

COPRC Mirror Lake N-20 Well Test Report

Grid # 65°00', 126°45'

2014/04/16



FINAL WELL REPORT CHECKLIST (Geoscience and Environment)

WID: 2079

Page 1 of 4

Complete for Allowables: _____

WELL: Mirror Lane N-20

ACTIVITY: Alter Condition of a Well

Reviewer: Galina Doubrovina

Signature: _____

Date Received: 15-Aug-2014

Date Approved: 18-Aug-2014

A Well Geophysics

N/A 1 Synthetic seismograms, velocity surveys, vertical seismic profiles.

Comments / Deficiencies:

The final re-entry report contains microseismic monitoring report

Reviewer: Brent Hogue

Signature: _____

Date Received: 15 Aug 2014

Date Approved: 15 Aug 2014

B Geology

- 1 Samples - Lithological description of cuttings and cores, note missed intervals
- 2 Cores - analysis, colour core photos (plane and ultra-violet). Sidewall - depths / description.
- 3 Lithological striplog
- 4 Biostratigraphic data - chart summary of biostratigraphic data (paleontology, micropaleontology).
- 5 Paper Logs - cased, openhole, other directional surveys. Approved coverage.
- 6 LAS CD's checked for completeness.
- 7 LAS Digits loaded into RDIMS
- 8 Formation TOP Record & confirmation DM # _____
- 9 Strike Area / Code: _____

Comments / Deficiencies:

None at this time

Reviewer: Christy Wickenheiser / Don Logan

Signature: _____

Date Received: _____

Date Approved: _____

C Environment

- 1 Environmental - compliance

Comments / Deficiencies:

FINAL WELL REPORT CHECKLIST (Drilling/Completion/Workover)

WID: 2079

Page 2 of 4

WELL: Mirror Lake N-20

ACTIVITY: Alter Condition of a Well

Reviewer: Abul Kabir

 Signature: *(Signature)*

Date Received: 17 Dec 2014

Date Approved: 17 Dec 2014

D Introduction

N/A → Ref Well

- 1 Summary; purpose, name operation and contractor, resume operations, zones penetrated and results
- 2 Location map

History Report

E General Data

N/A → Ref to Well History Report

- 1 Well name, land title number, federal designation w/unit, section and grid number
- 2 Surveying system
- 3 Unique well identifier
- 4 Name of drill unit, type or class, registry, year built and shipyard
- 5 Method used to maintain unit on location
- 6 Name, type and owner of support ships and aircraft
- 7 Graphs of prevailing weather, sea conditions and wave period. Vessel performance in response to said conditions on same time scale as first graph. Emphasis should be on peak periods
- 8 Problems summary - description of problems not directly associated with downhole operations
- 9 Cost - total well cost
- 10 Final survey plan - signed by company representative and a Canada Land Survey representative
- 11 Final well stick diagram
- 12 Tour Sheets
- 13 Daily Completion/Workover Reports
- 14 Well Termination and wellbore schematic

F Drilling Operations Summary

N/A → Ref to Well History Report.

- 1 Elevations - KB, rotary table, sea floor, ground
- 2 Depths - TD drilled, logged, PBD, Date and time spud, drilling completed, rig release
- 3 Casing and hole - sizes, depths; size, weight, grade, make, joints, thread type, date and set depth, and volume cement. To include location of shoes, centralizers, scratchers, cement and additives and cement top. Make of wellhead, hangers and seals.
- 4 Sidetracking operations - details of any; reason, method, and effectiveness
- 5 Mud system for each segment of hole
- 6 Fishing operations - explanation, details and list of lost equipment
- 7 Well control operations - explanation and details of any kicks
- 8 FLOT's - depth, fluid density, applied pressure, equivalent mud weight and last casing depth
- 9 Time distribution - table of hours from spud to RR
- 10 Deviation survey - plan view w/ respect to wellhead
- 11 Abandonment plugs - table summary; depths, remaining fluid and type
- 12 Drillers log showing ROP, major litho units, gas units, shows, cores, bit record, csg points, test intervals and plugs

Deficiencies (List outstanding reports/information that need to be requested from the company if applicable):

* NO changes to the well status.

* This Report should be put together with the Well History Reports.

Final well documents should be passed to all technical experts on this checklist and then returned to the data coordinator.

Approval acknowledges the existence, adequacy and appropriateness of the submitted information

RDIMS 278114

WELL: Mirror Lake N-20
 ACTIVITY: Alter Condition of a Well

Reviewer: Abul Kabir

Signature: *(Signature)*

Date Received:

Date Approved:

17-Dec-2014

17-Dec-2014

G Casing Summary

Casing Type	Hole Size (mm)	Casing Size (mm)	Casing Weight (kg/m)	Casing Grade	Casing Top (m KB)	Cut Depth (m KB)	Casing Bottom (m KB)	Cement Top (m KB)	Cement Type	Additives (Yes/No)

Casing Type Choices - 1Caisson, 2Conductor, 3Intermediate, 4Liner, 5Production, 6Surface, 7Other

Cement Type Choices - 1Common Construction, 2Arctic Set, 3Special Construction, 4High early strength, 5Coarse grind - retarder, 6Fill-Lite 100, 7Basic - no chem retarder, 8Basic course grind - no chem retarder, 14Standard Oilwell Grade, 15Thermal, 16Other, 17Radiaxial Fibrous Calcit, 9Resists strength retrogression, 10Permafrost, 11Portland Normal, 12Polar Set, 13Thixotropic,

H Plug Summary

Well Plug Type	Plug Top (m KB)	Plug Bottom (m KB)	Cement (m ³)

Plug Type Choices - 1Bridge, 2Cement, 3Other, 4Cement Retainer, 5Unknown

I Formation Leak Off Test

Test Depth (m KB)	Test Gradient (kPa/m)	Maximum Pressure (kPa)	Did it Hold? (Yes/No)	FM Fracture Pressure (kPa)	Reason for Failure

Deficiencies (List outstanding reports/information that need to be requested from the company if applicable):

FINAL WELL REPORT CHECKLIST (Reservoir)

Page 4 of 4

WID: 2079

WELL: Mirror Lake N-20
ACTIVITY: Alter Condition of a Well

Reviewer: Orlando Huang
Signature: _____
Date Received: _____
Date Approved: _____

J Engineering

- ___ 1 Drillstem test report with interval depths, recoveries, flow rates, all pressures
- ___ 2 MDT or RFT logs
- ___ 3 A detailed chronological history of the completion and testing operations. Includes operation description, dates, times, interval depths, contractor, rig
- ___ 4 Perforation reports
- ___ 5 Well Stimulation reports
- ___ 6 Completion fluid tally reports
- ___ 7 Production and/or swab reports
- ___ 8 Pressure reports including flow pressures, shut-in pressures, pressure build-ups, pressure fall-offs
- ___ 9 Laboratory gas analysis, hydrocarbon liquid analysis, water analysis
- ___ 10 Remedial cementing reports
- ___ 11 Production logs
- ___ 12 Final well configuration stick diagram

K Test Data for Input into Frontier Database:

<u>Flow Test</u> <u>Type and #</u>	<u>SI time</u> <u>Duration</u> <u>(hrs)</u>	<u>Initial SI or</u> <u>Extrapolated</u> <u>Pressure</u> <u>(kPA)</u>	<u>Interval</u> <u>Top (m)</u>	<u>Interval</u> <u>Bottom</u> <u>(m)</u>	<u>Oil</u> <u>Rate</u> <u>(m³/d)</u>	<u>Maximum</u> <u>Gas Rate</u> <u>(m³/d)</u>	<u>Condensate Rate</u> <u>(m³/d)</u>	<u>Water Rate</u> <u>(m³/d)</u>	<u>Specific</u> <u>Gravity</u> <u>(API)</u>

L Producing and Injection Wells Only - Input into Frontier database

Type of Well (circle one) - Producer or Injector

Product type (circle one) - sweet gas, sour gas, sweet oil, sour oil, sweet condensate, sour condensate

Injection type (circle one) - water injection, cutting injection, water disposal, propane injection, gas injection

Deficiencies (List outstanding reports/information that need to be requested from the company if applicable):

Final well documents should be passed to all technical experts on this checklist and then returned to the data coordinator.

Approval acknowledges the existence, adequacy and appropriateness of the submitted information

RDIMS 278114



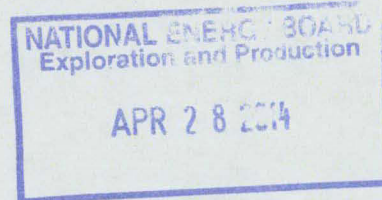
MAIL ROOM
SALLE DE COURIER
2014 APR 23 P 4: 00
NEB/ONE

Eric Hanson
Supervisor Central Mackenzie Valley
ConocoPhillips Canada
401 9th Avenue SW
Calgary, AB T2P 2H7
Tel.403.532.3527
Fax.403.532.3403

April 16, 2014

NEB COPY

Chief Conservation Officer
National Energy Board
444 Seventh Avenue SW
Calgary, AB
T2P 0X8
Canada



Attention: Patrick Smyth

SUBJECT: Submission of COPRC Mirror Lake N-20 Well Testing Report

Dear Sir:

ConocoPhillips Canada Resources Corp. ("ConocoPhillips") hereby submits the well testing reports for COPRC Mirror Lake N-20, UWI 300N206500126450 as per requirement COGDPR Part 11, Section 76-1. This submission contains:

- Two paper copies of the well schematic
- Two paper copies of the well testing report for three diagnostic fracture injection tests conducted in Mirror Lake N-20
- One electronic copy of the well schematic and well testing reports

As per Canada Petroleum Resources Act, Part IX, Section 101, 7-a, this information shall stay confidential until March 13, 2016 (two years after well termination date of March 13, 2014)

Please direct any questions or concerns concerning this submission to my attention at (403) 233-3250 or Cyril Jenkins at (403) 233-3326.

Sincerely,

Eric Hanson, P.Geol (AB)
Supervisor Central Mackenzie Valley
Chinook Appraisal

Current Schematic

COPRC MIRROR LAKE N-20 65-00 126-45

Surface Legal Location 011-L/94-P-16		API / UWI 200/C-011-L/094-P-16/99		License No. EL 470	
Country CANADA	State/Province N.W.T.	Region / Division WCBU	District NEW VENTURES	Field Name Mirror Lake	Field Code
Orig KB/RT (m) 286.50	Ground Elevation (m) 281.30	KB-Ground Distance (m) 5.20	KB-CF (m) 4.87	KB-TF (m) 4.32	Total Depth (mKB) 2,146.00
VERTICAL - Original Hole, 4/16/2014 2:45:36 PM		WELLHEADS			
MD (mKB) ()	Incl (°)	Type Casing Bowl			Install Date 3/3/2013
Vertical schematic (actual)		Des	Make	Model	WP (kPa)
WELL CONFIG: VERTICAL		Casing Bowl	Streamflo	CUM-API115X...	34,500
		Type Top Section			Install Date 3/27/2013
		Des	Make	Model	WP (kPa)
		Casing Valve (east)	Stream Flo	Gate 52.4mm...	69,000
		Tubing Spool	Stream Flo	279mm 35MP...	69,000
		Casing Valve (west)	Stream Flo	Gate 52.4mm...	69,000
		179mm Master Valve	Stream Flo	179mm Full Bore	69,000
		WH Adapter Flange	Stream Flo	179mm 69 MP...	34,500
		Master Valve	Stream Flo	Gate 65mm 35...	34,500
		Top Cap Flange	Stream Flo	R-27 35MPa x...	34,500
		#2 Casing Valve (east)	Stream Flo	Gate 52.4mm...	69,000
		#2 Casing Valve (west)	Stream Flo	Gate 52.4mm...	69,000
		CASING STRINGS			
		Csg Des	OD (mm)	WV/Len (kg/m)	Grade
		Surface	244.5	59.527	J-55
		Production	177.8	38.692	P-110
		PBTDs			
		Date	Type	Depth (mKB)	KO MD (mKB)
		3/26/2013	Float Collar	2,127.00	
		PERFORATIONS			
		Date	Top (mKB)	Btm (mKB)	Zone
		3/28/2013	1,993.00	1,994.00	Upper Lower...
		3/28/2013	2,023.00	2,024.00	Middle Lower...
		3/27/2013	2,059.00	2,060.00	Basal Lower...
		OTHER IN HOLE			
		Run Date	Description	Top Depth (mKB)	Bottom Depth (mKB)
		2/23/2014	Retrievable Bridge Plug	1,986.30	1,987.75
		OD (mm)	ID (mm)	Make	Model
		159.0		SLB /Smith	M- CW Retrievable
		Comment CE @ 1987 mkb			
		Run Date	Description	Top Depth (mKB)	Bottom Depth (mKB)
		2/23/2014	Retrievable Bridge Plug	1,976.28	1,977.75
		OD (mm)	ID (mm)	Make	Model
		159.0		SLB /Smith	M- CW Retrievable
		Comment CE @ 1977 mkb			
		Run Date	Description	Top Depth (mKB)	Bottom Depth (mKB)
		2/23/2014	Barrier - Fluid	160.00	1,976.28
		OD (mm)	ID (mm)	Make	Model
		159.0		fresh water	
		Comment fresh water			
		Run Date	Description	Top Depth (mKB)	Bottom Depth (mKB)
		2/24/2014	Barrier - Fluid	110.00	160.00
		OD (mm)	ID (mm)	Make	Model
		159.0		methanol	
		Comment methanol to winterize (1m³)			

OIL MINI-FRAC ANALYSIS

WELL NAME: **COPRC Mirror Lake**
 WELL LOCATION:
 Bottomhole Location: **300/N-20 65-00 126-45**
 Surface Location: **300/N-20 65-00 126-45**
 Well License #: **EL 470**

ZONE: **"UPPER" LOWER CANOL**

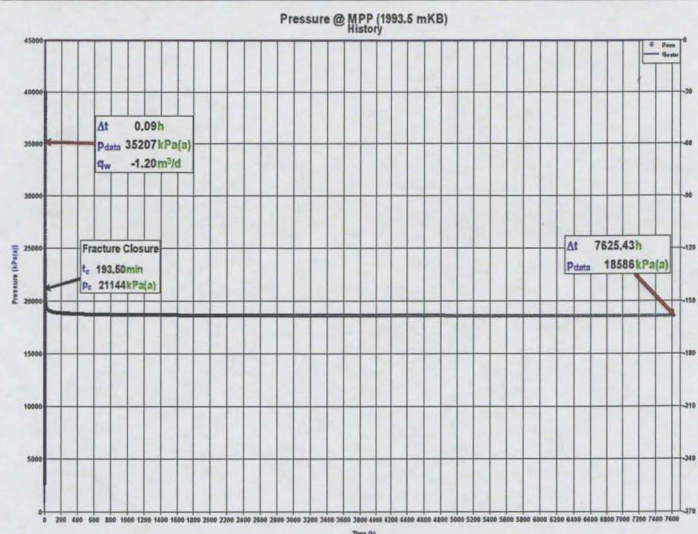
COST CENTRE: **10345530**

TEST DATE: **Mar 28/13 – Feb 9/14**

STAGE OF WELL TEST: **Post-Perf Inj-Falloff**

ORIENTATION: **Vertical**

TYPE/SIZE OF STIMULATION: **N/A**



Reservoir Properties

Injection Interval: 1993 – 1994 mKB	Porosity (ϕ): 10 %	Water Saturation (S_w): 10 %
Frac Height (h): 5 m (Estimate)	H ₂ S Content: 0 %	BHT: 87.0 °C
Oil Gravity: 50 °API (Estimate)		

Injection Data

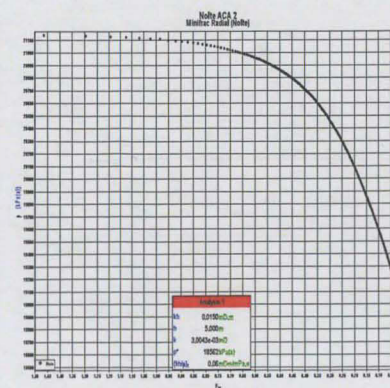
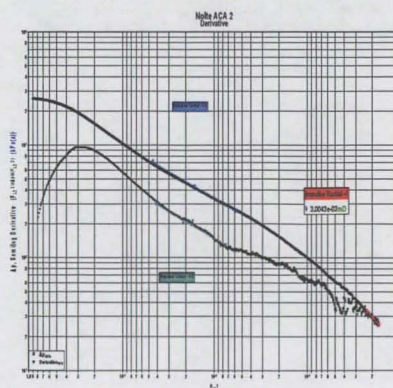
Test	Time	Final Rates				Final Pressures		
		Gas	New Oil	New H ₂ O	Load	Tubing	Casing	BHP
	Hours	e ³ m ³ /d	m ³ /d	m ³ /d	m ³ /d	kPag	kPag	kPaa
Injection	0.1	---	---	---	1.2	N/A	0	35207
Shut-In	7625.4	---	---	---	0	N/A	0	18586

Injection Summary

New Fluid (m ³)				Load Fluid (m ³)		Remaining Load (m ³)	
Gas (E ³ M ³)	Gas (MSCF)	Cond (m ³)	Water (m ³)	Oil (m ³)	Water (m ³)	Oil (m ³)	Water (m ³)
---	---	---	---	0	0.49	0	0.49

Pressure Transient Analysis Results Summary

Analysis Results	
P*	18562 kPaa
(kh/ μ) _o	0.06 mD·m/mPa·s
(kh) _o	0.015 mD·m
k _o	0.003 mD



Discussion

Test Procedure:

Segregated post-perf mini-frac tests were conducted on the “Basal” and “Middle” LOWER CANOL intervals. The mini-frac tests were conducted concurrently and as such, each interval was isolated below bridge plugs. On Mar 28th, 2013, the “Upper” LOWER CANOL interval was perforated. A retrievable bridge plug, with tandem electronic recorders hung below, was run in hole (center element at 1990 mKB). Fluid (70% Propylene Glycol / 30% Water) injection was initiated to achieve formation breakdown. Injection continued for several more minutes after breakdown, including for a brief period after the bridge plug setting mechanism was activated (dynamically set). The final water injection rate prior to shut-in was reported to be 1.2 m³/d (0.8 l/min). The subsequent falloff was monitored for about 11 months (~7625 hrs). On Feb 15th, 2014, the bridge plug (including the recorders) was unset and recovered. The primary objectives of the mini-frac test were to obtain frac design and reservoir flow parameters. It is noted that the analyses / results for each of the zones have been provided in separate reports.

The test data (injection & falloff) from the subject test was corrected to the mid-point of the perforations (MPP=1993.5 mKB) using an estimated water gradient of 10 kP/m.

Analysis:

The mini-frac test data was analyzed using traditional techniques. Diagnostic plots, such as the G-Function & Sqrt (t) plots, were utilized first to confirm the occurrence of fracture closure. For the subject zone, the diagnostic plots indicated closure at about 3.2 hours (or ~193.5 minutes) of shut-in. Although the data was slightly noisy, the derivative plot suggested evidence of pseudo-radial flow. Consequently, after-closure analysis, via Nolte & Soliman / Craig techniques, was conducted in order to obtain estimates for reservoir parameters. The corresponding results / plots have been presented in this report.

Conclusions / Recommendations:

The test was successful in satisfying the primary objectives set forth at the onset of the test program. The test results suggested an effective permeability to oil of 0.003 mD (3 μD). However, it is noted that this oil permeability was calculated based on estimated values for frac height (5 m) & oil viscosity (50 °API oil with a viscosity of 0.26 mPa·s).

The corresponding extrapolated reservoir pressure was determined to be about 18.6 MPaa.

The overall confidence of the test results is considered to be fair.

Analyzed by: Al Kassam

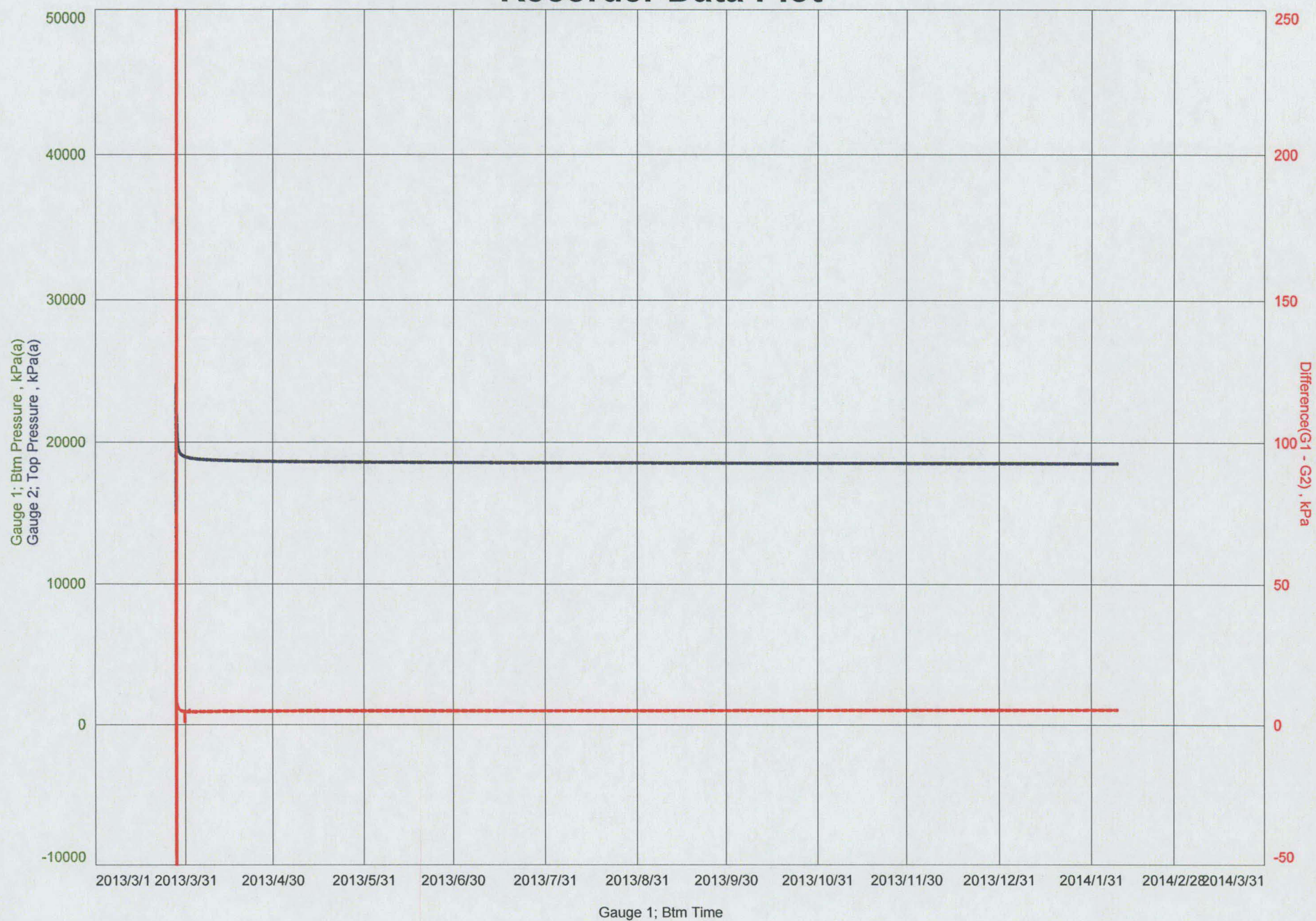
Report Date: Mar 27th, 2014

Copy: Kim Clarke Alex Novgorodova Well File

300/N-20 65-00 126-45

Recorder Data Plot

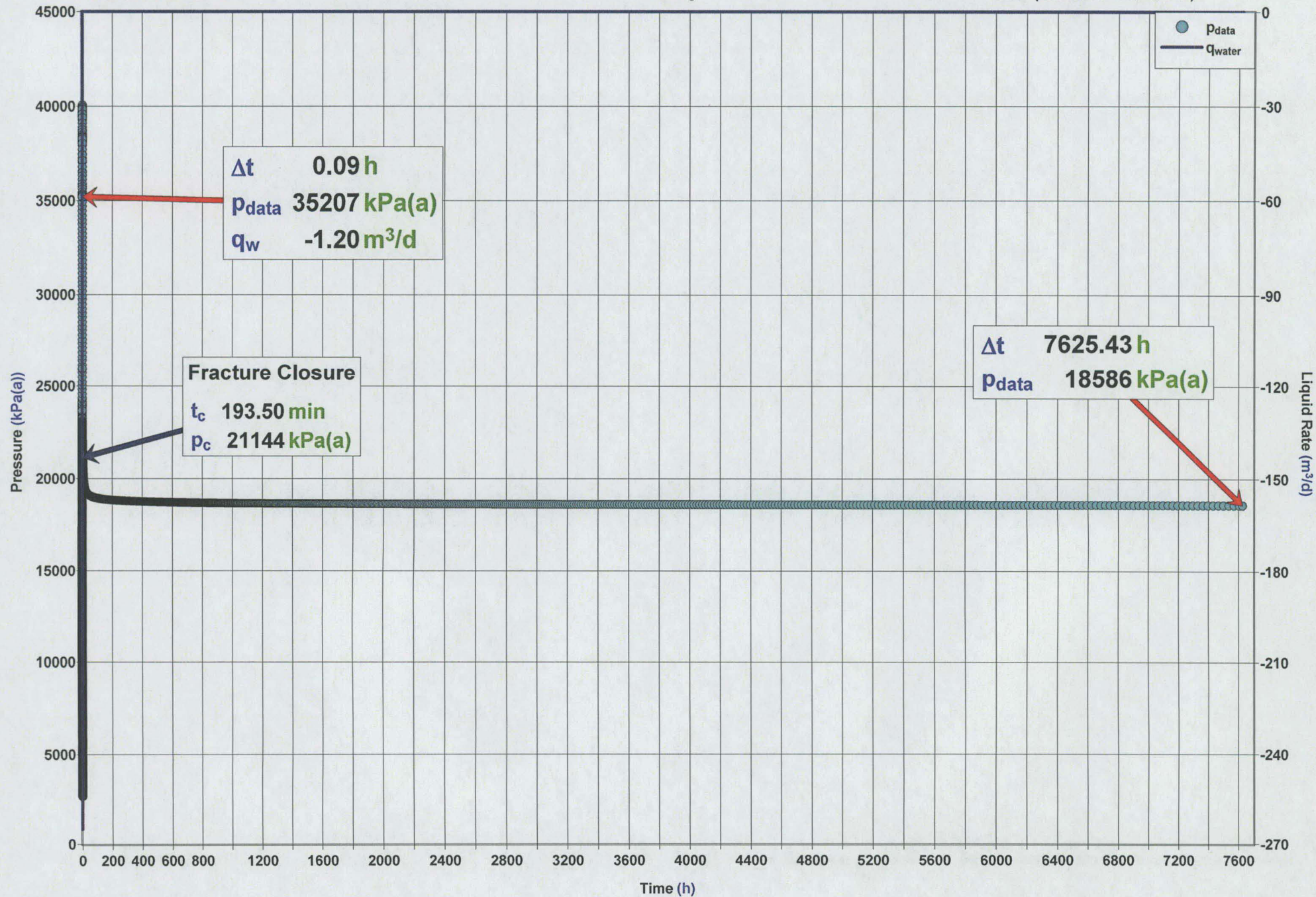
Formation: Upper Lower Canol



COPRC Mirror Lake
300/N-20 65-00 126-45

Pressure @ MPP (1993.5 mKB) History

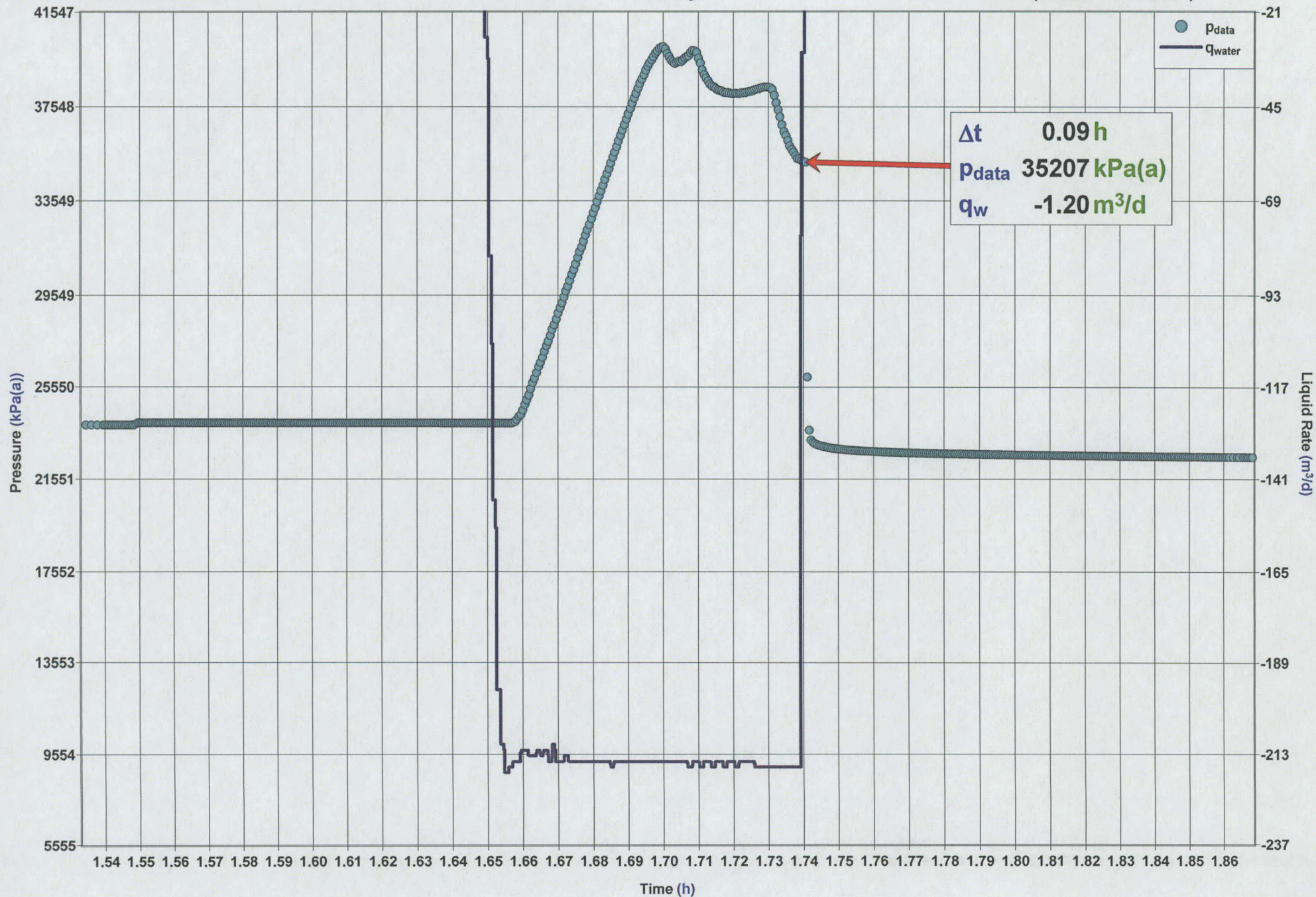
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Pressure @ MPP (1993.5 mKB) History

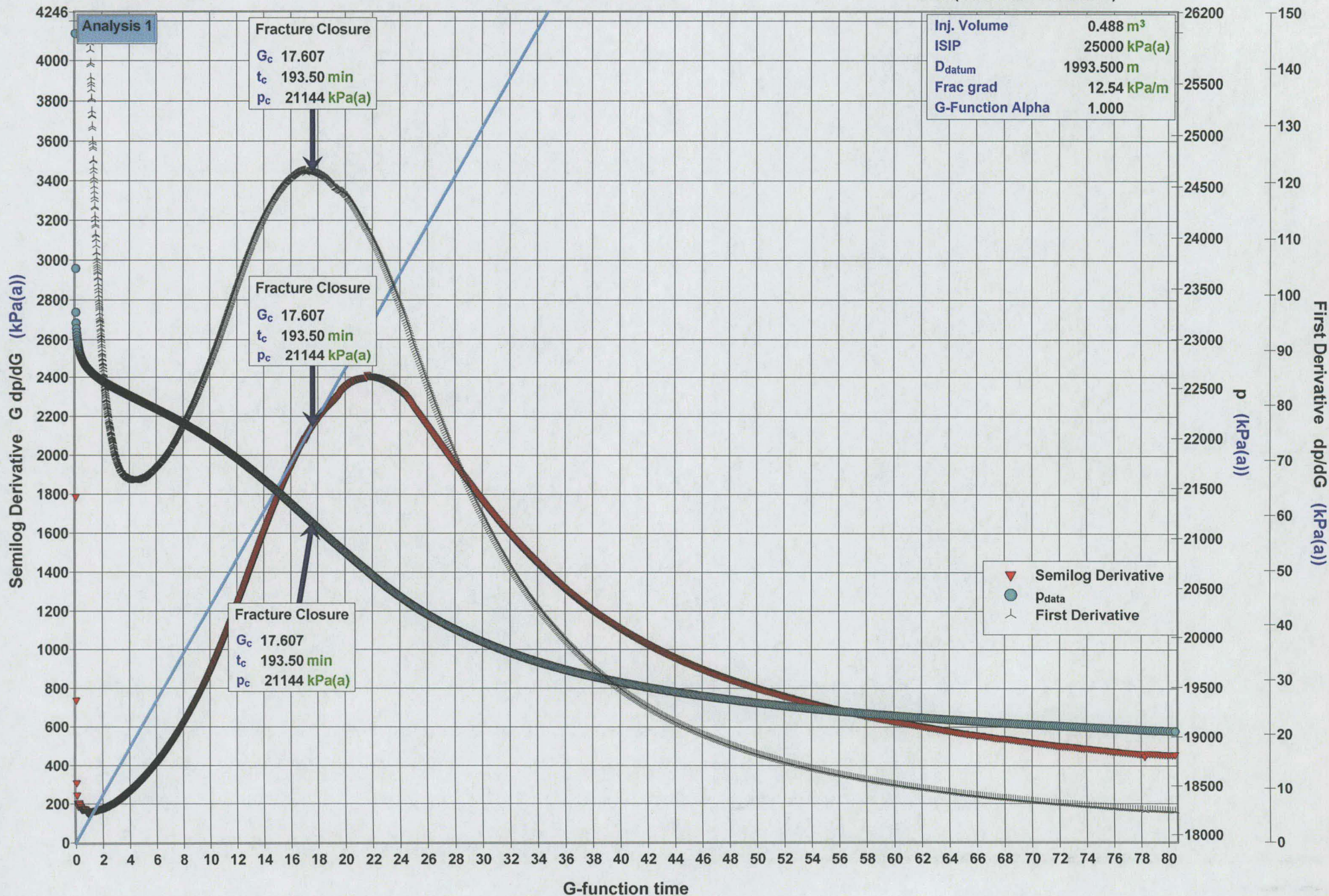
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 G-Function

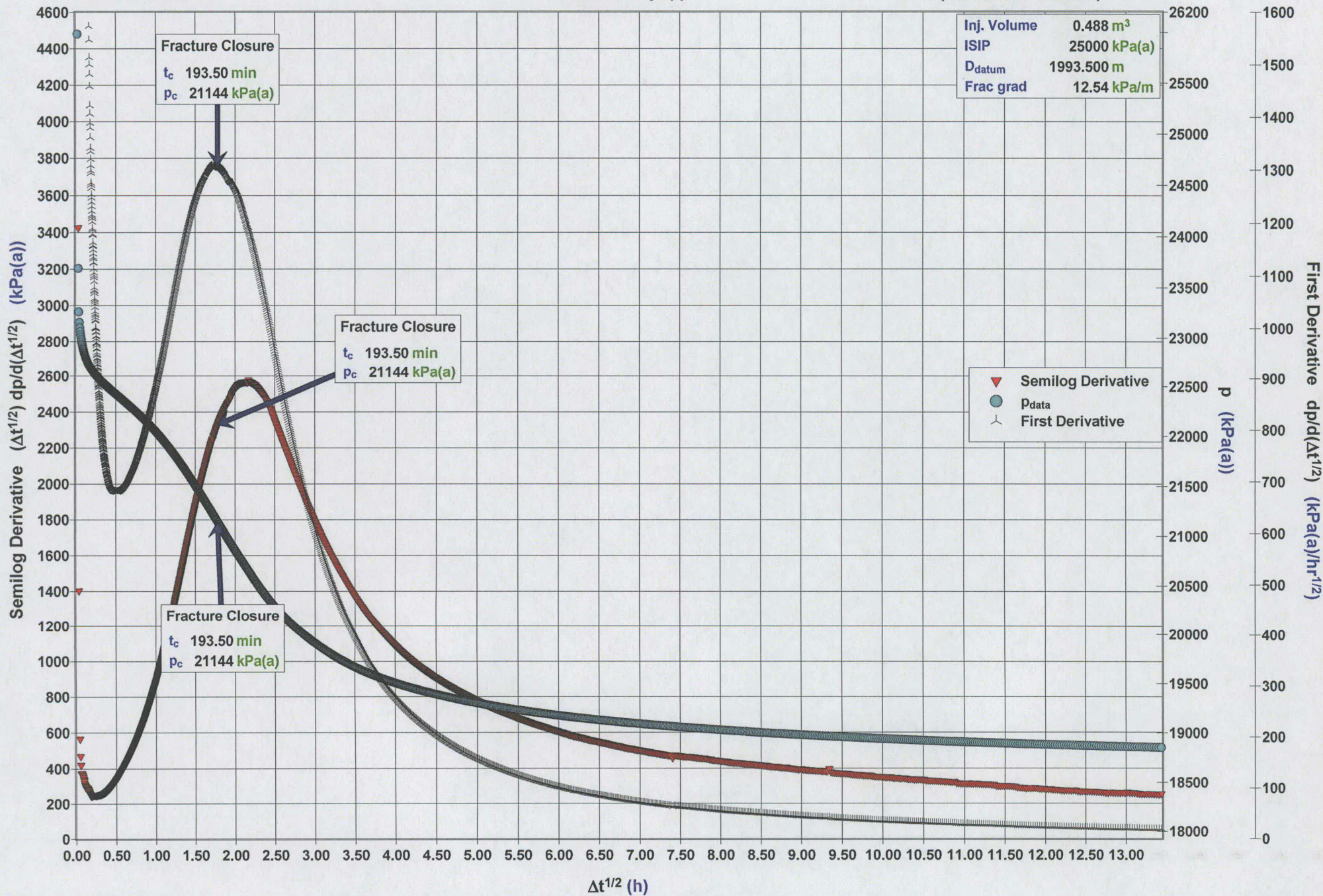
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 MiniFrac Sqrt(t)

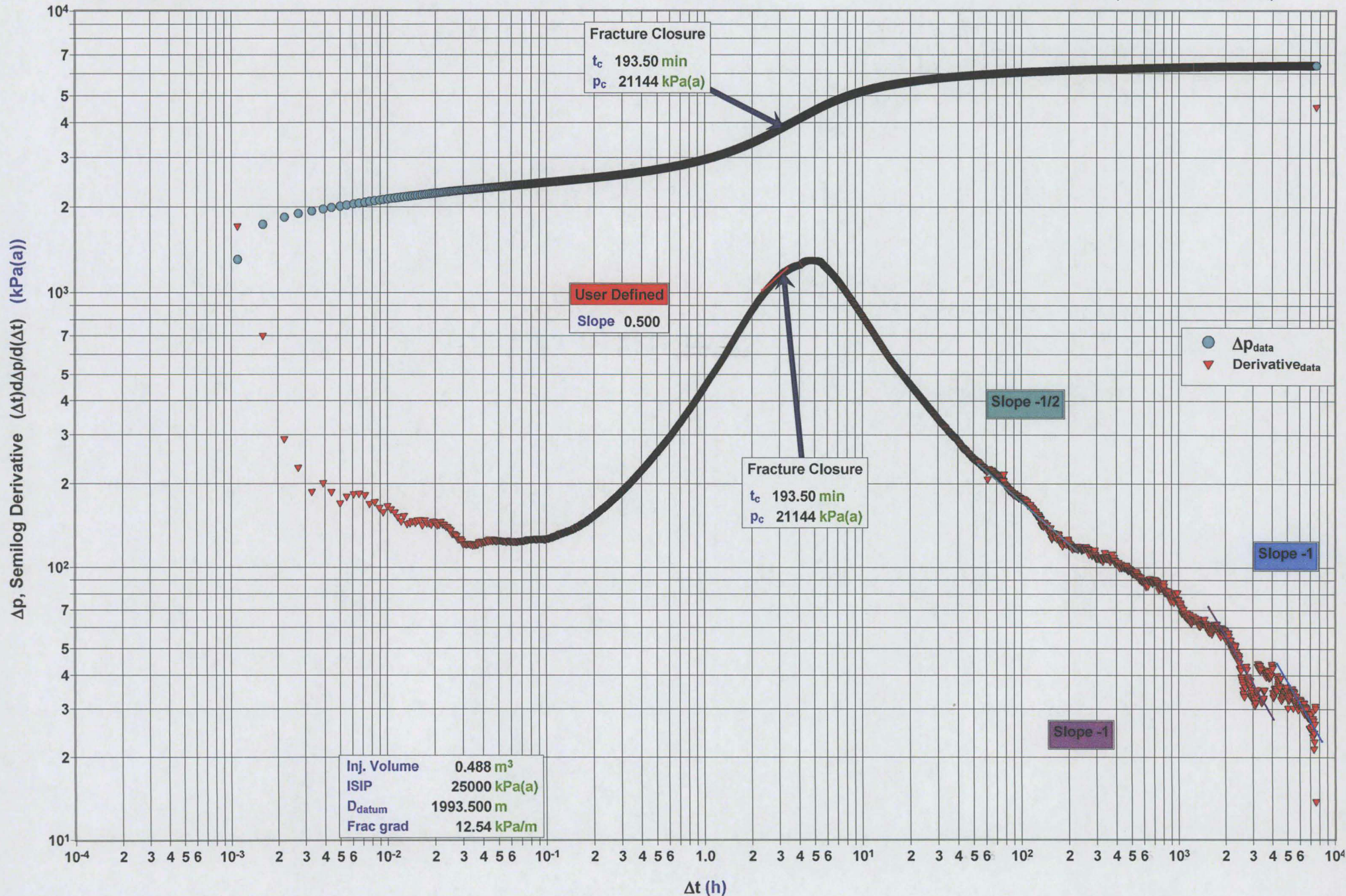
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 Derivative

Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



PCA Diagnostic 1

Input Data

Injected Volume 0.488 m³
Datum Depth 1993.500 m

Results

ISIP 25000 kPa(a)
Fracture Gradient 12.54 kPa/m

Closure Marker 1

Closure time (t_c) 3.2250 h
Closure pressure (p_c) 21144 kPa(a)
Net Frac Press (Δp_{net}) 3856 kPa
G-Function at Closure (G_c) 17.607
Fluid Efficiency (η) 89.80 %

Closure Marker 2

Closure time (t_c) 3.2250 h
Closure pressure (p_c) 21144 kPa(a)
Net Frac Press (Δp_{net}) 3856 kPa
G-Function at Closure (G_c) 17.607
Fluid Efficiency (η) 89.80 %

Fluid Properties

Oil Gravity (γ_o) 49.9 °API
Bubble Point Pressure (p_{bp}) 18573 kPa(a)
Oil Formation Volume Factor (B_o) 1.522
Oil Viscosity (μ_o) 0.2645 mPa.s
Oil Compressibility (c_o) 3.2194e-06 1/kPa
Solution Gas Ratio (R_s) 152.70 m³/m³

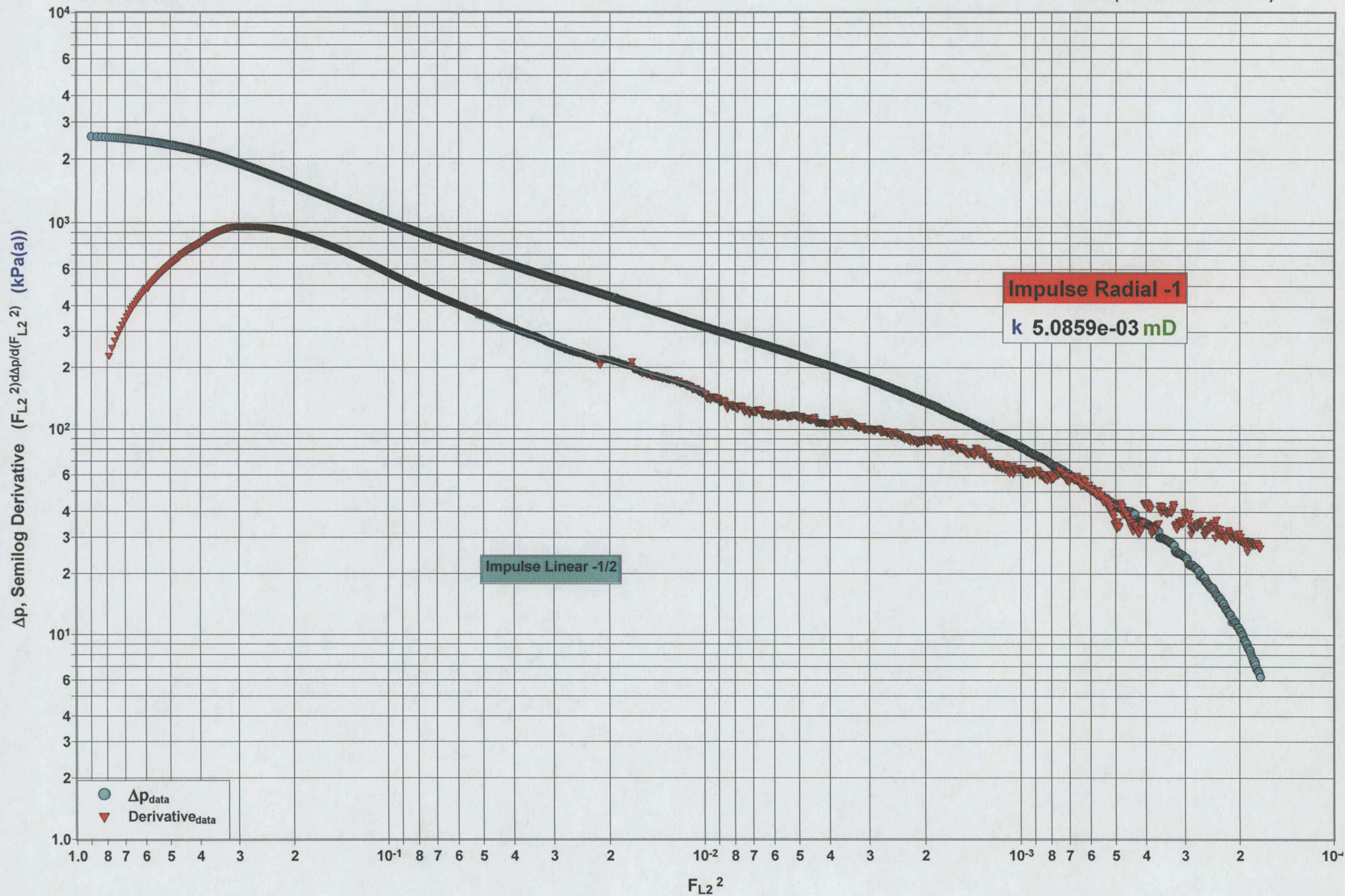
Reservoir Properties

Reservoir Temperature (T_{resv}) 87.0 °C
Reservoir Pressure (p_{resv}) 18580 kPa(a)

COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Derivative

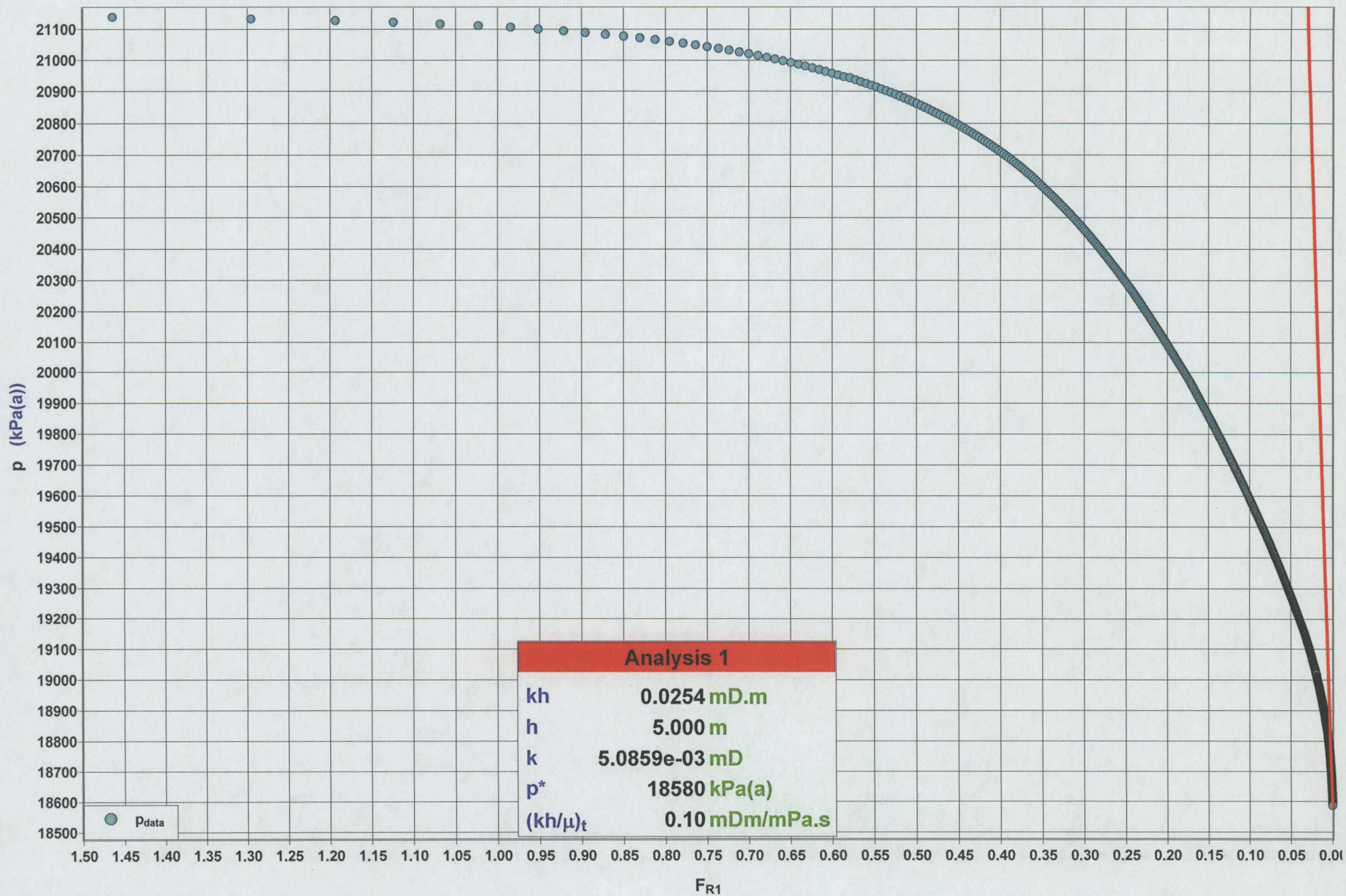
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Minifrac Radial (Nolte)

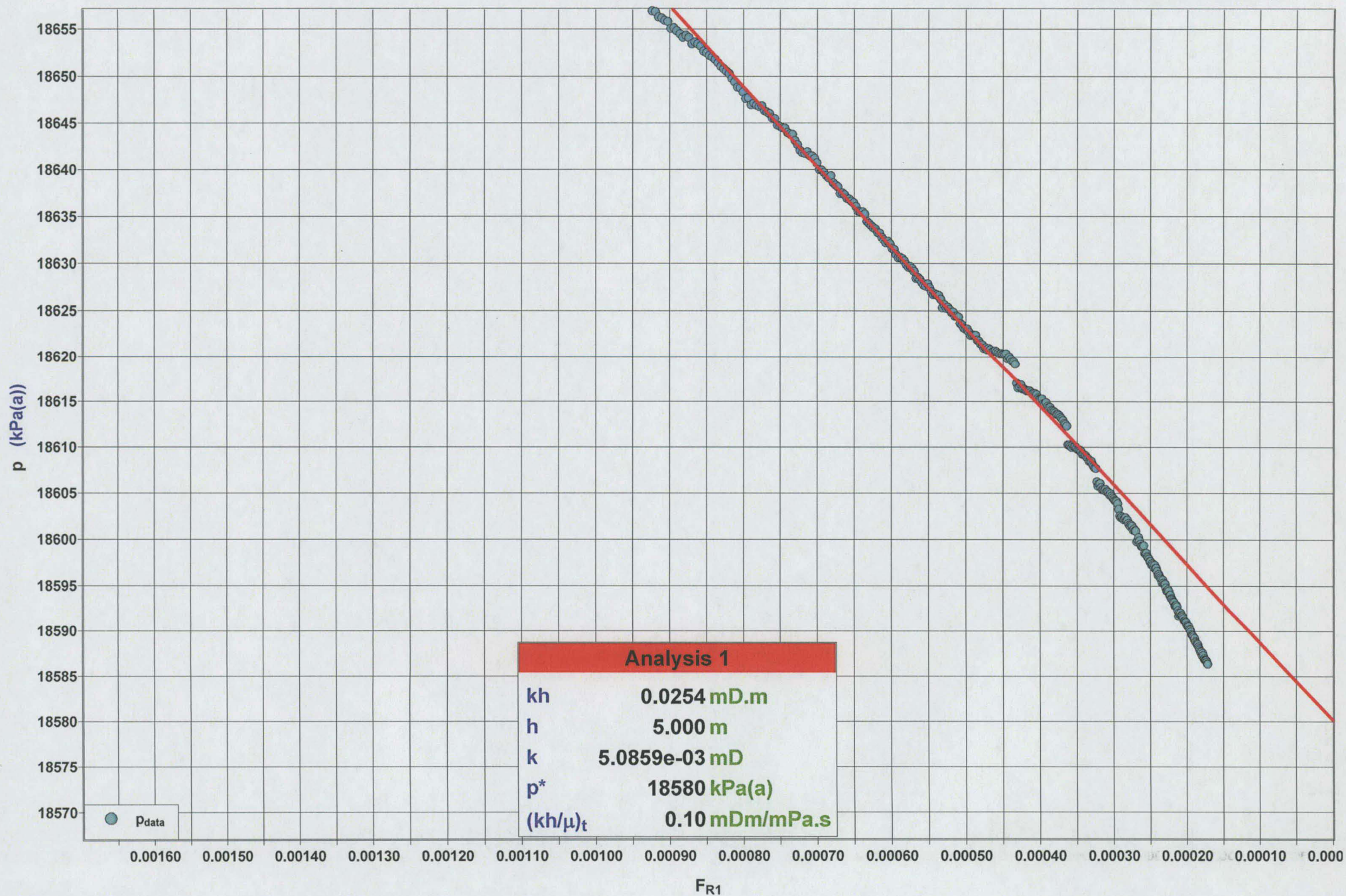
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1
Minifrac Radial (Nolte)

Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



Nolte ACA 1

Linear Analysis (FL)

Flow Capacity (kh)	mD.m
Effective Permeability (k)	mD
Extrapolated Pressure (p*)	18589 kPa(a)
Closure Pressure (pc)	kPa(a)
Reservoir Leakoff Coefficient (CR)	m/min ^{1/2}
Total Leakoff Coefficient (CT)	m/min ^{1/2}

Radial Analysis (FR)

Flow Capacity (kh)	0.0254 mD.m
Effective Permeability (k)	5.0859e-03 mD
Extrapolated Pressure (p*)	18580 kPa(a)

Input Parameters

Estimated Initial Pressure (p _i)	18580 kPa(a)
Closure time (t _c)	193.50 min

Fluid Properties

Oil Gravity (γ _o)	49.9 °API
Bubble Point Pressure (p _{bp})	18573 kPa(a)
Oil Formation Volume Factor (B _o)	1.522
Oil Viscosity (μ _o)	0.2645 mPa.s
Oil Compressibility (c _o)	3.2194e-06 1/kPa
Solution Gas Ratio (R _s)	152.70 m ³ /m ³

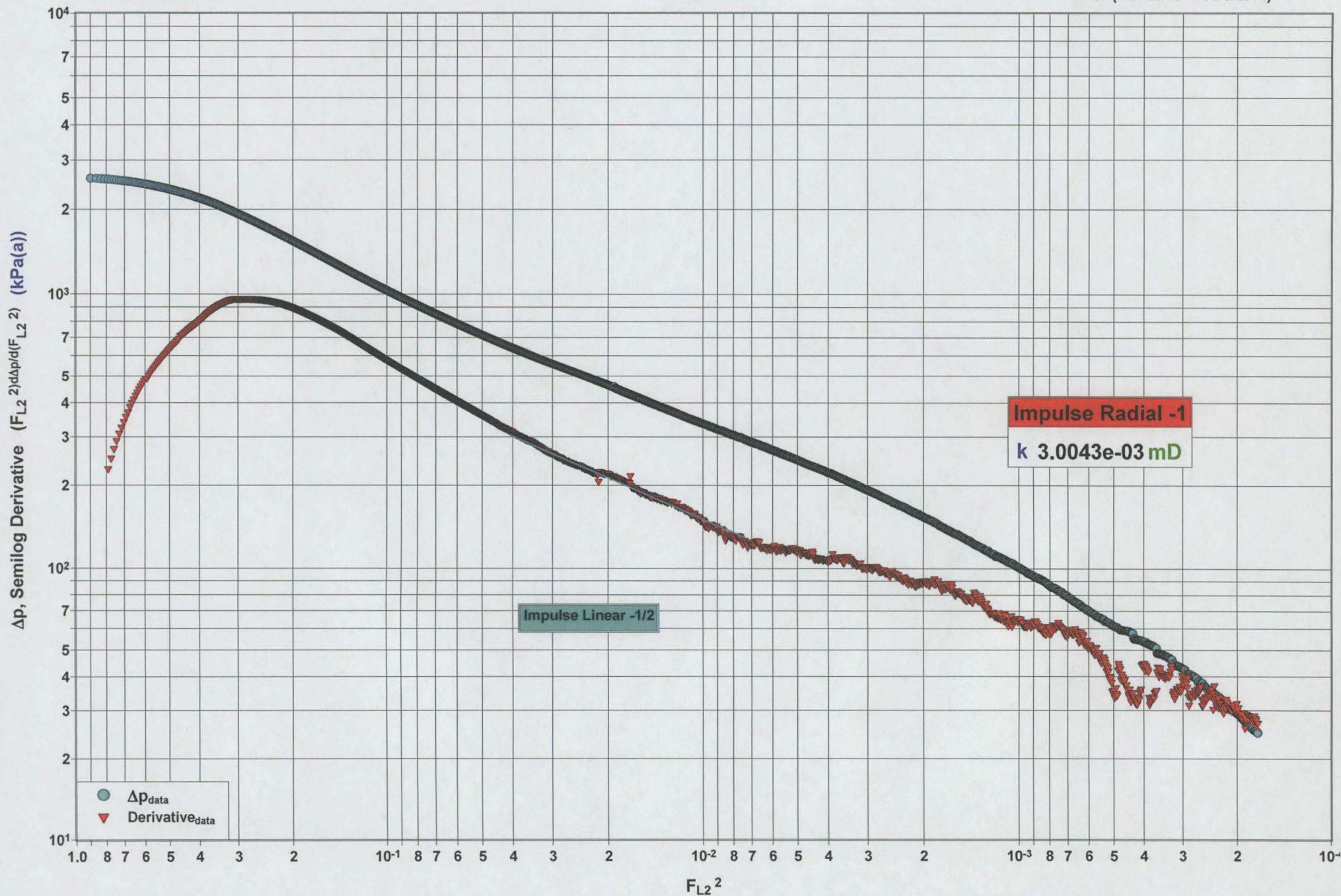
Reservoir Properties

Reservoir Temperature (T _{resv})	87.0 °C
Reservoir Pressure (p _{resv})	18580 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (φ _t)	10.00 %
Gas Saturation (S _g)	0.00 %
Oil Saturation (S _o)	90.00 %
Water Saturation (S _w)	10.00 %
Formation Compressibility (c _f)	7.0522e-07 1/kPa
Total Compressibility (c _t)	3.6471e-06 1/kPa

COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 2 Derivative

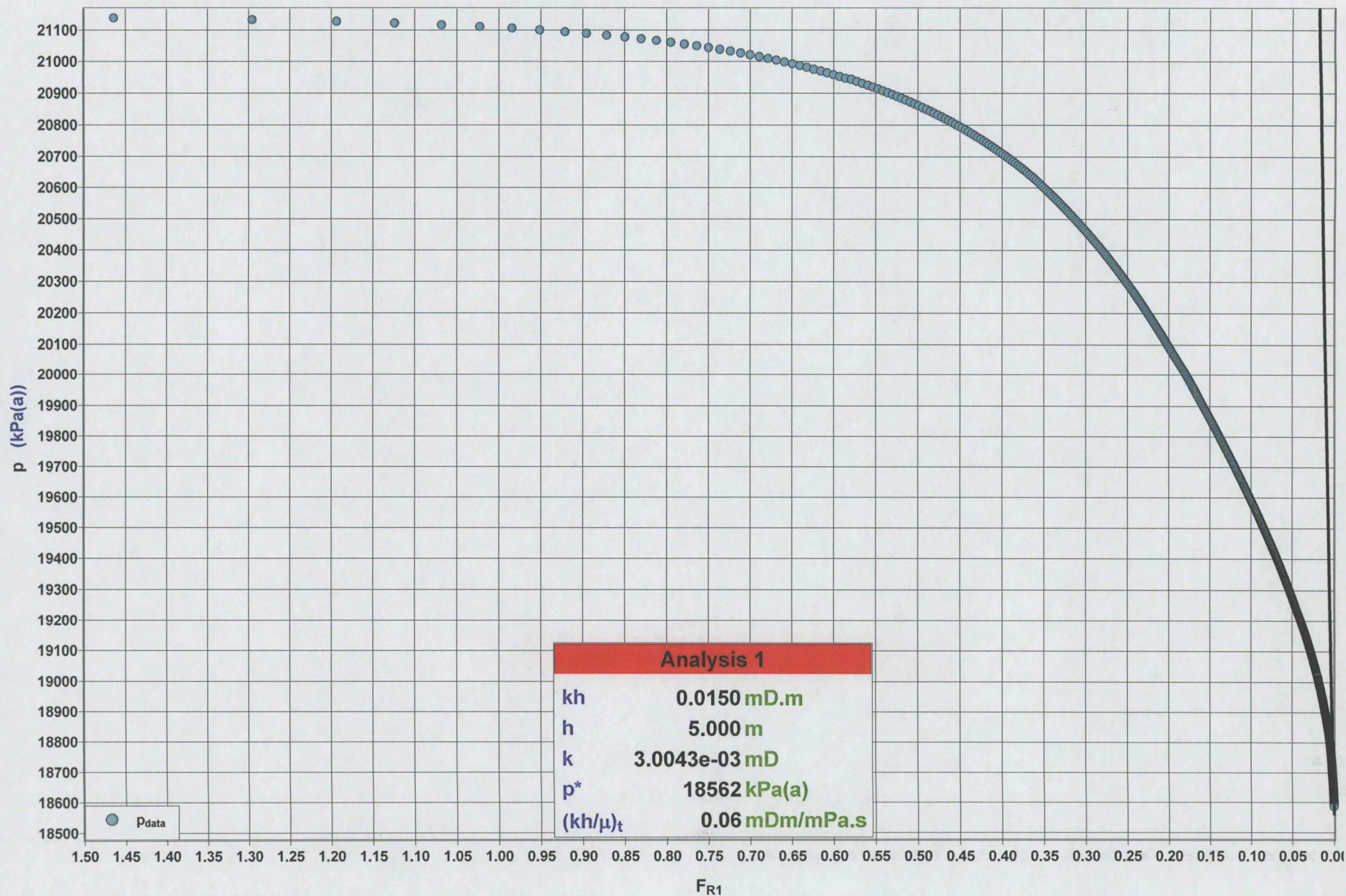
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 2
Minifrac Radial (Nolte)

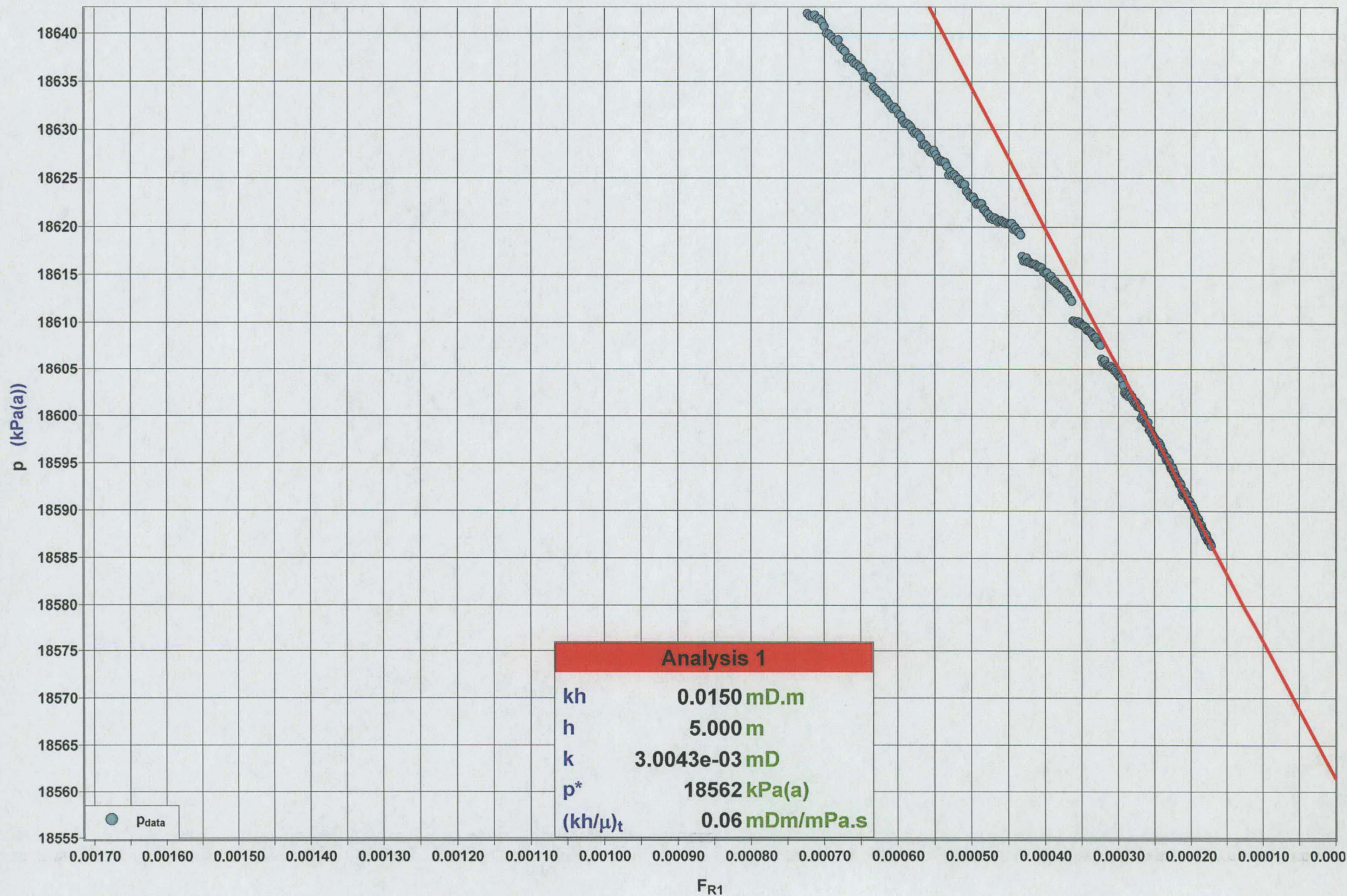
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 2 Minifrac Radial (Nolte)

Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



Nolte ACA 2

Linear Analysis (FL)

Flow Capacity (kh)	mD.m
Effective Permeability (k)	mD
Extrapolated Pressure (p*)	18589 kPa(a)
Closure Pressure (pc)	kPa(a)
Reservoir Leakoff Coefficient (CR)	m/min ^{1/2}
Total Leakoff Coefficient (CT)	m/min ^{1/2}

Radial Analysis (FR)

Flow Capacity (kh)	0.0254 mD.m
Effective Permeability (k)	5.0859e-03 mD
Extrapolated Pressure (p*)	18580 kPa(a)

Input Parameters

Estimated Initial Pressure (p _i)	18562 kPa(a)
Closure time (t _c)	193.50 min

Fluid Properties

Oil Gravity (γ _o)	49.9 °API
Bubble Point Pressure (p _{bp})	18573 kPa(a)
Oil Formation Volume Factor (B _o)	1.522
Oil Viscosity (μ _o)	0.2645 mPa.s
Oil Compressibility (c _o)	3.2194e-06 1/kPa
Solution Gas Ratio (R _s)	152.70 m ³ /m ³

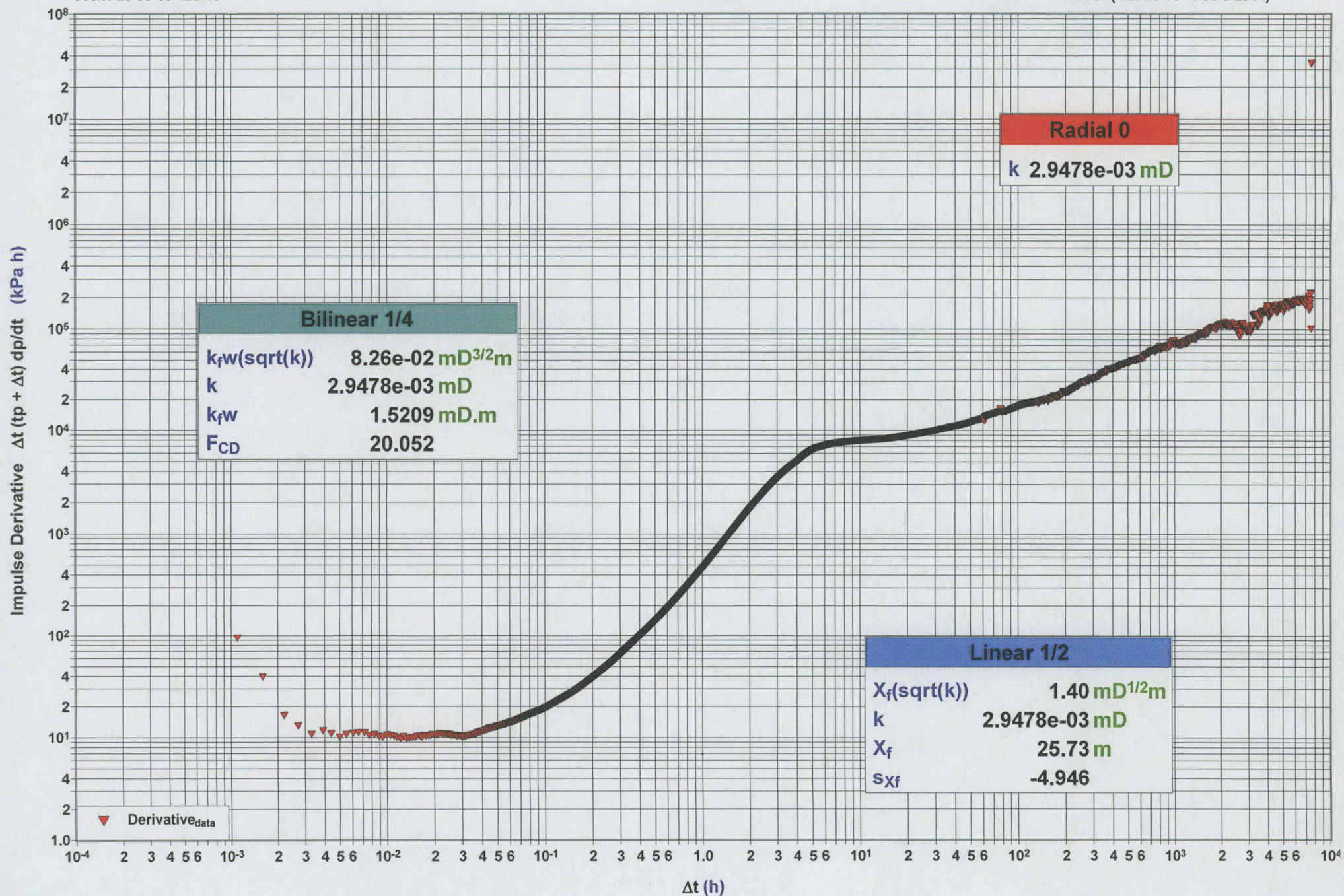
Reservoir Properties

Reservoir Temperature (T _{resv})	87.0 °C
Reservoir Pressure (p _{resv})	18580 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (φ _t)	10.00 %
Gas Saturation (S _g)	0.00 %
Oil Saturation (S _o)	90.00 %
Water Saturation (S _w)	10.00 %
Formation Compressibility (c _f)	7.0522e-07 1/kPa
Total Compressibility (c _t)	3.6471e-06 1/kPa

COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1 Derivative

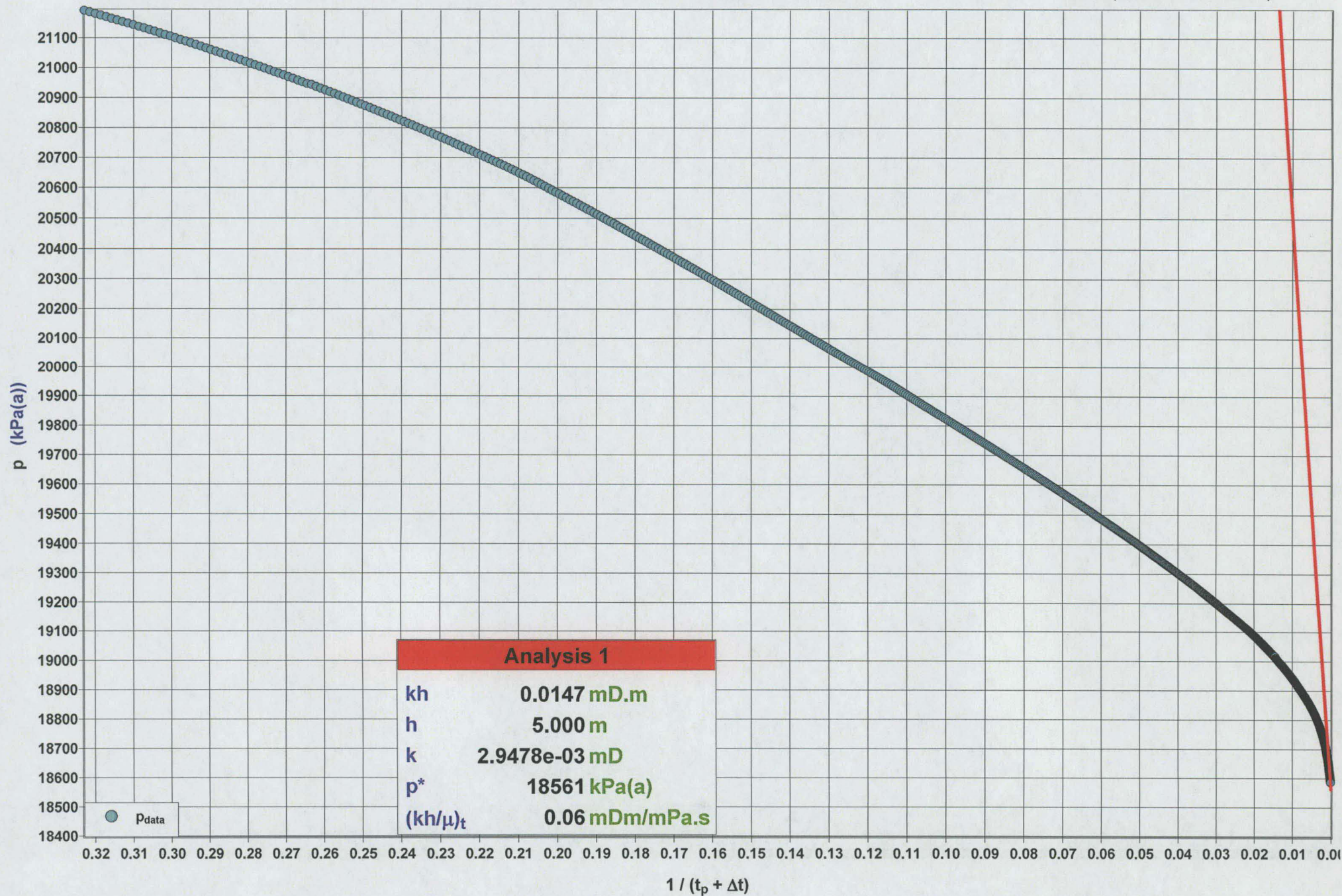
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Minifrac Radial (Soliman-Craig)

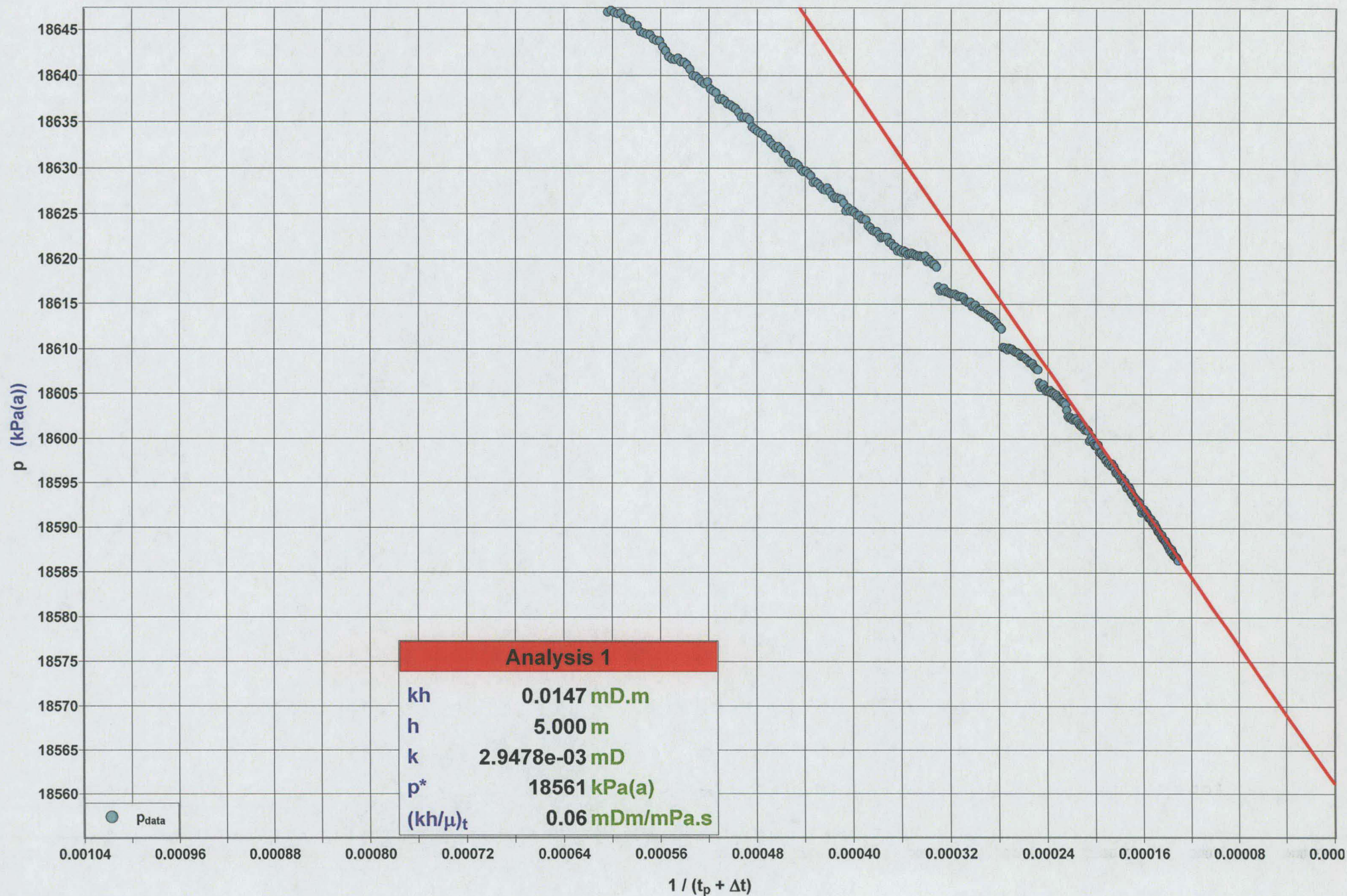
Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Minifrac Radial (Soliman-Craig)

Upper Lower Canol (1993 - 1994 mKB)
DFIT (Mar 28/13 - Feb 9/2014)



Soliman/Craig ACA 1

Linear Analysis

$X_r(\text{sqrt}(k))$	1.40 mD ^{1/2} m
Fracture Half-Length (X_f)	25.847 m
Effective Permeability (k)	2.9478e-03 mD
Skin Equivalent to X_f (S_{Xf})	-4.951

Radial Analysis

Flow Capacity (kh)	0.0147 mD.m
Effective Permeability (k)	2.9478e-03 mD
Extrapolated Pressure (p^*)	18561 kPa(a)

Fluid Properties

Oil Gravity (γ_o)	49.9 °API
Bubble Point Pressure (p_{bp})	18573 kPa(a)
Oil Correlation	Vasquez and Beggs
Oil Viscosity Correlation	Beggs & Robinson
Solution Gas Ratio (R_s)	152.70 m ³ /m ³
Oil Viscosity (μ_o)	0.2645 mPa.s
Oil Compressibility (c_o)	3.2194e-06 1/kPa
Oil Formation Volume Factor (B_o)	1.522

Reservoir Properties

Reservoir Temperature (T_{resv})	87.0 °C
Reservoir Pressure (p_{resv})	18580 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (ϕ_t)	10.00 %
Gas Saturation (S_g)	0.00 %
Oil Saturation (S_o)	90.00 %
Water Saturation (S_w)	10.00 %
Formation Compressibility (c_f)	7.0522e-07 1/kPa
Total Compressibility (c_t)	3.6471e-06 1/kPa

OIL MINI-FRAC ANALYSIS

WELL NAME: **COPRC Mirror Lake**
 WELL LOCATION:
 Bottomhole Location: **300/N-20 65-00 126-45**
 Surface Location: 300/N-20 65-00 126-45
 Well License #: **EL 470**

ZONE: **"MIDDLE" LOWER CANOL**

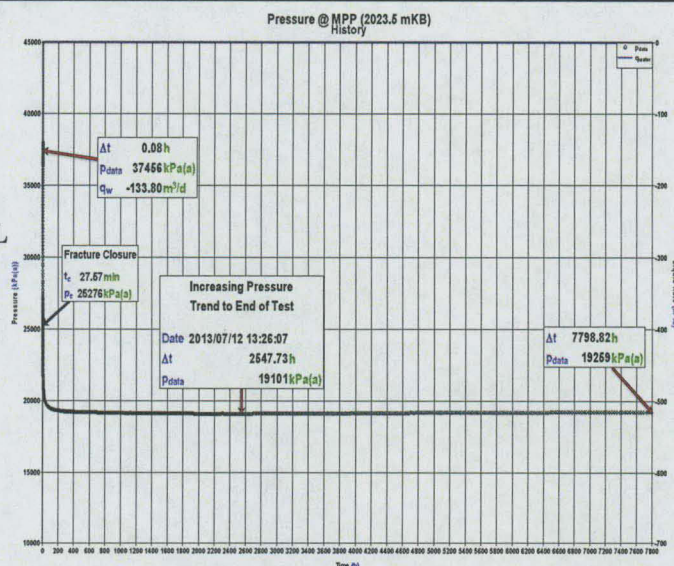
COST CENTRE: **10345530**

TEST DATE: **Mar 28/13 – Feb 16/14**

STAGE OF WELL TEST: **Post-Perf Inj-Falloff**

ORIENTATION: **Vertical**

TYPE/SIZE OF STIMULATION: **N/A**



Reservoir Properties

Injection Interval: 2023 – 2024 mKB		
Frac Height (h): 5 m (Estimate)	Porosity (ϕ): 7 %	Water Saturation (S_w): 20 %
Oil Gravity: 50 °API (Estimate)	H ₂ S Content: 0 %	BHT: 88.1 °C

Injection Data

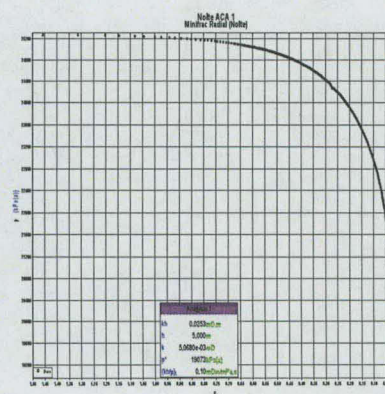
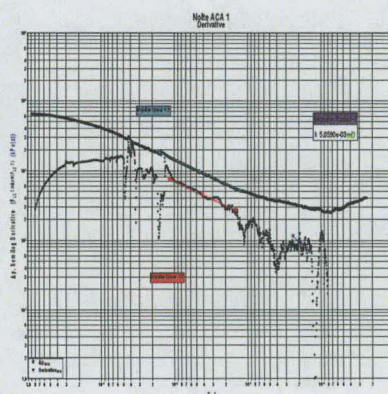
Test	Time	Final Rates				Final Pressures		
		Gas	New Oil	New H ₂ O	Load	Tubing	Casing	BHP
	Hours	e ³ m ³ /d	m ³ /d	m ³ /d	m ³ /d	kPag	kPag	kPaa
Injection	0.1	---	---	---	133.8	N/A	0	37456
Shut-In	7798.8	---	---	---	0	N/A	0	19259

Injection Summary

New Fluid (m ³)				Load Fluid (m ³)		Remaining Load (m ³)	
Gas (E ³ M ³)	Gas (MSCF)	Cond (m ³)	Water (m ³)	Oil (m ³)	Water (m ³)	Oil (m ³)	Water (m ³)
---	---	---	---	0	0.41	0	0.41

Pressure Transient Analysis Results Summary

Analysis Results	
P*	19073 kPaa
(kh/ μ) _o	0.10 mD·m/mPa·s
(kh) _o	0.025 mD·m
k _o	0.005 mD



Discussion

Test Procedure:

A segregated post-perf mini-frac test was conducted on the “Basal” Lower Canol interval. This interval was subsequently isolated below bridge plugs. On Mar 27th, 2013, the “Middle” LOWER CANOL interval was perforated. A retrievable bridge plug, with tandem electronic recorders hung below, was run in hole the following day (center element at 2020.5 mKB). Fluid (70% Propylene Glycol / 30% Water) injection was initiated to achieve formation breakdown. Injection continued for several more minutes after breakdown, including for a brief period after the bridge plug setting mechanism was activated (dynamically set). The final water injection rate prior to shut-in was reported to be 133.8 m³/d (92.9 l/min). The subsequent falloff was monitored for about 11 months (~7799 hrs). On Feb 18th, 2014, the bridge plug (including the recorders) was unset and recovered. The primary objectives of the mini-frac test were to obtain frac design and reservoir flow parameters. It is noted that upon isolating this interval, operations were conducted to carry out a mini-frac test on the “Upper” Lower Canol. The analyses / results for each of the zones have been provided in separate reports.

The test data (injection & falloff) from the subject test was corrected to the mid-point of the perforations (MPP=2023.5 mKB) using an estimated water gradient of 10 kP/m.

Analysis:

The mini-frac test data was analyzed using traditional techniques. Diagnostic plots, such as the G-Function & Sqrt (t) plots, were utilized first to confirm the occurrence of fracture closure. For the subject zone, the diagnostic plots indicated closure about a half hour (or ~28 minutes) of shut-in. Although an analysis of the data was conducted, there wasn't any conclusive evidence of pseudo-radial flow on the derivative plot prior to the end of the test. However, it is noted that the data was relatively noisy, resulting in ambiguous results. In addition, it is also noted that the actual pressure indicated an upward trend starting from Mid-July 2013 to the end of the test. It is not apparent at this time as to attributing factor for this phenomenon. Regardless, after-closure analysis, via Nolte & Soliman / Craig techniques, was then conducted in an attempt to obtain estimates for reservoir parameters. The corresponding results / plots have been presented in this report.

Conclusions / Recommendations:

The test was only partially successful in satisfying the primary objectives set forth at the onset of the test program. Although closure was achieved, pseudo-radial flow was not evident, most likely as a result of poor data quality. Therefore, the reported reservoir flow parameters ($k_o = 0.005$ mD, $P^* = 19.1$ MPaa) should be used with caution. Consequently, the overall confidence of the test results is considered to be poor. It is also noted that the oil permeability was calculated based on estimated values for frac height (5 m) & oil viscosity (50 °API oil with a viscosity of 0.26 mPa·s).

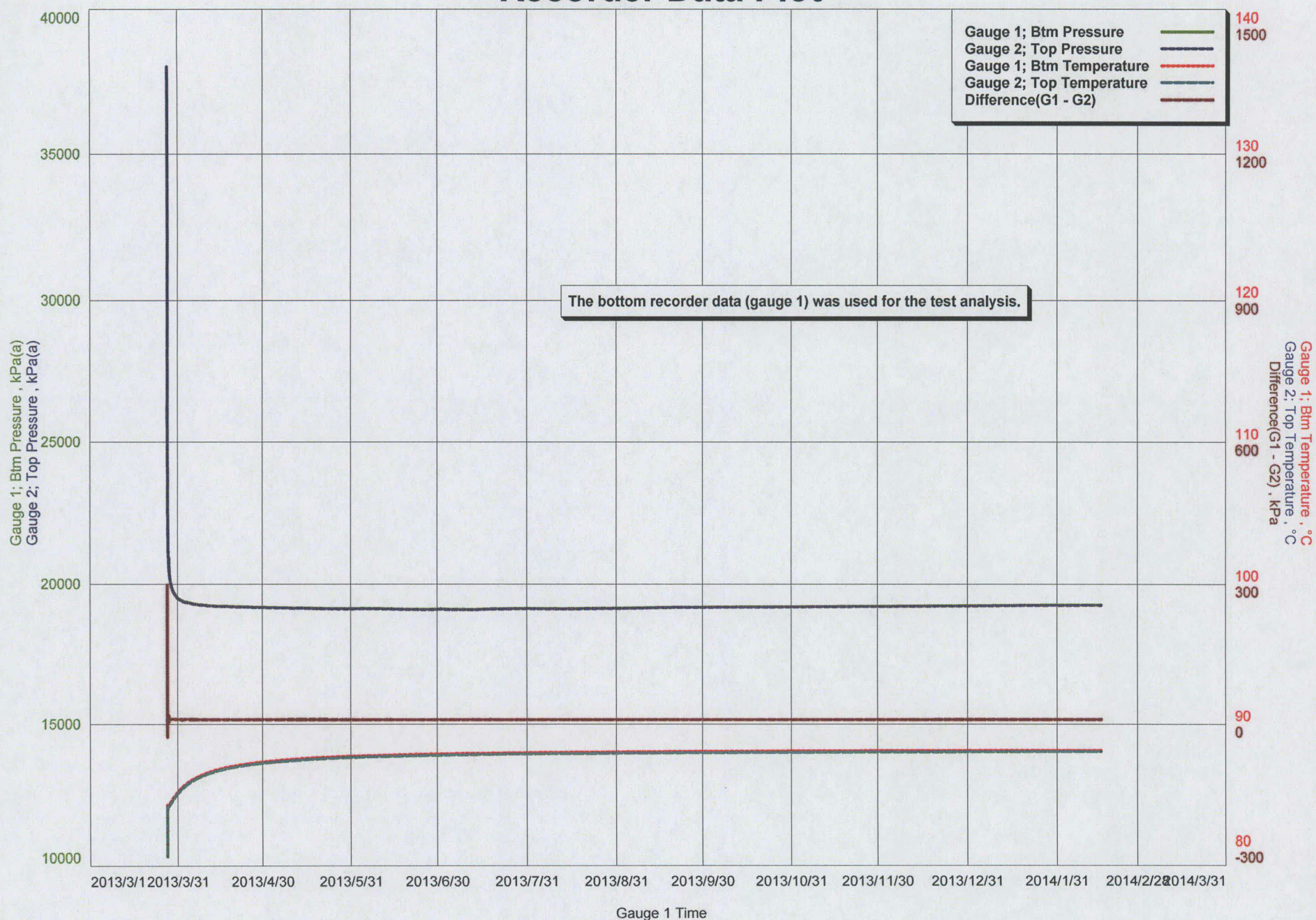
Analyzed by: Al Kassam

Report Date: Mar 27th, 2014

Copy: Kim Clarke Alex Novgorodova Well File

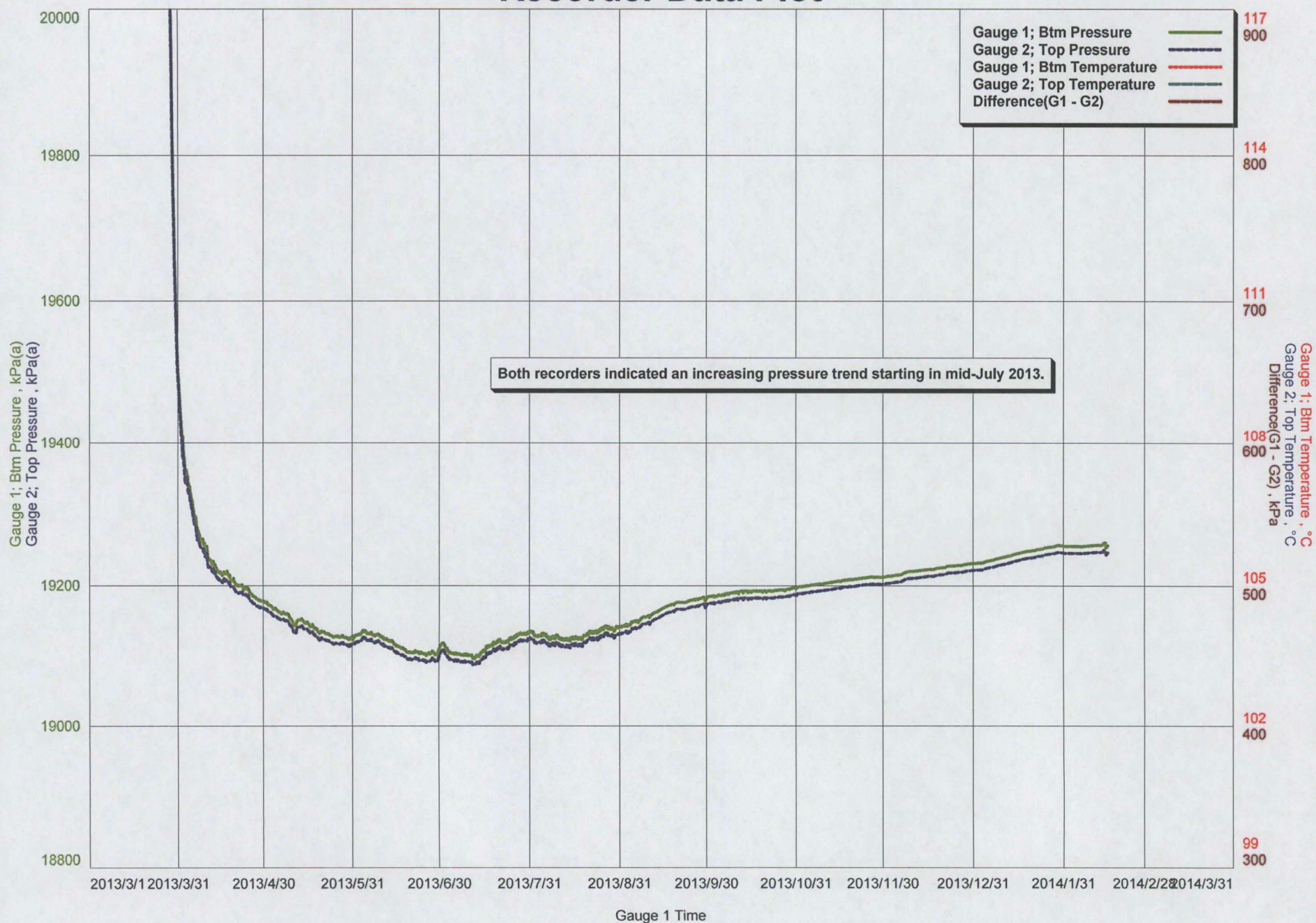
Recorder Data Plot

Formation: Middle Lower Canol



Recorder Data Plot

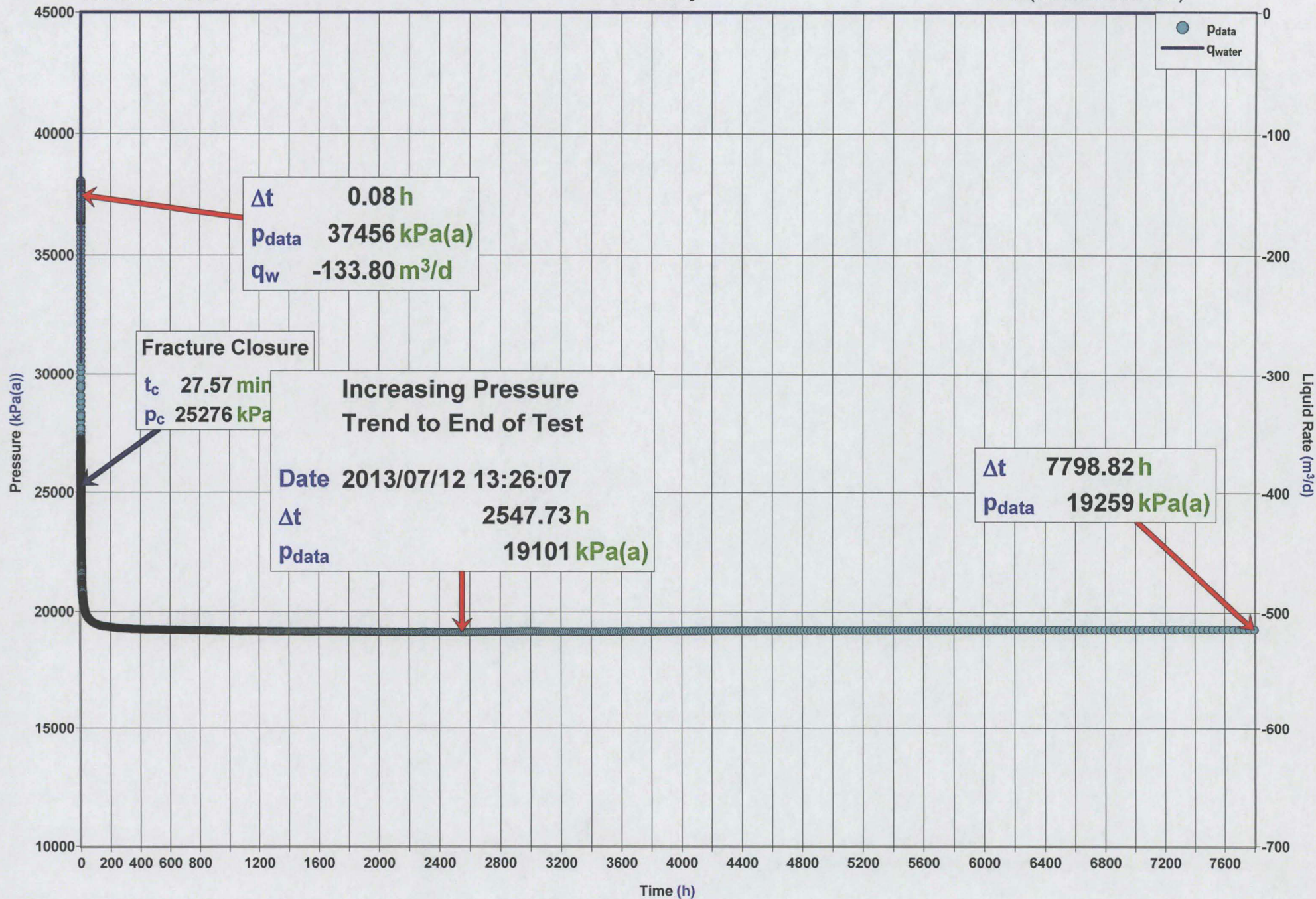
Formation: Middle Lower Canol



COPRC Mirror Lake
300/N-20 65-00 126-45

Pressure @ MPP (2023.5 mKB) History

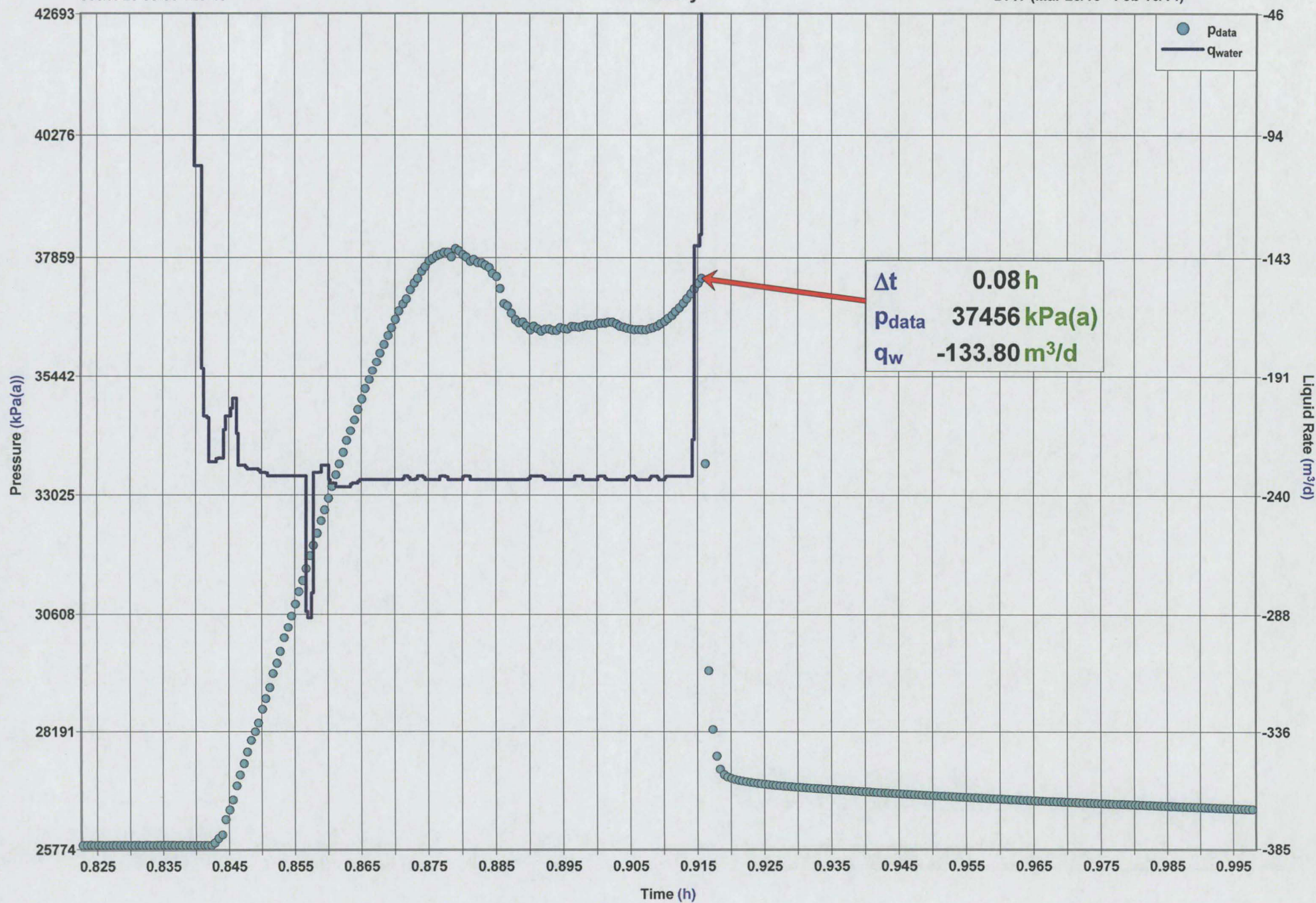
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Pressure @ MPP (2023.5 mKB) History

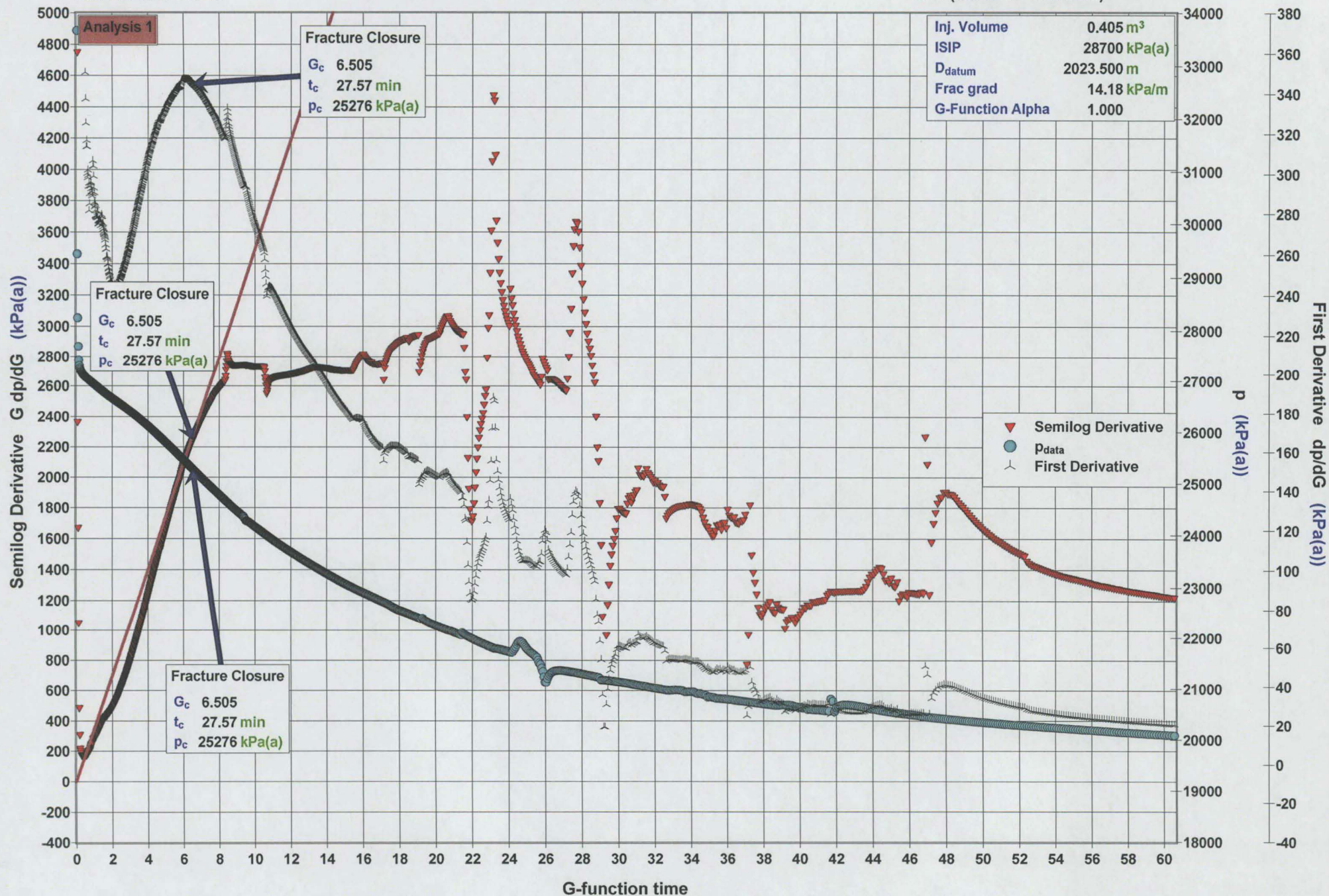
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 G-Function

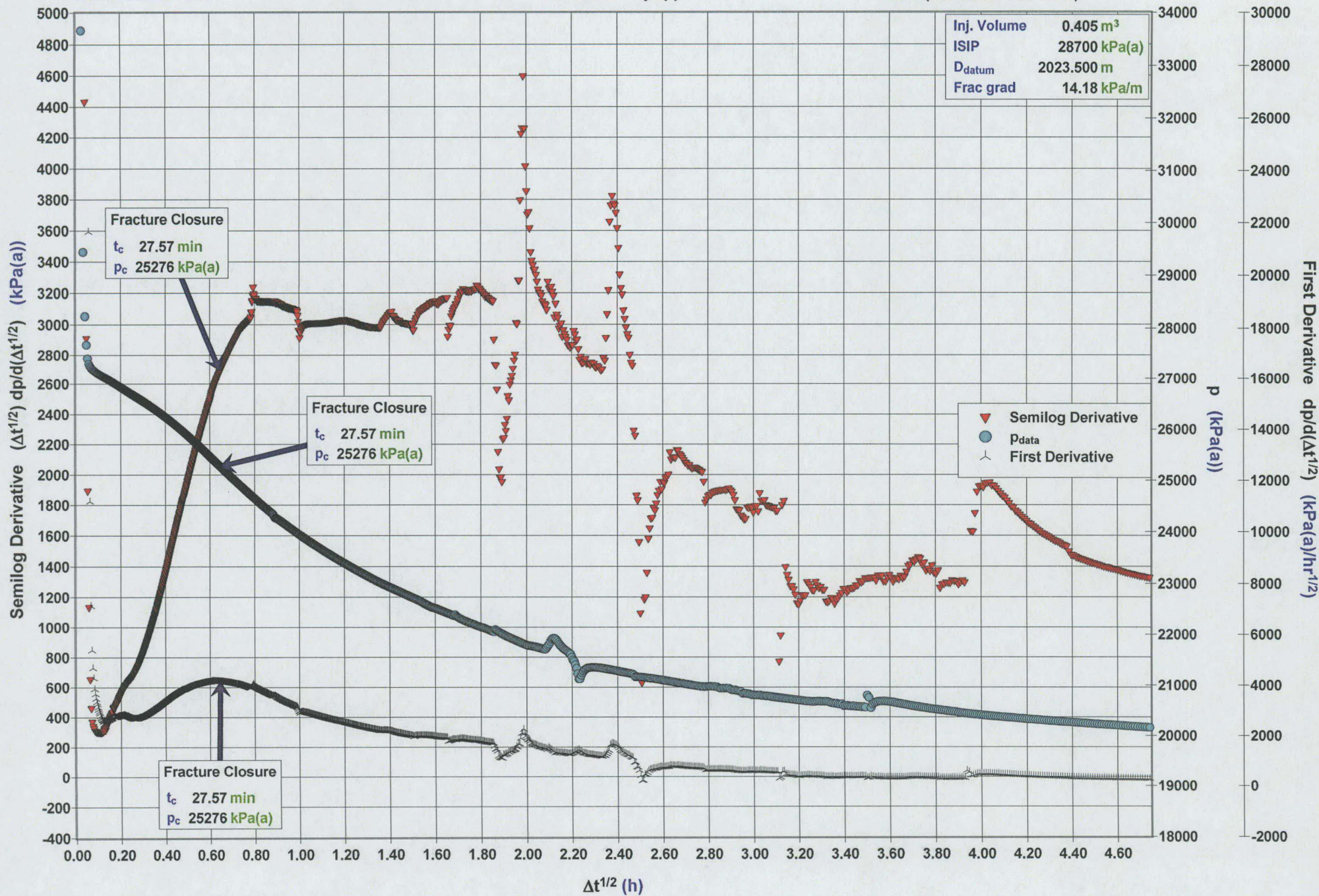
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 MiniFrac Sqrt(t)

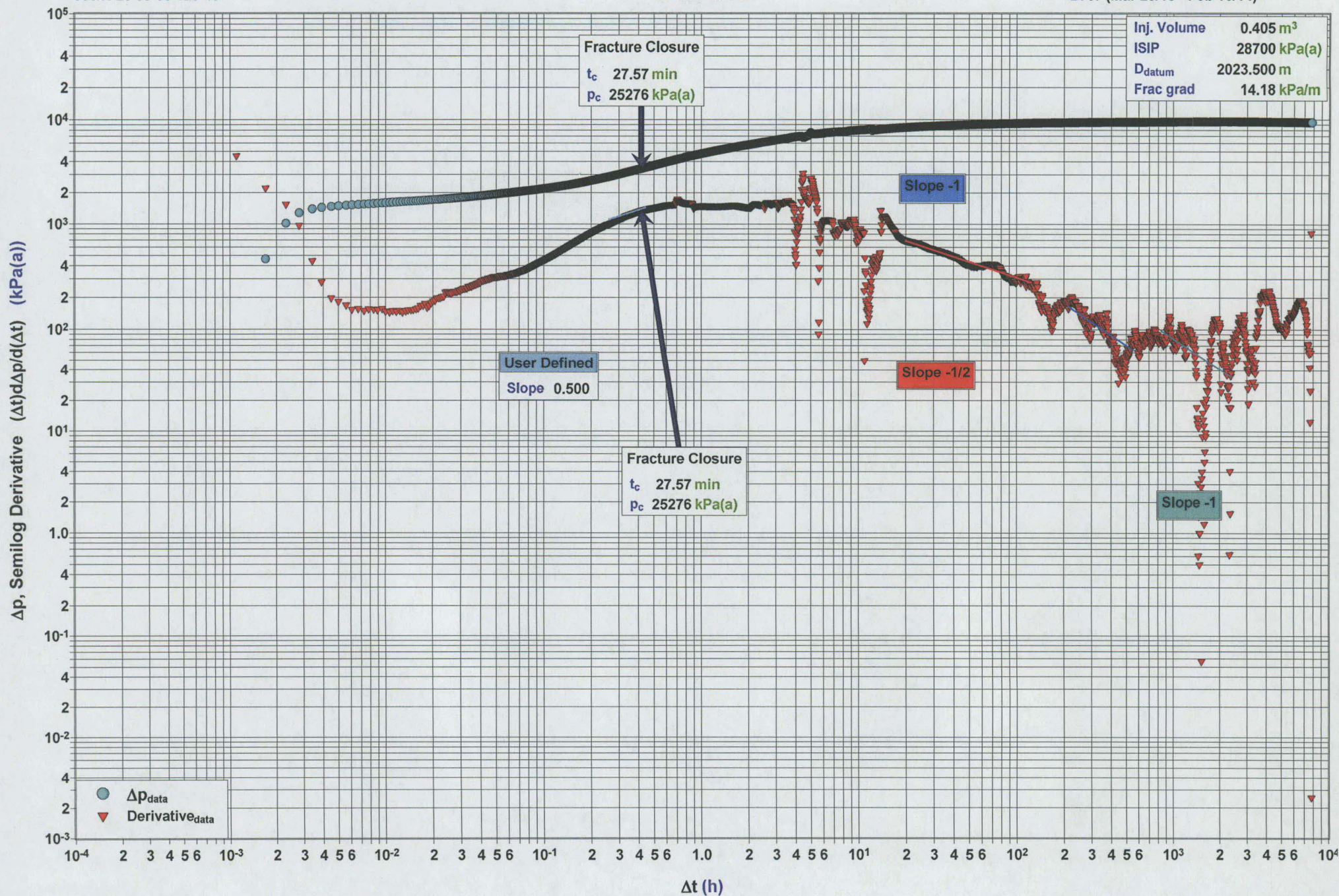
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 Derivative

Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



PCA Diagnostic 1

Input Data

Injected Volume 0.405 m³
Datum Depth 2023.500 m

Results

ISIP 28700 kPa(a)
Fracture Gradient 14.18 kPa/m

Closure Marker 1

Closure time (t_c) 0.4595 h
Closure pressure (p_c) 25276 kPa(a)
Net Frac Press (Δp_{net}) 3424 kPa
G-Function at Closure (G_c) 6.505
Fluid Efficiency (η) 76.48 %

Closure Marker 2

Closure time (t_c) 0.4595 h
Closure pressure (p_c) 25276 kPa(a)
Net Frac Press (Δp_{net}) 3424 kPa
G-Function at Closure (G_c) 6.505
Fluid Efficiency (η) 76.48 %

Fluid Properties

Oil Gravity (γ_o) 49.9 °API
Bubble Point Pressure (p_{bp}) 19252 kPa(a)
Oil Formation Volume Factor (B_o) 1.540
Oil Viscosity (μ_o) 0.2583 mPa.s
Oil Compressibility (c_o) 3.2079e-06 1/kPa
Solution Gas Ratio (R_s) 158.45 m³/m³

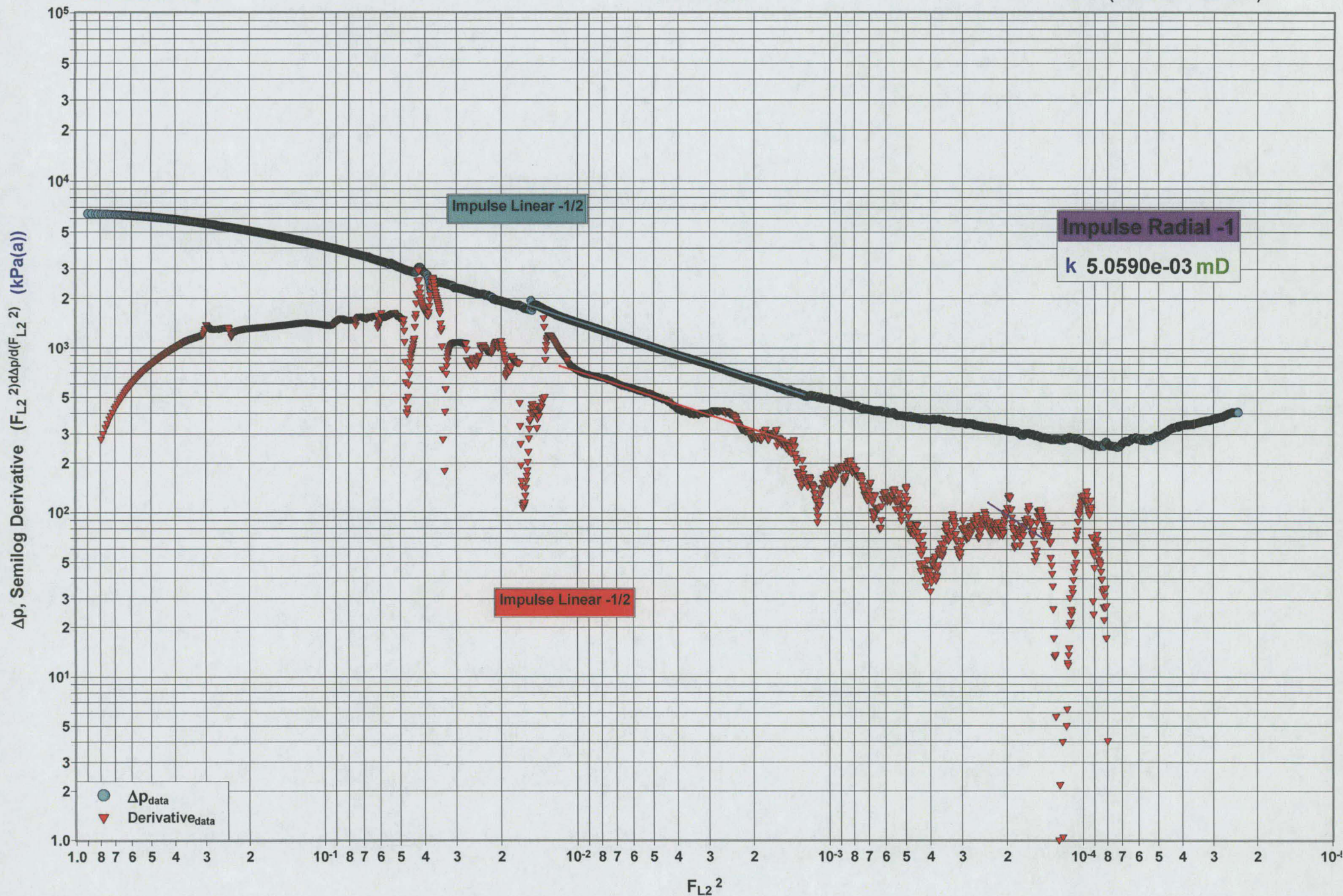
Reservoir Properties

Reservoir Temperature (T_{resv}) 88.1 °C
Reservoir Pressure (p_{resv}) 19259 kPa(a)

COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Derivative

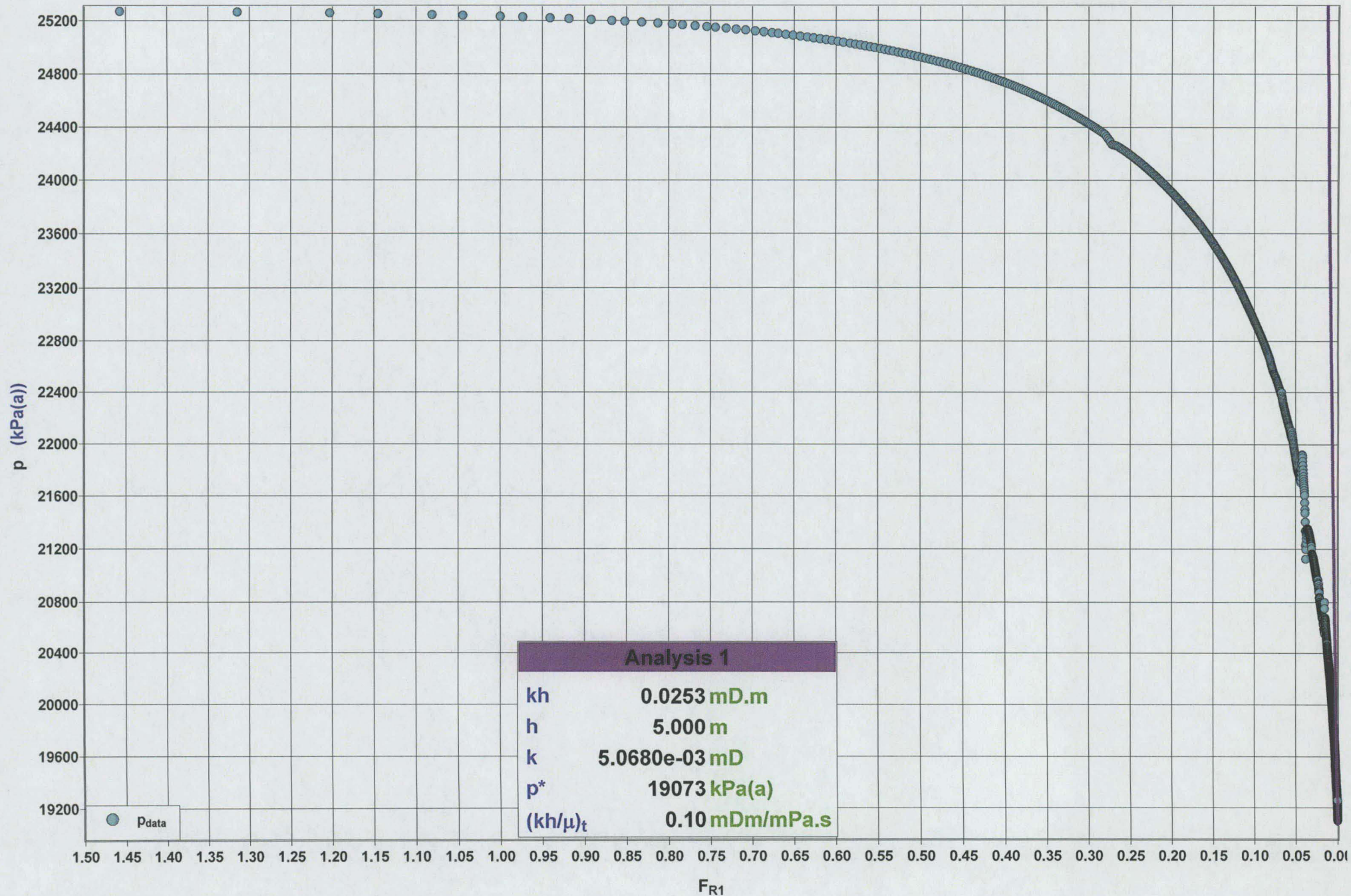
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Minifrac Radial (Nolte)

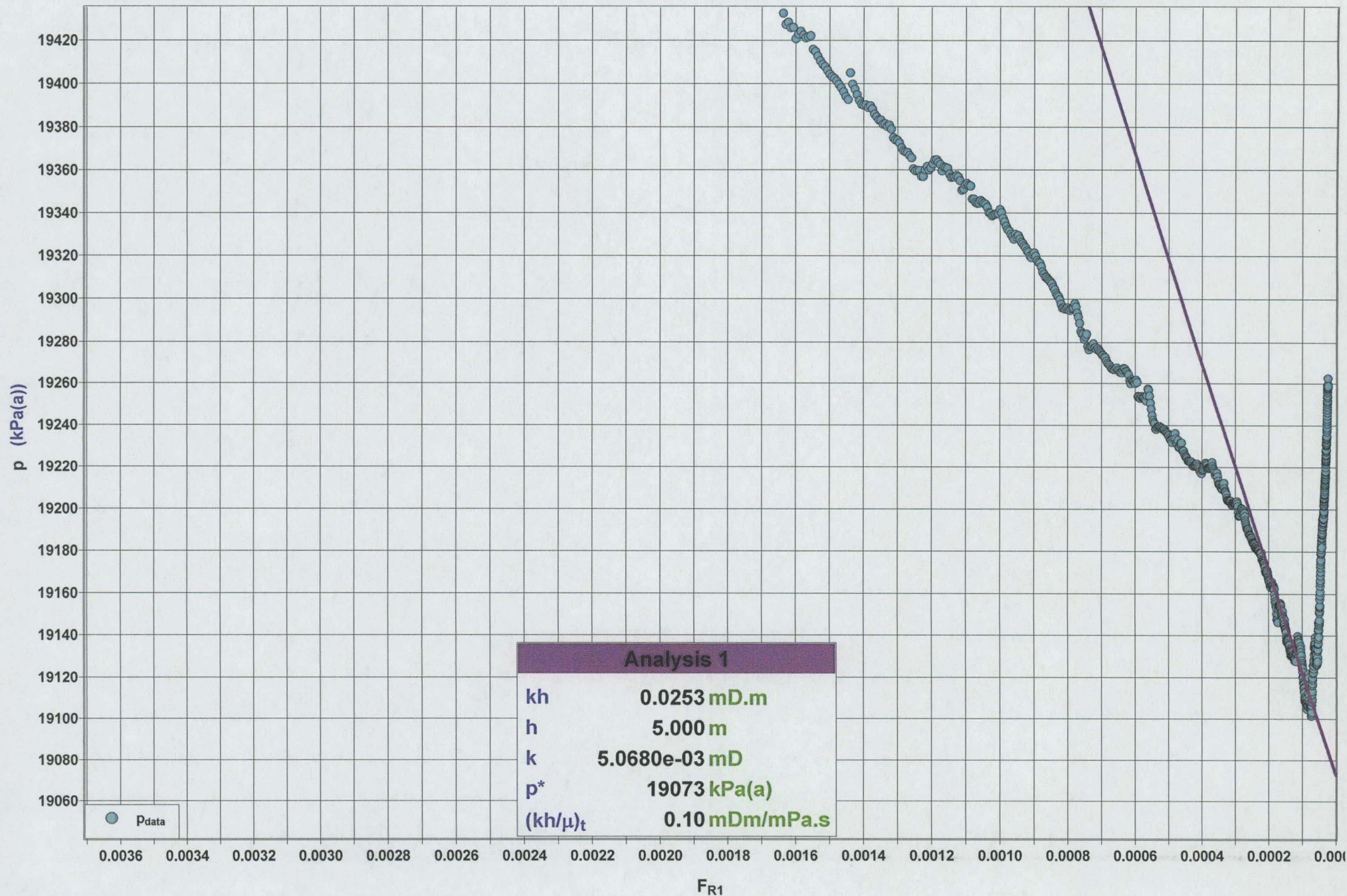
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Minifrac Radial (Nolte)

Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



Nolte ACA 1

Linear Analysis (FL)

Flow Capacity (kh)	mD.m
Effective Permeability (k)	mD
Extrapolated Pressure (p*)	18852 kPa(a)
Closure Pressure (pc)	kPa(a)
Reservoir Leakoff Coefficient (CR)	m/min ^{1/2}
Total Leakoff Coefficient (CT)	m/min ^{1/2}

Radial Analysis (FR)

Flow Capacity (kh)	0.0253 mD.m
Effective Permeability (k)	5.0680e-03 mD
Extrapolated Pressure (p*)	19073 kPa(a)

Input Parameters

Estimated Initial Pressure (p _i)	18852 kPa(a)
Closure time (t _c)	27.57 min

Fluid Properties

Oil Gravity (γ _o)	49.9 °API
Bubble Point Pressure (p _{bp})	19252 kPa(a)
Oil Formation Volume Factor (B _o)	1.540
Oil Viscosity (μ _o)	0.2583 mPa.s
Oil Compressibility (c _o)	3.2079e-06 1/kPa
Solution Gas Ratio (R _s)	158.45 m ³ /m ³

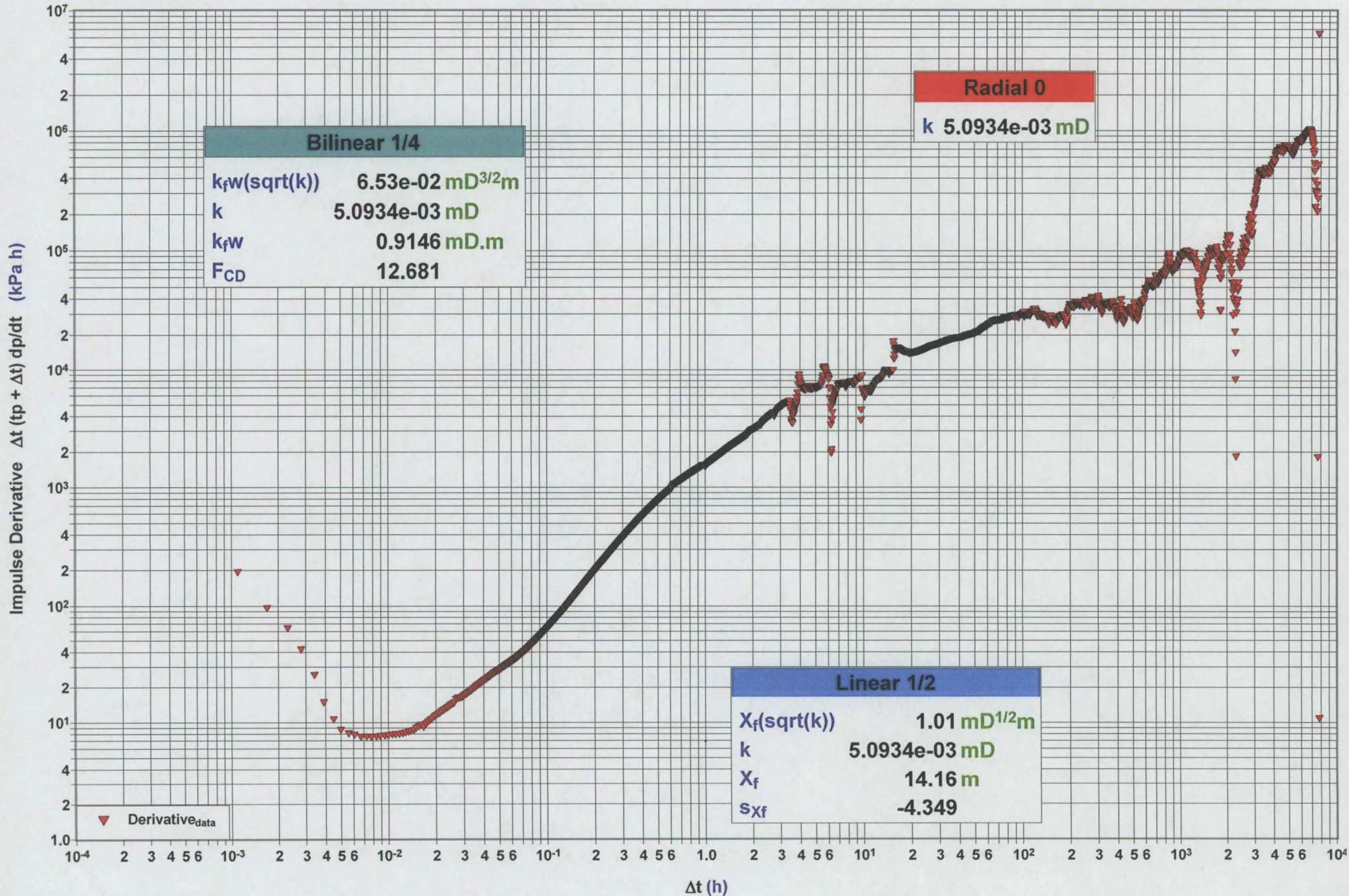
Reservoir Properties

Reservoir Temperature (T _{resv})	88.1 °C
Reservoir Pressure (p _{resv})	19259 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (φ _t)	7.00 %
Gas Saturation (S _g)	0.00 %
Oil Saturation (S _o)	80.00 %
Water Saturation (S _w)	20.00 %
Formation Compressibility (c _f)	8.1772e-07 1/kPa
Total Compressibility (c _t)	3.4730e-06 1/kPa

COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Derivative

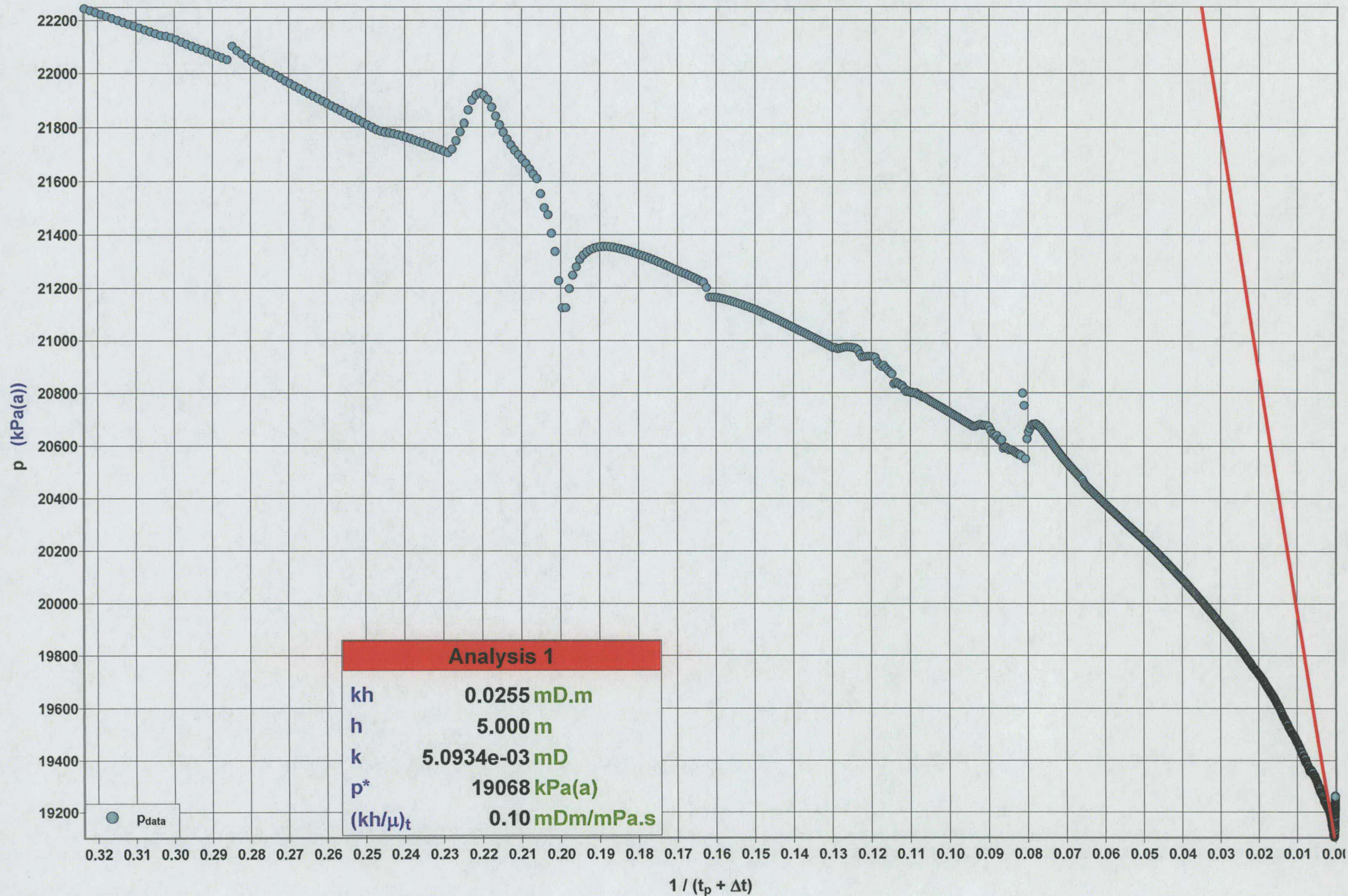
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Minifrac Radial (Soliman-Craig)

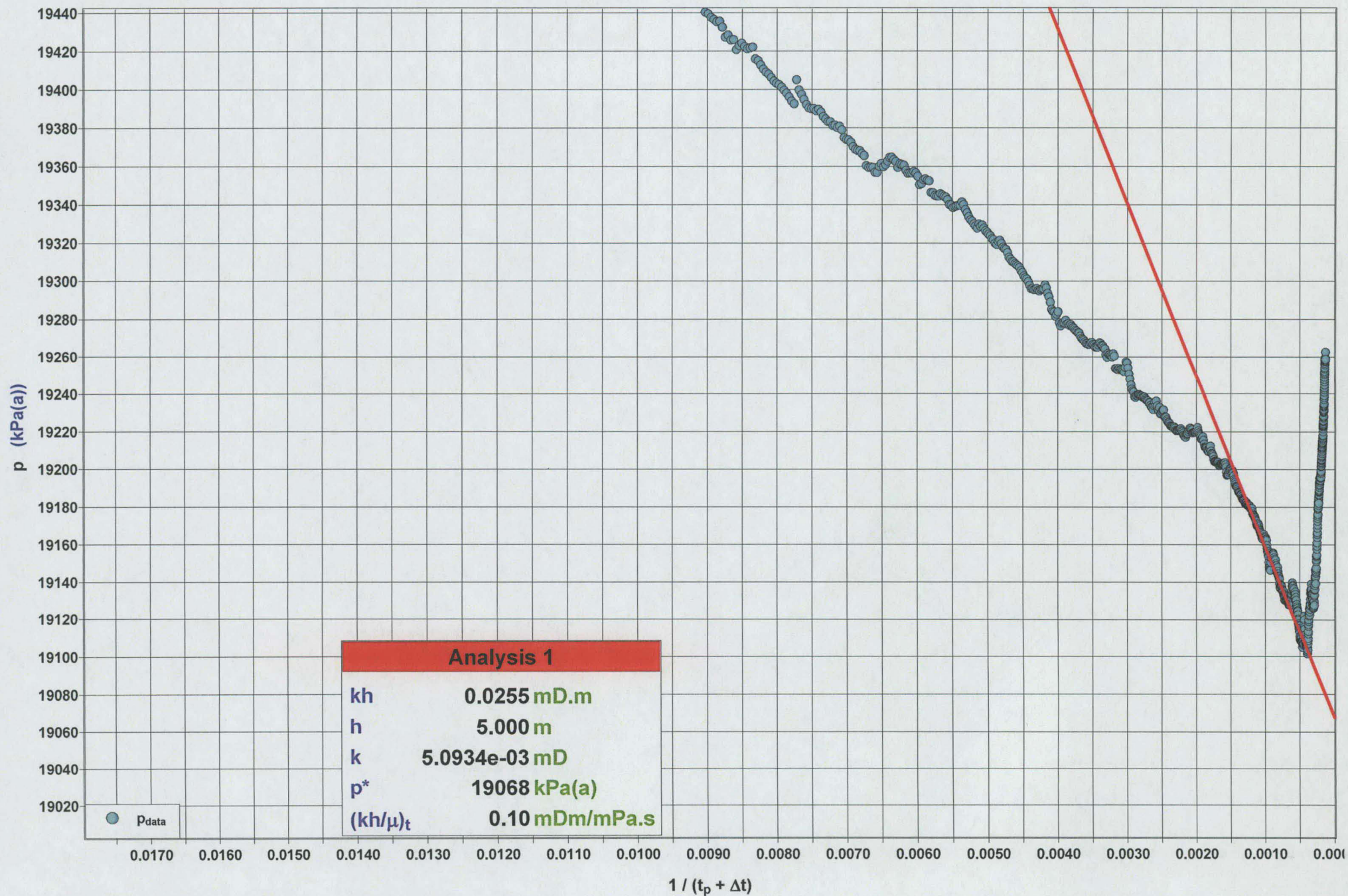
Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Minifrac Radial (Soliman-Craig)

Middle Lower Canol (2023 - 2024 mKB)
DFIT (Mar 28/13 - Feb 16/14)



Soliman/Craig ACA 1

Linear Analysis

$X_r(\sqrt{k})$	1.02 mD ^{1/2} m
Fracture Half-Length (X_f)	14.281 m
Effective Permeability (k)	5.0934e-03 mD
Skin Equivalent to X_r (s_{xr})	-4.358

Radial Analysis

Flow Capacity (kh)	0.0255 mD.m
Effective Permeability (k)	5.0934e-03 mD
Extrapolated Pressure (p^*)	19068 kPa(a)

Fluid Properties

Oil Gravity (γ_o)	49.9 °API
Bubble Point Pressure (p_{bp})	19252 kPa(a)
Oil Correlation	Vasquez and Beggs
Oil Viscosity Correlation	Beggs & Robinson
Solution Gas Ratio (R_s)	158.45 m ³ /m ³
Oil Viscosity (μ_o)	0.2583 mPa.s
Oil Compressibility (c_o)	3.2079e-06 1/kPa
Oil Formation Volume Factor (B_o)	1.540

Reservoir Properties

Reservoir Temperature (T_{resv})	88.1 °C
Reservoir Pressure (p_{resv})	19259 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (ϕ_t)	7.00 %
Gas Saturation (S_g)	0.00 %
Oil Saturation (S_o)	80.00 %
Water Saturation (S_w)	20.00 %
Formation Compressibility (c_f)	8.1772e-07 1/kPa
Total Compressibility (c_t)	3.4730e-06 1/kPa

OIL MINI-FRAC ANALYSIS

WELL NAME: **COPRC Mirror Lake**
 WELL LOCATION:
 Bottomhole Location: **300/N-20 65-00 126-45**
 Surface Location: **300/N-20 65-00 126-45**
 Well License #: **EL 470**

ZONE: **"BASAL" LOWER CANOL**

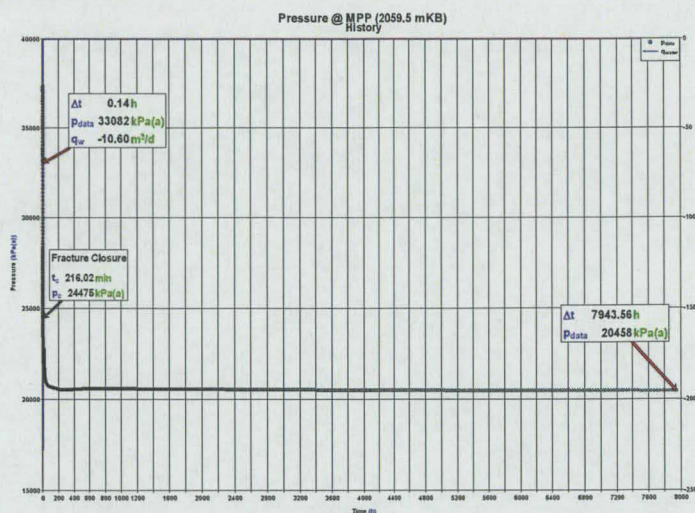
COST CENTRE: **10345530**

TEST DATE: **Mar 27/13 – Feb 21/14**

STAGE OF WELL TEST: **Post-Perf Inj-Falloff**

ORIENTATION: **Vertical**

TYPE/SIZE OF STIMULATION: **N/A**



Reservoir Properties

Injection Interval: 2059 – 2060 mKB		
Frac Height (h): 5 m (Estimate)	Porosity (φ): 15 %	Water Saturation (Sw): 8 %
Oil Gravity: 50 °API (Estimate)	H ₂ S Content: 0 %	BHT: 90.0 °C

Injection Data

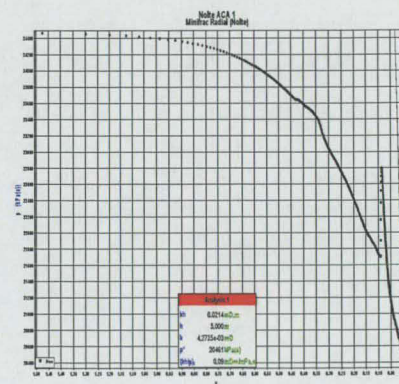
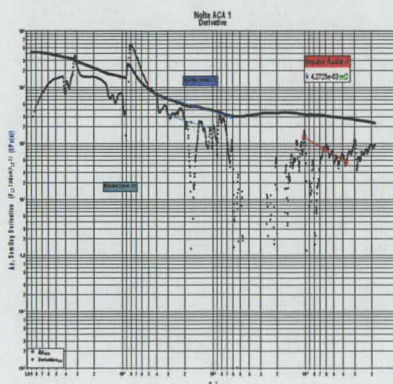
Test	Time	Final Rates				Final Pressures		
		Gas	New Oil	New H ₂ O	Load	Tubing	Casing	BHP
	Hours	e ³ m ³ /d	m ³ /d	m ³ /d	m ³ /d	kPag	kPag	kPaa
Injection	0.1	---	---	---	10.6	N/A	0	33082
Shut-In	7943.6	---	---	---	0	N/A	0	20458

Injection Summary

New Fluid (m ³)				Load Fluid (m ³)		Remaining Load (m ³)	
Gas (E ³ M ³)	Gas (MSCF)	Cond (m ³)	Water (m ³)	Oil (m ³)	Water (m ³)	Oil (m ³)	Water (m ³)
---	---	---	---	0	0.73	0	0.73

Pressure Transient Analysis Results Summary

Analysis Results	
P*	20461 kPaa
(kh/μ) _o	0.09 mD·m/mPa·s
(kh) _o	0.02 mD·m
k _o	0.004 mD



Discussion**Test Procedure:**

The "Basal" LOWER CANOL interval was perforated on Mar 27th, 2013. A retrievable bridge plug, with tandem electronic recorders hung below, was run in hole (center element at 2056.5 mKB). Fluid (70% Propylene Glycol / 30% Water) injection was initiated to achieve formation breakdown. Injection continued for several more minutes after breakdown, including for a brief period after the bridge plug setting mechanism was activated (dynamically set). The final water injection rate prior to shut-in was reported to be 10.6 m³/d (7.3 l/min). The subsequent falloff was monitored for about 11 months (~7944 hrs). Another bridge plug was run in hole shortly thereafter. Completion and test operations were then carried out on the "Middle" and "Upper" intervals of the Lower Canol formation while the "Basal" interval falloff was in progress. After recovering the respective bridge plugs & recorders for each of the upper intervals, the bridge plugs immediately above the "Basal" interval were unset and recovered (including the recorders) on Feb 22nd, 2014. The primary objectives of the mini-frac test were to obtain frac design and reservoir flow parameters. The analyses / results for the "Middle" and "Upper" intervals have been provided in separate reports.

The test data (injection & falloff) from the subject test was corrected to the mid-point of the perforations (MPP=2059.5 mKB) using an estimated water gradient of 10 kP/m.

Analysis:

The mini-frac test data was analyzed using traditional techniques. Diagnostic plots, such as the G-Function & Sqrt (t) plots, were utilized first to confirm the occurrence of fracture closure. For the subject zone, the diagnostic plots indicated closure after about 3.6 hrs (or ~216 minutes) of shut-in. Although an analysis of the data was conducted, there wasn't any definitive evidence of pseudo-radial flow on the derivative plot prior to the end of the test. It is noted however that the data was relatively noisy, resulting in ambiguous results. Regardless, after-closure analysis, via Nolte & Soliman / Craig techniques, was then conducted in an attempt to obtain estimates for reservoir parameters. It is also noted that the terminal portion of the data indicated the presence of non-reservoir effects, most likely as a result of uphole operations. Therefore, this portion of the falloff data was not used in the analysis. The corresponding results / plots have been presented in this report.

Conclusions / Recommendations:

The test was only partially successful in satisfying the primary objectives set forth at the onset of the test program. Although closure was achieved, pseudo-radial flow was not conclusive prior to the end of the test. Therefore, the reported reservoir flow parameters ($k_o = 0.004$ mD, $P^* = 20.5$ MPaa) should be used with caution. Consequently, the overall confidence of the test results is considered to be poor. It is also noted that the oil permeability was calculated based on estimated values for frac height (5 m) & oil viscosity (50 °API oil with a viscosity of 0.25 mPa·s).

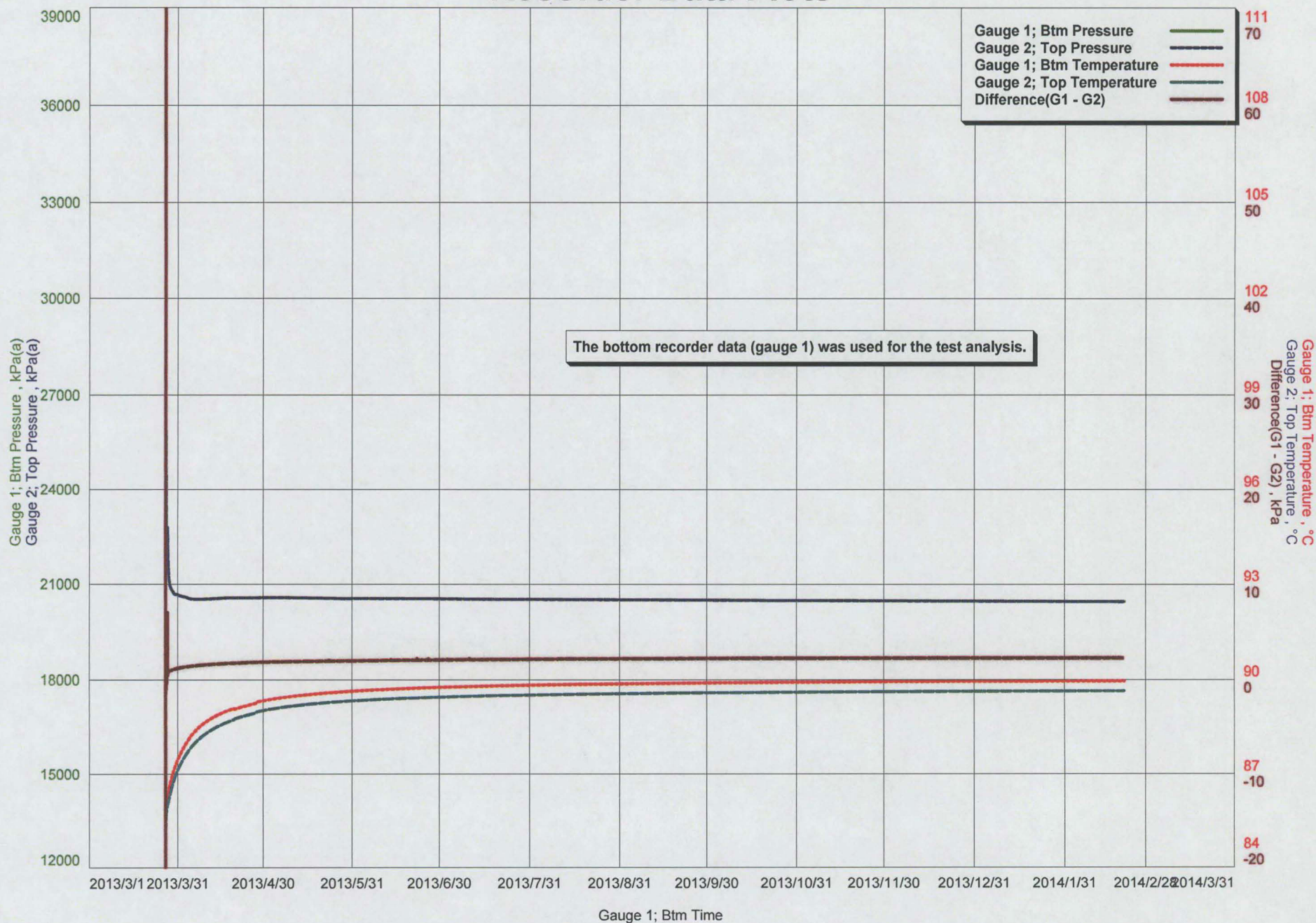
Analyzed by: Al Kassam

Report Date: Mar 27th, 2014

Copy: Kim Clarke Alex Novgorodova Well File

Recorder Data Plots

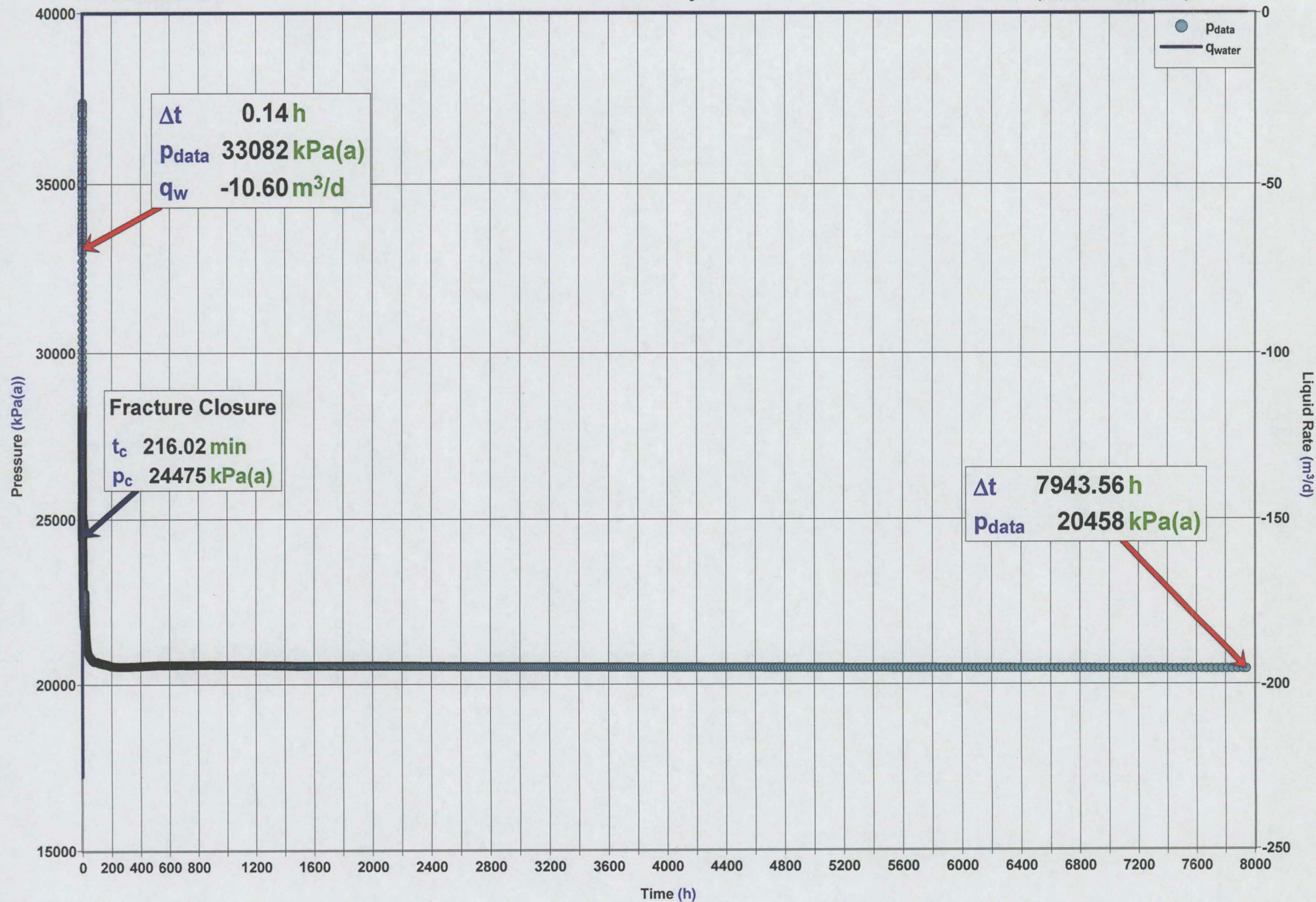
Formation: Basal Lower Canol



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 History

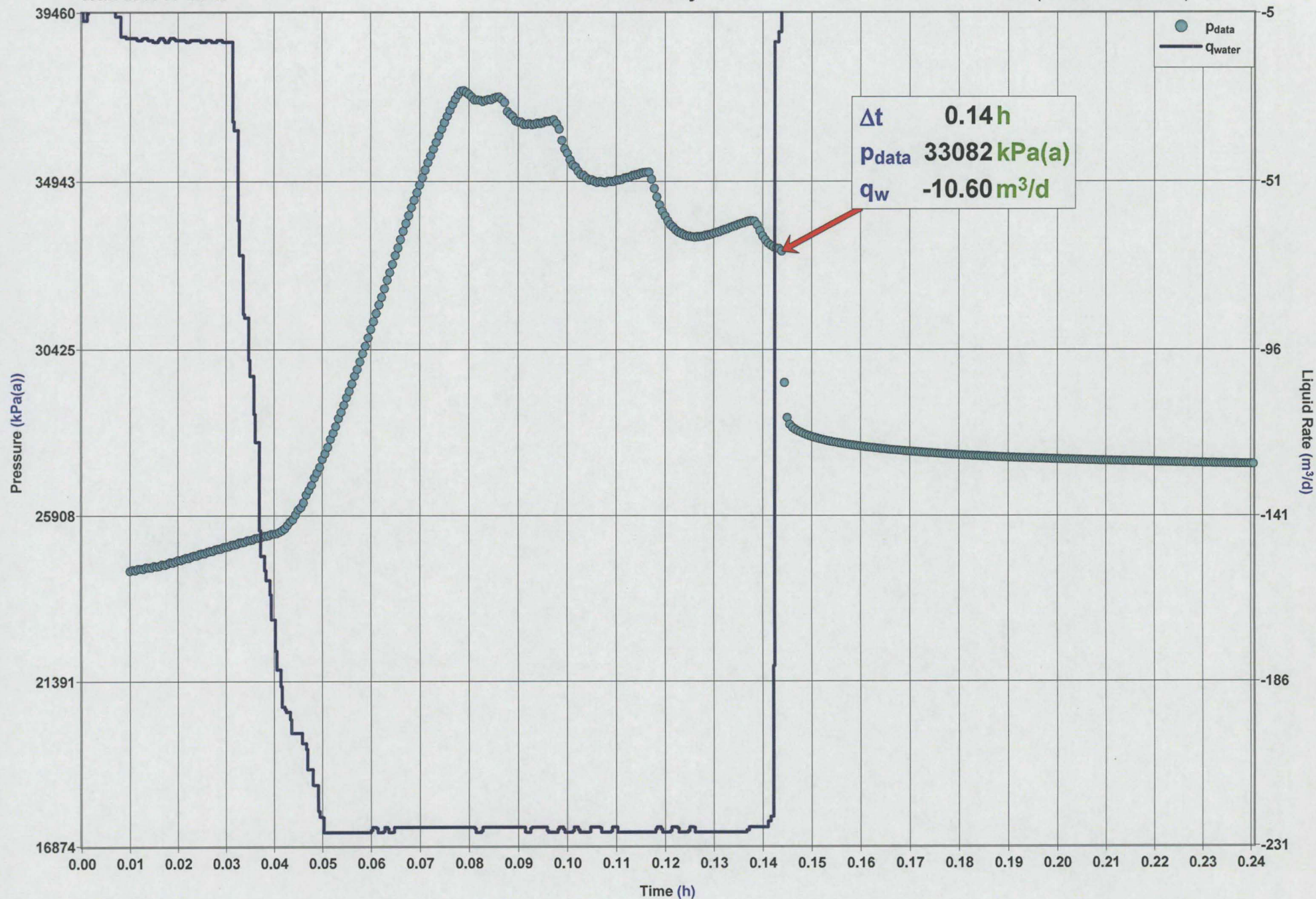
Basal Lower Canol (2059 - 2060 mKB)
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 History

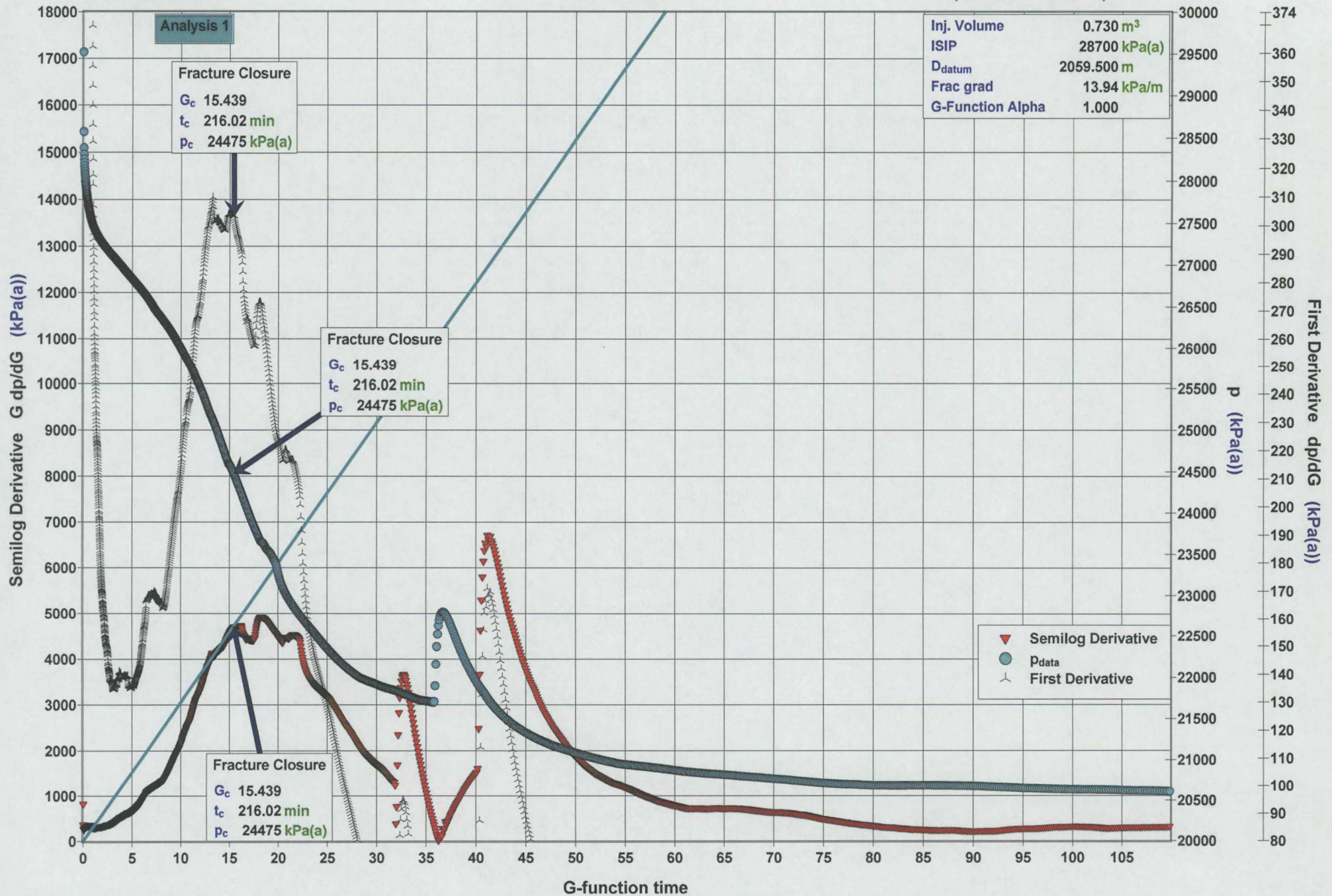
Basal Lower Canol (2059 - 2060 mKB)
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 G-Function

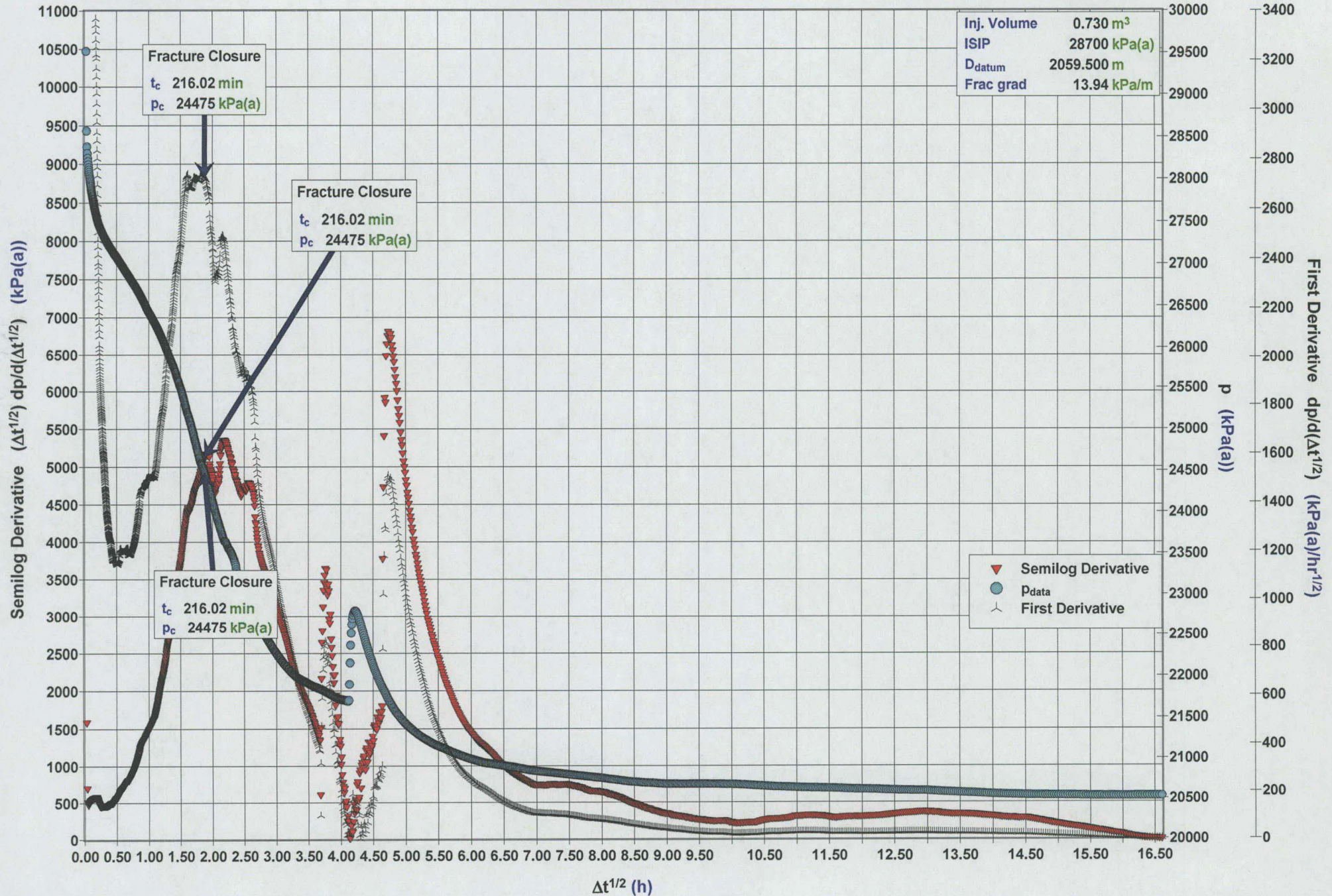
Basal Lower Canol (2059 - 2060 mKB)
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 MiniFrac Sqrt(t)

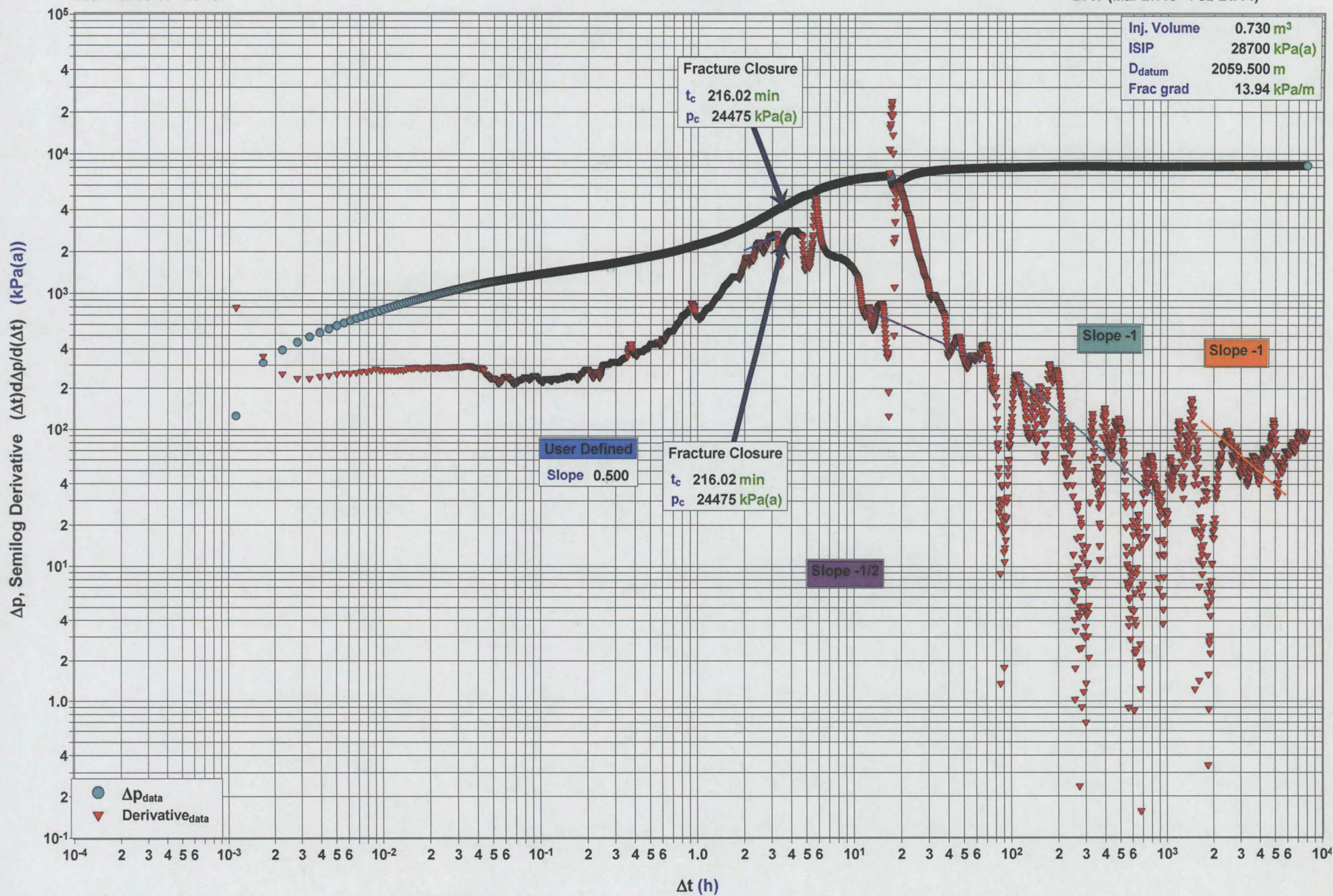
Basal Lower Canol (2059 - 2060 mKB)
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

PCA Diagnostic 1 Derivative

Basal Lower Canol (2059 - 2060 mKB)
DFIT (Mar 27/13 - Feb 21/14)



PCA Diagnostic 1

Input Data

Injected Volume 0.730 m³
Datum Depth 2059.500 m

Results

ISIP 28700 kPa(a)
Fracture Gradient 13.94 kPa/m

Closure Marker 1

Closure time (t_c) 3.6003 h
Closure pressure (p_c) 24475 kPa(a)
Net Frac Press (Δp_{net}) 4225 kPa
G-Function at Closure (G_c) 15.439
Fluid Efficiency (η) 88.53 %

Closure Marker 2

Closure time (t_c) 3.6003 h
Closure pressure (p_c) 24475 kPa(a)
Net Frac Press (Δp_{net}) 4225 kPa
G-Function at Closure (G_c) 15.439
Fluid Efficiency (η) 88.53 %

Fluid Properties

Oil Gravity (γ_o) 49.9 °API
Bubble Point Pressure (p_{bp}) 20451 kPa(a)
Oil Formation Volume Factor (B_o) 1.571
Oil Viscosity (μ_o) 0.2483 mPa.s
Oil Compressibility (c_o) 3.1887e-06 1/kPa
Solution Gas Ratio (R_s) 168.60 m³/m³

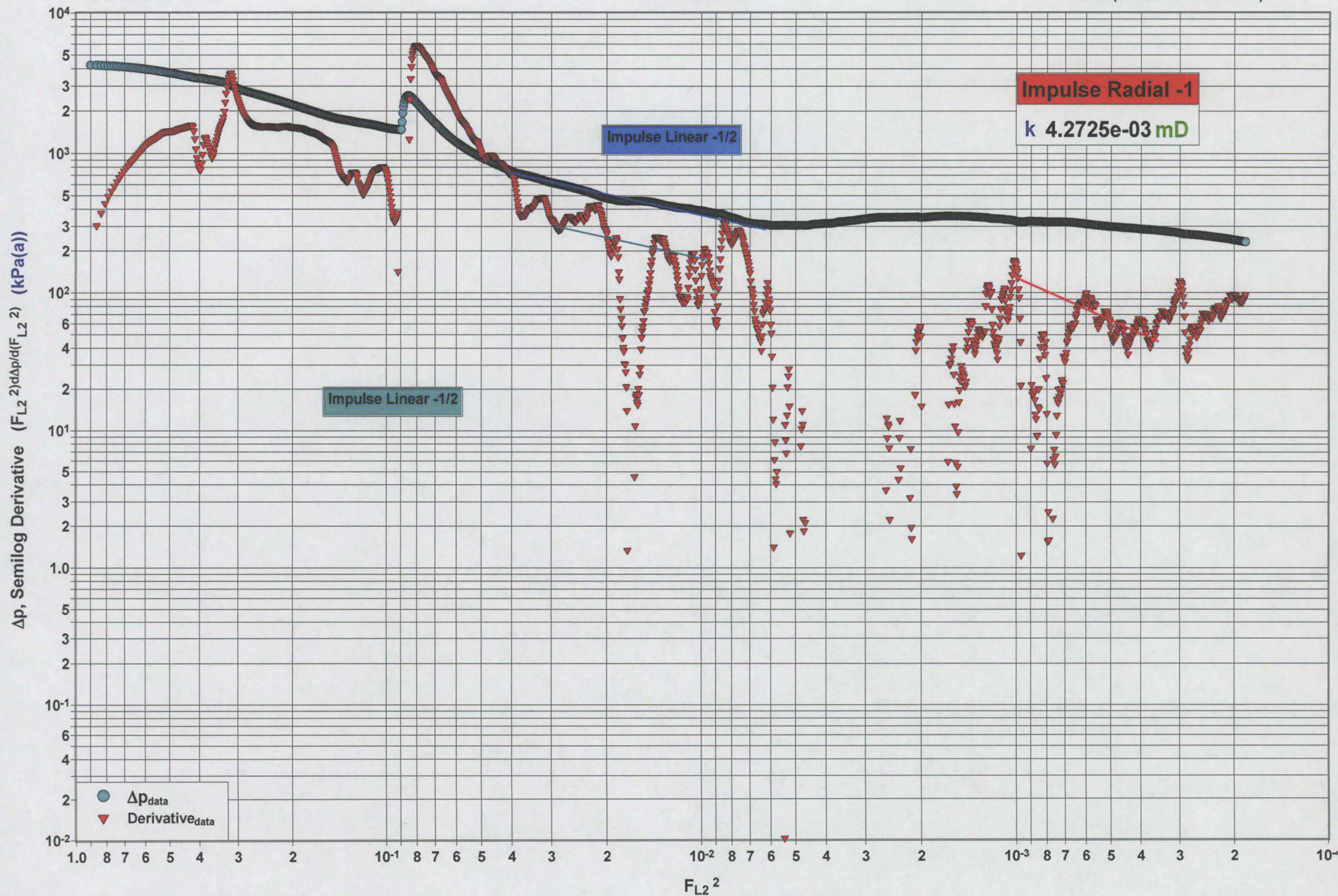
Reservoir Properties

Reservoir Temperature (T_{resv}) 90.0 °C
Reservoir Pressure (p_{resv}) 20458 kPa(a)

COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Derivative

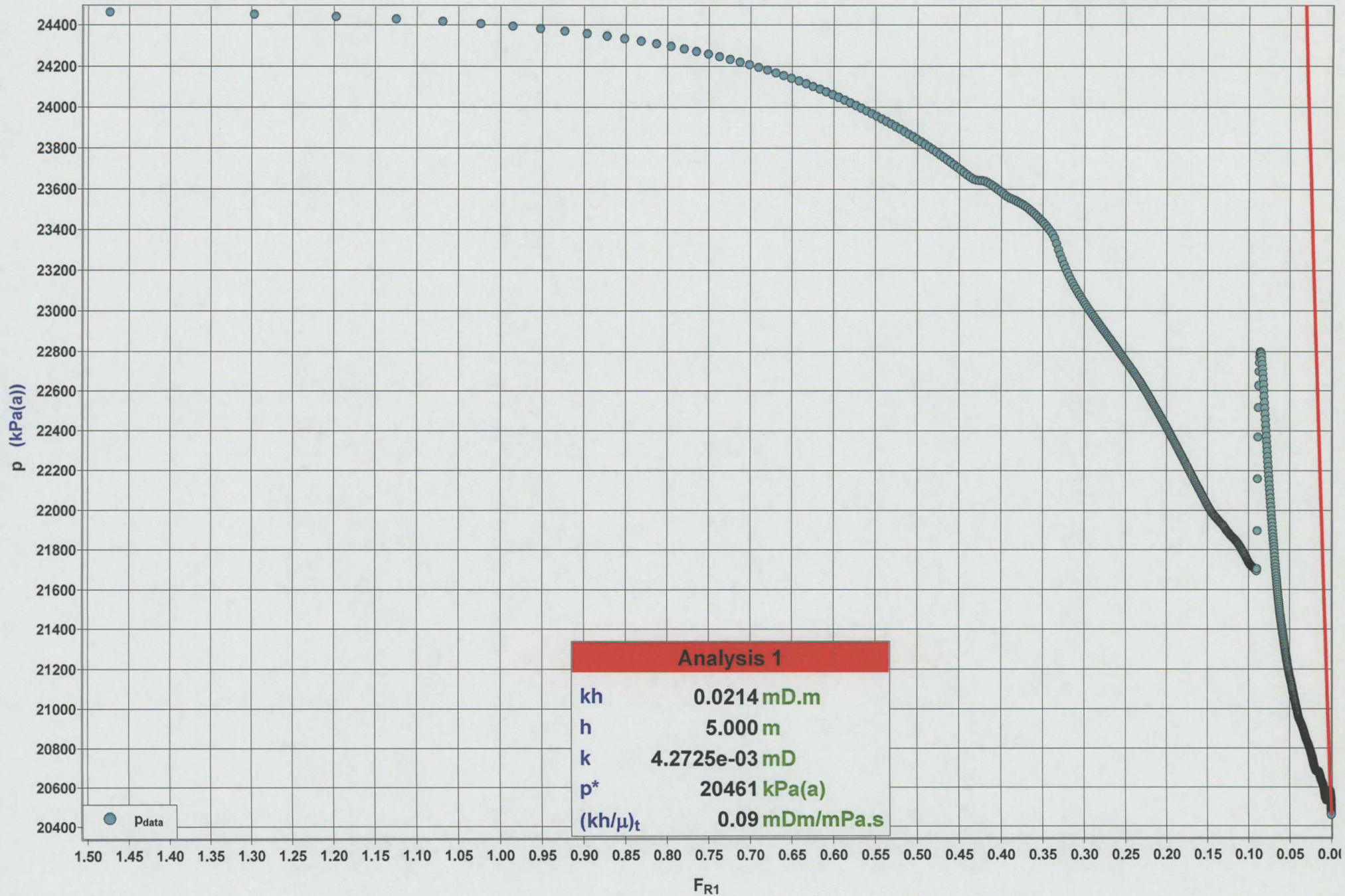
Basal Lower Canol (2059 - 2060 mKB)-
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1
Minifrac Radial (Nolte)

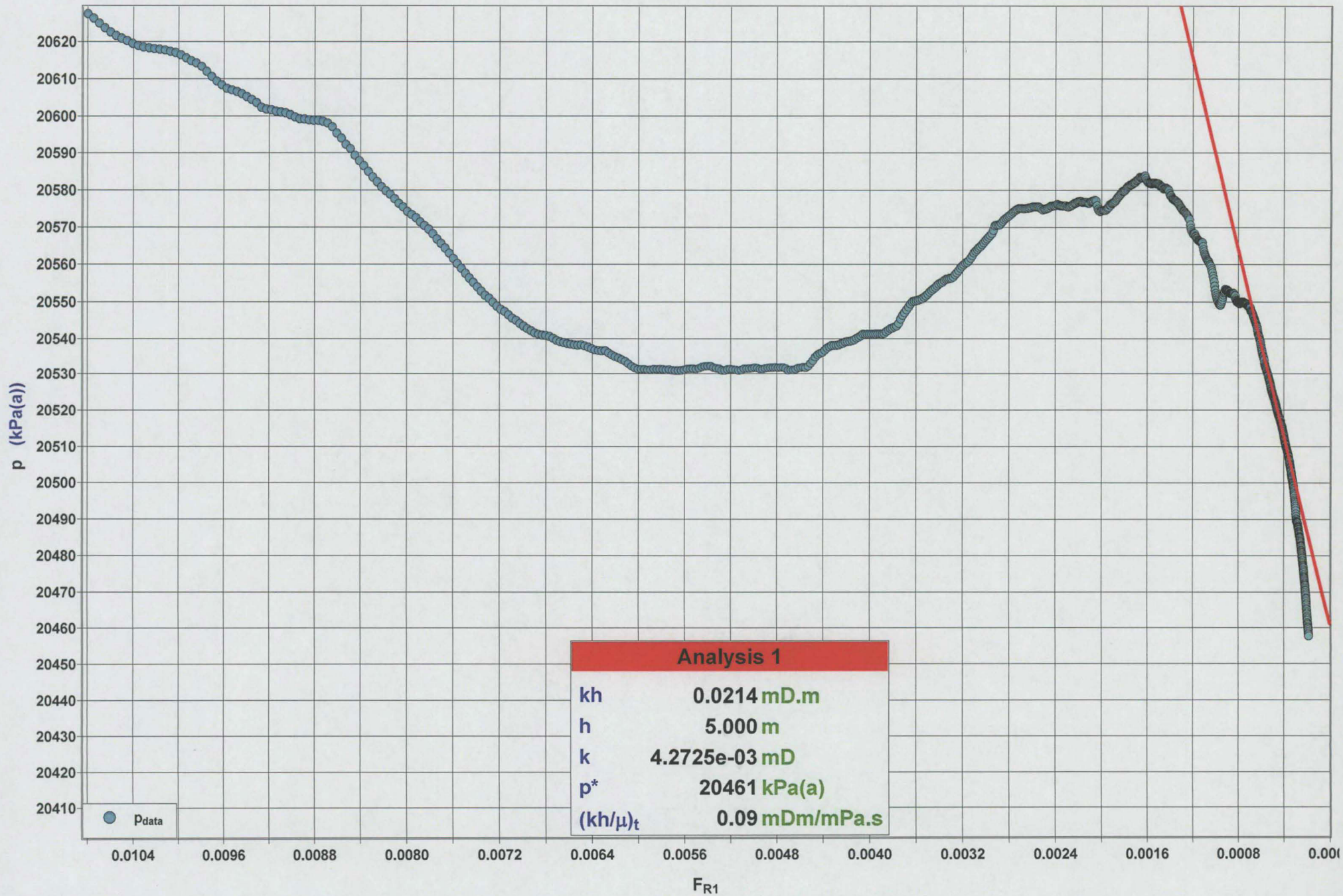
Basal Lower Canol (2059 - 2060 mKB) -
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Nolte ACA 1 Minifrac Radial (Nolte)

Basal Lower Canol (2059 - 2060 mKB) ·
DFIT (Mar 27/13 - Feb 21/14)



Nolte ACA 1

Linear Analysis (FL)

Flow Capacity (kh)	mD.m
Effective Permeability (k)	mD
Extrapolated Pressure (p*)	20225 kPa(a)
Closure Pressure (pc)	kPa(a)
Reservoir Leakoff Coefficient (CR)	m/min ^{1/2}
Total Leakoff Coefficient (CT)	m/min ^{1/2}

Radial Analysis (FR)

Flow Capacity (kh)	0.0214 mD.m
Effective Permeability (k)	4.2725e-03 mD
Extrapolated Pressure (p*)	20461 kPa(a)

Input Parameters

Estimated Initial Pressure (p _i)	20225 kPa(a)
Closure time (t _c)	216.02 min

Fluid Properties

Oil Gravity (γ_o)	49.9 °API
Bubble Point Pressure (p _{bp})	20451 kPa(a)
Oil Formation Volume Factor (B _o)	1.571
Oil Viscosity (μ_o)	0.2483 mPa.s
Oil Compressibility (c _o)	3.1887e-06 1/kPa
Solution Gas Ratio (R _s)	168.60 m ³ /m ³

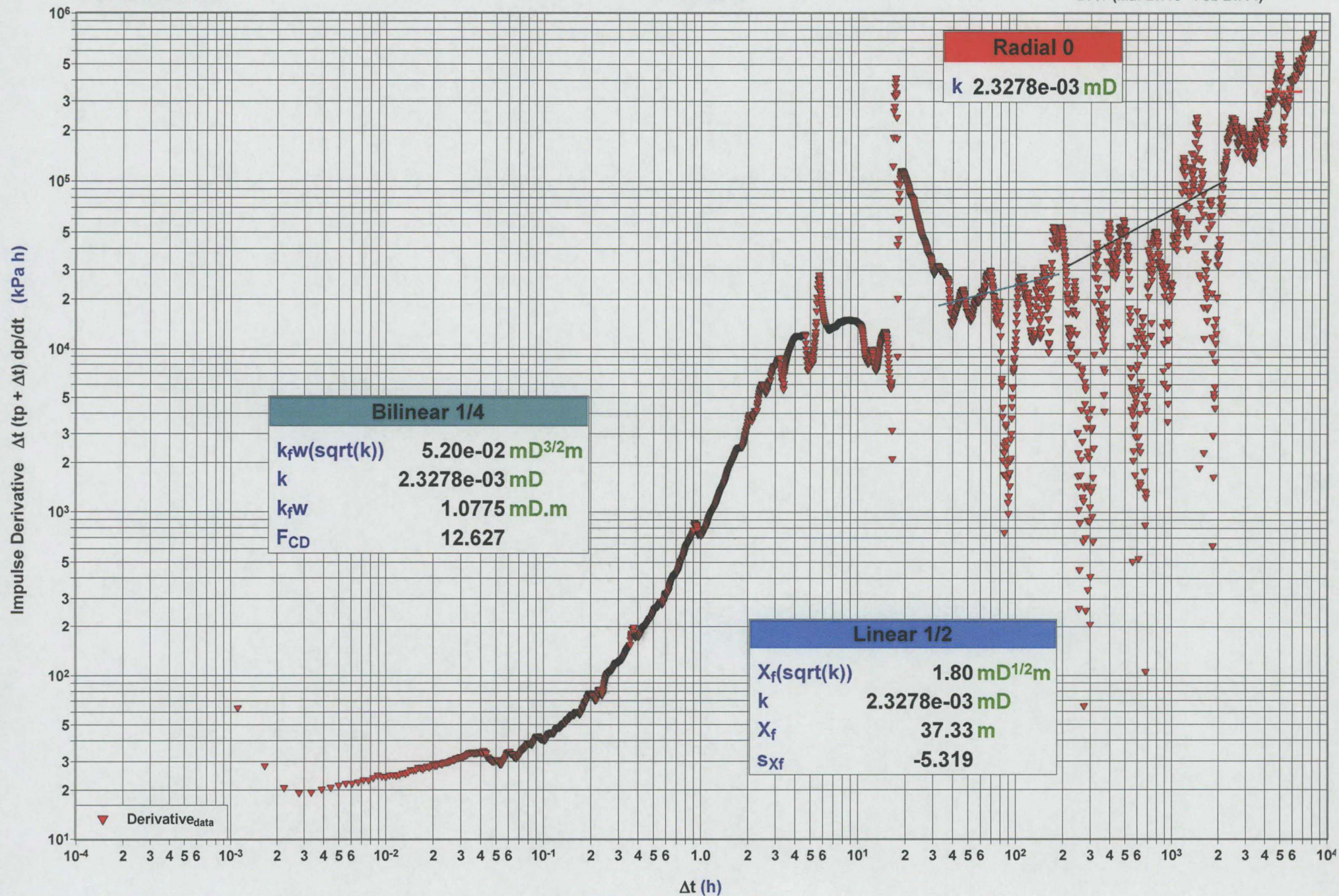
Reservoir Properties

Reservoir Temperature (T _{resv})	90.0 °C
Reservoir Pressure (p _{resv})	20458 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (ϕ_t)	15.00 %
Gas Saturation (S _g)	0.00 %
Oil Saturation (S _o)	92.00 %
Water Saturation (S _w)	8.00 %
Formation Compressibility (c _f)	5.9600e-07 1/kPa
Total Compressibility (c _t)	3.5652e-06 1/kPa

COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1 Derivative

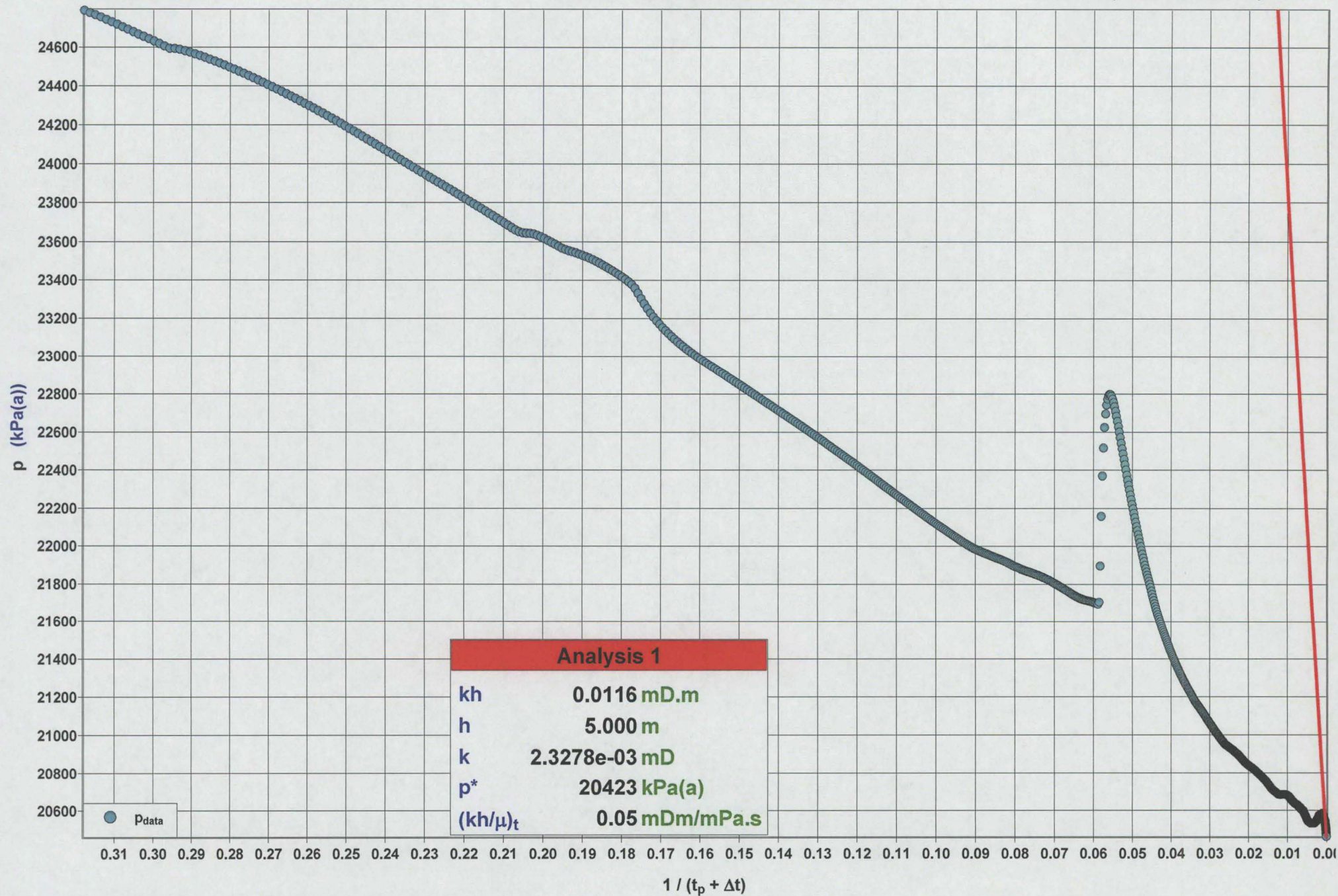
Basal Lower Canol (2059 - 2060 mKB) *
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Minifrac Radial (Soliman-Craig)

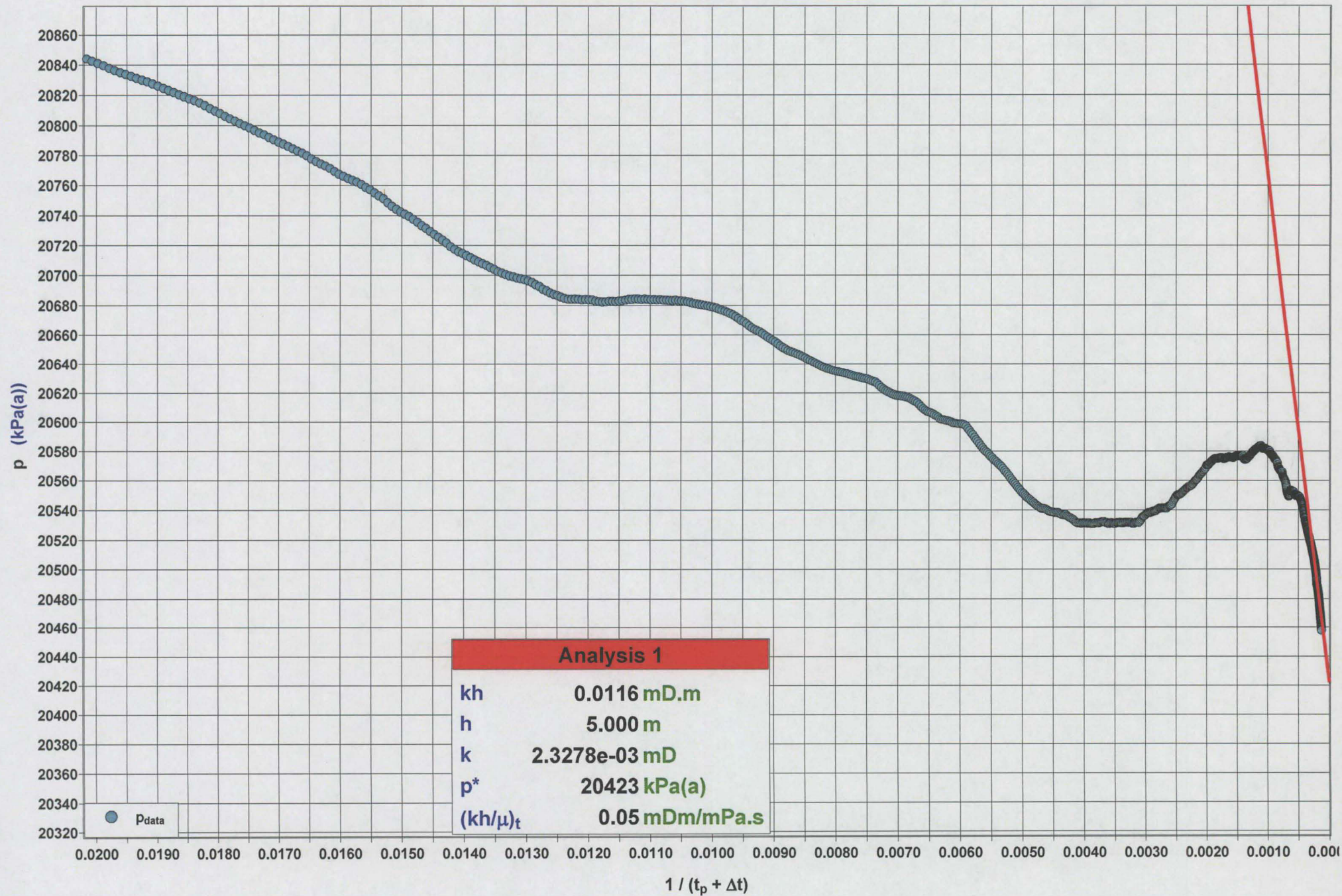
Basal Lower Canol (2059 - 2060 mKB)
DFIT (Mar 27/13 - Feb 21/14)



COPRC Mirror Lake
300/N-20 65-00 126-45

Soliman/Craig ACA 1
Minifrac Radial (Soliman-Craig)

Basal Lower Canol (2059 - 2060 mKB)*
DFIT (Mar 27/13 - Feb 21/14)



Soliman/Craig ACA 1

Linear Analysis

$X_f(\sqrt{k})$	1.80 mD ^{1/2} m
Fracture Half-Length (X_f)	37.334 m
Effective Permeability (k)	2.3278e-03 mD
Skin Equivalent to X_f (S_{xf})	-5.319

Radial Analysis

Flow Capacity (kh)	0.0116 mD.m
Effective Permeability (k)	2.3278e-03 mD
Extrapolated Pressure (p^*)	20423 kPa(a)

Fluid Properties

Oil Gravity (γ_o)	49.9 °API
Bubble Point Pressure (p_{bp})	20451 kPa(a)
Oil Correlation	Vasquez and Beggs
Oil Viscosity Correlation	Beggs & Robinson
Solution Gas Ratio (R_s)	168.60 m ³ /m ³
Oil Viscosity (μ_o)	0.2483 mPa.s
Oil Compressibility (c_o)	3.1887e-06 1/kPa
Oil Formation Volume Factor (B_o)	1.571

Reservoir Properties

Reservoir Temperature (T_{resv})	90.0 °C
Reservoir Pressure (p_{resv})	20458 kPa(a)
Net Pay (h)	5.000 m
Total Porosity (ϕ_t)	15.00 %
Gas Saturation (S_g)	0.00 %
Oil Saturation (S_o)	92.00 %
Water Saturation (S_w)	8.00 %
Formation Compressibility (c_f)	5.9600e-07 1/kPa
Total Compressibility (c_t)	3.5652e-06 1/kPa