 13-1500	88.9		3.68	828.19	831.87
1-11	1	Tubing Pup Joint	88.9	76.0	0.79	831.87	832.66
1-12	1	Slotted Joint	88.9	76.0	1.33	832.66	833.99

Rods

Rod String on 3/28/2010 14:00

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rod String	25.4	4.316	D	832.00

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	Polished Rod	31.7	10.97	0.56	11.53
1-2		Pony Rod	25.4	2.48	11.53	14.01
1-3		Pony Rod	25.4	3.10	14.01	17.11
1-4		Sucker Rod	25.4	803.00	17.11	820.11
1-5	1	Sucker Rod	25.4	7.62	820.11	827.73
1-6	1	Weatherford 13-1500 XXXLP Rotor		4.27	827.73	832.00

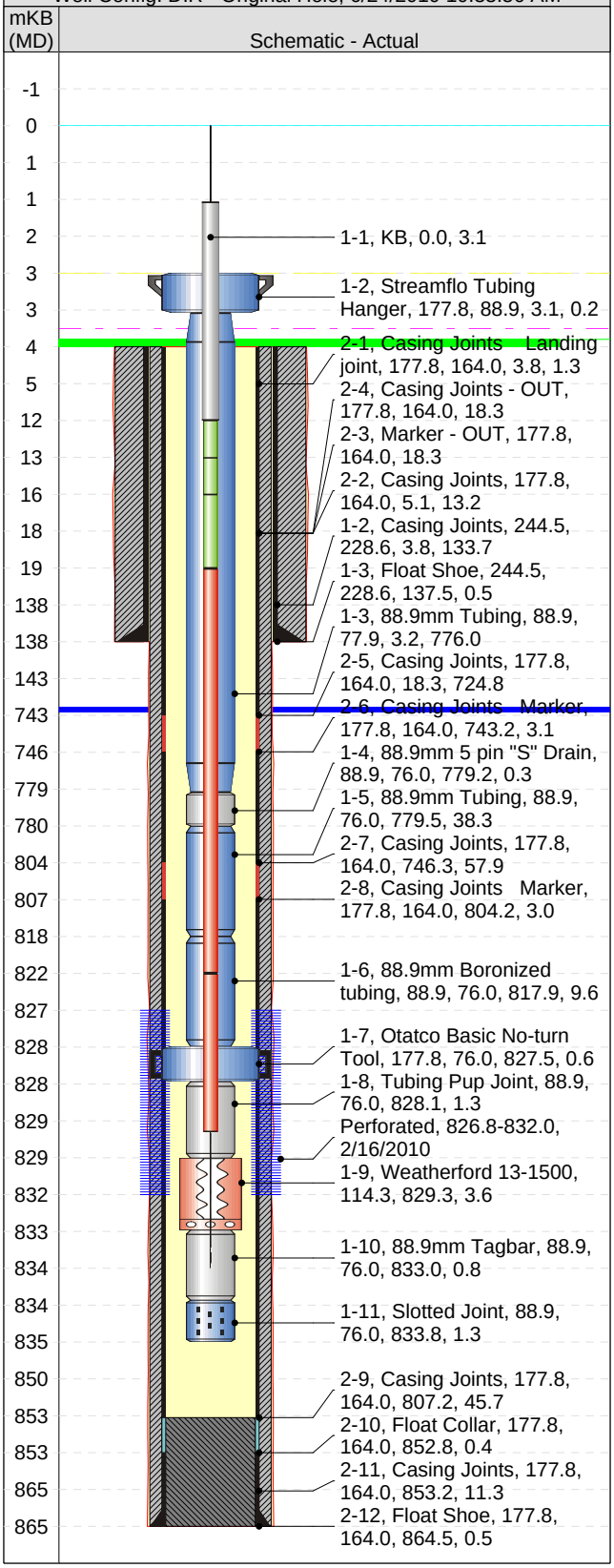
Downhole Schematic

Well Name: PENGROWTH 10A PROVOST 10-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
104/10-12-037-01W4/0	09-12-037-01 W4M	0415631	DIR	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
686.90	683.10	3.50	3.09	865.00	10/2/2010	12/2/2010

Well Config: DIR - Original Hole, 6/24/2010 10:33:56 AM



PBTDs

Date	Depth (mKB)
2/12/2010	852.82

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	244.5	48.068	H-40	138.00
Production	177.8	29.763	J-55	865.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Surface	casing	3.80	138.00			3.00
Production	casing	3.80	865.00	3.00	3	3.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Lloydminster, Original Hole	826.80	832.00	

Tubing Strings

Tubing - Production set at 835.09mKB on 3/29/2010 13:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Tubing - Production	88.9	11.459	J-55	835.09

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1	KB			3.09	0.00	3.09
1-2	1	Streamflo Tubing Hanger	177.8	88.9	0.15	3.09	3.24
1-3	81	88.9mm Tubing	88.9	77.9	775.99	3.24	779.23
1-4	1	88.9mm 5 pin "S" Drain	88.9	76.0	0.29	779.23	779.52
1-5	4	88.9mm Tubing	88.9	76.0	38.33	779.52	817.85
1-6	1	88.9mm Boronized tubing	88.9	76.0	9.64	817.85	827.49
1-7	1	Otatco Basic No-turn Tool	177.8	76.0	0.57	827.49	828.06
1-8	1	Tubing Pup Joint	88.9	76.0	1.27	828.06	829.33
1-9	1	Weatherford 13-1500	114.3		3.63	829.33	832.96
1-10	1	88.9mm Tagbar	88.9	76.0	0.80	832.96	833.76
1-11	1	Slotted Joint	88.9	76.0	1.33	833.76	835.09

Rods

Rod string on 3/29/2010 14:30

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rod string	25.4	4.316	D	833.50

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1		Polished Rod	31.7	10.97	1.22	12.19
1-2		Pony Rod	25.4	1.24	12.19	13.43
1-3		Pony Rod	25.4	2.48	13.43	15.91
1-4		Pony Rod	25.4	3.10	15.91	19.01
1-5	106	Sucker Rod	25.4	802.60	19.01	821.61
1-6	1	25.4mm "EL" Rod	25.4	7.62	821.61	829.23
1-7	1	Weatherford 13-1500 XXXLP Rotor		4.27	829.23	833.50

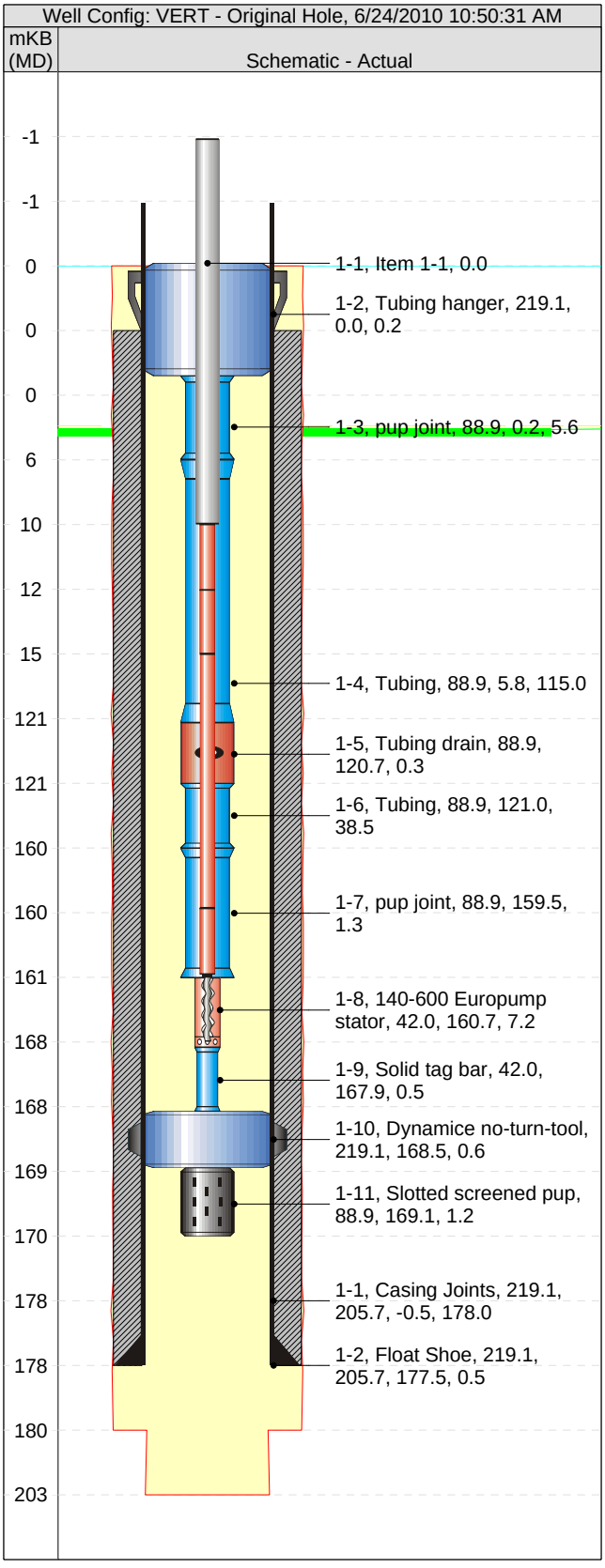
Downhole Schematic

Well Name: PENGROWTH WWC3 PROVOST 9-12-37-1

Btm Hole UWI	Surface Legal Location	License No.	Well Configuration Type	Field Name	State/Province
1F1/09-12-037-01W4/0	09-12-037-01 W4M	0415673	VERT	Provost	Alberta

KB Elevation (m)	Ground Elevation (m)	KB-CF (m)	KB - THF (m)	Total Depth (mKB)	Spud Date	Rig Release Date
689.87	686.10		2.86	203.00	1/26/2010	1/20/2010

Well Config: VERT - Original Hole, 6/24/2010 10:50:31 AM



PBTDs

Date	Depth (mKB)

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Set Depth (mKB)
Surface	219.1	35.716	J-55	178.00

Cement Stages

Description	Type	Top (mKB)	Btm (mKB)	Stroke (m)	Recip Rate (spm)	Cmnt Rtrn (m³)
Surface Casing Cement	casing	0.10	178.00	1.50	3	3.00

Tubing Strings

Stator set at 170.25mKB on 1/2/2010 08:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Stator	88.9	13.840	J55	170.25

Comment

Item No.	Jts	Item Description	OD (mm)	ID (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1	1				0.00	-0.02	-0.02
1-2	1	Tubing hanger	219.1		0.19	-0.02	0.17
1-3	2	pup joint	88.9		5.58	0.17	5.75
1-4	12	Tubing	88.9		114.97	5.75	120.72
1-5	1	Tubing drain	88.9		0.29	120.72	121.01
1-6	4	Tubing	88.9		38.46	121.01	159.47
1-7	1	pup joint	88.9		1.27	159.47	160.74
1-8	1	140-600 Europump stator	42.0		7.20	160.74	167.94
1-9	1	Solid tag bar	42.0		0.51	167.94	168.45
1-10	1	Dynamice no-turn-tool	219.1		0.61	168.45	169.06
1-11	1	Slotted screened pup	88.9		1.19	169.06	170.25

Rods

Rotor on 2/1/2010 15:00

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Rotor	25.4	4.316	D	167.87

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
1-1		Polished Rod	38.1	10.97	-1.18	9.79
1-2		Sucker Rod	25.4	2.44	9.79	12.23
1-3		Sucker Rod	25.4	3.05	12.23	15.28
1-4		Sucker Rod	25.4	144.78	15.28	160.06
1-5		Sucker Rod	25.4	0.61	160.06	160.67
1-6		PCP Rotor	16.0	7.20	160.67	167.87

APPENDIX D

SNF, Incorporated

P.O. Box 250 . Riceboro, GA 31323 . (912) 884-3366

PENGROWTH CORPORATION 10/21/2011
Attention: Regulatory Affairs Department
2100,222 THIRD AVENUE SW
ATTN: KEN BAIJOO

CALGARY, AB T2P 0

Dear Sir or Madam:

Please find enclosed the Material Safety Data Sheet(s) in 16 points, complying with the OSHA standard, for the product(s) listed below. Please give a copy of each Material Safety Data Sheet to your Occupational Physician and to any third-party to whom the product(s) may be retroceded.

Sincerely,

Ruben Westin

Product Name

SUPERPUSHER C 319

Material Safety Data Sheet

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY

Product name : **Superpusher C 319**

Company :
SNF Inc.
1 Chemical Plant Road
Riceboro, GA 31323
United States

Telephone : 912-884-3366
Telefax : 912-880-2330
E-mail : info@snfhc.com

Emergency telephone number : 800-424-9300 CHEMTREC (CCN 20412), Outside U.S. 703-527-3887

Product Use : Processing aid for industrial applications.

2. HAZARDS IDENTIFICATION

Appearance and Odor

Form : Granular solid
Color : White
Odor : None

Emergency Overview :
Aqueous solutions or powders that become wet render surfaces extremely slippery.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Identification : Anionic water-soluble polymer.

Regulated Components
None.

4. FIRST AID MEASURES

Inhalation : No hazards which require special first aid measures.

Skin contact : Wash with water and soap as a precaution. In case of persistent skin irritation, consult a physician.

Eye contact : Rinse thoroughly with plenty of water, also under the eyelids. In case of persistent eye irritation, consult a physician.

Ingestion : The product is not considered toxic based on studies on laboratory animals.

5. FIRE-FIGHTING MEASURES

Unsuitable extinguishing media : None.

Suitable extinguishing media : Foam. Dry powder. Water. Water spray. Carbon dioxide (CO2).

Precautions : Aqueous solutions or powders that become wet render surfaces extremely slippery.

Special protective equipment for firefighters : No special protective equipment required.

Flash point : Not applicable.

Autoignition temperature (°C): Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions : No special precautions required.

Environmental precautions : As with all chemical products, do not flush into surface water.

Methods for cleaning up : Do not flush with water Clean up promptly by sweeping or vacuum. Keep in suitable and closed containers for disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling

Safe handling advice : Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Wash hands before breaks and at the end of workday.

Storage

Keep in a cool, dry place (0 - 35 °C).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits
No exposure limits noted for ingredient(s).

Engineering measures
Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dusts.

Personal protective equipment

Respiratory protection : Dust safety masks are recommended where concentration of total dust is more than 10 mg/m^3.

Hand protection : Rubber gloves.

Eye protection : Safety glasses with side-shields. Do not wear contact lenses where this product is used.

Skin and body protection : Chemical resistant apron or protective suit if splashing or repeated contact with solution is likely.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form : Granular solid

Color : White

Odor : None

Melting point/range : Not applicable

Flash point : Not applicable

Autoignition temperature (°C): Not applicable

Approx. bulk density : 0.80

Water solubility : Completely miscible

LogPow : ~0

10. STABILITY AND REACTIVITY

Stability : Hazardous polymerisation does not occur. Stable.

Materials to avoid : Oxidizing agents may cause exothermic reactions.

Hazardous decomposition products : Thermal decomposition may produce. Nitrogen oxides (NOx). Carbon oxides (COx).

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral : LD50/oral/rat > 5000 mg/kg.

Skin : The results of testing on rabbits showed this material to be non-toxic even at high dose levels.

Inhalation : The product is not expected to be toxic by inhalation.

Irritation

Skin : The results of testing on rabbits showed this material to be non-irritating to the skin.

Eyes : Testing conducted according to the Draize technique showed the material produces no corneal or iridial effects and only slight transitory conjuctival effects similar to those which all granular materials have on conjuctivae.

Sensitization :
The results of testing on guinea pigs showed this material to be non-sensitizing.

Chronic toxicity :
A two-year feeding study on rats did not reveal adverse health effects. A one-year feeding study on dogs did not reveal adverse health effects.

12. ECOLOGICAL INFORMATION

Aquatic toxicity

Toxicity to fish : LC50/96 hours > 100 mg/l, (OECD 203), (Based on results obtained from tests on analogous products.).

Toxicity to daphnia : LC50/Daphnia m./48 hours > 100 mg/l, (OECD 202), (Based on results obtained from tests on analogous products.).

Toxicity to algae : IC50/Scenedesmus subspicatus/72 hours > 100 mg/l. (OECD 201), (Based on results obtained from tests on analogous products.).

Environmental fate

Persistence and degradability : Not readily biodegradable.

Hydrolysis : Does not hydrolyse.

LogPow : ~0

Bioaccumulation : Does not bioaccumulate.

13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of in accordance with local, state and federal regulations.

Container : Rinse empty containers with water and use the rinse water to prepare the working solution. Can be landfilled or incinerated, when in compliance with local, state and federal regulations.

14. TRANSPORT INFORMATION

DOT
Not classified as dangerous in the meaning of DOT regulations.

IMDG/IMO
Not classified as dangerous in the meaning of IMO/IMDG regulations.

ICAO/IATA
Not classified as dangerous in the meaning of ICAO/IATA regulations.

15. REGULATORY INFORMATION

US SARA Reporting Requirements:

SARA (Section 311/312) hazard class: Not concerned.

California Proposition 65 Information :
The following statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986. This product contains the following substance (s) known to the State of California to cause cancer : Acrylamide

International Inventories

USA (TSCA): All components of this product are either listed on the inventory or are exempt from listing.

Canada (DSL) : All components of this product are either listed on the inventory or are exempt from listing.

European Union (REACH) : All components of this product have been registered or pre-registered with the European Chemicals Agency or are exempt from registration.

Australia (AICS) : All components of this product are either listed on the inventory or are exempt from listing.

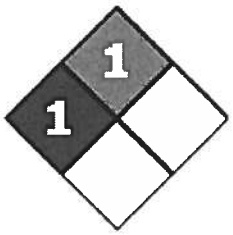
Japan (ENCS) : All components of this product are either listed on the inventory or are exempt from listing.

Korea (ECL) : All components of this product are either listed on the inventory or are exempt from listing.

Philippines (PICCS) : All components of this product are either listed on the inventory or are exempt from listing.

16. OTHER INFORMATION

NFPA and HMIS Ratings :



NFPA :

Health :	1
Flammability :	1
Instability :	0

HMIS :

Health :	1
Flammability :	1
Physical Hazard :	0

This MSDS was prepared in accordance with the following :

ISO 11014-1: Material Safety Data Sheet for Chemical Products
ANSI Z400.1-2004; Material Safety Data Sheets - Preparation

Contact : Regulatory Affairs Manager

Exova
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

T: +1 (780) 438-5522
F: +1 (780) 438-0396
E: Edmonton@exova.com
W: www.exova.com

Report Transmission Cover Page

Bill To:	Hydrogeological Consultants	Project:		Lot ID:	**725668**
Report To:	Hydrogeological Consultants	ID:	09-990	Control Number:	Z-624763
	17740 - 118 Avenue	Name:	License a Groundwater Supply	Date Received:	Feb 9, 2010
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M	Date Reported:	Feb 17, 2010
	T5S 2W3	LSD:	9-12-37-1 W4M	Report Number:	1296244
Attn:	Tara Parker	P.O.:	13529		
Sampled By:		Acct code:			
Company:	Mow Tech Ltd.				

Contact & Affiliation	Address	Delivery Commitments
Tara Parker HCL	17740 - 118 Avenue Edmonton, Alberta T5S 2W3 Phone: (780) 702-6242 Fax: (780) 484-9413 Email: tara@hcl.ca	On [Lot Verification] send (COA) by Email - Multiple Reports On [Report Approval] send (COC, Test Report) by Email - Multiple Reports On [Report Approval] send (Test Report) by Email - Multiple Reports On [Report Approval] send (Test Report, COC) by Email - Multiple Reports On [Report Approval] send (Test Report) by Email - Multiple Reports
Sonja Boyko HCL	17740 - 118 Avenue Edmonton, Alberta T5S 2W3 Phone: (780) 702-6221 Fax: (780) 484-9413 Email: sonja@hcl.ca	On [Lot Approval and Final Test Report Approval] send (Invoice) by Email - Multiple Reports

Notes To Clients:

Exova
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

T: +1 (780) 438-5522
F: +1 (780) 438-0396
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Sample Custody

Bill To:	Hydrogeological Consultants	Project:	
Report To:	Hydrogeological Consultants	ID:	09-990
	17740 - 118 Avenue	Name:	License a Groundwater Supply
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M
	T5S 2W3	LSD:	9-12-37-1 W4M
Attn:	Tara Parker	P.O.:	13529
Sampled By:		Acct code:	
Company:	Mow Tech Ltd.		

Lot ID:	**725668**
Control Number:	Z-624763
Date Received:	Feb 9, 2010
Date Reported:	Feb 17, 2010
Report Number:	1296244

Sample Disposal Date: March 13, 2010

All samples will be stored until this date unless other instructions are received. Please indicate other requirements below and return this form to the address or fax number on the top of this page.

☐ Extend Sample Storage Until _____ (MM/DD/YY)

The following charges apply to extended sample storage:

Storage for an additional 30 days	$ 2.50 per sample
Storage for an additional 60 days	$ 5.00 per sample
Storage for an additional 90 days	$ 7.50 per sample

☐ Return Sample, collect, to the address below via:

- ☐ Greyhound
- ☐ DHL
- ☐ Purolator
- ☐ Other (specify) _____

Name _____
Company _____
Address _____
_____
Phone _____
Fax _____

Signature _____

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7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

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Analytical Report

Bill To:	Hydrogeological Consultants	Project:		Lot ID:	**725668**
Report To:	Hydrogeological Consultants	ID:	09-990	Control Number:	Z-624763
	17740 - 118 Avenue	Name:	License a Groundwater Supply	Date Received:	Feb 9, 2010
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M	Date Reported:	Feb 17, 2010
	T5S 2W3	LSD:	9-12-37-1 W4M	Report Number:	1296244
Attn:	Tara Parker	P.O.:	13529		
Sampled By:		Acct code:			
Company:	Mow Tech Ltd.				

Reference Number	725668-1
Sample Date	Feb 03, 2010
Sample Time	13:53
Sample Location	
Sample Description	M40211.430104 (09-12 WSW)
Matrix	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties						
Colour	Apparent, Potable	Colour units	12			5
Turbidity		NTU	1.2			0.1
Routine Water						
pH			8.26			
Temperature of observed pH		°C	21.3			
Electrical Conductivity		µS/cm at 25 C	6160			1
Calcium	Extractable	mg/L	22			0.2
Magnesium	Extractable	mg/L	5.8			0.2
Sodium	Extractable	mg/L	1360			0.4
Potassium	Extractable	mg/L	5			0.4
Iron	Extractable	mg/L	0.21			0.01
Manganese	Extractable	mg/L	<0.02			0.005
Chloride	Dissolved	mg/L	2010			0.4
Fluoride		mg/L	<0.5			0.05
Nitrate - N		mg/L	<0.1			0.01
Nitrite - N		mg/L	<0.05			0.005
Nitrate and Nitrite - N		mg/L	<0.1			0.01
Sulfate (SO4)		mg/L	<4			0.9
Hydroxide		mg/L	<5			5
Carbonate		mg/L	<6			6
Bicarbonate		mg/L	371			5
P-Alkalinity	as CaCO3	mg/L	<5			5
T-Alkalinity	as CaCO3	mg/L	304			5
Total Dissolved Solids		mg/L	3590			1
Hardness	as CaCO3	mg/L	79			
Ionic Balance		%	97			

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7217 Roper Road NW
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Report To:	Hydrogeological Consultants	ID:	09-990	Control Number:	Z-624763
	17740 - 118 Avenue	Name:	License a Groundwater Supply	Date Received:	Feb 9, 2010
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M	Date Reported:	Feb 17, 2010
	T5S 2W3	LSD:	9-12-37-1 W4M	Report Number:	1296244
Attn:	Tara Parker	P.O.:	13529		
Sampled By:		Acct code:			
Company:	Mow Tech Ltd.				

Reference Number	725668-2
Sample Date	Feb 03, 2010
Sample Time	13:53
Sample Location	
Sample Description	M40211.430104 (09-12 WSW)
Matrix	Gases

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Gas Analysis - Not Air Corrected						
Helium	Not air corrected	Mole %	<0.01			0.01
Helium	Not air corrected	ppm	<100			100
Hydrogen	Not air corrected	Mole %	<0.01			0.01
Hydrogen	Not air corrected	ppm	<100			100
Carbon Dioxide	Not air corrected	Mole %	0.07			0.01
Carbon Dioxide	Not air corrected	ppm	742.00			100
Oxygen	Not air corrected	Mole %	1.34			0.01
Oxygen	Not air corrected	ppm	13410			100
Nitrogen	Not air corrected	Mole %	7.02			0.01
Nitrogen	Not air corrected	ppm	70200			100
Methane	Not air corrected	Mole %	91.55			0.01
Methane	Not air corrected	ppm	915500			100
Ethane	Not air corrected	Mole %	0.01			0.01
Ethane	Not air corrected	ppm	121			100
Propane	Not air corrected	Mole %	<0.01			0.01
Propane	Not air corrected	ppm	<100			100
Iso-Butane	Not air corrected	Mole %	<0.01			0.01
Iso-Butane	Not air corrected	ppm	<100			100
n-Butane	Not air corrected	Mole %	<0.01			0.01
n-Butane	Not air corrected	ppm	<100			100
Iso-Pentane	Not air corrected	Mole %	<0.01			0.01
Iso-Pentane	Not air corrected	ppm	<100			100
n-Pentane	Not air corrected	Mole %	<0.01			0.01
n-Pentane	Not air corrected	ppm	<100			100
Hexanes	Not air corrected	Mole %	<0.01			0.01
Hexanes	Not air corrected	ppm	<100			100
Heptanes	Not air corrected	Mole %	<0.01			0.01
Heptanes	Not air corrected	ppm	<100			100
Octanes	Not air corrected	Mole %	<0.01			0.01
Octanes	Not air corrected	ppm	<100			100
Nonanes	Not air corrected	Mole %	<0.01			0.01
Nonanes	Not air corrected	ppm	<100			100
Decanes +	Not air corrected	Mole %	<0.01			0.01
Hydrogen Sulfide	As Received	ppm	<0.1			0.1

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7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

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F: +1 (780) 438-0396
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Analytical Report

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Report To:	Hydrogeological Consultants	ID:	09-990
	17740 - 118 Avenue	Name:	License a Groundwater Supply
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M
	T5S 2W3	LSD:	9-12-37-1 W4M
Attn:	Tara Parker	P.O.:	13529
Sampled By:		Acct code:	
Company:	Mow Tech Ltd.		

Lot ID:	**725668**
Control Number:	Z-624763
Date Received:	Feb 9, 2010
Date Reported:	Feb 17, 2010
Report Number:	1296244

Approved by:

Darren Crichton, BSc, PChem
Operations Chemist

Exova
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

T: +1 (780) 438-5522
F: +1 (780) 438-0396
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Analytical Report

Bill To:	Hydrogeological Consultants	Project:	
Report To:	Hydrogeological Consultants	ID:	09-990
	17740 - 118 Avenue	Name:	License a Groundwater Supply
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M
	T5S 2W3	LSD:	9-12-37-1 W4M
Attn:	Tara Parker	P.O.:	13529
Sampled By:		Acct code:	
Company:	Mow Tech Ltd.		

Lot ID:	**725668**
Control Number:	Z-624763
Date Received:	Feb 9, 2010
Date Reported:	Feb 17, 2010
Report Number:	1296244

Reference Number	725668-1
Sample Date	February 03, 2010
Sample Time	13:53
Sample Location	
Sample Description	M40211.430104 (09-12 WSW)
Sample Matrix	Water

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Physical and Aggregate Properties						
Colour	Apparent, Potable	Colour units	12	5	15	Below AO
Turbidity		NTU	1.2	0.1	0.1	Above OG
Routine Water						
pH			8.26		6.5 - 8.5	Within AO
Temperature of observed pH		°C	21.3			
Electrical Conductivity		µS/cm at 25 C	6160	1		
Calcium	Extractable	mg/L	22	0.2		
Magnesium	Extractable	mg/L	5.8	0.2		
Sodium	Extractable	mg/L	1360	0.4	200	Above AO
Potassium	Extractable	mg/L	5	0.4		
Iron	Extractable	mg/L	0.21	0.01	0.3	Below AO
Manganese	Extractable	mg/L	<0.02	0.005	0.05	Below AO
Chloride	Dissolved	mg/L	2010	0.4	250	Above AO
Fluoride		mg/L	<0.5	0.05	1.5	Below MAC
Nitrate - N		mg/L	<0.1	0.01	10	Below MAC
Nitrite - N		mg/L	<0.05	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	<0.1	0.01	10	Below MAC
Sulfate (SO4)		mg/L	<4	0.9	500	Below AO
Hydroxide		mg/L	<5	5		
Carbonate		mg/L	<6	6		
Bicarbonate		mg/L	371	5		
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	304	5		
Total Dissolved Solids		mg/L	3590	1		
Hardness	as CaCO3	mg/L	79			
Ionic Balance		%	97			

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7217 Roper Road NW
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Analytical Report

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Report To:	Hydrogeological Consultants	ID:	09-990	Control Number:	Z-624763
	17740 - 118 Avenue	Name:	License a Groundwater Supply	Date Received:	Feb 9, 2010
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M	Date Reported:	Feb 17, 2010
	T5S 2W3	LSD:	9-12-37-1 W4M	Report Number:	1296244
Attn:	Tara Parker	P.O.:	13529		
Sampled By:		Acct code:			
Company:	Mow Tech Ltd.				

Reference Number	725668-2
Sample Date	February 03, 2010
Sample Time	13:53
Sample Location	
Sample Description	M40211.430104 (09-12 WSW)
Sample Matrix	Gases

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Gas Analysis - Not Air Corrected						
Helium	Not air corrected	Mole %	<0.01	0.01		
Helium	Not air corrected	ppm	<100	100		
Hydrogen	Not air corrected	Mole %	<0.01	0.01		
Hydrogen	Not air corrected	ppm	<100	100		
Carbon Dioxide	Not air corrected	Mole %	0.07	0.01		
Carbon Dioxide	Not air corrected	ppm	742.00	100		
Oxygen	Not air corrected	Mole %	1.34	0.01		
Oxygen	Not air corrected	ppm	13410	100		
Nitrogen	Not air corrected	Mole %	7.02	0.01		
Nitrogen	Not air corrected	ppm	70200	100		
Methane	Not air corrected	Mole %	91.55	0.01		
Methane	Not air corrected	ppm	915500	100		
Ethane	Not air corrected	Mole %	0.01	0.01		
Ethane	Not air corrected	ppm	121	100		
Propane	Not air corrected	Mole %	<0.01	0.01		
Propane	Not air corrected	ppm	<100	100		
Iso-Butane	Not air corrected	Mole %	<0.01	0.01		
Iso-Butane	Not air corrected	ppm	<100	100		
n-Butane	Not air corrected	Mole %	<0.01	0.01		
n-Butane	Not air corrected	ppm	<100	100		
Iso-Pentane	Not air corrected	Mole %	<0.01	0.01		
Iso-Pentane	Not air corrected	ppm	<100	100		
n-Pentane	Not air corrected	Mole %	<0.01	0.01		
n-Pentane	Not air corrected	ppm	<100	100		
Hexanes	Not air corrected	Mole %	<0.01	0.01		
Hexanes	Not air corrected	ppm	<100	100		
Heptanes	Not air corrected	Mole %	<0.01	0.01		
Heptanes	Not air corrected	ppm	<100	100		
Octanes	Not air corrected	Mole %	<0.01	0.01		
Octanes	Not air corrected	ppm	<100	100		
Nonanes	Not air corrected	Mole %	<0.01	0.01		
Nonanes	Not air corrected	ppm	<100	100		
Decanes +	Not air corrected	Mole %	<0.01	0.01		
Hydrogen Sulfide	As Received	ppm	<0.1	0.1		

Exova
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

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Analytical Report

Bill To:	Hydrogeological Consultants	Project:	
Report To:	Hydrogeological Consultants	ID:	09-990
	17740 - 118 Avenue	Name:	License a Groundwater Supply
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M
	T5S 2W3	LSD:	9-12-37-1 W4M
Attn:	Tara Parker	P.O.:	13529
Sampled By:		Acct code:	
Company:	Mow Tech Ltd.		

Lot ID:	**725668**
Control Number:	Z-624763
Date Received:	Feb 9, 2010
Date Reported:	Feb 17, 2010
Report Number:	1296244

Approved by:

Darren Crichton, BSc, PChem
Operations Chemist

Exova
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

T: +1 (780) 438-5522
F: +1 (780) 438-0396
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Methodology and Notes

Bill To:	Hydrogeological Consultants	Project:	
Report To:	Hydrogeological Consultants	ID:	09-990
	17740 - 118 Avenue	Name:	License a Groundwater Supply
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M
	T5S 2W3	LSD:	9-12-37-1 W4M
Attn:	Tara Parker	P.O.:	13529
Sampled By:		Acct code:	
Company:	Mow Tech Ltd.		

Lot ID:	**725668**
Control Number:	Z-624763
Date Received:	Feb 9, 2010
Date Reported:	Feb 17, 2010
Report Number:	1296244

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	*	Alkalinity - Titration Method, 2320 B	10-Feb-10	Exova Edmonton
Alkalinity, pH, and EC in water	APHA	*	Conductivity, 2510	10-Feb-10	Exova Edmonton
Alkalinity, pH, and EC in water	APHA	*	pH - Electrometric Method, 4500-H+ B	10-Feb-10	Exova Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	10-Feb-10	Exova Edmonton
Approval-Edmonton	APHA		Checking Correctness of Analyses, 1030 E	10-Feb-10	Exova Edmonton
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	10-Feb-10	Exova Edmonton
Colour (Apparent) in water	APHA	*	Visual Comparison Method, 2120 B	10-Feb-10	Exova Edmonton
Metals Trace (Extractable) in water	APHA		Hardness by Calculation, 2340 B	10-Feb-10	Exova Edmonton
Metals Trace (Extractable) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	10-Feb-10	Exova Edmonton
Natural Gas - C7/10 Composition	GPA	*	Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography, GPA 2261-00	11-Feb-10	Exova Edmonton
Total Reduced Sulfur Analysis of Natural Gas	ASTM	*	Standard Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence, D 5504-08	16-Feb-10	Exova Edmonton
Turbidity in Water	APHA	*	Turbidity - Nephelometric Method, 2130 B	10-Feb-10	Exova Edmonton

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
ASTM	Annual Book of ASTM Standards
GPA	Gas Processors Association

Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, May 2008
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants Refer to Health Canada GCDWQ for complete guidelines and additional drinking water information at www.hc-sc.gc.ca

Exova
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

T: +1 (780) 438-5522
F: +1 (780) 438-0396
E: Edmonton@exova.com
W: www.exova.com

Methodology and Notes

Bill To:	Hydrogeological Consultants	Project:	
Report To:	Hydrogeological Consultants	ID:	09-990
	17740 - 118 Avenue	Name:	License a Groundwater Supply
	Edmonton, AB, Canada	Location:	10-12-37-1 W4M
	T5S 2W3	LSD:	9-12-37-1 W4M
Attn:	Tara Parker	P.O.:	13529
Sampled By:		Acct code:	
Company:	Mow Tech Ltd.		

Lot ID:	**725668**
Control Number:	Z-624763
Date Received:	Feb 9, 2010
Date Reported:	Feb 17, 2010
Report Number:	1296244

Comments:

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.

WATER ANALYSIS

CONTAINER IDENTITY	METER ID	WELL LICENSE NUMBER	LABORATORY FILE NUMBER
498 - 1			52136-2010-0781

OPERATOR	PAGE
Pengrowth Corporation	1

LOCATION (UWI)	WELL NAME	KB ELEV (m)	GR ELEV (m)
09-14-037-01W4	Pengrowth Provost 9-14 Battery		

FIELD OR AREA	POOL OR ZONE	SAMPLER
Provost		Pengrowth

TEST TYPE AND NO.	TEST RECOVERY

POINT OF SAMPLE	SAMPLE POINT ID
Injection Water	

PUMPING | FLOWING | GAS LIFT | SWAB

WATER m³/d | OIL m³/d | GAS m³/d

TEST INTERVAL or PERFS (meters)

Pressures, kPa (gauge)

SEPARATOR | RESERVOIR | OTHER | CONTAINER WHEN SAMPLED @ °C | CONTAINER WHEN RECEIVED @ °C

Temperatures, °C

SEPARATOR | OTHER

DATE SAMPLED (Y/M/D)	DATE RECEIVED (Y/M/D)	DATE ANALYZED (Y/M/D)	ANALYST	AMT. AND TYPE CUSHION	MUD RESISTIVITY @ °C
2010 06 17	2010 06 18	2010 06 18	ML		

CATIONS

ION	mg/L	mg Fraction	meq/L
Na			
K			
Ca			
Mg			
Ba			
Sr			
Fe			
Mn			

ANIONS

ION	mg/L	mg Fraction	meq/L
Cl			
Br			
I			
HCO_3			
SO_4			
CO_3			
OH			
H_2S			

Total Dissolved Solids (mg/L)

By Evaporation @ 110 °C	By Evaporation @ 180 °C
Not Requested	Not Requested

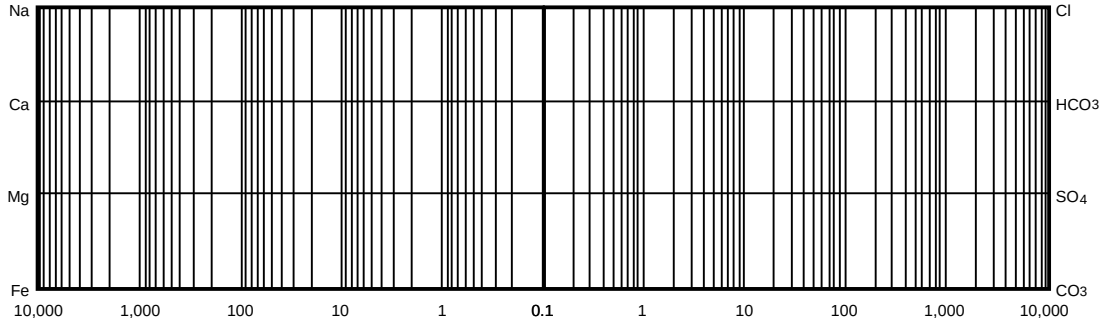
0 — Calculated

Specific Gravity	Refractive Index (n_D)
@ 15.6 °C	@ °C

pH	Resistivity (Ohm-Meters)
@ 25.0 °C	@ 25 °C

LOGARITHMIC PATTERNS OF DISSOLVED IONS

meq/L



REMARKS: Oil & Grease Content (mg/L) = 25.9

OIL ANALYSIS

CONTAINER IDENTITY	METER ID	WELL LICENSE NUMBER	LABORATORY FILE NUMBER
175 - 27		415632	52136-2010-1059

OPERATOR: Pengrowth Corporation — PAGE: 15

LOCATION (UWI)	WELL NAME	KB ELEV (m)	GR ELEV (m)
103/16-12-037-01W4/00	Pengrowth 16A Provo 16-12-37-1	686.8	683.1

FIELD OR AREA	POOL OR ZONE	SAMPLER
Provost	U Mannville Und	Pengrowth

TEST TYPE AND NO.: | TEST RECOVERY:

POINT OF SAMPLE: Wellhead at 9-12 — SAMPLE POINT ID:

TEST INTERVAL or PERFS (meters): 825.0 - 831.0

PUMPING | FLOWING | GAS LIFT | SWAB

WATER m³/d | OIL m³/d | GAS m³/d

Pressures, kPa (gauge)

SEPARATOR | RESERVOIR | OTHER | @ °C CONTAINER WHEN SAMPLED | @ °C CONTAINER WHEN RECEIVED

Temperatures, °C

SEPARATOR | OTHER

DATE SAMPLED (Y/M/D)	DATE RECEIVED (Y/M/D)	DATE ANALYZED (Y/M/D)	ANALYST	AMT. AND TYPE CUSHION	@ °C MUD RESISTIVITY
2010 08 22	2010 08 24	2010 09 14	GL		

SAMPLE PROPERTIES

APPEARANCE OF CLEAN OIL	WATER	BS	TOTAL BS & W
Dark Brown	0.010	0.001	0.011

ABSOLUTE DENSITY
kg/m³ @15°C

AS RECEIVED	AFTER CLEANING
	968.8

API GRAVITY @15.6°C

AS RECEIVED	AFTER CLEANING
	14.5

SULPHUR
26.7 grams/kg

SALT
kg/m³

POUR POINT °C
A.S.T.M.

REID VAPOUR PRESSURE
kPa

CARBON RESIDUE

CONRADSON	RAMSBOTTOM

VISCOSITY

TEMP °C	DYNAMIC mPa's	KINEMATIC mm²/s
20	2188	2268
30	897.2	936.1
40	418.4	439.5

FRACTION DISTILLED	TEMP °C
FBP	
CRACKED	

METHOD | BAROM PRESS kPa

ROOM TEMP °C | INITIAL BOIL PT °C

DISTILLATION SUMMARY

204 °C NAPHTHA	274 °C KEROSENE

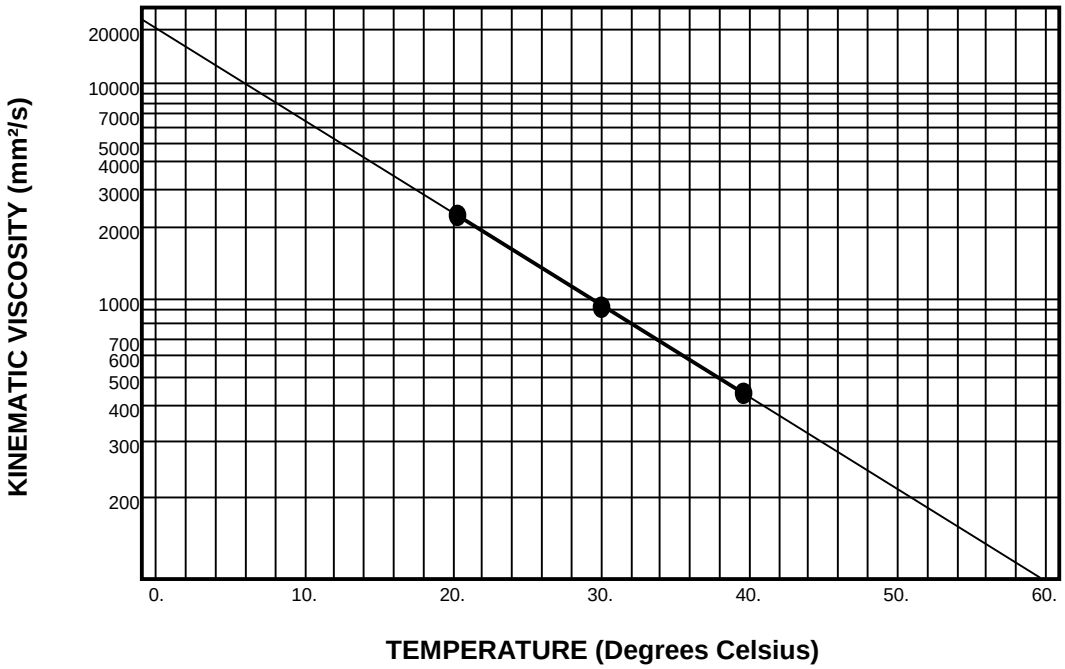
343 °C LIGHT GAS/OIL	RECOVERED

RESIDUE	DISTILLATION LOSS

REMARKS: Free water (volume %) = 74

Company Name: Pengrowth Corporation
Well Name: Pengrowth 16A Provo 16-12-37-1
Location: 103/16-12-037-01W4/00
Sampled From: Wellhead at 9-12
Sampling Date: 2010 08 22

VISCOSITY - TEMPERATURE CHART



OIL ANALYSIS

CONTAINER IDENTITY	METER ID	WELL LICENSE NUMBER	LABORATORY FILE NUMBER
165 - 17		415628	52136-2010-1059

OPERATOR: Pengrowth Corporation — PAGE: 12

LOCATION (UWI)	WELL NAME	KB ELEV (m)	GR ELEV (m)
103/10-12-037-01W4/00	Pengrowth 10C Provo 10-12-37-1	686.0	682.7

FIELD OR AREA	POOL OR ZONE	SAMPLER
Provost	U Mannville Und	Pengrowth

TEST TYPE AND NO.: | TEST RECOVERY:

POINT OF SAMPLE: Wellhead at 15-12 — SAMPLE POINT ID:

TEST INTERVAL or PERFS (meters): 833.5 - 839.5

PUMPING | FLOWING | GAS LIFT | SWAB

WATER m³/d | OIL m³/d | GAS m³/d

Pressures, kPa (gauge): SEPARATOR | RESERVOIR | OTHER | @ °C CONTAINER WHEN SAMPLED | @ °C CONTAINER WHEN RECEIVED

Temperatures, °C: SEPARATOR | OTHER

DATE SAMPLED (Y/M/D)	DATE RECEIVED (Y/M/D)	DATE ANALYZED (Y/M/D)	ANALYST	AMT. AND TYPE CUSHION	@ °C MUD RESISTIVITY
2010 08 22	2010 08 24	2010 09 14	GL		

SAMPLE PROPERTIES

APPEARANCE OF CLEAN OIL	WATER	BS	TOTAL BS & W
Dark Brown	0.002	0.001	0.003

ABSOLUTE DENSITY
kg/m³ @15°C

AS RECEIVED	AFTER CLEANING
	967.9

API GRAVITY @15.6°C

AS RECEIVED	AFTER CLEANING
	14.6

SULPHUR
27.3 grams/kg

SALT
kg/m³

POUR POINT °C
A.S.T.M.

REID VAPOUR PRESSURE
kPa

CARBON RESIDUE

CONRADSON	RAMSBOTTOM

VISCOSITY

TEMP °C	DYNAMIC mPa's	KINEMATIC mm²/s
20	2221	2302
30	907.5	946.8
40	424.3	445.7

FRACTION DISTILLED	TEMP °C
FBP	
CRACKED	

METHOD | BAROM PRESS (kPa)

ROOM TEMP (°C) | INITIAL BOIL PT (°C)

DISTILLATION SUMMARY

204 °C NAPHTHA	274 °C KEROSENE

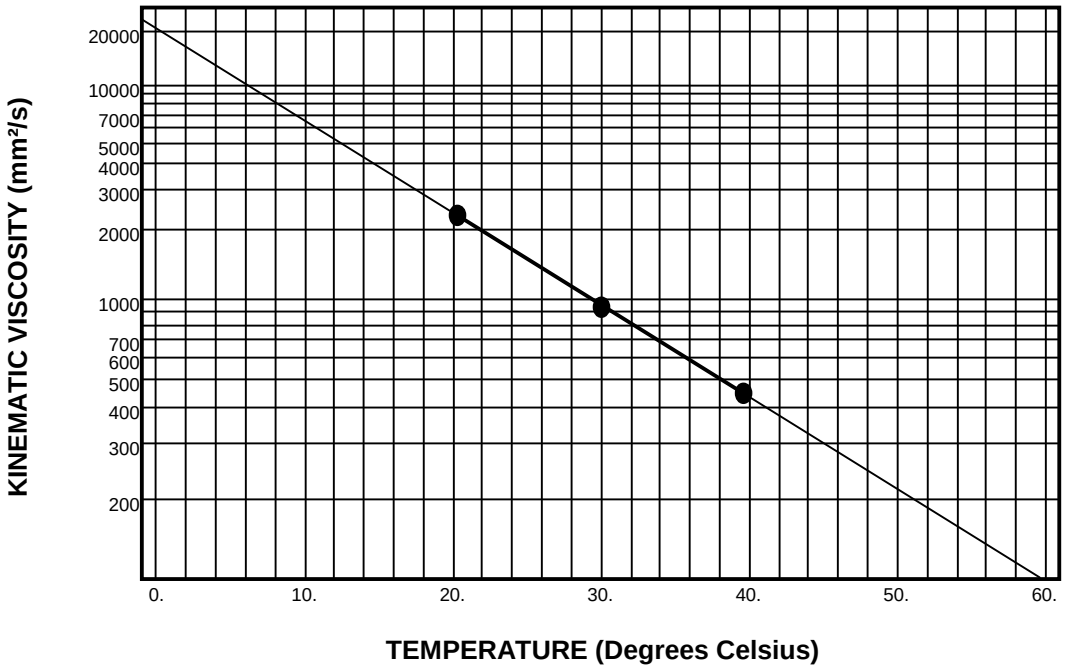
343 °C LIGHT GAS/OIL	RECOVERED

RESIDUE	DISTILLATION LOSS

REMARKS: Free water (volume %) = 79

Company Name: Pengrowth Corporation
Well Name: Pengrowth 10C Provo 10-12-37-1
Location: 103/10-12-037-01W4/00
Sampled From: Wellhead at 15-12
Sampling Date: 2010 08 22

VISCOSITY - TEMPERATURE CHART



OIL ANALYSIS

CONTAINER IDENTITY	METER ID	WELL LICENSE NUMBER	LABORATORY FILE NUMBER
166 - 18		415630	52136-2010-1059

OPERATOR: Pengrowth Corporation — PAGE: 14

LOCATION (UWI)	WELL NAME	KB ELEV (m)	GR ELEV (m)
102/16-12-037-01W4/00	Pengrowth 16C Provo 16-12-37-1	685.9	683.2

FIELD OR AREA	POOL OR ZONE	SAMPLER
Provost	U Mannville Und	Pengrowth

TEST TYPE AND NO.: | TEST RECOVERY:

POINT OF SAMPLE: Wellhead at 15-12 — SAMPLE POINT ID:

TEST INTERVAL or PERFS (meters): 832.5 - 839.5

PUMPING | FLOWING | GAS LIFT | SWAB

WATER m³/d | OIL m³/d | GAS m³/d

Pressures, kPa (gauge)

SEPARATOR | RESERVOIR | OTHER | @ °C CONTAINER WHEN SAMPLED | @ °C CONTAINER WHEN RECEIVED

Temperatures, °C

SEPARATOR | OTHER

DATE SAMPLED (Y/M/D)	DATE RECEIVED (Y/M/D)	DATE ANALYZED (Y/M/D)	ANALYST	AMT. AND TYPE CUSHION	@ °C MUD RESISTIVITY
2010 08 22	2010 08 24	2010 09 14	ML		

SAMPLE PROPERTIES

APPEARANCE OF CLEAN OIL	WATER	BS	TOTAL BS & W
Dark Brown	0.020	0.000	0.020

ABSOLUTE DENSITY
kg/m³ @15°C

AS RECEIVED	AFTER CLEANING
	969.2

API GRAVITY @15.6°C

AS RECEIVED	AFTER CLEANING
	14.4

SULPHUR
23.8 grams/kg

SALT
kg/m³

POUR POINT °C
A.S.T.M.

REID VAPOUR PRESSURE
kPa

CARBON RESIDUE

CONRADSON	RAMSBOTTOM

VISCOSITY

TEMP °C	DYNAMIC mPa's	KINEMATIC mm²/s
20	2308	2389
30	955.6	995.5
40	454.7	476.9

FRACTION DISTILLED	TEMP °C
FBP	
CRACKED	

METHOD | BAROM PRESS (kPa)

ROOM TEMP (°C) | INITIAL BOIL PT (°C)

DISTILLATION SUMMARY

204 °C NAPHTHA	274 °C KEROSENE

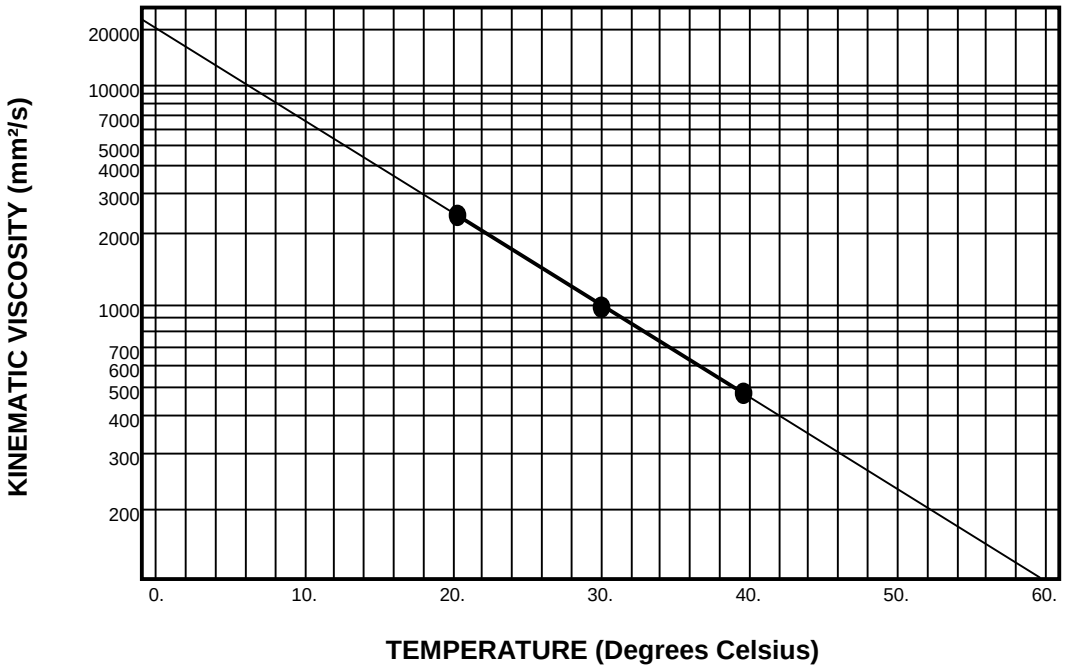
343 °C LIGHT GAS/OIL	RECOVERED

RESIDUE	DISTILLATION LOSS

REMARKS:

Company Name: Pengrowth Corporation
Well Name: Pengrowth 16C Provo 16-12-37-1
Location: 102/16-12-037-01W4/00
Sampled From: Wellhead at 15-12
Sampling Date: 2010 08 22

VISCOSITY - TEMPERATURE CHART



OIL ANALYSIS

CONTAINER IDENTITY	METER ID	WELL LICENSE NUMBER	LABORATORY FILE NUMBER
413 - 1		415626	52136-2010-0085

OPERATOR	PAGE
Pengrowth Corporation	1

LOCATION (UWI)	WELL NAME	KB ELEV (m)	GR ELEV (m)
102/10-12-037-01W4/00	Pengrowth 10D Provost 10-12-37-1		686.1

FIELD OR AREA	POOL OR ZONE	SAMPLER
Provost	Nisku	Pengrowth

TEST TYPE AND NO. | TEST RECOVERY

POINT OF SAMPLE: Wellhead Tubing | SAMPLE POINT ID

PUMPING | FLOWING | GAS LIFT | SWAB

WATER m³/d | OIL m³/d | GAS m³/d

TEST INTERVAL or PERFS (meters)

Pressures, kPa (gauge)

SEPARATOR | RESERVOIR | OTHER | @ °C CONTAINER WHEN SAMPLED | @ °C CONTAINER WHEN RECEIVED

Temperatures, °C

SEPARATOR | OTHER

DATE SAMPLED (Y/M/D)	DATE RECEIVED (Y/M/D)	DATE ANALYZED (Y/M/D)	ANALYST	AMT. AND TYPE CUSHION	@ °C MUD RESISTIVITY
2010 01 15	2010 01 21	2010 01 25	ST		

SAMPLE PROPERTIES

APPEARANCE OF CLEAN OIL	WATER	BS	TOTAL BS & W
Dark Brown	0.050	0.030	0.080

ABSOLUTE DENSITY
kg/m³ @15°C

AS RECEIVED	AFTER CLEANING
	966.7

API GRAVITY @15.6°C

AS RECEIVED	AFTER CLEANING
	14.8

SULPHUR
26.9 grams/kg

SALT
kg/m³

POUR POINT °C
A.S.T.M.

REID VAPOUR PRESSURE
kPa

CARBON RESIDUE

CONRADSON	RAMSBOTTOM

VISCOSITY

TEMP °C	DYNAMIC mPa's	KINEMATIC mm²/s
20	2064	2152
30	849.0	887.0
40	399.1	419.8

FRACTION DISTILLED	TEMP °C
FBP	
CRACKED	

METHOD | BAROM PRESS kPa

ROOM TEMP °C | INITIAL BOIL PT °C

DISTILLATION SUMMARY

204 °C NAPHTHA	274 °C KEROSENE

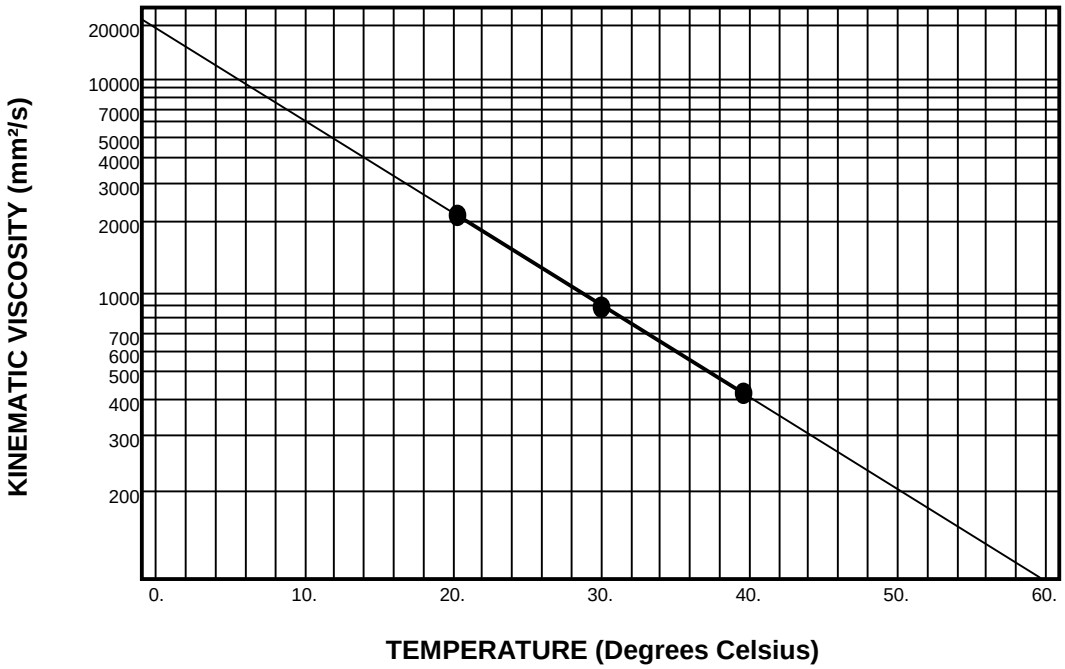
343 °C LIGHT GAS/OIL	RECOVERED

RESIDUE	DISTILLATION LOSS

REMARKS: Free water (volume %) = 35

Company Name: Pengrowth Corporation
Well Name: Pengrowth 10D Provost 10-12-37-1
Location: 102/10-12-037-01W4/00
Sampled From: Wellhead Tubing
Sampling Date: 2010 01 15

VISCOSITY - TEMPERATURE CHART



Appendix E

11878 - PROVOST UPPER MANNVILLE 'A' POOL UNIT (NET)

REVENUE	11/Mar (AV)	11/Apr (AV)	11/May (AV)	11/Jun (AV)	11/Jul (AV)	11/Aug (AV)	11/Sep (AV)	11/Oct (AV)	11/Nov (AV)	11/Dec (AV)	Total
7710 703 - HEAVY OIL SALES	$1,632,789.50	$1,742,547.19	$1,703,084.00	$1,429,065.74	$1,470,757.00	$1,291,163.69	$1,444,066.73	$1,738,248.79	$2,230,307.44	$2,386,735.62	**$17,068,765.70**
7711 703 - HEAVY OIL VOLUMES (IMPERIAL)	24,679.50	23,471.89	23,009.36	21,198.89	22,412.79	22,976.01	23,105.64	25,685.11	28,112.90	30,543.86	**245,195.95**
7711 703 - HEAVY OIL PRICE ($/BBL)	$66.16	$74.24	$74.02	$67.41	$65.62	$56.20	$62.50	$67.68	$79.33	$78.14	**$69.61**

EAST BODO SECTION 12 POLYMER PILOT	11/Mar (AV)	11/Apr (AV)	11/May (AV)	11/Jun (AV)	11/Jul (AV)	11/Aug (AV)	11/Sep (AV)	11/Oct (AV)	11/Nov (AV)	11/Dec (AV)	Total
INCREMENTAL OIL PRODUCTION (m3/d)	0.54	1.51	1.37	0.00	2.84	4.53	3.83	4.84	3.49	4.35	
7711 703 - HEAVY OIL VOLUMES (IMPERIAL)	105.34	285.07	267.26	0.00	554.03	883.71	723.05	944.19	658.87	848.60	**5,270.11**
7710 703 - HEAVY OIL SALES	$6,969.48	$21,163.40	$19,781.75	$0.00	$36,355.98	$49,661.22	$45,189.77	$63,898.17	$52,270.49	$66,310.48	**$361,600.74**

11878 - PROVOST UPPER MANNVILLE 'A' POOL UNIT (NET)

ROYALTIES	11/Mar (AV)	11/Apr (AV)	11/May (AV)	11/Jun (AV)	11/Jul (AV)	11/Aug (AV)	11/Sep (AV)	11/Oct (AV)	11/Nov (AV)	11/Dec (AV)	Total
7730 700 - OIL CROWN ROYALTIES	$219,404.92	$185,936.09	$220,743.22	$194,081.85	$209,472.36	$173,062.22	$159,261.70	$202,001.00	$233,133.13	$208,895.10	**$2,005,991.59**
7735 700 - OIL FREEHOLD MINERAL/PRODUCTION TAX										$234,331.07	**$234,331.07**
7740 700 - OIL FREEHOLD ROYALTY (PRODUCTION)	$160,067.35	$167,818.24	$165,574.35	$138,889.24	$143,210.50	$127,132.46	$138,165.06	$167,062.32	$219,366.33	$232,394.11	**$1,659,679.96**
7750 700 - OIL OVERRIDING ROYALTY (RESOURCE)	$4,753.39	$4,971.68	$4,904.94	$4,090.03	$4,201.46	$3,745.23	$4,046.17	$4,962.87	$6,476.14	$6,881.00	**$49,032.91**
Total	**$384,225.66**	**$358,726.01**	**$391,222.51**	**$337,061.12**	**$356,884.32**	**$303,939.91**	**$301,472.93**	**$374,026.19**	**$458,975.60**	**$682,501.28**	**$3,949,035.53**
ROYALTY RATE - CROWN	13.44%	10.67%	12.96%	13.58%	14.24%	13.40%	11.03%	11.62%	10.45%	8.75%	**11.75%**
ROYALTY RATE - PRODUCTION TAX	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.82%	**1.37%**
ROYALTY RATE - FREEHOLD	9.80%	9.63%	9.72%	9.72%	9.74%	9.85%	9.57%	9.61%	9.84%	9.74%	**11.10%**
ROYALTY RATE - OVERRIDING	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.28%	0.29%	0.29%	0.29%	**0.29%**
ROYALTY RATE - COMBINED	23.53%	20.59%	22.97%	23.59%	24.27%	23.54%	20.88%	21.52%	20.58%	28.60%	**23.14%**

EAST BODO SECTION 12 POLYMER PILOT	11/Mar (AV)	11/Apr (AV)	11/May (AV)	11/Jun (AV)	11/Jul (AV)	11/Aug (AV)	11/Sep (AV)	11/Oct (AV)	11/Nov (AV)	11/Dec (AV)	Total
CROWN ROYALITES	$936.52	$2,258.21	$2,563.99	$0.00	$5,178.00	$6,656.38	$4,983.84	$7,425.57	$5,463.81	$5,803.72	**$41,270.04**
PRODUCTION TAX	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6,510.40	**$4,964.29**
FREEHOLD ROYALTIES	$683.24	$2,038.17	$1,923.19	$0.00	$3,540.05	$4,889.82	$4,323.66	$6,141.22	$5,141.17	$6,456.59	**$35,137.10**
OVERRIDING ROYALTIES	$20.29	$60.38	$56.97	$0.00	$103.86	$144.05	$126.62	$182.44	$151.78	$191.17	**$1,037.56**
COMBINED ROYALTIES	**$1,640.05**	**$4,356.76**	**$4,544.15**	**$0.00**	**$8,821.91**	**$11,690.25**	**$9,434.12**	**$13,749.23**	**$10,756.76**	**$18,961.88**	**$83,955.10**

8637 - PROVOST NE 12-037-01W4 POLYMER SKID (NET)

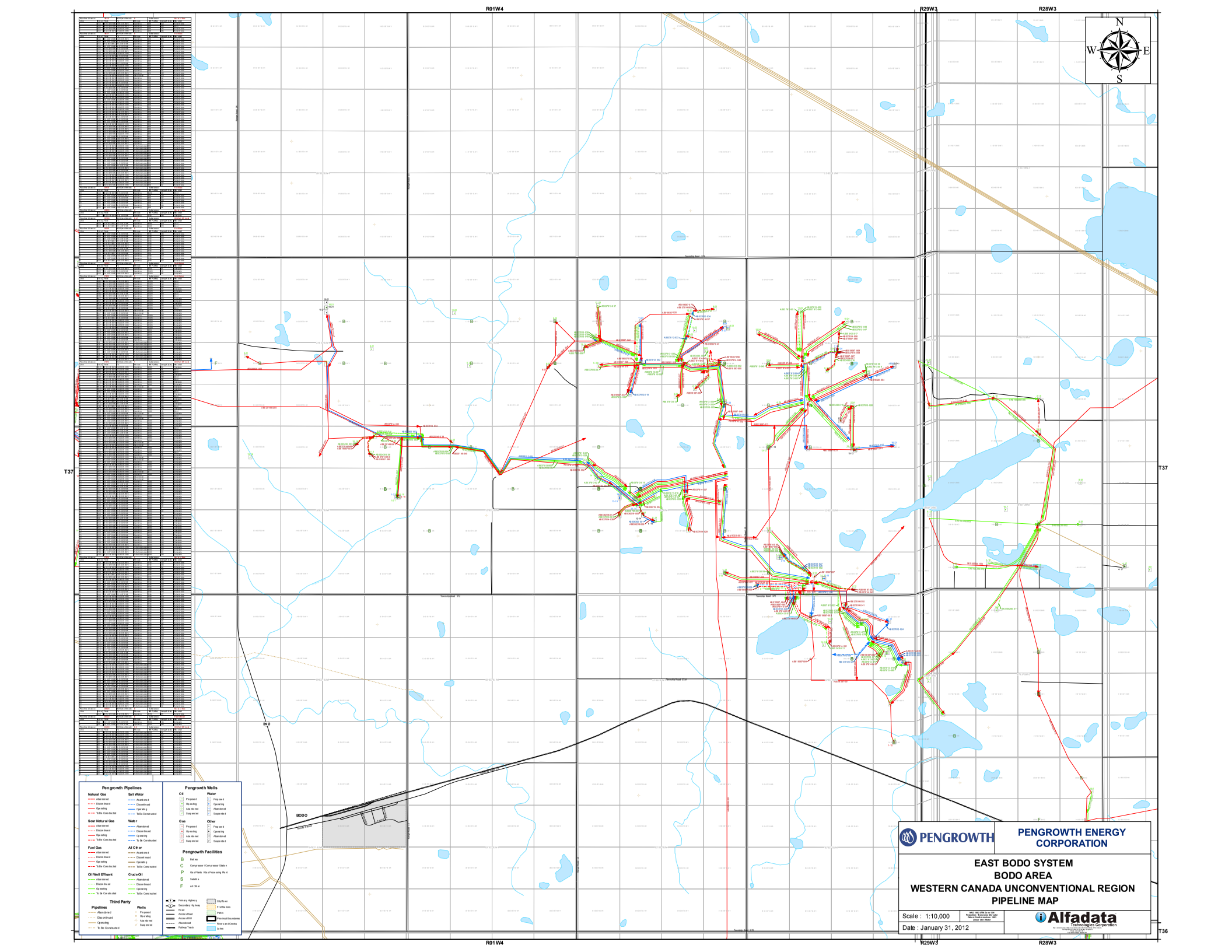
DIRECT OPERATING EXPENSES	11/Mar (AV)	11/Apr (AV)	11/May (AV)	11/Jun (AV)	11/Jul (AV)	11/Aug (AV)	11/Sep (AV)	11/Oct (AV)	11/Nov (AV)	11/Dec (AV)	Total
LABOUR		$5,942.71	$5,811.52	$4,198.69	$5,647.79	$6,220.44	$8,640.94	$8,977.96	$6,980.63	$6,773.83	**$59,194.51**
UTILITIES	$2,842.84	$3,327.08	$2,412.13	$3,459.74	$3,387.98	$4,687.37	$4,214.52	$3,486.70	$5,970.83	$3,936.76	**$37,725.95**
GENERAL MAINTENANCE	$4,267.30		$770.00	$3,080.46	$17,066.46	$4,918.49	$542.11				**$30,644.82**
SAFETY & ENVIRONMENT							$255.00	$510.02	$510.02	$510.02	**$1,785.06**
FREIGHT		$1,218.54	$1,365.00	$1,964.82	$1,178.91	$819.00	$1,092.00	$546.00	$923.00	$650.00	**$9,757.27**
PROPERTY TAX				$1,488.23							**$1,488.23**
TOTAL EXPENSES	**$7,110.14**	**$10,488.33**	**$10,358.65**	**$14,191.94**	**$27,281.14**	**$16,645.30**	**$14,744.57**	**$13,520.68**	**$14,384.48**	**$11,870.61**	**$140,595.84**

EAST BODO SECTION 12 POLYMER PILOT	11/Mar (AV)	11/Apr (AV)	11/May (AV)	11/Jun (AV)	11/Jul (AV)	11/Aug (AV)	11/Sep (AV)	11/Oct (AV)	11/Nov (AV)	11/Dec (AV)	Total
REVENUE	$6,969.48	$21,163.40	$19,781.75	$0.00	$36,355.98	$49,661.22	$45,189.77	$63,898.17	$52,270.49	$66,310.48	**$361,600.74**
ROYALTIES	($1,640.05)	($4,356.76)	($4,544.15)	$0.00	($8,821.91)	($11,690.25)	($9,434.12)	($13,749.23)	($10,756.76)	($18,961.88)	**($83,955.10)**
DIRECT OPERATING EXPENSES	($7,110.14)	($10,488.33)	($10,358.65)	($14,191.94)	($27,281.14)	($16,645.30)	($14,744.57)	($13,520.68)	($14,384.48)	($11,870.61)	**($140,595.84)**
CASH FLOW	**($1,780.71)**	**$6,318.31**	**$4,878.95**	**($14,191.94)**	**$252.94**	**$21,325.67**	**$21,011.08**	**$36,628.25**	**$27,129.25**	**$35,477.99**	**$137,049.80**

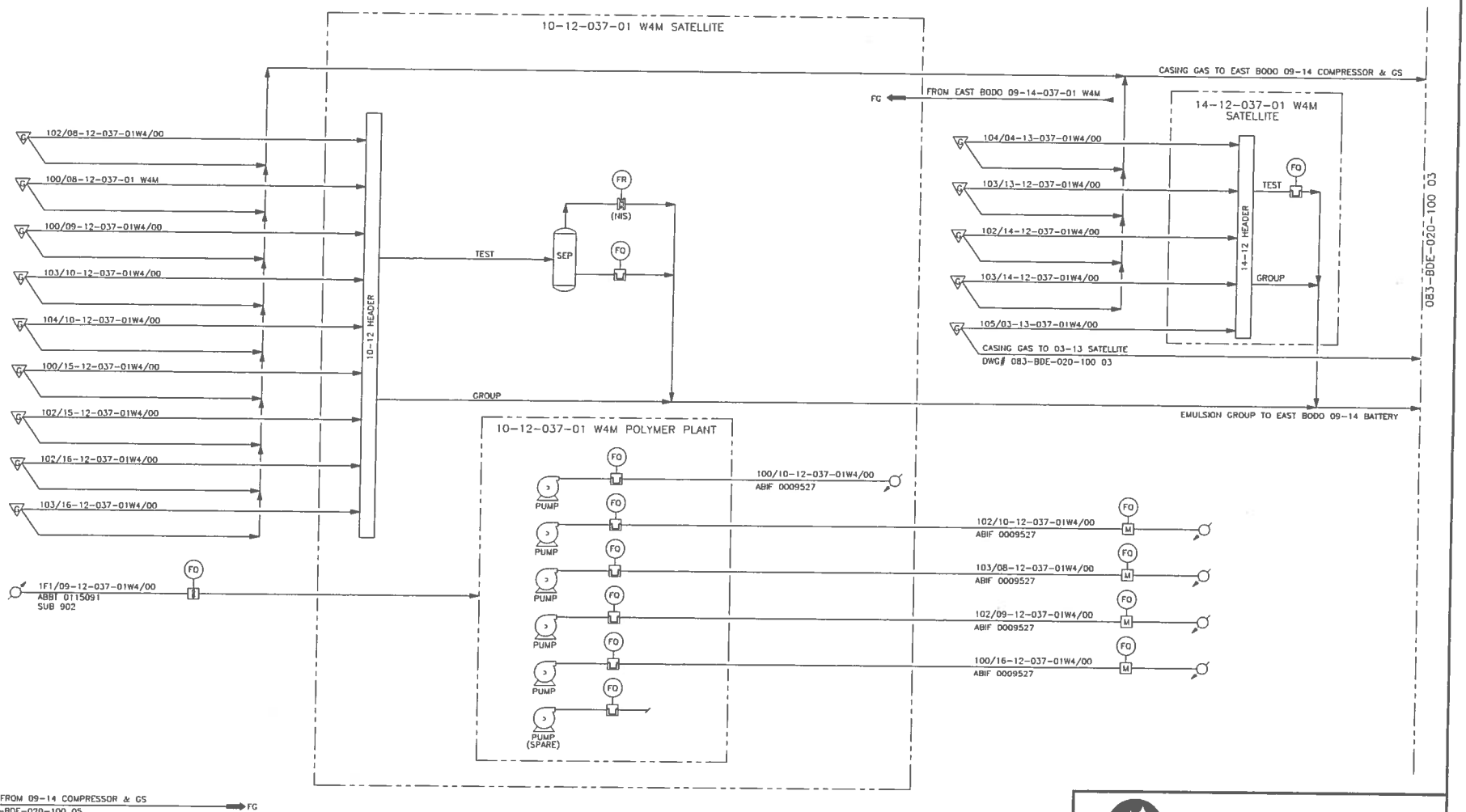
East Bodo Sec 12 Polymer Pilot
(000's unless otherwise stated)

	6.3	6.1	6.2	6.5	6.7	6.4	6.4	6.6	6.7		
	Capital Expenditures	Sales Volume (m3)	Sales Revenue	Total Royalties	Net Revenue	Operating Expenses (Direct)	Operating Expenses (Indirect)	Annual Cash Flow	Cumulative Project Costs	Total Project Income (Loss)	Cumulative Project Income (Loss)
2010	8,957.1		0.0	0.0	0.0	0.0	0.0	0.0	8,957.1	-8,957.1	-8,957.1
2011	3,948.7	837.5	361.6	84.0	277.6	140.6	0.0	137.0	4,089.3	-3,811.7	-12,768.8
TOTAL	12,905.8		361.6	84.0	277.6	140.6	0.0	137.0	13,046.4	-12,768.8	-12,768.8

APPENDIX F


R01W4
R29W3
R28W3
T37
T36
N
S
E
W
BODO
Pengrowth Pipelines
Natural Gas
Sour Natural Gas
Fuel Gas
Oil Well Effluent
Salt Water
Water
All Other
Crude Oil
Third Party
Pipelines
Wells
Pengrowth Wells
Oil
Gas
Water
Other
Pengrowth Facilities
Primary Highway
Secondary Highway
Railway
City/Town
Parks
Lakes
PENGROWTH
PENGROWTH ENERGY CORPORATION
EAST BODO SYSTEM
BODO AREA
WESTERN CANADA UNCONVENTIONAL REGION
PIPELINE MAP
Scale : 1:10,000
Date : January 31, 2012
Alfadata
Technologies Corporation

AutoCAD 2004 | 083-BDE-020-100 01



NO.	DATE	REVISIONS	DRAWN	CHECK	DESIGN	APPR
2	12 02 10	UPDATED AS PER FIELD MARK-UPS	RK	SD		
1	11 04 11	UPDATED AS PER FIELD MARK-UPS	JK	BJS		
0	10 08 23	NEW DRAWING	RD	MM		

DRAFTING | ENGINEERING

DWG NUMBER	REFERENCE NOTE
DRAWING NUMBER	TITLE

REFERENCE DRAWINGS

SEAL/STAMP-REV ___ SEAL/STAMP-REV 0

PERMIT

APPROVED FOR CONSTRUCTION

DATE | REV

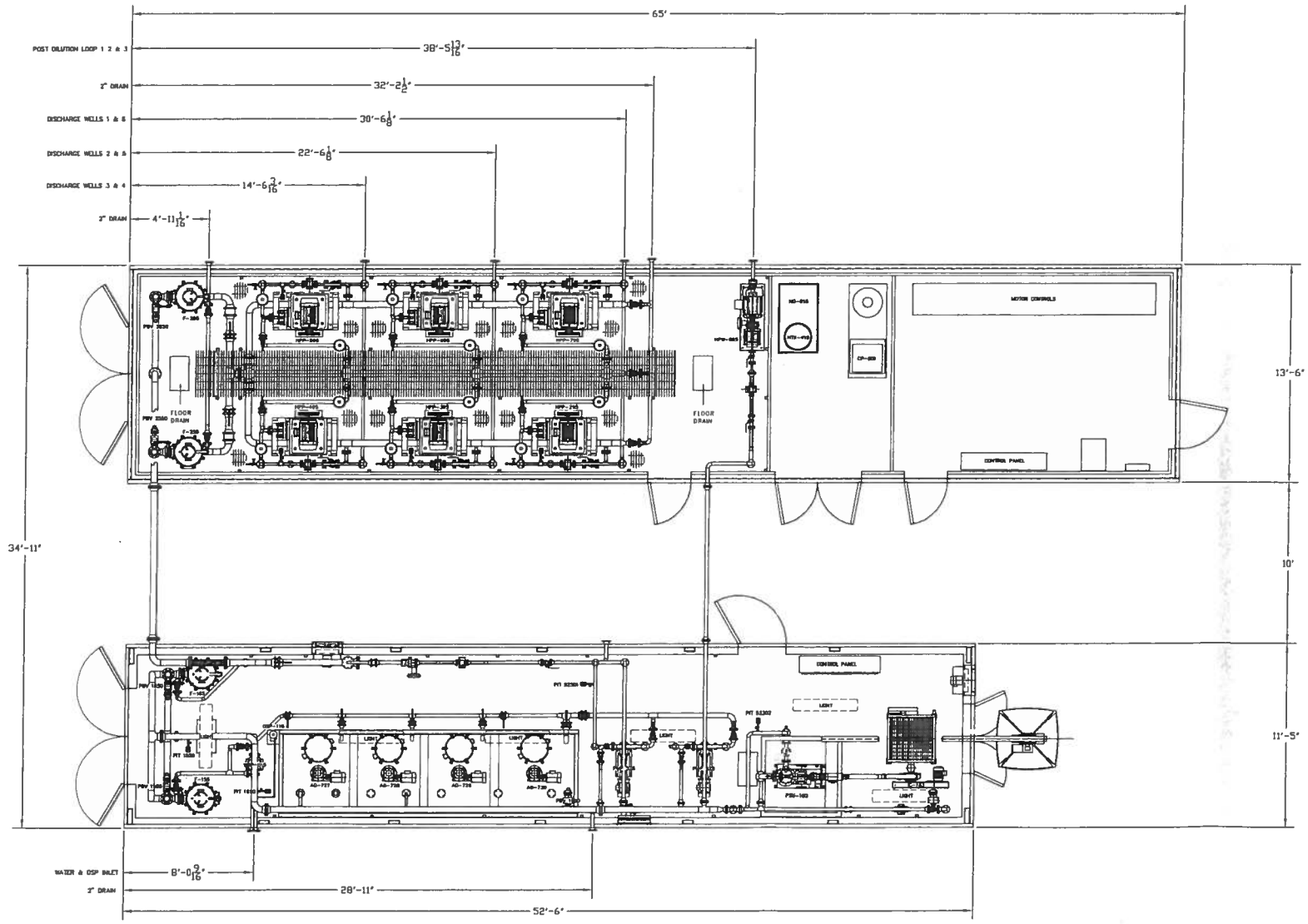
PROJECT ENGINEERING

PENGROWTH

EAST BODO
SATELLITES AND WELLS
MEASUREMENT SCHEMATIC

CONTRACTOR NAME	SCALE	PENGROWTH DRAWING NUMBER	SHEET
STANTEC	NTS	083-BDE-020-100 01	
CONTRACTOR DRAWING NUMBER 083-BDE-020-100 01	REV. 2		

WRK – WORKING



PLAN VIEW–POLYMER SYSTEM

NOTES:

1) –. BUILDING EXTERIOR PLAN.
PANEL: WHITE
TRIM: TAN

2) –. ICE RAKES AND DOOR CANOPIES REQUIRED ON BUILDING EXTERIOR.
(CANOPIES TO BE INSTALLED AT SITE.)

REV	DATE		DWN	CHK
0	9/9/10	FOR CONSTRUCTION	WF	JMD

FLOQUIP JOB NO. 10037	DATE
DESIGNER W. FLOWERS	8/23/2010
PROJECT MGR. W. BOND	–
CHECKED –	–
–	–
–	–
–	–
–	–

APPD. MGR-APPR

SCALE NONE –

DO NOT SCALE THIS DWG USE DIMENSIONS ONLY

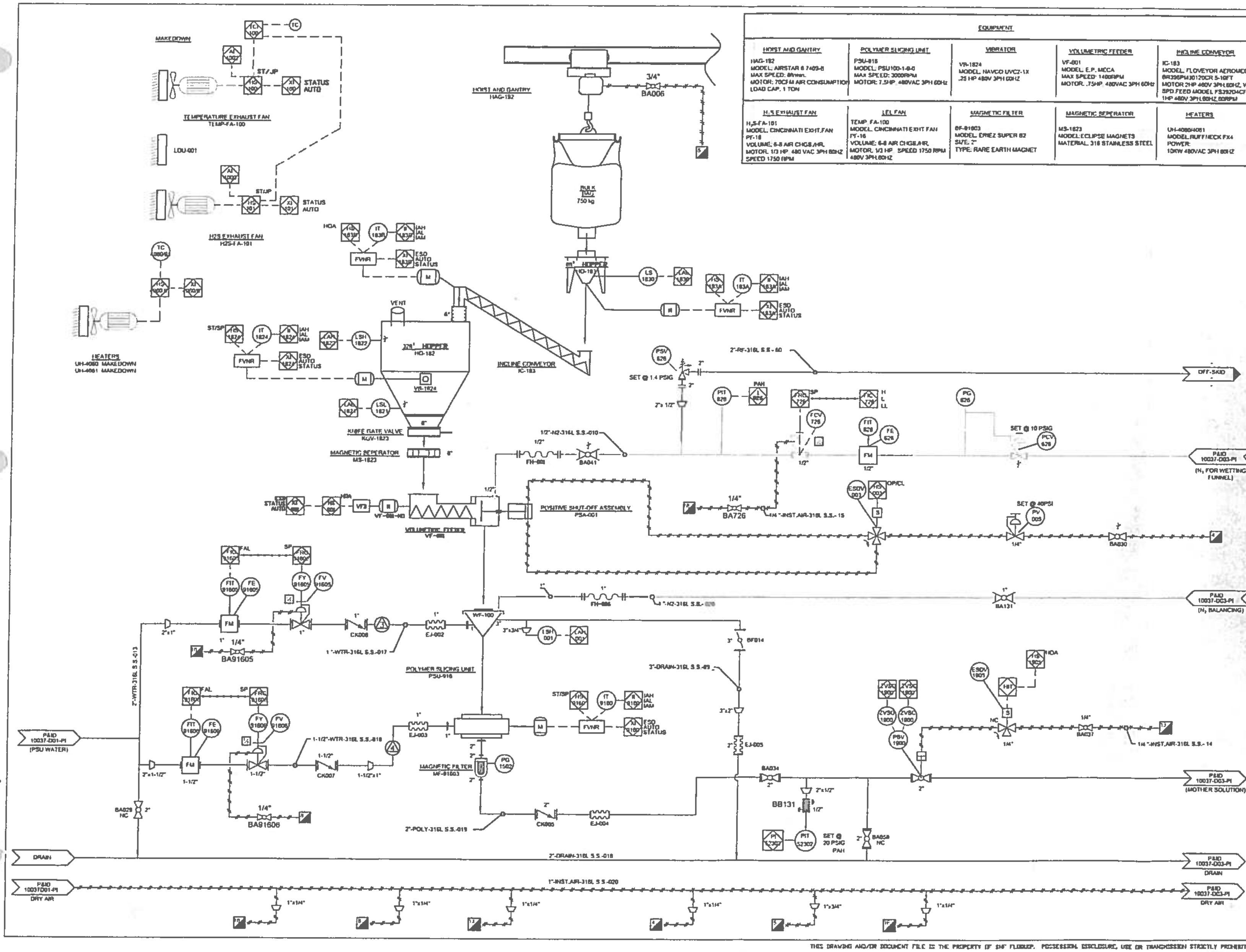
SNF FLOQUIP
P.O. BOX 850
RACEPONDS, GEORGIA 31323
VOICE - 912.884.8726
FAX - 912.884.4016
EMAIL- FLOQUIPCAD@SNFHC.COM

CLIENT
10037
PENGROWTH CORPORATION

TITLE
POLYMER MAKE-DOWN AND INJECTION BUILDING PLAN VIEW LAYOUT

NUMBER 10037-D01-GA

REVISION 0



EQUIPMENT				
HOIST AND GANTRY HAG-192 MODEL: AIRSTAR 6 7409-6 MAX SPEED: 8ft/min. MOTOR: 70CFM AIR CONSUMPTION LOAD CAP. 1 TON	POLYMER SLICING UNIT PSU-916 MODEL: PSU100-1-9-0 MAX SPEED: 3000RPM MOTOR: 7.5HP, 480VAC 3PH 60Hz	VIBRATOR VR-1824 MODEL: NAVCO UVC2-1X .25 HP 480V 3PH 60HZ	VOLUMETRIC FEEDER VF-001 MODEL: E.P. MECA MAX SPEED: 1400RPM MOTOR: .75HP, 480VAC 3PH 60Hz	INCLINE CONVEYOR IC-183 MODEL: FLOVEYOR AEROMECH, BR336PM30120CR 5-10FT MOTOR 2HP 460V 3PH 60HZ, W/ SPD.FEED MODEL FS392D4CF 1HP 460V 3PH 60HZ 60RPM
H_2S EXHAUST FAN H_2S-FA-101 MODEL: CINCINNATI EXHT.FAN PF-18 VOLUME: 6-8 AIR CHGS./HR. MOTOR: 1/3 HP, 480 VAC 3PH 60HZ SPEED 1750 RPM	LEL FAN TEMP. FA-100 MODEL: CINCINNATI EXHT FAN PF-16 VOLUME: 6-8 AIR CHGS./HR. MOTOR: 1/3 HP, SPEED 1750 RPM 480V 3PH 60HZ	MAGNETIC FILTER BF-91603 MODEL: ERIEZ SUPER 82 SIZE: 2" TYPE: RARE EARTH MAGNET	MAGNETIC SEPERATOR MS-1823 MODEL:ECLIPSE MAGNETS MATERIAL: 316 STAINLESS STEEL	HEATERS UH-4060/4061 MODEL:RUFFNECK FX4 POWER: 10KW 480VAC 3PH 60HZ

NOTES:

1) –. REFER TO PENGROWTH PIPING SPEC AX ASME 150 FOR LOW PRESSURE CORROSIVE SERVICE.

2) –. REFER TO PENGROWTH PIPING SPEC CX ASME 600 FOR HIGH PRESSURE CORROSIVE SERVICE.

REV	DATE		DWN	CHK	
4	10/13/10	AS BUILT	DW	-	MM
3	3/14/2010	REVISED PER COMMENTS	JHD	-	MM
2	1/16/10	REVISED PER COMMENTS	JHD	-	MW
1	7/13/2010	REISSUE FOR CONSTRUCTION	WF	-	MW
0	4/26/2010	FOR CONSTRUCTION	WF	-	MM
B	4/30/10	PER MARKUPS	JHD	-	MM
A	4/23/2010	FOR REVIEW	WF	-	MM

	DATE
FLOQUIP JOB NO. 10037	
DESIGNER –	4/23/2010
PROJECT MGR. M.MOGUL	–
CHECKED –	–
–	–
–	–
–	
	–

APPD. MGR–APPR

SCALE NTS

DO NOT SCALE THIS DWG USE DIMENSIONS ONLY

SNF FLOQUIP

P.O. BOX 250
RICEBORO, GEORGIA 31323
VOICE - 912 884 5726
FAX - 912.884.4016
EMAIL- FLOQUIPCAD@SNFHC.COM

CLIENT

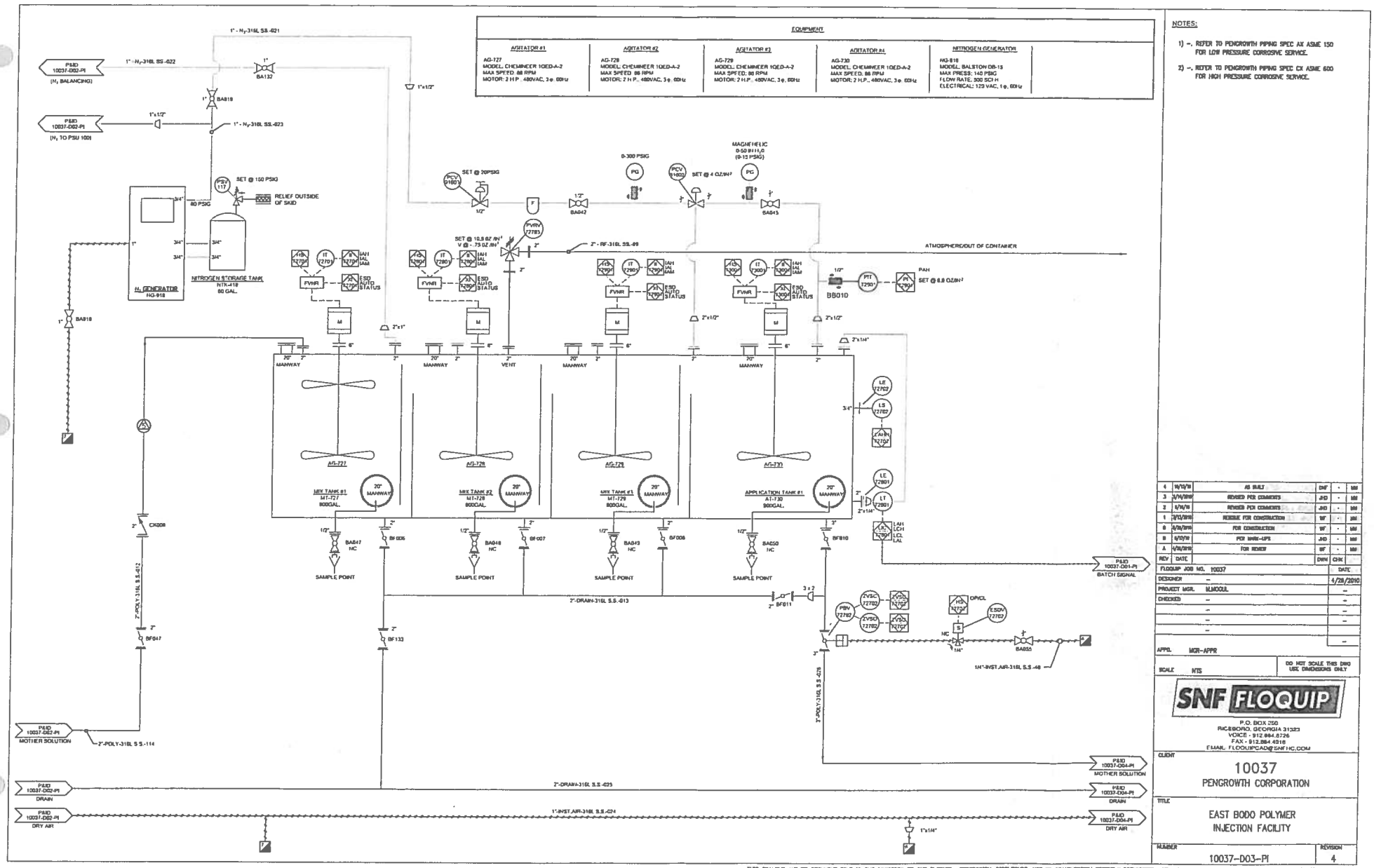
10037
PENGROWTH CORPORATION

TITLE

EAST BODO POLYMER
INJECTION FACILITY

NUMBER 10037–D02–PI

REVISION 4



REV	DATE		DWN	CHK
4	10/12/18	AS BUILT	DAF	MM
3	3/14/2018	REVISED PER COMMENTS	JHD	MM
2	1/16/18	REVISED PER COMMENTS	JHD	MM
1	9/15/2016	RELEASE FOR CONSTRUCTION	BF	MM
0	4/28/2016	FOR CONSTRUCTION	BF	MM
B	4/12/16	PER MARK-UPS	JHD	MM
A	4/28/2016	FOR REVIEW	BF	MM

FLOQUIP JOB NO. 10037 — DATE

DESIGNER	–	4/28/2010
PROJECT MGR.	M.WOOD	–
CHECKED	–	–
	–	–
	–	–
	–	–
		–

APPR. MGR-APPR

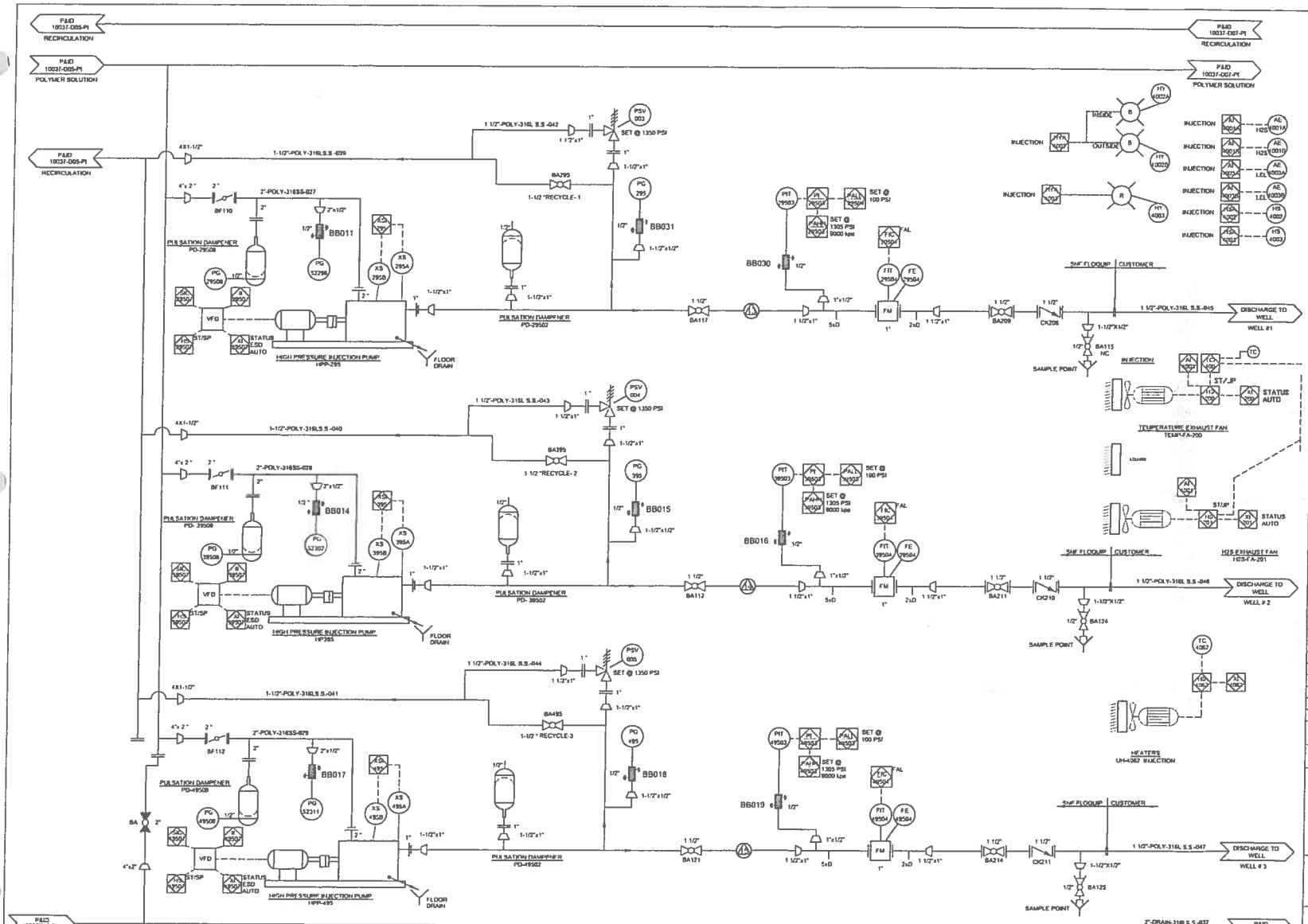
SCALE NTS — DO NOT SCALE THIS DWG USE DIMENSIONS ONLY

SNF FLOQUIP
P.O. BOX 250
RICEBORO, GEORGIA 31323
VOICE - 912.884.6726
FAX - 912.884.4916
EMAIL: FLOQUIPCAD@SNFINC.COM

CLIENT
10037
PENGROWTH CORPORATION

TITLE
EAST BODO POLYMER INJECTION FACILITY

NUMBER 10037-D03-PI — REVISION 4



NOTES:

1) –. REFER TO PENGROWTH PIPING SPEC AX ASME 150 FOR LOW PRESSURE CORROSIVE SERVICE.

2) –. REFER TO PENGROWTH PIPING SPEC CX ASME 600 FOR HIGH PRESSURE CORROSIVE SERVICE.

EQUIPMENT

HIGH PRESS. INJECTION PUMPS

HPP- 295, 395, 495
MODEL: NATIONAL OILWELL 327-214
MAX SPEED 436 RPM
MOTOR: 20 HP, 460VAC, 3 ø, 60Hz
MAX. PRESS.: 2585 PSIG.
DESIGN CAP.: 20.2 GPM @ 485 RPM.

SUCTION PULSATION DAMPNER

PD- 29508, 39508, 49508
MODEL: STATUS FLOW
SFU-1502-F-1100XRE

DISCHARGE PULSATION DAMPNER

PD- 29502, 39502, 49502
MODEL: STATUS FLOW
SFU-1440H-F1000XRE

HEATERS

UH-4062
MODEL: RUFFNECK F34
POWER:
19KW 480VAC 3PH 60HZ

LEL FAN

TEMP. FA-200
MODEL: CINCINNATI EXH.FAN
PF-18
VOLUME: 6-8 AIR CHGS./HR.
MOTOR: 1/3 HP. SPEED 1750 RPM
480V 3PH 60HZ

H2S EXHAUST FAN

H2S-FA-201
MODEL: CINCINNATI EXH.FAN
PF-18
VOLUME: 6-8 AIR CHGS./HR.
MOTOR: 1/3 HP. 480 VAC 3PH 60HZ
SPEED 1750 RPM

REV	DATE		DWN	CHK
4	10/31/19	AS BUILT	DHF	- MM
3	6/14/2019	REVISED PER COMMENTS	WF	- MM
2	5/31/19	REVISED PER COMMENTS	WF	- MM
1	3/13/2019	REISSUE FOR CONSTRUCTION	WF	- MM
0	8/31/2018	FOR CONSTRUCTION	WF	- MM
B	5/17/18	PER MARKUPS	JHD	- MM
A	4/26/2018	FOR REVIEW	–	- MM

FLOQUIP JOB NO.	10037
DESIGNER	–
PROJECT MGR.	M.MOGIL
CHECKED	–
	–
	–
	–
	–
APPD.	MGR-APPR
SCALE	NTS

DO NOT SCALE THIS DWG USE DIMENSIONS ONLY

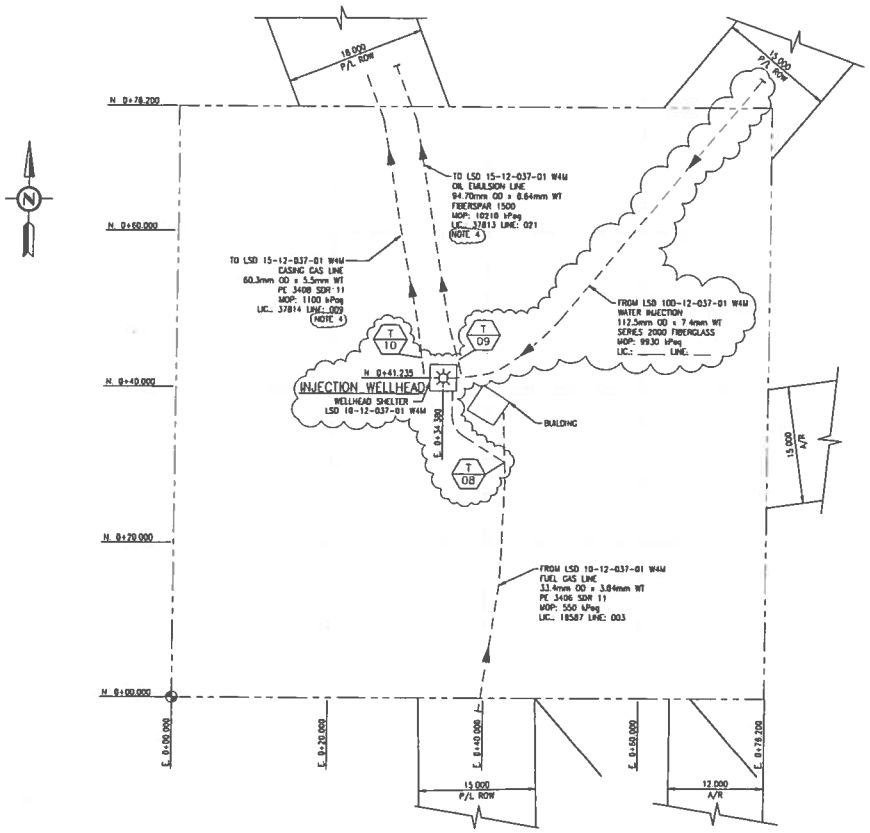
SNF FLOQUIP
P.O. BOX 250
RICEBORO, GEORGIA 31323
VOICE - 912.884.8726
FAX - 912.884.4016
E-MAIL: FLOQUIPCAD@SNFHC.COM

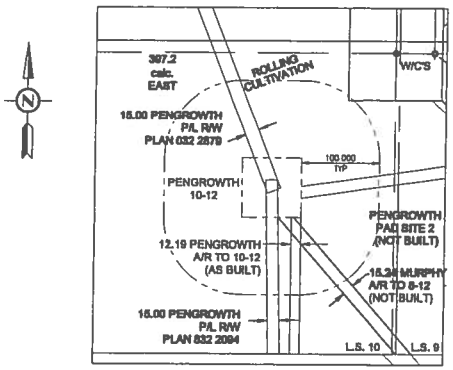
CLIENT
10037
PENGROWTH CORPORATION

TITLE
EAST BODO POLYMER INJECTION FACILITY

NUMBER	REVISION
10037-D06-PI	4

083-BDE-010-116 01





100m PERIMETER AREA PLAN
NTS

NOTES:
1. ENGINEER'S STAMP APPLIES TO CLOUDED NEW CONSTRUCTION ONLY.
2. ALL DIMENSIONS AND COORDINATES ARE IN METRES UNLESS NOTED OTHERWISE.
3. ON LEASE U/G PIPING TO HAVE 2000mm MINIMUM COVER.
4. PIPELINE TO BE DISCONNECTED FROM WELLHEAD AND TAKEN OUT OF SERVICE.

NO	DATE YY MM DD	REVISIONS	DRAWN	CHECK	DESIGN	APPR
			DRAFTING		ENGINEERING	
0	10 02 01	ISSUED FOR CONSTRUCTION (GRB PROJECT 1702.00)	KMM			
B	10 01 15	ISSUED FOR BID (GRB PROJECT 1702.00)	KMM			
A	09 12 14	ISSUED FOR APPROVAL (GRB PROJECT 1702.00)	DP			

DRAWING NUMBER | TITLE
REFERENCE DRAWINGS

SEAL/STAMP-REV | SEAL/STAMP-REV 0 | PERMIT

QC# P-BDE-10059

APPROVED FOR CONSTRUCTION
DATE | REV

PROJECT ENGINEERING

PENGROWTH CORPORATION

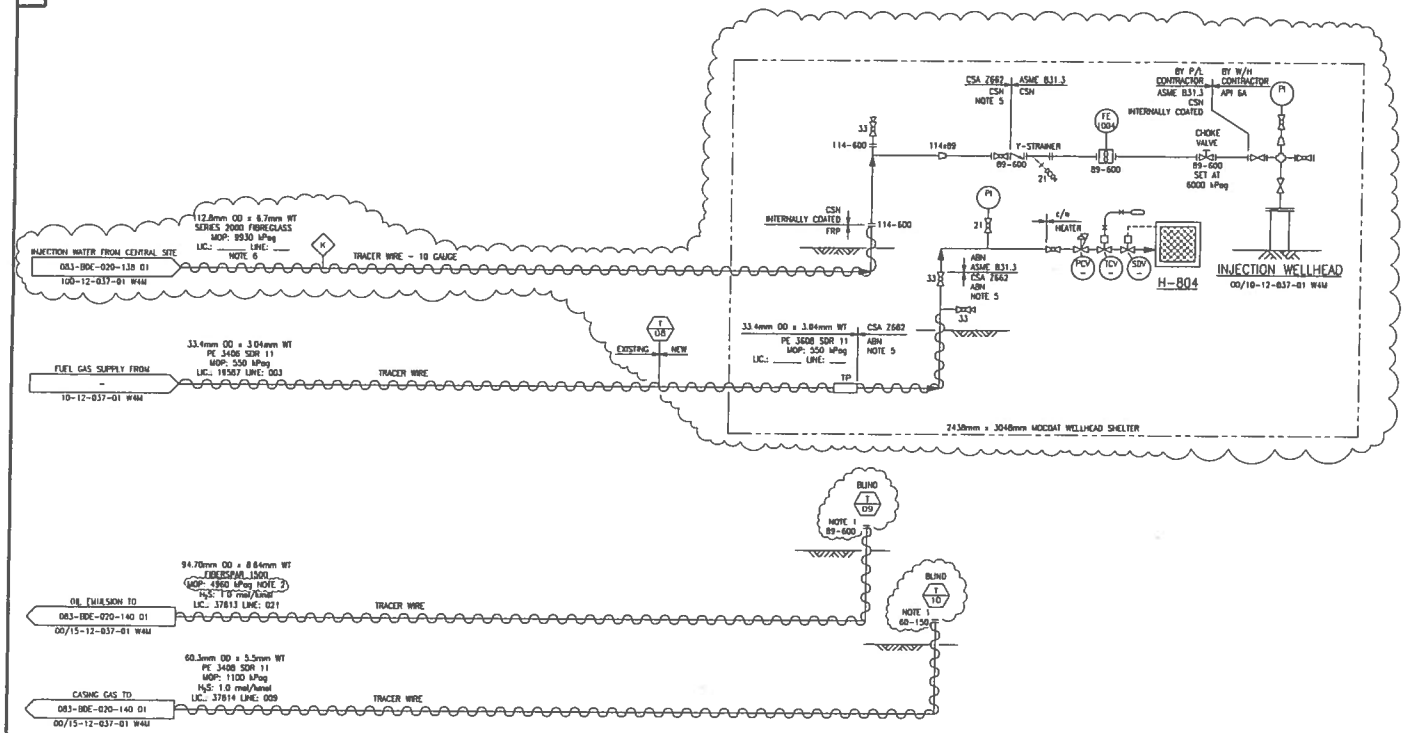
EAST BODO
00/10-12-37-01 W5M
WATER INJECTION PLOT PLAN

CONTRACTOR NAME	SCALE	PENGROWTH DRAWING NUMBER	SHEET
GRB Engineering Ltd	1:300	083-BDE-010-116 01	
CONTRACTOR DRAWING NUMBER 1702-C-007	REV 0		

2010-01-19 15:33 FILE: I:\1702\083-BDE-010-116 01.DWG KMORRISON

WRK – Working

083-BDE-020-142 01



NOTES:
1. PIPELINE TO BE DISCONNECTED FROM WELLHEAD.
2. MOP TO BE DE-RATED FROM 10210 kPag TO 4960 kPag BY PENGROWTH.
3. ENGINEERS' STAMP APPLIES TO CLOUDED NEW CONSTRUCTION ONLY.
4. CONTRACTOR TO SUPPLY/INSTALL HIGH POINT VENTS AND LOW POINT DRAINS AS REQUIRED.
5. ASME MATERIALS UNDER CSA Z662-2007, TABLES 5.1 AND 5.3 TO BE UTILIZED.
6. PIPELINE TO BE RE-LICENCED FROM OIL EFFLUENT (4960 kPag) TO WATER INJECTION (8930 kPag) BY PENGROWTH.

H-804
HEATER
MAKE/MODEL:
DUTY:
START:
SN:

NO.	DATE YY MM DD	REVISIONS	DRAWN	CHECK	DESIGN	APPR
0	10 02 10	ISSUED FOR CONSTRUCTION (GRB PROJECT 1702.00)	KMM			
B	10 01 15	ISSUED FOR BID (GRB PROJECT 1702.00)	KMM	BS	BS	
A	09 12 14	ISSUED FOR APPROVAL (GRB PROJECT 1702.00)	KMM	BS	BS	

DRAFTING | ENGINEERING

REFERENCE DRAWINGS	
DRAWING NUMBER	TITLE
083-BDE-170-117 01	PIPING ISOMETRIC
083-BDE-170-111 01	PIPING ISOMETRIC

SEAL/STAMP-REV ___ SEAL/STAMP-REV 0

PERMIT

QC# P-BDE-10059

APPROVED FOR CONSTRUCTION

DATE	REV

PROJECT ENGINEERING

PENGROWTH

PENGROWTH CORPORATION

EAST BODO - SECTION 12 TWP 037 RGE 01 W4M
EAST BODO WATER INJECTION - LSD 00/10-12-037-01 W4M
PIPING AND INSTRUMENTATION DIAGRAM (PROCESS)

CONTRACTOR NAME	SCALE	PENGROWTH DRAWING NUMBER	SHEET
GRB ENGINEERING LTD	NTS	083-BDE-020-142 01	
CONTRACTOR DRAWING NUMBER 1702-B-008	REV 0		

WRK - Working

2010-02-11 14:40 FILE: L:\1702\083-BDE-020-142 01.DWG RMORRISON

Appendix G

Government of Alberta ■
Environment

Environmental Management/
Central Region
304 4920 51 Street
Red Deer, Alberta T4N 6K8
Telephone: 403-340-7052
www.alberta.ca

September 9, 2010 File: 00267180

Darlene Loeffel
Pengrowth Corporation
2900 204 4 Avenue SW
Calgary, AB T2P 4H4

Dear Ms Loeffel:

RE: Licence under the *Water Act*
for the Purpose of Industrial (Oilfield Injection)
at NE 12-037-01-W4

Enclosed is Licence No. 00267180-00-00 authorizing the diversion of groundwater up to a maximum of 164250.0 cubic metres annually from a diversion site at NE 12-037-01-W4.

The *Water Act* provides a right to appeal this decision. Notice of appeal must be submitted not later than 30 days after receipt of this notice to:

Chairperson, Environmental Appeal Board
3rd Floor, Peace Hills Trust Tower
10011 – 109 Street
Edmonton, AB T5J 3S8
Telephone: 780-427-6207 Fax: 780-427-4693

Monitoring and reporting conditions of the licence indicate that monthly water levels are required for the observation and production wells. Monthly water volumes and annual water chemistry are also required for the production well. The reporting requirements are to be submitted online using the Water Use Reporting System at http://www.environment.alberta.ca/1286.html

Contact the Water Use Reporting Coordinator at (780) 427-6311 to initiate and complete the necessary steps to commence electronic water use reporting. Even if no water is diverted from the production well, this must be reported.

Please notify us should there be a change in the ownership of the land to which this licence is attached or an increase in water use.

Please call Laura Partridge at 403-340-7113 or Jaclyn Roulston at 403-341-8675 if you have questions.

Sincerely,

Todd Aasen, P.Eng.
District Approvals Manager
Central Region

Enclosures

cc: Jim Touw, Hydrological Consultants Ltd. (with enclosures)
Marjorie Crowhurst, AENV (with enclosures)
M.D. of Provost

Government of Alberta
Environment

LICENCE TO DIVERT WATER
PROVINCE OF ALBERTA
WATER ACT, R.S.A. 2000, c.W-3, as amended

LICENCE NO.: 00267180-00-00

FILE NO.: 00267180

PRIORITY NO.: 2010-04-19-001

EFFECTIVE DATE: 2010 09 09

EXPIRY DATE: 2012 09 08

SOURCE OF WATER: Aquifer accessed by water well ID 2088335, identified in Report No. 00267180-00-00 as WSW No. 09-12 in the NE 12-037-01-W4

LICENSEE: Pengrowth Corporation

Pursuant to the *Water Act*, R.S.A. 2000, c.W-3, as amended, a licence is issued to the Licensee to:

operate a works and to divert up to 164250.0 cubic metres of water annually from the source of water for the purpose of Industrial (Oilfield Injection)

subject to the attached terms and conditions.

Designated Director under the Act
Todd Aasen, P.Eng.
District Approvals Manager

Date Signed:

2010 09 09
Y/M/D

DEFINITIONS

1.0 All definitions from the Act and the Regulations apply except where expressly defined in this licence.

1.1 In all parts of this licence:

(a) "Act" means the *Water Act*, RSA 2000, c. W-3, as amended;

(b) "Application" means the written submissions to the Director in respect of application number 001-00267180 and any subsequent applications for amendments of Licence No. 00267180-00-00;

(c) "Aquifer" means the underground water-bearing formation that is capable of yielding water, that is accessed by the works authorized by this licence;

(d) "Director" means an employee of the Government of Alberta designated as a Director under the Act;

(e) "Monitoring well" means the well used to monitor the water levels associated with the diversion of water authorized by this licence;

(f) "Production well" means any well used to divert water for the purpose of this licence;

(g) "Regulations" means the regulations, as amended, enacted under the authority of the Act.

(h) "Water Use Reporting System" means the secure internet website provided by Alberta Environment at http://www.environment.alberta.ca/1286.html for submitting measuring and monitoring results electronically to the Director.

GENERAL

2.0 The Licensee shall immediately report to the Director by telephone any contravention of the terms and conditions of this licence at 1-780-422-4505.

2.1 The terms and conditions of this licence are severable. If any term or condition of this licence is held invalid, the application of such term or condition to other circumstances and the remainder of this licence shall not be affected thereby.

2.2 The Licensee shall not deposit or cause to be deposited any substance in, on or around the source of water that has or may have the potential to adversely affect the source of water.

2.3 The Licensee shall comply with the terms and conditions of the "Water Use Reporting System User Consent".

DIVERSION OF WATER

3.0 This licence is appurtenant to the production well as described in the following:

REPORT NO.	REPORT NAME
00267180-R001	Licence a Groundwater Supply Bodo Area 09-12-037-01 W4M Prepared for Pengrowth Heavy Oil Partnership Prepared by Hydrogeological Consultants Ltd (HCL) March 2010

3.1 The Licensee shall divert water only for the purpose specified in this licence.

3.2 The Licensee shall divert water only from the source of water specified in this licence.

3.3 The works used to divert the water authorized by this licence shall include, at a minimum, the production well ID 2088335 (WSW No. 09-12) referred to in Report No. 00267180-R001 dated March 2010 submitted with the application.

3.4 The Licensee shall not exceed any of the limits specified in Table 3-1.

3.5 The Licensee shall not position the pump intake in the production well at a depth greater than the maximum pump intake depth specified in Table 3-1.

TABLE 3-1

WELL NUMBER	LEGAL LAND DESCRIPTION for WELL LOCATION	PRODUCTION INTERVAL (metres below grade)	MAXIMUM PUMP INTAKE DEPTH (metres below grade)	LIMITS	
				MAXIMUM RATE OF DIVERSION (cubic metres per day)	MAXIMUM ANNUAL DIVERSION (cubic metres)
2088335 (WSW No. 09-12)	NE 12-037-01-W4	178.8 – 199.0	178.0	450.0	164250.0

3.6 Prior to diverting any water from the source of water, the Licensee shall equip the production well with a meter, which cumulatively measures the quantity of all water diverted during the term of this licence.

3.7 The Licensee shall maintain the measuring device referred to in 3.6 at all times.

3.8 The Licensee shall maintain the monitoring well (well ID 2088334) identified in Report No. 00267180-R001 as Obs. WW No. 09-12 located at NE 12-037-01-W4.

CONSERVATION PLAN

4.0 The licensee shall prepare and execute a Conservation and Productivity Plan on or before September 1, 2011.

4.1 The Conservation and Productivity Plan shall include at a minimum all of the following:

(a) a comparison of the amount of water used to the amount of productivity;

(b) a continuing economic assessment of alternative sources and reduction of non-saline water use as required in the *Water Conservation and Allocation Guideline for Oilfield Injection (2006), Alberta Environment*; and

(c) an impact assessment of any future water use reduction or any alternative technologies implemented for the purpose of enhanced oil recovery.

4.2 The licensee shall prepare and conduct an educational program related to water conservation in the oilfield recovery process to

(a) company employees and

(b) the general public.

4.3 The educational program must be executed at a minimum of one time during the term of this licence.

4.4 The Licensee shall prepare a summary of:

(a) the implemented Conservation and Productivity Plan and the results; and

(b) the educational program.

4.5 The Licensee shall submit the report required by 4.4 to the Director on or before September 8, 2012.

MONITORING AND REPORTING

5.0 The Licensee shall establish monitoring well(s) as and when required in writing by the Director.

5.1 Unless otherwise authorized in writing by the Director, the Licensee shall:

(a) measure the water level in the monitoring well (ID 2088334) identified in Report No. 00267180-R001 as Obs. WW No.09-12 located at NE 12-037-01-W4 on a daily basis;

(b) record the water level in the monitoring well in 5.1(a) on a daily basis; and

(c) any other monitoring well(s) as required in 5.0.

5.2 Unless otherwise authorized in writing by the Director, the Licensee shall:

(a) measure the water level in the production well (ID 2088335) identified in Report No. 00267180-R001 as WSW No.09-12 located at NE 12-037-01-W4 on a daily basis; and

(b) record the water level in the production well in 5.2(a) on a daily basis.

5.3 Unless otherwise authorized in writing by the Director, the Licensee shall on a monthly basis:

(a) measure the total number of cubic metres of water diverted from the production well (ID 2088335) identified in Report No. 00267180-R001 as WSW No.09-12; and

(b) record the total number of cubic metres of water diverted.

5.4 The Licensee shall ensure that the:

(a) collection;

(b) preservation;

(c) storage;

(d) handling; and

(e) analysis

of any sample required to be taken by this licence shall be conducted in accordance with the following, unless otherwise authorized in writing by the Director:

(i) the *Standard Methods for the Examination of Water and Wastewater*, published jointly by the American Public Health Association, American Water Works Association, and the Water Environment Federation, 1998, as amended.

5.5 Unless otherwise authorized in writing by the Director, the Licensee shall

(a) obtain a representative sample of water diverted from the production well and

(b) analyze the water collected in 5.4 for the following parameters:

(i) Total Dissolved Solids, Hardness, Alkalinity, pH, Calcium, Magnesium, Sodium, Potassium, Carbonate (CO_3), Bicarbonate (HCO_3), Sulphate (SO_4), Chloride, Nitrate, and Iron; and

(ii) any other parameters required by the Director

on an annual basis unless otherwise specified in writing by the Director.

5.6 The Licensee shall record and retain the results of the following information for a minimum of five years after being collected:

(a) the place, date and time of all monitoring and measuring and sampling;

(b) the results obtained pursuant to 5.1, 5.2, 5.3, 5.4 and 5.5;

(c) the name of the individual who conducted the monitoring, measuring and sampling stipulated in (a) and (b).

5.7 The Licensee shall report to the Director the results of the recording required by 5.1, 5.2, 5.3, 5.4 and 5.5 using the "Water Use Reporting System" and any other information required in writing by the Director.

5.8 The Licensee shall submit the report required by 5.7 on or before the end of the month following the month in which the information is based upon was collected.

5.9 Commencing from the date of the Licence, the Licensee shall compile the Evaluation Report.

5.10 The Licensee shall retain the Evaluation Report for a minimum of five years.

5.11 The Licensee shall submit the Evaluation Report to the Director annually to provide an evaluation of collected information for the previous year

(a) on or before February 28th; or

(b) within a time period specified in writing by the Director.

5.12 The Evaluation Report must be prepared by a qualified groundwater specialist who is a member of Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA) to include, at a minimum, the following information:

(a) total number of cubic metres of water diverted from the production well;

(b) results obtained pursuant to 5.1, 5.2, 5.3, 5.4 and 5.5;

(c) a review of the past performance of the production well and an assessment, supported by graphs and calculations, of the past performance of the aquifer(s);

(d) recommendations for adjustments of the pumping rates, the number and location of monitoring wells, and the monitoring requirements of production and monitoring wells; and

(e) any other information required in writing by the Director.

COMPLAINT INVESTIGATION

6.0 The Licensee shall;

(a) investigate all written complaints accepted by the Director relating to allegations of surface water and groundwater interference as a result of the operation of the production well;

(b) provide a written report to the Director, within a time specified in writing by the Director, detailing the results of the investigation relating to the complaint accepted by the Director in 6.0(a) including:

(i) recommendations to remediate and/or mitigate the impact(s) such as

A. lowering the intake of the pump to compensate for a drop in water level,

B. re-drilling the water well to an increased depth so as to allow the pump to be installed at a lower depth,

C. drilling a new well, or

D. providing an alternate water supply; and

(ii) any other information required by the Director.

6.1 The Licensee shall satisfy the Director that the report submitted pursuant to 6.0(b) has identified remedial and/or mitigative measures relating to the alleged interference.

RECLAMATION

7.0 The Licensee shall reclaim all abandoned wells or other holes related to the water diversion in accordance with the Act and the Regulations.

7.1 The Licensee shall submit a reclamation report to the Director documenting the actions taken under 7.0 within 90 days after the reclamation is complete.

Designated Director under the Act
Todd Aasen P. Eng.
District Approvals Manager

Date Signed:

2010 09 09
Y/M/D

ERCB Energy Resources Conservation Board

ENHANCED OIL RECOVERY
Approval No. 10529I

MADE at the City of Calgary, in the Province of Alberta, on 12th day of December 2011.	 ENERGY RESOURCES CONSERVATION BOARD

The Energy Resources Conservation Board, pursuant to the Oil and Gas Conservation Act, chapter O-6 of the Revised Statutes of Alberta, 2000, orders as follows:

1) The scheme of Pengrowth Energy Corporation for enhanced recovery of oil by polymer and water injection in that part of the **Provost Upper Mannville A Pool** outlined in Appendix A of the approval, as described in

   a) Application No. 1444822,
   b) Application No. 1473021,
   c) Application No. 1599385,
   d) Application No. 1617539,
   e) Application No. 1638343,
   f) Application No. 1659088,
   g) Proceeding No. 1683899,
   h) Application No. 1685673,
   i) Application No. 1698445,
   j) Application No. 1708942,
   k) Proceeding No. 1710322,

   is approved, subject to the terms and conditions herein contained.

2) Polymer and/or water may be injected into the subject pool through the well(s) with the following unique identifier(s):

   a) Previously approved injection wells:

Class II	Class II
02/09-12-037-01W4/0	03/13-15-037-01W4/0
03/09-12-037-01W4/0	03/14-15-037-01W4/0
00/10-12-037-01W4/0	02/01-21-037-01W4/0
02/10-12-037-01W4/0	00/01-23-037-01W4/3
00/14-12-037-01W4/2	00/03-23-037-01W4/2
00/16-12-037-01W4/0	00/06-23-037-01W4/0
00/14-13-037-01W4/0	00/08-23-037-01W4/0
00/16-13-037-01W4/0	00/09-23-037-01W4/0
00/08-14-037-01W4/0	00/11-23-037-01W4/2
00/11-14-037-01W4/0	00/06-24-037-01W4/0

   b) Previously approved injection wells:

Class II	Class II
02/13-12-037-01W4/0	04/03-13-037-01W4/0
04/14-12-037-01W4/0	02/04-13-037-01W4/0
03/02-13-037-01W4/0	03/08-23-037-01W4/0<rescinded[1]>
03/03-13-037-01W4/0	04/08-23-037-01W4/0<rescinded[1]>

[1] Application No. 1708942

04/09-23-037-01W4/2 03/07-24-037-01W4/0
02/07-24-037-01W4/0

Injection shall commence in the well(s) referred to in clause 2, subclause b by January 25, 2012.

The class of injection fluid is described in *Directive 051*.

3) The injection of polymer and/or water may commence in the well(s) referred to in clause 2 once the ERCB has confirmed in writing that *Directive 051* requirements have been met.

4) The polymer and/or water injected to that part of the subject pool outlined in Appendix A

   a) must maintain a voidage replacement ratio of 1.0 on the basis of cumulative production and injection volumes following the commencement of production, and

   b) shall target a voidage replacement ratio of 1.0 on a monthly basis.

   c) A re-pressurization period may commence where the voidage replacement ratio, on a monthly basis, shall be between 1.0 and 1.2 until such time as the voidage replacement ratio of 1.0, on the basis of cumulative production and injection volumes following the commencement of production, is reached. The conditions in clause 4, subclauses a and b will not apply during this period.

5) The approval holder shall initiate and continue a monitoring program which includes the sampling of produced water to determine polymer breakthrough.

6) (1) The approval holder shall file with, and make presentations to the ERCB on the progress of the scheme, on an annual basis with the first presentation to occur before March 31, 2011.

   (2) The annual performance presentations must include the following information:

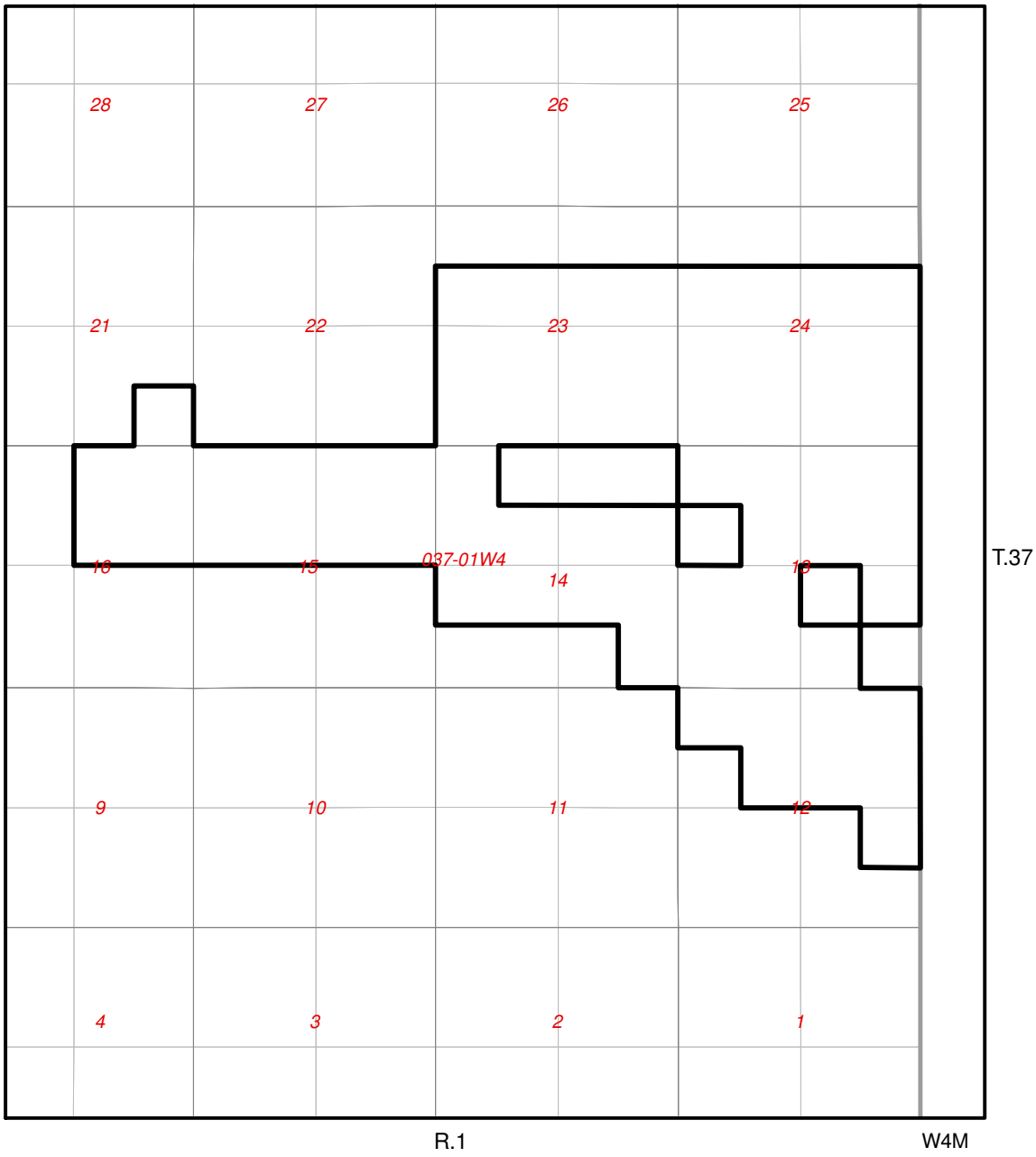
      a) the results of any measurements, observations, tests, or laboratory investigations which are pertinent to the determination of the success of the scheme,

      b) a discussion of the scheme's performance, including the production performance at each well, the injection performance, and related statements regarding the success and significance of the operations conducted on the wells, and

      c) verification that all conditions of the approval have been met and if not, detail the specific non-compliance events and the action plan to restore compliance.

7) Approval No. 10529I rescinds Approval No. 10529H.

END OF DOCUMENT



PROVOST UPPER MANNVILLE A POOL
APPENDIX A TO APPROVAL NO. 10529I

Area(s) of Change

Added

Deleted