**Innovative Energy Technologies Program – 2011 Annual Report**
**DEEP BASIN DEVELOPMENT AND MEASUREMENT OF MARGINAL ZONES - EXPANSION**

Submitted to:
Innovative Energy Technologies Program
Research and Technology Branch
Alberta Department of Energy

Submitted by:
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**Innovative Energy Technologies Program – 2011 Annual Report**
**DEEP BASIN DEVELOPMEMENT AND MEASUREMENT OF MARGINAL ZONES - EXPANSION**

## 1. Report abstract

Encana is currently working to evaluate zonal performance in the Deep Basin and increase recovered reserves in marginal zones. Encana's IETP Round 3 Project 03-063 entitled "DEEP BASIN DEVELOPMENT AND MEASUREMENT OF MARGINAL ZONES" involved a 10 well pilot to evaluate the production performance of marginal zones completed using limited entry completion techniques.

To increase the confidence in the statistical analysis of marginal zones' productive performance, Encana has expanded the project to include 10 additional wells in the IETP Round 5 Project 05-081.

This project is intended to evaluate the commercial viability of zones previously considered marginal or uneconomic to develop. Gas production over the first one to two years of the well's producing life is then monitored using Schlumberger's "OPTICall", previously "Sensaline" Distributed Temperature Sensing (DTS) technology.

Interpretations of rate estimates and commercial viability of marginal zones are provided in this report. This report covers the 2010 and 2011 calendar years.

## 2. Summary project status report

### 2.1. Project team members

The following table provides a listing of the IETP 05-081 project team members. Section c identifies changes to the project team from the approved application. The current project team consists of a Team Leader – Harvey Huebsch, Completions Engineer – Graham Walker and Reservoir Engineer – Gillian Tripp.

**Table 1 IETP 05-081 project team**

| | | | |
|---|---|---|---|
| **a) Team leader:** Harvey Huebsch | | | |
| **Title:** Group Lead, Bighorn Reservoir Characterization | | | |
| **Organization:** Encana Corporation | | | |
| **Address:** 150 – 9 Avenue S.W., PO Box 2850, Calgary, AB | | | |
| **Postal code:** T2P 2S5 | | **Email:** harvey.huebsch@encana.com | |
| **Phone:** 403.645.5434 | | | |
| **b) Original key team members** | | | |
| **Name** | **Institution** | **Email** | **Expertise added** |
| 1. Tara Smith (Cote) | Encana Corporation | tara.smith@encana.com | Reservoir Engineer |
| 2. Graham Walker | Encana Corporation | graham.walker@encana.com | Completions Engineer |
| 3. Jeremy Bruns | Encana Corporation | jeremy.bruns@encana.com | Reservoir Engineer |
| **c) Changes to project team** | | | |
| **Name** | **Institution** | **Email** | **Expertise added** |
| 1. Matthew MacDonald | Encana Corporation | matthew.macdonald@encana.com | Reservoir Engineer |
| 2. Gillian Tripp | Encana Corporation | gillian.tripp@encana.com | Reservoir Engineer |
| **Name** | **Institution** | **Email** | **Expertise removed** |
| 1. Tara Smith (Cote) | Encana Corporation | tara.smith@encana.com | Reservoir Engineer |
| 2. Jeremy Bruns | Encana Corporation | jeremy.bruns@encana.com | Reservoir Engineer |
| 3. Matthew MacDonald | Encana Corporation | matthew.macdonald@encana.com | Reservoir Engineer |

### 2.2. Chronological report of activities and operations since project initiation

The following table provides a chronological report of all activities and operations completed on the additional 10 project wells since the initiation of the IETP 05-081 project.

**Table 2 IETP 05-081 chronological report of activities and operations: 2010-2011**

| Date | Area | UWI | Description of Activity |
|---|---|---|---|
| 2010-01-22 | Red Rock | ECA KAKWA 100/13-18-062-06W6/00 | **Completion** |
| 2010-02-19 | Resthaven | ECA ECOG RESTHA 100/07-02-060-02W6/00 | **Completion** |
| 2010-04-10 | Red Rock | ECA KAKWA 100/13-18-062-06W6/00 | **1st DTS Survey** |
| 2010-07-18 | Resthaven | ECA ECOG RESTHA 100/07-02-060-02W6/00 | **1st DTS Survey** |
| 2010-10-27 | Kakwa | ECA KAKWA 100/16-16-061-05W6/00 | **Completion** |
| 2010-11-13 | Red Rock | ECA KAKWA 100/13-18-062-06W6/00 | **2nd DTS Survey** |
| 2010-11-26 | Resthaven | ECA ECOG RESTHA 100/07-02-060-02W6/00 | **2nd DTS Survey** |
| 2010-12-10 | Kakwa | ECA KAKWA 100/15-24-061-06W6/00 | **Completion** |
| 2011-01-11 | Kakwa | ECA KAKWA 100/08-04-061-06W6/00 | **Completion** |
| 2011-01-22 | Resthaven | ECA ECOG RESTHA 100/09-27-059-02W6/00 | **Completion** |
| 2011-02-03 | Kakwa | ECA KAKWA 100/05-15-061-06W6/00 | **Completion** |
| 2011-02-24 | Resthaven | ECA RESTHA 100/02-11-060-03W6/00 | **Completion** |
| 2011-04-18 | Kakwa | ECA KAKWA 100/16-16-061-05W6/00 | **1st DTS Survey** |
| 2011-06-02 | Kakwa | ECA KAKWA 100/08-04-061-06W6/00 | **1st DTS Survey** |
| 2011-06-13 | Kakwa | ECA KAKWA 100/05-15-061-06W6/00 | **1st DTS Survey** |
| 2011-06-20 | Resthaven | ECA ECOG RESTHA 100/09-27-059-02W6/00 | **1st DTS Survey** |
| 2011-08-20 | Red Rock | ECA REDROCK 100/04-11-063-07W6/00 | **Completion** |
| 2011-08-27 | Red Rock | ECA KAKWA 100/13-18-062-06W6/00 | **3rd DTS Survey** |
| 2011-10-27 | Kakwa | ECA KAKWA 100/08-04-061-06W6/00 | **2nd DTS Survey** |
| 2011-10-29 | Kakwa | ECA KAKWA 100/05-15-061-06W6/00 | **2nd DTS Survey** |
| 2011-11-02 | Kakwa | ECA KAKWA 100/16-16-061-05W6/00 | **2nd DTS Survey** |
| 2011-11-03 | Red Rock | ECA REDROCK 100/04-11-063-07W6/00 | **1st DTS Survey** |
| 2011-11-04 | Kakwa | ECA KAKWA 100/15-24-061-06W6/00 | **1st DTS Survey** |
| 2011-11-27 | Resthaven | ECA ECOG RESTHA 100/07-02-060-02W6/00 | **3rd DTS Survey** |
| 2011-11-28 | Resthaven | ECA RESTHA 100/02-11-060-03W6/00 | **1st DTS Survey** |
| **2011-03-04* | Resthaven | ECA SMOKY 100/02-10-059-02W6/00 | ****Rig Release Date*** |

Details of these activities are provided in subsequent sections of this report. The rig release date of ECA SMOKY 100/02-10-059-02W6/00 is provided for information only; no original completion operations took place during the current reporting period.

### 2.3. Production by month and calendar year

The following table provides a summary of production by calendar year for eight of the 10 wells included in the IETP 05-081 project compared to what was estimated when the project was approved. ECA ECOG RESTHA 100/09-27-059-02W6/00 and ECA SMOKY 100/02-10-059-02W6/00 are excluded from the summary as no interpretable DTS surveys were completed prior to the end of 2011. The predicted sales values presented in the following table have been adjusted from the original application to reflect production from eight wells rather than 20 wells.

**Table 3 IETP 05-081 production summary**

| | | 2010 | 2011 | Cumulative Gas at 2011 Year-end |
|---|---|---|---|---|
| IETP 05-081 | ***Base Case*** | | | |
| | Monthly GAS $e^3m^3$ | 13,855 | 42,426 | 56,281 |
| | Predicted Sales $e^3m^3$ | | 98,575 | 98,575 |
| | ***Incremental Case*** | | | |
| | Monthly GAS $e^3m^3$ | 19,061 | 46,122 | 65,183 |
| | Predicted Sales $e^3m^3$ | | 16,420 | 16,420 |
| | ***Total Case*** | | | |
| | Monthly GAS $e^3m^3$ | 32,916 | 88,547 | 121,463 |
| | Predicted Sales $e^3m^3$ | | 114,995 | 114,995 |

Monthly well production for the IETP 05-081 wells is provided in “Appendix A – IETP 05-081 Monthly Well Production”.

The objective of the project is to increase the confidence in the statistical analysis of marginal zones’ productive performance, by expanding the project to include 10 additional wells in addition the IETP 03-063 wells. The following table summarizes the first two years of production from the two datasets normalized to year zero and year one of the total combined project. The predicted sales values presented in the following table have been adjusted to a total of 18 wells rather than 20 wells to reflect work that has been competed to date.

**Table 4 IETP 03-063 and IETP 05-081 production summary**

| | | | | |
|---|---|---|---|---|
| IETP 03-063 | | **2007** | **2008** | **Cumulative Gas at 2008 Year-end** |
| | ***Base Case*** | | | |
| | Monthly GAS $e^3m^3$ | 25,801 | 84,655 | 110,456 |
| | Predicted Sales $e^3m^3$ | | 123,219 | 123,219 |
| | ***Incremental Case*** | | | |
| | Monthly GAS $e^3m^3$ | 8,337 | 44,406 | 52,743 |
| | Predicted Sales $e^3m^3$ | | 20,525 | 20,525 |
| | ***Total Case*** | | | |
| | Monthly GAS $e^3m^3$ | 34,139 | 129,061 | 163,200 |
| | Predicted Sales $e^3m^3$ | | 143,744 | 143,744 |
| IETP 05-081 | | **2010** | **2011** | **Cumulative Gas at 2011 Year-end** |
| | ***Base Case*** | | | |
| | Monthly GAS $e^3m^3$ | 13,855 | 42,426 | 56,281 |
| | Predicted Sales $e^3m^3$ | | 98,575 | 98,575 |
| | ***Incremental Case*** | | | |
| | Monthly GAS $e^3m^3$ | 19,061 | 46,122 | 65,183 |
| | Predicted Sales $e^3m^3$ | | 16,420 | 16,420 |
| | ***Total Case*** | | | |
| | Monthly GAS $e^3m^3$ | 32,916 | 88,547 | 121,463 |
| | Predicted Sales $e^3m^3$ | | 114,995 | 114,995 |
| TOTAL PROJECT | **Year** | **0** | **1** | **Cumulative Gas at Project-end** |
| | ***Base Case*** | | | |
| | Monthly GAS $e^3m^3$ | 39,656 | 127,080 | 166,737 |
| | Predicted Sales $e^3m^3$ | | 221,794 | 221,794 |
| | ***Incremental Case*** | | | |
| | Monthly GAS $e^3m^3$ | 27,398 | 90,528 | 117,926 |
| | Predicted Sales $e^3m^3$ | | 36,945 | 36,945 |
| | ***Total Case*** | | | |
| | Monthly GAS $e^3m^3$ | 67,055 | 217,608 | 284,663 |
| | Predicted Sales $e^3m^3$ | | 258,739 | 258,739 |

Monthly well production for IETP 03-063 wells is provided in “Appendix B – IETP 03-063 Monthly Well Production” of this report.

### 2.4. Year-end reserves estimate

The following table provides a year-end reserves estimate for eight of the 10 wells included in the IETP 05-081 project. ECA ECOG RESTHA 100/09-27-059-02W6/00 and ECA SMOKY 100/02-10-059-02W6/00 are excluded from the summary as no interpretable DTS surveys had been completed prior to the end of 2011.

**Table 5 IETP 05-081 year-end reserves estimate**

| | Well UWI | Base Case (MMSCF) | *Base Case $(10^6 m^3)$* | Marginal Zone Contribution (MMSCF) | *Marginal Zone Contribution $(10^6 m^3)$* | 2011 Year-end EUR - PDP (MMSCF) * | *2011 Year-end EUR - PDP $(10^6 m^3)$ ** |
|---|---|---|---|---|---|---|---|
| IETP 05-081 | 100/04-11-063-07W6/00 | 0 | *0* | 3250 | *92* | 3250 | *92* |
| | 100/13-18-062-06W6/00 | 378 | *11* | 1522 | *43* | 1900 | *54* |
| | 100/08-04-061-06W6/00 | 1524 | *43* | 476 | *13* | 2000 | *56* |
| | 100/05-15-061-06W6/00 | 60 | *2* | 1440 | *41* | 1500 | *42* |
| | 100/15-24-061-06W6/00 | 1399 | *39* | 1101 | *31* | 2500 | *70* |
| | 100/16-16-061-05W6/00 | 1237 | *35* | 1563 | *44* | 2800 | *79* |
| | 100/02-11-060-03W6/00 | 1858 | *52* | 142 | *4* | 2000 | *56* |
| | 100/07-02-060-02W6/00 | 1738 | *49* | 685 | *19* | 2423 | *68* |
| | 100/09-27-059-02W6/00 | - | - | - | - | - | - |
| | 100/02-10-059-02W6/00 | - | - | - | - | - | - |
| | **Total IETP 05-081:** | **8,195** | ***231*** | **10,178** | ***287*** | **18,373** | ***518*** |

* from GLJ Petroleum Consultants year-end report

The following table summarizes the year-end reserves estimates at IETP 03-063 project end and IETP 05-081 2011 year-end. The initial project estimate values presented in the following table have been adjusted to reflect a total of 18 rather than 20 wells.

**Table 6 IETP 03-063 and IETP 05-081 reserves estimate compared to initial project estimate**

| | Well UWI | Base Case (MMSCF) | *Base Case $(10^6 m^3)$* | Marginal Zone Contribution (MMSCF) | *Marginal Zone Contribution $(10^6 m^3)$* | 2010 Year-end EUR - PDP (MMSCF) * | *2010 Year-end EUR - PDP $(10^6 m^3)$ ** |
|---|---|---|---|---|---|---|---|
| IETP 03-063 | 100/09-02-062-05W6/00 | 4,535 | *128* | 1,465 | *41* | 6,000 | *169* |
| | 100/04-01-062-05W6/00 | 3,718 | *105* | 1,782 | *50* | 5,500 | *155* |
| | 100/04-22-061-05W6/00 | 1,217 | *34* | 1,333 | *38* | 2,550 | *72* |
| | 100/16-21-061-05W6/00 | 1,401 | *39* | 2,099 | *59* | 3,500 | *99* |
| | 103/12-06-062-04W6/00 | 2,630 | *74* | 1,370 | *39* | 4,000 | *113* |
| | 100/14-08-061-05W6/00 | 1,340 | *38* | 860 | *24* | 2,200 | *62* |
| | 100/02-04-062-05W6/00 | 161 | *5* | 2,339 | *66* | 2,500 | *70* |
| | 100/13-36-061-05W6/00 | 1,201 | *34* | 1,299 | *37* | 2,500 | *70* |
| | 100/08-08-062-04W6/00 | 1,310 | *37* | 1,190 | *34* | 2,500 | *70* |
| | 100/16-04-060-02W6/00 | 1,861 | *52* | 929 | *26* | 2,790 | *79* |
| | **Total IETP 03-063:** | **19,374** | ***546*** | **14,666** | ***413*** | **34,040** | ***959*** |
| | **Well UWI** | **Base Case (MMSCF)** | ***Base Case $(10^6 m^3)$*** | **Marginal Zone Contribution (MMSCF)** | ***Marginal Zone Contribution $(10^6 m^3)$*** | **2011 Year-end EUR - PDP (MMSCF) *** | ***2011 Year-end EUR - PDP $(10^6 m^3)$ **** |
| IETP 05-081 | 100/04-11-063-07W6/00 | 0 | *0* | 3250 | *92* | 3250 | *92* |
| | 100/13-18-062-06W6/00 | 378 | *11* | 1522 | *43* | 1900 | *54* |
| | 100/08-04-061-06W6/00 | 1524 | *43* | 476 | *13* | 2000 | *56* |
| | 100/05-15-061-06W6/00 | 60 | *2* | 1440 | *41* | 1500 | *42* |
| | 100/15-24-061-06W6/00 | 1399 | *39* | 1101 | *31* | 2500 | *70* |
| | 100/16-16-061-05W6/00 | 1237 | *35* | 1563 | *44* | 2800 | *79* |
| | 100/02-11-060-03W6/00 | 1858 | *52* | 142 | *4* | 2000 | *56* |
| | 100/07-02-060-02W6/00 | 1738 | *49* | 685 | *19* | 2423 | *68* |
| | 100/09-27-059-02W6/00 | - | - | - | - | - | - |
| | 100/02-10-059-02W6/00 | - | - | - | - | - | - |
| | **Total IETP 05-081:** | **8,195** | ***231*** | **10,178** | ***287*** | **18,373** | ***518*** |
| TOTAL | **Total Project:** | **27,569** | ***777*** | **24,844** | ***700*** | **52,413** | ***1477*** |
| | **Initial Total Project Estimate:** | **53,400** | ***1,504*** | **8,900** | ***251*** | **62,300** | ***1755*** |

* from GLJ Petroleum Consultants year-end report

## 3. Well information

### 3.1. Well layout map

The following figure shows the location of IETP 03-063 wells in green and IETP 05-081 in red. Encana lands in the Bighorn area are shown in yellow with the Red Rock, Kakwa and Resthaven properties identified by text.

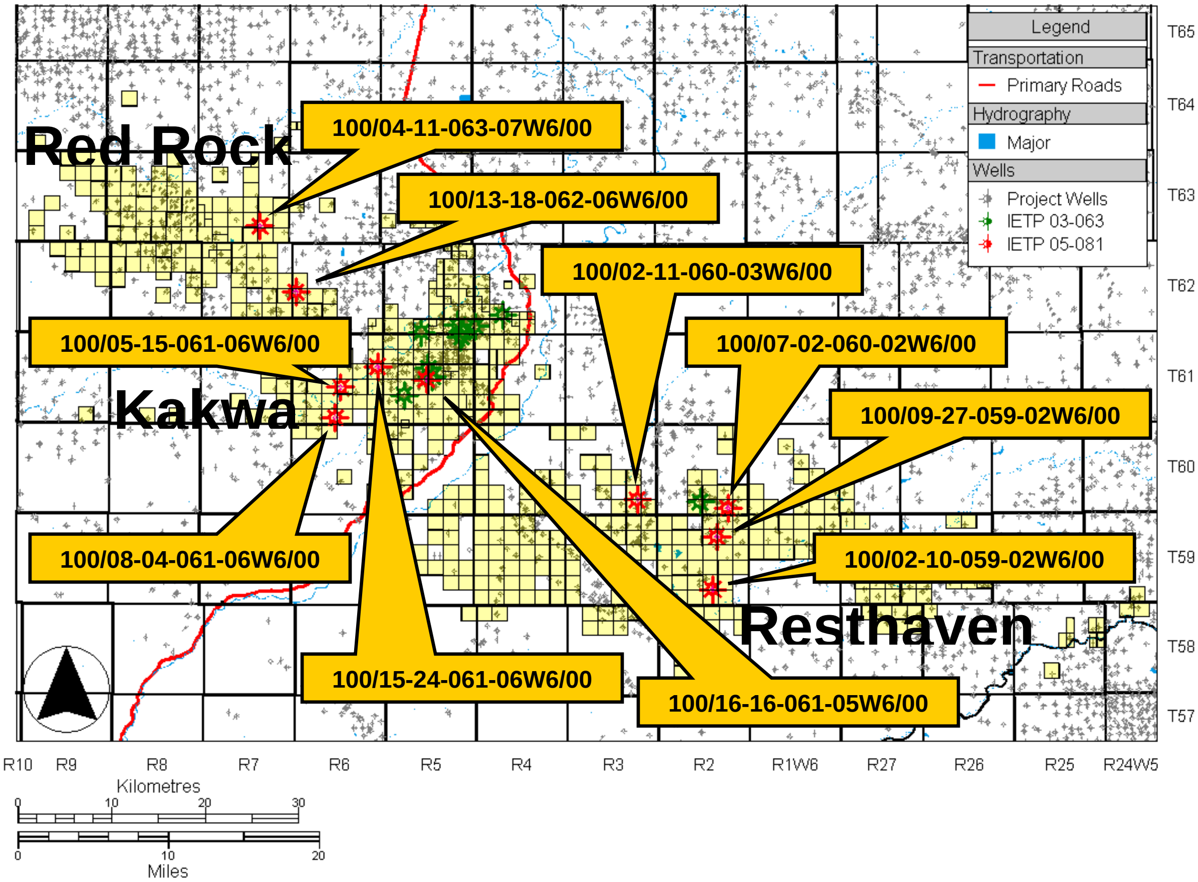


**Figure 1 IETP 03-063 and IETP 05-081 well layout map**

To increase the confidence in the statistical analysis of Deep Basin marginal zones' productive performance, Encana is expanding the original project area to include 10 additional wells from a greater geographical area as illustrated in the well layout map.

### 3.2. Drilling, completion and work-over operations and difficulties encountered

#### 3.2.1. Drilling

The following table provides details for each well including the corresponding surface location, significant dates, total depth, wellbore profile and tubing/casing size used.

**Table 7 IETP 05-081 drilling data**

| UWI | Surface Location | Spud Date | Rig Release Date | TD (mKB) | Profile Type | Kick off Point (mKB) | Tbg OD (mm) | Csg OD (mm) |
|---|---|---|---|---|---|---|---|---|
| ECA REDROCK 100/04-11-063-07W6/00 | 01-10-63-07 | 2011-03-30 | 2011-04-17 | 3397 | Deviated | 148 | 60.3 | 114.3 |
| ECA KAKWA 100/13-18-062-06W6/00 | 11-18-62-06 | 2009-11-13 | 2009-12-01 | 3483 | Deviated | 638 | 60.3 | 114.3 |
| ECA KAKWA 100/08-04-061-06W6/00 | 07-04-61-06 | 2010-09-09 | 2010-10-06 | 3631 | Deviated | 144 | 60.3 | 114.3 |
| ECA KAKWA 100/05-15-061-06W6/00 | 09-16-61-06 | 2010-11-10 | 2010-12-02 | 3511 | Deviated | 171 | 60.3 | 114.3 |
| ECA KAKWA 100/15-24-061-06W6/00 | 05-19-61-05 | 2010-07-08 | 2010-07-26 | 3596 | Deviated | 148 | 60.3 | 114.3 |
| ECA KAKWA 100/16-16-061-05W6/00 | 10-16-61-05 | 2010-07-28 | 2010-09-23 | 3510 | Deviated | 149 | 60.3 | 114.3 |
| ECA RESTHA 100/02-11-060-03W6/00 | 15-02-60-03 | 2010-10-21 | 2010-11-09 | 3446 | Deviated | 140 | 60.3 | 114.3 |
| ECA ECOG RESTHA 100/07-02-060-02W6/00 | 12-01-60-02 | 2010-01-18 | 2010-02-04 | 3468 | Deviated | 147 | 60.3 | 114.3 |
| ECA ECOG RESTHA 100/09-27-059-02W6/00 | 04-35-59-02 | 2010-09-19 | 2010-10-21 | 3644 | Deviated | 794 | 60.3 | 114.3 |
| ECA SMOKY 100/02-10-059-02W6/00 | 08-10-59-02 | 2011-02-08 | 2011-03-04 | 3562 | Deviated | 149 | 60.3 | 114.3 |

#### 3.2.2. Completions

All of the wells in this project were hydraulically fractured using limited entry fracture techniques. Typical completion procedures for wells in the Bighorn area involve first perforating and fracture stimulating all stages individually, while setting plugs between each fracture stage. Once all zones are completed, the composite or flow through bridge plugs are drilled out and the well is flowed back in order to recover completion fluids and limit formation damage. The drill-out and clean-up procedures are conducted using the production tubing string that will eventually be left in the well for production purposes. Once drill-out is complete, the tubing is typically landed at the bottommost set of perforations and the bit is dropped in the sump of the well. Individual zone clean ups are performed on select zones during initial clean-up.

Detailed completion information including perforated intervals, corresponding formations, fracture stages, and fluid system are provided in “Appendix C – IETP 05-081 Completion Data”.

#### 3.2.3. Work-overs

The following table provides a listing of work-overs and optimization operations performed on the IETP 05-081 wells during the reporting years.

**Table 8 IETP 05-081 work-overs and optimization**

| UWI | Work-over Type | Job Start Date | Job End Date | Objective |
|---|---|---|---|---|
| ECA REDROCK 100/04-11-063-07W6/00 | WAX CLEAN OUT | 2011-10-07 | 2011-12-21 | De-wax production tubing with 60.3 mm wax knife, R.I.H. with 48.26 mm gauge ring |
| ECA KAKWA 100/13-18-062-06W6/00 | WAX CLEAN OUT | 2010-05-18 | 2010-11-10 | R.I.H. with 60.3 mm wax knife to 1000 mCF P.O.O.H., R.I.H. with 48.26mm gauge ring to 1005 mCF P.O.O.H. |
| | WAX CLEAN OUT | 2010-11-16 | 2010-12-30 | R.I.H. with 60.3 mm wax knife to 1000 mCF P.O.O.H., R.I.H. with 48.26mm gauge ring to 1005 mCF P.O.O.H. |
| | WAX CLEAN OUT | 2011-08-26 | 2011-08-26 | R.I.H. with 60.3 mm wax knife to 1000 mCF P.O.O.H., R.I.H. with 48.26mm gauge ring to 1005 mCF P.O.O.H. |
| | WAX CLEAN OUT | 2011-08-31 | 2011-12-30 | R.I.H. with 60.3 mm wax knife to 1000 mCF P.O.O.H., R.I.H. with 48.26mm gauge ring to 1005 mCF P.O.O.H. |
| ECA KAKWA 100/08-04-061-06W6/00 | SLICKLINE | 2011-03-12 | 2011-03-12 | Use slickline to pull a downhole choke on 100/08-04-061-06W6/0 |
| | WAX CLEAN OUT | 2011-03-25 | 2011-07-18 | De-wax production tubing with 60.3 mm Wax /Knife to 1000 mCF, R.I.H. with 48.26 mm Gauge Ring to 1005mCF |
| | STIMULATION | 2011-05-21 | 2011-05-25 | Pump 1m³ Xylene down CSG |
| | WAX CLEAN OUT | 2011-05-24 | 2011-05-24 | De-wax production tubing with 60.3 mm Wax /Knife to 1000 mCF, R.I.H. with 48.26 mm Gauge Ring to 1005mCF |
| | WAX CLEAN OUT | 2011-07-22 | 2011-12-22 | De-wax production tubing with 60.3 mm Wax /Knife to 1000 mCF, R.I.H. with 48.26 mm Gauge Ring to 1005mCF |
| ECA KAKWA 100/05-15-061-06W6/00 | WAX CLEAN OUT | 2011-07-29 | 2011-10-19 | R.I.H. with 60.3 mm wax knife and de-wax production tubing to 1000 mCF, R.I.H. with 48.26 mm gauge ring to 1005 mCF |
| ECA KAKWA 100/15-24-061-06W6/00 | WAX CLEAN OUT | 2011-03-16 | 2011-03-16 | De-wax production tubing |
| | SLICKLINE | 2011-03-18 | 2011-03-18 | Use slickline to pull a downhole choke on 100/15-24-061-06W6 |
| | WAX CLEAN OUT | 2011-04-05 | 2011-12-22 | De-wax production tubing |
| ECA KAKWA 100/16-16-061-05W6/00 | SLICKLINE | 2011-01-12 | 2011-01-12 | Pull a downhole choke using slickline |
| | WAX CLEAN OUT | 2011-01-27 | 2011-04-14 | R.I.H. with 60.3 mm wax knife and de-wax production tubing to 1000 mCF P.O.O.H., R.I.H. with 48.26 mm gauge ring to 1005 mCF to ensure tubing clear of obstructions |
| | WAX CLEAN OUT | 2011-05-25 | 2011-12-22 | R.I.H. with 60.3 mm wax knife and de-wax production tubing to 1000 mCF P.O.O.H., R.I.H. with 48.26 mm gauge ring to 1005 mCF to ensure tubing clear of obstructions |
| ECA RESTHA 100/02-11-060-03W6/00 | SLICKLINE | 2011-07-21 | 2011-07-21 | To remove the downhole choke using Slickline |

#### 3.2.4. Difficulties

##### 3.2.4.1. Difficulties during original completion operations

Original completion operations were completed for nine out of the 10 wells included in the IETP 05-081 project during the reporting years. The following table provides a summary of difficulties experienced during initial completion operations for all wells included in the project.

**Table 9 IETP 05-081 difficulties during initial completion**

| UWI | Summary of Difficulties During Initial Completion Operations |
|---|---|
| ECA REDROCK 100/04-11-063-07W6/00 | • No difficulties |
| ECA KAKWA 100/13-18-062-06W6/00 | • Cadotte screened out with 88 tonnes placed (still a good fracture)<br>• Dunvegan A and D not completed due to sand in the well after Dunvegan E completion, no problems with drill-out |
| ECA KAKWA 100/08-04-061-06W6/00 | • No problems with fractures or drill-outs<br>• Excess cost due to multiple mobilization and de-mobilization at this location because of equipment availability |
| ECA KAKWA 100/05-15-061-06W6/00 | • Attempted to fracture the Nikanassin (do not normally complete this zone)<br>• Reached maximum pressure during the pad stage of the fracture<br>• Had to use coil to clean gelled fluid out of the casing before moving to next zone uphole, (significant cost overage)<br>• Cadotte fracture was planned as high quality $N^2$, but $N^2$ pumper failed, therefore desired foam quality was not achieved and fracture screened out<br>• Had to flow back the well for three days to clean out sand in casing<br>• No problems with plug drill-out |
| ECA KAKWA 100/15-24-061-06W6/00 | • Cadotte and below fractured in September 2010, due to heavy rain the operations were suspended to prevent environmental damage, well left shut-in<br>• Completed Dunvegan and Cardium in December 2010<br>• No problems with fractures or drill-outs<br>• Cost overages due to extra mobilization and demobilization of equipment |
| ECA KAKWA 100/16-16-061-05W6/00 | • Screened out with 130 of 140 tonnes placed on Falher F/Wilrich, had to flow back to clean sand out of casing<br>• No problems with other fractures or drill-out |
| ECA ECOG RESTHA 100/07-02-060-02W6/00 | • No difficulties |
| ECA RESTHA 100/02-11-060-03W6/00 | • No difficulties |
| ECA ECOG RESTHA 100/09-27-059-02W6/00 | • No difficulties |
| ECA SMOKY 100/02-10-059-02W6/00 | • Not completed during the reporting years |

##### 3.2.4.2. Difficulties during DTS surveys

As shown in “Table 2 IETP 05-081 chronological report of activities and operations: 2010-2011”, Encana completed 16 total DTS surveys on nine wells in the current reporting years. Of those 16 surveys, 14 yielded interpretable results that will be discussed in later sections of this report. Surveys on ECA KAKWA 100/13-18-062-06W6/00 and ECA ECOG RESTHA 100/09-27-059-02W6/00 yielded poor quality results and are excluded from any interpretations in this report.

The following figure illustrates the low flow rate during the flowing portion of the third DTS survey conducted on KAKWA 100/13-18-062-06W6/00.

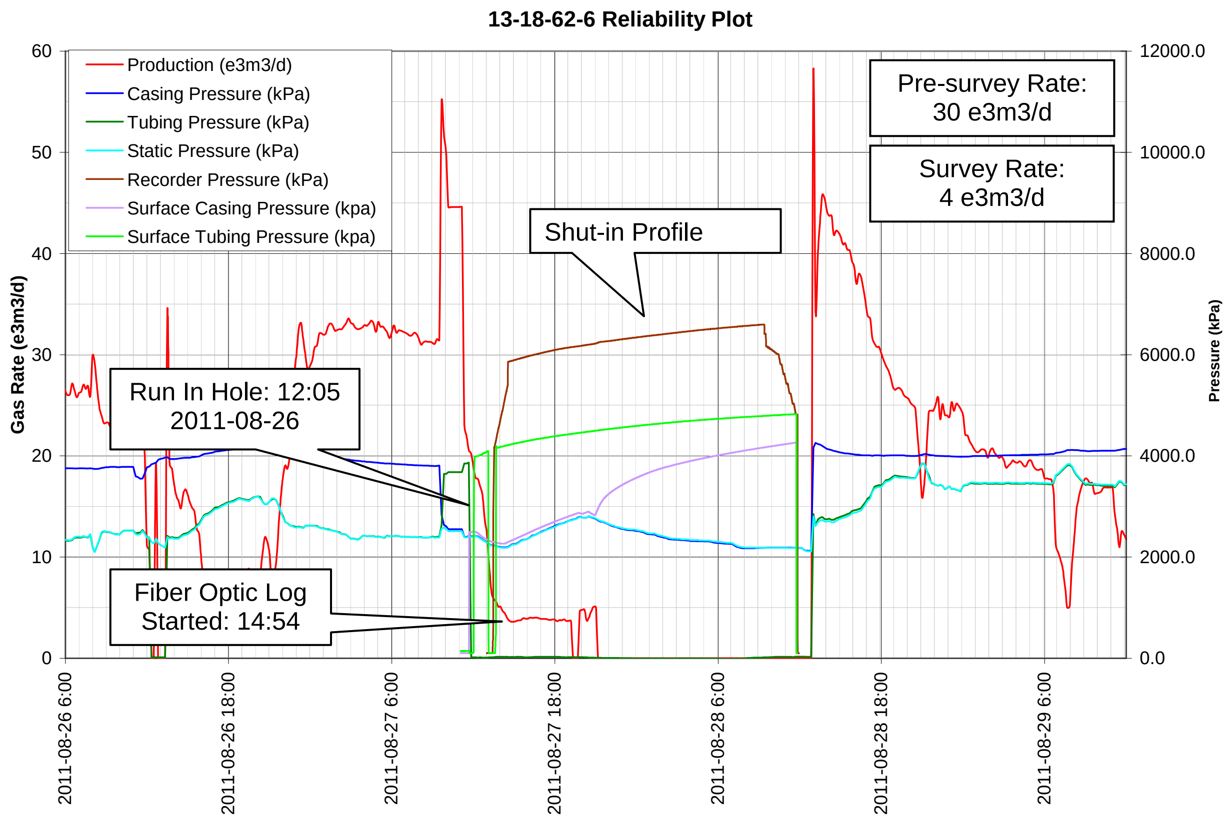


**Figure 2 ECA KAKWA 100/13-18-062-06W6/00 DTS reliability plot**

The ideal condition for the flowing portion of the DTS survey is to obtain a stable flow rate that is similar to the normal flow rate of the well. The interpreted rates from individual zones in this well are disproportionate to what the well would normally produce and are of low confidence.

The following figure shows the flowing and shut-in temperature traces during the ECA ECOG RESTHA 100/09-27-059-02W6/00 DTS survey. This well was surveyed on June 20, 2011 with a downhole choke in place.

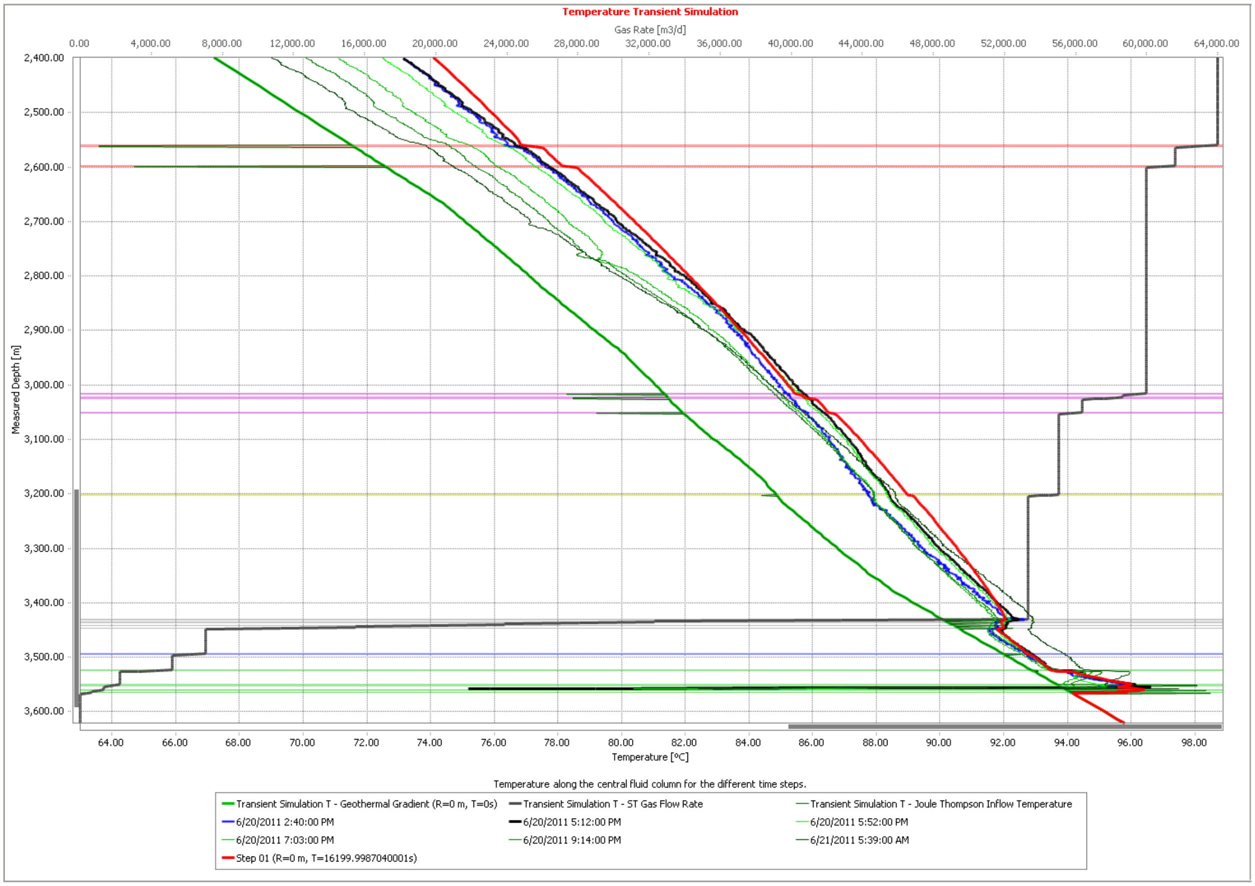


**Figure 3 ECA ECOG RESTHA 100/09-27-059-02W6/00 temperature traces and model match**

The model match illustrated by the red line indicates the bottom of the well has been significantly cooled by Joule-Thompson cooling across the choke. The model on this well is a poor match due to this cooling effect and is of very low confidence.

### 3.3. Well operation

Most wells in the Bighorn area initially produced up the tubing only to efficiently clean-up completion fluids and keep the wellbore clear of produced liquids. Encana's current practice is to continue to flow up the tubing for the life of the well. During the DTS survey operation, wells are temporarily produced up the annulus to provide a uniform flow path for temperature profile measurement.

### 3.4. Well list and status

The following table lists the wells in the IETP 05-081 project, the date they were placed on-production, and their current production status.

**Table 10 IETP 05-081 well list and status**

| Well Name | On Production Date | Status |
|---|---|---|
| ECA REDROCK 100/04-11-063-07W6/00 | 2011-Aug-16 | Flowing GAS |
| ECA KAKWA 100/13-18-062-06W6/00 | 2010-Feb-22 | Flowing GAS |
| ECA KAKWA 100/08-04-061-06W6/00 | 2011-Jan-25 | Flowing GAS |
| ECA KAKWA 100/05-15-061-06W6/00 | 2011-Mar-09 | Flowing GAS |
| ECA KAKWA 100/15-24-061-06W6/00 | 2011-Feb-16 | Flowing GAS |
| ECA KAKWA 100/16-16-061-05W6/00 | 2010-Dec-02 | Flowing GAS |
| ECA RESTHA 100/02-11-060-03W6/00 | 2011-Mar-11 | Flowing GAS |
| ECA ECOG RESTHA 100/07-02-060-02W6/00 | 2010-Mar-04 | Flowing GAS |
| ECA ECOG RESTHA 100/09-27-059-02W6/00 | 2011-Mar-21 | Flowing GAS |
| ECA SMOKY 100/02-10-059-02W6/00 | - | Drilled and Cased |

At the end of the current reporting period nine out of the 10 project wells were on production. The status of ECA SMOKY 100/02-10-059-02W6/00 at the end of the 2011 calendar year was drilled and cased.

### 3.5. Wellbore schematics

Please refer to "Appendix D – IETP 05-081 Wellbore Schematics" for current schematics of all IETP 05-081 project wells.

### 3.6. Well spacing and pattern

Due to the geological variability of the 30 development zones targeted in the Bighorn area, Encana is building a development plan on a section by section basis. Encana's holdings currently allow between four and sixteen completions per zone per section. It is anticipated, at this time, that most of the Kakwa area will ultimately be developed with eight to 12 vertical and horizontal well completions per zone per section. The following map details Encana's lands. Any section that is not shown as eight, 12 or 16 wells per section spacing is four wells per section by default.

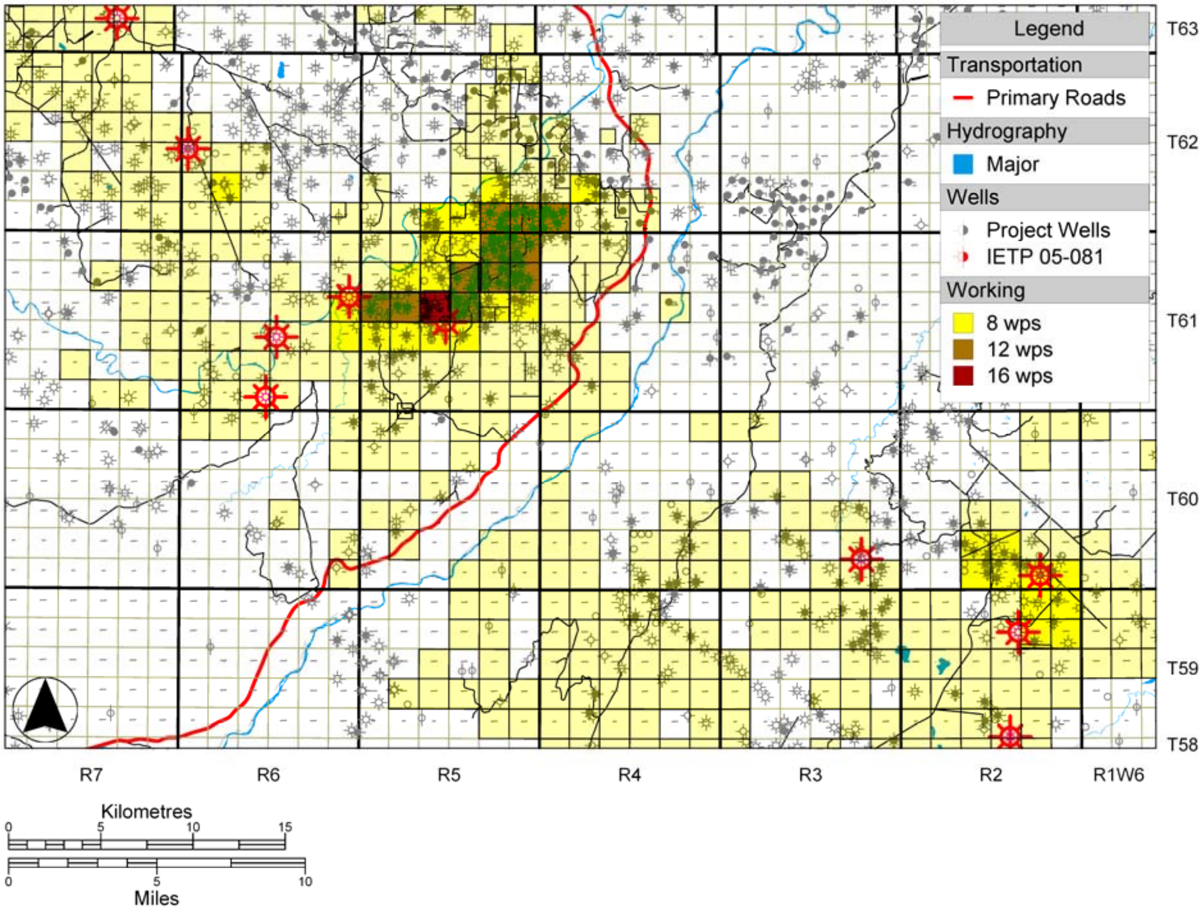


**Figure 4 Encana Bighorn area well spacing map**

## 4. Production performance and data for the reporting year

### 4.1. Injection and production history on an individual well and composite basis

#### 4.1.1. Injection history

There is no injection history for any of the wells in this project.

#### 4.1.2. Production History

Please refer to “Appendix E - IETP 05-081 ProcessNet Production and Pressure Plots” for production plots that were generated from Encana’s production database, ProcessNet. ProcessNet provides additional detailed real time and historic data from the field detailing each well’s gas rate, surface casing pressure, surface tubing pressure, and pipeline pressure. Each of the plots displays data from the on-production date of the individual well to 2011 year-end.

### 4.2. Composition of produced/injected fluids

The following table provides detail of the typical component profile, in mole fraction, of the produced fluids in all producing zones in the Bighorn area.

**Table 11 Encana Bighorn area composition of produced fluids**

| Component | Bluesky Mol% | Cadomin Mol% | Cadotte Mol% | Cardium Mol% | Dunvegan Mol% | Falher + Wilrich Mol% | Gething Mol% | Notikewin Mol% |
|---|---|---|---|---|---|---|---|---|
| N2 | 0.237 | 0.510 | 0.182 | 0.565 | 1.000 | 0.220 | 1.000 | 1.000 |
| CO2 | 0.990 | 1.699 | 0.999 | 0.608 | 0.554 | 1.032 | 1.183 | 0.742 |
| C1 | 84.056 | 91.850 | 89.188 | 82.275 | 80.745 | 88.486 | 86.150 | 85.782 |
| C2 | 8.459 | 4.249 | 5.450 | 9.223 | 9.551 | 7.364 | 7.811 | 7.622 |
| C3 | 2.854 | 0.790 | 2.072 | 4.014 | 4.757 | 1.554 | 2.158 | 2.810 |
| iC4 | 0.565 | 0.180 | 0.364 | 0.453 | 0.787 | 0.333 | 0.417 | 0.509 |
| nC4 | 0.651 | 0.130 | 0.637 | 0.960 | 1.403 | 0.267 | 0.452 | 0.595 |
| iC5 | 0.284 | 0.070 | 0.254 | 0.258 | 0.436 | 0.114 | 0.166 | 0.192 |
| nC5 | 0.220 | 0.040 | 0.224 | 0.255 | 0.366 | 0.069 | 0.100 | 0.149 |
| C6 | 0.426 | 0.078 | 0.274 | 0.243 | 0.277 | 0.130 | 0.207 | 0.215 |
| C7+ | 1.258 | 0.404 | 0.356 | 1.146 | 0.124 | 0.431 | 0.356 | 0.384 |

### 4.3. Comparison of predicted vs. actual well performance

Based on the petrophysical criteria used for identifying marginal zones at the onset of the project, 74 percent of perforated zones with measured gas response were considered marginal. Using the 30 day normalized rate measured from each zone as an estimate of their contribution, 37 percent of the measured gas was from non-marginal zones while 63 percent was from zones considered marginal.

The following table illustrates the production contribution from zones determined marginal as measured by multiple DTS surveys. Throughout this report the marginal zone results are calculated using the average contribution from marginal zones for each well.

**Table 12 IETP 05-081 measured flow contribution from marginal zones**

| Well UWI | Average Contribution From Marginal Zones (%)* |
|---|---|
| 100/04-11-063-07W6/00 | 100% |
| 100/13-18-062-06W6/00 | 80% |
| 100/08-04-061-06W6/00 | 24% |
| 100/05-15-061-06W6/00 | 96% |
| 100/15-24-061-06W6/00 | 44% |
| 100/16-16-061-05W6/00 | 56% |
| 100/02-11-060-03W6/00 | 7% |
| 100/07-02-060-02W6/00 | 28% |

* based on current DTS results

Please refer to “Appendix F – DTS Rates, Average Zone Contribution and 30 day Normalized Rates” for the measured DTS rates for the eight wells that have been surveyed to date in the IETP 05-081 project. The 30 day normalized rates by zone were calculated by multiplying the 30 day initial production (IP) rate by the average contribution of the zone. These normalized 30 day rates were used for evaluating production from marginal zones and limited entry completion techniques for the wells included in the IETP 05-081 project.

The following table summarizes predicted vs. actual well performance observed in the IETP 05-081 project to date.

**Table 13 IETP 05-081 summary of predicted vs. actual well performance**

| IETP 05-081 | | Cumulative Gas 2011 Year-end | Reserves Estimate 2011 Year-end EUR PDP* |
|---|---|---|---|
| | ***Base Case*** | | |
| | Actual $10^6m^3$ | 56 | 231 |
| | Predicted $10^6m^3$ | 99 | 669 |
| | ***Incremental Case*** | | |
| | Actual $10^6m^3$ | 65 | 287 |
| | Predicted $10^6m^3$ | 16 | 111 |
| | ***Total Case*** | | |
| | Actual $10^6m^3$ | 121 | 518 |
| | Predicted $10^6m^3$ | 115 | 780 |

* from GLJ Petroleum Consultants Year-end Report, converted to $10^6m^3$

The lower base production and higher production from marginal zones represented in the results of this project show a move in drilling focus away from the highest quality areas of the land base to areas where new conventional high productivity pools of significant size were not discovered. Without the additional reserves from these marginal zones the average well on these lands would have produced less than 30 percent of original proposed type curve.

The following table summarizes predicted vs. actual well performance for wells in the IETP 03-063 project and the IETP 05-081 project.

**Table 14 IETP 03-063 and IETP 05-081 summary of predicted vs. actual well performance**

| | | Cumulative Gas 2010 Year-end | Reserves Estimate 2010 Year-end EUR PDP* |
|---|---|---|---|
| IETP 03-063 | ***Base Case*** | | |
| | Actual $10^6m^3$ | 224 | 546 |
| | Predicted $10^6m^3$ | 295 | 836 |
| | ***Incremental Case*** | | |
| | Actual $10^6m^3$ | 151 | 409 |
| | Predicted $10^6m^3$ | 49 | 139 |
| | ***Total Case*** | | |
| | Actual $10^6m^3$ | 376 | 951 |
| | Predicted $10^6m^3$ | 344 | 975 |
| IETP 05-081 | | **Cumulative Gas 2011 Year-end** | **Reserves Estimate 2011 Year-end EUR PDP*** |
| | ***Base Case*** | | |
| | Actual $10^6m^3$ | 56 | 231 |
| | Predicted $10^6m^3$ | 99 | 669 |
| | ***Incremental Case*** | | |
| | Actual $10^6m^3$ | 65 | 287 |
| | Predicted $10^6m^3$ | 16 | 111 |
| | ***Total Case*** | | |
| | Actual $10^6m^3$ | 121 | 518 |
| | Predicted $10^6m^3$ | 115 | 780 |

* from GLJ Petroleum Consultants Year-end Report, converted to $10^6m^3$

The following figure displays the distribution of the rate by formation segregated by marginal or conventional zone contribution for the IETP 05-081 project.

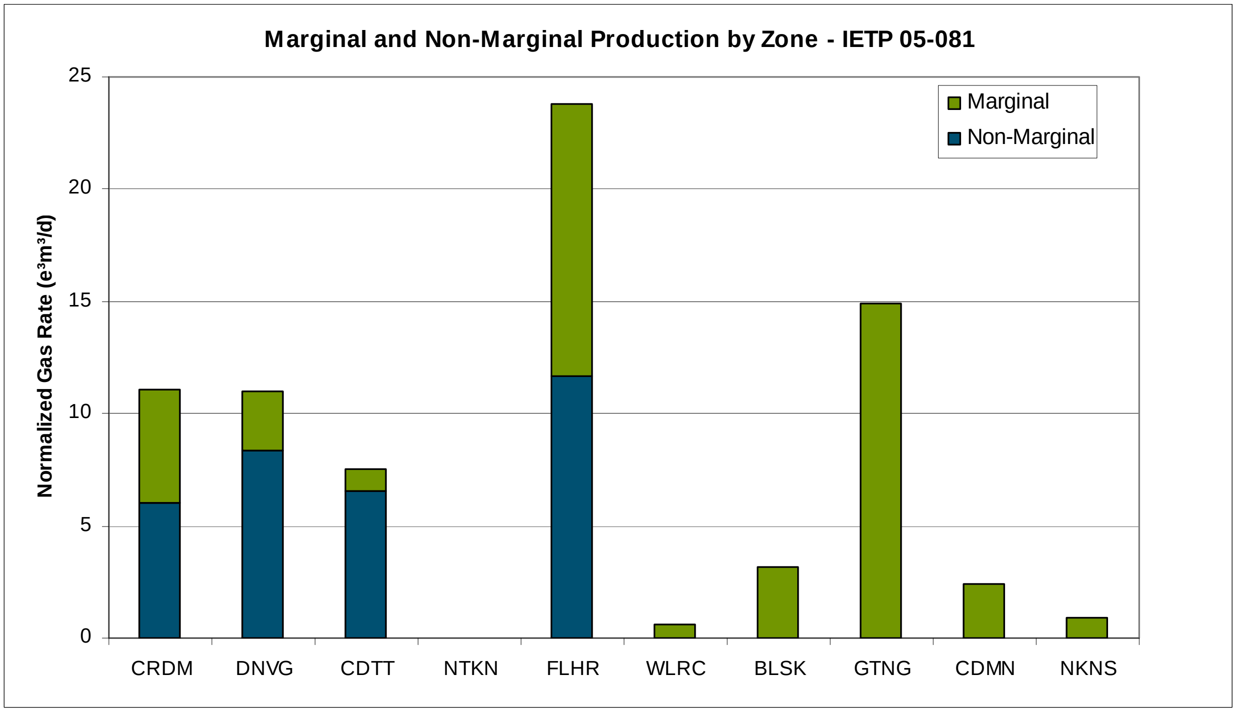


**Figure 5 IETP 05-081 marginal and non-marginal production by zone**

The following figure displays the distribution of the rate by formation segregated by marginal or non-marginal zone contribution for the IETP 03-063 project and the IETP 05-081 project.

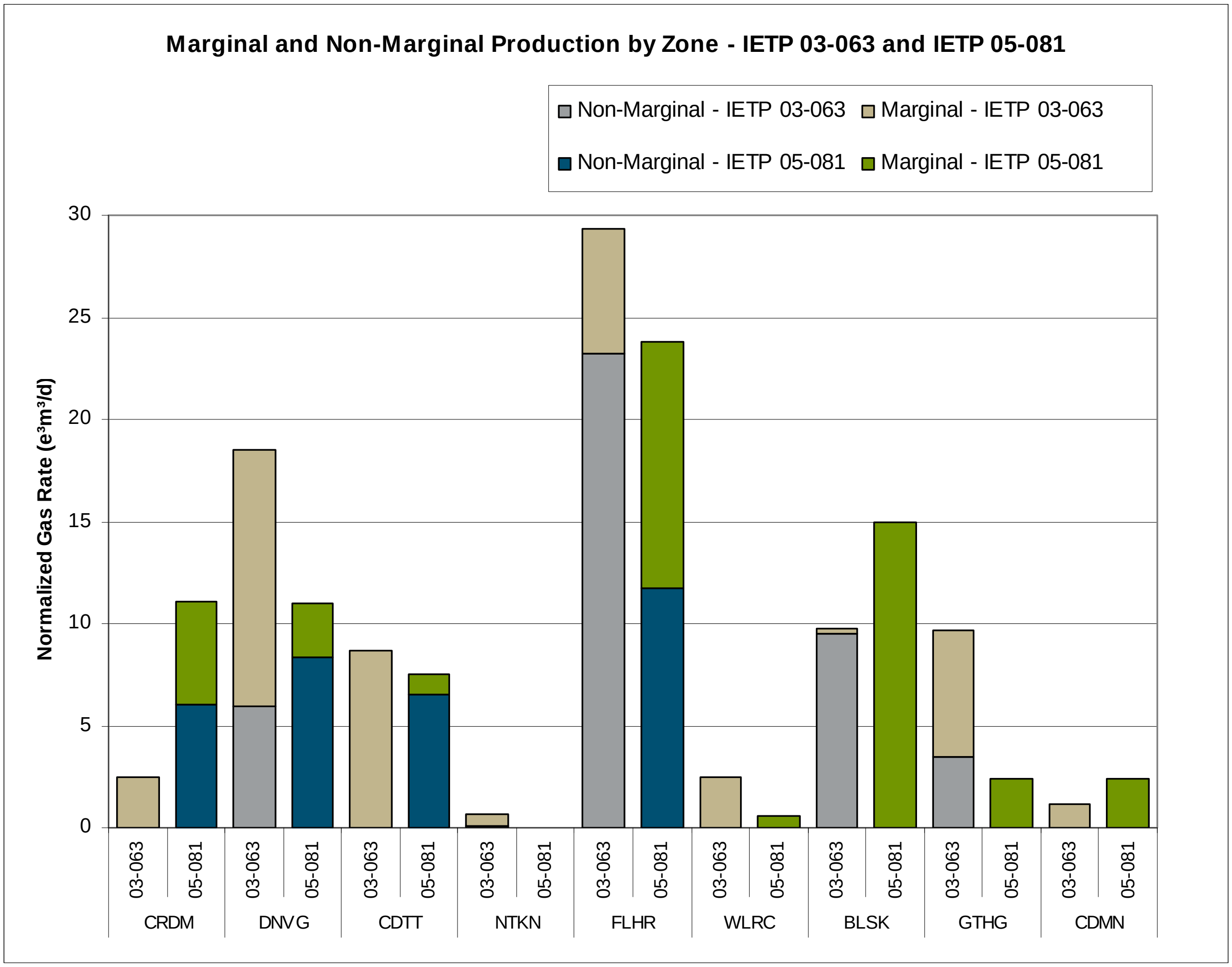


**Figure 6 IETP 03-063 and IETP 05-081 marginal and non-marginal production by zone**

This evaluation demonstrates that a significant amount of gas is being produced from zones which are or were considered marginal. The rates presented in the above graphs show the average results per well in the IETP 03-063 and IETP 05-081 projects.

#### 4.3.1. Petrophysical evaluation

Petrophysical data for the wells included in the IETP 05-081 project is provided in “Appendix G – IETP 05-081 Petrophysical Data”.

The following chart illustrates that predictability of production based on petrophysical data is weak, but most zones with calculated pay produce at measureable gas rates greater than one $e^3m^3/d$.

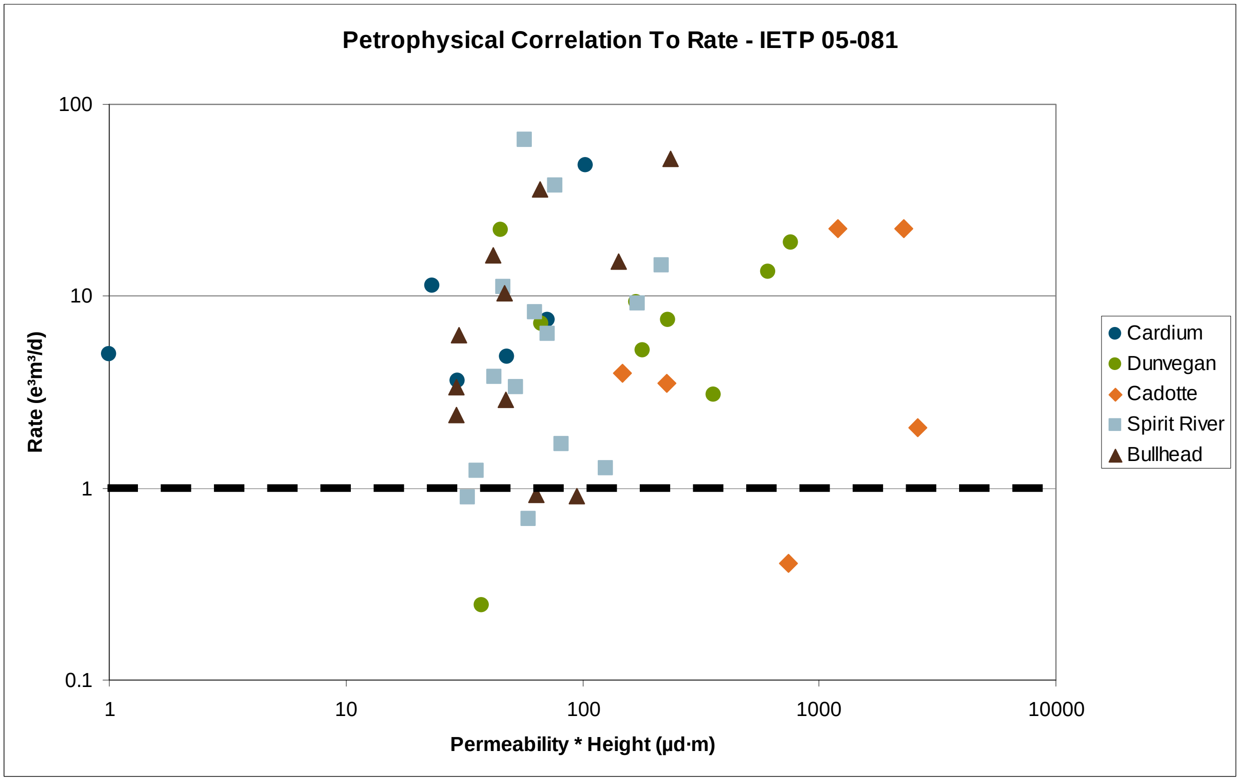


**Figure 7 IETP 05-081 petrophysical correlation**

The following chart illustrates that petrophysical correlation to rate does not increase with increased sample size. Similar results are observed for the IETP 03-063 project and the IETP 05-081 project.

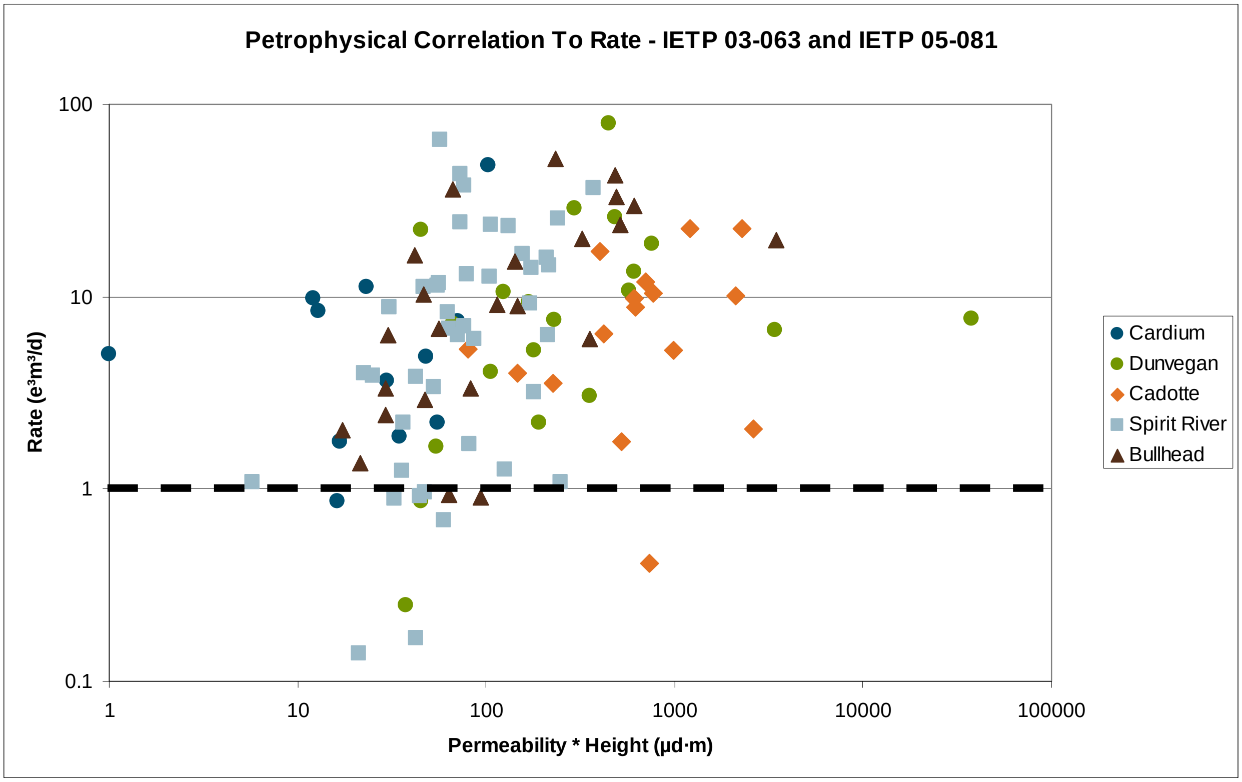


**Figure 8 IETP 03-063 and IETP 05-081 petrophysical correlation**

### 4.3.2. Evaluation of limited entry completion technique

By including virtually all zones with pay in the completion, the goal is to increase the likelihood of getting the most possible gas from the well. A key tool in completing as many zones as possible is limited entry fracturing or completing multiple zones in single pumping event with specific design of perforations to increase likelihood of fracturing all zones. The following table shows incremental gas uplift due to limited entry completion techniques if it is assumed that the zones that would have been completed in each stage would be the zone with the highest k*h value.

**Table 15 IETP 05-081 limited entry completion evaluation**

| | | Total Rate ($e^3m^3/d$) | Base Rate ($e^3m^3/d$) | Limited Entry Rate ($e^3m^3/d$) | % Increase |
|---|---|---|---|---|---|
| IETP 05-081 | 100/04-11-063-07W6/00 | 107.3 | 39.9 | 67.4 | 169% |
| | 100/13-18-062-06W6/00 | 103.6 | 97.7 | 5.9 | 6% |
| | 100/08-04-061-06W6/00 | 65.3 | 60.5 | 4.8 | 8% |
| | 100/05-15-061-06W6/00 | 51.2 | 38.3 | 12.9 | 34% |
| | 100/15-24-061-06W6/00 | 66.3 | 60.8 | 5.5 | 9% |
| | 100/16-16-061-05W6/00 | 61.3 | * | * | * |
| | 100/02-11-060-03W6/00 | 80.8 | 40.0 | 40.8 | 102% |
| | 100/07-02-060-02W6/00 | 68.5 | 60.0 | 8.4 | 14% |
| | 100/09-27-059-02W6/00 | | | | |
| | 100/02-10-059-02W6/00 | | | | |
| | **Total** | **604.3** | **397.3** | **145.7** | **37%** |

*Permeability not available for 100/16-16-061-05W6/00 - can not evaluate limited entry completion based on k*h

The variability in percent increase is due to the unpredictability of production results based only on logs in complex wells. An example of this variability is found in ECA REDROCK 100/04-11-063-07W6/00 where the Falher B zone produced over 60 $e^3m^3/d$ from a zone with less than 12µd·m of petrophysically derived pay. Similarly, ECA RESTHA 100/02-11-060-03W6/00 produced over 35 $e^3m^3/d$ from the Falher C zone which had a lower k*h value than the Falher A, that was included in the limited entry completion but did not produce a measureable gas rate.

The following table shows incremental gas uplift due to limited entry completion techniques if it is assumed the zones that would have been completed in each stage would be the zone with the highest k*h value for the IETP 03-063 project and the IETP 05-081 project.

**Table 16 IETP 03-063 and IETP 05-081 limited entry completion evaluation**

| | | Total Rate $(e^3m^3/d)$ | Base Rate $(e^3m^3/d)$ | Limited Entry Rate $(e^3m^3/d)$ | % Increase |
|---|---|---|---|---|---|
| IETP 03-063 | 100/09-02-062-05W6/00 | 168.5 | 85.8 | 82.7 | 96% |
| | 100/04-01-062-05W6/00 | 105.5 | 87.5 | 18.0 | 21% |
| | 100/04-22-061-05W6/00 | 79.1 | 51.7 | 27.4 | 53% |
| | 100/16-21-061-05W6/00 | 114.2 | 84.0 | 30.2 | 36% |
| | 103/12-060-62-04W6/00 | 71.5 | 63.6 | 7.9 | 12% |
| | 100/14-08-061-05W6/00 | 81.1 | 66.2 | 14.9 | 22% |
| | 100/02-04-062-05W6/00 | 42.8 | 25.3 | 17.5 | 69% |
| | 100/13-36-061-05W6/00 | 43.8 | 29.7 | 14.1 | 48% |
| | 100/08-08-062-04W6/00 | 64.5 | 54.0 | 10.5 | 19% |
| | 100/16-04-060-02W6/00 | 61.2 | 53.9 | 7.3 | 13% |
| | **Total** | **832.1** | **601.7** | **230.4** | **38%** |
| IETP 05-081 | | **Total Rate $(e^3m^3/d)$** | **Base Rate $(e^3m^3/d)$** | **Limited Entry Rate $(e^3m^3/d)$** | **% Increase** |
| | 100/04-11-063-07W6/00 | 107.3 | 39.9 | 67.4 | 169% |
| | 100/13-18-062-06W6/00 | 103.6 | 97.7 | 5.9 | 6% |
| | 100/08-04-061-06W6/00 | 65.3 | 60.5 | 4.8 | 8% |
| | 100/05-15-061-06W6/00 | 51.2 | 38.3 | 12.9 | 34% |
| | 100/15-24-061-06W6/00 | 66.3 | 60.8 | 5.5 | 9% |
| | 100/16-16-061-05W6/00 | 61.3 | * | * | * |
| | 100/02-11-060-03W6/00 | 80.8 | 40.0 | 40.8 | 102% |
| | 100/07-02-060-02W6/00 | 68.5 | 60.0 | 8.4 | 14% |
| | 100/09-27-059-02W6/00 | | | | |
| | 100/02-10-059-02W6/00 | | | | |
| | **Total** | **604.3** | **397.3** | **145.7** | **37%** |

*Permeability not available for 100/16-16-061-05W6/00 - can not evaluate limited entry completion based on k*h

Although DTS measurement can accurately pinpoint which perforation gas is flowing through, there is uncertainty to which reservoir the gas originates. With large volume hydraulic fractures, it is possible that several reservoirs could be connected outside of the casing, allowing for cross flow between zones before entering the wellbore. For example, placing a large hydraulic fracture with multiple points of entry in the Dunvegan, which only spans a total height of roughly 50 meters, it is probable that some or all fractures become connected allowing vertical mobility of gas in the reservoir prior to measurement.

### 4.4. History of injection, production and observation well pressures and average reservoir pressure

Surface pressure history of the wells included in the IETP 05-081 project is provided in “Appendix E - IETP 05-081 ProcessNet Production and Pressure Plots”.

Original reservoir pressure of the wells included in the IETP 05-081 project is provided in “Appendix H – IETP 05-081 Original Reservoir Pressure Data”. Average reservoir pressures for new wells are not expected to be affected by depletion due to the low permeability of marginal zones.

## 5. Pilot data

### 5.1. Additional data for activities conducted in the reporting year

#### 5.1.1. Geological and geophysical data

Within the project area, Encana produces all Cretaceous reservoirs from the Cardium to the Nikanassin, as illustrated in yellow in the following stratigraphic chart.

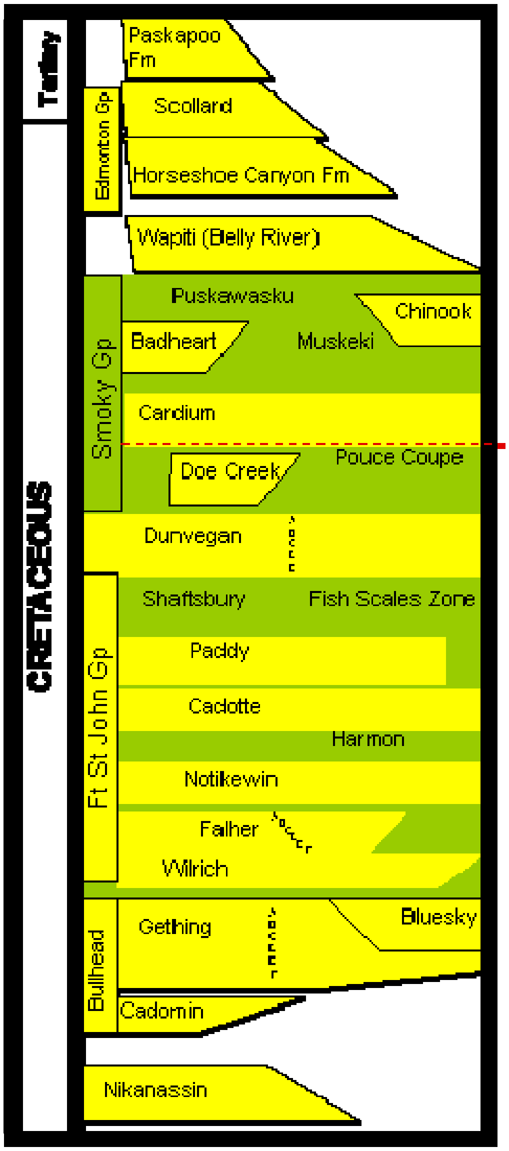


**Figure 9 Canadian Deep Basin stratigraphic chart**

#### 5.1.2. Laboratory studies

No laboratory studies were conducted for this project.

### 5.1.3. Reservoir simulation studies

No current reservoir simulation studies are available for the wells included in the IETP 05-081 project.

### 5.1.4. Pressure, temperature and other applicable reservoir data

Please refer to “Appendix I – IETP 05-081 Pressure and Production Data During DTS Survey Operations” for production and pressure plots that illustrate well production prior to, during, and after the Distributed Temperature Sensing survey. Key information from these plots include how long it took for the well to stabilize once it was switched to annular production prior to the survey, how the survey flow rates compare to the stabilized production rate prior to the test, how fluid levels at run-in compare to fluid levels post-shut-in and how quickly and easily the well stabilized when it was put back on-production after the survey. It is also possible to determine at which point liquids in the annulus begin to U-tube into the tubing when tubing and casing pressure gauges are connected at the surface.

Standard operating procedure is to install additional surface tubing and casing pressure recorders while conducting surveys.

A separate and unique graph is constructed for each well on an individual survey basis. Significant findings are identified by the use of comment boxes to better illustrate the interpretation of the graph.

### 5.1.5. Other measurements, observations, tests or data pertinent to the pilot

#### 5.1.5.1. Marginal and conventional zones

The following criteria was used to determine the marginality of the zones based on current petrophysical analysis for the IETP 03-063 project and the IETP 05-081 project:

- Falher and Wilrich are deemed marginal if the zone is < 3m pay and/or < 6% porosity

- Bluesky, Cadomin, Cadotte, Cardium, Dunvegan, Gething, and Notikewin are deemed marginal if the zone is < 2m pay and/or < 9% porosity

The following table provides the percentage of all zone completions within each well in the project that are considered marginal.

**Table 17 IETP 05-081 percentage of marginal zone completions by well**

| Well UWI | Percentage of Marginal Zones |
|---|---|
| 100/04-11-063-07W6/00 | 100% |
| 100/13-18-062-06W6/00 | 75% |
| 100/08-04-061-06W6/00 | 85% |
| 100/05-15-061-06W6/00 | 92% |
| 100/15-24-061-06W6/00 | 85% |
| 100/16-16-061-05W6/00 | 85% |
| 100/02-11-060-03W6/00 | 38% |
| 100/07-02-060-02W6/00 | 43% |
| 100/09-27-059-02W6/00 | 91% |
| 100/02-10-059-02W6/00 | 70% |

"Appendix G – IETP 05-081 Petrophysical Data" provides the petrophysical data used to determine marginal zones in the IETP 05-081 project wells.

### 5.2. Interpretation of pilot data

All interpretations of the DTS surveys were completed by a third-party company, Schlumberger, using their production logging interpretation software THERMA. The purpose of these interpretations is to generate a gas inflow profile along the wellbore from the measured temperature data.

For additional detail, Schlumberger's reports for the two completed project wells are included in "Appendix J – IETP 05-081 DTS Results and Interpretations". Each report explains how the DTS fibre optic tool operates, details pertinent well data, describes the methodology behind the DTS survey, indicates the producing zones for the well, explains where cross-flow may be occurring between zones while the well is shut-in and ultimately displays the interpretation results both graphically and in tabular form.

Significant liquids production complicates interpretation of DTS data. Post survey static gradients indicated that hydrocarbon liquids accumulated in ECA ECOG RESTHA 100/07-02-060-02W6/00. The Dunvegan formation is a likely source of hydrocarbon liquids in this well. Indications of hydrocarbon liquids provide information on the source of higher value products, whereas indications of water provide clues on zones which may not be appropriate to complete in the future.

The identification of rapidly depleting zones with moderate to higher permeability can be interpreted from shut-in temperature data and surface and bottom-hole pressure data. ECA RESTHA 100/02-11-060-03W6/00 showed an example of a Cadotte zone that had gas cross-flowing into it from above and below, as indicated by the shut-in temperature response, with minimal pressure build-up during the shut-in period. The following figure illustrates gas cross-flowing into the Cadotte zone, with all shut-in temperature traces overlapping above and below the Cadotte zone.

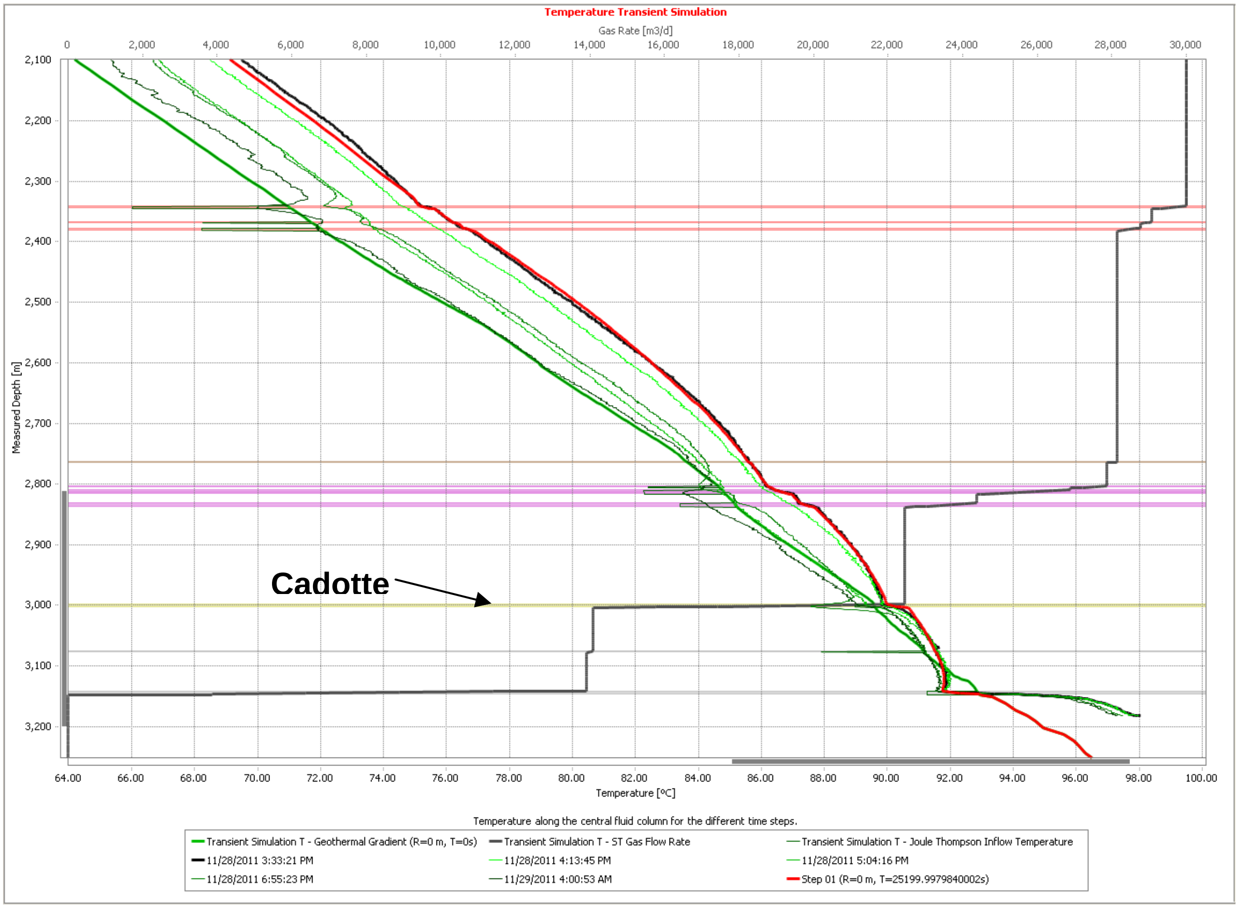


**Figure 10 ECA RESTHA 100/02-11-060-03W6/00 temperature traces and Cadotte cross-flow**

## 6. Pilot economics to date

### 6.1. Sales volumes of natural gas and by-products

The following table provides sales volumes of natural gas, oil and natural gas liquids (NGLs) for the current reporting period and cumulative project total at the time of reporting.

**Table 18 IETP 05-081 sales volumes of natural gas and by-products: 2010-2011**

| Volumes - Metric | 2010 | 2011 | Cumulative Project Total |
|---|---|---|---|
| Gas - $e^3m^3$ | 31,141 | 96,290 | 127,431 |
| Oil - $m^3$ | 61 | 172 | 233 |
| NGLs - $m^3$ | 1,923 | 7,285 | 9,208 |
| VOLUME TOTAL - $e^3m^3$ equivalent | 33,251 | 104,219 | 137,470 |

### 6.2. Revenue

The following table provides revenue from the sale of natural gas, oil and NGLs for the current reporting period and cumulative project total at the time of reporting.

**Table 19 IETP 05-081 revenue: 2010-2011**

| Revenue - $ | 2010 | 2011 | Cumulative Project Total |
|---|---|---|---|
| Gas Revenue Total | $4,385,277 | $12,642,823 | $17,028,100 |
| Oil Revenue Total | $24,610 | $82,765 | $107,376 |
| NGL Revenue Total | $895,953 | $4,240,087 | $5,136,040 |
| **Revenue Total** | **$5,305,840** | **$16,965,676** | **$22,271,516** |

### 6.3. Capital costs

The following table provides the capital costs associated with the IETP 05-081 project for the current reporting period and cumulative project total at the time of reporting.

**Table 20 IETP 05-081 capital costs: 2010-2011**

| Capital Cost - $ | 2010 | 2011 | Cumulative Project Total |
|---|---|---|---|
| Red Rock Original Completions Total | ($2,040,451) | ($2,377,922) | ($4,418,373) |
| Red Rock DTS Survey Total | ($95,353) | ($76,367) | ($171,720) |
| Kakwa Original Completions Total | ($3,925,200) | ($8,295,559) | ($12,220,758) |
| Kakwa DTS Survey Total | $0 | ($297,869) | ($297,869) |
| Resthaven Original Completions Total | ($1,622,554) | ($4,329,865) | ($5,952,419) |
| Resthaven DTS Survey Total | ($83,755) | ($80,299) | ($164,054) |
| **Capital Cost Total** | **($7,767,312)** | **($15,457,881)** | **($23,225,193)** |

### 6.4. Direct and indirect operating costs by category

The following table provides the operating costs associated with the IETP 05-081 project for the current reporting period and cumulative project total at the time of reporting.

**Table 21 IETP 05-081 operating costs: 2010-2011**

| Operating Cost - $ | 2010 | 2011 | Cumulative Project Total |
|---|---|---|---|
| Chemicals Total | ($6,253) | ($162,731) | ($168,984) |
| Gas Gathering/Processing Fees Total | ($702,152) | ($1,882,453) | ($2,584,605) |
| Other Total | ($2,768) | ($17,812) | ($20,580) |
| Overhead Total | ($6,000) | ($24,747) | ($30,747) |
| P.Tax & Lease Costs Total | ($484) | ($30,602) | ($31,087) |
| Purchased Fuels Total | ($1,478) | ($8,128) | ($9,606) |
| Repairs & Maintenance Total | ($92,164) | ($315,855) | ($408,019) |
| Salaries & Benefits Total | ($67,803) | ($229,668) | ($297,472) |
| Trucking Total | ($3,655) | ($5,439) | ($9,094) |
| Waste & Fuild Handling Total | ($42,987) | ($19,395) | ($62,382) |
| Workovers Total | ($55,074) | ($120,611) | ($175,685) |
| NGL Marketing Fee Total | ($128) | $0 | ($128) |
| **Operating Cost Total** | **($980,948)** | **($2,817,440)** | **($3,798,388)** |

### 6.5. Crown royalties, applicable freehold royalties and taxes

The following table provides the crown royalties and taxes paid during the current reporting period and cumulative project total at the time of reporting.

**Table 22 IETP 05-081 Crown royalties and taxes: 2010-2011**

| Royalties and Taxes - $ | 2010 | 2011 | Cumulative Project Total |
|---|---|---|---|
| Gas Royalty Total | ($101,040) | ($314,292) | ($415,332) |
| NGL Royalty Total | ($24,835) | ($114,102) | ($138,937) |
| Oil Royalty Total | ($824) | ($2,780) | ($3,604) |
| **Royalty Total** | **($126,699)** | **($431,173)** | **($557,872)** |
| **Taxes Total** | **($235,937)** | **($949,362)** | **($1,185,299)** |

Encana does not calculate taxes payable at the well level therefore a 25 percent tax rate was applied to net revenue from the wells included in the IETP 05-081 project to obtain total taxes.

### 6.6. Cash flow

The following table provides the total cash flow for the 10 wells included in the IETP 05-081 project during the current reporting period and cumulative project total at the time of reporting.

**Table 23 IETP 05-081 cash flow: 2010-2011**

| Revenue - $ | 2010 | 2011 | Cumulative Project Total |
|---|---|---|---|
| Gas Revenue Total | $2,353,338 | $6,784,711 | $9,138,049 |
| Oil Revenue Total | $13,207 | $44,416 | $57,623 |
| NGL Revenue Total | $480,809 | $2,275,423 | $2,756,231 |
| **Revenue Total** | **$2,847,354** | **$9,104,549** | **$11,951,902** |
| **Capital Cost - $** | **2010** | **2011** | **Cumulative Project Total** |
| Red Rock Original Completions Total | (1,530,337.99) | ($2,377,922) | ($3,908,260) |
| Red Rock DTS Survey Total | ($95,353) | ($76,367) | ($171,720) |
| Kakwa Original Completions Total | ($3,321,323) | ($7,331,737) | ($10,653,060) |
| Kakwa DTS Survey Total | $0 | ($297,869) | ($297,869) |
| Resthaven Original Completions Total | ($695,380) | ($2,781,961) | ($3,477,341) |
| Resthaven DTS Survey Total | ($83,755) | ($80,299) | ($164,054) |
| **Capital Cost Total** | **(5,726,148.58)** | **($12,946,156)** | **($18,672,305)** |
| **Operating Cost - $** | **2010** | **2011** | **Cumulative Project Total** |
| Chemicals Total | ($3,355) | ($87,329) | ($90,684) |
| Gas Gathering/Processing Fees Total | ($376,807) | ($1,010,209) | ($1,387,016) |
| Other Total | ($1,486) | ($9,559) | ($11,044) |
| Overhead Total | ($3,220) | ($13,280) | ($16,500) |
| P.Tax & Lease Costs Total | ($260) | ($16,423) | ($16,682) |
| Purchased Fuels Total | ($793) | ($4,362) | ($5,155) |
| Repairs & Maintenance Total | ($49,460) | ($169,502) | ($218,961) |
| Salaries & Benefits Total | ($36,386) | ($123,250) | ($159,637) |
| Trucking Total | ($1,961) | ($2,919) | ($4,880) |
| Waste & Fuild Handling Total | ($23,069) | ($10,408) | ($33,477) |
| Workovers Total | ($29,555) | ($64,725) | ($94,281) |
| NGL Marketing Fee Total | ($69) | $0 | ($69) |
| **Operating Cost Total** | **($526,421)** | **($1,511,966)** | **($2,038,387)** |
| **Royalties and Taxes - $** | **2010** | **2011** | **Cumulative Project Total** |
| Gas Royalty Total | ($101,040) | ($314,292) | ($415,332) |
| Oil Royalty Total | ($824) | ($2,780) | ($3,604) |
| **Royalty Total** | **($126,699)** | **($431,173)** | **($557,872)** |
| **Taxes Total** | **($235,937)** | **($949,362)** | **($1,185,299)** |
| **Net Revenue** | **($3,767,851)** | **($6,734,109)** | **($10,501,960)** |

Results from the DTS surveys were used to determine the proportion of the volume of gas that is coming from zones that were deemed marginal based on the criteria in section 5.1.5.1. This percentage of production coming from marginal zones was applied to the total revenue, operating cost and royalties and taxes paid for the 10 wells included in the IETP 05-081 project to provide the costs associated with marginal zones only.

The percentage of marginal zone completions provided in “Table 17 IETP 05-081 percentage of marginal zone completions by well” was applied to the total completion costs for each of the 10 wells in the IETP 056-081 project. The total cost of DTS surveys is shown in the above cash flow table.

### 6.7. Cumulative project costs and net revenue

The following table provides the cumulative project costs and net revenue for the first two years of the IETP 03-063 and IETP 05-081 projects for comparison purposes.

**Table 24 IETP 03-063 and IETP 05-081 cumulative project costs and net revenue**

| **Project Summary** | | | |
|---|---|---|---|
| ***IETP 03-063*** | **2007** | **2008** | **Cumulative Project Total** |
| Revenue Total | $3,716,492 | $19,491,291 | $23,207,783 |
| Costs Total | ($3,185,532) | ($17,648,091) | ($20,833,623) |
| **Net Revenue** | **$530,960** | **$1,843,200** | **$2,374,160** |
| ***IETP 05-081*** | **2010** | **2011** | **Cumulative Project Total** |
| Revenue Total | $2,847,354 | $9,104,549 | $11,951,902 |
| Costs Total | ($6,615,205) | ($15,838,658) | ($22,453,863) |
| **Net Revenue** | **($3,767,851)** | **($6,734,109)** | **($10,501,960)** |

From the table, project costs are within 10 percent of each other at similar stages of completion. The significant difference in revenue is attributed to the decline in natural gas prices that occurred in 2009.

### 6.8. Explanation of material deviations from budgeted costs

Excess costs were incurred during the original completion operations for three wells in the IETP 05-081 project due to excess mobilization and demobilization, completion difficulties and weather related issues. Detailed explanations of excess costs are included in “Table 9 IETP 05-081 difficulties during initial completion”.

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## 7. Facilities

### 7.1. Description of major capital incurred in the reporting year

No new facilities, or additions or modifications to existing facilities were required to accommodate incremental production from the completion of marginal zones, or to accommodate the DTS survey operation in the 10 project wells.

### 7.2. Capacity limitation, operational issues and equipment integrity

There were no capacity limitations, operational issues or equipment integrity issues that arose from this project.

### 7.3. Process flow and site diagram identifying major facilities

The following figure illustrates a typical process flow diagram for Encana wells in the Bighorn area.

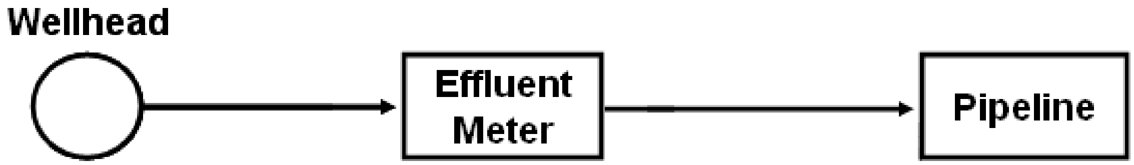



**Figure 11 Encana Bighorn area typical process flow diagram**

The following figure illustrates a typical well site diagram for Encana wells in the Bighorn area.

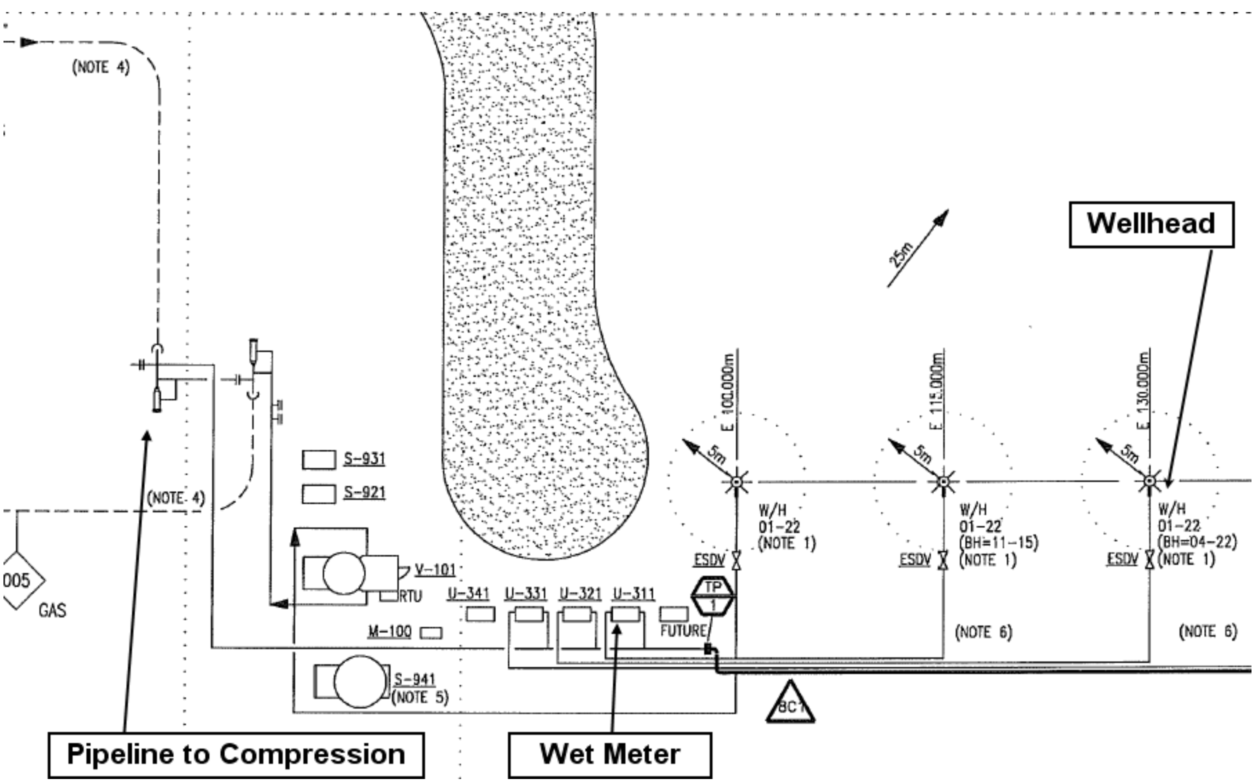



**Figure 12 Encana Bighorn area typical well site diagram**

## 7.4. Equipment, connected pipelines, gathering and compression facilities

Please refer to "Appendix K – IETP 05-081 Associated Facilities" for facilities associated with the IETP 05-081 project.

## 8. Environment/regulatory/compliance

### 8.1. Summary of project regulatory requirements and compliance status

The method of well operations will remain the same, which will not increase the disturbance to land, or increase pollutants to water or air.

To the best of Encana's knowledge, it is not required that any raw DTS data be submitted to the Alberta Energy Resources Conservation Board (ERCB).

## 9. Future operating plan

### 9.1. Project schedule update including deliverables and milestones

The following table provides a summary of key milestones for the work completed to date for the IETP 05-081 project and the proposed schedule for remaining work to be completed in grey.

**Table 25 IETP 05-081 project schedule update**

| Area | UWI | On Production Date | 1st DTS Survey Date | 2nd DTS Survey Date | 3rd DTS Survey Date |
|---|---|---|---|---|---|
| Red Rock | 100/04-11-063-07W6/00 | 2011-08-16 | 2011-11-03 | *Q1 2012* | *Q4 2012* |
| Red Rock | 100/13-18-062-06W6/00 | 2010-02-22 | 2010-04-10 | 2010-11-13 | 2011-08-27 |
| Kakwa | 100/08-04-061-06W6/00 | 2011-01-25 | 2011-06-02 | 2011-10-27 | *Q4 2012* |
| Kakwa | 100/05-15-061-06W6/00 | 2011-03-09 | 2011-06-13 | 2011-10-29 | *Q4 2012* |
| Kakwa | 100/15-24-061-06W6/00 | 2011-02-16 | 2011-11-04 | *Q2 2012* | *Q4 2012* |
| Kakwa | 100/16-16-061-05W6/00 | 2010-12-02 | 2011-04-18 | 2011-11-02 | *Q2 2012* |
| Resthaven | 100/02-11-060-03W6/00 | 2011-03-11 | 2011-11-28 | *Q1 2012* | *Q4 2012* |
| Resthaven | 100/07-02-060-02W6/00 | 2010-03-04 | 2010-07-18 | 2010-11-26 | 2011-11-27 |
| Resthaven | 100/09-27-059-02W6/00 | 2011-03-21 | 2011-06-20 | *Q1 2012* | *Q4 2012* |
| Resthaven | 100/02-10-059-02W6/00 | - | *Q2 2012* | *Q3 2012* | *Q4 2012* |

All work scheduled to be completed in 2012 is indicated in grey with the proposed quarter the work will take place. The IETP 05-081 project is expected to be complete by the end of 2012.

Encana will provide a detailed summary of how the production distribution changes over time for all wells in the final report for this project. The final report will further evaluate the technical viability of limited entry completions and fibre optic production logging based on the results from the 10 wells included in this IETP project and the 10 wells included in the IETP 03-063 project. The final report will also provide a detailed evaluation on the economic viability of production from marginal zones.

### 9.2. Changes in pilot operation, including production operations, injection process and Cost

No changes have been made to operations since the time of project approval.

### 9.3. Optimization strategies

No additional optimization strategies have been applied to the wells included in the IETP 05-081 project as a direct result of completing incremental marginal zones. A summary of optimization operations completed on the wells included in the project is provided in “Table 8 IETP 05-081 work-overs and optimization”.

### 9.4. Salvage update

An estimate of salvage value does not apply for completion of incremental marginal zones.

## 10. Interpretations and conclusions

### 10.1. Lessons learned so far

The wells chosen by Encana for the IETP 03-063 project had a practical bias towards being the better wells in the field as a result of the requirement for the wells to sustain flow for an entire year. The higher quality zones in the better wells tend to mask the performance of the lower quality zones, particularly in the early life of the well.

The operational plan for the IETP 03-063 project to collect three to four surveys over targeted time intervals and over the proposed time frame of the project, forced Encana to focus most of the data gathering in the Kakwa area because of its all season access. Encana recognized the benefit of collecting data from areas with restricted access, at less frequent intervals than the restricted access area would allow.

Two modifications to the DTS data acquisition program have made moving to more varied and remote IETP 05-081 project well locations possible. The timing of data acquisition has been altered to accommodate seasonal access at various sites and lower rate wells have been switched to annular flow during the morning of the survey, to minimize the accumulation of liquids in the wellbore prior to the survey. Switching to annular flow during the morning of the survey was found to provide reliable data for interpretation. Formerly, best practices as promoted by Schlumberger, was to switch wells to annular flow 24 hours in advance of the survey. None of the wells surveyed as part of the IETP 05-081 project had problems with restarting flow following shut-in due to liquids loading.

The IETP 05-081 project expanded the original project area to include 10 additional wells from a greater geographical area to obtain a more statistically significant dataset. As a result of expanding the geographical area of the project, Encana moved to areas of potentially lower quality reservoir and reduced well control. This move has provided Encana with data over a larger area and provided a dataset with greater variability in well performance. The survey of ECA KAKWA 100/08-04-061-06W6/00 indicates most of the typical zones of interest demonstrate lower rates in the southwest deeper part of the Deep Basin.

Limited entry completion techniques are expected to generate a cost effective means of obtaining marginal rates from marginal zones, however limited entry completed zones can generate significant unexpected rates as demonstrated by ECA REDROCK 100/04-11-063-07W6/00. All zones in this well were considered marginal based on petrophysical criteria.

Similar to much of the industry, Encana has reduced vertical well drilling due to current low natural gas prices. The understanding of individual zone rates provided by DTS data has assisted in providing the technical support to advance Encana's new and more economically viable Deep Basin liquids rich horizontal well strategies.

### 10.2. Difficulties encountered

A difficulty that presented some problems over the course of the IETP 03-063 and IETP 05-081 projects is that some wells, when switched to annular flow for the survey, produced at different rates than the pre-survey stabilized rate. It is uncertain whether the production loss or gain is consistent across all zones or whether the change in rate is due to only a few zones behaving differently under annular flow conditions. A method to account for this variation in production in the interpretation has yet to be determined.

### 10.3. Technical and economic viability

Encana considers the practice of conducting initial clean-up tests on individual zones or fracture stages in commingled Bighorn area wells to be cost prohibitive. DTS data acquisition and interpretation has provided Encana with a cost effective alternative to initial clean-up tests. DTS surveys provide flow rates at a single point in time as well as providing a measure of how rates from individual zones change when multiple surveys are conducted on a single well.

Schlumberger's OPTICall DTS data acquisition system has been found to provide good resolution and repeatability. DTS data is considered very accurate, but rate estimate uncertainties are inherent in the non-uniqueness of the DTS temperature data for certain zones under certain conditions. Collecting multiple surveys from individual wells and from the same field has provided additional data to constrain Schlumberger's THERMA software interpretation models, resulting in consistently higher confidence rate estimates. Uncertainty levels are considered within acceptable limits for investment decision making processes.

This project demonstrates that a significant amount of gas is being produced from zones, which are or were considered marginal. The economic assessment of individual zones indicates a significant number of completed zones are sub-economic to complete using conventional completion techniques based on the low rate interpreted for the zone. Completing multiple zones in a single pumping event, with specific design of perforations to increase the likelihood of fracturing all zones, has allowed Encana to economically capture more gas from marginal zones.

### 10.4. Overall effect on overall gas recovery

The DTS derived zonal performance data has allowed Encana to understand production trends for the marginal and non-marginal Deep Basin flow units, evaluate zone-specific production declines and optimize the field's depletion strategy. The data provides confidence to target more marginal zones that will prove economic with infill drilling and completion programs, thereby maximizing recovery.

This project has resulted in increased natural gas production from Canadian Deep Basin unconventional resources, through the limited entry completion of marginal zones. Seventy four percent of the zones completed in the IETP 05-081 project wells were considered marginal, resulting in 63 percent of the total production of the eight wells that have been evaluated to date. A 37 percent uplift in production for these eight wells can be attributed to limited entry completion techniques.

### 10.5. Assessment of future expansion or commercial field application

Encana employs DTS techniques to gather production data on other wells in the Bighorn Deep Basin area. At this time, DTS remains the only cost effective way to evaluate production in commingled deep gas wells where tubing remains set at the bottommost perforation intervals.

Fibre optics has proven successful in allowing producers to understand the zonal performance of their reservoir. This project will lead to optimized exploitation and operations resulting in minimal unnecessary fracturing of non-producing zones. By including virtually all zones with pay in the limited entry completion, the likelihood of getting the most possible gas from the well is increased.

## Appendix A – IETP 05-081 Monthly Well Production

| Unique Well ID | 100/04-11-063-07W6/00 | | | |
|---|---|---|---|---|
| **Date** | **Monthly GAS e3m3** | **Monthly WTR m3** | ***Monthly HRS hrs** | **Cumulative GAS e3m3** |
| Aug-2011 | 195.5 | 893.6 | 0 | 195.5 |
| Sep-2011 | 2527.4 | 508.7 | 0 | 2722.9 |
| Oct-2011 | 2990 | 88.8 | 0 | 5712.9 |
| Nov-2011 | 2244.2 | 73.6 | 0 | 7957.1 |
| Dec-2011 | 2110.8 | 96.4 | 0 | 10067.9 |
| **2011** | **10067.9** | **1661.1** | **0** | |

*100/04-11-063-07W6/00 confidential until 2012/04/14

| Unique Well ID | 100/13-18-062-06W6/00 | | | |
|---|---|---|---|---|
| **Date** | **Monthly GAS e3m3** | **Monthly WTR m3** | **Monthly HRS hrs** | **Cumulative GAS e3m3** |
| Jan-2010 | 584.5 | 0 | 154 | 584.5 |
| Feb-2010 | 122.5 | 0 | 76 | 707 |
| Mar-2010 | 3415 | 0 | 576 | 4122 |
| Apr-2010 | 2727.7 | 0 | 702 | 6849.7 |
| May-2010 | 1987.6 | 0 | 713 | 8837.3 |
| Jun-2010 | 1824.2 | 0 | 696 | 10661.5 |
| Jul-2010 | 1639.7 | 0 | 741 | 12301.2 |
| Aug-2010 | 1268.3 | 0 | 590 | 13569.5 |
| Sep-2010 | 1354.7 | 0 | 713 | 14924.2 |
| Oct-2010 | 907.2 | 0 | 715 | 15831.4 |
| Nov-2010 | 958.1 | 0 | 645 | 16789.5 |
| Dec-2010 | 988.9 | 0 | 704 | 17778.4 |
| **2010** | **17778.4** | **0** | **7025** | |
| Jan-2011 | 841.4 | 0 | 595 | 18619.8 |
| Feb-2011 | 761.3 | 0 | 489 | 19381.1 |
| Mar-2011 | 864 | 0 | 676 | 20245.1 |
| Apr-2011 | 889 | 6.8 | 717 | 21134.1 |
| May-2011 | 858 | 0 | 729 | 21992.1 |
| Jun-2011 | 780.9 | 0 | 661 | 22773 |
| Jul-2011 | 801 | 0 | 677 | 23574 |
| Aug-2011 | 803.2 | 0 | 720 | 24377.2 |
| Sep-2011 | 685.5 | 4.1 | 632 | 25062.7 |
| Oct-2011 | 707.5 | 0 | 596 | 25770.2 |
| Nov-2011 | 515.5 | 0 | 415 | 26285.7 |
| Dec-2011 | 419 | 0 | 209 | 26704.7 |
| **2011** | **8926.3** | **10.9** | **7116** | |

| Unique Well ID | 100/08-04-061-06W6/00 | | | |
|---|---|---|---|---|
| Date | Monthly GAS e3m3 | Monthly WTR m3 | Monthly HRS hrs | Cumulative GAS e3m3 |
| Jan-2011 | 0 | 870 | 24 | 0 |
| Feb-2011 | 499.3 | 1937.7 | 123 | 499.3 |
| Mar-2011 | 1890.3 | 281.4 | 679 | 2389.6 |
| Apr-2011 | 1162.5 | 145.3 | 717 | 3552.1 |
| May-2011 | 1109 | 137.1 | 737 | 4661.1 |
| Jun-2011 | 1001 | 115.4 | 704 | 5662.1 |
| Jul-2011 | 981.9 | 123.9 | 744 | 6644 |
| Aug-2011 | 899.4 | 101.6 | 739 | 7543.4 |
| Sep-2011 | 787.7 | 100.7 | 689 | 8331.1 |
| Oct-2011 | 758.4 | 85.2 | 727 | 9089.5 |
| Nov-2011 | 754.2 | 147.6 | 712 | 9843.7 |
| Dec-2011 | 679.8 | 135.1 | 744 | 10523.5 |
| **2011** | **10523.5** | **4181** | **7339** | |

| Unique Well ID | 100/05-15-061-06W6/00 | | | |
|---|---|---|---|---|
| Date | Monthly GAS e3m3 | Monthly WTR m3 | Monthly HRS hrs | Cumulative GAS e3m3 |
| Jan-2011 | 0 | 606 | 24 | 0 |
| Feb-2011 | 0 | 636.8 | 21 | 0 |
| Mar-2011 | 1236.1 | 415.5 | 477 | 1236.1 |
| Apr-2011 | 1172.1 | 407 | 720 | 2408.2 |
| May-2011 | 981.2 | 317 | 744 | 3389.4 |
| Jun-2011 | 800.4 | 256.2 | 688 | 4189.8 |
| Jul-2011 | 748.9 | 262.5 | 742 | 4938.7 |
| Aug-2011 | 688.4 | 216.1 | 740 | 5627.1 |
| Sep-2011 | 611.2 | 216.9 | 720 | 6238.3 |
| Oct-2011 | 584.7 | 182.6 | 725 | 6823 |
| Nov-2011 | 593.3 | 338.3 | 714 | 7416.3 |
| Dec-2011 | 531 | 293.3 | 744 | 7947.3 |
| **2011** | **7947.3** | **4148.2** | **7059** | |

| Unique Well ID | 100/15-24-061-06W6/00 | | | |
|---|---|---|---|---|
| Date | Monthly GAS e3m3 | Monthly WTR m3 | Monthly HRS hrs | Cumulative GAS e3m3 |
| Dec-2010 | 0 | 266 | 24 | 0 |
| **2010** | **0** | **266** | **24** | |
| Jan-2011 | 0 | 0 | 0 | 0 |
| Feb-2011 | 0 | 0 | 0 | 0 |
| Mar-2011 | 2880.2 | 0 | 647 | 2880.2 |
| Apr-2011 | 1947.9 | 0 | 720 | 4828.1 |
| May-2011 | 1718.4 | 0 | 744 | 6546.5 |
| Jun-2011 | 1470.5 | 0 | 720 | 8017 |
| Jul-2011 | 1387.2 | 175.1 | 744 | 9404.2 |
| Aug-2011 | 1271.1 | 143.7 | 744 | 10675.3 |
| Sep-2011 | 1089.9 | 139.3 | 663 | 11765.2 |
| Oct-2011 | 1235.5 | 138.8 | 737 | 13000.7 |
| Nov-2011 | 1083.6 | 212 | 704 | 14084.3 |
| Dec-2011 | 1043.2 | 207.4 | 743 | 15127.5 |
| **2011** | **15127.5** | **1016.3** | **7166** | |

| Unique Well ID | 100/16-16-061-05W6/00 | | | |
|---|---|---|---|---|
| Date | Monthly GAS e3m3 | Monthly WTR m3 | Monthly HRS hrs | Cumulative GAS e3m3 |
| Oct-2010 | 12 | 0 | 17 | 12 |
| Nov-2010 | 6.3 | 0 | 2 | 18.3 |
| Dec-2010 | 1965.1 | 878.2 | 462 | 1983.4 |
| **2010** | **1983.4** | **878.2** | **481** | |
| Jan-2011 | 2192.8 | 21 | 744 | 4176.2 |
| Feb-2011 | 1696.2 | 12.6 | 672 | 5872.4 |
| Mar-2011 | 1733.8 | 14.3 | 743 | 7606.2 |
| Apr-2011 | 1489.2 | 10.3 | 694 | 9095.4 |
| May-2011 | 1502.2 | 10 | 744 | 10597.6 |
| Jun-2011 | 1326.4 | 8.5 | 720 | 11924 |
| Jul-2011 | 1301.9 | 9.1 | 744 | 13225.9 |
| Aug-2011 | 1224.6 | 7.7 | 744 | 14450.5 |
| Sep-2011 | 1134.5 | 16.9 | 720 | 15585 |
| Oct-2011 | 955.4 | 12.5 | 642 | 16540.4 |
| Nov-2011 | 436.4 | 9.9 | 467 | 16976.8 |
| Dec-2011 | 1263.6 | 29.3 | 744 | 18240.4 |
| **2011** | **16257** | **162.1** | **8378** | |

| Unique Well ID | 100/02-11-060-03W6/00 | | | |
|---|---|---|---|---|
| Date | Monthly GAS e3m3 | Monthly WTR m3 | Monthly HRS hrs | Cumulative GAS e3m3 |
| Feb-2011 | 0 | 542.4 | 1 | 0 |
| Mar-2011 | 1052.4 | 100 | 180 | 1052.4 |
| Apr-2011 | 0 | 0 | 0 | 1052.4 |
| May-2011 | 1984.2 | 19.3 | 502 | 3036.6 |
| Jun-2011 | 1961.4 | 26 | 695 | 4998 |
| Jul-2011 | 1970.5 | 24.5 | 672 | 6968.5 |
| Aug-2011 | 1658.3 | 19.9 | 735 | 8626.8 |
| Sep-2011 | 1347 | 17 | 716 | 9973.8 |
| Oct-2011 | 727.1 | 8.3 | 449 | 10700.9 |
| Nov-2011 | 666.7 | 5.4 | 563 | 11367.6 |
| Dec-2011 | 586.5 | 8.7 | 704 | 11954.1 |
| **2011** | **11954.1** | **771.5** | **5217** | |

| Unique Well ID | 100/07-02-060-02W6/00 | | | |
|---|---|---|---|---|
| Date | Monthly GAS e3m3 | Monthly WTR m3 | Monthly HRS hrs | Cumulative GAS e3m3 |
| Mar-2010 | 1927.3 | 59.1 | 505 | 1927.3 |
| Apr-2010 | 1855 | 27.6 | 690 | 3782.3 |
| May-2010 | 1641.6 | 35.1 | 683 | 5423.9 |
| Jun-2010 | 1362.8 | 47.9 | 718 | 6786.7 |
| Jul-2010 | 1211.2 | 41.6 | 648 | 7997.9 |
| Aug-2010 | 1141.2 | 41 | 741 | 9139.1 |
| Sep-2010 | 1035 | 42.1 | 708 | 10174.1 |
| Oct-2010 | 1033.4 | 22.7 | 743 | 11207.5 |
| Nov-2010 | 941.3 | 21.7 | 689 | 12148.8 |
| Dec-2010 | 1005.3 | 29.3 | 730 | 13154.1 |
| **2010** | **13154.1** | **368.1** | **6855** | |
| Jan-2011 | 855.1 | 13.9 | 695 | 14009.2 |
| Feb-2011 | 746 | 9.8 | 671 | 14755.2 |
| Mar-2011 | 669.9 | 8.7 | 719 | 15425.1 |
| Apr-2011 | 637.6 | 8.6 | 697 | 16062.7 |
| May-2011 | 598 | 4 | 700 | 16660.7 |
| Jun-2011 | 598.3 | 8.4 | 709 | 17259 |
| Jul-2011 | 626.3 | 8.9 | 689 | 17885.3 |
| Aug-2011 | 570.1 | 8.3 | 702 | 18455.4 |
| Sep-2011 | 571.9 | 8.6 | 645 | 19027.3 |
| Oct-2011 | 248.9 | 3.2 | 340 | 19276.2 |
| Nov-2011 | 849 | 13.4 | 720 | 20125.2 |
| Dec-2011 | 772.6 | 9.9 | 720 | 20897.8 |
| **2011** | **7743.7** | **105.7** | **8007** | |

| Unique Well ID | 100/09-27-059-02W6/02 | | | |
|---|---|---|---|---|
| **Date** | **Monthly GAS e3m3** | **Monthly WTR m3** | **Monthly HRS hrs** | **Cumulative GAS e3m3** |
| Jan-2011 | 0 | 300 | 1 | 0 |
| Feb-2011 | 0 | 0 | 0 | 0 |
| Mar-2011 | 810.7 | 65.5 | 172 | 810.7 |
| Apr-2011 | 2362.7 | 148.8 | 656 | 3173.4 |
| May-2011 | 2186.1 | 87.2 | 701 | 5359.5 |
| Jun-2011 | 1943.9 | 75.7 | 696 | 7303.4 |
| Jul-2011 | 1938.7 | 79.1 | 697 | 9242.1 |
| Aug-2011 | 913.8 | 59.8 | 357 | 10155.9 |
| Sep-2011 | 361.6 | 30.8 | 98 | 10517.5 |
| Oct-2011 | 516 | 56.6 | 128 | 11033.5 |
| Nov-2011 | 2160.7 | 242.4 | 719 | 13194.2 |
| Dec-2011 | 1714.3 | 228.5 | 639 | 14908.5 |
| **2011** | **14908.5** | **1374.4** | **4864** | |

*100/09-27-059-02W6/02 is excluded from the production summary in Table 3 IETP 05-081 production summary, Monthly Production is provided for information only

## Appendix B – IETP 03-063 Monthly Well Production

| Unique Well ID | 100/09-02-062-05W6/00 | | | |
|---|---|---|---|---|
| Report Month | Monthly GAS e3m3 | Monthly HRS hrs | Monthly WTR m3 | Cumulative GAS e3m3 |
| Apr-2007 | 141.1 | 26 | 0.0 | 141.1 |
| May-2007 | 2608.2 | 399 | 52.9 | 2749.3 |
| Jun-2007 | 722.8 | 709 | 37.2 | 3472.1 |
| Jul-2007 | 6152.4 | 713 | 24.7 | 9624.5 |
| Aug-2007 | 6040.8 | 694 | 4.4 | 15665.3 |
| Sep-2007 | 5766.5 | 705 | 21.2 | 21431.8 |
| Oct-2007 | 5919.7 | 652 | 5.5 | 27351.5 |
| Nov-2007 | 1026.9 | 110 | 0.3 | 28378.4 |
| Dec-2007 | 5760.4 | 699 | 3.9 | 34138.8 |
| **2007** | **34138.8** | **4707** | **150.1** | |
| Jan-2008 | 6177.5 | 741 | 0.0 | 40316.3 |
| Feb-2008 | 5497.5 | 693 | 7.3 | 45813.8 |
| Mar-2008 | 5813.7 | 697 | 24.5 | 51627.5 |
| Apr-2008 | 5251.1 | 709 | 66.9 | 56878.6 |
| May-2008 | 4961.3 | 675 | 115.3 | 61839.9 |
| Jun-2008 | 4840.2 | 710 | 146.8 | 66680.1 |
| Jul-2008 | 4222.4 | 703 | 89.4 | 70902.5 |
| Aug-2008 | 3617.6 | 729 | 55.4 | 74520.1 |
| Sep-2008 | 2251.9 | 716 | 100.3 | 76772.0 |
| Oct-2008 | 2281.0 | 736 | 14.5 | 79053.0 |
| Nov-2008 | 2073.9 | 696 | 12.2 | 81126.9 |
| Dec-2008 | 1970.4 | 743 | 8.7 | 83097.3 |
| **2008** | **48958.5** | **8548** | **641.3** | |
| Jan-2009 | 1934.4 | 739 | 10.0 | 85031.7 |
| Feb-2009 | 1571.2 | 670 | 6.7 | 86602.9 |
| Mar-2009 | 1538.9 | 689 | 2.9 | 88141.8 |
| Apr-2009 | 1451.5 | 712 | 5.7 | 89593.3 |
| May-2009 | 1412.0 | 722 | 4.8 | 91005.3 |
| Jun-2009 | 1309.8 | 714 | 4.6 | 92315.1 |
| Jul-2009 | 1335.6 | 724 | 7.1 | 93650.7 |
| Aug-2009 | 1236.5 | 719 | 10.3 | 94887.2 |
| Sep-2009 | 1149.1 | 672 | 18.6 | 96036.3 |
| Oct-2009 | 988.3 | 530 | 15.0 | 97024.6 |
| Nov-2009 | 1007.0 | 695 | 9.6 | 98031.6 |
| Dec-2009 | 561.9 | 429 | 11.0 | 98593.5 |
| **2009** | **15496.2** | **8015** | **106.3** | |
| Jan-2010 | 407.4 | 349 | 5.6 | 99000.9 |
| Feb-2010 | 8.0 | 10 | 0.1 | 99008.9 |
| Mar-2010 | 792.6 | 478 | 20.5 | 99801.5 |
| Apr-2010 | 987.7 | 720 | 19.2 | 100789.2 |
| May-2010 | 855.7 | 637 | 13.3 | 101644.9 |
| Jun-2010 | 853.0 | 685 | 10.1 | 102497.9 |
| Jul-2010 | 472.8 | 508 | 6.1 | 102970.7 |
| Aug-2010 | 496.9 | 410 | 5.1 | 103467.6 |
| Sep-2010 | 824.0 | 685 | 11.3 | 104291.6 |
| Oct-2010 | 828.2 | 744 | 11.5 | 105119.8 |
| Nov-2010 | 618.4 | 648 | 10.0 | 105738.2 |
| Dec-2010 | 702.2 | 744 | 11.0 | 106440.4 |
| **2010** | **7846.9** | **6618** | **123.8** | |

| Unique Well ID | 100/04-01-062-05W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Feb-2008 | 328.1 | 105 | 0.0 | 328.1 |
| Mar-2008 | 2063.0 | 334 | 65.0 | 2391.1 |
| Apr-2008 | 4616.9 | 668 | 90.3 | 7008.0 |
| May-2008 | 4886.7 | 695 | 174.5 | 11894.7 |
| Jun-2008 | 4715.2 | 688 | 220.1 | 16609.9 |
| Jul-2008 | 4284.7 | 685 | 139.5 | 20894.6 |
| Aug-2008 | 3959.4 | 684 | 93.2 | 24854.0 |
| Sep-2008 | 3622.9 | 709 | 48.9 | 28476.9 |
| Oct-2008 | 3517.8 | 701 | 74.7 | 31994.7 |
| Nov-2008 | 2994.0 | 705 | 59.8 | 34988.7 |
| Dec-2008 | 2599.3 | 737 | 34.4 | 37588.0 |
| **2008** | **37588.0** | **6711** | **1000.4** | |
| Jan-2009 | 2321.9 | 732 | 41.5 | 39909.9 |
| Feb-2009 | 2013.2 | 646 | 28.4 | 41923.1 |
| Mar-2009 | 2226.3 | 724 | 29.0 | 44149.4 |
| Apr-2009 | 2005.6 | 689 | 26.5 | 46155.0 |
| May-2009 | 2043.8 | 736 | 23.4 | 48198.8 |
| Jun-2009 | 1906.4 | 717 | 11.2 | 50105.2 |
| Jul-2009 | 1881.8 | 743 | 16.4 | 51987.0 |
| Aug-2009 | 1767.6 | 738 | 14.8 | 53754.6 |
| Sep-2009 | 1683.0 | 691 | 27.2 | 55437.6 |
| Oct-2009 | 1011.2 | 421 | 15.3 | 56448.8 |
| Nov-2009 | 1582.9 | 706 | 15.1 | 58031.7 |
| Dec-2009 | 1453.0 | 697 | 28.3 | 59484.7 |
| **2009** | **21896.7** | **8240** | **277.1** | |
| Jan-2010 | 1414.5 | 710 | 19.4 | 60899.2 |
| Feb-2010 | 1258.4 | 654 | 17.2 | 62157.6 |
| Mar-2010 | 1297.8 | 697 | 33.6 | 63455.4 |
| Apr-2010 | 1234.7 | 673 | 24.1 | 64690.1 |
| May-2010 | 1258.4 | 742 | 19.6 | 65948.5 |
| Jun-2010 | 1114.2 | 672 | 13.1 | 67062.7 |
| Jul-2010 | 1036.2 | 665 | 13.5 | 68098.9 |
| Aug-2010 | 1043.2 | 742 | 10.6 | 69142.1 |
| Sep-2010 | 985.3 | 685 | 11.6 | 70127.4 |
| Oct-2010 | 1062.1 | 731 | 12.6 | 71189.5 |
| Nov-2010 | 988.6 | 720 | 13.7 | 72178.1 |
| Dec-2010 | 1005.7 | 738 | 12.3 | 73183.8 |
| **2010** | **13699.1** | **8429** | **201.3** | |

| Unique Well ID | 100/04-22-061-05W6/00 | | | |
|---|---|---|---|---|
| Report Month | Monthly GAS e3m3 | Monthly HRS hrs | Monthly WTR m3 | Cumulative GAS e3m3 |
| Jun-2008 | 1169.9 | 265 | 0.0 | 1169.9 |
| Jul-2008 | 2344.6 | 729 | 261.2 | 3514.5 |
| Aug-2008 | 2141.6 | 715 | 0.0 | 5656.1 |
| Sep-2008 | 1781.5 | 717 | 44.4 | 7437.6 |
| Oct-2008 | 1687.1 | 720 | 66.1 | 9124.7 |
| Nov-2008 | 1496.2 | 702 | 54.7 | 10620.9 |
| Dec-2008 | 1397.5 | 709 | 37.8 | 12018.4 |
| **2008** | **12018.4** | **4557** | **464.2** | |
| Jan-2009 | 1239.8 | 675 | 41.0 | 13258.2 |
| Feb-2009 | 1121.7 | 671 | 29.2 | 14379.9 |
| Mar-2009 | 1202.4 | 742 | 28.9 | 15582.3 |
| Apr-2009 | 1104.5 | 710 | 27.0 | 16686.8 |
| May-2009 | 1089.3 | 739 | 23.0 | 17776.1 |
| Jun-2009 | 997.0 | 696 | 21.6 | 18773.1 |
| Jul-2009 | 1003.3 | 692 | 32.4 | 19776.4 |
| Aug-2009 | 984.2 | 736 | 15.1 | 20760.6 |
| Sep-2009 | 930.5 | 712 | 27.7 | 21691.1 |
| Oct-2009 | 753.1 | 459 | 20.8 | 22444.2 |
| Nov-2009 | 922.4 | 709 | 16.2 | 23366.6 |
| Dec-2009 | 836.5 | 646 | 30.0 | 24203.1 |
| **2009** | **12184.7** | **8187** | **312.9** | |
| Jan-2010 | 828.1 | 742 | 20.8 | 25031.2 |
| Feb-2010 | 742.9 | 671 | 18.7 | 25774.1 |
| Mar-2010 | 506.0 | 360 | 24.1 | 26280.1 |
| Apr-2010 | 857.5 | 712 | 30.6 | 27137.6 |
| May-2010 | 808.8 | 743 | 23.1 | 27946.4 |
| Jun-2010 | 716.7 | 718 | 15.5 | 28663.1 |
| Jul-2010 | 639.6 | 714 | 15.1 | 29302.7 |
| Aug-2010 | 702.0 | 712 | 10.2 | 30004.7 |
| Sep-2010 | 688.6 | 581 | 11.5 | 30693.3 |
| Oct-2010 | 709.7 | 649 | 11.9 | 31403.0 |
| Nov-2010 | 592.9 | 498 | 11.6 | 31995.9 |
| Dec-2010 | 624.6 | 547 | 11.9 | 32620.5 |
| **2010** | **8417.4** | **7647** | **205.0** | |

| Unique Well ID | 100/16-21-061-05W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Jul-2008 | 2465.5 | 460 | 60.2 | 2465.5 |
| Aug-2008 | 2567.3 | 720 | 45.3 | 5032.8 |
| Sep-2008 | 2052.6 | 719 | 20.7 | 7085.4 |
| Oct-2008 | 1797.2 | 660 | 88.3 | 8882.6 |
| Nov-2008 | 1747.5 | 718 | 79.0 | 10630.1 |
| Dec-2008 | 1637.1 | 741 | 54.9 | 12267.2 |
| **2008** | **12267.2** | **4018** | **348.4** | |
| Jan-2009 | 1449.7 | 681 | 59.7 | 13716.9 |
| Feb-2009 | 1305.0 | 667 | 42.3 | 15021.9 |
| Mar-2009 | 1386.1 | 738 | 41.4 | 16408.0 |
| Apr-2009 | 1278.0 | 714 | 38.9 | 17686.0 |
| May-2009 | 1271.6 | 742 | 33.4 | 18957.6 |
| Jun-2009 | 1192.9 | 718 | 32.2 | 20150.5 |
| Jul-2009 | 1141.9 | 671 | 45.9 | 21292.4 |
| Aug-2009 | 1243.9 | 743 | 25.2 | 22536.3 |
| Sep-2009 | 1126.9 | 715 | 44.2 | 23663.2 |
| Oct-2009 | 854.4 | 425 | 31.3 | 24517.6 |
| Nov-2009 | 889.3 | 502 | 20.5 | 25406.9 |
| Dec-2009 | 586.9 | 371 | 27.6 | 25993.8 |
| **2009** | **13726.6** | **7687** | **442.6** | |
| Jan-2010 | 880.5 | 376 | 30.9 | 26874.3 |
| Feb-2010 | 1076.7 | 671 | 35.6 | 27951.0 |
| Mar-2010 | 1003.8 | 744 | 62.7 | 28954.8 |
| Apr-2010 | 899.4 | 704 | 42.4 | 29854.2 |
| May-2010 | 918.5 | 742 | 34.5 | 30772.7 |
| Jun-2010 | 743.6 | 634 | 21.2 | 31516.3 |
| Jul-2010 | 453.1 | 190 | 14.2 | 31969.4 |
| Aug-2010 | 1041.4 | 738 | 25.6 | 33010.8 |
| Sep-2010 | 799.1 | 534 | 16.4 | 33809.9 |
| Oct-2010 | 776.2 | 613 | 16.1 | 34586.1 |
| Nov-2010 | 669.3 | 398 | 16.2 | 35255.4 |
| Dec-2010 | 832.6 | 739 | 19.6 | 36088.0 |
| **2010** | **10094.2** | **7083** | **335.4** | |

| Unique Well ID | 103/12-06-062-04W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Jul-2008 | 816.4 | 263 | 0.0 | 816.4 |
| Aug-2008 | 2138.6 | 736 | 0.0 | 2955.0 |
| Sep-2008 | 1992.2 | 711 | 0.0 | 4947.2 |
| Oct-2008 | 1965.9 | 719 | 81.4 | 6913.1 |
| Nov-2008 | 1621.4 | 634 | 61.9 | 8534.5 |
| Dec-2008 | 1702.9 | 717 | 48.5 | 10237.4 |
| **2008** | **10237.4** | **3780** | **191.8** | |
| Jan-2009 | 1593.4 | 699 | 54.7 | 11830.8 |
| Feb-2009 | 1496.3 | 669 | 54.5 | 13327.1 |
| Mar-2009 | 1639.7 | 734 | 41.5 | 14966.8 |
| Apr-2009 | 1575.5 | 713 | 40.6 | 16542.3 |
| May-2009 | 1540.2 | 688 | 34.4 | 18082.5 |
| Jun-2009 | 1515.3 | 717 | 34.7 | 19597.8 |
| Jul-2009 | 1541.4 | 743 | 52.6 | 21139.2 |
| Aug-2009 | 1493.1 | 740 | 40.7 | 22632.3 |
| Sep-2009 | 1428.4 | 694 | 48.2 | 24060.7 |
| Oct-2009 | 911.5 | 455 | 28.8 | 24972.2 |
| Nov-2009 | 1408.7 | 712 | 28.0 | 26380.9 |
| Dec-2009 | 1163.9 | 605 | 47.4 | 27544.8 |
| **2009** | **17307.4** | **8169** | **506.1** | |
| Jan-2010 | 1143.6 | 657 | 32.6 | 28688.4 |
| Feb-2010 | 1042.1 | 659 | 29.7 | 29730.5 |
| Mar-2010 | 1139.0 | 734 | 61.4 | 30869.5 |
| Apr-2010 | 1074.6 | 720 | 43.7 | 31944.1 |
| May-2010 | 1063.7 | 743 | 34.4 | 33007.8 |
| Jun-2010 | 991.6 | 698 | 24.4 | 33999.4 |
| Jul-2010 | 889.3 | 682 | 24.0 | 34888.7 |
| Aug-2010 | 741.7 | 597 | 15.8 | 35630.4 |
| Sep-2010 | 922.9 | 717 | 22.5 | 36553.3 |
| Oct-2010 | 986.7 | 744 | 24.4 | 37540.0 |
| Nov-2010 | 920.3 | 720 | 26.5 | 38460.3 |
| Dec-2010 | 929.8 | 744 | 26.1 | 39390.1 |
| **2010** | **11845.3** | **8415** | **365.5** | |

| Unique Well ID | 100/14-08-061-05W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Aug-2008 | 2040.7 | 538 | 21.6 | 2040.7 |
| Sep-2008 | 1916.5 | 698 | 11.6 | 3957.2 |
| Oct-2008 | 1539.7 | 695 | 39.5 | 5496.9 |
| Nov-2008 | 1314.2 | 707 | 38.8 | 6811.1 |
| Dec-2008 | 1180.4 | 714 | 25.8 | 7991.5 |
| **2008** | **7991.5** | **3352** | **137.3** | |
| Jan-2009 | 1040.7 | 743 | 28.1 | 9032.2 |
| Feb-2009 | 876.5 | 650 | 18.5 | 9908.7 |
| Mar-2009 | 863.1 | 613 | 16.8 | 10771.8 |
| Apr-2009 | 817.4 | 716 | 16.2 | 11589.2 |
| May-2009 | 791.4 | 703 | 13.6 | 12380.6 |
| Jun-2009 | 755.0 | 715 | 13.3 | 13135.6 |
| Jul-2009 | 706.9 | 716 | 18.5 | 13842.5 |
| Aug-2009 | 679.0 | 702 | 14.2 | 14521.5 |
| Sep-2009 | 579.6 | 479 | 1.5 | 15101.1 |
| Oct-2009 | 592.7 | 407 | 1.4 | 15693.8 |
| Nov-2009 | 699.0 | 618 | 1.2 | 16392.8 |
| Dec-2009 | 656.3 | 615 | 2.2 | 17049.1 |
| **2009** | **9057.6** | **7677** | **145.5** | |
| Jan-2010 | 587.1 | 470 | 1.4 | 17636.2 |
| Feb-2010 | 570.3 | 554 | 1.3 | 18206.5 |
| Mar-2010 | 587.0 | 563 | 2.6 | 18793.5 |
| Apr-2010 | 552.4 | 558 | 1.8 | 19345.9 |
| May-2010 | 570.6 | 571 | 1.4 | 19916.5 |
| Jun-2010 | 506.6 | 544 | 1.0 | 20423.1 |
| Jul-2010 | 429.1 | 431 | 0.9 | 20852.2 |
| Aug-2010 | 542.3 | 532 | 0.9 | 21394.5 |
| Sep-2010 | 492.1 | 497 | 1.0 | 21886.6 |
| Oct-2010 | 517.6 | 720 | 1.0 | 22404.2 |
| Nov-2010 | 316.4 | 432 | 0.8 | 22720.6 |
| Dec-2010 | 477.0 | 624 | 1.0 | 23197.6 |
| **2010** | **6148.5** | **6496** | **15.1** | |

| Unique Well ID | 100/02-04-062-05W6/04 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Jan-2009 | 63.1 | 48 | 0.0 | 63.1 |
| Feb-2009 | 580.6 | 315 | 0.0 | 643.7 |
| Mar-2009 | 1374.5 | 742 | 53.5 | 2018.2 |
| Apr-2009 | 1257.3 | 670 | 49.9 | 3275.5 |
| May-2009 | 1317.6 | 713 | 45.2 | 4593.1 |
| Jun-2009 | 1194.4 | 704 | 42.0 | 5787.5 |
| Jul-2009 | 1170.7 | 733 | 26.5 | 6958.2 |
| Aug-2009 | 1104.7 | 710 | 20.0 | 8062.9 |
| Sep-2009 | 1063.9 | 692 | 37.3 | 9126.8 |
| Oct-2009 | 1183.3 | 323 | 38.8 | 10310.1 |
| Nov-2009 | 1308.7 | 674 | 27.2 | 11618.8 |
| Dec-2009 | 984.2 | 444 | 49.5 | 12603.0 |
| **2009** | **12603.0** | **6768** | **389.9** | |
| Jan-2010 | 1193.0 | 682 | 50.4 | 13796.0 |
| Feb-2010 | 997.2 | 664 | 35.3 | 14793.2 |
| Mar-2010 | 1089.8 | 744 | 72.9 | 15883.0 |
| Apr-2010 | 1019.3 | 661 | 51.3 | 16902.3 |
| May-2010 | 1057.0 | 744 | 42.4 | 17959.3 |
| Jun-2010 | 1005.1 | 719 | 30.6 | 18964.4 |
| Jul-2010 | 934.9 | 744 | 31.2 | 19899.3 |
| Aug-2010 | 918.6 | 744 | 24.3 | 20817.9 |
| Sep-2010 | 815.8 | 720 | 24.8 | 21633.7 |
| Oct-2010 | 822.2 | 744 | 25.2 | 22455.9 |
| Nov-2010 | 257.2 | 244 | 9.1 | 22713.1 |
| Dec-2010 | 0.0 | 0 | 0.0 | 22713.1 |
| **2010** | **10110.1** | **7410** | **397.5** | |

| Unique Well ID | 100/13-36-061-05W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Jun-2009 | 62.0 | 64 | 27.2 | 62.0 |
| Jul-2009 | 1507.7 | 350 | 0.0 | 1569.7 |
| Aug-2009 | 1892.3 | 742 | 0.0 | 3462.0 |
| Sep-2009 | 1403.2 | 654 | 9.5 | 4865.2 |
| Oct-2009 | 928.6 | 446 | 5.8 | 5793.8 |
| Nov-2009 | 1179.8 | 678 | 208.7 | 6973.6 |
| Dec-2009 | 856.2 | 527 | 6.9 | 7829.8 |
| **2009** | **7829.8** | **3461** | **258.1** | |
| Jan-2010 | 979.1 | 710 | 107.0 | 8808.9 |
| Feb-2010 | 768.3 | 554 | 4.4 | 9577.2 |
| Mar-2010 | 791.5 | 628 | 8.6 | 10368.7 |
| Apr-2010 | 806.8 | 677 | 6.4 | 11175.5 |
| May-2010 | 716.2 | 621 | 4.6 | 11891.7 |
| Jun-2010 | 639.2 | 638 | 3.1 | 12530.9 |
| Jul-2010 | 642.1 | 606 | 3.4 | 13173.0 |
| Aug-2010 | 610.4 | 583 | 2.6 | 13783.4 |
| Sep-2010 | 591.9 | 604 | 2.9 | 14375.3 |
| Oct-2010 | 682.6 | 737 | 3.4 | 15057.9 |
| Nov-2010 | 524.8 | 573 | 3.0 | 15582.7 |
| Dec-2010 | 591.1 | 672 | 4.0 | 16173.8 |
| **2010** | **8344.0** | **7603** | **153.4** | |

| Unique Well ID | 100/08-08-062-04W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Aug-2009 | 140.5 | 128 | 0.0 | 140.5 |
| Sep-2009 | 2079.6 | 645 | 179.3 | 2220.1 |
| Oct-2009 | 1612.2 | 583 | 52.9 | 3832.3 |
| Nov-2009 | 1402.3 | 669 | 29.1 | 5234.6 |
| Dec-2009 | 1222.9 | 690 | 67.6 | 6457.5 |
| **2009** | **6457.5** | **2715** | **328.9** | |
| Jan-2010 | 1063.3 | 744 | 41.3 | 7520.8 |
| Feb-2010 | 804.4 | 505 | 31.2 | 8325.2 |
| Mar-2010 | 860.7 | 651 | 63.1 | 9185.9 |
| Apr-2010 | 848.9 | 699 | 47.0 | 10034.8 |
| May-2010 | 782.5 | 743 | 34.4 | 10817.3 |
| Jun-2010 | 706.9 | 715 | 23.6 | 11524.2 |
| Jul-2010 | 661.3 | 705 | 24.2 | 12185.5 |
| Aug-2010 | 613.6 | 690 | 17.8 | 12799.1 |
| Sep-2010 | 587.8 | 661 | 19.6 | 13386.9 |
| Oct-2010 | 534.9 | 630 | 11.7 | 13921.8 |
| Nov-2010 | 586.5 | 679 | 14.9 | 14508.3 |
| Dec-2010 | 383.6 | 527 | 9.5 | 14891.9 |
| **2010** | **8434.4** | **7949** | **338.3** | |

| Unique Well ID | 100/16-04-060-02W6/00 | | | |
|---|---|---|---|---|
| **Report Month** | **Monthly GAS e3m3** | **Monthly HRS hrs** | **Monthly WTR m3** | **Cumulative GAS e3m3** |
| Dec-2009 | 2.5 | 12 | 0.0 | 2.5 |
| **2009** | **2.5** | **12** | **0.0** | |
| Jan-2010 | 1395.9 | 482 | 83.8 | 1398.4 |
| Feb-2010 | 1637.4 | 671 | 62.7 | 3035.8 |
| Mar-2010 | 1421.0 | 724 | 6.7 | 4456.8 |
| Apr-2010 | 545.3 | 286 | 1.9 | 5002.1 |
| May-2010 | 0.0 | 0 | 0.0 | 5002.1 |
| Jun-2010 | 1449.2 | 411 | 78.3 | 6451.3 |
| Jul-2010 | 904.1 | 336 | 71.4 | 7355.4 |
| Aug-2010 | 1057.1 | 579 | 107.6 | 8412.5 |
| Sep-2010 | 941.2 | 688 | 128.5 | 9353.7 |
| Oct-2010 | 824.4 | 659 | 85.2 | 10178.1 |
| Nov-2010 | 499.1 | 433 | 67.7 | 10677.2 |
| Dec-2010 | 539.1 | 223 | 63.0 | 11216.3 |
| **2010** | **11213.8** | **5492** | **756.8** | |

## Appendix C – IETP 05-081 Completion Data

| Btm Hole UWI: 100/04-11-063-07W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| CRDM_KWA_T | 2,041.00 | 2,043.00 | 7 | Borate | 121.1 | 31 | N2 | 25 | 575 |
| DNVG G | 2,679.00 | 2,682.00 | 6 | Borate | 129.2 | 40 | N2 | 25 | 690 |
| CDTT | 2,887.00 | 2,889.00 | | | | | | | |
| L CDTT | 2,899.00 | 2,901.00 | 5 | N2 Foam | 167.4 | 102 | N2 | 65 | 520 |
| NTKN L | 2,963.00 | 2,964.00 | | | | | | | |
| FLHA CH1 | 2,993.00 | 2,994.00 | | | | | | | |
| FLHB SF1 | 3,003.00 | 3,004.00 | | | | | | | |
| FLHB CH1 | 3,025.00 | 3,026.00 | | | | | | | |
| FLHC CH1 | 3,049.00 | 3,050.00 | 4 | Borate | 254.9 | 130 | N2 | 25 | 895 |
| FLHF U | 3,144.00 | 3,145.00 | | | | | | | |
| FLHF L | 3,155.00 | 3,157.00 | | | | | | | |
| FLHF L | 3,170.00 | 3,172.00 | | | | | | | |
| WLRC A | 3,180.00 | 3,181.00 | 3 | Borate | 304 | 160 | N2 | 25 | 840 |
| BLSK U | 3,252.00 | 3,253.00 | | | | | | | |
| GTNG A CH1 | 3,282.00 | 3,284.00 | | | | | | | |
| GTNG C CH1 | 3,317.00 | 3,318.00 | 2 | Borate | 277.5 | 91 | N2 | 25 | 540 |
| CDMN | 3,372.00 | 3,374.00 | | | | | | | |
| CDMN | 3,378.00 | 3,380.00 | 1 | Borate | 174.2 | 62 | N2 | 25 | 210 |

| Btm Hole UWI: 100/13-18-062-06W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| CRDM_KWA_T | 2,155.00 | 2,159.00 | 7 | Borate | 211.6 | 61 | N2 | 25 | 500 |
| DNVG E | 2,734.00 | 2,735.00 | | | | | | | |
| DNVG E | 2,740.00 | 2,741.00 | | | | | | | |
| DNVG E | 2,748.00 | 2,750.00 | 6 | Borate | 235.5 | 100 | N2 | 25 | 750 |
| CDTT | 2,981.00 | 2,982.00 | | | | | | | |
| CDTT | 2,984.00 | 2,985.00 | | | | | | | |
| CDTT | 2,987.00 | 2,988.00 | | | | | | | |
| L CDTT | 2,994.00 | 2,995.00 | 5 | CO2 Foam | 166.3 | 82 | CO2 | 55 | 500 |
| FLHA CH1 | 3,081.00 | 3,083.00 | | | | | | | |
| FLHA CH1 | 3,085.00 | 3,086.00 | | | | | | | |
| FLHA CH1 | 3,089.50 | 3,090.50 | 4 | Borate | 298.1 | 140 | N2 | 25 | 1000 |
| FLHF L | 3,243.00 | 3,244.00 | | | | | | | |
| FLHF L | 3,251.50 | 3,252.00 | | | | | | | |
| FLHF L | 3,254.00 | 3,254.50 | | | | | | | |
| WLRC A | 3,259.50 | 3,260.00 | | | | | | | |
| WLRC A | 3,264.00 | 3,264.50 | | | | | | | |
| WLRC A | 3,271.00 | 3,271.50 | | | | | | | |
| WLRC A | 3,275.00 | 3,275.50 | 3 | Borate | 296.9 | 140 | N2 | 25 | 1000 |
| BLSK U | 3,338.00 | 3,339.00 | | | | | | | |
| BLSK M | 3,343.00 | 3,344.00 | | | | | | | |
| BLSK L | 3,347.00 | 3,349.00 | 2 | Borate | 131.9 | 30 | N2 | 25 | 500 |
| GTNG B CH1 | 3,381.00 | 3,383.00 | | | | | | | |
| GTNG B CH1 | 3,387.00 | 3,388.00 | 1 | Borate | 206.6 | 51 | N2 | 25 | 550 |

| Btm Hole UWI: 100/08-04-061-06W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| CRDM_KWA_T | 2,316.00 | 2,318.00 | | | | | | | |
| CRDM_KWA_T2 | 2,329.00 | 2,330.00 | | | | | | | |
| CRDM_KWA_T2 | 2,339.50 | 2,340.00 | 8 | Borate | 223 | 75 | N2 | 25 | 645 |
| DNVG A | 2,880.00 | 2,881.00 | | | | | | | |
| DNVG D | 2,903.00 | 2,903.50 | | | | | | | |
| DNVG E | 2,921.00 | 2,922.00 | 7 | Borate | 207.7 | 75 | N2 | 25 | 776 |
| CDTT | 3,137.00 | 3,139.00 | | | | | | | |
| L CDTT | 3,147.50 | 3,149.00 | 6 | N2 Foam | 177.2 | 102 | N2 | 65 | 516 |
| FLHC CH1 | 3,268.00 | 3,270.00 | | | | | | | |
| FLHC CH1 | 3,280.00 | 3,281.00 | | | | | | | |
| FLHC CH1 | 3,301.50 | 3,302.00 | 5 | Borate | 263.4 | 150 | N2 | 25 | 1086 |
| FLHE CH1 | 3,337.00 | 3,340.00 | | | | | | | |
| FLHE CH1 | 3,382.50 | 3,383.00 | 4 | Borate | 167.5 | 75 | N2 | 25 | 1137 |
| FLHF L | 3,388.00 | 3,389.00 | | | | | | | |
| FLHF L | 3,392.00 | 3,393.00 | | | | | | | |
| WLRC A | 3,406.00 | 3,407.50 | 3 | Borate | 247.8 | 140 | N2 | 25 | 1067 |
| BLSK U | 3,488.00 | 3,488.50 | | | | | | | |
| BLSK L | 3,500.50 | 3,501.00 | | | | | | | |
| GTNG D CH1 | 3,578.00 | 3,580.00 | 2 | Borate | 232.2 | 61 | N2 | 25 | 475 |
| CDMN | 3,609.00 | 3,612.00 | 1 | Borate | 254.4 | 52 | N2 | 25 | 457 |

| Btm Hole UWI: 100/05-15-061-06W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| CRDM RRVR | 2,055.00 | 2,055.50 | | | | | | | |
| CRDM MUSR | 2,064.50 | 2,065.00 | | | | | | | |
| CRDM_KWA_T | 2,073.00 | 2,074.00 | | | | | | | |
| CRDM_KWA_T | 2,077.00 | 2,078.00 | 7 | Borate | 180.2 | 61 | N2 | 22 | 600 |
| DNVG A | 2,611.50 | 2,612.00 | | | | | | | |
| DNVG A | 2,615.00 | 2,615.50 | | | | | | | |
| DNVG E | 2,658.00 | 2,660.00 | | | | | | | |
| DNVG E | 2,666.50 | 2,667.00 | 6 | Borate | 202.8 | 75 | N2 | 24 | 750 |
| CDTT | 2,876.00 | 2,878.00 | | | | | | | |
| L CDTT | 2,891.00 | 2,893.00 | 5 | Borate | 209.1 | 94 | N2 | 33 | 800 |
| FLHC CH1 | 3,022.50 | 3,023.50 | | | | | | | |
| FLHC CH1 | 3,032.00 | 3,034.00 | | | | | | | |
| FLHC CH1 | 3,054.00 | 3,055.00 | 4 | Borate | 244 | 120 | N2 | 24 | 1000 |
| FLHF L | 3,129.00 | 3,130.00 | | | | | | | |
| FLHF L | 3,138.50 | 3,139.00 | | | | | | | |
| WLRC A | 3,145.00 | 3,146.00 | 3 | Borate | 279.4 | 150 | N2 | 25 | 1000 |
| BLSK U | 3,223.50 | 3,225.50 | | | | | | | |
| BLSK L | 3,237.50 | 3,238.50 | 2 | Borate | 141.5 | 30 | N2 | 25 | 500 |
| GTNG E CH1 | 3,333.00 | 3,333.50 | | | | | | | |
| CDMN | 3,348.00 | 3,350.00 | | Borate | 220.2 | 53 | N2 | 25 | 400 |
| NKNS | 3,439.00 | 3,441.00 | 1 | Borate | 40.1 | 0 | N2 | 25 | 0 |

| Btm Hole UWI: 100/15-24-061-06W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| CRDM RRVR | 2,297.50 | 2,298.00 | | | | | | | |
| CRDM_KWA_T | 2,318.00 | 2,321.00 | 8 | Borate | 147.3 | 37 | N2 | 25 | 600 |
| DNVG A | 2,835.00 | 2,835.50 | | | | | | | |
| DNVG B | 2,847.50 | 2,848.00 | | | | | | | |
| DNVG E | 2,881.00 | 2,883.00 | 7 | Borate | 209.5 | 75 | N2 | 25 | 750 |
| CDTT | 3,089.00 | 3,091.00 | | | | | | | |
| L CDTT | 3,103.00 | 3,105.00 | 6 | N2 Foam | 167.5 | 105 | N2 | 65 | 500 |
| FLHB SF1 | 3,188.50 | 3,189.50 | 5 | Borate | 116 | 30 | N2 | 25 | 900 |
| FLHC CH1 | 3,225.00 | 3,226.50 | | | | | | | |
| FLHC CH1 | 3,235.00 | 3,236.00 | | | | | | | |
| FLHC CH1 | 3,249.50 | 3,250.50 | | | | | | | |
| FLHC CH1 | 3,271.50 | 3,272.00 | 4 | Borate | 292.6 | 165 | N2 | 25 | 1000 |
| FLHF L | 3,338.00 | 3,339.00 | | | | | | | |
| FLHF L | 3,345.00 | 3,346.00 | | | | | | | |
| WLRC A | 3,362.00 | 3,363.00 | | | | | | | |
| WLRC A | 3,370.00 | 3,370.50 | 3 | Borate | 252.8 | 131 | N2 | 25 | 1000 |
| BLSK U | 3,439.00 | 3,440.00 | | | | | | | |
| BLSK L | 3,448.50 | 3,449.00 | | | | | | | |
| GTNG A CH1 | 3,465.00 | 3,466.00 | 2 | Borate | 158.4 | 36 | N2 | 25 | 500 |
| CDMN | 3,561.00 | 3,563.00 | 1 | Borate | 190.5 | 33 | N2 | 25 | 400 |

| Btm Hole UWI: 100/16-16-061-05W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration (kg/$m^3$) |
| CRDM RRVR | 2,276.50 | 2,277.00 | | | | | | | |
| CRDM RRVR | 2,280.00 | 2,281.00 | | | | | | | |
| CRDM KWA | 2,293.00 | 2,295.00 | 7 | Borate | 176.7 | 61 | N2 | 25 | 600 |
| DNVG B | 2,771.00 | 2,771.50 | | | | | | | |
| DNVG D | 2,786.50 | 2,787.00 | | | | | | | |
| DNVG D | 2,789.00 | 2,789.50 | | | | | | | |
| DNVG E | 2,799.00 | 2,799.50 | | | | | | | |
| DNVG E | 2,806.00 | 2,807.00 | 6 | Borate | 192.7 | 75 | N2 | 25 | 750 |
| CDTT | 3,008.00 | 3,010.00 | | | | | | | |
| L CDTT | 3,020.00 | 3,022.00 | 5 | CO2 Foam | 192.4 | 102 | CO2 | 55 | 500 |
| FLHC CH2 | 3,147.00 | 3,148.00 | | | | | | | |
| FLHC CH1 | 3,169.00 | 3,170.00 | | | | | | | |
| FLHC CH1 | 3,188.00 | 3,189.00 | 4 | Borate | 270.4 | 165 | N2 | 25 | 1000 |
| FLHF L | 3,254.00 | 3,256.00 | | | | | | | |
| FLHF L | 3,261.00 | 3,262.00 | | | | | | | |
| WLRC A | 3,274.00 | 3,275.00 | 3 | Borate | 223.8 | 129 | N2 | 25 | 1000 |
| GTNG A CH1 | 3,380.00 | 3,382.00 | 2 | Borate | 155.5 | 41 | N2 | 25 | 600 |
| GTNG C CH1 | 3,424.00 | 3,425.00 | | | | | | | |
| GTNG F CH1 | 3,467.00 | 3,468.00 | | | | | | | |
| CDMN | 3,476.00 | 3,477.00 | 1 | Borate | 254.5 | 76 | N2 | 25 | 520 |

| Btm Hole UWI: 100/02-11-060-03W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration (kg/$m^3$) |
| CRDM_DRAT | 2,345.00 | 2,346.00 | | | | | | | |
| CRDM_MUS | 2,369.00 | 2,370.00 | | | | | | | |
| CRDM_MUS | 2,380.00 | 2,382.00 | 5 | Borate | 170.8 | 51 | N2 | 25 | 709 |
| DCRK | 2,764.50 | 2,765.50 | | | | | | | |
| DNVG_D | 2,805.00 | 2,806.00 | | | | | | | |
| DNVG_D | 2,812.00 | 2,813.00 | | | | | | | |
| DNVG_D | 2,815.00 | 2,816.00 | 4 | CO2 Foam | 155.1 | 50 | CO2 | 60 | 750 |
| DNVG_E | 2,834.00 | 2,838.00 | 3 | Borate | 178.6 | 75 | N2 | 25 | 750 |
| CDTT | 3,000.00 | 3,004.00 | 2 | Borate | 110.2 | 27 | N2 | 25 | 350 |
| FLHR_A | 3,076.00 | 3,078.00 | | | | | | | |
| FLHR_C | 3,143.00 | 3,145.00 | 1 | Borate | 203.6 | 100 | N2 | 25 | 900 |

| Btm Hole UWI: 100/07-02-060-02W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water (m3) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration (kg/m3) |
| DNVG_C | 2,849.00 | 2,850.50 | | | | | | | |
| DNVG_D | 2,856.00 | 2,857.50 | 5 | Borate | 130.1 | 23 | N2 | 25 | 673 |
| DNVG_E | 2,877.00 | 2,878.00 | | | | | | | |
| DNVG_E | 2,882.00 | 2,884.00 | 4 | Borate | 160.7 | 50 | N2 | 25 | 750 |
| FLHR_E | 3,219.00 | 3,221.00 | 3 | Borate | 142.8 | 50 | N2 | 25 | 800 |
| FLHR_F | 3,255.00 | 3,256.00 | | | | | | | |
| FLHR_F | 3,268.00 | 3,269.50 | | | | | | | |
| FLHR_F | 3,275.00 | 3,276.00 | 2 | Borate | 269.6 | 150 | N2 | 25 | 1073 |
| GTNG_A | 3,352.50 | 3,353.50 | | | | | | | |
| GTNG_C | 3,391.00 | 3,392.00 | | | | | | | |
| GTNG_C | 3,394.00 | 3,395.00 | 1 | Borate | 196.6 | 51 | N2 | 25 | 547 |

| Btm Hole UWI: 100/09-27-059-02W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| CRDM_AMND | 2,560.00 | 2,562.00 | | | | | | | |
| CRDM_MUS | 2,598.00 | 2,600.00 | 5 | Borate | 159 | 51 | N2 | 25 | 600 |
| DNVG_C | 3,017.00 | 3,018.00 | | | | | | | |
| DNVG_D | 3,022.50 | 3,023.50 | | | | | | | |
| DNVG_E | 3,050.00 | 3,052.00 | 4 | Borate | 140.5 | 50 | N2 | 25 | 750 |
| CDTT | 3,201.00 | 3,205.00 | 3 | CO2 Foam | 97.9 | 27 | CO2 | 60 | 400 |
| FLHR_F | 3,430.00 | 3,431.00 | | | | | | | |
| FLHR_F | 3,437.00 | 3,438.00 | | | | | | | |
| FLHR_F | 3,442.00 | 3,443.00 | | | | | | | |
| FLHR_F | 3,446.00 | 3,447.00 | 2 | Borate | 239.1 | 125 | N2 | 25 | 1000 |
| BLSK | 3,493.00 | 3,494.00 | | | | | | | |
| GTNG_A | 3,524.00 | 3,525.00 | | | | | | | |
| GTNG_C | 3,551.00 | 3,552.00 | | | | | | | |
| GTNG_D | 3,560.00 | 3,561.00 | | | | | | | |
| GTNG_D | 3,566.00 | 3,567.00 | 1 | Borate | 193 | 51 | N2 | 25 | 500 |

| Btm Hole UWI: 100/02-10-059-02W6/00 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | Frac Stop | Base Fluid | Total Water ($m^3$) | Total Sand (tonnes) | Energy | Energy % | Maximum Proppant Concentration ($kg/m^3$) |
| DCRK | 2,907.50 | 2,908.50 | | | | | | | |
| DNVG_A | 2,941.50 | 2,942.50 | | | | | | | |
| DNVG_C | 2,950.50 | 2,951.50 | | | | | | | |
| DNVG_D | 2,958.50 | 2,959.50 | 5 | Borate | 146.4 | 50 | N2 | 25 | 800 |
| DNVG_E | 2,980.00 | 2,984.00 | 4 | Borate | 193.7 | 75 | N2 | 25 | 750 |
| NTKN | 3,164.00 | 3,165.00 | | | | | | | |
| NTKN | 3,167.50 | 3,168.50 | | | | | | | |
| NTKN | 3,170.50 | 3,172.50 | 3 | Borate | 277.6 | 85 | N2 | 25 | 600 |
| FLHR_F | 3,354.00 | 3,356.00 | | | | | | | |
| FLHR_F | 3,360.00 | 3,363.00 | 2 | Borate | 287 | 150 | N2 | 25 | 1000 |
| BLSK | 3,422.00 | 3,423.00 | | | | | | | |
| GTNG_B | 3,463.50 | 3,464.50 | | | | | | | |
| GTNG_D | 3,500.00 | 3,502.00 | 1 | Borate | 210.2 | 51 | N2 | 25 | 500 |

## Appendix D – IETP 05-081 Wellbore Schematics

# Schematic - Current

**Well Name: ECA REDROCK 4-11-63-7**

| Bottom Hole UWI | Surface Legal Location | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|
| 100/04-11-063-07W6/00 | LSD 1-10-63-7W6 | RED ROCK 1-10 | | RED ROCK | 0430031 | AB |

| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
|---|---|---|---|---|---|---|---|
| DEVIATED | 1,139.40 | 5.76 | 5.28 | 4.88 | 3,397.00 | UNKNOWN | |

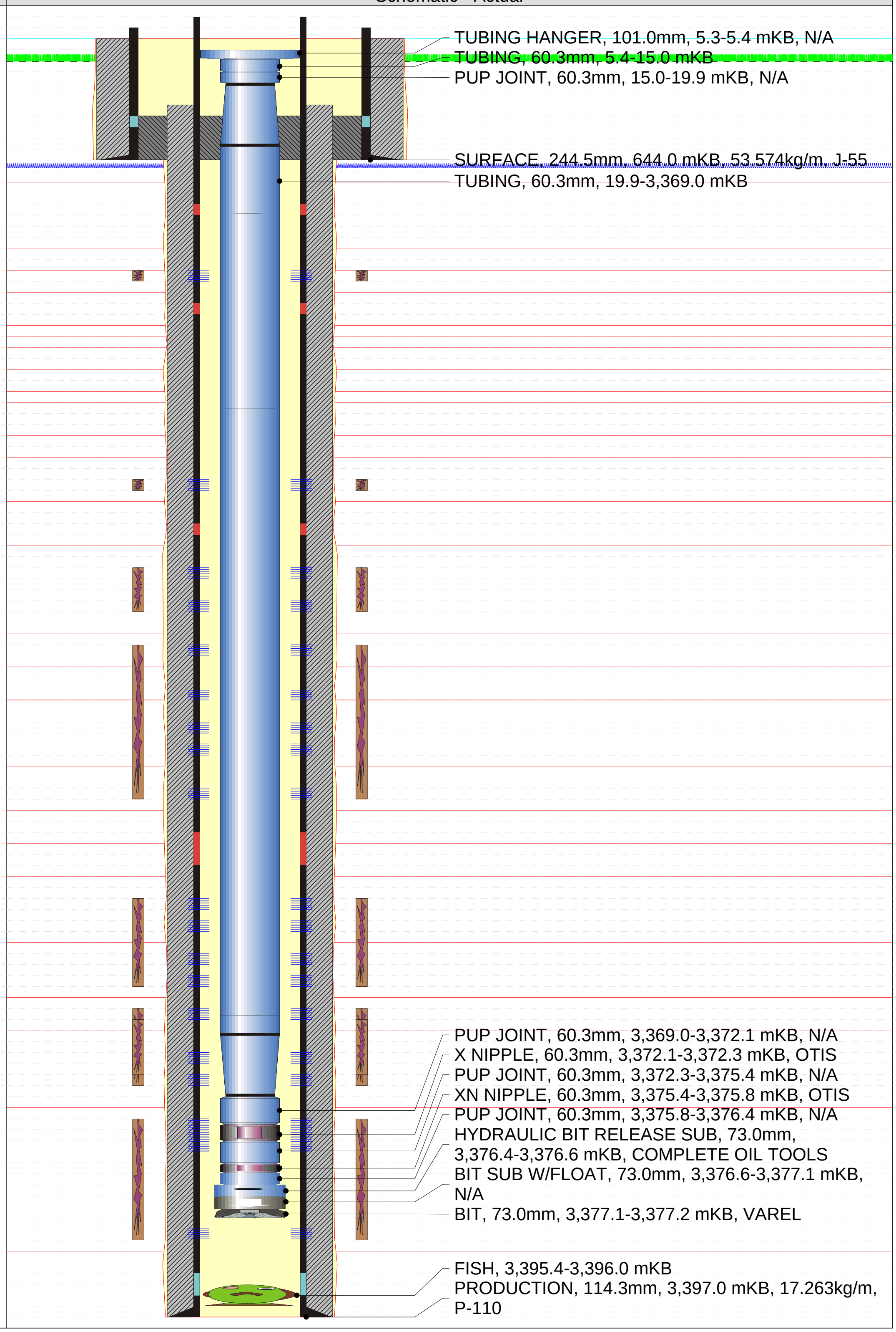
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | SPECIAL STUDY | 2012-03-17 | 2012-03-18 |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:26:13 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -174 | |
| 0 | |
| 5 | |
| 20 | |
| 350 | 344 |
| 630 | 601 |
| 644 | 614 |
| 1,367 | 1,289 |
| 1,729 | 1,648 |
| 1,852 | 1,772 |
| 1,933 | 1,852 |
| 1,964 | 1,883 |
| 2,043 | 1,962 |
| 2,394 | 2,314 |
| 2,506 | 2,425 |
| 2,588 | 2,507 |
| 2,600 | 2,519 |
| 2,610 | 2,529 |
| 2,615 | 2,534 |
| 2,647 | 2,566 |
| 2,670 | 2,589 |
| 2,679 | 2,598 |
| 2,774 | 2,693 |
| 2,799 | 2,718 |
| 2,871 | 2,790 |
| 2,887 | 2,806 |
| 2,890 | 2,809 |
| 2,901 | 2,820 |
| 2,923 | 2,842 |
| 2,964 | 2,883 |
| 2,973 | 2,892 |
| 2,994 | 2,913 |
| 3,003 | 2,922 |
| 3,025 | 2,944 |
| 3,031 | 2,950 |
| 3,049 | 2,968 |
| 3,070 | 2,989 |
| 3,096 | 3,015 |
| 3,101 | 3,020 |
| 3,134 | 3,053 |
| 3,144 | 3,063 |
| 3,155 | 3,074 |
| 3,169 | 3,088 |
| 3,172 | 3,091 |
| 3,181 | 3,100 |
| 3,252 | 3,171 |
| 3,264 | 3,183 |
| 3,282 | 3,201 |
| 3,317 | 3,236 |
| 3,369 | 3,288 |
| 3,372 | 3,291 |
| 3,372 | 3,291 |
| 3,375 | 3,294 |
| 3,376 | 3,295 |
| 3,377 | 3,296 |
| 3,378 | 3,297 |
| 3,382 | 3,301 |
| 3,395 | 3,314 |
| 3,396 | 3,315 |
| 3,397 | 3,316 |

Schematic - Actual



# Schematic - Current

**Well Name: ECA KAKWA 13-18-62-6**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/13-18-062-06W6/00 | LSD 11-18-62-6W6 | | RED ROCK 11-18 | | KAKWA | 0413731 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 1,207.09 | 5.70 | 5.80 | 6.60 | 3,483.00 | SWEET | |

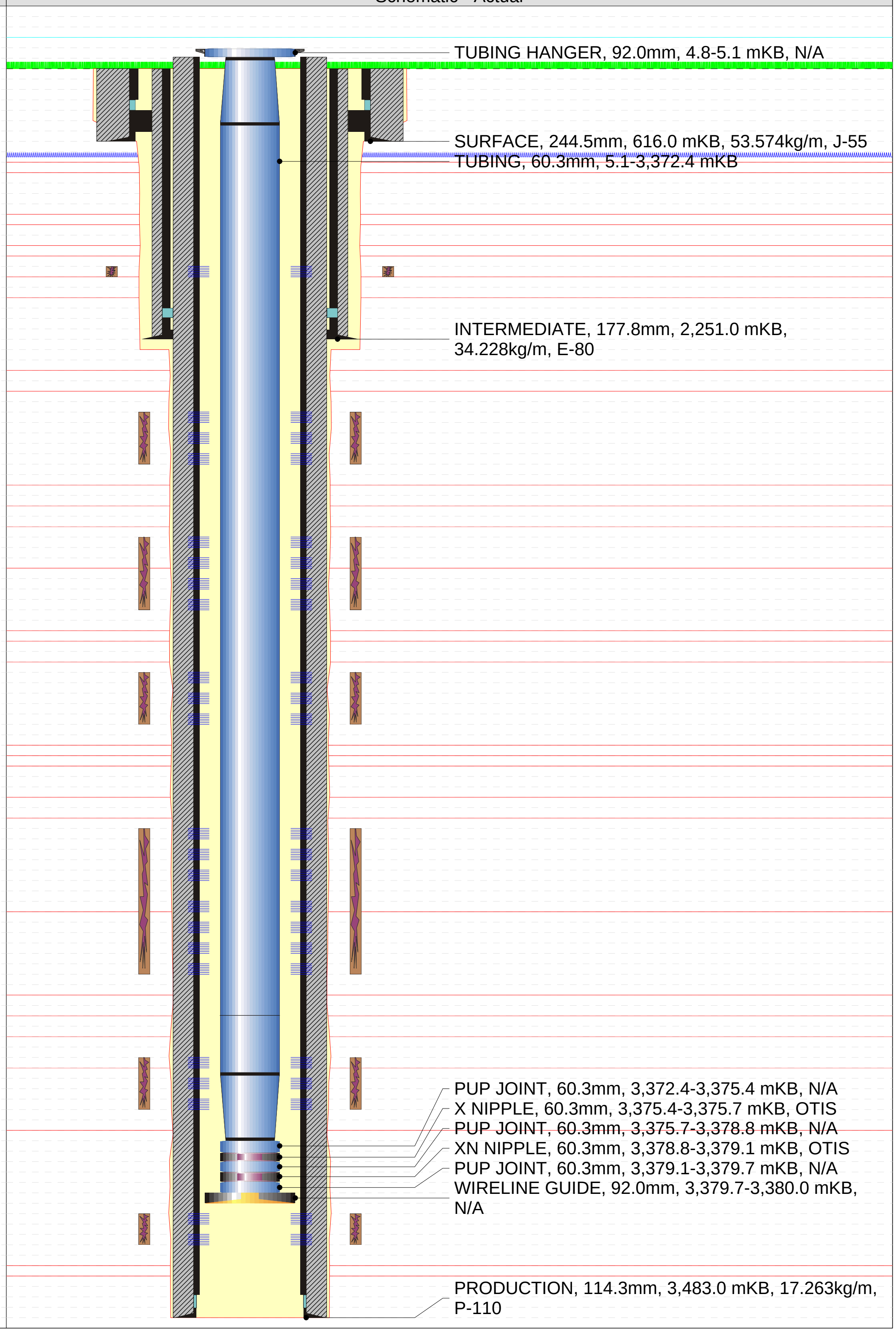
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | OPTIMIZATION | 2012-01-06 | |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:29:47 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -1 | |
| 0 | |
| 5 | |
| 50 | 50 |
| 602 | 602 |
| 610 | 610 |
| 616 | 616 |
| 1,779 | 1,742 |
| 1,839 | 1,800 |
| 1,940 | 1,900 |
| 2,039 | 1,996 |
| 2,076 | 2,032 |
| 2,155 | 2,109 |
| 2,174 | 2,128 |
| 2,237 | 2,191 |
| 2,251 | 2,204 |
| 2,258 | 2,212 |
| 2,621 | 2,575 |
| 2,700 | 2,654 |
| 2,734 | 2,688 |
| 2,740 | 2,694 |
| 2,748 | 2,702 |
| 2,799 | 2,753 |
| 2,873 | 2,827 |
| 2,967 | 2,921 |
| 2,981 | 2,935 |
| 2,984 | 2,938 |
| 2,987 | 2,941 |
| 2,994 | 2,948 |
| 3,003 | 2,957 |
| 3,020 | 2,974 |
| 3,065 | 3,019 |
| 3,083 | 3,037 |
| 3,086 | 3,040 |
| 3,091 | 3,044 |
| 3,094 | 3,048 |
| 3,157 | 3,111 |
| 3,187 | 3,141 |
| 3,226 | 3,180 |
| 3,243 | 3,197 |
| 3,252 | 3,205 |
| 3,254 | 3,208 |
| 3,258 | 3,212 |
| 3,260 | 3,214 |
| 3,265 | 3,218 |
| 3,272 | 3,225 |
| 3,276 | 3,229 |
| 3,289 | 3,242 |
| 3,313 | 3,266 |
| 3,327 | 3,281 |
| 3,338 | 3,292 |
| 3,343 | 3,297 |
| 3,347 | 3,301 |
| 3,361 | 3,315 |
| 3,372 | 3,326 |
| 3,376 | 3,329 |
| 3,379 | 3,333 |
| 3,380 | 3,334 |
| 3,383 | 3,337 |
| 3,388 | 3,342 |
| 3,463 | 3,417 |
| 3,482 | 3,436 |
| 3,483 | 3,436 |

Schematic - Actual



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# Schematic - Current

**Well Name: ECA KAKWA 8-4-61-6**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/08-04-061-06W6/00 | LSD 7-4-61-6W6 | | KAKWA 7-4 | | KAKWA | 0421869 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 1,205.00 | 5.70 | 5.92 | 5.23 | 3,631.00 | SWEET | |

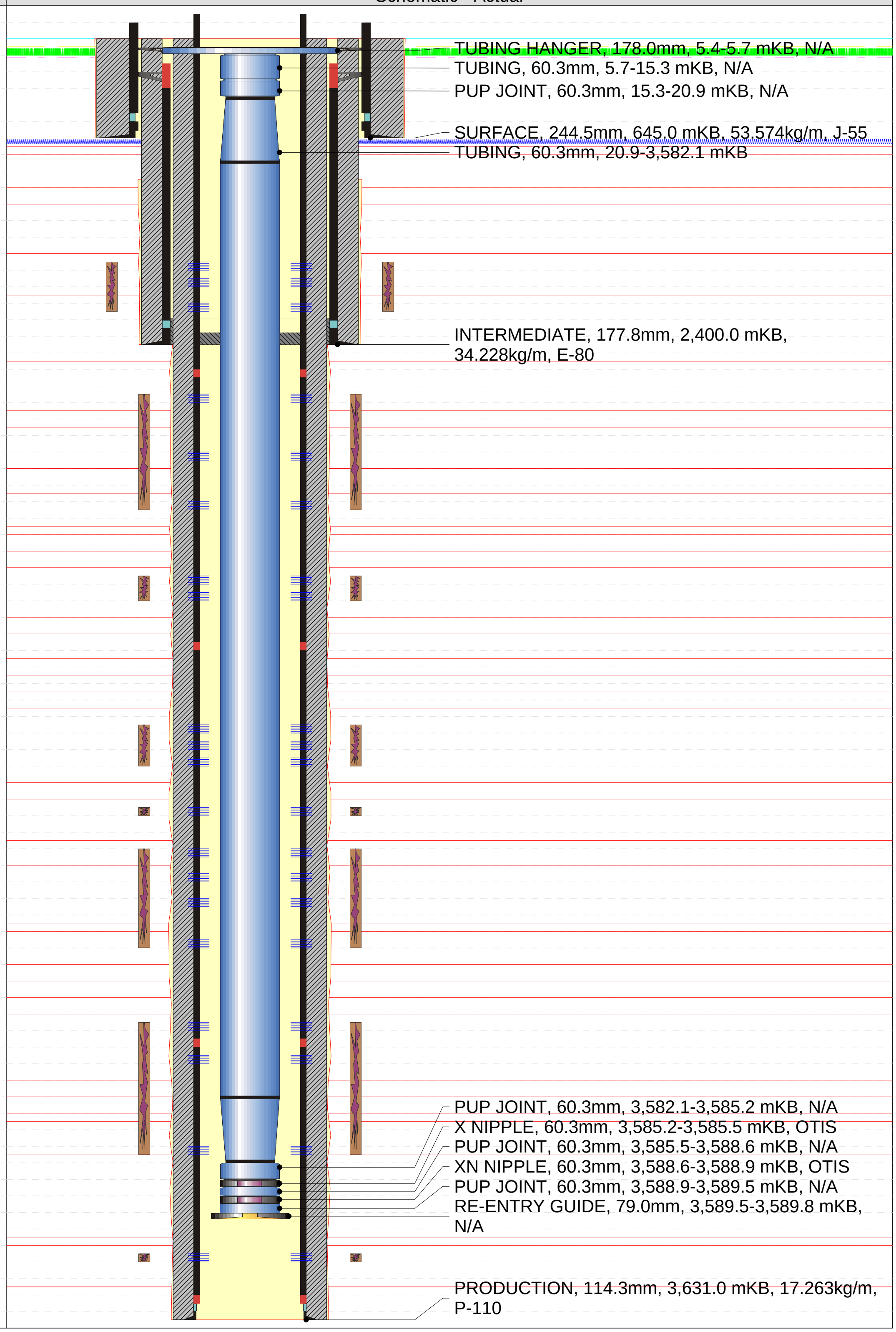
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | OPTIMIZATION | 2012-01-05 | |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:30:42 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -1 | |
| 6 | 6 |
| 17 | 17 |
| 633 | 609 |
| 1,898 | 1,845 |
| 2,175 | 2,122 |
| 2,265 | 2,212 |
| 2,315 | 2,262 |
| 2,330 | 2,277 |
| 2,385 | 2,332 |
| 2,801 | 2,748 |
| 2,878 | 2,825 |
| 2,891 | 2,838 |
| 2,903 | 2,850 |
| 2,913 | 2,860 |
| 2,948 | 2,895 |
| 3,042 | 2,989 |
| 3,139 | 3,086 |
| 3,160 | 3,107 |
| 3,194 | 3,141 |
| 3,211 | 3,158 |
| 3,256 | 3,203 |
| 3,281 | 3,228 |
| 3,316 | 3,263 |
| 3,340 | 3,287 |
| 3,383 | 3,329 |
| 3,389 | 3,336 |
| 3,396 | 3,343 |
| 3,408 | 3,354 |
| 3,447 | 3,394 |
| 3,487 | 3,434 |
| 3,497 | 3,444 |
| 3,506 | 3,453 |
| 3,543 | 3,490 |
| 3,578 | 3,525 |
| 3,585 | 3,532 |
| 3,590 | 3,536 |
| 3,604 | 3,551 |
| 3,615 | 3,562 |
| 3,630 | 3,577 |

Schematic - Actual



# Schematic - Current

**Well Name: ECA KAKWA 5-15-61-6**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/05-15-061-06W6/00 | LSD 9-16-61-6W6 | | KAKWA 9-16 | | KAKWA | 0421059 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 953.00 | 6.10 | 6.52 | 5.82 | 3,511.00 | SWEET | |

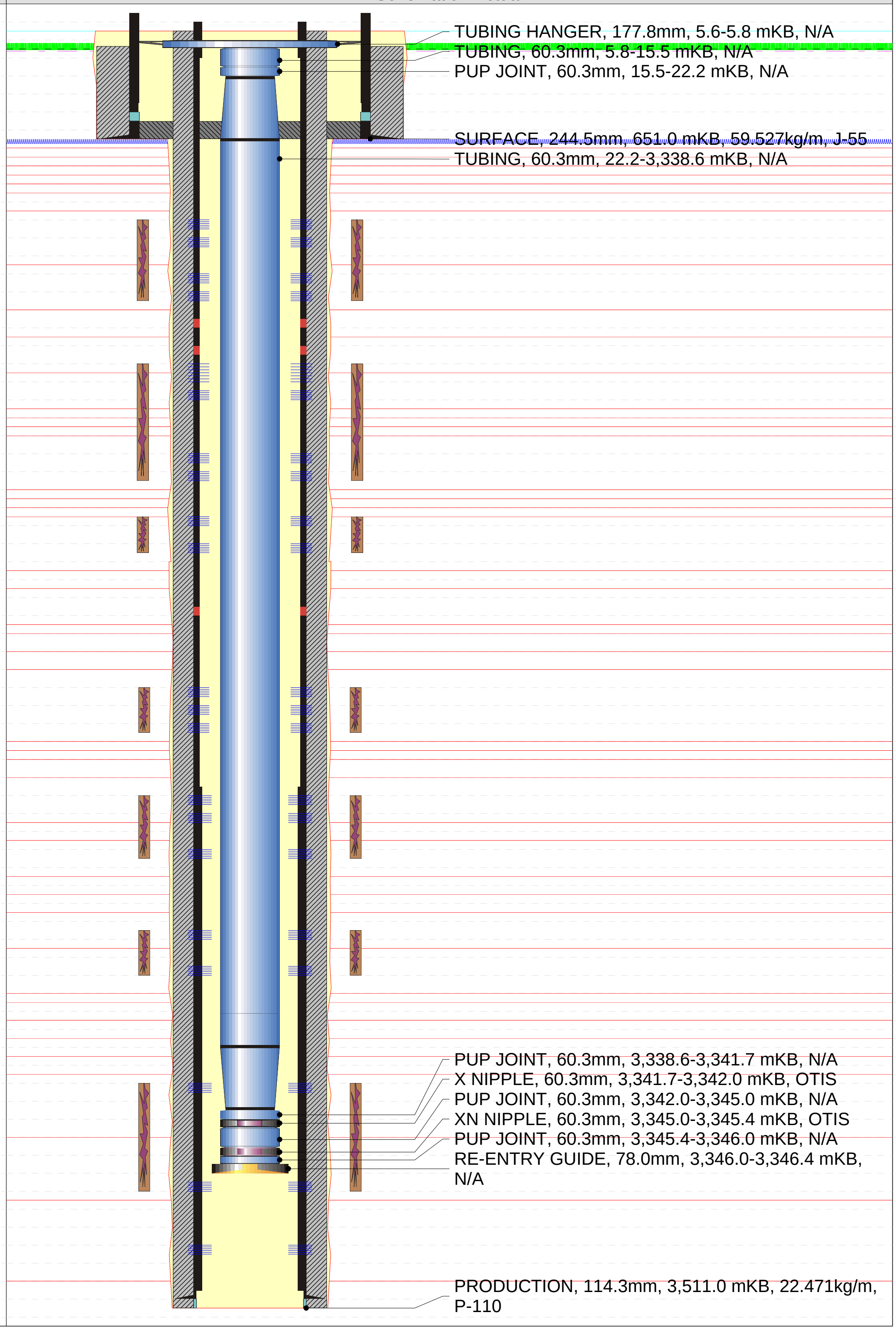
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | SPECIAL STUDY | 2011-10-24 | 2011-10-30 |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:31:36 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -1 | |
| 9 | |
| 171 | 171 |
| 651 | 625 |
| 1,712 | 1,617 |
| 2,040 | 1,944 |
| 2,065 | 1,969 |
| 2,073 | 1,977 |
| 2,082 | 1,986 |
| 2,592 | 2,496 |
| 2,612 | 2,516 |
| 2,630 | 2,534 |
| 2,658 | 2,562 |
| 2,680 | 2,584 |
| 2,878 | 2,782 |
| 2,897 | 2,801 |
| 2,916 | 2,820 |
| 2,958 | 2,862 |
| 3,001 | 2,905 |
| 3,032 | 2,936 |
| 3,065 | 2,969 |
| 3,124 | 3,028 |
| 3,139 | 3,042 |
| 3,145 | 3,049 |
| 3,173 | 3,077 |
| 3,218 | 3,122 |
| 3,228 | 3,132 |
| 3,247 | 3,151 |
| 3,283 | 3,187 |
| 3,316 | 3,220 |
| 3,334 | 3,238 |
| 3,343 | 3,247 |
| 3,346 | 3,250 |
| 3,355 | 3,259 |
| 3,439 | 3,343 |
| 3,506 | 3,410 |

Schematic - Actual



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# Schematic - Current

**Well Name: ECA KAKWA 15-24-61-6**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/15-24-061-06W6/00 | LSD 5-19-61-5W6 | | KAKWA 5-19 | | KAKWA | 0419259 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 1,058.77 | 5.80 | 5.65 | 4.96 | 3,596.00 | SWEET | |

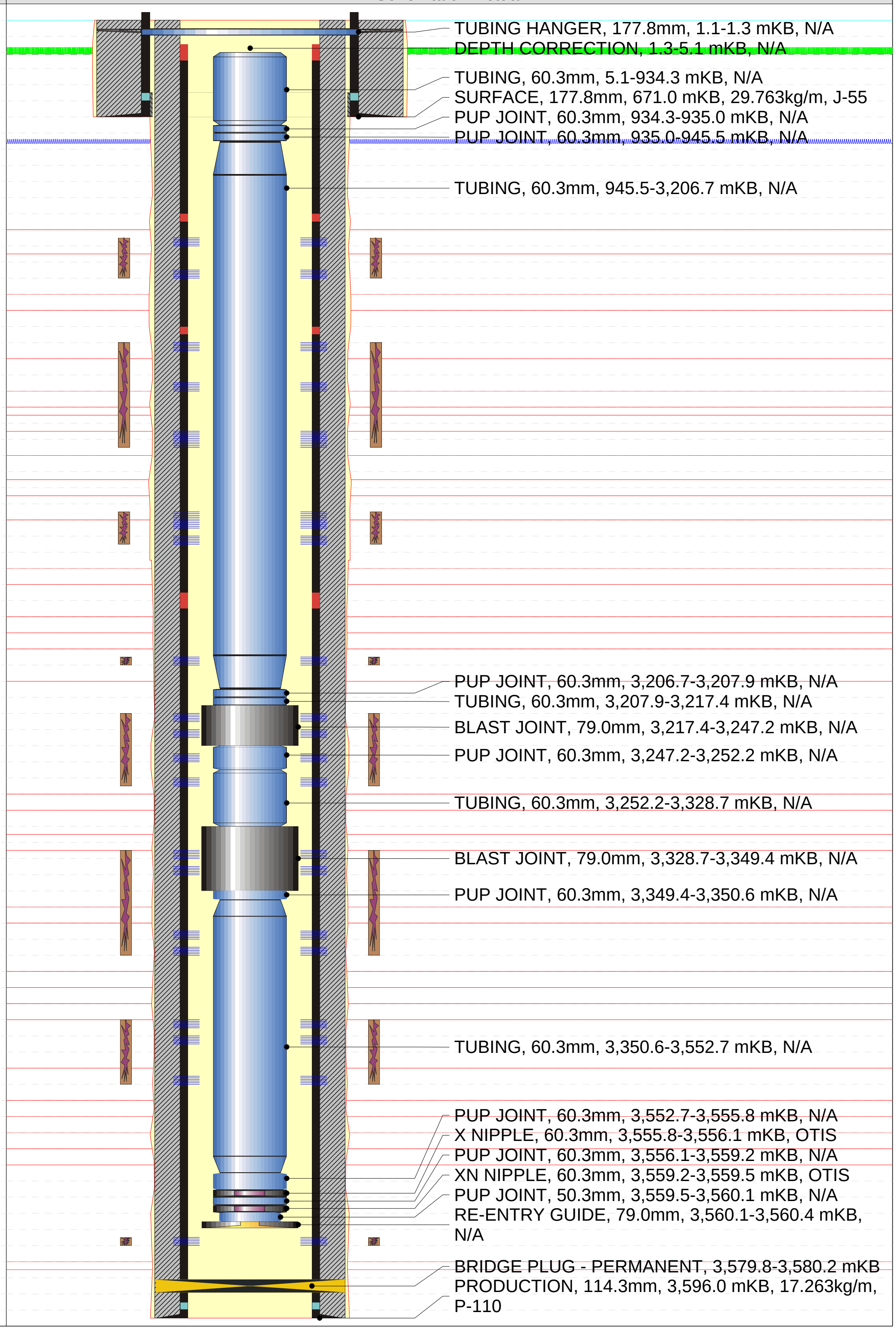
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | OPTIMIZATION | 2012-01-05 | |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:32:24 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| 0 | 0 |
| 5 | 0 |
| 148 | 148 |
| 671 | 620 |
| 1,338 | 1,170 |
| 1,969 | 1,707 |
| 2,264 | 1,997 |
| 2,298 | 2,031 |
| 2,321 | 2,054 |
| 2,760 | 2,493 |
| 2,835 | 2,568 |
| 2,845 | 2,578 |
| 2,862 | 2,595 |
| 2,882 | 2,614 |
| 2,997 | 2,730 |
| 3,083 | 2,816 |
| 3,103 | 2,836 |
| 3,122 | 2,855 |
| 3,151 | 2,884 |
| 3,169 | 2,902 |
| 3,190 | 2,922 |
| 3,208 | 2,940 |
| 3,235 | 2,968 |
| 3,251 | 2,983 |
| 3,277 | 3,010 |
| 3,329 | 3,061 |
| 3,339 | 3,072 |
| 3,349 | 3,082 |
| 3,359 | 3,092 |
| 3,371 | 3,103 |
| 3,407 | 3,139 |
| 3,439 | 3,171 |
| 3,456 | 3,188 |
| 3,466 | 3,198 |
| 3,492 | 3,224 |
| 3,524 | 3,256 |
| 3,555 | 3,287 |
| 3,560 | 3,292 |
| 3,563 | 3,295 |
| 3,580 | 3,312 |
| 3,595 | 3,328 |

Schematic - Actual



# Schematic - Current

**Well Name: ECA KAKWA 16-16-61-5**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/16-16-061-05W6/00 | LSD 10-16-61-5W6 | | KAKWA 10-16 | | KAKWA | 0421033 | AB |
| **Profile Type** | **Orig KB Elev (...** | **KB-Grd (m)** | **KB-CF (m)** | **KB-TH (m)** | **Total Depth (mKB)** | **Sour Class (Licensed)** | **Sour Status Date** |
| DEVIATED | 1,077.00 | 5.55 | 6.21 | 5.91 | 3,510.00 | SWEET | |

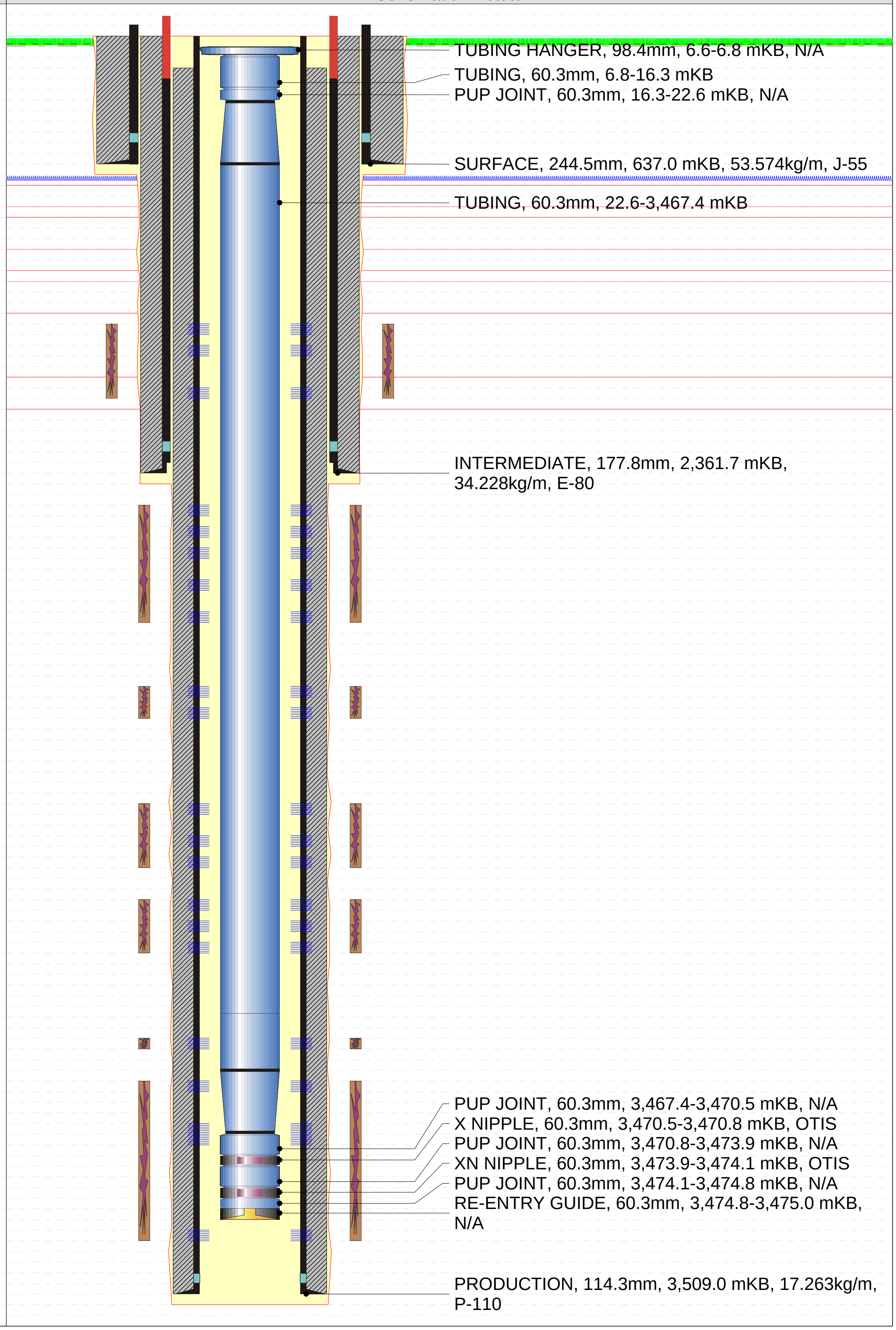
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | OPTIMIZATION | 2012-01-11 | |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:36:05 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -2 | |
| 0 | |
| 7 | |
| 9 | |
| 23 | |
| 149 | 149 |
| 625 | 601 |
| 637 | 611 |
| 1,443 | 1,316 |
| 1,897 | 1,716 |
| 1,944 | 1,758 |
| 2,067 | 1,871 |
| 2,178 | 1,978 |
| 2,212 | 2,010 |
| 2,252 | 2,049 |
| 2,277 | 2,073 |
| 2,281 | 2,077 |
| 2,292 | 2,088 |
| 2,295 | 2,090 |
| 2,324 | 2,119 |
| 2,348 | 2,142 |
| 2,361 | 2,155 |
| 2,379 | 2,173 |
| 2,771 | 2,565 |
| 2,787 | 2,581 |
| 2,789 | 2,583 |
| 2,794 | 2,588 |
| 2,800 | 2,594 |
| 2,806 | 2,600 |
| 2,811 | 2,605 |
| 2,838 | 2,632 |
| 2,955 | 2,749 |
| 3,010 | 2,804 |
| 3,022 | 2,816 |
| 3,038 | 2,832 |
| 3,071 | 2,865 |
| 3,107 | 2,901 |
| 3,147 | 2,941 |
| 3,159 | 2,953 |
| 3,170 | 2,964 |
| 3,189 | 2,983 |
| 3,245 | 3,039 |
| 3,256 | 3,050 |
| 3,262 | 3,056 |
| 3,275 | 3,069 |
| 3,294 | 3,088 |
| 3,324 | 3,118 |
| 3,367 | 3,161 |
| 3,380 | 3,174 |
| 3,399 | 3,193 |
| 3,424 | 3,218 |
| 3,433 | 3,227 |
| 3,467 | 3,261 |
| 3,468 | 3,262 |
| 3,471 | 3,265 |
| 3,474 | 3,268 |
| 3,475 | 3,269 |
| 3,476 | 3,270 |
| 3,494 | 3,288 |
| 3,508 | 3,302 |
| 3,509 | 3,303 |
| 3,513 | |

Schematic - Actual



# Schematic - Current

**Well Name: ECA RESTHA 2-11-60-3**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/02-11-060-03W6/00 | LSD 15-2-60-3W6 | | RESTHAVEN 15-2 | | RESTHAVEN | 0424163 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 1,253.00 | 6.13 | 6.69 | 6.02 | 3,446.50 | SWEET | |

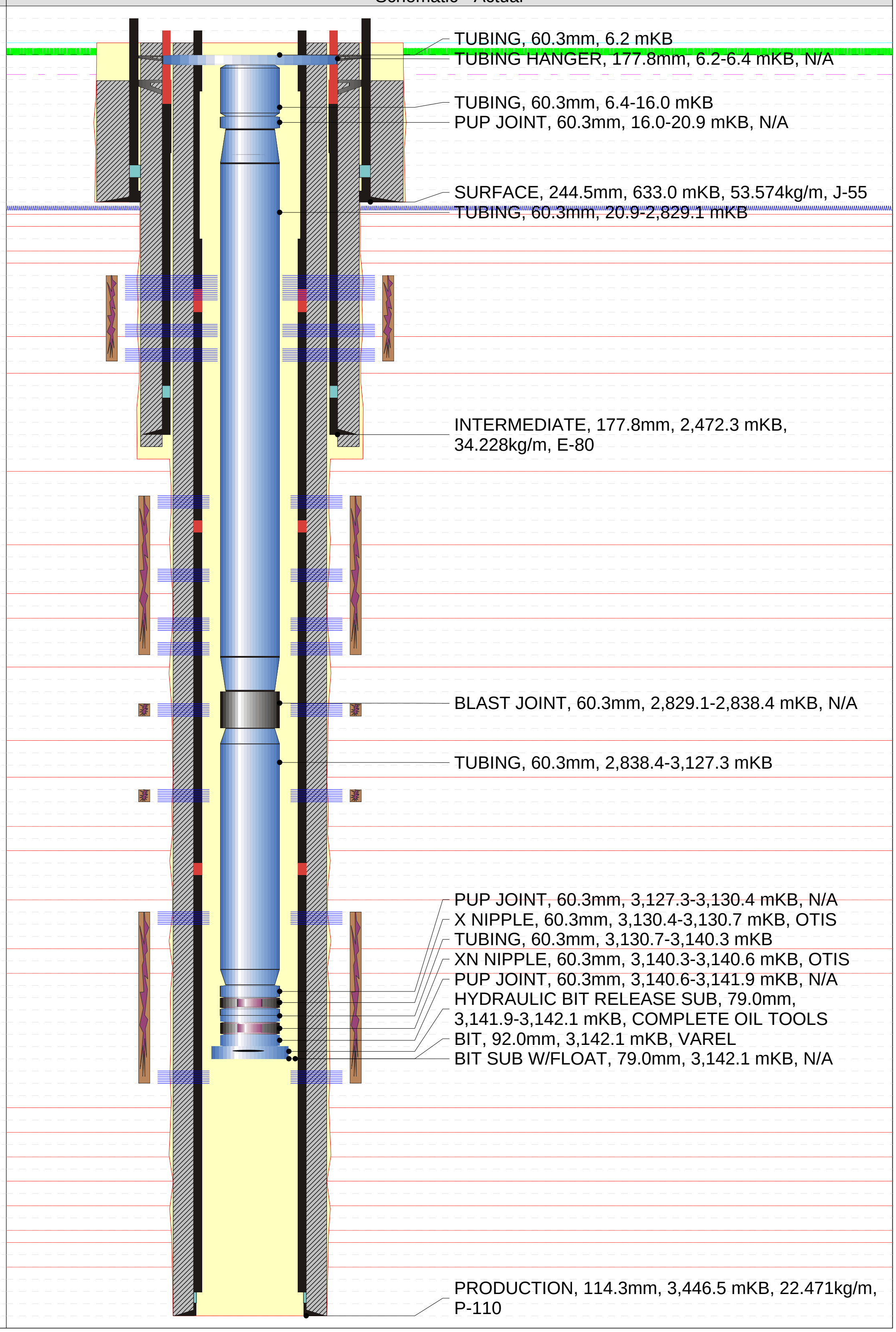
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | SPECIAL STUDY | 2012-03-06 | 2012-03-07 |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:37:27 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -1 | |
| 0 | |
| 6 | |
| 8 | |
| 16 | |
| 140 | 140 |
| 621 | 607 |
| 633 | 619 |
| 1,558 | 1,523 |
| 2,244 | 2,210 |
| 2,291 | 2,256 |
| 2,346 | 2,311 |
| 2,349 | 2,314 |
| 2,370 | 2,335 |
| 2,382 | 2,347 |
| 2,458 | 2,423 |
| 2,468 | 2,433 |
| 2,472 | 2,438 |
| 2,481 | 2,446 |
| 2,743 | 2,708 |
| 2,766 | 2,731 |
| 2,770 | 2,735 |
| 2,797 | 2,762 |
| 2,806 | 2,771 |
| 2,810 | 2,775 |
| 2,813 | 2,778 |
| 2,816 | 2,781 |
| 2,826 | 2,791 |
| 2,834 | 2,799 |
| 2,838 | 2,803 |
| 2,938 | 2,903 |
| 2,997 | 2,962 |
| 3,004 | 2,969 |
| 3,014 | 2,979 |
| 3,020 | 2,985 |
| 3,027 | 2,992 |
| 3,051 | 3,016 |
| 3,078 | 3,043 |
| 3,088 | 3,053 |
| 3,107 | 3,072 |
| 3,130 | 3,095 |
| 3,140 | 3,105 |
| 3,142 | 3,107 |
| 3,143 | 3,108 |
| 3,151 | 3,116 |
| 3,162 | 3,127 |
| 3,210 | 3,175 |
| 3,243 | 3,208 |
| 3,302 | 3,267 |
| 3,315 | 3,280 |
| 3,423 | 3,388 |
| 3,433 | 3,398 |
| 3,445 | 3,410 |
| 3,447 | 3,411 |

Schematic - Actual



# Schematic - Current

**Well Name: ECA ECOG RESTHA 7-2-60-2**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/07-02-060-02W6/00 | LSD 12-1-60-2W6 | | RESTHAVEN 12-1 | | RESTHAVEN | 0410475 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 1,283.00 | 6.30 | 7.30 | 6.30 | 3,468.00 | SWEET | |

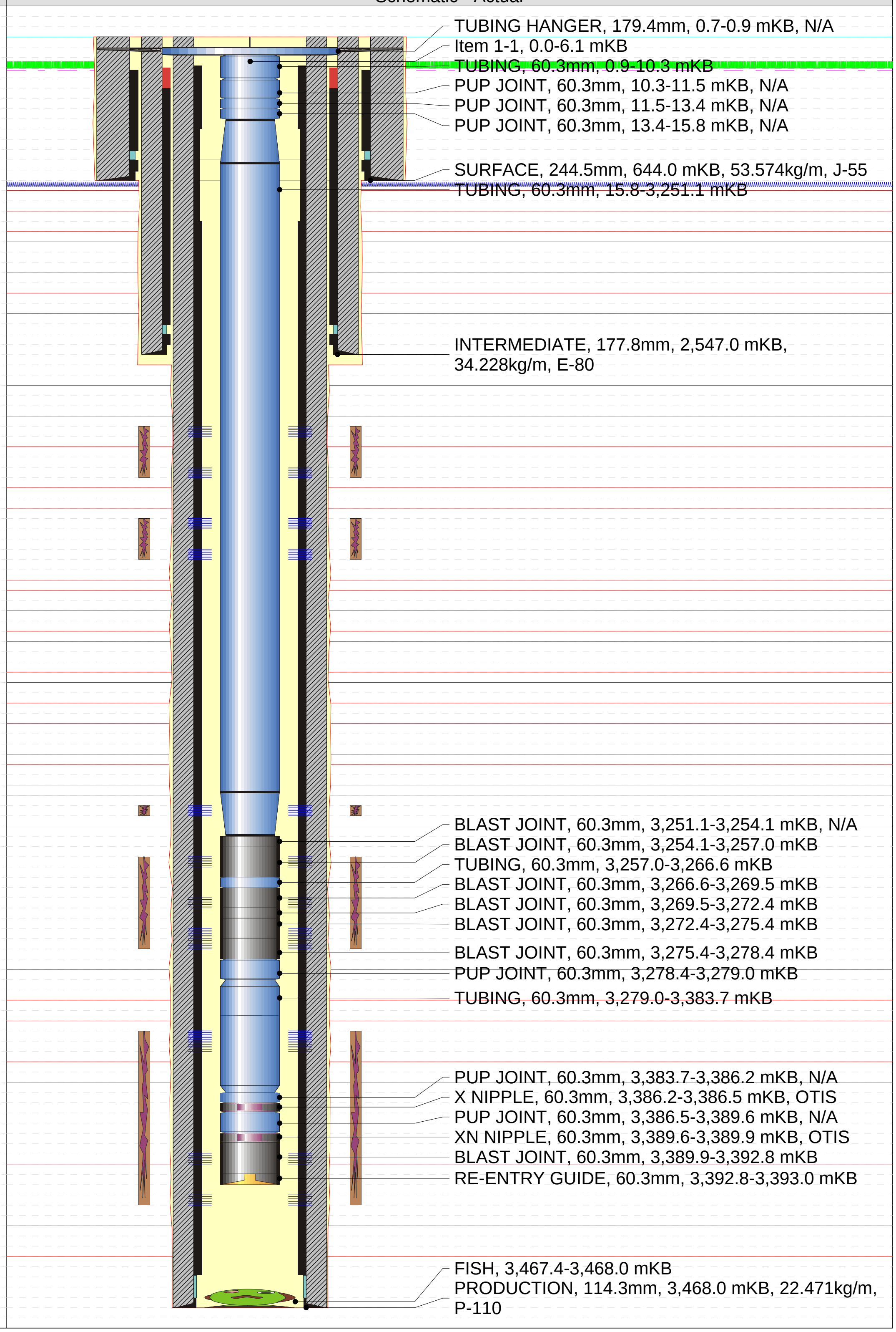
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | SPECIAL STUDY | 2011-12-13 | 2011-12-15 |

Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:38:13 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| -2 | |
| 0 | 0 |
| 1 | 1 |
| 10 | 10 |
| 12 | 11 |
| 16 | 16 |
| 147 | 147 |
| 630 | 602 |
| 644 | 614 |
| 1,724 | 1,605 |
| 2,248 | 2,114 |
| 2,335 | 2,201 |
| 2,399 | 2,265 |
| 2,432 | 2,298 |
| 2,461 | 2,327 |
| 2,533 | 2,399 |
| 2,547 | 2,412 |
| 2,553 | 2,419 |
| 2,797 | 2,663 |
| 2,843 | 2,709 |
| 2,849 | 2,715 |
| 2,851 | 2,717 |
| 2,856 | 2,722 |
| 2,859 | 2,725 |
| 2,874 | 2,740 |
| 2,878 | 2,744 |
| 2,882 | 2,748 |
| 2,888 | 2,754 |
| 2,893 | 2,759 |
| 2,949 | 2,815 |
| 2,970 | 2,836 |
| 3,022 | 2,888 |
| 3,028 | 2,893 |
| 3,044 | 2,910 |
| 3,048 | 2,914 |
| 3,087 | 2,953 |
| 3,115 | 2,980 |
| 3,142 | 3,008 |
| 3,205 | 3,071 |
| 3,221 | 3,087 |
| 3,251 | 3,117 |
| 3,255 | 3,121 |
| 3,257 | 3,123 |
| 3,268 | 3,134 |
| 3,272 | 3,138 |
| 3,275 | 3,141 |
| 3,278 | 3,144 |
| 3,279 | 3,145 |
| 3,332 | 3,198 |
| 3,345 | 3,211 |
| 3,353 | 3,219 |
| 3,358 | 3,224 |
| 3,377 | 3,243 |
| 3,386 | 3,252 |
| 3,388 | 3,254 |
| 3,390 | 3,256 |
| 3,392 | 3,258 |
| 3,393 | 3,259 |
| 3,395 | 3,261 |
| 3,406 | 3,272 |
| 3,456 | 3,322 |
| 3,467 | 3,333 |
| 3,467 | 3,333 |
| 3,468 | 3,334 |

Schematic - Actual



# Schematic - Current

**Well Name: ECA ECOG RESTHA 9-27-59-2**

| Bottom Hole UWI | Surface Legal Location | | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|---|
| 100/09-27-059-02W6/00 | LSD 4-35-59-2W6 | | SMOKY 2-34 | | RESTHAVEN | 0413133 | AB |
| Profile Type | Orig KB Elev (... | KB-Grd (m) | KB-CF (m) | KB-TH (m) | Total Depth (mKB) | Sour Class (Licensed) | Sour Status Date |
| DEVIATED | 1,305.00 | 6.00 | 6.00 | 5.50 | 3,644.00 | SWEET | |

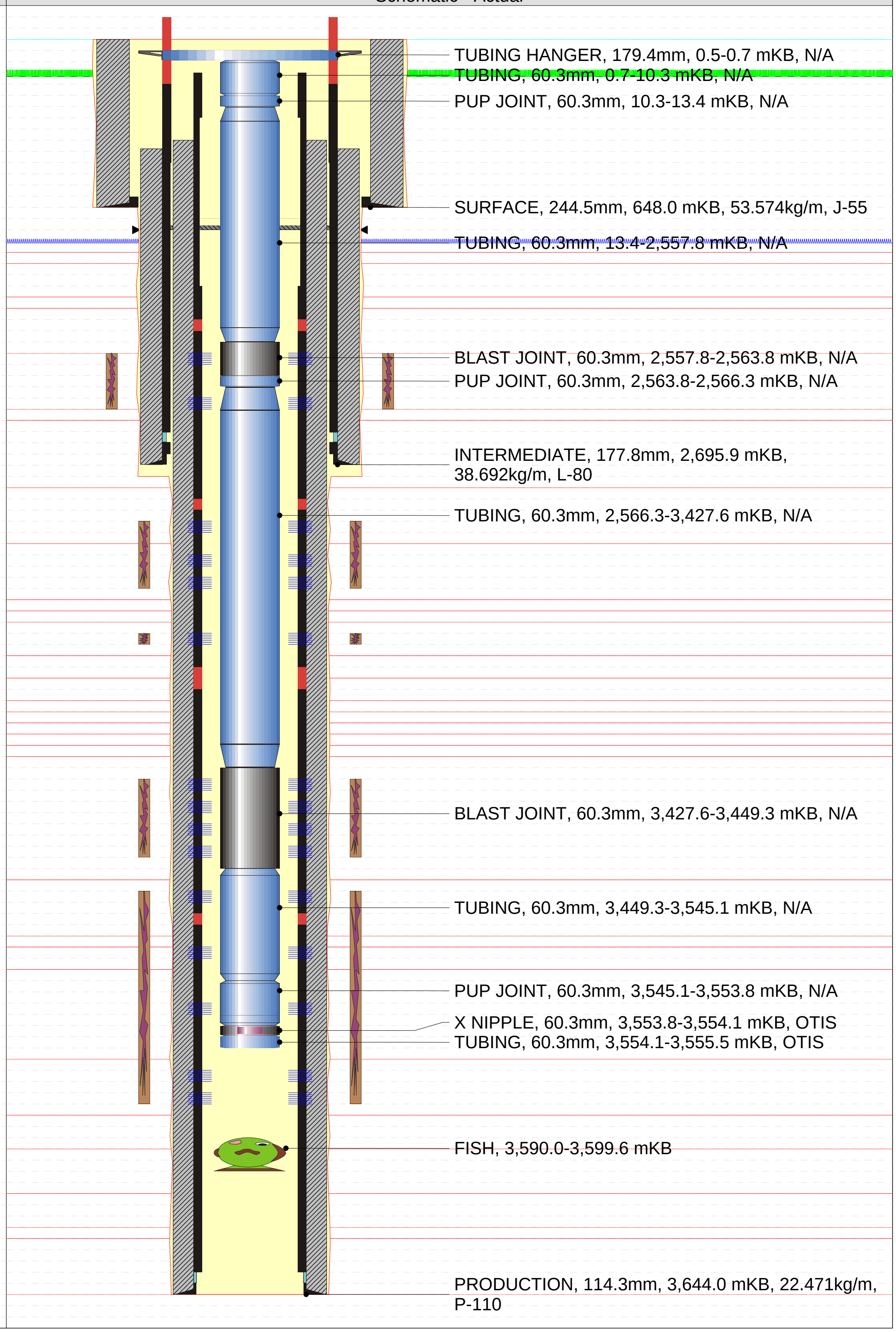
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| WORKOVER | SPECIAL STUDY | 2012-03-07 | 2012-03-08 |

Profile Type: DEVIATED - ST 1, 2012-04-27 3:26:20 PM

| mKB (MD) | mKB (TVD) |
|---|---|
| -1 | |
| 0 | 0 |
| 1 | 1 |
| 9 | 9 |
| 13 | 13 |
| 157 | 157 |
| 583 | 554 |
| 634 | 599 |
| 648 | 610 |
| 690 | 648 |
| 1,152 | 1,058 |
| 2,285 | 2,070 |
| 2,389 | 2,171 |
| 2,514 | 2,295 |
| 2,557 | 2,337 |
| 2,560 | 2,341 |
| 2,564 | 2,345 |
| 2,598 | 2,379 |
| 2,625 | 2,406 |
| 2,682 | 2,463 |
| 2,696 | 2,477 |
| 2,967 | 2,748 |
| 2,978 | 2,759 |
| 3,018 | 2,799 |
| 3,023 | 2,803 |
| 3,050 | 2,831 |
| 3,148 | 2,929 |
| 3,200 | 2,981 |
| 3,205 | 2,986 |
| 3,219 | 2,999 |
| 3,222 | 3,002 |
| 3,280 | 3,061 |
| 3,348 | 3,129 |
| 3,410 | 3,191 |
| 3,430 | 3,211 |
| 3,437 | 3,218 |
| 3,442 | 3,223 |
| 3,446 | 3,227 |
| 3,449 | 3,230 |
| 3,493 | 3,274 |
| 3,501 | 3,281 |
| 3,505 | 3,286 |
| 3,525 | 3,306 |
| 3,545 | 3,326 |
| 3,551 | 3,331 |
| 3,554 | 3,334 |
| 3,556 | 3,336 |
| 3,560 | 3,340 |
| 3,566 | 3,346 |
| 3,575 | 3,355 |
| 3,590 | 3,370 |
| 3,596 | 3,376 |
| 3,605 | 3,385 |
| 3,618 | 3,398 |
| 3,622 | 3,402 |
| 3,630 | 3,411 |
| 3,643 | 3,423 |
| 3,644 | 3,424 |
| 3,661 | |

Schematic - Actual



# Schematic - Current

**Well Name: ECA SMOKY 2-10-59-2**

| Bottom Hole UWI | Surface Legal Location | Pad | | Field Name | License # | State/Province |
|---|---|---|---|---|---|---|
| 100/02-10-059-02W6/00 | LSD 8-10-59-2W6 | RESTHAVEN 8-10 | | SMOKY | 0427629 | AB |
| **Profile Type** | **Orig KB Elev (... / KB-Grd (m)** | **KB-CF (m)** | **KB-TH (m)** | **Total Depth (mKB)** | **Sour Class (Licensed)** | **Sour Status Date** |
| DEVIATED | 1,288.10 / 5.80 | 6.32 | 5.72 | 3,562.00 | SWEET | |

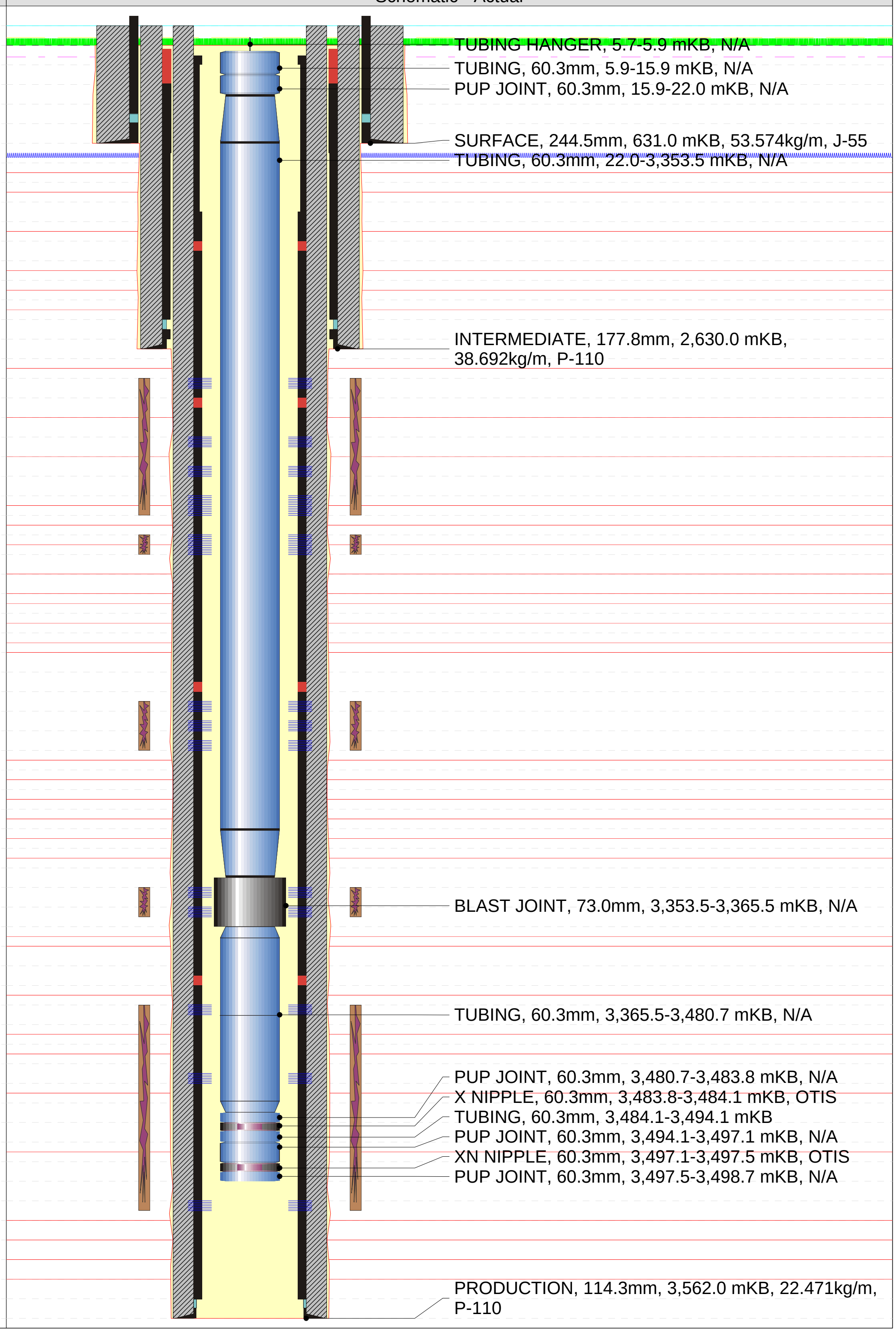
**Most Recent Job**

| Job Category | Type | Job Start Date | Job End Date |
|---|---|---|---|
| COMPLETION | ORIGINAL | 2011-11-21 | 2012-02-23 |

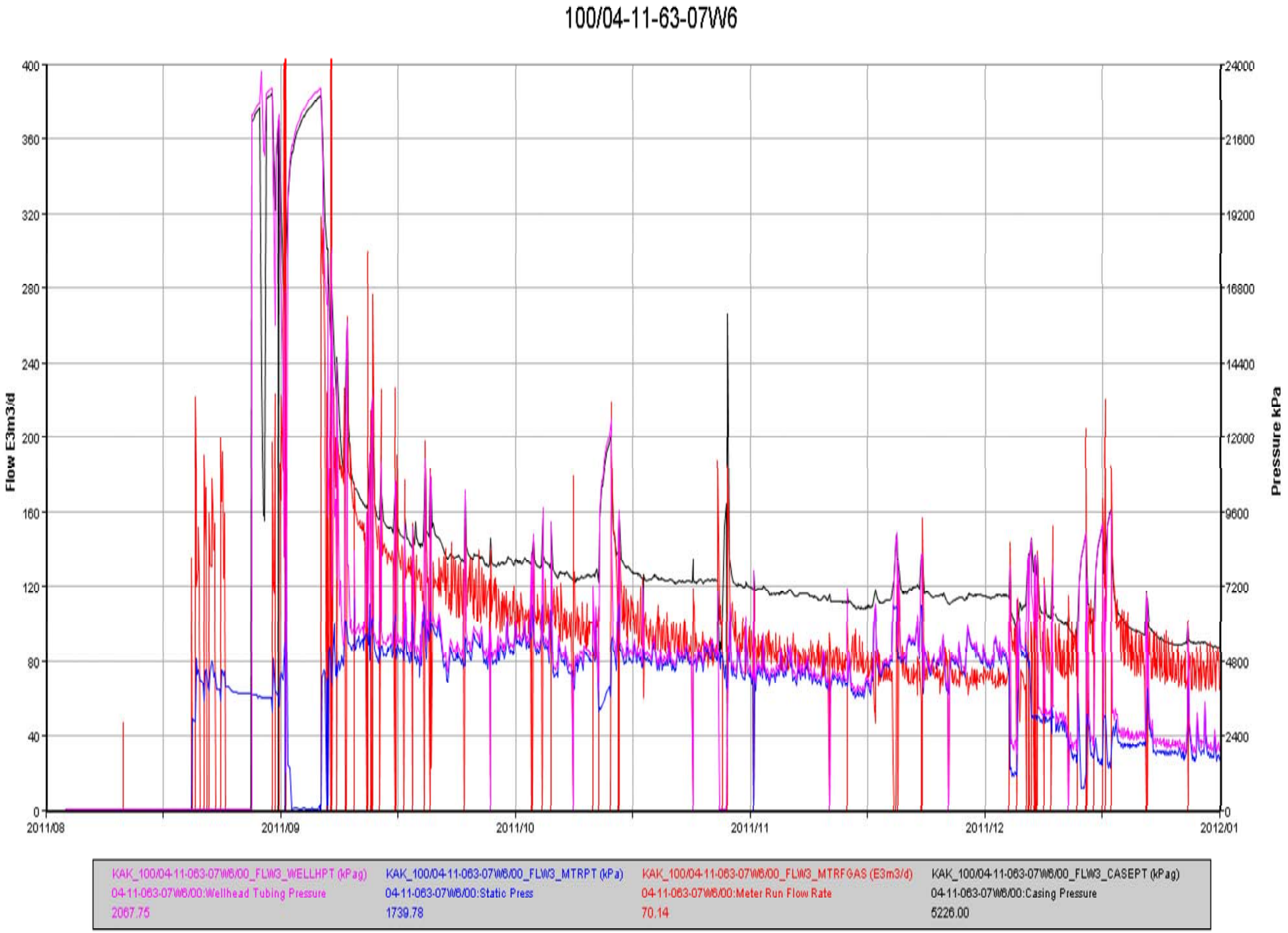
Profile Type: DEVIATED - ORIGINAL HOLE, 2012-04-05 8:41:32 AM

| mKB (MD) | mKB (TVD) |
|---|---|
| 0 | 0 |
| 8 | 8 |
| 149 | 149 |
| 631 | 613 |
| 2,163 | 2,083 |
| 2,411 | 2,331 |
| 2,489 | 2,409 |
| 2,538 | 2,458 |
| 2,629 | 2,549 |
| 2,908 | 2,828 |
| 2,933 | 2,853 |
| 2,948 | 2,868 |
| 2,959 | 2,879 |
| 2,980 | 2,900 |
| 3,048 | 2,968 |
| 3,126 | 3,046 |
| 3,144 | 3,064 |
| 3,161 | 3,081 |
| 3,169 | 3,088 |
| 3,186 | 3,106 |
| 3,238 | 3,158 |
| 3,300 | 3,220 |
| 3,354 | 3,274 |
| 3,366 | 3,285 |
| 3,382 | 3,302 |
| 3,422 | 3,342 |
| 3,445 | 3,365 |
| 3,465 | 3,384 |
| 3,484 | 3,404 |
| 3,497 | 3,417 |
| 3,500 | 3,420 |
| 3,522 | 3,442 |
| 3,548 | 3,468 |

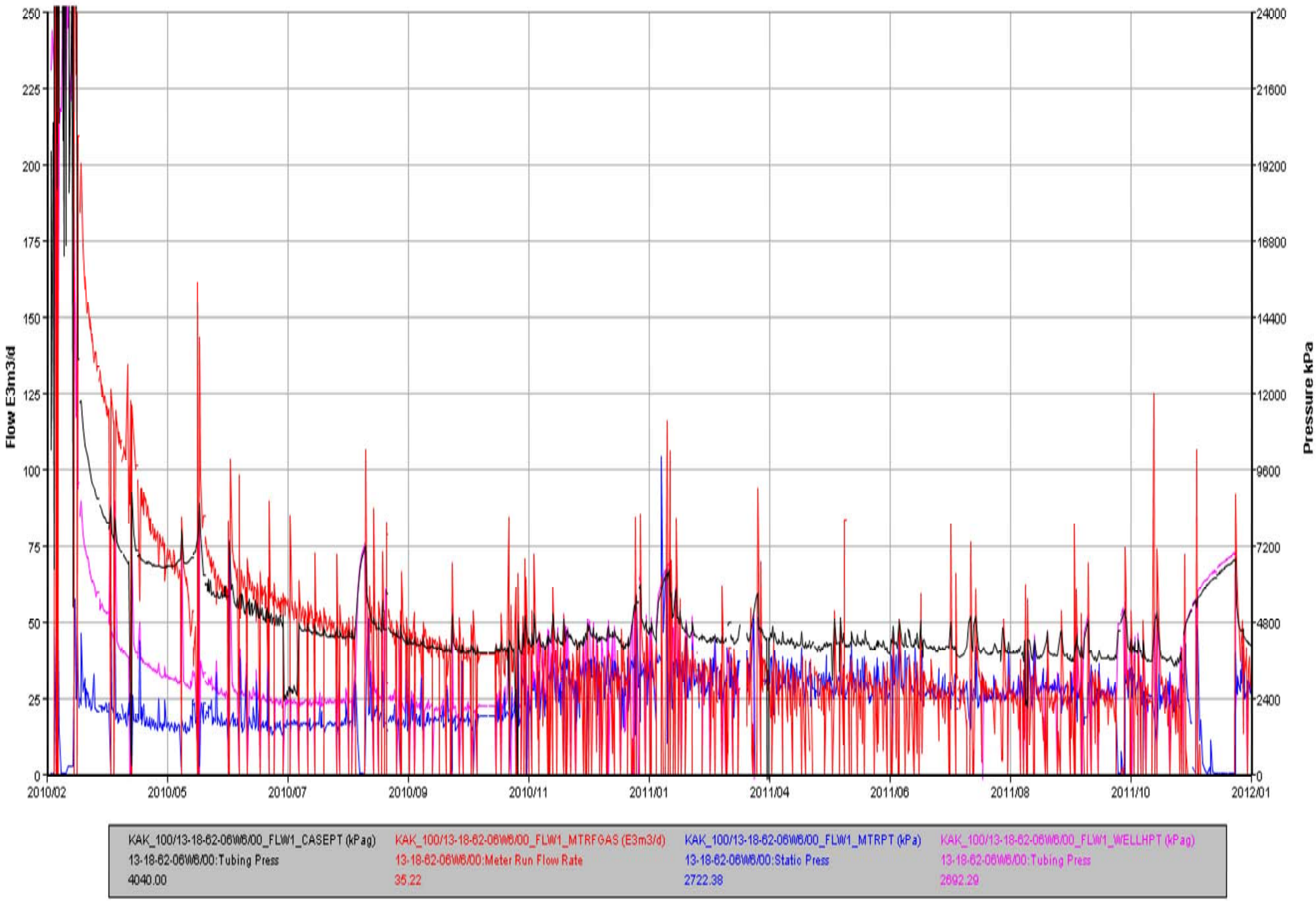
Schematic - Actual

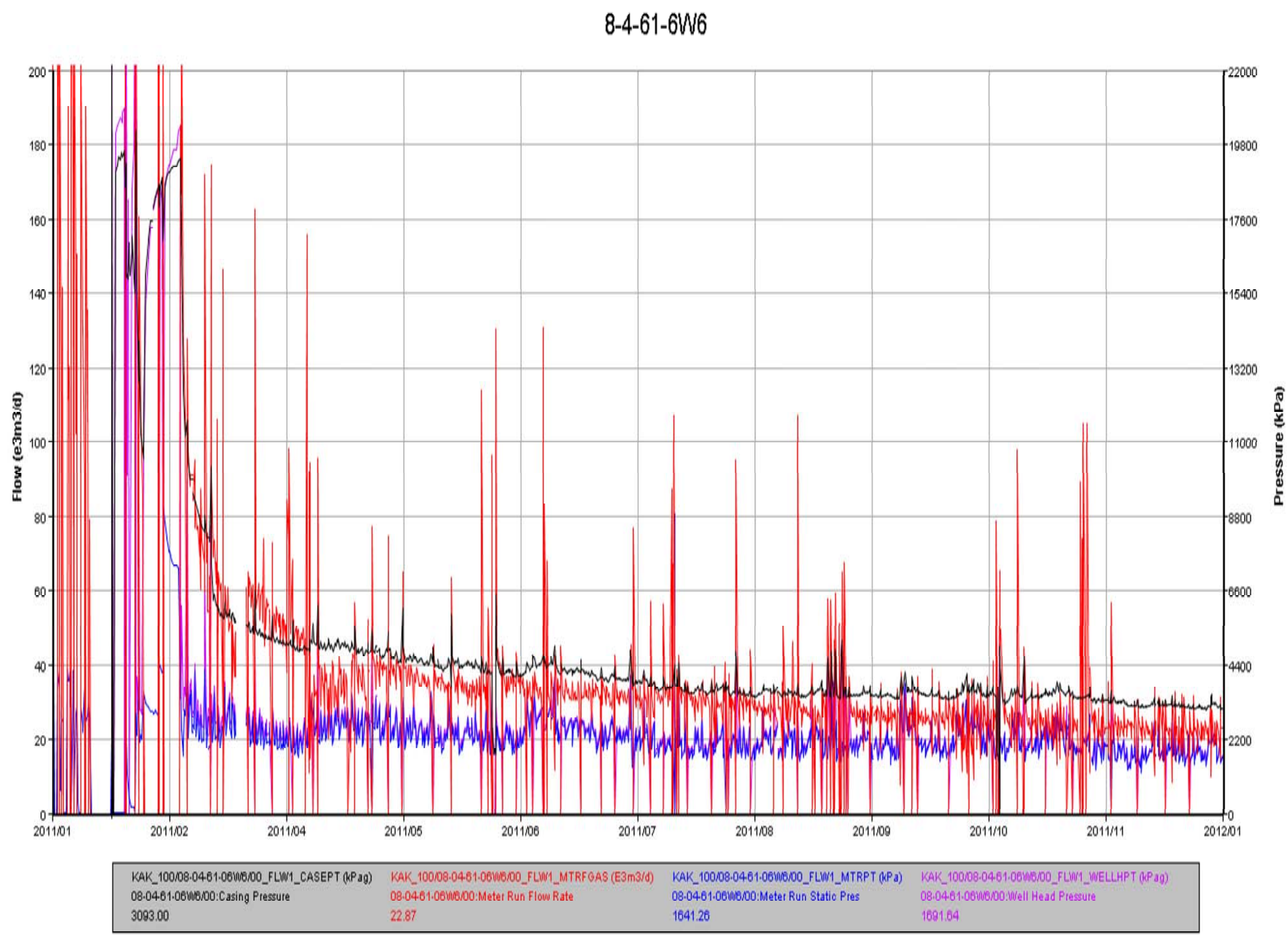


## Appendix E - IETP 05-081 ProcessNet Production and Pressure Plots

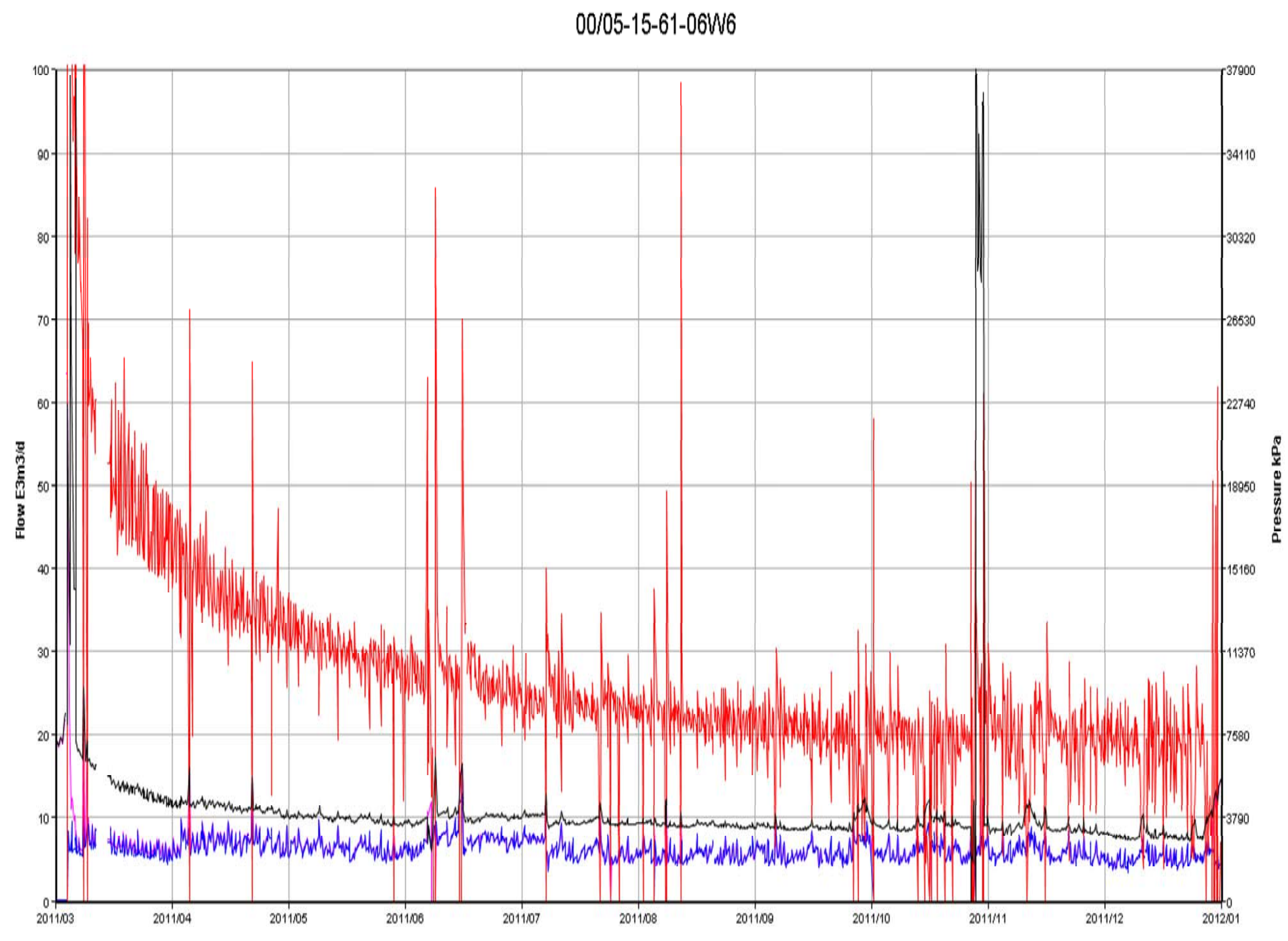

100/04-11-63-07W6
Flow E3m3/d
Pressure kPa
400
360
320
280
240
200
160
120
80
40
0
24000
21600
19200
16800
14400
12000
9600
7200
4800
2400
0
2011/08
2011/09
2011/10
2011/11
2011/12
2012/01
KAK_100/04-11-063-07W6/00_FLW3_WELLHPT (kPag)
04-11-063-07W6/00:Wellhead Tubing Pressure
2067.75
KAK_100/04-11-063-07W6/00_FLW3_MTRPT (kPa)
04-11-063-07W6/00:Static Press
1739.78
KAK_100/04-11-063-07W6/00_FLW3_MTRFGAS (E3m3/d)
04-11-063-07W6/00:Meter Run Flow Rate
70.14
KAK_100/04-11-063-07W6/00_FLW3_CASEPT (kPag)
04-11-063-07W6/00:Casing Pressure
5226.00

100/13-18-62-06W6

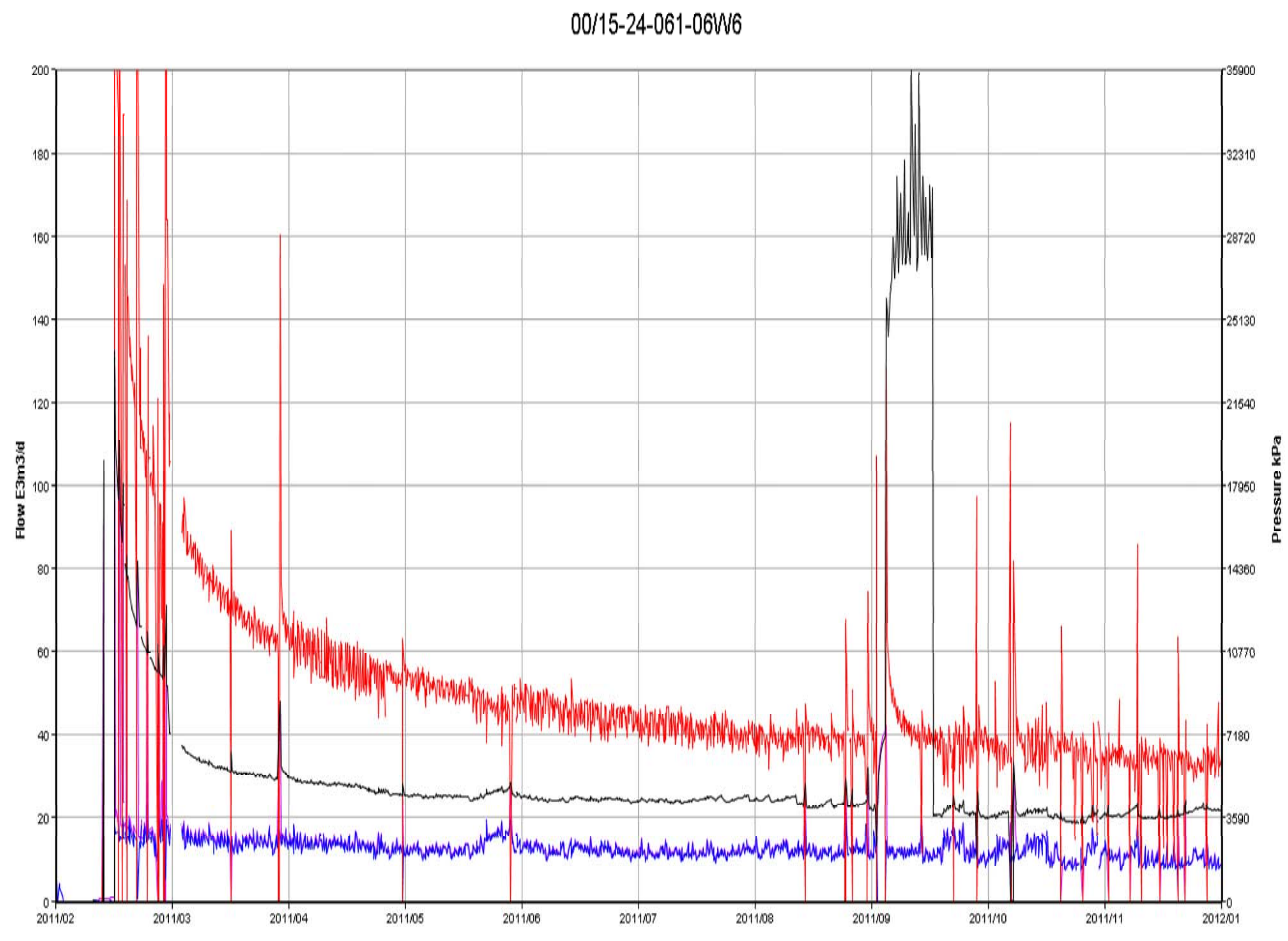




8-4-61-6W6
Flow (e3m3/d)
Pressure (kPa)
200
180
160
140
120
100
80
60
40
20
0
22000
19800
17600
15400
13200
11000
8800
6600
4400
2200
0
2011/01
2011/02
2011/04
2011/05
2011/06
2011/07
2011/08
2011/09
2011/10
2011/11
2012/01
KAK_100/08-04-61-06W6/00_FLW1_CASEPT (kPag)
08-04-61-06W6/00:Casing Pressure
3093.00
KAK_100/08-04-61-06W6/00_FLW1_MTRFGAS (E3m3/d)
08-04-61-06W6/00:Meter Run Flow Rate
22.87
KAK_100/08-04-61-06W6/00_FLW1_MTRPT (kPa)
08-04-61-06W6/00:Meter Run Static Pres
1641.26
KAK_100/08-04-61-06W6/00_FLW1_WELLHPT (kPag)
08-04-61-06W6/00:Well Head Pressure
1691.64

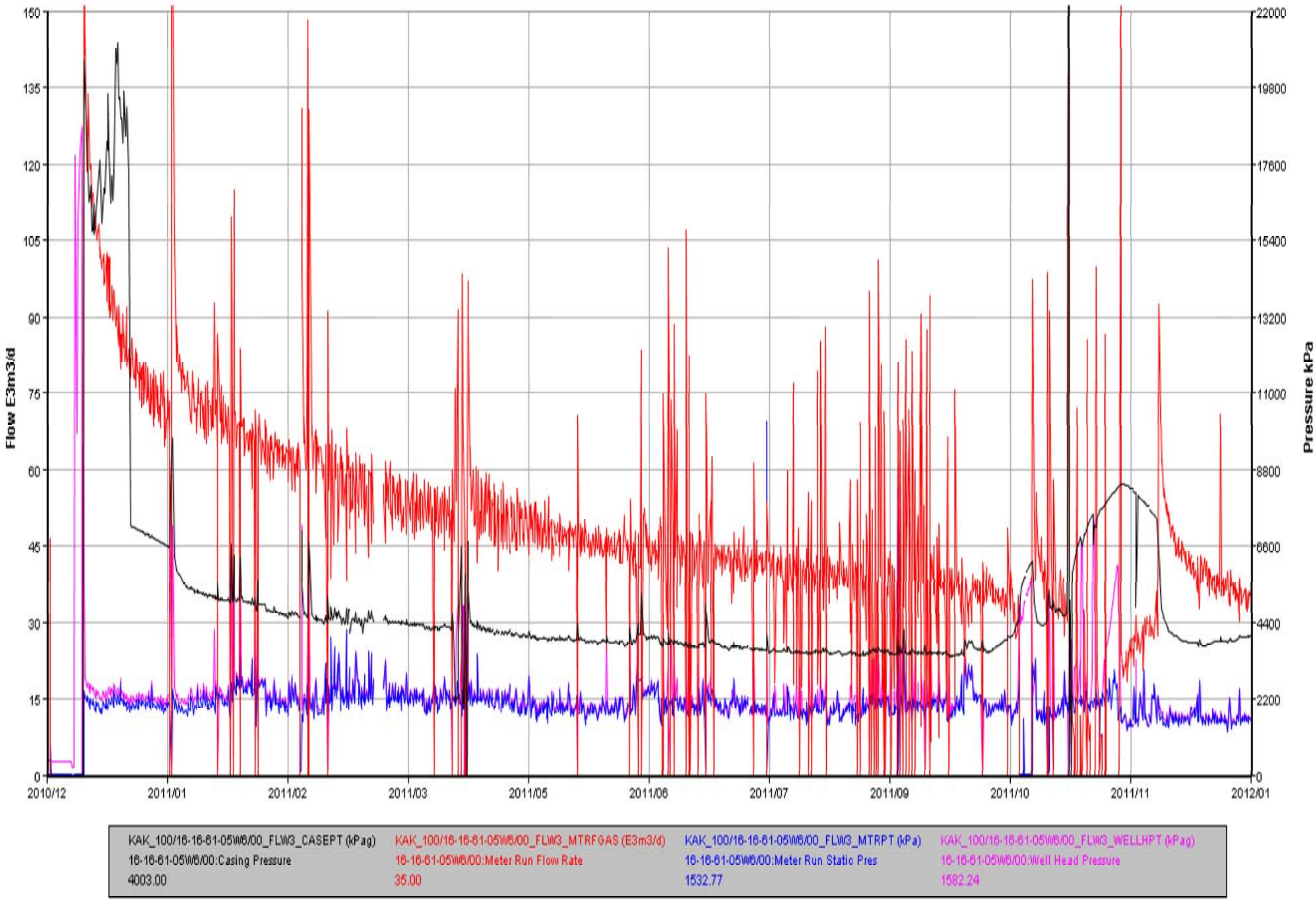


00/05-15-61-06W6
Flow E3m3/d
Pressure kPa
100
90
80
70
60
50
40
30
20
10
0
37900
34110
30320
26530
22740
18950
15160
11370
7580
3790
0
2011/03
2011/04
2011/05
2011/06
2011/07
2011/08
2011/09
2011/10
2011/11
2011/12
2012/01

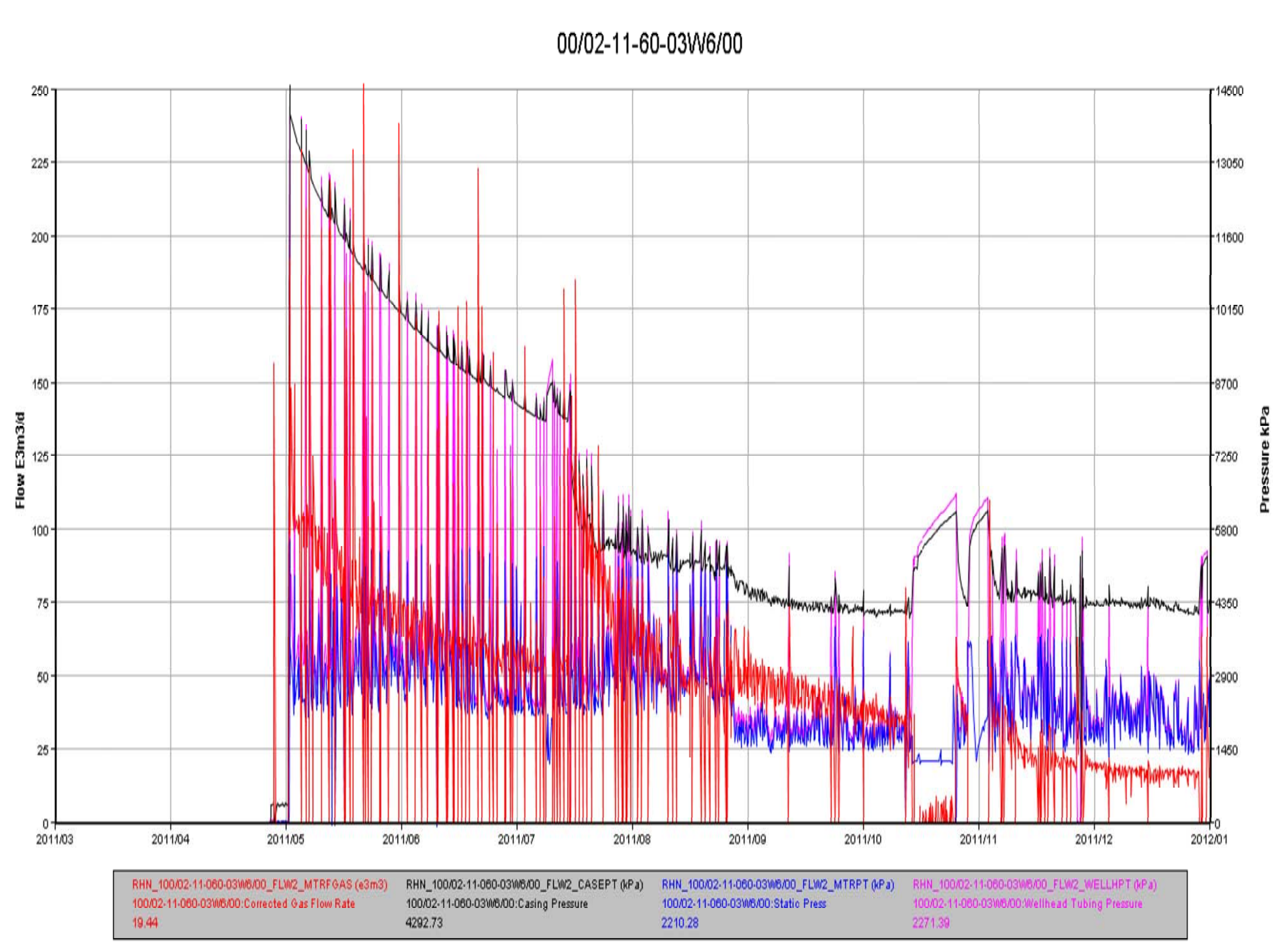


00/15-24-061-06W6
Flow E3m3/d
Pressure kPa
200
180
160
140
120
100
80
60
40
20
0
35900
32310
28720
25130
21540
17950
14360
10770
7180
3590
0
2011/02
2011/03
2011/04
2011/05
2011/06
2011/07
2011/08
2011/09
2011/10
2011/11
2012/01

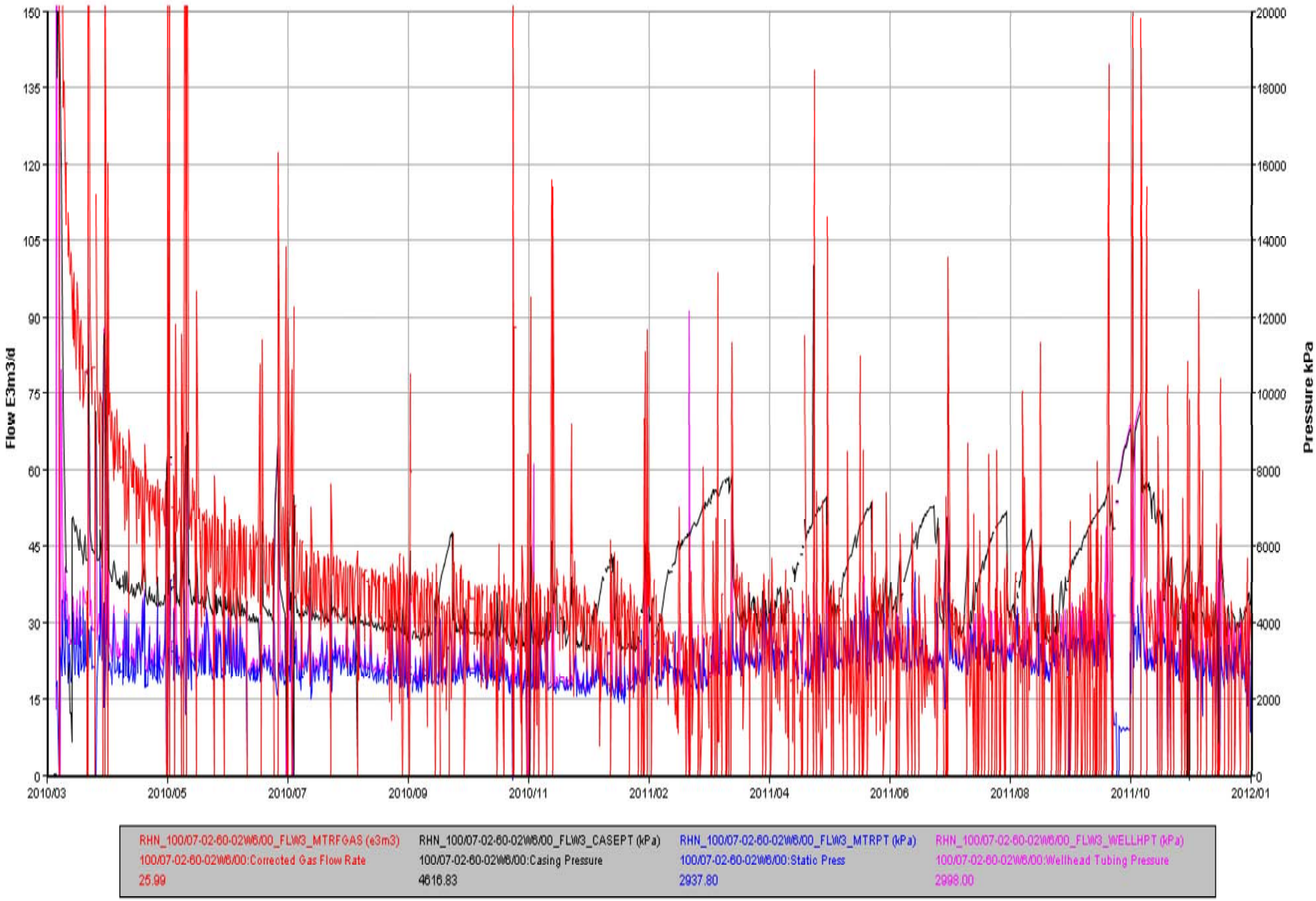
# 16-16-61-05W6



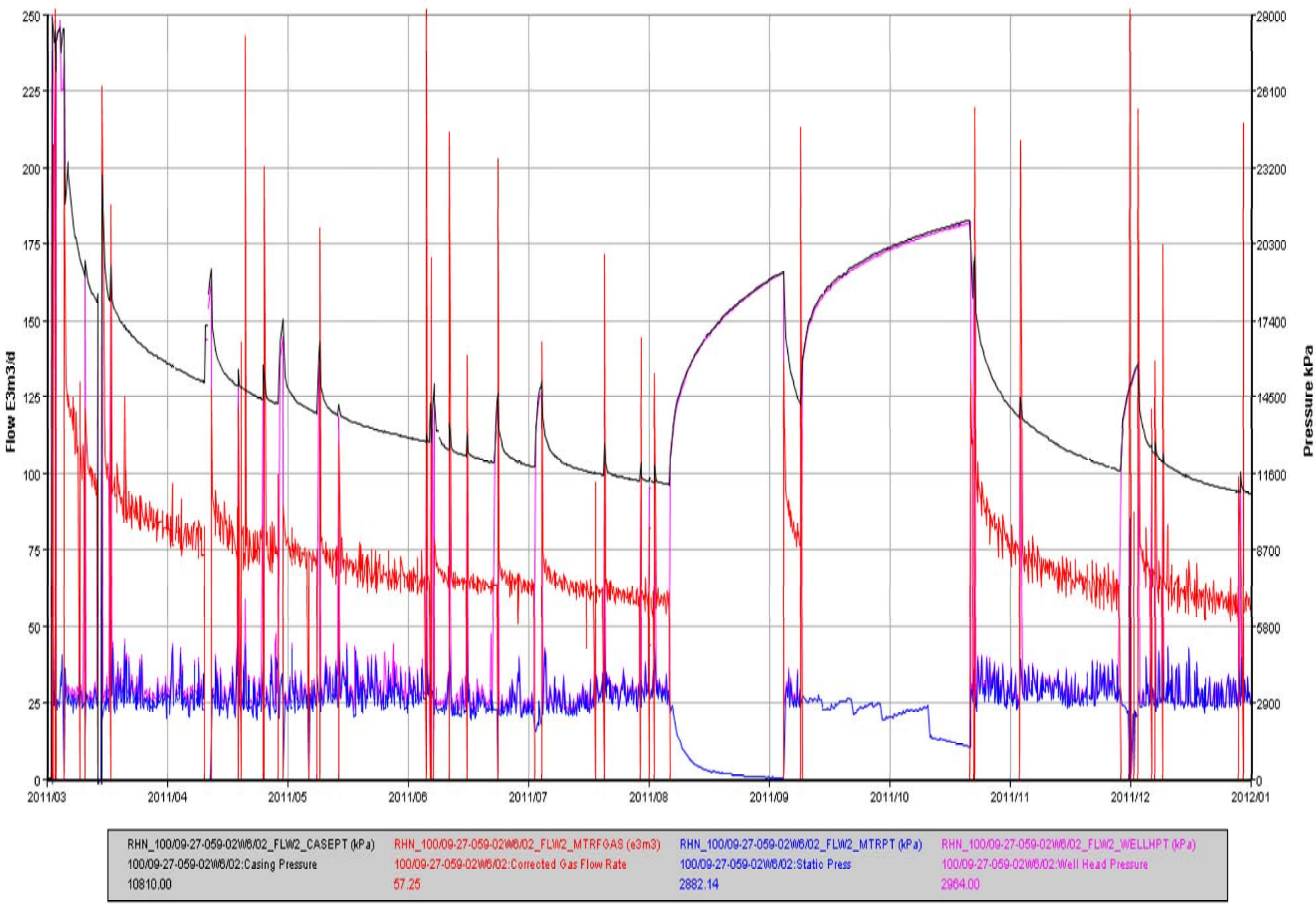
Flow E3m3/d
Pressure kPa
150
135
120
105
90
75
60
45
30
15
0
22000
19800
17600
15400
13200
11000
8800
6600
4400
2200
0
2010/12
2011/01
2011/02
2011/03
2011/05
2011/06
2011/07
2011/09
2011/10
2011/11
2012/01
KAK_100/16-16-61-05W6/00_FLW3_CASEPT (kPag)
16-16-61-05W6/00:Casing Pressure
4003.00
KAK_100/16-16-61-05W6/00_FLW3_MTRFGAS (E3m3/d)
16-16-61-05W6/00:Meter Run Flow Rate
35.00
KAK_100/16-16-61-05W6/00_FLW3_MTRPT (kPa)
16-16-61-05W6/00:Meter Run Static Pres
1532.77
KAK_100/16-16-61-05W6/00_FLW3_WELLHPT (kPag)
16-16-61-05W6/00:Well Head Pressure
1582.24


00/02-11-60-03W6/00
Flow E3m3/d
Pressure kPa
250
225
200
175
150
125
100
75
50
25
0
14500
13050
11600
10150
8700
7250
5800
4350
2900
1450
0
2011/03
2011/04
2011/05
2011/06
2011/07
2011/08
2011/09
2011/10
2011/11
2011/12
2012/01
RHN_100/02-11-060-03W6/00_FLW2_MTRFGAS (e3m3)
100/02-11-060-03W6/00:Corrected Gas Flow Rate
19.44
RHN_100/02-11-060-03W6/00_FLW2_CASEPT (kPa)
100/02-11-060-03W6/00:Casing Pressure
4292.73
RHN_100/02-11-060-03W6/00_FLW2_MTRPT (kPa)
100/02-11-060-03W6/00:Static Press
2210.28
RHN_100/02-11-060-03W6/00_FLW2_WELLHPT (kPa)
100/02-11-060-03W6/00:Wellhead Tubing Pressure
2271.39

00/07-02-60-02W6/00



00/09-27-59-02W6 (4-35 Pad)



## Appendix F – DTS Rates, Average Zone Contribution and 30 day Normalized Rates

| Btm Hole UWI: 100/04-11-063-07W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM_KWA_T | 3.38 | | | 3.38% | 3.63 |
| DNVG G | 0.23 | | | 0.23% | 0.25 |
| CDTT | 0.19 | | | 0.19% | 0.20 |
| L CDTT | 0.19 | | | 0.19% | 0.20 |
| NTKN L | 0.19 | | | 0.19% | 0.20 |
| FLHA CH1 | 0.18 | | | 0.18% | 0.19 |
| FLHB SF1<br>FLHB CH1 | 60.24 | | | 60.25% | 64.68 |
| FLHC CH1 | 0.18 | | | 0.18% | 0.19 |
| FLHF U<br>FLHF L<br>FLHF L | 0.49 | | | 0.49% | 0.53 |
| WLRC A | 0.15 | | | 0.15% | 0.16 |
| BLSK U | 1.47 | | | 1.47% | 1.58 |
| GTNG A CH1 | 32.15 | | | 32.16% | 34.52 |
| GTNG C CH1 | 0.10 | | | 0.10% | 0.11 |
| CDMN<br>CDMN | 0.84 | | | 0.84% | 0.90 |

| Btm Hole UWI: 100/13-18-062-06W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM_KWA_T | 4.03 | 2.12 | | 4.71% | 4.88 |
| DNVG E<br>DNVG E<br>DNVG E | 20.92 | 6.69 | | 18.27% | 18.94 |
| CDTT<br>CDTT<br>CDTT | 2.07 | 0.43 | | 1.48% | 1.53 |
| L CDTT | 1.04 | 1.05 | | 1.93% | 2.00 |
| FLHA CH1<br>FLHA CH1<br>FLHA CH1 | 1.79 | 0.63 | | 1.65% | 1.71 |
| FLHF L<br>FLHF L<br>FLHF L | 3.34 | 2.06 | | 4.33% | 4.49 |
| WLRC A<br>WLRC A<br>WLRC A<br>WLRC A | 1.39 | 0.85 | | 1.79% | 1.86 |
| BLSK U | 1.10 | 0.75 | | 1.53% | 1.59 |
| BLSK M | 3.15 | 0.75 | | 2.38% | 2.47 |
| BLSK L | 12.69 | 4.69 | | 11.99% | 12.42 |
| GTNG B CH1<br>GTNG B CH1 | 68.52 | 14.97 | | 49.93% | 51.74 |

| Btm Hole UWI: 100/08-04-061-06W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM_KWA_T | 25.89 | 15.33 | | 73.58% | 48.05 |
| CRDM_KWA_T2<br>CRDM_KWA_T2 | | | | | |
| DNVG A | 0.24 | 0.31 | | 1.07% | 0.70 |
| DNVG D | 0.21 | 0.29 | | 0.98% | 0.64 |
| DNVG E | 0.64 | 0.73 | | 2.63% | 1.72 |
| CDTT | 1.31 | 0.94 | | 4.10% | 2.68 |
| L CDTT | 0.63 | 0.46 | | 1.99% | 1.30 |
| FLHC CH1<br>FLHC CH1<br>FLHC CH1 | 2.05 | 1.21 | | 5.82% | 3.80 |
| FLHE CH1<br>FLHE CH1 | 0.93 | 0.00 | | 1.37% | 0.89 |
| FLHF L<br>FLHF L | 0.63 | 0.20 | | 1.39% | 0.91 |
| WLRC A | 0.25 | 0.06 | | 0.51% | 0.33 |
| BLSK U | 0.19 | 0.34 | | 1.07% | 0.70 |
| BLSK L | 0.51 | 0.93 | | 2.90% | 1.90 |
| GTNG D CH1 | 0.24 | 0.35 | | 1.16% | 0.76 |
| CDMN | 0.29 | 0.43 | | 1.42% | 0.93 |

| Btm Hole UWI: 100/05-15-061-06W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM RRVR | 0.53 | 1.05 | | 4.09% | 2.10 |
| CRDM MUSR | 0.68 | 0.20 | | 2.39% | 1.22 |
| CRDM_KWA_T<br>CRDM_KWA_T | 1.44 | 4.65 | | 15.61% | 7.99 |
| DNVG A<br>DNVG A | 0.20 | 0.14 | | 0.91% | 0.46 |
| DNVG E<br>DNVG E | 2.97 | 2.24 | | 13.84% | 7.09 |
| CDTT | 0.45 | 0.69 | | 2.97% | 1.52 |
| L CDTT | 0.29 | 0.09 | | 1.03% | 0.53 |
| FLHC CH1<br>FLHC CH1<br>FLHC CH1 | 4.27 | 3.98 | | 21.80% | 11.16 |
| FLHF L<br>FLHF L | 0.72 | 0.75 | | 3.87% | 1.98 |
| WLRC A | 0.47 | 0.56 | | 2.70% | 1.38 |
| BLSK U | 0.54 | 0.93 | | 3.82% | 1.96 |
| BLSK L | 0.14 | 0.20 | | 0.89% | 0.45 |
| GTNG E CH1 | 0.06 | 0.08 | | 0.37% | 0.19 |
| CDMN | 2.39 | 2.12 | | 11.93% | 6.11 |
| NKNS | 2.85 | 2.34 | | 13.76% | 7.05 |

| Btm Hole UWI: 100/15-24-061-06W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM RRVR | 0.30 | | | 0.86% | 0.57 |
| CRDM_KWA_T | 3.66 | | | 10.44% | 6.92 |
| DNVG A | 1.01 | | | 2.88% | 1.91 |
| DNVG B | 0.97 | | | 2.77% | 1.83 |
| DNVG E | 1.82 | | | 5.19% | 3.44 |
| CDTT | 5.21 | | | 14.86% | 9.85 |
| L CDTT | 6.74 | | | 19.23% | 12.74 |
| FLHB SF1 | 0.02 | | | 0.06% | 0.04 |
| FLHC CH1<br>FLHC CH1<br>FLHC CH1<br>FLHC CH1 | 7.67 | | | 21.88% | 14.50 |
| FLHF L | 0.42 | | | 1.20% | 0.79 |
| FLHF L | | | | | 0.00 |
| WLRC A<br>WLRC A | 0.25 | | | 0.71% | 0.47 |
| BLSK U | 1.17 | | | 3.34% | 2.21 |
| BLSK L | 0.08 | | | 0.23% | 0.15 |
| GTNG A CH1 | 0.28 | | | 0.80% | 0.53 |
| CDMN | 5.45 | | | 15.55% | 10.30 |

| Btm Hole UWI: 100/16-16-061-05W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM RRVR<br>CRDM RRVR | 5.22 | | | 11.60% | 7.11 |
| CRDM KWA | 1.00 | | | 2.22% | 1.36 |
| DNVG B | 0.09 | | | 0.20% | 0.12 |
| DNVG D<br>DNVG D | 0.22 | | | 0.49% | 0.30 |
| DNVG E<br>DNVG E | 0.26 | | | 0.58% | 0.35 |
| CDTT<br>L CDTT | 2.55<br>1.19 | | | 5.67%<br>2.64% | 3.47<br>1.62 |
| FLHC CH2<br>FLHC CH1<br>FLHC CH1 | 16.14 | | | 35.86% | 21.99 |
| FLHF L<br>FLHF L | 5.12 | | | 11.38% | 6.98 |
| WLRC A | 0.37 | | | 0.82% | 0.50 |
| GTNG A CH1 | 6.60 | | | 14.66% | 8.99 |
| GTNG C CH1 | 4.58 | | | 10.18% | 6.24 |
| GTNG F CH1 | 0.83 | | | 1.84% | 1.13 |
| CDMN | 0.84 | | | 1.87% | 1.14 |

| Btm Hole UWI: 100/02-11-060-03W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| CRDM_DRAT | 0.92 | | | 3.07% | 2.48 |
| CRDM_MUS<br>CRDM_MUS | 0.93 | | | 3.10% | 2.51 |
| DCRK | 0.28 | | | 0.93% | 0.75 |
| DNVG_D<br>DNVG_D<br>DNVG_D | 3.48 | | | 11.61% | 9.38 |
| DNVG_E | 1.94 | | | 6.47% | 5.23 |
| CDTT | 8.34 | | | 27.82% | 22.48 |
| FLHR_A | 0.17 | | | 0.57% | 0.46 |
| FLHR_C | 13.92 | | | 46.43% | 37.53 |

| Btm Hole UWI: 100/07-02-060-02W6/00 | | | | | |
|---|---|---|---|---|---|
| Formation | DTS 1 Rate ($e^3m^3$) | DTS 2 Rate ($e^3m^3$) | DTS 3 Rate ($e^3m^3$) | Average % Zone Contribution | Normalized Rate (30 day) |
| DNVG_C | 3.11 | 1.06 | 1.46 | 6.01% | 4.11 |
| DNVG_D | 11.87 | 5.76 | 6.41 | 26.52% | 18.16 |
| DNVG_E<br>DNVG_E | 6.25 | 3.98 | 6.41 | 19.69% | 13.48 |
| FLHR_E | 4.00 | 1.53 | 4.74 | 12.12% | 8.30 |
| FLHR_F<br>FLHR_F<br>FLHR_F | 6.69 | 4.83 | 1.05 | 13.42% | 9.19 |
| GTNG_A | 2.94 | 1.82 | 1.02 | 6.29% | 4.31 |
| GTNG_C<br>GTNG_C | 8.17 | 5.03 | 1.82 | 15.96% | 10.93 |

## Appendix G – IETP 05-081 Petrophysical Data

| Btm Hole UWI: 100/04-11-063-07W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM_KWA_T | 2,041.00 | 2,043.00 | 7.70 | 3.60 | Yes | 8.22 |
| DNVG G | 2,679.00 | 2,682.00 | 7.90 | 4.20 | Yes | 8.99 |
| CDTT | 2,887.00 | 2,889.00 | 7.90 | 4.60 | Yes | 122.59 |
| L CDTT | 2,899.00 | 2,901.00 | 5.28 | 11.60 | | 15.28 |
| NTKN L | 2,963.00 | 2,964.00 | 9.99 | 1.00 | Yes | 8.32 |
| FLHA CH1 | 2,993.00 | 2,994.00 | 4.97 | 2.00 | Yes | 4.39 |
| FLHB SF1 | 3,003.00 | 3,004.00 | 4.39 | 3.60 | Yes | 3.24 |
| FLHB CH1 | 3,025.00 | 3,026.00 | 5.13 | 6.00 | | 1.61 |
| FLHC CH1 | 3,049.00 | 3,050.00 | 5.50 | 5.60 | Yes | 3.30 |
| FLHF U | 3,144.00 | 3,145.00 | 4.96 | 4.20 | Yes | 1.57 |
| FLHF L | 3,155.00 | 3,157.00 | 4.14 | 15.20 | | 3.00 |
| FLHF L | 3,170.00 | 3,172.00 | | | | |
| WLRC A | 3,180.00 | 3,181.00 | 4.47 | 4.00 | Yes | 1.83 |
| BLSK U | 3,252.00 | 3,253.00 | 4.79 | 2.40 | Yes | 10.77 |
| GTNG A CH1 | 3,282.00 | 3,284.00 | 6.13 | 4.60 | Yes | 7.86 |
| GTNG C CH1 | 3,317.00 | 3,318.00 | 3.81 | 2.00 | Yes | 2.18 |
| CDMN | 3,372.00 | 3,374.00 | 5.47 | 8.20 | Yes | 11.49 |
| CDMN | 3,378.00 | 3,380.00 | | | | |

| Btm Hole UWI: 100/13-18-062-06W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM_KWA_T | 2,155.00 | 2,159.00 | 7.35 | 5.40 | Yes | 8.88 |
| DNVG E | 2,734.00 | 2,735.00 | 9.19 | 18.00 | No | 42.07 |
| DNVG E | 2,740.00 | 2,741.00 | | | | |
| DNVG E | 2,748.00 | 2,750.00 | | | | |
| CDTT | 2,981.00 | 2,982.00 | 6.10 | 4.20 | Yes | 31.22 |
| CDTT | 2,984.00 | 2,985.00 | | | | |
| CDTT | 2,987.00 | 2,988.00 | | | | |
| L CDTT | 2,994.00 | 2,995.00 | 4.95 | 5.80 | | 16.32 |
| FLHA CH1 | 3,081.00 | 3,083.00 | 5.97 | 23.40 | No | 3.50 |
| FLHA CH1 | 3,085.00 | 3,086.00 | | | | |
| FLHA CH1 | 3,089.50 | 3,090.50 | | | | |
| FLHF L | 3,243.00 | 3,244.00 | 4.31 | 10.60 | Yes | 3.89 |
| FLHF L | 3,251.50 | 3,252.00 | | | | |
| FLHF L | 3,254.00 | 3,254.50 | | | | |
| WLRC A | 3,259.50 | 3,260.00 | 4.68 | 11.60 | Yes | 2.60 |
| WLRC A | 3,264.00 | 3,264.50 | | | | |
| WLRC A | 3,271.00 | 3,271.50 | | | | |
| WLRC A | 3,275.00 | 3,275.50 | | | | |
| BLSK U | 3,338.00 | 3,339.00 | 3.18 | 0.40 | Yes | 5.21 |
| BLSK M | 3,343.00 | 3,344.00 | 3.16 | 0.60 | | 3.63 |
| BLSK L | 3,347.00 | 3,349.00 | 4.57 | 1.80 | | 20.99 |
| GTNG B CH1 | 3,381.00 | 3,383.00 | 6.19 | 8.00 | Yes | 29.38 |
| GTNG B CH1 | 3,387.00 | 3,388.00 | | | | |

| Btm Hole UWI: 100/08-04-061-06W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM_KWA_T | 2,316.00 | 2,318.00 | 9.11 | 7.20 | No | 12.72 |
| CRDM_KWA_T2 | 2,329.00 | 2,330.00 | 7.26 | 2.40 | Yes | 4.68 |
| CRDM_KWA_T2 | 2,339.50 | 2,340.00 | | | | |
| DNVG A | 2,880.00 | 2,881.00 | 7.29 | 1.20 | Yes | 14.42 |
| DNVG D | 2,903.00 | 2,903.50 | 6.32 | 0.60 | Yes | 6.39 |
| DNVG E | 2,921.00 | 2,922.00 | 9.31 | 3.00 | No | 111.78 |
| CDTT | 3,137.00 | 3,139.00 | 5.88 | 6.00 | Yes | 23.16 |
| L CDTT | 3,147.50 | 3,149.00 | 3.57 | 1.40 | | 5.85 |
| FLHC CH1 | 3,268.00 | 3,270.00 | 5.41 | 16.60 | Yes | 2.54 |
| FLHC CH1 | 3,280.00 | 3,281.00 | | | | |
| FLHC CH1 | 3,301.50 | 3,302.00 | | | | |
| FLHE CH1 | 3,337.00 | 3,340.00 | 5.49 | 14.80 | Yes | 2.21 |
| FLHE CH1 | 3,382.50 | 3,383.00 | | | | |
| FLHF L | 3,388.00 | 3,389.00 | 3.32 | 4.80 | Yes | 1.82 |
| FLHF L | 3,392.00 | 3,393.00 | | | | |
| WLRC A | 3,406.00 | 3,407.50 | 4.61 | 14.00 | Yes | 1.93 |
| BLSK U | 3,488.00 | 3,488.50 | 3.07 | 1.40 | Yes | 1.86 |
| BLSK L | 3,500.50 | 3,501.00 | 2.80 | 1.60 | | 2.34 |
| GTNG D CH1 | 3,578.00 | 3,580.00 | 3.78 | 3.00 | Yes | 7.61 |
| CDMN | 3,609.00 | 3,612.00 | 5.47 | 6.20 | Yes | 10.31 |

| Btm Hole UWI: 100/05-15-061-06W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM RRVR | 2,055.00 | 2,055.50 | 0.00 | 0.00 | Yes | |
| CRDM MUSR | 2,064.50 | 2,065.00 | 0.00 | 0.00 | Yes | |
| CRDM_KWA_T | 2,073.00 | 2,074.00 | 7.48 | 3.40 | Yes | 6.83 |
| CRDM_KWA_T | 2,077.00 | 2,078.00 | | | | |
| DNVG A | 2,611.50 | 2,612.00 | 7.17 | 1.00 | Yes | 15.47 |
| DNVG A | 2,615.00 | 2,615.50 | | | | |
| DNVG E | 2,658.00 | 2,660.00 | 8.09 | 10.60 | Yes | 20.12 |
| DNVG E | 2,666.50 | 2,667.00 | | | | |
| CDTT | 2,876.00 | 2,878.00 | 9.64 | 9.00 | No | 269.88 |
| L CDTT | 2,891.00 | 2,893.00 | 4.79 | 8.80 | | 19.63 |
| FLHC CH1 | 3,022.50 | 3,023.50 | 7.08 | 2.80 | Yes | 16.61 |
| FLHC CH1 | 3,032.00 | 3,034.00 | | | | |
| FLHC CH1 | 3,054.00 | 3,055.00 | | | | |
| FLHF L | 3,129.00 | 3,130.00 | 3.58 | 12.20 | Yes | 2.32 |
| FLHF L | 3,138.50 | 3,139.00 | | | | |
| WLRC A | 3,145.00 | 3,146.00 | 4.57 | 9.80 | Yes | 2.48 |
| BLSK U | 3,223.50 | 3,225.50 | 3.84 | 2.80 | Yes | 9.38 |
| BLSK L | 3,237.50 | 3,238.50 | 2.93 | 1.20 | | 2.62 |
| GTNG E CH1 | 3,333.00 | 3,333.50 | 0.00 | 0.00 | Yes | |
| CDMN | 3,348.00 | 3,350.00 | 4.57 | 4.20 | Yes | 7.18 |
| NKNS | 3,439.00 | 3,441.00 | 5.10 | 2.80 | Yes | |

| Btm Hole UWI: 100/15-24-061-06W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM RRVR | 2,297.50 | 2,298.00 | 9.10 | 1.00 | Yes | |
| CRDM_KWA_T | 2,318.00 | 2,321.00 | 6.83 | 5.80 | Yes | 12.27 |
| DNVG A | 2,835.00 | 2,835.50 | 6.15 | 1.20 | Yes | 5.02 |
| DNVG B | 2,847.50 | 2,848.00 | 0.00 | 0.00 | Yes | |
| DNVG E | 2,881.00 | 2,883.00 | 7.15 | 3.00 | Yes | 20.24 |
| CDTT | 3,089.00 | 3,091.00 | 8.80 | 14.60 | No | 117.61 |
| L CDTT | 3,103.00 | 3,105.00 | 6.81 | 8.60 | | 65.03 |
| FLHB SF1 | 3,188.50 | 3,189.50 | 5.08 | 1.60 | Yes | 10.61 |
| FLHC CH1 | 3,225.00 | 3,226.50 | 6.16 | 34.60 | No | 6.26 |
| FLHC CH1 | 3,235.00 | 3,236.00 | | | | |
| FLHC CH1 | 3,249.50 | 3,250.50 | | | | |
| FLHC CH1 | 3,271.50 | 3,272.00 | | | | |
| FLHF L | 3,338.00 | 3,339.00 | 4.37 | 12.20 | Yes | 7.96 |
| FLHF L | 3,345.00 | 3,346.00 | | | | |
| WLRC A | 3,362.00 | 3,363.00 | 4.69 | 11.60 | Yes | 2.47 |
| WLRC A | 3,370.00 | 3,370.50 | | | | |
| BLSK U | 3,439.00 | 3,440.00 | 4.00 | 3.20 | Yes | 7.57 |
| BLSK L | 3,448.50 | 3,449.00 | 3.73 | 2.00 | | 10.50 |
| GTNG A CH1 | 3,465.00 | 3,466.00 | 3.99 | 0.60 | Yes | 3.66 |
| CDMN | 3,561.00 | 3,563.00 | 4.35 | 5.80 | Yes | 8.05 |

| Btm Hole UWI: 100/16-16-061-05W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM RRVR | 2,276.50 | 2,277.00 | 0.00 | 0.00 | Yes | |
| CRDM RRVR | 2,280.00 | 2,281.00 | | | | |
| CRDM KWA | 2,293.00 | 2,295.00 | 0.00 | 0.00 | Yes | |
| DNVG B | 2,771.00 | 2,771.50 | 6.88 | 1.63 | Yes | |
| DNVG D | 2,786.50 | 2,787.00 | 5.84 | 0.75 | Yes | |
| DNVG D | 2,789.00 | 2,789.50 | | | | |
| DNVG E | 2,799.00 | 2,799.50 | 6.58 | 5.50 | Yes | |
| DNVG E | 2,806.00 | 2,807.00 | | | | |
| CDTT | 3,008.00 | 3,010.00 | 9.31 | 7.63 | No | |
| L CDTT | 3,020.00 | 3,022.00 | 5.40 | 6.75 | | |
| FLHC CH2 | 3,147.00 | 3,148.00 | 6.74 | 11.25 | No | |
| FLHC CH1 | 3,169.00 | 3,170.00 | 6.11 | 15.63 | | |
| FLHC CH1 | 3,188.00 | 3,189.00 | | | | |
| FLHF L | 3,254.00 | 3,256.00 | 4.68 | 13.25 | Yes | |
| FLHF L | 3,261.00 | 3,262.00 | | | | |
| WLRC A | 3,274.00 | 3,275.00 | 5.26 | 13.63 | Yes | |
| GTNG A CH1 | 3,380.00 | 3,382.00 | 7.60 | 7.75 | Yes | |
| GTNG C CH1 | 3,424.00 | 3,425.00 | 3.938 | 7.75 | Yes | |
| GTNG F CH1 | 3,467.00 | 3,468.00 | 3.92 | 2.00 | Yes | |
| CDMN | 3,476.00 | 3,477.00 | 0.00 | 0.00 | Yes | |

| Btm Hole UWI: 100/02-11-060-03W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM_DRAT | 2,345.00 | 2,346.00 | 0.00 | 0.00 | Yes | |
| CRDM_MUS | 2,369.00 | 2,370.00 | 0.00 | 0.00 | Yes | |
| CRDM_MUS | 2,380.00 | 2,382.00 | | | | |
| DCRK | 2,764.50 | 2,765.50 | 8.07 | 1.52 | Yes | 5.40 |
| DNVG_D | 2,805.00 | 2,806.00 | 9.23 | 6.23 | No | 27.01 |
| DNVG_D | 2,812.00 | 2,813.00 | | | | |
| DNVG_D | 2,815.00 | 2,816.00 | | | | |
| DNVG_E | 2,834.00 | 2,838.00 | 8.61 | 12.16 | No | 14.74 |
| CDTT | 3,000.00 | 3,004.00 | 8.67 | 11.24 | No | 106.93 |
| FLHR_A | 3,076.00 | 3,078.00 | 6.42 | 6.08 | No | 7.41 |
| FLHR_C | 3,143.00 | 3,145.00 | 6.07 | 6.23 | No | 5.16 |

| Btm Hole UWI: 100/07-02-060-02W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| DNVG_C | 2,849.00 | 2,850.50 | 9.93 | 1.68 | Yes | 8.63 |
| DNVG_D | 2,856.00 | 2,857.50 | 9.72 | 3.20 | No | 9.67 |
| DNVG_E | 2,877.00 | 2,878.00 | 9.95 | 12.04 | No | 50.80 |
| DNVG_E | 2,882.00 | 2,884.00 | | | | |
| FLHR_E | 3,219.00 | 3,221.00 | 8.25 | 5.18 | No | 12.10 |
| FLHR_F | 3,255.00 | 3,256.00 | 7.29 | 27.73 | No | 6.20 |
| FLHR_F | 3,268.00 | 3,269.50 | | | | |
| FLHR_F | 3,275.00 | 3,276.00 | | | | |
| GTNG_A | 3,352.50 | 3,353.50 | 5.42 | 3.96 | Yes | 3.70 |
| GTNG_C | 3,391.00 | 3,392.00 | 5.86 | 10.21 | Yes | 12.51 |
| GTNG_C | 3,394.00 | 3,395.00 | | | | |

| Btm Hole UWI: 100/09-27-059-02W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| CRDM_AMND | 2,560.00 | 2,562.00 | 12.03 | 6.30 | No | 52.61 |
| CRDM_MUS | 2,598.00 | 2,600.00 | 7.04 | 11.70 | Yes | 6.43 |
| DNVG_C | 3,017.00 | 3,018.00 | 8.13 | 1.10 | Yes | 11.76 |
| DNVG_D | 3,022.50 | 3,023.50 | 7.42 | 1.00 | Yes | 17.18 |
| DNVG_E | 3,050.00 | 3,052.00 | 7.62 | 4.90 | Yes | 12.54 |
| CDTT | 3,201.00 | 3,205.00 | 7.44 | 6.49 | Yes | 29.51 |
| FLHR_F | 3,430.00 | 3,431.00 | 4.36 | 1.20 | Yes | 1.38 |
| FLHR_F | 3,437.00 | 3,438.00 | | | | |
| FLHR_F | 3,442.00 | 3,443.00 | | | | |
| FLHR_F | 3,446.00 | 3,447.00 | | | | |
| BLSK | 3,493.00 | 3,494.00 | 5.55 | 2.00 | Yes | 7.10 |
| GTNG_A | 3,524.00 | 3,525.00 | 0.00 | 0.00 | Yes | |
| GTNG_C | 3,551.00 | 3,552.00 | 5.33 | 2.90 | Yes | 8.11 |
| GTNG_D | 3,560.00 | 3,561.00 | 4.64 | 2.60 | Yes | 5.88 |
| GTNG_D | 3,566.00 | 3,567.00 | | | | |

| Btm Hole UWI: 100/02-10-059-02W6/00 | | | | | | |
|---|---|---|---|---|---|---|
| Formation | Top Perforation (mKB) | Bottom Perforation (mKB) | PhiT (%) | Net Pay (m) | Marginal Zone | Geometric Permeability (µd) |
| DCRK | 2,907.50 | 2,908.50 | 10.42 | 1.60 | Yes | 6.58 |
| DNVG_A | 2,941.50 | 2,942.50 | 10.21 | 3.40 | No | 17.52 |
| DNVG_C | 2,950.50 | 2,951.50 | 8.35 | 0.60 | Yes | 4.27 |
| DNVG_D | 2,958.50 | 2,959.50 | 9.38 | 0.10 | Yes | 3.06 |
| DNVG_E | 2,980.00 | 2,984.00 | 8.48 | 12.40 | No | 14.37 |
| NTKN | 3,164.00 | 3,165.00 | 7.29 | 10.90 | Yes | 10.60 |
| NTKN | 3,167.50 | 3,168.50 | | | | |
| NTKN | 3,170.50 | 3,172.50 | | | | |
| FLHR_F | 3,354.00 | 3,356.00 | 7.09 | 28.49 | No | 6.91 |
| FLHR_F | 3,360.00 | 3,363.00 | | | | |
| BLSK | 3,422.00 | 3,423.00 | 0.00 | 0.00 | Yes | |
| GTNG_B | 3,463.50 | 3,464.50 | 4.30 | 0.80 | Yes | 8.44 |
| GTNG_D | 3,500.00 | 3,502.00 | 5.04 | 3.80 | Yes | 10.31 |

## Appendix H – IETP 05-081 Original Reservoir Pressure Data

| Btm Hole UWI: 100/04-11-063-07W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM_KWA_T | 20 |
| DNVG G | 25 |
| CDTT | 19 |
| L CDTT | 19 |
| NTKN L | 35 |
| FLHA CH1 | 37 |
| FLHB SF1 | 37 |
| FLHB CH1 | 37 |
| FLHC CH1 | 38 |
| FLHF U | 38 |
| FLHF L | 38 |
| FLHF L | 38 |
| WLRC A | 38 |
| BLSK U | 38 |
| GTNG A CH1 | 38 |
| GTNG C CH1 | 37 |
| CDMN | 28 |
| CDMN | 28 |

| Btm Hole UWI: 100/13-18-062-06W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM_KWA_T | 22 |
| DNVG E | 27 |
| DNVG E | 27 |
| DNVG E | 27 |
| CDTT | 20 |
| CDTT | 20 |
| CDTT | 20 |
| L CDTT | 20 |
| FLHA CH1 | 39 |
| FLHA CH1 | 39 |
| FLHA CH1 | 39 |
| FLHF L | 41 |
| FLHF L | 41 |
| FLHF L | 41 |
| WLRC A | 41 |
| WLRC A | 41 |
| WLRC A | 41 |
| WLRC A | 41 |
| BLSK U | 41 |
| BLSK M | 41 |
| BLSK L | 41 |
| GTNG B CH1 | 41 |
| GTNG B CH1 | 41 |

| Btm Hole UWI: 100/08-04-061-06W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM_KWA_T | 24 |
| CRDM_KWA_T2 | 24 |
| CRDM_KWA_T2 | 24 |
| DNVG A | 34 |
| DNVG D | 34 |
| DNVG E | 34 |
| CDTT | 23 |
| L CDTT | 23 |
| FLHC CH1 | 45 |
| FLHC CH1 | 45 |
| FLHC CH1 | 45 |
| FLHE CH1 | 44 |
| FLHE CH1 | 44 |
| FLHF L | 44 |
| FLHF L | 44 |
| WLRC A | 44 |
| BLSK U | 44 |
| BLSK L | 44 |
| GTNG D CH1 | 37 |
| CDMN | 30 |

| Btm Hole UWI: 100/05-15-061-06W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM RRVR | 23 |
| CRDM MUSR | 23 |
| CRDM_KWA_T | 23 |
| CRDM_KWA_T | 23 |
| DNVG A | 32 |
| DNVG A | 32 |
| DNVG E | 32 |
| DNVG E | 32 |
| CDTT | 22 |
| L CDTT | 22 |
| FLHC CH1 | 44 |
| FLHC CH1 | 44 |
| FLHC CH1 | 44 |
| FLHF L | 42 |
| FLHF L | 42 |
| WLRC A | 42 |
| BLSK U | 42 |
| BLSK L | 42 |
| GTNG E CH1 | 29 |
| CDMN | 29 |
| NKNS | 29 |

| Btm Hole UWI: 100/15-24-061-06W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM RRVR | 23 |
| CRDM_KWA_T | 23 |
| DNVG A | 28 |
| DNVG B | 28 |
| DNVG E | 28 |
| CDTT | 19 |
| L CDTT | 19 |
| FLHB SF1 | 39 |
| FLHC CH1 | 41 |
| FLHC CH1 | 41 |
| FLHC CH1 | 41 |
| FLHC CH1 | 41 |
| FLHF L | 41 |
| FLHF L | 41 |
| WLRC A | 41 |
| WLRC A | 41 |
| BLSK U | 41 |
| BLSK L | 41 |
| GTNG A CH1 | 41 |
| CDMN | 28 |

| Btm Hole UWI: 100/16-16-061-05W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM RRVR | 23 |
| CRDM RRVR | 23 |
| CRDM KWA | 23 |
| DNVG B | 28 |
| DNVG D | 28 |
| DNVG D | 28 |
| DNVG E | 28 |
| DNVG E | 28 |
| CDTT | 20 |
| L CDTT | 20 |
| FLHC CH2 | 41 |
| FLHC CH1 | 41 |
| FLHC CH1 | 41 |
| FLHF L | 41 |
| FLHF L | 41 |
| WLRC A | 41 |
| GTNG A CH1 | 41 |
| GTNG C CH1 | 35 |
| GTNG F CH1 | 28 |
| CDMN | 28 |

| Btm Hole UWI: 100/02-11-060-03W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM_DRAT | 24 |
| CRDM_MUS | 24 |
| CRDM_MUS | 24 |
| DCRK | 35 |
| DNVG_D | 35 |
| DNVG_D | 35 |
| DNVG_D | 35 |
| DNVG_E | 35 |
| CDTT | 21 |
| FLHR_A | 39 |
| FLHR_C | 41 |

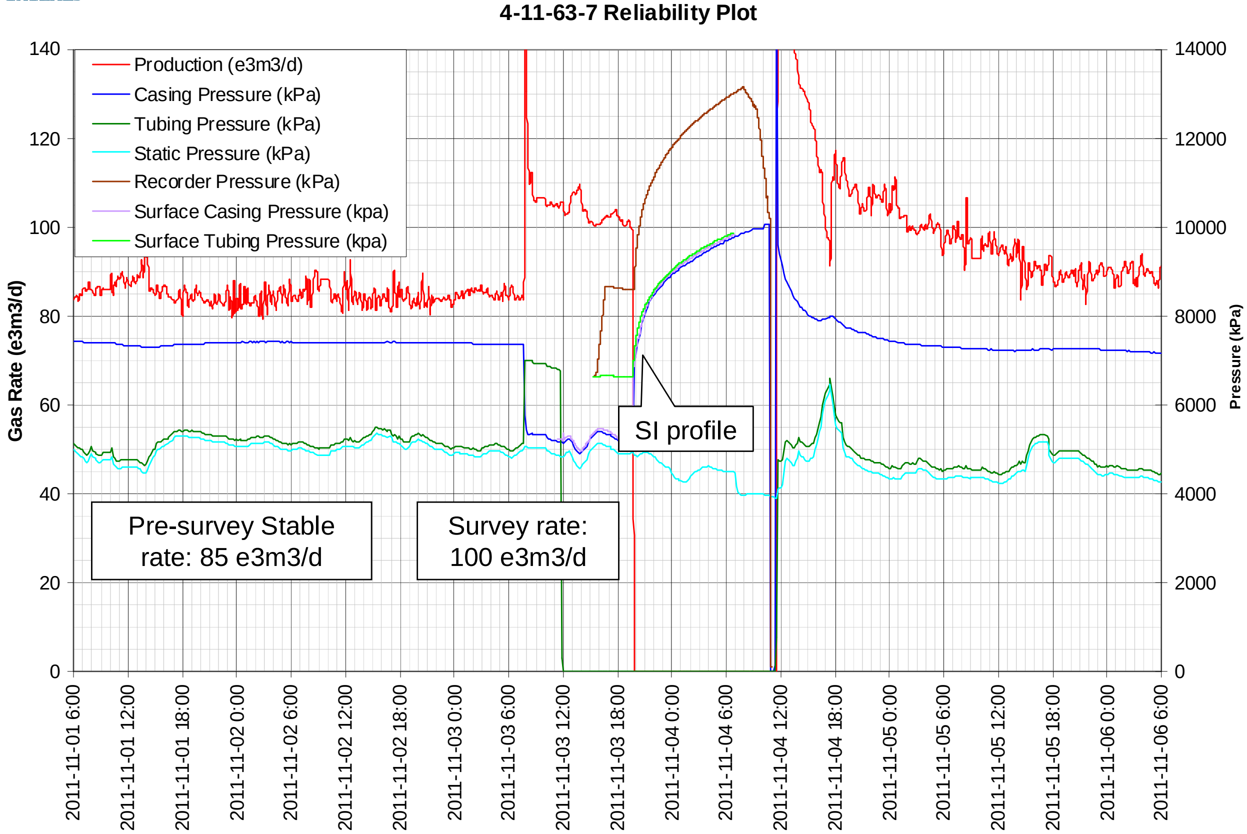
| Btm Hole UWI: 100/07-02-060-02W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| DNVG_C | 34 |
| DNVG_D | 34 |
| DNVG_E | 34 |
| DNVG_E | 34 |
| FLHR_E | 46 |
| FLHR_F | 46 |
| FLHR_F | 46 |
| FLHR_F | 46 |
| GTNG_A | 43 |
| GTNG_C | 28 |
| GTNG_C | 28 |

| Btm Hole UWI: 100/09-27-059-02W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| CRDM_AMND | 25 |
| CRDM_MUS | 25 |
| DNVG_C | 36 |
| DNVG_D | 36 |
| DNVG_E | 36 |
| CDTT | 21 |
| FLHR_F | 47 |
| FLHR_F | 47 |
| FLHR_F | 47 |
| FLHR_F | 47 |
| BLSK | 43 |
| GTNG_A | 43 |
| GTNG_C | 29 |
| GTNG_D | 29 |
| GTNG_D | 29 |

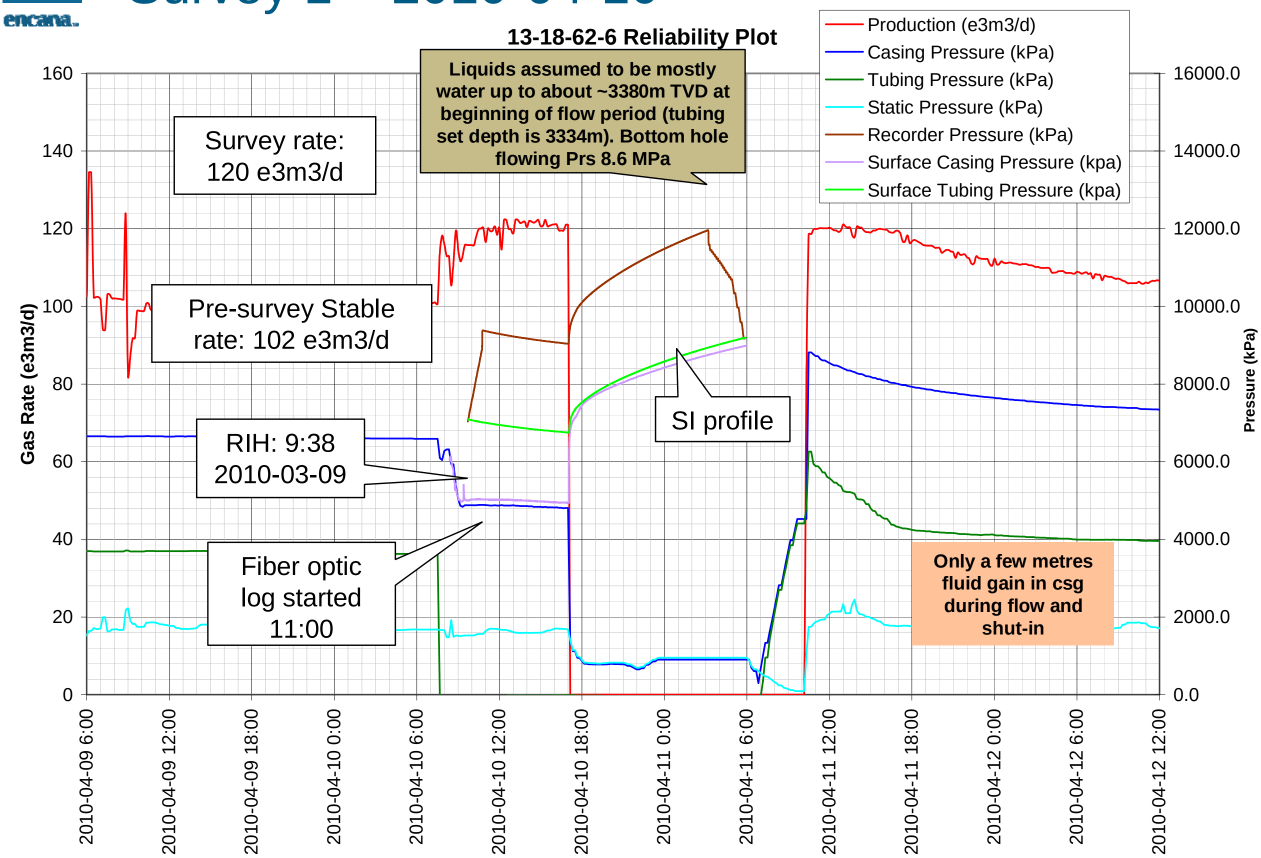
| Btm Hole UWI: 100/02-10-059-02W6/00 | |
|---|---|
| Formation | Reservoir Pressure (MPa) |
| DCRK | 39 |
| DNVG_A | 39 |
| DNVG_C | 39 |
| DNVG_D | 39 |
| DNVG_E | 39 |
| NTKN | 35 |
| NTKN | 35 |
| NTKN | 35 |
| FLHR_F | 47 |
| FLHR_F | 47 |
| BLSK | 44 |
| GTNG_B | 44 |
| GTNG_D | 29 |

## Appendix I – IETP 05-081 Pressure and Production Data During DTS Survey Operations

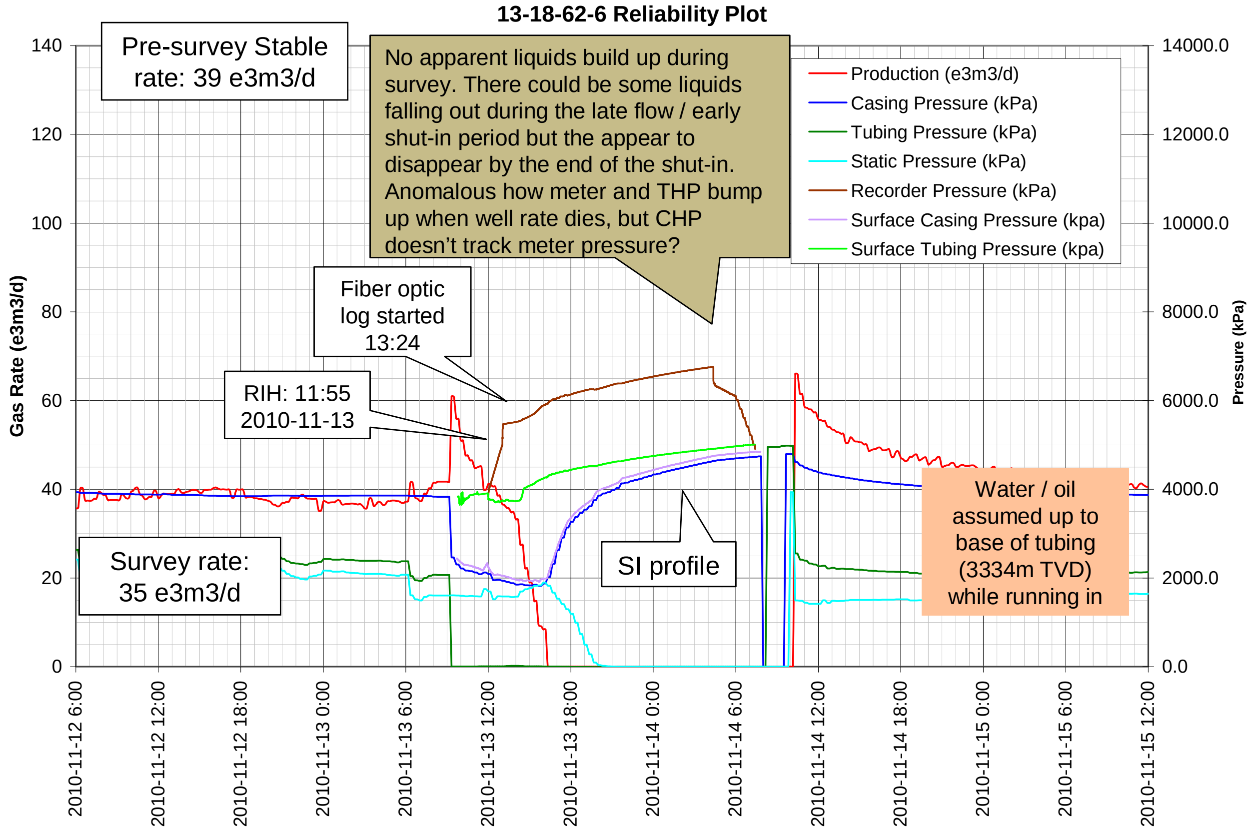
# ECA REDROCK 04-11-063-7W6
# Survey 1 – 2011-11-03



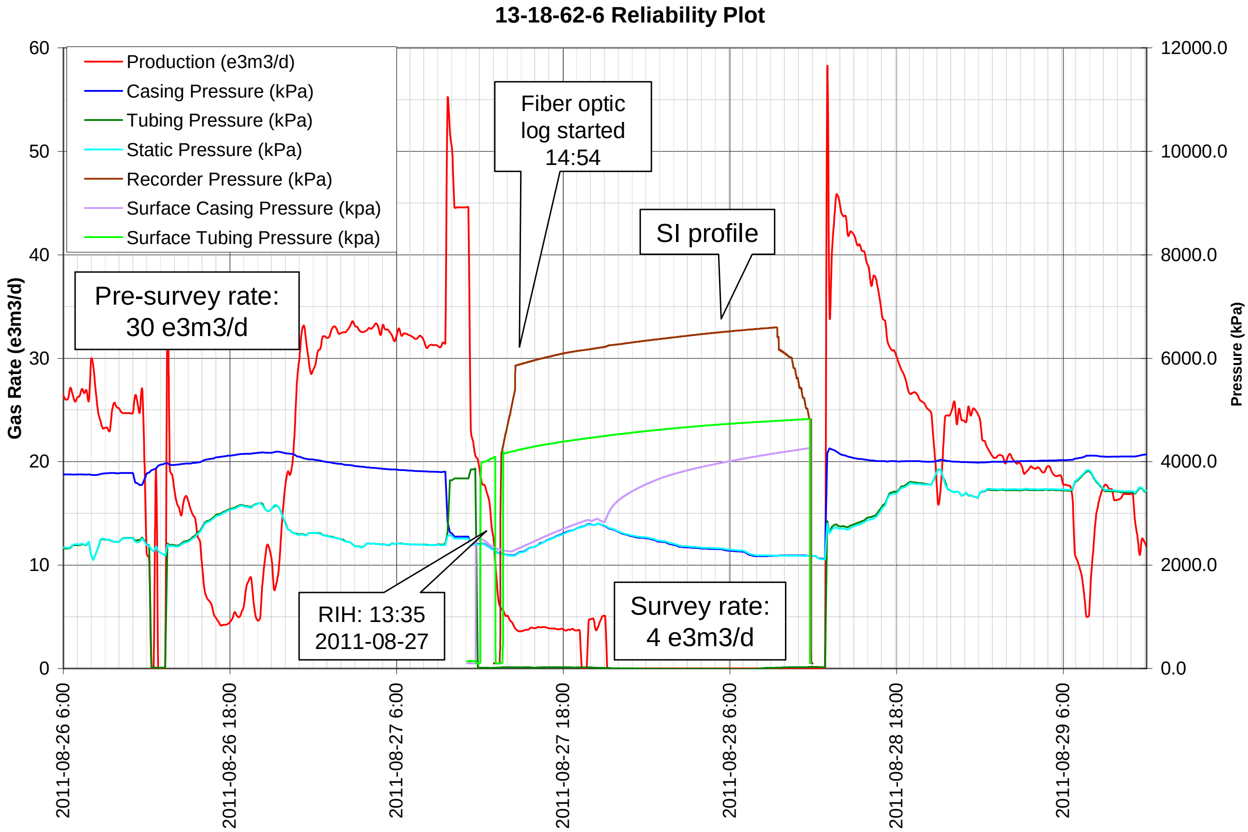
# ECA KAKWA 13-18-062-6W6
# Survey 1 – 2010-04-10



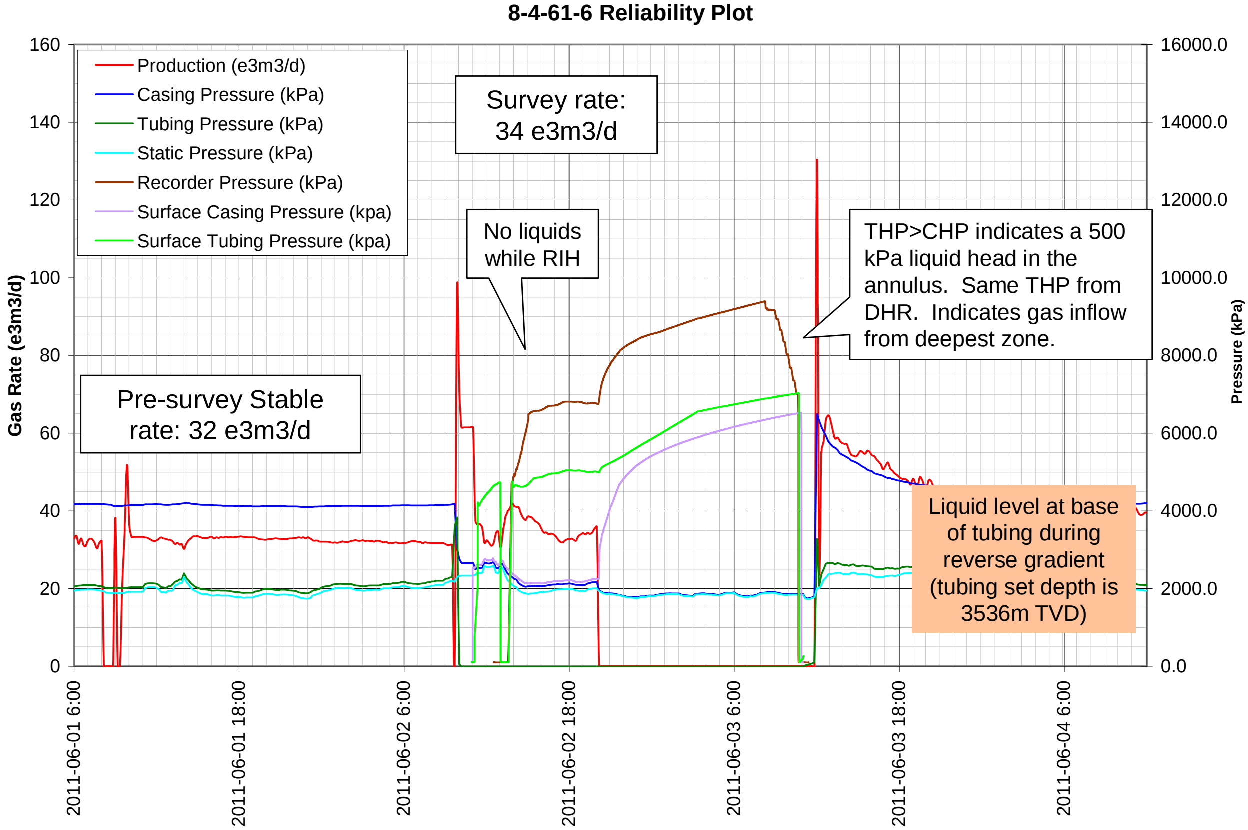
# ECA KAKWA 13-18-062-6W6
# Survey 2 – 2010-11-13



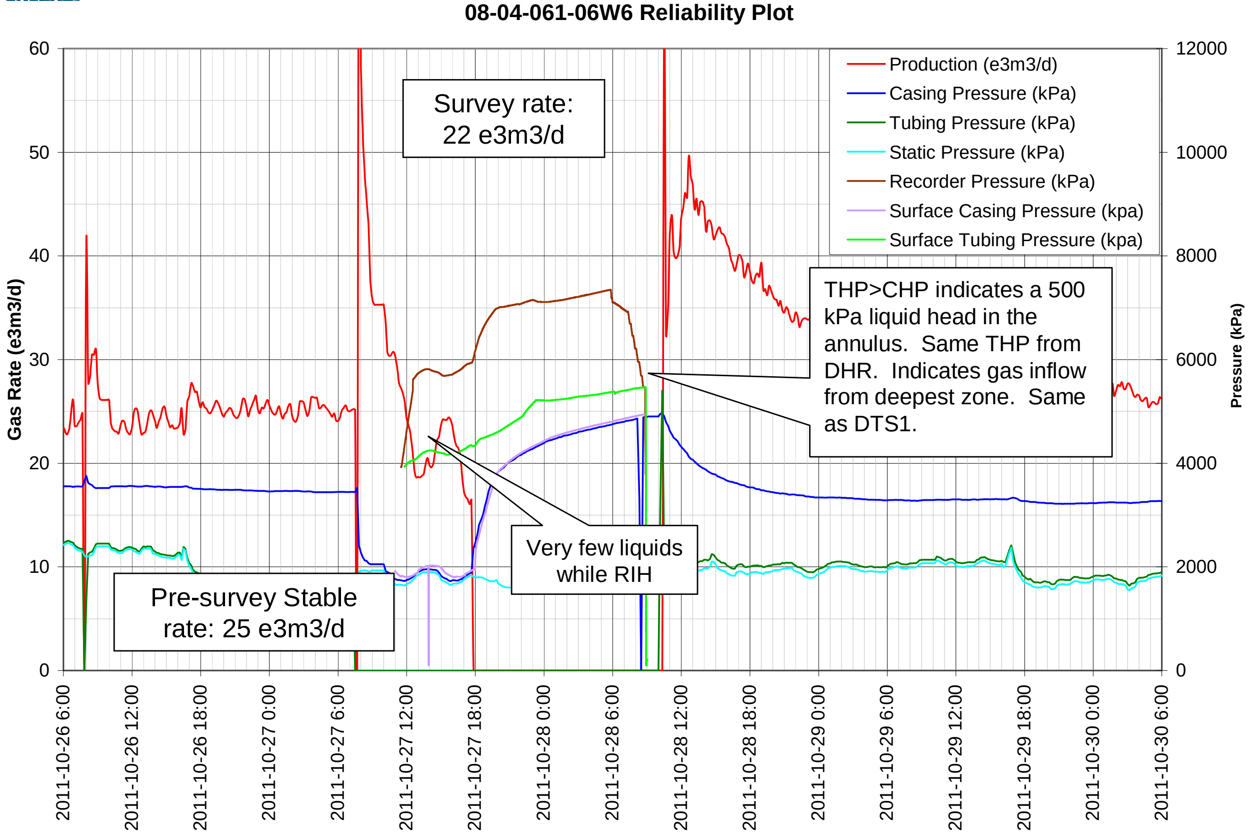
# ECA KAKWA 13-18-062-6W6
# Survey 3 – 2011-08-27



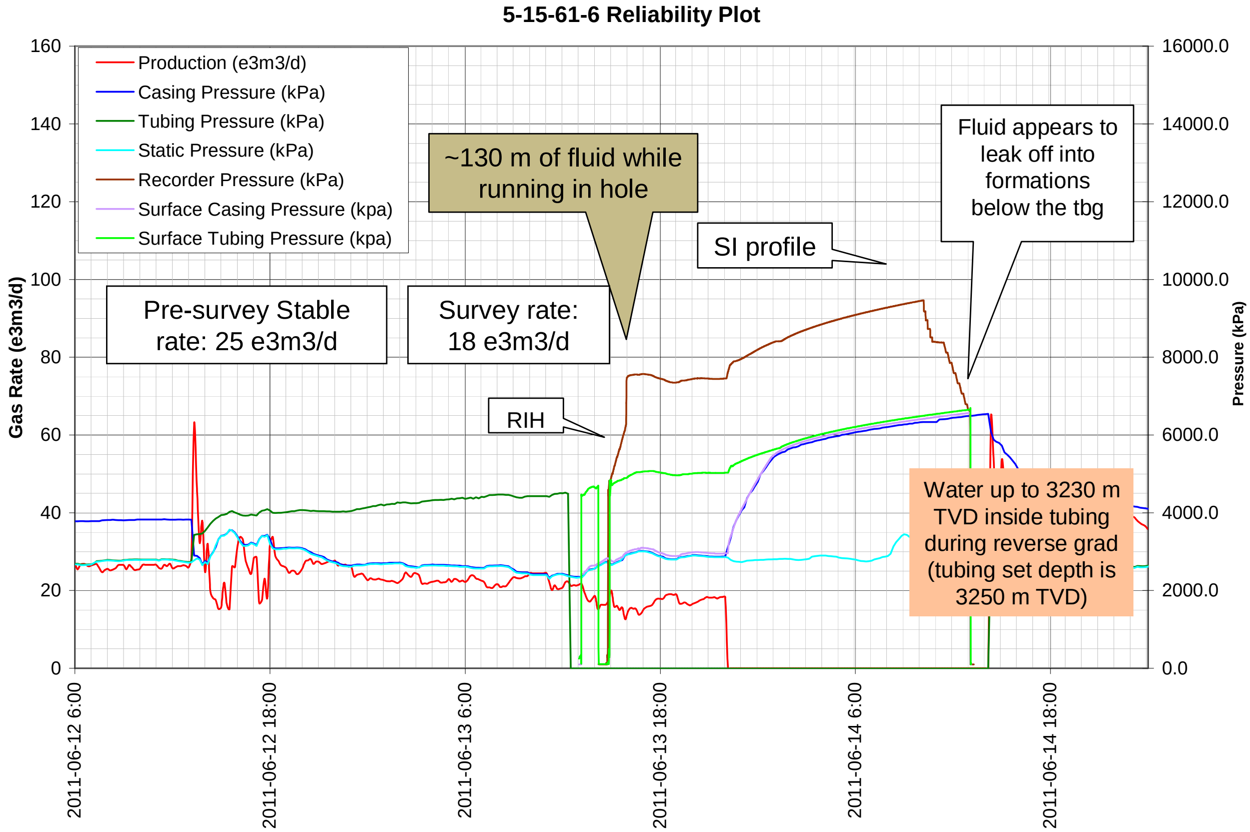
# ECA KAKWA 08-04-061-06W6
# Survey 1 – 2011-06-02



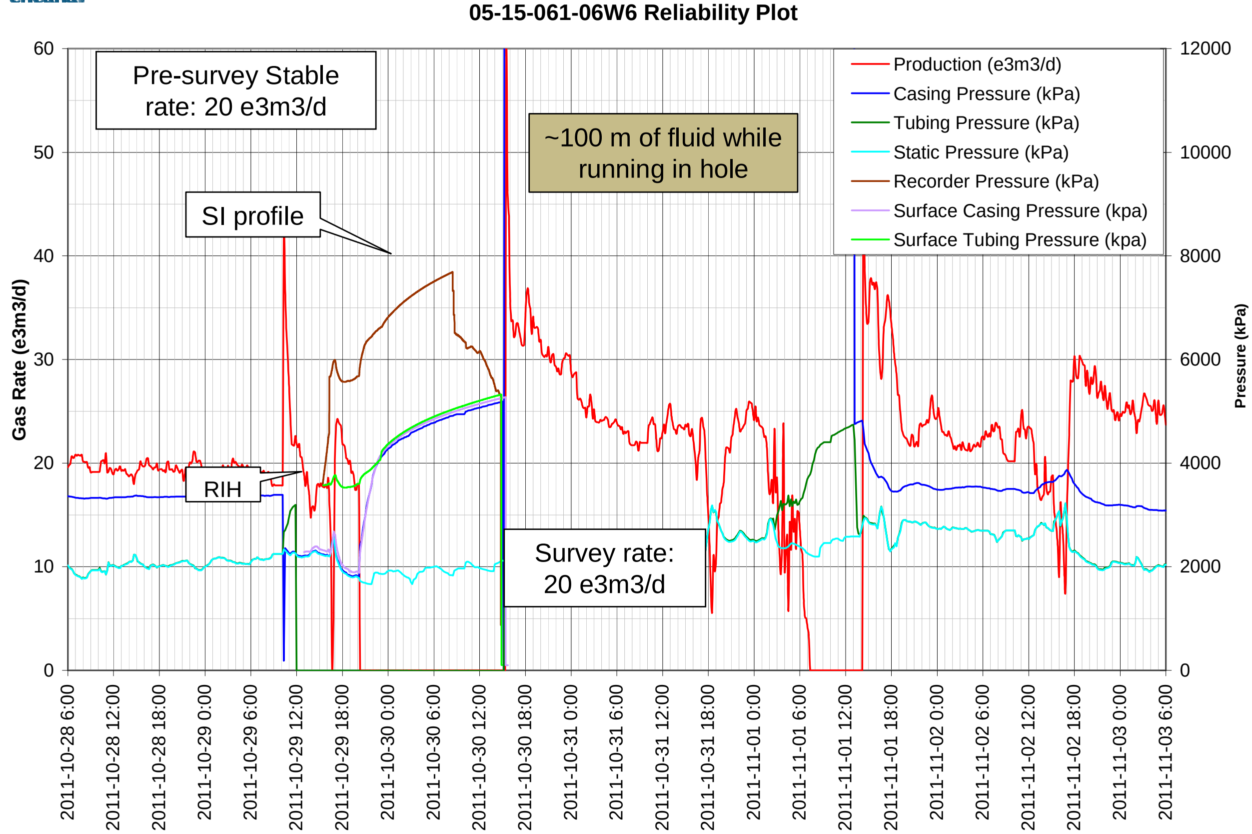
# ECA KAKWA 08-04-061-06W6
# Survey 2 – 2011-10-27



# ECA KAKWA 05-15-061-6W6
# Survey 1 – 2011-06-13

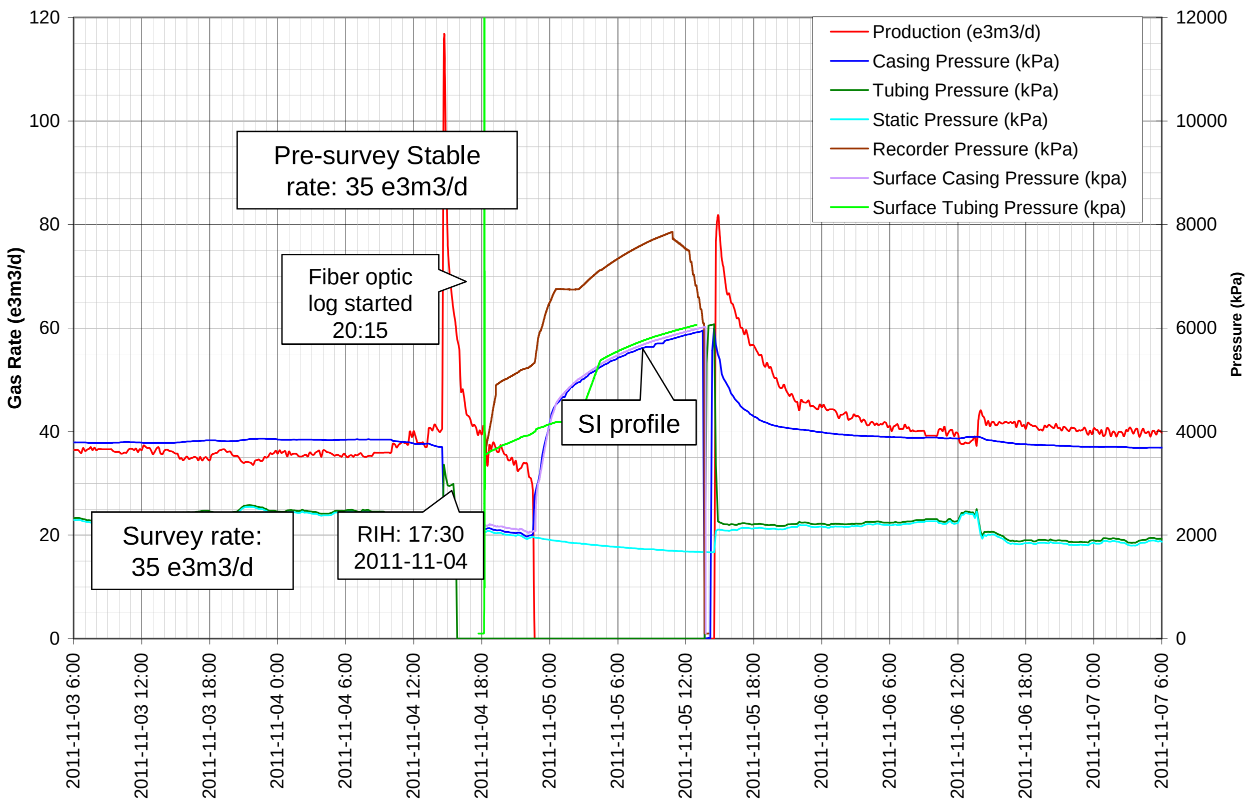


# ECA KAKWA 05-15-061-6W6
# Survey 2 – 2011-10-29

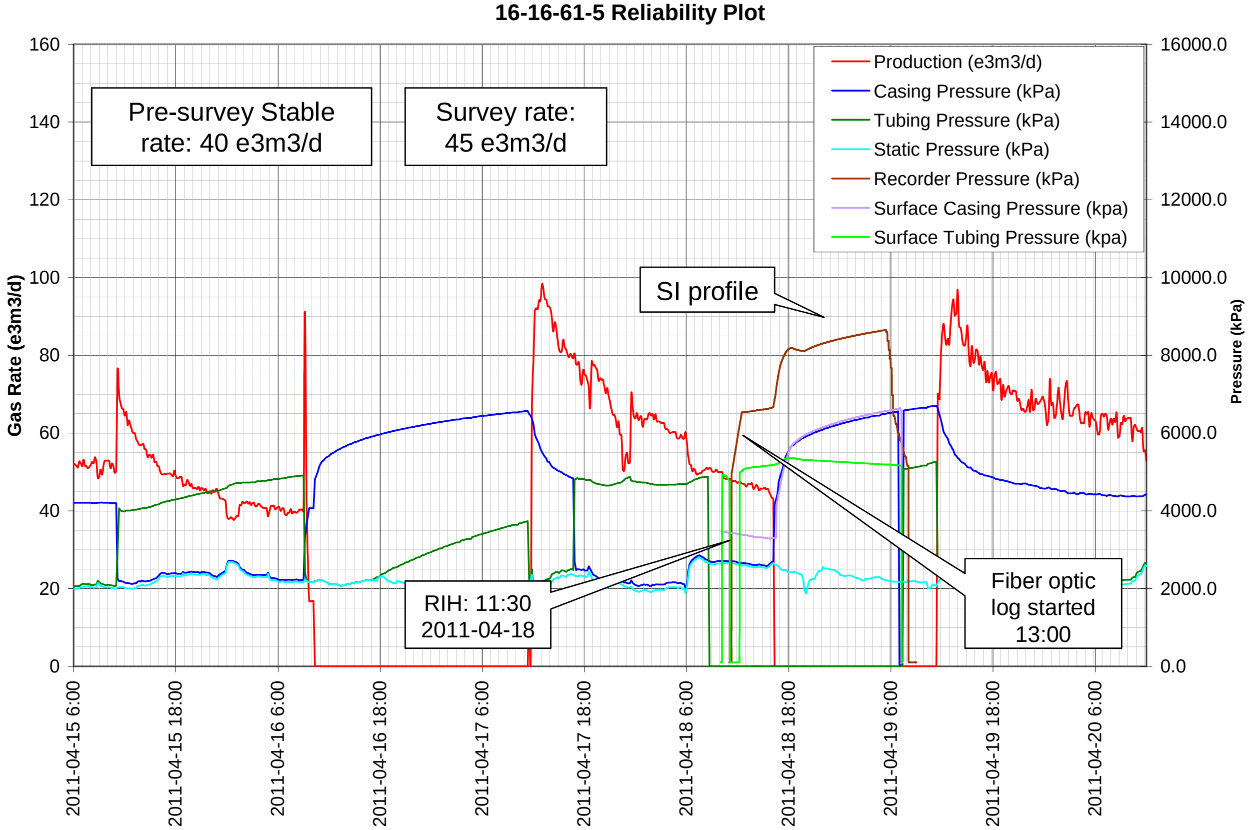


# ECA KAKWA 15-24-061-6W6
# Survey 1 – 2011-11-04

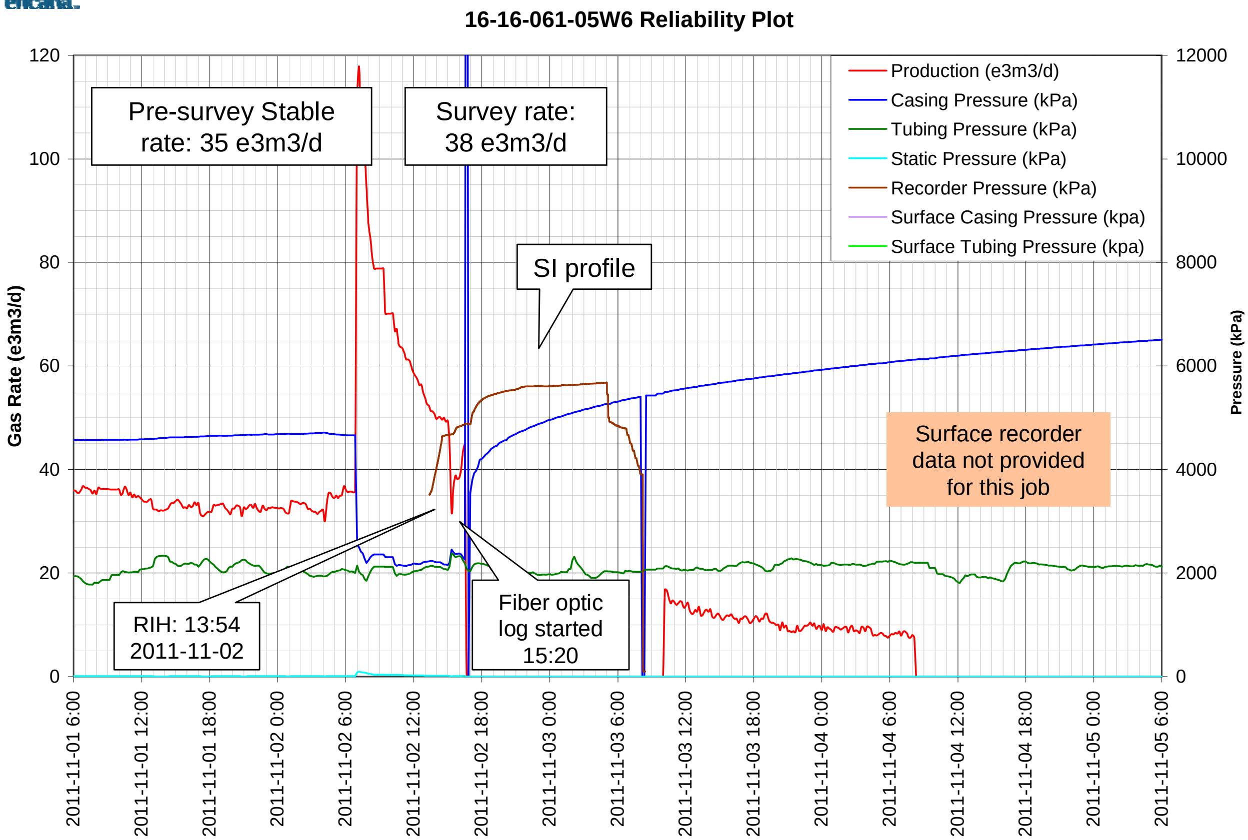
**15-24-61-6 Reliability Plot**



# ECA KAKWA 16-16-061-5W6
# Survey 1 - 2011-04-18

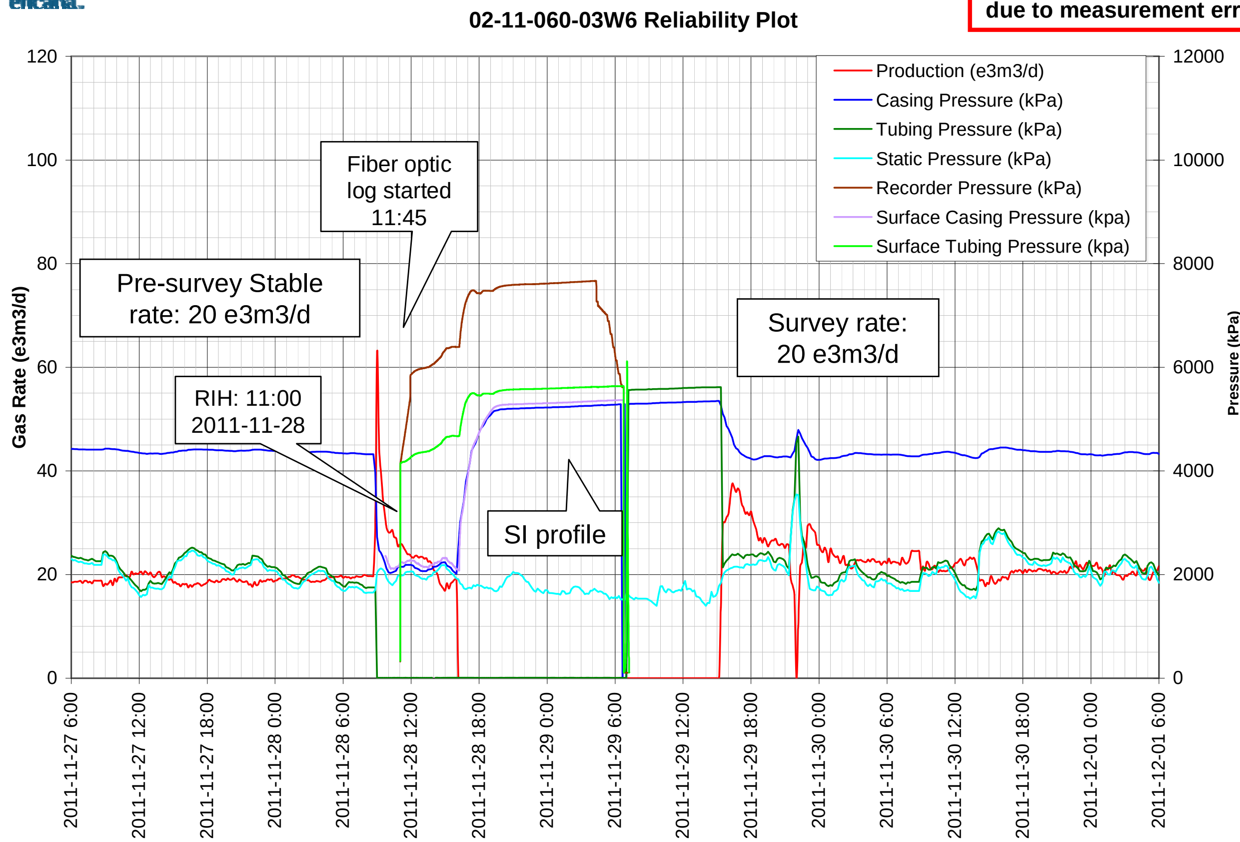


# ECA KAKWA 16-16-061-5W6
# Survey 2 - 2011-11-02

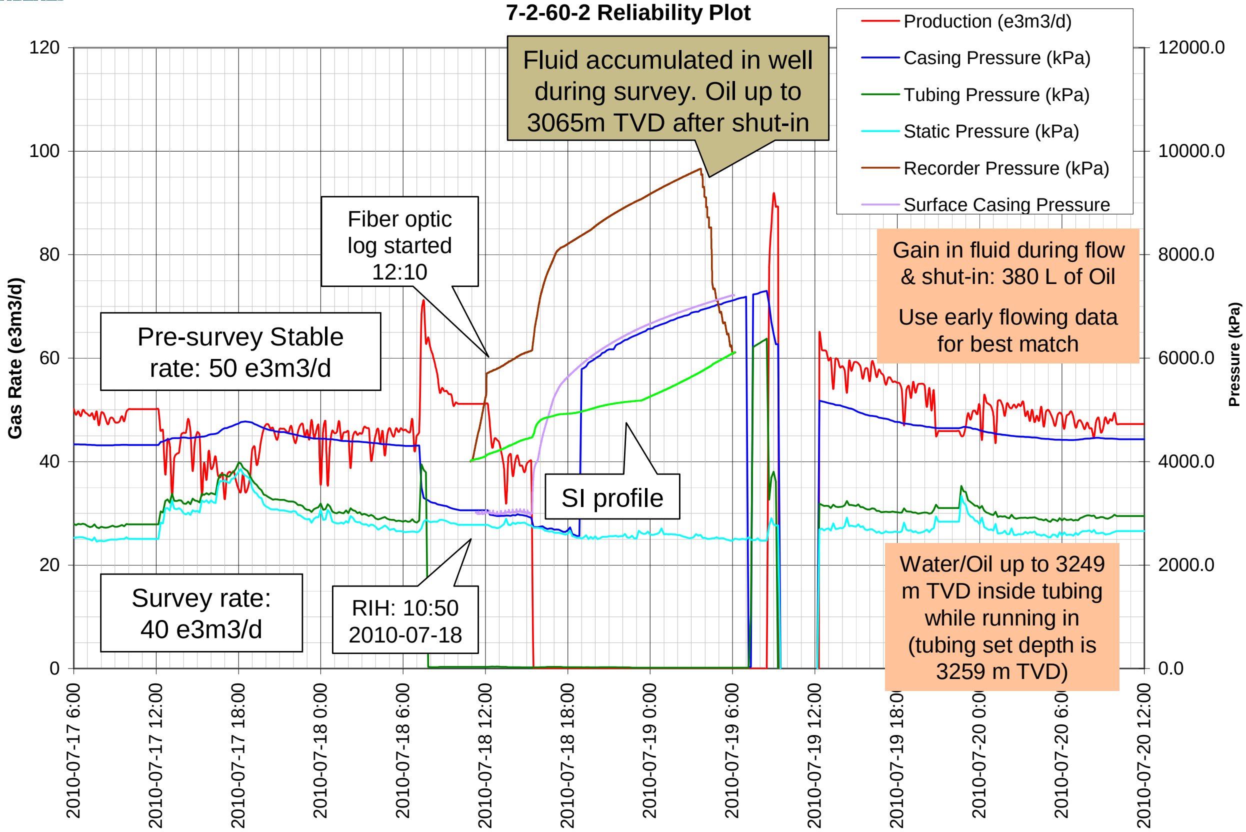


# ECA RESTHAVEN 02-11-60-03W6
# Survey 1 – 2011-11-28

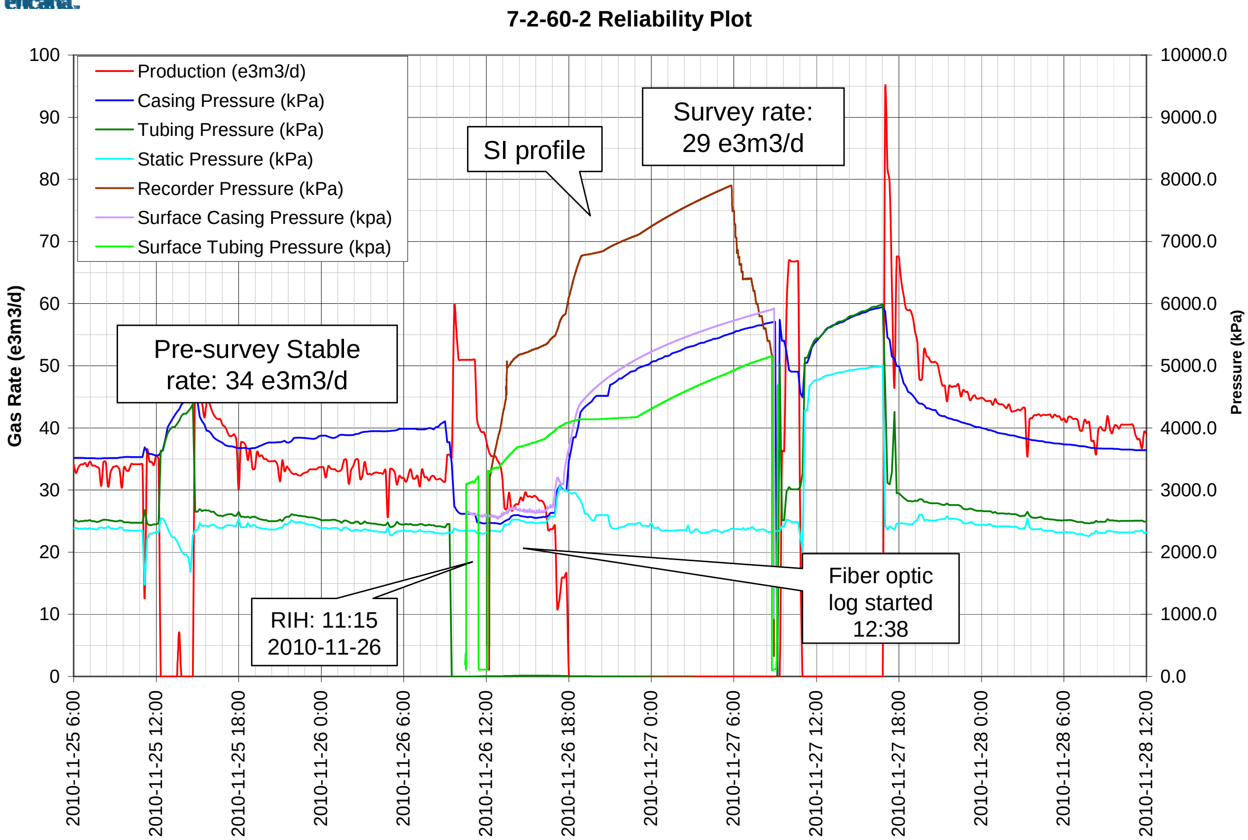
**Analysis match done with 30e3m3/d - not 20e3m3 as reported from the field due to measurement error**



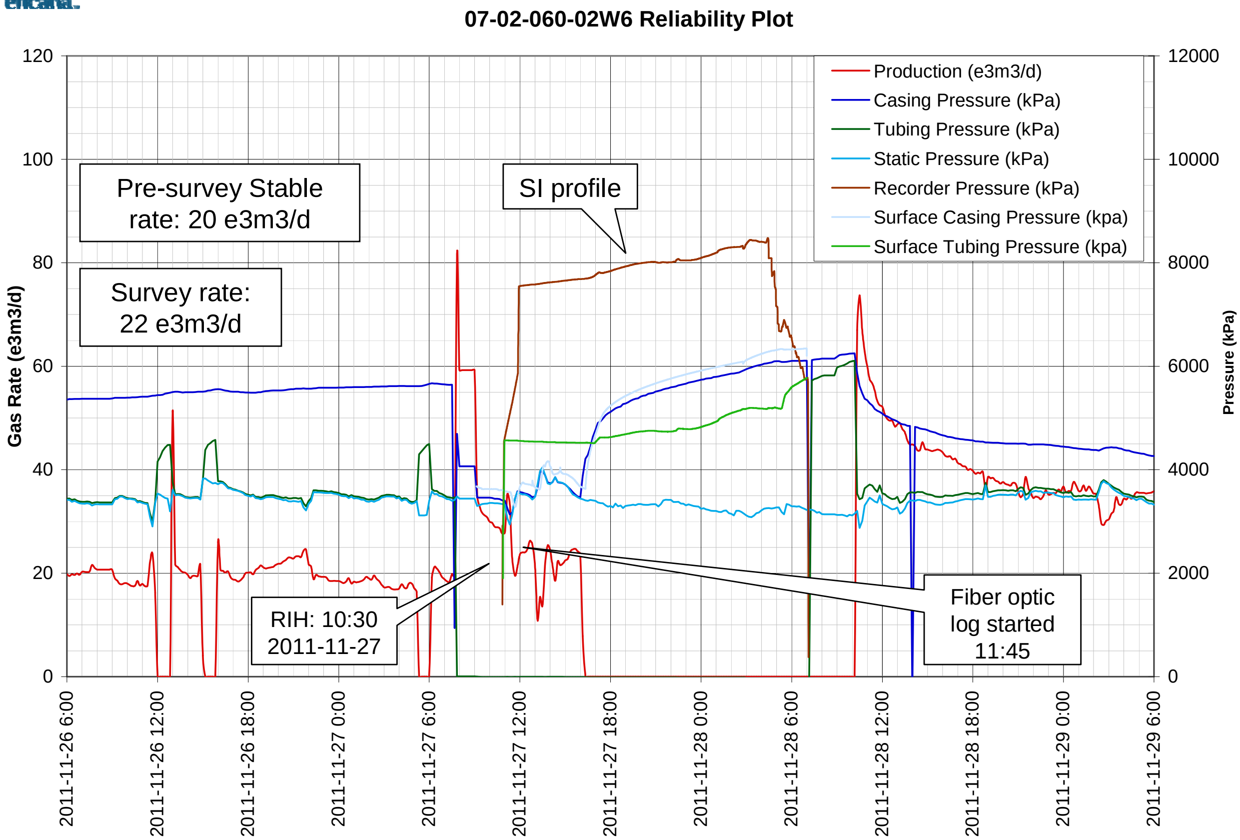
# ECA ECOG 07-02-060-02W6
# Survey 1 – 2010-07-18



# ECA ECOG 07-02-060-02W6
# Survey 2 – 2010-11-26

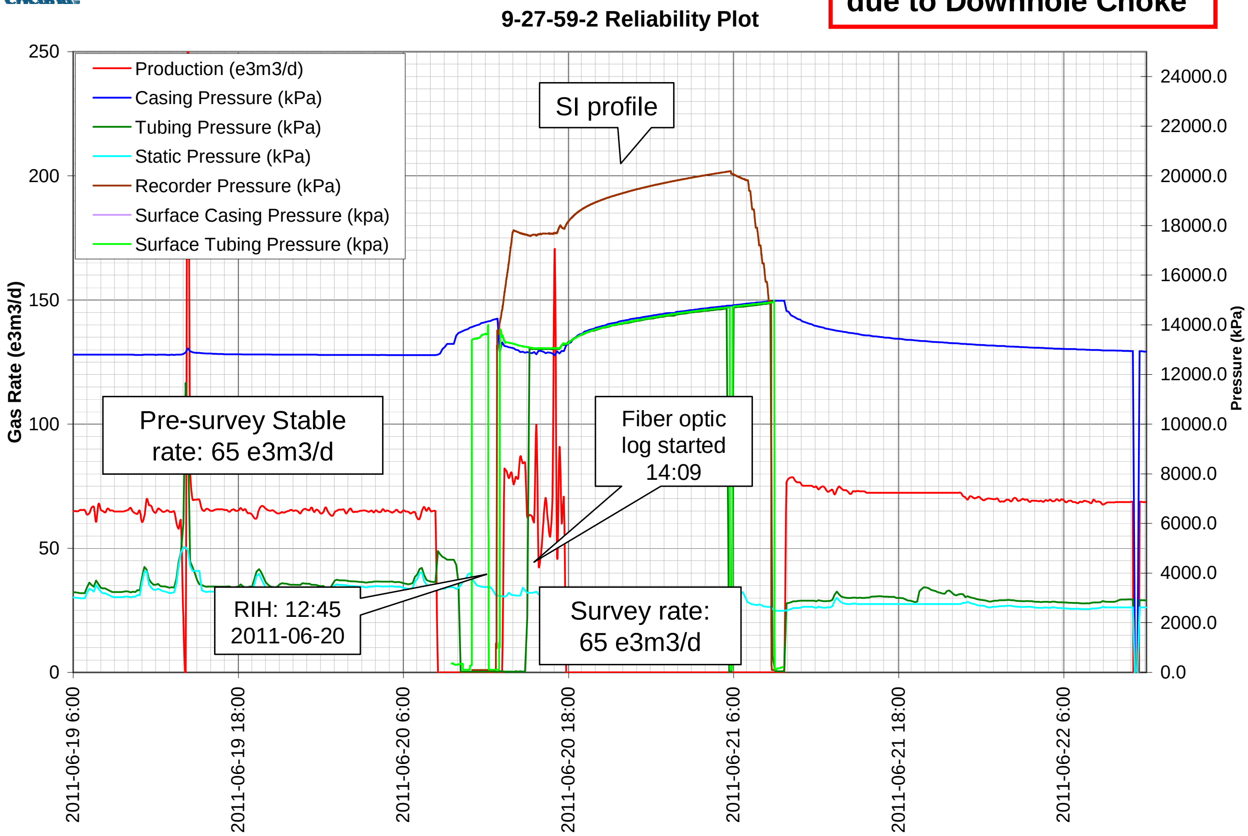


# ECA ECOG 07-02-060-02W6
# Survey 3 – 2011-11-27



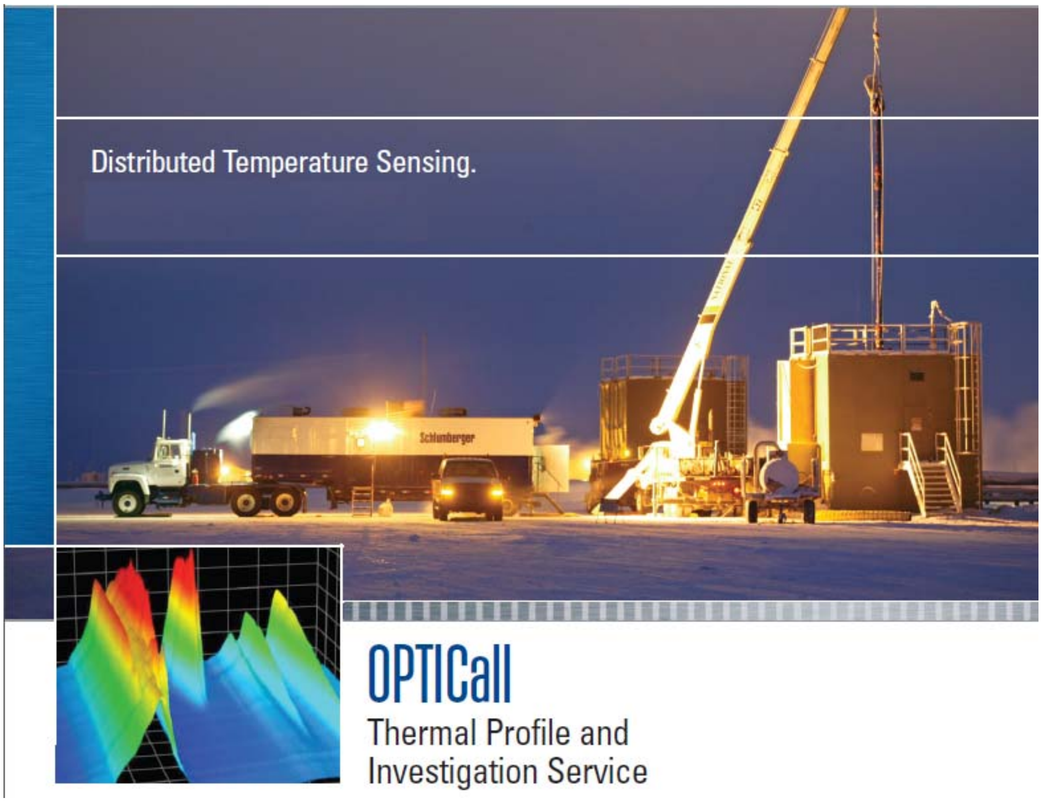
# ECA ECOG RESTHA 09-27-059-02W6
# Survey 1 - 2011-06-20

**Poor Quality Results due to Downhole Choke**



# Appendix J – IETP 05-081 DTS Results and Interpretations

Schlumberger




# TIME LAPSE STUDY

| | |
|---|---|
| Company: | ENCANA |
| Field: | KAKWA |
| Well Name: | ECA ECOG KAKWA 13-18-62-6 |
| UWID: | 100 / 13-18-062-06W6/00 |
| Well License: | 0413731 |
| Job Reference Number: | AY17-00043, BGHW-00008, BROZ-00009 |
| Logging Date: | Apr 10 - 2010, Nov 13 - 2010, Aug 27 - 2011 |
| Interpretation Date: | Oct-2011 |
| Analyst: | Alejandro Sanchez |

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretation, and shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretations made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule

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# 1. Objectives

This report details thermal analysis of OptiCall Slick-line Distributed Temperature Sensing (DTS) data recorded in **ECA ECOG KAKWA 13-18-62-6**. The objective of this Time Lapse analysis is to interpret all 3 surveys done in this well on a consistent basis, thereby minimizing the uncertainty in the gas inflow profile determined for each of the surveys. The analysis also reflects the incorporation of a new geothermal gradient based on the June 2009 surveys done by Encana on shut-in undisturbed wells.

# 2. Well Data

The well is “S” shaped with the kick off point at around 650 mKB and a maximum deviation of around 18 deg from 600 to 2100 mKB. The deviation drops to less than 2 deg at 2200 mKB and has an almost vertical profile below to its total depth of 3483 mKB. The well completion is shown in Appendix D.

# 3. Methodology of OptiCall Slick-line operation

The OptiCall Slick-line tool string is a specialized Schlumberger slickline cable, with an embedded fiber-optic cable for recording DTS data and a crystal quartz gauge for single-point pressure measurements. Raw DTS data is depth corrected and filtered to enhance the signal to noise ratio in proprietary thermal analysis software –THERMA*. OptiCall Slick-line data is generally recorded in the following steps:

- Flowing profile measurements from 4 to 6 hours.
- Shut-in temperature measurements for 12 hours.
- Static gradient measurements using the CQG pressure sensor while pulling out of hole; sensor also used to record the flowing and shut-in profile versus time.

The well is switched to annular only flow, one day prior to the survey. The tubing is shut-in while running the slick-line tool into the well, with gas continuously flowing up the annulus during the OptiCall Slick-line survey to eliminate the complex heat transfer associated with the normal pre-survey flow path down the annulus and up the tubing. Temperature effects caused by gas flow in the annulus are monitored through the tubing with the OptiCall Slick-line used DTS data to generate a temperature log every 10 minutes. The flowing temperature profile of the well is recorded with this procedure without snubbing the tubing above the reservoir interval.

A near wellbore thermal model is generated in THERMA using data provided by Encana (see Appendices A). The Joule-Thomson cooling caused by near wellbore pressure drawdown is calculated in THERMA; the gas inflow distribution is calculated after refining individual zone permeabilities and pressures to match the measured flowing DTS temperature. In fractured gas wells, the thermal model uses “pseudo” permeabilities and pressures to account for these fracture and matrix properties.



## 4. Methodology of Time Lapse Interpretation

If two or more DTS surveys taken in the same well are available, the better survey in terms of data stability and operational execution is chosen as first survey to be interpreted. Once the reservoir model, the geothermal gradient and the transient simulation match curve are defined in this first survey, all these parameters are taken to initialize the second survey interpretation process. In theory, all these parameters must remain the same with the exception of the reservoir pressure, which naturally depletes along with the gas reservoir production depletion. Following interpretation of the second and subsequent surveys, required reservoir model changes are tested in the first survey in an effort to maintain a consistent model. Further iterations are then attempted to define the most consistent reservoir model. The iterative process constrains the solution and provides the most reliable interpretations of all surveys from the same well.

In the “ideal” case, permeability, geothermal gradient and thermal zones do not necessarily change, but we have seen that certain minor adjustments are required during the analysis. For instance, the permeability may vary due to changes in the fracture conductivity due to ongoing post-fracture stimulation clean-up, so the permeability value in the Therma simulator may be modified to allow the simulation curve a better match. Similar modifications may be required to the geothermal gradient, where small changes in the temperature profile may happen as result of the long term gas cooling or heating effects in certain portions of the well.

The final target is to define the changes in gas production for each reservoir interval while minimizing changes in permeability and geothermal gradient, thereby generating more consistent and reliable rate estimates.

## 4.1 Gas Inflow Profile

The THERMA model used the latest practical reported surface test gas rates in every survey, recorded during the later portion of the DTS test flowing pass. The gas inflow rates from thermal interpretation results for the 3 surveys are summarized in Tables 5.1, 6.1, 7.1 and 8.1. The main Thermal model with the most representative DTS traces and gas production profile per perforated zone for the 3 surveys are showed in the Figures 6.2, 7.2 and 8.2.

The Inflow table for all zones and survey is shown in section 5.

## 4.2 Conclusions

The DTS time-lapse process has proved to result in better estimates and better understanding of the natural gas depletion process in every reservoir perforated interval. In the particular case of the 3 time-lapse surveys done on ECA ECOG KAKWA 13-18-62-6, the gas production depletion per interval had been calculated with high confidence. Future surveys in this well could also be added to this time-lapse process.

# 5. Time Lapse (TL) Combined Survey Results

## 5.1 Time Lapse Rate Summary Comparison

| Zone | Perforation Interval (mKB) | | Reservoir Interval | Gas Rate, E3m3/d | Gas Rate, E3m3/d | Gas Rate, E3m3/d |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | Thermal Zone (mKB) | Survey 1 APR-2010 | Survey 2 NOV-2010 | Survey 3 AUG-2011 |
| CARDIUM | 2155.00 | 2159.00 | 2150-2160 | 4.592 | 2.109 | 0.712 |
| DUNVEGAN E | 2734.00 | 2735.00 | 2732-2737 | 2.168 | 1.134 | 0.577 |
| DUNVEGAN E | 2740.00 | 2741.00 | 2739-2742.5 | 10.23 | 2.305 | 0.408 |
| DUNVEGAN E | 2748.00 | 2750.00 | 2748-2751 | 10.307 | 3.259 | 0.288 |
| CADOTTE | 2981.00 | 2982.00 | 2981-2984 | 1.323 | 0.153 | 0.17 |
| CADOTTE | 2984.00 | 2985.00 | 2984-2987 | 1.378 | 0.148 | 0.16 |
| CADOTTE | 2987.00 | 2988.00 | 2987-2990 | 1.378 | 0.136 | 0.149 |
| LOWER CADOTTE | 2994.00 | 2995.00 | 2993-2998 | 2.226 | 1.052 | 0.225 |
| FALHER A | 3081.00 | 3083.00 | 3081-3091 | 1.808 | 0.635 | 0.272 |
| FALHER A | 3085.00 | 3086.00 | | | | |
| FALHER A | 3089.50 | 3090.50 | | | | |
| FALHER F | 3243.00 | 3244.00 | 3241-3244 | 1.629 | 0.641 | 0.163 |
| FALHER F | 3251.50 | 3252.00 | 3251-3256 | 2.577 | 1.015 | 0.25 |
| FALHER F | 3254.00 | 3254.50 | | | | |
| FALHER F | 3259.50 | 3260.00 | 3258-3262 | 1.071 | 0.407 | 0.102 |
| WILRICH A | 3264.00 | 3264.50 | 3263.5-3266.5 | 0.026 | 0.286 | 0.072 |
| WILRICH A | 3271.00 | 3271.50 | 3269-3272 | 0.021 | 0.282 | 0.067 |
| WILRICH A | 3275.00 | 3275.50 | 3273-3276 | 0.036 | 0.286 | 0.069 |
| BLUESKY | 3338.00 | 3339.00 | 3338-3342 | 1.097 | 0.752 | 0.01 |
| BLUESKY | 3343.00 | 3344.00 | 3343-3346 | 3.316 | 0.743 | 0.008 |
| BLUESKY | 3347.00 | 3349.00 | 3347-3351 | 13.335 | 4.704 | 0.01 |
| GETHING B | 3381.00 | 3383.00 | 3379-3386 | 40.549 | 10.824 | 0.168 |
| GETHING B | 3387.00 | 3388.00 | 3387-3392 | 20.933 | 4.129 | 0.12 |
| TOTAL | | | | 120 | 35 | 4 |

## 5.2 Time Lapse Pressure Summary Comparison BHFP vs. Gauge vs. Simulation

| | Depth (m) | | Flowing Pressures (MPa) | | | Shut-in Pressure (MPa) |
|---|---|---|---|---|---|---|
| | @ MD | @ TVD | Gauge Pressure | Estimated BHFP* | Therma BHFP | Gauge Final Pressure |
| **Survey 1 - Apr 2010** | 3441 | 3396 | 9 | 8.8 | 8.7 | 12 |
| **Survey 2 - Nov 2010** | 3440 | 3395 | 5.5 | 5.3 | 5.25 | 6.8 |
| **Survey 3 - Aug 2011** | 3445.8 | 3400.6 | 6 | 5.5 | 5.55 | 6.6 |
| | | | | * without liquids in bottom | | |

## 5.3 Time Lapse View of Input Reservoir Parameters

| | **Layer** | | **CRDM** | **DUN A** | **DUN B** | **DUN D** | **CDTT** | **CDTT** | **CDTT** | **L. CDTT** | **FAL A** | **FAL F** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Thermal | m | 2150 | 2732 | 2739 | 2748 | 2981 | 2984 | 2987 | 2993 | 3081 | 3241 |
| | Zone | | 2160 | 2737 | 2742.5 | 2751 | 2984 | 2987 | 2990 | 2998 | 3091 | 3244 |
| | Thickness | m | 9.92 | 4.99 | 3.49 | 2.99 | 2.99 | 2.99 | 2.99 | 4.99 | 9.99 | 2.99 |
| **Survey 1** | Permeability | mD | 1 | 1.5 | 6 | 6.5 | 4.62 | 4.62 | 4.62 | 4.62 | 1.78 | 3.3 |
| **Apr 2010** | Pressure | MPa | 8.6 | 9.05 | 9.05 | 9.05 | 8.55 | 8.55 | 8.55 | 8.55 | 8.7 | 8.8 |
| **Survey 2** | Permeability | mD | 3.31 | 1.6 | 6.6 | 6 | 4.77 | 4.77 | 4.77 | 4.77 | 1.87 | 3.2 |
| **Nov 2010** | Pressure | MPa | 5.04 | 5.45 | 5.35 | 5.55 | 5.2 | 5.2 | 5.2 | 5.3 | 5.3 | 5.45 |
| **Survey 3** | Permeability | mD | 1 | 7.2 | 7.92 | 7.2 | 3.6 | 3.6 | 3.6 | 3.6 | 2.24 | 0.96 |
| **Aug 2011** | Pressure | MPa | 5.12 | 5.25 | 5.25 | 5.25 | 5.38 | 5.38 | 5.38 | 5.38 | 5.43 | 5.65 |

| | **Layer** | | **FAL F** | **FAL F** | **WRCH A** | **WRCH A** | **WRCH A** | **BLSK** | **BLSK** | **BLSK** | **GTGH** | **GTGH** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Thermal | m | 3251 | 3258 | 3263.5 | 3269 | 3273 | 3338 | 3343 | 3347 | 3379 | 3387 |
| | Zone | | 3256 | 3262 | 3266.5 | 3272 | 3276 | 3342 | 3346 | 3351 | 3386 | 3392 |
| | Thickness | m | 4.99 | 3.99 | 2.99 | 2.99 | 2.99 | 3.99 | 2.99 | 3.99 | 6.99 | 4.99 |
| **Survey 1** | Permeability | mD | 3.3 | 1.65 | 1.65 | 1.65 | 1.65 | 1 | 3.9 | 11.7 | 21.9 | 12.1 |
| **Apr 2010** | Pressure | MPa | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 9.15 | 9.15 | 9.15 | 9.25 | 9.35 |
| **Survey 2** | Permeability | mD | 3.2 | 1.55 | 1.55 | 1.55 | 1.55 | 1 | 2.3 | 2.3 | 2.3 | 1.4 |
| **Nov 2010** | Pressure | MPa | 5.45 | 5.45 | 5.45 | 5.45 | 5.45 | 5.8 | 5.6 | 6.6 | 7.05 | 6.85 |
| **Survey 3** | Permeability | mD | 0.96 | 0.48 | 0.48 | 0.48 | 0.48 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| **Aug 2011** | Pressure | MPa | 5.65 | 5.65 | 5.65 | 5.65 | 5.65 | 5.6 | 5.6 | 5.6 | 6.1 | 6.1 |

# 6. Apr 2010 Survey Summary

Bottom hole flowing pressure was estimated to be approximately 8.6 MPa based on the gauge pressure the day of the survey. At that time, the rate was around 120 $E^3m^3$/d. Downhole pressure gauge data indicates some liquids accumulation in the wellbore during the survey, the liquid level was around 3,390 mKB inside the tubing. The temperature trace at 4:46 PM was used because the rate of the well was stable around that time.

There is no evidence of crossflow during shut-in during the time of the survey.

| Zone | Perforation Interval (mKB) | | Reservoir Interval | Gas Inflow Rate | Gas Inflow Contribution | Gas Inflow Contribution |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | Thermal Zone (mKB) | (E3m3/day) | (%/total) | (%/total) |
| CARDIUM | 2155.00 | 2159.00 | 2150-2160 | 4.59 | 3.83% | 3.83% |
| DUNVEGAN E | 2734.00 | 2735.00 | 2732-2737 | 2.17 | 1.81% | 18.92% |
| DUNVEGAN E | 2740.00 | 2741.00 | 2739-2742.5 | 10.23 | 8.52% | |
| DUNVEGAN E | 2748.00 | 2750.00 | 2748-2751 | 10.31 | 8.59% | |
| CADOTTE | 2981.00 | 2982.00 | 2981-2984 | 1.32 | 1.10% | 5.25% |
| CADOTTE | 2984.00 | 2985.00 | 2984-2987 | 1.38 | 1.15% | |
| CADOTTE | 2987.00 | 2988.00 | 2987-2990 | 1.38 | 1.15% | |
| LOWER CADOTTE | 2994.00 | 2995.00 | 2993-2998 | 2.23 | 1.86% | |
| FALHER A | 3081.00 | 3083.00 | 3081-3091 | 1.81 | 1.51% | 5.97% |
| FALHER A | 3085.00 | 3086.00 | | | | |
| FALHER A | 3089.50 | 3090.50 | | | | |
| FALHER F | 3243.00 | 3244.00 | 3241-3244 | 1.63 | 1.36% | |
| FALHER F | 3251.50 | 3252.00 | 3251-3256 | 2.58 | 2.15% | |
| FALHER F | 3254.00 | 3254.50 | | | | |
| FALHER F | 3259.50 | 3260.00 | 3258-3262 | 1.07 | 0.89% | |
| WILRICH A | 3264.00 | 3264.50 | 3263.5-3266.5 | 0.03 | 0.02% | |
| WILRICH A | 3271.00 | 3271.50 | 3269-3272 | 0.02 | 0.02% | |
| WILRICH A | 3275.00 | 3275.50 | 3273-3276 | 0.04 | 0.03% | |
| BLUESKY | 3338.00 | 3339.00 | 3338-3342 | 1.10 | 0.91% | 14.79% |
| BLUESKY | 3343.00 | 3344.00 | 3343-3346 | 3.32 | 2.76% | |
| BLUESKY | 3347.00 | 3349.00 | 3347-3351 | 13.34 | 11.11% | |
| GETHING B | 3381.00 | 3383.00 | 3379-3386 | 40.55 | 33.79% | 51.24% |
| GETHING B | 3387.00 | 3388.00 | 3387-3392 | 20.93 | 17.44% | |
| **TOTAL** | | | | **120** | **100.0%** | **100.0%** |

Table 6.1: Gas Inflow Rates from Thermal Interpretation – Apr 2010 Survey

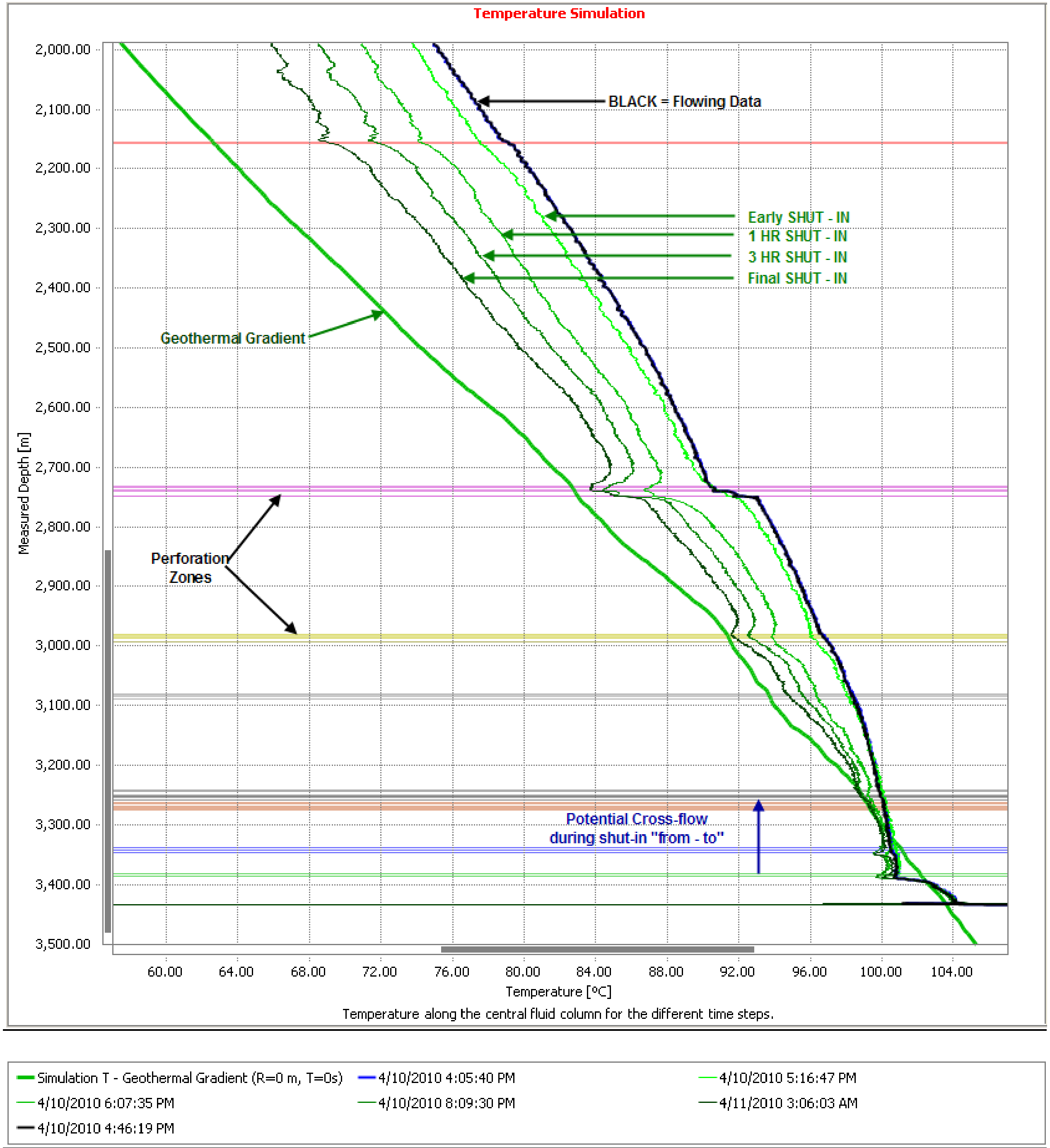



Figure 6.1: DTS data, perforations and comments on potential cross-flow during shut-in Apr 2010 Survey

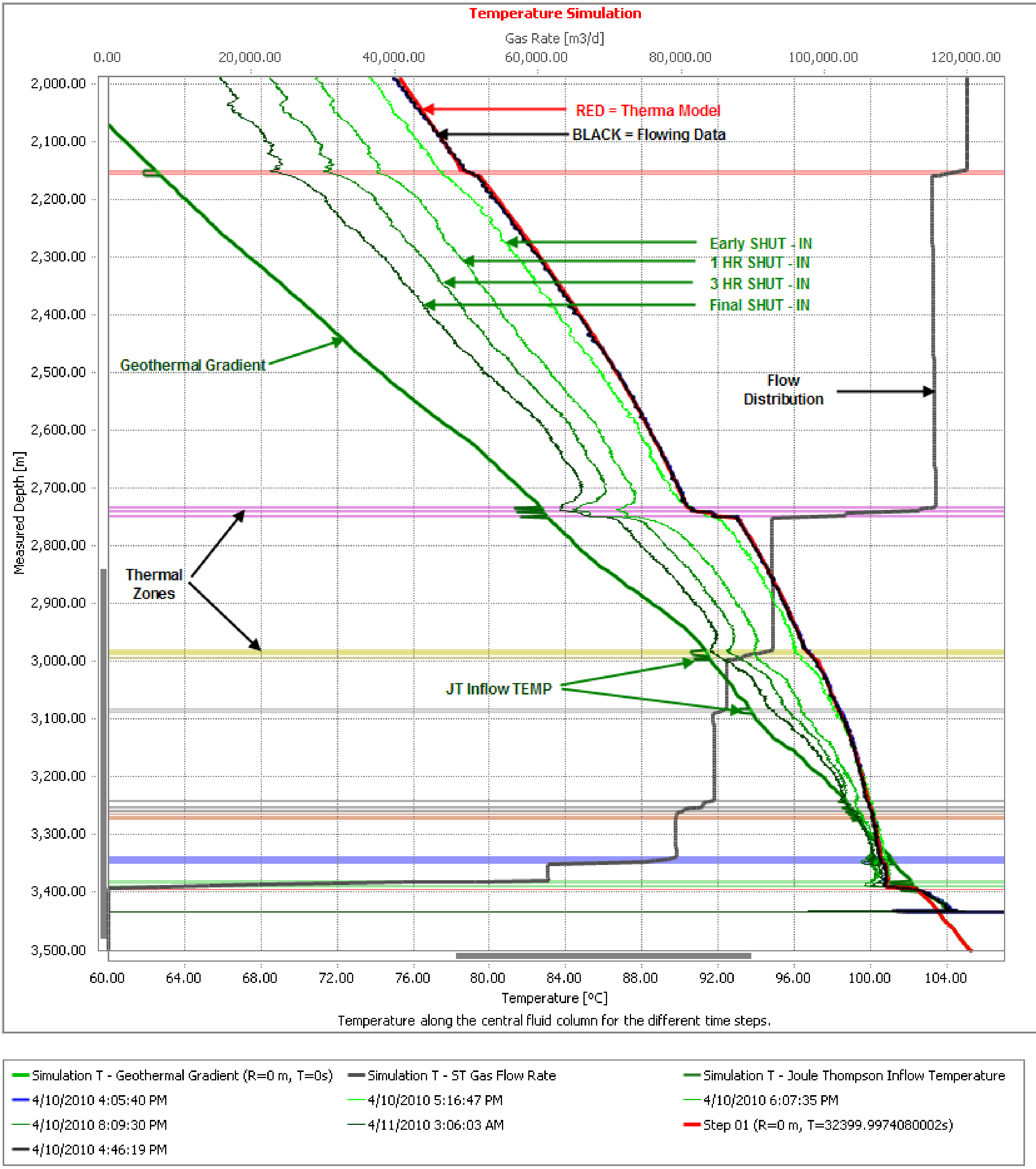



Figure 6.2: Thermal Model over the Producing Intervals - Apr 2010 Survey

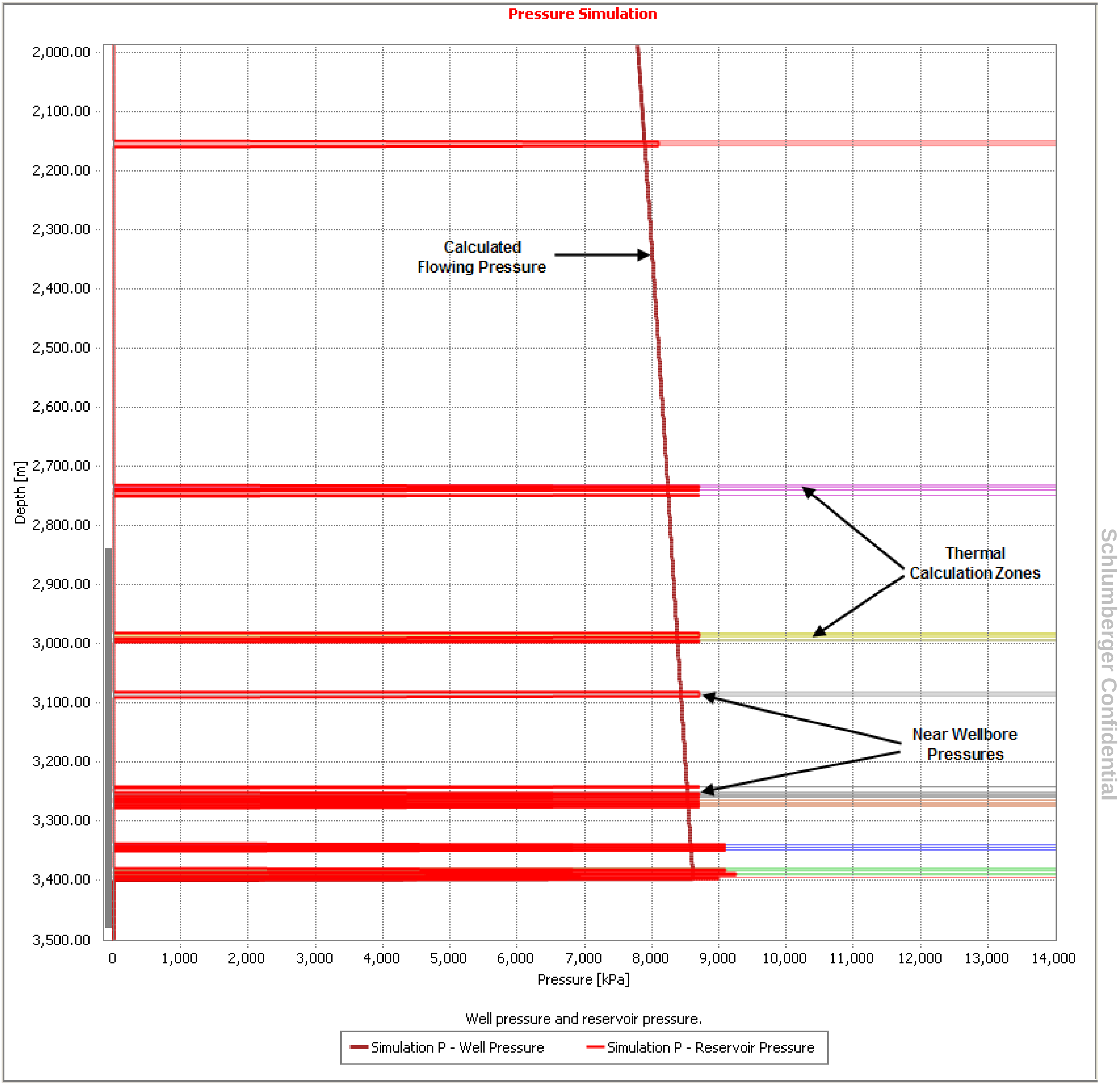



Figure 6.3: Thermal zones with wellbore flowing pressure and near wellbore modeled reservoir pressures - Apr 2010 Survey

# Appendix 6A: THERMA Model Parameters - Apr 2010 Survey

| | |
|---|---|
| Project | THERMA 3.0 Study |
| Prepared By | SLB & EnCana |
| Date | 4/16/2010 |
| Analysis Model Type | Compositional |
| Company | EnCana Corporation |

Geothermal Gradient

| | ☑ MD | ☐ TVD | Temperature | Gradient |
|---|---|---|---|---|
| | m | | °C | degC/m |
| 1 | 0.00 | 0.00 | 7.00 | N/A |
| 2 | 610.03 | 610.00 | 21.70 | 0.02 |
| 3 | 2258.05 | 2212.00 | 67.00 | 0.03 |
| 4 | 2514.23 | 2468.10 | 74.89 | 0.03 |
| 5 | 2619.84 | 2573.70 | 78.73 | 0.04 |
| 6 | 2827.87 | 2781.70 | 84.48 | 0.03 |
| 7 | 2966.89 | 2920.70 | 89.62 | 0.04 |
| 8 | 3062.19 | 3016.00 | 91.92 | 0.02 |
| 9 | 3071.19 | 3025.00 | 92.54 | 0.07 |
| 10 | 3104.39 | 3058.20 | 93.15 | 0.02 |
| 11 | 3114.39 | 3068.20 | 93.79 | 0.06 |
| 12 | 3134.40 | 3088.20 | 94.38 | 0.03 |
| 13 | 3139.20 | 3093.00 | 95.06 | 0.14 |
| 14 | 3154.40 | 3108.20 | 95.92 | 0.06 |
| 15 | 3189.21 | 3143.00 | 96.78 | 0.02 |
| 16 | 3202.62 | 3156.40 | 97.47 | 0.05 |
| 17 | 3239.23 | 3193.00 | 98.44 | 0.03 |
| 18 | 3362.45 | 3316.20 | 100.72 | 0.02 |
| 19 | 3421.85 | 3375.60 | 102.45 | 0.03 |
| 20 | 3483.00 | 3436.74 | 103.65 | 0.02 |
| 21 | | | | |

## Flow Steps

| Duration | Time Subdivision | Step Type | Surface Flow rate |
|---|---|---|---|
| (h) | (h) | | (E3 m3/d) |
| 9.00 h | 1.00 h | Production | 120 |

## Reservoir Model

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | | Non-reservoir | Cardium | Dunv E | Dunv E | Dunv E | Cadotte | Cadotte | Cadotte | Lwr Cadotte |
| **MD Top** | m | | 2150 | 2732 | 2739 | 2748 | 2981 | 2984 | 2987 | 2993 |
| **MD Bottom** | | | 2160 | 2737 | 2742.5 | 2751 | 2984 | 2987 | 2990 | 2998 |
| **Color** | | | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | mD | | 1 | 1.5 | 6 | 6.5 | 4.62 | 4.62 | 4.62 | 4.62 |
| **Vert. Permeability** | | | 1 | 1.5 | 6 | 6.5 | 4.62 | 4.62 | 4.62 | 4.62 |
| **Static Pressure** | MPa | Update all -> | 8.6 | 9.05 | 9.05 | 9.05 | 8.55 | 8.55 | 8.55 | 8.55 |
| **Formation** | | Default For... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | m | | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | m | Update all -> | 9.92 | 4.99 | 3.49 | 2.99 | 2.99 | 2.99 | 2.99 | 4.99 |
| **Model Type** | | | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | ºC | Update all -> | 62.6 | 82.73 | 82.85 | 83.02 | 91.38 | 91.42 | 91.46 | 91.57 |
| **Compositional Oil** | | | Cardium | EnC Du... | EnC Du... | EnC Du... | EnC Ca... | EnC Ca... | EnC Ca... | EnC Ca... |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | Falher A | Falher F | Falher F | Falher F | Wilrich A | Wilrich A | Wilrich A | Bluesky | Bluesky | Bluesky | Gething B | Gething B | Dummy Z |
| **MD Top** | 3081 | 3241 | 3251 | 3258 | 3263.5 | 3269 | 3273 | 3338 | 3343 | 3347 | 3379 | 3387 | 3394 |
| **MD Bottom** | 3091 | 3244 | 3256 | 3262 | 3266.5 | 3272 | 3276 | 3342 | 3346 | 3351 | 3386 | 3392 | 3397 |
| **Color** | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | 1.78 | 3.3 | 3.3 | 1.65 | 1.65 | 1.65 | 1.65 | 1 | 3.9 | 11.7 | 21.9 | 12.1 | 0.01 |
| **Vert. Permeability** | 1.78 | 3.3 | 3.3 | 1.65 | 1.65 | 1.65 | 1.65 | 1 | 3.9 | 11.7 | 21.9 | 12.1 | 0.01 |
| **Static Pressure** | 8.7 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 9.15 | 9.15 | 9.15 | 9.25 | 9.35 | 9 |
| **Formation** | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | 9.99 | 2.99 | 4.99 | 3.99 | 2.99 | 2.99 | 2.99 | 3.99 | 2.99 | 3.99 | 6.99 | 4.99 | 4.99 |
| **Model Type** | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | 93.74 | 98.74 | 98.93 | 99.08 | 99.18 | 99.29 | 99.36 | 101.08 | 101.17 | 101.25 | 102.14 | 102.29 | 102.5 |
| **Compositional Oil** | EnC Fa... | EnC Fa... | EnC Fa... | EnC Fa... | WILRICH | WILRICH | WILRICH | EnC Bl... | EnC Bl... | EnC Bl... | EnC Ge... | EnC Ge... | EnC Ge... |

## Appendix 6B: Job Sequence and Tool String - Apr 2010 Survey

| | | | | |
|---|---|---|---|---|
| **Well Name** | ECA KAKWA 13-18-62-6 | **Schlumberger Crew** | **Position** | **District** |
| **Well UWI** | 100/13-18-062-06W6/00 | Liang Nang | Sensaline FE | Red Deer |
| **Surface Location** | 11-18-62-6W6 | Majid Khan | Sensaline FS | Red Deer |
| **Lisence Number** | 0413731 | Levi Brazier | Slickline FS | Red Deer |
| **Job Start Date** | Saturday, April 10, 2010 | Dexter Agonoy | Sensaline Crew | Red Deer |
| **Job End Date** | April 11. 2010 | | | |
| **Service Order #** | AY17-00043 | | | |

### Job Sequence of Events

| Date | Time | Description of Avtivity |
|---|---|---|
| 10-Apr-10 | 8:00 | Arrived at location, safety meeting, wait for slickline to complete operation |
| | 9:15 | Start rig up 0.125 fiber optic slickline |
| | 9:36 | N2 purge, test for leaks |
| | 9:38 | Open well, RIH 0.125 fiber optic slickline |
| | 9:50 | Pull test at 500 mKB, 197 lbs |
| | 9:59 | Pull test at 1000 mKB, 265 lbs |
| | 10:08 | Pull test at 1500 mKB, 325 lbs |
| | 10:16 | Pull test at 2000 mKB, 410 lbs |
| | 10:25 | Pull test at 2500 mKB, 510 lbs |
| | 10:34 | Pull test at 3000 mKB, 605 lbs |
| | 10:41 | Pull test at 3400 mKB, 640 lbs |
| | 10:45 | Stop at gauge depth 3441 mKB, making fiber depth 3436.9 mKB |
| | 11:00 | Start DTS data acquisition, acquiring flowing profiles. The flowing period is extended to 17:00 as per Encana instruction. |
| | 17:00 | Shut in well at casing wing valve, continue acquiring shut in profiles. Shut in period is reduced to 10 hours instead of the usual 12 hours as per Encana instruction. |
| 11-Apr-10 | 3:06 | Stop DTS acquisition |
| | 3:08 | Start POOH with reverse static gradients |
| | 5:45 | Sensaline at surface |
| | 5:51 | Close master valve, bleed off pressure |
| | 6:28 | Start rig out |
| | 6:45 | Finished rig out, leave location |

Schlumberger

ENCANA

## TOOLSTRING SCHEMATIC.

| | | | | |
|---|---|---|---|---|
| **Customer:** | EnCana | **Customer Rep:** | Todd Schneider | **Toolstring No: 1** |
| **Field:** | KAKWA | **Well Type:** | GAS PRODUCTION | **Operation Detail:** |
| **UWI** | 100/13-18-062-06W6/00 | **Schlumberger Rep/s:** | Liang Nang | Sensa fiber optic Temp log |
| **Well Name** | ECA KAKWA 13-18-62-6 | **Schlumberger Base** | Red Deer Slickline | Quartz pressure, temp memory gauges |
| **Surface LSD** | 11-18-62-6W6 | **Lisence Number** | 0413731 | **Tensile Strength of cable: 200 KSPI** |
| **Rig/Crane** | Big Horn Crane | **Start Date** | 10-Apr-10 | **End Date** April 11. 2010 |

| Item Nos | S/Rod or TIC / QC | Length Meter | Weight (LBS) | Description of Item Including Part Nos & Serial Nos Where Applicable | OD mm | F/Neck (Inches) |
|---|---|---|---|---|---|---|
| 1 | 5/8 sucker rod | 0.20 | 2.00 | Sensa Slick line rope socket fish neck | 38.10 | 1.375 |
| 2 | 5/8 sucker rod | 0.26 | 4.00 | Swivel, 1.5 inch | 38.10 | 1.375 |
| 3 | QC X-Over | 0.18 | 1.00 | 5/8 Sucker Rod to Quick Connect | 38.10 | 1.375 |
| 4 | Quick Connect | 0.91 | 33.00 | Weight bar, 3 foot 1.5 inch | 38.10 | 1.375 |
| 5 | Quick Connect | 0.30 | 5.00 | Knuckle Joint | 38.10 | 1.375 |
| 6 | Quick Connect | 1.52 | 55.00 | Weight bar, 5 foot 1.5 inch | 38.10 | 1.375 |
| 7 | QC X-Over | 0.12 | 1.00 | Quick Connect to 5/8 Sucker Rod | 38.10 | 1.375 |
| 8 | 5/8 Sucker rod | 0.60 | 10.00 | Bomwell with 2 quartz pressure/temprature gauges | 38.10 | na |
| | Casing Flange to KB | 5.80 | | Largest OD in mm | 38.10 | |
| | Tool String Length in Meters | 4.09 | | | | |
| | Sensa FO line Zero | 1.71 | Primary Depth on laptop | Sensaline Depth | | |
| | Gauge Zero | 5.80 | Secondary Depth on laptop | Gauge depth | | |
| | Total Tool Weight | | 111 | | | |

# Appendix 6C: Flowing & Static Gradient Plots - Apr 2010 Survey

Client: Encana
Test Date: 2010/04/10 - 2010/04/11
Tool Serial #: 8935

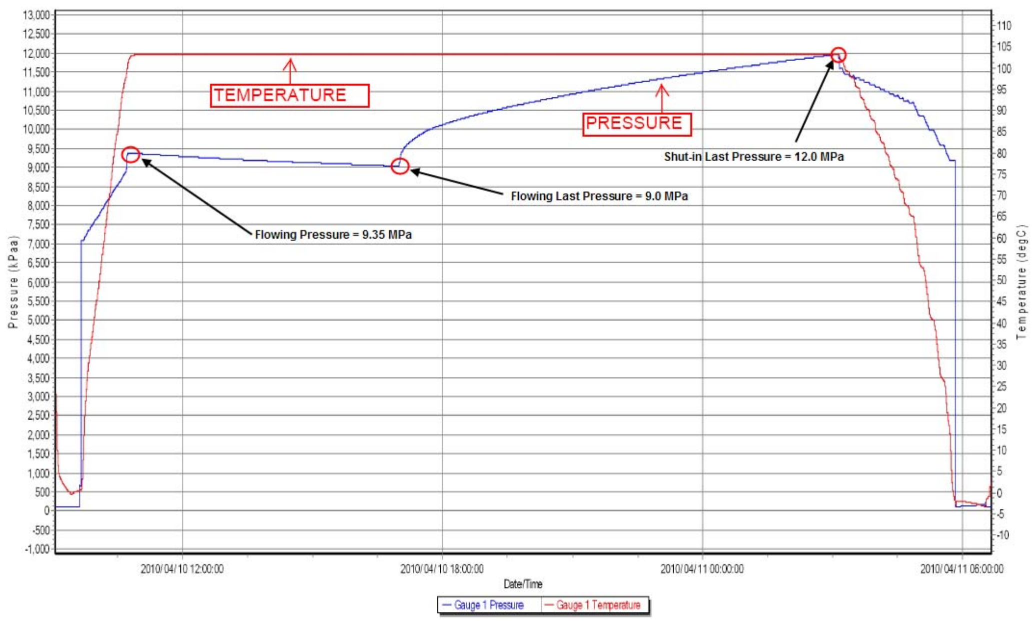
Well Name: ECA KAKWA 13-18-62-6
Location: 11-18-62-6W6
Field/Pool: KAKWA

Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3396
Test/Prod. Interval Top [m KB (TVD)]: 2110.34
Test/Prod. Interval Base [m KB (TVD)]: 3343

**Sensaline Production Logging Downhole Gauges**

**DATA PLOT**

BOTTOM GAUGE PRESSURE AND TEMPERATURE DATA PLOT



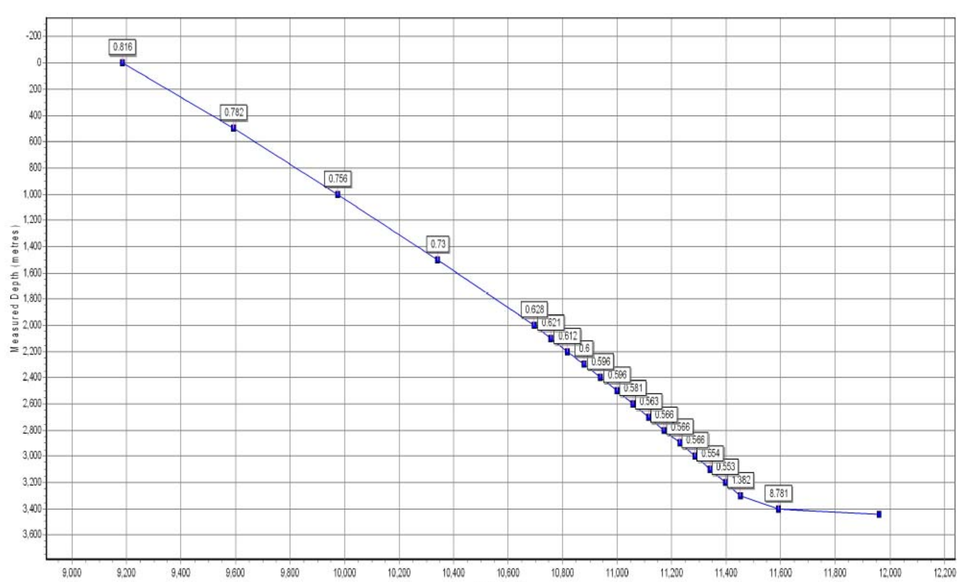

Client: Encana
Test Date: 2010/04/10 - 2010/04/11
Tool Serial #: 8935

Well Name: ECA KAKWA 13-18-62-6
Location: 11-18-62-6W6
Field/Pool: KAKWA

Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3396
Test/Prod. Interval Top [m KB (TVD)]: 2110.34
Test/Prod. Interval Base [m KB (TVD)]: 3343

**Sensaline Production Logging Downhole Gauges**

**PRESSURE GRADIENT PLOT**



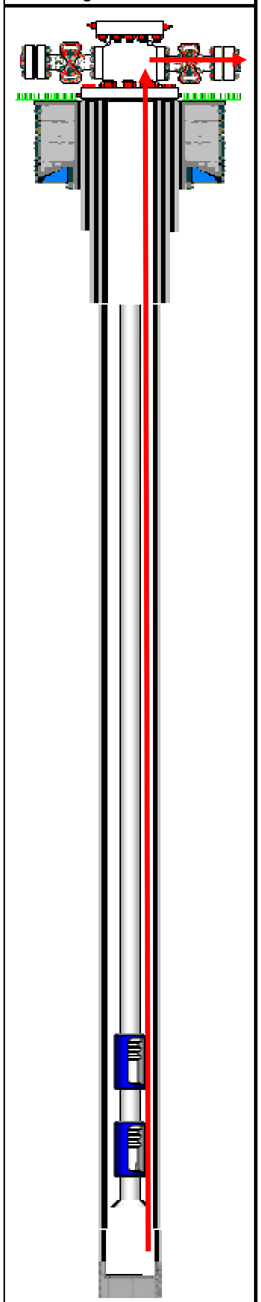
# Appendix 6D: Well Schematic - Apr 2010 Survey

Schlumberger

EnCana

| | | | | | |
|---|---|---|---|---|---|
| Customer | EnCana | KB (m) | 1207.09 | Start Date | 10-Apr-10 |
| Well Name | ECA KAKWA 13-18-62-6 | GL (m) | 1201.39 | End Date | April 11. 2010 |
| UWI | 100/13-18-062-06W6/00 | CF (m) | 1201.29 | Deviated | ☑ Yes ☐ No |
| Lisence # | 0413731 | KB-CF (m) | 5.8 | Packer | ☐ Yes ☑ No |
| Field Name | KAKWA | KB-GL(m) | 5.7 | SO # | AY17-00043 |
| Well Type | GAS PRODUCTION | TDPB (mKB) | 3482.16 | | |
| Flow Path | ☑ CASING ☐ TUBING ☐ BOTH CASING AND TUBING | PBTVD (mKB) | 0 | | |

Well Diagram



Flow Path Indicated with Red Arrows

| Well Head Connection Type ☐ FLANGE ☑ SWAGE | Size: | 2 3/8 EUE |
|---|---|---|
| | | |

| | Casing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Surface | 244.5 | 226.6 | J-55 | 53.574 | | 616.0 |
| ☑ | Intermediate | 177.8 | 161.7 | E-80 | 34.228 | | 2251.0 |
| ☑ | Production | 114.3 | 101.6 | P-110 | 17.263 | | 3483.0 |
| ☐ | Production Liner | | | | | | |

Down Hole Items - Packers / Bridge Plugs / Fish / Misc. Down Hole Equiptment

| Type of Down Hole Item | Depth mKB | Remarks |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| | Tubing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Production Tubing | 60.3 | 50.7 | L-80 EUE | 6.990 | 48.29 | 3380 |
| ☐ | Coil Tubing | | | | | | |
| | | | | | | | |

Tubing Jewlery (nipples, plugs, damage, holes, re-entry guides ect.)

| # | Iteme | Top Depth | Bottom Dept | OD mm | ID mm | Remarks |
|---|---|---|---|---|---|---|
| 1 | X Profile Nipple | 3375.44 | 3375.71 | 60.3 | 47.6 | |
| 2 | XN Profile | 3378.78 | 3379.09 | 60.3 | 45.5 | No-go |
| 3 | Re-entry guide | 3379.7 | 3380 | 60.3 | 47.6 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Remarks:

Schlumberger

# 7. Nov 2010 Survey Summary

Bottom hole flowing pressure was estimated to be approximately 5.3 MPa based on the gauge pressure the day of the survey. At that time, the rate was around 35 $E^3m^3/d$. Downhole pressure gauge data indicates some liquids accumulation in the wellbore during the survey causing the flowing down-hole pressure building up by around 0.6 Mpa. High flow instability was seen in flowing traces behavior the reason that three flowing traces were taken for interpretation purposes.

The temperature trace at 1:54, was used to make a balance between the temperatures trace performance beginning and ending the mentioned unstable period. The developed thermal model was matched considering the mentioned flowing trace.

There is evidence of crossflow during shut-in time from Dunvegan to Cardium.

| Zone | Perforation Interval (mKB) | | Reservoir Interval | Gas Inflow Rate | Gas Inflow Contribution | Gas Inflow Contribution |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | Thermal Zone (mKB) | (E3m3/day) | (%/total) | (%/total) |
| CARDIUM | 2155.00 | 2159.00 | 2150-2160 | 2.11 | 6.03% | 6.03% |
| DUNVEGAN E | 2734.00 | 2735.00 | 2732-2737 | 1.13 | 3.24% | 19.14% |
| DUNVEGAN E | 2740.00 | 2741.00 | 2739-2742.5 | 2.31 | 6.59% | |
| DUNVEGAN E | 2748.00 | 2750.00 | 2748-2751 | 3.26 | 9.31% | |
| CADOTTE | 2981.00 | 2982.00 | 2981-2984 | 0.15 | 0.44% | 4.25% |
| CADOTTE | 2984.00 | 2985.00 | 2984-2987 | 0.15 | 0.42% | |
| CADOTTE | 2987.00 | 2988.00 | 2987-2990 | 0.14 | 0.39% | |
| LOWER CADOTTE | 2994.00 | 2995.00 | 2993-2998 | 1.05 | 3.01% | |
| FALHER A | 3081.00 | 3083.00 | 3081-3091 | 0.64 | 1.81% | 10.15% |
| FALHER A | 3085.00 | 3086.00 | | | | |
| FALHER A | 3089.50 | 3090.50 | | | | |
| FALHER F | 3243.00 | 3244.00 | 3241-3244 | 0.64 | 1.83% | |
| FALHER F | 3251.50 | 3252.00 | 3251-3256 | 1.02 | 2.90% | |
| FALHER F | 3254.00 | 3254.50 | | | | |
| FALHER F | 3259.50 | 3260.00 | 3258-3262 | 0.41 | 1.16% | |
| WILRICH A | 3264.00 | 3264.50 | 3263.5-3266.5 | 0.29 | 0.82% | |
| WILRICH A | 3271.00 | 3271.50 | 3269-3272 | 0.28 | 0.81% | |
| WILRICH A | 3275.00 | 3275.50 | 3273-3276 | 0.29 | 0.82% | |
| BLUESKY | 3338.00 | 3339.00 | 3338-3342 | 0.75 | 2.15% | 17.71% |
| BLUESKY | 3343.00 | 3344.00 | 3343-3346 | 0.74 | 2.12% | |
| BLUESKY | 3347.00 | 3349.00 | 3347-3351 | 4.70 | 13.44% | |
| GETHING B | 3381.00 | 3383.00 | 3379-3386 | 10.82 | 30.93% | 42.72% |
| GETHING B | 3387.00 | 3388.00 | 3387-3392 | 4.13 | 11.80% | |
| **TOTAL** | | | | **35** | **100.0%** | **100.0%** |

Table 7.1: Gas Inflow Rates from Thermal Interpretation - Nov 2010 Survey

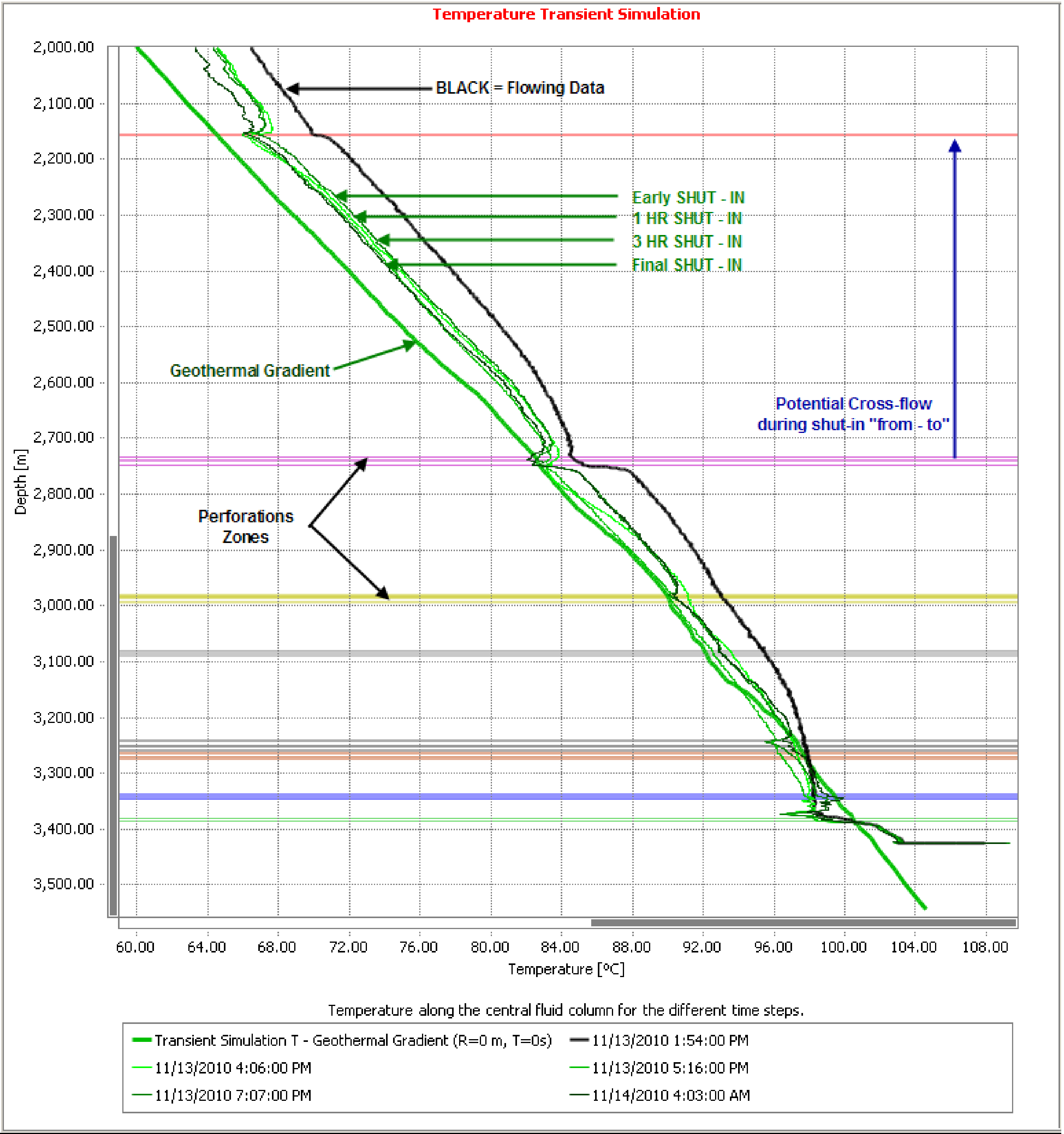





Figure 7.1: DTS data, perforations and comments on potential cross-flow during shut-in Nov 2010 Survey

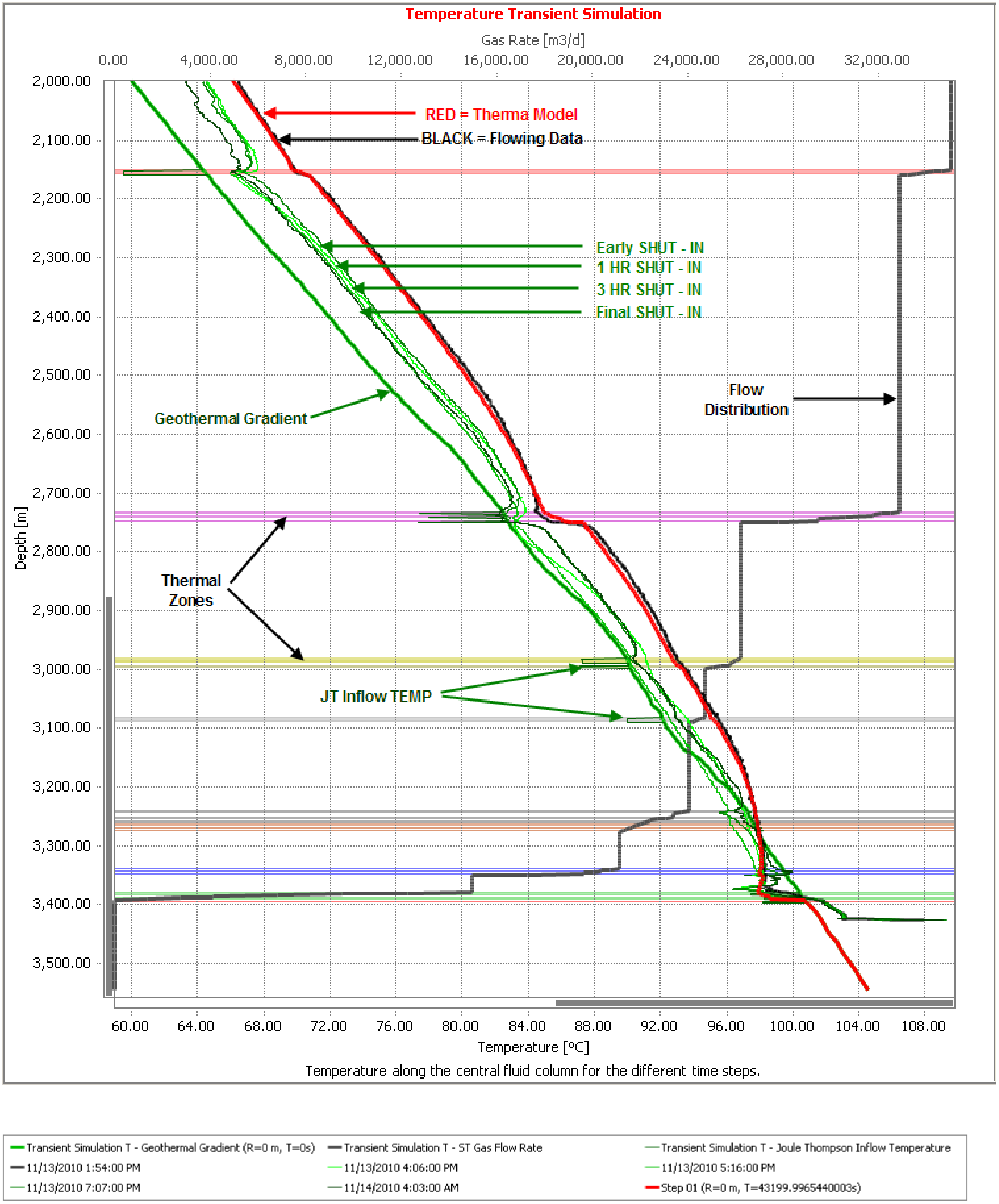





Figure 7.2: Thermal Model over the Producing Intervals - Nov 2010 Survey

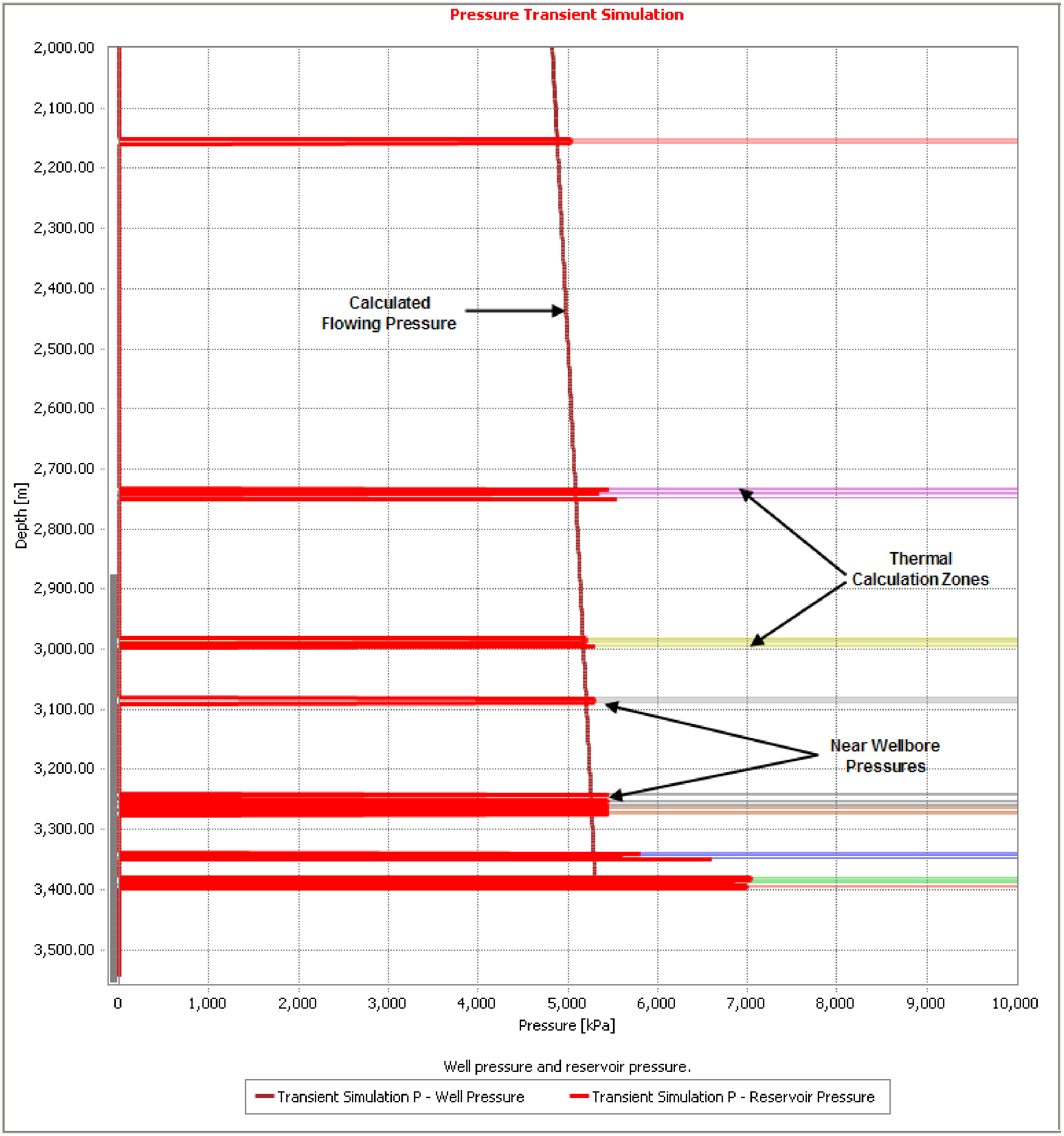



Figure 7.3: Thermal zones with wellbore flowing pressure and near wellbore modeled reservoir pressures - Nov 2010 Survey

## Appendix 7A: THERMA Model Parameters - Nov 2010 Survey

| | |
|---|---|
| **Project** | THERMA 4.0 Study |
| **Prepared By** | Schlumberger & Encana |
| **Re-interpretation Date** | Nov 2010 |
| **Analysis Model Type** | Compositional |
| **Company** | Encana Corporation |

Geothermal Gradient - Nov 2010 Survey

| | ☑ MD | ☐ TVD | Temperature | Gradient |
|---|---|---|---|---|
| | m | | °C | degC/m |
| 1 | 0.00 | 0.00 | 7.50 | N/A |
| 2 | 610.03 | 610.00 | 20.40 | 0.02 |
| 3 | 2258.25 | 2212.20 | 67.51 | 0.03 |
| 4 | 2514.23 | 2468.10 | 75.39 | 0.03 |
| 5 | 2619.84 | 2573.70 | 79.23 | 0.04 |
| 6 | 2827.87 | 2781.70 | 84.98 | 0.03 |
| 7 | 2894.28 | 2848.10 | 87.54 | 0.04 |
| 8 | 2925.68 | 2879.50 | 88.47 | 0.03 |
| 9 | 2979.29 | 2933.10 | 89.94 | 0.03 |
| 10 | 3001.19 | 2955.00 | 90.20 | 0.01 |
| 11 | 3062.19 | 3016.00 | 91.52 | 0.02 |
| 12 | 3071.39 | 3025.20 | 91.93 | 0.04 |
| 13 | 3104.39 | 3058.20 | 92.45 | 0.02 |
| 14 | 3134.40 | 3088.20 | 93.34 | 0.03 |
| 15 | 3154.40 | 3108.20 | 94.48 | 0.06 |
| 16 | 3230.82 | 3184.60 | 96.99 | 0.03 |
| 17 | 3283.23 | 3237.00 | 97.97 | 0.02 |
| 18 | 3362.45 | 3316.20 | 99.83 | 0.02 |
| 19 | 3423.45 | 3377.20 | 101.72 | 0.03 |
| 20 | 3483.00 | 3436.74 | 103.03 | 0.02 |
| 21 | | | | |

## Flow Steps - Nov 2010 Survey

| Duration | Time Subdivision | Step Type | Surface Flow rate |
|---|---|---|---|
| (h) | (h) | | (E3m3/d) |
| 12 | 1.00 | Production | 35 |

## Reservoir Model – Nov 2010 Survey

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | | Non-reservoir | Cardium | Dunv E | Dunv E | Dunv E | Cadotte | Cadotte | Cadotte | Cadotte_L |
| **MD Top** | m | | 2150 | 2732 | 2739 | 2748 | 2981 | 2984 | 2987 | 2993 |
| **MD Bottom** | | | 2160 | 2737 | 2742.5 | 2751 | 2984 | 2987 | 2990 | 2998 |
| **Color** | | | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | mD | | 3.31 | 1.6 | 6.6 | 6 | 4.77 | 4.77 | 4.77 | 4.77 |
| **Vert. Permeability** | | | 3.31 | 1.6 | 6.6 | 6 | 4.77 | 4.77 | 4.77 | 4.77 |
| **Static Pressure** | MPa | Update all -> | 5.04 | 5.45 | 5.35 | 5.55 | 5.2 | 5.2 | 5.2 | 5.3 |
| **Formation** | | Default For... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | m | | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | m | Update all -> | 9.92 | 4.99 | 3.49 | 2.99 | 2.99 | 2.99 | 2.99 | 4.99 |
| **Model Type** | | | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | ºC | Update all -> | 60.15 | 78.83 | 78.93 | 79.08 | 87.33 | 87.37 | 87.4 | 87.49 |
| **Compositional Oil** | | | Cardium | EnC Du... | EnC Du... | EnC Du... | EnC Ca... | EnC Ca... | EnC Ca... | EnC Ca... |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | Falher A | Falher F | Falher F | Falher F | Wilrich A | Wilrich A | Wilrich A | Bluesky | Bluesky | Bluesky | Gething B | Gething B | Dummy Z |
| **MD Top** | 3081 | 3241 | 3251 | 3258 | 3263.5 | 3269 | 3273 | 3338 | 3343 | 3347 | 3379 | 3387 | 3394 |
| **MD Bottom** | 3091 | 3244 | 3256 | 3262 | 3266.5 | 3272 | 3276 | 3342 | 3346 | 3351 | 3386 | 3392 | 3397 |
| **Color** | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | 1.87 | 3.2 | 3.2 | 1.55 | 1.55 | 1.55 | 1.55 | 1 | 2.3 | 2.3 | 2.3 | 1.4 | 0.01 |
| **Vert. Permeability** | 1.87 | 3.2 | 3.2 | 1.55 | 1.55 | 1.55 | 1.55 | 1 | 2.3 | 2.3 | 2.3 | 1.4 | 0.01 |
| **Static Pressure** | 5.3 | 5.45 | 5.45 | 5.45 | 5.45 | 5.45 | 5.45 | 5.8 | 5.6 | 6.6 | 7.05 | 6.85 | 7 |
| **Formation** | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | 9.99 | 2.99 | 4.99 | 3.99 | 2.99 | 2.99 | 2.99 | 3.99 | 2.99 | 3.99 | 6.99 | 4.99 | 2.99 |
| **Model Type** | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | 90.28 | 97.99 | 98.18 | 98.39 | 98.5 | 98.62 | 98.7 | 100.81 | 100.9 | 100.99 | 102.29 | 102.49 | 102.82 |
| **Compositional Oil** | EnC Fa... | EnC Fa... | EnC Fa... | EnC Fa... | WILRICH | WILRICH | WILRICH | EnC Bl... | EnC Bl... | EnC Bl... | EnC Ge... | EnC Ge... | EnC Ge... |

Schlumberger | EnCana

| | | | | |
|---|---|---|---|---|
| **Well Name** | ECA KAKWA 13-18-62-6 | **Schlumberger Crew** | **Position** | **District** |
| **Well UWI** | 100/13-18-062-06W6/00 | Majid Khan | Sensaline FS | Red Deer |
| **Surface Location** | 11-18-62-6W6 | Keith Domoney | Slickline FS | Red Deer |
| **Lisence Number** | 0413731 | Levi Brazier | Sensaline FS | Red Deer |
| **Job Start Date** | Saturday, November 13, 2010 | Mike Braun | Sensaline Crew | Red Deer |
| **Job End Date** | Sunday, November 14, 2010 | | | |
| **Service Order #** | BGHW-00008 | | | |

## Job Sequence of Events

| Date | Time | Description of Avtivity |
|---|---|---|
| 12-Nov-10 | 11:00 | Leave Base from Red Deer |
| | 20:00 | Arrive in Grande Prairie, Stay night in Hotel |
| 13-Nov-10 | 5:30 | Leave Hotel for location |
| | 8:00 | Arrive on location |
| | 8:15 | Hold Safety Meeting |
| | 9:15 | Rig up Slickline with nipple brush |
| | 9:30 | N2 Purse & Pressure test. |
| | 9:45 | Start RIH with Nipple Brush |
| | 10:00 | Found wax problem while RiH surface to 100mkb. |
| | 10:08 | Pull test 500 mkb, 260 lbs. |
| | 10:12 | Pull test 1000 mkb, 330 lbs. |
| | 10:16 | Pull test 1500 mkb, 410 lbs. |
| | 10:20 | Pull test 2000 mkb, 480 lbs. |
| | 10:25 | Pull test 2500 mkb, 590 lbs. |
| | 10:29 | Pull test 3000 mkb, 700 lbs. |
| | 10:42 | Tag at 3446 mkb |
| | 10:43 | Start POOH |
| | 11:08 | Slickline at surface. Close master valve ,bleed off pressure & rig down slickline |
| | 11:10 | Start rig up 0.125 fiber optic slickline |
| | 11:40 | N2 Purse & Pressure test. |
| | 11:55 | Open well, RIH 0.125 fiber optic slickline |
| | 12:00 | Pull test at 500 mKB, 167 lbs |
| | 12:08 | Pull test at 1000 mKB, 255 lbs |
| | 12:18 | Pull test at 1500 mKB, 305 lbs |
| | 12:26 | Pull test at 2000 mKB, 360 lbs |
| | 12:36 | Pull test at 2500 mKB, 450 lbs |
| | 12:45 | Pull test at 3000 mKB, 530 lbs |
| | 12:52 | Pull test at 3400 mKB, 565 lbs |
| | 12:55 | Stop at gauge depth 3440 mKB, making fiber depth 3435.8 mKB |
| | 13:24 | Start DTS data acquisition, acquiring flowing profiles. |
| | 15:00 | Well is not making stable flow, drop down fast after 14:30 hrs. waiting for flow back |
| | 14:05 | Well stable for half an hour in 15:30 to 14:10 about 8 E3M3/Day, but start drop down after |
| | 14:10 | Shut in well at casing wing valve, continue acquiring shut in profiles. |
| 14-Nov-10 | 4:10 | |
| | 4:12 | Start POOH with reverse static gradients |
| | 7:10 | Sensaline at surface |
| | 7:15 | Close master valve, bleed off pressure |
| | 7:16 | Start rig out |
| | 8:30 | Finished rig out, leave location & standby in Grande cache |
| | | |
| | | |
| | | |
| | | |
| | | |

Schlumberger

## TOOLSTRING SCHEMATIC.

ENCANA

| | | | | | |
|---|---|---|---|---|---|
| **Customer:** | EnCana Corporation | **Customer Rep:** | Todd Schneider | **Toolstring No: 1** | |
| **Field:** | KAKWA | **Well Type:** | GAS PRODUCTION | **Operation Detail:** | |
| **UWI** | 100/13-18-062-06W6/00 | **Schlumberger Rep/s:** | Majid Khan | Sensa fiber optic Temp log | |
| **Well Name** | ECA KAKWA 13-18-62-6 | **Schlumberger Base** | Red Deer Slickline | Quartz pressure, temp memory gauges | |
| **Surface LSD** | 11-18-62-6W6 | **Lisence Number** | 0413731 | **Tensile Strength of cable: 200 KSPI** | |
| **Rig/Crane** | Big Horn Crane | **Start Date** | 13-Nov-10 | **End Date** | 14-Nov-10 |

| Item Nos | S/Rod or TIC / QC | Length Meter | Weight (LBS) | Description of Item Including Part Nos & Serial Nos Where Applicable | OD mm | F/Neck (Inches) |
|---|---|---|---|---|---|---|
| 1 | 5/8 sucker rod | 0.20 | 2.00 | Sensa Slick line rope socket fish neck | 38.10 | 1.375 |
| 2 | 5/8 sucker rod | 0.26 | 4.00 | Swivel, 1.5 inch | 38.10 | 1.375 |
| 3 | QC X-Over | 0.18 | 1.00 | 5/8 Sucker Rod to Quick Connect | 38.10 | 1.375 |
| 4 | Quick Connect | 0.91 | 33.00 | Weight bar, 3 foot 1.5 inch | 38.10 | 1.375 |
| 5 | Quick Connect | 0.30 | 5.00 | Knuckle Joint | 38.10 | 1.375 |
| 6 | Quick Connect | 1.52 | 55.00 | Weight bar, 5 foot 1.5 inch | 38.10 | 1.375 |
| 7 | QC X-Over | 0.12 | 1.00 | Quick Connect to 5/8 Sucker Rod | 38.10 | 1.375 |
| 8 | 5/8 Sucker rod | 0.60 | 10.00 | Bomwell with 2 quartz pressure/temprature gauges | 38.10 | na |
| | | | | | | |
| | Casing Flange to KB | 5.80 | | Largest OD in mm | 38.10 | |
| | Tool String Length in Meters | 4.09 | | | | |
| | Sensa FO line Zero | 1.71 | Primary Depth on laptop | Sensaline Depth | | |
| | Gauge Zero | 5.80 | Secondary Depth on laptop | Gauge depth | | |
| | Total Tool Weight | | 111 | | | |

## Appendix 7C: Flowing & Static Gradient Plots - Nov 2010 Survey

Client: EnCana Corporation
Test Date: 2010/11/13 - 2010/11/14
Tool Serial #: 7975

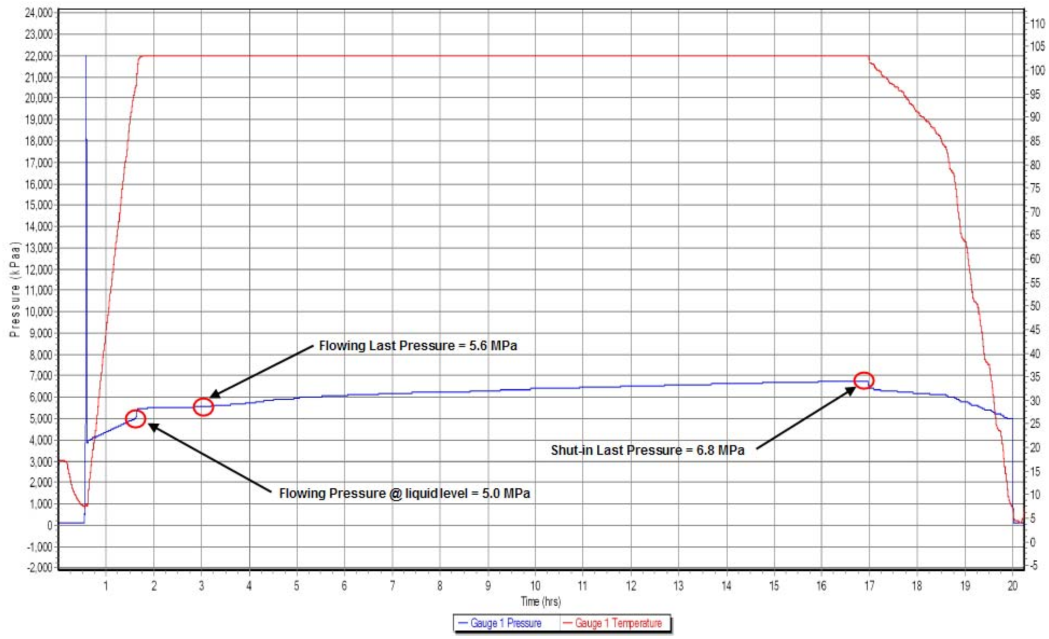
Well Name: ECA KAKWA 13-18-62-6
Location: 11-18-62-6W6
Field/Pool: KAKWA

Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3395.00
Test/Prod. Interval Top [m KB (TVD)]: 2109.13
Test/Prod. Interval Base [m KB (TVD)]: 3341.78

**DOWNHOLE GAUGES DATA**

**DATA PLOT**

BOTTOM GAUGE PRESSURE & TEMPERATURE DATA PLOT





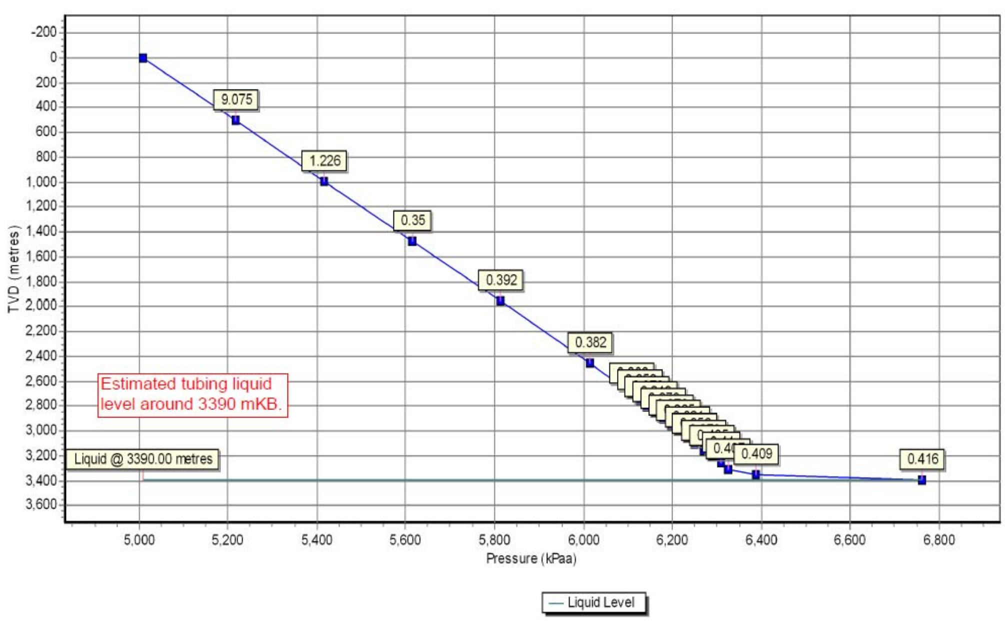
Client: EnCana Corporation
Test Date: 2010/11/13 - 2010/11/14
Tool Serial #: 7975

Well Name: ECA KAKWA 13-18-62-6
Location: 11-18-62-6W6
Field/Pool: KAKWA

Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3395.00
Test/Prod. Interval Top [m KB (TVD)]: 2109.13
Test/Prod. Interval Base [m KB (TVD)]: 3341.78

**DOWNHOLE GAUGES DATA**


**PRESSURE GRADIENT PLOT**

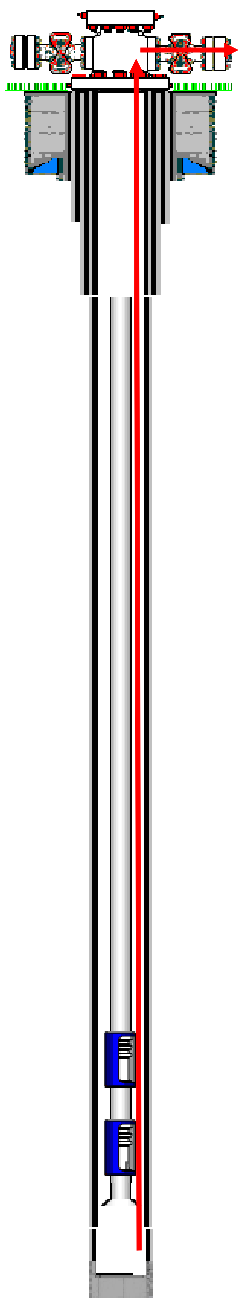


# Appendix 7D: Well Schematic - Nov 2010 Survey

Schlumberger | EnCana

| | | | | | |
|---|---|---|---|---|---|
| Customer | EnCana Corporation | KB (m) | 1207.09 | Start Date | 13-Nov-10 |
| Well Name | ECA KAKWA 13-18-62-6 | GL (m) | 1201.39 | End Date | 14-Nov-10 |
| UWI | 100/13-18-062-06W6/00 | CF (m) | 1201.29 | Deviated | [x] Yes [ ] No |
| Lisence # | 0413731 | KB-CF (m) | 5.8 | Packer | [ ] Yes [x] No |
| Field Name | KAKWA | KB-GL(m) | 5.7 | SO # | BGHW-00008 |
| Well Type | GAS PRODUCTION | TDPB (mKB) | 3482.16 | | |
| Flow Path | [x] CASING [ ] TUBING [ ] BOTH CASING AND TUBING | PBTVD (mKB) | 0 | | |

Well Diagram



Flow Path Indicated with Red Arrows

| | | |
|---|---|---|
| Well Head Connection Type [ ] FLANGE [x] SWAGE | Size: | 2 3/8 EUE |

| | Casing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| [x] | Surface | 244.5 | 226.6 | J-55 | 53.574 | | 616.0 |
| [x] | Intermediate | 177.8 | 161.7 | E-80 | 34.228 | | 2251.0 |
| [x] | Production | 114.3 | 101.6 | P-110 | 17.263 | | 3483.0 |
| [ ] | Production Liner | | | | | | |

Down Hole Items - Packers / Bridge Plugs / Fish / Misc. Down Hole Equiptment

| Type of Down Hole Item | Depth mKB | Remarks |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| | Tubing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| [x] | Production Tubing | 60.3 | 50.7 | L-80 EUE | 6.990 | 48.29 | 3380 |
| [ ] | Coil Tubing | | | | | | |
| | | | | | | | |

Tubing Jewlery (nipples, plugs, damage, holes, re-entry guides ect.)

| # | Iteme | Top Depth | Bottom Dept | OD mm | ID mm | Remarks |
|---|---|---|---|---|---|---|
| 1 | X Profile Nipple | 3375.44 | 3375.71 | 60.3 | 47.6 | |
| 2 | XN Profile | 3378.78 | 3379.09 | 60.3 | 45.5 | No-go |
| 3 | Re-entry guide | 3379.7 | 3380 | 60.3 | 47.6 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |

Remarks:

Schlumberger

# 8. Aug 2011 Survey Summary

Bottom hole flowing pressure was assumed to be approximately 5.6 MPa based on the gauge pressure the day of the survey. At that time, the rate was around 4 $E^3m^3/d$. Downhole pressure gauge data indicates highly liquids accumulation in the wellbore during the survey causing the flowing down-hole pressure building up by around 0.8 Mpa before shut-in the well.

High flow instability was seen in flowing traces behavior the reason that two flowing traces were taken for interpretation purposes.

The temperature traces at 4:07 and 8:25 PM were used to make a balance between the temperatures trace performance beginning and ending the mentioned unstable period. The developed thermal model was matched considering the two mentioned flowing traces.

There is evidence of crossflow during shut-in time from Gething to Falher, from Falher to Cadotte, from Cadotte to Dunvegan, from Dunvegan to Cardium.

<table>
<tr><th rowspan="2">Zone</th><th colspan="2">Perforation Interval (mKB)</th><th>Reservoir Interval</th><th>Gas Inflow Rate</th><th>Gas Inflow Contribution</th><th>Gas Inflow Contribution</th></tr>
<tr><th>Top Shot</th><th>Bottom Shot</th><th>Thermal Zone (mKB)</th><th>(E3m3/day)</th><th>(%/total)</th><th>(%/total)</th></tr>
<tr><td>CARDIUM</td><td>2155.00</td><td>2159.00</td><td>2150-2160</td><td>0.71</td><td>17.80%</td><td>17.80%</td></tr>
<tr><td>DUNVEGAN E</td><td>2734.00</td><td>2735.00</td><td>2732-2737</td><td>0.58</td><td>14.43%</td><td rowspan="3">31.83%</td></tr>
<tr><td>DUNVEGAN E</td><td>2740.00</td><td>2741.00</td><td>2739-2742.5</td><td>0.41</td><td>10.20%</td></tr>
<tr><td>DUNVEGAN E</td><td>2748.00</td><td>2750.00</td><td>2748-2751</td><td>0.29</td><td>7.20%</td></tr>
<tr><td>CADOTTE</td><td>2981.00</td><td>2982.00</td><td>2981-2984</td><td>0.17</td><td>4.25%</td><td rowspan="4">17.60%</td></tr>
<tr><td>CADOTTE</td><td>2984.00</td><td>2985.00</td><td>2984-2987</td><td>0.16</td><td>4.00%</td></tr>
<tr><td>CADOTTE</td><td>2987.00</td><td>2988.00</td><td>2987-2990</td><td>0.15</td><td>3.73%</td></tr>
<tr><td>LOWER CADOTTE</td><td>2994.00</td><td>2995.00</td><td>2993-2998</td><td>0.23</td><td>5.63%</td></tr>
<tr><td>FALHER A</td><td>3081.00</td><td>3083.00</td><td rowspan="3">3081-3091</td><td rowspan="3">0.27</td><td rowspan="3">6.80%</td><td rowspan="10">24.88%</td></tr>
<tr><td>FALHER A</td><td>3085.00</td><td>3086.00</td></tr>
<tr><td>FALHER A</td><td>3089.50</td><td>3090.50</td></tr>
<tr><td>FALHER F</td><td>3243.00</td><td>3244.00</td><td>3241-3244</td><td>0.16</td><td>4.08%</td></tr>
<tr><td>FALHER F</td><td>3251.50</td><td>3252.00</td><td rowspan="2">3251-3256</td><td rowspan="2">0.25</td><td rowspan="2">6.25%</td></tr>
<tr><td>FALHER F</td><td>3254.00</td><td>3254.50</td></tr>
<tr><td>FALHER F</td><td>3259.50</td><td>3260.00</td><td>3258-3262</td><td>0.10</td><td>2.55%</td></tr>
<tr><td>WILRICH A</td><td>3264.00</td><td>3264.50</td><td>3263.5-3266.5</td><td>0.07</td><td>1.80%</td></tr>
<tr><td>WILRICH A</td><td>3271.00</td><td>3271.50</td><td>3269-3272</td><td>0.07</td><td>1.68%</td></tr>
<tr><td>WILRICH A</td><td>3275.00</td><td>3275.50</td><td>3273-3276</td><td>0.07</td><td>1.73%</td></tr>
<tr><td>BLUESKY</td><td>3338.00</td><td>3339.00</td><td>3338-3342</td><td>0.01</td><td>0.25%</td><td rowspan="3">0.70%</td></tr>
<tr><td>BLUESKY</td><td>3343.00</td><td>3344.00</td><td>3343-3346</td><td>0.01</td><td>0.20%</td></tr>
<tr><td>BLUESKY</td><td>3347.00</td><td>3349.00</td><td>3347-3351</td><td>0.01</td><td>0.25%</td></tr>
<tr><td>GETHING B</td><td>3381.00</td><td>3383.00</td><td>3379-3386</td><td>0.17</td><td>4.20%</td><td rowspan="2">7.20%</td></tr>
<tr><td>GETHING B</td><td>3387.00</td><td>3388.00</td><td>3387-3392</td><td>0.12</td><td>3.00%</td></tr>
<tr><td colspan="4">TOTAL</td><td>4</td><td>100.0%</td><td>100.0%</td></tr>
</table>

Table 8.1: Gas Inflow Rates from Thermal Interpretation – Aug 2011 Survey

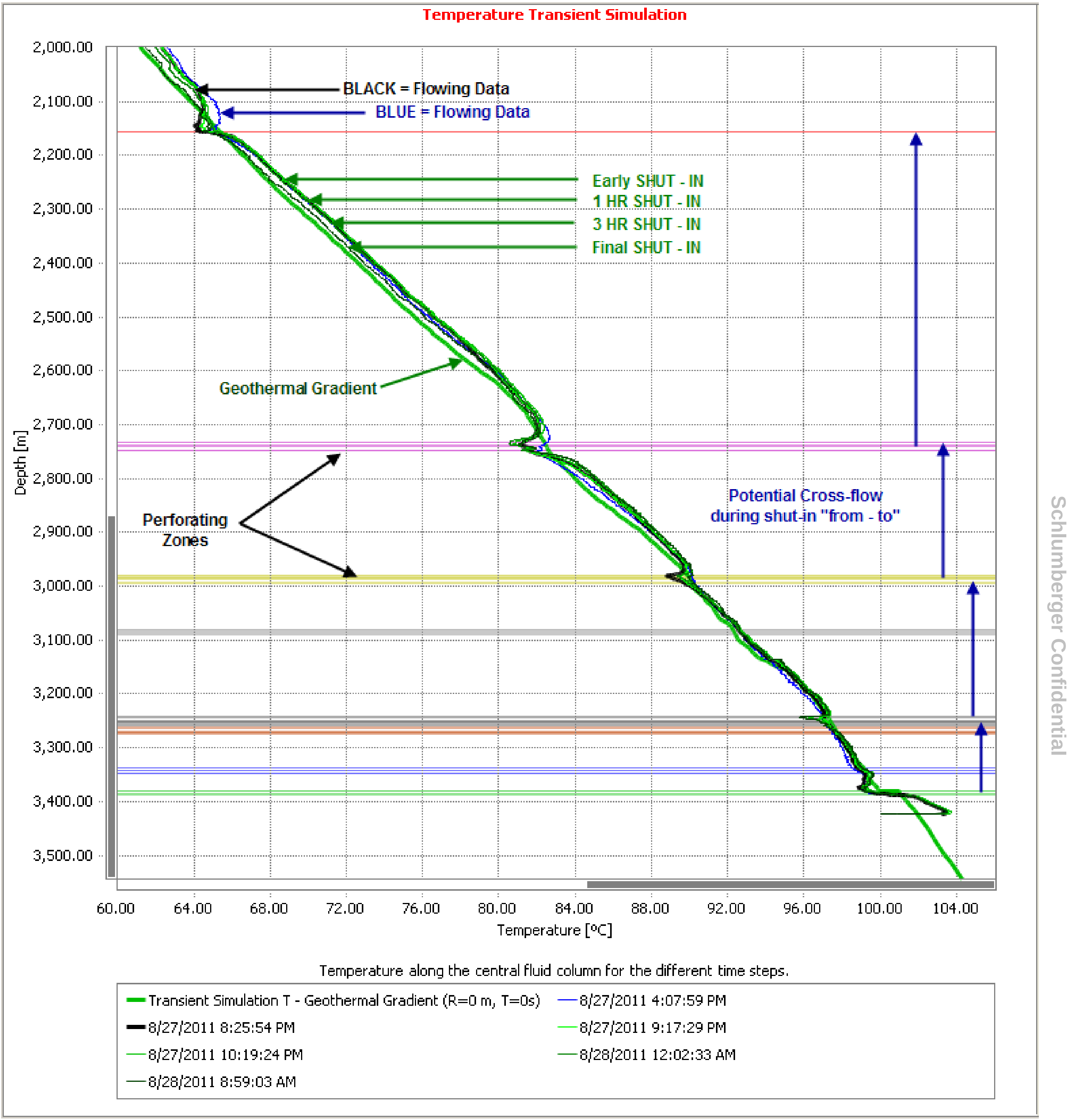



Figure 8.1: DTS data, perforations and comments on potential cross-flow during shut-in Aug 2011 Survey

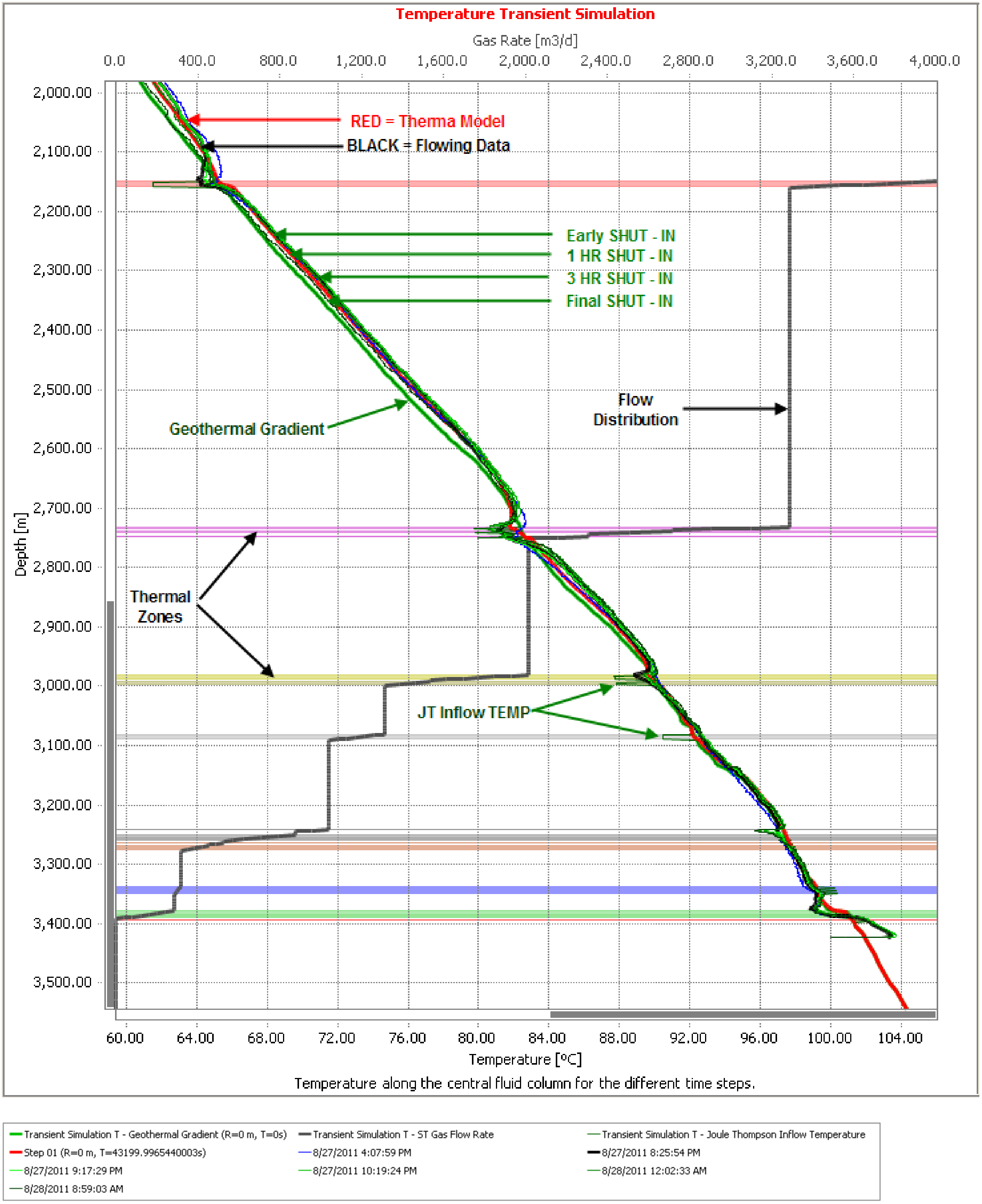



Figure 8.2: Thermal Model over the Producing Intervals - Aug 2011 Survey

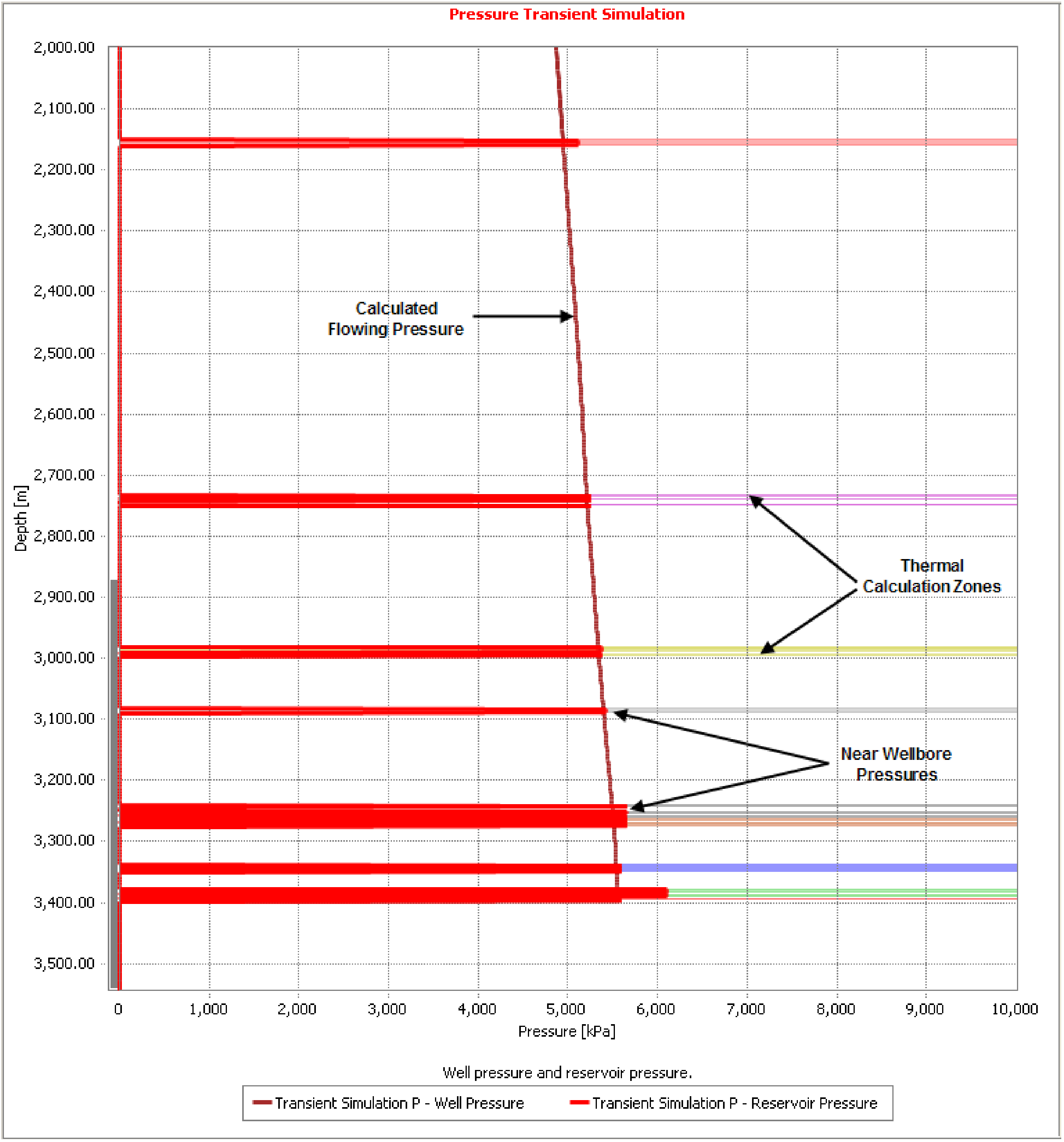





Figure 8.3: Thermal zones with wellbore flowing pressure and near wellbore modeled reservoir pressures - Aug 2011 Survey

# Appendix 8A: THERMA Model Parameters - Aug 2011 Survey

| | |
|---|---|
| Project | THERMA 4.0 Study |
| Prepared By | Schlumberger & Encana |
| Interpretation Date | Sep 2011 |
| Analysis Model Type | Compositional |
| Company | Encana Corporation |

Geothermal Gradient - Nov 2011 Survey

| | ☑ MD | ☐ TVD | Temperature | Gradient |
|---|---|---|---|---|
| | m | | ºC | degC/m |
| 1 | 0.00 | 0.00 | 7.50 | N/A |
| 2 | 610.03 | 610.00 | 23.90 | 0.03 |
| 3 | 2258.05 | 2212.00 | 68.20 | 0.03 |
| 4 | 2514.63 | 2468.50 | 76.02 | 0.03 |
| 5 | 2650.44 | 2604.30 | 80.72 | 0.03 |
| 6 | 2676.24 | 2630.10 | 81.40 | 0.03 |
| 7 | 2762.05 | 2715.90 | 82.86 | 0.02 |
| 8 | 2828.27 | 2782.10 | 84.82 | 0.03 |
| 9 | 2894.48 | 2848.30 | 87.34 | 0.04 |
| 10 | 2961.89 | 2915.70 | 89.45 | 0.03 |
| 11 | 3062.19 | 3016.00 | 91.60 | 0.02 |
| 12 | 3071.39 | 3025.20 | 92.08 | 0.05 |
| 13 | 3104.39 | 3058.20 | 92.63 | 0.02 |
| 14 | 3134.40 | 3088.20 | 93.63 | 0.03 |
| 15 | 3154.40 | 3108.20 | 95.02 | 0.07 |
| 16 | 3167.61 | 3121.40 | 95.50 | 0.04 |
| 17 | 3239.03 | 3192.80 | 97.23 | 0.02 |
| 18 | 3283.23 | 3237.00 | 97.90 | 0.02 |
| 19 | 3362.45 | 3316.20 | 99.50 | 0.02 |
| 20 | 3379.05 | 3332.80 | 99.91 | 0.02 |
| 21 | 3379.25 | 3333.00 | 101.00 | 5.45 |
| 22 | 3483.00 | 3436.74 | 103.08 | 0.02 |
| 23 | | | | |

## Flow Steps - Aug 2011 Survey

| Duration | Time Subdivision | Step Type | Surface Flow rate |
|---|---|---|---|
| (h) | (h) | | (E3m3/d) |
| 12 | 1.00 | Production | 4 |

## Reservoir Model - Aug 2011 Survey

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | | Non-reservoir | Cardium | Dunv E | Dunv E | Dunv E | Cadotte | Cadotte | Cadotte | Cadotte_L |
| **MD Top** | m | | 2150 | 2732 | 2739 | 2748 | 2981 | 2984 | 2987 | 2993 |
| **MD Bottom** | | | 2160 | 2737 | 2742.5 | 2751 | 2984 | 2987 | 2990 | 2998 |
| **Color** | | | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | mD | | 1 | 7.2 | 7.92 | 7.2 | 3.6 | 3.6 | 3.6 | 3.6 |
| **Vert. Permeability** | | | 1 | 7.2 | 7.92 | 7.2 | 3.6 | 3.6 | 3.6 | 3.6 |
| **Static Pressure** | MPa | Update all -> | 5.12 | 5.25 | 5.25 | 5.25 | 5.38 | 5.38 | 5.38 | 5.38 |
| **Formation** | | Default For... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | m | | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | m | Update all -> | 9.92 | 4.99 | 3.49 | 2.99 | 2.99 | 2.99 | 2.99 | 4.99 |
| **Model Type** | | | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | °C | Update all -> | 62.19 | 79.87 | 79.97 | 80.11 | 87.82 | 87.85 | 87.88 | 87.97 |
| **Compositional Oil** | | | Cardium | EnC Du... | EnC Du... | EnC Du... | EnC Ca... | EnC Ca... | EnC Ca... | EnC Ca... |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | Falher A | Falher F | Falher F | Falher F | Wilrich A | Wilrich A | Wilrich A | Bluesky | Bluesky | Bluesky | Gething B | Gething B | Dummy Z |
| **MD Top** | 3081 | 3241 | 3251 | 3258 | 3263.5 | 3269 | 3273 | 3338 | 3343 | 3347 | 3379 | 3387 | 3394 |
| **MD Bottom** | 3091 | 3244 | 3256 | 3262 | 3266.5 | 3272 | 3276 | 3342 | 3346 | 3351 | 3386 | 3392 | 3397 |
| **Color** | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | 2.24 | 0.96 | 0.96 | 0.48 | 0.48 | 0.48 | 0.48 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.02 |
| **Vert. Permeability** | 2.24 | 0.96 | 0.96 | 0.48 | 0.48 | 0.48 | 0.48 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.02 |
| **Static Pressure** | 5.43 | 5.65 | 5.65 | 5.65 | 5.65 | 5.65 | 5.65 | 5.6 | 5.6 | 5.6 | 6.1 | 6.1 | 5.6 |
| **Formation** | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | 9.99 | 2.99 | 4.99 | 3.99 | 2.99 | 2.99 | 2.99 | 3.99 | 2.99 | 3.99 | 6.99 | 4.99 | 2.99 |
| **Model Type** | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | 90.57 | 97.77 | 97.96 | 98.15 | 98.25 | 98.36 | 98.44 | 100.41 | 100.49 | 100.58 | 101.79 | 101.99 | 102.28 |
| **Compositional Oil** | EnC Fa... | EnC Fa... | EnC Fa... | EnC Fa... | WILRICH | WILRICH | WILRICH | EnC Bl... | EnC Bl... | EnC Bl... | EnC Ge... | EnC Ge... | EnC Ge... |

## Appendix 8B: Job Sequence and Tool String - Aug 2011 Survey

Schlumberger

| | | Schlumberger Crew | Position | District |
|---|---|---|---|---|
| **Well Name** | ECA KAKWA 13-18-62-6 | **Schlumberger Crew** | **Position** | **District** |
| **Well UWI** | 100/13-18-62-6w6 | Ryan Bidyk | Day Supervisor | Red Deer |
| **Surface Location** | 11-18-62-6w6 | Richard Robbins | Day Hand | Red Deer |
| **Lisence Number** | 0413731 | Majid Khan | Night Supervisor | Red Deer |
| **Job Start Date** | Saturday, August 27, 2011 | Levi Brazier | Night Supervisor | Red Deer |
| **Job End Date** | Sunday, August 28, 2011 | | | |
| **Service Order #** | BROZ-00009 | | | |

### Job Sequence of Events

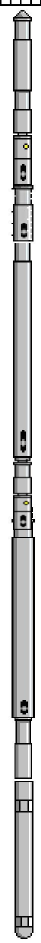
| Date | Time | Description of Activity |
|---|---|---|
| 26-Aug-11 | 11:00 | Arrive on location, await lease hand over |
| | 11:15 | Hols safety meeting |
| | 11:30 | Rig up slickline drift run |
| | 11:50 | N2 Purge - pressure sest |
| | 12:05 | Open master, RIH |
| | 12:36 | Tag at 3452 mKB - POOH |
| | 13:04 | Bump up, bleed off |
| | 13:10 | Rig out sl, rig in fiber optic slickline |
| | 13:30 | Pressure test - N2 purge |
| | 13:35 | Open master, RIH |
| | 14:00 | Pull test at 1000 mKB - 240 lbs |
| | 14:20 | Pull test at 2000 mKB - 370 lbs |
| | 14:35 | Pull test at 3000 mKB - 565 lbs |
| | 14:44 | On Bottom |
| | 14:54 | Begin DTS acquisition recording flowing profiles |
| | 21:00 | shut in casing flow, log build up |
| 27-Aug-11 | 9:00 | Shut down DTS - try to un-plug pigtail, brok ogg in DTS, splice new connector or |
| | 9:35 | POOH |
| | 11:56 | Bump up |
| | 12:01 | Bleed off |
| | 12:03 | Rig out |
| | 13:30 | Leave location |

Schlumberger Confidential

Schlumberger

**TOOLSTRING SCHEMATIC.**

| | | | | | |
|---|---|---|---|---|---|
| **Customer:** | EnCana Corporation 1800, 855-2nd Street S | **Customer Rep:** | Don Wilson | **Toolstring No: 1** | |
| **Field:** | Kakwa | **Well Type:** | DEEP GAS | **Operation Detail:** | |
| **UWI** | 100/13-18-62-6w6 | **Schlumberger Rep/s:** | Ryan Bidyk Phone: 1-4 | Sensa fiber optic temp log | |
| **Well Name** | ECA KAKWA 13-18-62-6 | **Schlumberger Base** | Red Deer Slickline | Quartz pressure, temp memory gauges | |
| **Surface LSD** | 11-18-62-6w6 | **Licence Number** | 0413731 | **Tensile Strength of cable: 200 KSPI** | |
| **Rig/Crane** | | **Start Date** | 27-Aug-11 | **End Date** | 28-Aug-11 |



| Item Nos | S/Rod or TIC / QC | Length Meter | Weight (LBS) | Description of Item Including Part Nos & Serial Nos Where Applicable | OD mm | F/Neck (Inches) |
|---|---|---|---|---|---|---|
| 1 | 5/8 sucker rod | 0.18 | 1.00 | Sensaline rope socket fish neck | 38.10 | 1.375 |
| | 5/8 sucker rod | 0.26 | 4.00 | Swivel, 1.5 inch | 38.10 | 1.375 |
| 2 | QC X-Over | 0.18 | 1.50 | 5/8 Sucker Rod to Quick Connect | 38.10 | 1.375 |
| 3 | Quick Connect | 1.52 | 55.00 | Weight bar, 5 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 4 | Quick Connect | 0.35 | 6.00 | Knuckle, 1.5 inch | 38.10 | 1.375 |
| 4 | Quick Connect | 0.91 | 33.00 | Weight bar, 3 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 5 | QC X-Over | 0.12 | 1.50 | Quick Connect to 5/8 Sucker Rod | 38.10 | 1.375 |
| 6 | 5/8 Sucker rod | 0.68 | 10.00 | Bomwell with 2 quartz pressure/temprature gauges | 38.10 | N/A |
| | Casing Flange to KB | 5.8 | | | | |
| | Tool String Length in Meters | 4.20 | | Largest OD in mm | 38.10 | |
| | Sensa FO line Zero | **1.60** | **Primary Depth on laptop** | **Sensaline Depth** | | |
| | Gauge Zero | **5.8** | **Secondary Depth on laprop** | **Gauge Depth** | | |
| | | | | | | |
| | Total Tool Weight | | 112.00 | | | |

# Appendix 8C: Flowing & Static Gradient Plots - Aug 2011 Survey

Client: EnCana Corporation
Test Date: 2011/08/27 - 2011/08/28
Tool Serial #: 5024

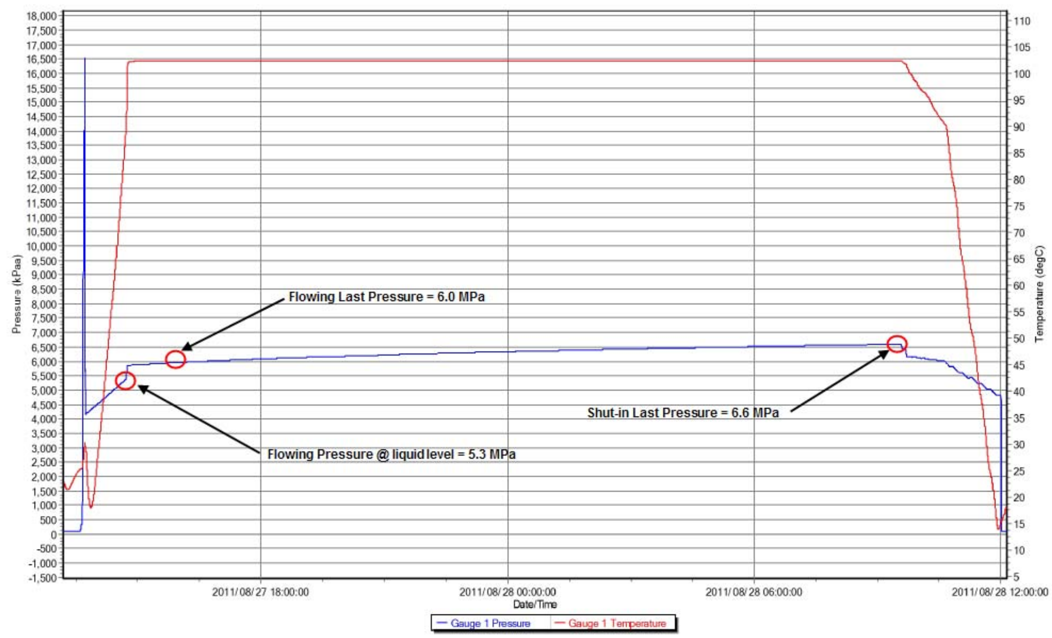
Well Name: ECA KAKWA 13-18-62-6
Location: 11-18-62-6w6
Field/Pool: Kakwa

Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3340 mKB
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

Schlumberger

**Fiber Optic Production Profile Down Hole Perssures and Gradient**

**Pressure / Temperature Data Plot - Bottom Gauge**




Client: EnCana Corporation
Test Date: 2011/08/27 - 2011/08/28
Tool Serial #: 5024

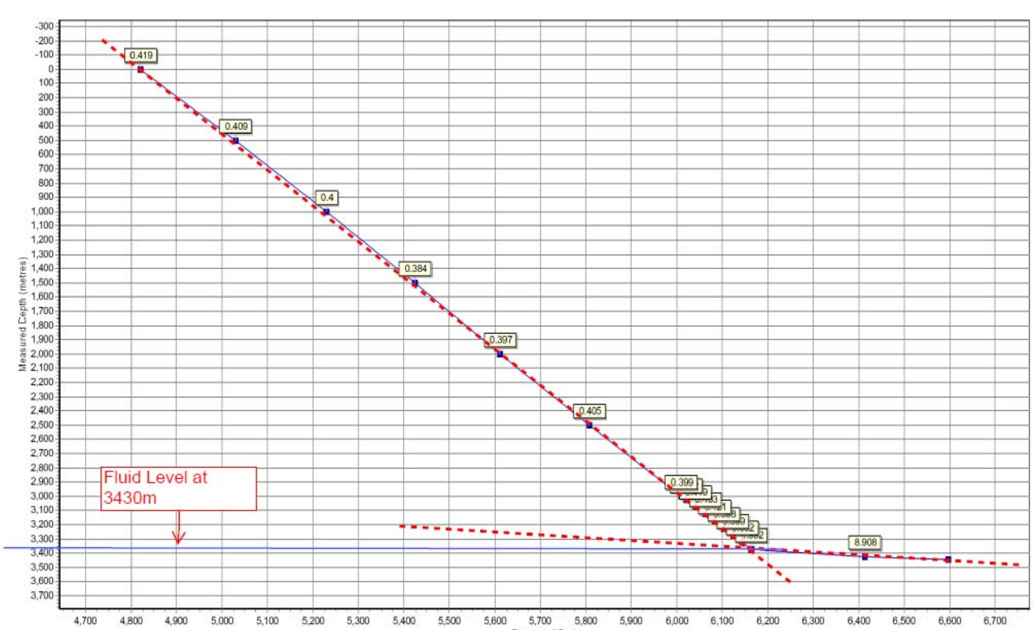
Well Name: ECA KAKWA 13-18-62-6
Location: 11-18-62-6w6
Field/Pool: Kakwa

Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3340 mKB
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

Schlumberger

**Fiber Optic Production Profile Down Hole Perssures and Gradient**

**PRESSURE GRADIENT PLOT**

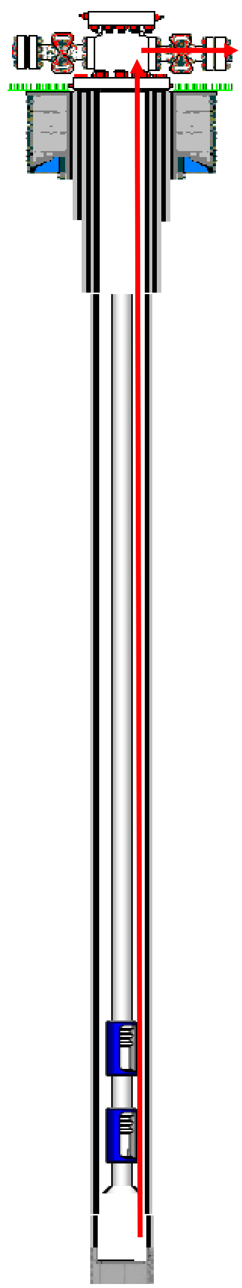


# Appendix 8D: Well Schematic - Aug 2011 Survey

Schlumberger

| | | | | | |
|---|---|---|---|---|---|
| Customer | EnCana Corporation 1800, 855-2 | KB (m) | 1207.09 | Start Date | 27-Aug-11 |
| Well Name | ECA KAKWA 13-18-62-6 | GL (m) | 1201.39 | End Date | 28-Aug-11 |
| UWI | 100/13-18-62-6w6 | CF (m) | 1201.29 | Deviated | ☑ Yes ☐ No |
| Lisence # | 0413731 | KB-CF (m) | 5.8 | Packer | ☐ Yes ☑ No |
| Field Name | Kakwa | KB-GL(m) | 5.7 | SO # | BC91-00027 |
| Well Type | DEEP GAS | TDPB (mKB) | 3367.33 | | |
| Flow Path | ☐ CASING ☐ TUBING ☐ BOTH CASING AND TUBING | PBTVD (mKB) | KELLY BUSHING | | |

Well Diagram



| | | | |
|---|---|---|---|
| Well Head Connection Type | ☐ FLANGE ☑ SWAGE | Size: | 2 3/8 |

| | Casing Details | OD mm | ID | Weight kg/m | Drift | Grade | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Surface | | | | | | |
| ☐ | Intermediate | | | | | | |
| ☑ | Production | 114.3 | 101.6 | 17.26 | 98.43 | P-110 | |
| ☐ | Production Liner | | | | | | |

Down Hole Items - Packers / Bridge Plugs / Fish / Misc. Down Hole Equiptment

| Type of Down Hole Item | Depth mKB | Remarks |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| | Tubing Details | OD mm | ID | Weight kg/m | Drift | Grade | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Production Tubing | 60.3 | 50.67 | 6.99 | 48.29 | L-80 | 3380 |
| ☐ | Coil Tubing | | | | | | |
| | | | | | | | |

Tubing Jewlery (nipples, plugs, damage, holes, re-entry guides ect.)

| # | Iteme | Top Depth | BTM Depth | OD mm | ID mm | Remarks |
|---|---|---|---|---|---|---|
| 1 | X Profile Nipple | 3373.44 | 3375.71 | 60.3 | 47.6 | |
| 2 | XN Profile | 3378.78 | 3379.7 | 60.3 | 45.49 | |
| 3 | Re-entry guide | | 3380 | 60.3 | 50.7 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Remarks:

Schlumberger

Flow Path Indicated with Red Arrows

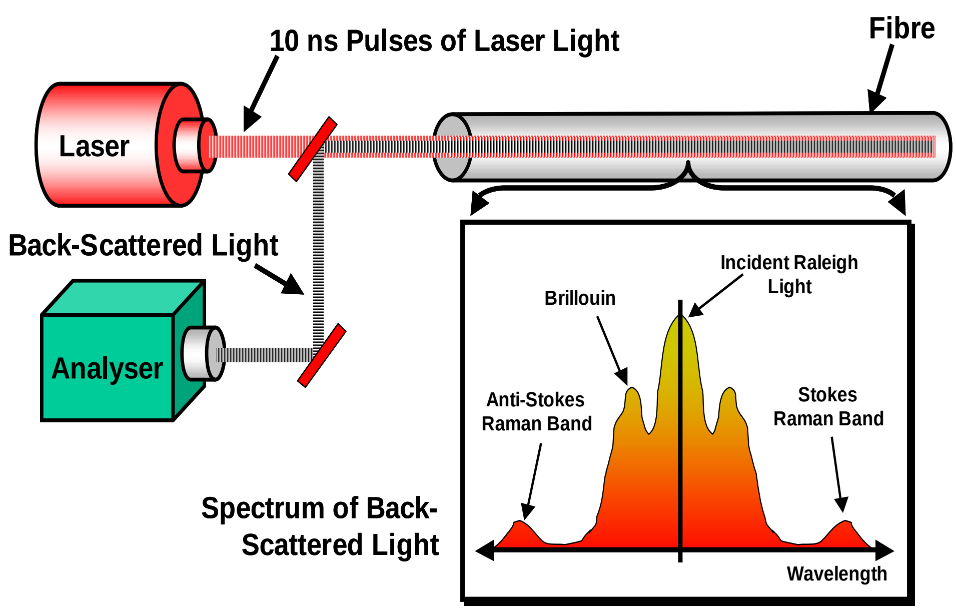
# Appendix I: Distributed Temperature Sensing Data Acquisition

The fiber-optic distributed temperature measurement (DTS) uses an industrial laser to launch 10 nanosecond bursts of light down the optic fiber. During the passage of each packet of light a small amount is back-scattered from molecules in the fiber. Since the speed of light is constant a spectrum of the back-scattered light can be generated for each meter of the fiber using time sampling.

A physical property of each spectrum of back-scattered light is that the ratio of the Stokes Raman to the Anti-Stokes Raman Bands is directly proportional to the temperature at the point in the fiber where it is generated. Consequently, a log of temperature can be calculated every meter along the whole length of the fiber using only the laser source, analyzer, and a reference temperature in the surface system.

Spectrum acquisition times define the accuracy and resolution of the measured temperature log, and can be varied from as little as seven seconds to hours. Typically, a resolution of 0.1 °C is required for reservoir surveillance.



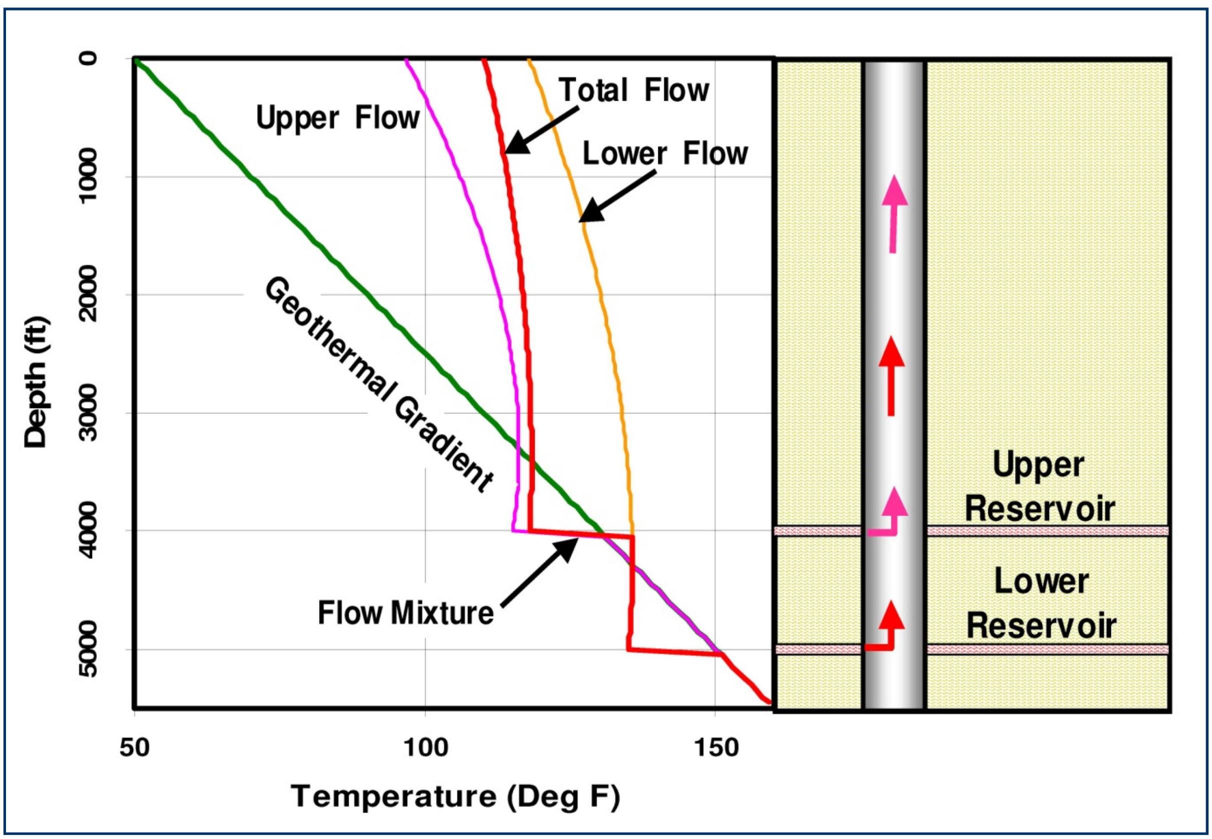



**Distributed Temperature Sensing (DTS) Measurement**

# Appendix II: Multi-Zone Producing Theory (Gas Wells)

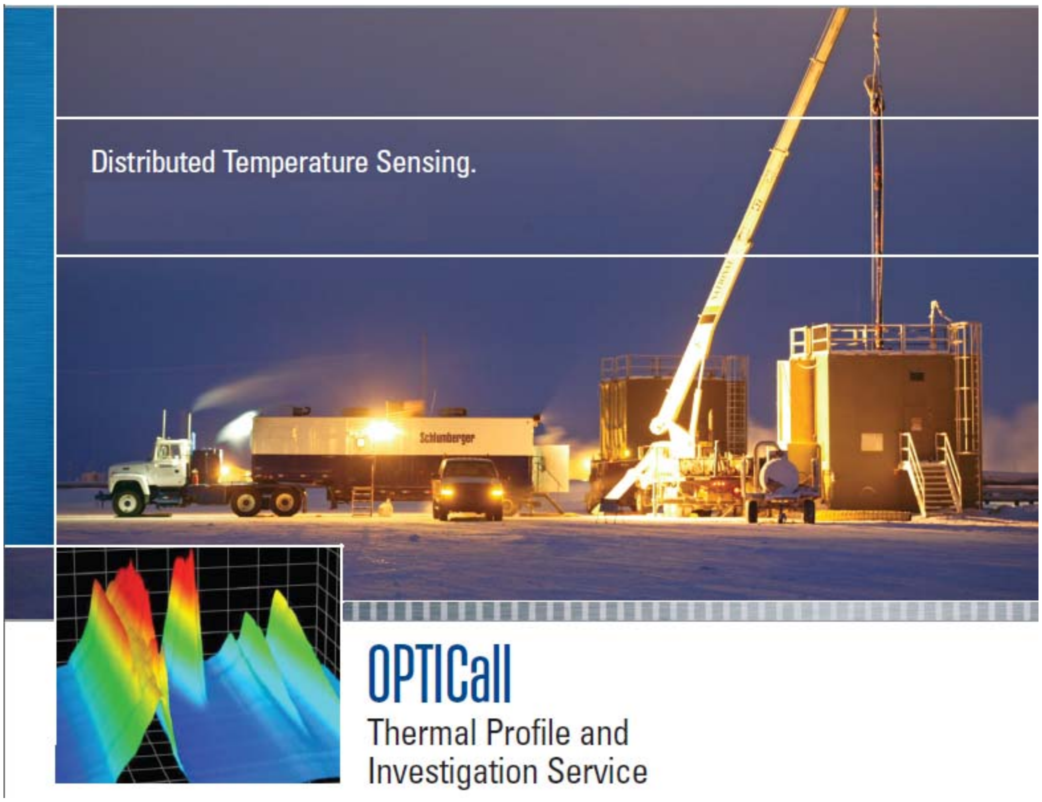
Where there are two or more producing reservoirs the flow of gas from the upper reservoir(s) may enter the wellbore below the ambient geothermal temperature due to Joule Thomson expansion in the reservoir. The addition of this colder gas to the flowing stream causes a decrease in the wellbore temperature, clearly identifying the point of produced gas entry.

The thermal response is a function of the combined flow rate from the upper reservoir and the flow rate from the lower reservoir. Therefore, given the geothermal gradient and the measured steady state temperature profile (obtained by the OptiCall DTS) the proportional contribution from two or more stacked flowing reservoirs can be calculated. The THERMA software uses nodal analysis and well established temperature algorithms to calculate a thermal profile with the given model parameters.




**Example of Thermal Response in a Multi-zone Gas Well**

Schlumberger




# TIME LAPSE STUDY

| | |
|---|---|
| Company: | ENCANA |
| Field: | RESTHAVEN |
| Well Name: | ECA ECOG RESTHAVEN 7-2-60-2 |
| UWID: | 100 / 07-02-060-02W6/00 |
| Well License: | A0410475 |
| Job Reference Number: | BB0W-00020, BC91-00017, BV50-00001 |
| Logging Date: | Jul 18 - 2010, Nov 25 - 2010, Nov 27 - 2011 |
| Interpretation Date: | Feb-2012 |
| Analyst: | Alejandro Sanchez |

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## 1. Objectives

This report details thermal analysis of OptiCall Slick-line Distributed Temperature Sensing (DTS) data recorded in **ECA ECOG RESTHAVEN 7-2-60-2**. The objective of this Time Lapse analysis is to interpret all 3 surveys done in this well on a consistent basis, thereby minimizing the uncertainty in the gas inflow profile determined for each of the surveys. The analysis also reflects the incorporation of a new geothermal gradient based on the June 2009 surveys done by Encana on shut-in undisturbed wells.

## 2. Well Data

The well is "S" shaped with the kick off point at around 160 mKB and a maximum deviation of around 26 deg from 300 to 1800 mKB. The deviation drops to less than 2 deg at 2100 mKB and has an almost vertical profile below to its total depth of 3468 mKB. The well completion is shown in Appendix D.

## 3. Methodology of OptiCall Slick-line operation

The OptiCall Slick-line tool string is a specialized Schlumberger slickline cable, with an embedded fiber-optic cable for recording DTS data and a crystal quartz gauge for single-point pressure measurements. Raw DTS data is depth corrected and filtered to enhance the signal to noise ratio in proprietary thermal analysis software –THERMA*. OptiCall Slick-line data is generally recorded in the following steps:

- Flowing profile measurements from 4 to 6 hours.
- Shut-in temperature measurements for 12 hours.
- Static gradient measurements using the CQG pressure sensor while pulling out of hole; sensor also used to record the flowing and shut-in profile versus time.

The well is switched to annular only flow, one day prior to the survey. The tubing is shut-in while running the slick-line tool into the well, with gas continuously flowing up the annulus during the OptiCall Slick-line survey to eliminate the complex heat transfer associated with the normal pre-survey flow path down the annulus and up the tubing. Temperature effects caused by gas flow in the annulus are monitored through the tubing with the OptiCall Slick-line used DTS data to generate a temperature log every 10 minutes. The flowing temperature profile of the well is recorded with this procedure without snubbing the tubing above the reservoir interval.

A near wellbore thermal model is generated in THERMA using data provided by Encana (see Appendices A). The Joule-Thomson cooling caused by near wellbore pressure drawdown is calculated in THERMA; the gas inflow distribution is calculated after refining individual zone permeabilities and pressures to match the measured flowing DTS temperature. In fractured gas wells, the thermal model uses “pseudo” permeabilities and pressures to account for these fracture and matrix properties.



## 4. Methodology of Time Lapse Interpretation

If two or more DTS surveys taken in the same well are available, the better survey in terms of data stability and operational execution is chosen as first survey to be interpreted. Once the reservoir model, the geothermal gradient and the transient simulation match curve are defined in this first survey, all these parameters are taken to initialize the second survey interpretation process. In theory, all these parameters must remain the same with the exception of the reservoir pressure, which naturally depletes along with the gas reservoir production depletion. Following interpretation of the second and subsequent surveys, required reservoir model changes are tested in the first survey in an effort to maintain a consistent model. Further iterations are then attempted to define the most consistent reservoir model. The iterative process constrains the solution and provides the most reliable interpretations of all surveys from the same well.

In the "ideal" case, permeability, geothermal gradient and thermal zones do not necessarily change, but we have seen that certain minor adjustments are required during the analysis. For instance, the permeability may vary due to changes in the fracture conductivity due to ongoing post-fracture stimulation clean-up, so the permeability value in the Therma simulator may be modified to allow the simulation curve a better match. Similar modifications may be required to the geothermal gradient, where small changes in the temperature profile may happen as result of the long term gas cooling or heating effects in certain portions of the well.

The final target is to define the changes in gas production for each reservoir interval while minimizing changes in permeability and geothermal gradient, thereby generating more consistent and reliable rate estimates.

## *4.1 Gas Inflow Profile*

The THERMA model used the latest practical reported surface test gas rates in every survey, recorded during the later portion of the DTS test flowing pass. The gas inflow rates from thermal interpretation results for the 3 surveys are summarized in Tables 5.1, 6.1, 7.1 and 8.1. The main Thermal model with the most representative DTS traces and gas production profile per perforated zone for the 3 surveys are showed in the Figures 6.2, 7.2 and 8.2.

The Inflow table for all zones and survey can be seen in section 5.

## *4.2 Conclusions*

The DTS time-lapse process has proved to result in better estimates and better understanding of the natural gas depletion process in every reservoir perforated interval. In the particular case of the 3 time-lapse surveys done on ECA ECOG RESTHAVEN 7-2-60-2, the gas production depletion per interval had been calculated with high confidence. Future surveys in this well could also be added to this time-lapse process.

# 5. Time Lapse (TL) Combined Survey Results

## 5.1 Time Lapse Rate Summary Comparison

| Zone | Perforation Interval (mKB) | | Thermal Zone (mKB) | Gas Rate, E3m3/d Survey 1 JUL-2010 | Gas Rate, E3m3/d Survey 2 NOV-2010 | Gas Rate, E3m3/d Survey 3 NOV-2011 |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | | | | |
| **Dunvegan C** | 2849.0 | 2850.5 | 2849-2852 | 3.089 | 1.05 | 1.466 |
| **Dunvegan D** | 2856.0 | 2857.5 | 2855-2858 | 11.868 | 5.757 | 6.378 |
| **Dunvegan E** | 2877.0 | 2878.0 | 2876-2880 | 4.359 | 2.332 | 4.062 |
| **Dunvegan E** | 2882.0 | 2884.0 | 2882-2885 | 1.878 | 1.658 | 2.386 |
| **Falher E** | 3219.0 | 3221.0 | 3218-3224 | 4.002 | 1.525 | 4.722 |
| **Falher F** | 3255.0 | 3256.0 | 3251-3260 | 1.987 | 1.402 | 0.342 |
| **Falher F** | 3268.0 | 3269.5 | 3264-3273 | 3.312 | 2.467 | 0.492 |
| **Falher F** | 3275.0 | 3276.0 | 3275-3279 | 1.403 | 0.946 | 0.231 |
| **Gething A** | 3352.5 | 3353.5 | 3352-3355 | 2.931 | 1.834 | 1.008 |
| **Gething C** | 3391.0 | 3392.0 | 3392-3396 | 8.171 | 5.029 | 0.913 |
| **Gething C** | 3394.0 | 3395.0 | | | | |
| | | | **TOTAL** | **43** | **24** | **22** |

## 5.2 Time Lapse Pressure Summary Comparison BHFP vs. Gauge vs. Simulated

| | Depth (m) | | Flowing Pressures (MPa) | | | Shut-in Pressure (MPa) |
|---|---|---|---|---|---|---|
| | @ MD | @ TVD | Gauge Pressure | Estimated BHFP* | Therma BHFP | Gauge Final Pressure |
| **Survey 1 - Jul 2010** | 3438.5 | 3304.3 | 6.2 | 5.5 | 5.35 | 9.7 |
| **Survey 2 - Nov 2010** | 3441 | 3306.5 | 5.4 | 5.1 | 5.4 | 8 |
| **Survey 3 - Nov 2011** | 3434.5 | 3302.9 | 7.8 | 6 | 4.85 | 8.4 |

## 5.3 Time Lapse View of Input Reservoir Parameters

| | Layer | | Dunv C | Dunv D | Dunv E | Dunv E | Falher E | Falher F | Falher F | Falher F | Gething A | Gething C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Thermal | m | 2849 | 2855 | 2876 | 2882 | 3218 | 3251 | 3264 | 3275 | 3352 | 3392 |
| | Zone | | 2852 | 2858 | 2880 | 2885 | 3224 | 3260 | 3273 | 3279 | 3355 | 3396 |
| | Thickness | m | 3 | 3 | 4 | 3 | 6 | 9 | 9 | 4 | 3 | 4 |
| **Survey 1** | Permeability | mD | 1.76 | 6.72 | 4.01 | 1.52 | 2.78 | 0.41 | 0.56 | 0.71 | 2.85 | 1.8 |
| **Jul 2010** | Pressure | MPa | 6.5 | 6.35 | 6 | 6.3 | 6.05 | 6.85 | 7.15 | 6.9 | 6.6 | 8.2 |
| **Survey 2** | Permeability | mD | 1 | 4 | 3 | 1.7 | 2.93 | 0.43 | 0.59 | 0.75 | 1 | 0.7 |
| **Nov 2010** | Pressure | MPa | 6.2 | 6.45 | 5.8 | 6.1 | 5.65 | 6.4 | 6.65 | 6.3 | 7 | 9.5 |
| **Survey 3** | Permeability | mD | 1 | 4 | 3 | 1.7 | 1 | 0.07 | 0.1 | 0.25 | 1 | 0.7 |
| **Nov 2011** | Pressure | MPa | 6.1 | 6.15 | 5.7 | 6 | 7 | 6.4 | 6.4 | 5.6 | 5.9 | 5.9 |

# 6. Jul 2010 Survey Summary

Bottom hole flowing pressure was estimated to be approximately 5.5 MPa based on the gauge pressure the day of the survey. At that time, the rate was around 43 $E^3m^3$/d. Downhole pressure gauge data indicates some liquids accumulation in the wellbore during the survey, the liquid level was around 3,190 mKB inside the tubing. The temperature trace at 1:10 PM was used because the rate of the well was stable around that time.

There is no evidence of crossflow during shut-in during the time of the survey.

| Zone | Perforation Interval (mKB) | | Reservoir Interval | Gas Inflow Rate | Gas Inflow Contribution | Gas Inflow Contribution |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | Thermal Zone (mKB) | (E3m3/day) | (%/total) | (%/total) |
| Dunvegan C | 2849.0 | 2850.5 | 2849-2852 | 3.09 | 7.18% | 49.29% |
| Dunvegan D | 2856.0 | 2857.5 | 2855-2858 | 11.87 | 27.60% | |
| Dunvegan E | 2877.0 | 2878.0 | 2876-2880 | 4.36 | 10.14% | |
| Dunvegan E | 2882.0 | 2884.0 | 2882-2885 | 1.88 | 4.37% | |
| Falher E | 3219.0 | 3221.0 | 3218-3224 | 4.00 | 9.31% | 24.89% |
| Falher F | 3255.0 | 3256.0 | 3251-3260 | 1.99 | 4.62% | |
| Falher F | 3268.0 | 3269.5 | 3264-3273 | 3.31 | 7.70% | |
| Falher F | 3275.0 | 3276.0 | 3275-3279 | 1.40 | 3.26% | |
| Gething A | 3352.5 | 3353.5 | 3352-3355 | 2.93 | 6.82% | 25.82% |
| Gething C | 3391.0 | 3392.0 | 3392-3396 | 8.17 | 19.00% | |
| Gething C | 3394.0 | 3395.0 | | | | |
| **TOTAL** | | | | **43** | **100.0%** | **100.0%** |

Table 6.1: Gas Inflow Rates from Thermal Interpretation – Jul 2010 Survey

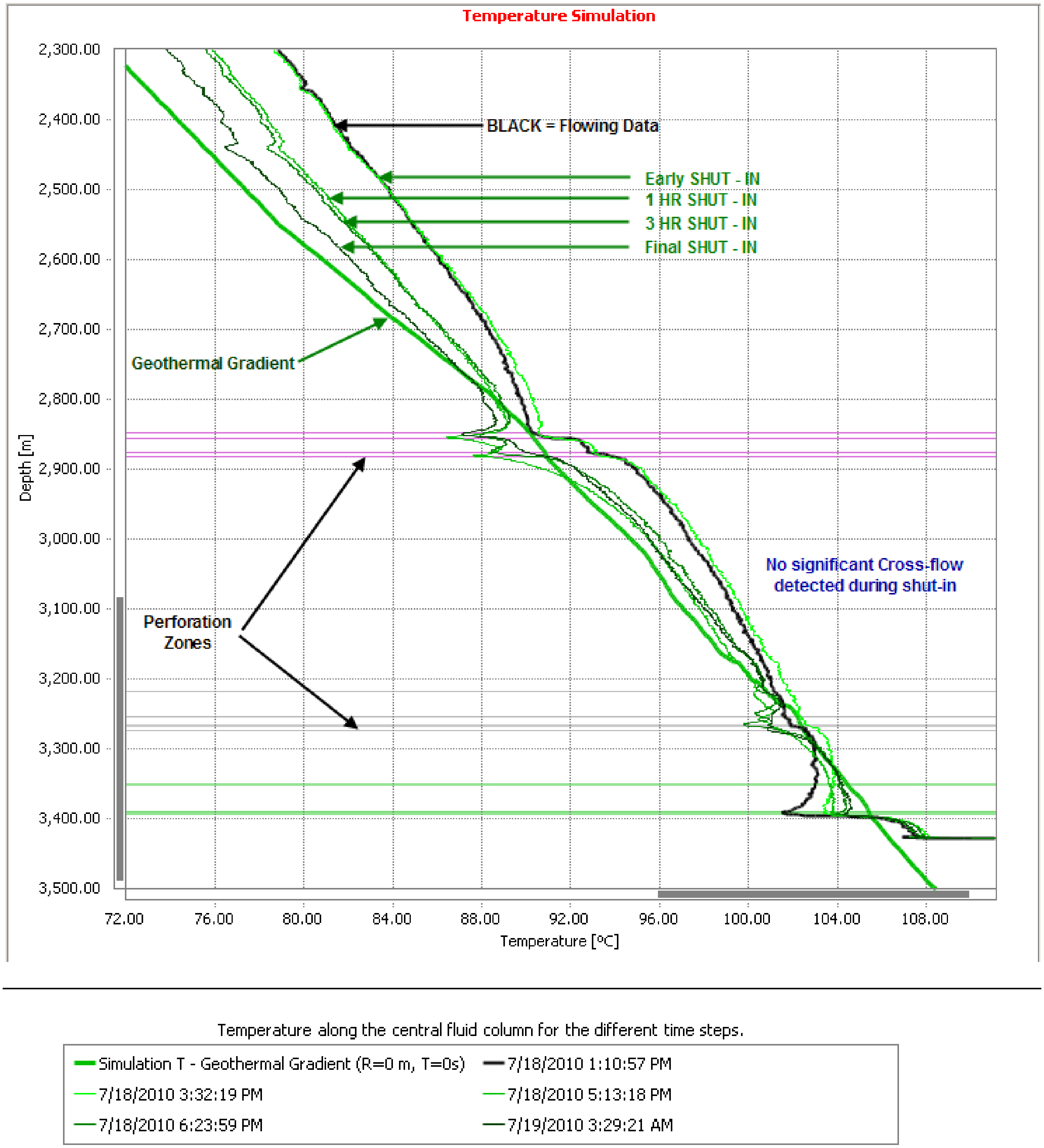





Figure 6.1: DTS data, perforations and comments on potential cross-flow during shut-in Jul 2010 Survey

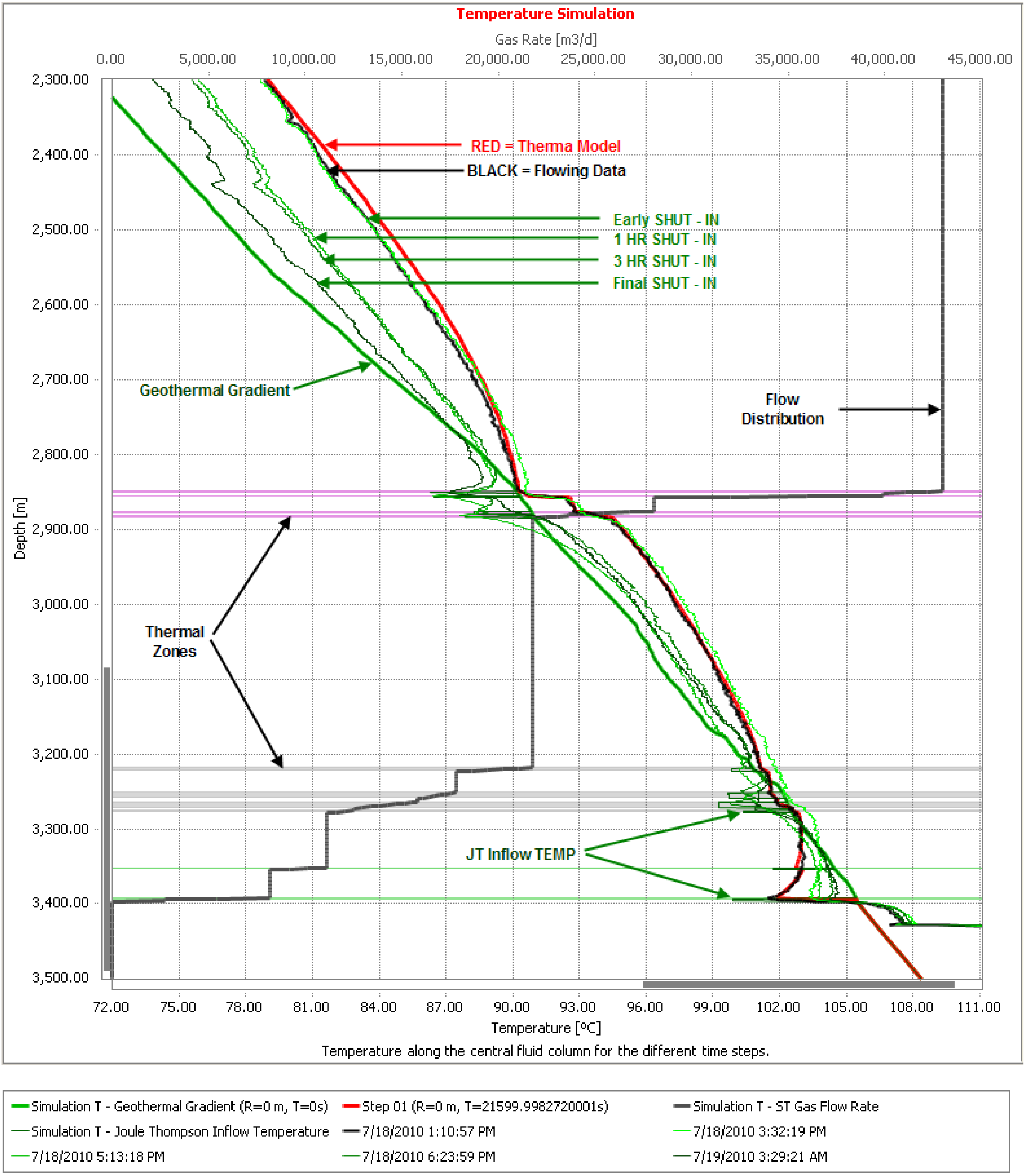



Figure 6.2: Thermal Model over the Producing Intervals - Jul 2010 Survey

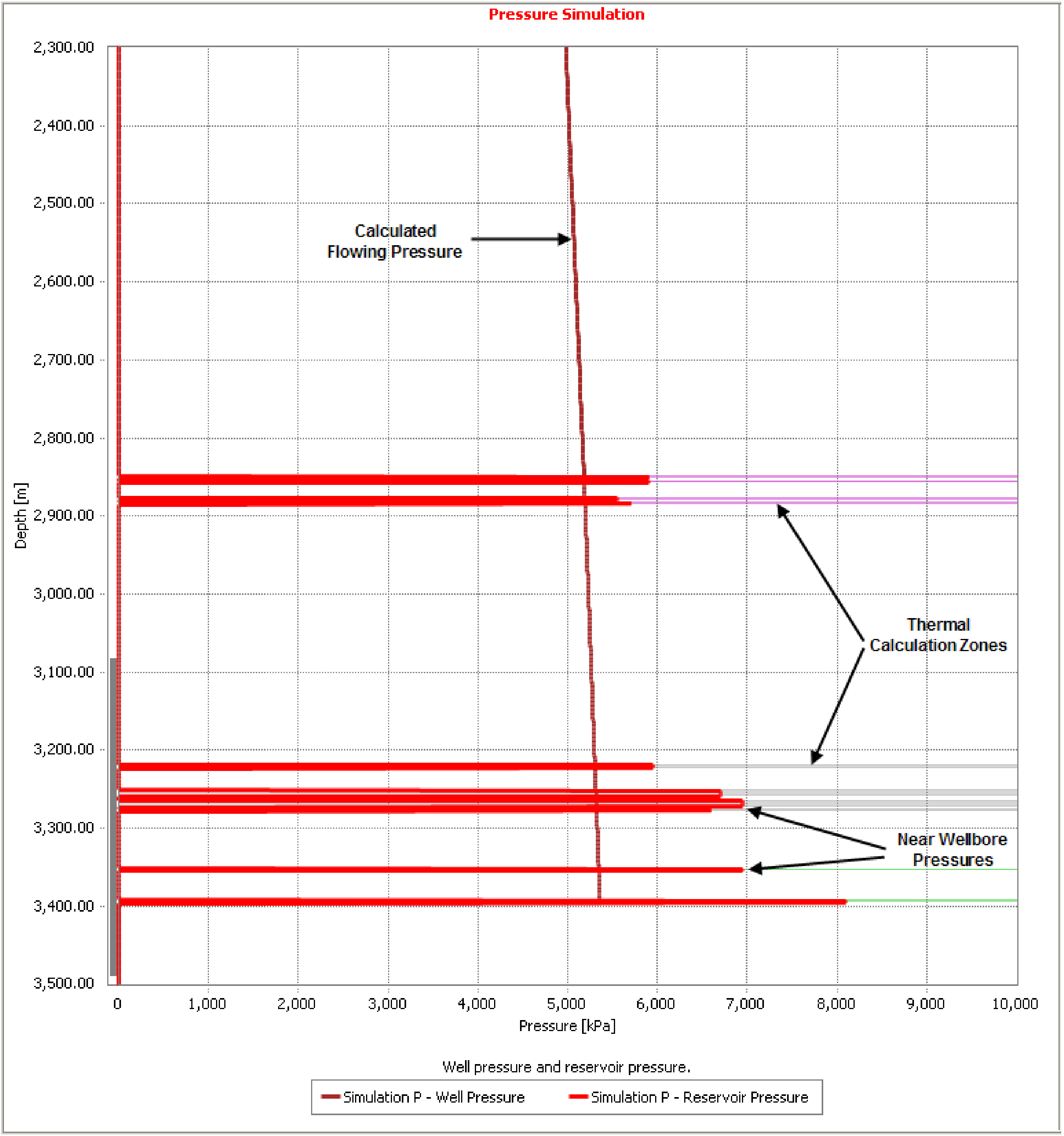



Figure 6.3: Thermal zones with wellbore flowing pressure and near wellbore modeled reservoir pressures - Jul 2010 Survey

# Appendix 6A: THERMA Model Parameters - Jul 2010 Survey

| | |
|---|---|
| Project | THERMA 4.0 Study |
| Prepared By | Schlumberger & Encana |
| Time Lapse-interpretation Date | Mar 2011 |
| Analysis Model Type | Compositional |

Geothermal Gradient - Jul 2010 Survey

| | MD | TVD | Temperature | Gradient |
|---|---|---|---|---|
| | m | | ºC | degC/m |
| 1 | 0.00 | 0.00 | 5.50 | N/A |
| 2 | 644.00 | 614.08 | 25.51 | 0.03258679 |
| 3 | 1718.81 | 1600.00 | 54.00 | 0.02889595 |
| 4 | 2553.01 | 2418.99 | 79.00 | 0.03052534 |
| 5 | 2789.07 | 2655.02 | 88.25 | 0.03917673 |
| 6 | 2846.07 | 2712.02 | 90.11 | 0.0326034 |
| 7 | 2888.90 | 2754.84 | 91.09 | 0.02302402 |
| 8 | 3025.91 | 2891.83 | 95.48 | 0.03204647 |
| 9 | 3081.23 | 2947.12 | 96.55 | 0.01927814 |
| 10 | 3164.89 | 3030.76 | 98.79 | 0.02686438 |
| 11 | 3176.33 | 3042.19 | 99.53 | 0.06481013 |
| 12 | 3236.37 | 3102.23 | 101.37 | 0.03058497 |
| 13 | 3244.45 | 3110.30 | 102.00 | 0.07788642 |
| 14 | 3278.89 | 3144.74 | 102.56 | 0.0162573 |
| 15 | 3468.00 | 3333.82 | 107.44 | 0.02582392 |
| 16 | | | | |

## Flow Steps - Jul 2010 Survey

| Duration | Time Subdivision | Step Type | Surface Flow rate |
|---|---|---|---|
| (h) | (h) | | (E3m3/d) |
| 6 | 1 | Production | 43 |

## Reservoir Model - Jul 2010 Survey

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | | Dunv C | Dunv D | Dunv E | Dunv E | Falher E | Falher F | Falher F | Falher F | Gething A | Gething C |
| MD Top | m | 2849 | 2855 | 2876 | 2882 | 3218 | 3251 | 3264 | 3275 | 3352 | 3392 |
| MD Bottom | | 2852 | 2858 | 2880 | 2885 | 3224 | 3260 | 3273 | 3279 | 3355 | 3396 |
| Color | | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ |
| Horz. Permeability | mD | 3.9 | 14.2 | 8.45 | 3.2 | 2.93 | 0.43 | 0.59 | 0.75 | 1.6 | 1.85 |
| Vert. Permeability | | 3.9 | 14.2 | 8.45 | 3.2 | 2.93 | 0.43 | 0.59 | 0.75 | 1.6 | 1.85 |
| Static Pressure | MPa | 5.9 | 5.9 | 5.55 | 5.7 | 5.95 | 6.7 | 6.95 | 6.6 | 6.95 | 8.1 |
| Formation | | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| Skin | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Drainage Radius | m | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| Reservoir Thickness | m | 3 | 3 | 4 | 3 | 6 | 9 | 9 | 4 | 3 | 4 |
| Model Type | | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| Rock Temperature | ºC | 88.78 | 88.94 | 89.52 | 89.63 | 101.61 | 103.41 | 103.62 | 103.77 | 106 | 107.16 |
| Compositional Oil | | EnC Du... | EnC Du... | EnC Du... | EnC Du... | EnC Fa... | EnC Fa... | EnC Fa... | EnC Fa... | EnC Ge... | EnC Ge... |

# Appendix 6B: Job Sequence and Tool String - Jul 2010 Survey

Schlumberger

| Well Name | ECA ECOG RESTHAVEN 7-2-60-2 | Schlumberger Crew | Position | District |
|---|---|---|---|---|
| Well UWI | 100/07-02-060-02W6/00 | Ryan Bidyk | Supervisor | Red Deer |
| Surface Location | 12-01-060-02W6 | Mike Braun | Operator | Red Deer |
| Lisence Number | 0410475 | Mike | Lonkar | Red Deer |
| Job Start Date | Sunday, July 18, 2010 | Levi Brazier | Night Sup | Red Deer |
| Job End Date | Monday, July 19, 2010 | Fred | Lonkar | Red Deer |
| Service Order # | BB0W-00020 | | | |

## Job Sequence of Events

| Date | Time | Description of Avtivity |
|---|---|---|
| 18-Jul-10 | 7:15 | Pre trip safety meeting |
| | 7:30 | Drive to location |
| | 9:30 | Arrive on location - Blew a tire on the way in |
| | 10:00 | Rig up 0.150 fiber optic SL |
| | 10:45 | N2 Purge - Pressure test |
| | 10:50 | Open well, RIH |
| | 11:26 | Pull test at 1600 mKB - 360 lbs |
| | 11:55 | Pull test at 3300 mKB - 610 lbs |
| | 12:00 | On bottom |
| | 12:10 | Begin DTS acquisition recording flowing profiles |
| 19-Jul-10 | 3:30 | Shut down DTS |
| | 3:40 | Pull off bottom, perform Static Gradient with five minute stops at intervals |
| | 6:05 | Bump up, shutin well, bleed off. |

Schlumberger

**TOOLSTRING SCHEMATIC.**

| | | | | | |
|---|---|---|---|---|---|
| **Customer:** | EnCana | **Customer Rep:** | Todd Schneider | **Toolstring No: 1** | |
| **Field:** | Resthaven | **Well Type:** | Gas Production | **Operation Detail:** | |
| **UWI** | 100/07-02-060-02W6/00 | **Schlumberger Rep/s:** | Ryan Bidyk | Sensa fiber optic Temp log | |
| **Well Name** | ECA ECOG RESTHAVEN 7-2-60-2 | **Schlumberger Base** | Red Deer Slickline | Quartz pressure, temp memory gauges | |
| **Surface LSD** | 12-01-060-02W6 | **Lisence Number** | 0410475 | | |
| **Rig/Crane** | | **Start Date** | 18-Jul-10 | **End Date** | 19-Jul-10 |

| Item Nos | S/Rod or TIC / QC | Length Meter | Weight (LBS) | Description of Item Including Part Nos & Serial Nos Where Applicable | OD mm | F/Neck (Inches) |
|---|---|---|---|---|---|---|
| 1 | 5/8 sucker rod | 0.20 | 1.00 | Sensa Slick line rope socket fish neck | 38.10 | 1.375 |
| 2 | 5/8 sucker rod | 0.26 | 4.00 | Swivel | 38.10 | 1.375 |
| 3 | QC X-Over | 0.18 | 1.00 | 5/8 Sucker Rod to Quick Connect | 38.10 | 1.375 |
| 4 | Quick Connect | 0.91 | 33.00 | Weight bar, 3 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 5 | Quick Connect | 0.35 | 4.00 | Weight bar, 3 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 6 | Quick Connect | 1.52 | 55.00 | Weight bar, 5 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 7 | QC X-Over | 0.12 | 1.00 | Quick Connect to 5/8 Sucker Rod | 38.10 | 1.375 |
| 8 | 5/8 Sucker rod | 0.60 | 10.00 | Bomwell with 2 quartz pressure/temprature gauges | 38.10 | na |
| | Casing Flange to KB | 7.1 | | | | |
| | Tool String Length in Meters | 4.15 | | Largest OD in mm | 38.10 | |
| | Sensa FO line Zero | **2.95** | **Primary Depth on laptop** | **Sensaline Depth** | | |
| | Gauge Zero | **7.1** | **Secondary Depth on laprop** | **Gauge Depth** | | |
| | Total Tool Weight | | 109.00 | | | |

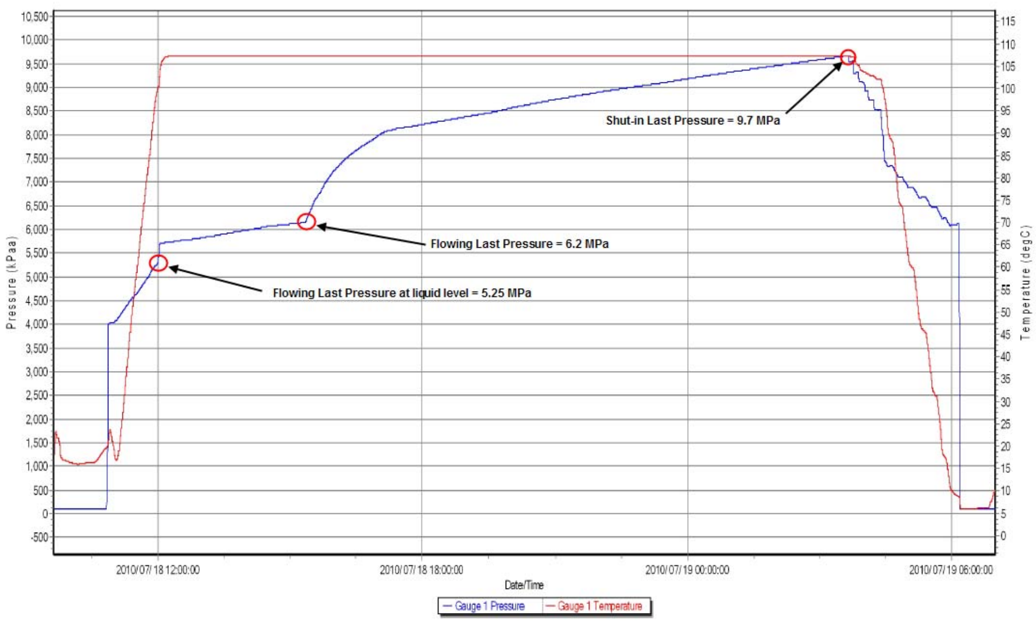
# Appendix 6C: Flowing & Static Gradient Plots - Jul 2010 Survey

Client: EnCana
Test Date: 2010/07/18 - 2010/07/19
Tool Serial #: 8890
Well Name: ECA ECOG RESTHAVEN 7-2-60-2
Location: 12-01-60-2W6M
Field/Pool: Resthaven
Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3445 mKB
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

Schlumberger

**Fiber Optic PL Bottom Hole Pressure / Temperature recorders**

Bottom Gauge Pressure / Temperature Data Plot



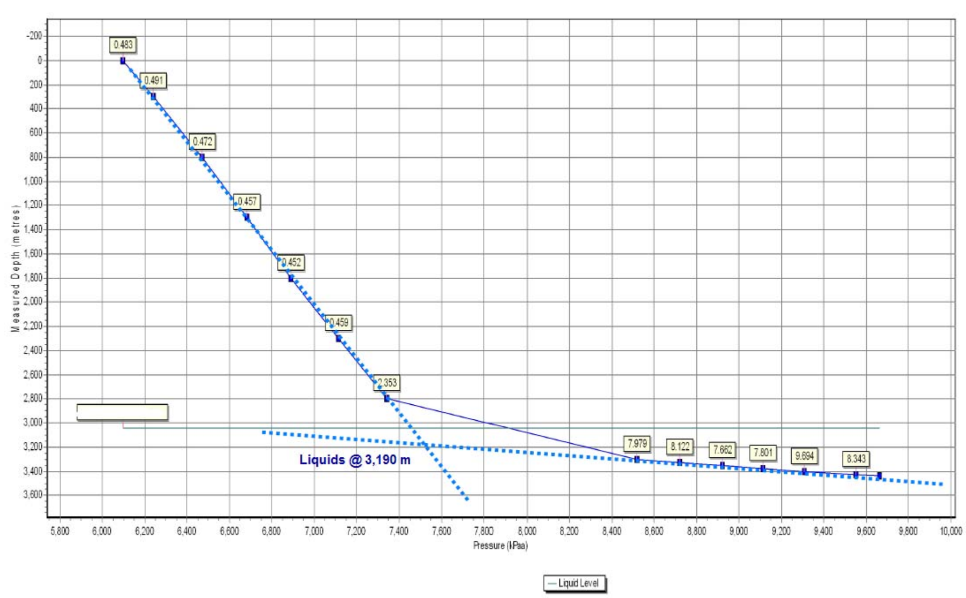


Client: EnCana
Test Date: 2010/07/18 - 2010/07/19
Tool Serial #: 8890
Well Name: ECA ECOG RESTHAVEN 7-2-60-2
Location: 12-01-60-2W6M
Field/Pool: Resthaven
Formation Name: Comingled Zones
Gauge Run Depth [m KB (TVD)]: 3445 mKB
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

Schlumberger

**Fiber Optic PL Bottom Hole Pressure / Temperature recorders**

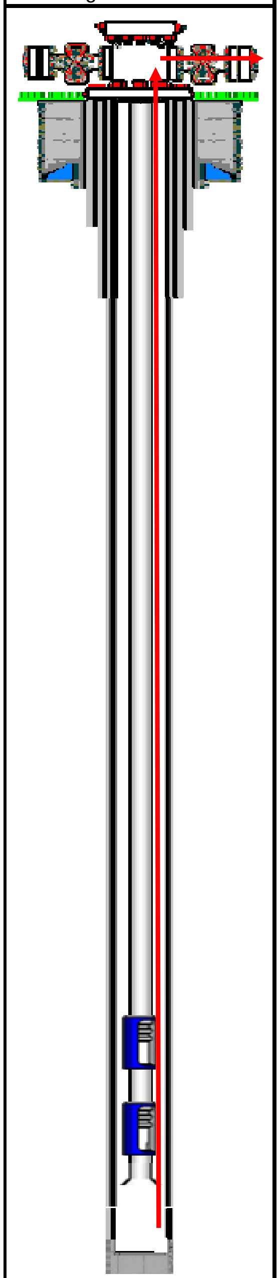

**PRESSURE GRADIENT PLOT**



# Appendix 6D: Well Schematic - Jul 2010 Survey

| | | | | | |
|---|---|---|---|---|---|
| Customer | EnCana | KB (m) | 1282.8 | Start Date | 18-Jul-10 |
| Well Name | ECA ECOG RESTHAVEN 7-2-60-2 | GL (m) | 1276.7 | End Date | 19-Jul-10 |
| UWI | 100/07-02-060-02W6/00 | CF (m) | 1275.7 | Deviated | ☑ Yes ☐ No |
| Lisence # | 0410475 | KB-CF (m) | 7.1 | Packer | ☐ Yes ☑ No |
| Field Name | Resthaven | KB-GL(m) | 6.1 | SO # | BB0W-00020 |
| Well Type | Gas Production | TDPB (mKB) | 3468 | | |
| Flow Path | ☑ CASING ☐ TUBING ☐ BOTH CASING AND TUBING | TVD (mKB) | 0 | | |

Well Diagram



Flow Path Indicated with Red Arrows

| Well Head Connection Type | ☐ FLANGE ☑ SWAGE | Size: | 2 3/8 EUE |
|---|---|---|---|

| | Casing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Surface | 244.5 | 226.6 | J-55 | 53.574 | | 644.0 |
| ☑ | Intermediate | 177.8 | 161.7 | L-80 | 43.228 | | 2547.0 |
| ☑ | Production | 114.3 | 101.6 | P-110 | 17.263 | | 3468.0 |
| ☐ | Production Liner | | | | | | |

Down Hole Items - Packers / Bridge Plugs / Fish / Misc. Down Hole Equiptment

| Type of Down Hole Item | Depth mKB | Remarks |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| | Tubing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Production Tubing | 60.3 | 50.7 | L-80 | 6.846 | 48.26 | 3393 |
| ☐ | Coil Tubing | | | | | | |
| | | | | | | | |

Tubing Jewlery (nipples, plugs, damage, holes, re-entry guides ect.)

| # | Iteme | Top Depth | Bottom Deptl | OD mm | ID mm | Remarks |
|---|---|---|---|---|---|---|
| 1 | X Profile Nipple | | | | | |
| 2 | XN Profile | | | | | |
| 3 | Re-entry guide | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Remarks:

# 7. Nov 2010 Survey Summary

Bottom hole flowing pressure was estimated to be approximately 5.1 MPa based on the gauge pressure the day of the survey. At that time, the rate was around 24 $E^3m^3$/d. Downhole pressure gauge data indicates highly liquids accumulation in the wellbore during the survey causing the flowing down-hole pressure building up by around 0.7 Mpa. High flow instability was seen in flowing traces behavior the reason that three flowing traces were taken for interpretation purposes.

The temperature traces at 2:27, 2:57 and 3:58 PM were used to make a balance between the temperatures trace performance beginning and ending the mentioned unstable period. The developed thermal model was matched considering the three mentioned flowing traces.

There is no conclusive evidence of crossflow during shut-in during the time of the survey.

| Zone | Perforation Interval (mKB) | | Reservoir Interval | Gas Inflow Rate | Gas Inflow Contribution | Gas Inflow Contribution |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | Thermal Zone (mKB) | (E3m3/day) | (%/total) | (%/total) |
| Dunvegan C | 2849.0 | 2850.5 | 2849-2852 | 1.05 | 4.38% | 44.99% |
| Dunvegan D | 2856.0 | 2857.5 | 2855-2858 | 5.76 | 23.99% | |
| Dunvegan E | 2877.0 | 2878.0 | 2876-2880 | 2.33 | 9.72% | |
| Dunvegan E | 2882.0 | 2884.0 | 2882-2885 | 1.66 | 6.91% | |
| Falher E | 3219.0 | 3221.0 | 3218-3224 | 1.53 | 6.35% | 26.42% |
| Falher F | 3255.0 | 3256.0 | 3251-3260 | 1.40 | 5.84% | |
| Falher F | 3268.0 | 3269.5 | 3264-3273 | 2.47 | 10.28% | |
| Falher F | 3275.0 | 3276.0 | 3275-3279 | 0.95 | 3.94% | |
| Gething A | 3352.5 | 3353.5 | 3352-3355 | 1.83 | 7.64% | 28.60% |
| Gething C | 3391.0 | 3392.0 | 3392-3396 | 5.03 | 20.95% | |
| Gething C | 3394.0 | 3395.0 | | | | |
| **TOTAL** | | | | **24** | **100.0%** | **100.0%** |

Table 7.1: Gas Inflow Rates from Thermal Interpretation - Nov 2010 Survey

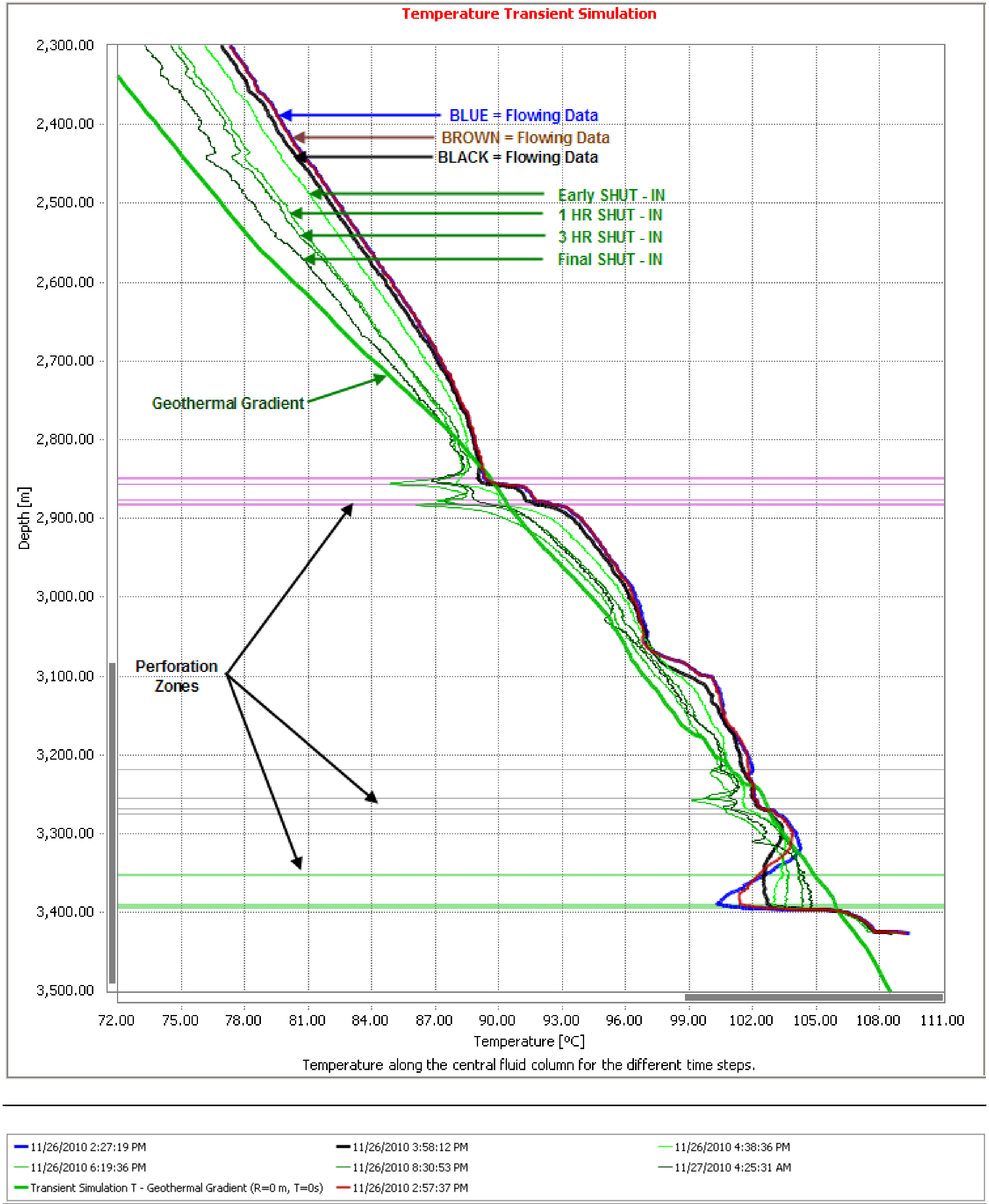





Figure 7.1: DTS data, perforations and comments on potential cross-flow during shut-in Nov 2010 Survey

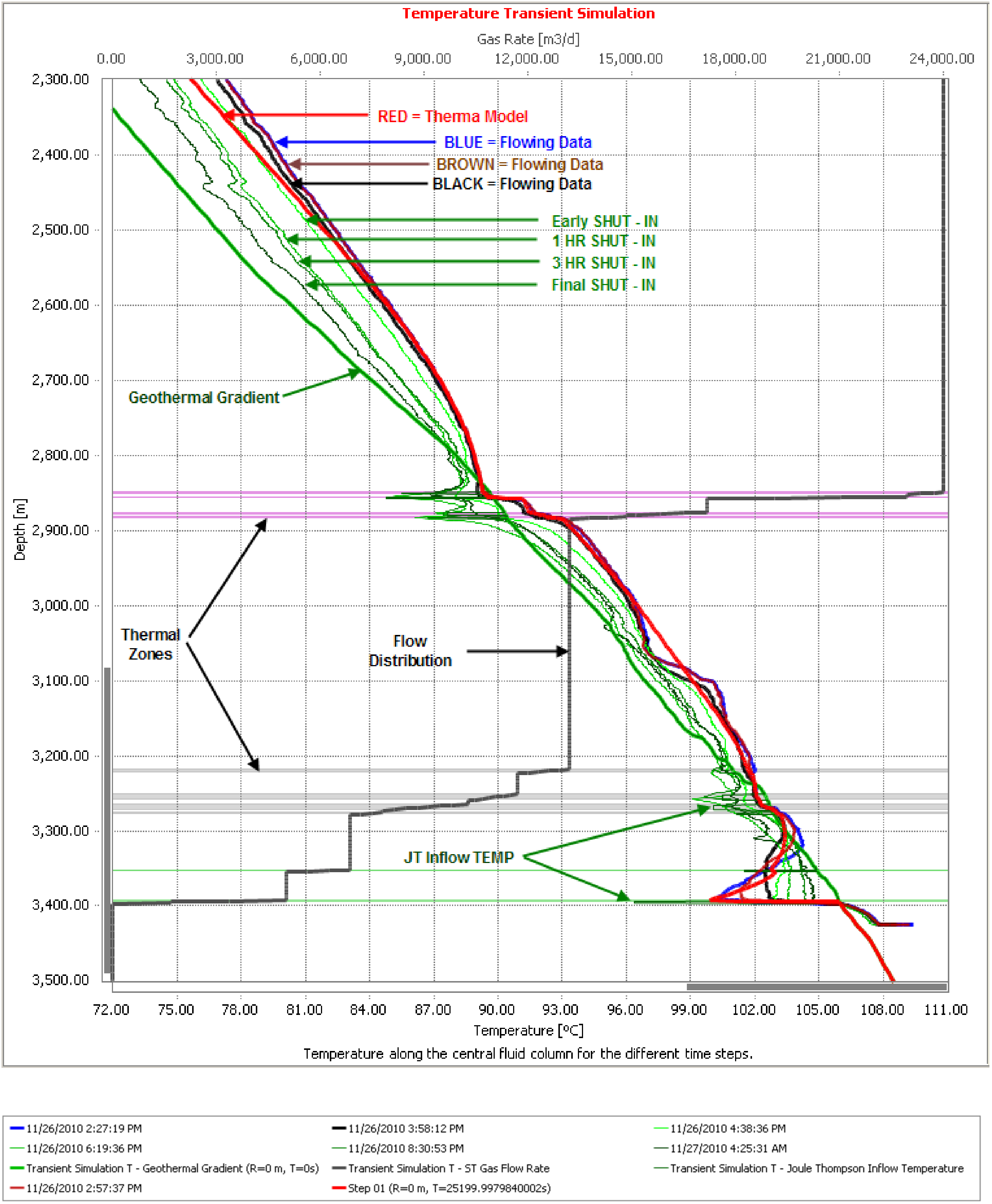



Figure 7.2: Thermal Model over the Producing Intervals - Nov 2010 Survey

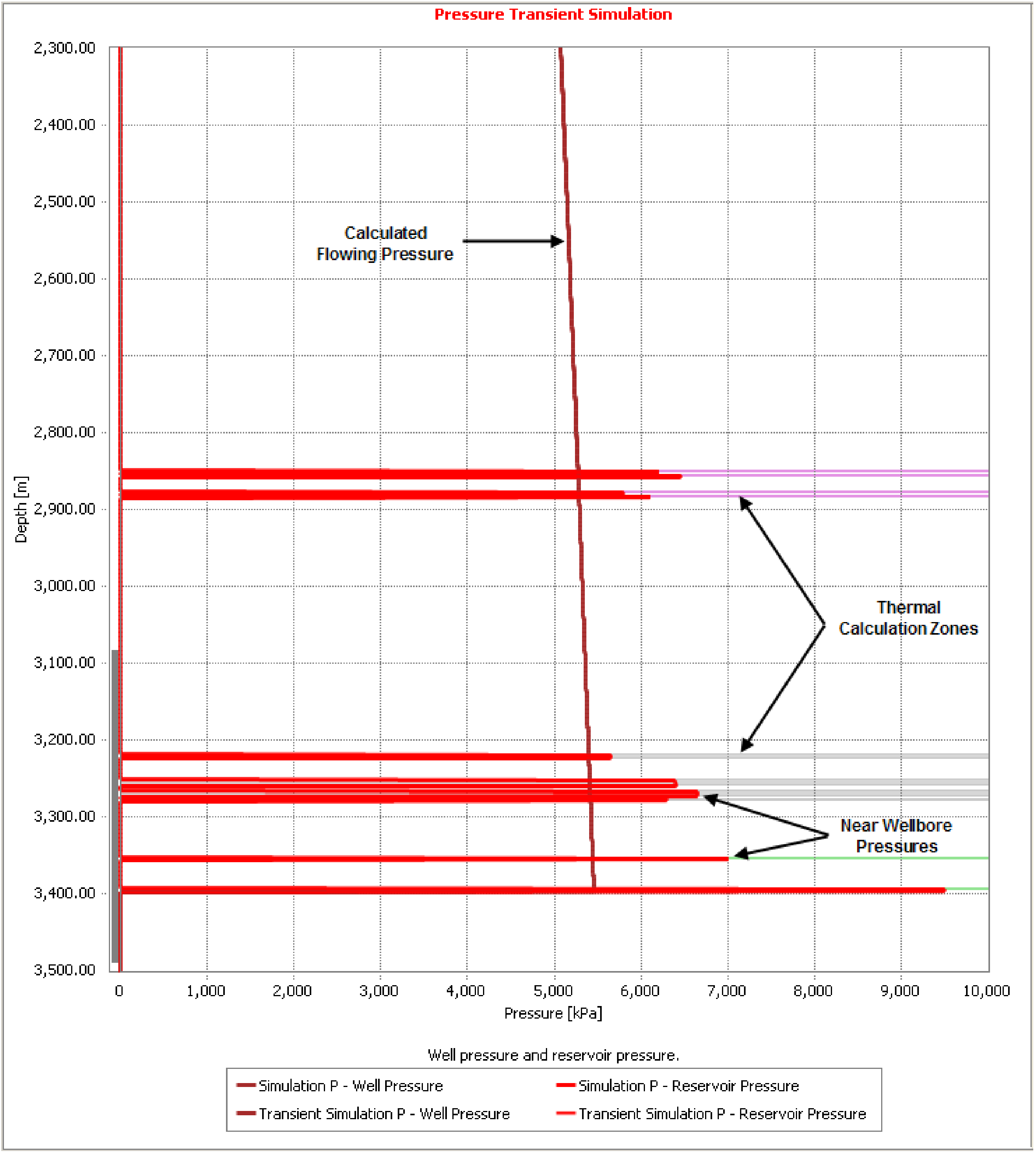



Figure 7.3: Thermal zones with wellbore flowing pressure and near wellbore modeled reservoir pressures - Nov 2010 Survey

## Appendix 7A: THERMA Model Parameters - Nov 2010 Survey

| | |
|---|---|
| **Project** | THERMA 4.0 Study |
| **Prepared By** | Schlumberger & Encana |
| **Re-interpretation Date** | Mar 2011 |
| **Analysis Model Type** | Compositional |
| **Company** | Encana Corporation |

Geothermal Gradient - Nov 2010 Survey

Simplify..

| | MD | TVD | Temperature | Gradient |
|---|---|---|---|---|
| | m | | °C | degC/m |
| 1 | 0.00 | 0.00 | 5.00 | N/A |
| 2 | 644.02 | 614.10 | 23.00 | 0.03 |
| 3 | 2553.01 | 2419.00 | 78.50 | 0.03 |
| 4 | 2798.05 | 2664.00 | 87.98 | 0.04 |
| 5 | 2913.15 | 2779.10 | 91.33 | 0.03 |
| 6 | 3025.87 | 2891.80 | 95.22 | 0.03 |
| 7 | 3081.41 | 2947.30 | 96.33 | 0.02 |
| 8 | 3164.93 | 3030.80 | 98.72 | 0.03 |
| 9 | 3176.34 | 3042.20 | 99.58 | 0.08 |
| 10 | 3202.54 | 3068.40 | 100.23 | 0.02 |
| 11 | 3208.44 | 3074.30 | 100.70 | 0.08 |
| 12 | 3236.35 | 3102.20 | 101.59 | 0.03 |
| 13 | 3240.45 | 3106.30 | 102.20 | 0.15 |
| 14 | 3278.75 | 3144.60 | 102.90 | 0.02 |
| 15 | 3379.76 | 3245.60 | 105.73 | 0.03 |
| 16 | 3468.00 | 3333.82 | 107.84 | 0.02 |
| 17 | | | | |

## Flow Steps - Nov 2010 Survey

| Duration | Time Subdivision | Step Type | Surface Flow rate |
|---|---|---|---|
| (h) | (h) | | (E3m3/d) |
| 7 | 1.00 | Production | 24 |

## Reservoir Model – Nov 2010 Survey

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | | Non-reservoir | Dunv C | Dunv D | Dunv E | Dunv E | Falher E | Falher F | Falher F | Falher F | Gething A | Gething C |
| **MD Top** | m | | 2849 | 2855 | 2876 | 2882 | 3218 | 3251 | 3264 | 3275 | 3352 | 3392 |
| **MD Bottom** | | | 2852 | 2858 | 2880 | 2885 | 3224 | 3260 | 3273 | 3279 | 3355 | 3396 |
| **Color** | | | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | mD | | 1 | 4 | 3 | 1.7 | 2.93 | 0.43 | 0.59 | 0.75 | 1 | 0.7 |
| **Vert. Permeability** | | | 1 | 4 | 3 | 1.7 | 2.93 | 0.43 | 0.59 | 0.75 | 1 | 0.7 |
| **Static Pressure** | MPa | Update all -> | 6.2 | 6.45 | 5.8 | 6.1 | 5.65 | 6.4 | 6.65 | 6.3 | 7 | 9.5 |
| **Formation** | | Default For... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | m | | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | m | Update all -> | 3 | 3 | 4 | 3 | 6 | 9 | 9 | 4 | 3 | 4 |
| **Model Type** | | | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | ºC | Update all -> | 88.67 | 88.83 | 89.4 | 89.51 | 101.37 | 103.16 | 103.36 | 103.51 | 105.72 | 106.87 |
| **Compositional Oil** | | | EnC Du... | EnC Du... | EnC Du... | EnC Du... | EnC Fa... | EnC Fa... | EnC Fa... | EnC Fa... | EnC Ge... | EnC Ge... |

# Appendix 7B: Job Sequence and Tool String - Nov 2010 Survey

| Well Name | ECA ECOG RESTHAVEN 7-2-60-2W6 | Schlumberger Crew | Position | District |
|---|---|---|---|---|
| Well UWI | 100/07-02-060-02W6/00 | Levi Brazier | Supervisor | Red Deer |
| Surface Location | 12-01-060-02W6 | Mike Braun | Operator | Red Deer |
| Lisence Number | 410475 | Ryan Bidyk | Night Shift | Red Deer |
| Job Start Date | Friday, November 26, 2010 | Chris Hopper | Night shift | Red Deer |
| Job End Date | Saturday, November 27, 2010 | | | |
| Service Order # | BC91-00017 | | | |

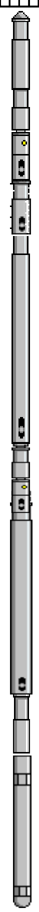
## Job Sequence of Events

| Date | Time | Description of Avtivity |
|---|---|---|
| 26-Nov-10 | 7:30 | Travel from camp to loc. |
| | 8:00 | Held safety meeting |
| | 8:30 | Rig up wireline & picker |
| | 9:15 | Press. Test WHE to 21 MPA |
| | 9:30 | RIH w/ 2 2/8 nipple brush tag PB @ 3397 mkb, POOh |
| | 10:45 | Rig down slickline, rig up sensaline |
| | 11:00 | Press. Test WHE to 21 MPA |
| | 11:15 | RIH w/ Sensaline & EMR's |
| | 11:30 | Pull test @ 1000 MKB 245 lbs |
| | 11:50 | Pull test @ 2000 MKB 385 lbs |
| | 12:10 | Pull test @ 3000 MKB 520 lbs |
| | 12:20 | Pull test @ 3325 MKB 580 lbs |
| | 12:30 | On bottom with sensaline |
| | 12:38 | Start DTS aqusition log casing flow |
| | 16:36 | Shut in casing flow, log build up for 12 hrs |
| | 19:00 | Night shift takes over |
| 27-Nov-10 | 4:41 | stop DTS aquistion, POOH perform reverse static gradient |
| | 7:45 | Bump up, bleed off well download EMR's, Rig out wireline |

Schlumberger

# TOOLSTRING SCHEMATIC.

| | | | | |
|---|---|---|---|---|
| **Customer:** | EnCana | **Customer Rep:** | Todd Schneider | **Toolstring No: 1** |
| **Field:** | RESTHAVEN | **Well Type:** | Gas | **Operation Detail:** |
| **UWI** | 100/07-02-060-02W6/00 | **Schlumberger Rep/s:** | Levi Brazier | Sensa fiber optic Temp log |
| **Well Name** | ECA ECOG RESTHAVEN 7-2-60-2W6 | **Schlumberger Base** | Red Deer Slickline | Quartz pressure, temp memory gauges |
| **Surface LSD** | 12-01-060-02W6 | **Lisence Number** | 0410475 | **Tensile Strength of cable: 200 KSPI** |
| **Rig/Crane** | | **Start Date** | 25-Nov-10 | **End Date** 27-Nov-10 |



| Item Nos | | S/Rod or TIC / QC | Length Meter | Weight (LBS) | Description of Item Including Part Nos & Serial Nos Where Applicable | OD mm | F/Neck (Inches) |
|---|---|---|---|---|---|---|---|
| 1 | | 5/8 sucker rod | 0.18 | 1.00 | Sensaline rope socket fish neck | 38.10 | 1.375 |
| | | 5/8 sucker rod | 0.26 | 4.00 | Swivel, 1.5 inch | 38.10 | 1.375 |
| 2 | | QC X-Over | 0.18 | 1.50 | 5/8 Sucker Rod to Quick Connect | 38.10 | 1.375 |
| 3 | | Quick Connect | 1.52 | 55.00 | Weight bar, 5 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 4 | | Quick Connect | 0.35 | 6.00 | Knuckle, 1.5 inch | 38.10 | 1.375 |
| 4 | | Quick Connect | 0.91 | 33.00 | Weight bar, 3 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 5 | | QC X-Over | 0.12 | 1.50 | Quick Connect to 5/8 Sucker Rod | 38.10 | 1.375 |
| 6 | | 5/8 Sucker rod | 0.68 | 10.00 | Bomwell with 2 quartz pressure/temprature gauges | 38.10 | N/A |
| | | Casing Flange to KB | 7.10 | | | | |
| | | Tool String Length in Meters | 4.20 | | Largest OD in mm | 38.10 | |
| | | Sensa FO line Zero | 2.90 | Primary Depth on laptop | Sensaline Depth | | |
| | | Gauge Zero | 7.1 | Secondary Depth on laprop | Gauge Depth | | |
| | | | | | | | |
| | | Total Tool Weight | | 112.00 | | | |

# Appendix 7C: Flowing & Static Gradient Plots - Nov 2010 Survey

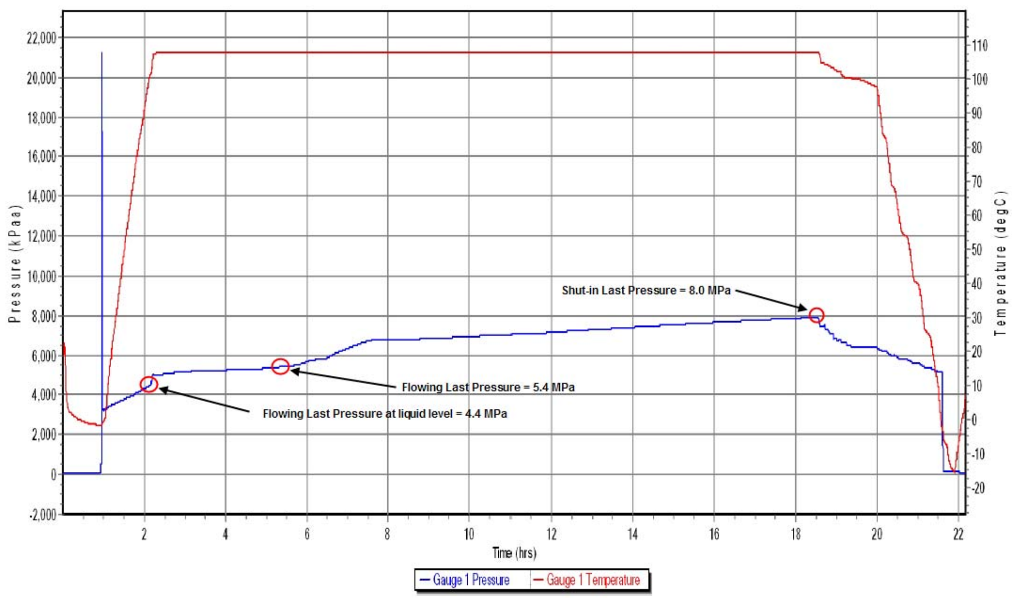
Client: Encana
Test Date: 2010/11/26 - 2010/11/27
Tool Serial #: 7975

Well Name: ECA ECOG RESTHAVEN 7-2-60-2W
Location: 12-01-060-02W6
Field/Pool: RESTHAVEN

Formation Name: CO-MINGLED
Gauge Run Depth [m KB (TVD)]: 3265.5
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

**FLOW BUILD UP & STATIC GRADIENT**

**DATA PLOT**





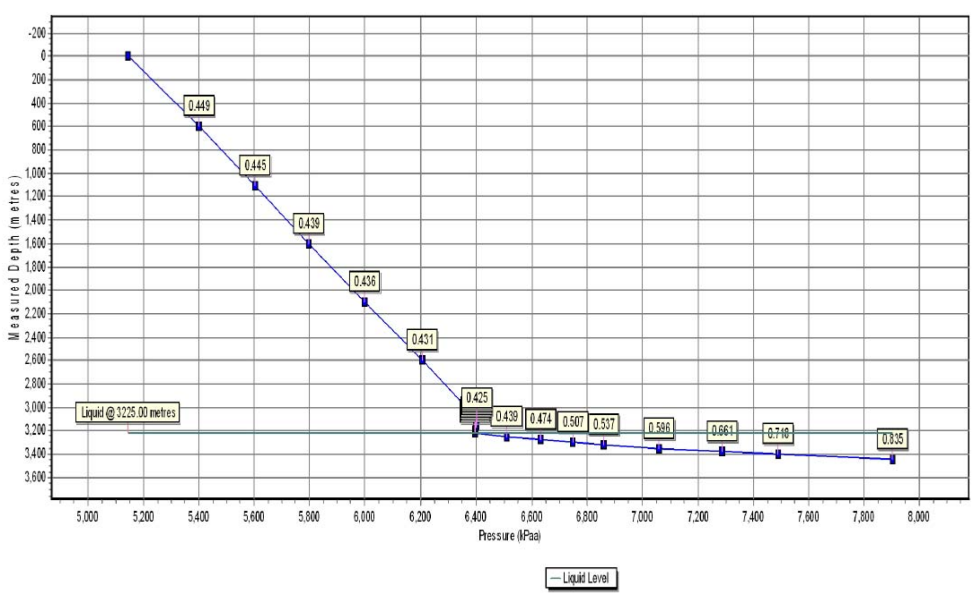
Client: Encana
Test Date: 2010/11/26 - 2010/11/27
Tool Serial #: 7975

Well Name: ECA ECOG RESTHAVEN 7-2-60-2W
Location: 12-01-060-02W6
Field/Pool: RESTHAVEN

Formation Name: CO-MINGLED
Gauge Run Depth [m KB (TVD)]: 3265.5
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

**FLOW BUILD UP & STATIC GRADIENT**


**PRESSURE GRADIENT PLOT**

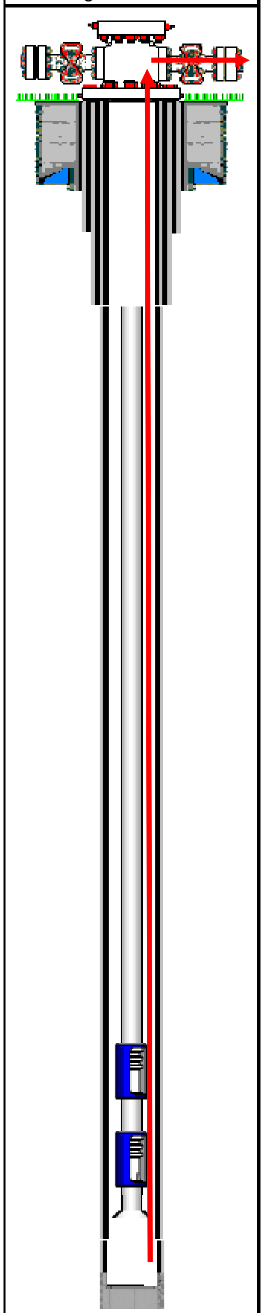


# Appendix 7D: Well Schematic - Nov 2010 Survey

Schlumberger

| | | | | | |
|---|---|---|---|---|---|
| Customer | EnCana | KB (m) | 1282.8 | Start Date | 26-Nov-10 |
| Well Name | ECA ECOG RESTHAVEN 7-2-60-2W6 | GL (m) | 1276.7 | End Date | 27-Nov-10 |
| UWI | 100/07-02-060-02W6/00 | CF (m) | 1275.7 | Deviated | ☑ Yes ☐ No |
| Lisence # | 0410475 | KB-CF (m) | 7.1 | Packer | ☐ Yes ☑ No |
| Field Name | RESTHAVEN | KB-GL(m) | 6.1 | SO # | BC91-00017 |
| Well Type | Gas | TDPB (mKB) | 3468 | | |
| Flow Path | ☐ CASING ☐ TUBING ☑ BOTH CASING AND TUBING | PBTVD (mKB) | 3326 | | |

Well Diagram



Flow Path Indicated with Red Arrows

| | | |
|---|---|---|
| Well Head Connection Type ☐ FLANGE ☑ SWAGE | Size: | 2 3/8 EUE |

| | Casing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Surface | 244.5 | 226.6 | J-55 | 53.574 | | 644.0 |
| ☑ | Intermediate | 177.8 | 161.7 | L-80 | 34.228 | | 2547.0 |
| ☑ | Production | 114.3 | 101.6 | P-110 | 17.263 | | 3468.0 |
| ☐ | Production Liner | | | | | | |

Down Hole Items - Packers / Bridge Plugs / Fish / Misc. Down Hole Equiptment

| Type of Down Hole Item | Depth mKB | Remarks |
|---|---|---|
| | | |

| | Tubing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Production Tubing | 60.3 | 50.7 | L-80 | 6.846 | 48.26 | 3386.19 |
| ☐ | Coil Tubing | | | | | | |

Tubing Jewlery (nipples, plugs, damage, holes, re-entry guides ect.)

| # | Iteme | Top Depth | Bottom Dept | OD mm | ID mm | Remarks |
|---|---|---|---|---|---|---|
| 1 | X Profile Nipple | 3386.16 | 3386.47 | 60.3 | 47.6 | |
| 2 | XN Profile | 3389.55 | 3389.86 | 60.3 | 45.5 | |
| 3 | Re-entry guide | 3392.76 | 3393 | 60.3 | 50.7 | |

Remarks:

Re-entry guide @ 3393.00 mkb

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# 8. Nov 2011 Survey Summary

Bottom hole flowing pressure was assumed to be approximately 6.0 MPa based on the gauge pressure the day of the survey. At that time, the rate was around 22 $E^3m^3$/d. Downhole pressure gauge data indicates highly liquids accumulation in the wellbore during the survey causing the flowing down-hole pressure building up by around 0.5 Mpa before shut-in the well.

High flow instability was seen in flowing traces behavior the reason that two flowing traces were taken for interpretation purposes.

The temperature traces at 1:15 and 3:51 PM were used to make a balance between the temperatures trace performance beginning and ending the mentioned unstable period. The developed thermal model was matched considering the two mentioned flowing traces.

There is no conclusive evidence of crossflow during shut-in during the time of the survey.

| Zone | Perforation Interval (mKB) | | Reservoir Interval | Gas Inflow Rate | Gas Inflow Contribution | Gas Inflow Contribution |
|---|---|---|---|---|---|---|
| | Top Shot | Bottom Shot | Thermal Zone (mKB) | (E3m3/day) | (%/total) | (%/total) |
| Dunvegan C | 2849.0 | 2850.5 | 2849-2852 | 1.47 | 6.66% | 64.96% |
| Dunvegan D | 2856.0 | 2857.5 | 2855-2858 | 6.38 | 28.99% | |
| Dunvegan E | 2877.0 | 2878.0 | 2876-2880 | 4.06 | 18.46% | |
| Dunvegan E | 2882.0 | 2884.0 | 2882-2885 | 2.39 | 10.85% | |
| Falher E | 3219.0 | 3221.0 | 3218-3224 | 4.72 | 21.46% | 26.30% |
| Falher F | 3255.0 | 3256.0 | 3251-3260 | 0.34 | 1.55% | |
| Falher F | 3268.0 | 3269.5 | 3264-3273 | 0.49 | 2.24% | |
| Falher F | 3275.0 | 3276.0 | 3275-3279 | 0.23 | 1.05% | |
| Gething A | 3352.5 | 3353.5 | 3352-3355 | 1.01 | 4.58% | 8.73% |
| Gething C | 3391.0 | 3392.0 | 3392-3396 | 0.91 | 4.15% | |
| Gething C | 3394.0 | 3395.0 | | | | |
| **TOTAL** | | | | **22** | **100.0%** | **100.0%** |

Table 8.1: Gas Inflow Rates from Thermal Interpretation – Nov 2011 Survey

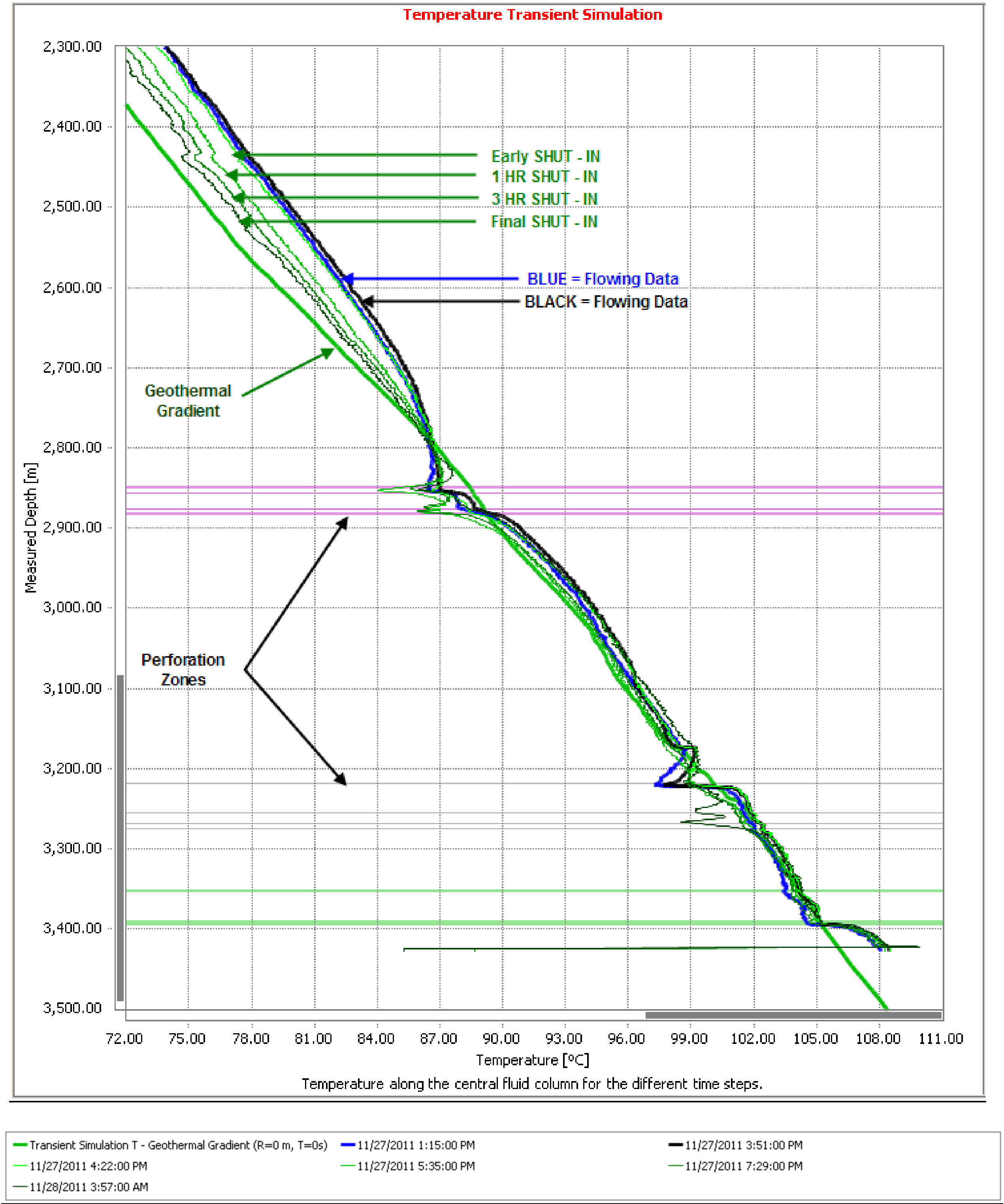


Figure 8.1: DTS data, perforations and comments on potential cross-flow during shut-in Nov 2011 Survey

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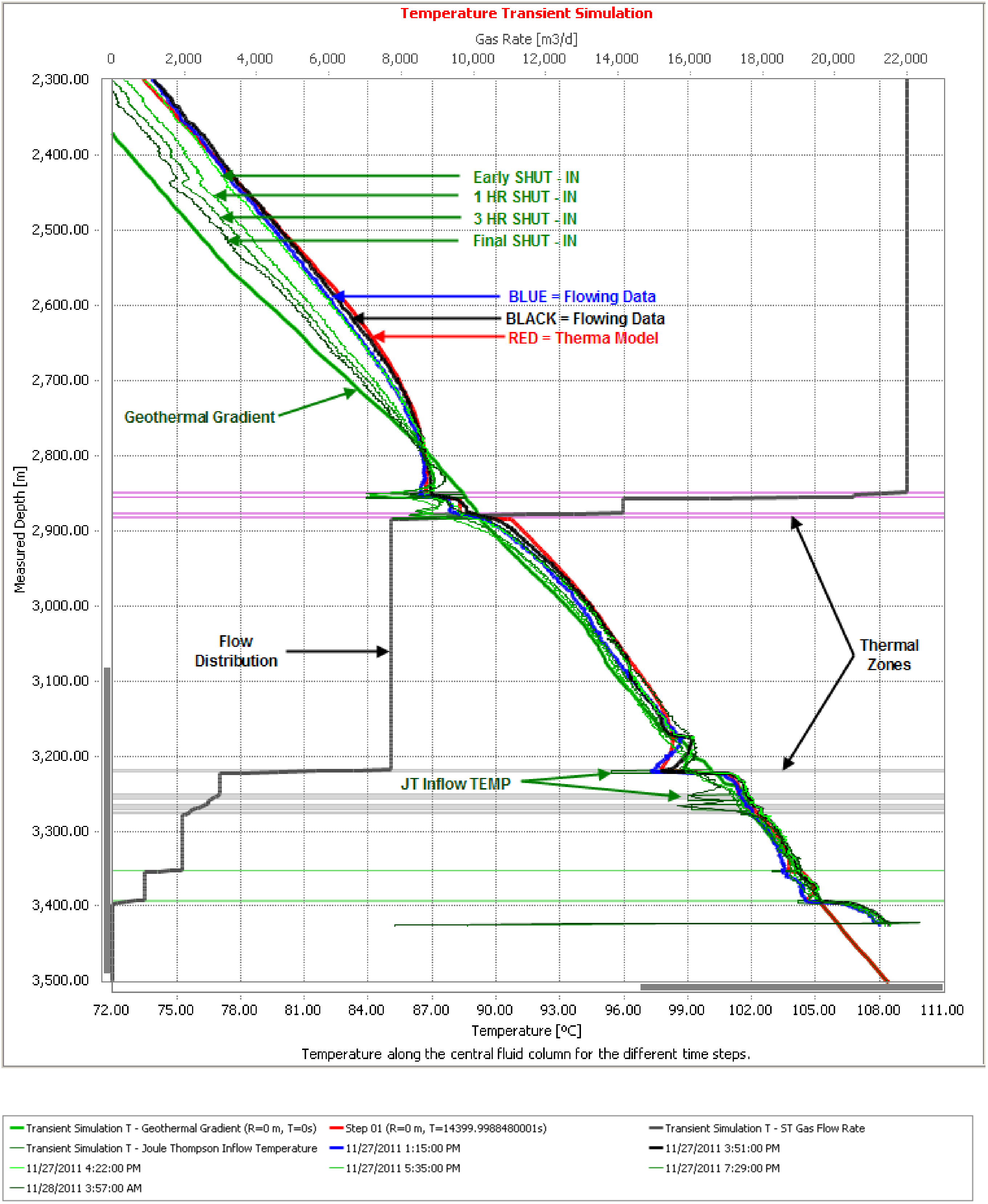


Figure 8.2: Thermal Model over the Producing Intervals - Nov 2011 Survey

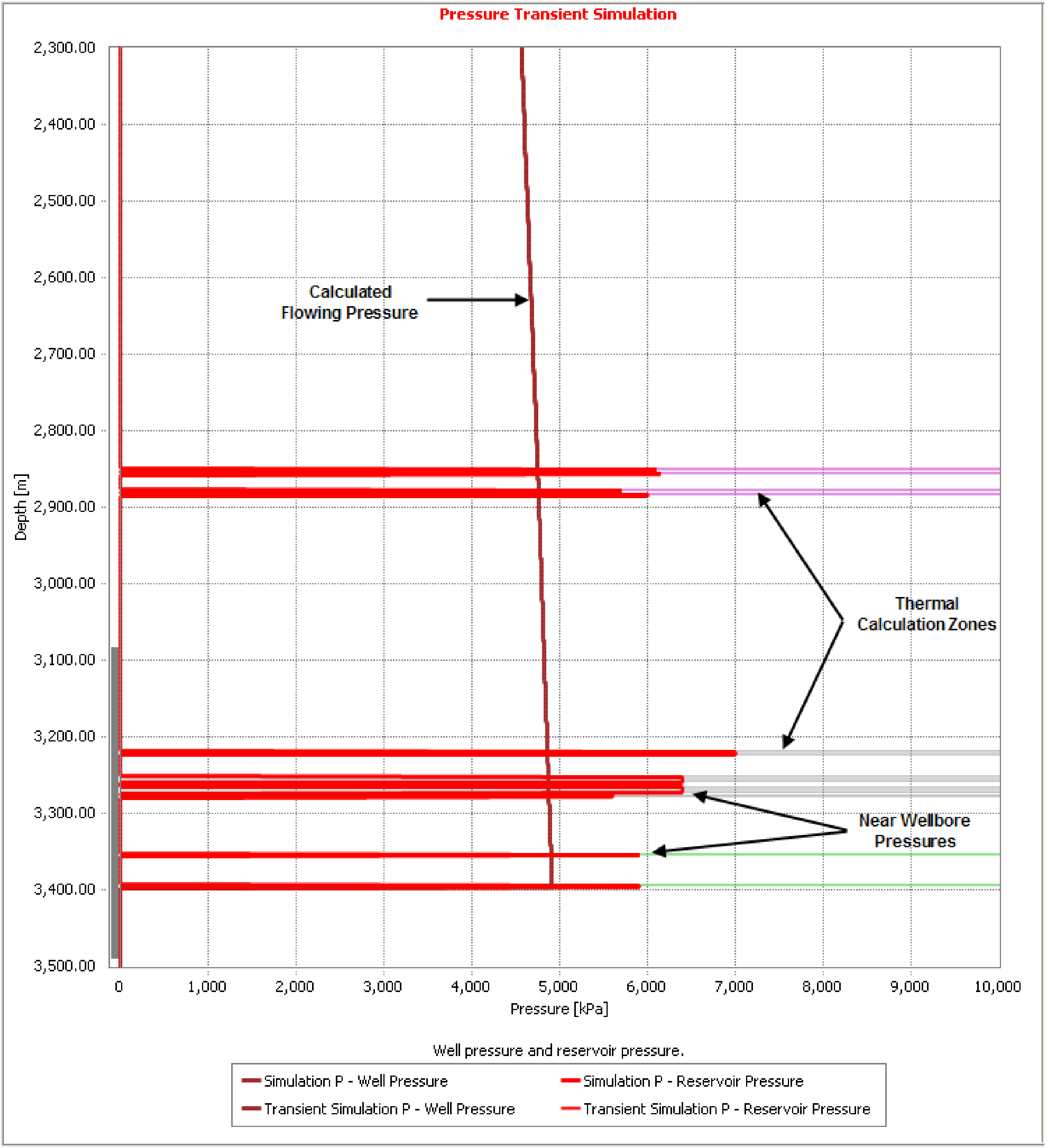


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Figure 8.3: Thermal zones with wellbore flowing pressure and near wellbore modeled reservoir pressures - Nov 2011 Survey

# Appendix 8A: THERMA Model Parameters - Nov 2011 Survey

| | |
|---|---|
| Project | THERMA 4.0 Study |
| Prepared By | Schlumberger & Encana |
| Interpretation Date | Feb 2012 |
| Analysis Model Type | Compositional |
| Company | Encana Corporation |

Geothermal Gradient - Nov 2011 Survey

| | ☑ MD | ☐ TVD | Temperature | Gradient |
|---|---|---|---|---|
| | m | | °C | degC/m |
| 1 | 0.00 | 0.00 | 4.00 | N/A |
| 2 | 644.02 | 614.10 | 22.20 | 0.03 |
| 3 | 2553.01 | 2419.00 | 77.50 | 0.03 |
| 4 | 2798.65 | 2664.60 | 86.86 | 0.04 |
| 5 | 2889.25 | 2755.20 | 89.40 | 0.03 |
| 6 | 3025.87 | 2891.80 | 94.17 | 0.03 |
| 7 | 3081.41 | 2947.30 | 95.30 | 0.02 |
| 8 | 3164.93 | 3030.80 | 97.75 | 0.03 |
| 9 | 3176.34 | 3042.20 | 98.66 | 0.08 |
| 10 | 3202.54 | 3068.40 | 99.33 | 0.03 |
| 11 | 3208.44 | 3074.30 | 99.83 | 0.08 |
| 12 | 3236.35 | 3102.20 | 100.74 | 0.03 |
| 13 | 3240.45 | 3106.30 | 101.39 | 0.16 |
| 14 | 3279.55 | 3145.40 | 102.12 | 0.02 |
| 15 | 3468.00 | 3333.82 | 107.38 | 0.03 |
| 16 | | | | |

## Flow Steps - Nov 2011 Survey

| Duration | Time Subdivision | Step Type | Surface Flow rate |
|---|---|---|---|
| (h) | (h) | | (E3m3/d) |
| 4 | 1.00 | Production | 22 |

## Reservoir Model - Nov 2011 Survey

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | | Non-reservoir | Dunv C | Dunv D | Dunv E | Dunv E | Falher E | Falher F | Falher F | Falher F | Gething A | Gething C |
| **MD Top** | m | | 2849 | 2855 | 2876 | 2882 | 3218 | 3251 | 3264 | 3275 | 3352 | 3392 |
| **MD Bottom** | | | 2852 | 2858 | 2880 | 2885 | 3224 | 3260 | 3273 | 3279 | 3355 | 3396 |
| **Color** | | | @ | @ | @ | @ | @ | @ | @ | @ | @ | @ |
| **Horz. Permeability** | mD | | 1 | 4 | 3 | 1.7 | 1 | 0.07 | 0.1 | 0.25 | 1 | 0.7 |
| **Vert. Permeability** | | | 1 | 4 | 3 | 1.7 | 1 | 0.07 | 0.1 | 0.25 | 1 | 0.7 |
| **Static Pressure** | MPa | Update all -> | 6.1 | 6.15 | 5.7 | 6 | 7 | 6.4 | 6.4 | 5.6 | 5.9 | 5.9 |
| **Formation** | | Default For... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... | Use De... |
| **Skin** | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Drainage Radius** | m | | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 | 152.4 |
| **Reservoir Thickness** | m | Update all -> | 3 | 3 | 4 | 3 | 6 | 9 | 9 | 4 | 3 | 4 |
| **Model Type** | | | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas | V Gas |
| **Rock Temperature** | °C | Update all -> | 88.67 | 88.83 | 89.4 | 89.51 | 101.37 | 103.16 | 103.36 | 103.51 | 105.72 | 106.87 |
| **Compositional Oil** | | | EnC Du... | EnC Du... | EnC Du... | EnC Du... | EnC Fa... | EnC Fa... | EnC Fa... | EnC Fa... | EnC Ge... | EnC Ge... |

## Appendix 8B: Job Sequence and Tool String - Nov 2011 Survey

Schlumberger ENCANA

| Well Name | ECA ECOG RESTHAVEN 7-2-60-2W6 | Schlumberger Crew | Position | District |
|---|---|---|---|---|
| Well UWI | 100/07-02-060-02W6/00 | Levi Brazier | Supervisor | Red Deer |
| Surface Location | 12-01-060-02W6 | Ryan Bidyk | Day Shift | Red Deer |
| Lisence Number | 410475 | Chris Hopper | Night Shift | Red Deer |
| Job Start Date | Sunday, November 27, 2011 | Tony LONKAR | Night shift | Red Deer |
| Job End Date | Monday, November 28, 2011 | | | |
| Service Order # | BV5O-00001 | | | |

### Job Sequence of Events

| Date | Time | Description of Avtivity |
|---|---|---|
| 27-Nov-11 | 7:00 | Travel to loc. |
| | 7:30 | Held safety meeting |
| | 7:45 | Spot equipment |
| | 8:00 | Rig up slickline |
| | 8:45 | Pressure test to 21 mpa |
| | 9:00 | RIH w/ nipple brush tag fill @ 3437 mkb, pooh |
| | 9:45 | Bump up bleed off |
| | 9:50 | Rig out slickline rig up fiber optic line |
| | 10:15 | Pressure test to 21 mpa |
| | 10:30 | RIH w/ EMR's & fuber optic line |
| | 11:30 | On bottom with Fiber optic line & EMR's 3434.5 MKB |
| | 11:45 | Start DTS aquasition log flowing perfs |
| | 16:00 | Shut in casing flow log build up for 12 hrs |
| | 3:58 | Stop and Disconnect DTS Aquasition. |
| | 4:05 | recoders off bottom, begin reverce gradient. |
| | 6:31 | Arrive at surface, 5 min stop at surface, shut in, and bleed off lubricator. |
| | 6:38 | rig out. |
| | 8:00 | off location, head to next locatin. |

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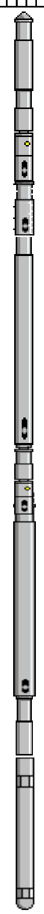
## TOOLSTRING SCHEMATIC.

| | | | | | |
|---|---|---|---|---|---|
| **Customer:** | EnCana | **Customer Rep:** | Todd Schneider | **Toolstring No: 1** | |
| **Field:** | RESTHAVEN | **Well Type:** | Gas | **Operation Detail:** | |
| **UWI** | 100/07-02-060-02W6/00 | **Schlumberger Rep/s:** | Levi Brazier | Sensa fiber optic Temp log | |
| **Well Name** | ECA ECOG RESTHAVEN 7-2-60-2W6 | **Schlumberger Base** | Red Deer Slickline | Quartz pressure, temp memory gauges | |
| **Surface LSD** | 12-01-060-02W6 | **Lisence Number** | 0410475 | **Tensile Strength of cable: 200 KSPI** | |
| **Rig/Crane** | | **Start Date** | 25-Nov-10 | **End Date** | 28-Nov-11 |



| Item Nos | | S/Rod or TIC / QC | Length Meter | Weight (LBS) | Description of Item Including Part Nos & Serial Nos Where Applicable | OD mm | F/Neck (Inches) |
|---|---|---|---|---|---|---|---|
| 1 | | 5/8 sucker rod | 0.18 | 1.00 | Sensaline rope socket fish neck | 38.10 | 1.375 |
| | | 5/8 sucker rod | 0.26 | 4.00 | Swivel, 1.5 inch | 38.10 | 1.375 |
| 2 | | QC X-Over | 0.18 | 1.50 | 5/8 Sucker Rod to Quick Connect | 38.10 | 1.375 |
| 3 | | Quick Connect | 1.52 | 55.00 | Weight bar, 5 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 4 | | Quick Connect | 0.35 | 6.00 | Knuckle, 1.5 inch | 38.10 | 1.375 |
| 4 | | Quick Connect | 0.91 | 33.00 | Weight bar, 3 foot 1.5 inch Tungston | 38.10 | 1.375 |
| 5 | | QC X-Over | 0.12 | 1.50 | Quick Connect to 5/8 Sucker Rod | 38.10 | 1.375 |
| 6 | | 5/8 Sucker rod | 0.68 | 10.00 | Bomwell with 2 quartz pressure/temprature gauges | 38.10 | N/A |
| | | Casing Flange to KB | 7.10 | | | | |
| | | Tool String Length in Meters | 4.20 | | Largest OD in mm | 38.10 | |
| | | Sensa FO line Zero | 2.90 | Primary Depth on laptop | Sensaline Depth | | |
| | | Gauge Zero | 7.1 | Secondary Depth on laprop | Gauge Depth | | |
| | | | | | | | |
| | | Total Tool Weight | | 112.00 | | | |

# Appendix 8C: Flowing & Static Gradient Plots - Nov 2011 Survey

Client: ENCANA
Test Date: 2011/11/27 - 2011/11/28
Tool Serial #: 5209

Well Name: ECA ECOG RESTHAVEN 7-2-60-2
Location: 12-01-060-02W6
Field/Pool: RESTHAVEN

Formation Name: CO-MINGLED
Gauge Run Depth [m KB (TVD)]: 3302.9
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

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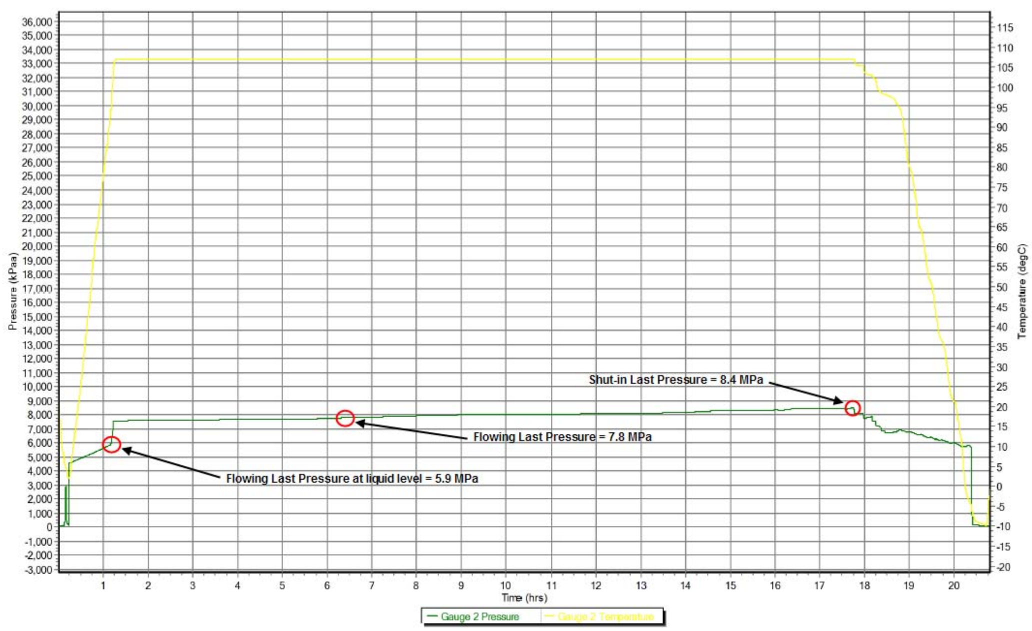
**FLOW BUILD UP & REVERSE GRADIENT**

**DATA PLOT**




Client: ENCANA
Test Date: 2011/11/27 - 2011/11/28
Tool Serial #: 5216

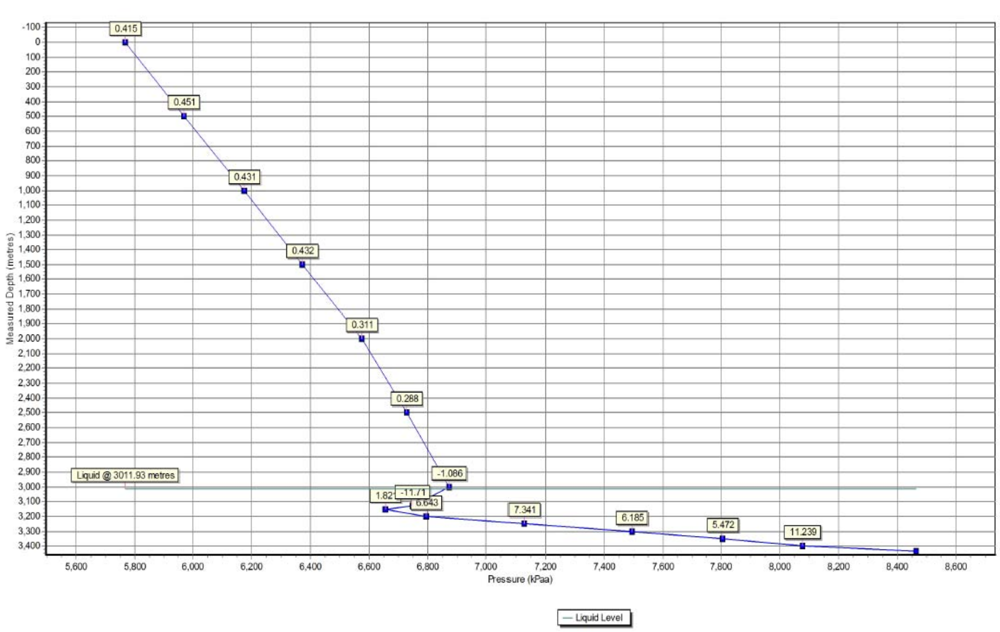
Well Name: ECA ECOG RESTHAVEN 7-2-60-2
Location: 12-01-060-02W6
Field/Pool: RESTHAVEN

Formation Name: CO-MINGLED
Gauge Run Depth [m KB (TVD)]: 3302.9
Test/Prod. Interval Top [m KB (TVD)]:
Test/Prod. Interval Base [m KB (TVD)]:

Schlumberger

**FLOW BUILD UP & REVERSE GRADIENT**

**PRESSURE GRADIENT PLOT**

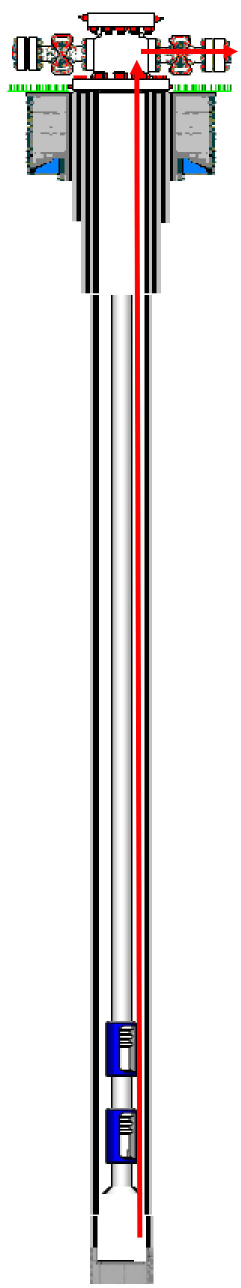


## Appendix 8D: Well Schematic - Nov 2011 Survey

Schlumberger

| | | | | | |
|---|---|---|---|---|---|
| Customer | EnCana | KB (m) | 1282.8 | Start Date | 27-Nov-11 |
| Well Name | ECA ECOG RESTHAVEN 7-2-60-2W6 | GL (m) | 1276.7 | End Date | 28-Nov-11 |
| UWI | 100/07-02-060-02W6/00 | CF (m) | 1275.7 | Deviated | ☑ Yes ☐ No |
| Lisence # | 0410475 | KB-CF (m) | 7.1 | Packer | ☐ Yes ☑ No |
| Field Name | RESTHAVEN | KB-GL(m) | 6.1 | SO # | |
| Well Type | Gas | TDPB (mKB) | 3468 | | |
| Flow Path | ☐ CASING ☐ TUBING ☑ BOTH CASING AND TUBING | PBTVD (mKB) | 3326 | | |

Well Diagram



**Flow Path Indicated with Red Arrows**

| Well Head Connection Type | ☐ FLANGE ☑ SWAGE | Size: | 2 3/8 EUE |
|---|---|---|---|

| | Casing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Surface | 244.5 | 226.6 | J-55 | 53.574 | | 644.0 |
| ☑ | Intermediate | 177.8 | 161.7 | L-80 | 34.228 | | 2547.0 |
| ☑ | Production | 114.3 | 101.6 | P-110 | 17.263 | | 3468.0 |
| ☐ | Production Liner | | | | | | |

Down Hole Items - Packers / Bridge Plugs / Fish / Misc. Down Hole Equiptment

| Type of Down Hole Item | Depth mKB | Remarks |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| | Tubing Details | OD mm | ID mm | Grade | Weight kg/m | Drift | Depth mKB |
|---|---|---|---|---|---|---|---|
| ☑ | Production Tubing | 60.3 | 50.7 | L-80 | 6.846 | 48.26 | 3386.19 |
| ☐ | Coil Tubing | | | | | | |
| | | | | | | | |

Tubing Jewlery (nipples, plugs, damage, holes, re-entry guides ect.)

| # | Iteme | Top Depth | Bottom Dept | OD mm | ID mm | Remarks |
|---|---|---|---|---|---|---|
| 1 | X Profile Nipple | 3386.16 | 3386.47 | 60.3 | 47.6 | |
| 2 | XN Profile | 3389.55 | 3389.86 | 60.3 | 45.5 | |
| 3 | Re-entry guide | 3392.76 | 3393 | 60.3 | 50.7 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Remarks:

Re-entry guide @ 3393.00 mkb

Schlumberger

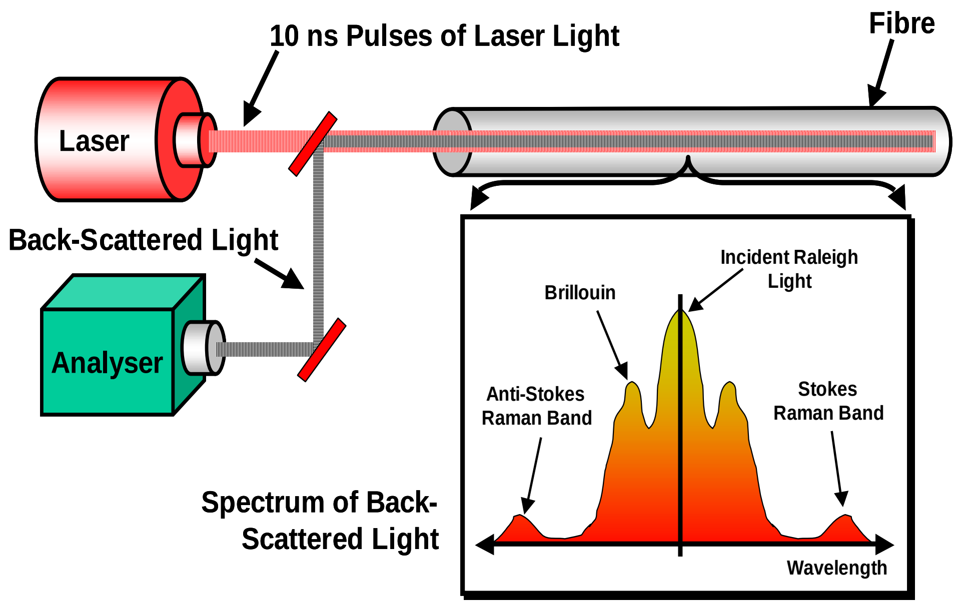
# <u>Appendix I:</u> Distributed Temperature Sensing Data Acquisition

The fiber-optic distributed temperature measurement (DTS) uses an industrial laser to launch 10 nanosecond bursts of light down the optic fiber. During the passage of each packet of light a small amount is back-scattered from molecules in the fiber. Since the speed of light is constant a spectrum of the back-scattered light can be generated for each meter of the fiber using time sampling.

A physical property of each spectrum of back-scattered light is that the ratio of the Stokes Raman to the Anti-Stokes Raman Bands is directly proportional to the temperature at the point in the fiber where it is generated. Consequently, a log of temperature can be calculated every meter along the whole length of the fiber using only the laser source, analyzer, and a reference temperature in the surface system.

Spectrum acquisition times define the accuracy and resolution of the measured temperature log, and can be varied from as little as seven seconds to hours. Typically, a resolution of 0.1 °C is required for reservoir surveillance.



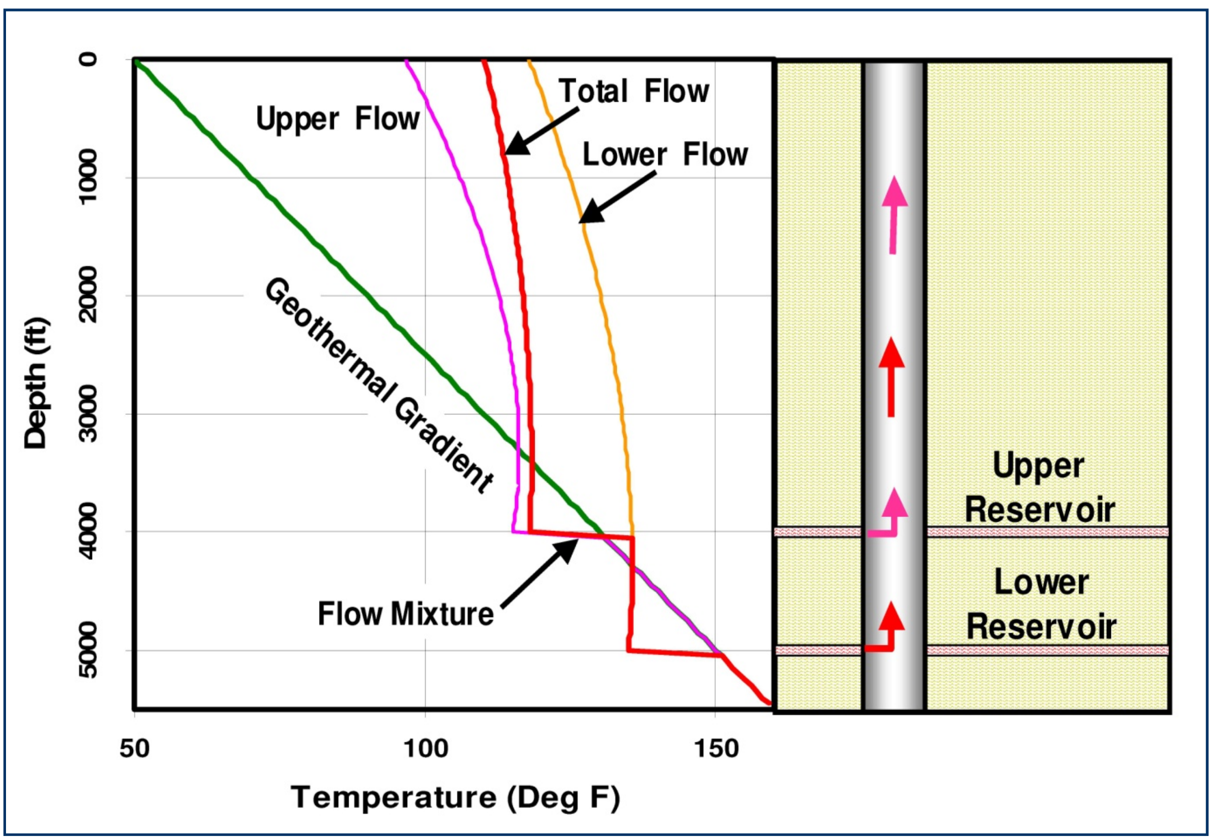



**Distributed Temperature Sensing (DTS) Measurement**

## Appendix II: Multi-Zone Producing Theory (Gas Wells)

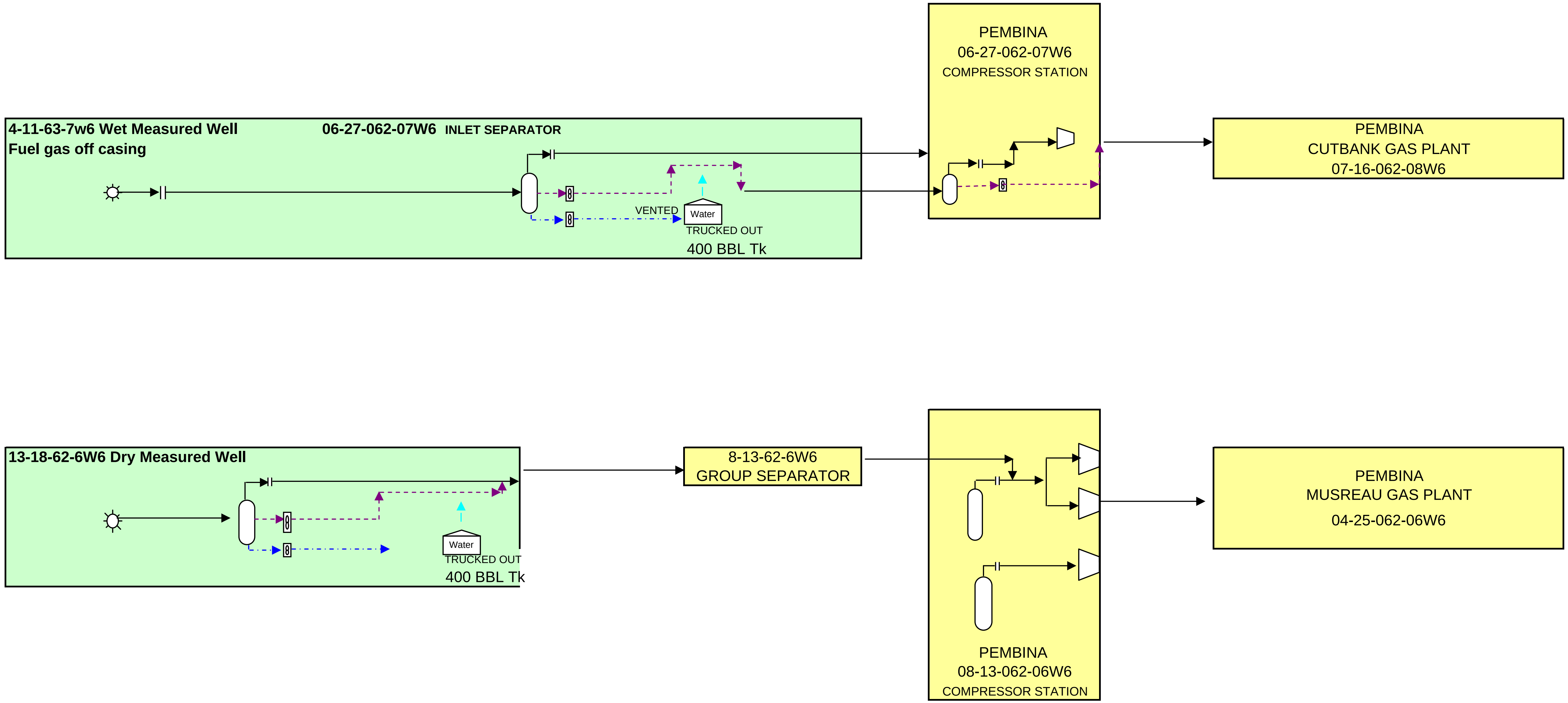
Where there are two or more producing reservoirs the flow of gas from the upper reservoir(s) may enter the wellbore below the ambient geothermal temperature due to Joule Thomson expansion in the reservoir. The addition of this colder gas to the flowing stream causes a decrease in the wellbore temperature, clearly identifying the point of produced gas entry.

The thermal response is a function of the combined flow rate from the upper reservoir and the flow rate from the lower reservoir. Therefore, given the geothermal gradient and the measured steady state temperature profile (obtained by the OptiCall DTS) the proportional contribution from two or more stacked flowing reservoirs can be calculated. The THERMA software uses nodal analysis and well established temperature algorithms to calculate a thermal profile with the given model parameters.



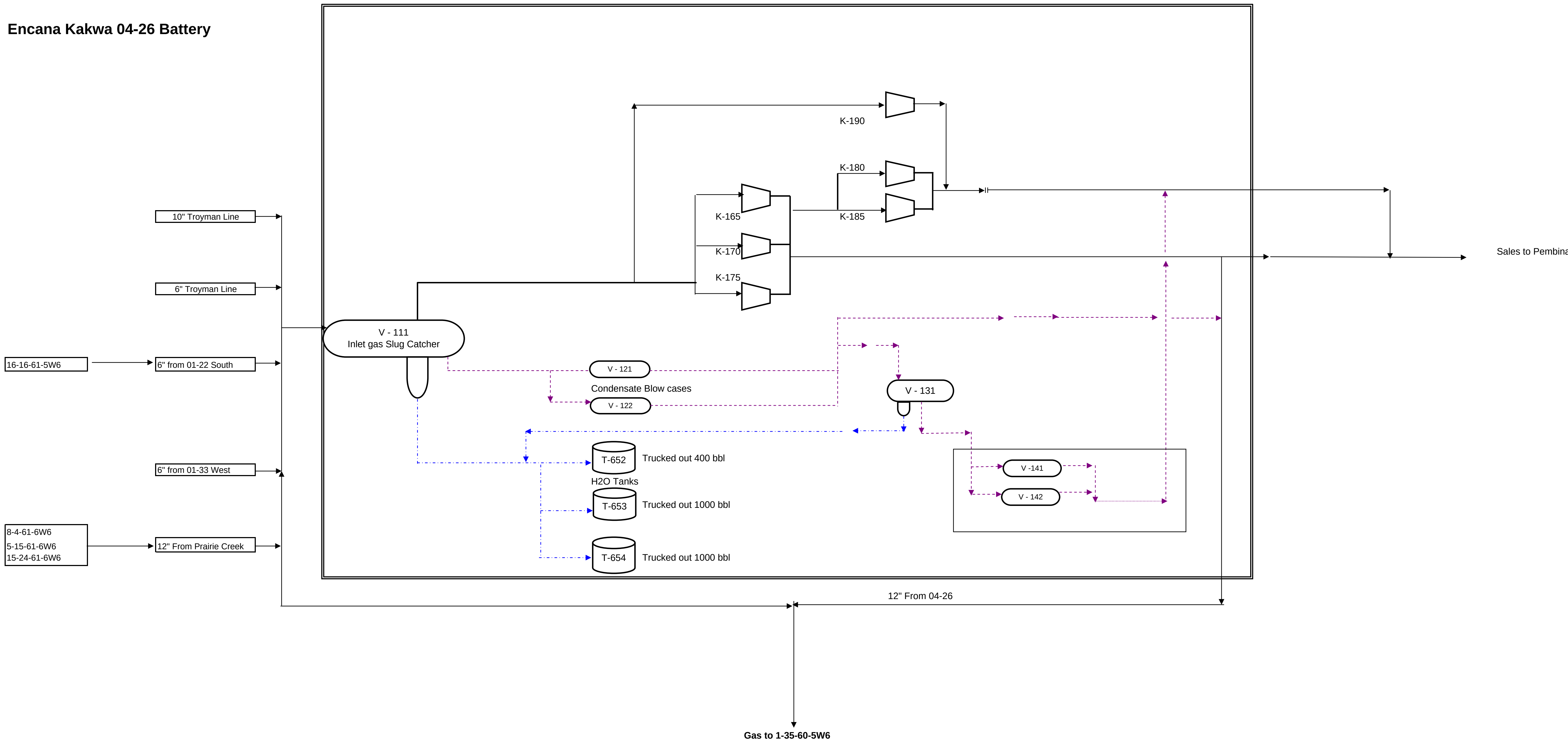

**Example of Thermal Response in a Multi-zone Gas Well**

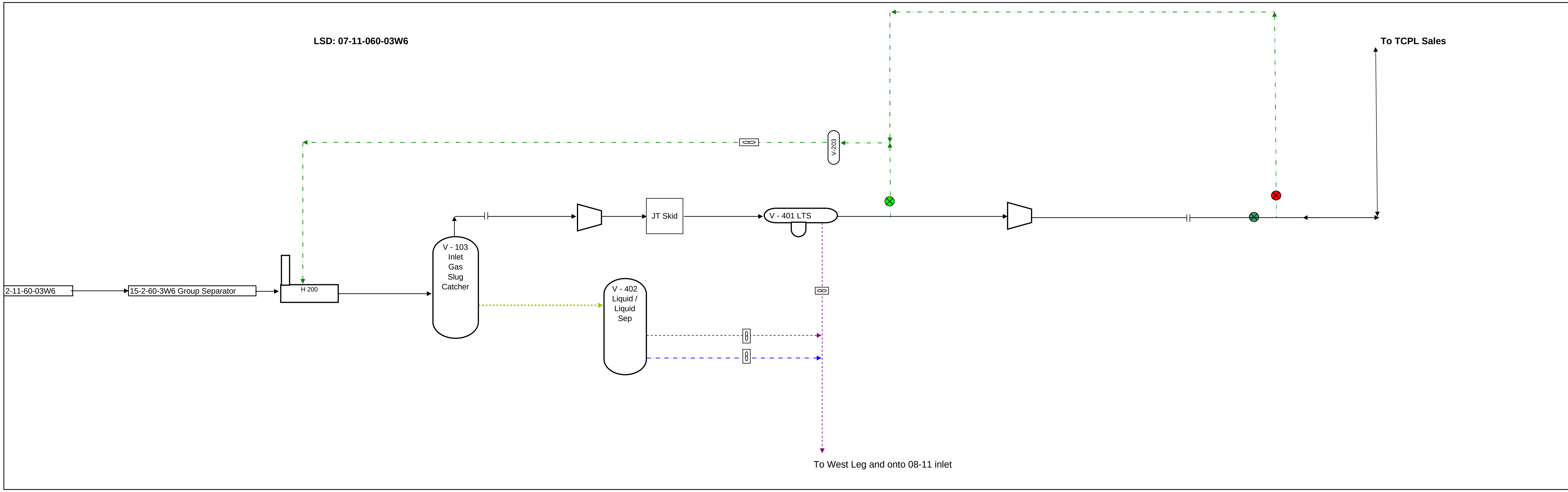
## Appendix K – IETP 05-081 Associated Facilities



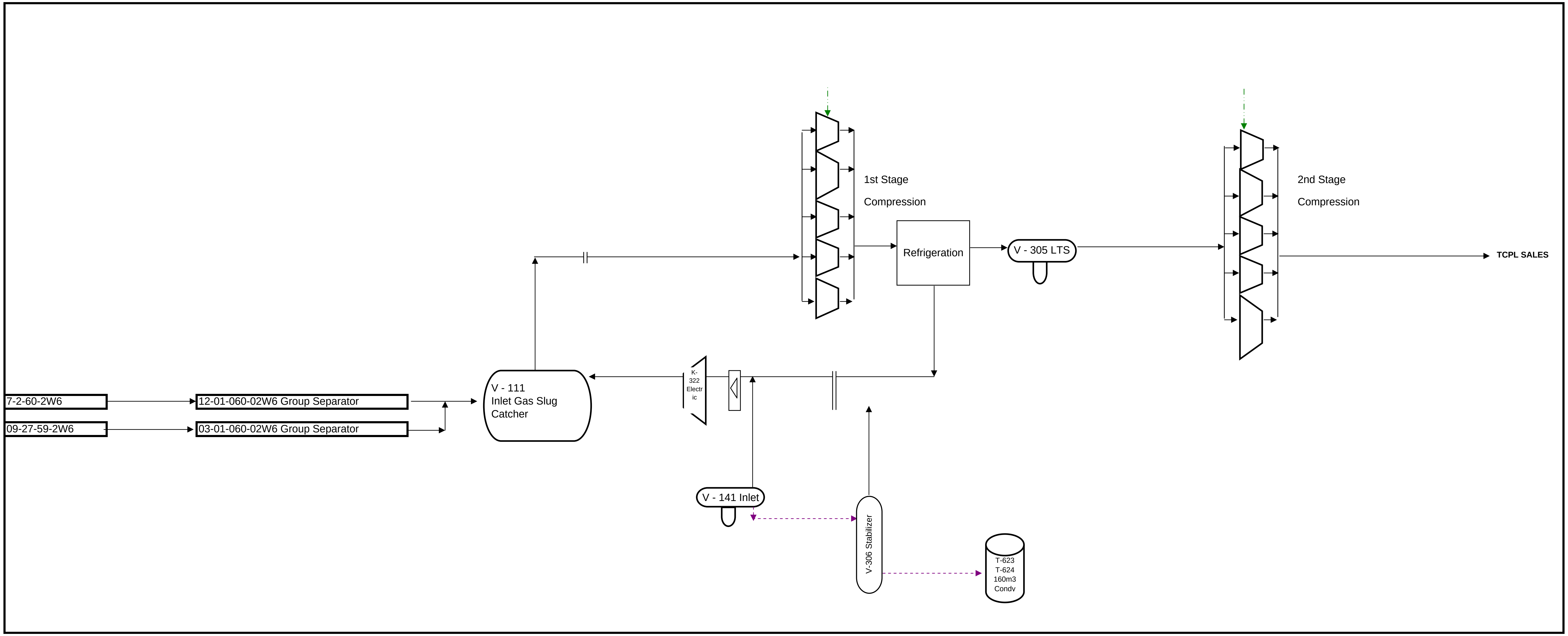
PEMBINA
06-27-062-07W6
COMPRESSOR STATION
4-11-63-7w6 Wet Measured Well
Fuel gas off casing
06-27-062-07W6 INLET SEPARATOR
VENTED
Water
TRUCKED OUT
400 BBL Tk
PEMBINA
CUTBANK GAS PLANT
07-16-062-08W6
13-18-62-6W6 Dry Measured Well
Water
TRUCKED OUT
400 BBL Tk
8-13-62-6W6
GROUP SEPARATOR
PEMBINA
MUSREAU GAS PLANT
04-25-062-06W6
PEMBINA
08-13-062-06W6
COMPRESSOR STATION

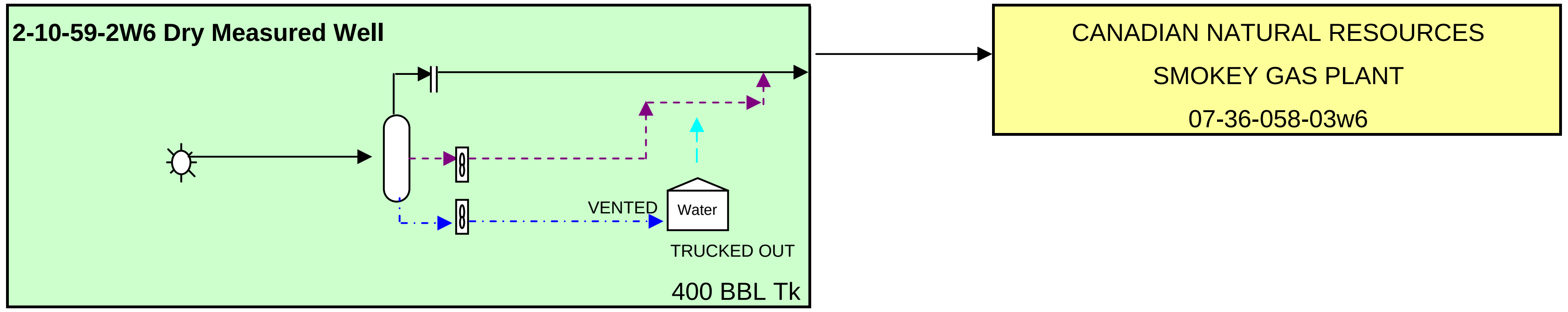
## Encana Kakwa 04-26 Battery




LSD: 07-11-060-03W6
To TCPL Sales
V-203
JT Skid
V - 401 LTS
V - 103
Inlet
Gas
Slug
Catcher
2-11-60-03W6
15-2-60-3W6 Group Separator
H 200
V - 402
Liquid /
Liquid
Sep
To West Leg and onto 08-11 inlet

## 8-11-60-3W6 Gas Plant




2-10-59-2W6 Dry Measured Well
VENTED
Water
TRUCKED OUT
400 BBL Tk
CANADIAN NATURAL RESOURCES
SMOKEY GAS PLANT
07-36-058-03w6