P-05-222

Oskarshamn site investigation

Hydraulic injection tests in borehole KLX05, 2005

Subarea Laxemar

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December 2005

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Keywords: Site/project, Hydrogeology, Hydraulic tests, Injection test, Hydraulic parameters, Transmissivity, Constant head.

Abstract

Hydraulic injection tests have been performed in Borehole KLX05 at the Laxemar area, Oskarshamn. The tests are part of the general program for site investigations and specifically for the Laxemar subarea. The hydraulic testing programme has the aim to characterise the rock with respect to its hydraulic properties of the fractured zones and rock mass between them. Data is subsequently delivered for the site descriptive model.

This report describes the results and primary data evaluation of the hydraulic injection tests in borehole KLX05 performed between 1st of June and 17th of June 2005.

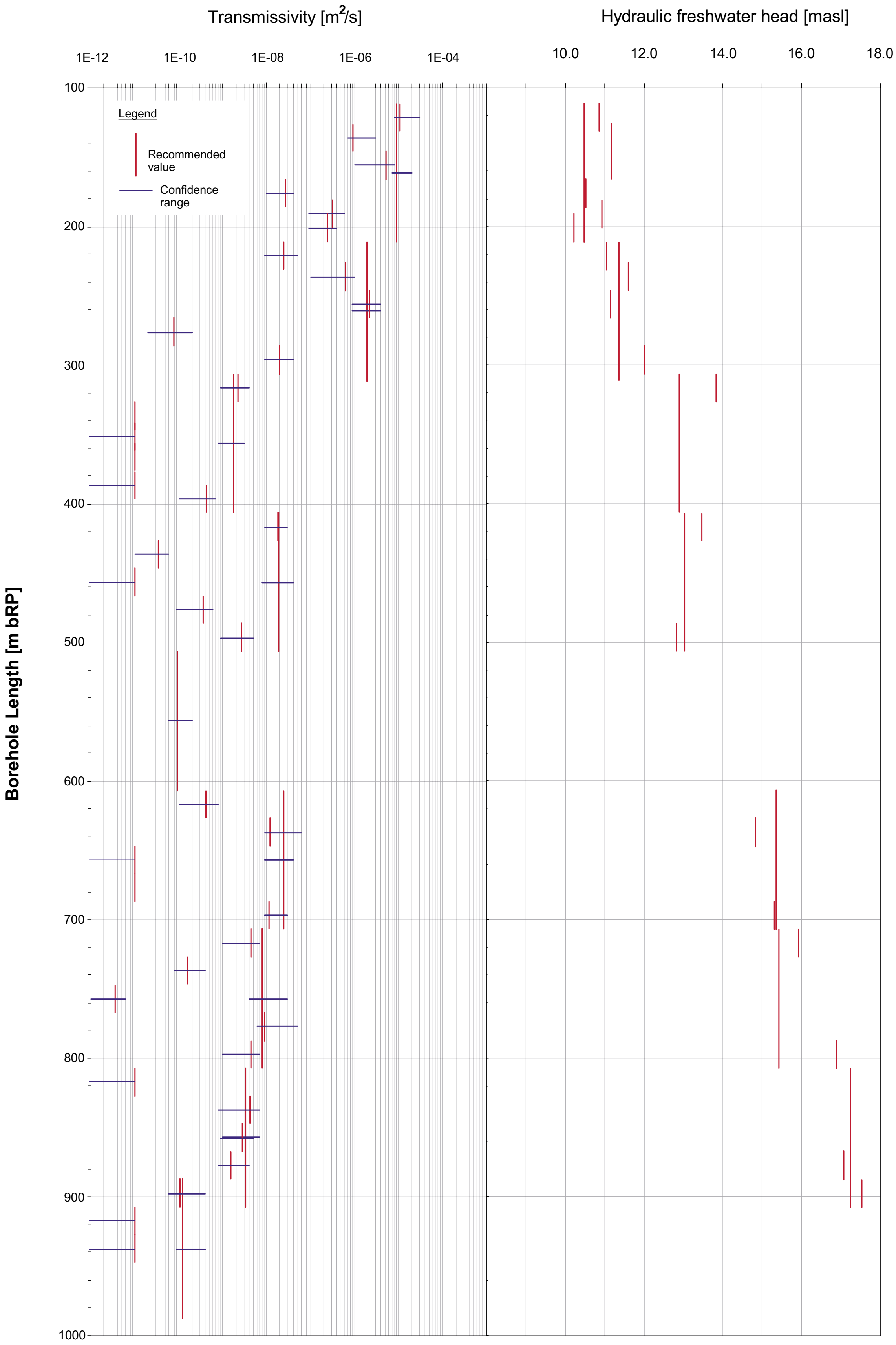
The objective of the hydrotests was to describe the rock around the borehole with respect of hydraulic parameters, mainly transmissivity (T) and hydraulic conductivity (K) at different measurement scales of 100 m and 20 m sections. Transient evaluation during flow and recovery period provided additional information such as flow regimes, hydraulic boundaries and cross-over flows. Constant pressure injection tests were conducted between 111.30–947.34 m below ToC. The results of the test interpretation are presented as transmissivity, hydraulic conductivity and hydraulic freshwater head.

Sammanfattning

Injektionstester har utförts i borrhål KLX05 i delområde Laxemar, Oskarshamn. Testerna är en del av SKB:s platsundersökningar. Hydraultestprogrammet där injektionstesterna ingår har som mål att karakterisera berget med avseende på dess hydrauliska egenskaper av sprickzoner och mellanliggande bergmassa. Data från testerna används vid den platsbeskrivande modelleringen av området.

Denna rapport redovisar resultaten och utvärderingar av primärdata de hydrauliska injektionstesterna i borrhål KLX05. Testerna utfördes mellan den 1 juni till den 17 juni 2005.

Syftet med hydraultesterna var framförallt att beskriva bergets hydrauliska egenskaper runt borrhålet med avseende på hydrauliska parametrar, i huvudsak transmissvitet (T) och hydraulisk konduktivitet (K) vid olika mätskalor av 100 m och 20 m sektioner. Transient utvärdering under injektions- och återhämntningsfasen gav ytterligare information avseende flödesgeometri, hydrauliska gränser och sprickläckage. Injektionstester utfördes mellan 111,30–947,34 m borrhålslängd. Resultaten av testutvärderingen presenteras som transmissivitet, hydraulisk konduktivitet och grundvattennivå uttryckt i ekvivalent sötvattenpelare (freshwater head).



Borehole KLX05 – Summary of results.

Contents

1 Introduction

A general program for site investigations presenting survey methods has been prepared /SKB 2001a/, as well as a site-specific program for the investigations in the Simpevarp area /SKB 2001b/. The hydraulic injection tests form part of the site characterization program under item 1.1.5.8 in the work breakdown structure of the execution programme, /SKB 2002/.

Measurements were carried out in borehole KLX05 during 1st of June and 17th of June 2005 following the methodology described in SKB MD 323.001 and in the activity plan AP PS 400-05-043 (SKB controlling documents). Data and results were delivered to the SKB site characterization database SICADA.

The hydraulic testing programme has the aim to characterise the rock with respect to its hydraulic properties of the fractured zones and rock mass between them. This report describes the results and primary data evaluation of the hydraulic injection tests in borehole KLX05. The commission was conducted by Golder Associates AB and Golder Associates GmbH.

Borehole KLX05 is situated in the Laxemar area approximately 2 km west of the nuclear power plant of Simpevarp, Figure 1-1. The borehole was drilled from August 2004 to January 2005 at 1,000.16 m length with an inner diameter of 76 mm and an inclination of approximately –65°. The upper 12.60 m is cased with large diameter telescopic casing ranging from diameter (outer diameter) 208–323 mm.

The work was carried out in accordance with activity plan AP PS 400-05-043. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents. Measurements were conducted utilising SKB's custom made testing equipment PSS2.

Table 1-1. Controlling documents for the performance of the activity.

Activity plan	Number	Version
Test pumping and hydraulic injection tests in borehole KLX05	AP PS 400-05-043	1.0
Method descriptions	**Number**	**Version**
Analysis of injection and single-hole pumping tests	SKB MD 320.004e	1.0
Hydraulic injection tests	SKB MD 323.001	1.0
Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning	SKB MD 600.004	1.0
Instruktion för längdkalibrering vid undersökningar i kärnborrhål	SKB MD 620.010	1.0
Allmänna ordning-, skydds- och miljöregler för platsundersökningar Oskarshamn	SKB SDPO-003	1.0
Miljökontrollprogram Platsundersökningar	SKB SDP-301	1.0
Hantering av primärdata vid platsundersökningar	SKB SDP-508	1.0

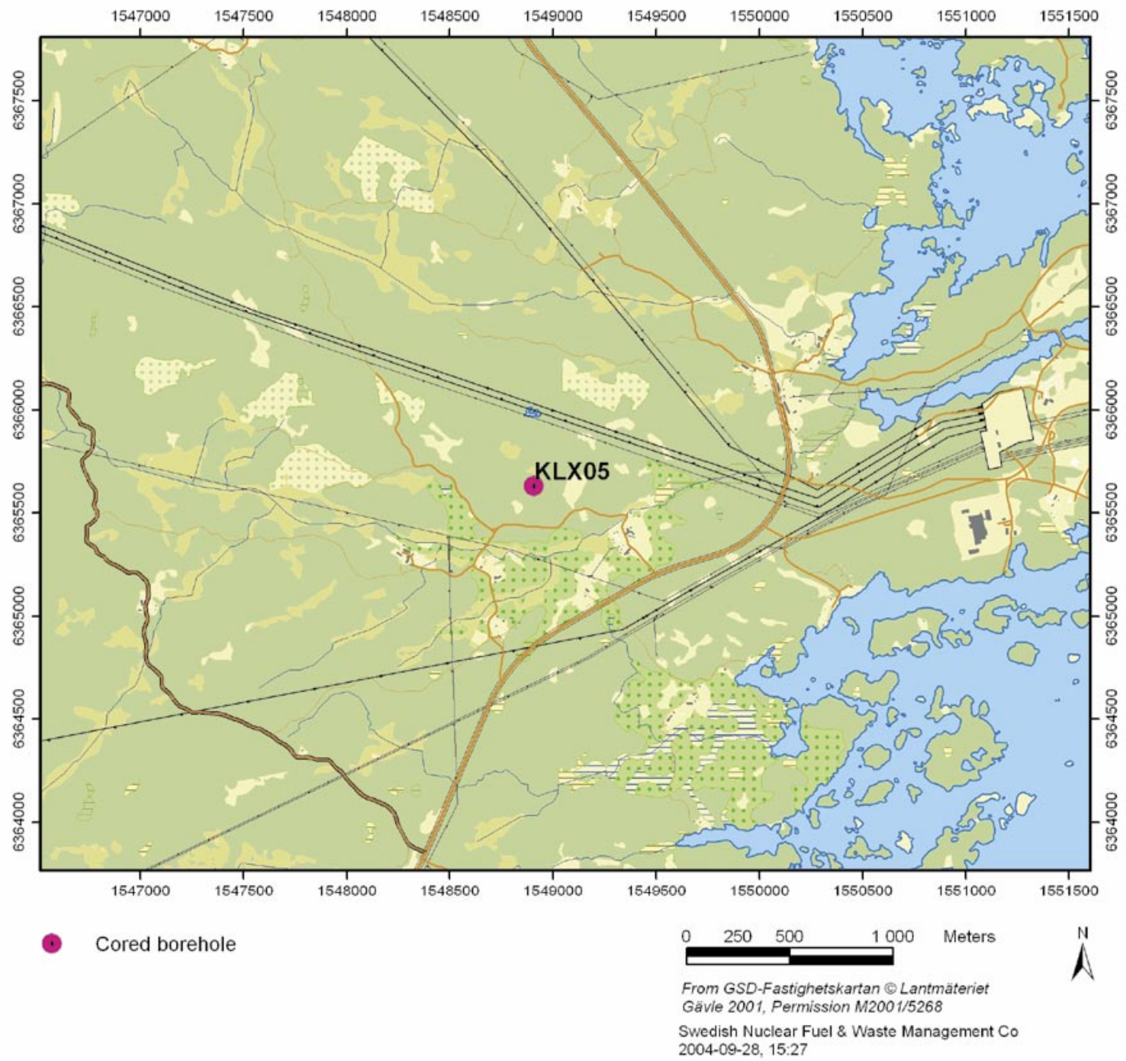


Figure 1-1. *The investigation area Laxemar, Oskarshamn with location of borehole KLX05.*

2 Objective

The objective of the hydrotests in borehole KLX05 is to describe the rock around the borehole with respect to hydraulic parameters, mainly transmissivity (T) and hydraulic conductivity (K). This is done at different measurement scales of 100 m and 20 m sections. Among these parameters transient evaluation during the flow and recovery period provides additional information such as flow regimes, hydraulic boundaries and cross-over flows.

3 Scope of work

The scope of work consisted of preparation of the PSS2 tool which included cleaning of the down-hole tools, calibration and functional checks, injection tests of 100 m and 20 m test sections, analyses and reporting.

Preparation for testing was done according to the Quality plan. This step mainly consists of functions checks of the equipment to be used, the PSS2 tool. Calibration checks and function checks were documented in the daily log and/or relevant documents.

The following hydraulic injection tests were performed between 1st June and 17th June 2005.

Table 3-1. Performed injection tests at borehole KLX05.

No of injection tests	Interval	Positions	Time/test	Total test time
9	100 m	111.30–987.27 m	125 min	18.8 hrs
39*	20 m	111.30–947.34 m	90 min	58.5 hrs
Total				77.3 hrs

* excluding repeated tests.

The initially planned 20 m tests between 947 and 987 m were not performed due to the response of the section below at the test from 927.34–947.34 m bToC. The response showed clearly, that this part of the borehole is very tight and below the rated measurement limit of the testing system. This was approved by SKB.

3.1 Borehole

The borehole is telescope drilled with specifications on its construction according to Table 3-2. The reference point of the borehole is the centre of top of casing (ToC), given as elevation in table below. The Swedish National coordinate system (RT90) is used in the x-y direction and RHB70 in the z-direction. Northing and Easting refer to the top of the boreholes at the ground surface. The borehole diameter in Table 3-2 refers to the final diameter of the drill bit after drilling to full depth.

Table 3-2. Information about KLX05 (from SICADA 2005-05-18 09:11:01).

Title	Value				
Borehole length (m):	1,000.160				
Drilling period (s):	From date	To date	Secup (m)	Seclow (m)	Drilling type
	2004-08-11	2004-08-25	0.000	100.300	Percussion drilling
	2004-10-01	2005-10-22	100.300	1,000.160	Core drilling
Starting point coordinate:	Length (m)	Northing (m)	Easting (m)	Elevation (masl)	Coord system
(centerpoint of TOC)	0.000	6365632.555	1548909.477	17.538	RT38-RH00 Transformed
	0.000	6365633.374	1548909.431	17.608	RT90-RHB70 Measured
	0.000	5660.073	–775.586	17.580	ÄSPÖ96 Transformed
Angles:	Length (m)	Bearing	Inclination (– = down)		
	0.000	189.721	–65.120		RT90-RHB70
Borehole diameter:	Secup (m)	Seclow (m)	Hole Diam (m)		
	0.000	12.600	0.343		
	12.600	15.000	0.230		
	15.000	75.100	0.195		
	75.100	76.480	0.086		
	76.480	1,000.160	0.076		
Core diameter:	Secup (m)	Seclow (m)	Core diam (m)		
	75.100	76.480	0.072		
	76.480	1,000.160	0.050		
Casing diameter:	Secup (m)	Seclow (m)	Case in (m)	Case out (m)	
	0.000	15.000	0.220	0.208	
	0.000	12.600	0.310	0.323	
Cone dimensions:	Secup (m)	Seclow (m)	Cone in (m)	Cone out (m)	
	70.950				
Grove milling:	Length (m)	Trace detectable			
	110.000	YES			
	150.000	YES			
	200.000	YES			
	250.000	YES			
	300.000	YES			
	350.000	YES			
	399.000	YES			
	450.000	YES			
	500.000	YES			
	550.000	YES			
	600.000	YES			
	650.000	YES			
	700.000	YES			
	750.000	YES			
	800.000	YES			
	850.000	YES			
	900.000	YES			

During the 20 m testing campaign, the markers were not detected due to malfunctioning caliper sensor. Length correction was made with marker values detected during the 100 m testing!

3.2 Injection tests

Injection tests were conducted according to the Activity Plan AP PS 400-05-043 and the method description for hydraulic injection tests, SKB MD 323.001 (SKB internal documents). Tests were done in 100 m test sections between 111.30–987.27 m below ToC and in 20 m test sections between 111.30–947.37 m below ToC (see Table 3-3). The initial criteria for performing injection tests in 20 m test sections was a measurable flow of Q > 0.001 L/min in the previous measured 100 m tests covering the smaller 20 m sections (see Figure 3-1). The measurements were performed with SKBs custom made equipment for hydraulic testing called PSS2.

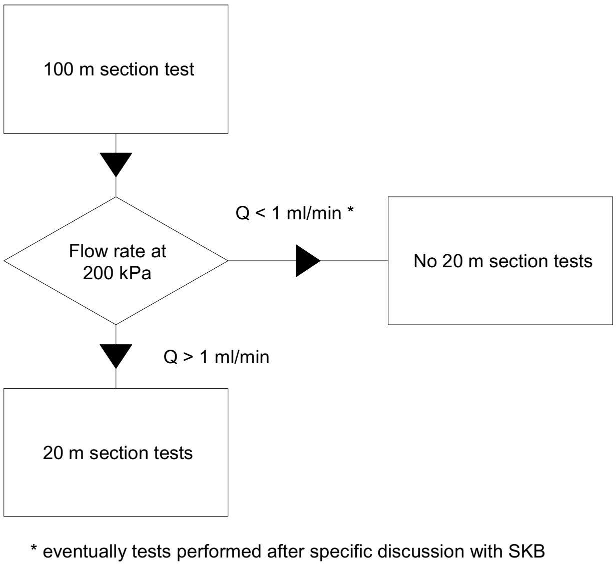


Figure 3-1. *Flow chart for test sections.*

Table 3-3. Tests performed.

Bh ID	Test section (m bToC)	Test type[1]	Test no	Test start date, time	Test stop date, time
KLX05	111.30–211.30	3	1	2005.06.01 17:37	2005.06.01 21:07
KLX05	211.14–311.14	3	1	2005.06.02 09:21	2005.06.02 11:45
KLX05	306.37–406.37	3	1	2005.06.02 13:30	2005.06.02 16:22
KLX05	406.54–506.54	3	1	2005.06.02 17:49	2005.06.02 23:32
KLX05	506.63–606.63	4	1	2005.06.03 09:11	2005.06.03 11:11
KLX05	606.82–706.82	3	1	2005.06.03 12:41	2005.06.03 15:26
KLX05	706.83–806.83	3	1	2005.06.03 16:56	2005.06.04 00:46
KLX05	807.11–907.11	3	1	2005.06.04 09:20	2005.06.04 12:18
KLX05	887.27–987.27	3	1	2005.06.04 14:00	2005.06.04 17:10
KLX05	111.30–131.30	3	1	2005.06.09 19:46	2005.06.09 22:00
KLX05	111.30–131.30	3	2	2005.06.10 13:12	2005.06.10 14:40
KLX05	126.02–146.02	3	1	2005.06.10 15:35	2005.06.10 17:02
KLX05	146.10–166.10	3	1	2005.06.10 17:47	2005.06.10 20:20
KLX05	166.12–186.12	3	1	2005.06.11 08:54	2005.06.11 10:27
KLX05	181.13–201.13	3	1	2005.06.11 11:14	2005.06.11 13:04
KLX05	191.14–201.14	3	1	2005.06.11 13:38	2005.06.11 15:11
KLX05	211.14–231.14	3	1	2005.06.11 15:55	2005.06.11 17:23
KLX05	226.14–246.14	3	1	2005.06.11 18:10	2005.06.11 19:59
KLX05	246.15–266.15	3	1	2005.06.12 08:10	2005.06.12 09:44
KLX05	266.21–286.21	4	1	2005.06.12 10:21	2005.06.12 11:49
KLX05	286.28–306.28	3	1	2005.06.12 12:29	2005.06.12 13:58
KLX05	306.37–326.37	3	1	2005.06.12 14:39	2005.06.12 16:22
KLX05	326.38–346.38	4	1	2005.06.12 17:03	2005.06.12 18:05
KLX05	341.40–361.40	3	1	2005.06.12 18:38	2005.06.12 19:40
KLX05	356.42–376.42	3	1	2005.06.13 07:26	2005.06.13 08:31
KLX05	376.47–396.47	3	1	2005.06.13 09:17	2005.06.13 10:23
KLX05	386.50–406.50	4	1	2005.06.13 11:00	2005.06.13:12:27
KLX05	406.54–426.54	3	1	2005.06.13 13:04	2005.06.13 14:46
KLX05	426.55–446.55	4	1	2005.06.13 15:32	2005.06.13 16:53
KLX05	446.57–466.57	3	1	2005.06.13 17:33	2005.06.13 18:38
KLX05	466.58–486.58	4	1	2005.06.13 19:13	2005.06.14 01:56
KLX05	486.59–506.59	3	1	2005.06.14 07:40	2005.06.14 09:27
KLX05	606.82–626.82	4	1	2005.06.14 11:09	2005.06.14 12:33
KLX05	626.85–646.85	3	1	2005.06.14 13:16	2005.06.14 15:26
KLX05	646.85–666.85	3	1	2005.06.14 16:07	2005.06.14 17:12
KLX05	666.85–686.85	3	1	2005.06.14 17:56	2005.06.14 18:57
KLX05	686.83–706.83	3	1	2005.06.14 19:48	2005.06.15 00:58
KLX05	706.83–726.83	3	1	2005.06.15 08:02	2005.06.15 09:58
KLX05	726.91–746.91	4	1	2005.06.15 10:40	2005.06.15 11:52
KLX05	747.00–767.00	4	1	2005.06.15 12:45	2005.06.15 14:11
KLX05	767.06–787.06	3	1	2005.06.15 14:50	2005.06.15 16:25
KLX05	787.07–807.07	3	1	2005.06.15 17:07	2005.06.16 01:36
KLX05	807.11–827.11	3	1	2005.06.16 08:05	2005.06.16 09:07
KLX05	827.15–847.15	3	1	2005.06.16 09:52	2005.06.16 12:29
KLX05	847.20–867.20	3	1	2005.06.16 13:09	2005.06.16 00:00
KLX05	867.24–887.24	3	1	2005.06.16 15:39	2005.06.16 17:25
KLX05	887.27–907.27	3	1	2005.06.16 18:07	2005.06.17 03:30
KLX05	907.30–927.30	4	1	2005.06.17 07:33	2005.06.17 08:27
KLX05	927.34–947.34	3	1	2005.06.17 09:13	2005.06.17 10:14

[1] 1: 3: Injection test; 4: Pulse injection test.

No other additional measurements except the actual hydraulic tests and related measurements of packer position and water level in annulus of borehole KLX05 were conducted.

3.3 Control of equipment

Control of equipment was mainly performed according to the Quality plan. The basis for equipment handling is described in the "Mätssystembeskrivning" SKB MD 345.101–123 which is composed of two parts 1) management description, 2) drawings and technical documents of the modified PSS2 tool.

Function checks were performed before and during the tests. Among these pressure sensors were checked at ground level and while running in the hole calculated to the static head. Temperature was checked at ground level and while running in. Leakage checks at joints in the pipe string were done at least every 100 m of running in.

Any malfunction was recorded, and measures were taken accordingly for proper operation. Approval was made according to SKB site manager, or Quality plan and the "Mätssystembeskrivning".

4 Equipment

4.1 Description of equipment

The equipment called PSS2 (Pipe String System 2) is a highly integrated tool for testing boreholes at great depth (see conceptual drawing in the next figure). The system is built inside a container suitable for testing at any weather. Briefly, the components consists of a hydraulic rig, down-hole equipment including packers, pressure gauges, shut-in tool and level indicator, racks for pump, gauge carriers, breakpins, etc shelfs and drawers for tools and spare parts.

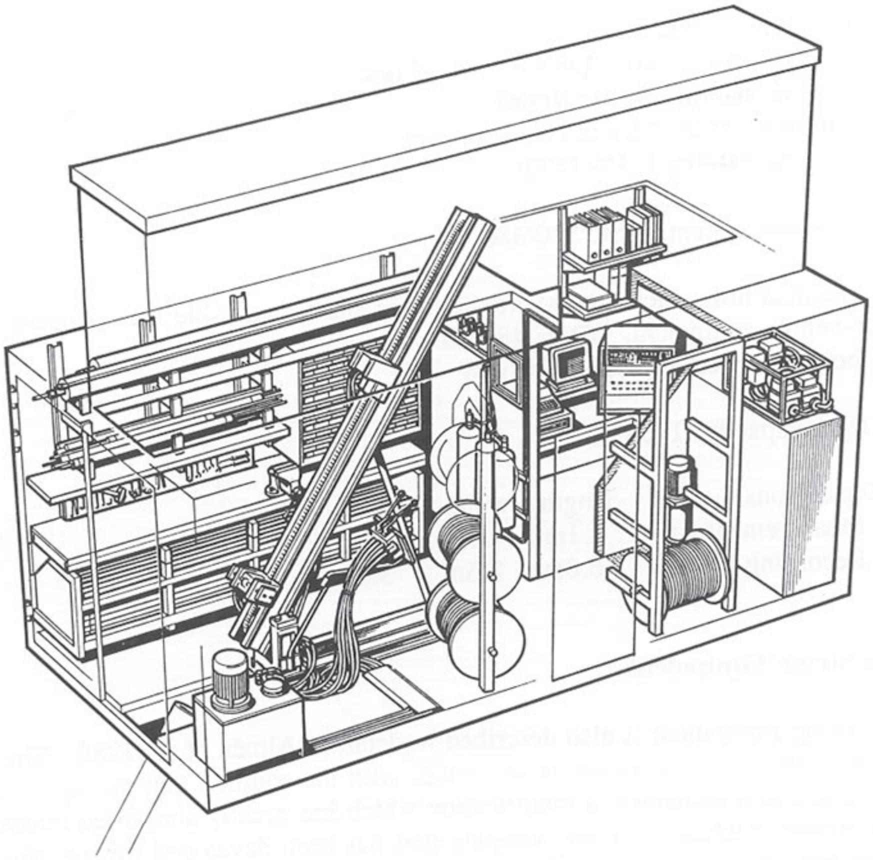


Figure 4-1. *A view of the layout and equipment of PSS2.*

There are three spools for a multi-signal cable, a test valve hose and a packer inflation hose. There is a water tank for injection purposes, pressure vessels for injection of packers, to open test valve and for low flow injection. The PSS2 has been upgraded with a computerized flow regulation system. The office part of the container consists of a computer, regulation valves for the nitrogen system, a 24 V back-up system in case of power shut-offs and a flow regulation board.

PSS2 is documented in photographs 1–6.

Photo 1. *Hydraulic rig.*

Photo 2. *Rack for pump, down-hole equipment, workbench and drawers for tools.*

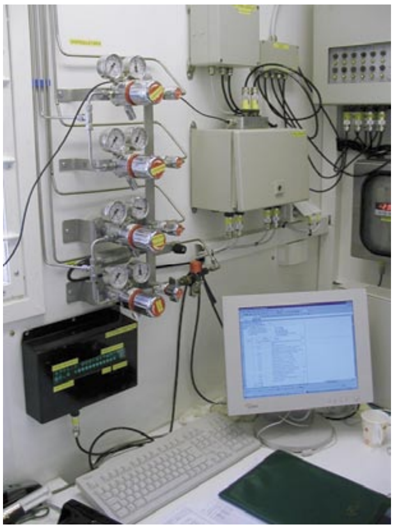


Photo 3. *Computer room, displays and gas regulators.*

Photo 4. *Pressure vessels for test valve, packers and injection.*

Photo 5. *Positioner, bottom end of down-in-hole string.*

Photo 6. *Packer and gauge carrier.*

The down-hole equipment consists from bottom to top of the following equipment:

- Level indicator – SS 630 mm pipe with OD 73 mm with 3 plastic wheels connected to a Hallswitch.
- Gauge carrier – SS 1.5 m carrying bottom section pressure transducer and connections from positioner.
- Lower packer – SS and PUR 1.5 m with OD 72 mm, stiff ends, tightening length 1.0 m, maximum pressure 6.5 MPa, working pressure 1.6 MPa.
- Gauge carrier with breakpin – SS 1.75 m carrying test section pressure transducer, temperature sensor and connections for sensors below. Breakpin with maximum load of 47.3 (± 1.0) kN. The gauge carrier is covered by split pipes and connected to a stone catcher on the top.
- Pop joint – SS 1.0 or 0.5 m with OD 33 mm and ID 21 mm, double O-ring fittings, trapezoid thread, friction loss of 3 kPa/m at 50 L/min.
- Pipe string – SS 3.0 m with OD 33 mm and ID 21 mm, double O-ring fittings, trapezoid thread, friction loss of 3 kPa/m at 50 L/min.
- Contact carrier – SS 1.0 m carrying connections for sensors below.
- Upper packer – SS and PUR 1.5 m with OD 72 mm, fixed ends, seal length 1.0 m, maximum pressure 6.5 MPa, working pressure 1.6 MPa.
- Breakpin – SS 250 mm with OD 33.7 mm. Maximum load of 47.3 (± 1.0) kN.
- Gauge carrier – SS 1.5 m carrying top section pressure transducer, connections from sensors below. Flow pipe is double bent at both ends to give room for sensor equipment. The pipe gauge carrier is covered by split pipes.
- Shut-in tool (test valve) – SS 1.0 m with a OD of 48 mm, Teflon coated valve piston, friction loss of 11 kPa at 10 L/min (260 kPa–50 L/min). Working pressure 2.8–4.0 MPa. Breakpipe with maximum load of 47.3 (± 1.0) kN. The shut-in tool is covered by split pipes and connected to a stone catcher on the top.

The tool scheme is presented in Figure 4-2.

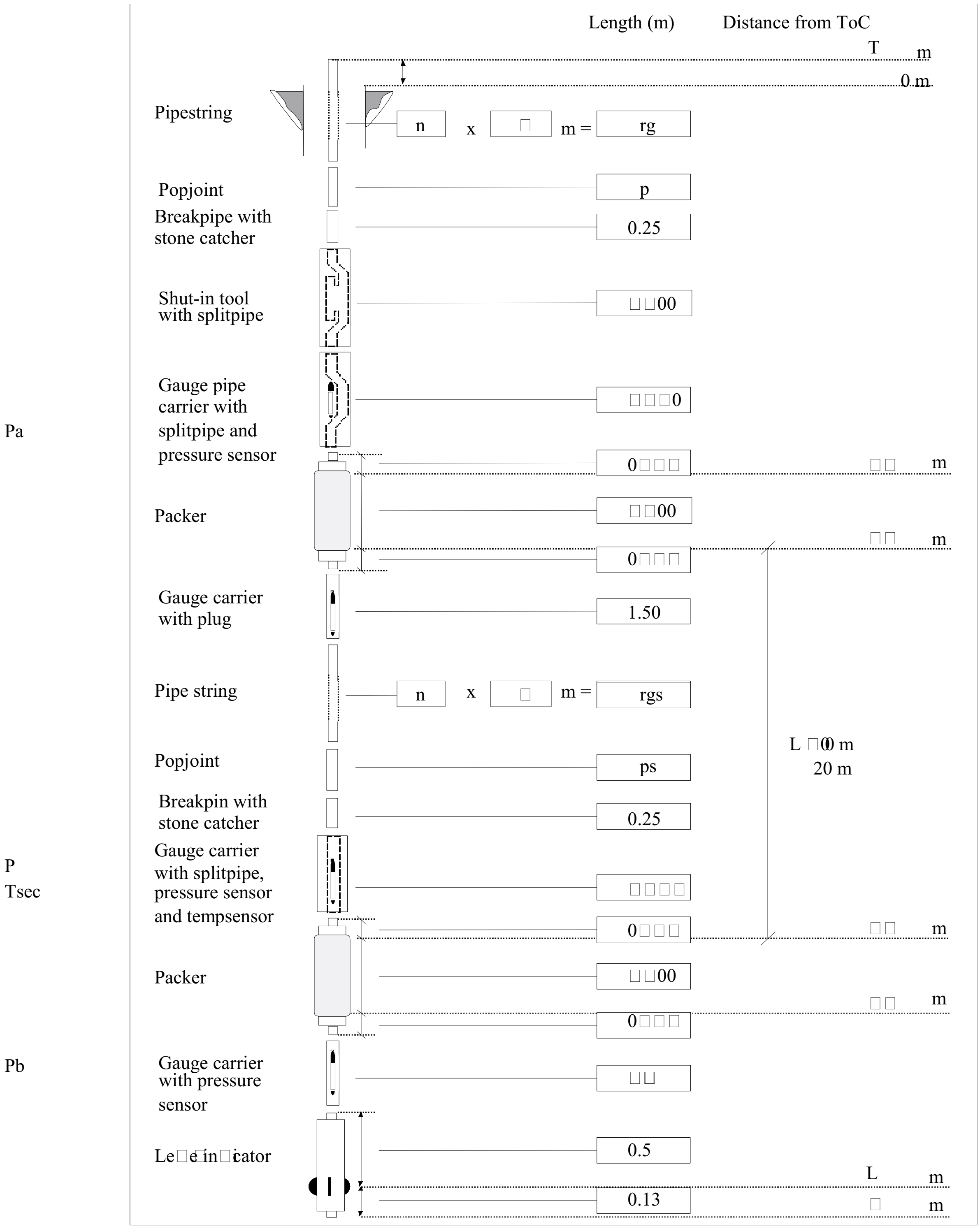


Figure 4-2. *Schematic drawing of the down-hole equipment in the PSS2 system*

4.2 Sensors

Table 4-1. Technical specifications of sensors.

Keyword	Sensor	Name	Value/range	Unit	Comments
$p_{sec,a,b}$	Pressure	Druck PTX 162-1464abs	9–30 4–20 0–13.5 ± 0.1	VDC mA MPa % of FS	
$T_{sec,surf,air}$	Temperature	BGI	18–24 4–20 0–32 ± 0.1	VDC mA °C °C	
Q_{big}	Flow	Micro motion Elite sensor	0–100 ± 0.1	kg/min %	Massflow
Q_{small}	Flow	Micro motion Elite sensor	0–1,8 ± 0.1	kg/min %	Massflow
p_{air}	Pressure	Druck PTX 630	9–30 4–20 0–120 ± 0.1	VDC mA KPa % of FS	
p_{pack}	Pressure	Druck PTX 630	9–30 4–20 0–4 ± 0.1	VDC mA MPa % of FS	
$p_{in,out}$	Pressure	Druck PTX 1400	9–28 4–20 0–2,5 ± 0.15	VDC mA MPa % of FS	
L	Level Indicator				Length correction

Table 4-2. Sensor positions and wellbore storage (WBS) controlling factors.

Borehole information			Sensors		Equipment affecting WBS coefficient		
ID	Test section (m)	Test no	Type	Position (m fr ToC)	Position	Function	Outer diameter (mm)
KLX05	111.30–211.30	1	p_a p T p_b L	110.30 210.53 210.28 213.31 214.68	Test section	Signal cable Pump string Packer line	9.1 33 6
KLX05	111.30–131.30	2	p_a p T p_b L	110.30 130.53 130.28 133.31 134.68	Test section	Signal cable Pump string Packer line	9.1 33 6

4.3 Data acquisition system

The data acquisition system in the PSS2 container contains a stationary PC with the software Orchestrator, pump- and injection test parameters such as pressure, temperature and flow are monitored and sensor data collected. A second laptop PC is connected to the stationary PC through a network containing evaluation software, Flowdim. While testing, data from previously tested section is converted with IPPlot and entered in Flowdim for evaluation.

The data acquisition system starts and stops the test automatically or can be disengaged for manual operation of magnetic and regulation valves within the injection/pumping system. The flow regulation board is used for differential pressure and valve settings prior testing and for monitoring valves during actual test. An outline of the data acquisition system is outlined in Figure 4-3.

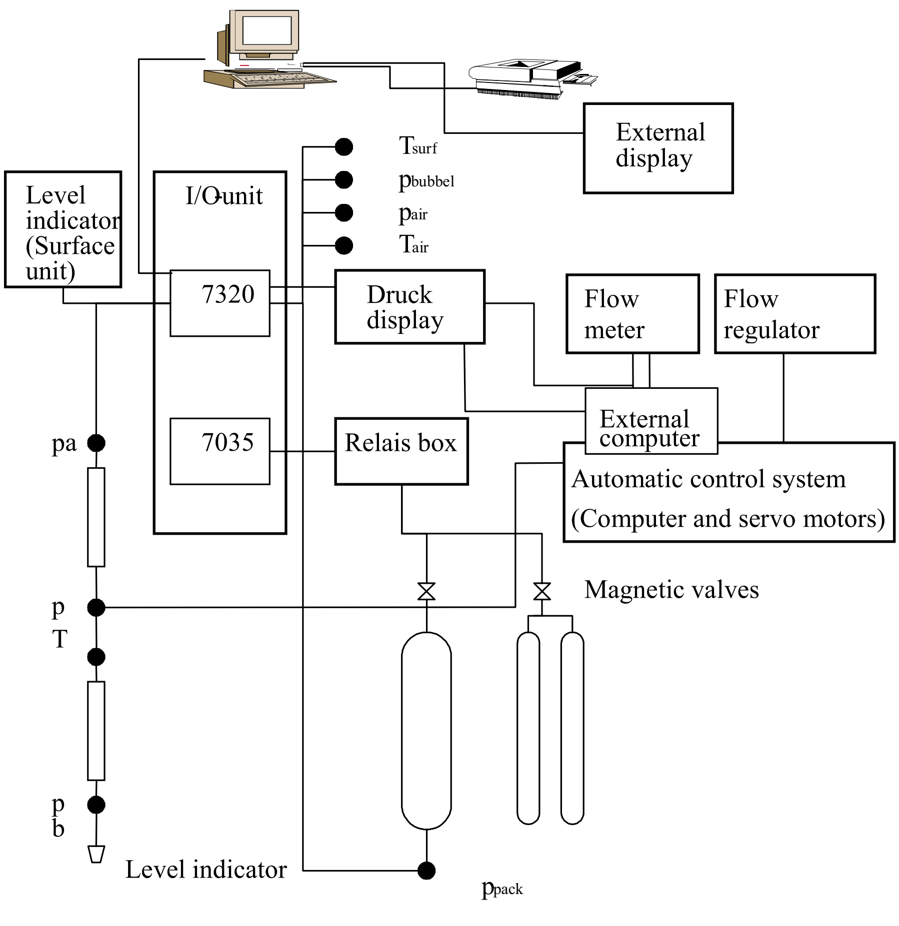


Figure 4-3. Schematic drawing of the data acquisition system and the flow regulation control system in PSS2.

5 Execution

5.1 Preparations

Following preparation work and functional checks were conducted prior to starting test activities:

- Place pallets and container, lifting rig up, installing fence on top of container, lifting tent on container.
- Clean and desinfect of Multikabel and hoses for packer and test valve. Clean the tubings with hot steam.
- Clean tanks with chloride dioxide. Filling injection tank with water out of the borehole KLX05.
- Filling buffer tank with water and tracer it with Uranin; take water sample.
- Filling vessels.
- Filling the hoses for test valve and packer.
- Entering calibration constants to system and regulation unit.
- Synchronize clocks on all computers.
- Function check of shut-in tool both ends, overpressure by 900 kPa for 5 min (OK).
- Check pressure gauges against atmospheric pressure and than on test depth against column of water.
- Translate all protocols into English (where necessary).
- Filling packers with water and de-air.
- Measure and assemble test tool.

5.2 Length correction

By running in with the test tool, a level indicator is incorporated at the bottom of the tool. The level indicator is able to record groves milled into the borehole wall. The depths of this groves are given by SKB in the activity plan (see Table 3-2) and the measured depth is counter checked against the number/length of the tubes build in. The achieved correction value, based on linear interpolation between the reference marks, is used to adjust the location of the packers for the testsections to avoid wrong placements and minimize elongation effects of the test string.Due to a technical problem with the level indicator, no markers were detected during the 20 m tests. It was decided to use the correction values received from the 100 m tests to adjust the depth for the 20 m tests. This was approved by SKB.

5.3 Execution of tests/measurements

5.3.1 Test principle

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a shut-in pressure recovery (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

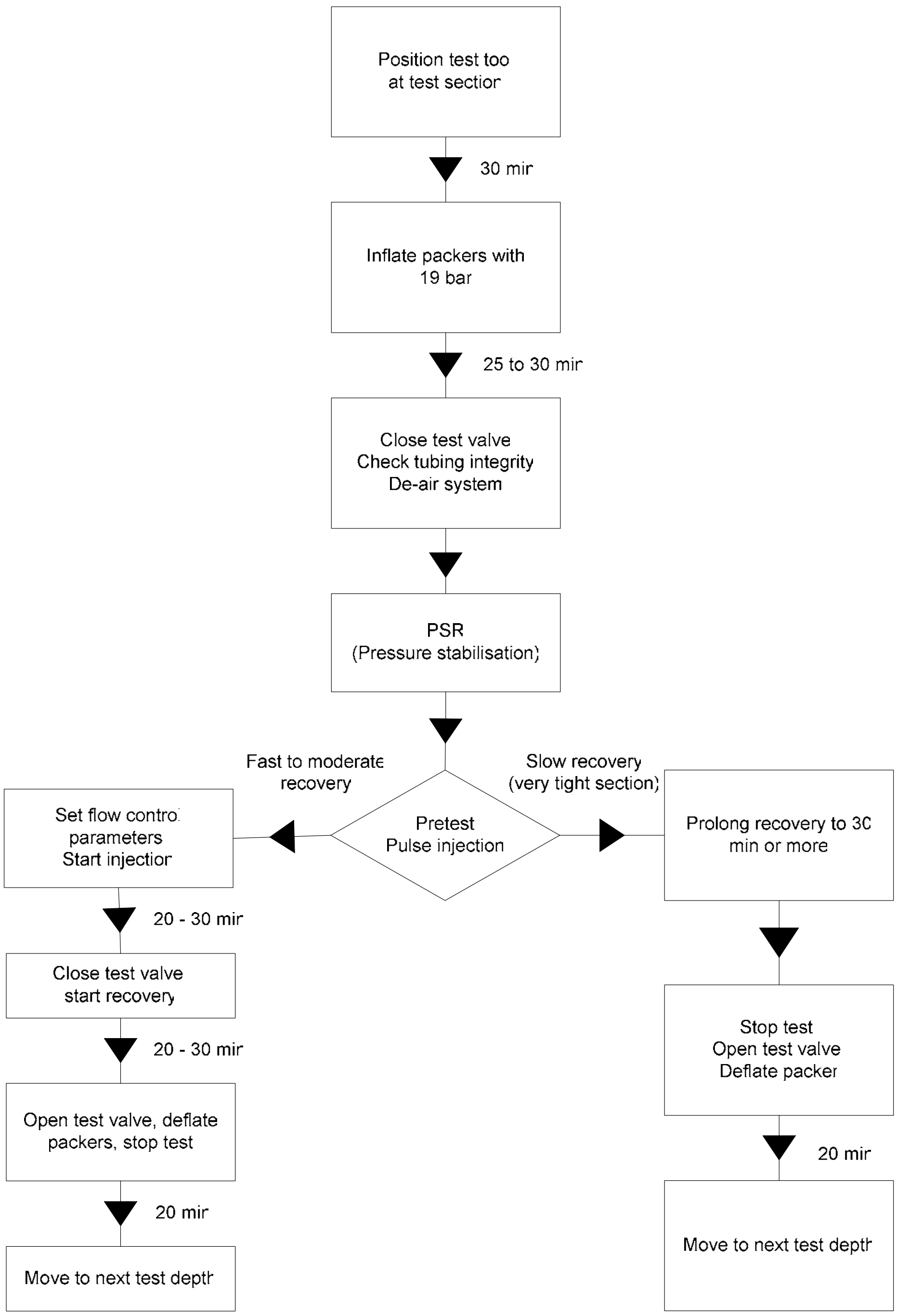


Figure 5-1. *Flow chart for test performance.*

5.3.2 Test procedure

A test cycle includes the following phases: 1) Transfer of down-hole equipment to the next section. 2) Packer inflation. 3) Pressure stabilisation. 4) Pulse injection. 5) Constant head injection. 6) Pressure recovery. 7) Packer deflation. The injection tests in KLX05 has been carried out by applying a constant injection pressure of approximately 200 kPa (20 m water column) above the static formation pressure in the test section. Before start of the injection tests, approximately stable pressure conditions prevailed in the test section. After the injection period, the pressure recovery in the section was measured. In cases, where small flow rates were expected, the automatic regulation unit was switched off and the test was performed manually. In those cases, the constant difference pressure was usually unequal to 200 kPa. In other cases, where the pressure recovery of the pulse injection test took very long, the recovery was extended and the pulse test was taken for the analysis. No injection test was performed in those sections.

The duration for each phase is presented in Table 5-1.

Table 5-1. Durations for packer inflation, pressure stabilisation, injection and recovery phase and packer deflation in KLX05.

• Position test tool to new test section (correct position using the borehole markers)	Approx 30 min
• Inflate packers with approx 1,900 kPa	25 min
• Close test valve	10 min
• Check tubing integrity with approx 800 kPa	5 min
• De-air system	2 min
• Pretest, pulse injection	2–30 min
• Set automatic flow control parameters or setting for manual test	5 min
• Start injection	20 to 45 min
• Close test valve, start recovery	20 min or more
• Open test valve	10 min
• Deflate packers	25 min
• Move to next test depth	–

5.4 Data handling

The data handling followed several stages. The data acquisition software (Orchestrator) produced an ASCII raw data file (*.ht2) which contains the data in voltage and milliampere format plus calibration coefficients. The *.ht2 files were processed to *.dat files using the SKB program called IPPlot. These files contain the time, pressure, flow rate and temperature data. The *.dat files were synthesised in Excel to a *.xls file for plotting purposes. Finally, the test data to be delivered to SKB were exported from Excel in *.csv format. These files were also used for the subsequent test analysis.

5.5 Analyses and interpretation

5.5.1 Analysis software

The tests were analysed using a type curve matching method. The analysis was performed using Golder's test analysis program FlowDim. FlowDim is an interactive analysis environment allowing the user to interpret constant pressure, constant rate and slug/pulse tests in source as well as observation boreholes. The program allows the calculation of type-curves for homogeneous, dual porosity and composite flow models in variable flow geometries from linear to spherical.

5.5.2 Analysis approach

Constant pressure tests are analysed using a rate inverse approach. The method initially known as the /Jacob and Lohman 1952/ method was further improved for the use of type curve derivatives and for different flow models.

Constant pressure recovery tests are analysed using the method described by /Gringarten 1986/ and /Bourdet et al. 1989/ by using type curve derivatives calculated for different flow models.

Pulse tests are analysed by using the pressure deconvolution method described by /Peres et al. 1989/ with improvements introduced by /Chakrabarty and Enachescu 1997/.

5.5.3 Analysis methodology

Each of the relevant test phases is subsequently analyzed using the following steps:

- **Injection Tests**
  - Identification of the flow model by evaluation of the derivative on the log-log diagnostic plot. Initial estimates of the model parameters are obtained by conventional straight-line analysis.
  - Superposition type curve matching in log-log coordinates. A non-linear regression algorithm is used to provide optimized model parameters in the latter stages.
  - Non-linear regression in semi-log coordinates (superposition HORNER plot) /Horner 1951/. In this stage of the analysis, the static formation pressure is selected for regression.

The test analysis methodology is best explained in /Horne 1990/.

- **Pulse Injection Tests**

A test cycle always started with a pulse injection test whose goal it was to derive a first estimation of the formation transmissivity. If the pressure recovery of this brief injection was very slow, it indicated a very tight section. It is then decided to extend the recovery time and measure the pressure recovery (PI).

During the brief injection phase a small volume is injected (derived from the flowmeter measurements and/or replacement in injection vessel). This injected volume produces the pressure increase of dp. Using a dV/dp approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity. Figure 5-2 below show an example of a typical pressure versus time evolution for such a tight section.

– Calculation of initial estimates of the model parameters by using the Ramey Plot /Ramey et al. 1975/. This plot is typically not presented in the appendix.
– Flow model identification and type curve analysis in the deconvolution Peres Plot /Peres et al. 1989, Chakrabarty and Enachescu 1997/. A non-linear regression algorithm is used to provide optimized model parameters in the later stages. An Example of the type curves is presented in Figure 5-3.

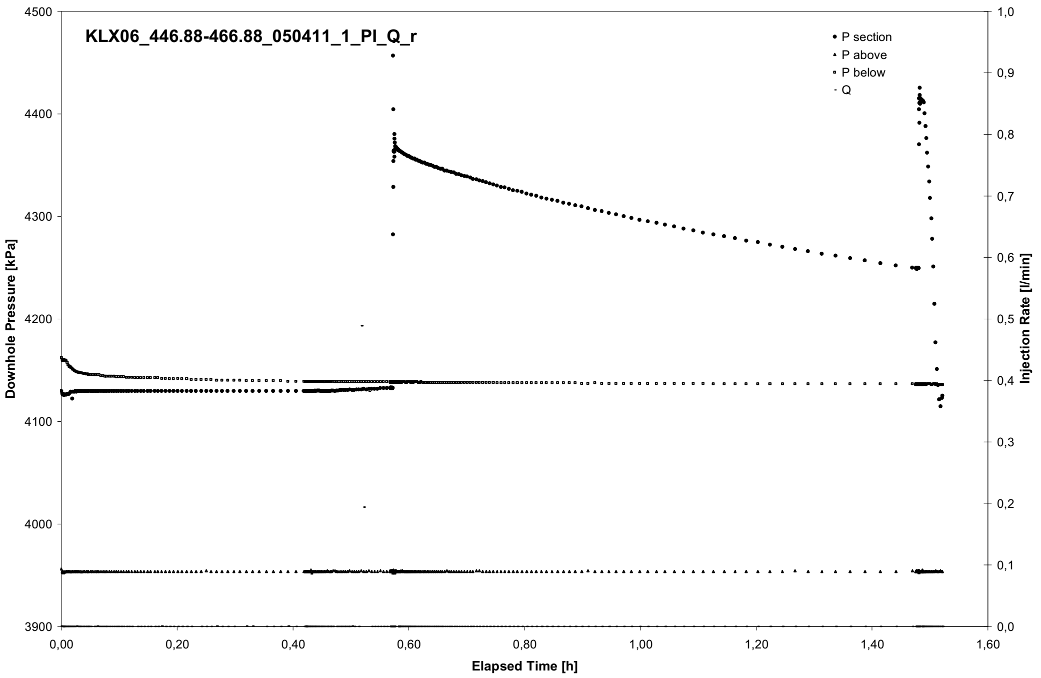


Figure 5-2. *Typical pressure versus time plot of a Pulse injection test.*

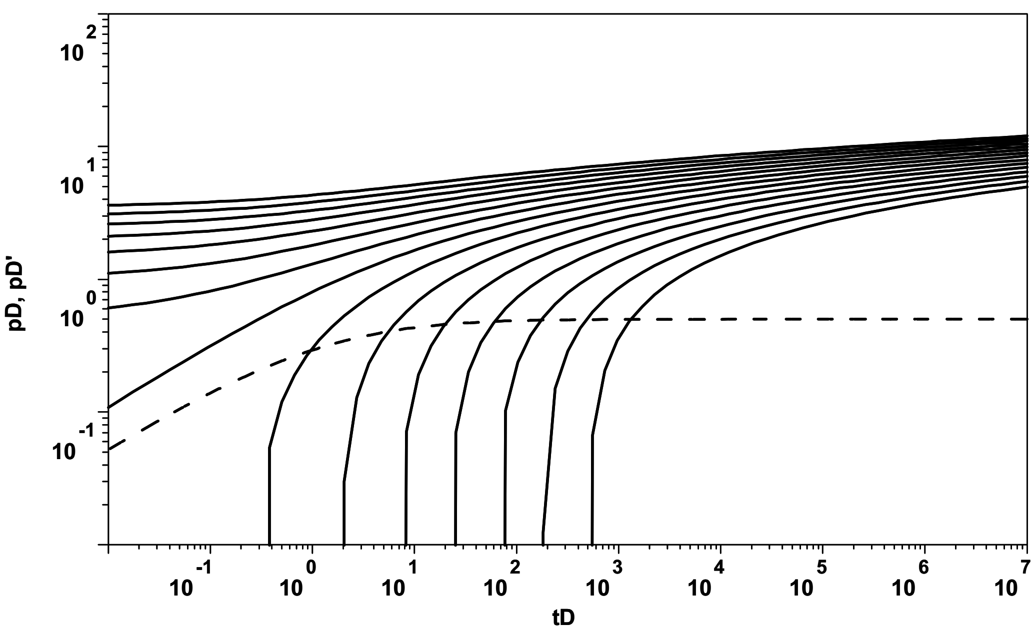


Figure 5-3. *Deconvolution type curve set for pulse test analysis.*

5.5.4 Steady state analysis

In addition to the type curve analysis, an interpretation based on the assumption of stationary conditions was performed as described by /Moye 1967/.

5.5.5 Flow models used for analysis

The flow models used in analysis were derived from the shape of the pressure derivative calculated with respect to log time and plotted in log-log coordinates.

In several cases the pressure derivative suggests a change of transmissivity with the distance from the borehole. In such cases a composite flow model was used in the analysis.

If there were different flow models matching the data in comparable quality, the simplest model was preferred.

The flow dimension displayed by the test can be diagnosed from the slope of the pressure derivative. A slope of 0.5 indicates linear flow, a slope of 0 (horizontal derivative) indicates radial flow and a slope of –0.5 indicates spherical flow. The flow dimension diagnosis was commented for each of the tests. At tests where a flow regime could not clearly identified from the test data, we assume in general a radial flow regime as the most simple flow model available. The value of p* was then calculated according to this assumption.

In cases when the infinite acting radial flow (IARF) phase was not supported by the data the derivative was extrapolated using the most conservative assumption, which is that the derivative would stabilise short time after test end. In such cases the additional uncertainty was accounted for in the estimation of the transmissivity confidence ranges.

5.5.6 Calculation of the static formation pressure and equivalent freshwater head

The static formation pressure (p*) measured at transducer depth, was derived from the pressure recovery (CHir) following the constant pressure injection phase by using straight line or type curve extrapolation in the Horner plot, assuming that infinite acting radial flow (IARF) occurred.

The equivalent freshwater head (expressed in metres above sea level) was calculated from the extrapolated static formation pressure (p*), corrected for athmospheric pressure measured by the surface gauge and corrected for the vertical depth considering the inclination of the drillhole, by assuming a water density of 1,000 kg/m^3 (freshwater). The equivalent freshwater head is the static water level an individual test interval would show if isolated and connected to the surface by tubing full of freshwater. Figure 5-4 shows the methodology schematically.

The freshwater head in metres above sea level is calculated as following:

$$head = \frac{(p^* - p_{atm})}{\rho \cdot g}$$

which is the p* value expressed in a water column of freshwater.

With consideration of the elevation of the reference point (RP) and the gauge depth (Gd), the freshwater head h_{iwf} is:

$$h_{iwf} = RP_{elev} - Gd + \frac{(p^* - p_{atm})}{\rho \cdot g}$$

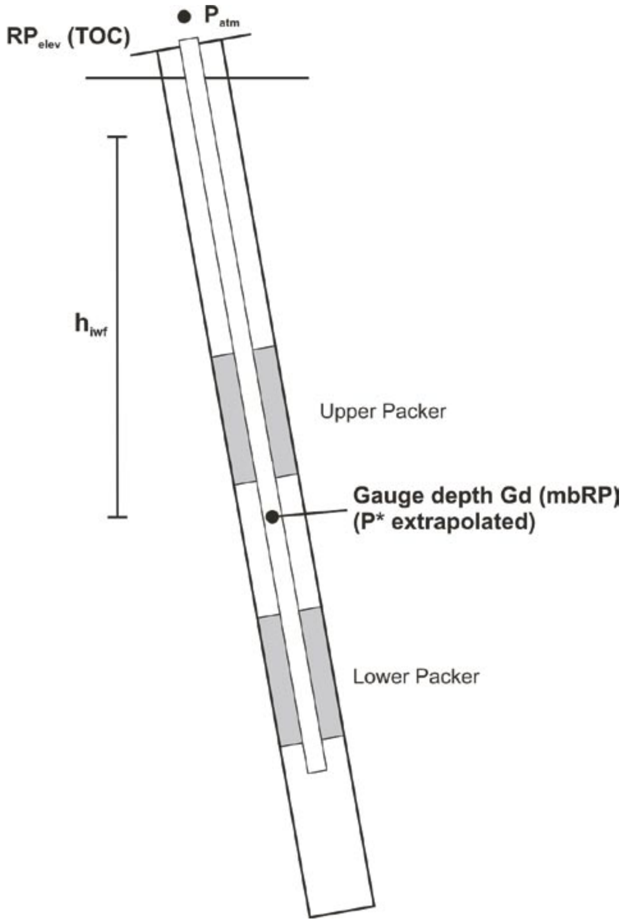


Figure 5-4. *Schematic methodologies for calculation of the freshwater head.*

5.5.7 Derivation of the recommended transmissivity and the confidence range

In most of the cases more than one analysis was conducted on a specific test. Typically both test phases were analysed (CHi and CHir) and in some cases the CHi or the CHir phase was analysed using two different flow models. The parameter sets (i.e. transmissivities) derived from the individual analyses of a specific test usually differ. In the case when the differences are small (which is typically the case) the recommended transmissivity value is chosen from the test phase that shows the best data and derivative quality.

In cases when the difference in results of the individual analyses was large (more than half order of magnitude) the test phases were compared and the phase showing the best derivative quality was selected.

The confidence range of the transmissivity was derived using expert judgement. Factors considered were the range of transmissivities derived from the individual analyses of the test as well as additional sources of uncertainty such as noise in the flow rate measurement, numeric effects in the calculation of the derivative or possible errors in the measurement of the wellbore storage coefficient. No statistical calculations were performed to derive the confidence range of transmissivity.

In cases when the infinite acting radial flow (IARF) phase was not supported by the data the additional uncertainty was accounted for in the estimation of the transmissivity confidence ranges.

6 Results

In the following, results of all tests are presented and analysed. Chapter 6.1 presents the 100 m tests and 6.2 the 20 m tests. The results are given as general comments to test performance, the identified flow regimes and calculated parameters. Finally, the parameters which are considered as most representative are chosen and justifications are given. All results are also summarised in Tables 7-1 and 7-2 of the Synthesis chapter.

6.1 100 m single-hole injection tests

In the following, the 100 m section tests conducted in borehole KLX05 are presented and analysed.

6.1.1 Section 111.30–211.30 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 215 kPa. A slight reaction between the test interval and the bottom zone was observed The injection rate decreased from 30.2 L/min at start of the CHi phase to 15.8 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows a slight indication of horizontal stabilization at early times and a downward trend at middle times, followed by a new stabilization at late times, which is indicative for a transition to a zone of higher transmissivity at some distance from the borehole. The response of the CHir phase is consistent to the response of the CHi phase. A two shell radial composite flow model was chosen for the analysis of the CHi and CHir phase. The analysis is presented in Appendix 2-1.

Selected representative parameters

The recommended transmissivity of 9.1E–6 m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 7.0E–6 to 2.0E–5 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,882.8 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.1.2 Section 211.14–311.14 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 200 kPa. No hydraulic connection between test interval and the adjacent zones was observed The injection rate decreased from 10.5 L/min at start of the CHi phase to 3.5 L/min at the end, indicating a relatively high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a flat derivative at early times, followed by a downward trend at middle times and a stabilization at a lower level at late times, indicating a higher transmissivity away from the borehole and radial flow. The derivative of the CHir phase is compatible with the one of the CHi phase, except of the late time stabilization. Both phases were matched using a radial composite flow model. The analysis is presented in Appendix 2-2.

Selected representative parameters

The recommended transmissivity of 1.9E–6 m^2/s was derived from the analysis of the CHi phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–7 to 4.0E–6 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,770.3 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.1.3 Section 306.37–406.37 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. All test phases (Pi, CHi and CHir) were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 193 kPa. No hydraulic connection between test interval and the adjacent zones was observed. Due to the low flow, the recorded flow rate is very noisy. However, the CHi phase is still amenable for qualitative analysis. The injection rate decreased from 10 mL/min at start of the CHi phase to 3 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems, but due to the fact that no radial flow was reached, the results should be regarded carefully. The Pi phase could be analysed quantitatively, too.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is quite noisy and does not allow flow model identification. The CHi phase was matched using an infinite acting radial homogeneous flow model. The CHir response shows a unit slop upward trend of the derivative at early and middle times without reaching a radial flow stabilization, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. A radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The Pi phase shows a flat derivative at middle times indicating a flow dimension of two (radial flow) and was analysed using a homogeneous flow model. The analysis is presented in Appendix 2-3.

Selected representative parameters

The recommended transmissivity of 1.8E–9 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E–10 to 3.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3,613.2 kPa.

The analysis of the Pi, CHi and CHir phases shows consistencies. No further analysis is recommended.

6.1.4 Section 406.54–506.54 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively moderate formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 192 kPa. No hydraulic connection between test interval and the adjacent zones was observed The injection rate decreased from 49 mL/min at start of the CHi phase to 14 mL/min at the end, indicating a relatively moderate to low transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the CHi phase shows a horizontal stabilization at early times, followed by an unit slope upward trend at middle and late times, indicating either a transition to a zone of lower transmissivity or a change in flow dimension. The derivative of the CHir phase shows an upward trend at late times, too. Both phases were matched using a radial composite flow model with decreasing transmissivity away from the borehole. The analysis is presented in Appendix 2-4.

Selected representative parameters

The recommended transmissivity of 1.9E–8 m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E–9 to 4.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 4,517.7 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.1.5 Section 506.63–606.63 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was prolonged and analysed.

After closing the testvalve, the pressure in the test section rose by 2 kPa. During the brief injection phase of the pulse injection phase, a total volume of about 39 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 195 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 2.0E–10 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the deconvolved Pi pressure shows a continuing upward trend, which can be attributed to the fact that the dimensionless test time is to small and the semi-logarithmic asymptotic solution was not achieved (due to the very small transmissivity). The Pi phase was matched using a radial homogeneous flow model. The analysis is presented in Appendix 2-5.

Selected representative parameters

The recommended transmissivity of 9.4E–11 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 6E–11 to 2E–10 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.1.6 Section 606.82–706.82 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 195 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 48 mL/min at start of the CHi phase to 23 mL/min at the end, indicating a relatively medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a relatively flat derivative at middle and late times, which is typical for a flow dimension of two (radial flow). The CHi phase was matched using a radial homogeneous flow model. The derivative of the CHir phase shows a slight indication of horizontal stabilization at late times, indicating radial flow. A radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-6.

Selected representative parameters

The recommended transmissivity of 2.5E–8 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–9 to 4.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 6,306.5 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.1.7 Section 706.83–806.83 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 181 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The CHi phase was conducted manually with the pressure vessel. The pressure was instable at the beginning and kept falling at the end of the perturbation phase. However, the CHi phase was analysed quantitative. The injection rate decreased from 374 mL/min at start of the CHi phase to 20 mL/min at the end, indicating a relatively moderate interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the data of the CHi phase is relatively poor. However, the CHi phase was matched using a two shell composite flow model with decreasing transmissivity away from the test section and a flow dimension of 2. The derivative of the CHir phase shows a steep upward trend at middle times, followed by a transition to a horizontal part at late times, indicating a transition to a zone of lower transmissivity. A radial composite flow model was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-7.

Selected representative parameters

The recommended transmissivity of 7.9E–9 m^2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 4.0E–9 to 3.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7,183.9 kPa.

The analysis of the CHi and CHir phases shows consistency. No further analysis is recommended.

6.1.8 Section 807.11–907.11 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 183 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 62 mL/min at start of the CHi phase to 8 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). Both phase show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the CHi phase shows a relatively flat derivative at late times, which indicates a flow dimension of 2 (radial flow). The derivative of the CHir phase shows a horizontal stabilization at middle times, indicating radial flow. Both phases were analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-8.

Selected representative parameters

The recommended transmissivity of 3.4E–9 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E–9 to 7.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 8,082.9 kPa.

The analysis of the CHi and CHir phases shows relatively good consistency. No further analysis is recommended.

6.1.9 Section 887.27–987.27 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. All test phases (Pi, CHi and CHir) were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 175 kPa. No hydraulic connection between test interval and the adjacent zones was observed. Due to the low flow, the recorded flow rate is very noisy. However, the CHi phase is still amenable for analysis. The injection rate decreased from 10 mL/min at start of the CHi phase to 1 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems, but due to the fact that no radial flow was reached, the results should be regarded carefully. The Pi phase could be analysed quantitatively, too.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is quite noisy and does not allow for a specific determination of the flow model. The CHi phase was matched using an infinite acting radial homogeneous flow model. The CHir response shows a continues upward trend of the derivative at early times without reaching a radial flow stabilization, which is typical for wellbore storage dominated flow. Because the formation flow stabilisation was not observed, a radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The derivative of the Pi phase shows a continuing upward trend, which can be attributed to the fact that the dimensionless test time is to small and the semi-logarithmic asymptotic solution was not achieved (due to the very small transmissivity). The Pi phase was matched using a radial homogeneous flow model. The analysis is presented in Appendix 2-9.

Selected representative parameters

The recommended transmissivity of 1.2E–10 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–11 to 4.0E–10 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth was not calculated due to the tight formation.

The analysis of the Pi, CHi and CHir phases shows consistencies. No further analysis is recommended.

6.2 20 m single-hole injection tests

In the following, the 20 m section tests conducted in borehole KLX05 are presented and analysed.

6.2.1 Section 111.30–131.30 m, test no 1 and 2, injection

Comments to test

The first test conducted in this section was repeated due to technical problems with the connections of the multikabel and resulting misreadings from the pressure transducers. The second test was conducted without problems. The Cartesian plot of the second test is shown in the Appendix 2-10. Only the second test was analysed.

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 210 kPa. The pressure in the bottom zone rose by 15 kPa during the injection phase, indicating a connection to the test interval. Due to the slow flow regulation at the beginning of the injection phase, the first part is very noisy. However, the second part of the CHi phase is amenable for qualitative analysis. The injection rate decreased from 24 L/min at start of the CHi phase to 13 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analyses.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. Due to the poor data quality of the CHi phase at early times, only the late time data was matched by using a radial composite flow model with increasing transmissivity away from the borehole. The response of the CHir phase is not consistent to the CHi response and a radial composite flow model with decreasing transmissivity away from the borehole was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-10.

Selected representative parameters

The recommended transmissivity of 1.6E–5 m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E–06 to 3.0E–5 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,185.4 kPa.

The analysis of the CHi and CHir phases shows an inconsistency concerning the middle and late time response of the two phases. However, regarding the derived transmissivities, both phases show relatively good consistencies. In case further analysis is planned a total test simulation should attempt to clarify the inconsistency between the two phases.

6.2.2 Section 126.02–146.02 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively moderate formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 200 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The automatic rate control functioned well, the recorded flow rate is however noisy. The injection rate decreased from 1.7 L/min at start of the CHi phase to 1.1 L/min at the end, indicating a moderate interval transmissivity (consistent with the pulse recovery). The CHir phase shows a relatively fast recovery. Both phases are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the CHi phase shows a downward trend at middle times, followed by a noisy stabilization at late times, which is indicative for a transition to a zone of higher transmissivity and a flow dimension of 2 (radial flow). The derivative of the CHir phase shows a horizontal stabilization at late times, too. Due to the fast recovery, the stabilisation level is linked to the smoothing factor of the data. So the derived transmissivity is uncertain. A two shell composite flow model with increasing transmissivity and a flow dimension of 2 (radial flow) was used for the analysis of both phases phase. The analysis is presented in Appendix 2-11.

Selected representative parameters

The recommended transmissivity of 9.3E–7 m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 7.0E–7 to 3.0E–6 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,317.5 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.2.3 Section 146.10–166.10 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 200 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The automatic rate control functioned well, the recorded flow rate is however noisy. The injection rate decreased from 1.5 L/min at start of the CHi phase to 1.4 L/min at the end, indicating a relatively high interval transmissivity (consistent with the pulse recovery). The CHir phase shows a relatively fast recovery.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the CHi phase shows a very noisy derivative. However, a radial homogeneous flow model was chosen for the analysis of this CHi phase. The derivative of the CHir phase shows a unit slope downward trend at middle times, indicating a large positive skin, and followed by a radial flow stabilization at late times. The CHir phase was matched using a radial homogeneous flow model with wellbore storage and skin. The analysis is presented in Appendix 2-12.

Selected representative parameters

The recommended transmissivity of 5.1E–6 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E–6 to 8.0E–6 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,492.6 kPa.

The analysis of the CHi and CHir phases shows consistency, with the exception of the very high skin derived from the CHir phase, which may be caused by non-Darcy flow effects in the formation. No further analysis is recommended.

6.2.4 Section 166.12–186.12 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a moderate formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 197 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 90 mL/min at start of the CHi phase to 27 mL/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows a horizontal stabilization at early times, followed by a unit slope upward trend at middle times and new radial flow stabilization at a higher level at late times, which is typical for a decrease of transmissivity at some distance from the borehole. The response of the CHir phase is consistent to the response of the CHi phase. A two shell radial composite flow model was used for the analysis of the CHi and CHir phase. The analysis is presented in Appendix 2-13.

Selected representative parameters

The recommended transmissivity of 2.7E–8 m^2/s was derived from the analysis of the CHi phase (inner zone), which shows a clear derivative stabilization. The confidence range for the interval transmissivity is estimated to be 1.0E–8 to 4.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,662.1 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.2.5 Section 181.13–201.13 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 200 kPa. The pressure in the bottom zone roses by 8 kPa during the injection phase indicating a connection to the test interval. The injection rate control during the beginning of the CHi phase was not very good. However, the second part of the CHi phase can be analysed quantitively. The injection rate decreased from 0.7 L/min at start of the CHi phase to 0.3 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The recovery phase (CHir) shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows a horizontal stabilization at middle times, followed by a unit slope downward trend at late times, indicating either a increase of transmissivity away from the borehole or a change of flow dimension. The response of the CHir phase is similar to the response of the CHi phase, with the difference that a slight indication of radial flow stabilization was observed at late times. A two shell composite flow model with a flow dimension of 2 (radial flow) was used for the analysis of the CHi and CHir phase. The analysis is presented in Appendix 2-14.

Selected representative parameters

he recommended transmissivity of 3.1E–7 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–8 to 6.0E–7 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,797.9 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.2.6 Section 191.14–201.14 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 201 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 2.4 L/min at start of the CHi phase to 0.7 L/min at the end, indicating a relatively high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows an slight upward trend at early and middle times, followed by a short part that shows horizontal stabilization at late times, which is typical for a flow dimension of 2 (radial flow). The CHi phase was matched using an infinite acting radial homogeneous flow model. The derivative of the CHir phase shows an upward trend at middle times, followed by a horizontal stabilization at late times. The CHir phase was analysed using a composite flow model with decreasing transmissivity away from the borehole. The choice of the model is dictated by the log-log derivative plot of the CHir phase. This is consistent with the negative skin derived from the CHi phase. The analysis is presented in Appendix 2-15.

Selected representative parameters

The recommended transmissivity of 2.4E–7 m^2/s was derived from the analysis of the CHir phase (outer zone), which shows a clear derivative stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E–8 to 4.0E–7 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,878.7 kPa.

The analysis of the CHi and CHir phases shows consistency. No further analysis is recommended.

6.2.7 Section 211.14–231.14 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 201 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate control during the beginning of the CHi phase was not very good. However, the second part of the CHi phase can be analysed quantitively. The injection rate decreased from approximately 0.5 L/min at start of the CHi phase to 0.1 L/min at the end, indicating a relatively medium interval transmissivity (consistent with the pulse recovery). The Chir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows a downward trend at middle times, followed by a short part that shows radial flow stabilization at late times, indicating a transition to a zone of higher transmissivity at some distance from the borehole. The CHi phase was matched using a two shell radial composite flow model. The CHir phase shows a downward trend at late times indicating either an increase of transmissivity or a change of flow dimension. A radial composite flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-16.

Selected representative parameters

The recommended transmissivity of 2.5E–8 m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative. The confidence range for the interval transmissivity is estimated to be 9.0E–9 to 5.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,062.5 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.2.8 Section 226.14–246.14 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 201 kPa. A slight reaction in the bottom zone was observed during the injection phase was observed, indicating a connection to the test interval. The automatic rate control functioned well, nevertheless the recorded flow rate is noisy. The injection rate decreased from 0.5 L/min at start of the CHi phase to 0.4 L/min at the end, indicating a relatively medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows a relatively fast recovery, but is still amenable for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the CHi phase shows a noisy but flat derivative, which is typical for a flow dimension of 2 (radial flow). The derivative of the CHir phase shows a unit slope downward trend at middle times, indicating a large positive skin, followed by a radial flow stabilization at late times. Both phases were matched using an infinite acting homogeneous radial flow model. The analysis is presented in Appendix 2-17.

Selected representative parameters

The recommended transmissivity of 6.2E–7 m^2/s was derived from the analysis of the CHi phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E–7 to 1.0E–6 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,199.8 kPa.

The analysis of the CHi and CHir phases shows little inconsistency, regarding the derived transmissivities and the high skin of the CHir phase, which is attributed to the fast recovery of the CHir phase. This is probably caused by non-Darcy flow effects in the formation. No further analysis is recommended.

6.2.9 Section 246.15–266.15 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 210 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. Due to the slow flow regulation at the beginning of the injection phase, the first part is very noisy. However, the second part of the CHi phase is amenable for qualitative analysis. The injection rate decreased from 10 L/min at start of the CHi phase to 4 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows a horizontal stabilization at middle times, followed by a unit slope downward trend at late times, indicating either a transition to a zone of higher transmissivity at some distance from the borehole or a change in flow dimension. The CHi phase was matched using a two shell radial composite flow model. The CHir phase shows a slight stabilisation (inflexion) at middle times, followed by a downward trend at late times indicating whether an increase of transmissivity or a change of flow dimension. A radial composite flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-18.

Selected representative parameters

The recommended transmissivity of 2.2E–6 m^2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative. The confidence range for the interval transmissivity is estimated to be 9.0E–7 to 4.0E–6 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,371.3 kPa.

The analysis of the CHi and CHir phases shows relatively good consistency. No further analysis is recommended.

6.2.10 Section 266.21–286.21 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was analysed.

After closing the testvalve, the pressure in the test section rose by 2 kPa. During the brief injection phase of the pulse injection, a total volume of about 14 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 199 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 6.9E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity. Due to a probably not proper working testvalve, the start of the pulse recovery shows a nontypical behaviour. However, the Pi phase shows no further problems and is amenable for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the deconvolved Pi pressure shows a short horizontal stabilization at middle times, followed by a unit slope downward trend at late times, indicating a change either of transmissivity or of flow dimension.
The analysis of the Pi phase was conducted using a two shell composite flow model with increasing transmissivity away from the borehole and a flow dimension of 2 (radial flow). The analysis is presented in Appendix 2-19.

Selected representative parameters

The recommended transmissivity of 7.6E–11 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 2E–11 to 2E–10 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.11 Section 286.28–306.28 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 205 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 82 mL/min at start of the CHi phase to 30 mL/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the CHi phase shows a horizontal stabilization at early times, followed by a unit slope downward trend at middle times and a new stabilization at a lower level at late times, indicating an increase of transmissivity at some distance from the borehole and a flow dimension of 2 (radial flow). The CHi phase was matched using a two shell radial composite flow model. The CHir phase shows a downward trend at middle and late times indicating either an increase of transmissivity or a change of flow dimension. A radial composite flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-20.

Selected representative parameters

The recommended transmissivity of 2.0E–8 m^2/s was derived from the analysis of the CHi phase (outer zone), which shows the clearest derivative stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E–9 to 4.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,733.6 kPa.

The analysis of the CHi and CHir phases shows good consistency. No further analysis is recommended.

6.2.12 Section 306.37–326.37 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 205 kPa. No hydraulic connection between test interval and the adjacent zones was observed. Due to the low flow, the recorded flow rate is very noisy. However, the CHi phase is still amenable for qualitative analysis. The injection rate decreased from 7 mL/min at start of the CHi phase to 2 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is quite noisy and does not allow flow model identification. The CHi phase was matched using a two shell composite radial flow model with decreasing transmissivity away from the test section. The CHir response shows a downward trend of the derivative at middle and late times, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. Because the formation flow stabilisation was not observed, a radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-21.

Selected representative parameters

The recommended transmissivity of 2.2E–9 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–10 to 4.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,929.0 kPa.

The analysis of the CHi and CHir phases shows some inconsistencies, regarding the chosen flow models. However, regarding the derived inner zone transmissivities, both phases show very good consistencies. No further analysis is recommended.

6.2.13 Section 326.38–346.38 m, test no 1, pulse injection

Comments to test

The intention was to design the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and opening/closing the test valve for conducting the preliminary pulse injection, no pulse recovery was observed and the pressure stayed stable for 20 minutes. This phenomenon is caused by a combination of prolonged packer expansion and a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-22.

Selected representative parameters

Based on the test response the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.14 Section 341.40–361.40 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 35 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-23.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.15 Section 356.42–376.42 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 25 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-24.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.16 Section 376.47–396.47 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 21 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-24.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.17 Section 386.50–406.50 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was analysed.

After closing the testvalve for conducting the pressure stabilization phase (PSR), the pressure in the test section rose by 10 kPa. This can be explained, either by prolonged packer expansion in a relatively tight section or by the fact that the initial formation pressure is higher than the pressure measured on test depth.

During the brief injection phase a total volume of about 14 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 197 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 7.0E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the deconvolved Pi pressure shows a horizontal stabilization at early and middle times which is typical for a flow dimension of 2. Due to the uncertainty of the initial formation pressure only the early and middle time data was matched using an infinite acting radial flow model. The analysis is presented in Appendix 2-26.

Selected representative parameters

The recommended transmissivity of 4.4E–10 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 1E–10 to 7E–10 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.18 Section 406.54–426.54 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 196 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 90 mL/min at start of the CHi phase to 14 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the CHi phase shows a horizontal stabilization at early times and a unit slope upward trend at middle and late times, which is indicative either for transition to a zone of lower transmissivity away from the borehole or a change of flow dimension. The response of the CHir phase is compatible with the response of the CHi phase. A two shell composite flow model with decreasing transmissivity and a flow dimension of 2 (radial flow) was chosen for the analysis of both phases. The analysis is presented in Appendix 2-27.

Selected representative parameters

The recommended transmissivity of 1.8E–8 m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–9 to 3.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3,827.3 kPa.

The analysis of the CHi and CHir phases shows very good consistencies. No further analysis is recommended.

6.2.19 Section 426.55–446.55 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was analysed.

After closing the testvalve for conducting the pressure stabilization phase (PSR), the pressure in the test section rose by 5 kPa. This can be explained, either by prolonged packer expansion in a relatively tight section or by the fact that the initial formation pressure is higher than the pressure measured on test depth.

During the brief injection phase a total volume of about 12 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 207 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 5.6E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the deconvolved Pi pressure shows a horizontal stabilization at middle times indicating a flow dimension of 2. Due to the noisy derivative at late times, only the middle time data was matched using an infinite acting homogeneous flow model. The analysis is presented in Appendix 2-28.

Selected representative parameters

The recommended transmissivity of 3.4E–11 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 1E–11 to 6E–11 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.20 Section 446.57–466.57 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 20 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-29.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.21 Section 466.58–486.58 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was prolonged and analysed.

During the brief injection phase a total volume of about 13 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 206 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 6.1E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the deconvolved Pi pressure shows a horizontal stabilization (although noisy) at early times, followed by a upward trend at middle times and a new radial flow stabilization at a higher level at late times, which is consistent to an increase of transmissivity at some distance from the borehole. For the analysis of the Pi phase a two shell composite radial flow model was chosen. The analysis is presented in Appendix 2-30.

Selected representative parameters

The recommended transmissivity of 3.7E–10 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 9.0E–11 to 6.0E–10 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.22 Section 486.59–506.59 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

After closing the testvalve, the pressure in the test section rose by 5 kPa. The CHi phase was conducted using a pressure difference of 202 kPa. No hydraulic connection between test interval and the adjacent zones was observed. Due to the low flow, the recorded flow rate is very noisy. The injection rate decreased from 4 mL/min at start of the CHi phase to 2 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is quite noisy and does not allow for a specific determination of the flow model. The CHi phase was matched using an infinite acting radial homogeneous flow model. The CHir response shows a unit slop downward trend of the derivative at middle and late times, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. Because the formation flow stabilisation was not observed, a radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-31.

Selected representative parameters

The recommended transmissivity of 2.7E–9 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–10 to 5.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 4,516.0 kPa.

The analysis of the CHi and CHir phases shows good consistencies. No further analysis is recommended.

6.2.23 Section 606.82–626.82 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was analysed.

After closing the testvalve, the pressure in the test section rose by 2 kPa. During the brief injection phase of the pulse injection, a total volume of about 11 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 203 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 5.2E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the deconvolved Pi pressure shows a horizontal stabilization at early and middle times which is typical for a flow dimension of 2. Due to the uncertainty of the initial formation pressure only the early and middle time data was matched using an infinite acting radial flow model. The analysis is presented in Appendix 2-32.

Selected representative parameters

The recommended transmissivity of 4.1E–10 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 1E–10 to 8E–10 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.24 Section 626.85–646.85 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 170 kPa. No hydraulic connections between the test interval and the adjacent zones were observed. The injection rate control during the beginning of the CHi phase was not very good. After the oscillating start period, the flow rate got stable and the automatic rate control functioned well, nevertheless, the recorded flow rate is noisy. The injection rate decreased from 33 mL/min at start of the CHi phase to 10 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). The recovery phase (CHir) shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the CHi phase shows a very noisy derivative and does not allow flow model identification. However, the late time data of the CHi was matched using a radial homogeneous flow model. The CHir response shows a unit slop downward trend of the derivative at middle and late times, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. Because the formation flow stabilisation was not observed, a radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-33.

Selected representative parameters

The recommended transmissivity of 1.2E–8 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–9 to 6.0E–8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 5,774.7 kPa.

The analysis of the CHi and CHir phases shows consistency. No further analysis is recommended.

6.2.25 Section 646.85–666.85 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 40 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-34.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.26 Section 666.85–706.85 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 65 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-23.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.27 Section 686.83–706.83 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 204 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 27 mL/min at start of the CHi phase to 13 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the, derivative of the CHi phase shows a horizontal stabilization at middle times and a unit slope upward trend late times, indicating either a transition to a zone of lower transmissivity away from the borehole or a change of flow dimension. The response of the CHir phase is consistent to the response of the CHi phase. A two shell composite radial flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-36.

Selected representative parameters

The recommended transmissivity of 1.2E–8 m^2/s was derived from the analysis of the CHi phase (inner zone), which shows the clearest derivative stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E–9 to 3.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 6,306.3 kPa.

The analysis of the CHi and CHir phases shows good consistencies. No further analysis is recommended.

6.2.28 Section 706.83–726.83 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 208 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 29 mL/min at start of the CHi phase to 10 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the CHi phase shows a horizontal stabilization at early times, followed by a unit slope upward trend middle times and slight indication of radial flow stabilization at late times. The derivative of the CHir shows a slight indication of horizontal stabilization at late times, too. A two shell composite flow model with decreasing transmissivity and a flow dimension of 2 (radial flow) was chosen for the analysis of both phases. The analysis is presented in Appendix 2-37.

Selected representative parameters

The recommended transmissivity of 4.5E–9 m^2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E–9 to 7.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 6,487.4 kPa.

The analysis of the CHi and CHir phases shows good consistencies. No further analysis is recommended.

6.2.29 Section 726.91–746.91 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was prolonged and analysed.

After closing the testvalve, the pressure in the test section rose by 10 kPa. During the brief injection phase of the pulse injection, a total volume of about 8 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 200 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 4.1E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the deconvolved Pi pressure shows a horizontal stabilization late times indicating a flow dimension of 2. The Pi phase was analysed using an infinite acting homogeneous radial flow model. The analysis is presented in Appendix 2-38.

Selected representative parameters

The recommended transmissivity of 1.6E–10 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 8E–11 to 4E–10 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.30 Section 747.00–767.00 m, test no 1, pulse injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was analysed.

After closing the testvalve, the pressure in the test section rose by 17 kPa. During the brief injection phase of the pulse injection, a total volume of about 13 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 198 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 6.8E–11 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the deconvolved Pi pressure shows a continuing upward trend, which can be attributed to the fact that the dimensionless test time is to small and the semi-logarithmic asymptotic solution was not achieved (due to the very small transmissivity). The Pi phase was matched using a radial homogeneous flow model. The analysis is presented in Appendix 2-39.

Selected representative parameters

The recommended transmissivity of 3.6E–12 m^2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 1E–12 to 6E–12 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.31 Section 767.06–787.06 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 223 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The automatic rate control functioned well, the recorded flow rate is however noisy. The injection rate decreased from 39 mL/min at start of the CHi phase to 11 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). The CHir phase shows a relatively fast recovery.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a relatively flat derivative (although noisy), typical for radial flow geometry. The CHi phase was matched using an infinite acting homogeneous radial flow model. The CHir response shows a steep downward trend of the derivative at middle times, which is consistent with the high positive skin factor. The CHir phase was matched using a radial homogeneous flow model with wellbore storage and skin. The analysis is presented in Appendix 2-40.

Selected representative parameters

The recommended transmissivity of 9.2E–9 m^2/s was derived from the analysis of the CHi phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 6.0E–9 to 5.0E–8 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7,038.9 kPa.

The analysis of the CHi and CHir phases shows little inconsistencies in the derived transmissivities, which is probably attributed to the relatively fast recovery of the CHir phase, and inconsistencies in the derived high skin from the CHir phase, which may be caused by non-Darcy flow effects in the formation. No further analysis is recommended.

6.2.32 Section 787.07–807.07 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a relatively low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 140 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 26 mL/min at start of the CHi phase to 12 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivatives of both test phases show an upward trend at middle and late times, indicating either a decreasing of transmissivity at some distance form the borehole or a change of flow dimension. A two shell composite radial flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-41.

Selected representative parameters

The recommended transmissivity of 4.3E–9 m^2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E–9 to 7.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7,200.4 kPa.

The analysis of the CHi and CHir phases show consistency. No further analysis is recommended.

6.2.33 Section 807.11–827.11 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 55 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-42.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.34 Section 827.15–847.15 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a very low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. All test phases (Pi, CHi and CHir) were analysed quantitatively.

After closing the testvalve , the pressure in the test section rose by 10 kPa. During the following test phases a slight reaction in the bottom zone was observed. During the brief injection of the pulse injection a total volume of about 11 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 204 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 5.6E–11 m^3/Pa. The Pi phase shows no problems and is adequate for quantitative analysis.

The CHi phase was conducted using a pressure difference of 153 kPa. After 7 minutes of injection the flow rate dropped down below a flow of 1 mL/min, indicating a very low interval transmissivity (consistent with the pulse recovery), and the injection phase was aborted. Due to the low flow, the recorded flow rate is very noisy and the results should be regarded very carefully. The CHir phase shows no problems.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present tests, the derivative of the Pi phase shows a steep upward trend at middle and late times, indicating a small inner zone with a much higher transmissivity than the outer zone. The formation reacts like a closed system. The responses of the CHi phase and CHir phase are relatively similar to the Pi response. Due to the low transmissivity and due to the fact that no horizontal stabilization was observed at late times, the derived outer zones transmissivities are very uncertain. All three test phases were matched using a two shell composite flow model with decreasing transmissivity away from the borehole and a flow dimension of 2. The analysis is presented in Appendix 2-43.

Selected representative parameters

The recommended transmissivity of 4.3E–09 m^2/s was derived from the analysis of the Pi phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E–10 to 7.0E–09 m^2/s (which includes the values derived from inner zones of the CHi and CHir phase). The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low interval transmissivity.

The analysis of the Pi, CHi and CHir phases show little inconsistencies in the derived transmissivities. No further analysis is recommended.

6.2.35 Section 847.20–867.20 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 209 kPa. A slight connection between the bottom zone and test interval was observed. Due to the low flow, the recorded data of the flow rate is very noisy. The injection rate decreased from 16 mL/min at start of the CHi phase to 5 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is quite noisy and does not allow flow model identification. The CHi phase was matched using an infinite acting radial homogeneous flow model. The CHir response shows a unit slop downward trend of the derivative at middle times, followed by slight indication of radial flow stabilization at late times, indicating radial flow geometry. A radial homogeneous flow model with wellbore storage and skin was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-44.

Selected representative parameters

The recommended transmissivity of 2.8E–9 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E–10 to 5.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7,747.4 kPa.

The analyses of the CHi and CHir phases show good consistency. No further analysis is recommended.

6.2.36 Section 867.24–887.24 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

After closing the testvalve for conducting the pressure stabilization phase (PSR), the pressure in the test section rose by 4 kPa. This can be explained, either by prolonged packer expansion in a relatively tight section or by the fact that the initial formation pressure is higher than the pressure measured on test depth.

The CHi phase was conducted using a pressure difference of 214 kPa. A slight reaction between the bottom zone and test interval was observed. The difference pressure was not stable at the beginning of the injection phase. However, the pressure stays relatively stable during the second part of the CHi phase. Due to the low flow, the recorded flow rate is noisy. The injection rate decreased from 19 mL/min at start of the CHi phase to 5 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the both phases show a slight indication of horizontal stabilization at late times. A two shell composite flow model with decreasing transmissivity at some distance from the borehole and a flow dimension of 2 (radial flow) was chosen for the analysis of both test phases. The analysis is presented in Appendix 2-45.

Selected representative parameters

The recommended transmissivity of 1.5E–9 m^2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E–10 to 4.0E–9 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7,907.0 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

6.2.37 Section 887.27–907.27 m, test no 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

After closing the testvalve, the pressure in the test section rose by 10 kPa. The CHi phase was conducted using a pressure difference of 170 kPa. A slight connection between the bottom zone and test interval was observed. Due to the low flow, the recorded flow rate is noisy. After 15 minutes of injection the flow rate drops down below a flow of 1 mL/min, indicating a very low interval transmissivity (consistent with the pulse recovery), and the perturbation phase was aborted. The CHir phase shows no problems and is adequate for quantitative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, the derivative of the CHi phase is noisy due to the low flow rate. However, a two shell composite flow model with decreasing transmissivity at some distance from the borehole and a flow dimension of 2 (radial flow) was chosen for the analysis of the Chi phase. The CHir phase shows a relatively flat derivative at late times, indicating radial flow geometry, and was matched using an infinite acting homogeneous radial flow model. The analysis is presented in Appendix 2-46.

Selected representative parameters

The recommended transmissivity of 1.1E–10 m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 6.0E–11 to 4.0E–10 m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 8,087.3 kPa.

The analyses of the CHi and CHir phases shows some inconsistencies, regarding the derived transmissivities and the chosen flow models, which is attributed to the poor data quality of the CHi phase. No further analysis is recommended.

6.2.38 Section 907.30–927.30 m, test no 1, pulse injection

Comments to test

The intention was to design the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and opening/closing the test valve for conducting the preliminary pulse injection, no pulse recovery was observed and the pressure stayed stable for 20 minutes. This phenomenon is caused by a combination of prolonged packer expansion and a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-22.

Selected representative parameters

Based on the test response the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

6.2.39 Section 927.34–947.34 m, test no 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by 80 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). None of the test phases is analysable.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the flow model cannot be determined. No analysis was performed. The measured data is presented in Appendix 2-48.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E–11 m^2/s.

No further analysis recommended.

7 Synthesis

The synthesis chapter summarizes the basic test parameters and analysis results. In addition, the correlation between steady state and transient transmissivities as well as between the matched and the theoretical wellbore storage (WBS) coefficient are presented and discussed.

7.1 Summary of results

Table 7-1. General test data from constant head injection tests in KLX05.

Borehole secup (m)	Borehole seclow (m)	Date and time for test, start YYYYMMDD hh:mm	Date and time for test, stop YYYYMMDD hh:mm	Q_p (m**3/s)	Q_m (m**3/s)	t_p (s)	t_F (s)	p_0 (kPa)	p_i (kPa)	p_p (kPa)	p_F (kPa)	Te_w (°C)	Test phases measured Analysed test phases marked bold
111.30	211.30	20050601 17:37	20050601 21:07	2.63E–04	2.87E–04	1,800	7,200	1,887	1,884	2,099	1,885	10.0	**CHi / CHir**
211.14	311.14	20050602 09:21	20050602 11:45	5.80E–05	6.63E–05	1,800	3,600	2,774	2,772	2,972	2,777	11.2	**CHi / CHir**
306.37	406.37	20050602 13:30	20050602 16:22	5.00E–08	8.33E–08	1,800	1,800	3,623	3,630	3,823	3,673	12.5	**CHi / CHir**
406.54	506.54	20050602 17:49	20050602 23:32	2.33E–07	3.17E–07	1,800	14,400	4,521	4,528	4,720	4,529	13.9	**CHi / CHir**
506.63	606.63	20050603 09:11	20050603 11:11	#NV	#NV	1	3,840	5,410	5,421	5,623	5,529	15.2	**Pi**
606.82	706.82	20050603 12:41	20050603 15:26	3.83E–07	4.67E–07	1,800	3,600	6,304	6,305	6,500	6,313	16.6	**CHi / CHir**
706.83	806.83	20050603 16:56	20050604 00:46	3.33E–07	8.33E–07	1,800	21,600	7,191	7,201	7,382	7,196	18.0	**CHi / CHir**
807.11	907.11	20050604 09:20	20050604 12:18	1.67E–07	1.67E–07	1,800	3,600	8,078	8,086	8,269	8,108	19.5	**CHi / CHir**
887.27	987.27	20050604 14:00	20050604 17:10	1.67E–08	6.67E–08	1,800	1,800	8,791	8,847	9,022	8,938	20.6	**CHi / CHir**
111.30	131.30	20050610 13:12	20050610 14:40	2.22E–04	2.37E–04	1,200	1,200	1,191	1,188	1,398	1,192	8.9	**CHi / CHir**
126.02	146.02	20050610 15:35	20050610 17:02	1.87E–05	1.90E–05	1,200	1,200	1,320	1,318	1,518	1,318	9.1	**CHi / CHir**
146.10	166.10	20050610 17:47	20050610 20:20	2.28E–05	2.35E–05	1,800	2,400	1,497	1,494	1,694	1,494	9.4	**CHi / CHir**
166.12	186.12	20050611 08:54	20050611 10:27	4.50E–07	5.33E–07	1,200	1,200	1,669	1,669	1,866	1,674	9.6	**CHi / CHir**
181.13	201.13	20050611 11:14	20050611 13:04	8.83E–06	9.33E–06	1,200	2,400	1,801	1,801	2,001	1,802	9.8	**CHi / CHir**
191.14	211.14	20050611 13:38	20050611 15:11	1.15E–05	1.40E–05	1,200	1,200	1,890	1,892	2,093	1,914	9.9	**CHi / CHir**
211.14	231.14	20050611 15:55	20050611 17:23	2.00E–06	2.17E–06	1,200	1,200	2,068	2,067	2,268	2,067	10.2	**CHi / CHir**
226.14	246.14	20050611 18:10	20050611 19:59	6.33E–06	6.50E–06	1,200	2,400	2,200	2,200	2,401	2,200	10.4	**CHi / CHir**
246.15	266.15	20050612 08:10	20050612 09:44	6.08E–05	7.00E–05	1,200	1,200	2,377	2,376	2,586	2,387	10.6	**CHi / CHir**
266.21	286.21	20050612 10:21	20050612 11:49	#NV	#NV	1	2,700	2,557	2,565	2,773	2,613	10.9	**Pi**
286.28	306.28	20050612 12:29	20050612 13:58	5.00E–07	5.00E–07	1,200	1,200	2,735	2,736	2,941	2,743	11.1	**CHi / CHir**
306.37	326.37	20050612 14:39	20050612 16:22	5.00E–08	6.67E–08	1,200	1,200	2,915	2,926	3,131	2,956	11.4	**CHi / CHir**
326.38	346.38	20050612 17:03	20050612 18:05	0.00E+00	0.00E+00	0	0	3,092	#NV	#NV	#NV	11.7	**#NV**
341.40	361.40	20050612 18:38	20050612 19:40	0.00E+00	0.00E+00	0	0	3,226	#NV	#NV	#NV	11.9	**#NV**
356.42	376.42	20050613 07:26	20050613 08:31	0.00E+00	0.00E+00	0	0	3,356	#NV	#NV	#NV	12.1	**#NV**

Borehole secup (m)	Borehole seclow (m)	Date and time for test, start YYYYMMDD hh:mm	Date and time for test, stop YYYYMMDD hh:mm	Q_p (m**3/s)	Q_m (m**3/s)	t_p (s)	t_F (s)	p_0 (kPa)	p_i (kPa)	p_p (kPa)	p_F (kPa)	Te_w (°C)	Test phases measured Analysed test phases marked bold
376.42	396.42	20050613 09:17	20050613 10:23	0.00E+00	0.00E+00	0	0	3,536	#NV	#NV	#NV	12.3	**#NV**
386.50	406.50	20050613 11:00	20050613:12:27	#NV	#NV	1	2,400	3,626	3,642	3,837	3,668	12.5	**Pi**
406.54	426.54	20050613 13:04	20050613 14:46	2.33E–07	3.00E–07	1,200	1,800	3,807	3,812	4,008	3,849	12.8	**CHi / CHir**
426.55	446.55	20050613 15:32	20050613 16:53	#NV	#NV	1	2,400	3,986	3,999	4,204	4,030	13.1	**Pi**
446.57	466.57	20050613 17:33	20050613 18:38	0.00E+00	0.00E+00	0	0	4,166	#NV	#NV	#NV	13.3	**#NV**
466.58	486.58	20050613 19:13	20050614 01:56	#NV	#NV	1	21,600	4,351	4,351	4,563	4,337	13.6	**Pi**
486.59	506.59	20050614 07:40	20050614 09:27	3.33E–08	3.33E–08	1,200	1,200	4,520	4,533	4,735	4,539	13.9	**CHi / Chir**
606.82	626.82	20050614 11:09	20050614 12:33	#NV	#NV	1	2,400	5,599	5,608	5,811	5,610	15.5	**CHi / Chir**
626.85	646.85	20050614 13:16	20050614 15:26	1.67E–07	1.67E–07	1,800	1,800	5,777	5,777	5,947	5,782	15.9	**CHi / CHir**
646.85	666.85	20050614 16:07	20050614 17:12	0.00E+00	0.00E+00	0	0	5,956	#NV	#NV	#NV	16.1	**#NV**
666.85	686.85	20050614 17:56	20050614 18:57	0.00E+00	0.00E+00	0	0	6,135	#NV	#NV	#NV	16.4	**#NV**
686.83	706.83	20050614 19:48	20050615 00:58	2.17E–07	2.50E–07	1,200	14,400	6,312	6,315	6,519	6,312	16.7	**CHi / CHir**
706.83	726.83	20050615 08:02	20050615 09:58	1.67E–07	2.17E–07	1,200	2,400	6,483	6,488	6,696	6,505	16.9	**CHi / CHir**
726.91	746.91	20050615 10:40	20050615 11:52	#NV	#NV	1	2,400	6,664	6,679	6,889	6,705	17.2	**Pi**
747.00	767.00	20050615 12:45	20050615 14:11	#NV	#NV	1	2,400	6,845	6,868	7,069	7,034	17.5	**Pi**
767.06	787.06	20050615 14:50	20050615 16:25	1.83E–07	2.00E–07	1,200	1,200	7,025	7,027	7,250	7,046	17.8	**CHi / CHir**
787.07	807.07	20050615 17:07	20050616 01:36	2.00E–07	4.83E–07	1,200	21,600	7,203	7,267	7,407	7,239	18.1	**CHi / CHir**
807.11	827.11	20050616 08:05	20050616 09:07	0.00E+00	0.00E+00	0	0	7,372	#NV	#NV	#NV	18.3	**#NV**
827.15	847.15	20050616 09:52	20050616 12:29	1.67E–08	5.00E–08	420	3,600	7,556	7,625	7,778	7,696	18.6	**CHi / CHir**
847.20	867.20	20050616 13:09	20050616 00:00	1.00E–07	1.17E–07	1,200	1,200	7,737	7,744	7,953	7,770	18.9	**CHi / CHir**
867.24	887.24	20050616 15:39	20050616 17:25	8.33E–08	1.17E–07	1,200	1,200	7,914	7,930	8,144	7,960	19.2	**CHi / CHir**
887.27	907.27	20050616 18:07	20050617 03:30	1.67E–08	1.67E–08	1,200	28,800	8,094	8,137	8,306	8,097	19.5	**CHi / CHir**
907.30	927.30	20050617 07:33	20050617 08:27	0.00E+00	0.00E+00	0	0	8,261	#NV	#NV	#NV	19.8	**#NV**
927.34	947.34	20050617 09:13	20050617 10:14	0.00E+00	0.00E+00	0	0	8,439	#NV	#NV	#NV	20.0	**#NV**

#NV: Not analysed.
CHi: Constant Head injection phase.
CHir: Recovery phase following the constant head injection phase.
Pi: Pulse injection.

Table 7–2. Results from analysis of constant head tests in KLX05.

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up m btoc	low m btoc	Q/s m^2/s	T_M m^2/s	Perturb. phase	Recovery phase	T_{f1} m^2/s	T_{f2} m^2/s	T_{s1} m^2/s	T_{s2} m^2/s	T_T m^2/s	T_{TMIN} m^2/s	T_{TMAX} m^2/s	C m^3/Pa	ξ –	dt_1 min	dt_2 min	p* kPa	h_{wif} masl
111.30	211.30	1.20E–05	1.56E–05	22	WBS22	1.11E–05	1.44E–05	9.1E–06	1.3E–05	9.1E–06	7.0E–06	2.0E–05	1.4E–08	–3.6	0.3	0.7	1,882.8	10.49
211.14	311.14	2.84E–06	3.70E–06	22	WBS22	1.9E–06	2.8E–06	6.1E–07	1.9E–06	1.9E–06	9.0E–07	4.0E–06	7.3E–10	3.4	1.9	4.3	2,770.3	11.37
306.37	406.37	2.54E–09	3.31E–09	2	WBS2	1.7E–09	#NV	1.8E–09	#NV	1.8E–09	8.0E–10	3.0E–09	2.5E–10	–0.7	16.9	29.5	3,613.2	12.90
406.54	506.54	1.19E–08	1.55E–08	22	WBS22	1.2E–08	4.3E–09	1.9E–08	4.3E–09	1.9E–08	8.0E–09	4.0E–08	3.1E–10	0.6	1.8	4.2	4,517.7	13.04
506.63	606.63	#NV	#NV	#NV	WBS2	#NV	#NV	9.4E–11	#NV	9.4E–11	6.0E–11	2.0E–10	2.0E–10	–1.5	#NV	#NV	#NV	#NV
606.82	706.82	1.93E–08	2.51E–08	2	WBS2	1.4E–08	#NV	2.5E–08	#NV	2.5E–08	9.0E–09	4.0E–08	3.5E–10	1.2	1.8	4.1	6,306.5	15.34
706.83	806.83	1.81E–08	2.35E–08	22	WBS22	9.7E–08	1.7E–08	2.5E–07	7.9E–09	7.9E–09	4.0E–09	3.0E–08	7.9E–10	–2.2	#NV	#NV	7,183.9	15.42
807.11	907.11	8.93E–09	1.16E–08	2	WBS2	2.2E–09	#NV	3.4E–09	#NV	3.4E–09	1.0E–09	7.0E–09	3.1E–10	–2.8	11.2	34.1	8,082.9	17.23
887.27	987.27	9.34E–10	1.22E–09	2	WBS2	1.8E–10	#NV	1.2E–10	#NV	1.2E–10	9.0E–11	4.0E–10	2.9E–10	–2.3	#NV	#NV	#NV	#NV
111.30	131.30	1.04E–05	1.08E–05	22	WBS22	1.3E–05	1.8E–05	1.6E–05	1.1E–05	1.6E–05	8.0E–06	3.0E–05	1.6E–08	–0.3	2.8	5.0	1,185.4	10.86
126.02	146.02	9.16E–07	9.58E–07	22	WBS22	8.0E–07	2.1E–06	9.3E–07	3.2E–06	9.3E–07	7.0E–07	3.0E–06	3.2E–10	1.7	#NV	#NV	1,317.5	11.19
146.10	166.10	1.12E–06	1.17E–06	2	WBS2	2.9E–06	#NV	5.1E–06	#NV	5.1E–06	1.0E–06	8.0E–06	1.0E–10	20.7	0.2	9.6	1,492.6	11.18
166.12	186.12	2.24E–08	2.34E–08	22	WBS22	2.7E–08	1.4E–08	4.0E–08	2.6E–08	2.7E–08	1.0E–08	4.0E–08	5.2E–11	1.1	0.2	1.1	1,662.1	10.53
181.13	201.13	4.33E–07	4.53E–07	22	WBS22	5.2E–07	7.7E–07	3.1E–07	5.6E–07	3.1E–07	9.0E–08	6.0E–07	2.4E–10	–1.6	0.5	1.1	1,797.9	10.94
191.14	211.14	5.61E–07	5.87E–07	2	WBS22	2.0E–07	#NV	5.4E–07	2.4E–07	2.4E–07	9.0E–08	4.0E–07	3.8E–10	–3.6	6.4	18.3	1,878.7	10.22
211.14	231.14	9.76E–08	1.02E–07	22	WBS22	9.6E–08	2.3E–07	2.5E–08	2.1E–07	2.5E–08	9.0E–09	5.0E–08	1.3E–10	–3.1	0.7	1.78	2,062.5	11.06
226.14	246.14	3.09E–07	3.23E–07	2	WBS2	6.2E–07	#NV	1.4E–06	#NV	6.2E–07	1.0E–07	1.0E–06	7.3E–11	5.5	0.2	14.6	2,199.8	11.61
246.15	266.15	2.84E–06	2.97E–06	22	WBS22	1.7E–06	2.5E–06	7.8E–07	2.2E–06	2.2E–06	9.0E–07	4.0E–06	2.8E–09	–5.2	8.7	18.3	2,371.3	11.15
266.21	286.21	#NV	#NV	#NV	WBS22	#NV	#NV	2.3E–11	7.6E–11	7.6E–11	2.0E–11	2.0E–10	6.9E–11	–2.4	18.9	36.3	#NV	#NV
286.28	306.28	2.39E–08	2.50E–08	22	WBS22	1.5E–08	2.0E–08	2.0E–08	2.9E–08	2.0E–08	9.0E–09	4.0E–08	7.9E–11	–0.8	1.9	8.8	2,733.6	12.01
306.37	326.37	2.39E–09	2.50E–09	22	WBS2	2.1E–09	8.4E–10	2.2E–09	#NV	2.2E–09	9.0E–10	4.0E–09	5.0E–11	0.3	#NV	#NV	2,929.0	13.82
326.38	346.38	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
341.40	361.40	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
356.42	376.42	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
376.47	396.47	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
386.50	406.50	#NV	#NV	#NV	WBS2	#NV	#NV	4.4E–10	#NV	4.4E–10	1.0E–10	7.0E–10	7.0E–11	0.7	0.6	11.0	#NV	#NV

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up m btoc	low m btoc	Q/s m^2/s	T_M m^2/s	Perturb. phase	Recovery phase	T_{f1} m^2/s	T_{f2} m^2/s	T_{s1} m^2/s	T_{s2} m^2/s	T_T m^2/s	T_{TMIN} m^2/s	T_{TMAX} m^2/s	C m^3/Pa	ξ –	dt_1 min	dt_2 min	p* kPa	h_{wif} masl
406.54	426.54	1.17E–08	1.22E–08	22	WBS22	1.3E–08	4.6E–09	1.8E–08	4.5E–09	1.8E–08	9.0E–09	3.0E–08	5.8E–11	0.5	2.0	4.5	3,827.3	13.46
426.55	446.55	#NV	#NV	#NV	WBS2	#NV	#NV	3.4E–11	#NV	3.4E–11	1.0E–11	6.0E–11	5.6E–11	0.6	1.1	7.4	#NV	#NV
446.57	466.57	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
466.58	486.58	#NV	#NV	#NV	WBS22	#NV	#NV	3.7E–10	2.5E–10	3.7E–10	9.0E–11	6.0E–10	6.1E–11	0.6	0.5	6.9	#NV	#NV
486.59	506.59	1.62E–09	1.69E–09	2	WBS2	1.5E–09	#NV	2.7E–09	#NV	2.7E–09	9.0E–10	5.0E–09	4.8E–11	5.0	#NV	#NV	4,516.0	12.82
606.82	626.82	#NV	#NV	#NV	WBS2	#NV	#NV	4.1E–10	#NV	4.1E–10	1.0E–10	8.0E–10	5.2E–11	–0.6	1.4	5.5	#NV	#NV
626.85	646.85	9.62E–09	1.01E–08	2	WBS2	9.69E–09	#NV	1.2E–08	#NV	1.2E–08	9.0E–09	6.0E–08	9.5E–11	2.3	12.7	25.6	5,774.7	14.82
646.85	666.85	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
666.85	686.85	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
686.83	706.83	1.04E–08	1.09E–08	22	WBS22	1.2E–08	5.9E–09	2.2E–08	4.2E–09	1.2E–08	9.0E–09	3.0E–08	7.6E–11	1.2	0.4	2.9	6,306.3	15.31
706.83	726.83	7.86E–09	8.22E–09	22	WBS22	7.62E–09	3.8E–09	7.5E–09	4.49E–09	4.5E–09	1.0E–09	7.0E–09	3.9E–11	–0.7	13.2	34.8	6,487.4	15.92
726.91	746.91	#NV	#NV	#NV	WBS2	#NV	#NV	1.6E–10	#NV	1.6E–10	8.0E–11	4.0E–10	4.2E–11	–1.1	7.4	35.0	#NV	#NV
747.00	767.00	#NV	#NV	#NV	WBS2	#NV	#NV	3.6E–12	#NV	3.6E–12	1.0E–12	6.0E–12	6.8E–11	–1.6	#NV	#NV	#NV	#NV
767.06	787.06	8.07E–09	8.44E–09	2	WBS22	9.18E–09	#NV	3.2E–08	#NV	9.2E–09	6.0E–09	5.0E–08	4.1E–11	2.2	0.6	14.4	7,038.9	18.33
787.07	807.07	1.40E–08	1.47E–08	22	WBS22	3.62E–08	4.3E–09	3.7E–07	3.29E–09	4.3E–09	1.0E–09	7.0E–09	2.0E–10	–3.0	#NV	#NV	7,200.4	16.89
807.11	827.11	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
827.15	847.15	1.07E–09	1.12E–09	#NV	WBS2	#NV	#NV	4.3E–09	#NV	4.3E–09	8.0E–10	7.0E–09	5.6E–11	1.0	#NV	#NV	#NV	#NV
847.20	867.20	4.69E–09	4.91E–09	2	WBS2	2.1E–09	#NV	2.8E–09	#NV	2.8E–09	9.0E–10	5.0E–09	5.2E–11	–0.9	9.8	17.8	7,747.4	18.75
867.24	887.24	3.82E–09	4.00E–09	22	WBS22	2.2E–09	1.2E–09	2.7E–09	1.5E–09	1.5E–09	8.0E–10	4.0E–09	6.9E–11	–1.6	8.6	19.8	7,907.0	17.07
887.27	907.27	9.67E–10	1.01E–09	22	WBS2	5.1E–10	9.8E–11	1.1E–10	#NV	1.1E–10	6.0E–11	4.0E–10	3.6E–11	–1.3	37.4	112.4	8,087.3	17.53
907.30	927.30	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
927.34	947.34	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV

Notes

1 T1 and T2 refer to the transmissivity(s) derived from the analysis while using the recommended flow model. In case a homogeneous flow model was recommended only one T value is reported, in case a two zones composite model was recommended both T1 and T2 are given T_T denotes the recommended transmissivity.

2 The parameter p* denoted the static formation pressure (measured at transducer depth) and was derived from the HORNER plot of the CHIR phase using straight line or type-curve extrapolation.

3 The flow regime description refers to the recommended model used in the transient analysis. WBS denotes wellbore storage and skin and is followed by a set of numbers describing the flow dimension used in the analysis (1 = linear flow, 2 = radial flow, 3 = spherical flow). If only one number is used (e.g. WBS2 or 2) a homogeneous flow model (1 composite zone) was used in the analysis, if two numbers are given (WBS22 or 22) a 2 zones composite model was used.

The Figures 7-1 to 7-3 present the transmissivity, conductivity and hydraulic freshwater head profiles.

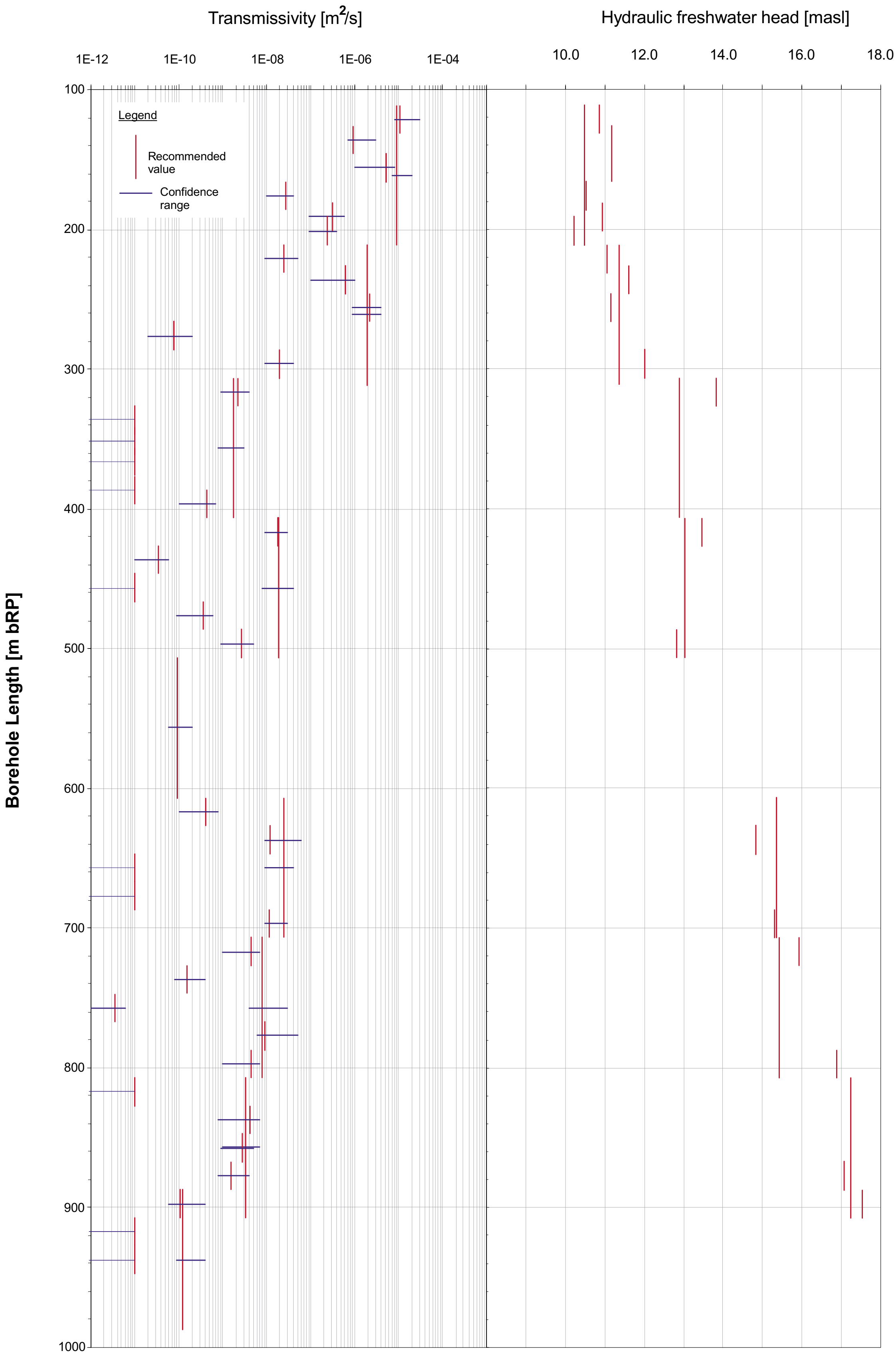


Figure 7-1. Results summary – profiles of transmissivity and equivalent freshwater head, transmissivities derived from injectiontests, freshwater head extrapolated.

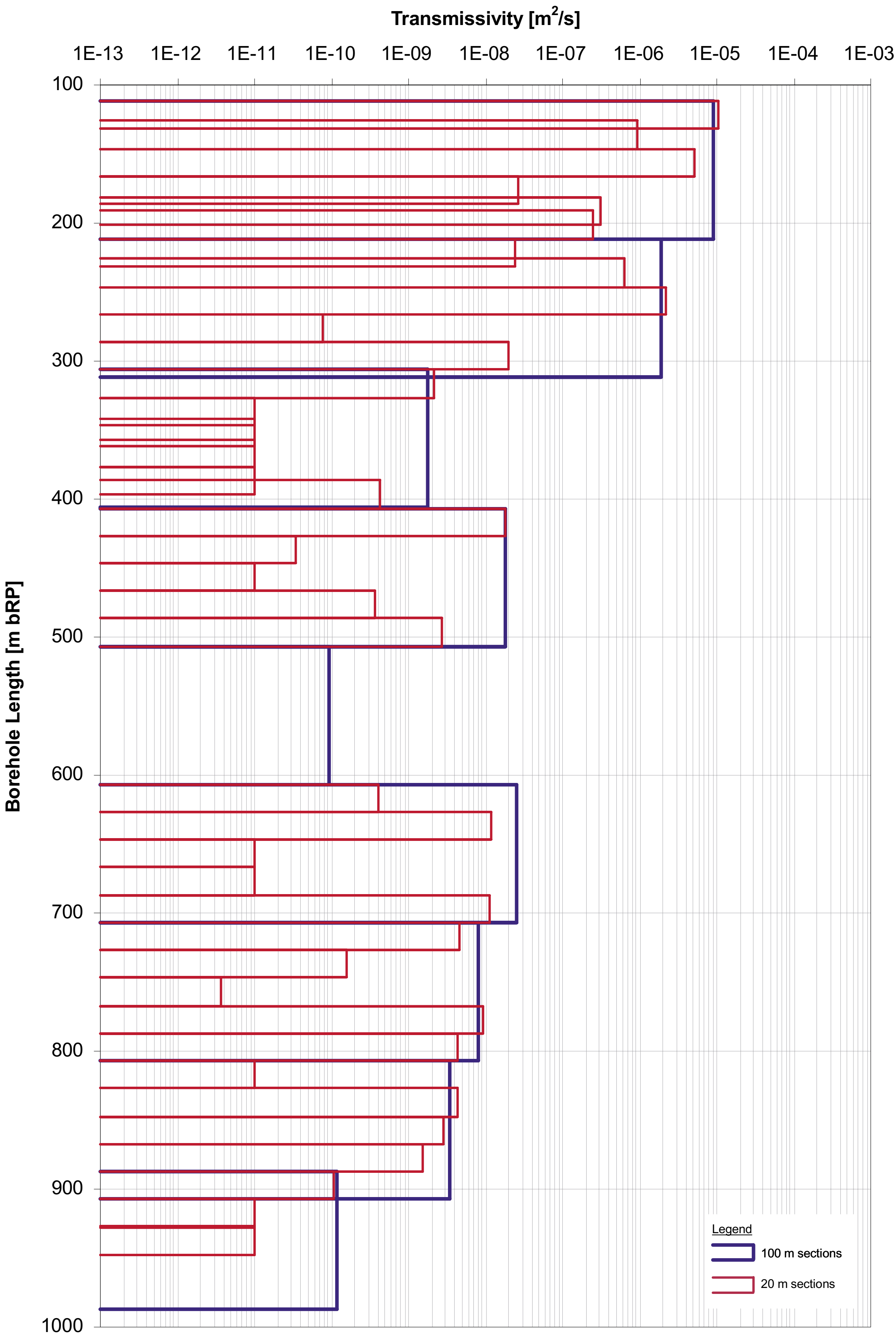


Figure 7-2. *Results summary – profile of transmissivity.*

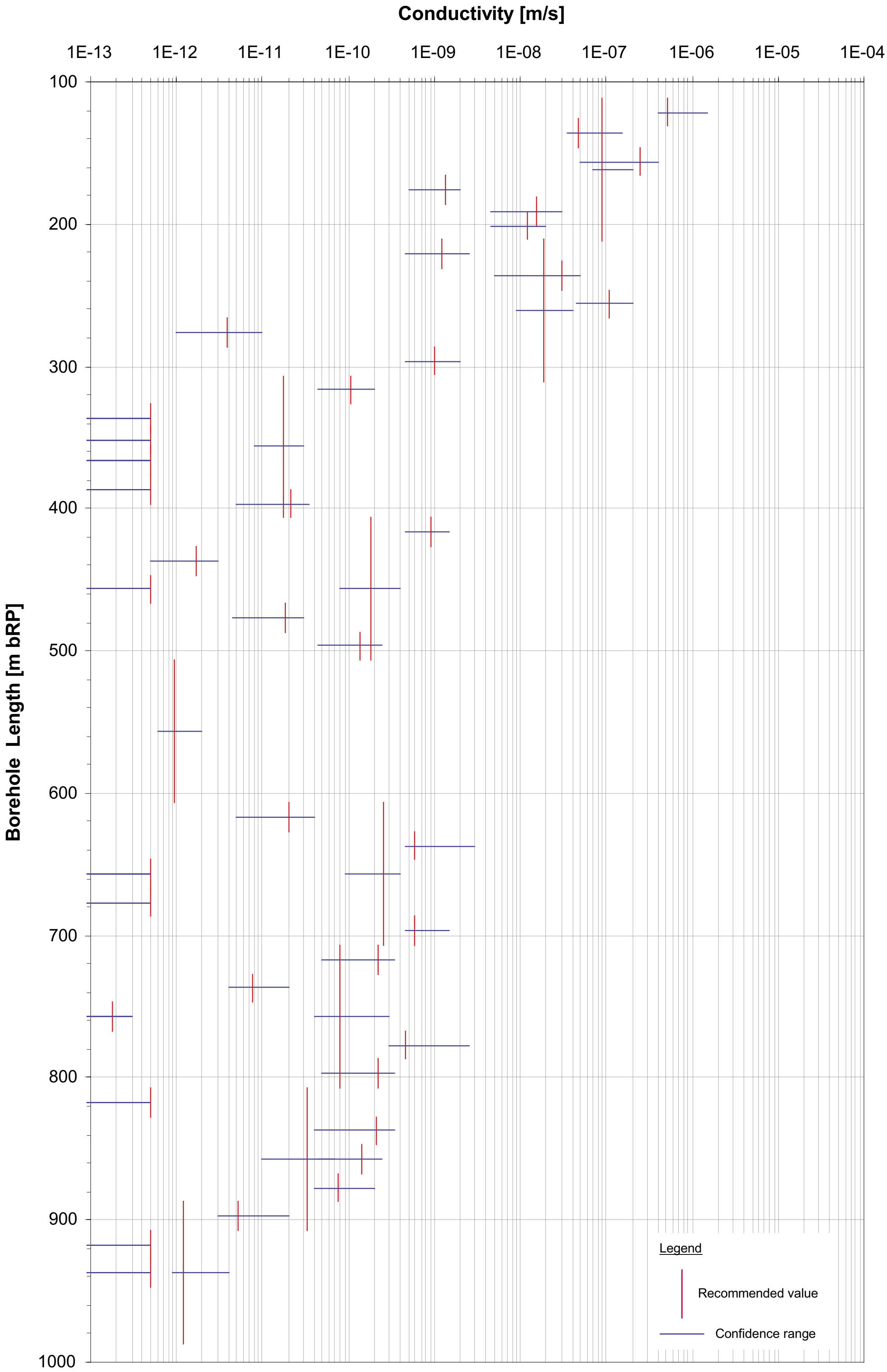


Figure 7-3. *Results summary – profile of hydraulic conductivity.*

7.2 Correlation analysis

A correlation analysis was used with the aim of examining the consistency of results and deriving general conclusion regarding the testing and analysis methods used.

7.2.1 Comparison of steady state and transient analysis results

The steady state derived transmissivities (T_M and Q/s) were compared in a cross-plot with the recommended transmissivity values derived from the transient analysis (see following figure).

The correlation analysis shows that all of the steady state derived transmissivities differ by less than one order of magnitude from the transmissivities derived from the transient analysis. The values of the steady state analysis are in the most cases slightly higher than the recommended values.

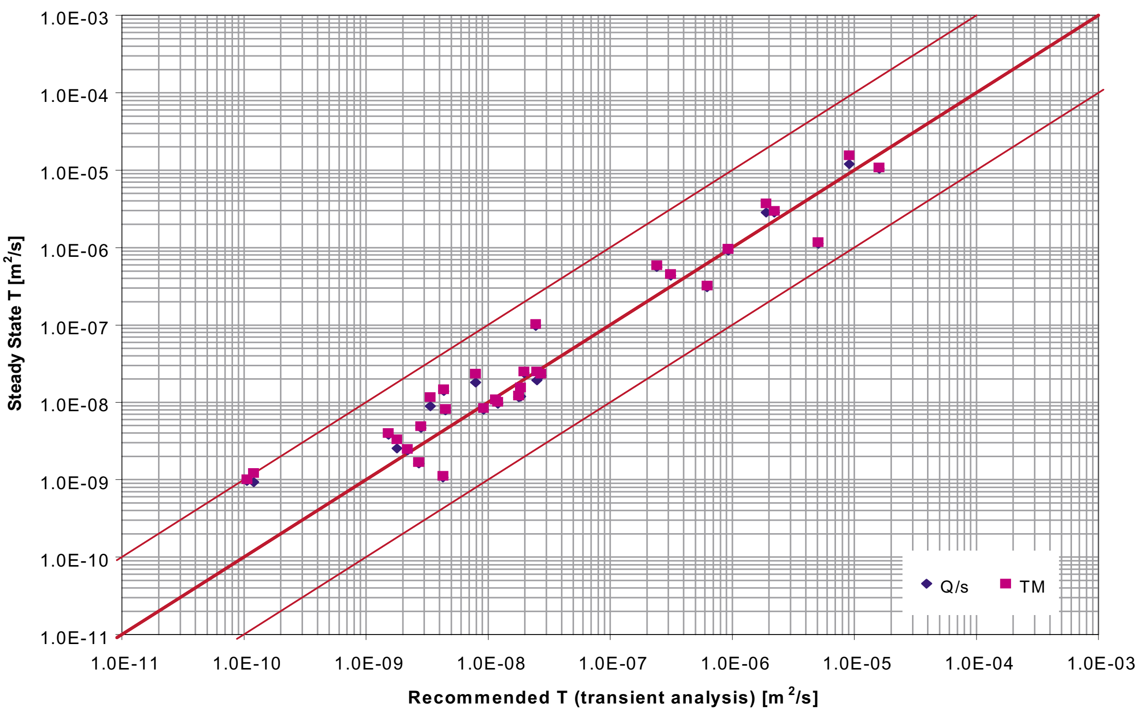


Figure 7-4. *Correlation analysis of transmissivities derived by steady state and transient methods.*

7.2.2 Comparison between the matched and theoretical wellbore storage coefficient

The wellbore storage coefficient describes the capacity of the test interval to store fluid as result to an unit pressure change in the interval. For a closed system (i.e. closed downhole valve) the theoretical value of the wellbore storage coefficient is given by the product between the interval volume and the test zone compressibility. The interval volume is calculated from the borehole radius and interval length. There are uncertainties concerning the interval volume calculation. Cavities or high transmissivity fractures intersecting the interval may enlarge the effective volume of the interval. The test zone compressibility is given by the sum of compressibilities of the individual components present in the interval (water, packer elements, other test tool components, and the borehole wall). A minimum value for the test zone compressibility is given by the water compressibility which is approximately 5E–10 1/Pa. For the calculation of the theoretical wellbore storage coefficient a test zone compressibility of 7E–10 1/Pa was used. The matched wellbore storage coefficient is derived from the transient type curve analysis by matching the unit slope early times derivative plotted in log-log coordinates.

The following figure presents a cross-plot of the matched and theoretical wellbore storage coefficients.

It can be seen that the matched wellbore storage coefficients are up to three orders of magnitude larger than the theoretical values. This phenomenon was already observed at the previous boreholes. A three orders of magnitude increase is difficult to explain by volume uncertainty. Even if large fractures are connected to the interval, a volume increase by three orders of magnitude does not seem probable. The discrepancy can be more likely explained by increased compressibility of the packer system. In order to better understand this phenomenon, a series of tool compressibility tests should be conducted in order to measure the tool compressibility and to assess to what extent the system behaves elastically.

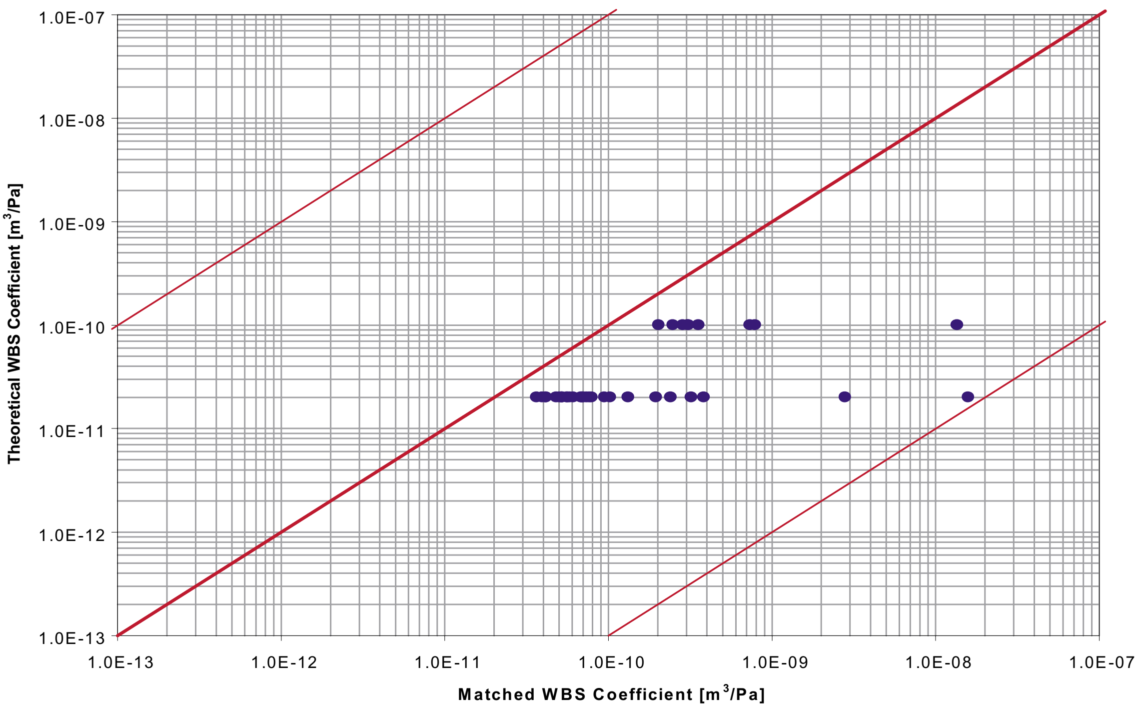


Figure 7-5. *Correlation analysis of theoretical and matched wellbore storage coefficients.*

8 Conclusions

8.1 Transmissivity

Figure 7-1 presents a profile of transmissivity, including the confidence ranges derived from the transient analysis. The method used for deriving the recommended transmissivity and its confidence range is described in Section 5.5.7.

Whenever possible, the transmissivities derived are representative for the "undisturbed formation" further away from the borehole. The borehole vicinity was typically described by using a skin effect.

In some cases, no injection test were performed due to the fact that the preliminary pulse was showing a slow recovery indicating a low transmissivity. In such cases the preliminary pulse injection (Pi) was prolonged and analysed. One pulse injection test in the 100 m sections and eight Pulse injection tests in the 20 m sections were conducted without performing a constant head injection test. The recommended transmissivities of these sections range between 3.6E–12 m^2/s and 4.4E–10 m^2/s. Eight constat head injection tests were performed in 100 m sections and 22 in 20 m sections. The derived transmissivities of these injection tests range between 1.2E–10 m^2/s and 1.6E–5 m^2/s.

The transmissivity profiles in Figures 7.1 and 7.2 show transmissivities that ranges between 9.4E–11 m^2/s and 9.1E–6 m^2/s for the 100 m sections. The lowest transmissivities were derived in the test sections 506.63–606.63 m and 887.27–987.27 m with values of 9.6E–11 m^2/s and 1.2E–10 m^2/s, respectively. From 111.30 m to 311.14 m the highest transmissivities were observed (9.1E–6 m^2/s and 1.9E–6 m^2/s).

For the 20 m sections, the transmissivities range from 3.6E–12 m^2/s to 1.6E–5 m^2/s.The results form the 20 m section are consistent to the results of the appropriate longer intervals. Only four 20 m sectios show larger transmissivities. The differences are small and are covered by the confidence range.

8.2 Equivalent freshwater head

Figure 7-1 presents a profile of the derived equivalent freshwater head expressed in metres above sea level. The method used for deriving the equivalent freshwater head is described in Section 5.5.6.

The head profile shows a freshwater head that ranges from 10.20 m for the upper part of the borehole to 17.50 m for the lower part. It shows a continuesly increase of the freshwater head with increase of depth. This can be explained by higher salinity of the water. The profile shows no distinct zones, which means that there is a good vertical connectivity in the formation around the borehole.

The uncertainty related to the derived freshwater heads is dependent on the test section transmissivity, Due to the relatively short pressure recovery phase, the static pressure extrapolation becomes increasingly uncertain at lower transmissivities.

8.3 Flow regimes encountered

The flow models used in analysis were derived from the shape of the pressure derivative calculated with respect to log time and plotted in log-log coordinates.

In several cases the pressure derivative suggests a change of transmissivity with the distance from the borehole. In such cases a composite flow model was used in the analysis.

If there were different flow models matching the data in comparable quality, the simplest model was preferred.

In few cases very large skins has been observed. This is unusual and should be further examined. There are several possible explanations to this behaviour:

- If the behaviour is to be completely attributed to changes of transmissivity in the formation, this indicates the presence of larger transmissivity zones in the borehole vicinity, which could be caused by steep fractures that do not intersect the test interval, but are connected to the interval by lower transmissivity fractures. The fact that in many cases the test derivatives of adjacent test sections converge at late times seems to support this hypothesis.
- A further possibility is that the large skins are caused by turbulent flow taking place in the tool or in fractures connected to the test interval. This hypothesis is more difficult to examine. However, considering the fact that some high skins were observed in sections with transmissivities as low as 1E–8 m^2/s (which imply low flow rates) seems to speak against this hypothesis.

The flow dimension displayed by the test can be diagnosed from the slope of the pressure derivative. A slope of 0.5 indicates linear flow, a slope of 0 (horizontal derivative) indicates radial flow and a slope of –0.5 indicates spherical flow. The flow dimension diagnosis was commented for each of the tests. In all of the cases it was possible to get a good match quality by using radial flow geometry. In no cases an alternative analysis with a flow dimension unequal to two was performed. Those analyses are presented in Appendix 2.

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APPENDIX 1

File Description Table

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX05				
TEST- AND FILEPROTOCOL					**Testorder dated : 2005-05-31**				
Teststart		Interval boundaries		Name of Datafiles		Testtype	Copied to	Plotted	Sign.
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)	
2005-06-01	17:37	111.30	211.30	___KLX05_0111.30_200506011737.ht2	KLX05_111.30-211.30_050601_1_CHir_Q_r.csv	Chir		2005-06-02	
2005-06-02	09:21	211.14	311.14	___KLX05_0211.14_200506020921.ht2	KLX05_211.14-311.14_050602_1_CHir_Q_r.csv	Chir		2005-06-02	
2005-06-02	13:30	306.37	406.37	___KLX05_0306.37_200506021330.ht2	KLX05_306.37-406.37_050602_1_CHir_Q_r.csv	Chir		2005-06-02	
2005-06-02	17:49	406.54	506.54	___KLX05_0406.54_200506021749.ht2	KLX05_406.54-506.54_050602_1_CHir_Q_r.csv	Chir		2005-06-03	
2005-06-03	09:11	506.63	606.63	___KLX05_0506.63_200506030911.ht2	KLX05_506.63-606.63_050603_1_Pi_Q_r.csv	Pi		2005-06-03	
2005-06-03	12:41	606.82	706.82	___KLX05_0606.82_200506031241.ht2	KLX05_606.82-706.82_050603_1_CHir_Q_r.csv	Chir		2005-06-03	
2005-06-03	16:56	706.83	806.83	___KLX05_0706.83_200506031656.ht2	KLX05_706.83-806.83_050603_1_CHir_Q_r.csv	Chir		2005-06-03	
2005-06-04	09:20	807.11	907.11	___KLX05_0807.11_200506040920.ht2	KLX05_807.11-907.11_050604_1_CHir_Q_r.csv	Chir		2005-06-04	
2005-06-04	14:00	887.27	987.27	___KLX05_0887.27_200506041400.ht2	KLX05_887.27-987.27_050604_1_CHir_Q_r.csv	Chir		2005-06-04	
2005-06-09	19:46	111.30	131.30	___KLX05_0111.30_200506091946.ht2	KLX05_111.30-131.30_050609_1_CHir_Q_r.csv	Chir		2005-06-10	
2005-06-10	13:12	111.30	131.30	___KLX05_0111.30_200506101312.ht2	KLX05_111.30-131.30_050610_2_CHir_Q_r.csv	Chir		2005-06-10	
2005-06-10	15:35	126.02	146.02	___KLX05_0126.02_200506101535.ht2	KLX05_126.02-146.02_050610_1_CHir_Q_r.csv	Chir		2005-06-10	
2005-06-10	17:47	146.10	166.10	___KLX05_0146.10_200506101747.ht2	KLX05_146.10-166.10_050610_1_CHir_Q_r.csv	Chir		2005-06-11	
2005-06-11	08:54	166.12	186.12	___KLX05_0166.12_200506110854.ht2	KLX05_166.12-186.12_050611_1_CHir_Q_r.csv	Chir		2005-06-11	
2005-06-11	11:14	181.13	201.13	___KLX05_0181.13_200506111114.ht2	KLX05_181.13-201.13_050611_1_CHir_Q_r.csv	Chir		2005-06-11	
2005-06-11	13:38	191.14	211.14	___KLX05_0191.14_200506111338.ht2	KLX05_191.14-211.14_050611_1_CHir_Q_r.csv	Chir		2005-06-11	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX05				
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2005-06-11	18:10	226.14	246.14	___KLX05_0226.14_200506111810.ht2	KLX05_226.14-246.14_050611_1_CHir_Q_r.csv	Chir		2005-06-12	
2005-06-12	08:10	246.15	266.15	___KLX05_0246.15_200506120810.ht2	KLX05_246.15-266.15_050612_1_CHir_Q_r.csv	Chir		2005-06-12	
2005-06-12	10:21	266.21	286.21	___KLX05_0266.21_200506121021.ht2	KLX05_266.21-286.21_050612_1_Pi_Q_r.csv	Pi		2005-06-12	
2005-06-12	12:29	286.28	306.28	___KLX05_0286.28_200506121229.ht2	KLX05_286.28-306.28_050612_1_CHir_Q_r.csv	Chir		2005-06-12	
2005-06-12	14:39	306.37	326.37	___KLX05_0306.37_200506121439.ht2	KLX05_306.37-326.37_050612_1_CHir_Q_r.csv	Chir		2005-06-12	
2005-06-12	17:03	326.38	346.38	___KLX05_0326.38_200506121703.ht2	KLX05_326.38-346.38_050612_1_Pi_Q_r.csv	Pi		2005-06-12	
2005-06-12	18:38	341.40	361.40	___KLX05_0341.40_200506121838.ht2	KLX05_341.40-361.40_050612_1_CHir_Q_r.csv	Chir		2005-06-13	
2005-06-13	07:26	356.42	376.42	___KLX05_0356.42_200506130726.ht2	KLX05_356.42-376.42_050613_1_CHir_Q_r.csv	Chir		2005-06-13	
2005-06-13	09:17	376.47	396.47	___KLX05_0376.47_200506130917.ht2	KLX05_376.47-396.47_050613_1_CHir_Q_r.csv	Chir		2005-06-13	
2005-06-13	11:00	386.50	406.50	___KLX05_0386.50_200506131100.ht2	KLX05_386.50-406.50_050613_1_Pi_Q_r.csv	Pi		2005-06-13	
2005-06-13	13:04	406.54	426.54	___KLX05_0406.54_200506131304.ht2	KLX05_406.54-426.54_050613_1_CHir_Q_r.csv	Chir		2005-06-13	
2005-06-13	15:32	426.55	446.55	___KLX05_0426.55_200506131532.ht2	KLX05_426.55-446.55_050613_1_Pi_Q_r.csv	Pi		2005-06-13	
2005-06-13	17:33	446.57	466.57	___KLX05_0446.57_200506131733.ht2	KLX05_446.57-466.57_050613_1_CHir_Q_r.csv	Chir		2005-06-13	
2005-06-13	19:13	466.58	486.58	___KLX05_0466.58_200506131913.ht2	KLX05_466.58-486.58_050613_1_Pi_Q_r.csv	Pi		2005-06-14	
2005-06-14	07:40	486.59	506.59	___KLX05_0486.59_200506140740.ht2	KLX05_486.59-506.59_050614_1_CHir_Q_r.csv	Chir		2005-06-14	

HYDROTESTING WITH PSS										DRILLHOLE IDENTIFICATION NO.: KLX05
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2005-06-14	13:16	626.85	646.85	___KLX05_0626.85_200506141316.ht2	KLX05_626.85-646.85_050614_1_CHir_Q_r.csv	Chir		2005-06-14		
2005-06-14	16:07	646.85	666.85	___KLX05_0646.85_200506141607.ht2	KLX05_646.85-666.85_050614_1_CHir_Q_r.csv	Chir		2005-06-14		
2005-06-14	17:56	666.85	686.85	___KLX05_0666.85_200506141756.ht2	KLX05_666.85-686.85_050614_1_CHir_Q_r.csv	Chir		2005-06-14		
2005-06-14	19:48	686.83	706.83	___KLX05_0686.83_200506141948.ht2	KLX05_686.83-706.83_050614_1_CHir_Q_r.csv	Chir		2005-06-15		
2005-06-15	08:02	706.83	726.83	___KLX05_0706.83_200506150802.ht2	KLX05_706.83-726.83_050615_1_CHir_Q_r.csv	Chir		2005-06-15		
2005-06-15	10:40	726.91	746.91	___KLX05_0726.91_200506151040.ht2	KLX05_726.91-746.91_050615_1_Pi_Q_r.csv	Pi		2005-06-15		
2005-06-15	12:45	747.00	767.00	___KLX05_0747.00_200506151245.ht2	KLX05_747.00-767.00_050615_1_Pi_Q_r.csv	Pi		2005-06-15		
2005-06-15	17:07	787.07	807.07	___KLX05_0787.07_200506151707.ht2	KLX05_787.07-807.07_050615_1_CHir_Q_r.csv	Chir		2005-06-16		
2005-06-16	08:05	807.11	827.11	___KLX05_0807.11_200506160805.ht2	KLX05_807.11-827.11_050616_1_CHir_Q_r.csv	Chir		2005-06-16		
2005-06-16	09:52	827.15	847.15	___KLX05_0827.15_200506160952.ht2	KLX05_827.15-847.15_050616_1_CHir_Q_r.csv	Chir		2005-06-16		
2005-06-16	13:09	847.20	867.20	___KLX05_0847.20_200506161309.ht2	KLX05_847.20-867.20_050616_1_CHir_Q_r.csv	Chir		2005-06-16		
2005-06-16	15:39	867.24	887.24	___KLX05_0867.24_200506161539.ht2	KLX05_867.24-887.24_050616_1_CHir_Q_r.csv	Chir		2005-06-16		
2005-06-16	18:07	887.27	907.27	___KLX05_0887.27_200506161807.ht2	KLX05_887.27-907.27_050616_1_CHir_Q_r.csv	Chir		2005-06-17		
2005-06-17	07:33	907.30	927.30	___KLX05_0907.30_200506170733.ht2	KLX05_907.30-927.30_050617_1_Pi_Q_r.csv	Pi		2005-06-17		

HYDROTESTING WITH PSS						DRILLHOLE IDENTIFICATION NO.: KLX05				
TEST- AND FILEPROTOCOL						**Testorder dated : 2005-05-31**				
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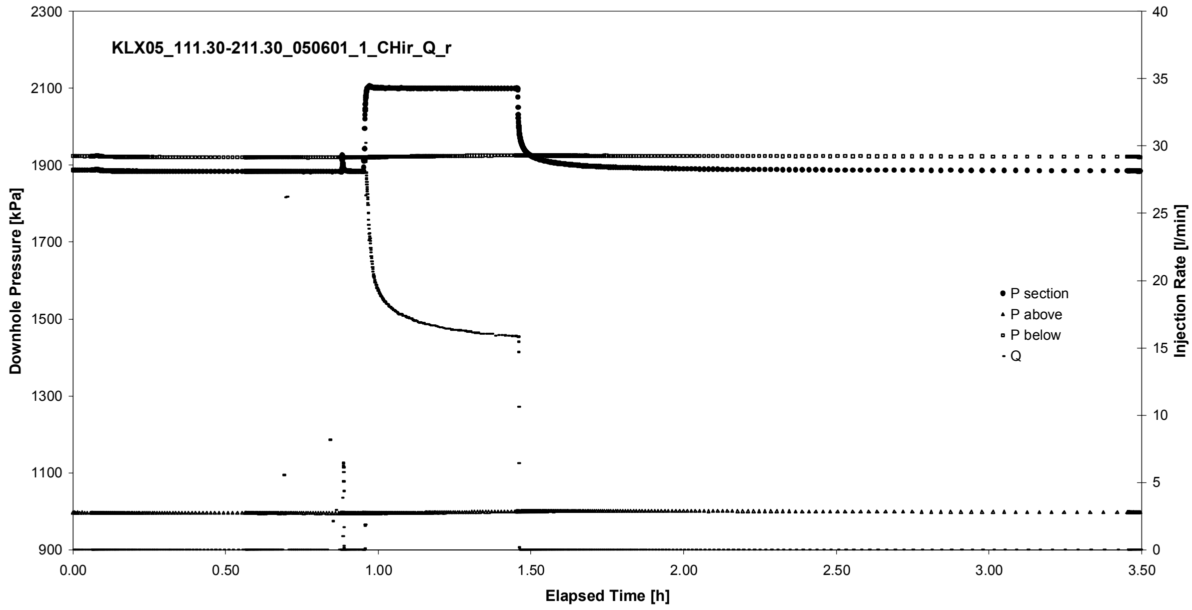
APPENDIX 2

Analysis diagrams

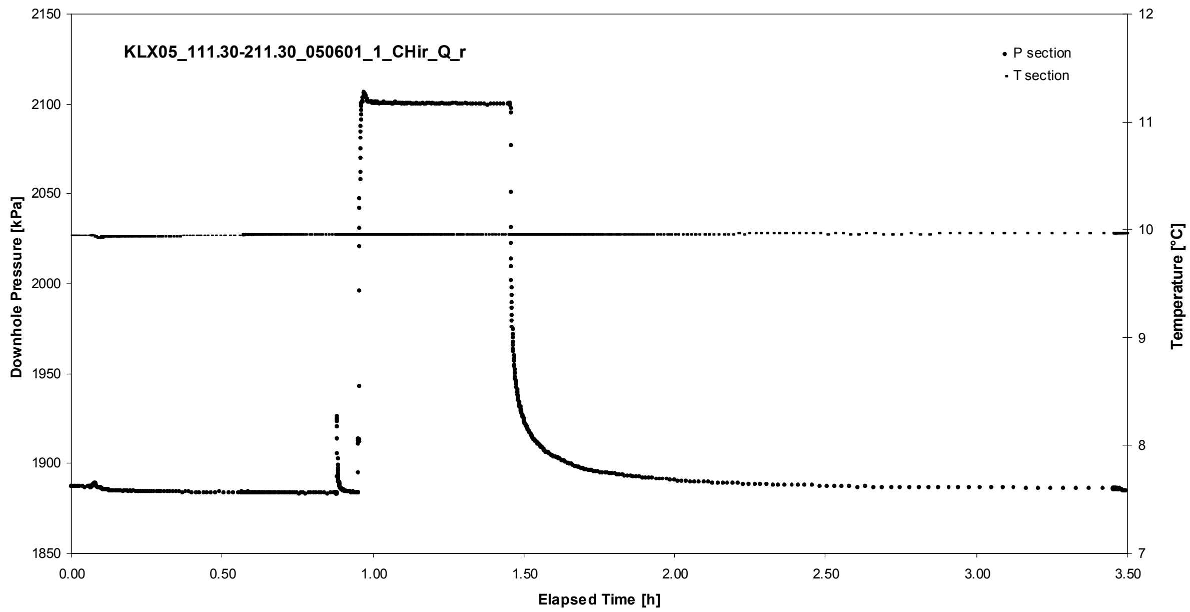
APPENDIX 2-1

Test 111.30 – 211.30 m

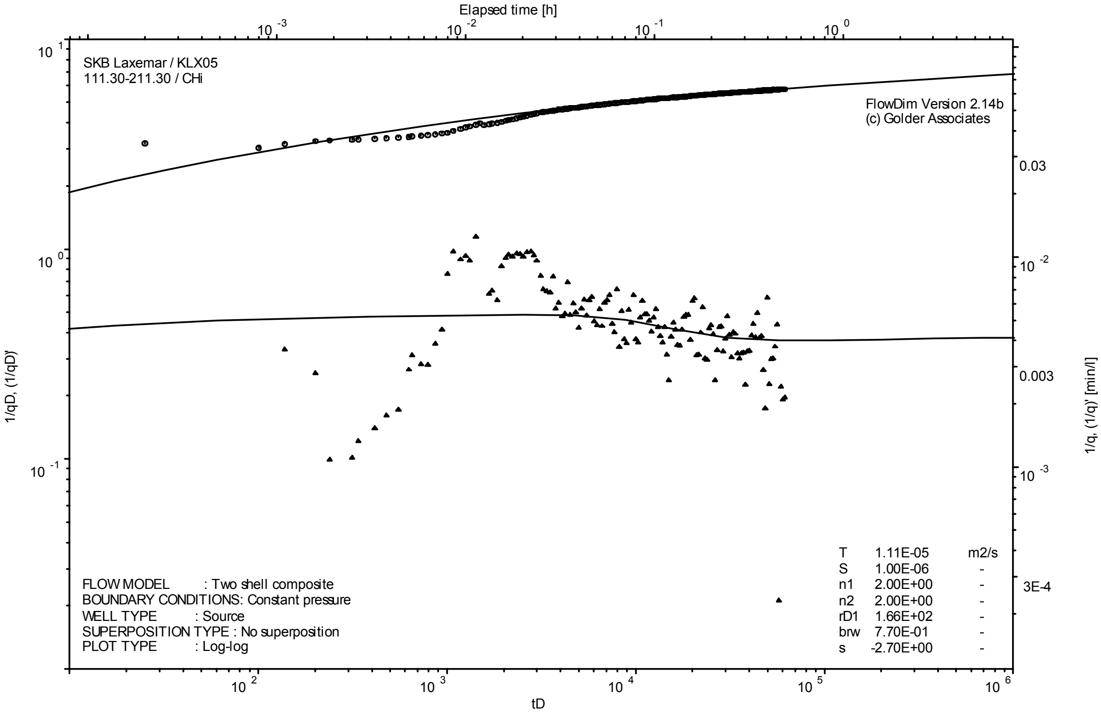
Analysis diagrams



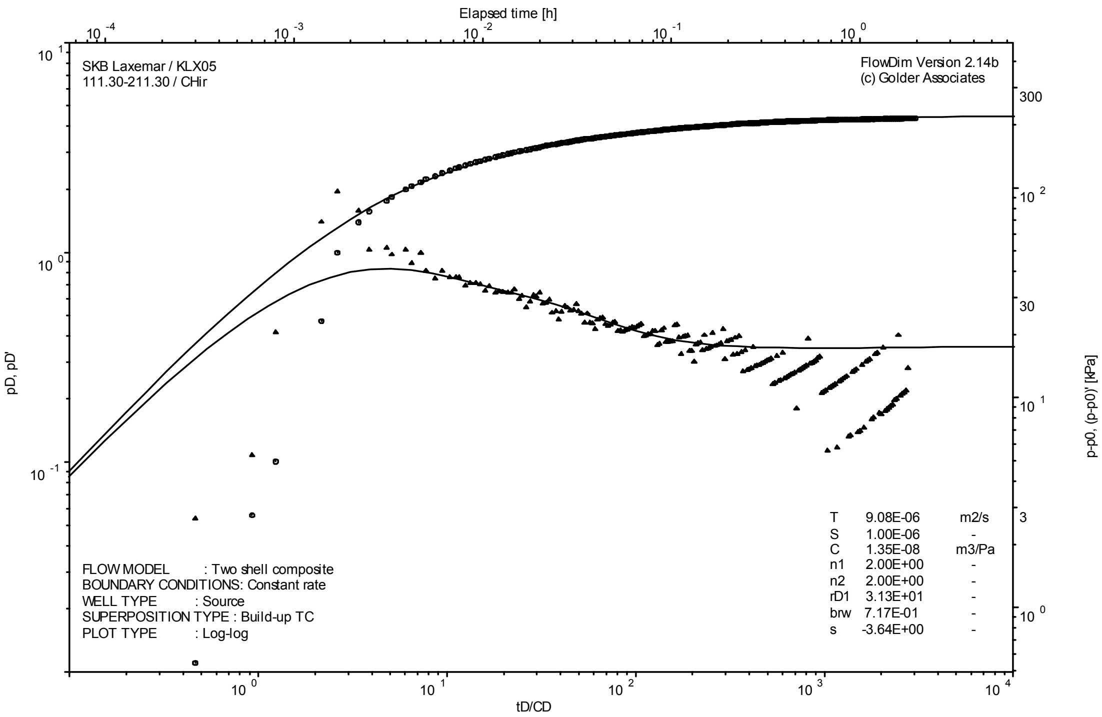
Pressure and flow rate vs. time; cartesian plot



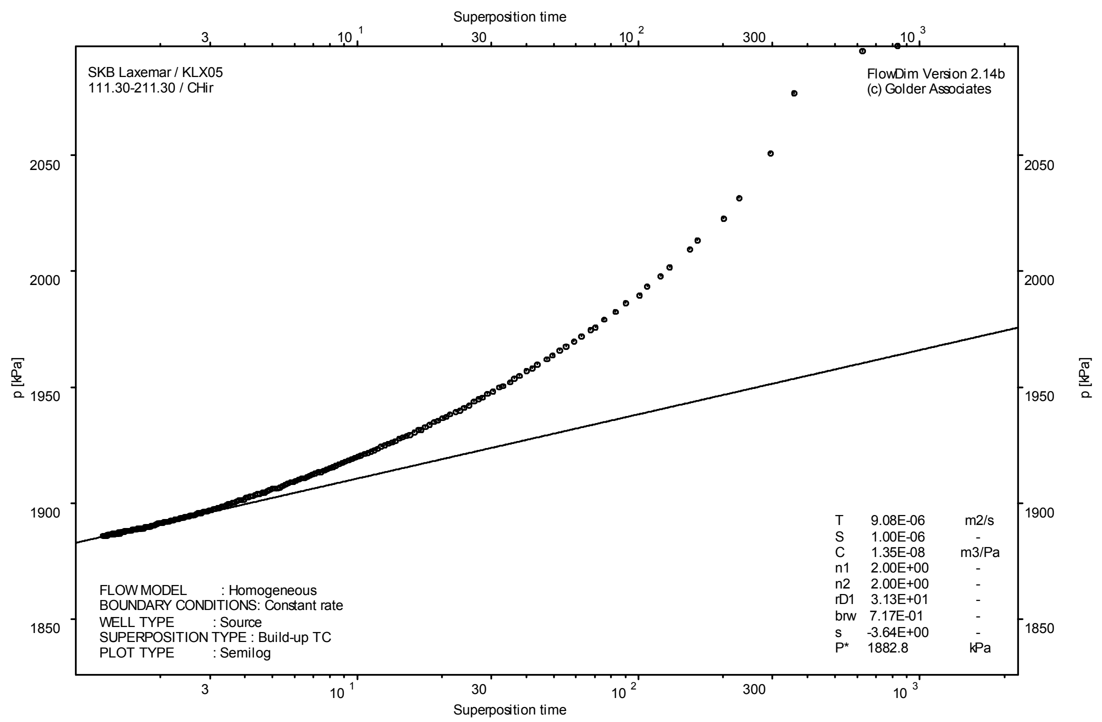
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

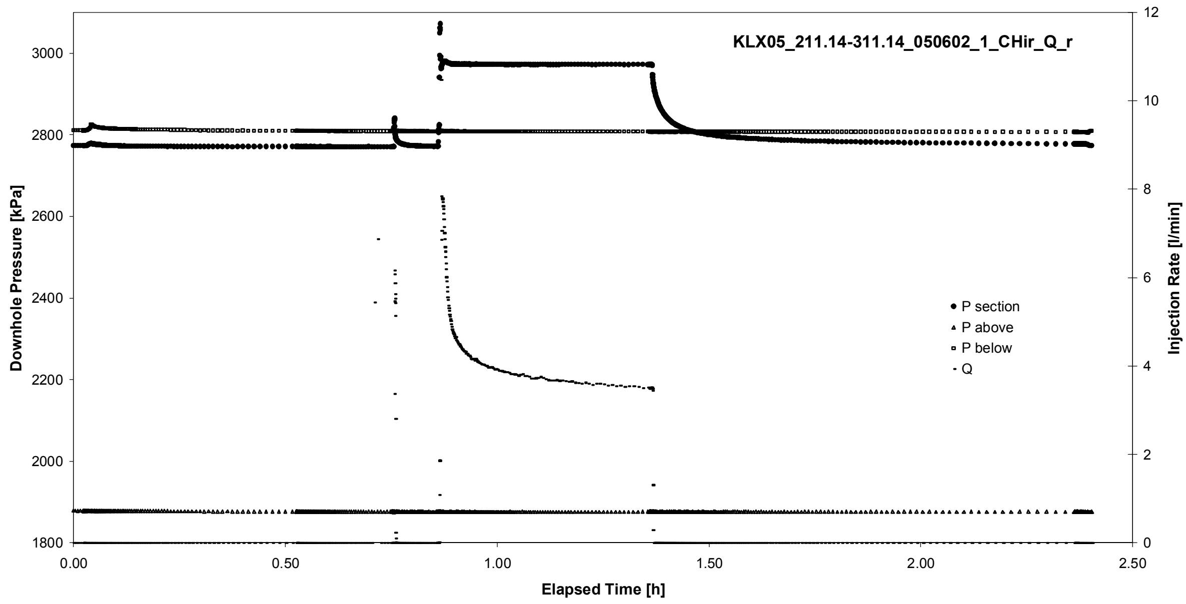


CHIR phase; HORNER match

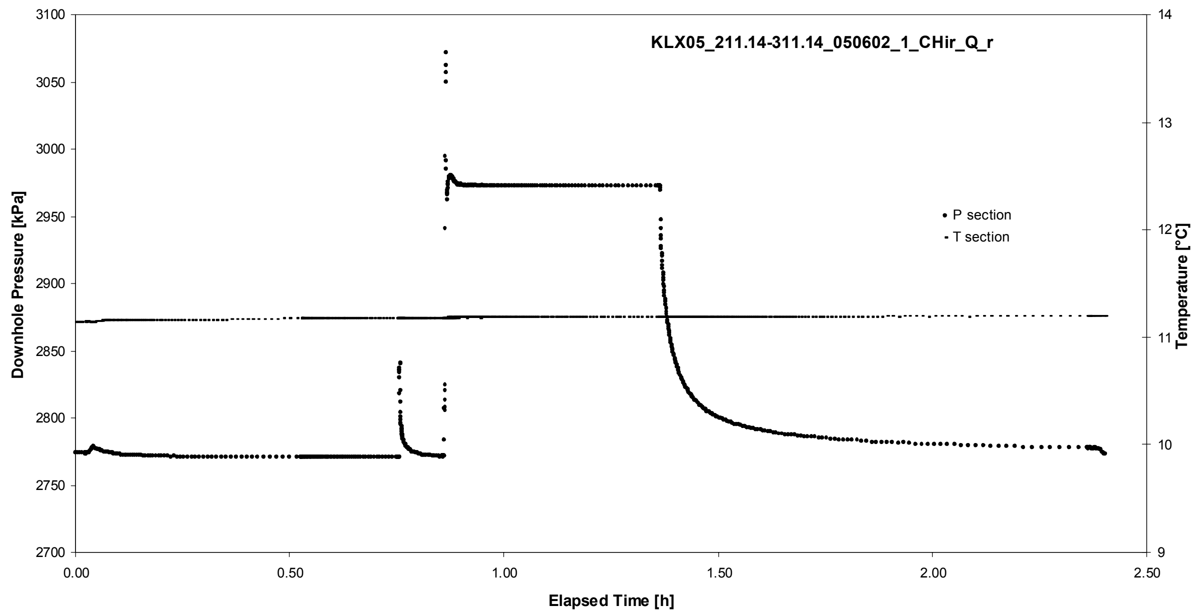
APPENDIX 2-2

Test 211.14 – 311.14 m

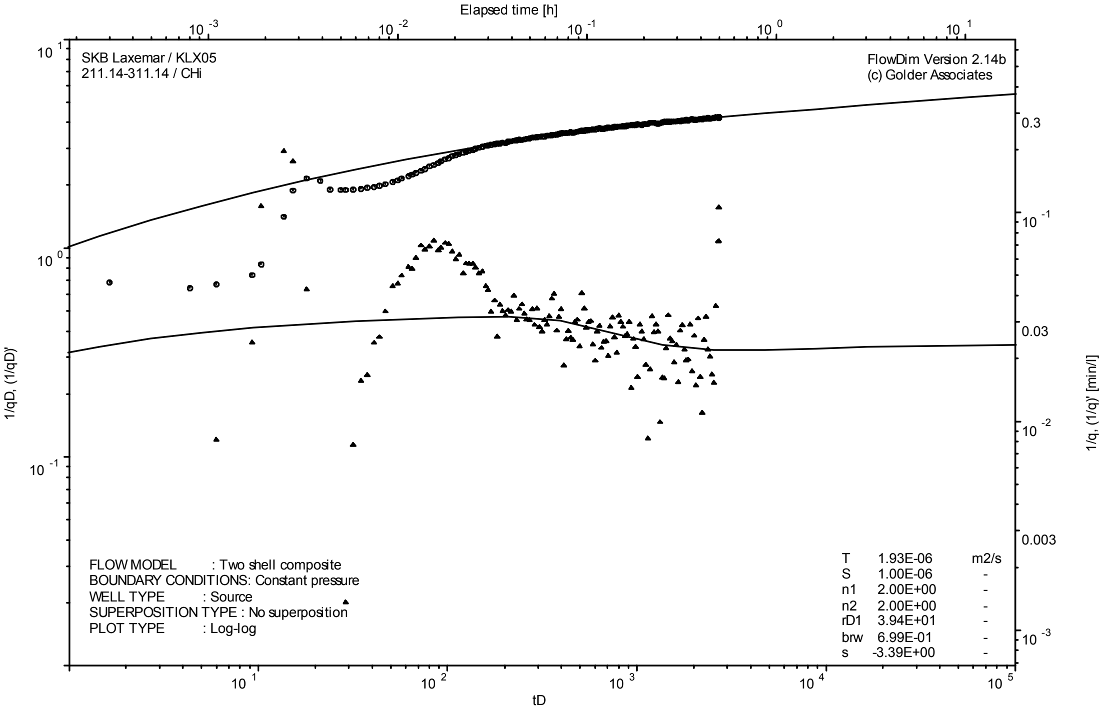
Analysis diagrams



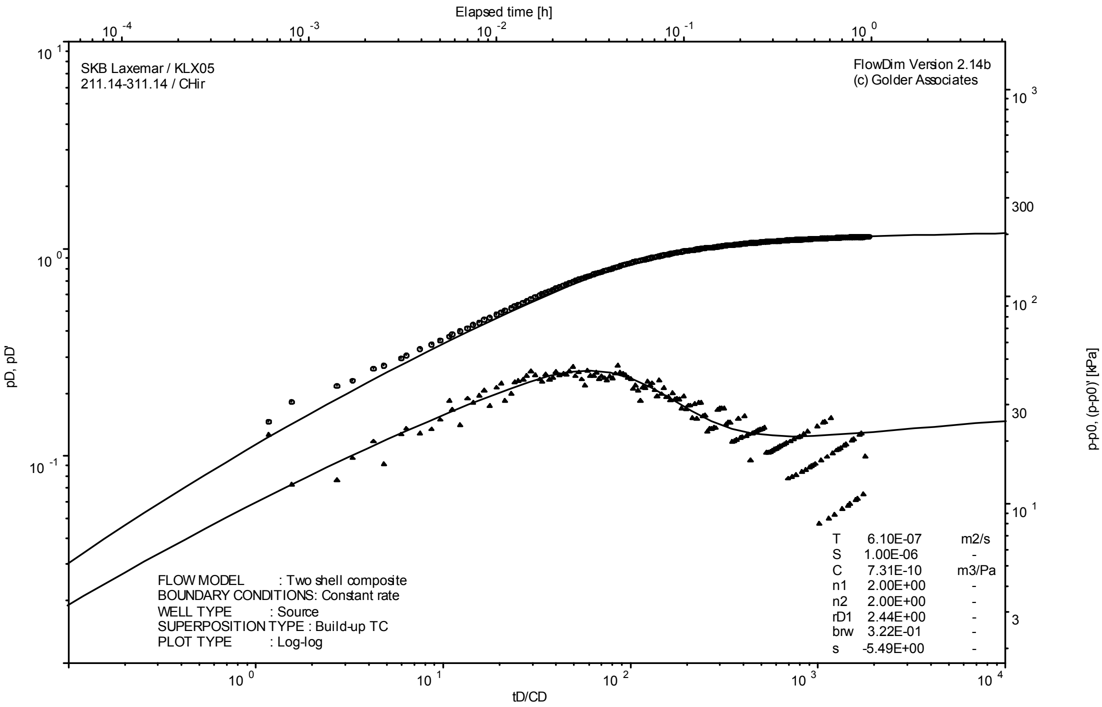
Pressure and flow rate vs. time; cartesian plot



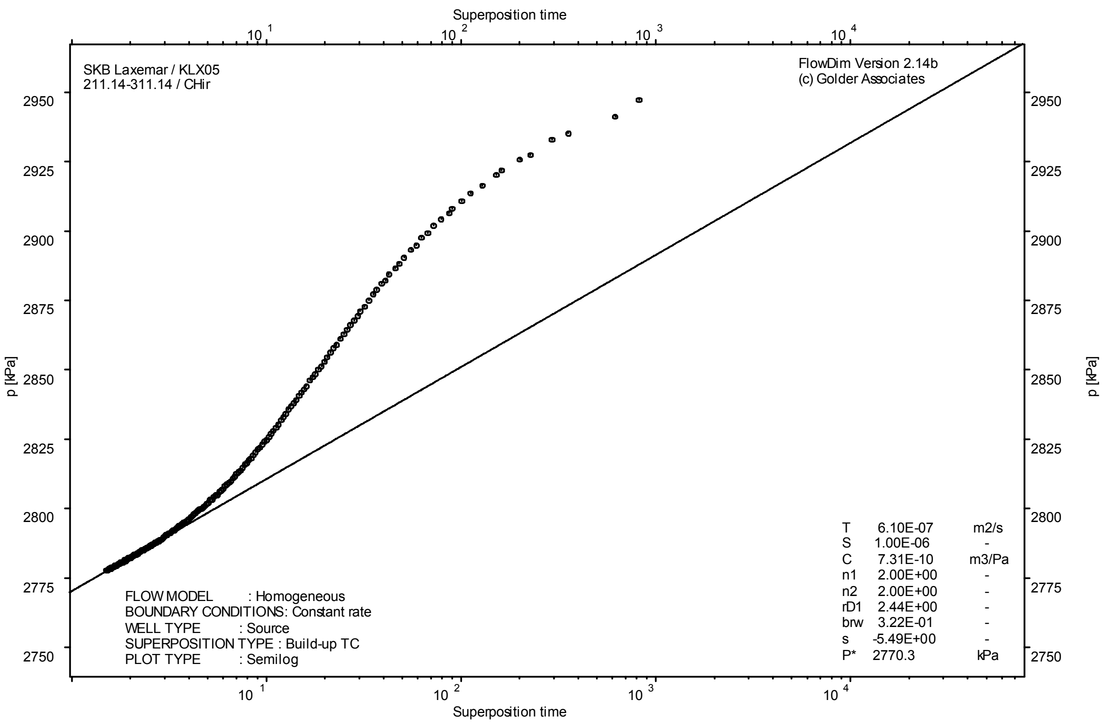
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

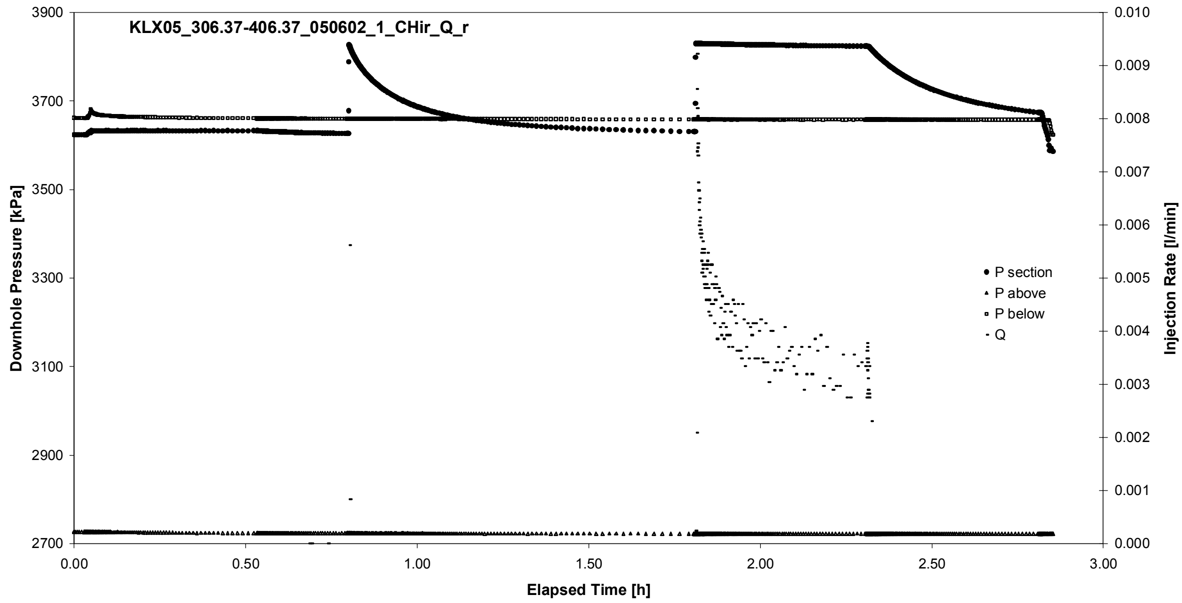


CHIR phase; HORNER match

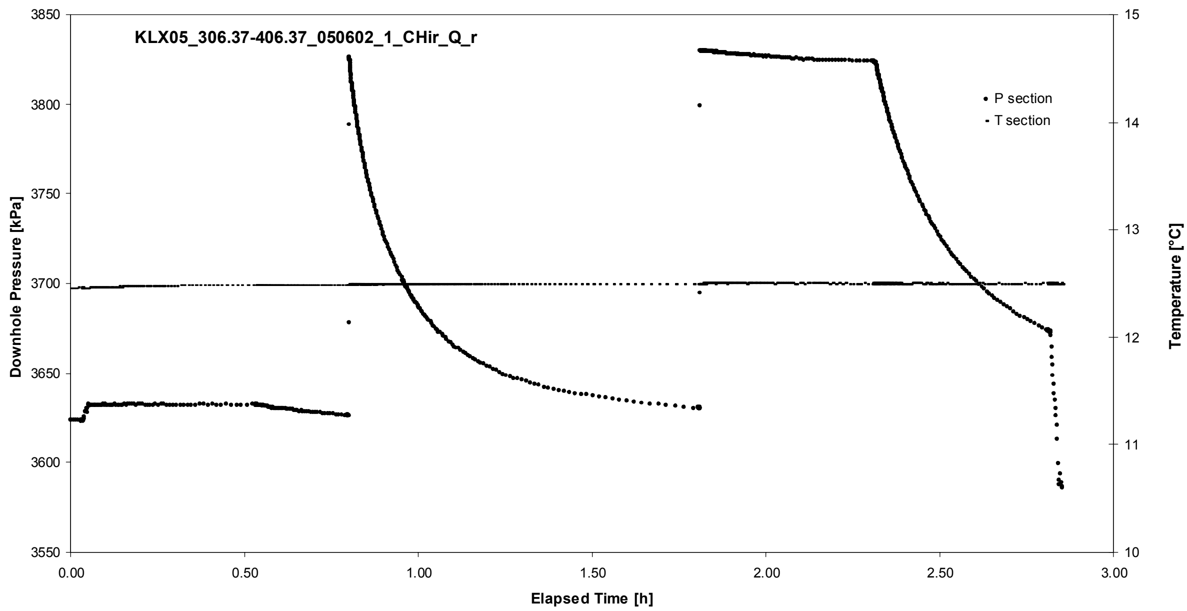
APPENDIX 2-3

Test 306.37 – 406.37 m

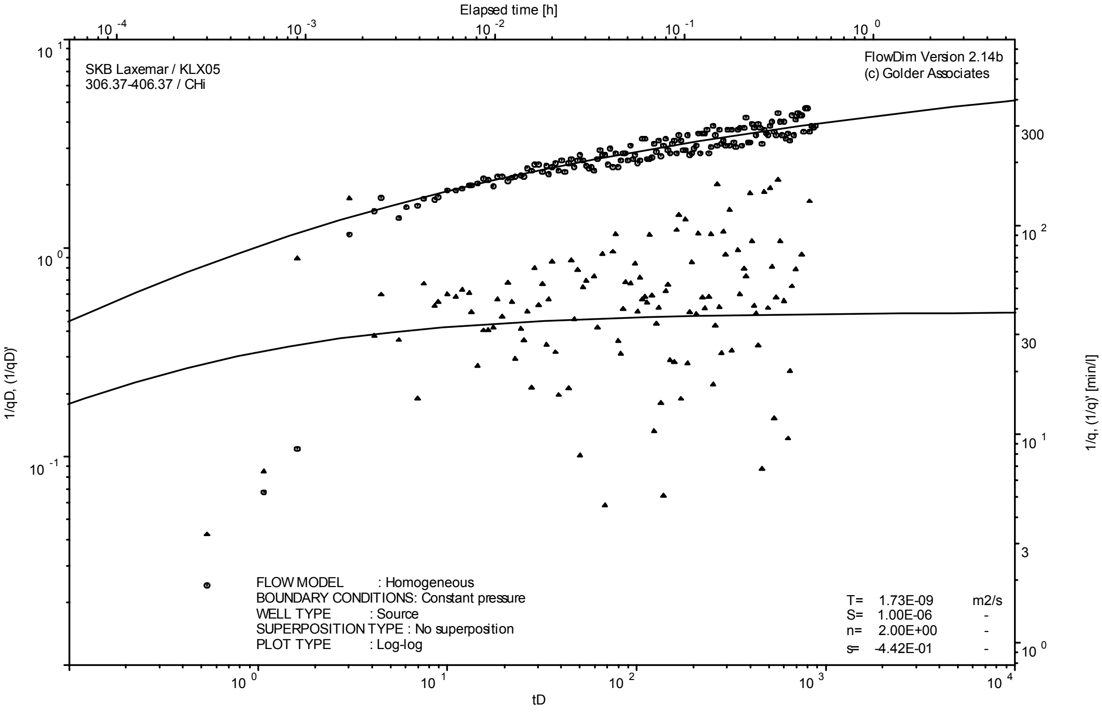
Analysis diagrams



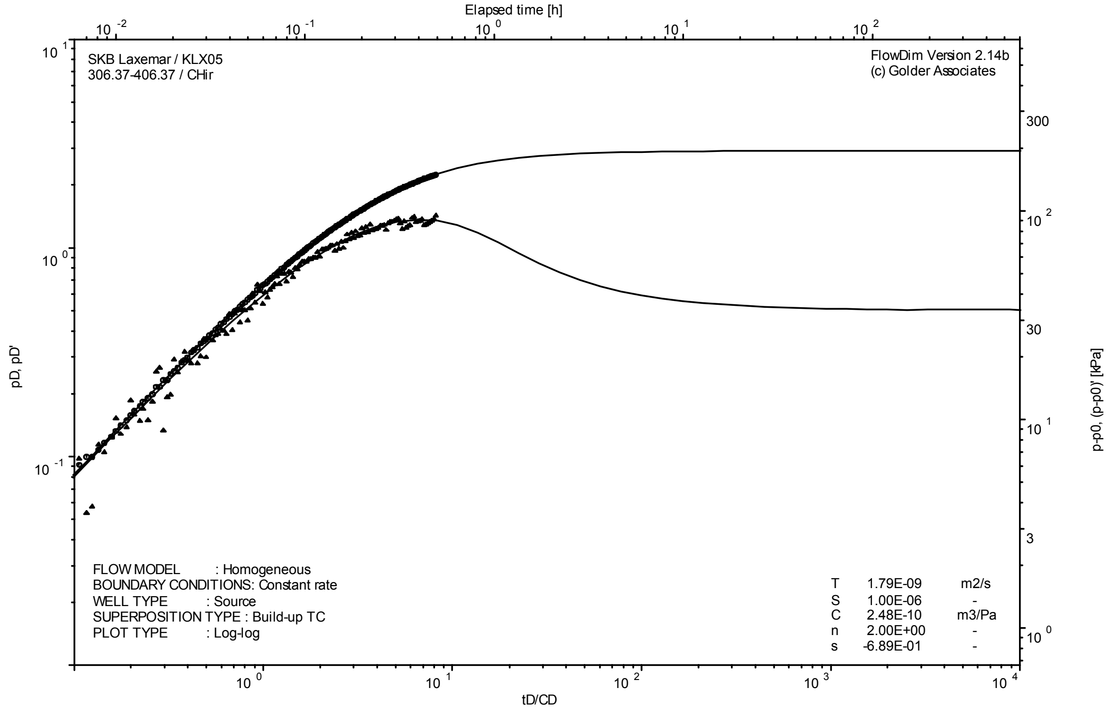
Pressure and flow rate vs. time; cartesian plot



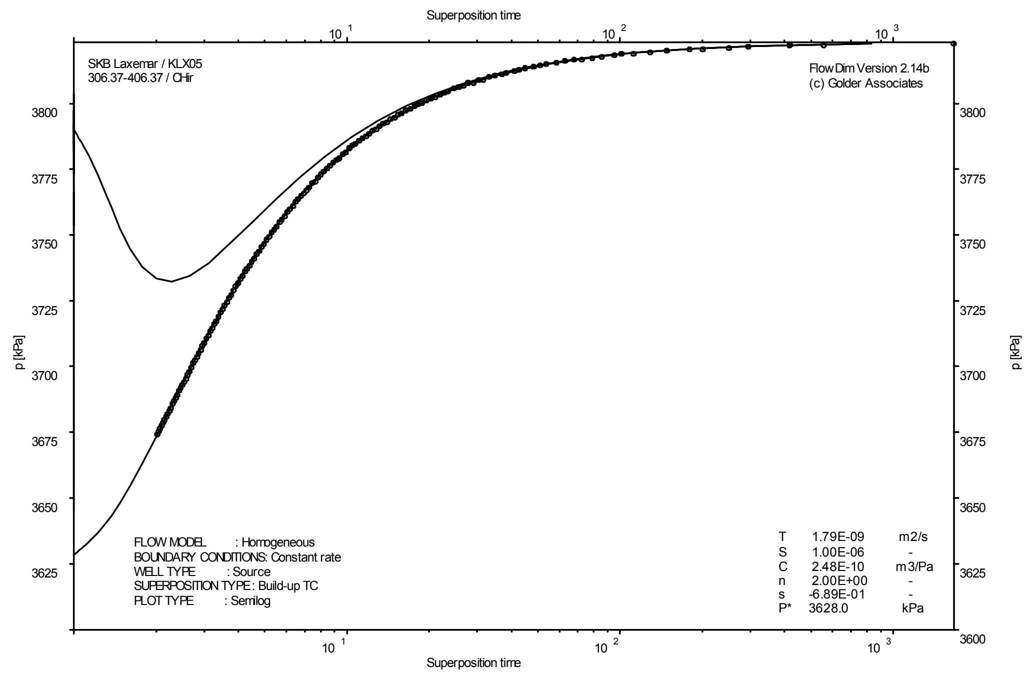
Interval pressure and temperature vs. time; cartesian plot



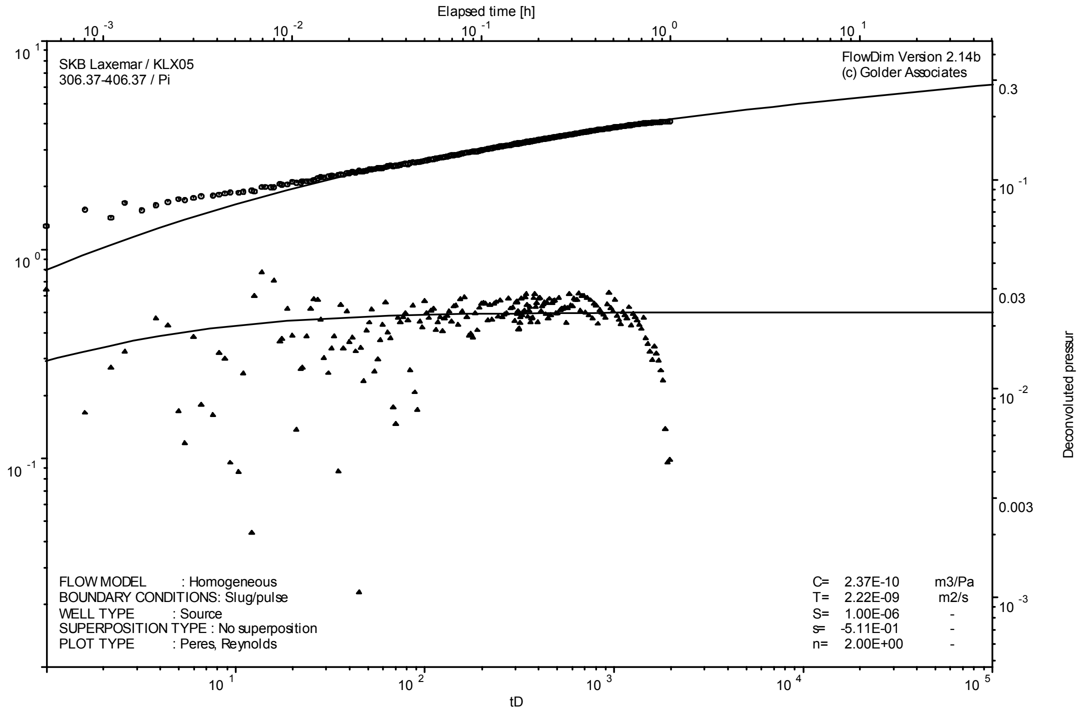
CHI phase; log-log match



CHIR phase; log-log match



CHIR phase; HORNER match

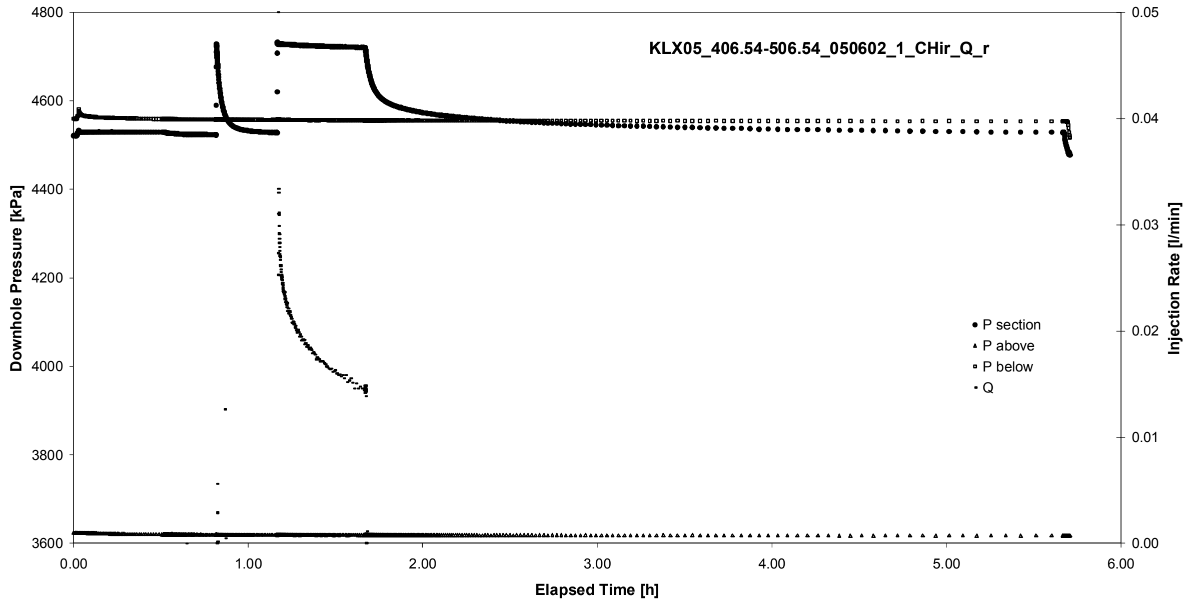


Pulse injection; deconvolution match

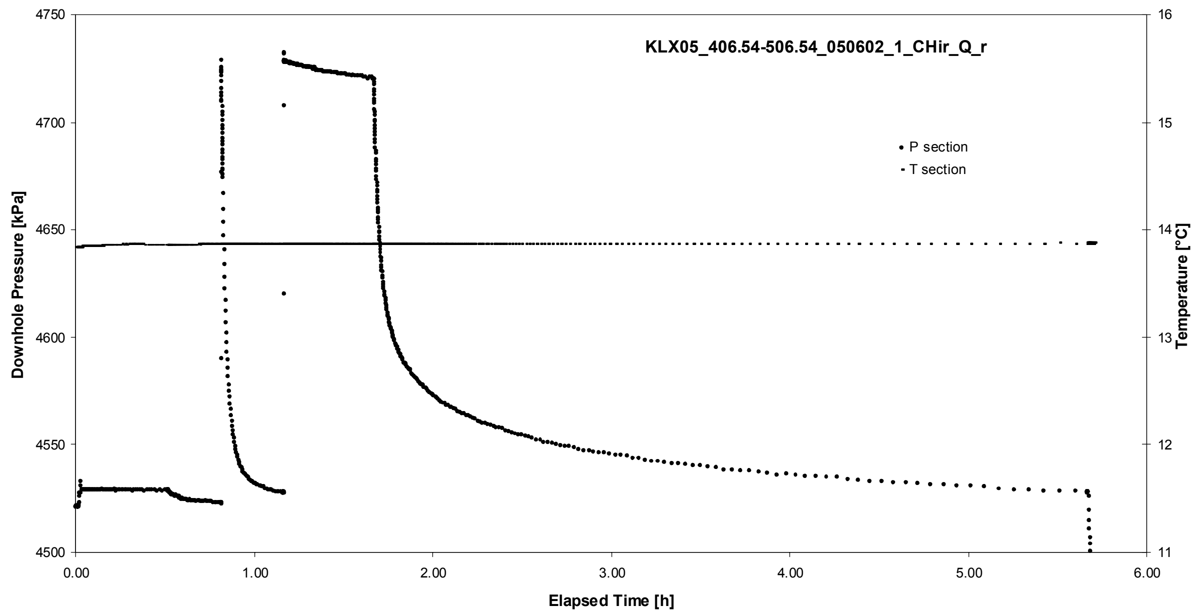
APPENDIX 2-4

Test 406.54 – 506.54 m

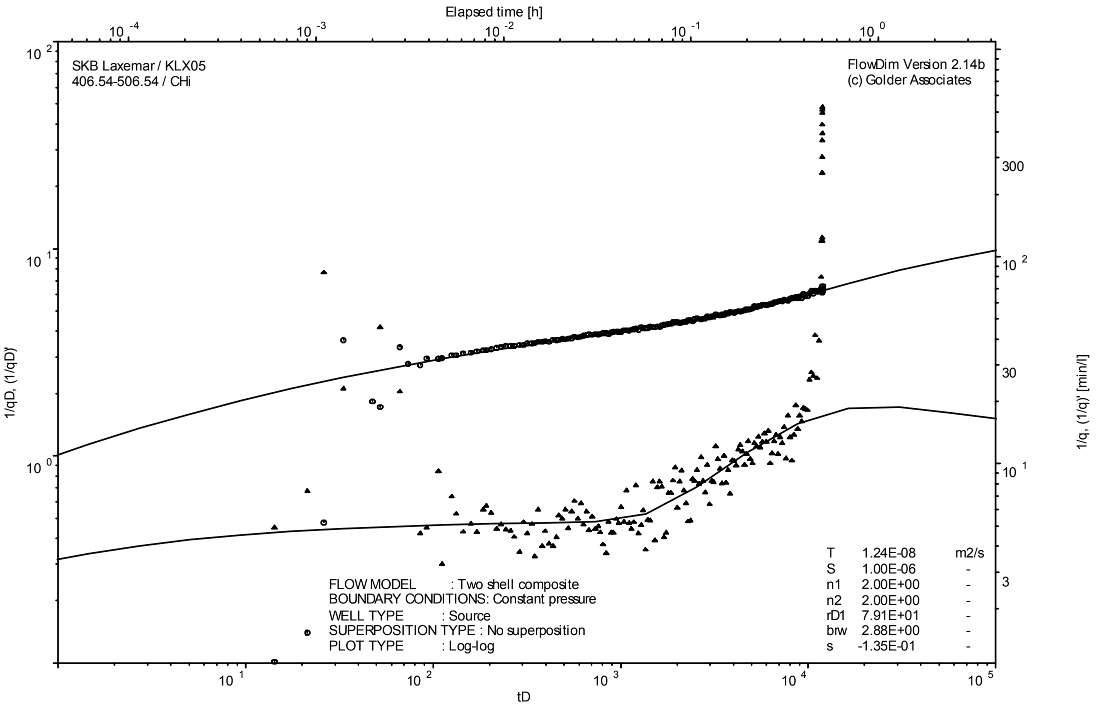
Analysis diagrams



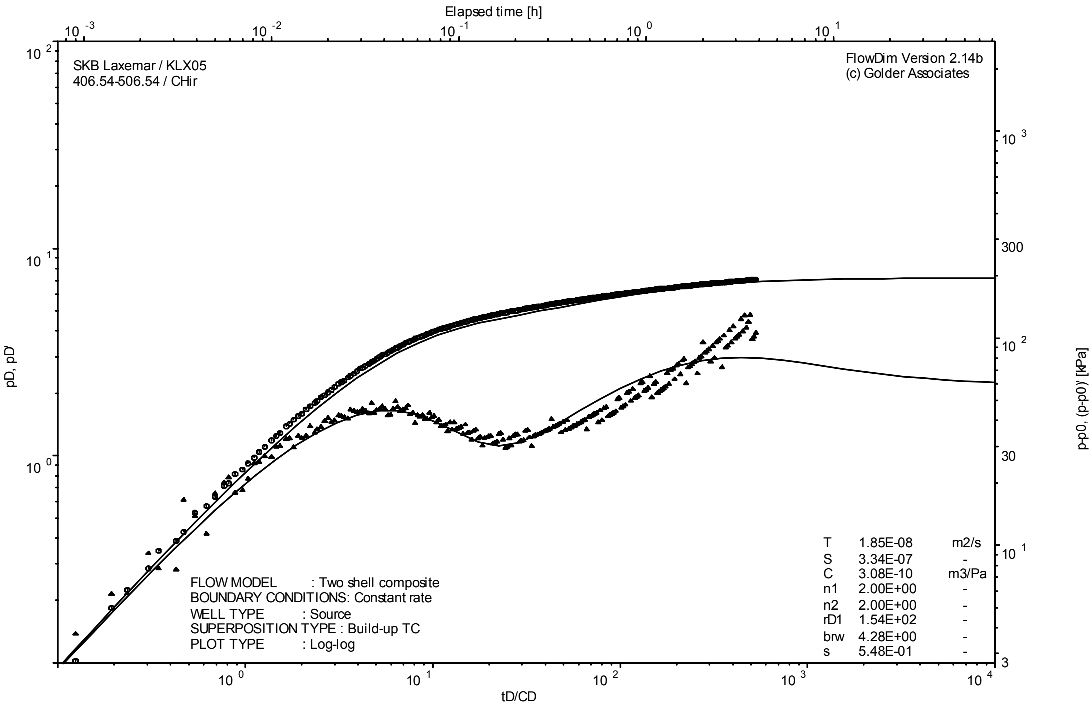
Pressure and flow rate vs. time; cartesian plot



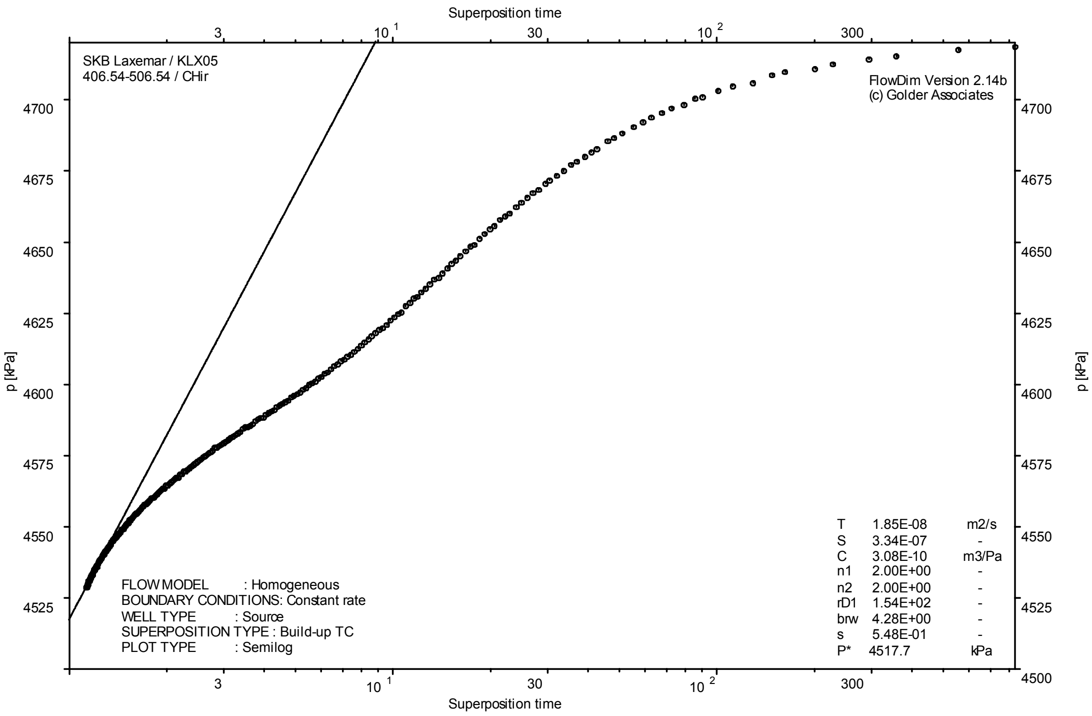
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

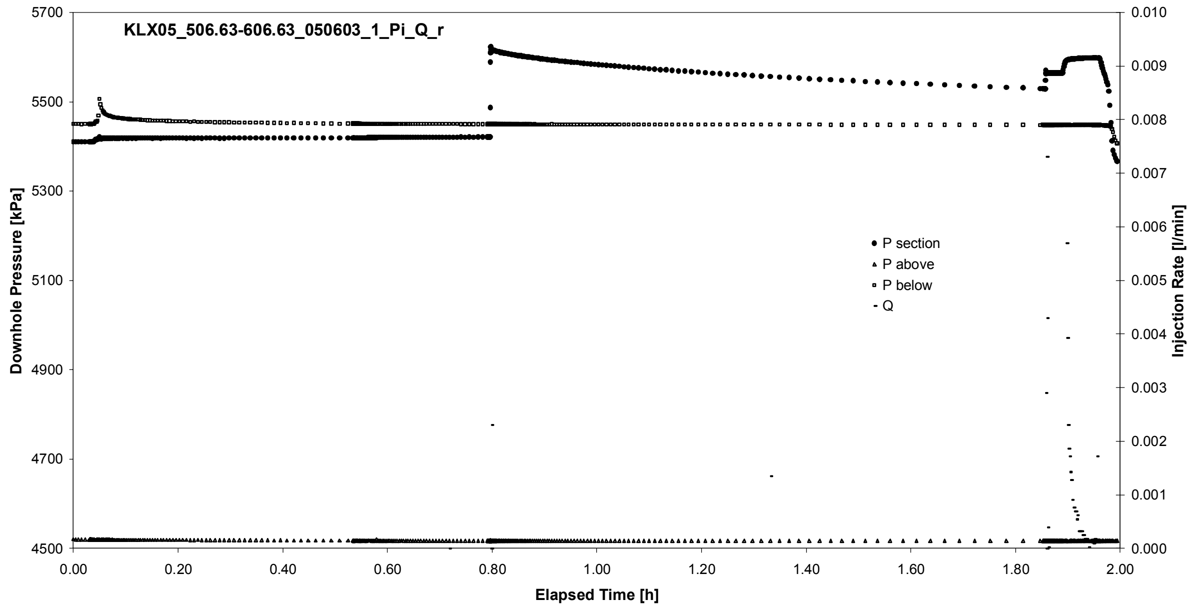


CHIR phase; HORNER match

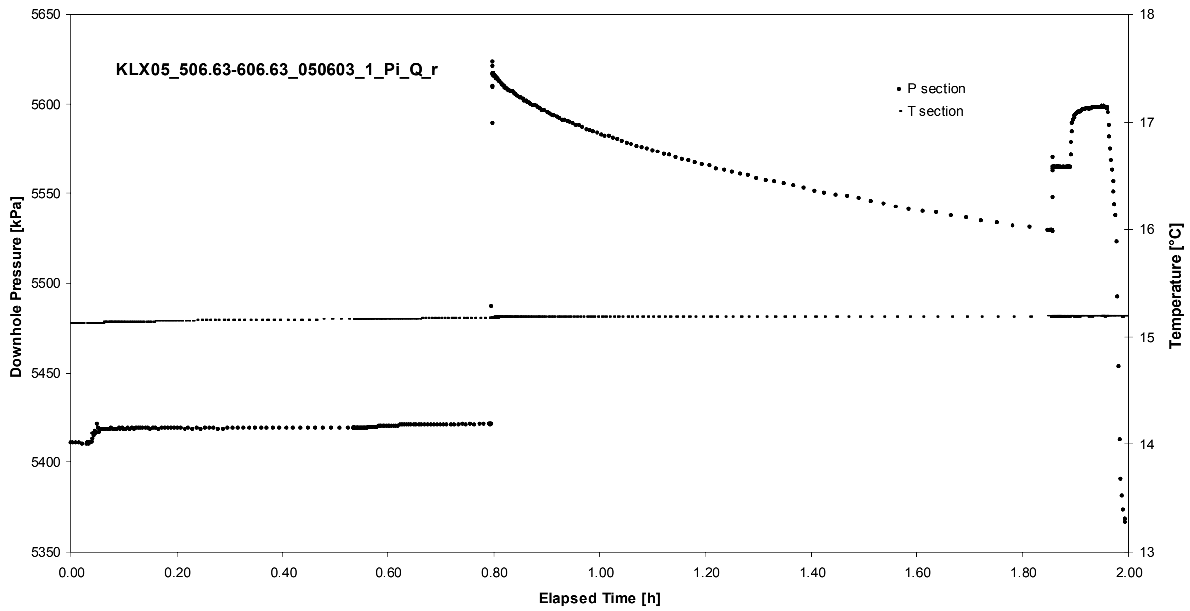
APPENDIX 2-5

Test 506.63 – 606.63 m

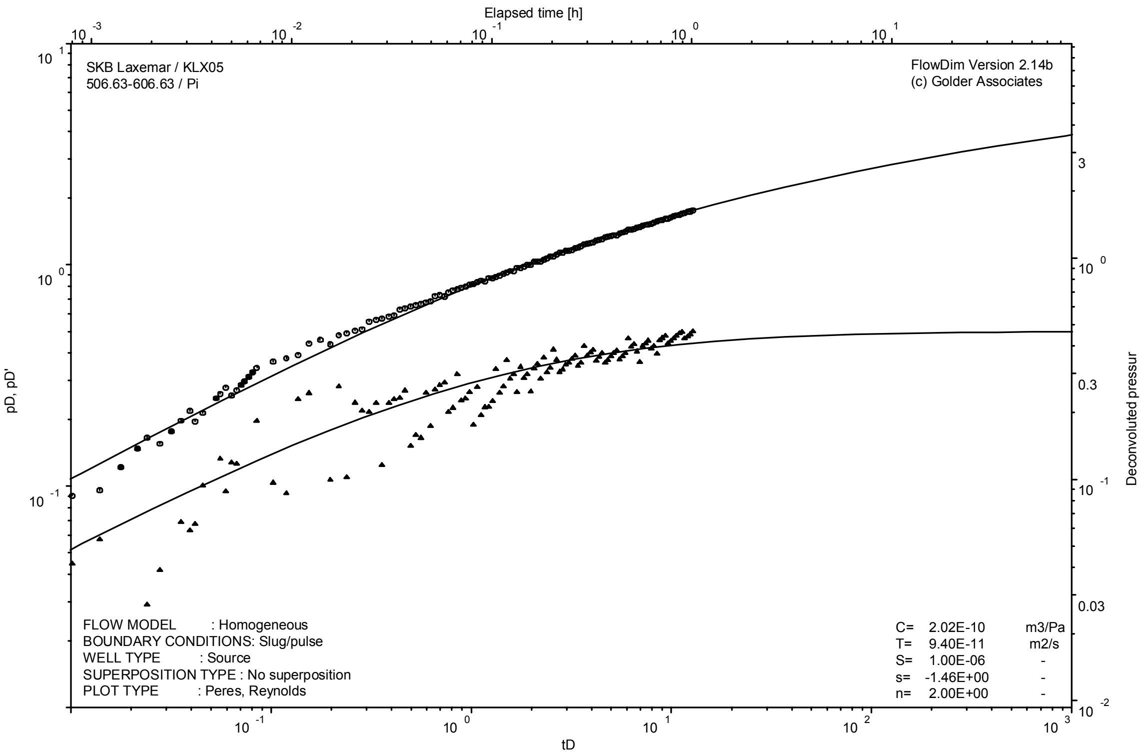
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

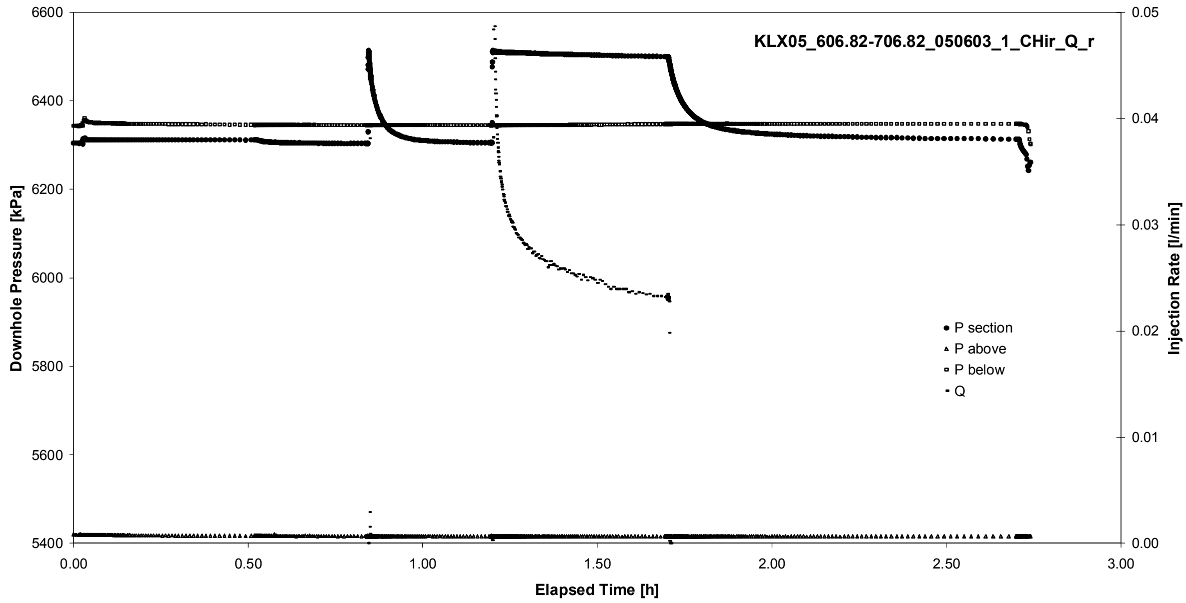


PI phase; log-log match

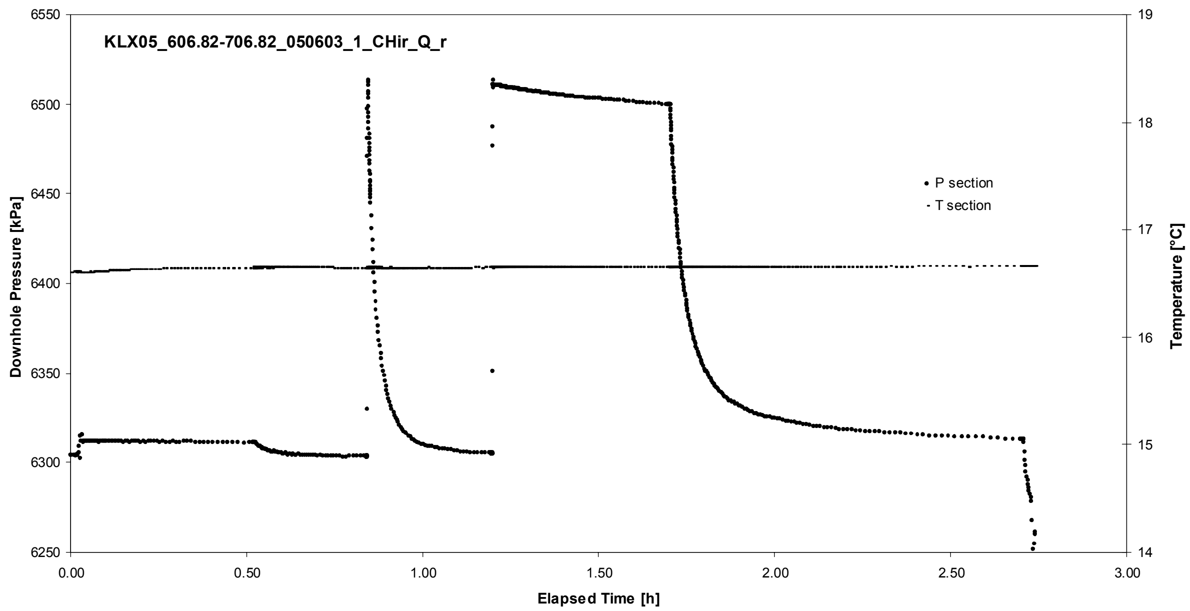
APPENDIX 2-6

Test 606.82 – 706.82 m

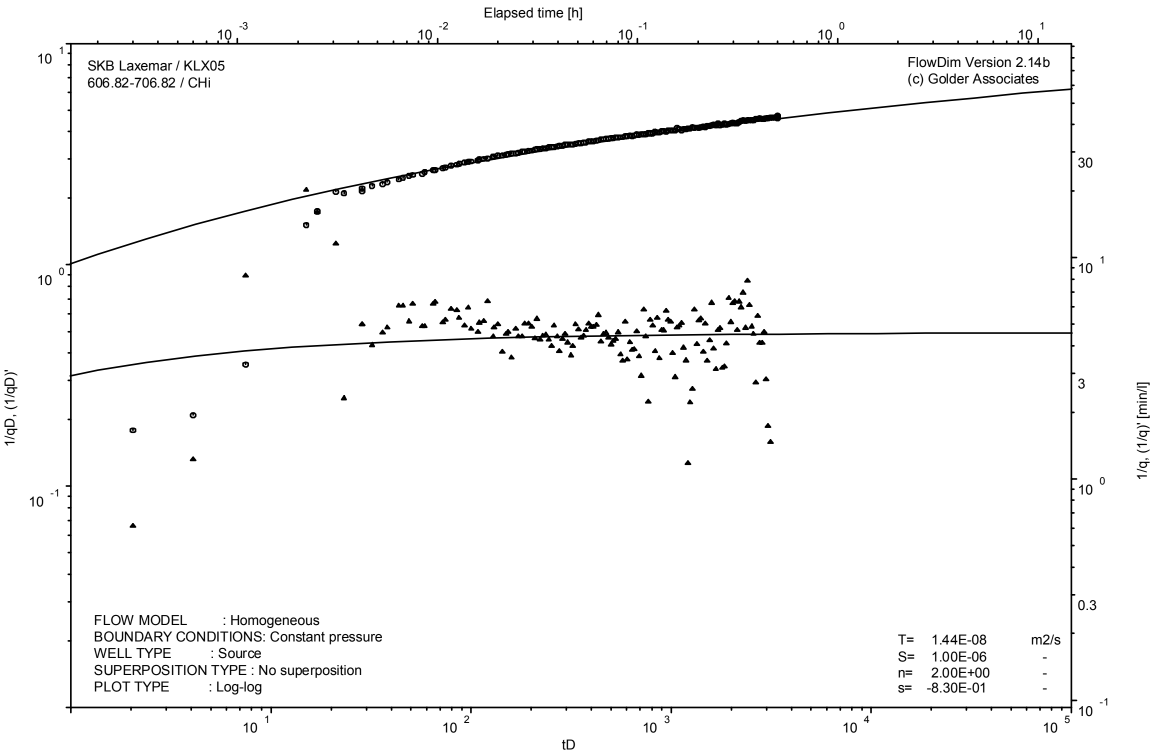
Analysis diagrams



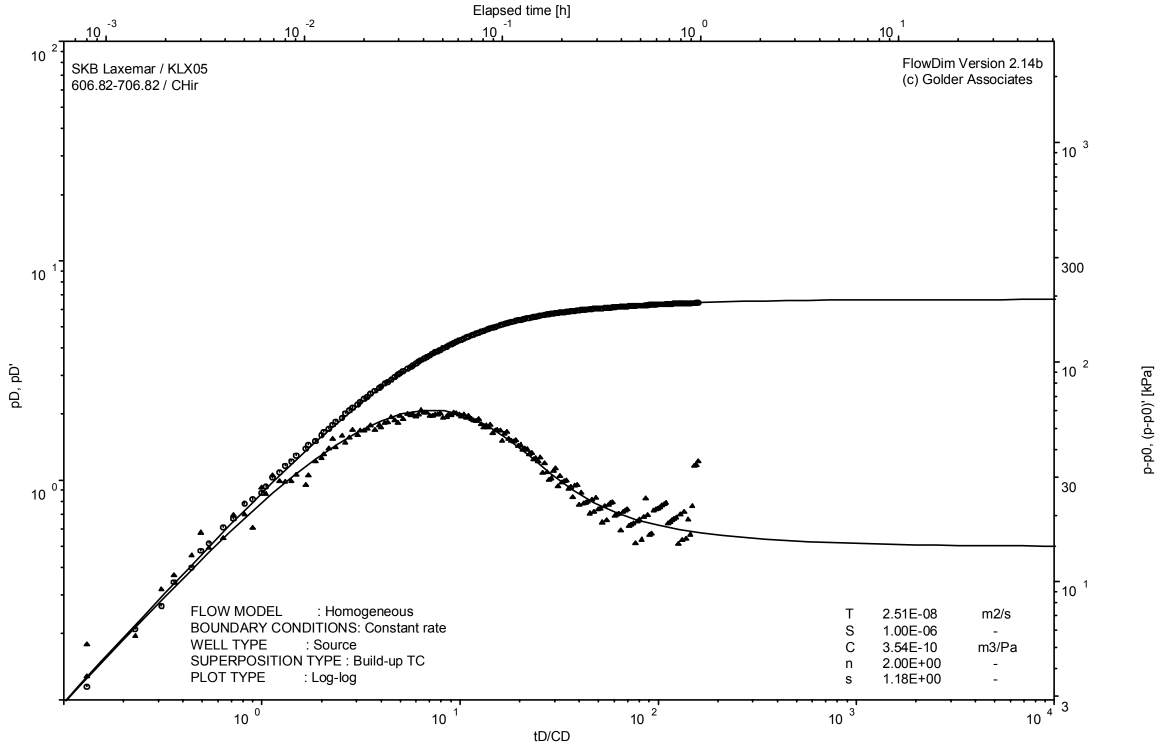
Pressure and flow rate vs. time; cartesian plot



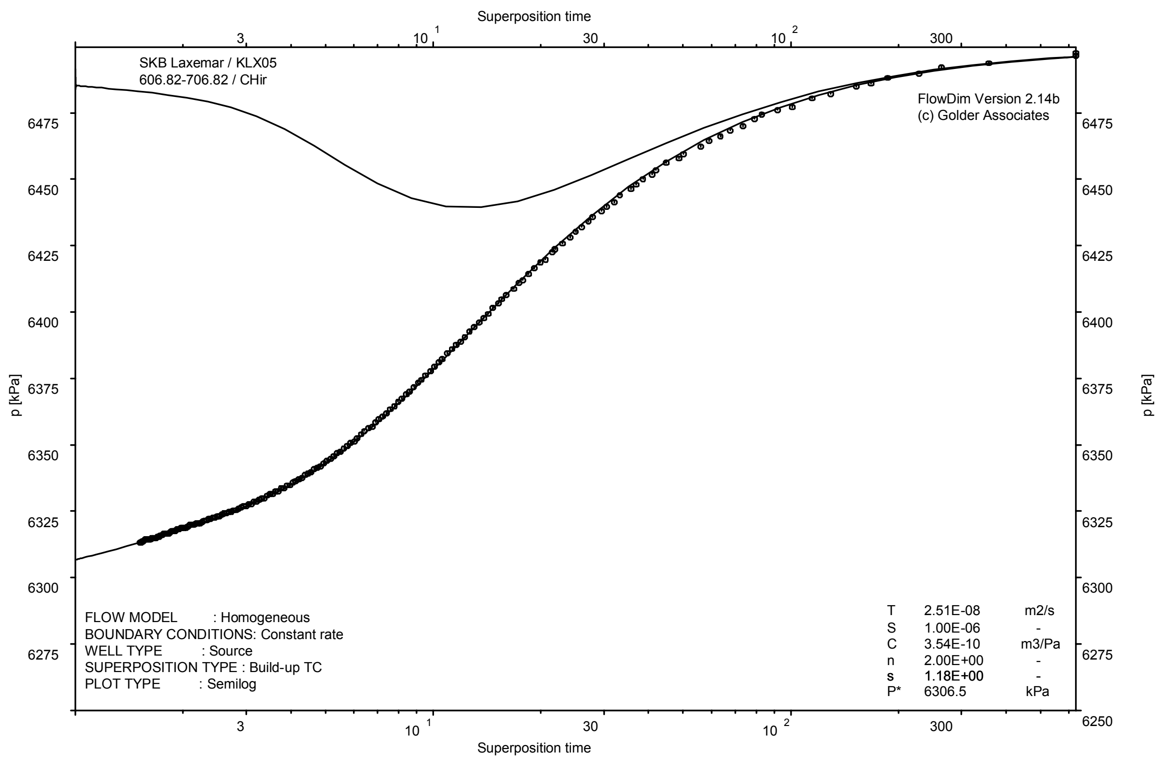
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

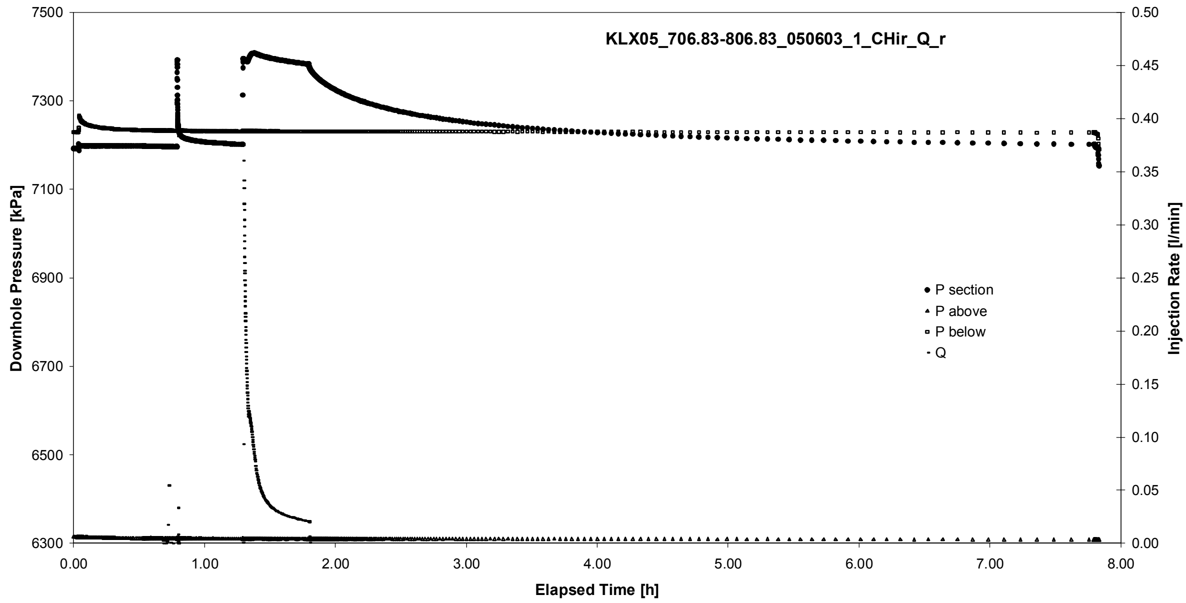


CHIR phase; HORNER match

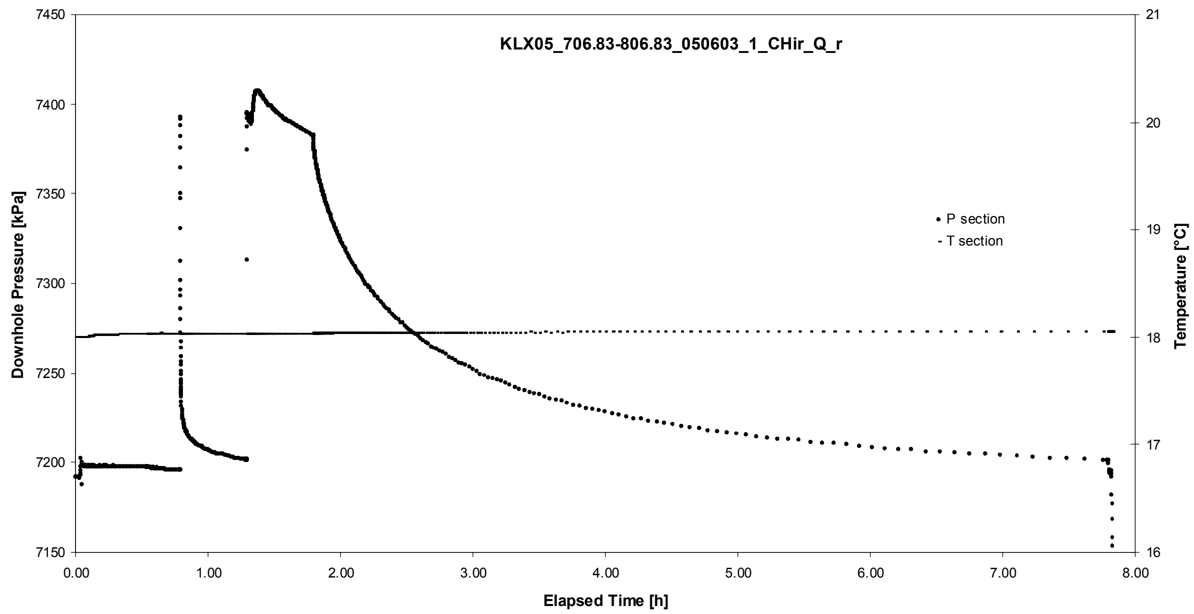
APPENDIX 2-7

Test 706.83 – 806.83 m

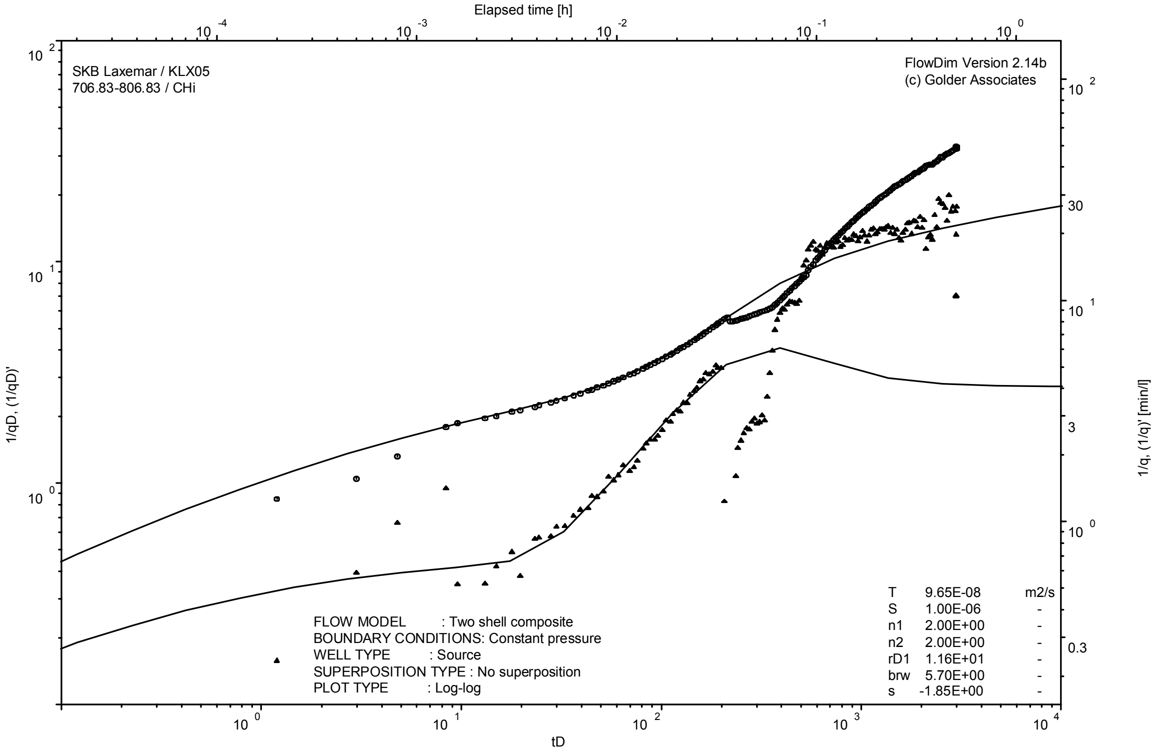
Analysis diagrams



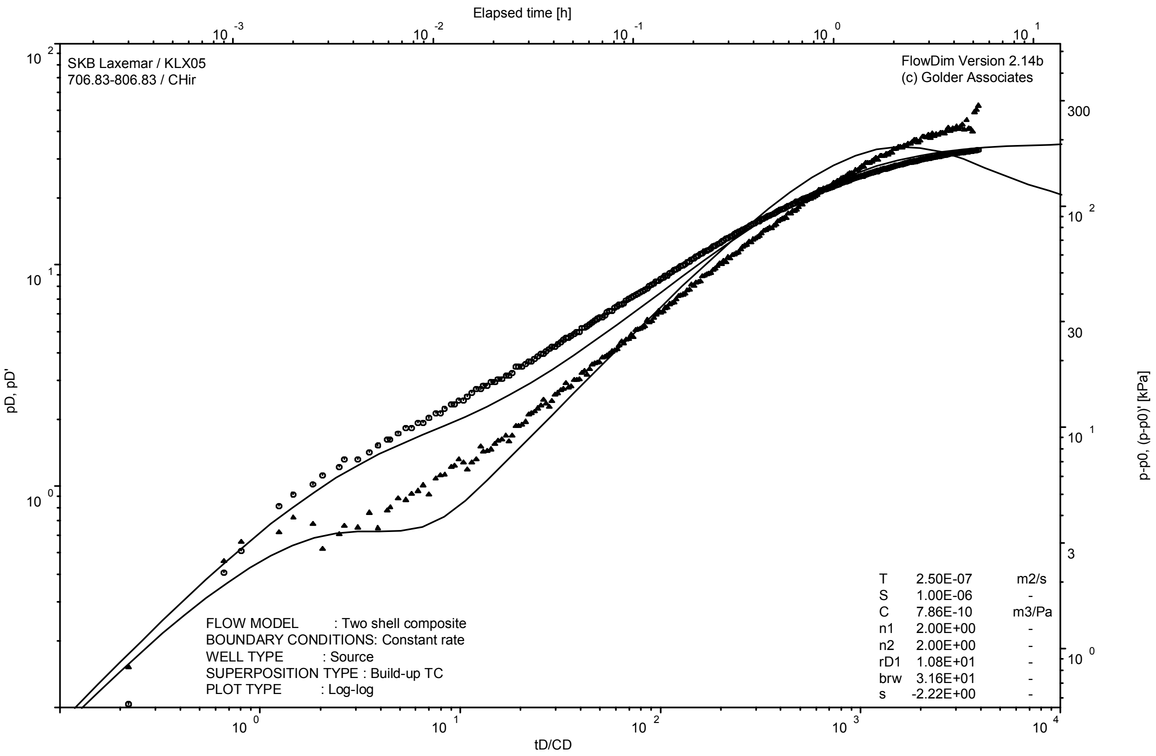
Pressure and flow rate vs. time; cartesian plot



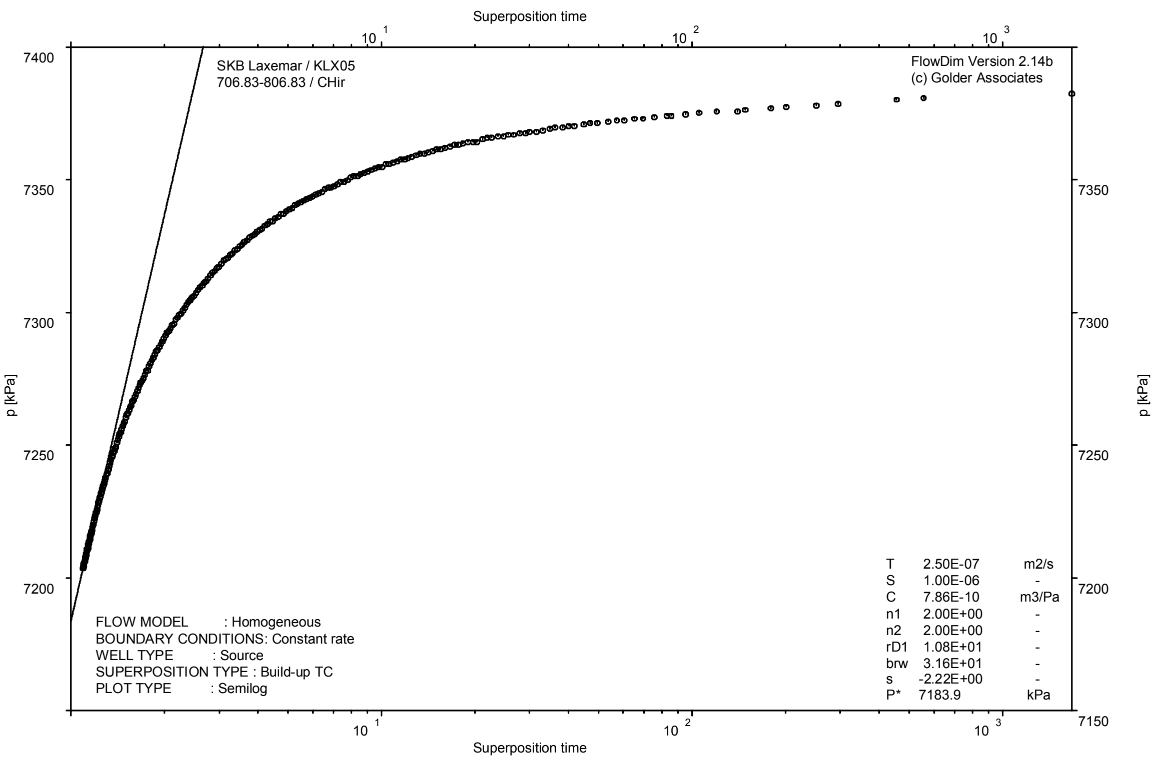
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

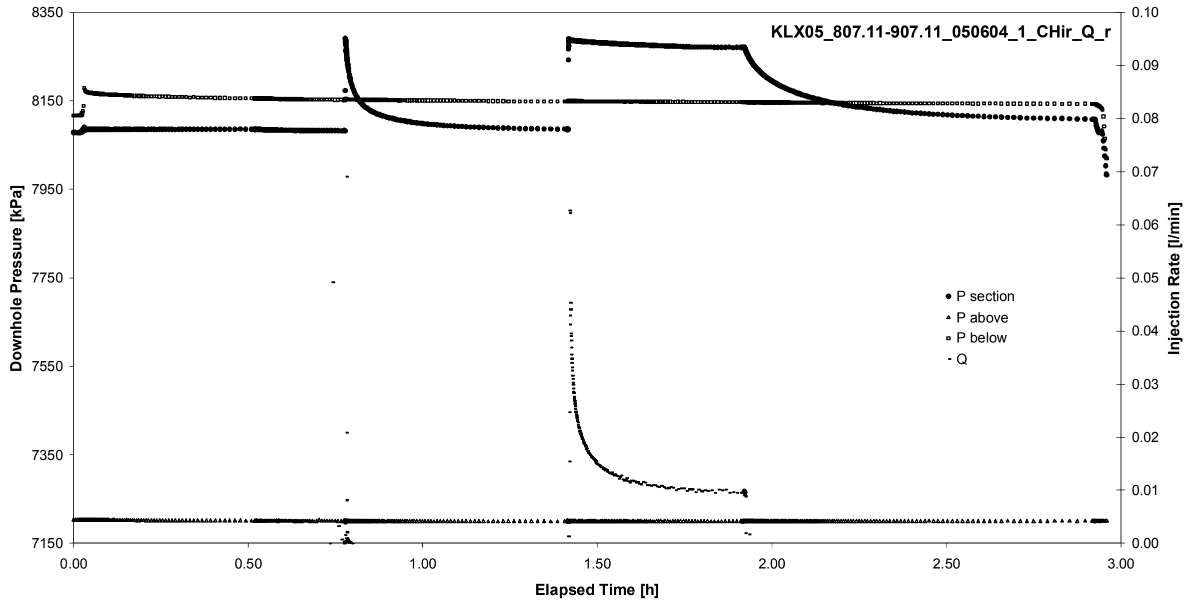


CHIR phase; HORNER match

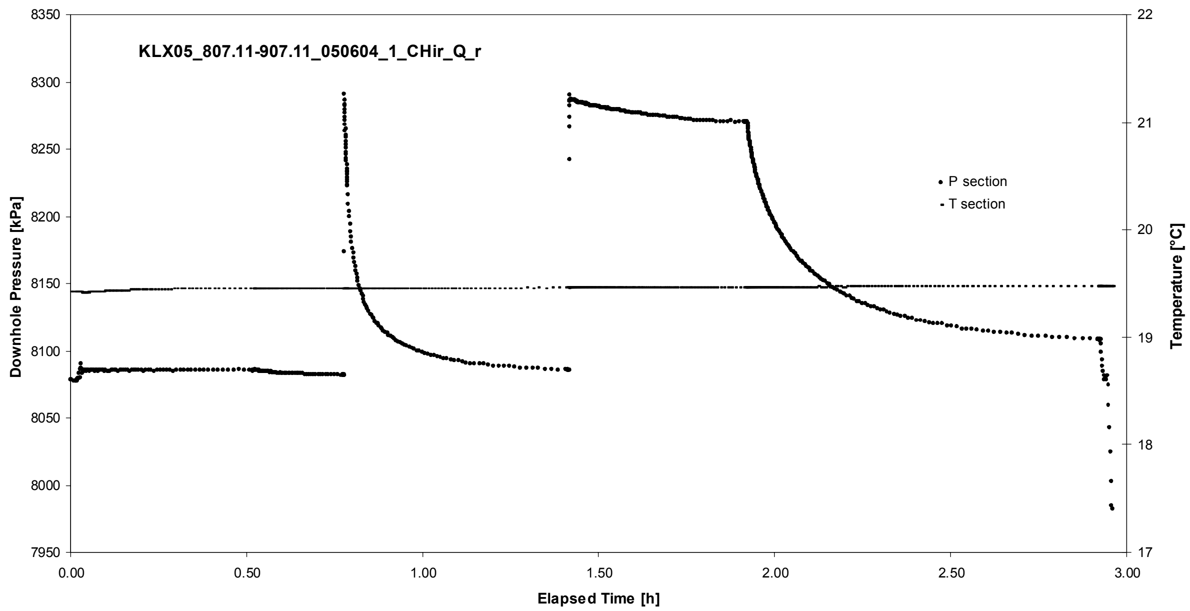
APPENDIX 2-8

Test 807.11 – 907.11 m

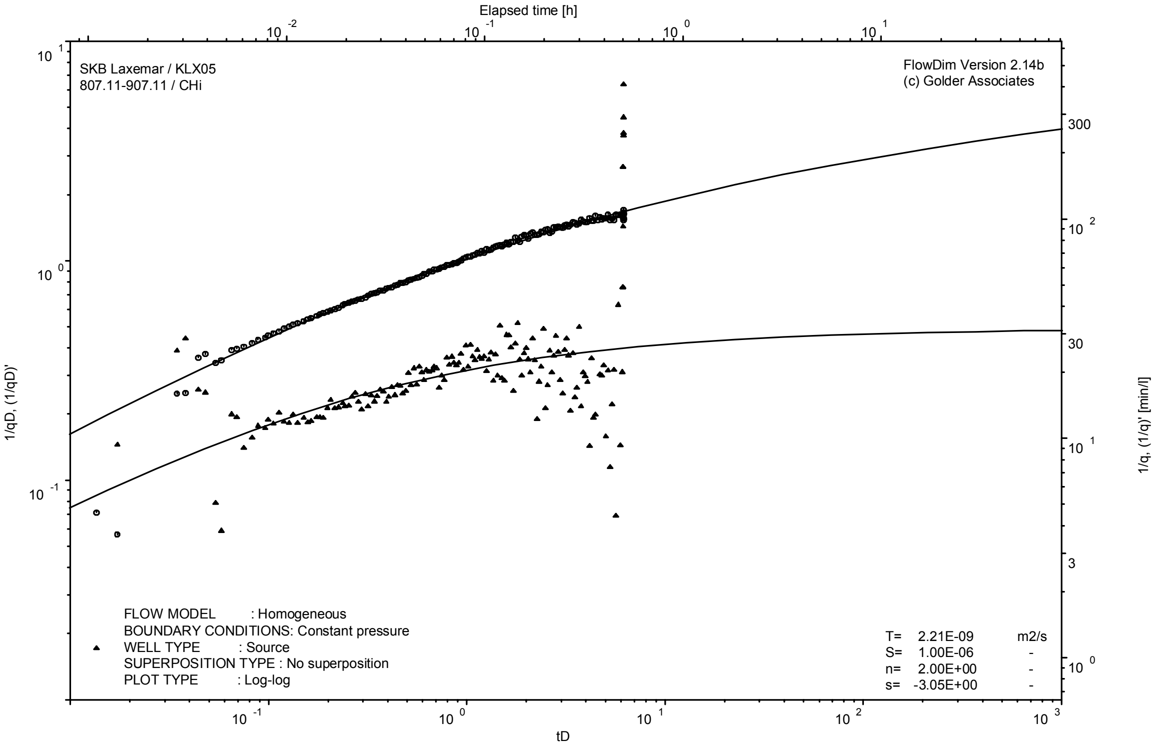
Analysis diagrams



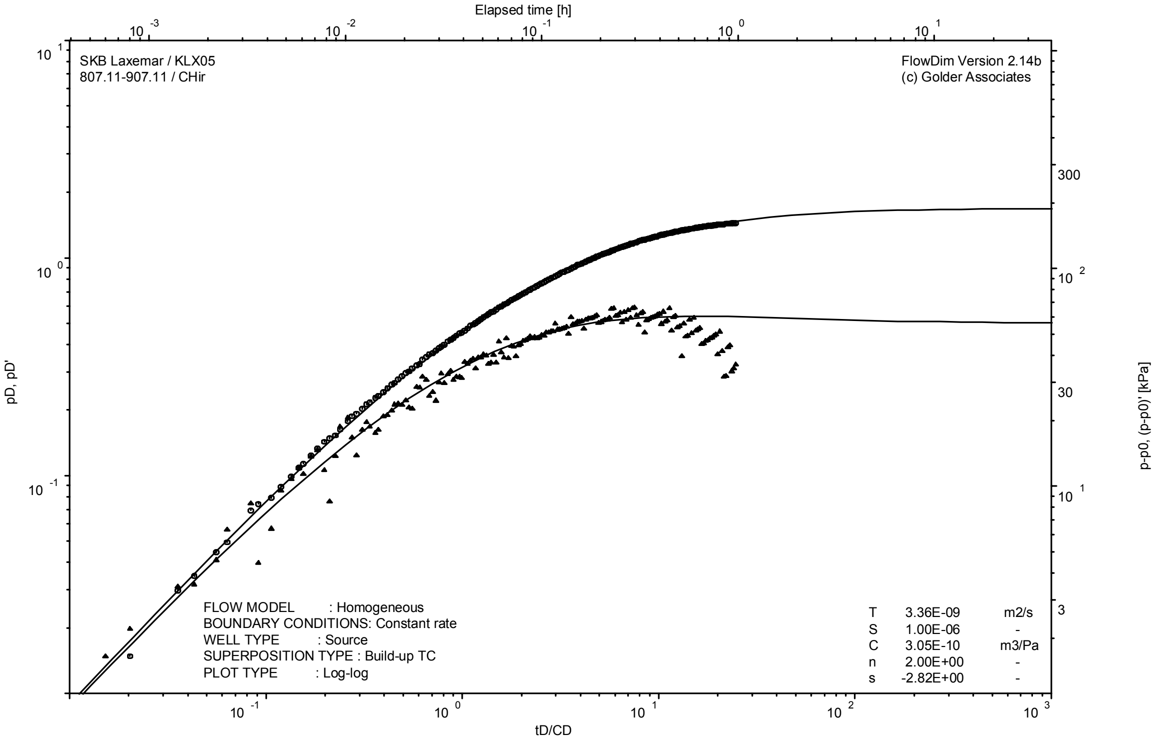
Pressure and flow rate vs. time; cartesian plot



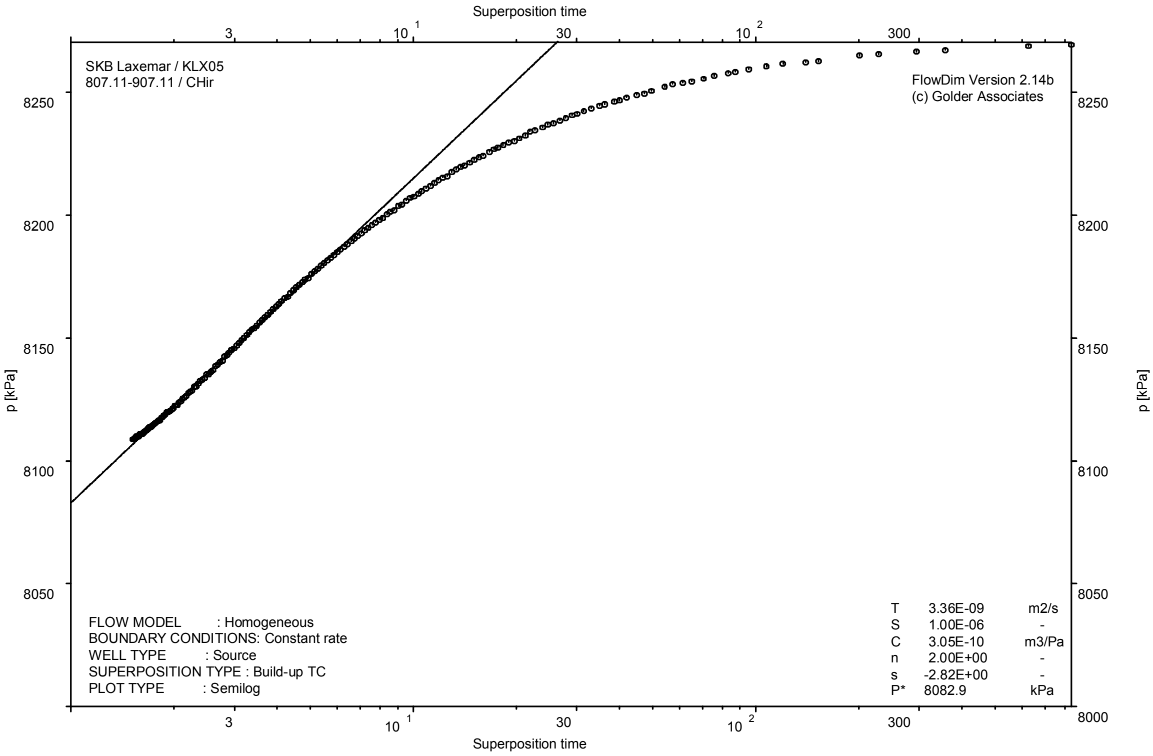
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

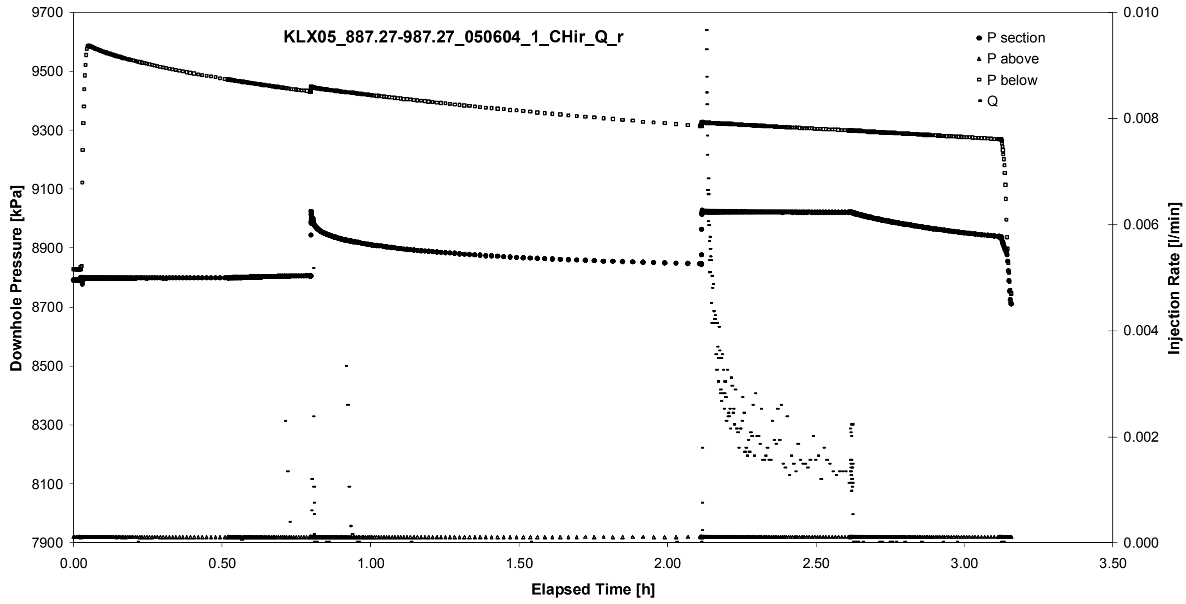


CHIR phase; HORNER match

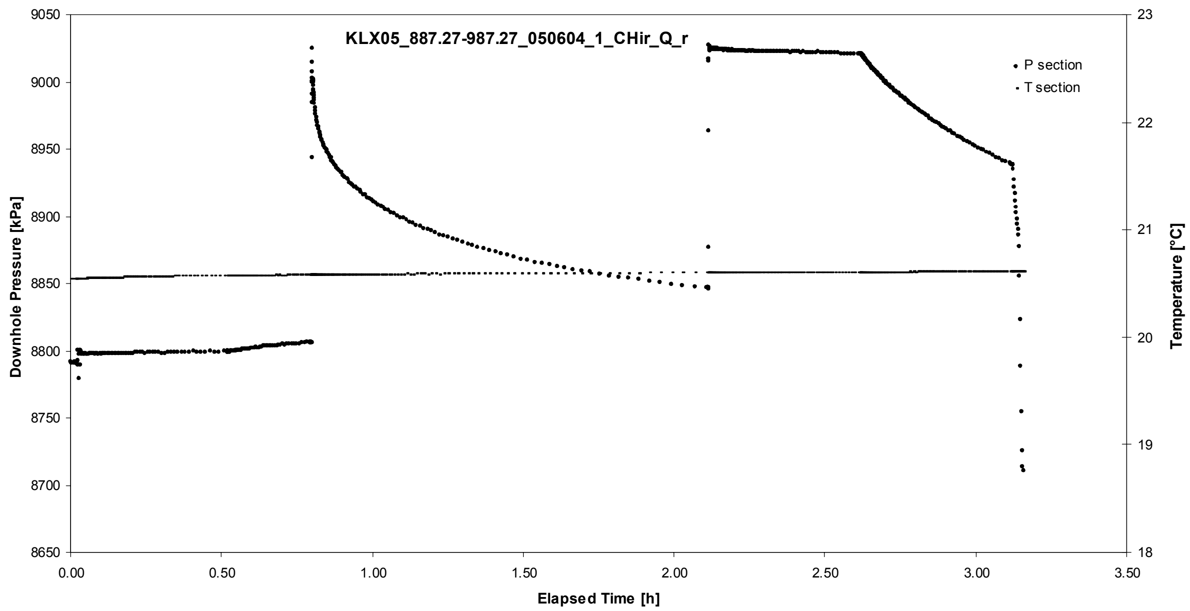
APPENDIX 2-9

Test 887.27 – 987.27 m

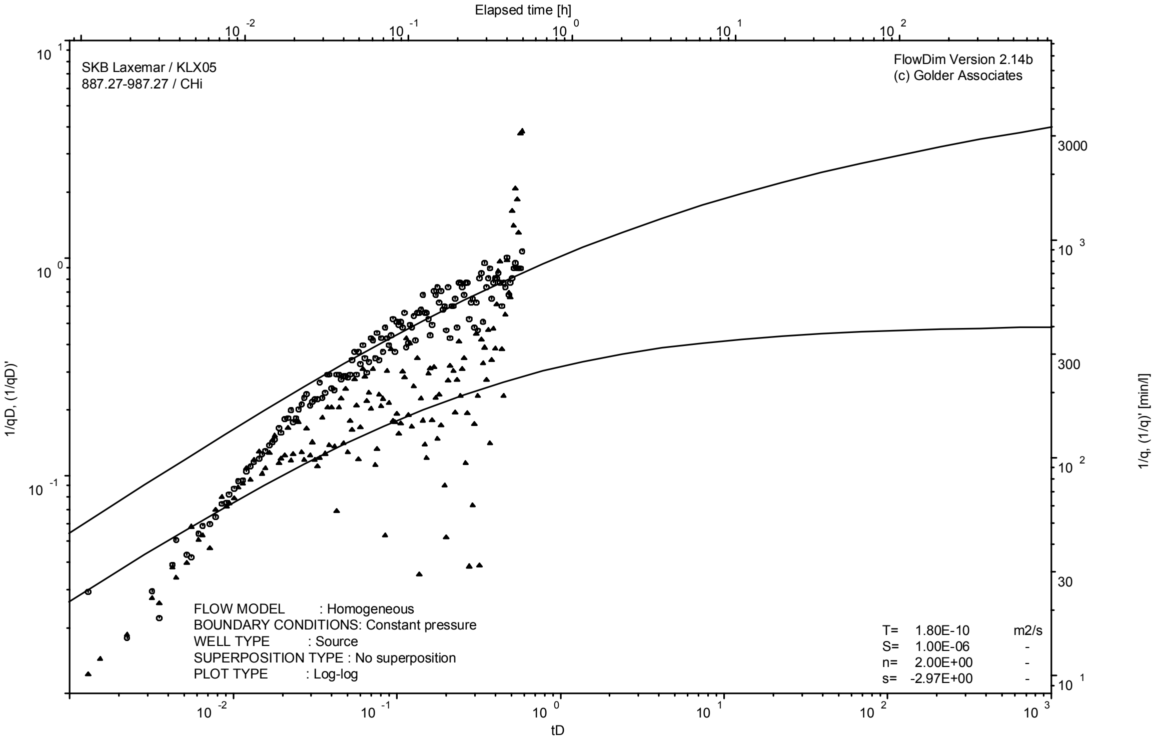
Analysis diagrams



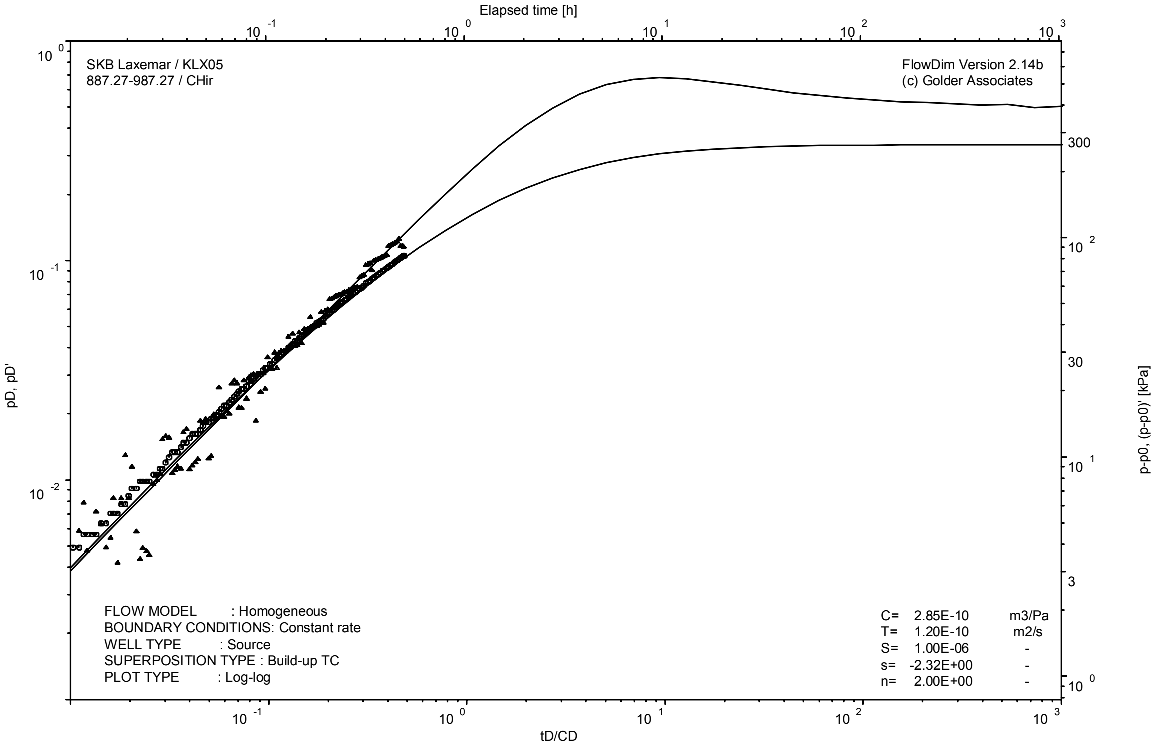
Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot



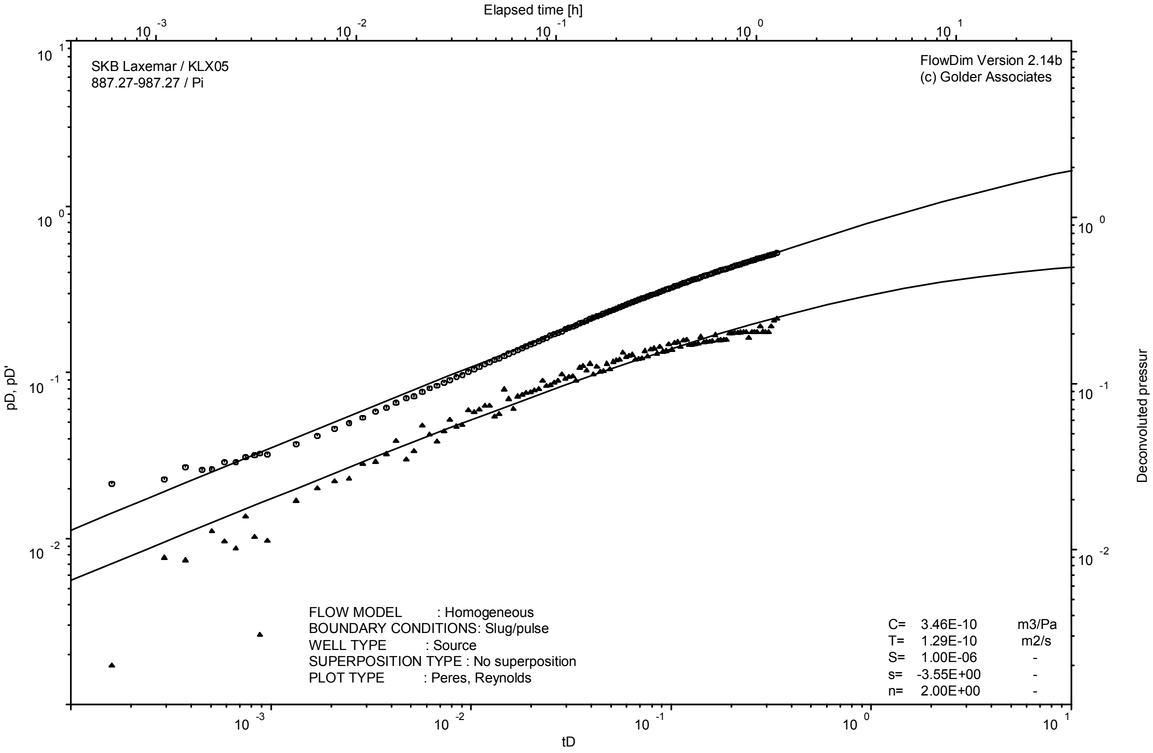
CHI phase; log-log match



CHIR phase; log-log match

No calculation due to the tight section

CHIR phase; HORNER match

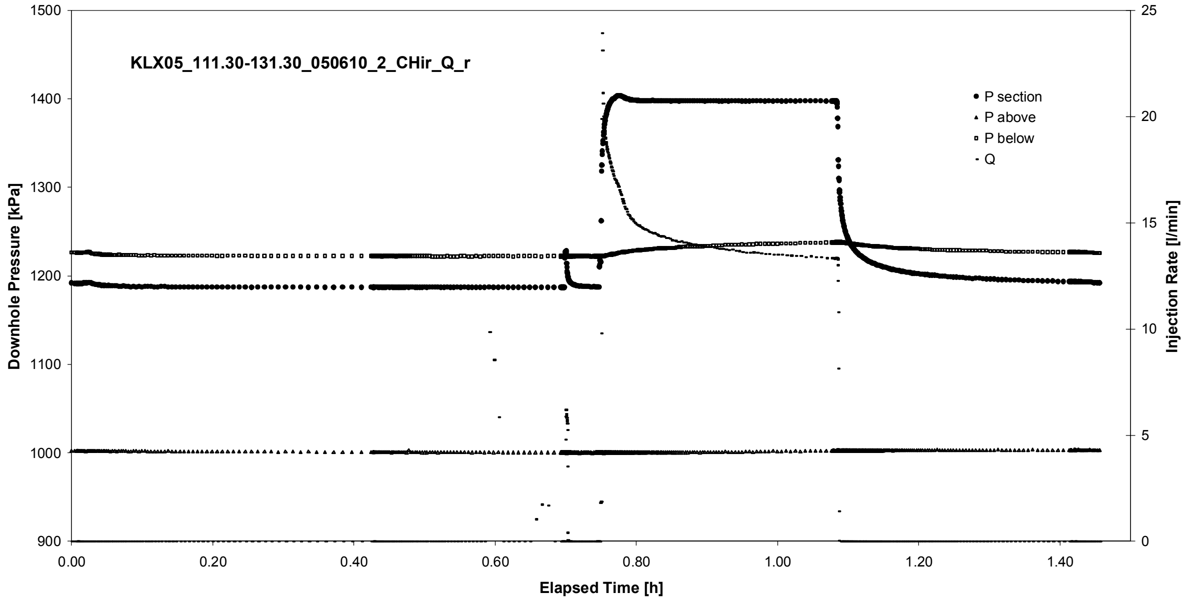


Pulse injection; deconvolution match

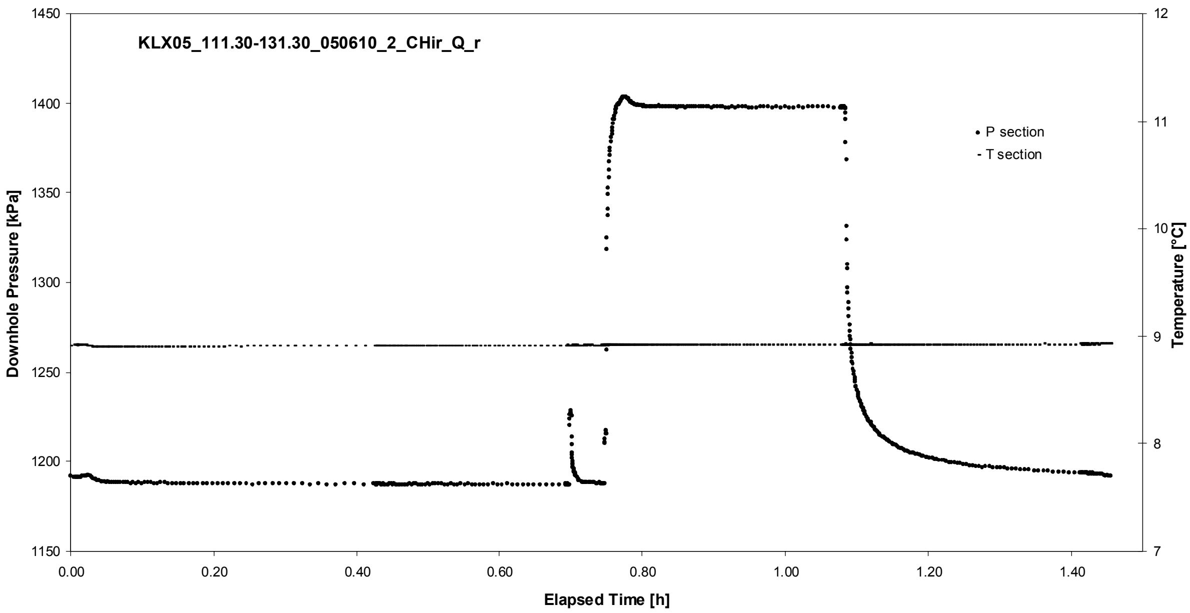
APPENDIX 2-10

Test 111.30 – 131.30 m

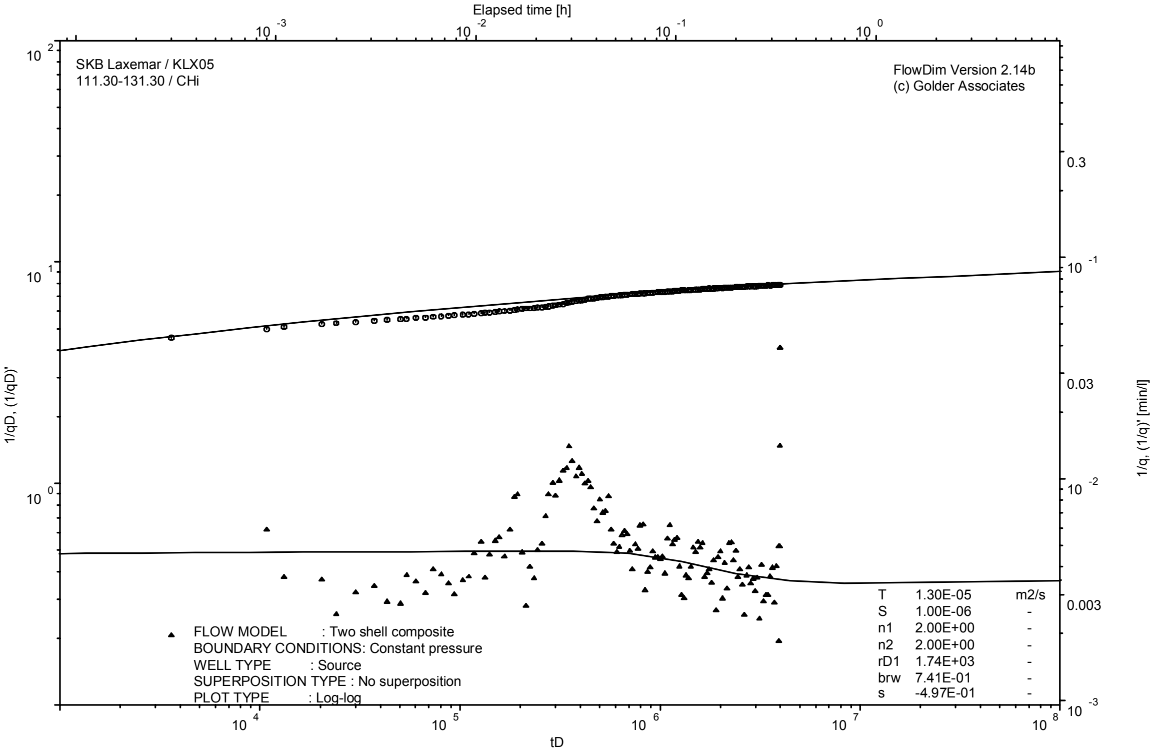
Analysis diagrams



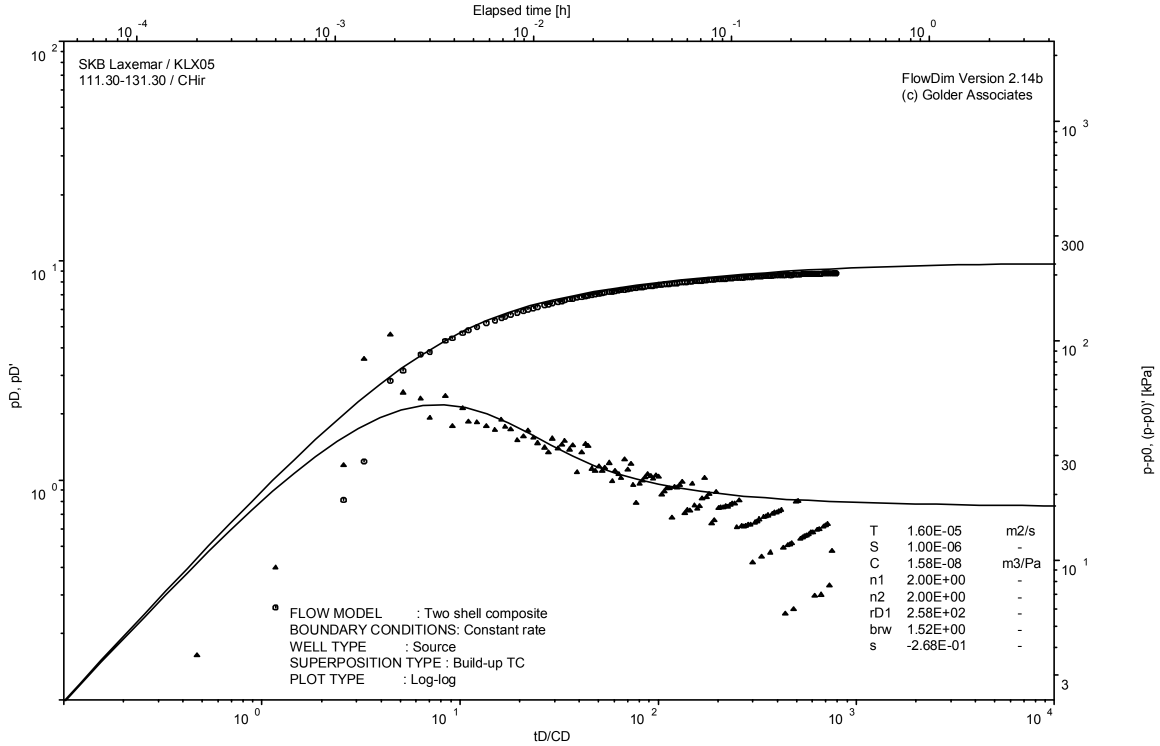
Pressure and flow rate vs. time; cartesian plot



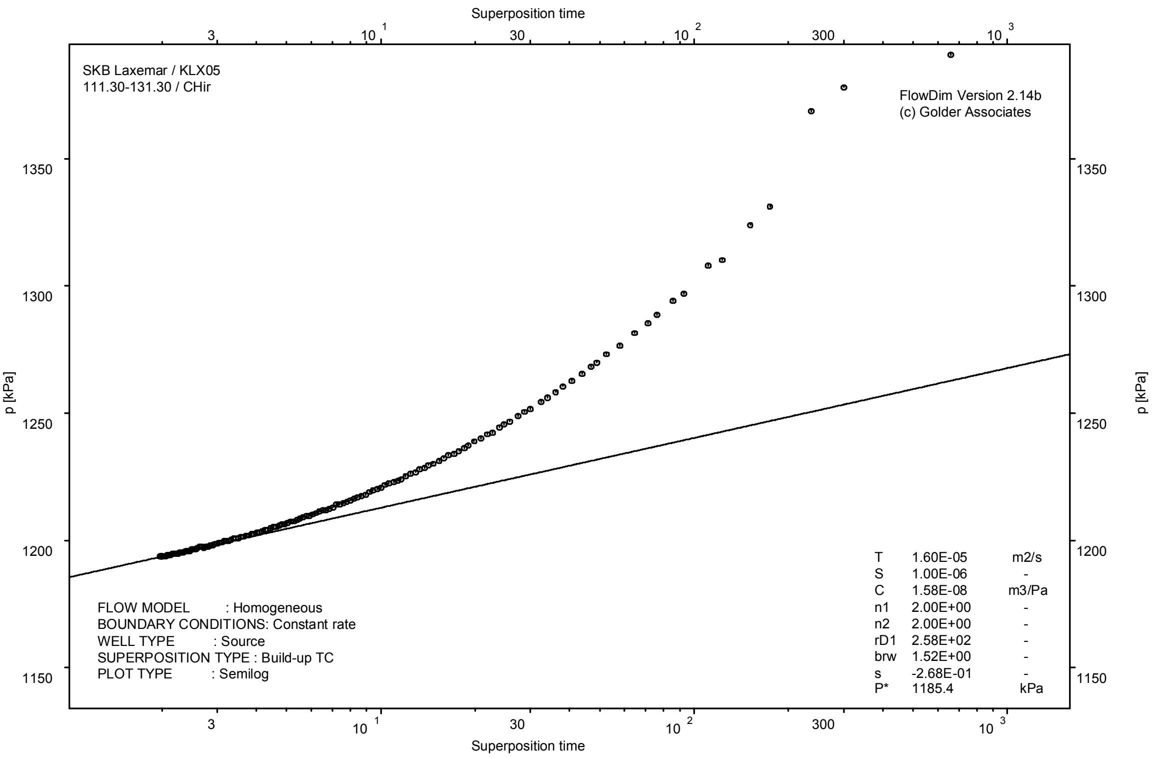
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

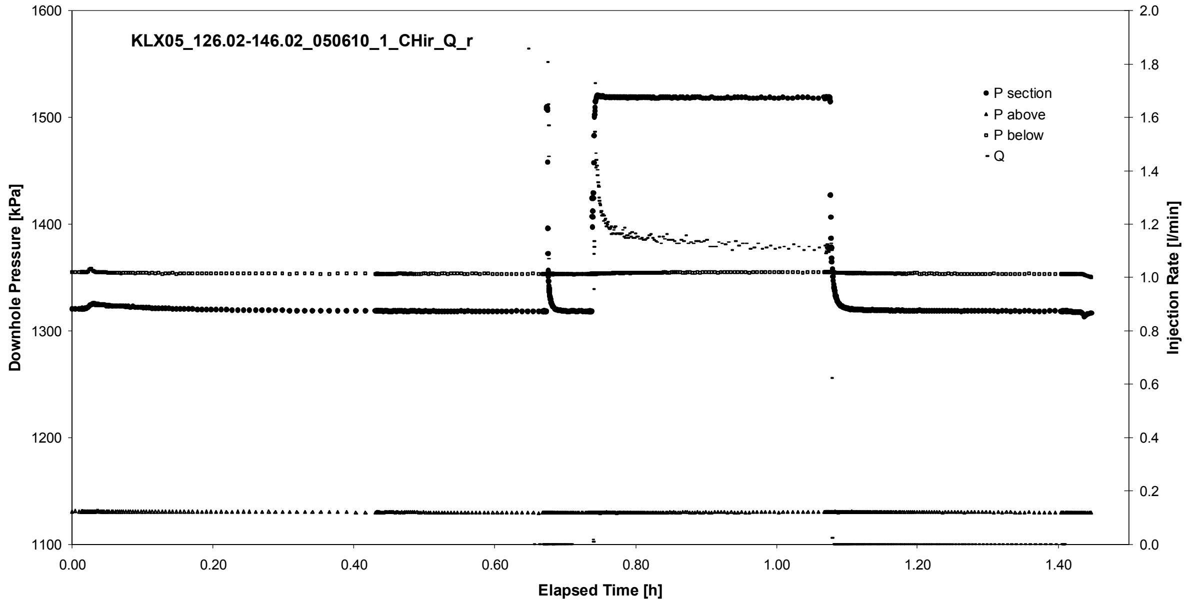


CHIR phase; HORNER match

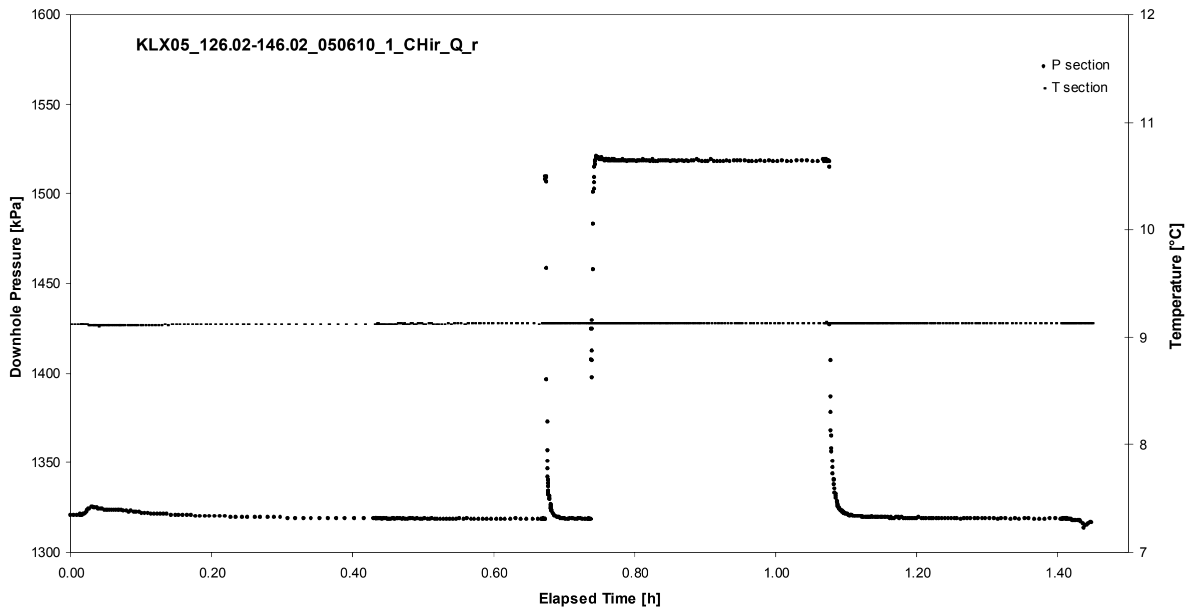
APPENDIX 2-11

Test 126.02 – 146.02 m

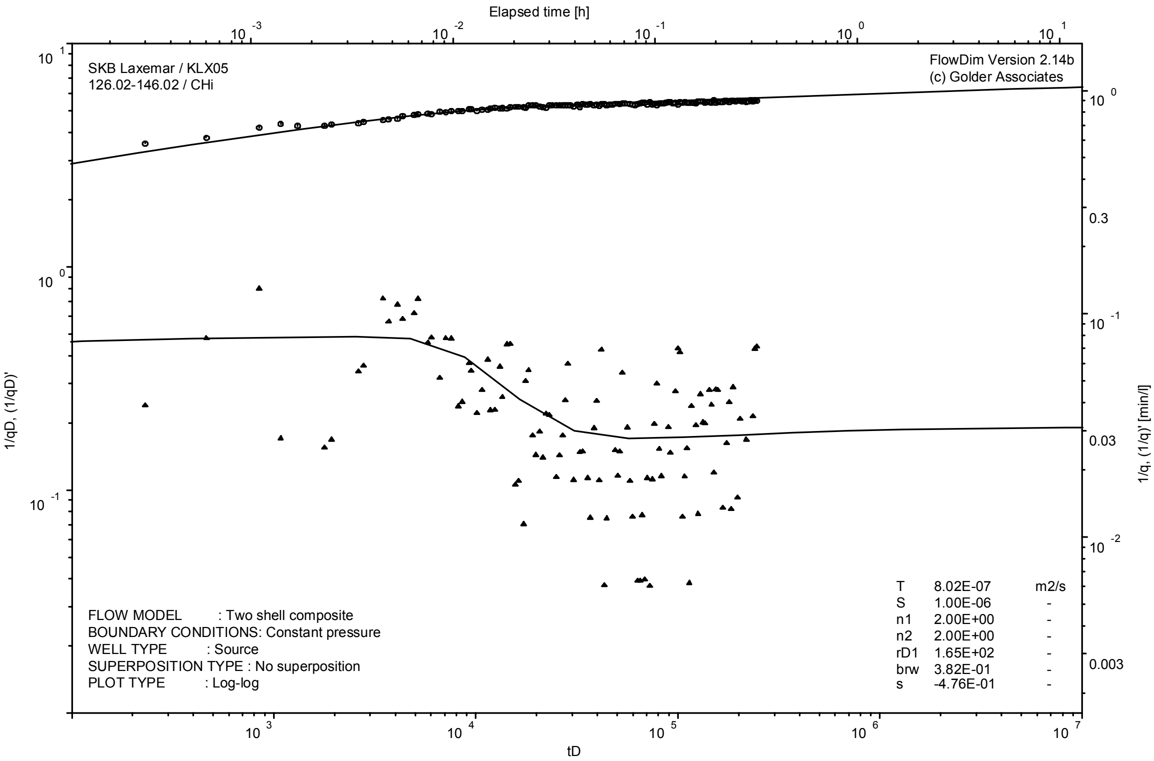
Analysis diagrams



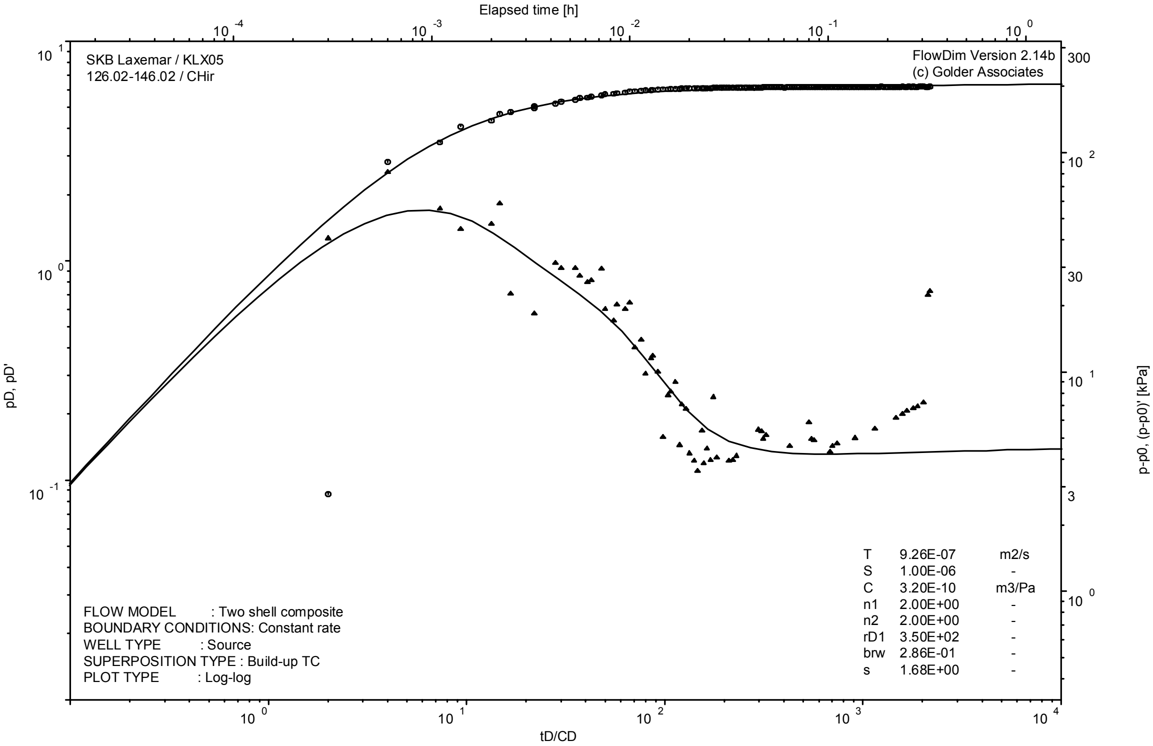
Pressure and flow rate vs. time; cartesian plot



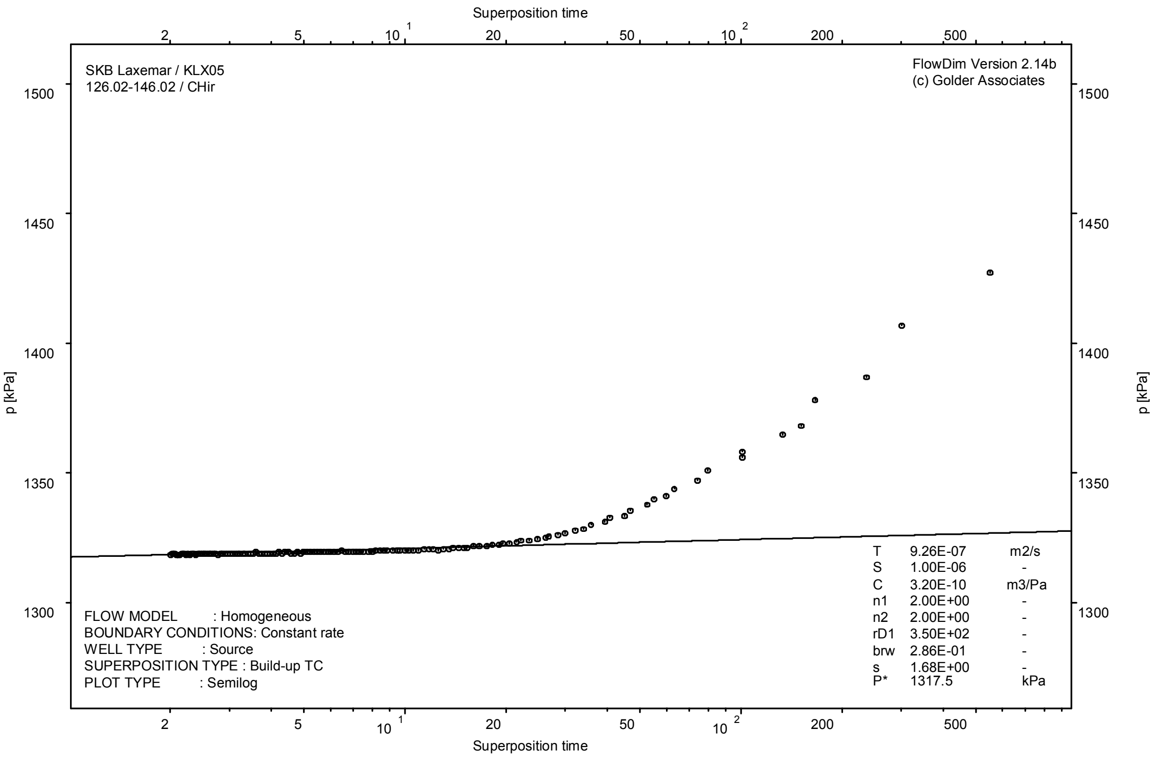
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

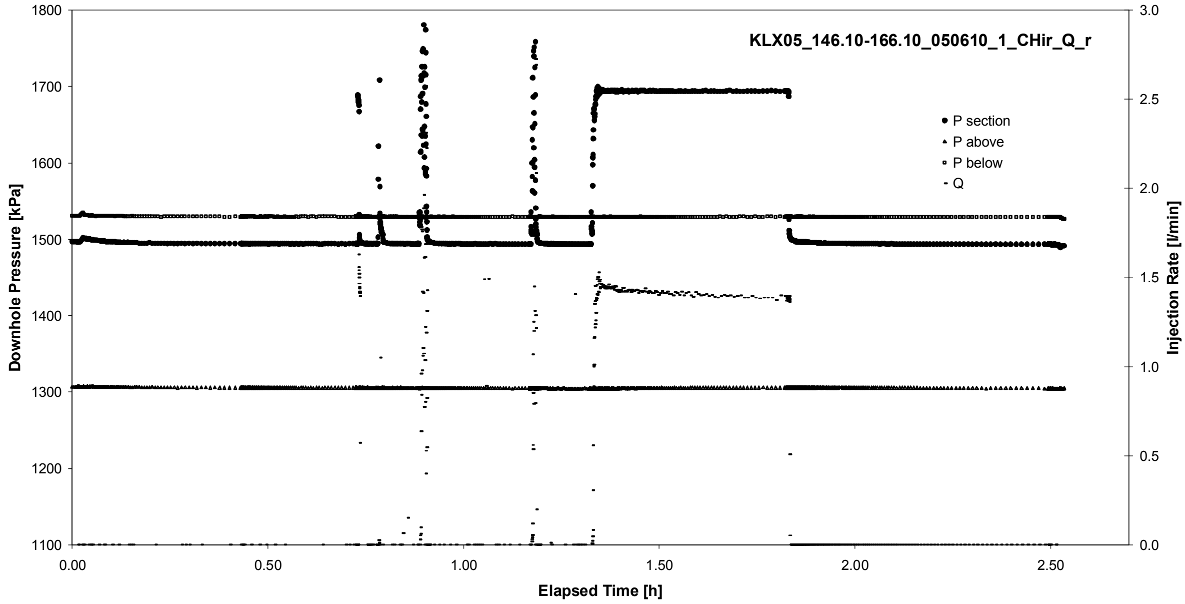


CHIR phase; HORNER match

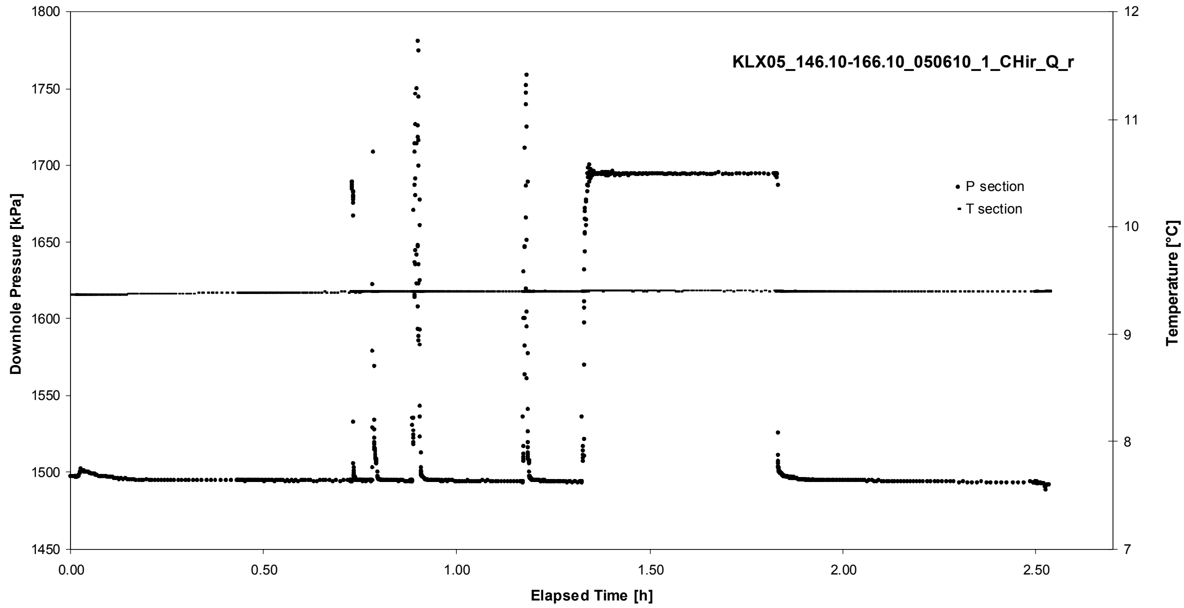
APPENDIX 2-12

Test 146.10 – 166.10 m

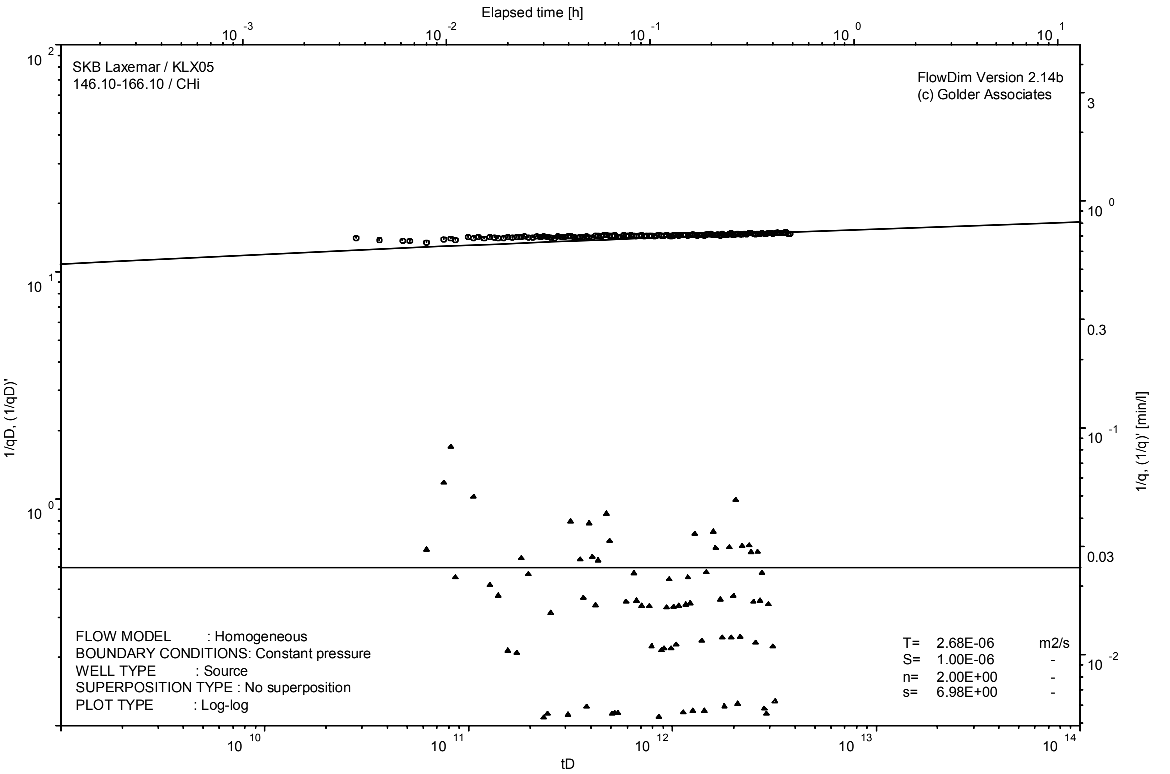
Analysis diagrams



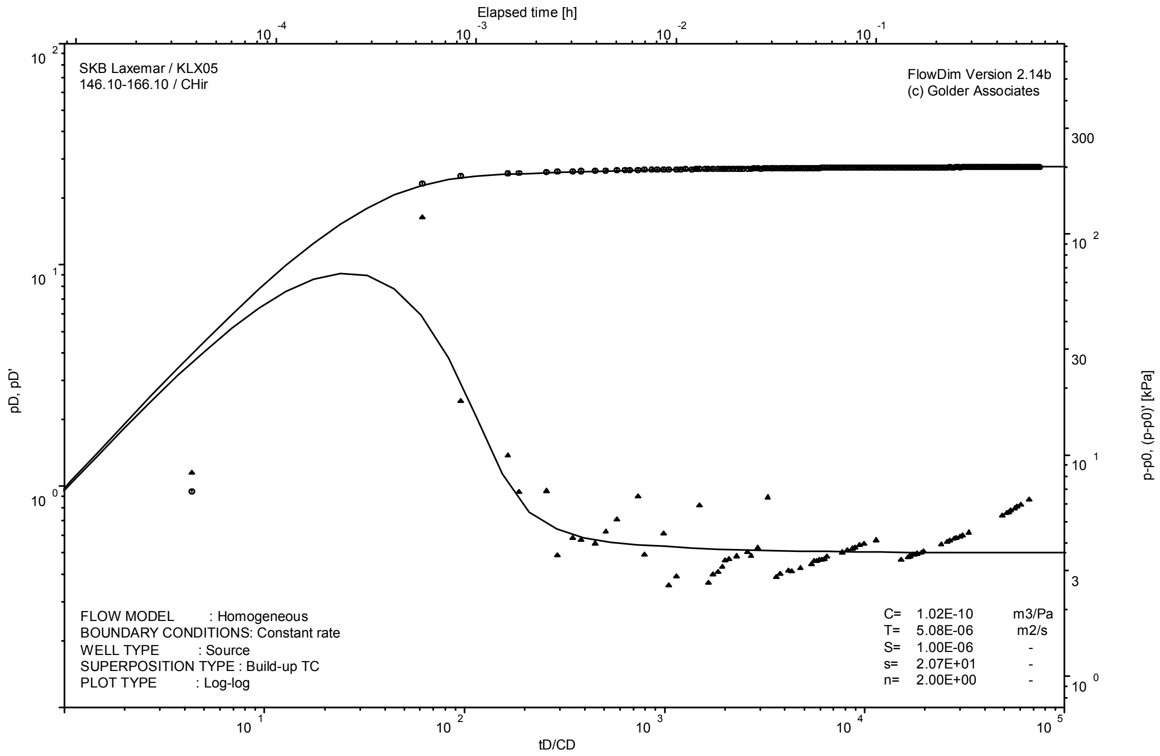
Pressure and flow rate vs. time; cartesian plot



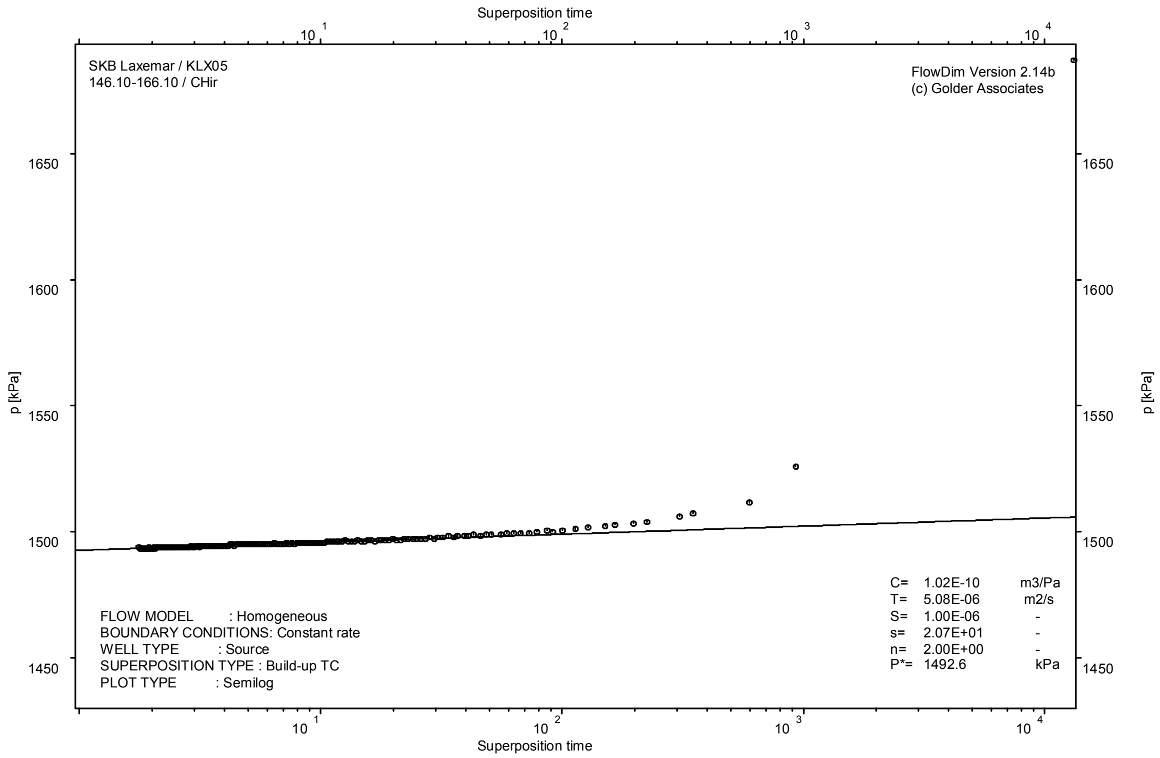
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

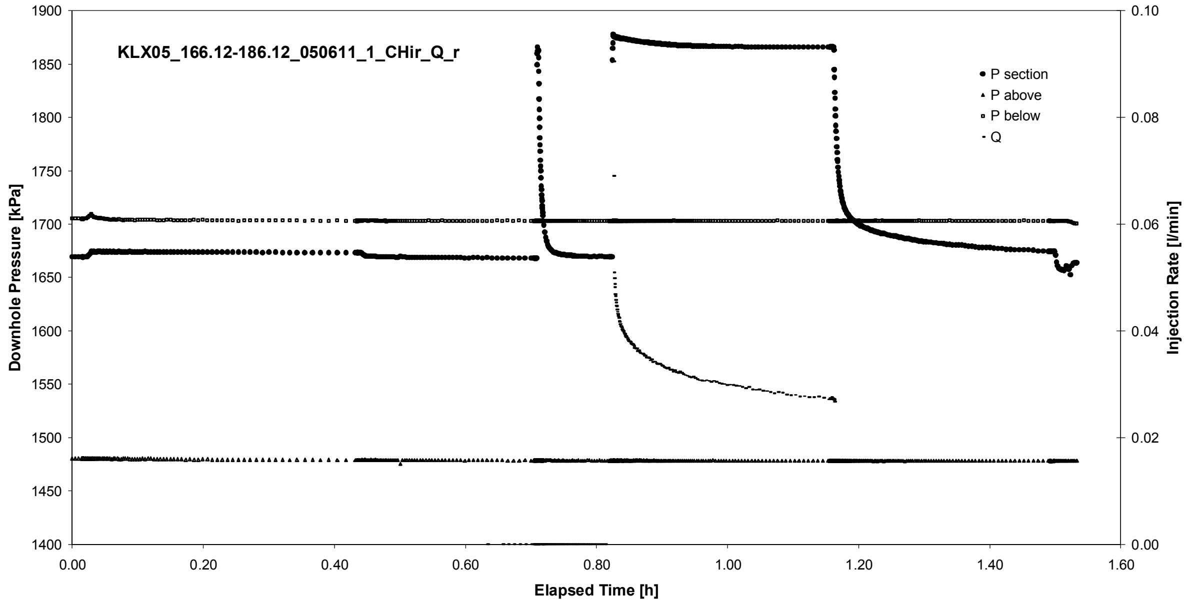


CHIR phase; HORNER match

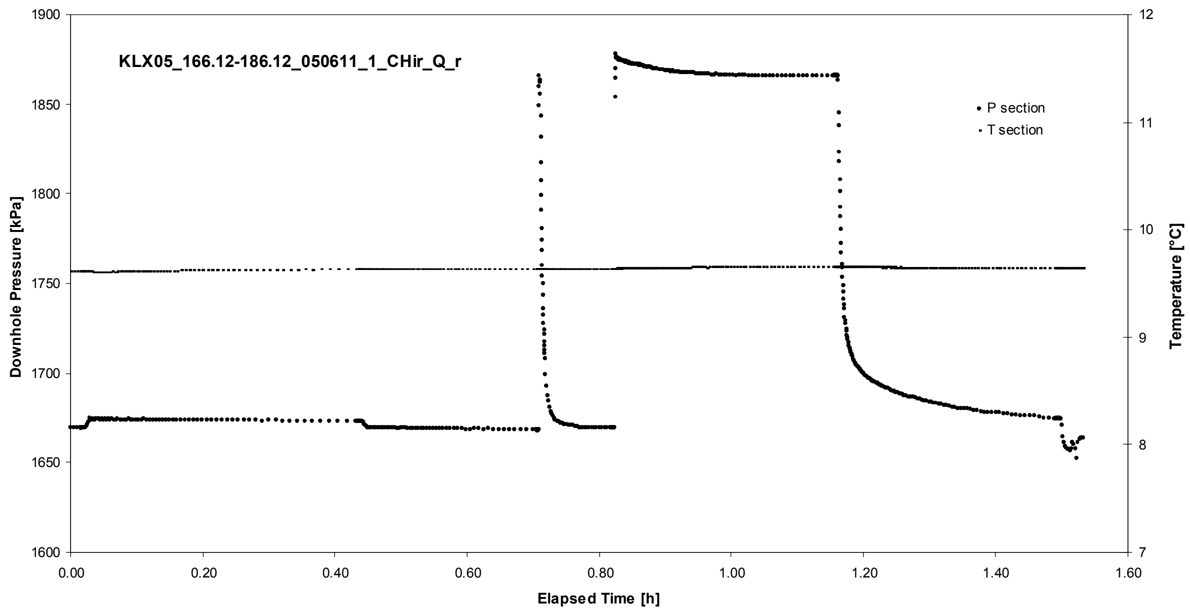
APPENDIX 2-13

Test 166.12 – 186.12 m

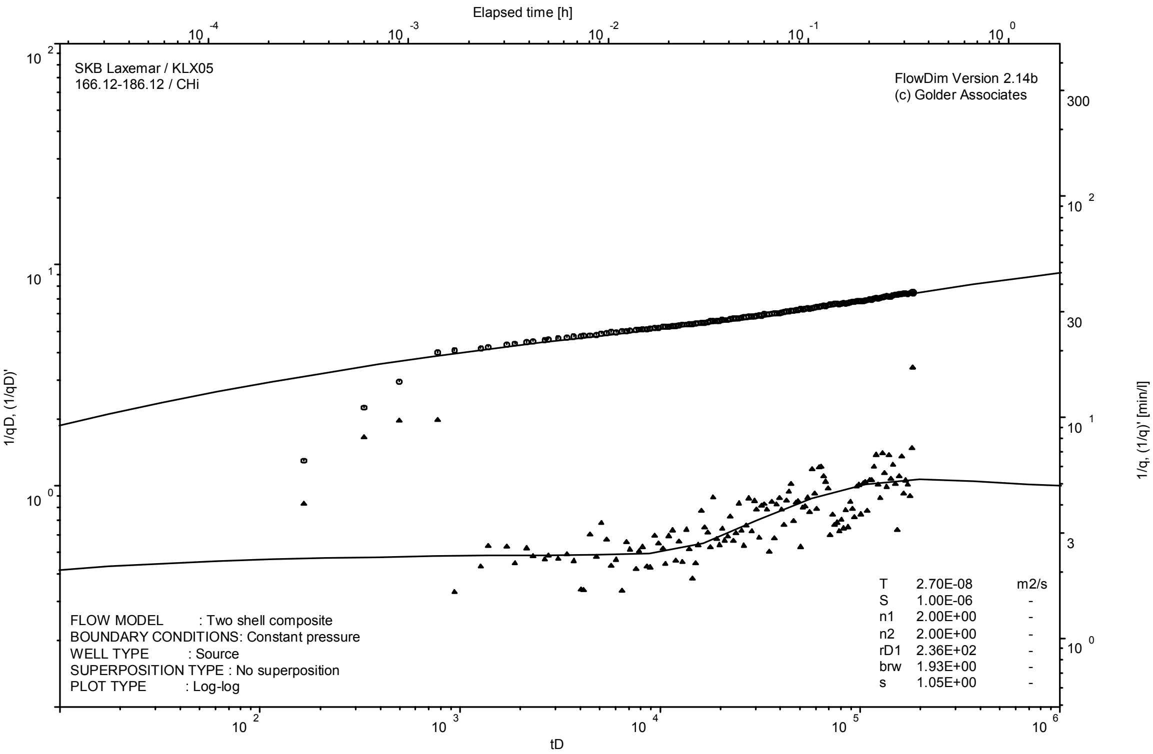
Analysis diagrams



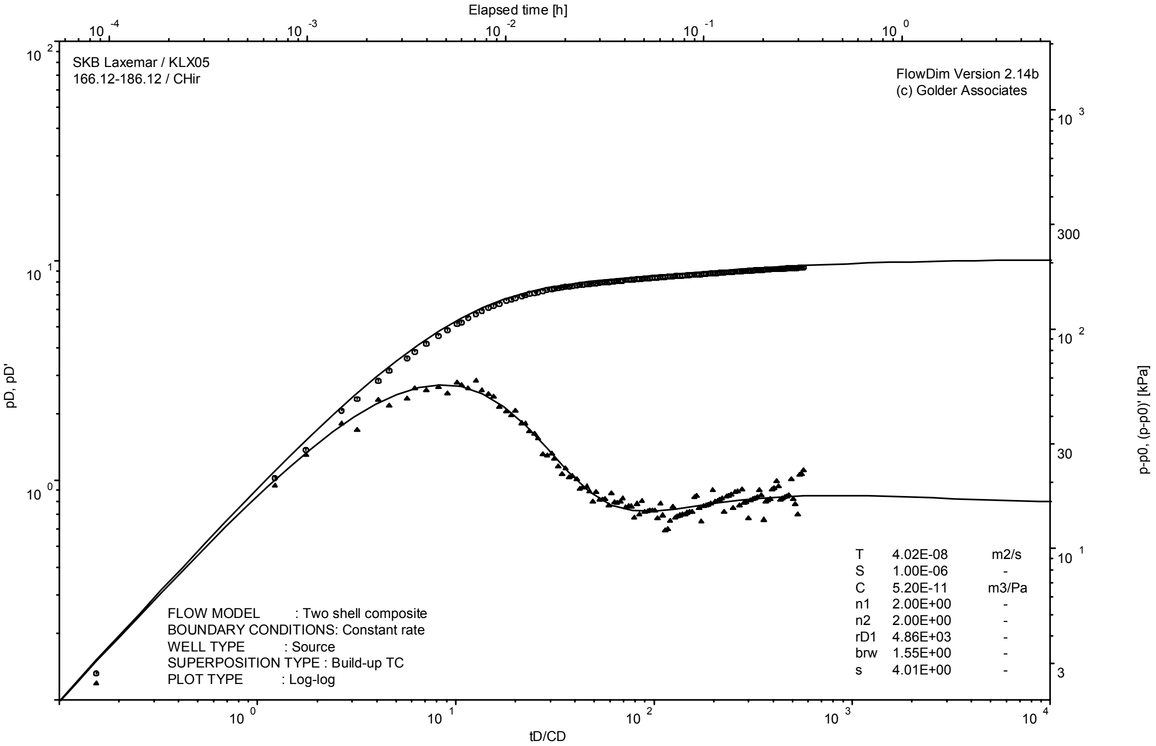
Pressure and flow rate vs. time; cartesian plot



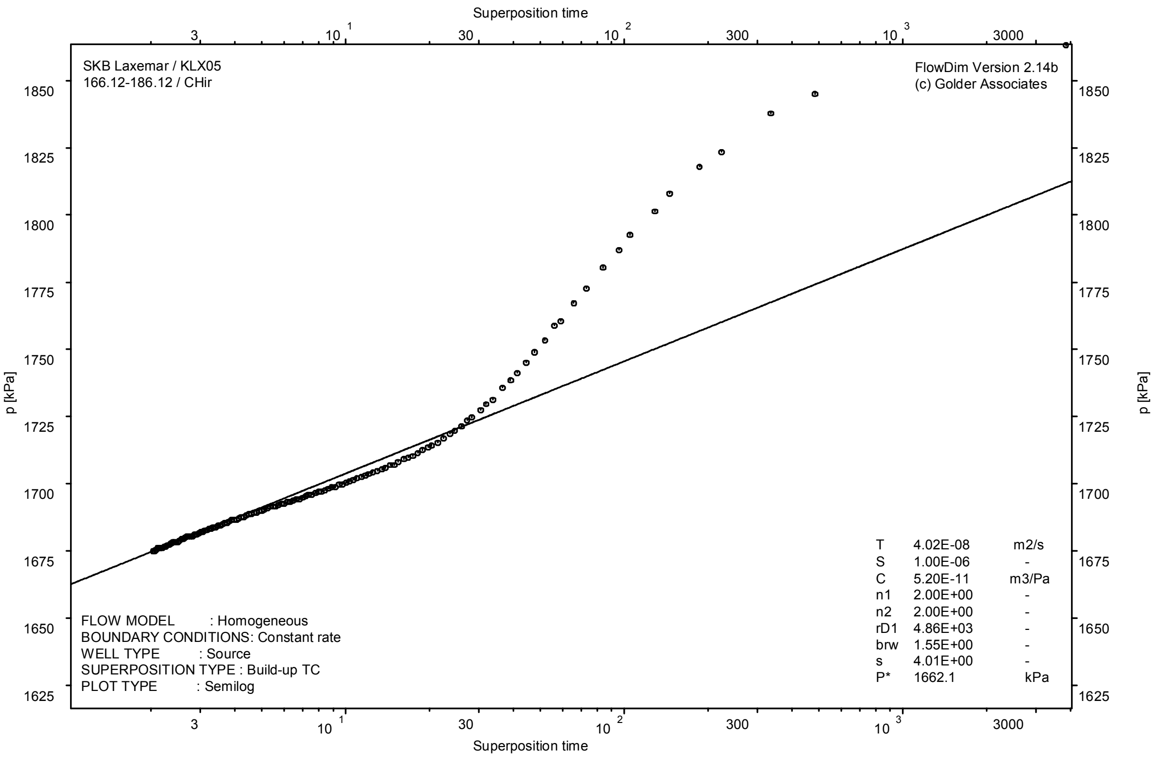
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

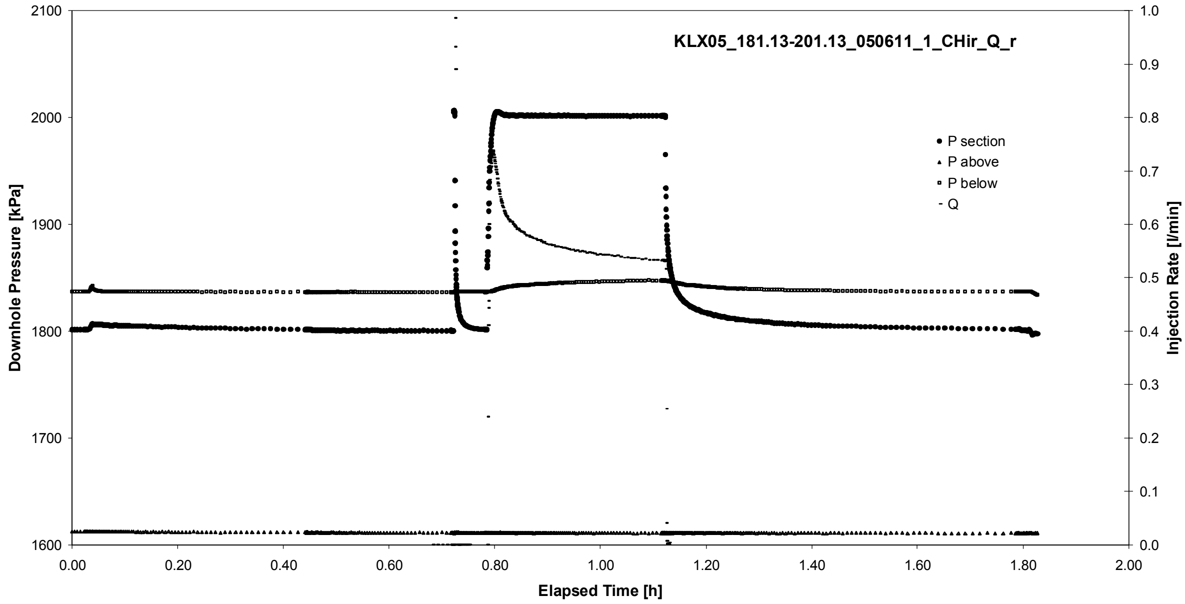


CHIR phase; HORNER match

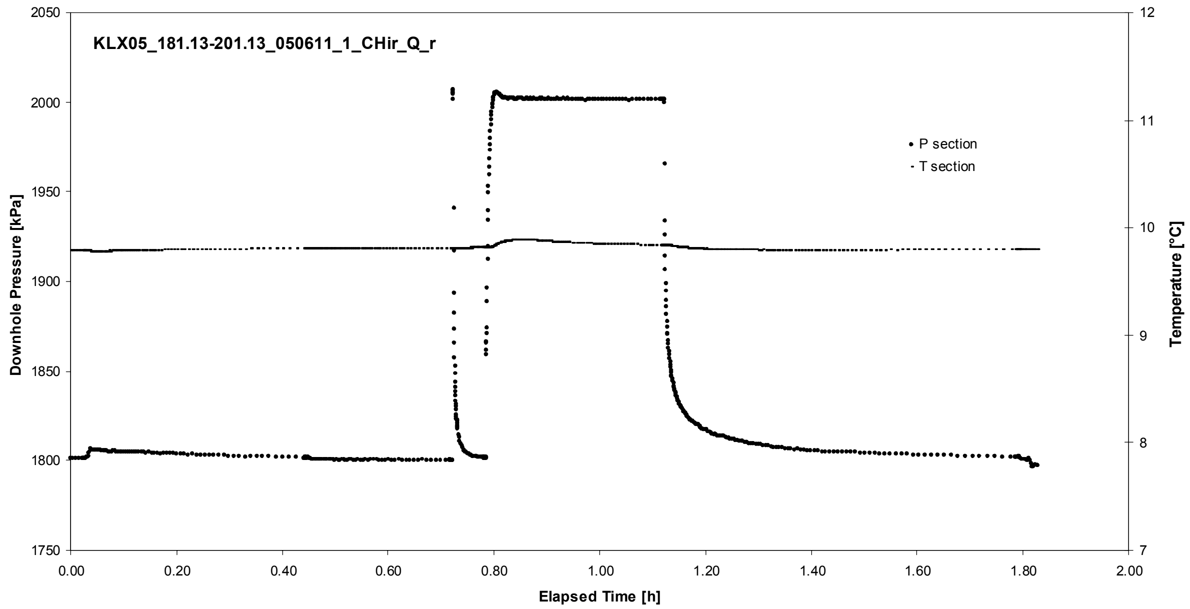
APPENDIX 2-14

Test 181.13 – 201.13 m

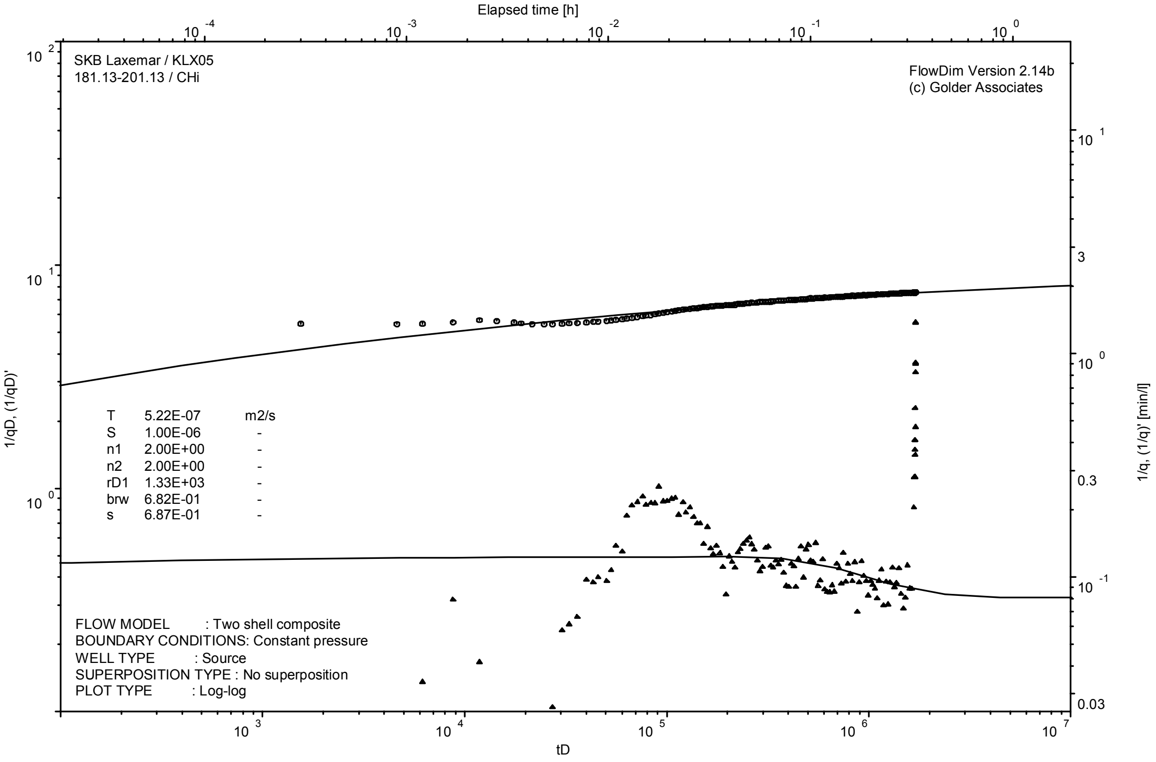
Analysis diagrams



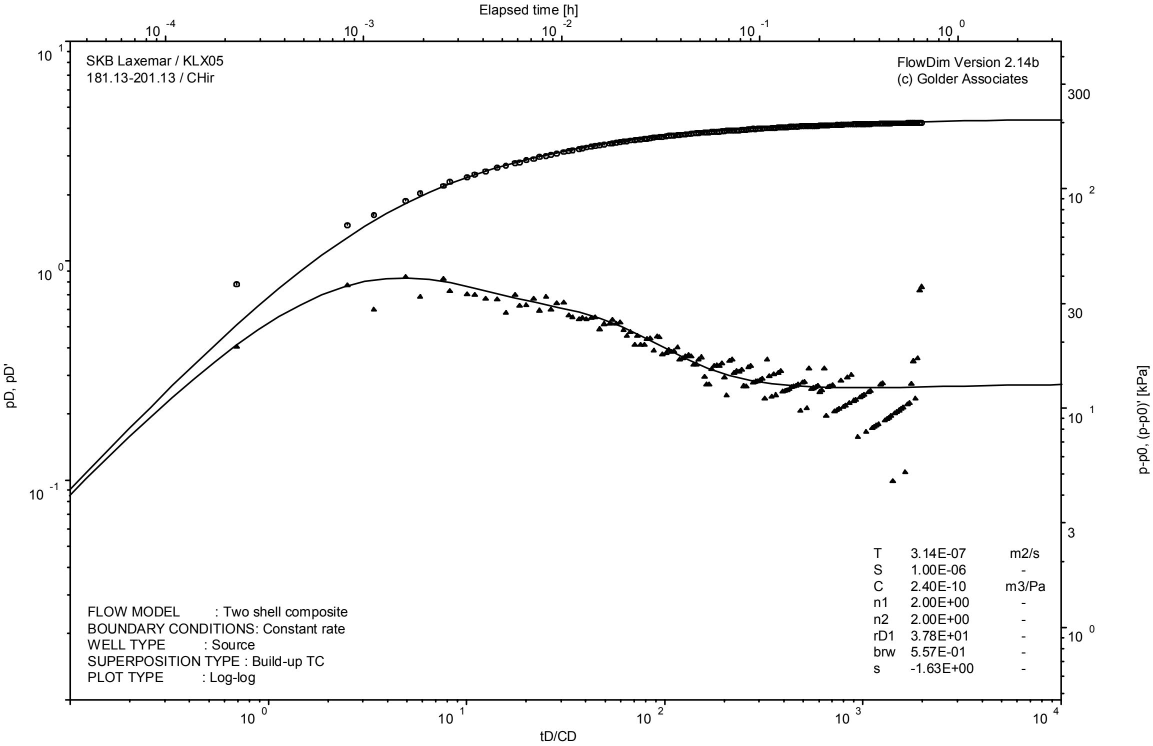
Pressure and flow rate vs. time; cartesian plot



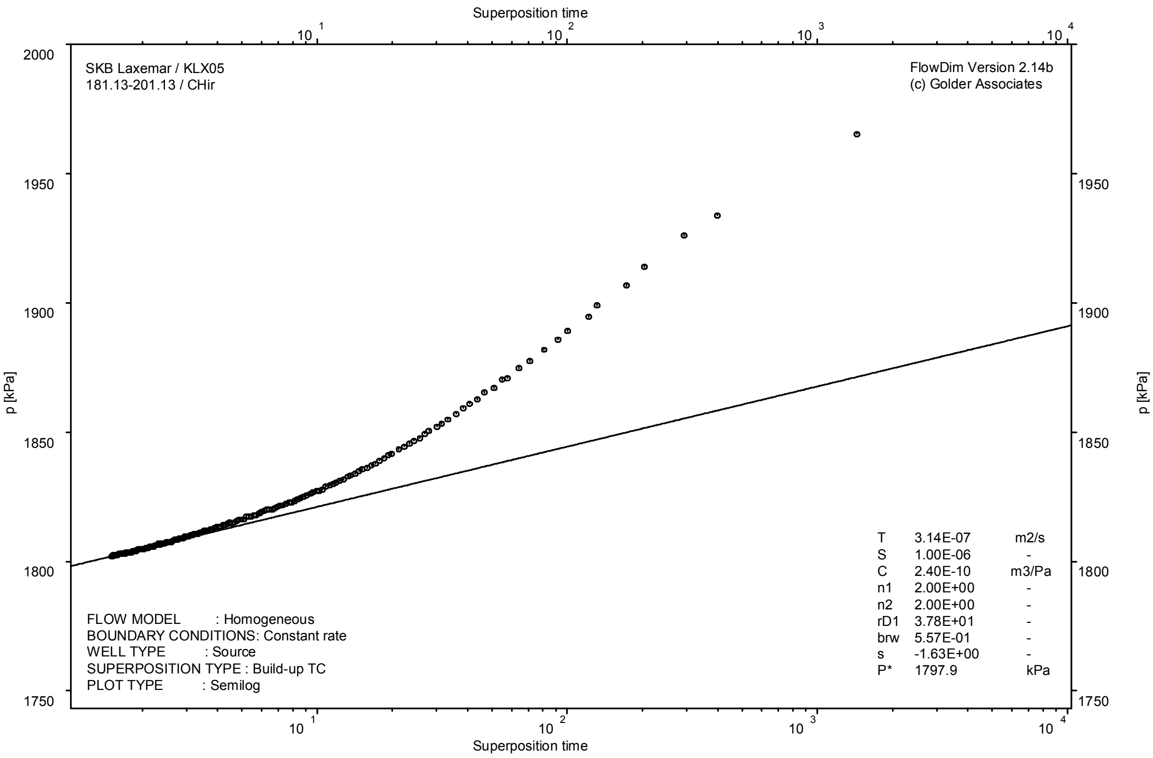
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

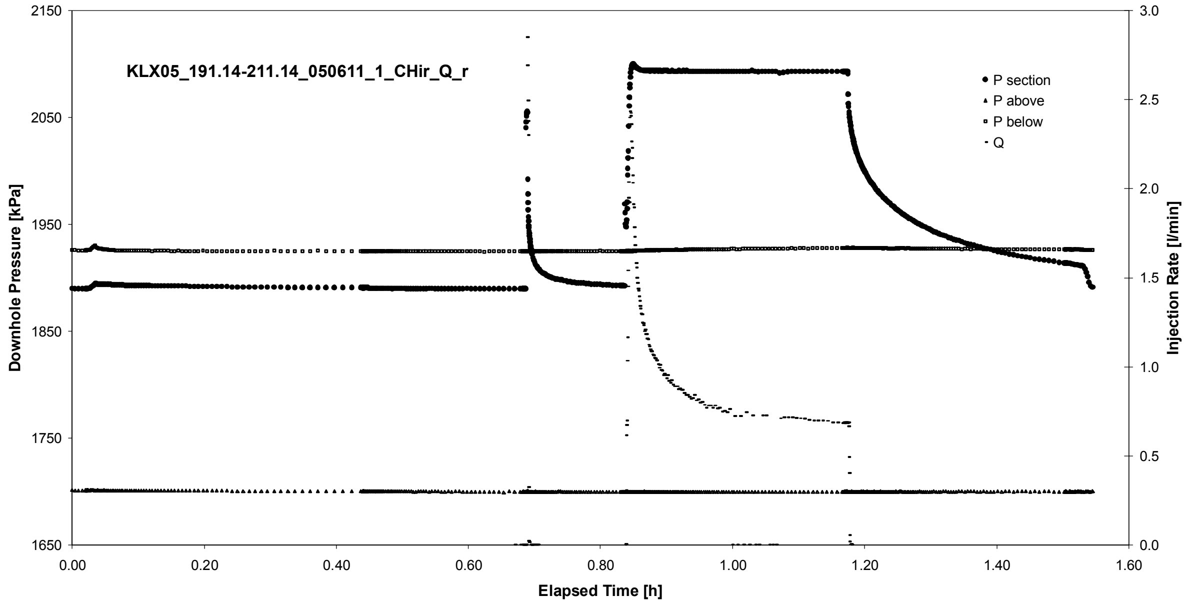


CHIR phase; HORNER match

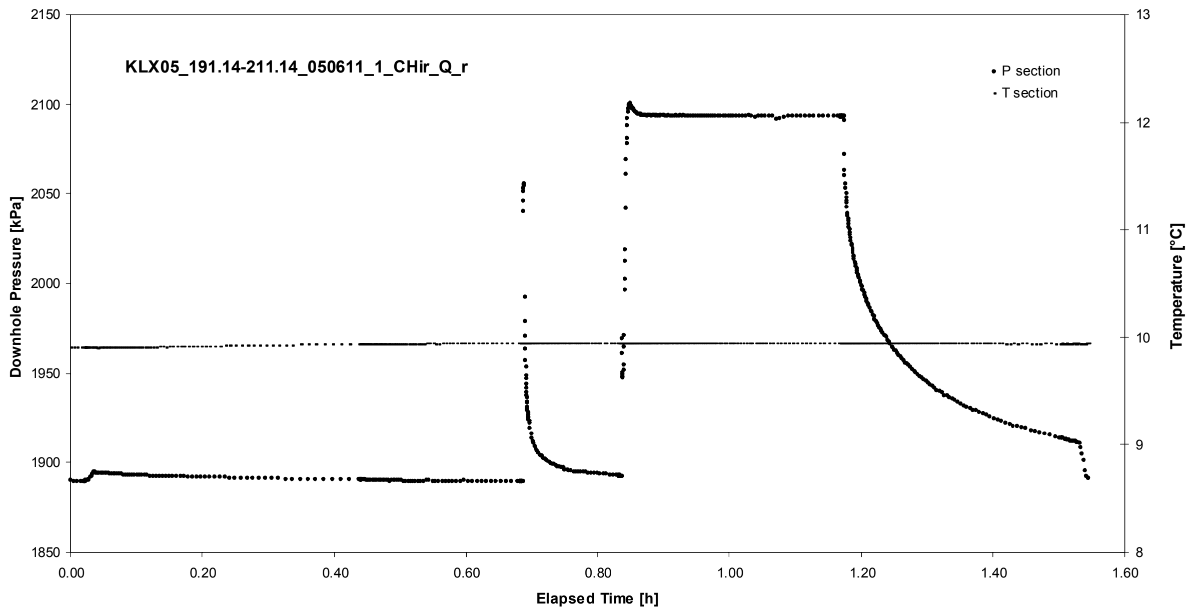
APPENDIX 2-15

Test 191.14 – 211.14 m

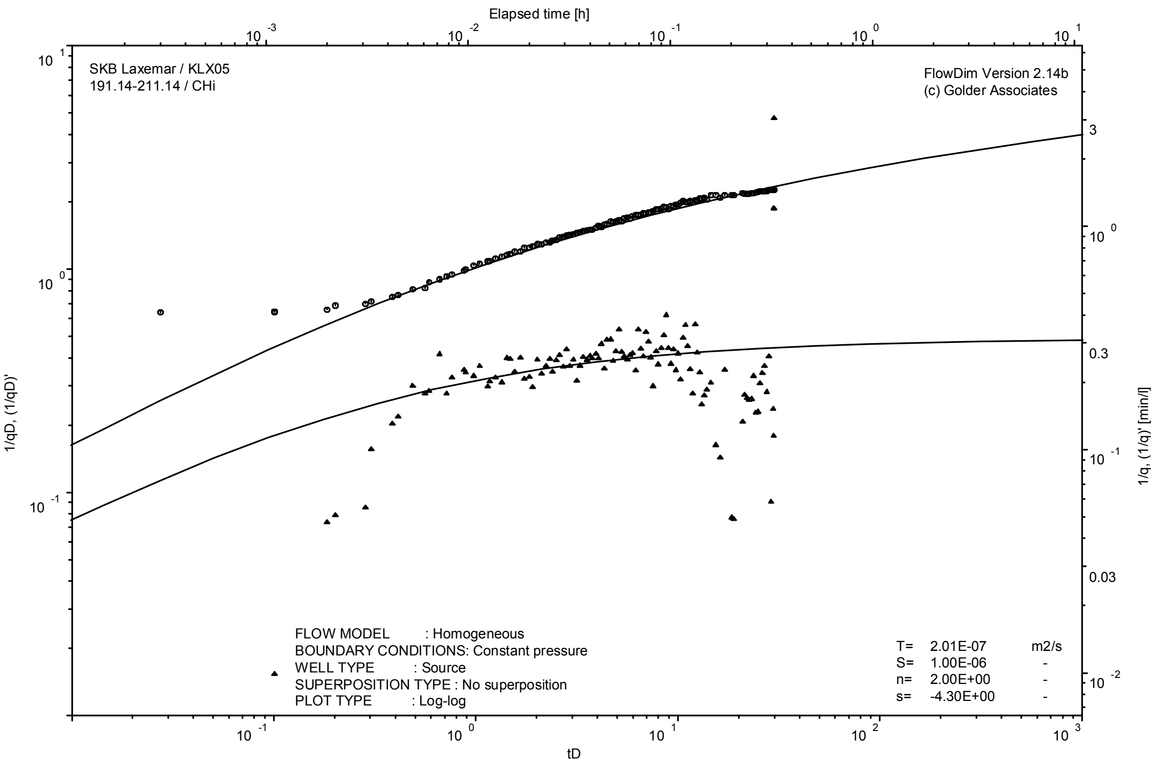
Analysis diagrams



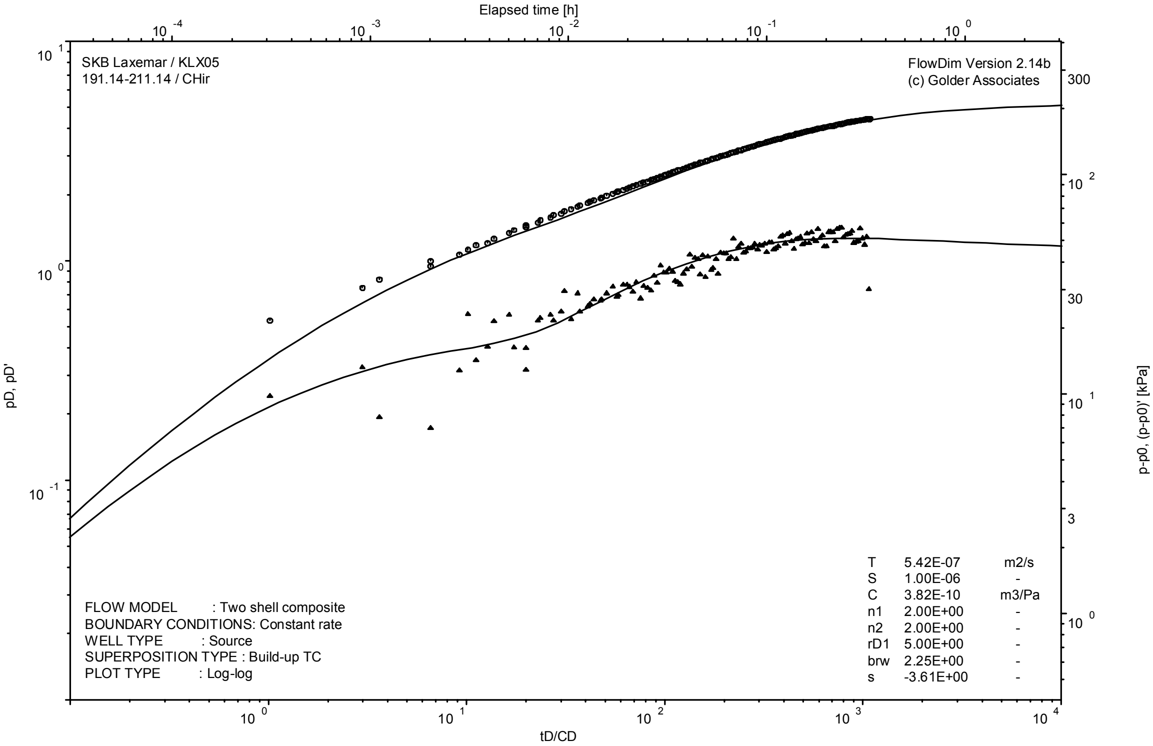
Pressure and flow rate vs. time; cartesian plot



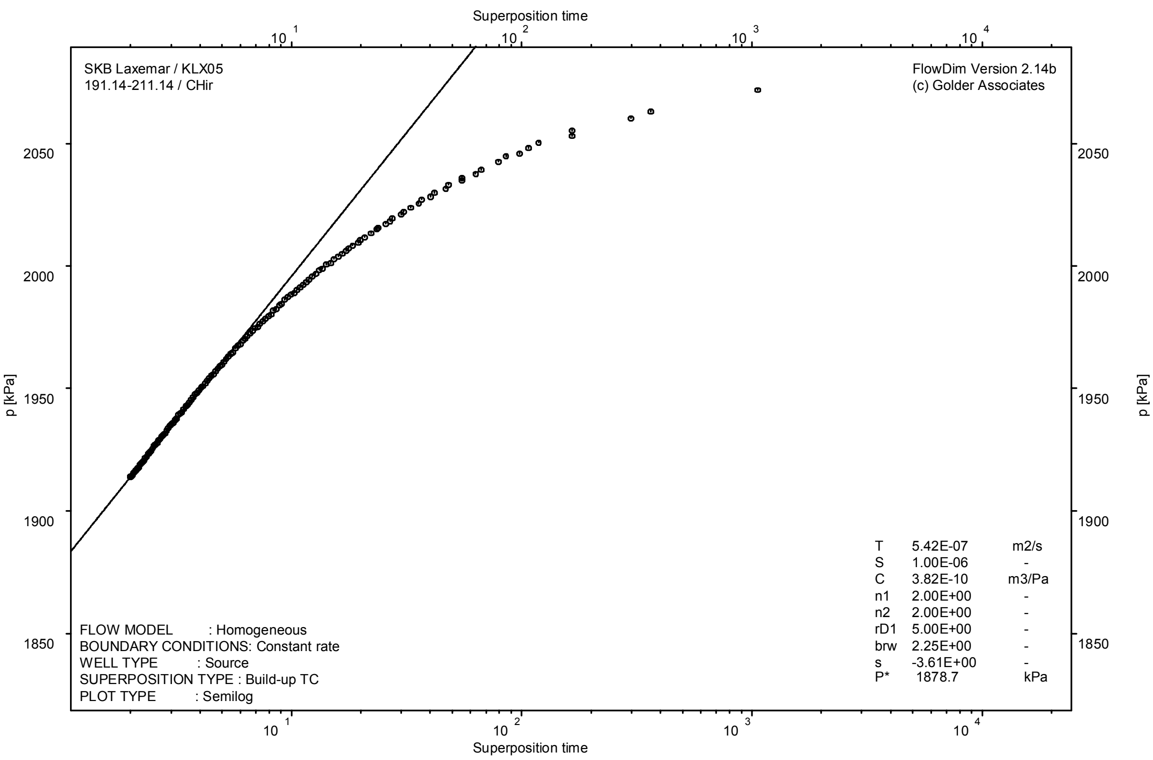
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

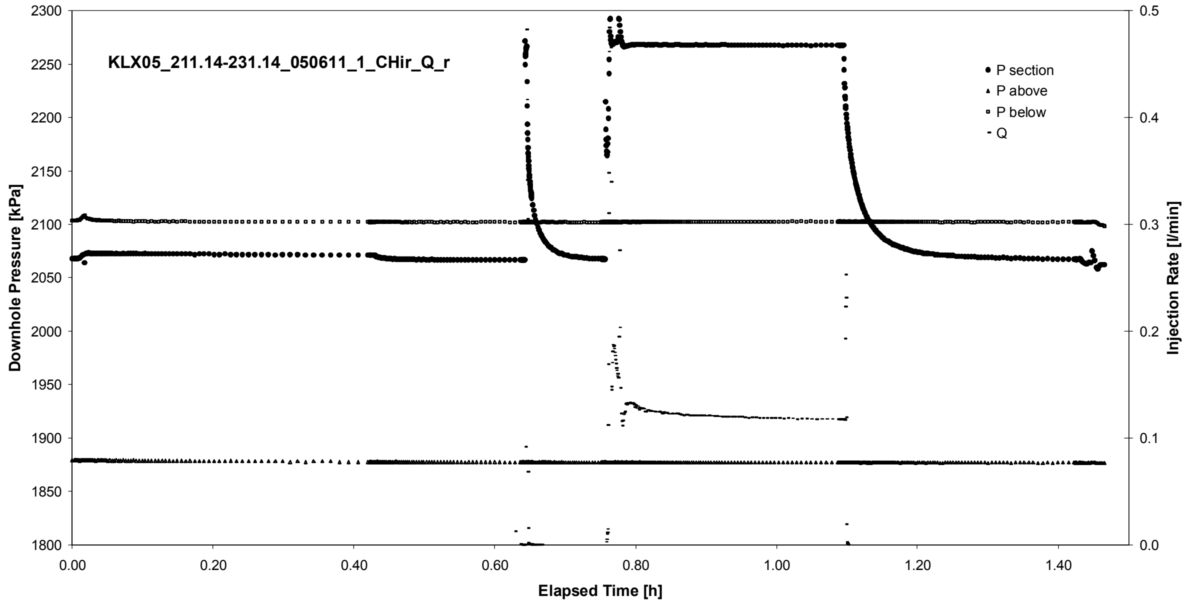


CHIR phase; HORNER match

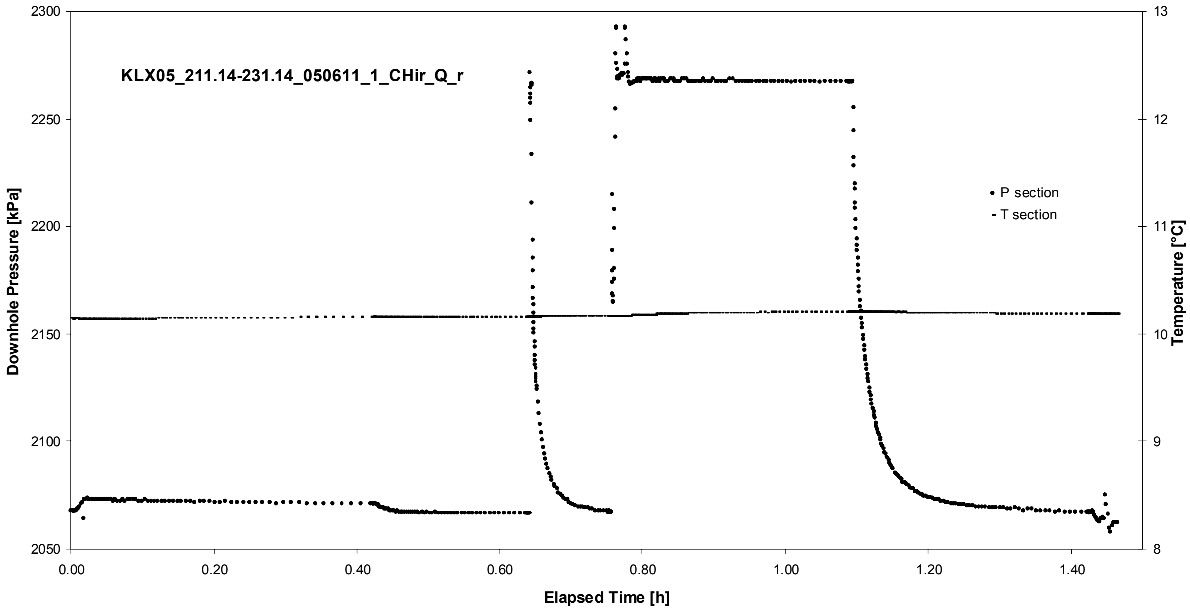
APPENDIX 2-16

Test 211.14 – 231.14 m

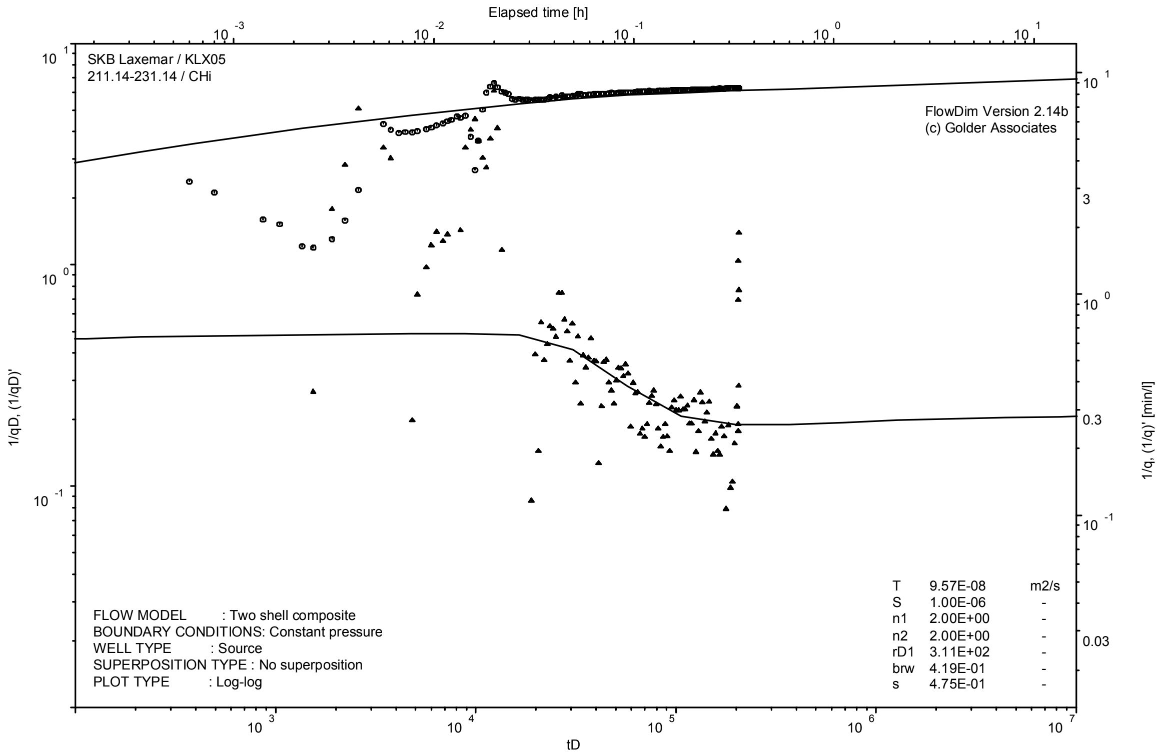
Analysis diagrams



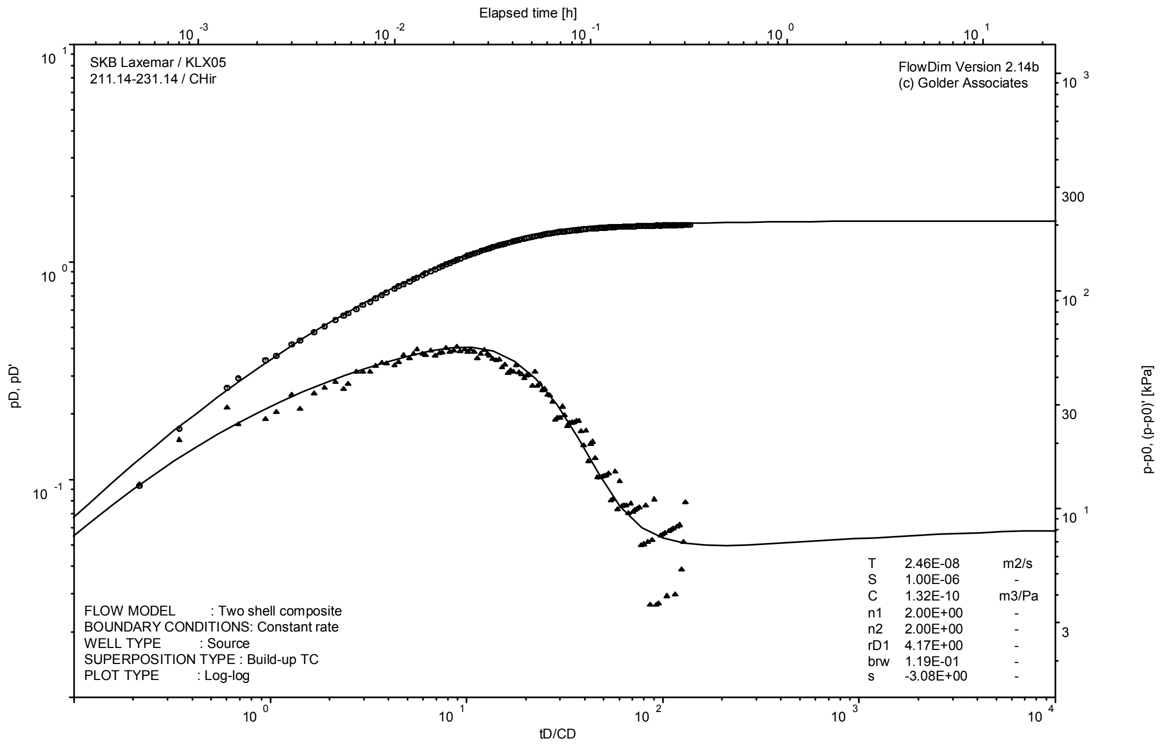
Pressure and flow rate vs. time; cartesian plot



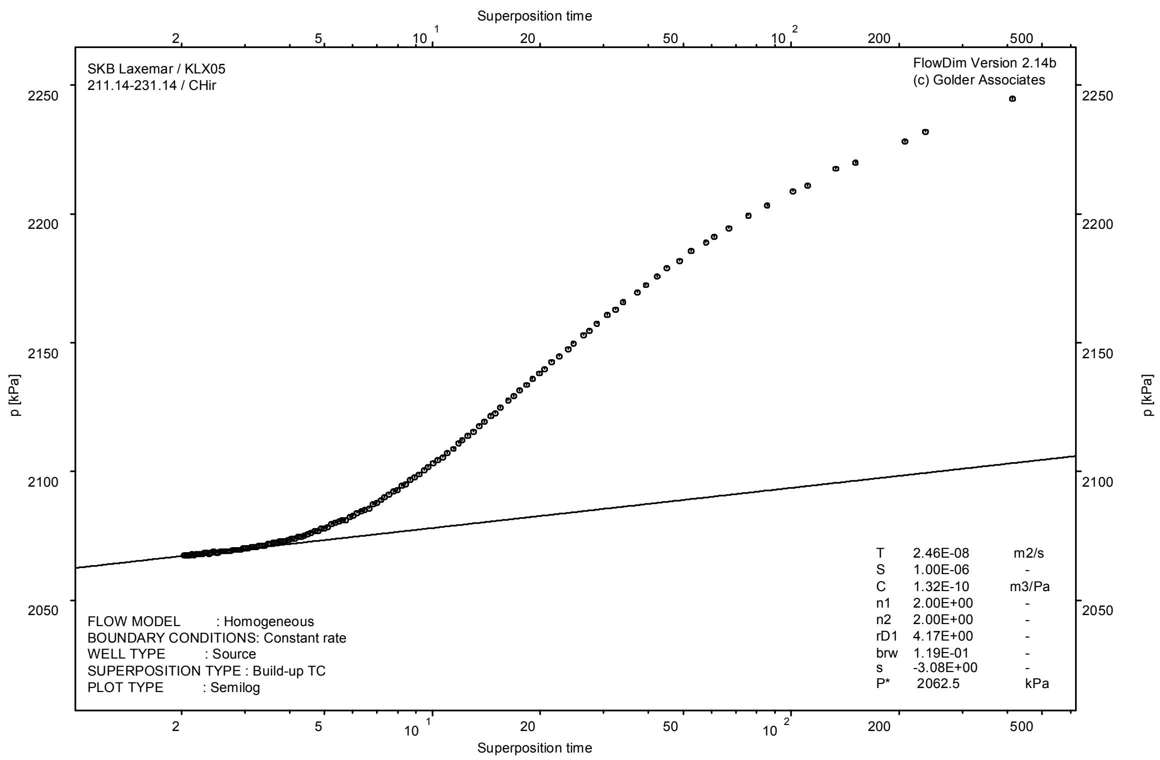
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

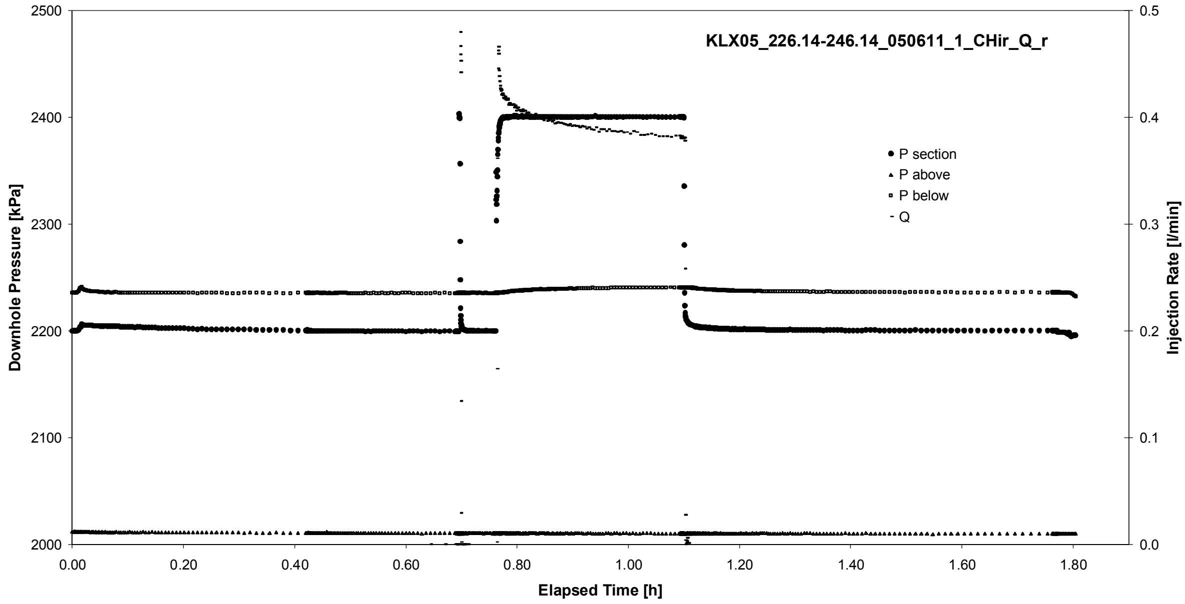


CHIR phase; HORNER match

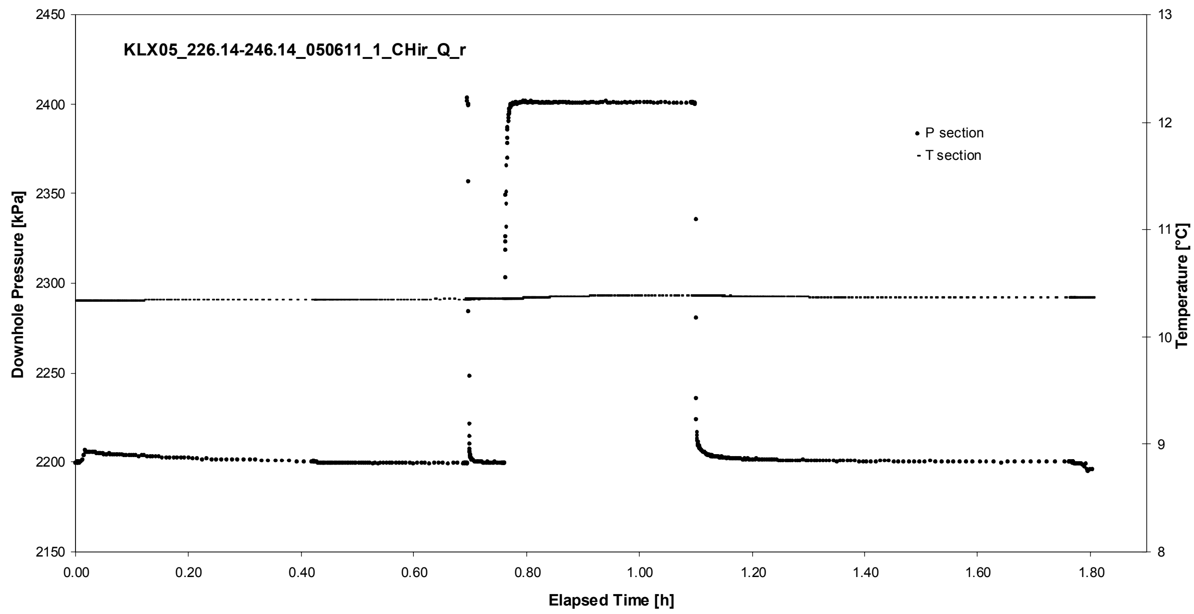
APPENDIX 2-17

Test 226.14 – 246.14 m

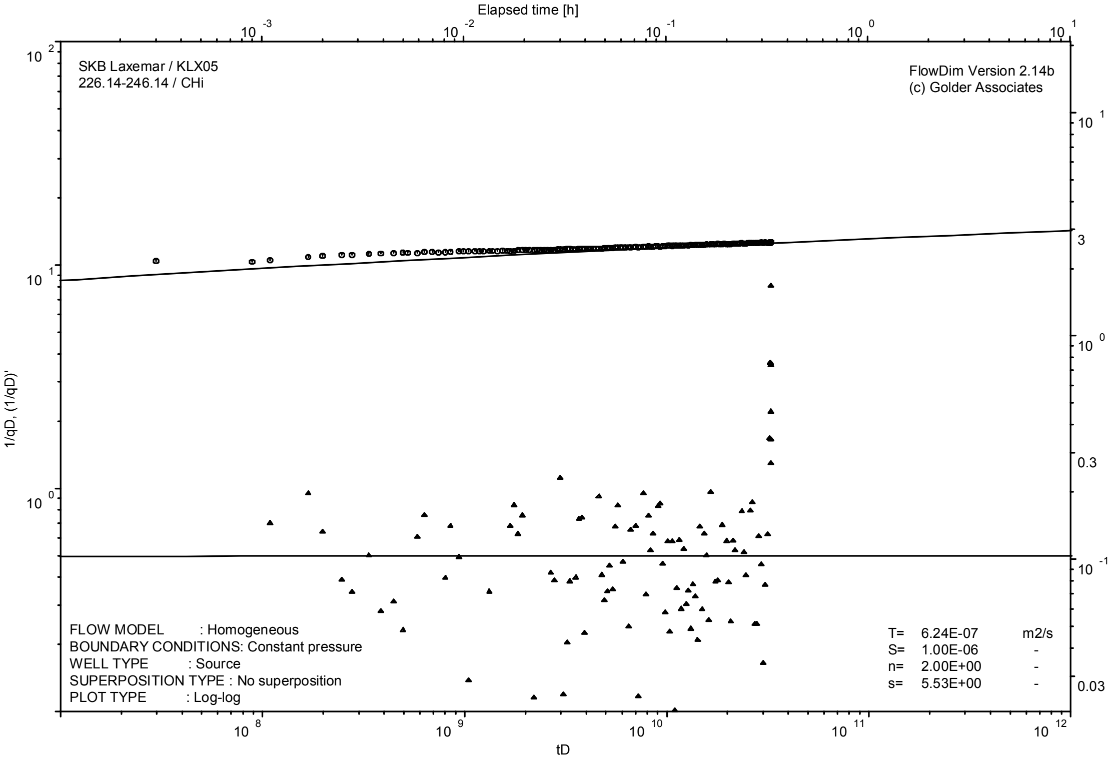
Analysis diagrams



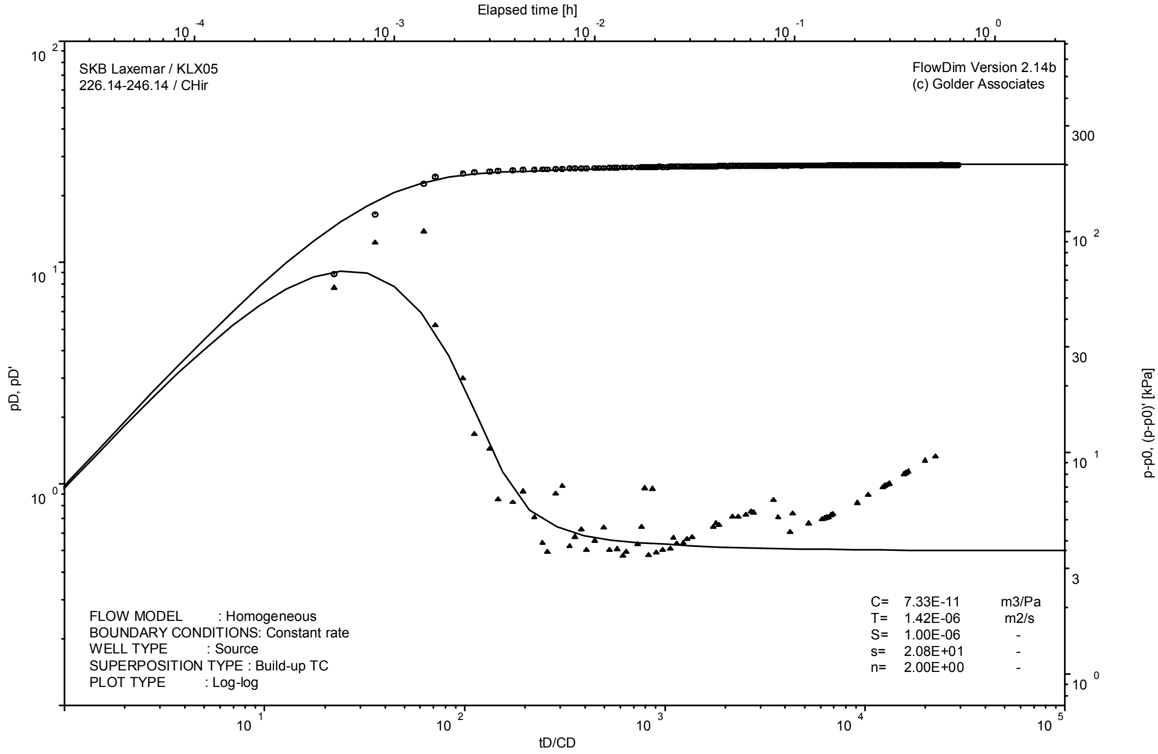
Pressure and flow rate vs. time; cartesian plot



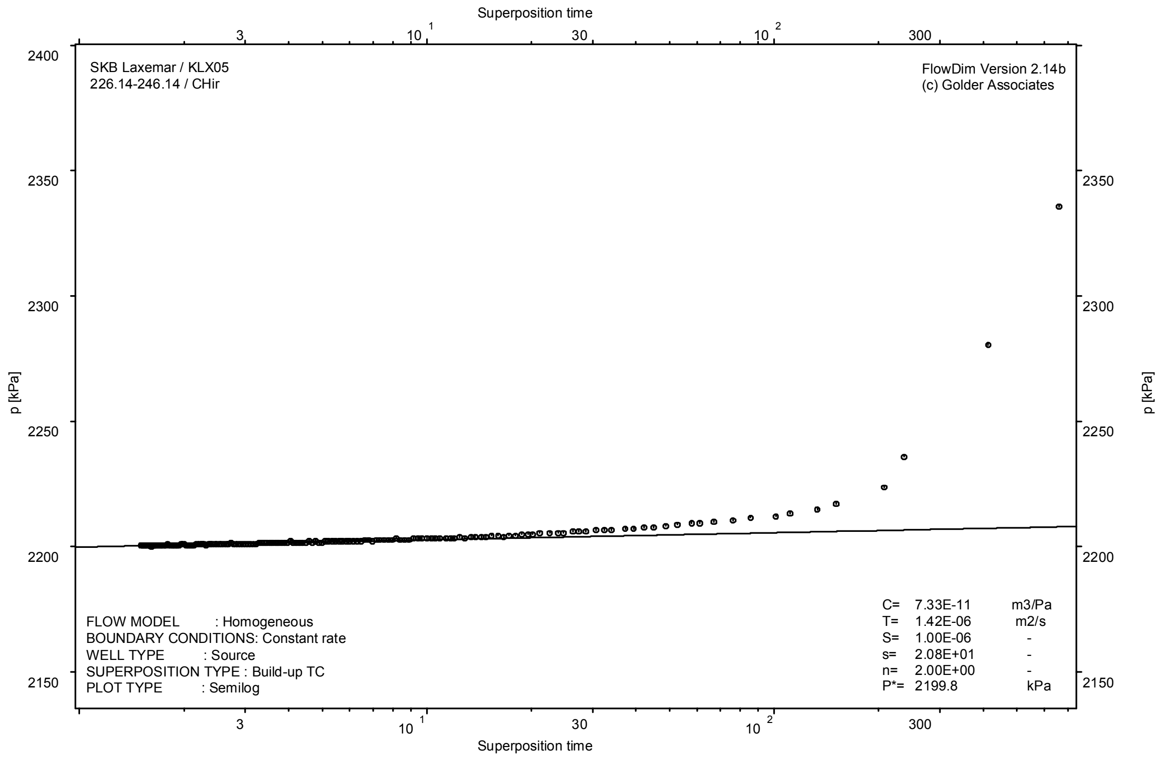
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

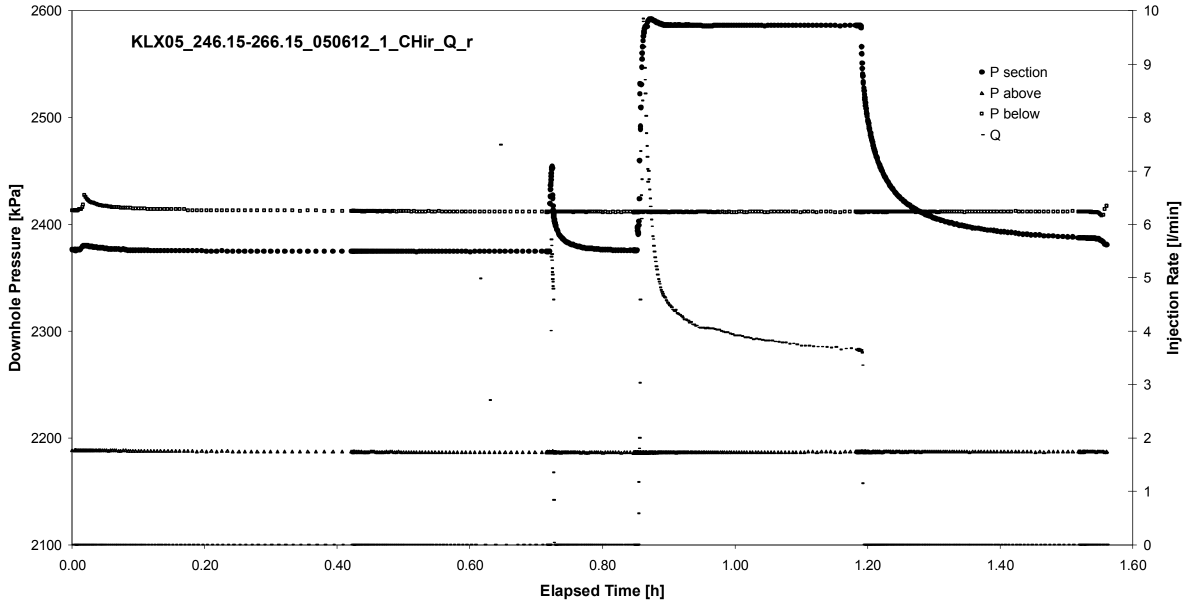


CHIR phase; HORNER match

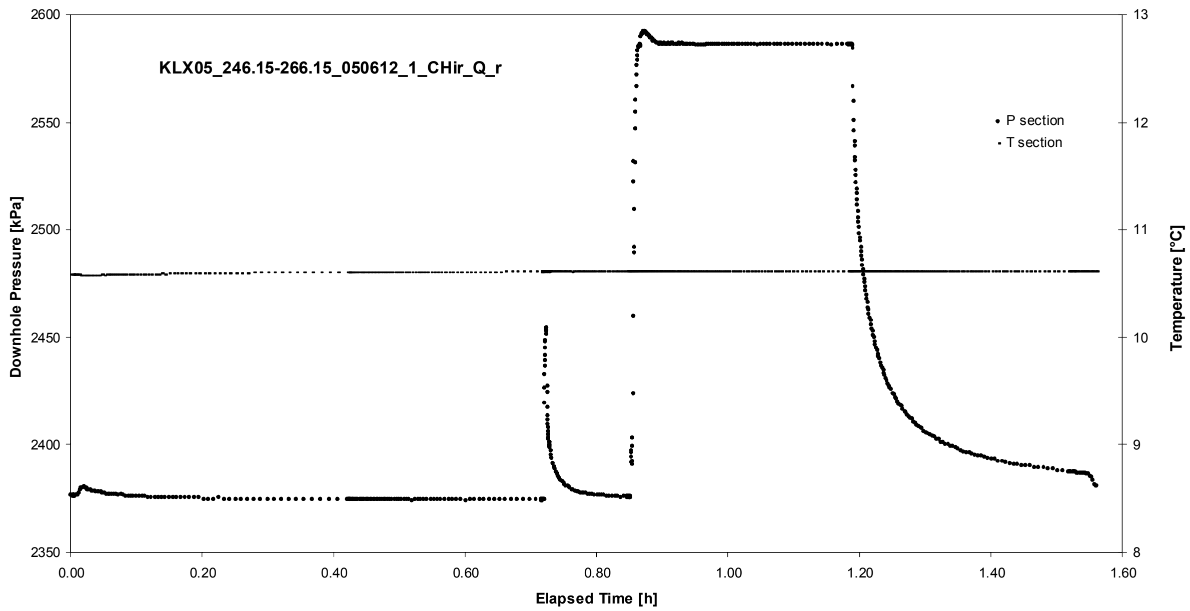
APPENDIX 2-18

Test 246.15 – 266.15 m

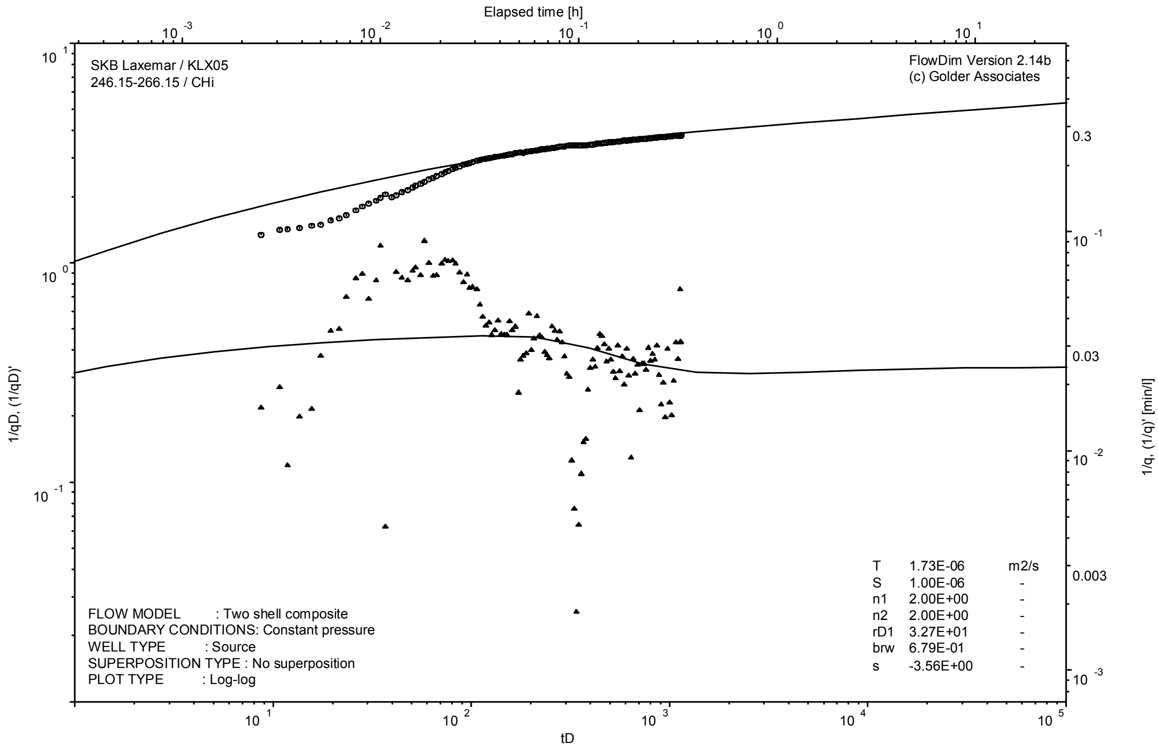
Analysis diagrams



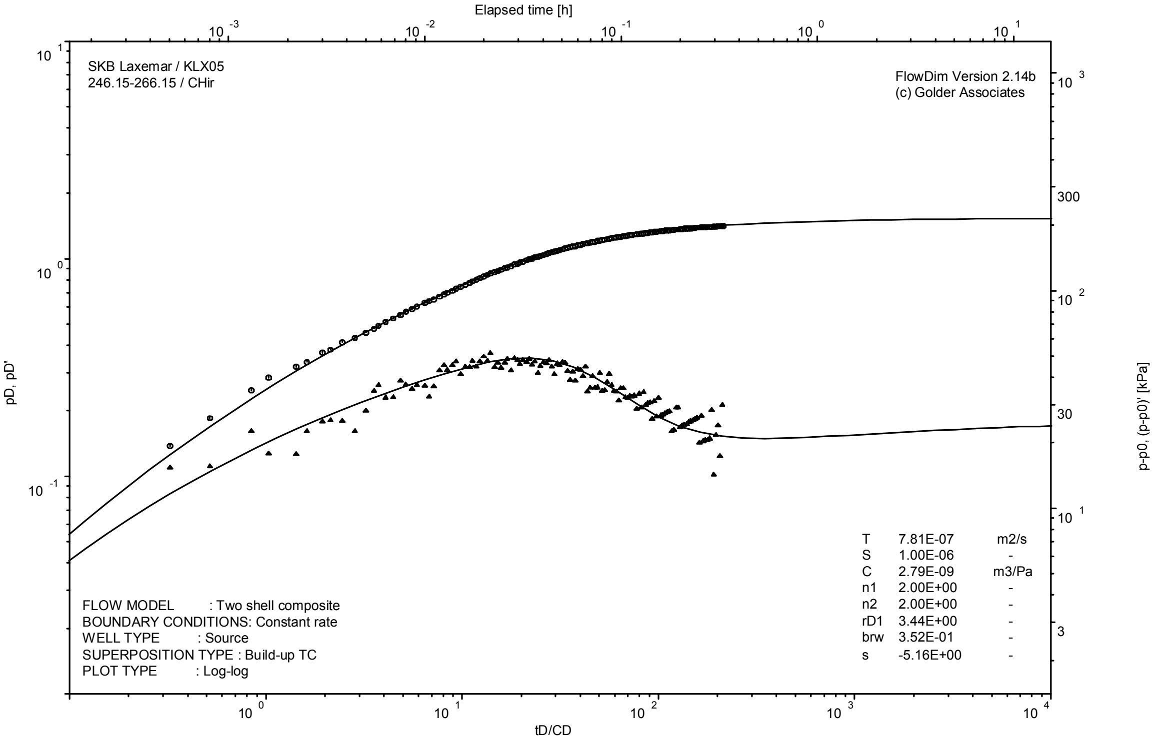
Pressure and flow rate vs. time; cartesian plot



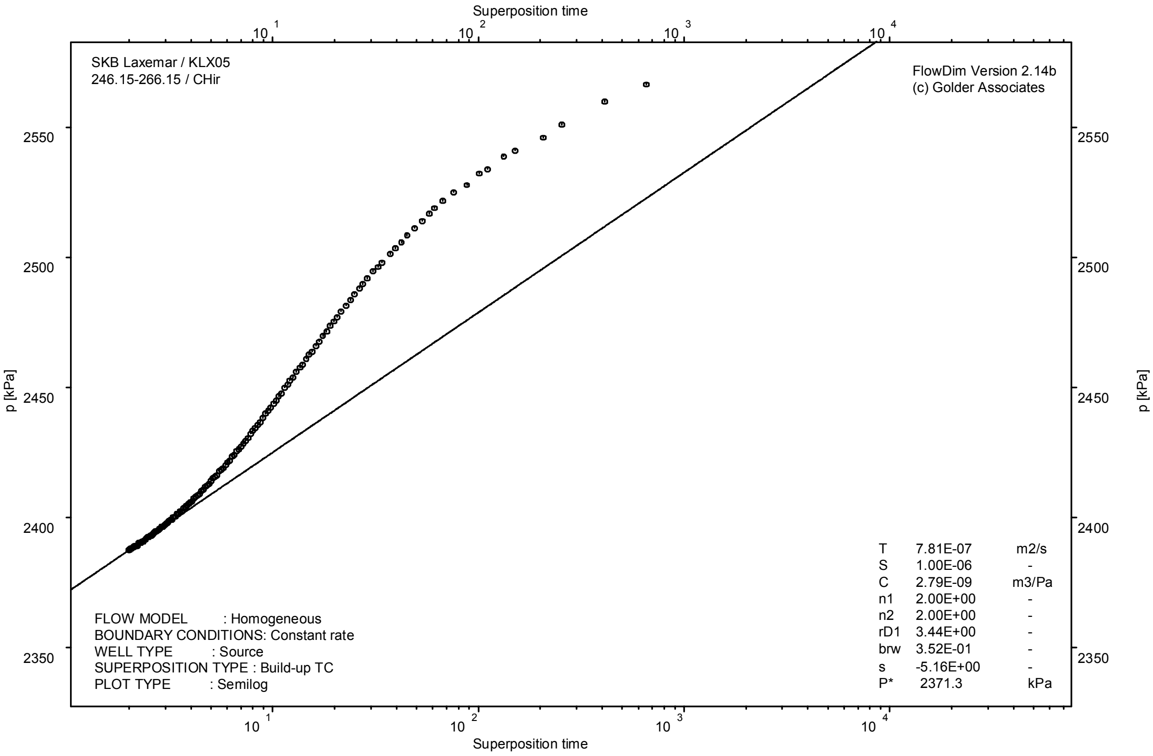
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

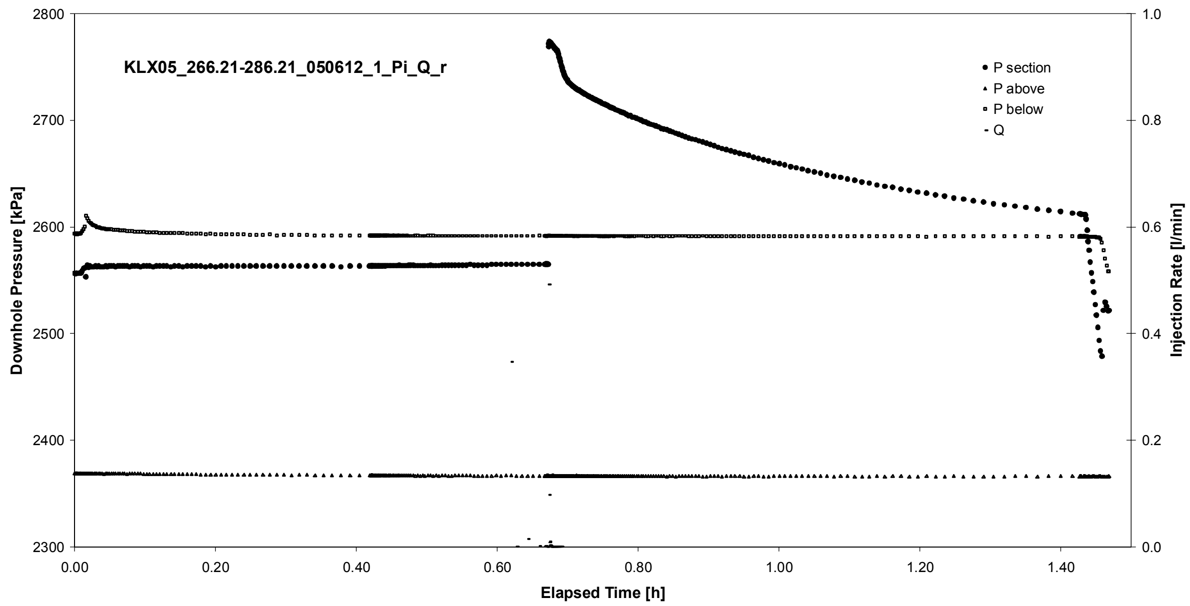


CHIR phase; HORNER match

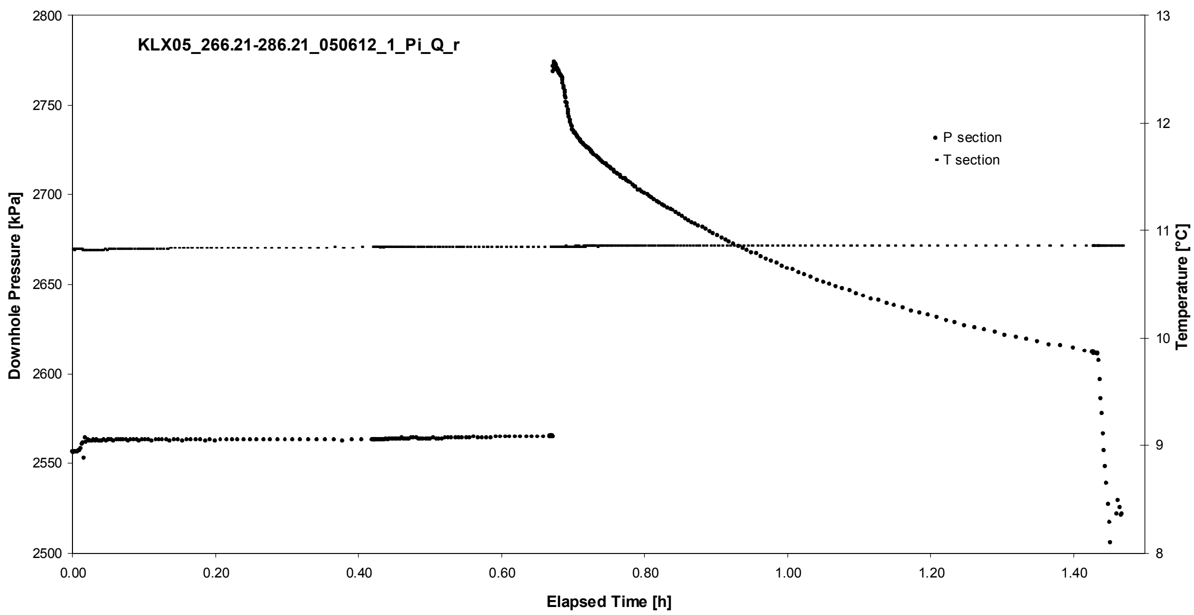
APPENDIX 2-19

Test 266.21 – 286.21 m

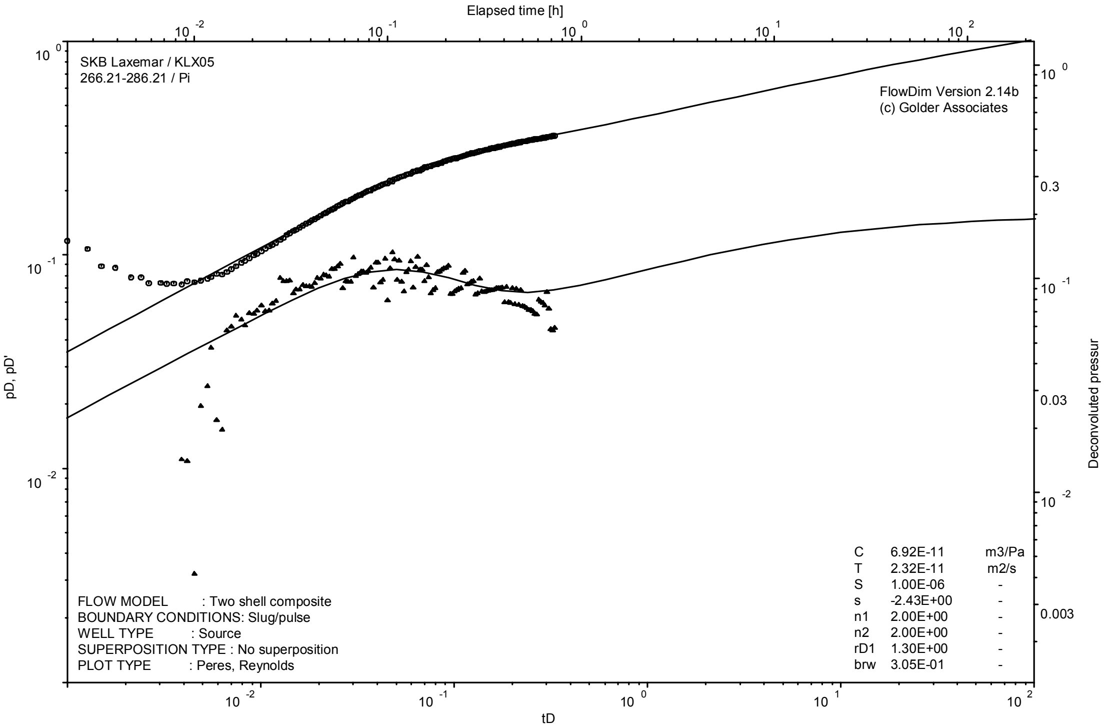
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

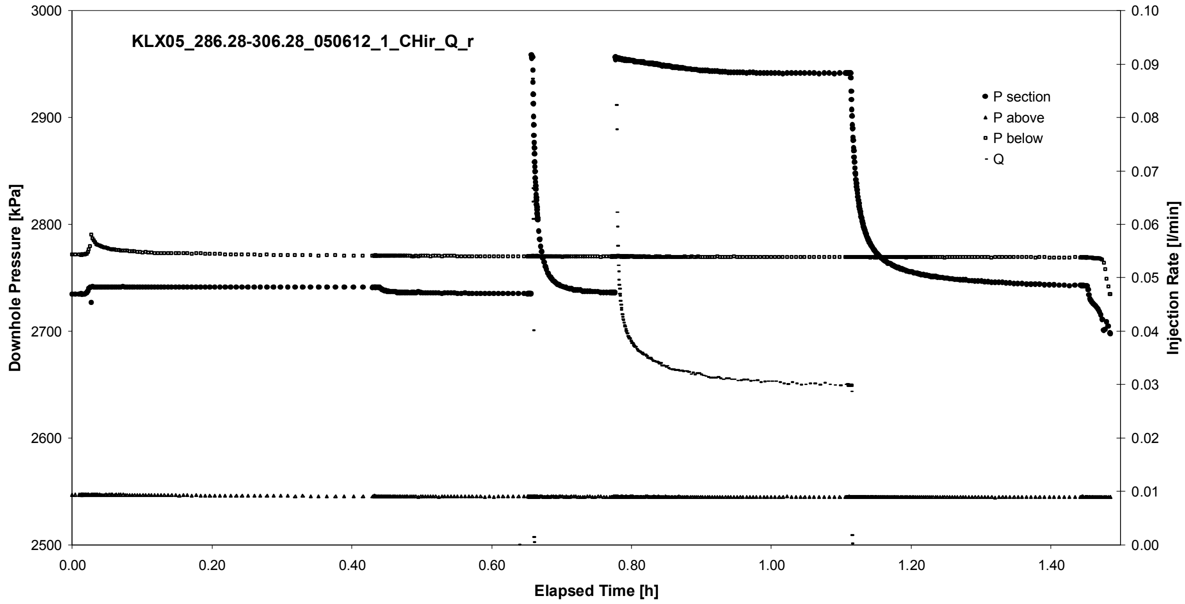


PI phase; deconvolution match

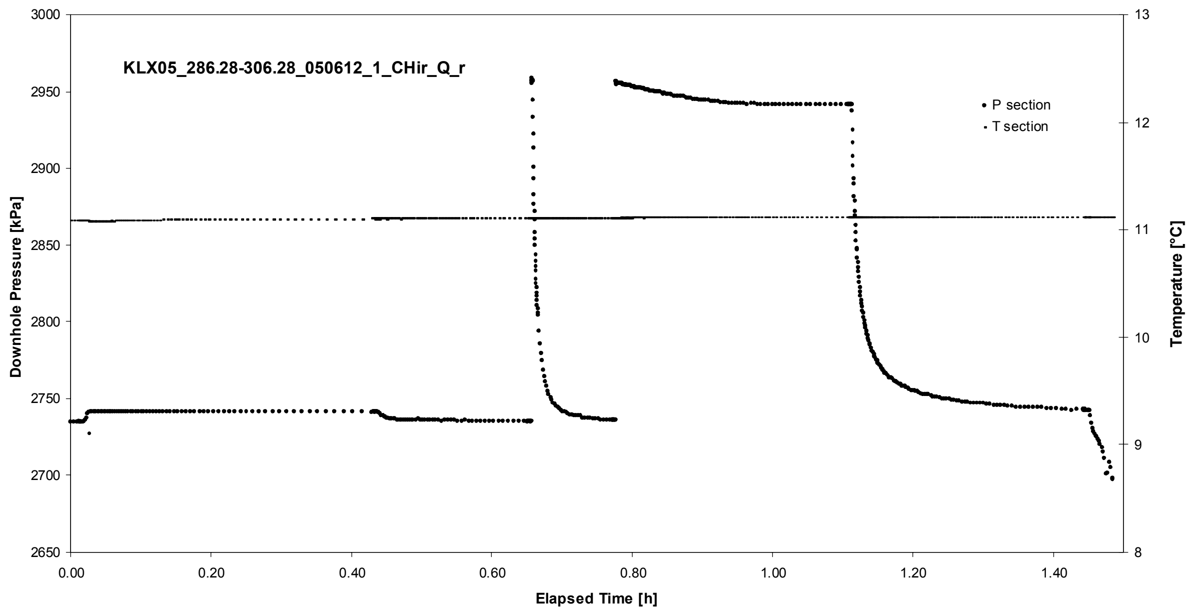
APPENDIX 2-20

Test 286.28 – 306.28 m

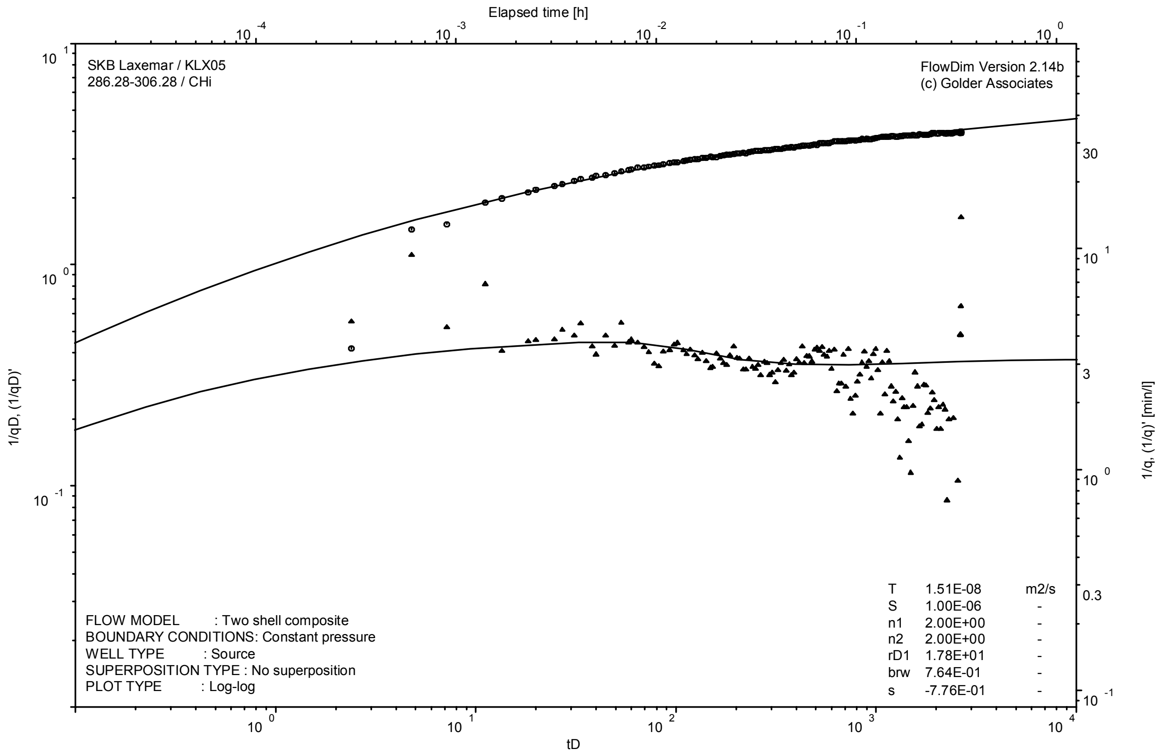
Analysis diagrams



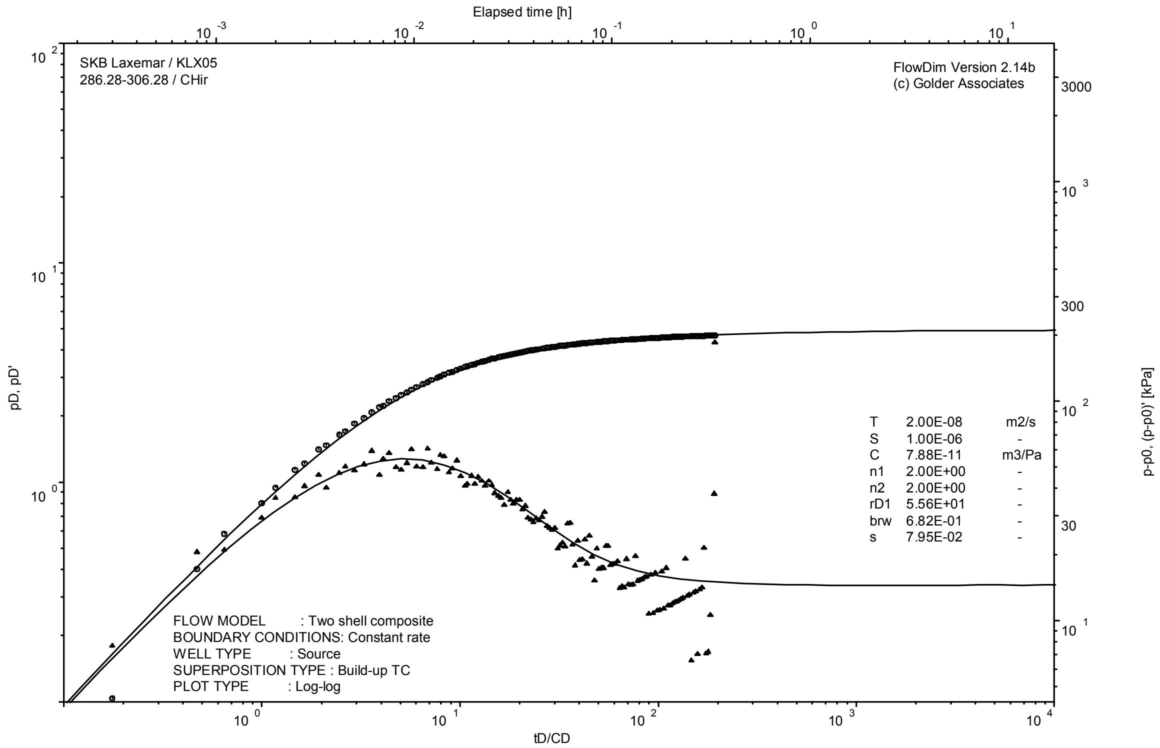
Pressure and flow rate vs. time; cartesian plot



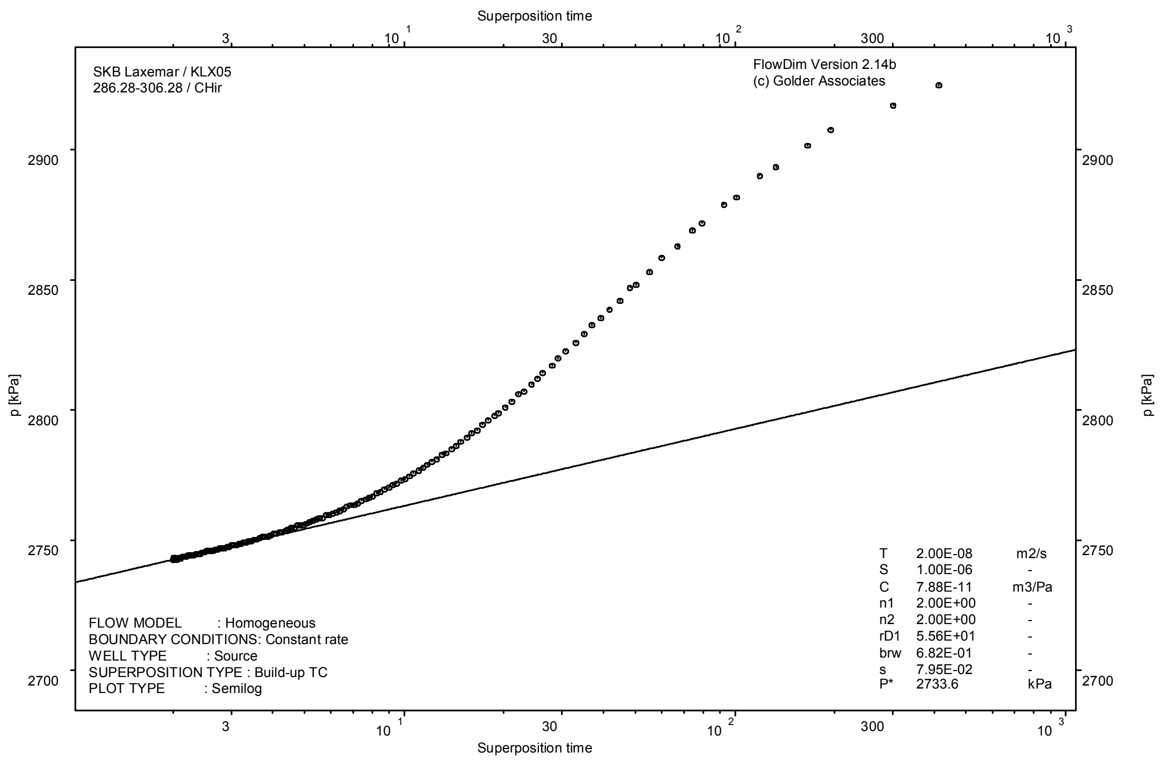
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

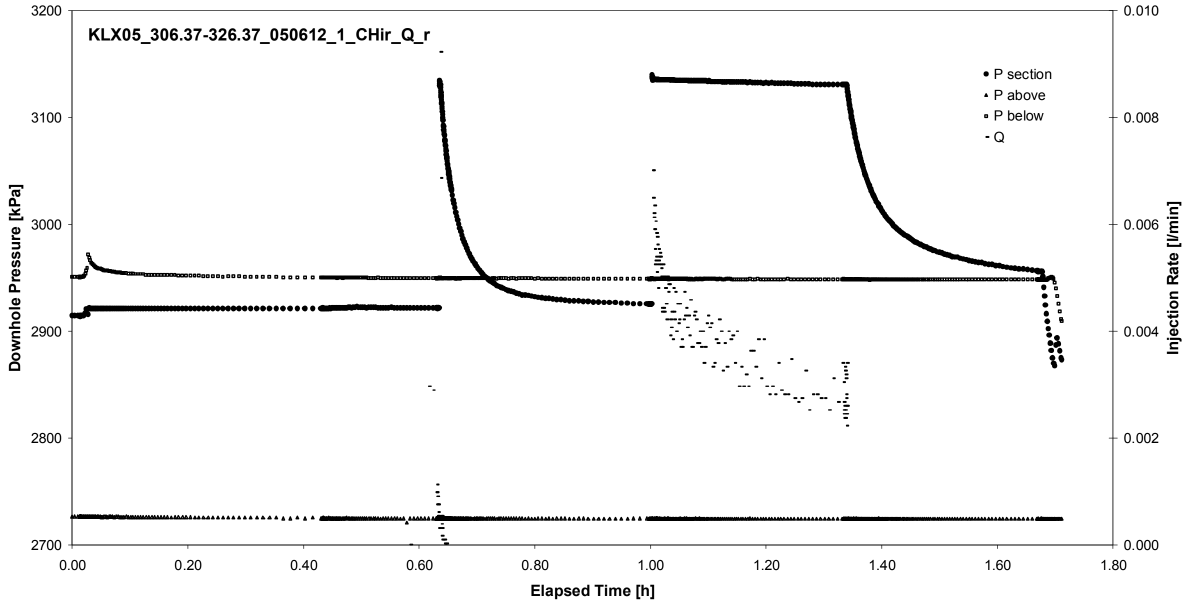


CHIR phase; HORNER match

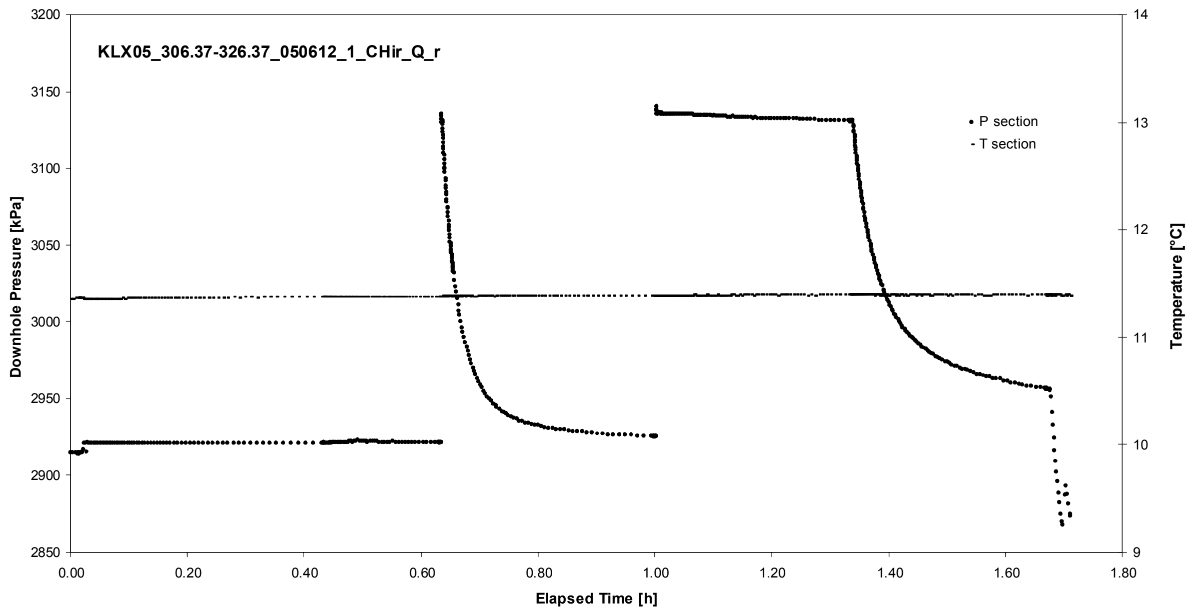
APPENDIX 2-21

Test 306.37 – 326.37 m

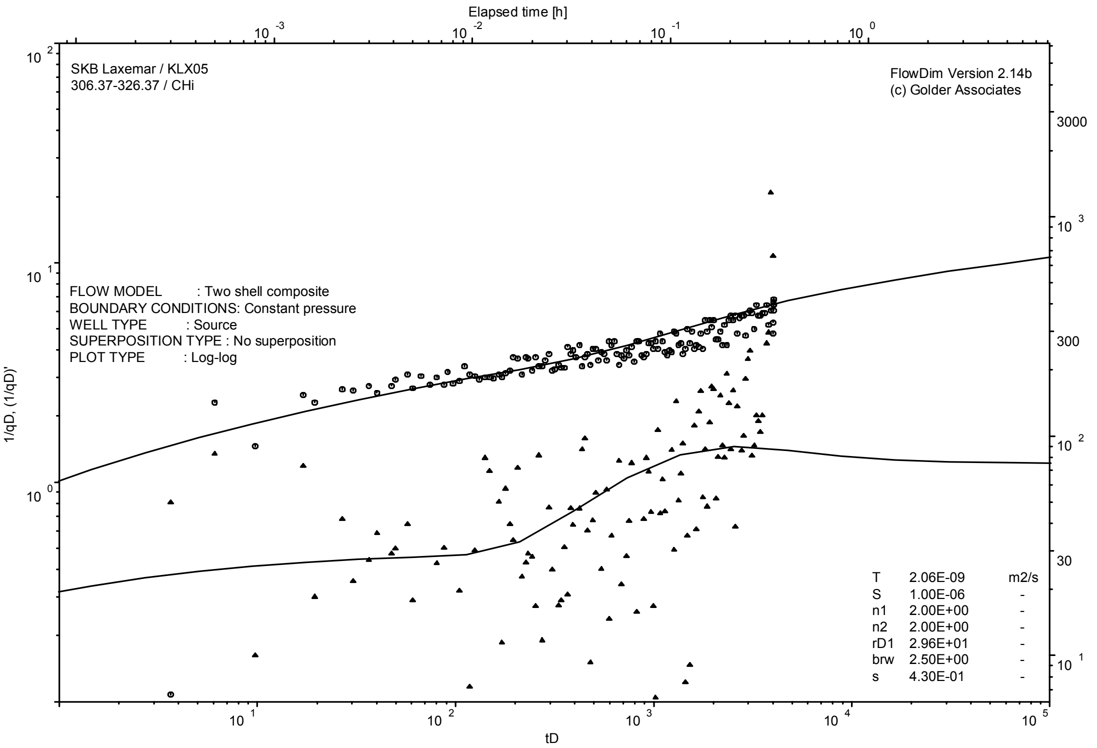
Analysis diagrams



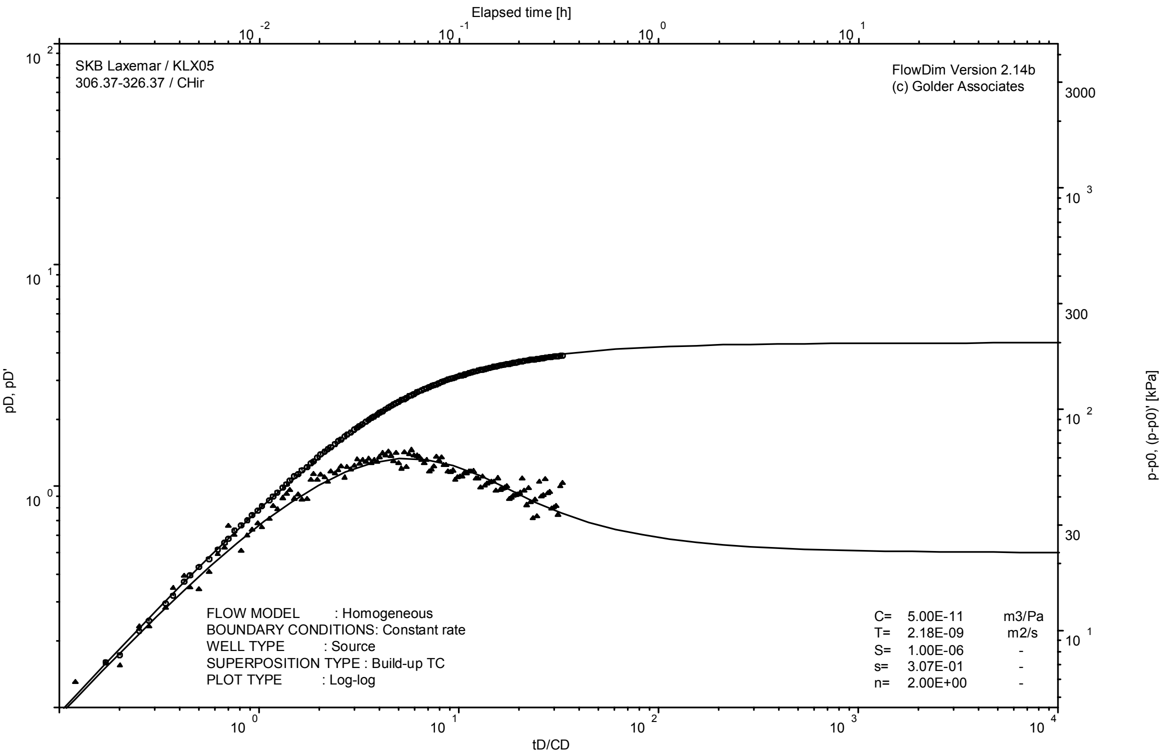
Pressure and flow rate vs. time; cartesian plot



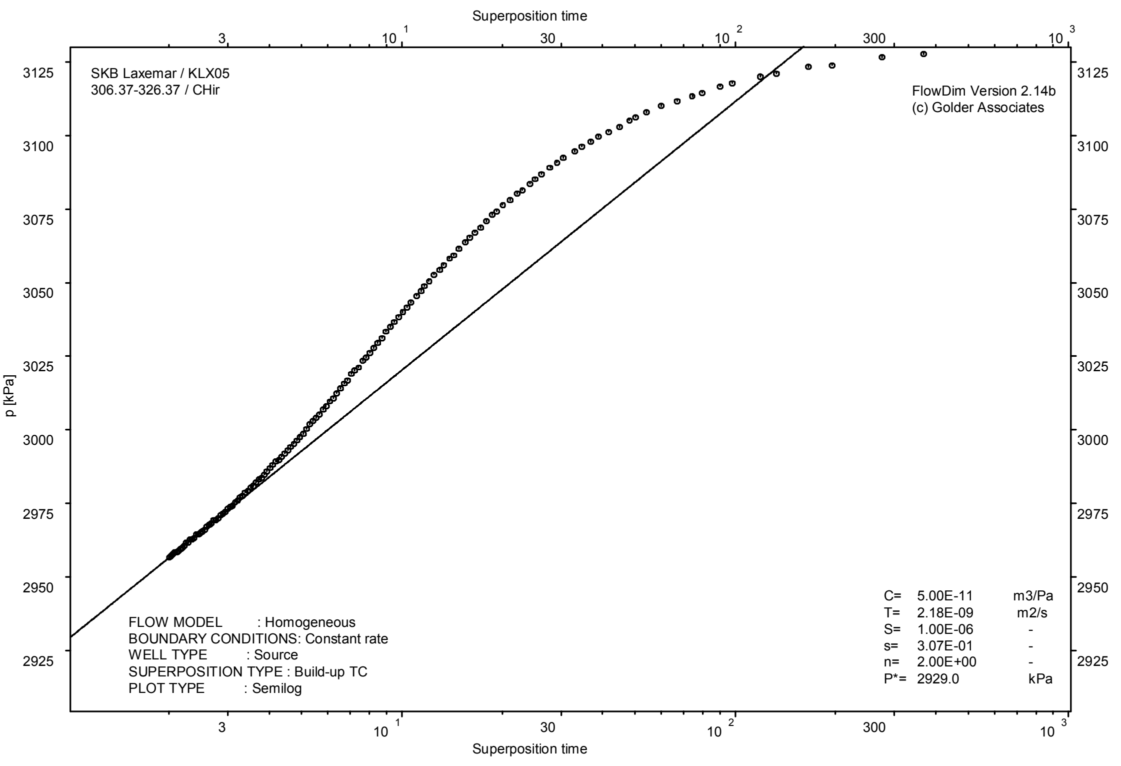
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

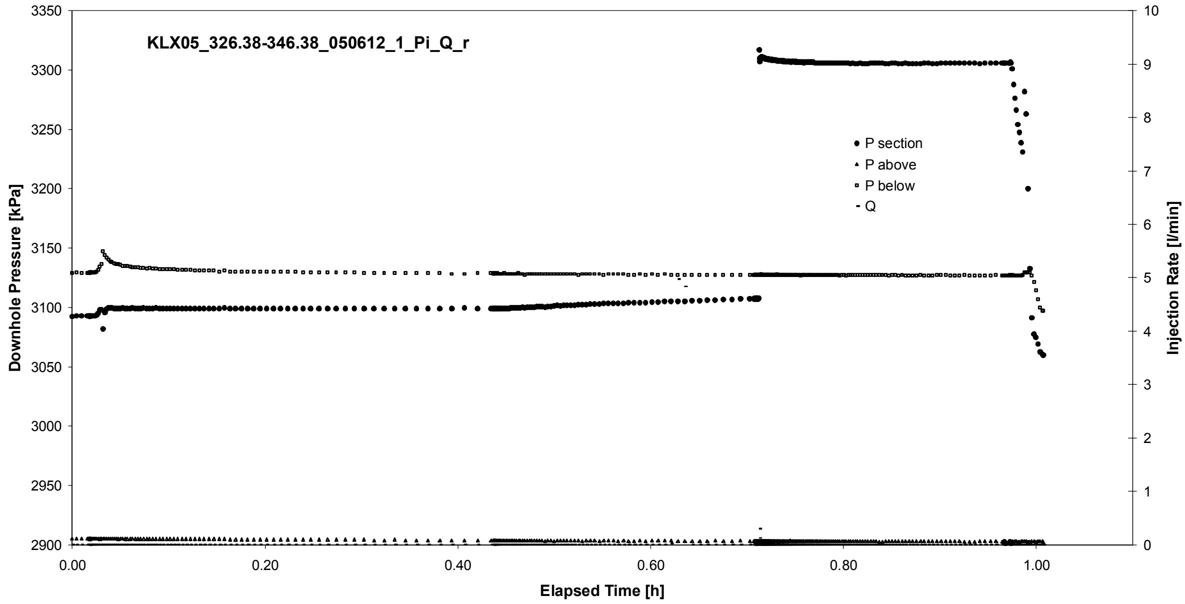


CHIR phase; HORNER match

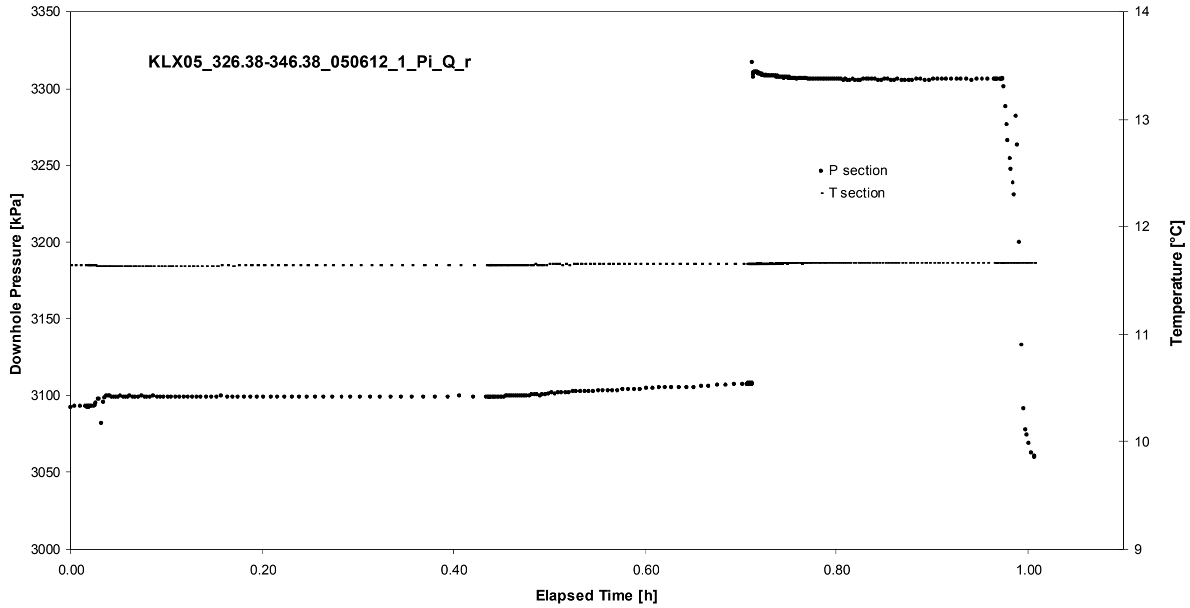
APPENDIX 2-22

Test 326.38 – 346.38 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

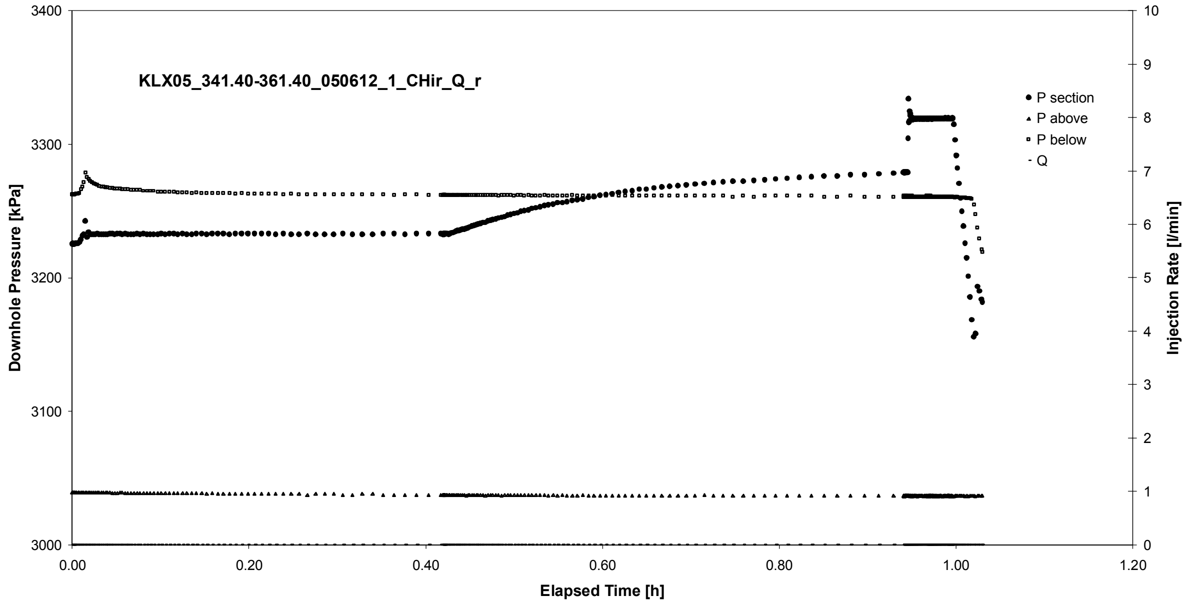
Not Analysed

CHIR phase; HORNER match

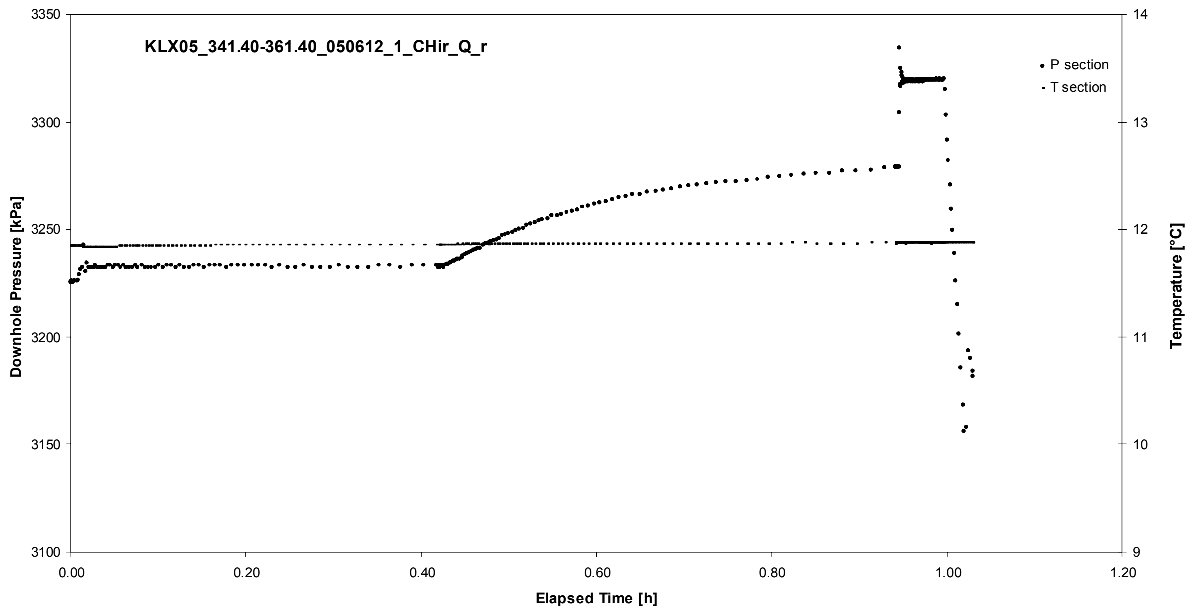
APPENDIX 2-23

Test 341.40 – 361.40 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

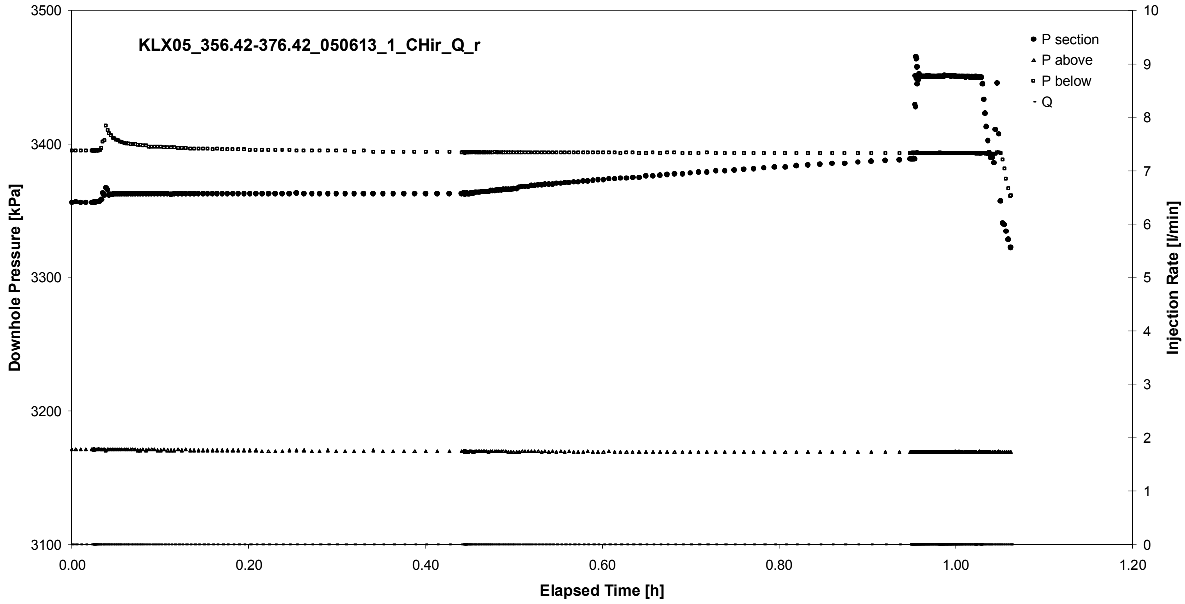
Not Analysed

CHIR phase; HORNER match

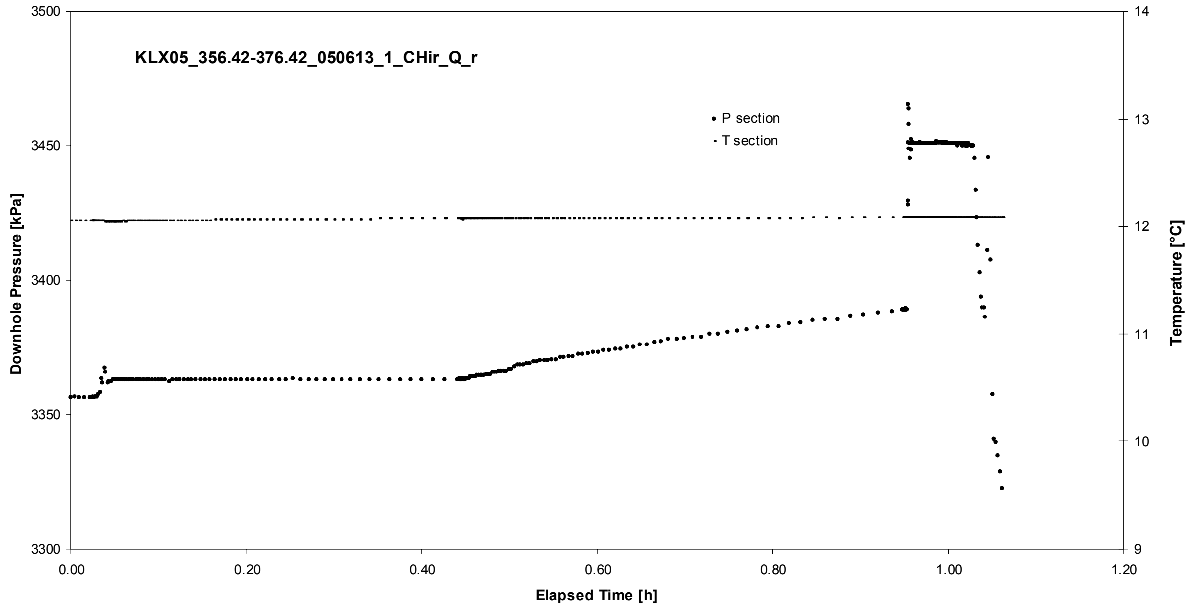
APPENDIX 2-24

Test 356.42 – 376.42 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

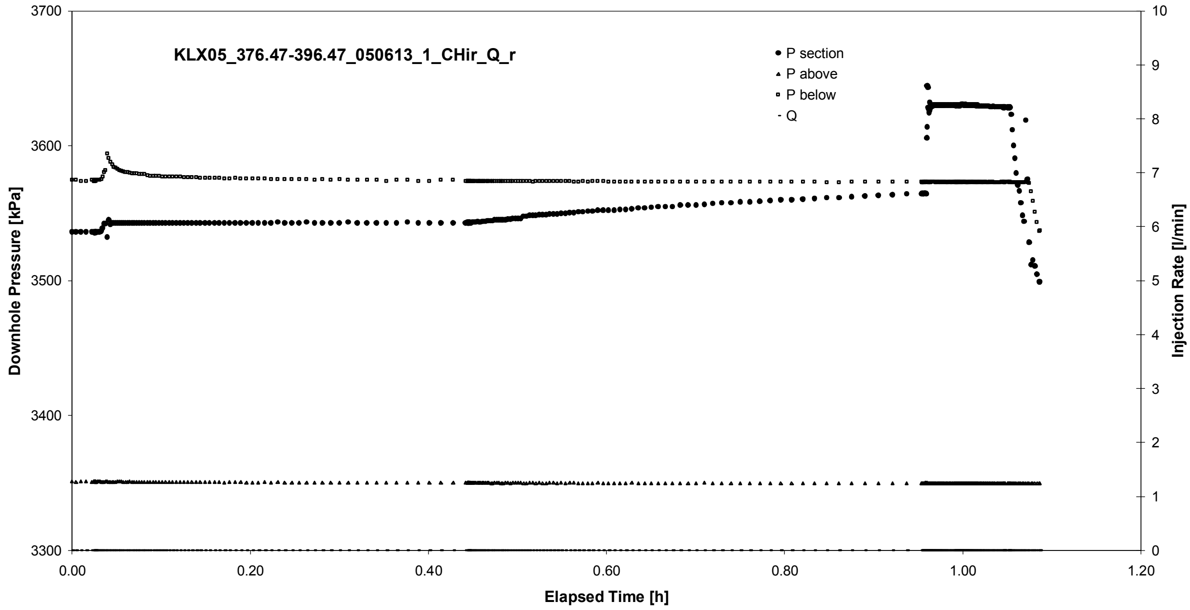
Not Analysed

CHIR phase; HORNER match

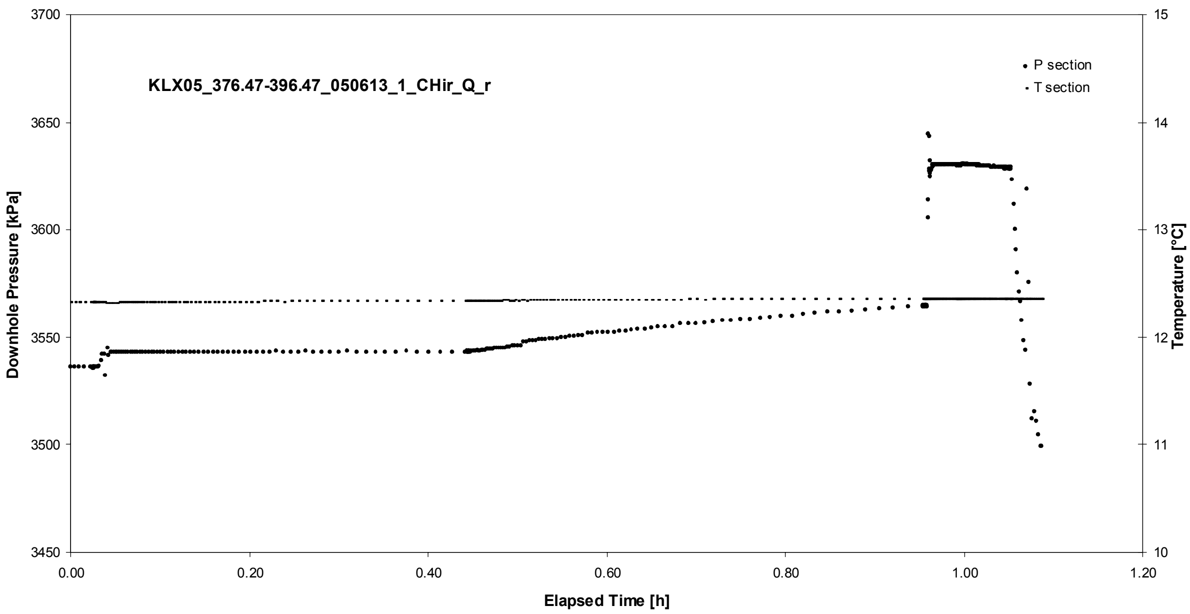
APPENDIX 2-25

Test 376.47 – 396.47 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

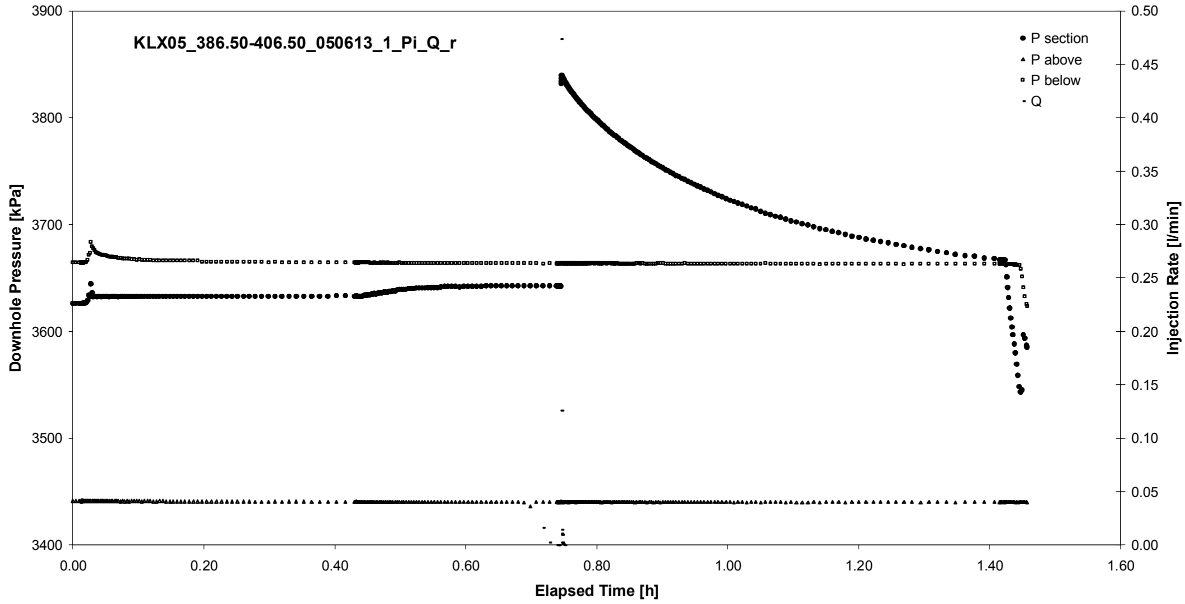
Not Analysed

CHIR phase; HORNER match

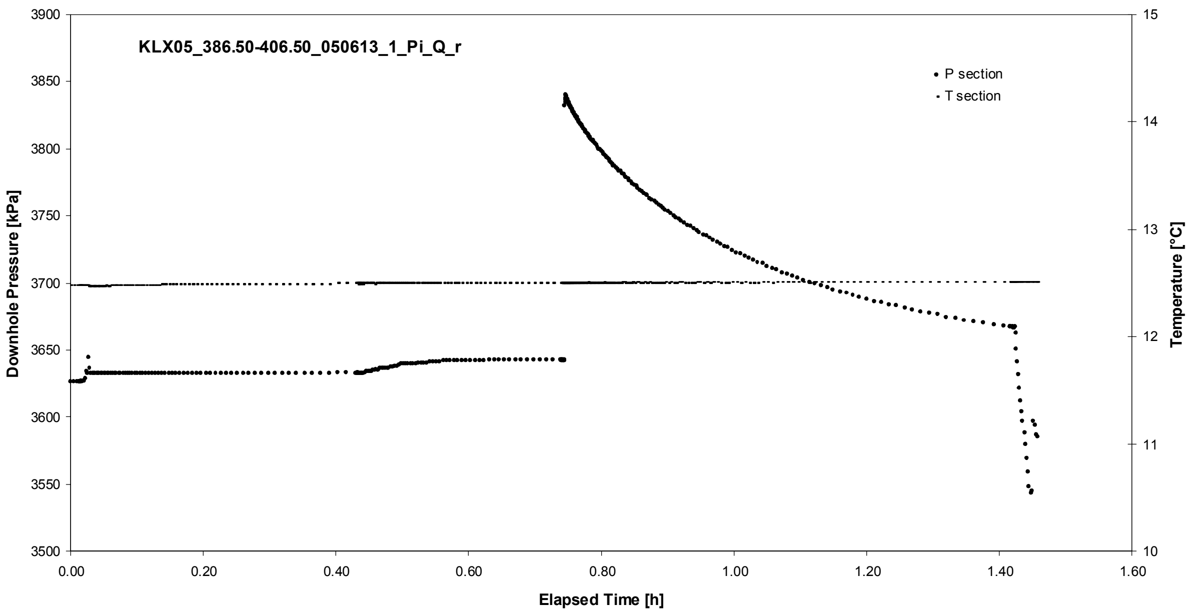
APPENDIX 2-26

Test 386.50 – 406.50 m

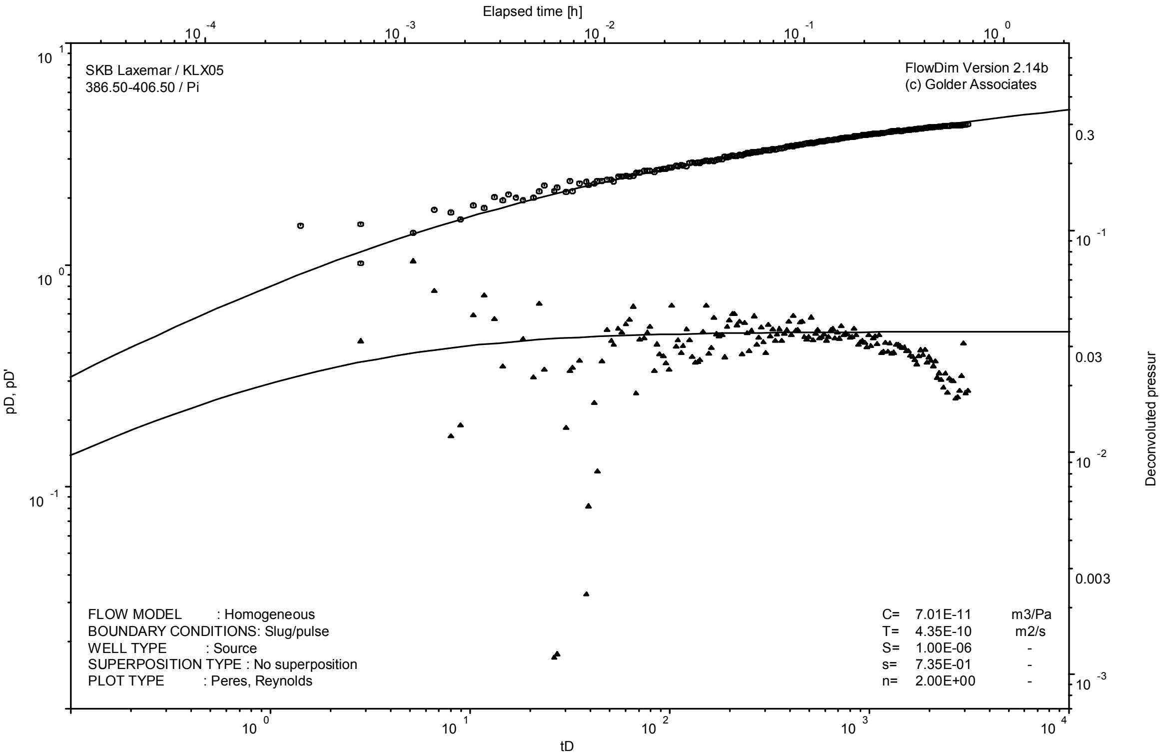
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

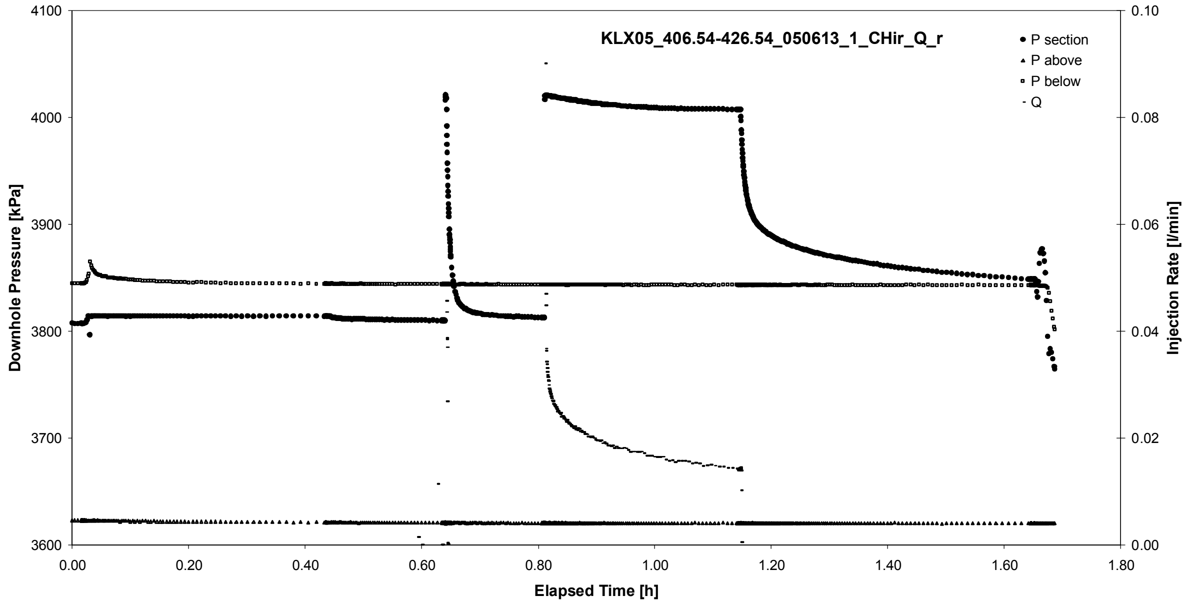


PI phase; deconvolution match

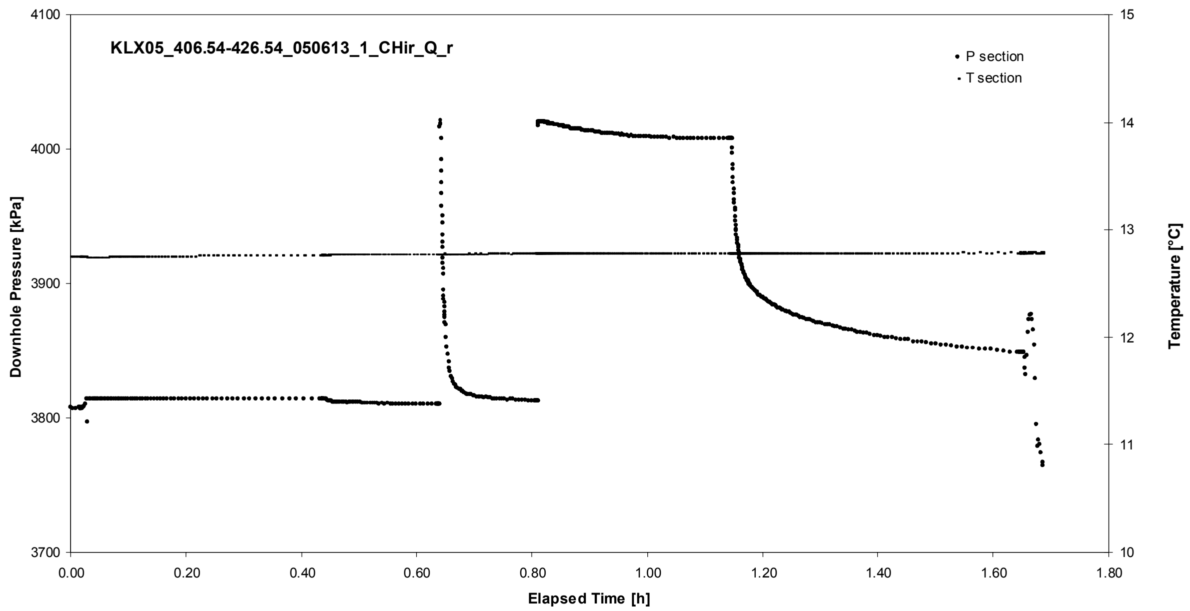
APPENDIX 2-27

Test 406.54 – 426.54 m

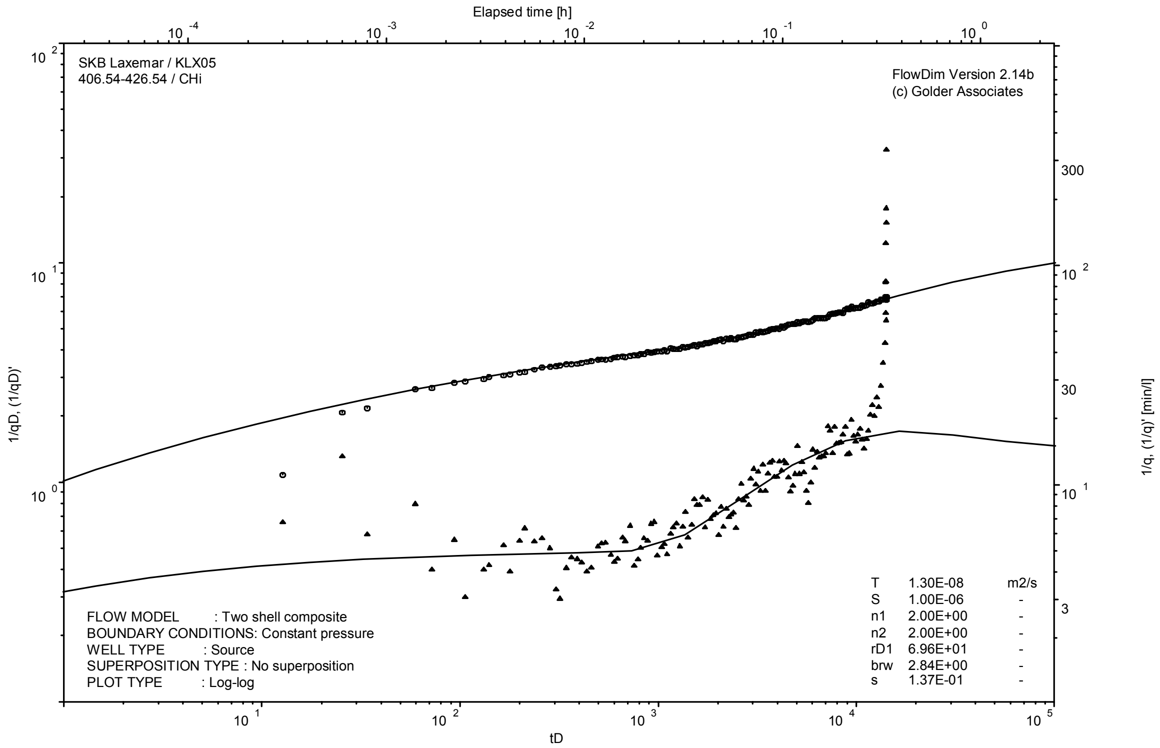
Analysis diagrams



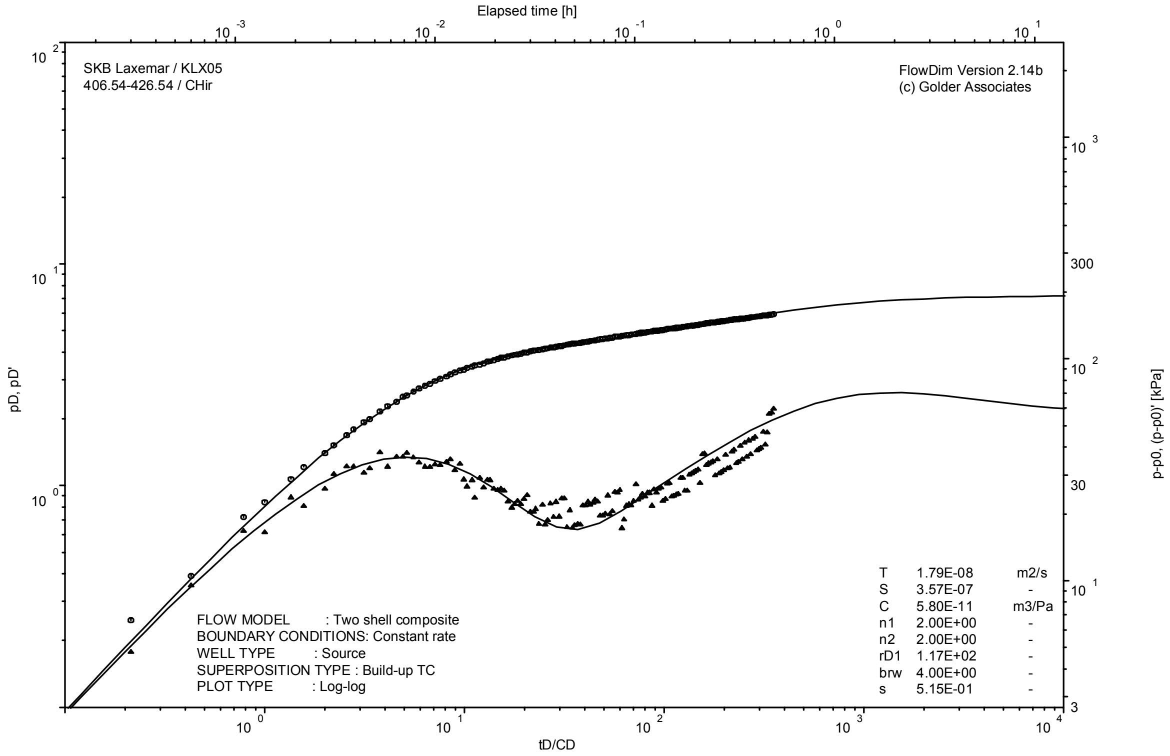
Pressure and flow rate vs. time; cartesian plot



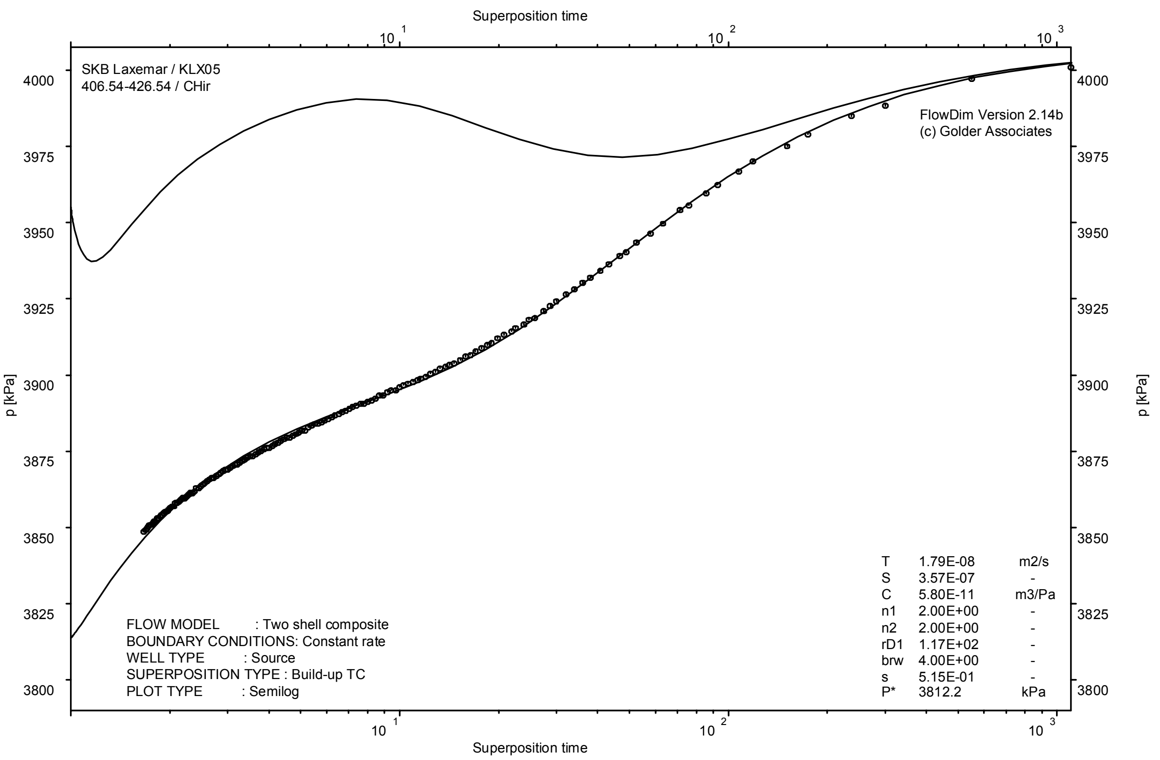
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

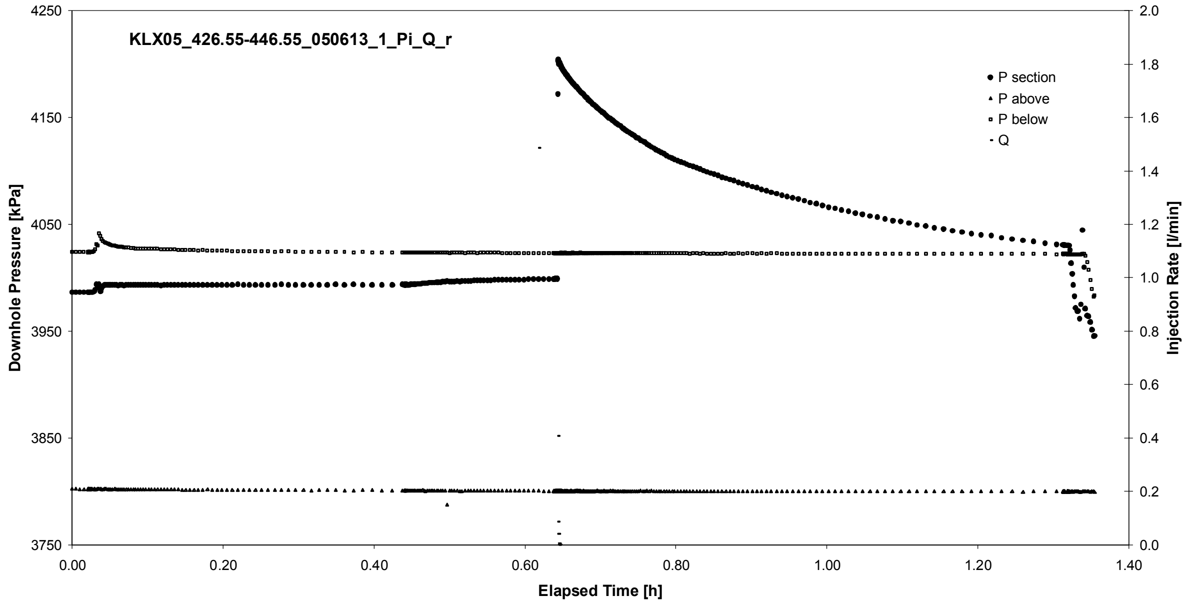


CHIR phase; HORNER match

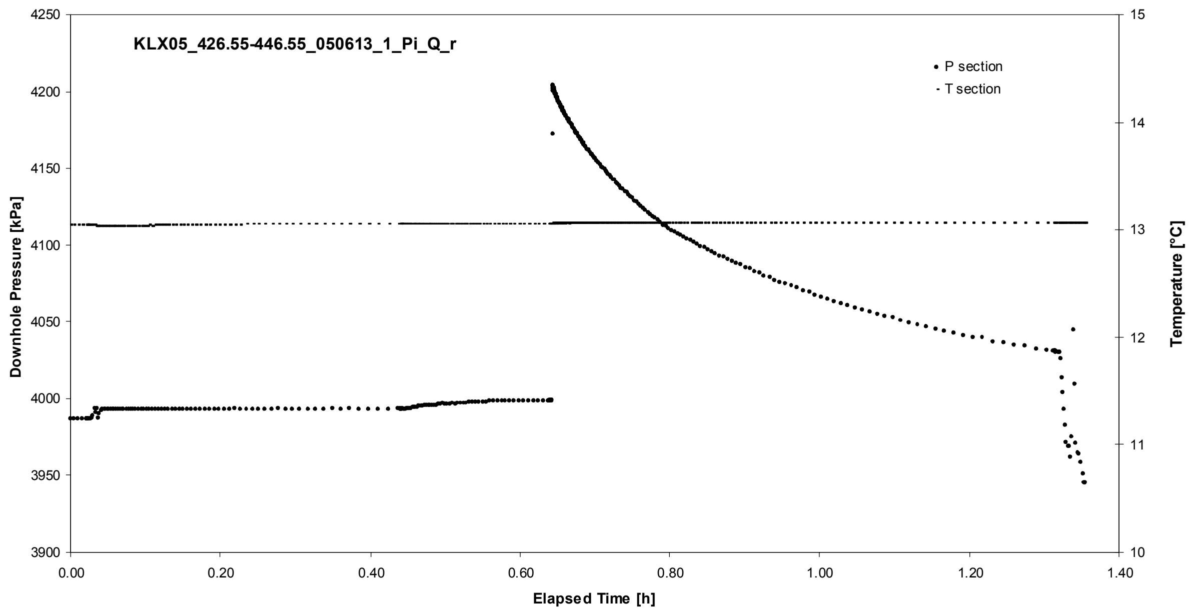
APPENDIX 2-28

Test 426.55 – 446.55 m

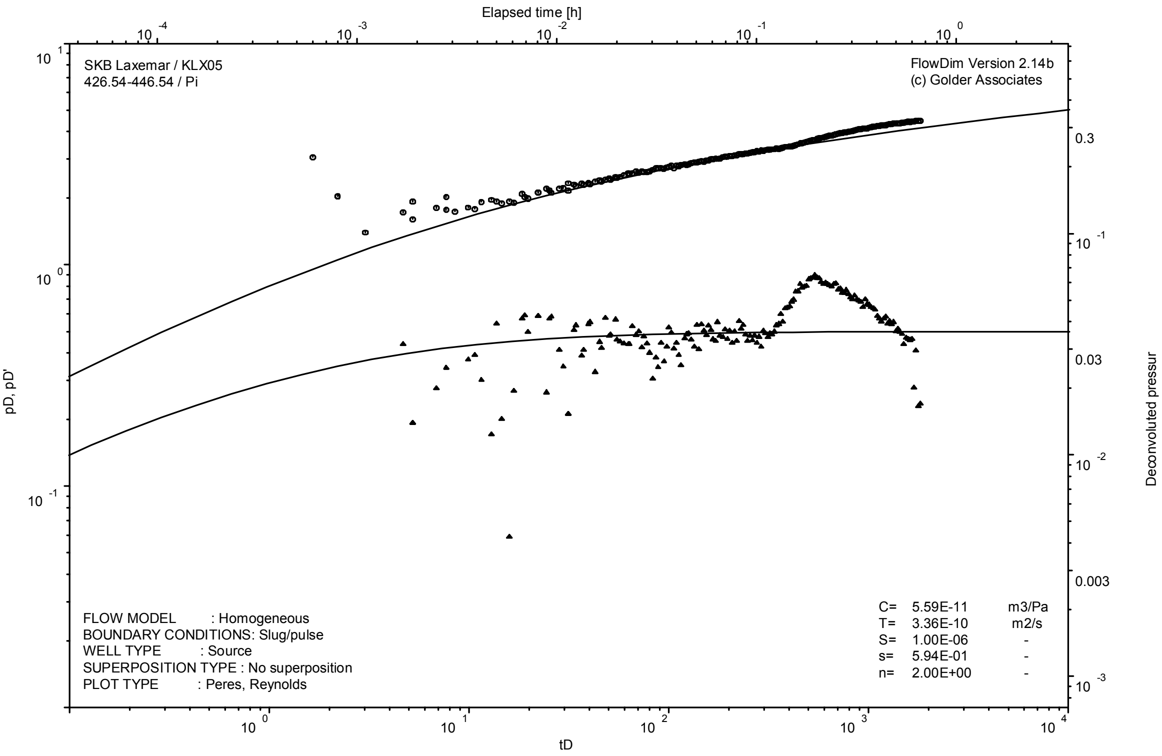
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

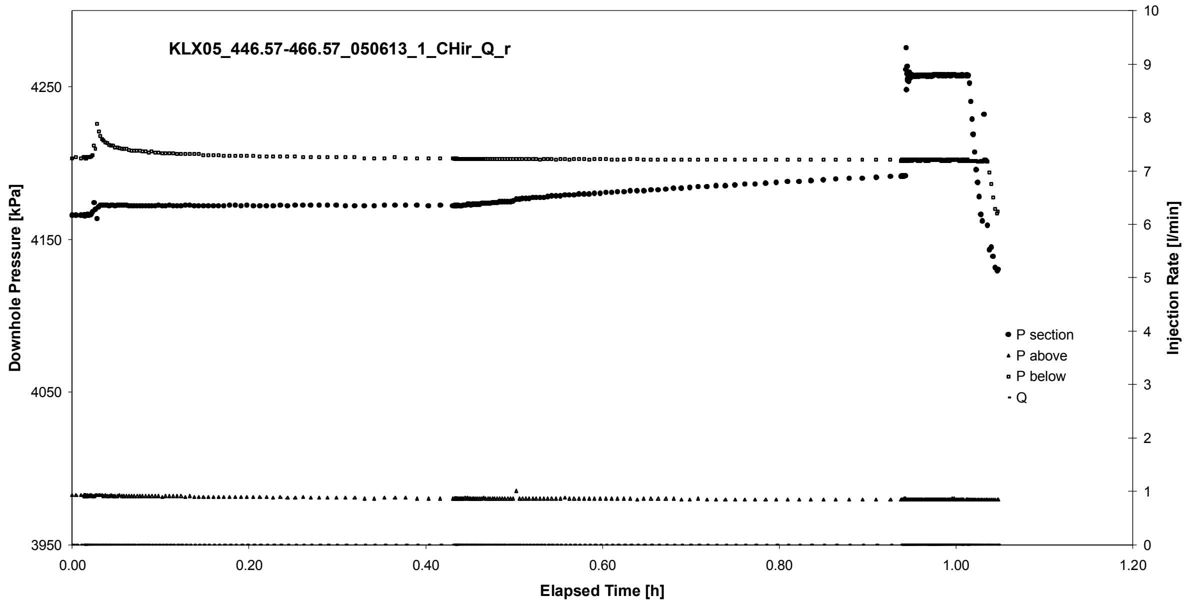


PI phase; deconvolution match

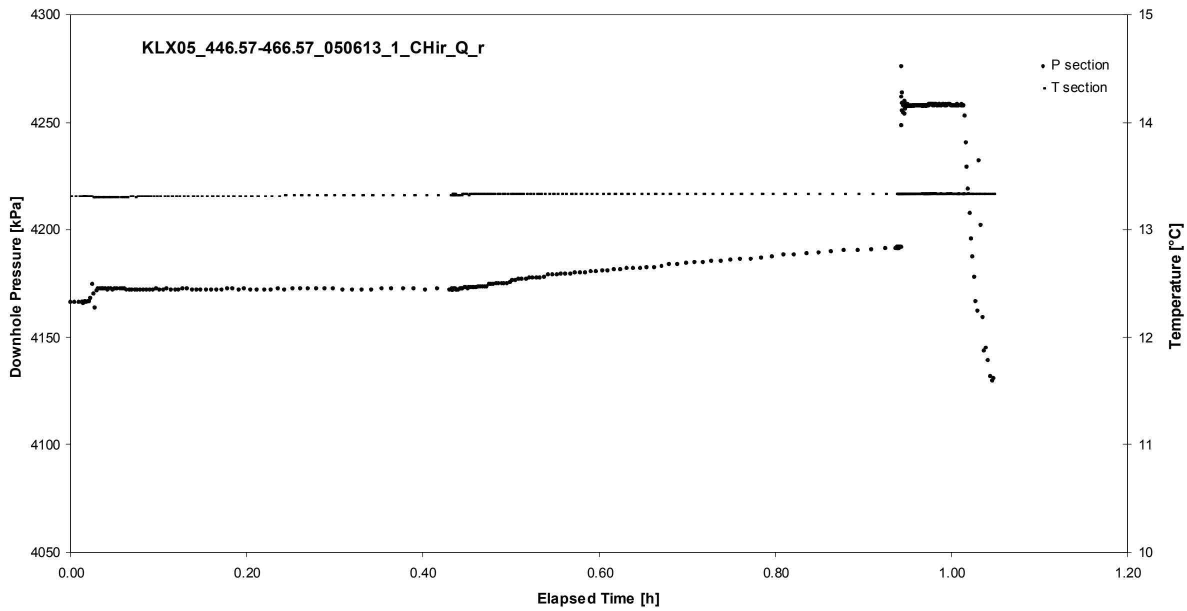
APPENDIX 2-29

Test 446.57 – 466.57 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

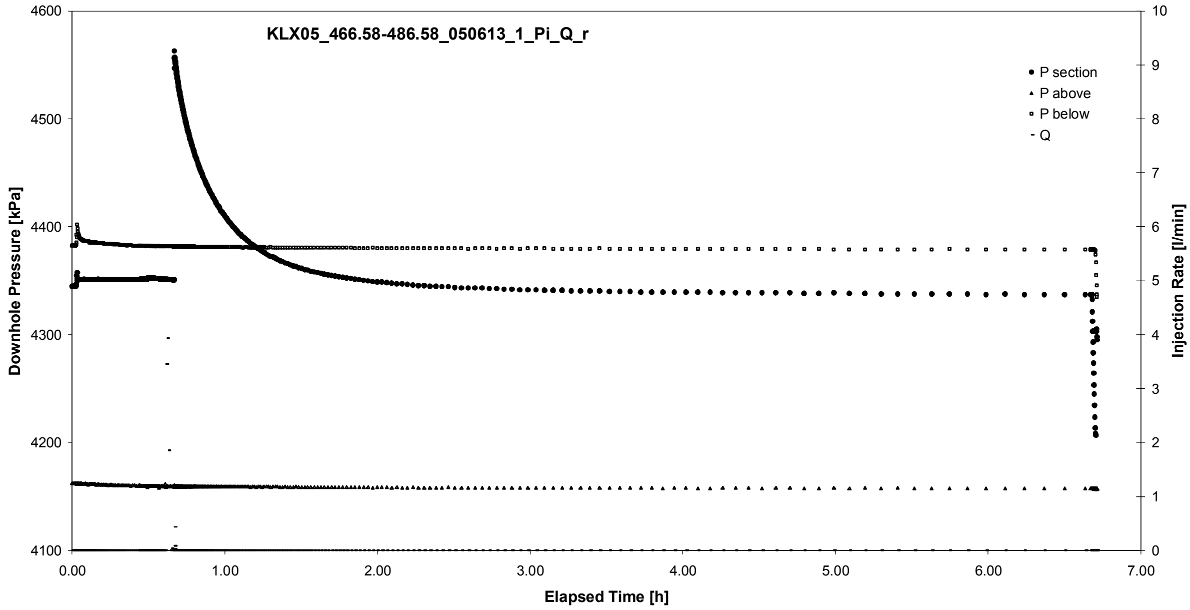
Not Analysed

CHIR phase; HORNER match

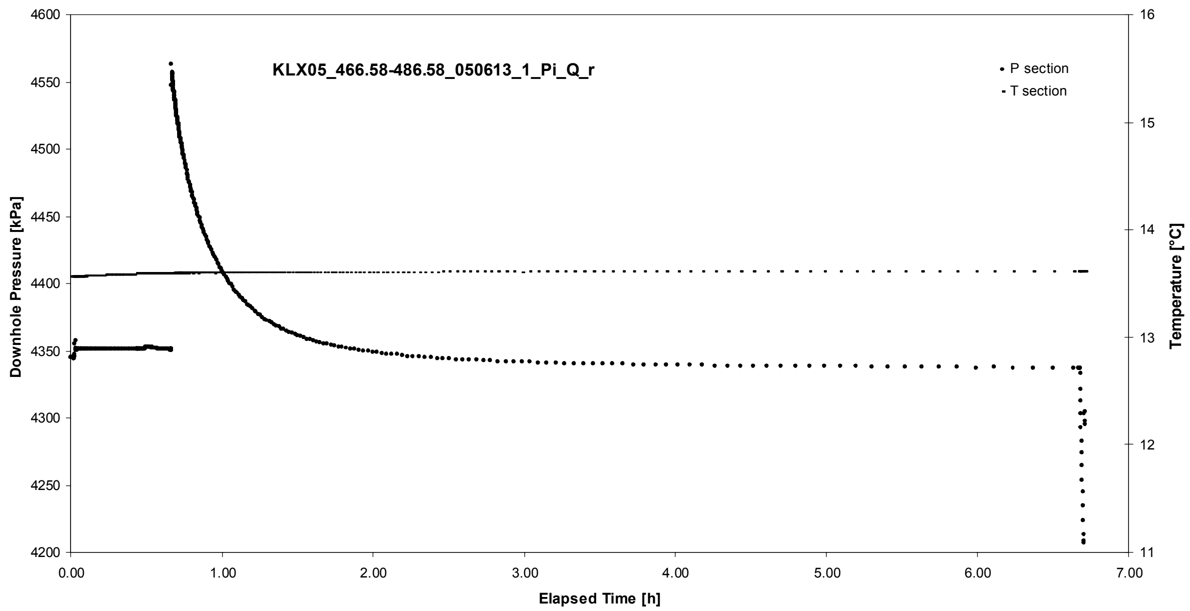
APPENDIX 2-30

Test 466.58 – 486.58 m

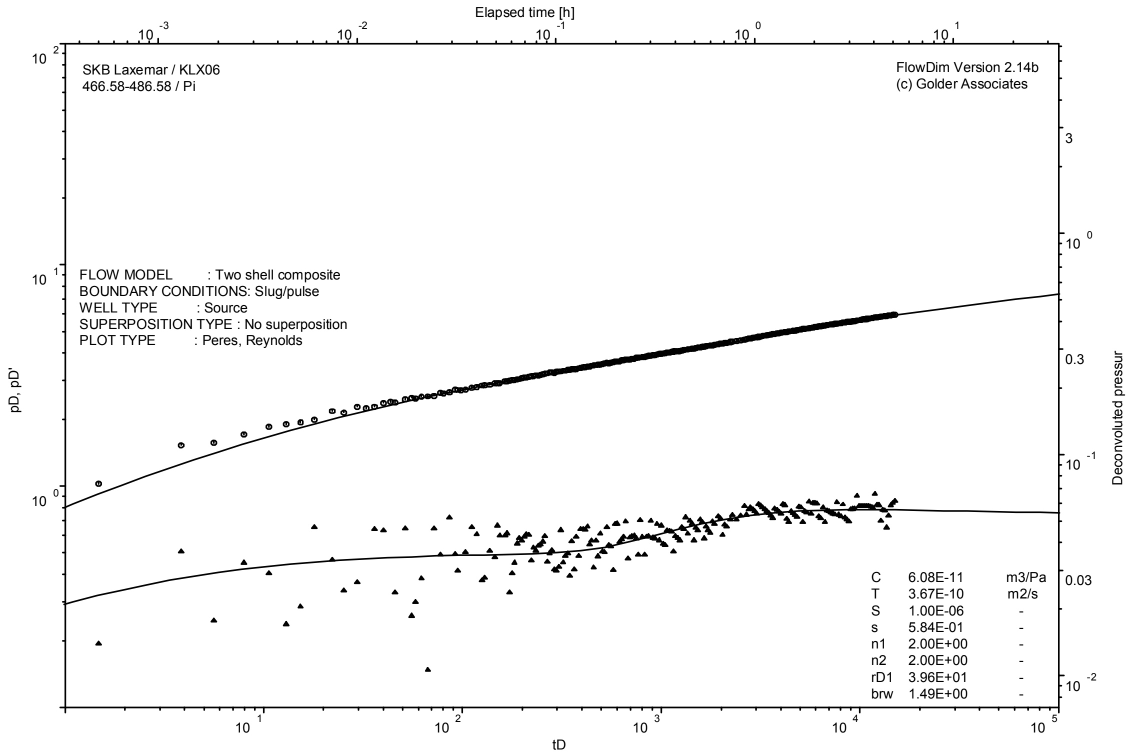
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

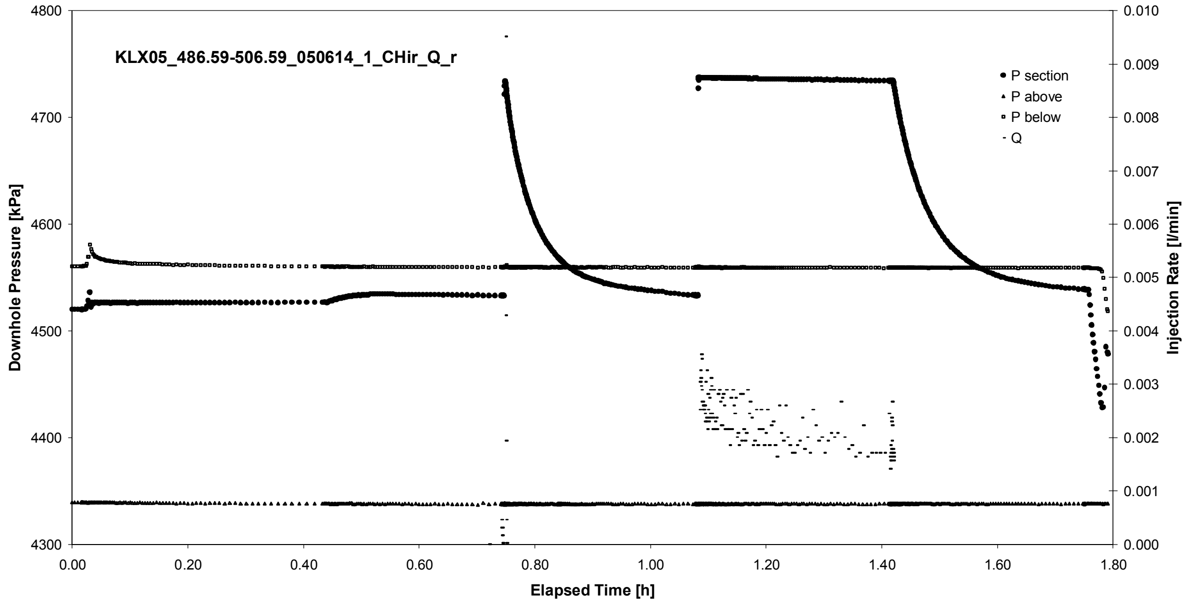


PI phase; deconvolution match

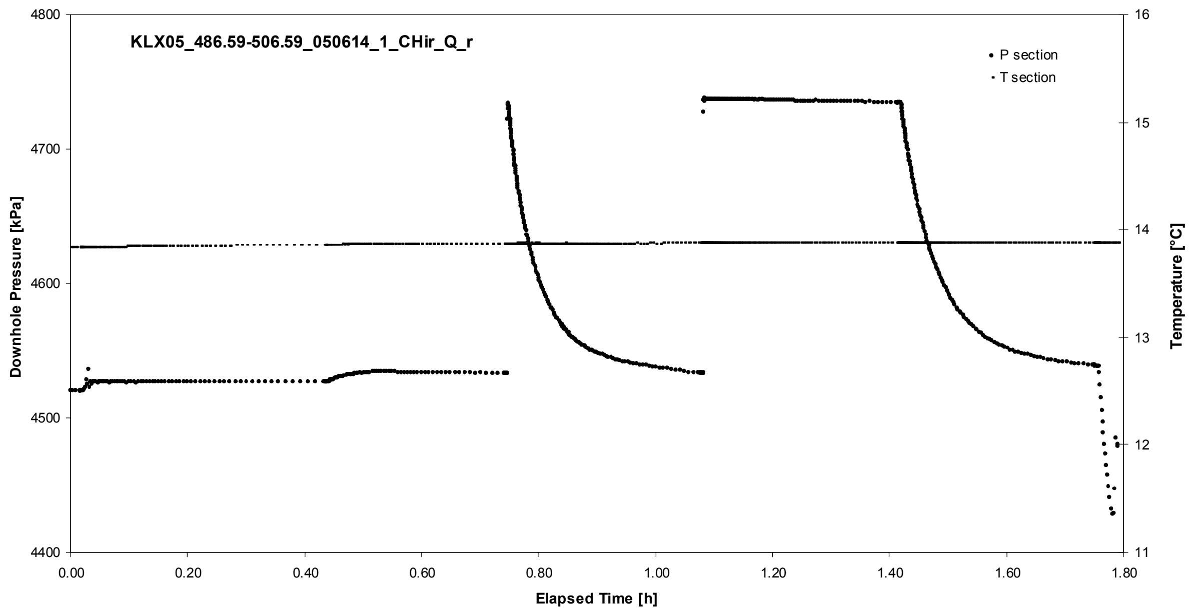
APPENDIX 2-31

Test 486.59 – 506.59 m

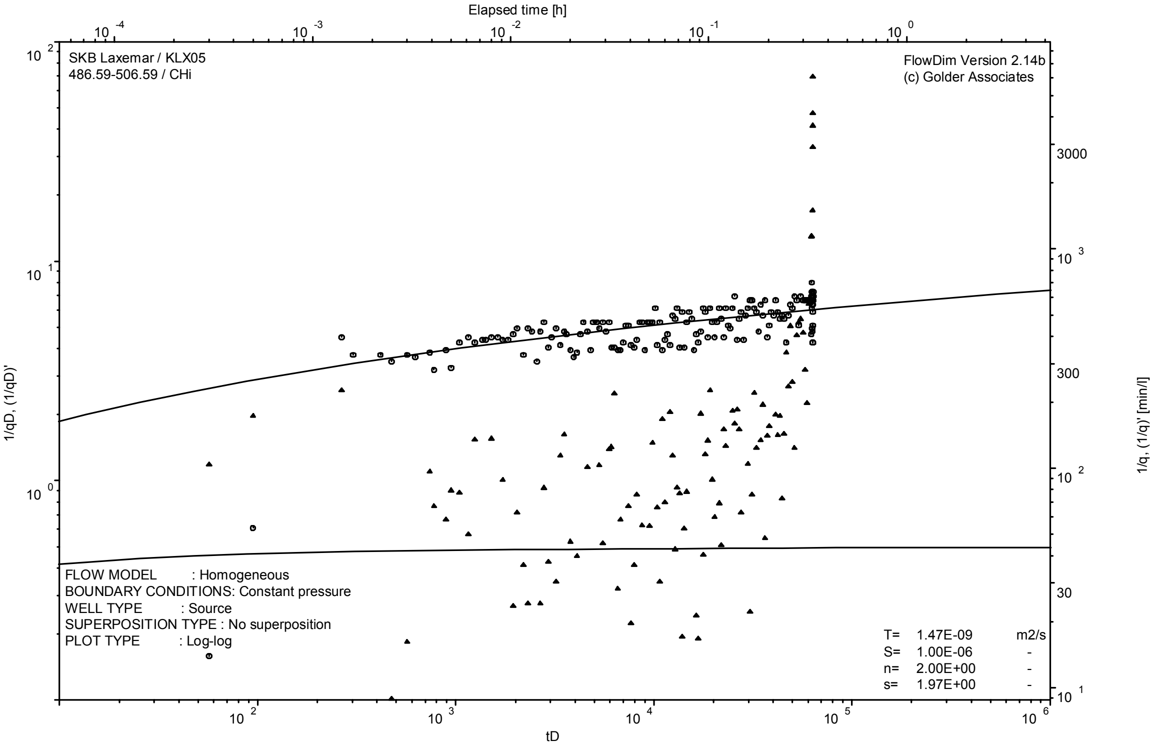
Analysis diagrams



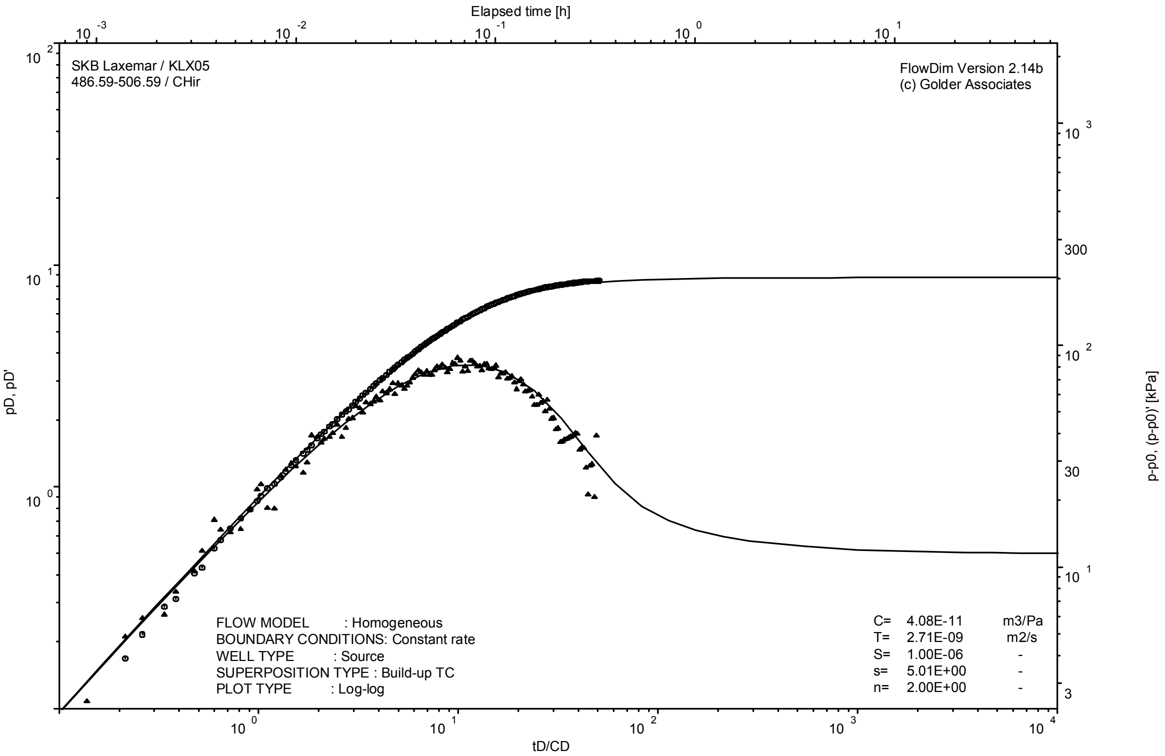
Pressure and flow rate vs. time; cartesian plot



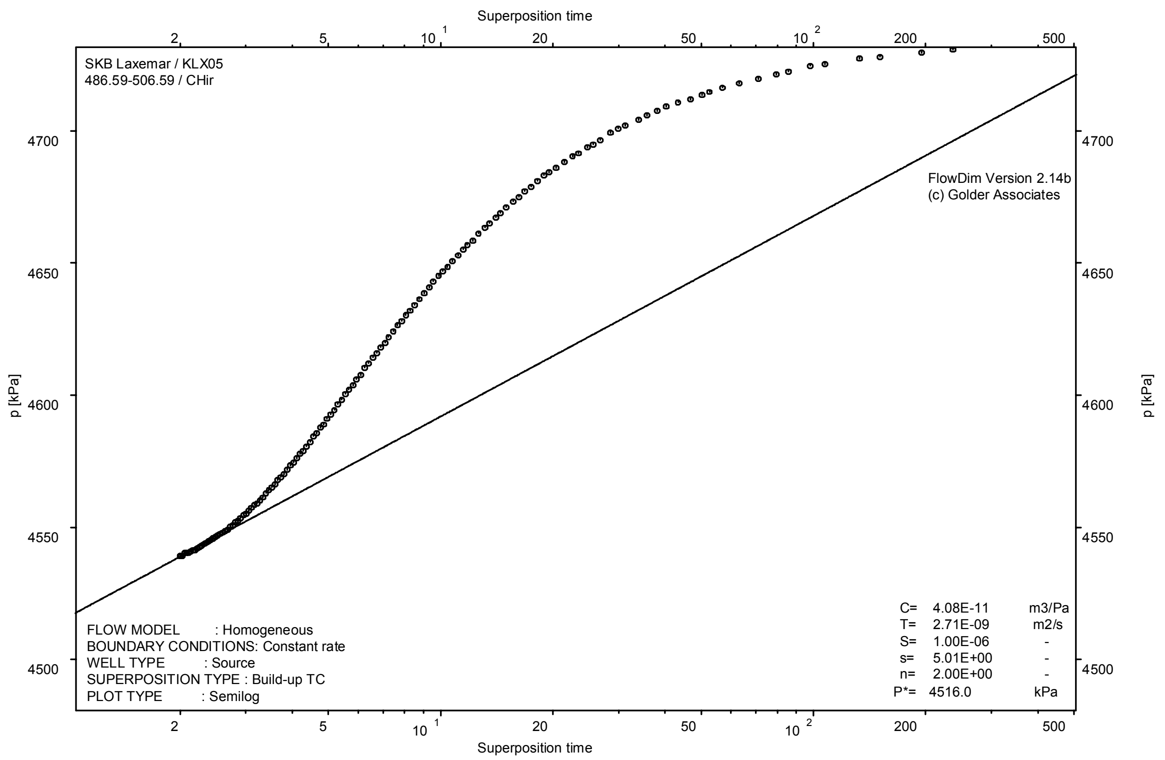
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

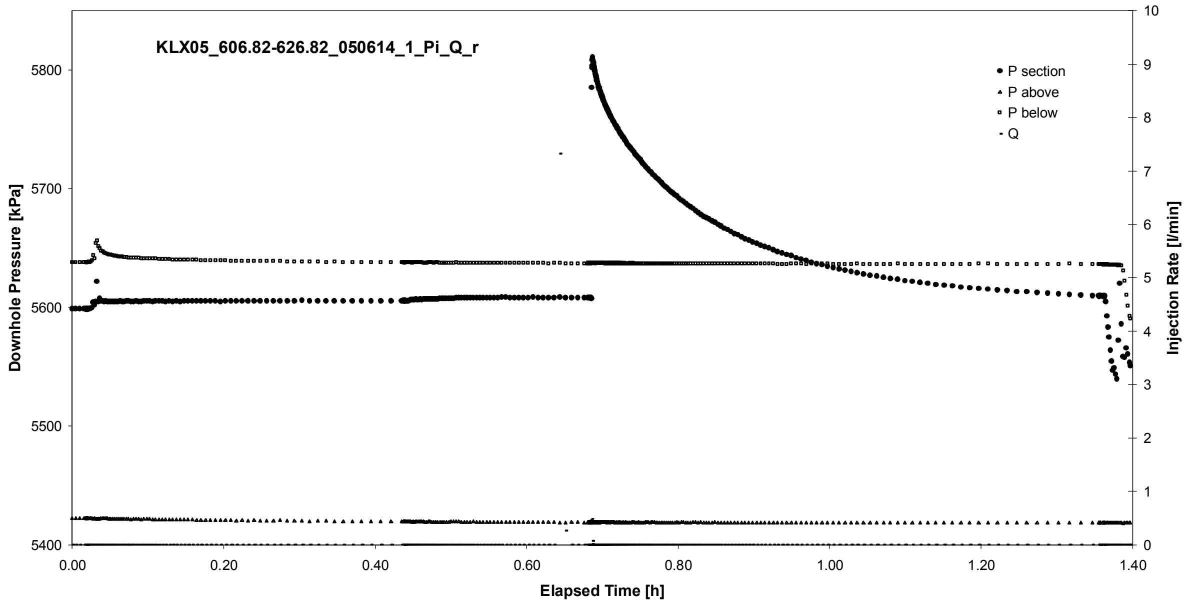


CHIR phase; HORNER match

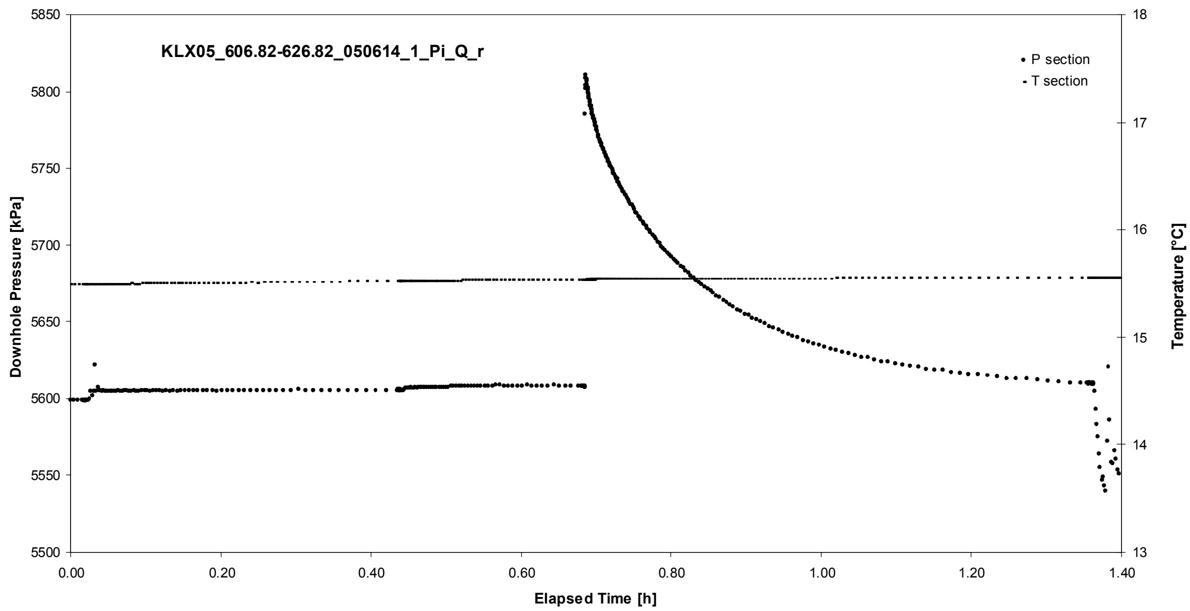
APPENDIX 2-32

Test 606.82 – 626.82 m

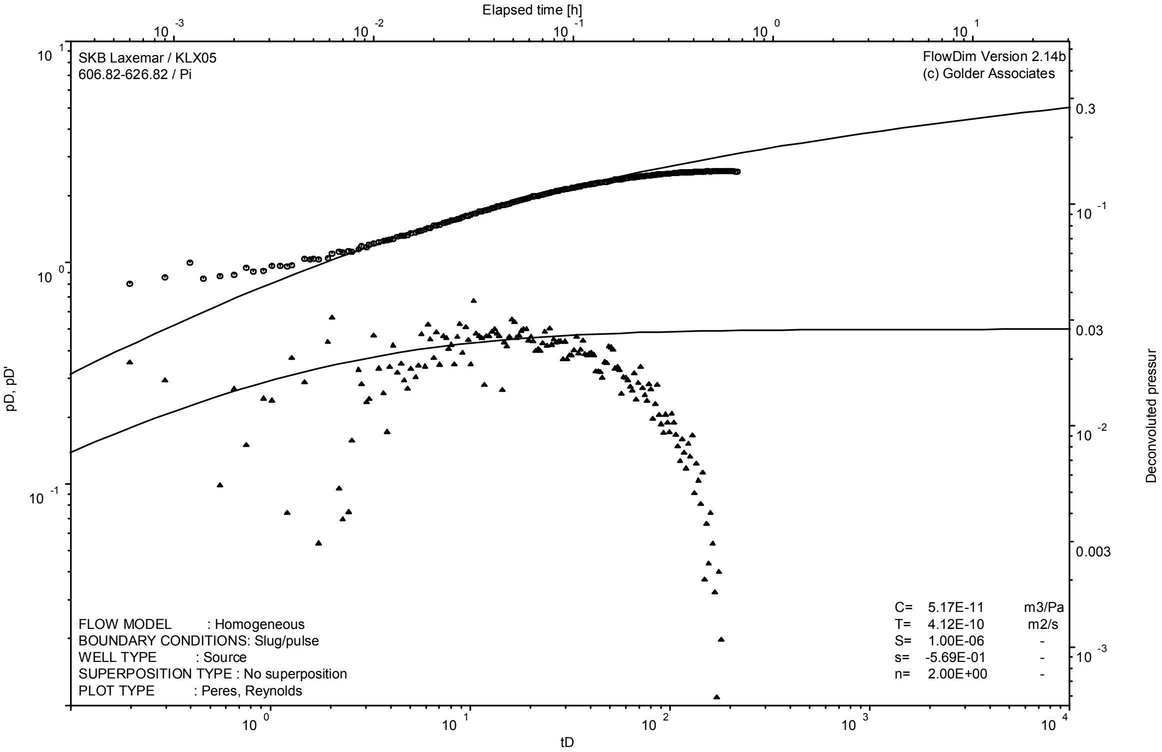
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

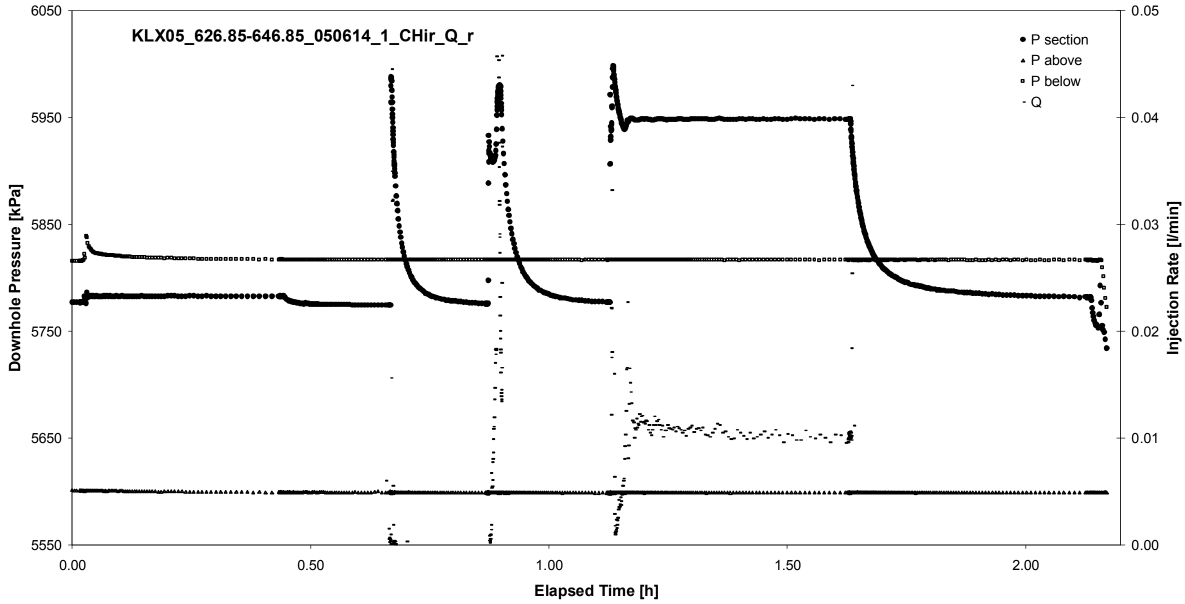


PI phase; deconvolution match

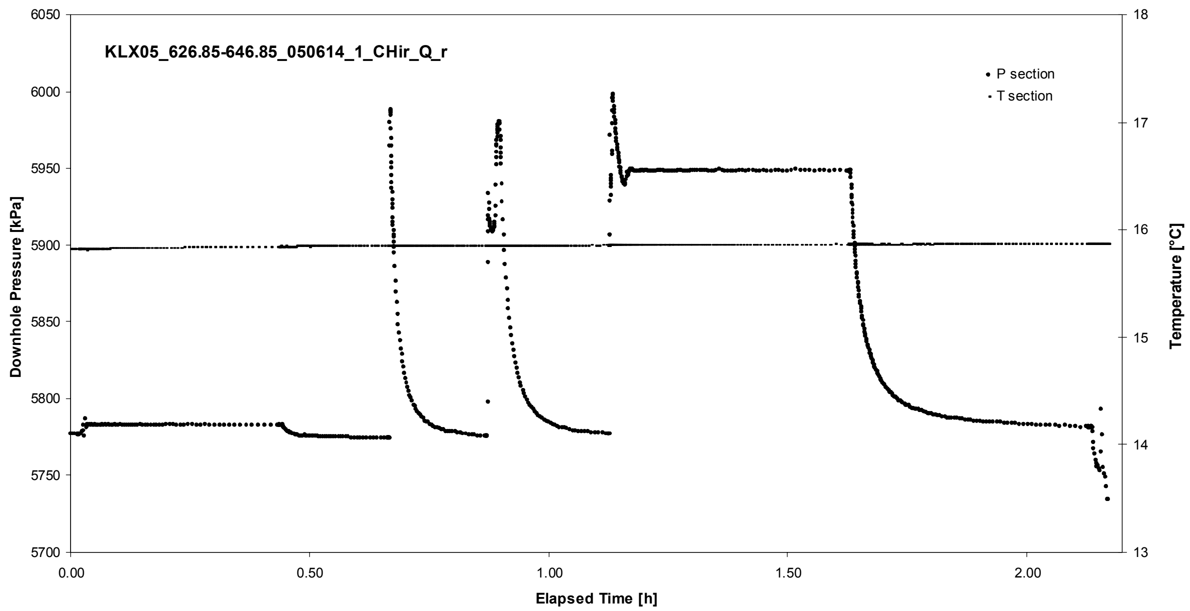
APPENDIX 2-33

Test 626.85 – 646.85 m

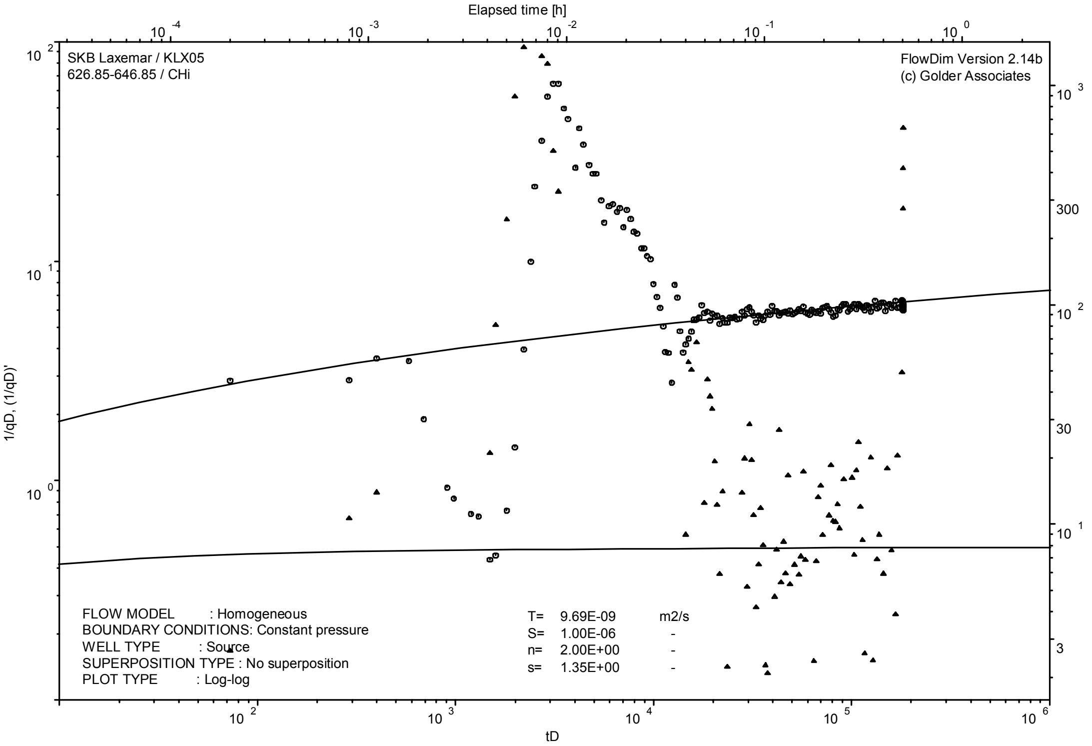
Analysis diagrams



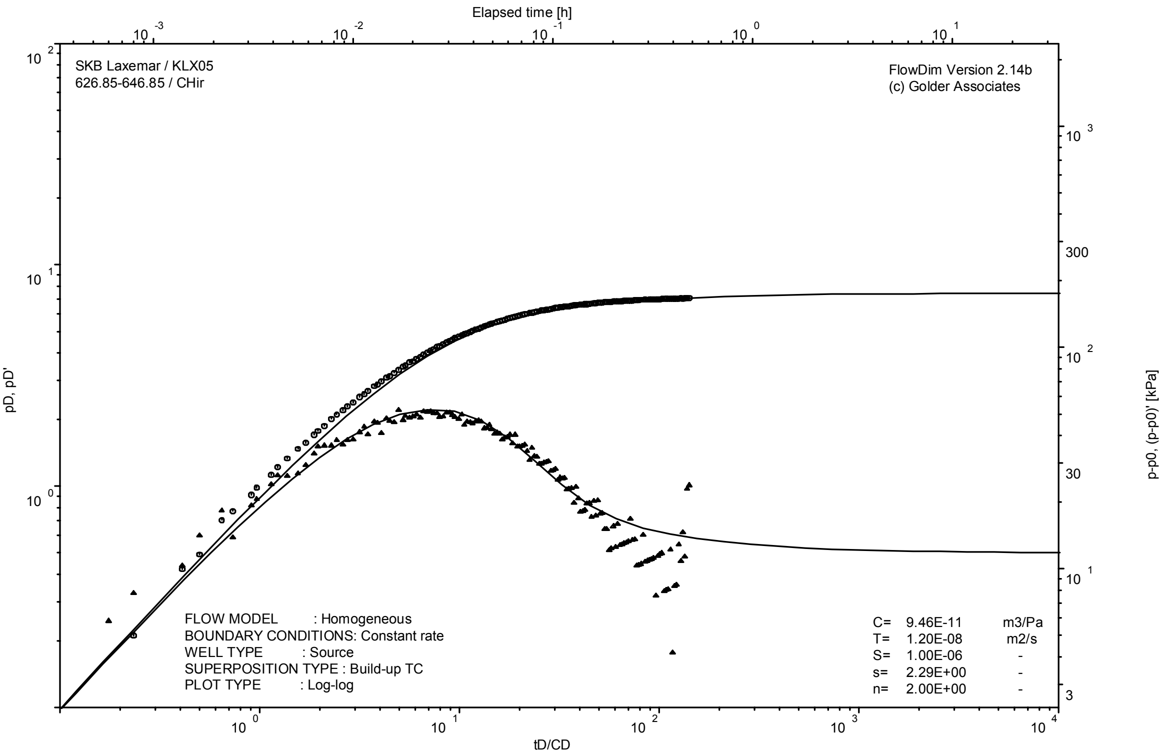
Pressure and flow rate vs. time; cartesian plot



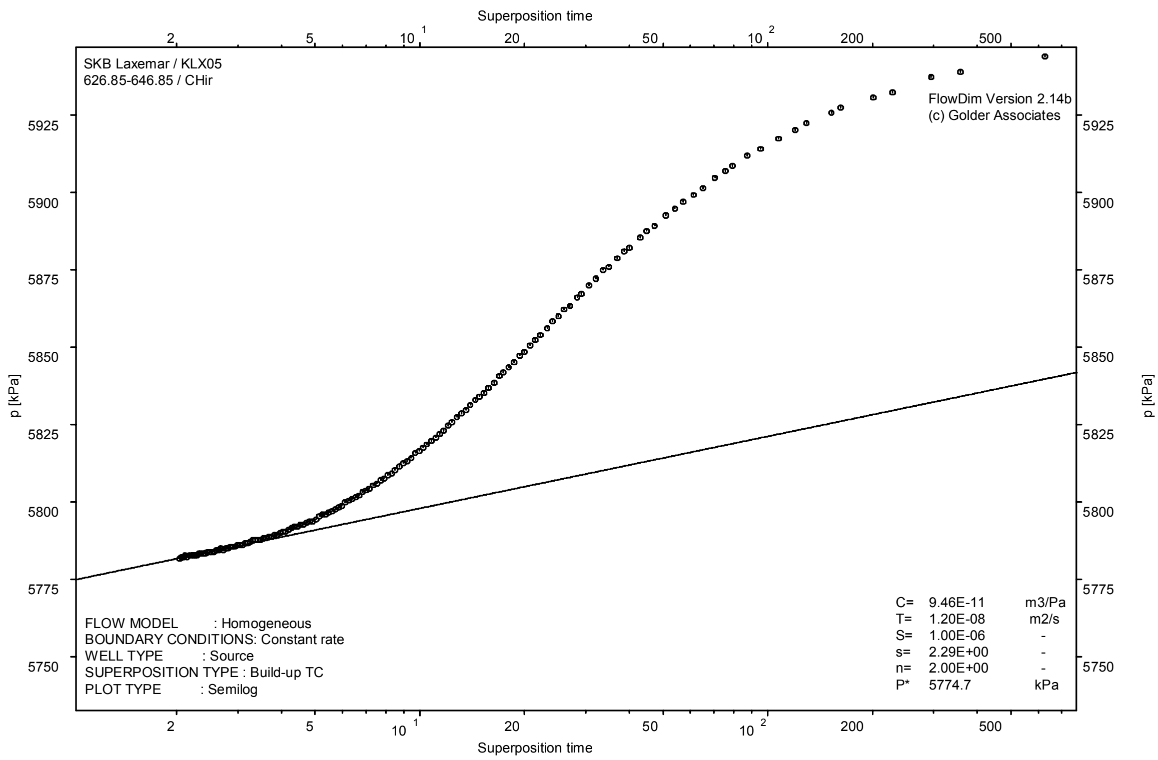
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

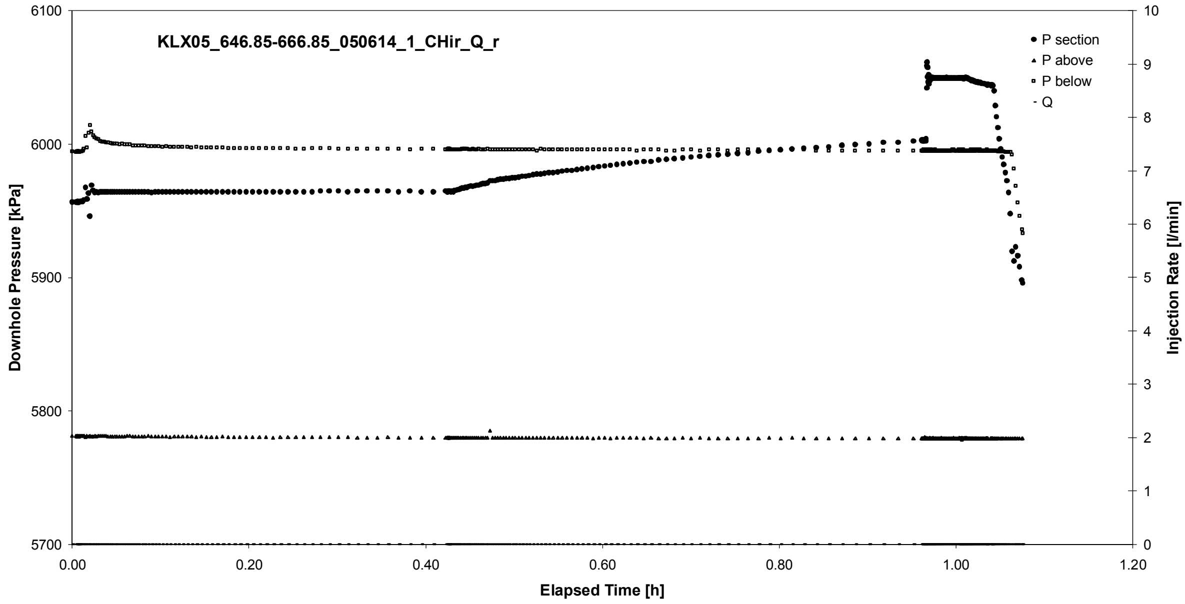


CHIR phase; HORNER match

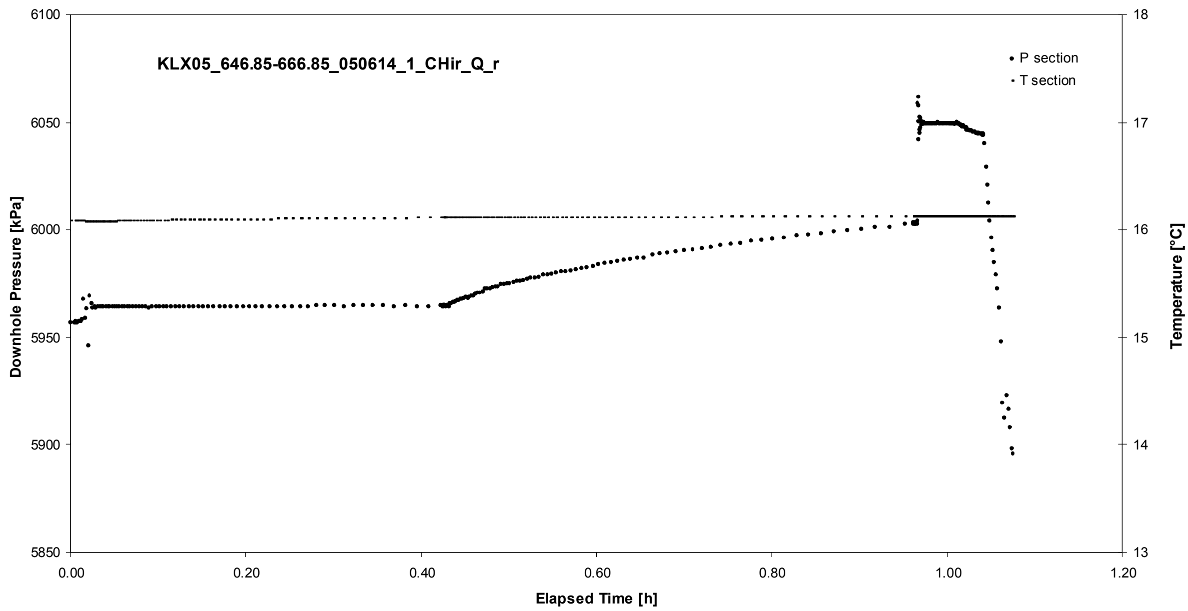
APPENDIX 2-34

Test 646.85 – 666.85 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

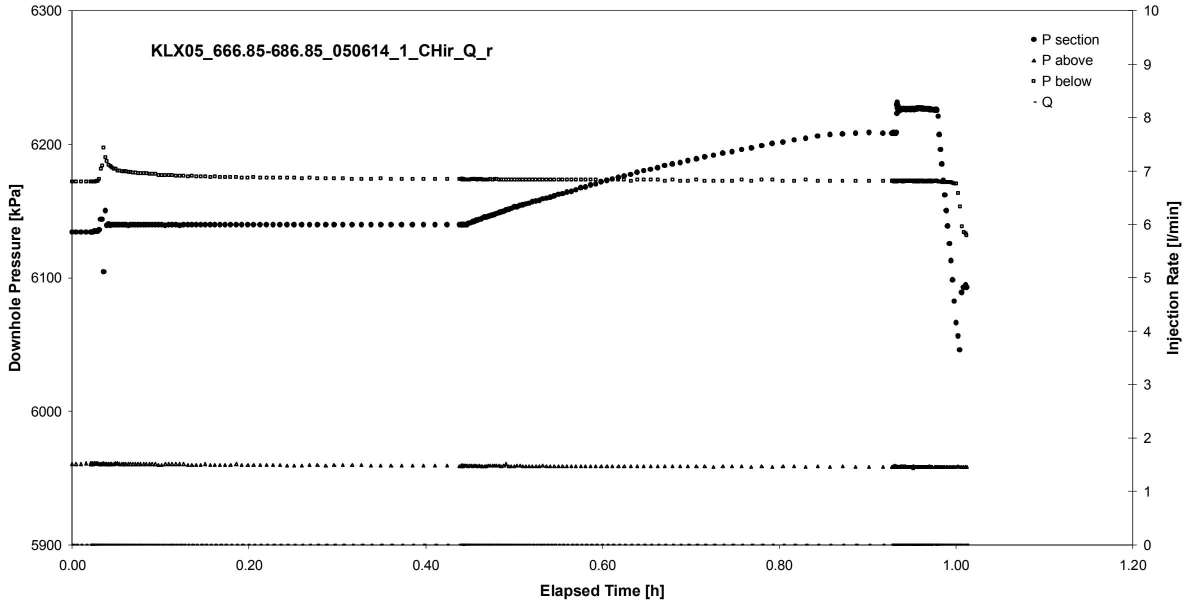
Not Analysed

CHIR phase; HORNER match

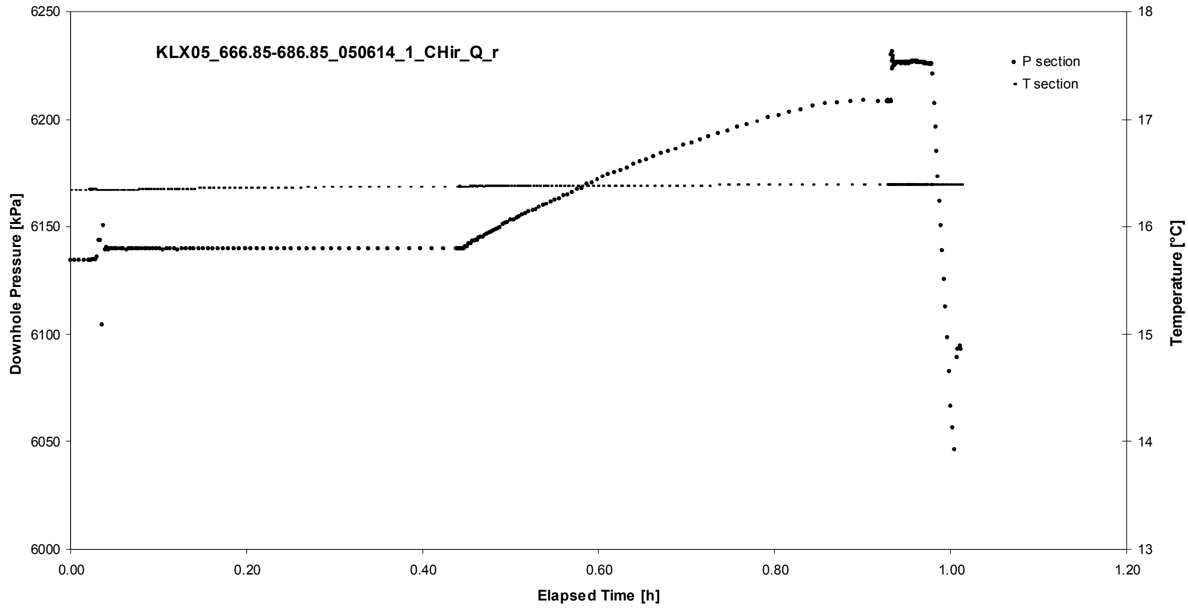
APPENDIX 2-35

Test 666.85 – 686.85 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

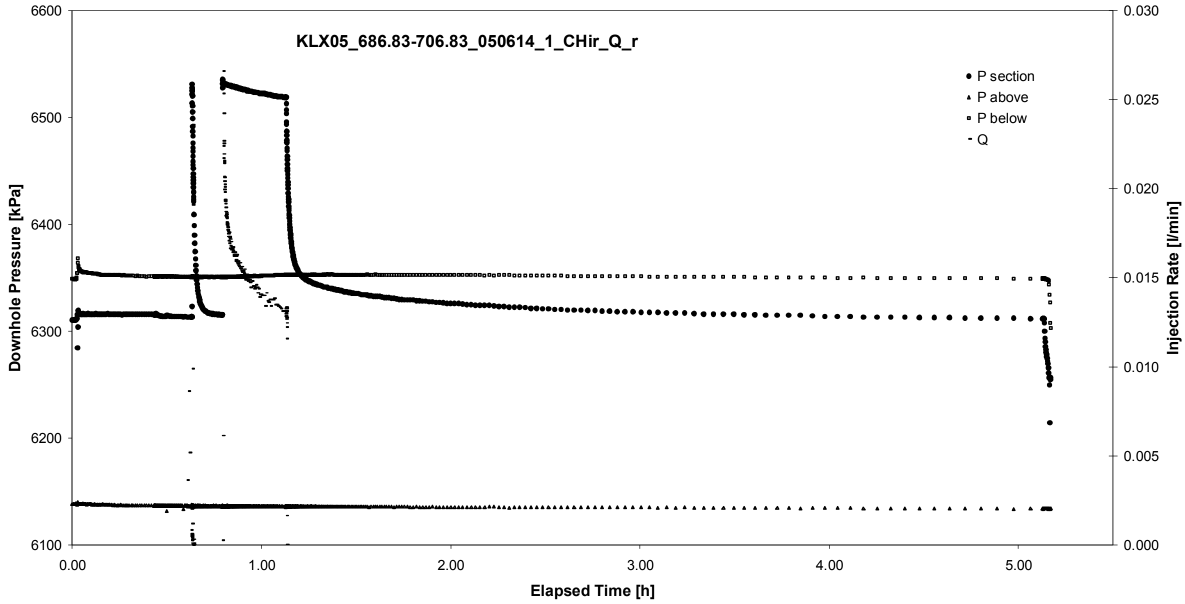
Not Analysed

CHI phase; log-log match

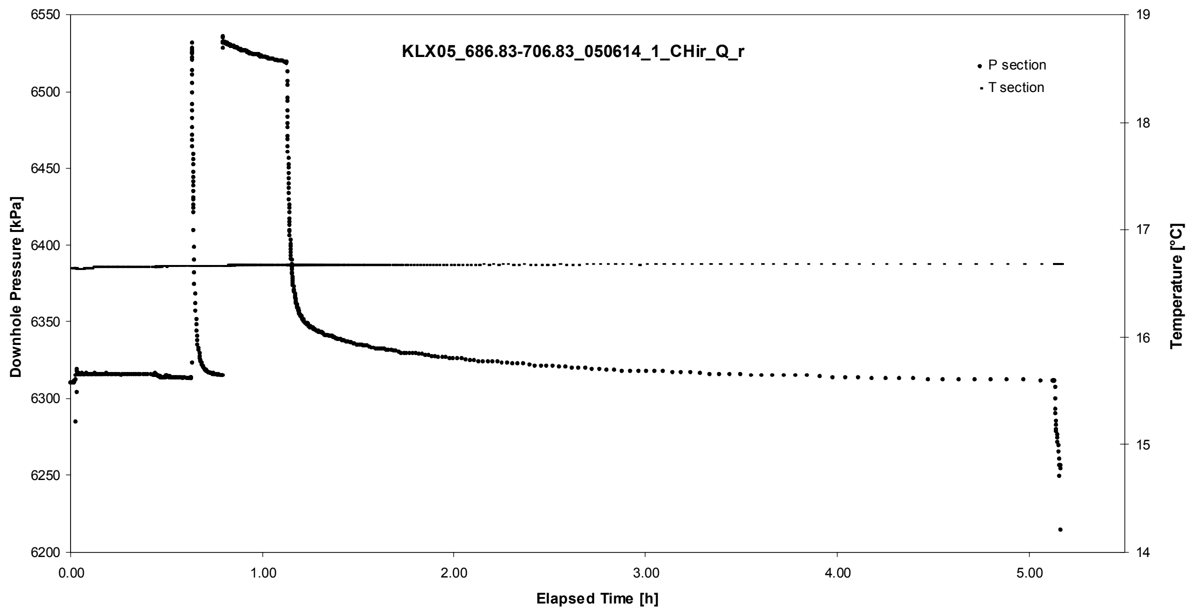
APPENDIX 2-36

Test 686.83 – 706.83 m

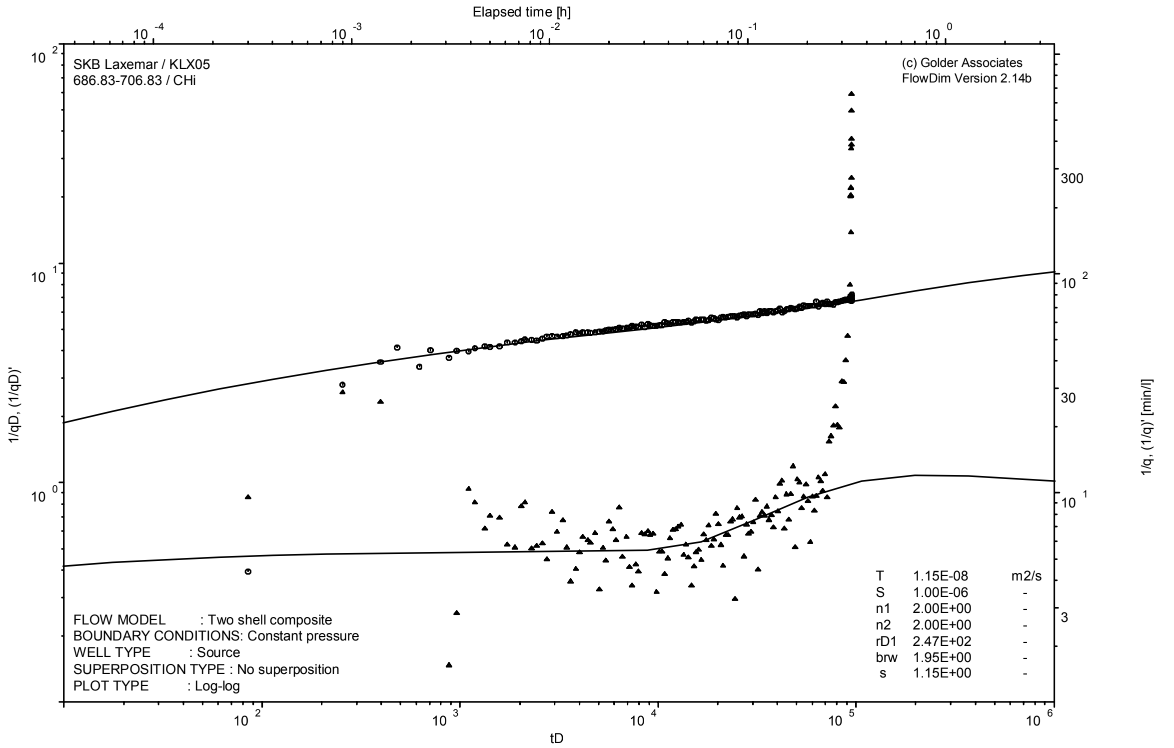
Analysis diagrams



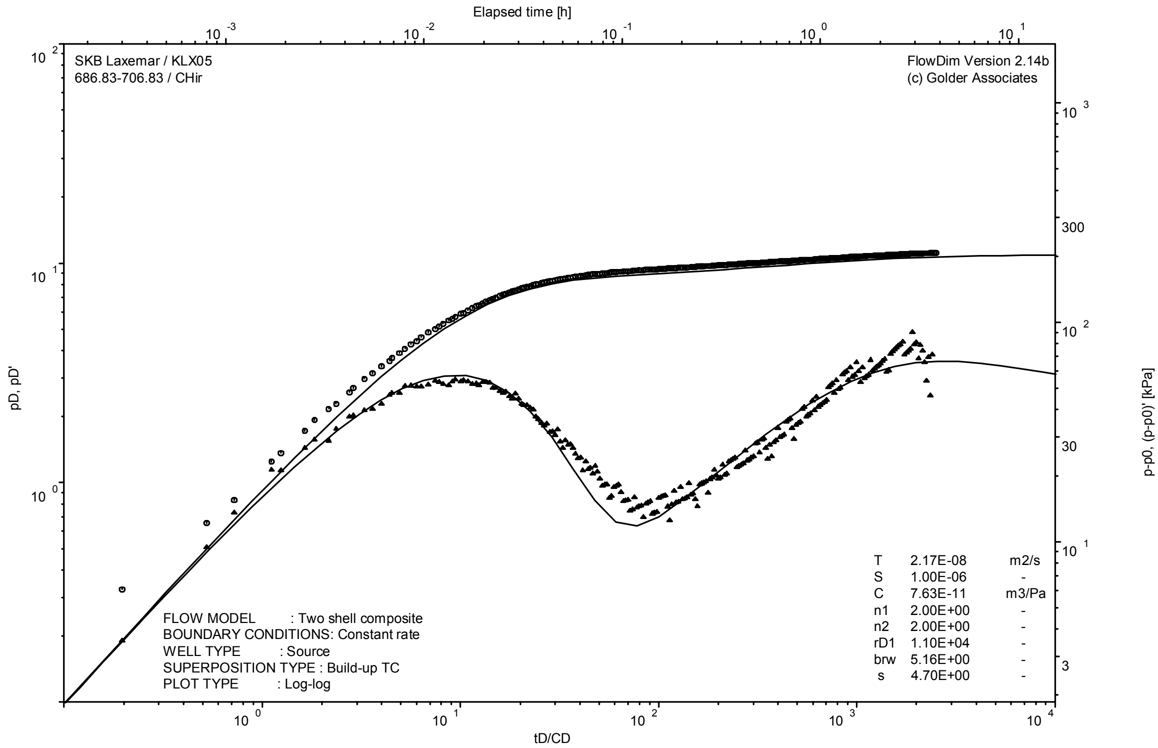
Pressure and flow rate vs. time; cartesian plot



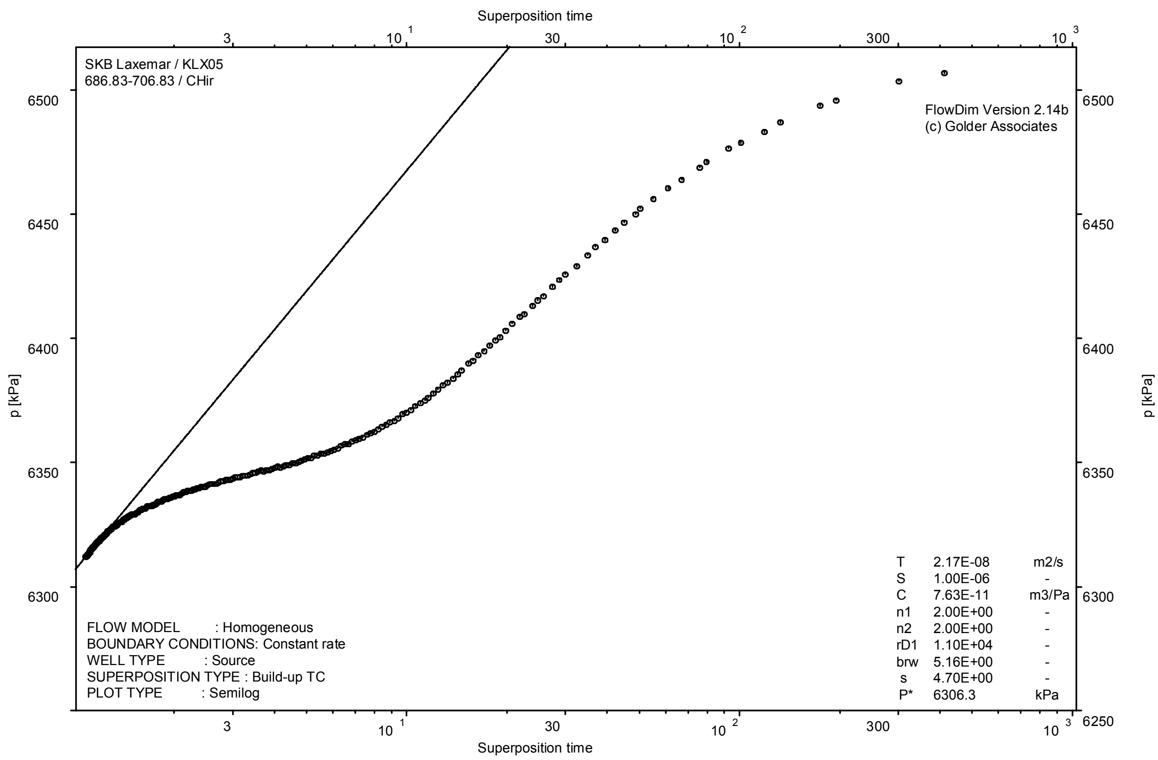
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

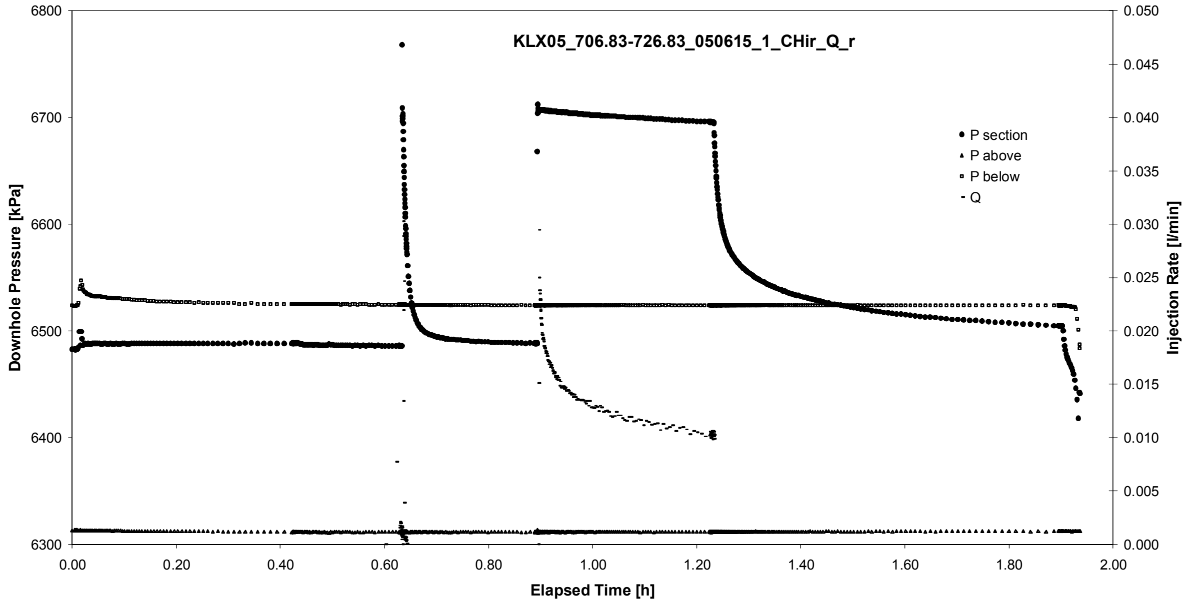


CHIR phase; HORNER match

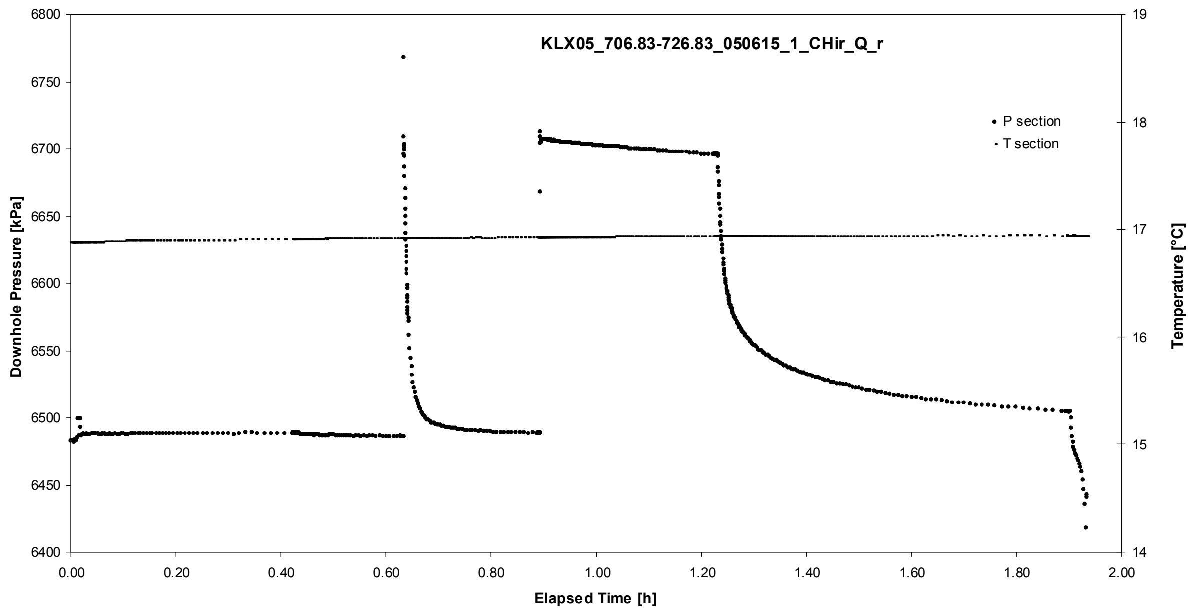
APPENDIX 2-37

Test 706.83 – 726.83 m

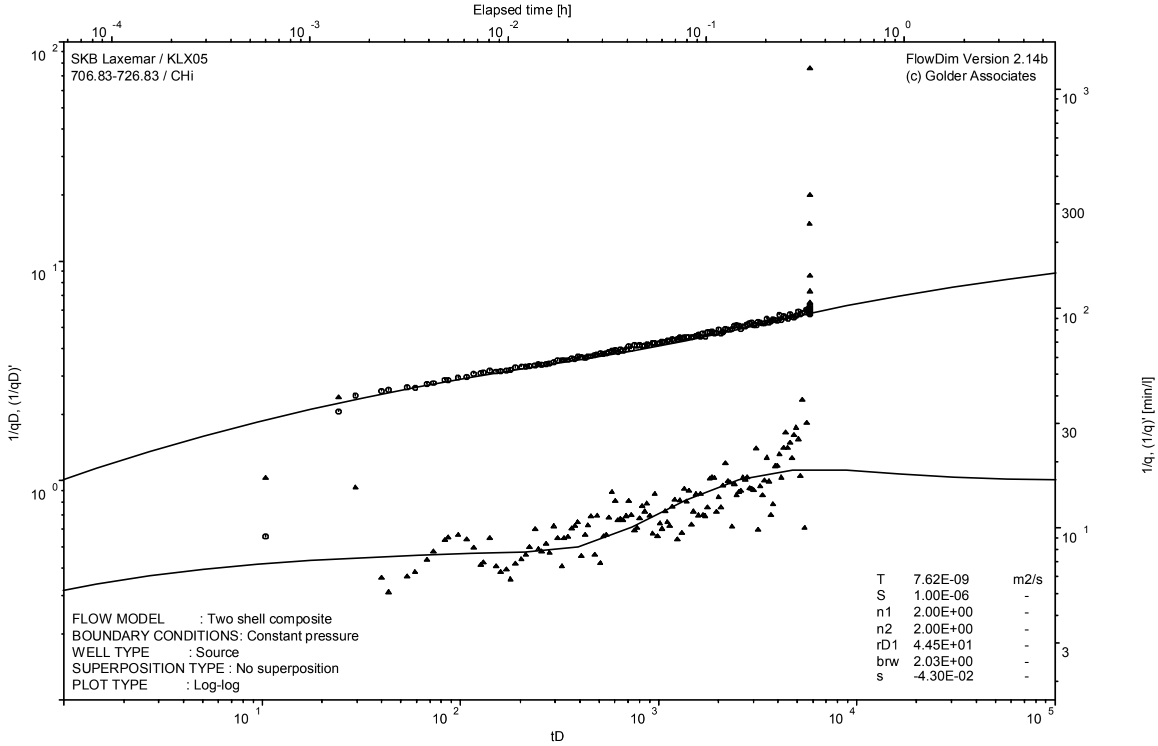
Analysis diagrams



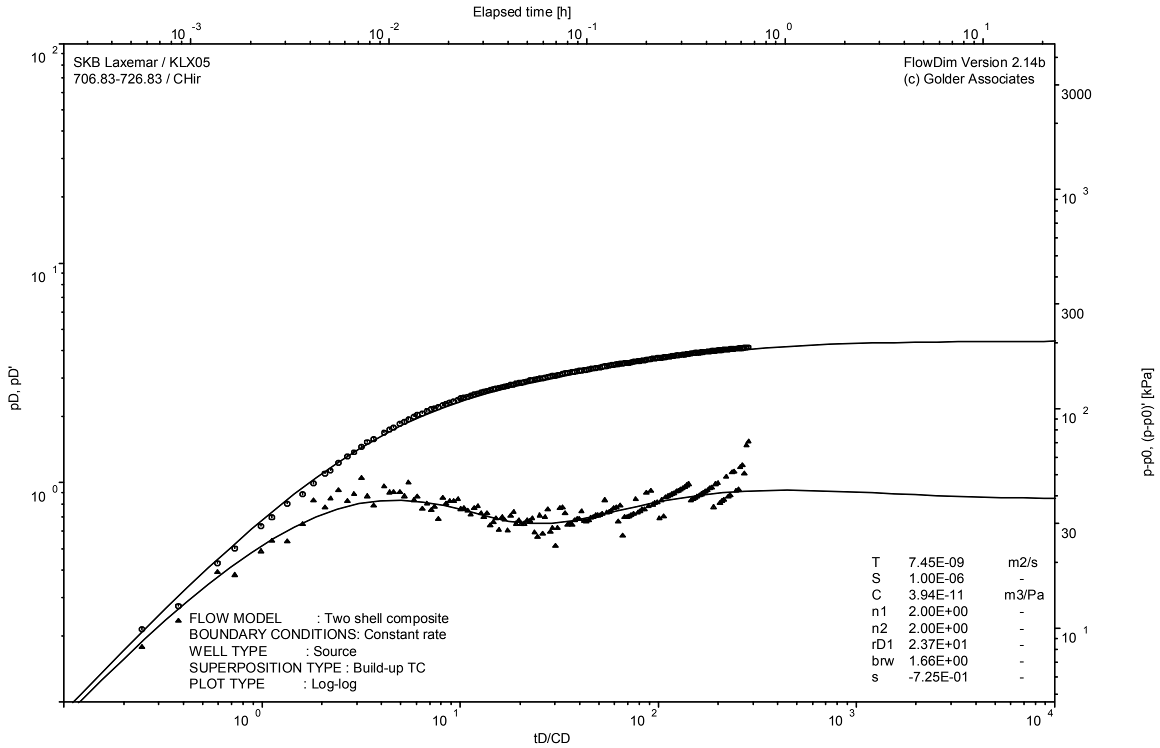
Pressure and flow rate vs. time; cartesian plot



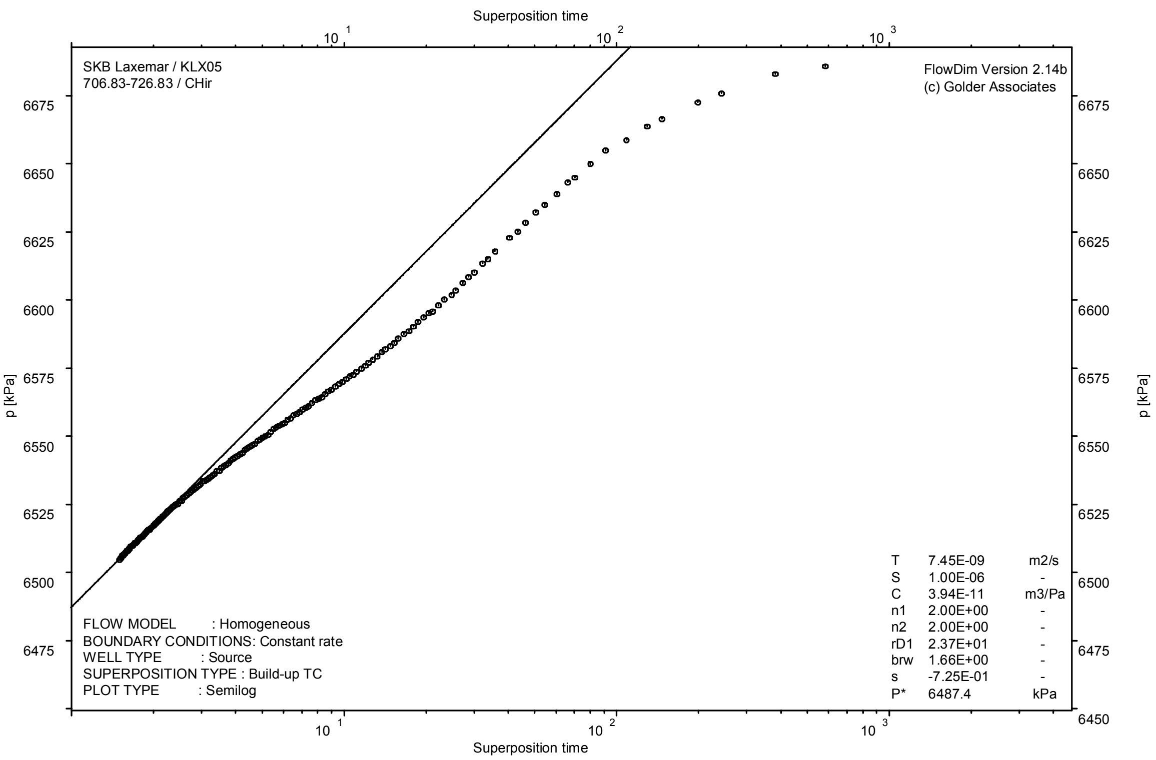
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

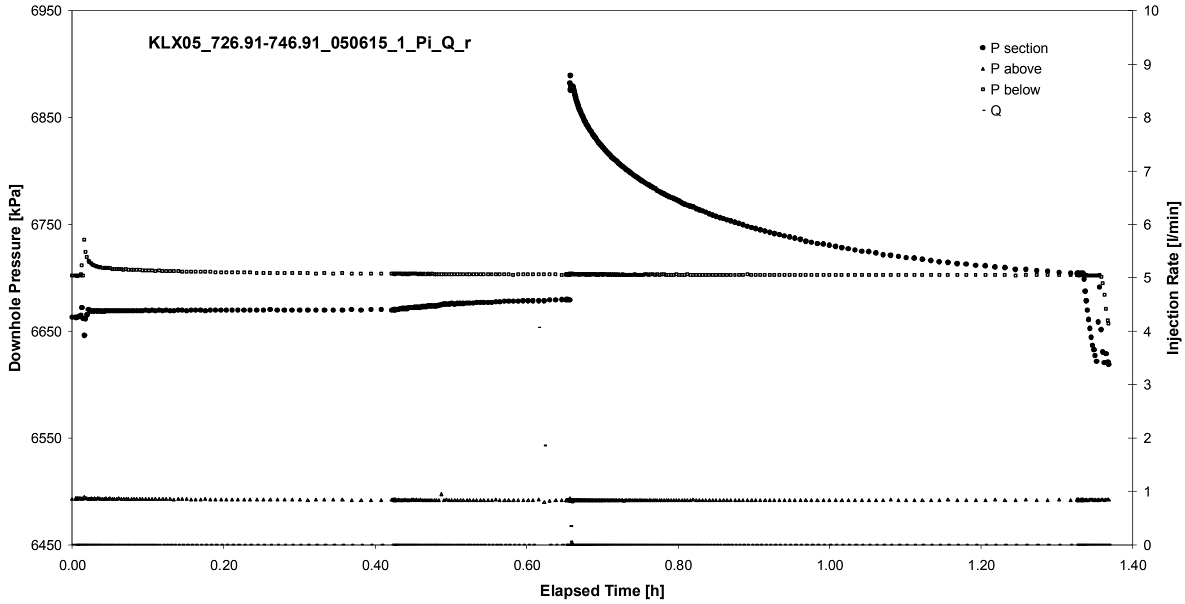


CHIR phase; HORNER match

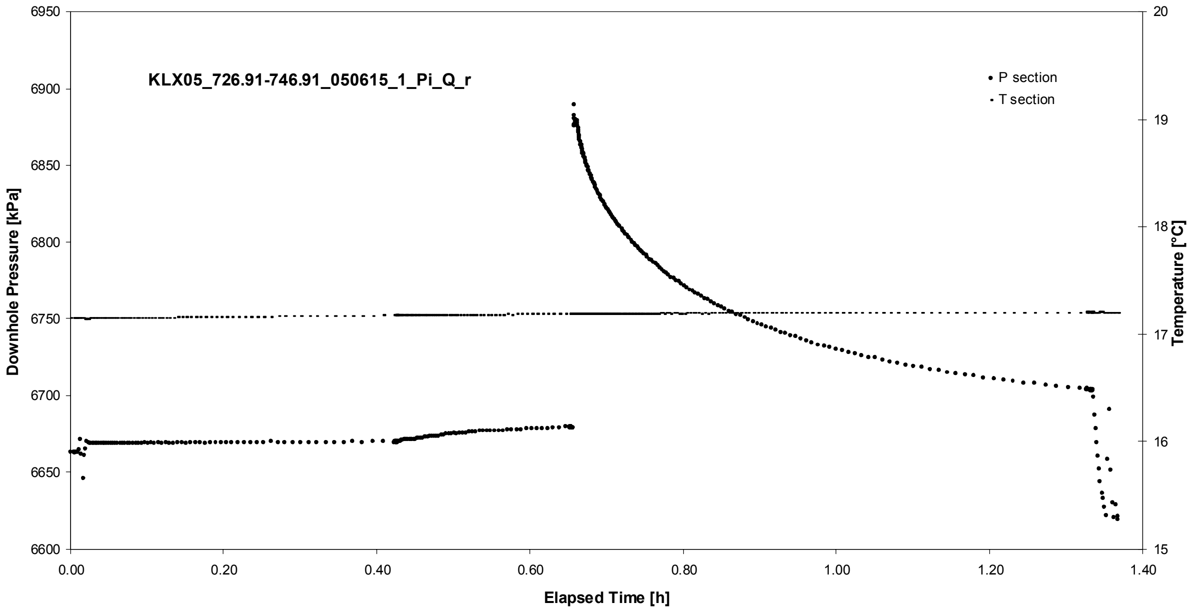
APPENDIX 2-38

Test 726.91 – 746.91 m

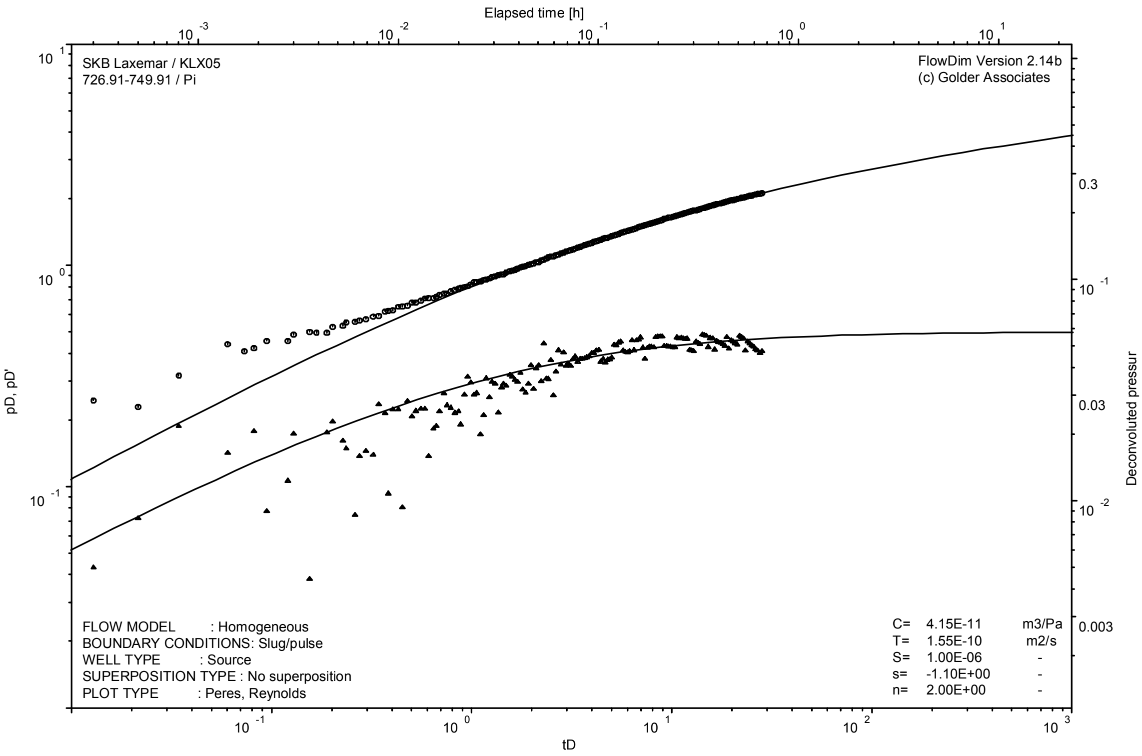
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

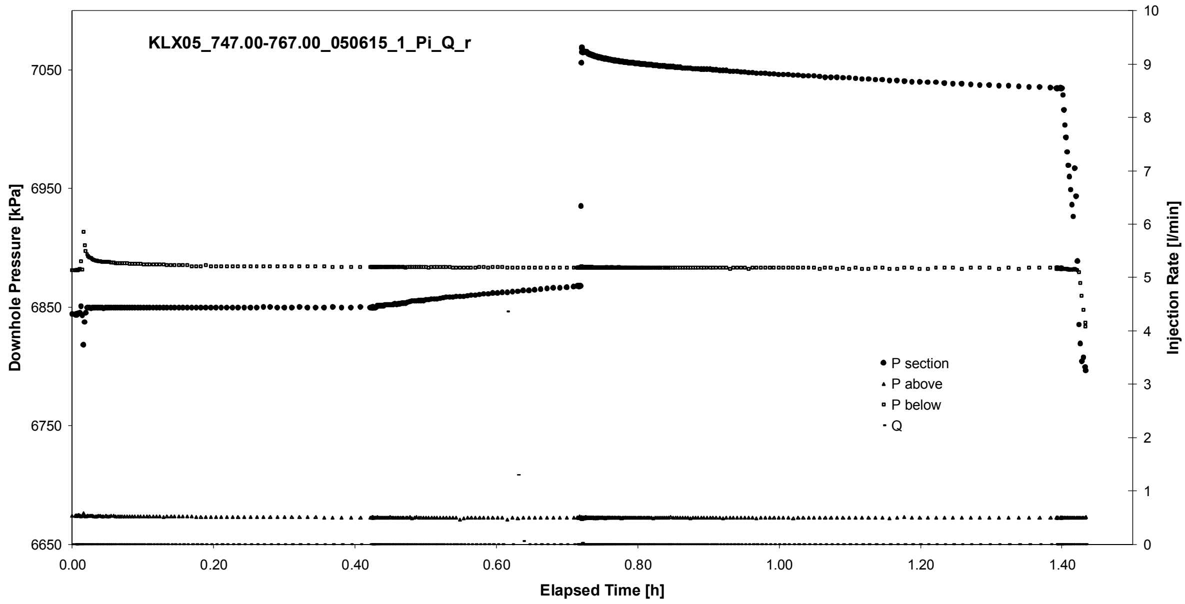


PI phase; deconvolution match

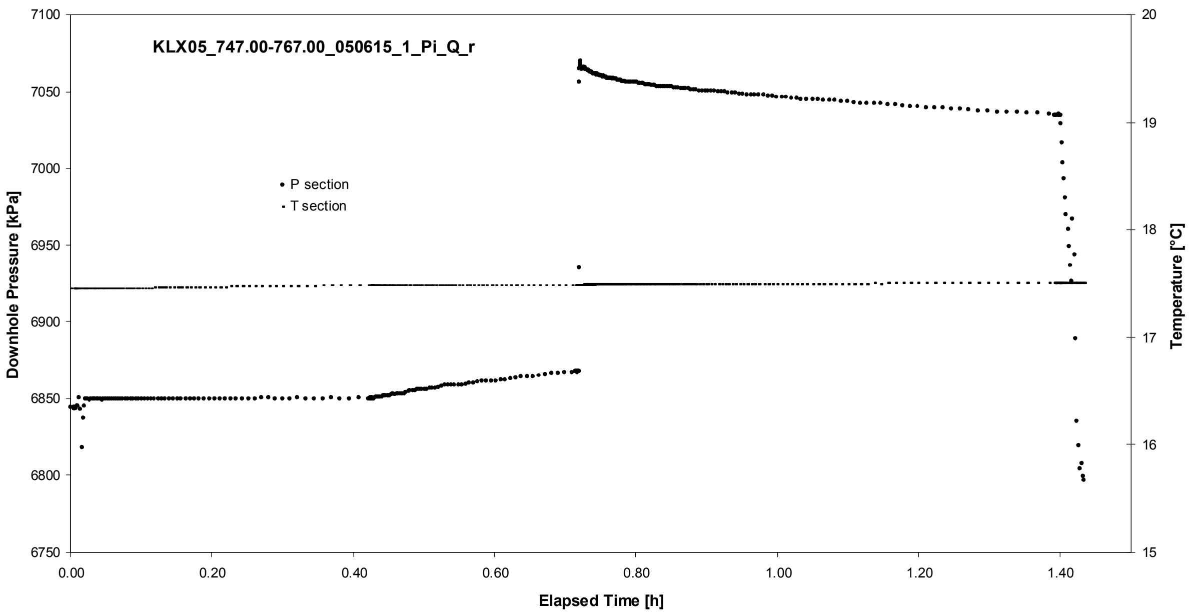
APPENDIX 2-39

Test 747.00 – 767.00 m

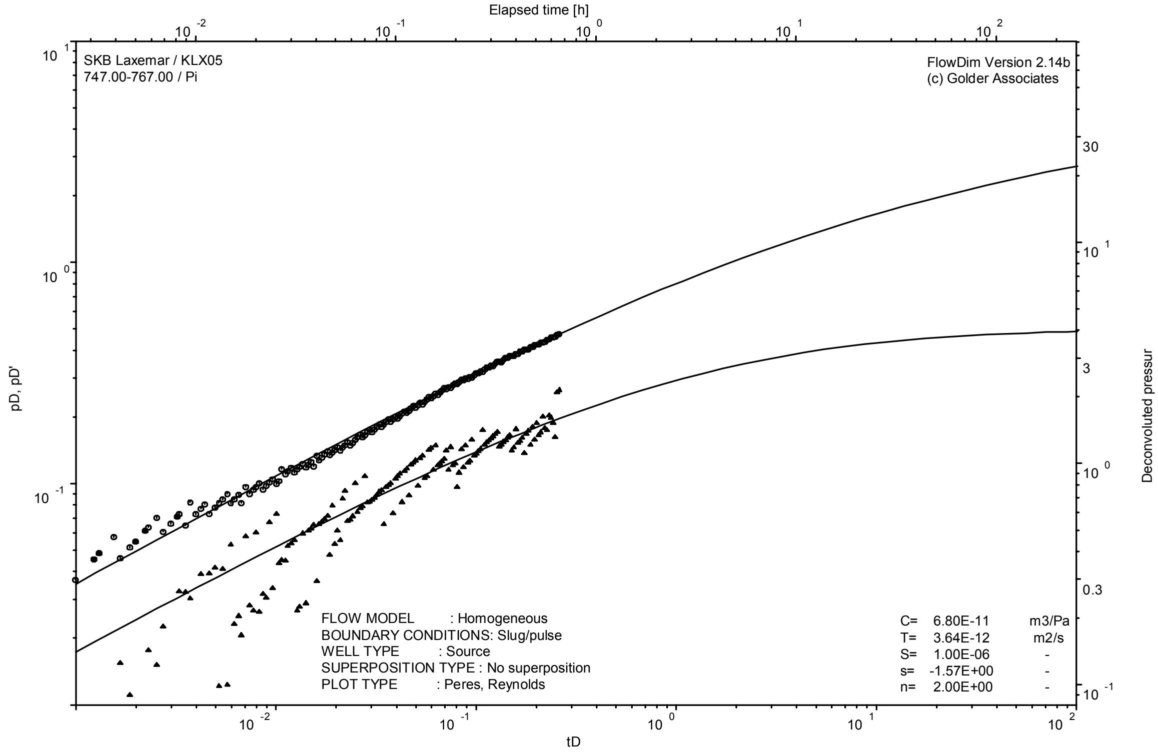
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

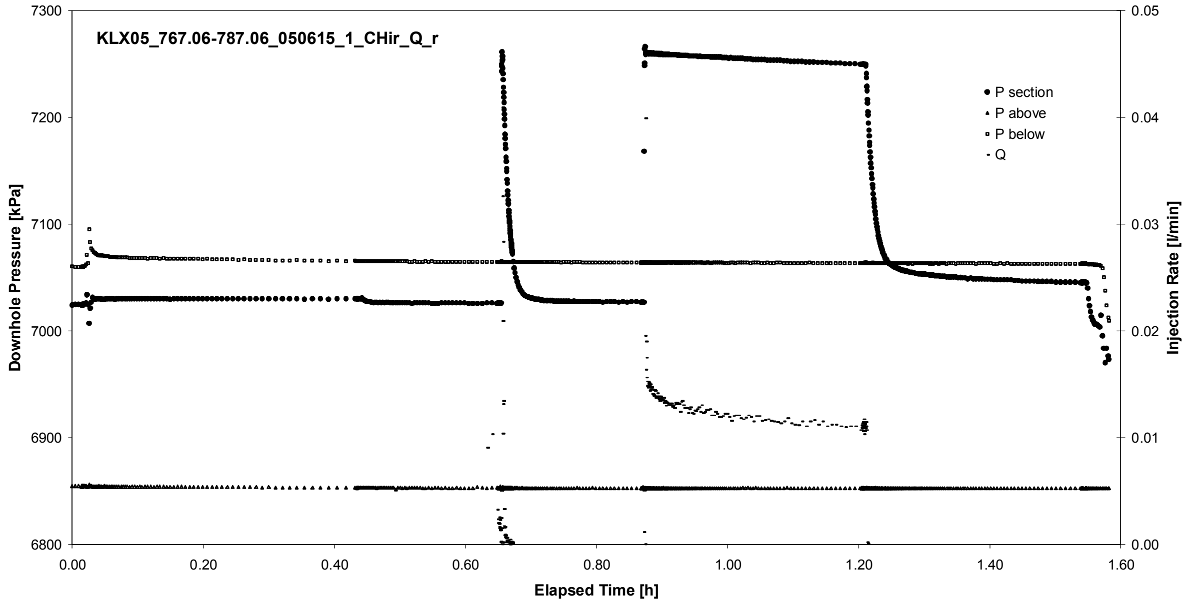


PI phase; deconvolution match

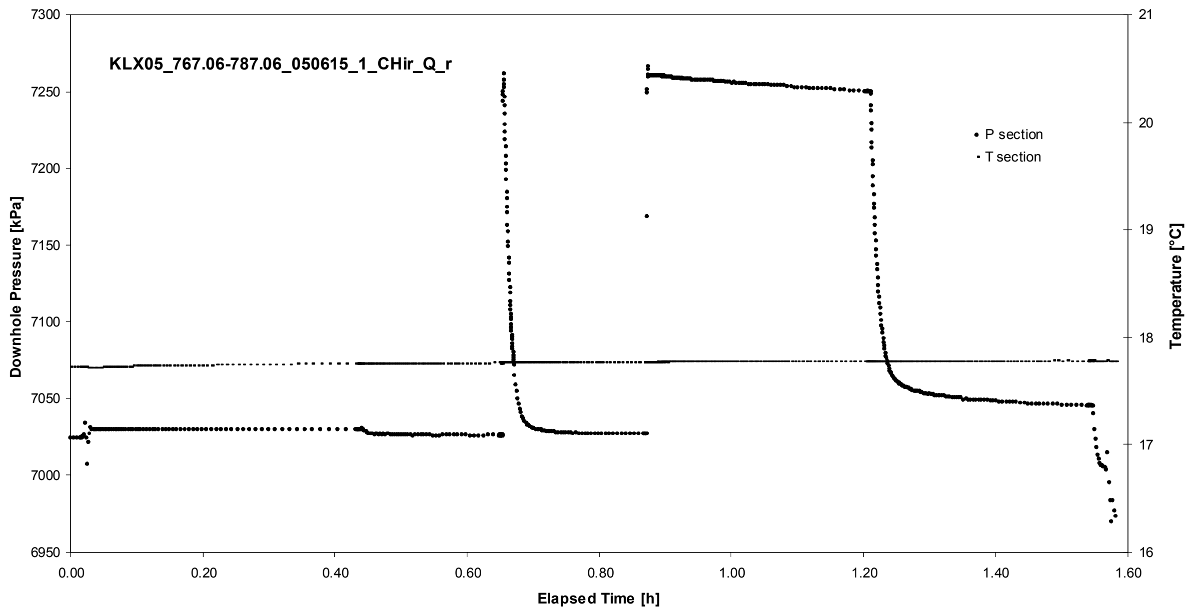
APPENDIX 2-40

Test 767.06 – 787.06 m

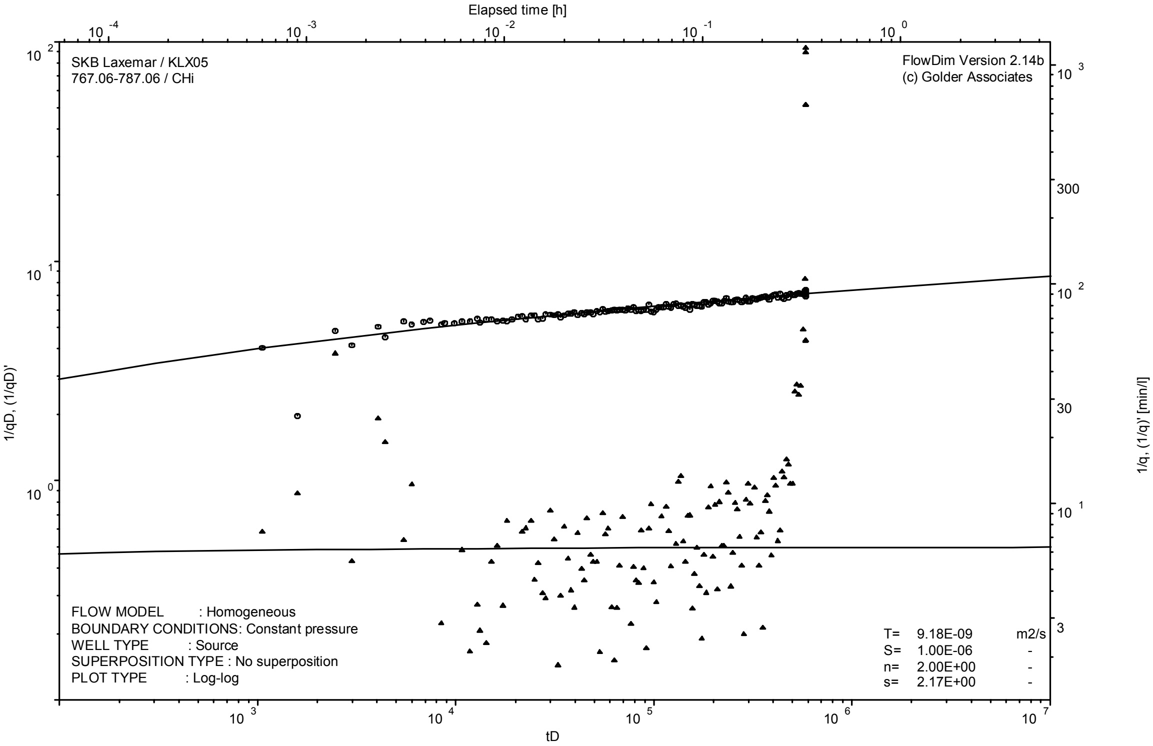
Analysis diagrams



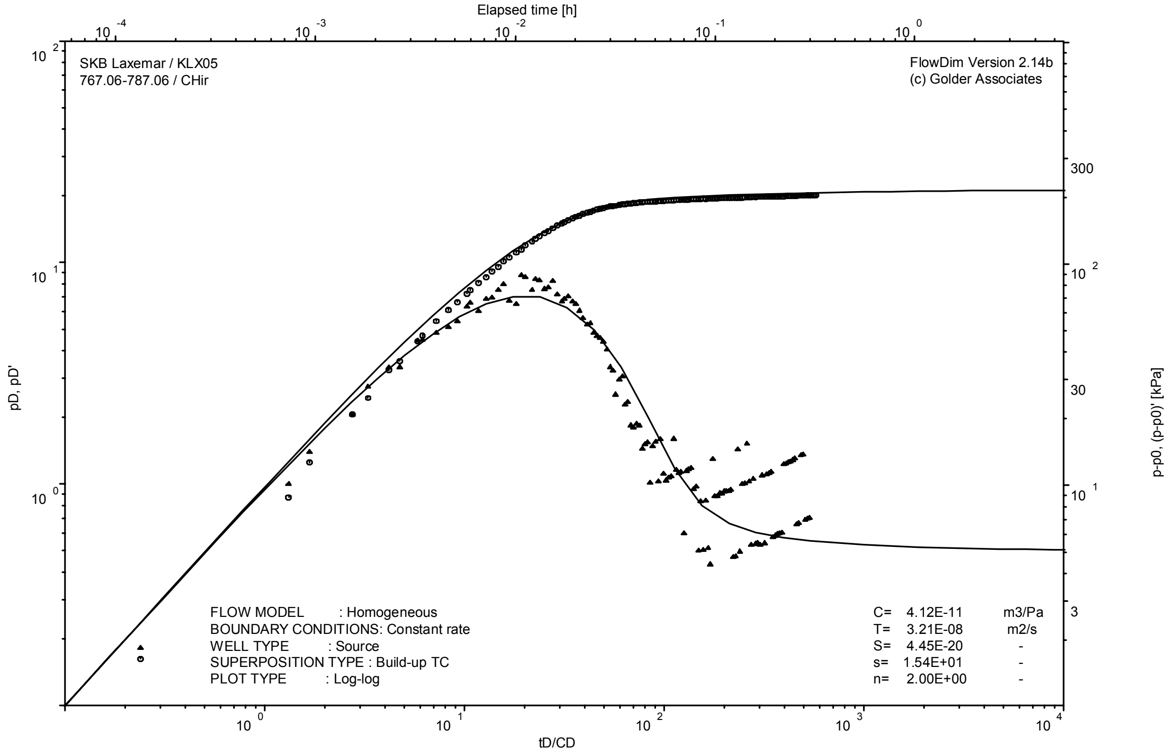
Pressure and flow rate vs. time; cartesian plot



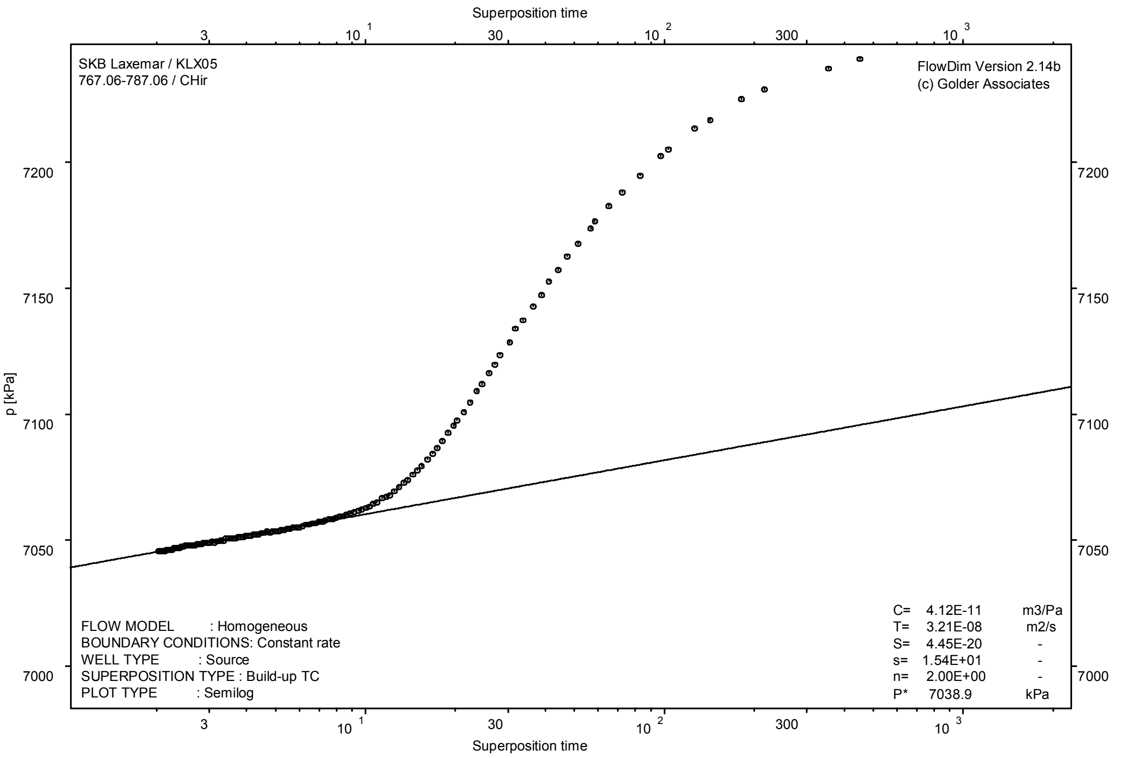
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

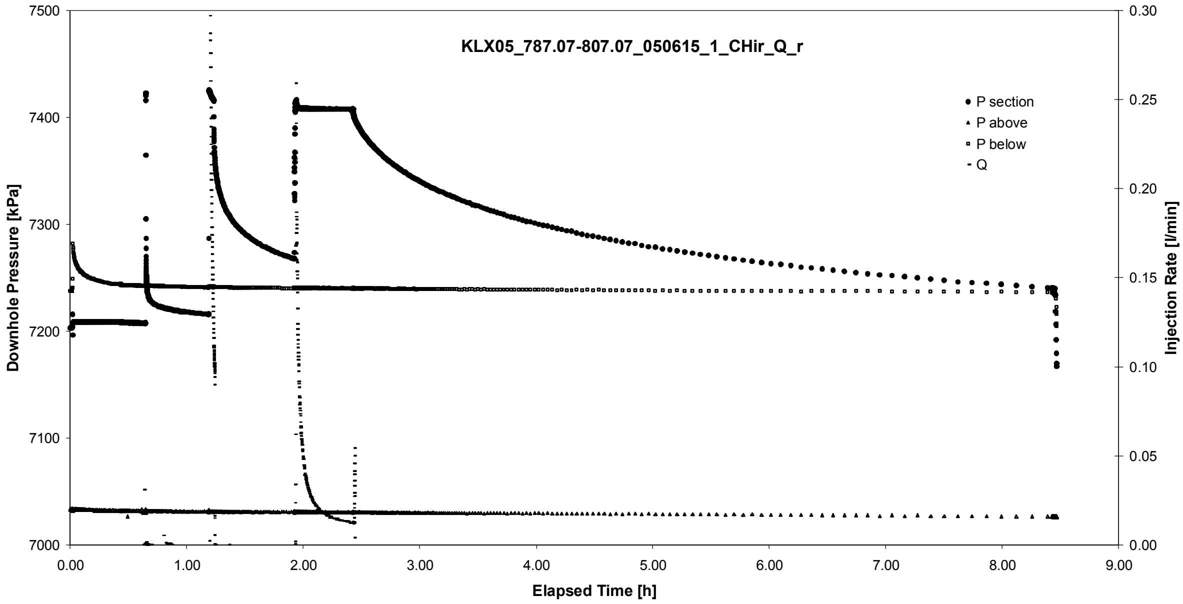


CHIR phase; HORNER match

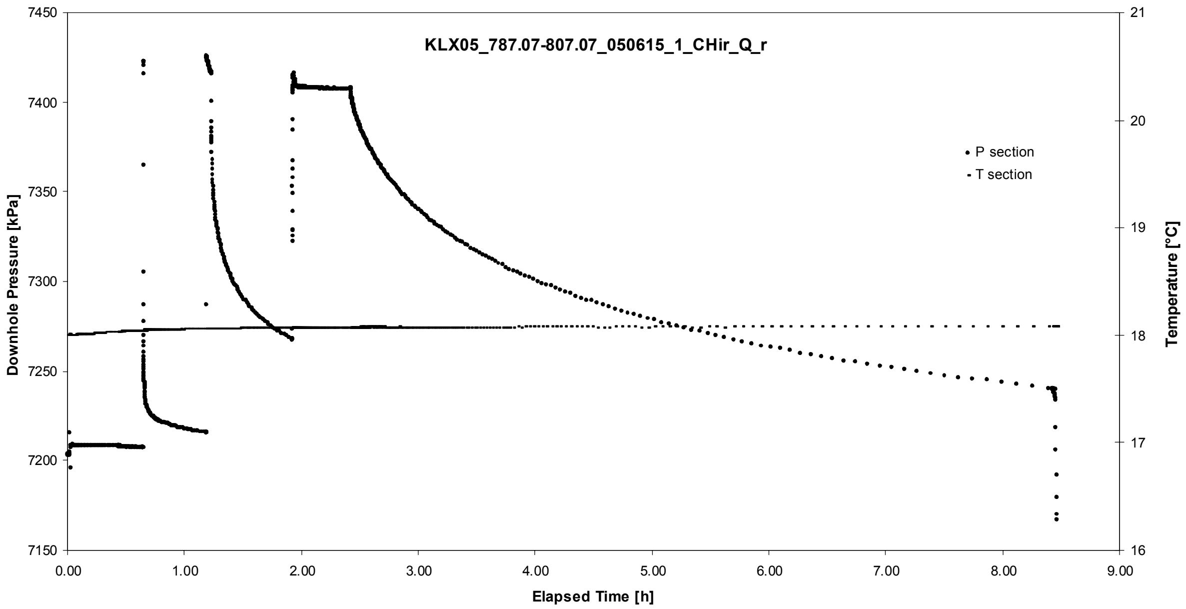
APPENDIX 2-41

Test 787.07 – 807.07 m

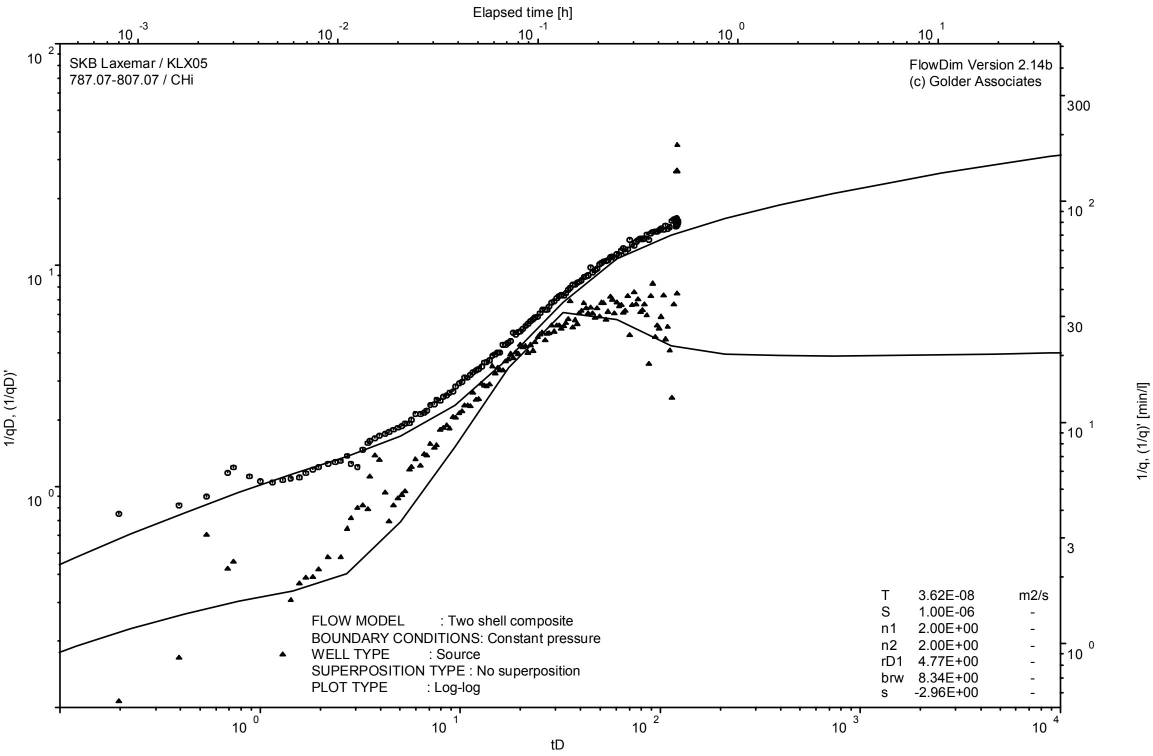
Analysis diagrams



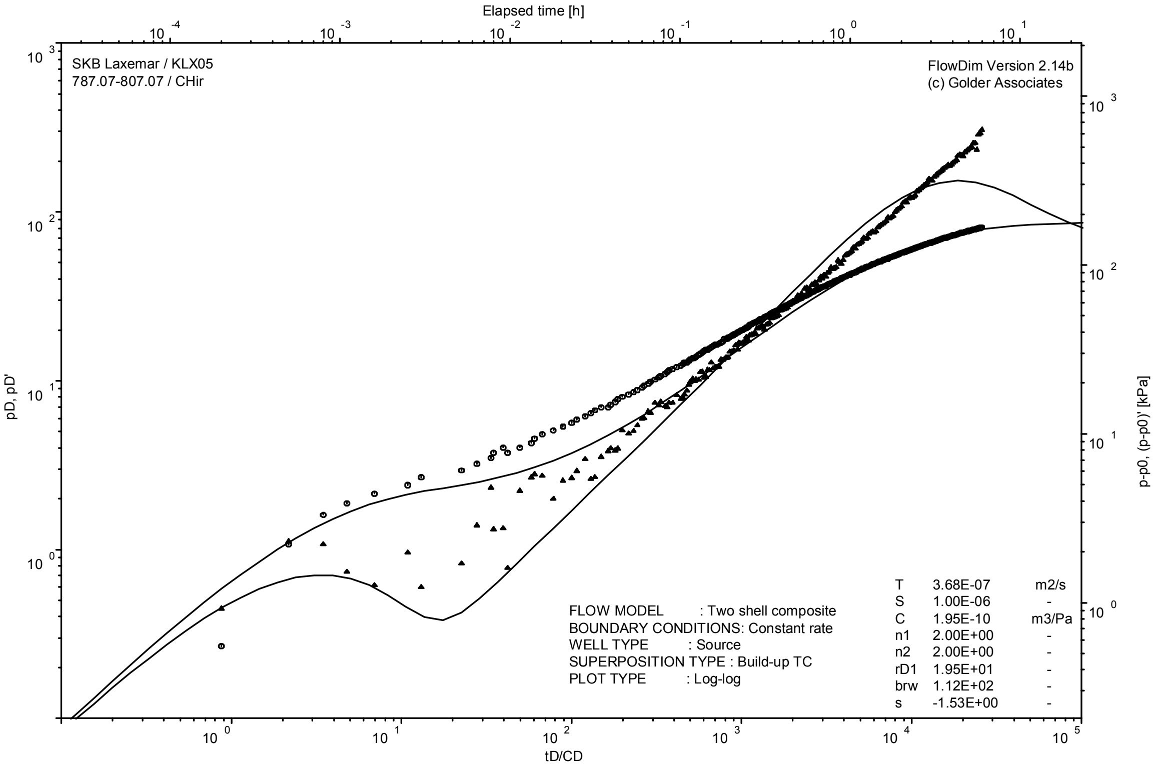
Pressure and flow rate vs. time; cartesian plot



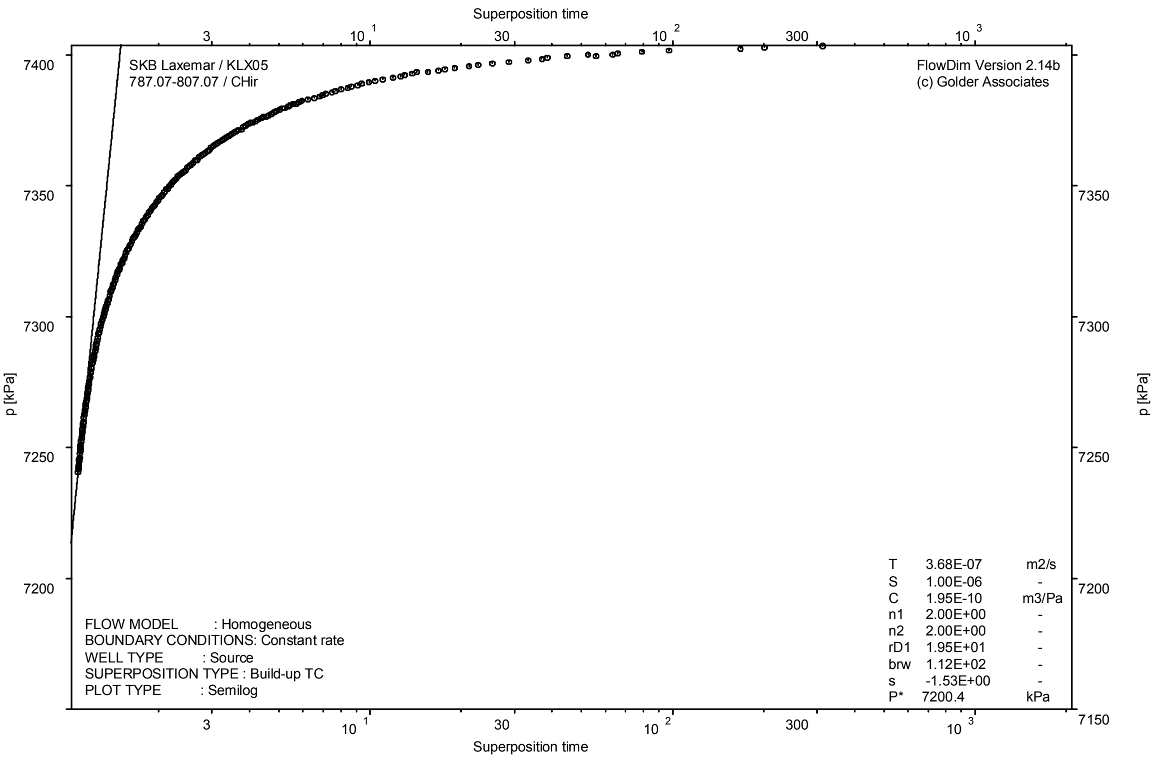
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

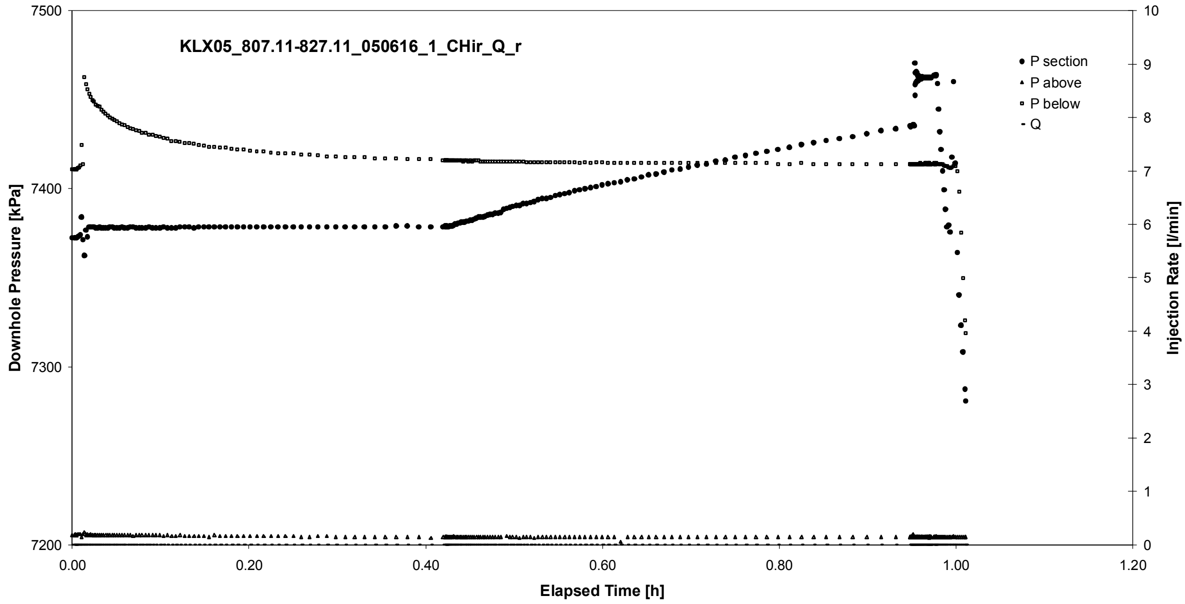


CHIR phase; HORNER match

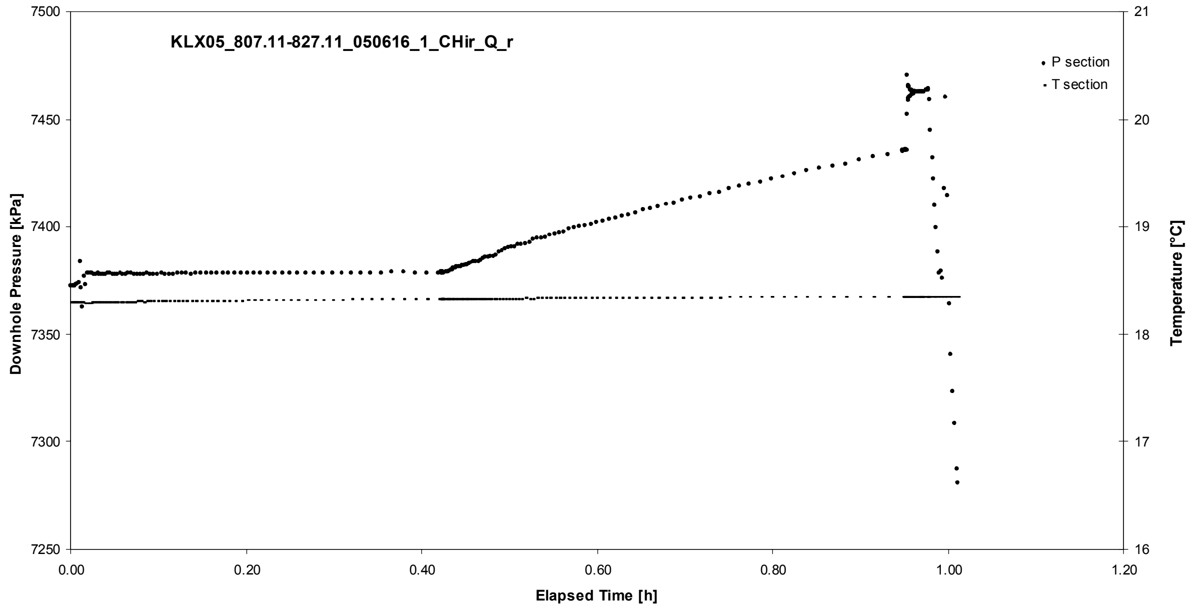
APPENDIX 2-42

Test 807.11 – 827.11 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

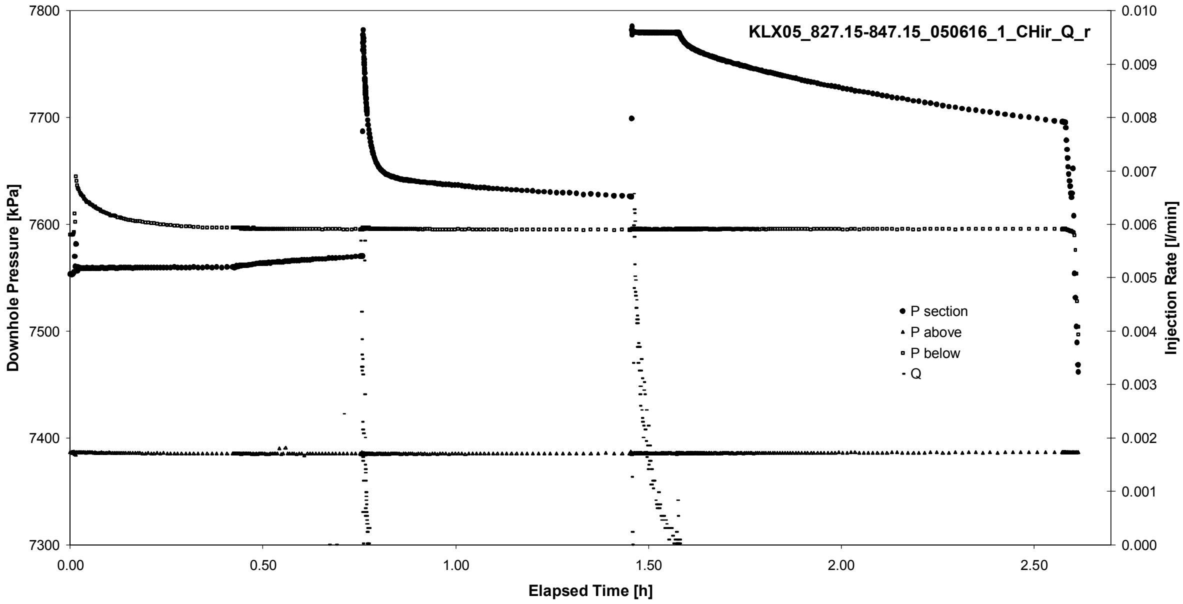
Not Analysed

CHIR phase; HORNER match

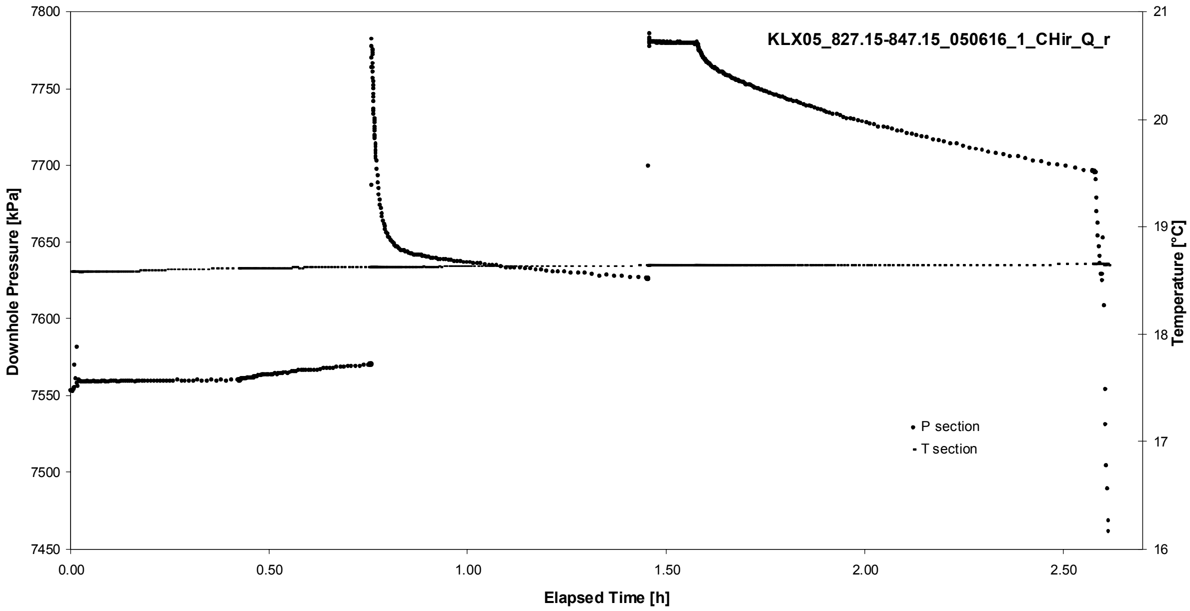
APPENDIX 2-43

Test 827.15 – 847.15 m

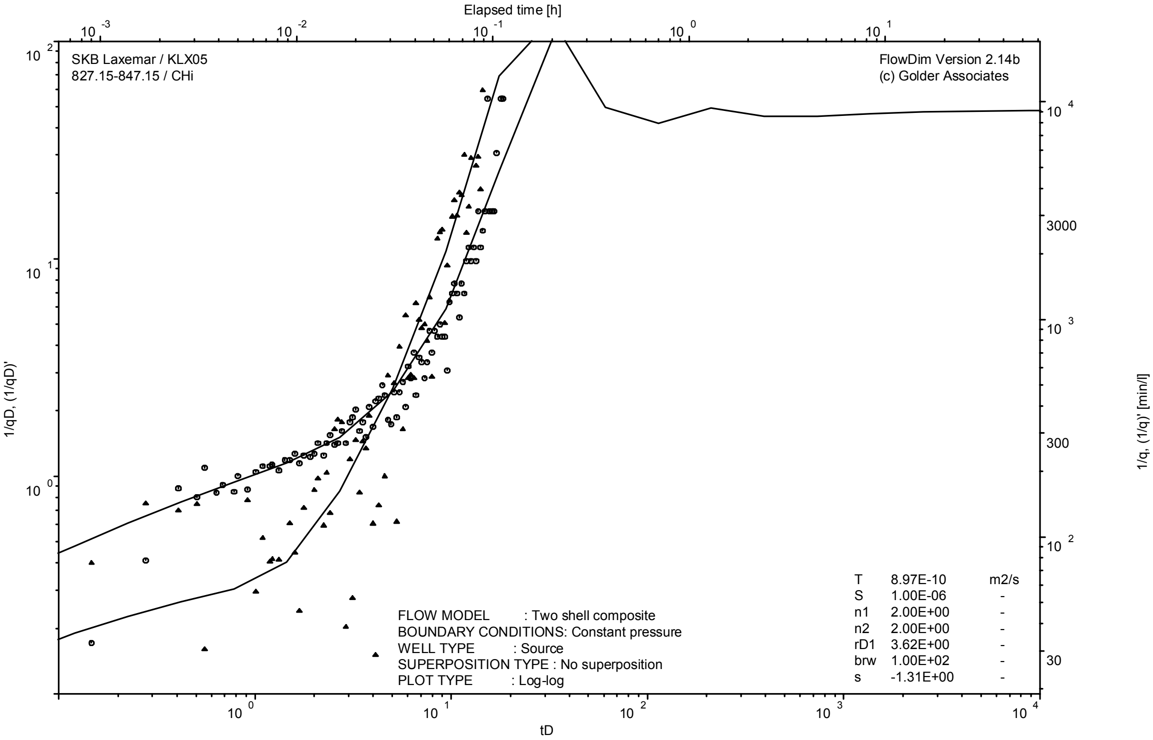
Analysis diagrams



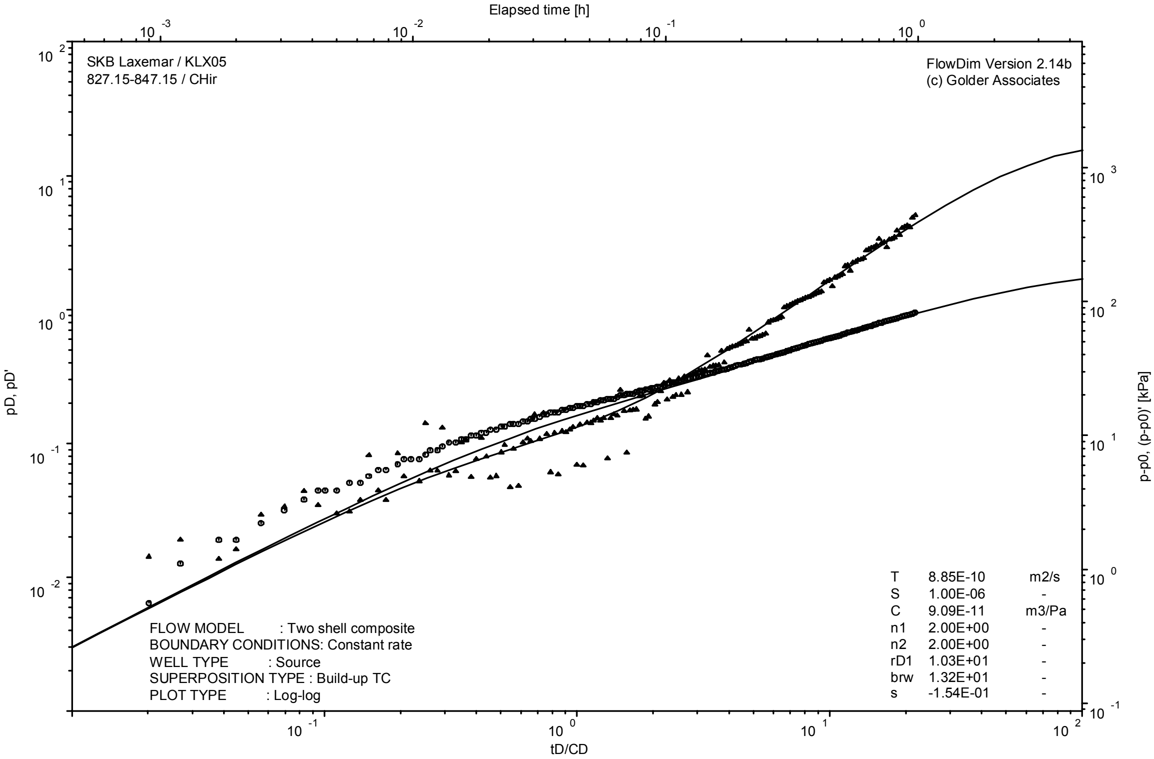
Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot



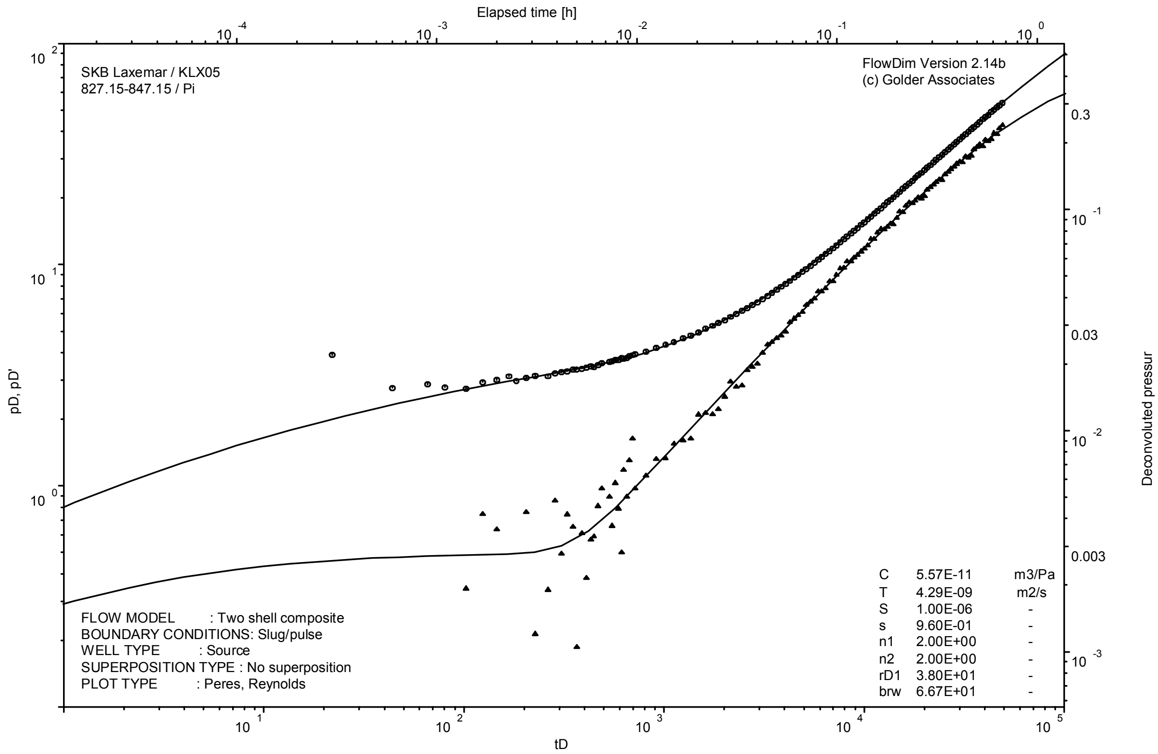
CHI phase; log-log match



CHIR phase; log-log match

Not calculated due to the tight formation

CHIR phase; HORNER match

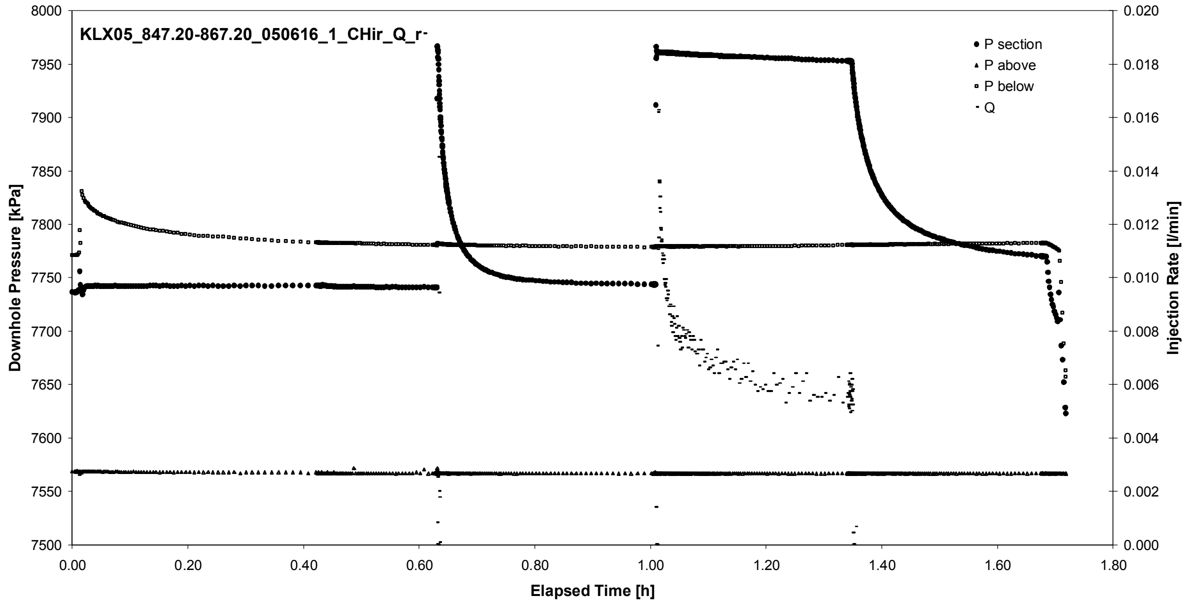


PI phase; deconvolution match

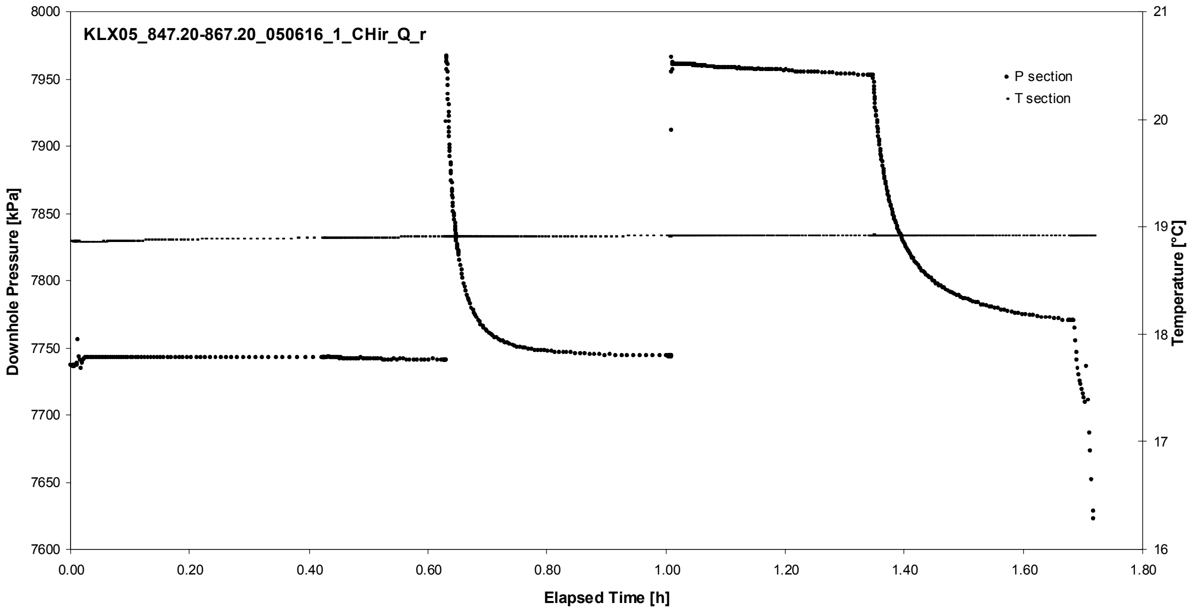
APPENDIX 2-44

Test 847.20 – 867.20 m

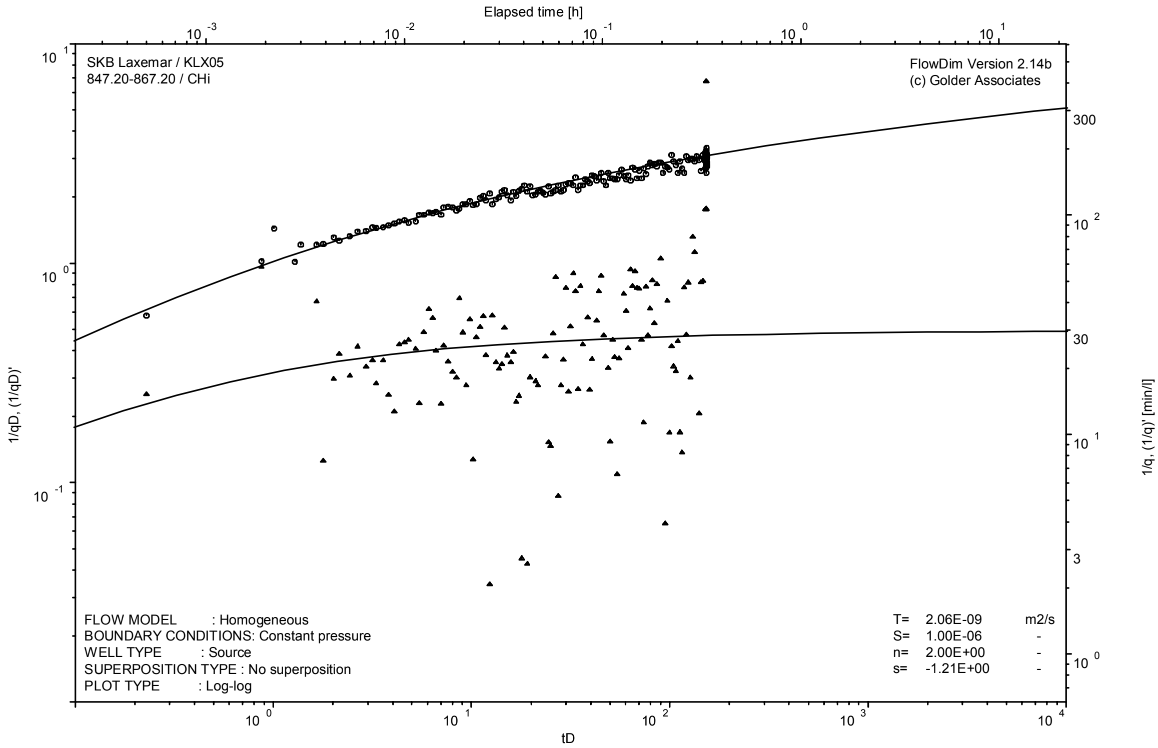
Analysis diagrams



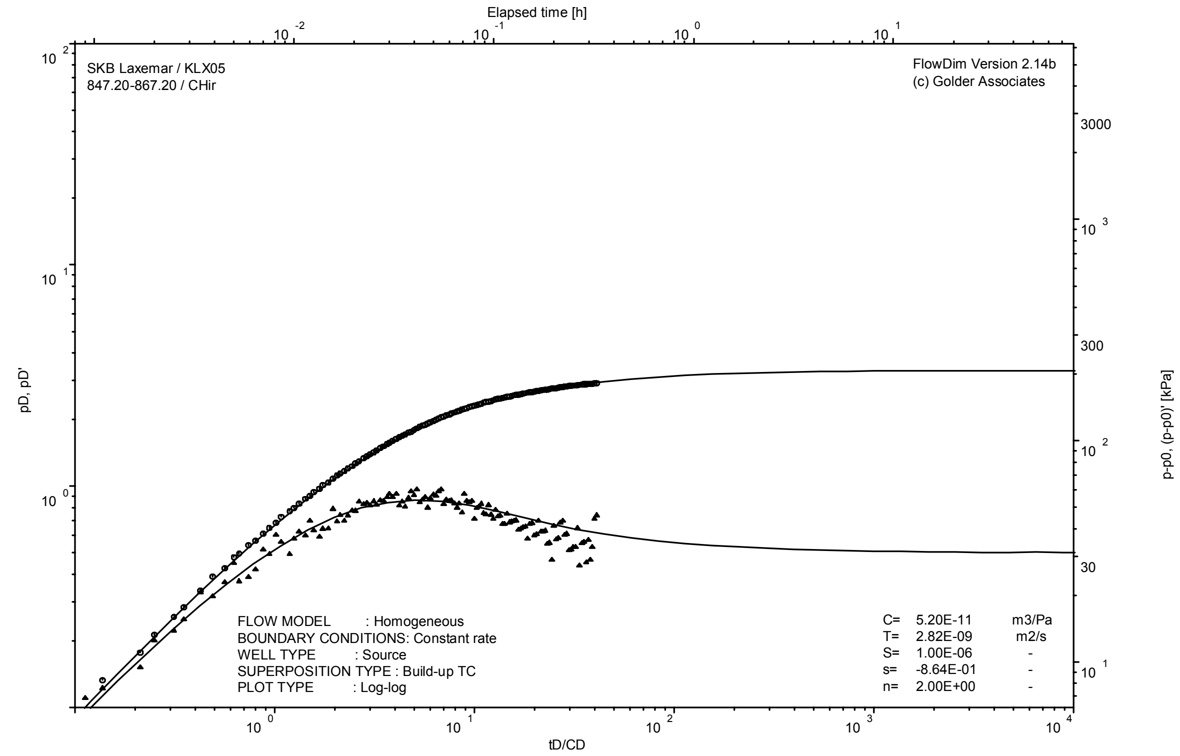
Pressure and flow rate vs. time; cartesian plot



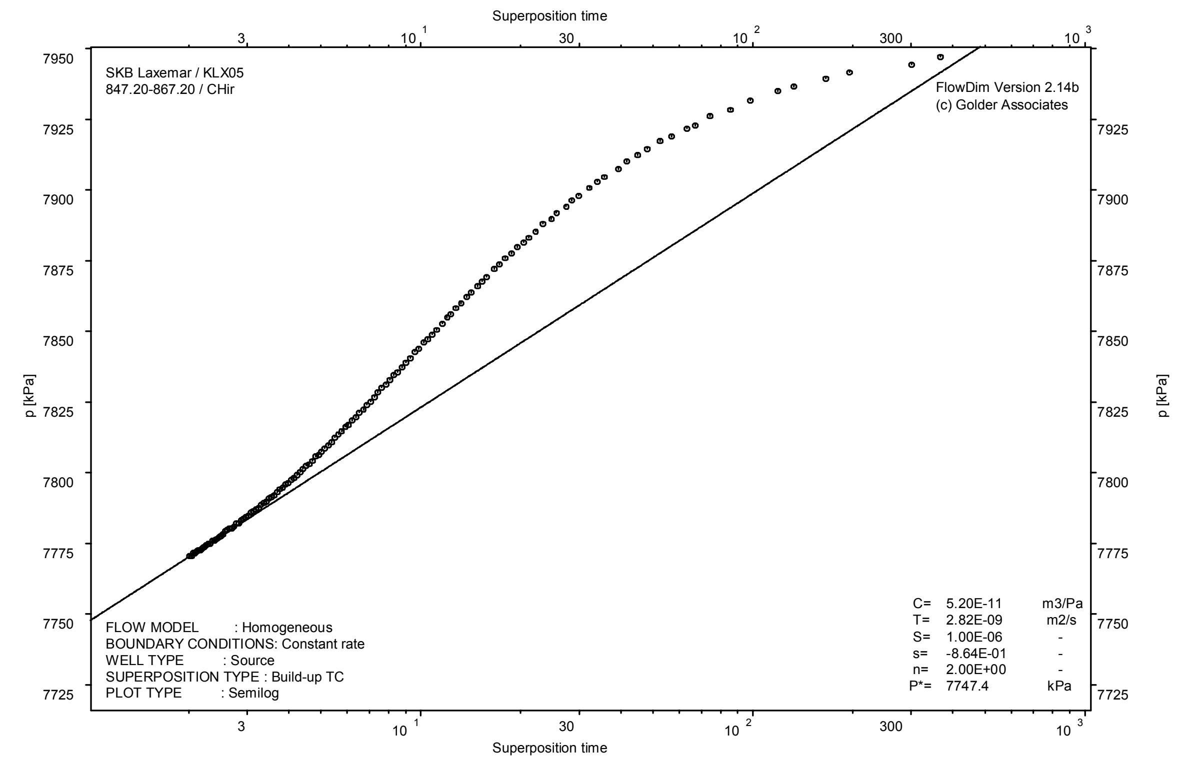
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

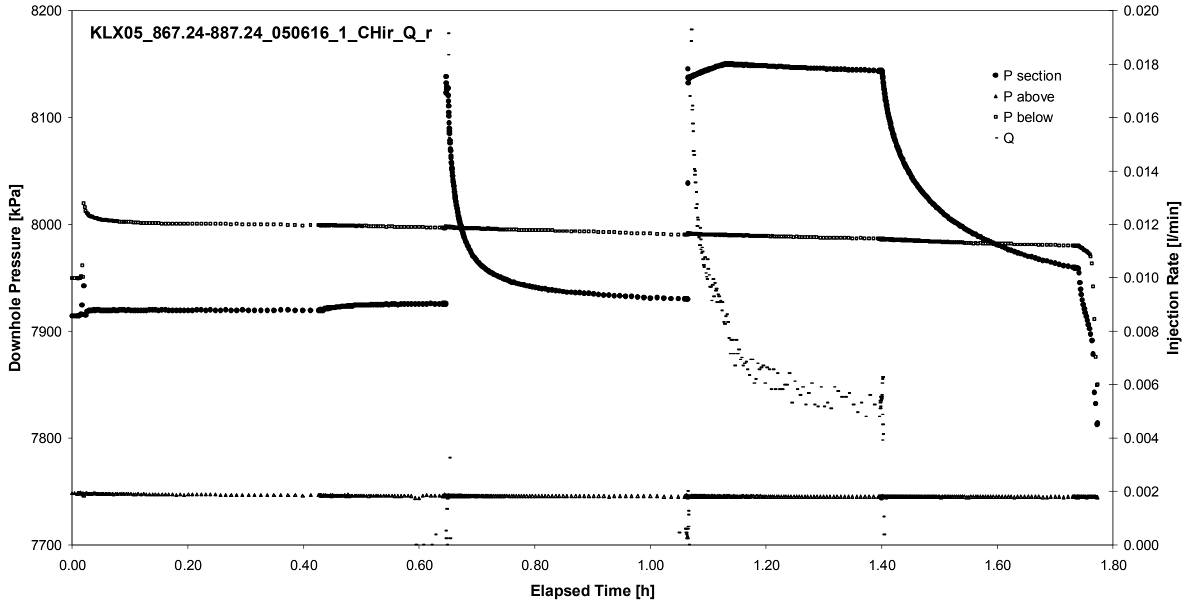


CHIR phase; HORNER match

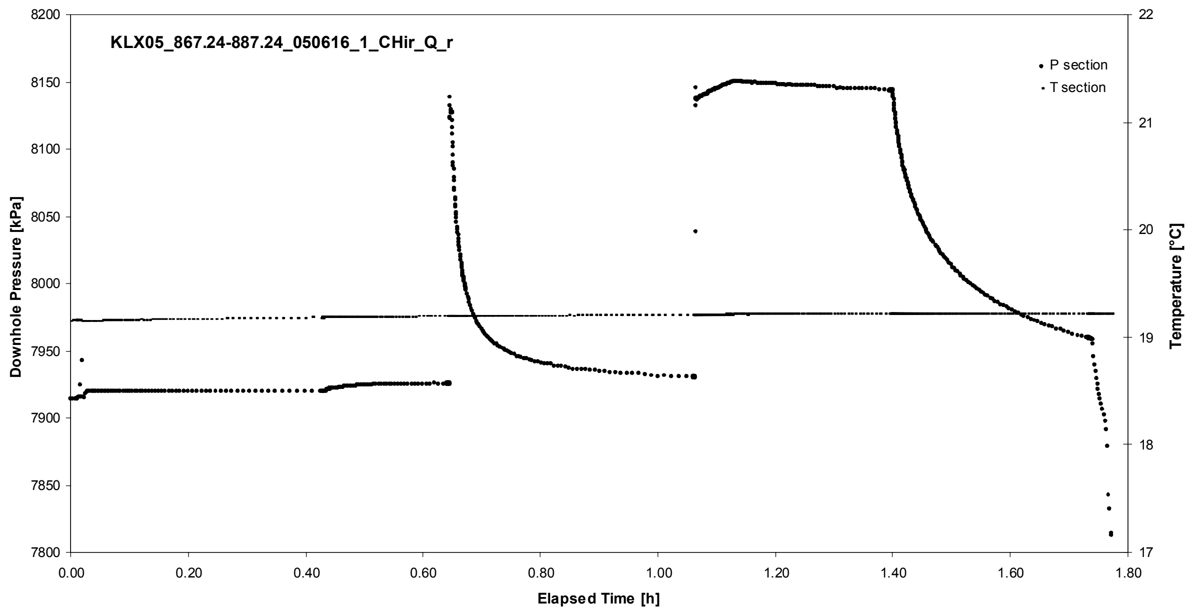
APPENDIX 2-45

Test 867.24 – 887.24 m

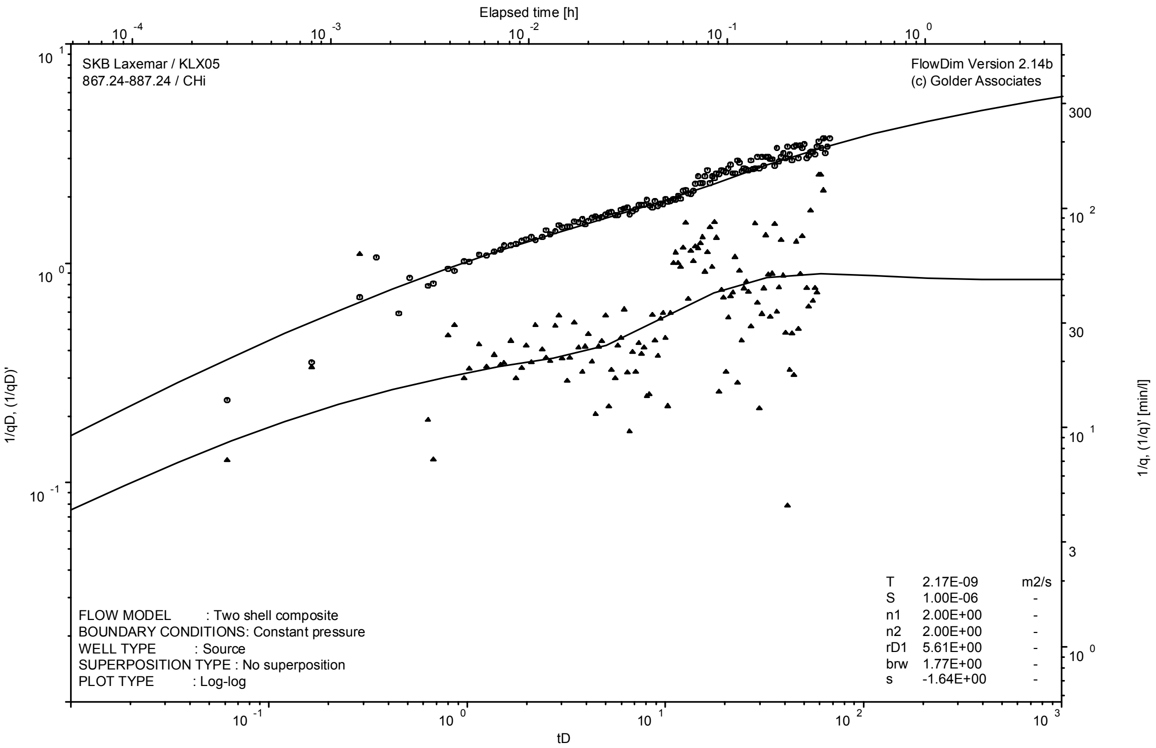
Analysis diagrams



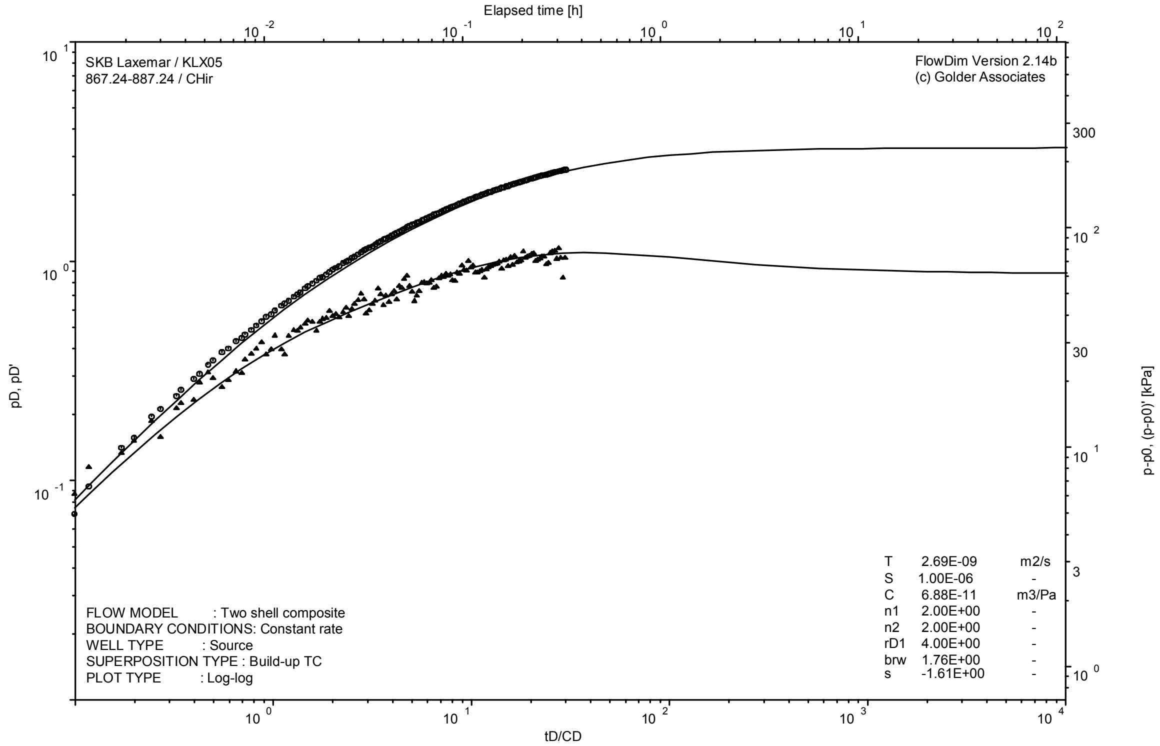
Pressure and flow rate vs. time; cartesian plot



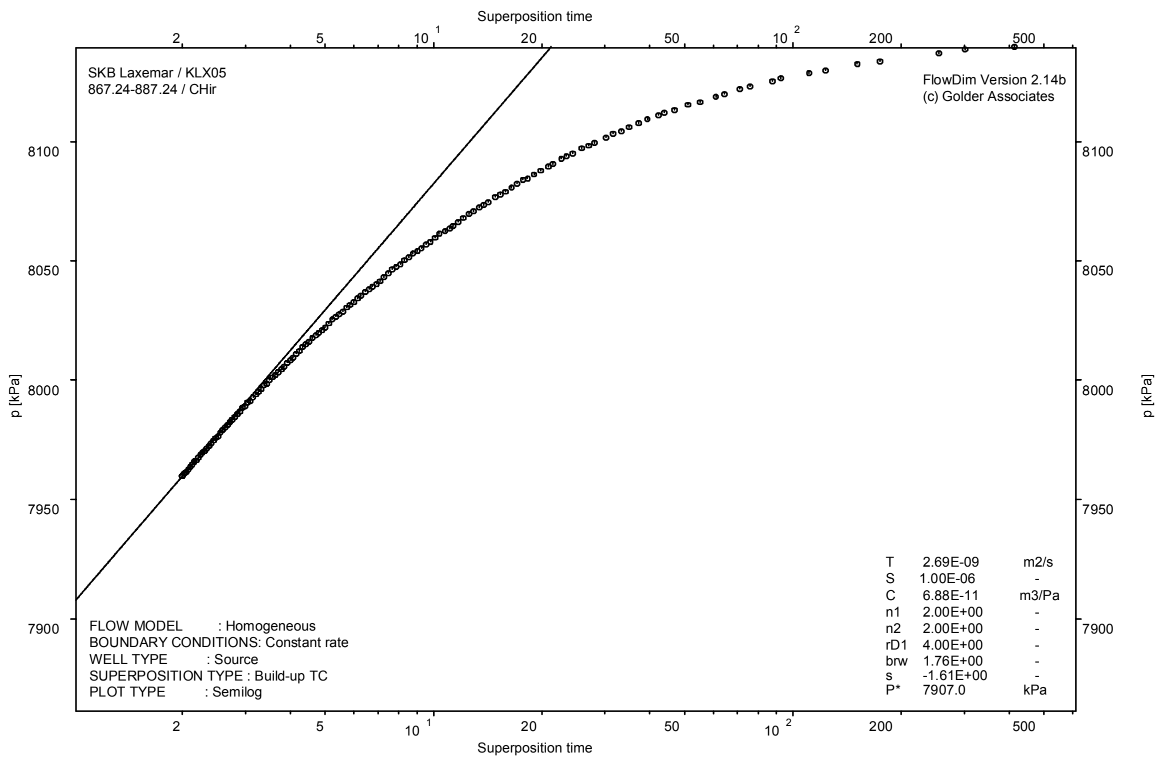
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

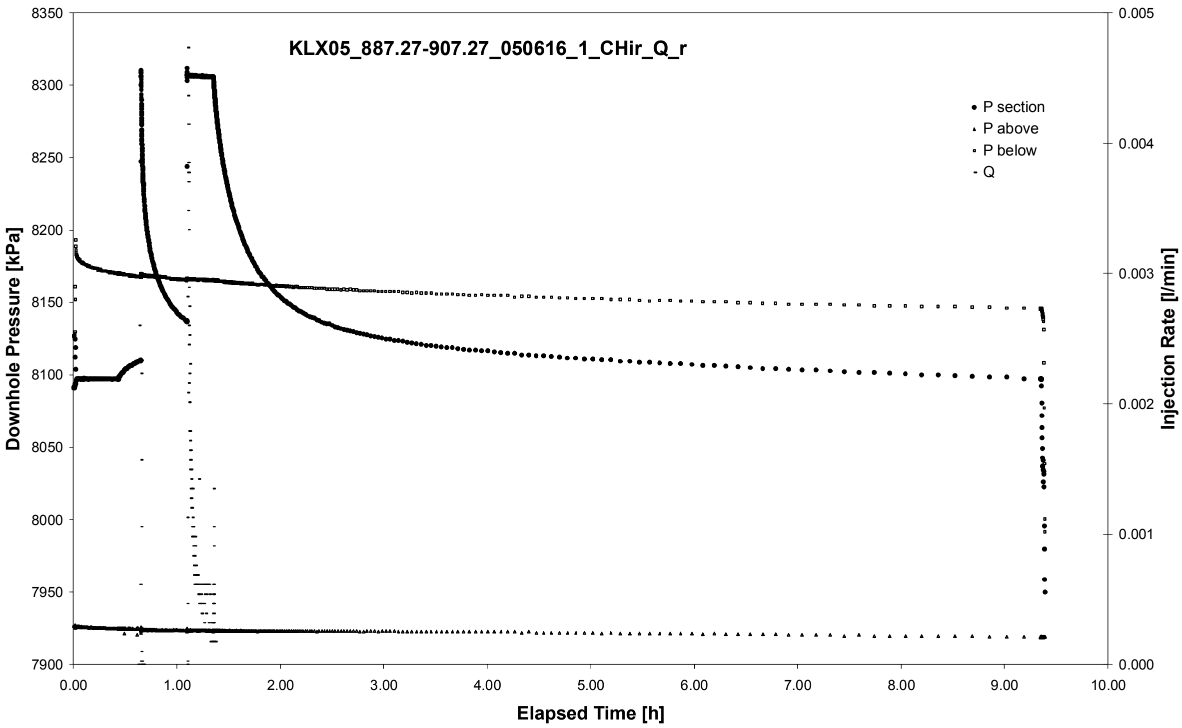


CHIR phase; HORNER match

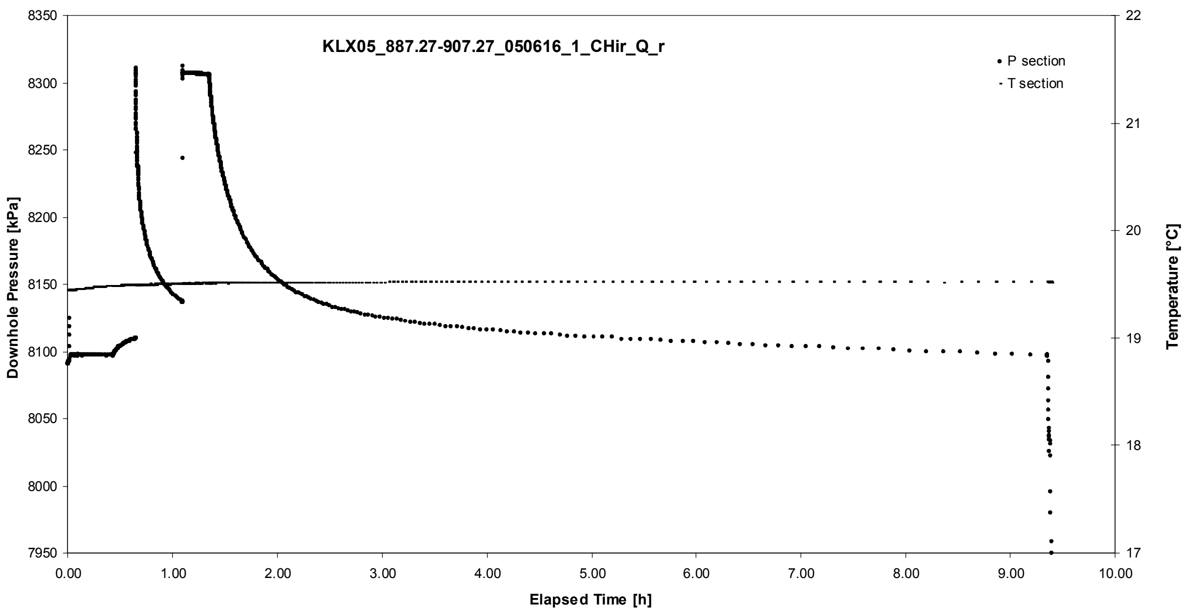
APPENDIX 2-46

Test 887.27 – 907.27 m

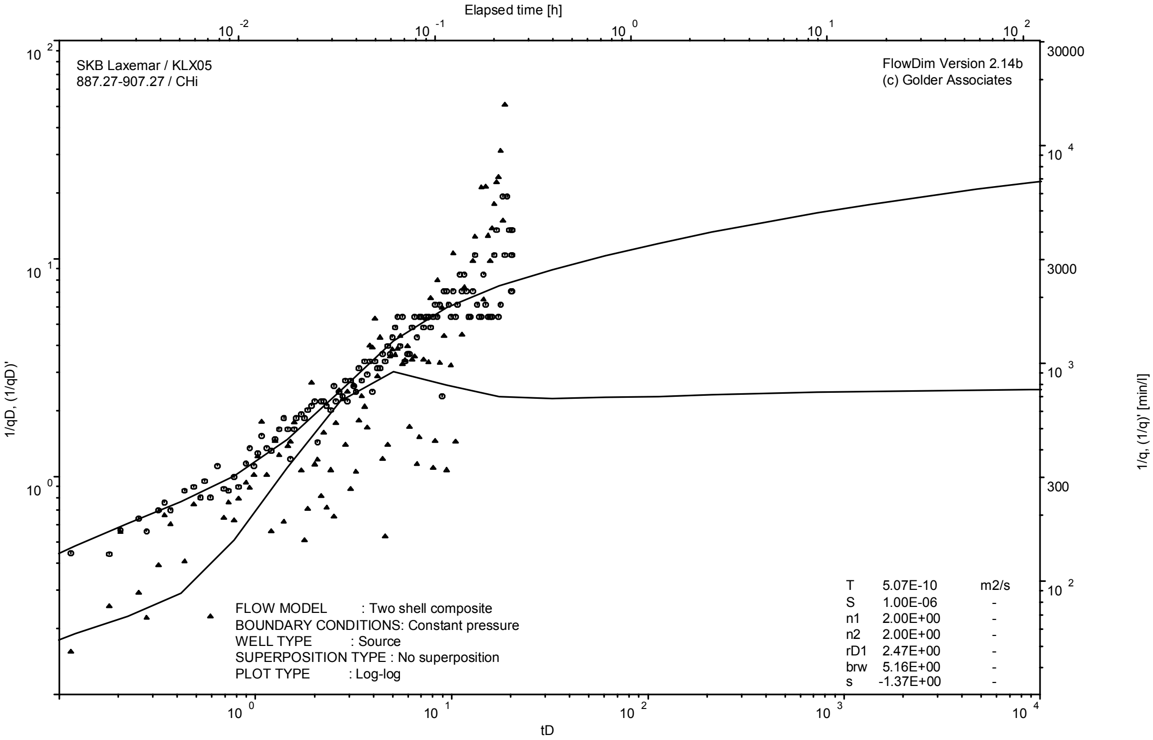
Analysis diagrams



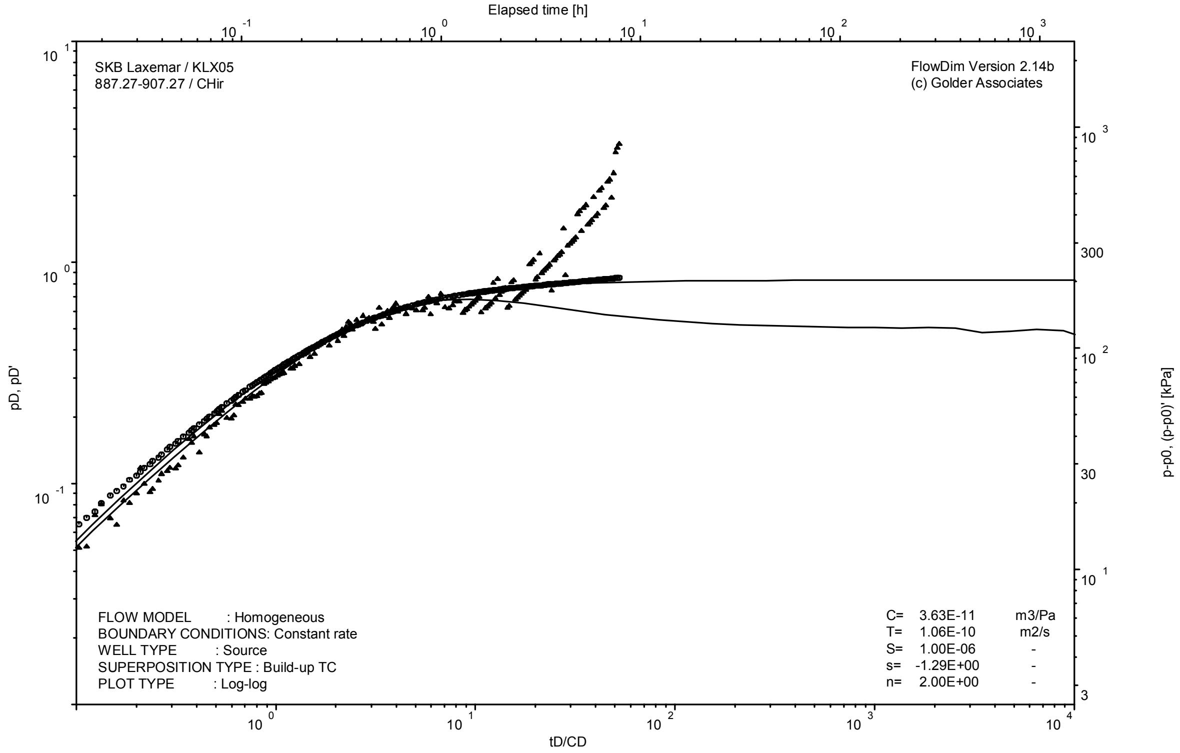
Pressure and flow rate vs. time; cartesian plot



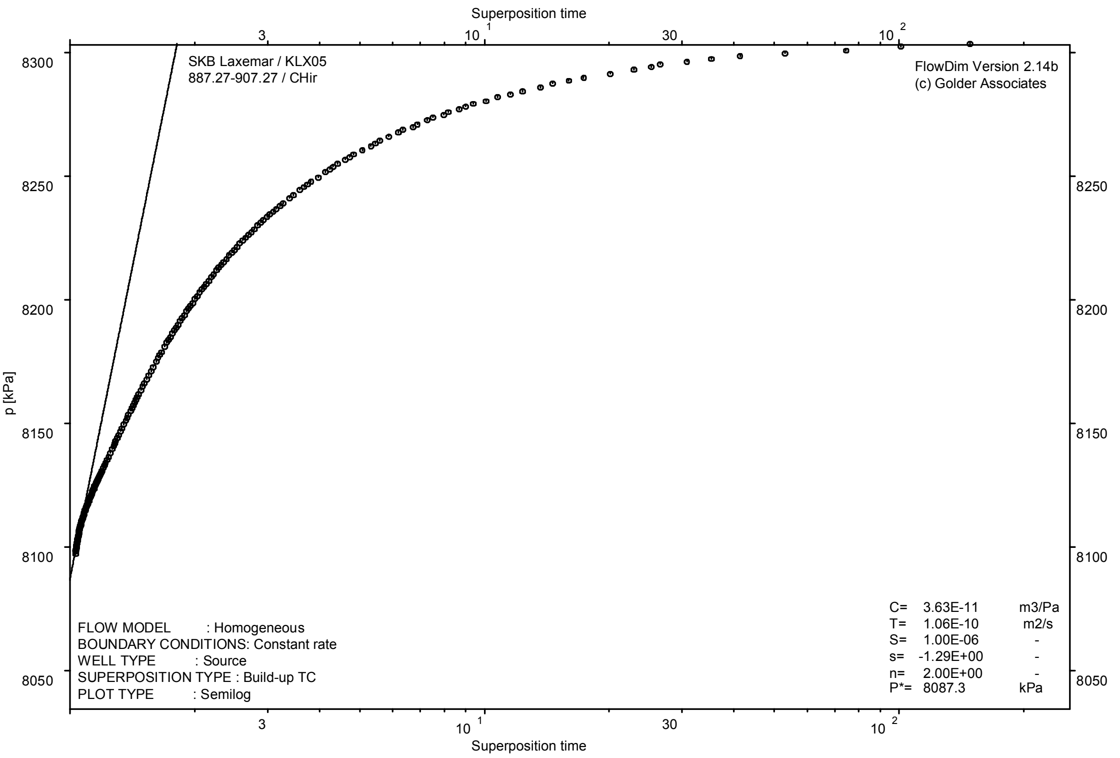
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

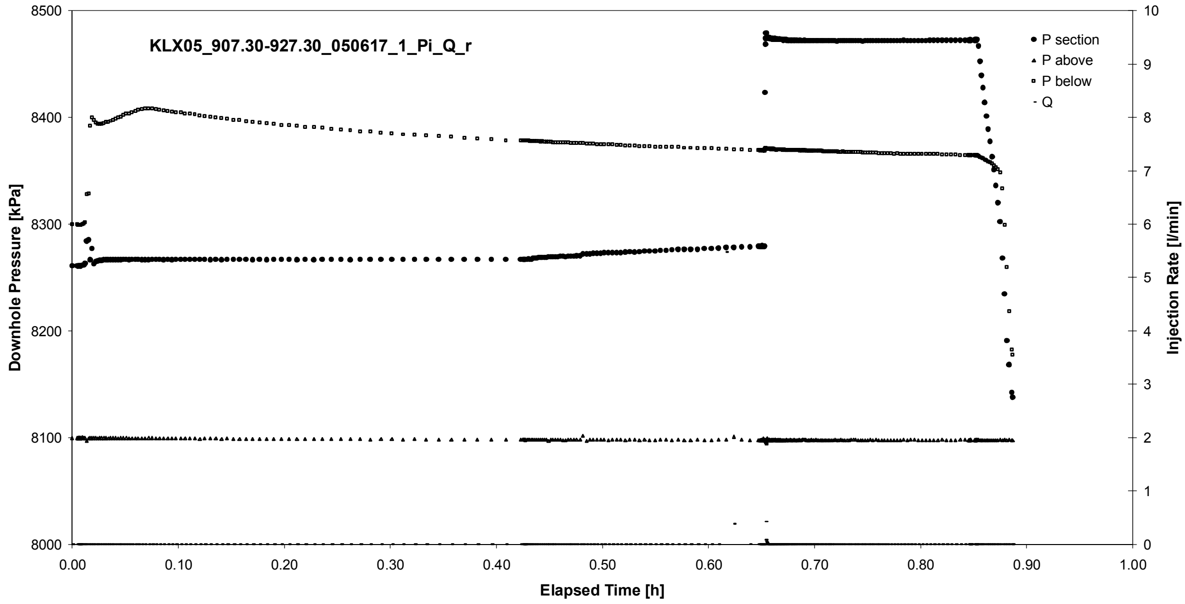


CHIR phase; HORNER match

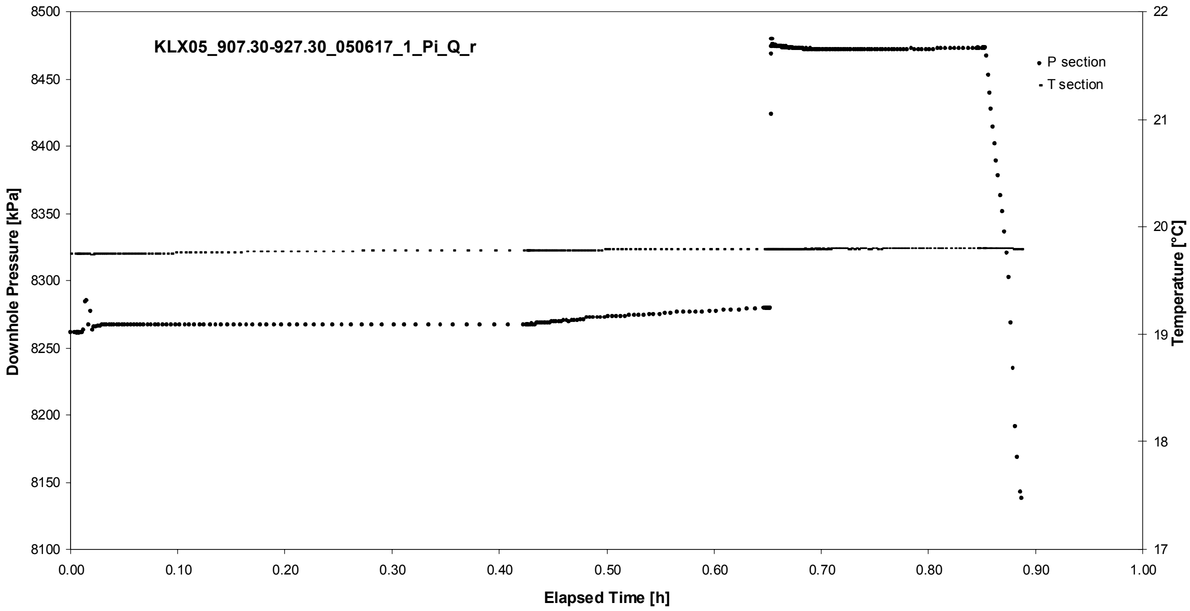
APPENDIX 2-47

Test 907.30 – 927.30 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

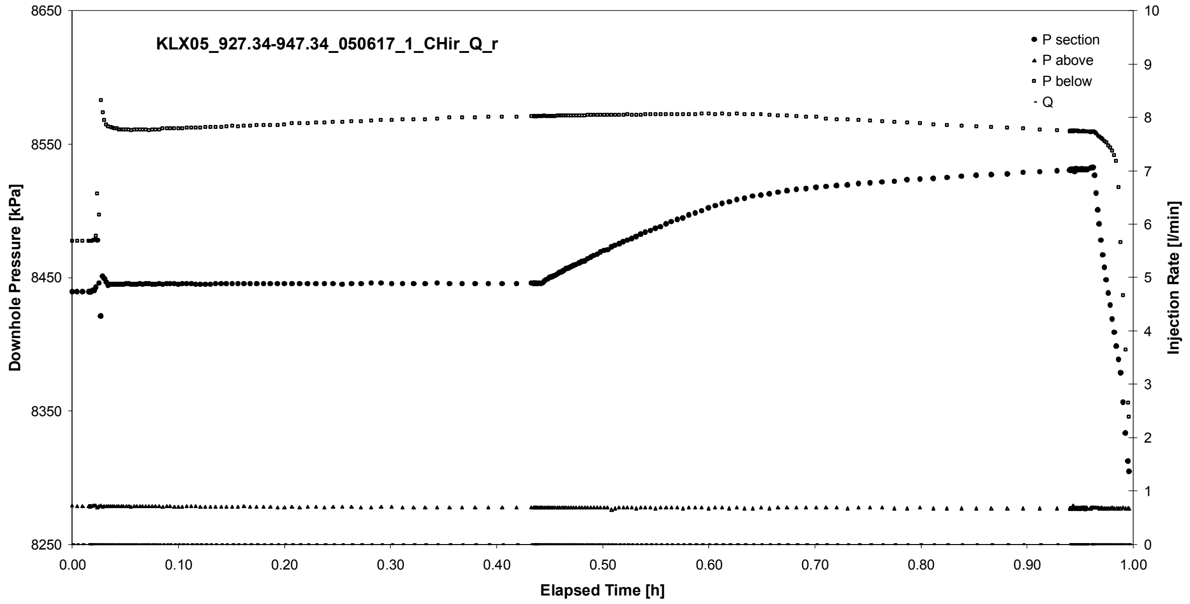
Not Analysed

CHIR phase; HORNER match

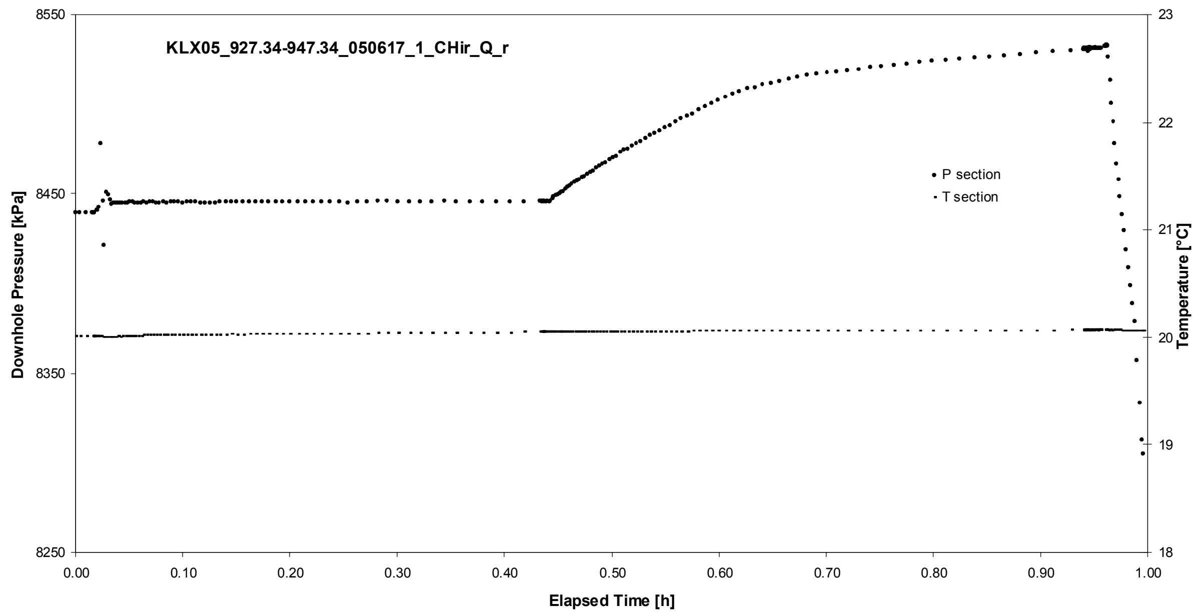
APPENDIX 2-48

Test 927.34 – 947.34 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

Not Analysed

CHIR phase; HORNER match

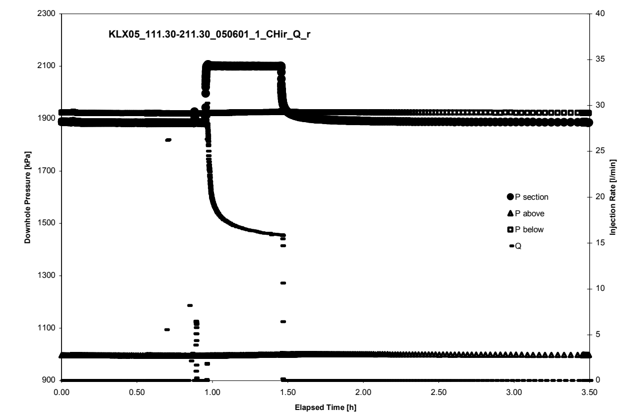
APPENDIX 3

Test Summary Sheets

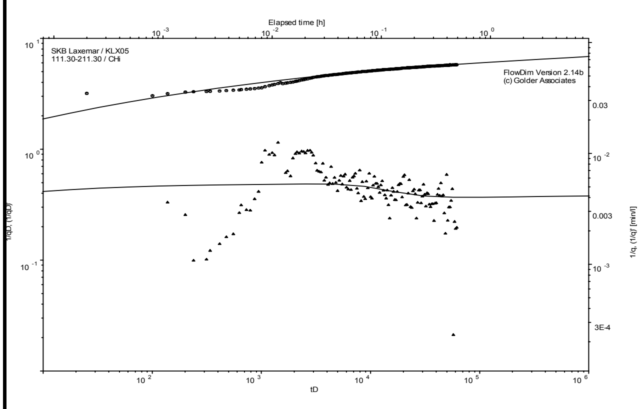
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050601 17:37
Test section from - to (m):	111.30-211.30	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

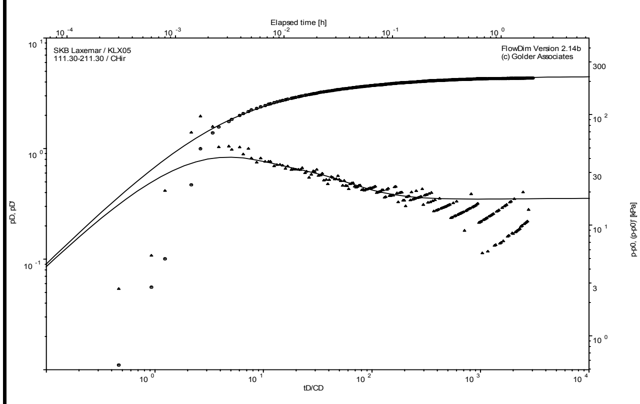
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1887		
p_i (kPa) =	1884		
p_p(kPa) =	2099	p_F (kPa) =	1885
Q_p (m^3/s)=	2.63E-04		
tp (s) =	1800	t_F (s) =	7200
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10		
Derivative fact.=	0.02	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	1.2E-05		
T_M (m^2/s)=	1.6E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.98	dt_1 (min) =	0.30
dt_2 (min) =	5.04	dt_2 (min) =	0.66
T (m^2/s) =	1.1E-05	T (m^2/s) =	9.1E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.1E-07	K_s (m/s) =	9.1E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.4E-08
C_D (-) =	NA	C_D (-) =	1.5E+00
ξ (-) =	-2.70	ξ (-) =	-3.64
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	
Selected representative parameters.			
dt_1 (min) =	0.30	C (m^3/Pa) =	1.4E-08
dt_2 (min) =	0.66	C_D (-) =	1.5E+00
T_T (m^2/s) =	9.1E-06	ξ (-) =	-3.64
S (-) =	1.0E-06		
K_s (m/s) =	9.1E-08		
S_s (1/m) =	1.0E-08		

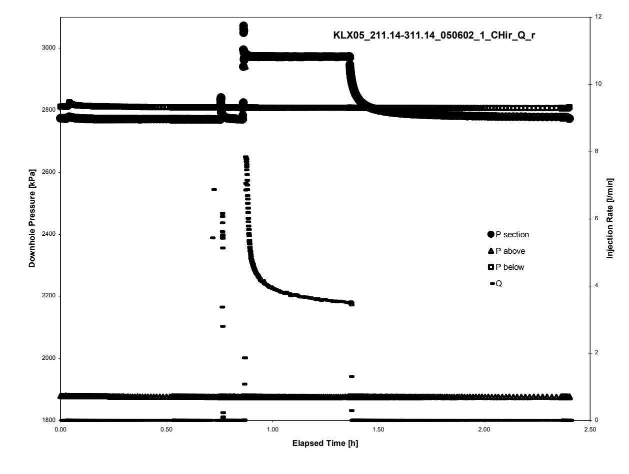
Comments:

The recommended transmissivity of 9.1E-6 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 7.0E-6 to 2.0E-5 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1882.8 kPa.

Test Summary Sheet

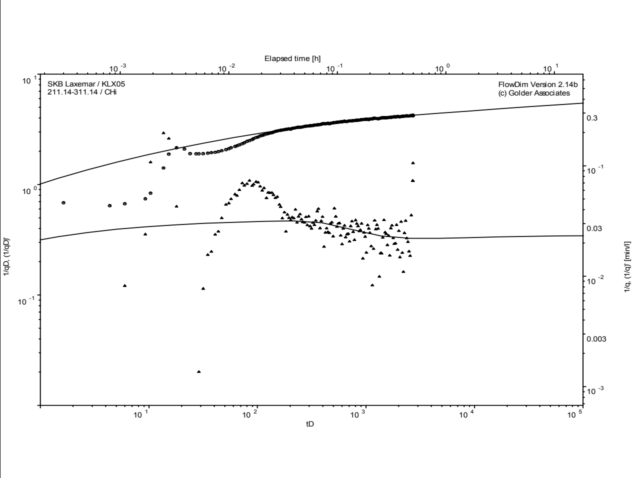
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050602 09:21
Test section from - to (m):	211.14-311.14 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

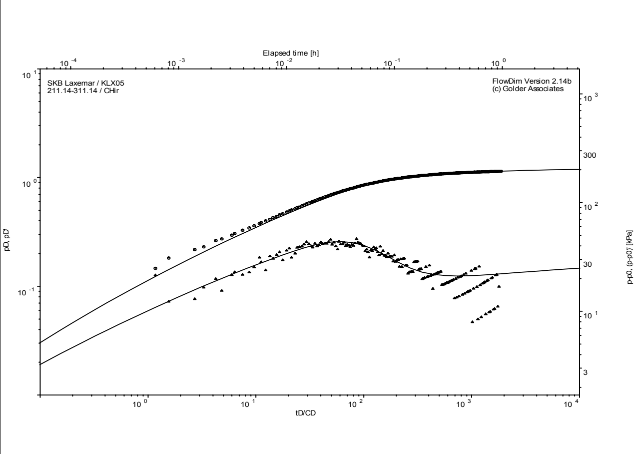


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	2774		
p_i (kPa) =	2772		
p_p(kPa) =	2972	p_F (kPa) =	2777
Q_p (m^3/s)=	5.80E-05		
tp (s) =	1800	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.2		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.8E-06		
T_M (m^2/s)=	3.7E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.87	dt_1 (min) =	14.67
dt_2 (min) =	4.27	dt_2 (min) =	44.15
T (m^2/s) =	1.9E-06	T (m^2/s) =	1.9E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.9E-08	K_s (m/s) =	1.9E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.3E-10
C_D (-) =	NA	C_D (-) =	8.0E-02
ξ (-) =	-3.39	ξ (-) =	-5.49
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.87	C (m^3/Pa) =	7.3E-10
dt_2 (min) =	4.27	C_D (-) =	8.0E-02
T_T (m^2/s) =	1.9E-06	ξ (-) =	-3.39
S (-) =	1.0E-06		
K_s (m/s) =	1.9E-08		
S_s (1/m) =	1.0E-08		

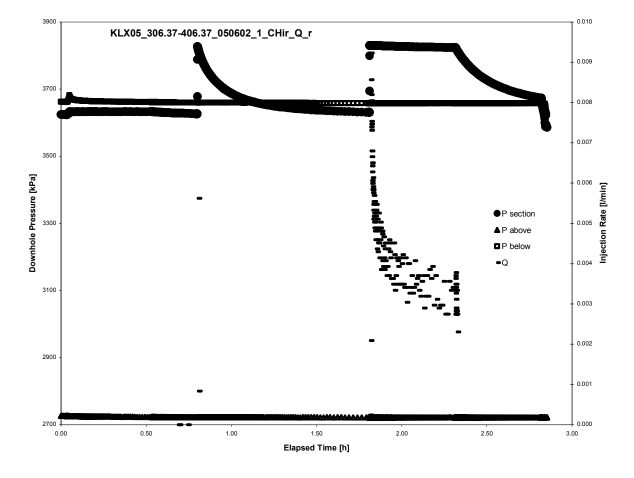
Comments:

The recommended transmissivity of 1.9E-6 m2/s was derived from the analysis of the CHi phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-7 to 4.0E-6 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2770.3 kPa.

Test Summary Sheet

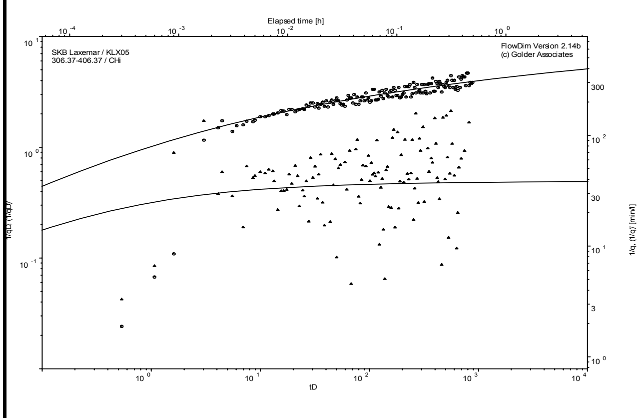
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050602 13:30
Test section from - to (m):	306.37-406.37 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

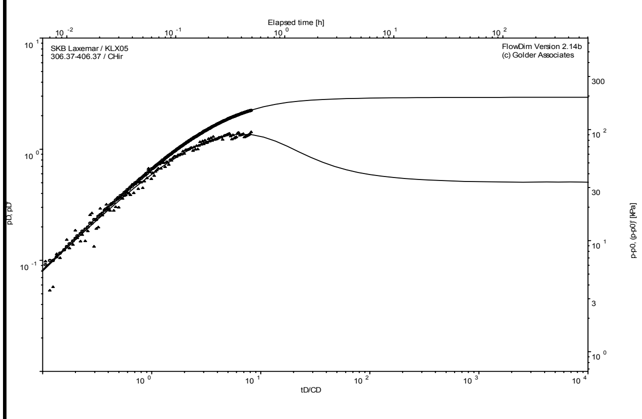


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3623		
p_i (kPa) =	3630		
p_p(kPa) =	3823	p_F (kPa) =	3673
Q_p (m^3/s)=	5.00E-08		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.5		
Derivative fact.=	0.14	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.5E-09		
T_M (m^2/s)=	3.3E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.59	dt_1 (min) =	16.94
dt_2 (min) =	16.65	dt_2 (min) =	29.48
T (m^2/s) =	1.7E-09	T (m^2/s) =	1.8E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.7E-11	K_s (m/s) =	1.8E-11
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.5E-10
C_D (-) =	NA	C_D (-) =	2.8E-02
ξ (-) =	-0.44	ξ (-) =	-0.69
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	16.94	C (m^3/Pa) =	2.5E-10
dt_2 (min) =	29.48	C_D (-) =	2.8E-02
T_T (m^2/s) =	1.8E-09	ξ (-) =	-0.69
S (-) =	1.0E-06		
K_s (m/s) =	1.8E-11		
S_s (1/m) =	1.0E-08		

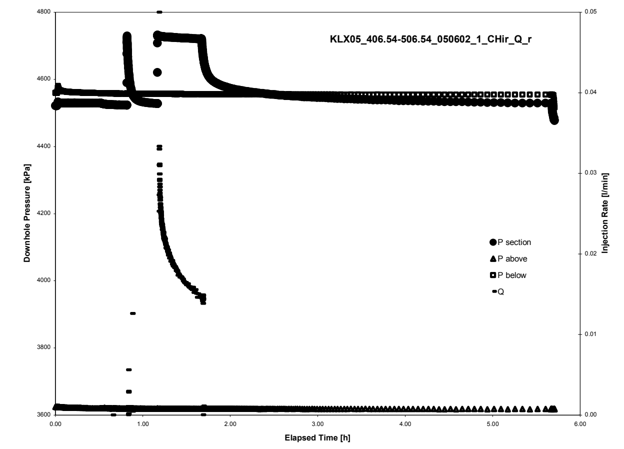
Comments:

TThe recommended transmissivity of 1.8E-9 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-10 to 3.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3613.2 kPa.

Test Summary Sheet

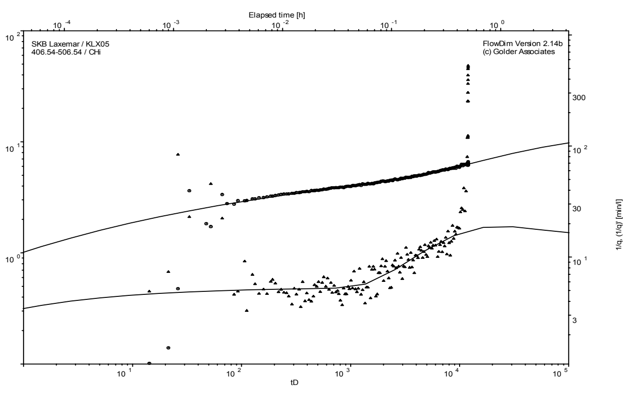
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050602 17:49
Test section from - to (m):	406.54-506.54	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

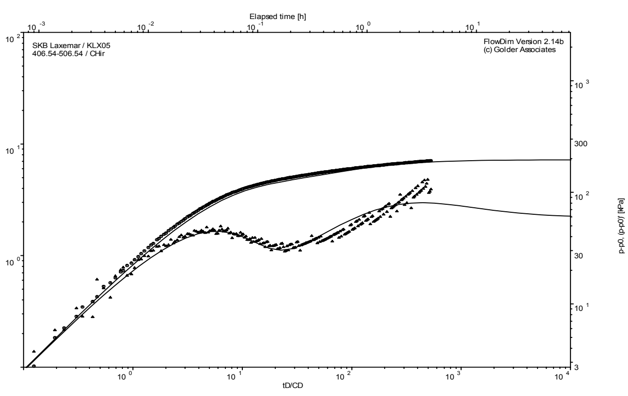


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4521		
p_i (kPa) =	4528		
p_p(kPa) =	4720	p_F (kPa) =	4529
Q_p (m^3/s)=	2.33E-07		
tp (s) =	1800	t_F (s) =	14400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.9		
Derivative fact.=	0.07	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	1.2E-08		
T_M (m^2/s)=	1.6E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.40	dt_1 (min) =	1.78
dt_2 (min) =	2.63	dt_2 (min) =	4.18
T (m^2/s) =	1.2E-08	T (m^2/s) =	1.9E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.2E-10	K_s (m/s) =	1.9E-10
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.1E-10
C_D (-) =	NA	C_D (-) =	3.4E-02
ξ (-) =	-0.14	ξ (-) =	0.55
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.78	C (m^3/Pa) =	3.1E-10
dt_2 (min) =	4.18	C_D (-) =	3.4E-02
T_T (m^2/s) =	1.9E-08	ξ (-) =	0.55
S (-) =	1.0E-06		
K_s (m/s) =	1.9E-10		
S_s (1/m) =	1.0E-08		

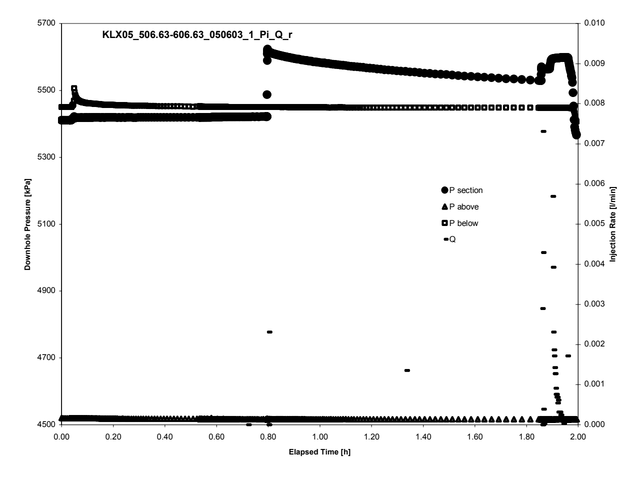
Comments:

The recommended transmissivity of 1.9E-8 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-9 to 4.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 4517.7 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050603 09:11
Test section from - to (m):	506.63-606.63 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

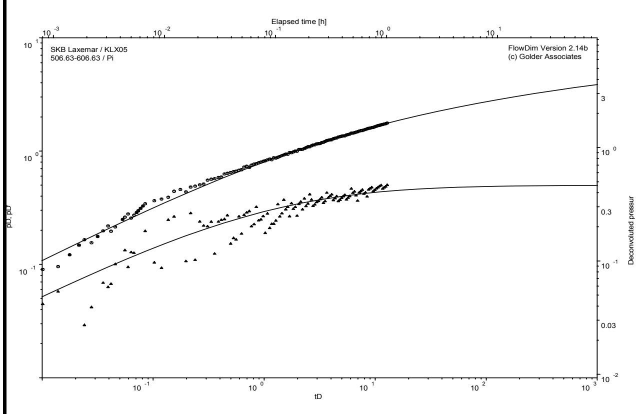
Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5410		
p_i (kPa) =	5421		
p_p(kPa) =	5623	p_F (kPa) =	5529
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	3840
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.2		
Derivative fact.=	NA	Derivative fact.=	0.05
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	9.4E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	9.4E-13
S_s (1/m) =	NA	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.0E-10
C_D (-) =	NA	C_D (-) =	2.2E-02
ξ (-) =	NA	ξ (-) =	-1.46
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	
Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	2.0E-10
dt_2 (min) =	NA	C_D (-) =	2.2E-02
T_T (m^2/s) =	9.4E-11	ξ (-) =	-1.46
S (-) =	1.0E-06		
K_s (m/s) =	9.4E-13		
S_s (1/m) =	1.0E-08		

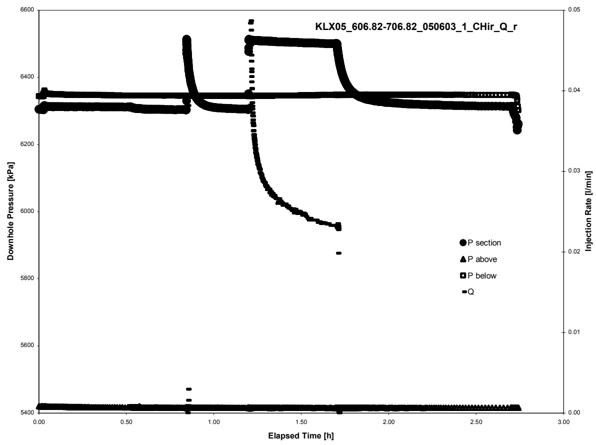
Comments:

The recommended transmissivity of 9.4E-11 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 6E-11 to 2E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

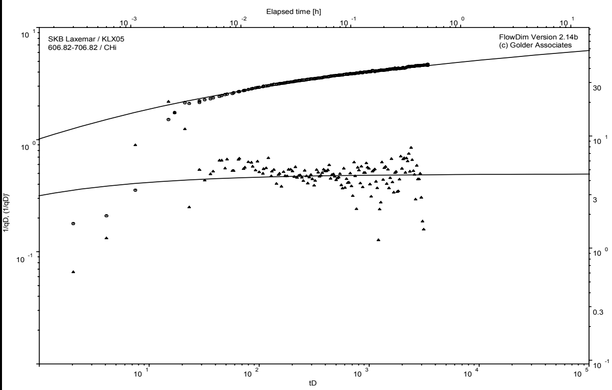
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050603 12:41
Test section from - to (m):	606.82-706.82 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

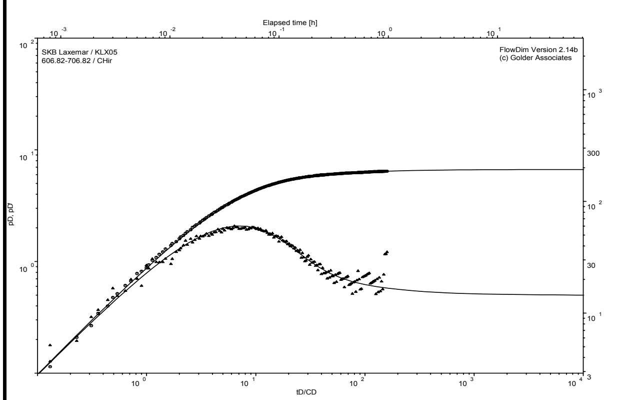
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	6304		
p_i (kPa) =	6305		
p_p(kPa) =	6500	p_F (kPa) =	6313
Q_p (m^3/s)=	3.83E-07		
tp (s) =	1800	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.6		
Derivative fact.=	0.05	Derivative fact.=	0.05
Results		**Results**	
Q/s (m^2/s)=	1.9E-08		
T_M (m^2/s)=	2.5E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.13	dt_1 (min) =	1.83
dt_2 (min) =	25.69	dt_2 (min) =	4.05
T (m^2/s) =	1.4E-08	T (m^2/s) =	2.5E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.4E-10	K_s (m/s) =	2.5E-10
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.5E-10
C_D (-) =	NA	C_D (-) =	3.9E-02
ξ (-) =	-0.38	ξ (-) =	1.18
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	1.83	C (m^3/Pa) =	3.5E-10
dt_2 (min) =	4.05	C_D (-) =	3.9E-02
T_T (m^2/s) =	2.5E-08	ξ (-) =	1.18
S (-) =	1.0E-06		
K_s (m/s) =	2.5E-10		
S_s (1/m) =	1.0E-08		

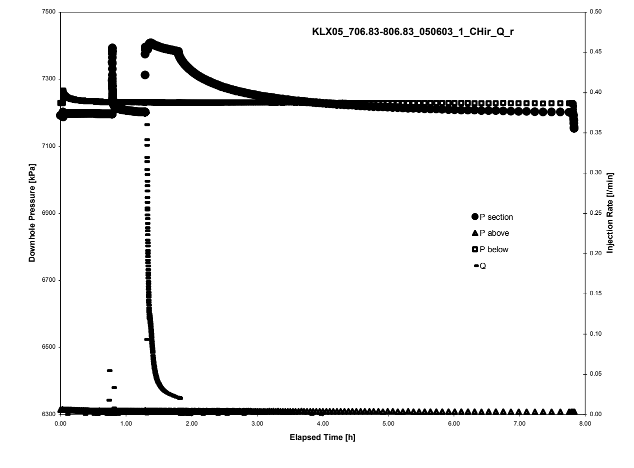
Comments:

The recommended transmissivity of 2.5E-8 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-9 to 4.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 6306.5 kPa.

Test Summary Sheet

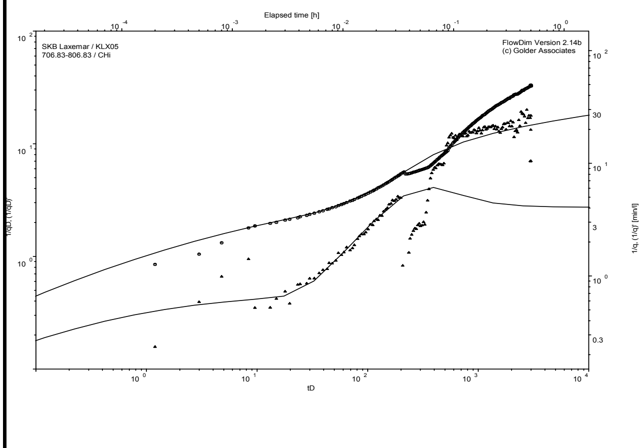
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050603 16:56
Test section from - to (m):	706.83-806.83 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

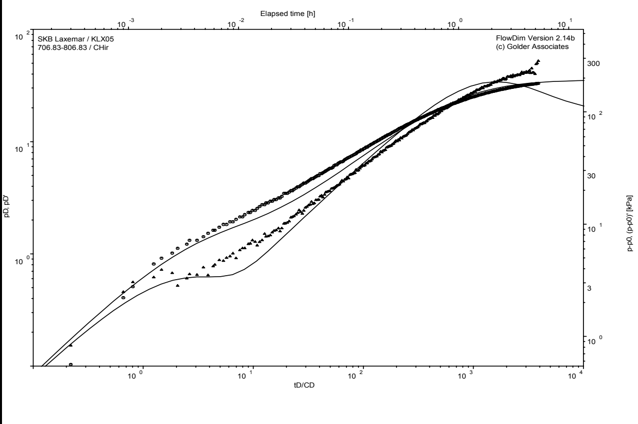


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	7191		
p_i (kPa) =	7201		
p_p(kPa) =	7382	p_F (kPa) =	7196
Q_p (m^3/s)=	3.33E-07		
tp (s) =	1800	t_F (s) =	21600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18		
Derivative fact.=	0.02	Derivative fact.=	0.17
Results		**Results**	
Q/s (m^2/s)=	1.8E-08		
T_M (m^2/s)=	2.4E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	9.7E-08	T (m^2/s) =	7.9E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	9.7E-10	K_s (m/s) =	7.9E-11
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.9E-10
C_D (-) =	NA	C_D (-) =	8.7E-02
ξ (-) =	-1.85	ξ (-) =	-2.22
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	7.9E-10
dt_2 (min) =	NA	C_D (-) =	8.7E-02
T_T (m^2/s) =	7.9E-09	ξ (-) =	-2.22
S (-) =	1.0E-06		
K_s (m/s) =	7.9E-11		
S_s (1/m) =	1.0E-08		

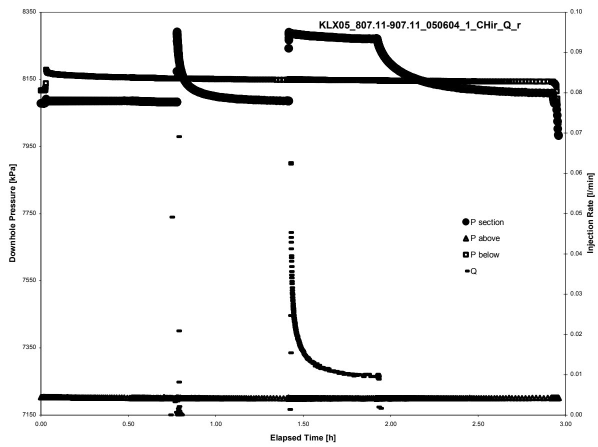
Comments:

The recommended transmissivity of 7.9E-9 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 4.0E-9 to 3.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7183.9 kPa.

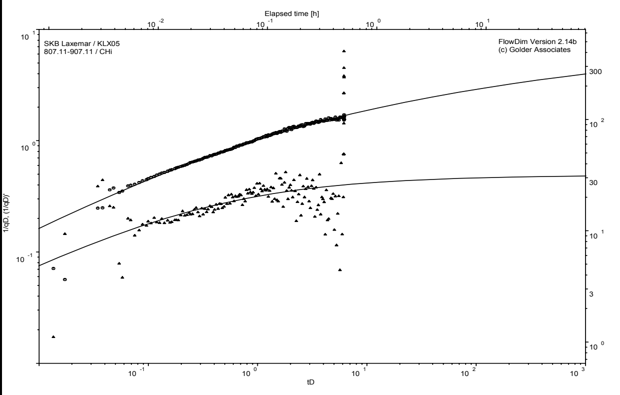
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050604 09:20
Test section from - to (m):	807.11-907.11 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

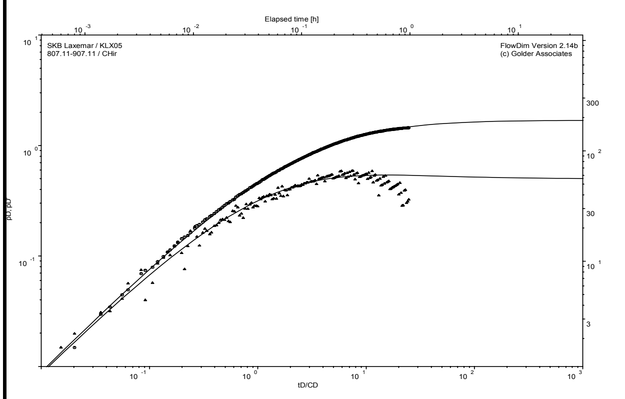
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	8078		
p_i (kPa) =	8086		
p_p(kPa) =	8269	p_F (kPa) =	8108
Q_p (m^3/s)=	1.67E-07		
tp (s) =	1800	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	19.5		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	8.9E-09		
T_M (m^2/s)=	1.2E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	9.47	dt_1 (min) =	11.17
dt_2 (min) =	16.69	dt_2 (min) =	34.05
T (m^2/s) =	2.2E-09	T (m^2/s) =	3.4E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.2E-11	K_s (m/s) =	3.4E-11
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.1E-10
C_D (-) =	NA	C_D (-) =	3.4E-02
ξ (-) =	-3.05	ξ (-) =	-2.82
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	11.17	C (m^3/Pa) =	3.1E-10
dt_2 (min) =	34.05	C_D (-) =	3.4E-02
T_T (m^2/s) =	3.4E-09	ξ (-) =	-2.82
S (-) =	1.0E-06		
K_s (m/s) =	3.4E-11		
S_s (1/m) =	1.0E-08		

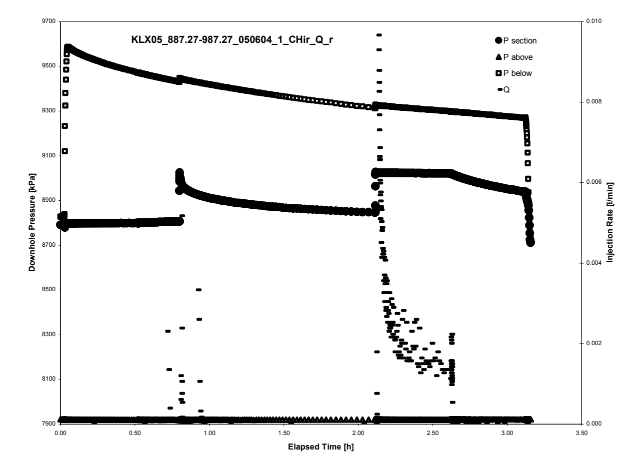
Comments:

The recommended transmissivity of 3.4E-9 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E-9 to 7.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 8082.9 kPa.

Test Summary Sheet

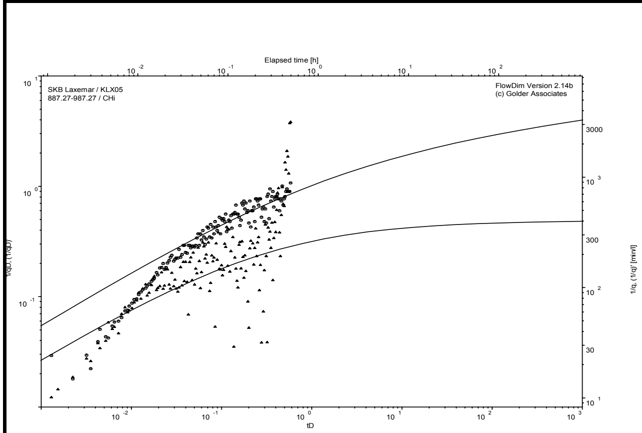
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050604 14:00
Test section from - to (m):	887.27-987.27 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

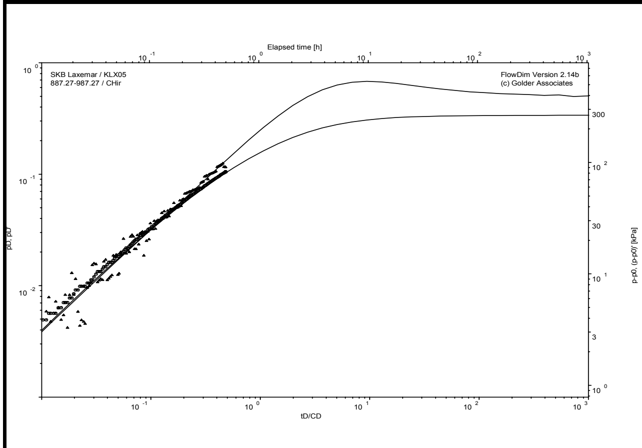


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	8791		
p_i (kPa) =	8847		
p_p(kPa) =	9022	p_F (kPa) =	8938
Q_p (m^3/s)=	1.67E-08		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	20.6		
Derivative fact.=	0.19	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	9.3E-10		
T_M (m^2/s)=	1.2E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.8E-10	T (m^2/s) =	1.2E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.8E-12	K_s (m/s) =	1.2E-12
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.9E-10
C_D (-) =	NA	C_D (-) =	3.2E-02
ξ (-) =	-2.97	ξ (-) =	-2.32
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	2.9E-10
dt_2 (min) =	NA	C_D (-) =	3.2E-02
T_T (m^2/s) =	1.2E-10	ξ (-) =	-2.32
S (-) =	1.0E-06		
K_s (m/s) =	1.2E-12		
S_s (1/m) =	1.0E-08		

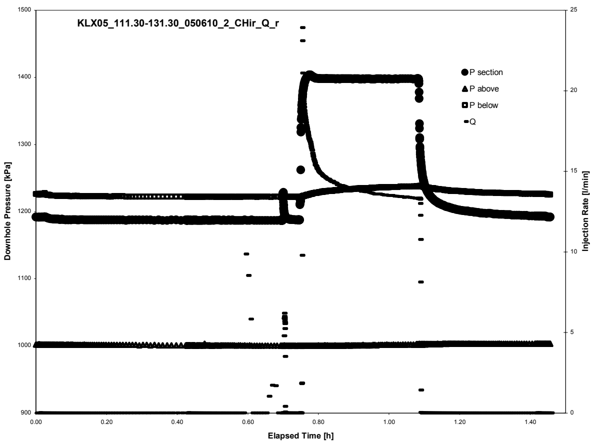
Comments:

The recommended transmissivity of 1.2E-10 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-11 to 4.0E-10 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth was not calculated due to the tight formation.

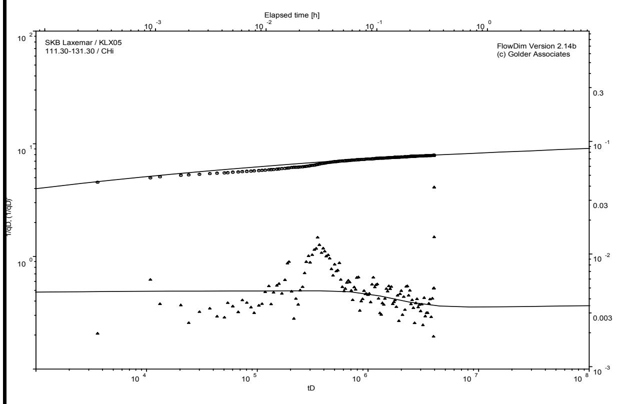
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX05	Test start:	050610 13:12
Test section from - to (m):	111.30-131.30 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

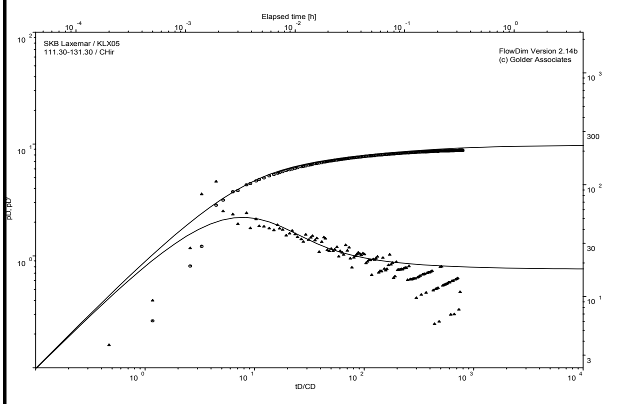
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1191		
p_i (kPa) =	1188		
p_p(kPa) =	1398	p_F (kPa) =	1192
Q_p (m^3/s)=	2.22E-04		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	8.9		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.0E-05		
T_M (m^2/s)=	1.1E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.59	dt_1 (min) =	2.75
dt_2 (min) =	1.22	dt_2 (min) =	5.03
T (m^2/s) =	1.3E-05	T (m^2/s) =	1.6E-05
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.5E-07	K_s (m/s) =	5.5E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.6E-08
C_D (-) =	NA	C_D (-) =	1.8E+00
ξ (-) =	-0.50	ξ (-) =	-0.27
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	2.75	C (m^3/Pa) =	1.6E-08
dt_2 (min) =	5.03	C_D (-) =	1.8E+00
T_T (m^2/s) =	1.6E-05	ξ (-) =	-0.27
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-07		
S_s (1/m) =	5.0E-08		

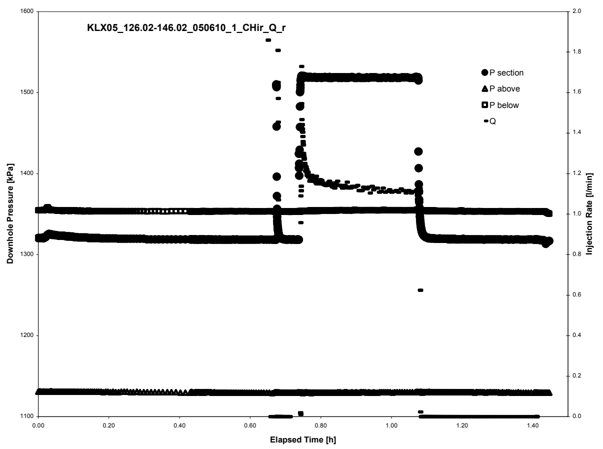
Comments:

The recommended transmissivity of 1.6E-5 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-06 to 3.0E-5 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1185.4 kPa.

Test Summary Sheet

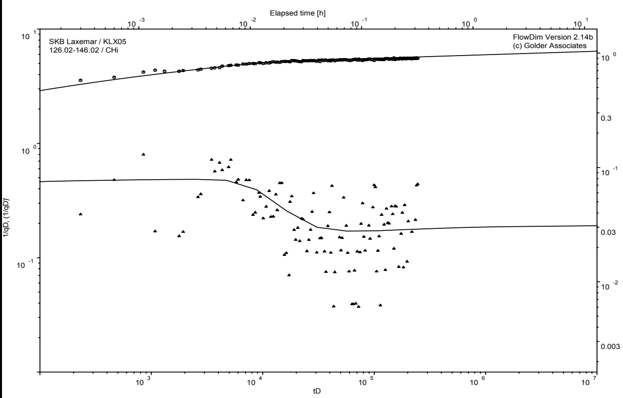
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050610 15:35
Test section from - to (m):	126.02-146.02 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

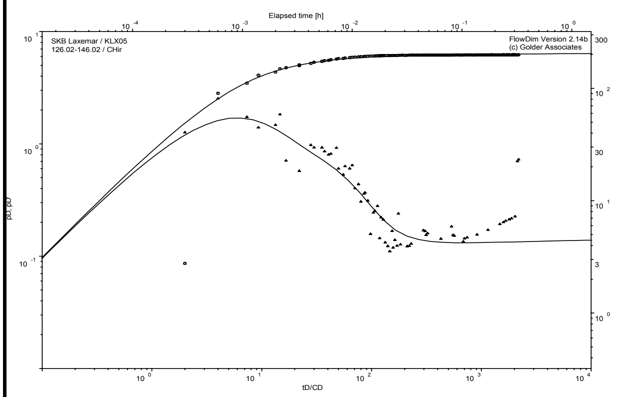


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1320		
p_i (kPa) =	1318		
p_p(kPa) =	1518	p_F (kPa) =	1318
Q_p (m^3/s)=	1.87E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.1		
Derivative fact.=	0.1	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	9.2E-07		
T_M (m^2/s)=	9.6E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	2.99	dt_1 (min) =	NA
dt_2 (min) =	16.92	dt_2 (min) =	NA
T (m^2/s) =	2.1E-06	T (m^2/s) =	9.3E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.1E-07	K_s (m/s) =	4.7E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.2E-10
C_D (-) =	NA	C_D (-) =	3.5E-02
ξ (-) =	-0.48	ξ (-) =	1.68
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	3.2E-10
dt_2 (min) =	NA	C_D (-) =	3.5E-02
T_T (m^2/s) =	9.3E-07	ξ (-) =	1.68
S (-) =	1.0E-06		
K_s (m/s) =	4.7E-08		
S_s (1/m) =	5.0E-08		

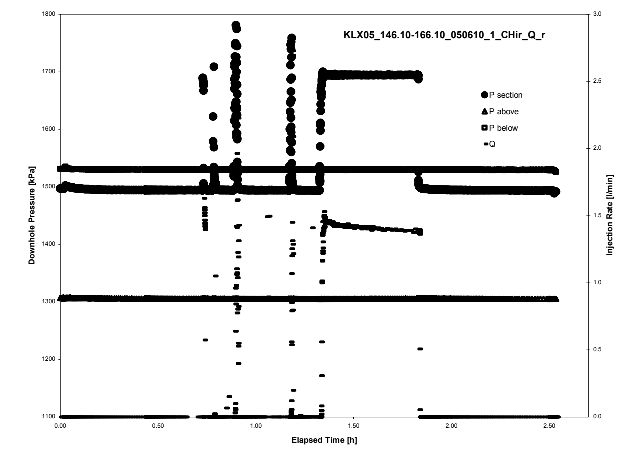
Comments:

The recommended transmissivity of 9.3E-7 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 7.0E-7 to 3.0E-6 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1317.5 kPa.

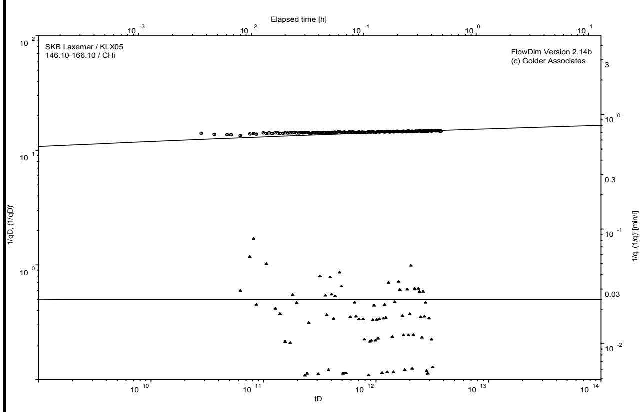
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050610 17:47
Test section from - to (m):	146.10-166.10	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

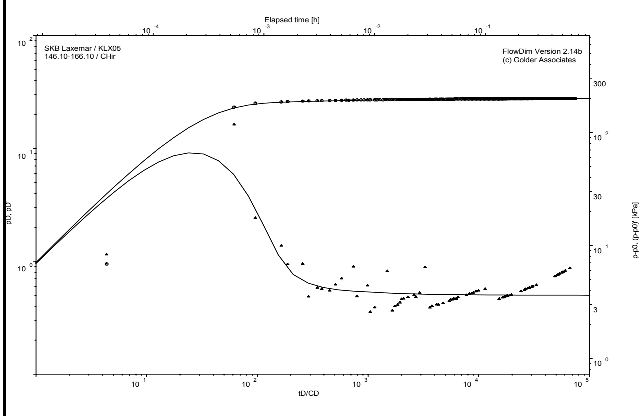
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1497		
p_i (kPa) =	1494		
p_p(kPa) =	1694	p_F (kPa) =	1494
Q_p (m^3/s)=	2.28E-05		
tp (s) =	1800	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.4		
Derivative fact.=	0.07	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	1.1E-06		
T_M (m^2/s)=	1.2E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.52	dt_1 (min) =	0.23
dt_2 (min) =	21.23	dt_2 (min) =	9.58
T (m^2/s) =	2.9E-06	T (m^2/s) =	5.1E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.5E-07	K_s (m/s) =	2.6E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.0E-10
C_D (-) =	NA	C_D (-) =	1.1E-02
ξ (-) =	6.98	ξ (-) =	20.67
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	0.23	C (m^3/Pa) =	1.0E-10
dt_2 (min) =	9.58	C_D (-) =	1.1E-02
T_T (m^2/s) =	5.1E-06	ξ (-) =	20.67
S (-) =	1.0E-06		
K_s (m/s) =	2.6E-07		
S_s (1/m) =	5.0E-08		

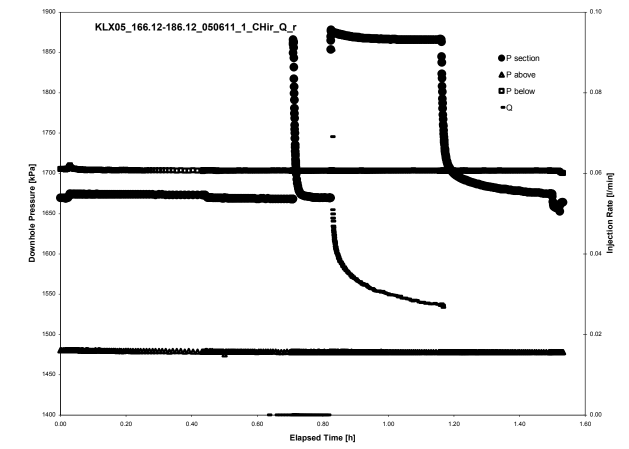
Comments:

The recommended transmissivity of 5.1E-6 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E-6 to 8.0E-6 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1492.6 kPa.

Test Summary Sheet

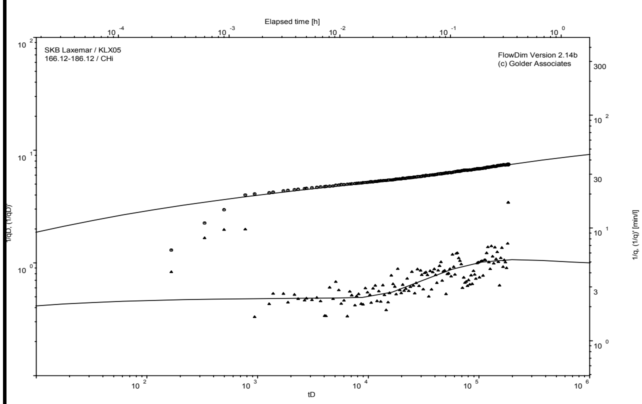
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050611 08:54
Test section from - to (m):	166.12-186.12 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

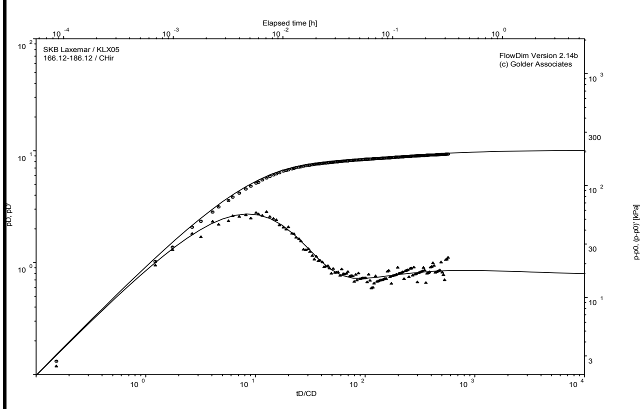


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1669		
p_i (kPa) =	1669		
p_p(kPa) =	1866	p_F (kPa) =	1674
Q_p (m^3/s)=	4.50E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.6		
Derivative fact.=	0.04	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	2.2E-08		
T_M (m^2/s)=	2.3E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.15	dt_1 (min) =	7.21
dt_2 (min) =	1.12	dt_2 (min) =	16.97
T (m^2/s) =	2.7E-08	T (m^2/s) =	2.6E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.4E-09	K_s (m/s) =	1.3E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.2E-11
C_D (-) =	NA	C_D (-) =	5.7E-03
ξ (-) =	1.05	ξ (-) =	4.01
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.15	C (m^3/Pa) =	5.2E-11
dt_2 (min) =	1.12	C_D (-) =	5.7E-03
T_T (m^2/s) =	2.7E-08	ξ (-) =	1.05
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-09		
S_s (1/m) =	5.0E-08		

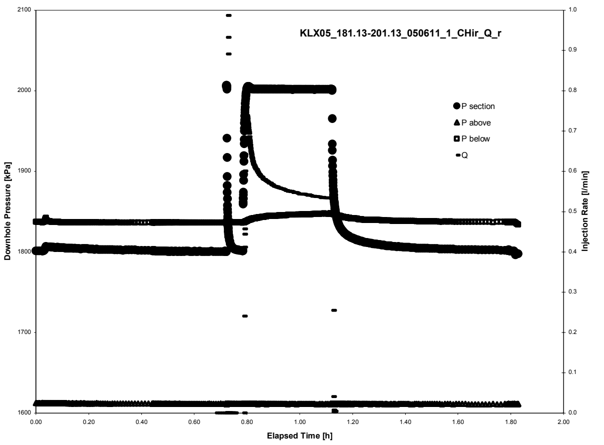
Comments:

The recommended transmissivity of 2.7E-8 m2/s was derived from the analysis of the CHi phase (inner zone), which shows a clear derivative stabilization. The confidence range for the interval transmissivity is estimated to be 1.0E-8 to 4.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1662.1 kPa.

Test Summary Sheet

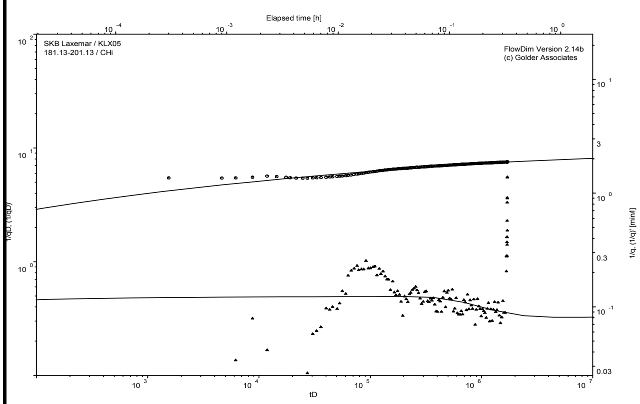
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050611 11:14
Test section from - to (m):	181.13-201.13 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

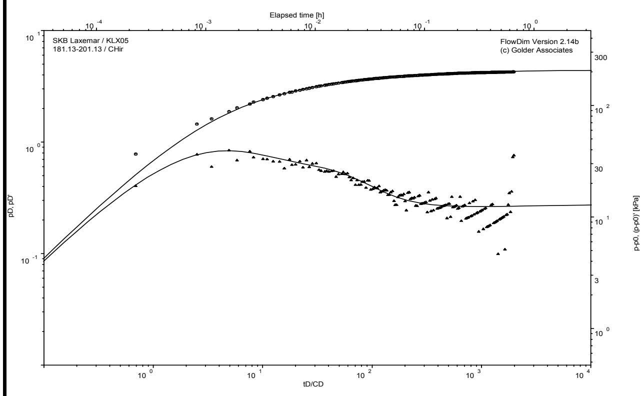


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1801		
p_i (kPa) =	1801		
p_p(kPa) =	2001	p_F (kPa) =	1802
Q_p (m^3/s)=	8.83E-06		
tp (s) =	1200	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.8		
Derivative fact.=	0.04	Derivative fact.=	0.05
Results		**Results**	
Q/s (m^2/s)=	4.3E-07		
T_M (m^2/s)=	4.5E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	2.14	dt_1 (min) =	0.46
dt_2 (min) =	4.28	dt_2 (min) =	1.05
T (m^2/s) =	5.2E-07	T (m^2/s) =	3.1E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.6E-08	K_s (m/s) =	1.6E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.4E-10
C_D (-) =	NA	C_D (-) =	2.6E-02
ξ (-) =	0.69	ξ (-) =	-1.63
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.46	C (m^3/Pa) =	2.4E-10
dt_2 (min) =	1.05	C_D (-) =	2.6E-02
T_T (m^2/s) =	3.1E-07	ξ (-) =	-1.63
S (-) =	1.0E-06		
K_s (m/s) =	1.6E-08		
S_s (1/m) =	5.0E-08		

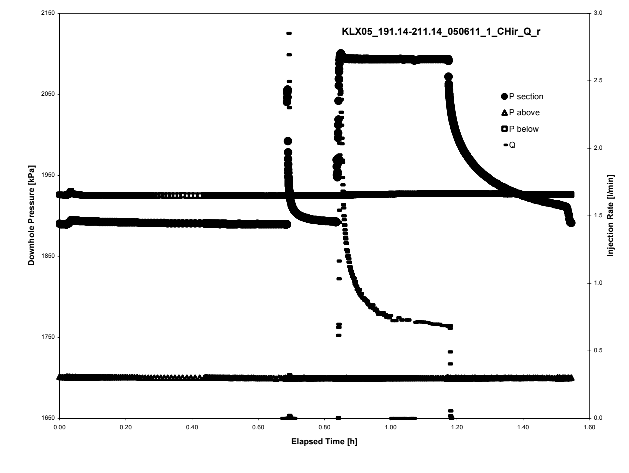
Comments:

The recommended transmissivity of 3.1E-7 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-8 to 6.0E-7 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1797.9 kPa.

Test Summary Sheet

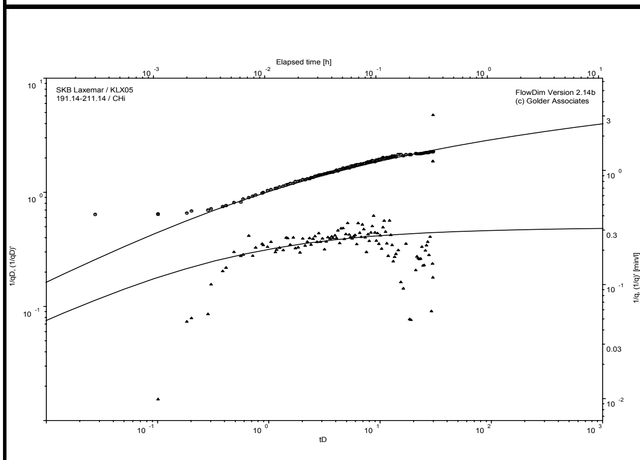
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050611 13:38
Test section from - to (m):	191.14-211.14 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

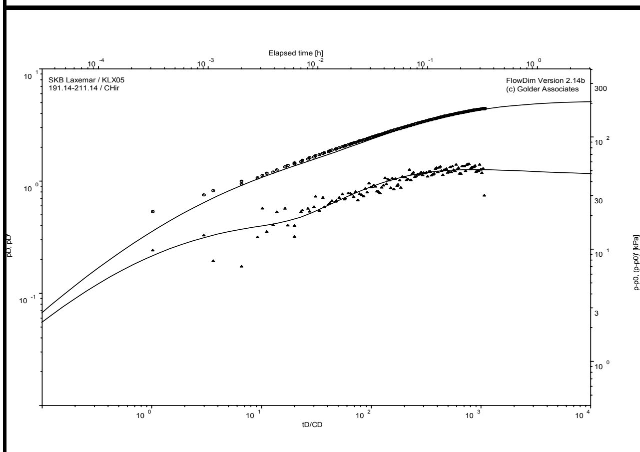


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1890		
p_i (kPa) =	1892		
p_p(kPa) =	2093	p_F (kPa) =	1914
Q_p (m^3/s)=	1.15E-05		
tp (s) =	1200	t_F (s) =	1200
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.9		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	5.6E-07		
T_M (m^2/s)=	5.9E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	2.15	dt_1 (min) =	6.35
dt_2 (min) =	7.32	dt_2 (min) =	18.27
T (m^2/s) =	2.0E-07	T (m^2/s) =	2.4E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.0E-08	K_s (m/s) =	1.2E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.8E-10
C_D (-) =	NA	C_D (-) =	4.2E-02
ξ (-) =	-4.30	ξ (-) =	-3.61
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	6.35	C (m^3/Pa) =	3.8E-10
dt_2 (min) =	18.27	C_D (-) =	4.2E-02
T_T (m^2/s) =	2.4E-07	ξ (-) =	-3.61
S (-) =	1.0E-06		
K_s (m/s) =	1.2E-08		
S_s (1/m) =	5.0E-08		

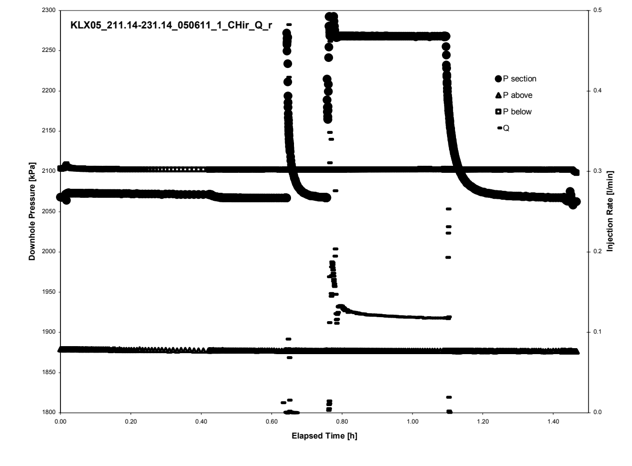
Comments:

The recommended transmissivity of 2.4E-7 m2/s was derived from the analysis of the CHir phase (outer zone), which shows a clear derivative stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E-8 to 4.0E-7 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1878.7 kPa.

Test Summary Sheet

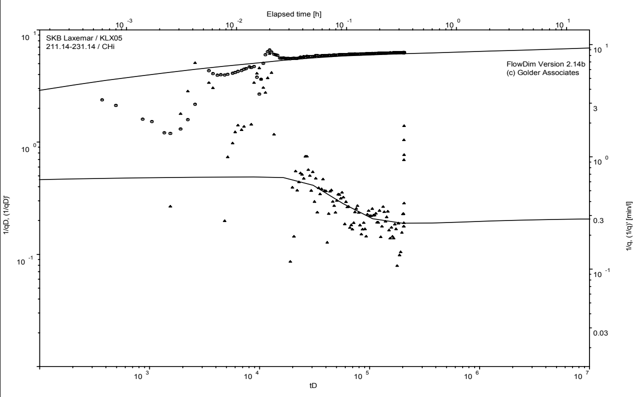
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050611 15:55
Test section from - to (m):	211.14-231.14 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

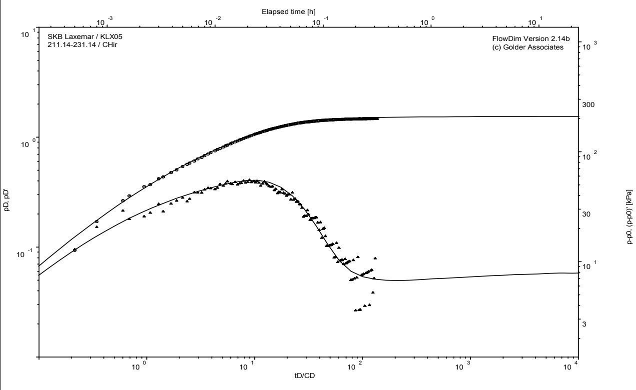


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2068		
p_i (kPa) =	2067		
p_p(kPa) =	2268	p_F (kPa) =	2067
Q_p (m^3/s)=	2.00E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.2		
Derivative fact.=	0.09	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	9.8E-08		
T_M (m^2/s)=	1.0E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	11.66	dt_1 (min) =	0.67
dt_2 (min) =	19.91	dt_2 (min) =	1.78
T (m^2/s) =	2.3E-07	T (m^2/s) =	2.5E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.2E-08	K_s (m/s) =	1.3E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.3E-10
C_D (-) =	NA	C_D (-) =	1.4E-02
ξ (-) =	0.48	ξ (-) =	-3.08
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.67	C (m^3/Pa) =	1.3E-10
dt_2 (min) =	1.78	C_D (-) =	1.4E-02
T_T (m^2/s) =	2.5E-08	ξ (-) =	-3.08
S (-) =	1.0E-06		
K_s (m/s) =	1.3E-09		
S_s (1/m) =	5.0E-08		

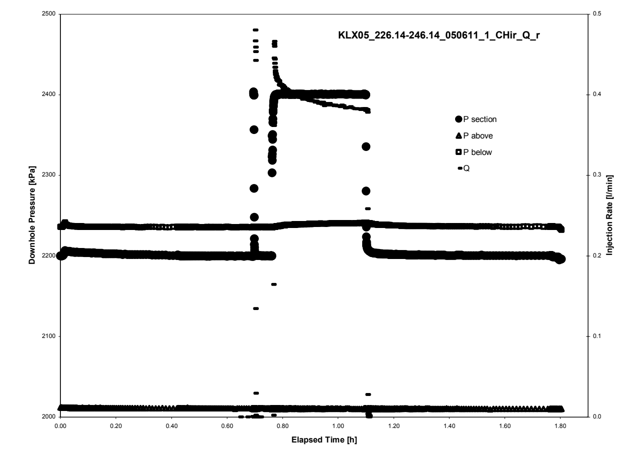
Comments:

The recommended transmissivity of 2.5E-8 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative. The confidence range for the interval transmissivity is estimated to be 9.0E-9 to 5.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2062.5 kPa.

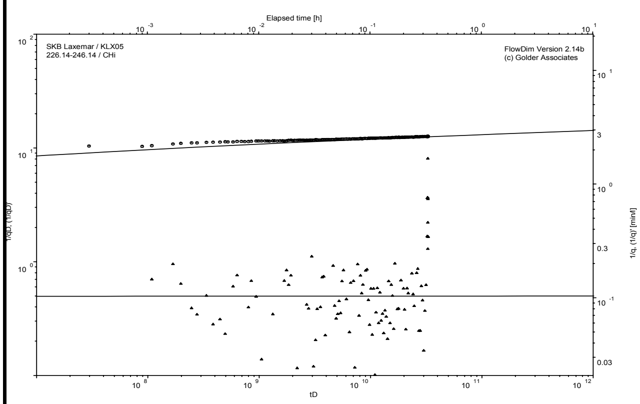
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050611 18:10
Test section from - to (m):	226.14-246.14 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

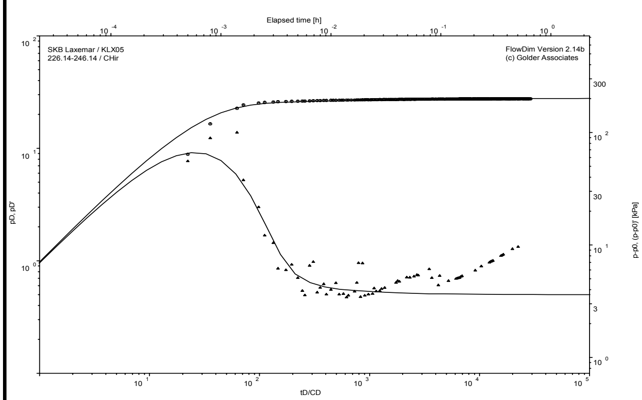
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	2200		
p_i (kPa) =	2200		
p_p(kPa) =	2401	p_F (kPa) =	2200
Q_p (m^3/s)=	6.33E-06		
tp (s) =	1200	t_F (s) =	2400
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.4		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.1E-07		
T_M (m^2/s)=	3.2E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.20	dt_1 (min) =	0.60
dt_2 (min) =	14.62	dt_2 (min) =	1.67
T (m^2/s) =	6.2E-07	T (m^2/s) =	1.4E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.1E-08	K_s (m/s) =	7.0E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.3E-11
C_D (-) =	NA	C_D (-) =	8.0E-03
ξ (-) =	5.53	ξ (-) =	20.84
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	0.20	C (m^3/Pa) =	7.3E-11
dt_2 (min) =	14.62	C_D (-) =	8.0E-03
T_T (m^2/s) =	6.2E-07	ξ (-) =	5.53
S (-) =	1.0E-06		
K_s (m/s) =	3.1E-08		
S_s (1/m) =	5.0E-08		

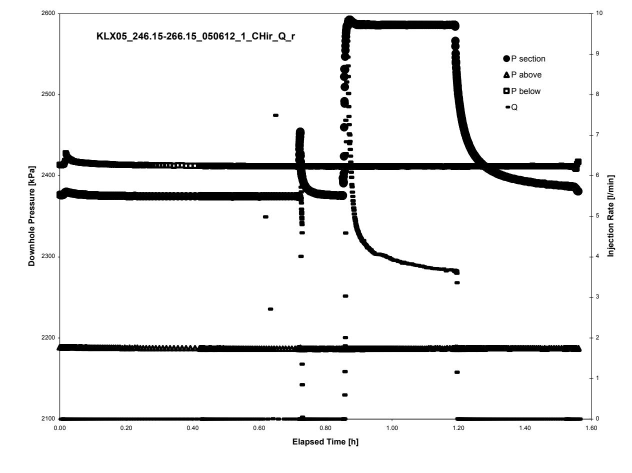
Comments:

The recommended transmissivity of 6.2E-7 m2/s was derived from the analysis of the CHi phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E-7 to 1.0E-6 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2199.8 kPa.

Test Summary Sheet

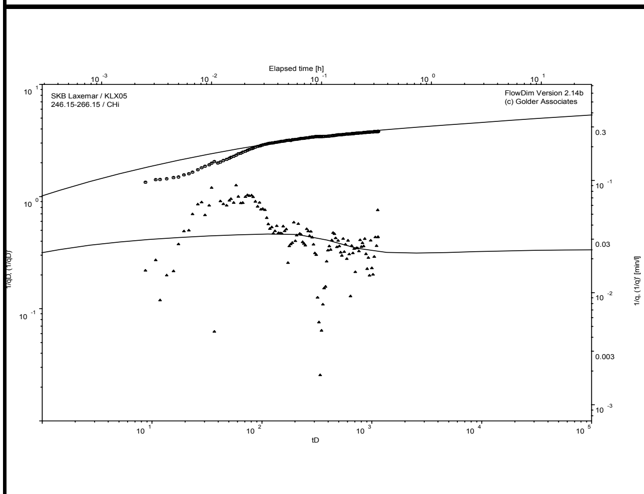
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050612 08:10
Test section from - to (m):	246.15-266.15 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

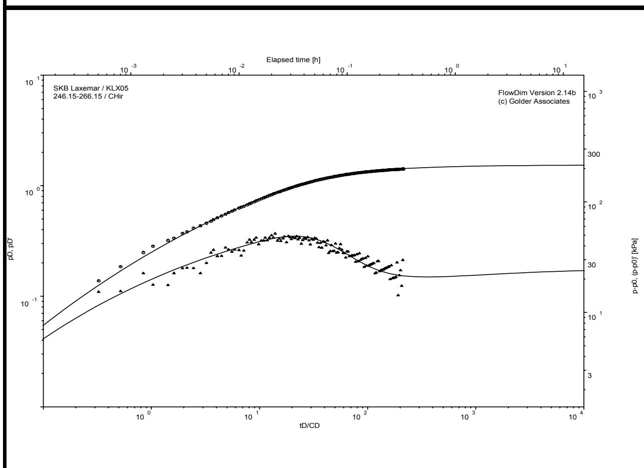


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2377		
p_i (kPa) =	2376		
p_p(kPa) =	2586	p_F (kPa) =	2387
Q_p (m^3/s)=	6.08E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.6		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.8E-06		
T_M (m^2/s)=	3.0E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	2.18	dt_1 (min) =	8.65
dt_2 (min) =	4.94	dt_2 (min) =	18.25
T (m^2/s) =	1.7E-06	T (m^2/s) =	2.2E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	8.5E-08	K_s (m/s) =	1.1E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.8E-09
C_D (-) =	NA	C_D (-) =	3.1E-01
ξ (-) =	-3.56	ξ (-) =	-5.16
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	8.65	C (m^3/Pa) =	2.8E-09
dt_2 (min) =	18.25	C_D (-) =	3.1E-01
T_T (m^2/s) =	2.2E-06	ξ (-) =	-5.16
S (-) =	1.0E-06		
K_s (m/s) =	1.1E-07		
S_s (1/m) =	5.0E-08		

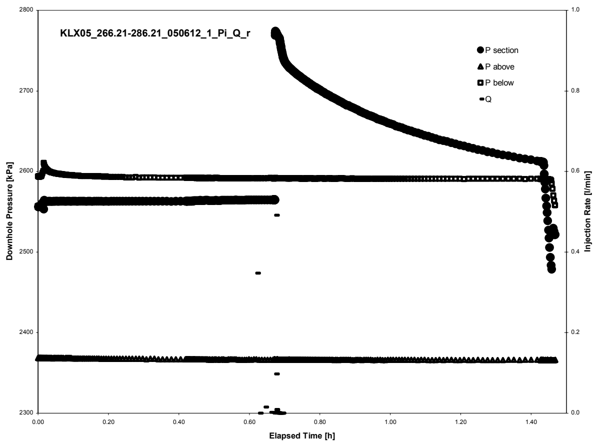
Comments:

The recommended transmissivity of 2.2E-6 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative. The confidence range for the interval transmissivity is estimated to be 9.0E-7 to 4.0E-6 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2371.3 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050612 10:21
Test section from - to (m):	266.21-286.21 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

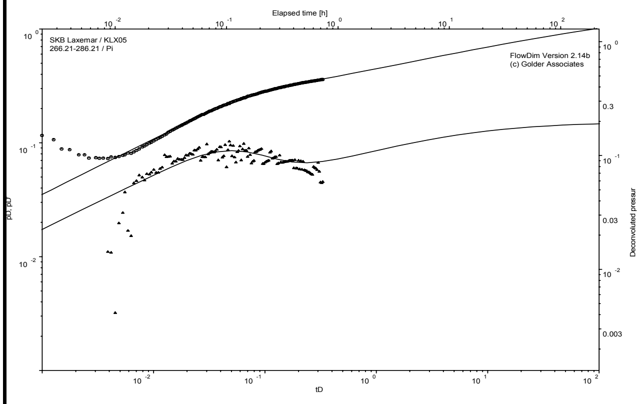


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2557		
p_i (kPa) =	2565		
p_p(kPa) =	2773	p_F (kPa) =	2613
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	2700
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.9		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	18.90
dt_2 (min) =	NA	dt_2 (min) =	36.60
T (m^2/s) =	NA	T (m^2/s) =	7.6E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	3.8E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.9E-11
C_D (-) =	NA	C_D (-) =	7.6E-03
ξ (-) =	NA	ξ (-) =	-2.43
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	18.90	C (m^3/Pa) =	6.9E-11
dt_2 (min) =	36.60	C_D (-) =	7.6E-03
T_T (m^2/s) =	7.6E-11	ξ (-) =	-2.43
S (-) =	1.0E-06		
K_s (m/s) =	3.8E-12		
S_s (1/m) =	5.0E-08		

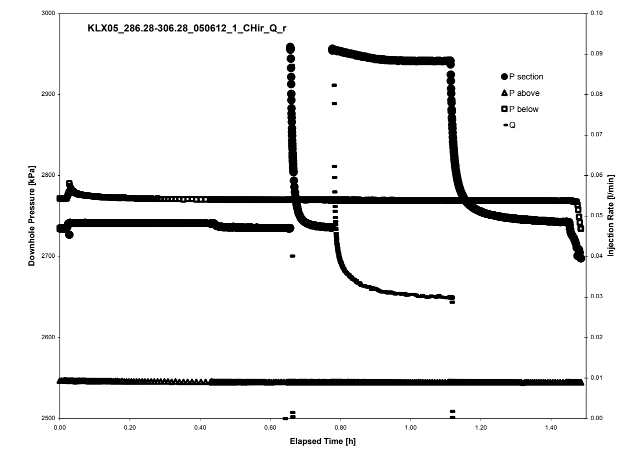
Comments:

The recommended transmissivity of 7.6E-11 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process , the confidence range for the transmissivity is estimated to be 2E-11 to 2E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

Test Summary Sheet

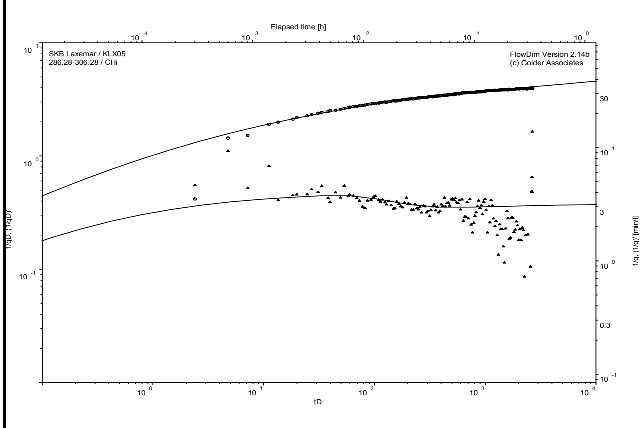
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050612 12:29
Test section from - to (m):	286.28-306.28 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

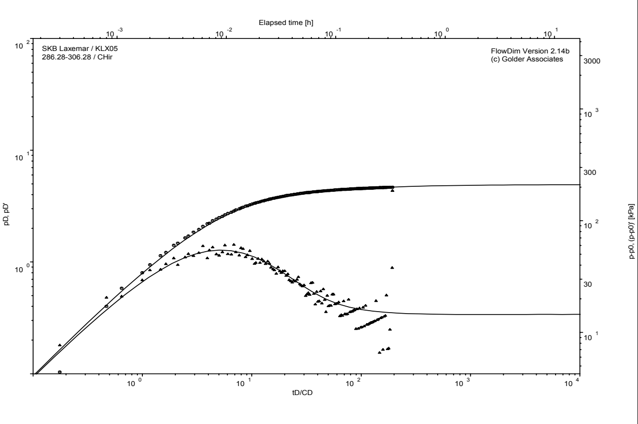


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	2735		
p_i (kPa) =	2736		
p_p(kPa) =	2941	p_F (kPa) =	2743
Q_p (m^3/s)=	5.00E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.1		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.4E-08		
T_M (m^2/s)=	2.5E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.94	dt_1 (min) =	8.93
dt_2 (min) =	8.75	dt_2 (min) =	17.03
T (m^2/s) =	2.0E-08	T (m^2/s) =	2.9E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.0E-09	K_s (m/s) =	1.5E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.9E-11
C_D (-) =	NA	C_D (-) =	8.7E-03
ξ (-) =	-0.78	ξ (-) =	0.08
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.94	C (m^3/Pa) =	7.9E-11
dt_2 (min) =	8.75	C_D (-) =	8.7E-03
T_T (m^2/s) =	2.0E-08	ξ (-) =	-0.78
S (-) =	1.0E-06		
K_s (m/s) =	1.0E-09		
S_s (1/m) =	5.0E-08		

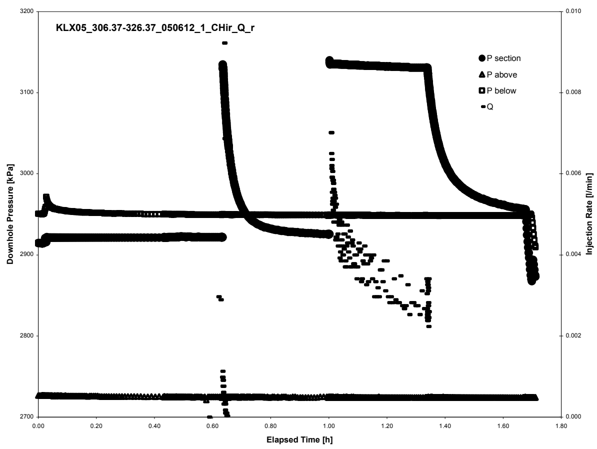
Comments:

The recommended transmissivity of 2.0E-8 m2/s was derived from the analysis of the CHi phase (outer zone), which shows the clearest derivative stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E-9 to 4.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2733.6 kPa.

Test Summary Sheet

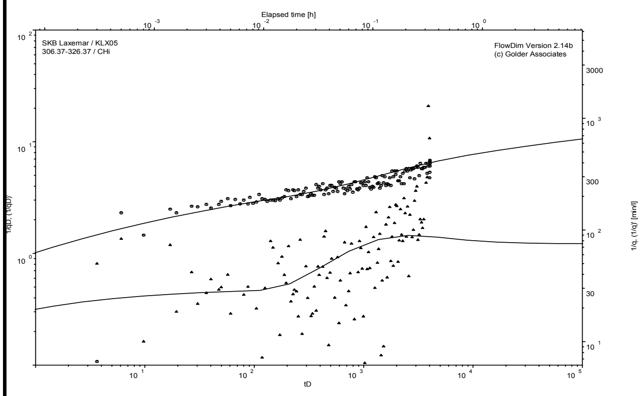
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050612 14:39
Test section from - to (m):	306.37-326.37 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

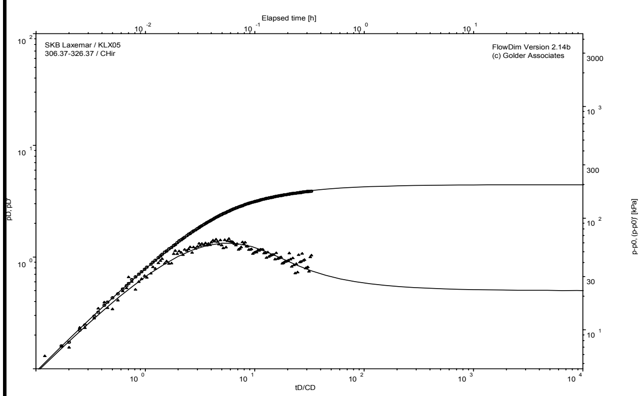


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2915		
p_i (kPa) =	2926		
p_p(kPa) =	3131	p_F (kPa) =	2956
Q_p (m^3/s)=	5.00E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.4		
Derivative fact.=	0.14	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.4E-09		
T_M (m^2/s)=	2.5E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.18	dt_1 (min) =	NA
dt_2 (min) =	0.97	dt_2 (min) =	NA
T (m^2/s) =	2.1E-09	T (m^2/s) =	2.2E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.1E-10	K_s (m/s) =	1.1E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.0E-11
C_D (-) =	NA	C_D (-) =	5.5E-03
ξ (-) =	0.43	ξ (-) =	0.31
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	5.0E-11
dt_2 (min) =	NA	C_D (-) =	5.5E-03
T_T (m^2/s) =	2.2E-09	ξ (-) =	0.31
S (-) =	1.0E-06		
K_s (m/s) =	1.1E-10		
S_s (1/m) =	5.0E-08		

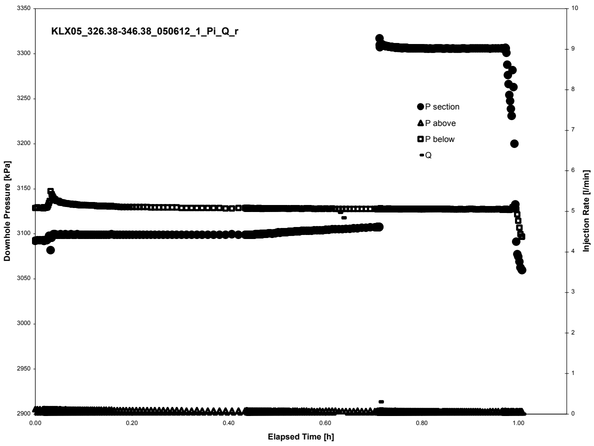
Comments:

The recommended transmissivity of 2.2E-9 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-10 to 4.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2929.0 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050612 17:03
Test section from - to (m):	326.38-346.38 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3092		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.7		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

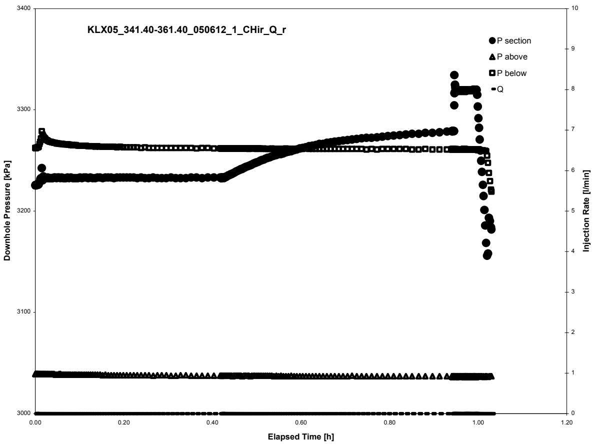
Comments:

Based on the test response the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050612 18:38
Test section from - to (m):	341.40-361.40 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3226		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.9		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

Log-Log plot incl. derivatives- recovery period

Not Analysed

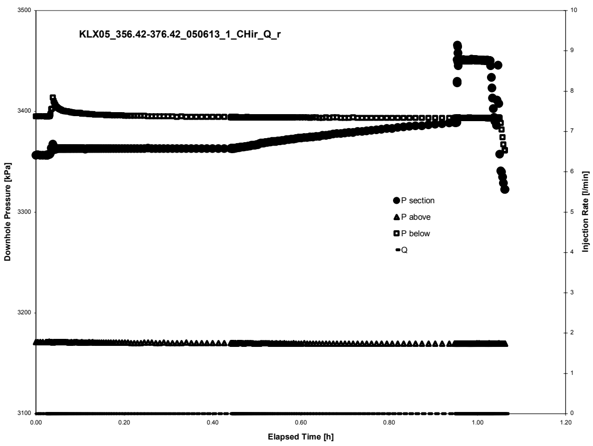
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 07:26
Test section from - to (m):	356.42-376.42 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3356		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.1		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

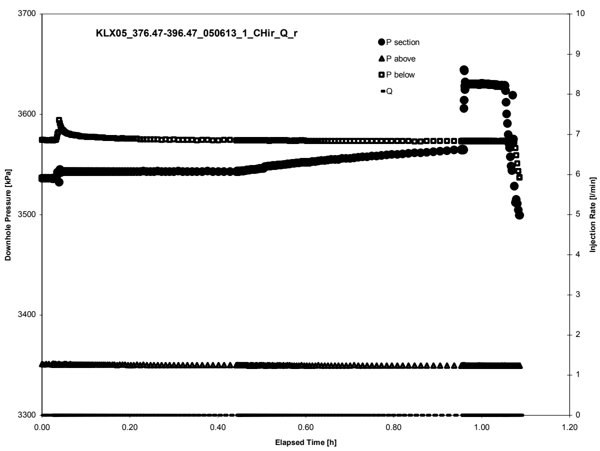
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 09:17
Test section from - to (m):	376.47-396.47 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3536		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.3		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

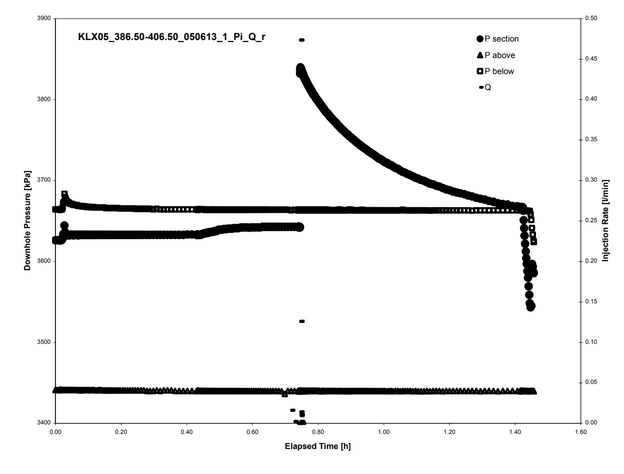
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 11:00
Test section from - to (m):	386.50-406.50 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

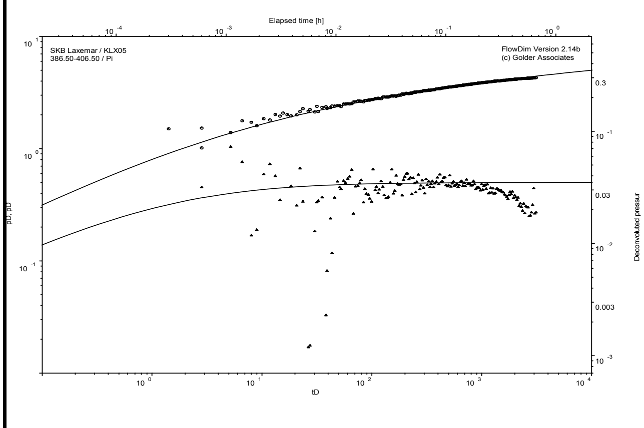


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3626		
p_i (kPa) =	3642		
p_p(kPa) =	3837	p_F (kPa) =	3668
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.5		
Derivative fact.=	NA	Derivative fact.=	0.08
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.62
dt_2 (min) =	NA	dt_2 (min) =	10.95
T (m^2/s) =	NA	T (m^2/s) =	4.4E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	2.2E-11
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.0E-11
C_D (-) =	NA	C_D (-) =	7.7E-03
ξ (-) =	NA	ξ (-) =	0.74
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.62	C (m^3/Pa) =	7.0E-11
dt_2 (min) =	10.95	C_D (-) =	7.7E-03
T_T (m^2/s) =	4.4E-10	ξ (-) =	0.74
S (-) =	1.0E-06		
K_s (m/s) =	2.2E-11		
S_s (1/m) =	5.0E-08		

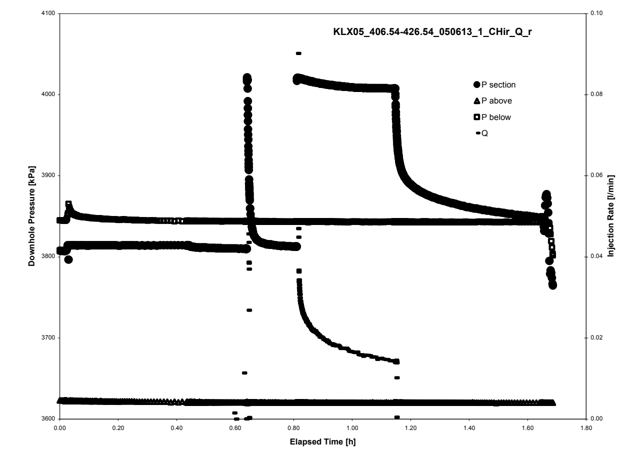
Comments:

The recommended transmissivity of 4.4E-10 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process, the confidence range for the transmissivity is estimated to be 1E-10 to 7E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

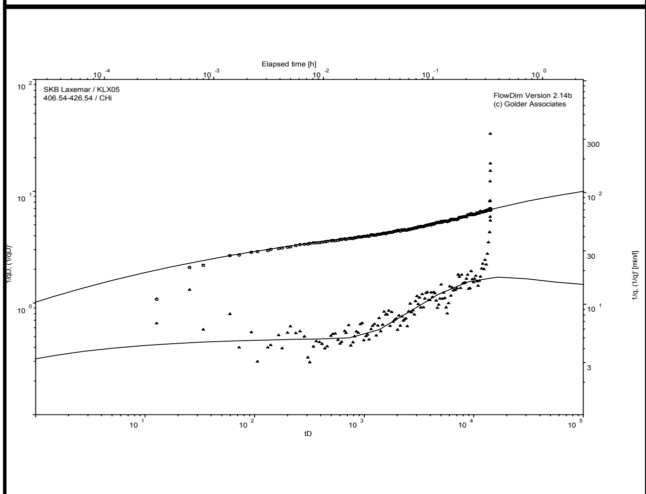
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 13:04
Test section from - to (m):	406.54-426.54 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

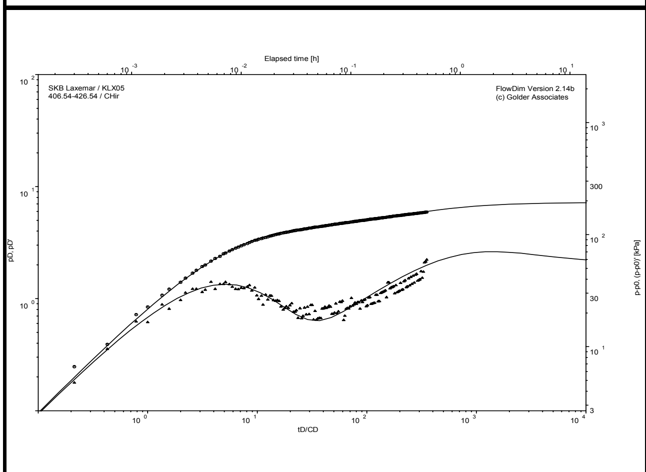
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3807		
p_i (kPa) =	3812		
p_p(kPa) =	4008	p_F (kPa) =	3849
Q_p (m^3/s)=	2.33E-07		
tp (s) =	1200	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.8		
Derivative fact.=	0.08	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	1.2E-08		
T_M (m^2/s)=	1.2E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.40	dt_1 (min) =	1.99
dt_2 (min) =	1.47	dt_2 (min) =	4.50
T (m^2/s) =	1.3E-08	T (m^2/s) =	1.8E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.5E-10	K_s (m/s) =	9.0E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.8E-11
C_D (-) =	NA	C_D (-) =	6.4E-03
ξ (-) =	0.14	ξ (-) =	0.25
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	1.99	C (m^3/Pa) =	5.8E-11
dt_2 (min) =	4.50	C_D (-) =	6.4E-03
T_T (m^2/s) =	1.8E-08	ξ (-) =	0.52
S (-) =	1.0E-06		
K_s (m/s) =	9.0E-10		
S_s (1/m) =	5.0E-08		

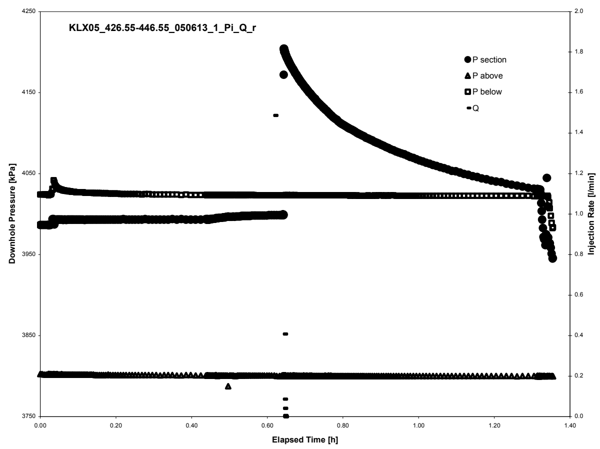
Comments:

The recommended transmissivity of 1.8E-8 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-9 to 3.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3827.3 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 15:32
Test section from - to (m):	426.55-446.55 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

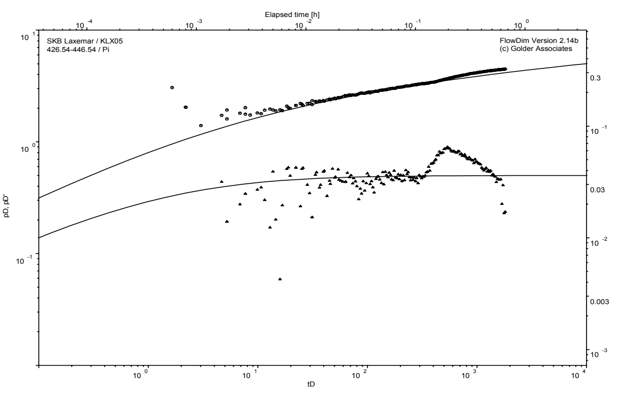


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3986		
p_i (kPa) =	3999		
p_p(kPa) =	4204	p_F (kPa) =	4030
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.1		
Derivative fact.=	NA	Derivative fact.=	0.1
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	1.12
dt_2 (min) =	NA	dt_2 (min) =	7.35
T (m^2/s) =	NA	T (m^2/s) =	3.4E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.7E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.6E-11
C_D (-) =	NA	C_D (-) =	6.2E-03
ξ (-) =	NA	ξ (-) =	0.59
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	1.12	C (m^3/Pa) =	5.6E-11
dt_2 (min) =	7.35	C_D (-) =	6.2E-03
T_T (m^2/s) =	3.4E-11	ξ (-) =	0.59
S (-) =	1.0E-06		
K_s (m/s) =	1.7E-12		
S_s (1/m) =	5.0E-08		

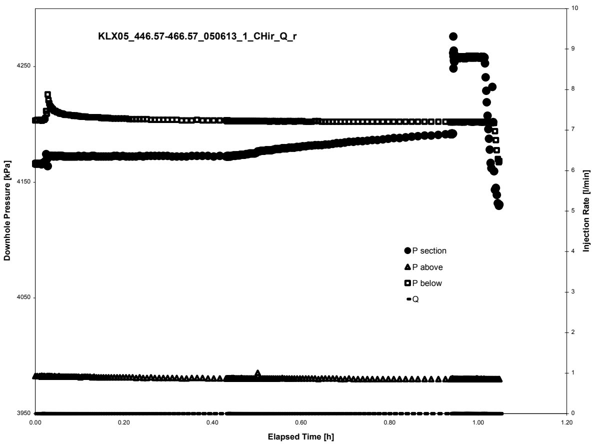
Comments:

The recommended transmissivity of 3.4E-11 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process, the confidence range for the transmissivity is estimated to be 1E-11 to 6E-11 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 17:33
Test section from - to (m):	446.57-466.57 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4166		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.3		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

Log-Log plot incl. derivatives- recovery period

Not Analysed

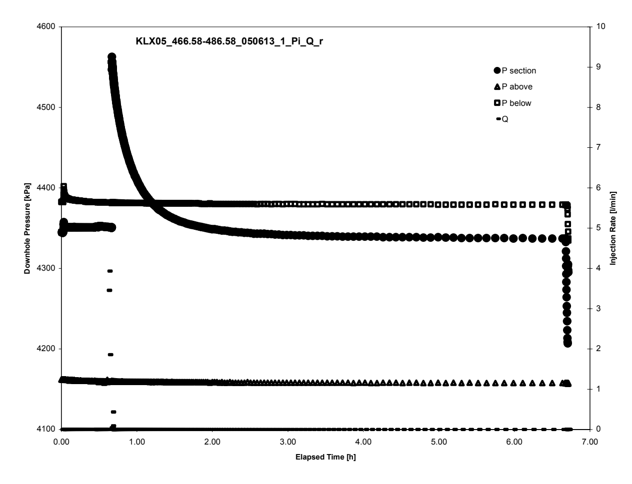
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050613 19:13
Test section from - to (m):	466.58-486.58 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

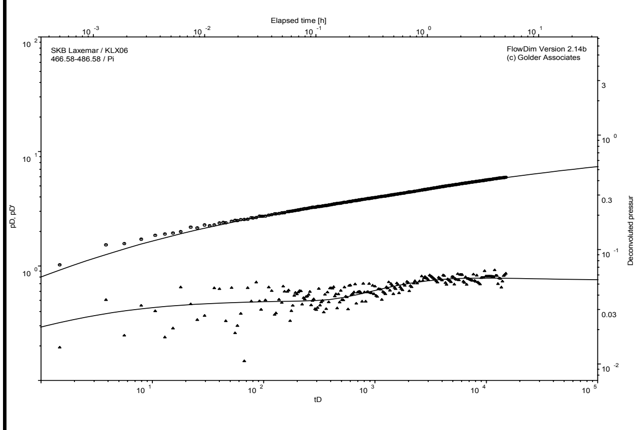


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4351		
p_i (kPa) =	4563		
p_p(kPa) =	NA	p_F (kPa) =	4337
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	21600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.6		
Derivative fact.=	NA	Derivative fact.=	0.07
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.45
dt_2 (min) =	NA	dt_2 (min) =	6.88
T (m^2/s) =	NA	T (m^2/s) =	3.7E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.8E-11
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.1E-11
C_D (-) =	NA	C_D (-) =	6.7E-03
ξ (-) =	NA	ξ (-) =	0.58
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.45	C (m^3/Pa) =	6.1E-11
dt_2 (min) =	6.88	C_D (-) =	6.7E-03
T_T (m^2/s) =	3.7E-10	ξ (-) =	0.58
S (-) =	1.0E-06		
K_s (m/s) =	1.8E-11		
S_s (1/m) =	5.0E-08		

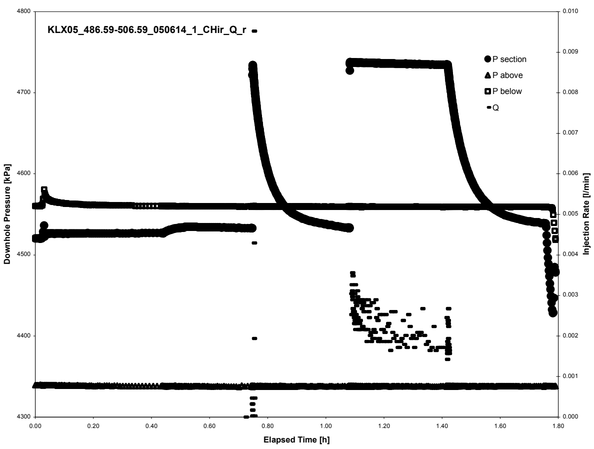
Comments:

The recommended transmissivity of 3.7E-10 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process, the confidence range for the transmissivity is estimated to be 9.0E-11 to 6.0E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

Test Summary Sheet

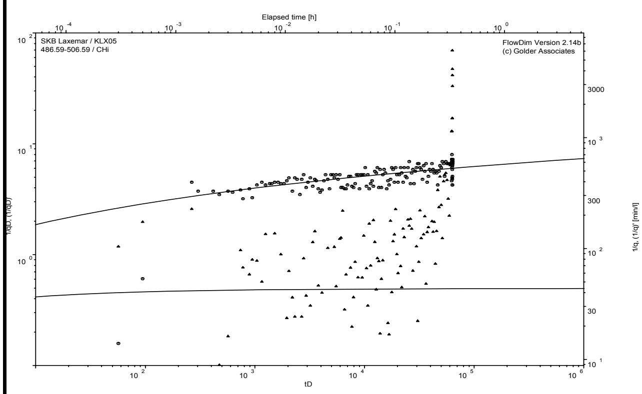
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050614 07:40
Test section from - to (m):	486.59-506.59 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

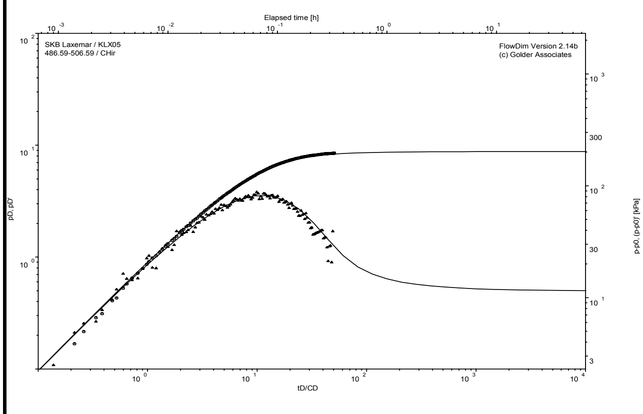


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4520		
p_i (kPa) =	4533		
p_p(kPa) =	4735	p_F (kPa) =	4539
Q_p (m^3/s)=	3.33E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.9		
Derivative fact.=	0.2	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.6E-09		
T_M (m^2/s)=	1.7E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.20	dt_1 (min) =	NA
dt_2 (min) =	6.93	dt_2 (min) =	NA
T (m^2/s) =	1.5E-09	T (m^2/s) =	2.7E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	7.5E-11	K_s (m/s) =	1.4E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.8E-11
C_D (-) =	NA	C_D (-) =	5.3E-03
ξ (-) =	1.97	ξ (-) =	5.01
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	4.8E-11
dt_2 (min) =	NA	C_D (-) =	5.3E-03
T_T (m^2/s) =	2.7E-09	ξ (-) =	5.01
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-10		
S_s (1/m) =	5.0E-08		

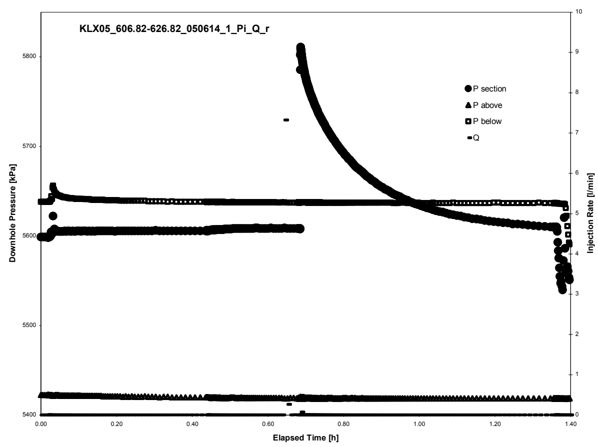
Comments:

The recommended transmissivity of 2.7E-9 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-10 to 5.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 4516.0 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050614 11:09
Test section from - to (m):	606.82-626.82 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

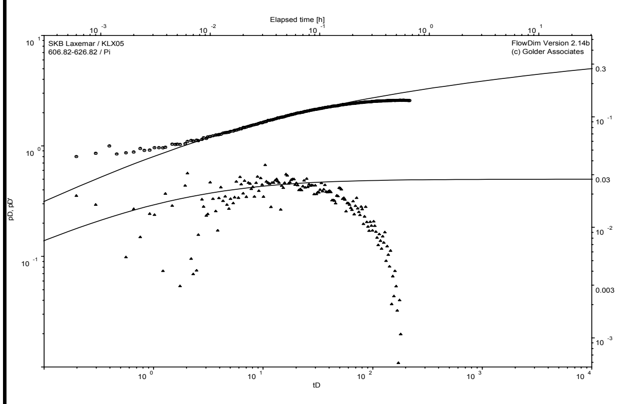
Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5599		
p_i (kPa) =	5608		
p_p(kPa) =	5811	p_F (kPa) =	5610
Q_p (m^3/s)=	1.67E-04		
tp (s) =	0	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.5		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	1.42
dt_2 (min) =	NA	dt_2 (min) =	5.45
T (m^2/s) =	NA	T (m^2/s) =	4.1E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	2.1E-11
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.2E-11
C_D (-) =	NA	C_D (-) =	5.7E-03
ξ (-) =	NA	ξ (-) =	-0.57
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	1.42	C (m^3/Pa) =	5.2E-11
dt_2 (min) =	5.45	C_D (-) =	5.7E-03
T_T (m^2/s) =	4.1E-10	ξ (-) =	-0.57
S (-) =	1.0E-06		
K_s (m/s) =	2.1E-11		
S_s (1/m) =	5.0E-08		

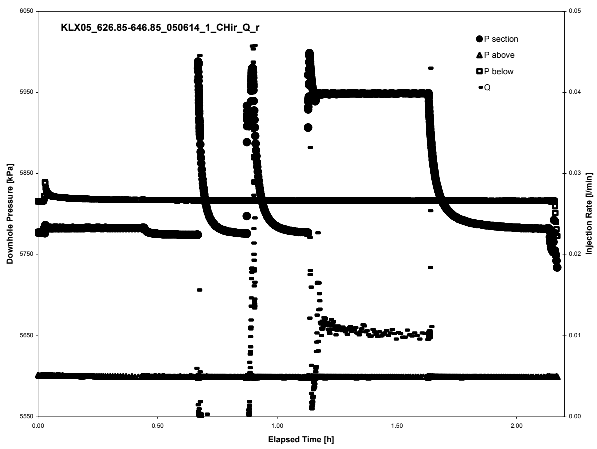
Comments:

The recommended transmissivity of 4.1E-10 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 1E-10 to 8E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

Test Summary Sheet

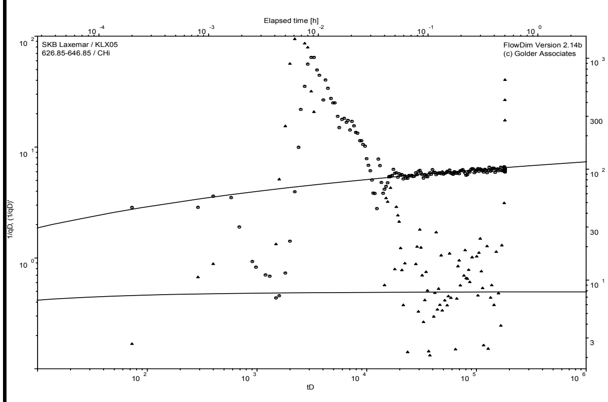
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050614 13:16
Test section from - to (m):	626.85-646.85	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

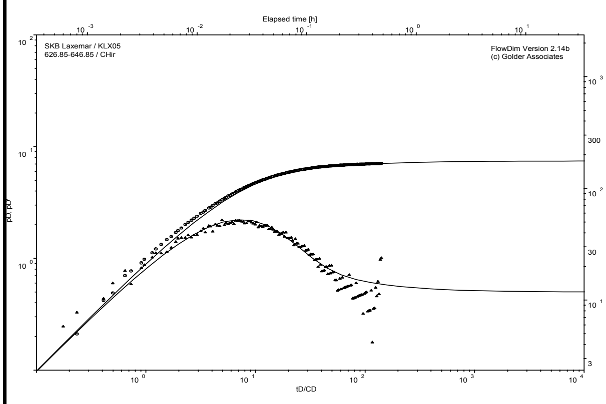


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5777		
p_i (kPa) =	5777		
p_p(kPa) =	5947	p_F (kPa) =	5782
Q_p (m^3/s)=	1.67E-07		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.9		
Derivative fact.=	0.11	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	9.6E-09		
T_M (m^2/s)=	1.0E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	5.92	dt_1 (min) =	12.68
dt_2 (min) =	26.28	dt_2 (min) =	25.63
T (m^2/s) =	9.7E-09	T (m^2/s) =	1.2E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.8E-10	K_s (m/s) =	6.0E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	9.5E-11
C_D (-) =	NA	C_D (-) =	1.0E-02
ξ (-) =	1.35	ξ (-) =	2.29
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	12.68	C (m^3/Pa) =	9.5E-11
dt_2 (min) =	25.63	C_D (-) =	1.0E-02
T_T (m^2/s) =	1.2E-08	ξ (-) =	2.29
S (-) =	1.0E-06		
K_s (m/s) =	6.0E-10		
S_s (1/m) =	5.0E-08		

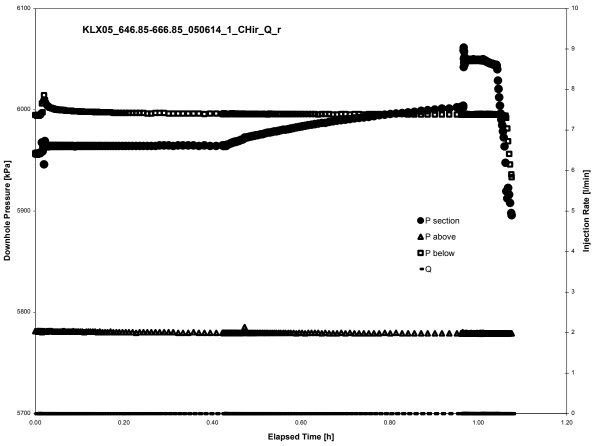
Comments:

The recommended transmissivity of 1.2E-8 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-9 to 6.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 5774.7 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050614 16:07
Test section from - to (m):	646.85-666.85 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5956		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.1		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

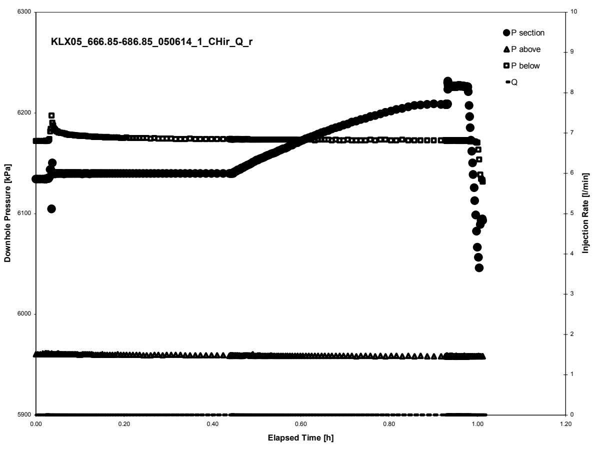
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050614 17:56
Test section from - to (m):	666.85-686.85 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6135		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.4		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

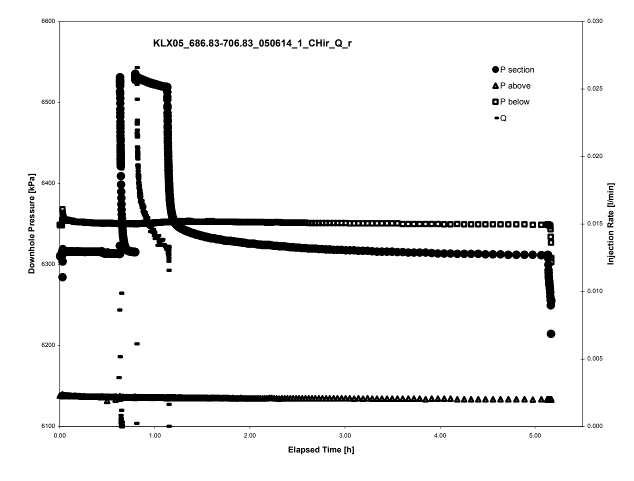
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

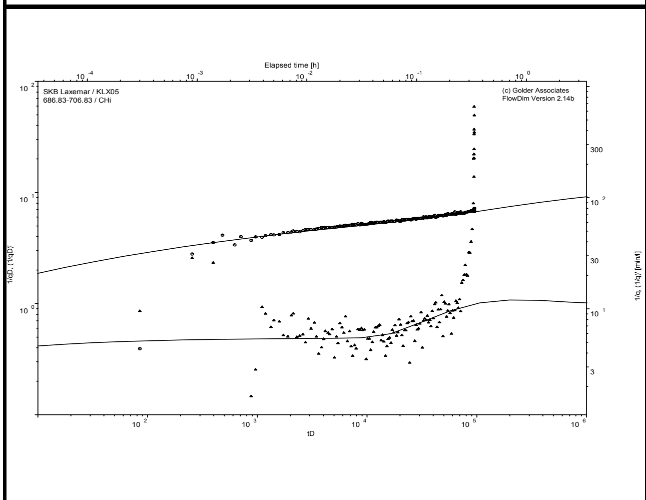
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050614 19:48
Test section from - to (m):	686.83-706.83 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

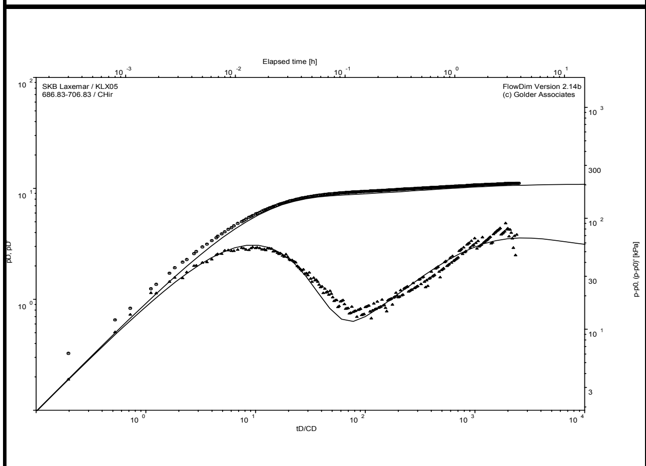


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6312		
p_i (kPa) =	6315		
p_p(kPa) =	6519	p_F (kPa) =	6312
Q_p (m^3/s)=	2.17E-07		
tp (s) =	1200	t_F (s) =	14400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.7		
Derivative fact.=	0.11	Derivative fact.=	0.08
Results		**Results**	
Q/s (m^2/s)=	1.0E-08		
T_M (m^2/s)=	1.1E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.40	dt_1 (min) =	NA
dt_2 (min) =	2.93	dt_2 (min) =	NA
T (m^2/s) =	1.2E-08	T (m^2/s) =	2.2E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.0E-10	K_s (m/s) =	1.1E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.6E-11
C_D (-) =	NA	C_D (-) =	8.4E-03
ξ (-) =	1.15	ξ (-) =	4.70
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.40	C (m^3/Pa) =	7.6E-11
dt_2 (min) =	2.93	C_D (-) =	8.4E-03
T_T (m^2/s) =	1.2E-08	ξ (-) =	1.15
S (-) =	1.0E-06		
K_s (m/s) =	6.0E-10		
S_s (1/m) =	5.0E-08		

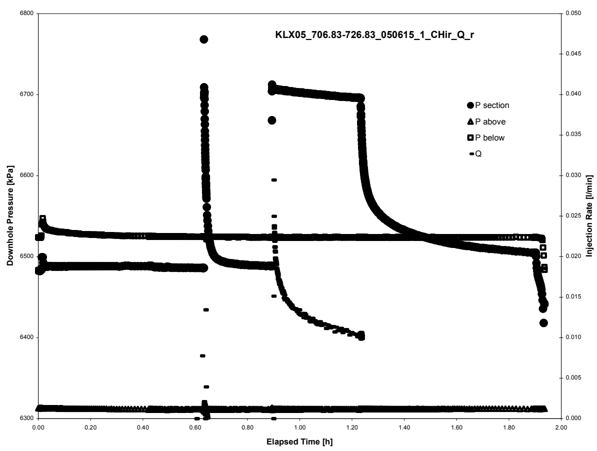
Comments:

The recommended transmissivity of 1.2E-8 m2/s was derived from the analysis of the CHi phase (inner zone), which shows the clearest derivative stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E-9 to 3.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 6306.3 kPa.

Test Summary Sheet

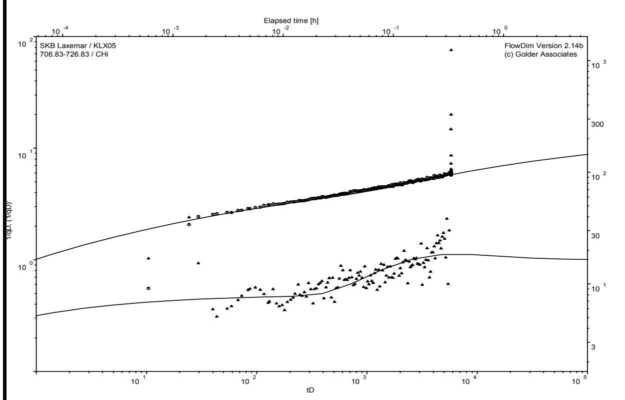
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050615 08:02
Test section from - to (m):	706.83-726.83 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

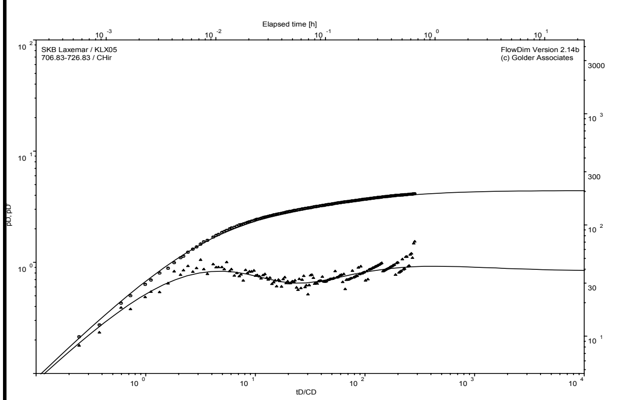


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6483		
p_i (kPa) =	6488		
p_p(kPa) =	6696	p_F (kPa) =	6505
Q_p (m^3/s)=	1.67E-07		
tp (s) =	1200	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.9		
Derivative fact.=	0.11	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	7.9E-09		
T_M (m^2/s)=	8.2E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.25	dt_1 (min) =	13.24
dt_2 (min) =	1.47	dt_2 (min) =	34.82
T (m^2/s) =	7.6E-09	T (m^2/s) =	4.5E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.8E-10	K_s (m/s) =	2.3E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.9E-11
C_D (-) =	NA	C_D (-) =	4.3E-03
ξ (-) =	-0.04	ξ (-) =	-0.73
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	13.24	C (m^3/Pa) =	3.9E-11
dt_2 (min) =	34.82	C_D (-) =	4.3E-03
T_T (m^2/s) =	4.5E-09	ξ (-) =	-0.73
S (-) =	1.0E-06		
K_s (m/s) =	2.3E-10		
S_s (1/m) =	5.0E-08		

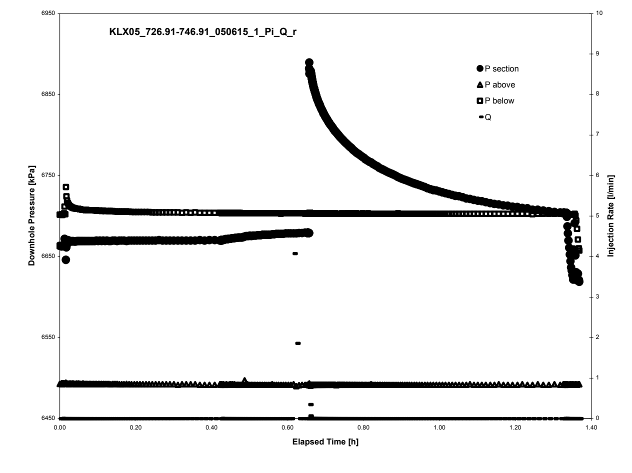
Comments:

The recommended transmissivity of 4.5E-9 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E-9 to 7.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 6487.4 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050615 10:40
Test section from - to (m):	726.91-746.91 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

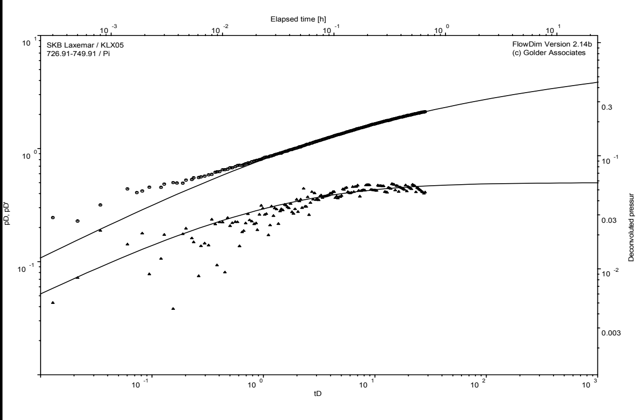
Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	6664		
p_i (kPa) =	6679		
p_p(kPa) =	6889	p_F (kPa) =	6705
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.2		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	7.38
dt_2 (min) =	NA	dt_2 (min) =	35.03
T (m^2/s) =	NA	T (m^2/s) =	1.6E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	8.0E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.2E-11
C_D (-) =	NA	C_D (-) =	4.6E-03
ξ (-) =	NA	ξ (-) =	-1.10
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	7.38	C (m^3/Pa) =	4.2E-11
dt_2 (min) =	35.03	C_D (-) =	4.6E-03
T_T (m^2/s) =	1.6E-10	ξ (-) =	-1.10
S (-) =	1.0E-06		
K_s (m/s) =	8.0E-12		
S_s (1/m) =	5.0E-08		

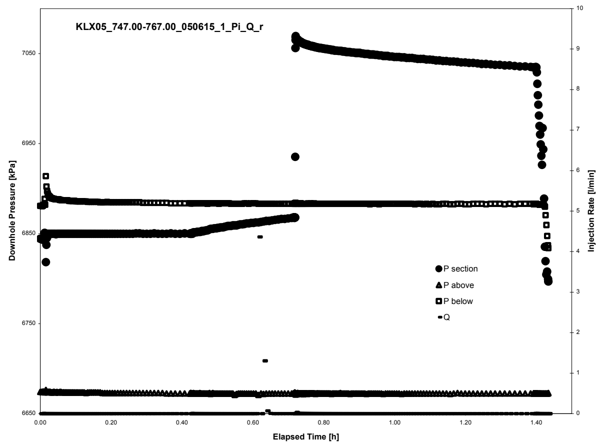
Comments:

The recommended transmissivity of 1.6E-10 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 8E-11 to 4E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050615 12:45
Test section from - to (m):	747.00-767.00 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

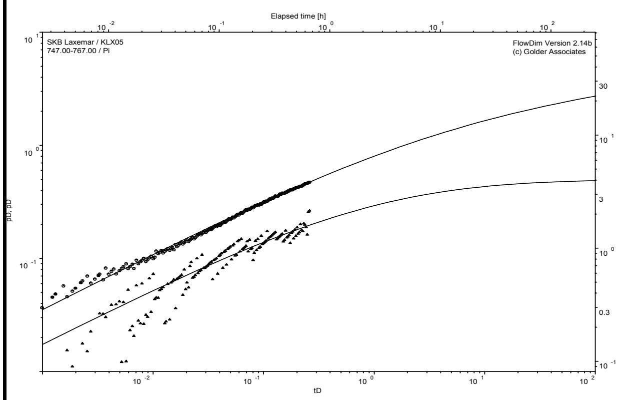


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6845		
p_i (kPa) =	6868		
p_p(kPa) =	7069	p_F (kPa) =	7034
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.5		
Derivative fact.=	NA	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	3.6E-12
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.8E-13
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.8E-11
C_D (-) =	NA	C_D (-) =	7.5E-03
ξ (-) =		ξ (-) =	-1.57
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	6.8E-11
dt_2 (min) =	NA	C_D (-) =	7.5E-03
T_T (m^2/s) =	3.6E-12	ξ (-) =	-1.57
S (-) =	1.0E-06		
K_s (m/s) =	1.8E-13		
S_s (1/m) =	5.0E-08		

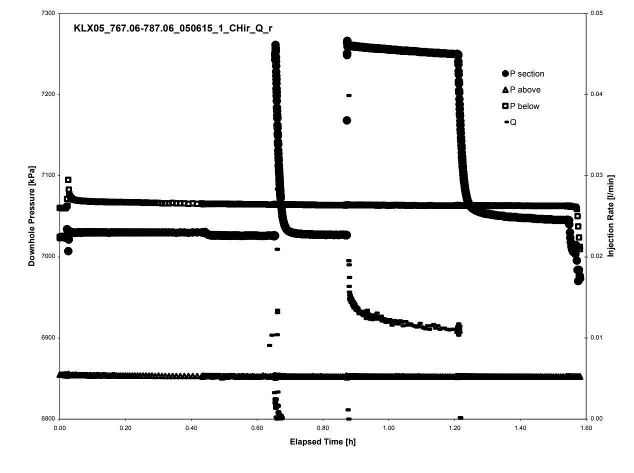
Comments:

The recommended transmissivity of 3.6E-12 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurement of the wellbore storage coefficient) and to the analysis process (e.g. numeric distortion when calculating the derivative and pressure history effects), the confidence range for the transmissivity is estimated to be 1E-12 to 6E-12 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

Test Summary Sheet

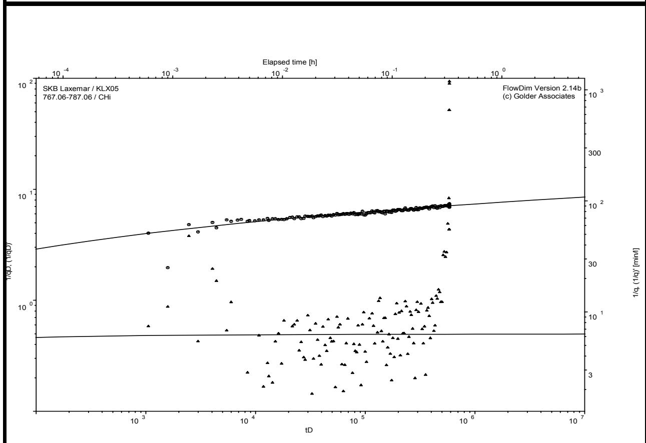
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050615 14:50
Test section from - to (m):	767.06-787.06 m	Responsible for test execution:	Stephan Rohs
Section diameter, 2·r_w (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

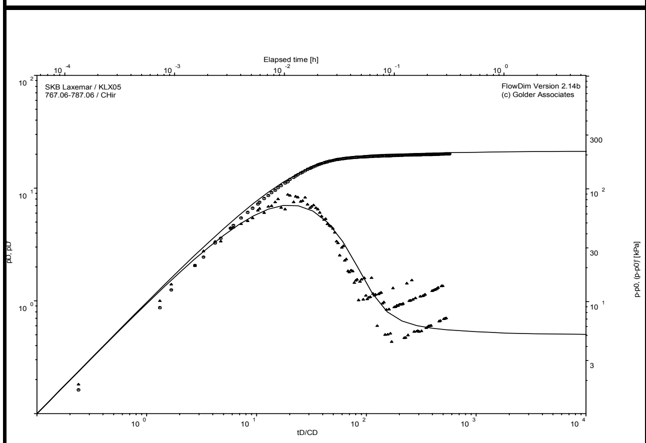


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7025		
p_i (kPa) =	7027		
p_p(kPa) =	7250	p_F (kPa) =	7046
Q_p (m^3/s)=	1.83E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.8		
Derivative fact.=	0.12	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	8.1E-09		
T_M (m^2/s)=	8.4E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.55	dt_1 (min) =	NA
dt_2 (min) =	14.39	dt_2 (min) =	NA
T (m^2/s) =	9.2E-09	T (m^2/s) =	3.2E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.6E-10	K_s (m/s) =	9.0E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.1E-11
C_D (-) =	NA	C_D (-) =	4.5E-03
ξ (-) =	2.17	ξ (-) =	-0.77
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.55	C (m^3/Pa) =	4.4E-11
dt_2 (min) =	14.39	C_D (-) =	4.8E-03
T_T (m^2/s) =	9.2E-09	ξ (-) =	2.17
S (-) =	1.0E-06		
K_s (m/s) =	4.6E-10		
S_s (1/m) =	5.0E-08		

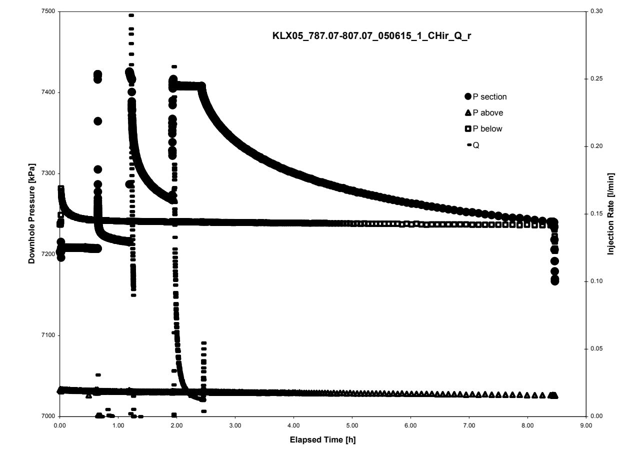
Comments:

The recommended transmissivity of 9.2E-9 m2/s was derived from the analysis of the CHi phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 6.0E-9 to 5.0E-8 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7038.9 kPa.

Test Summary Sheet

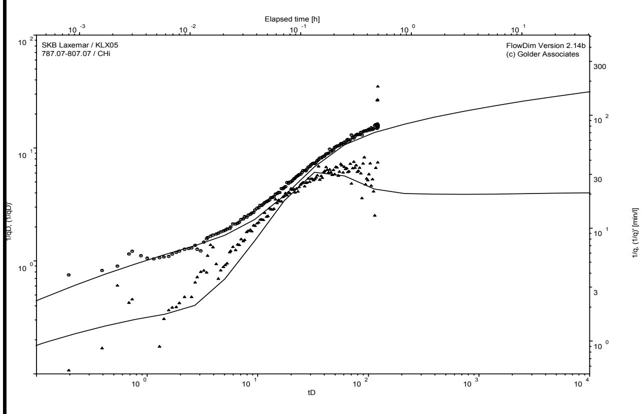
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050615 17:07
Test section from - to (m):	787.07-807.07 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

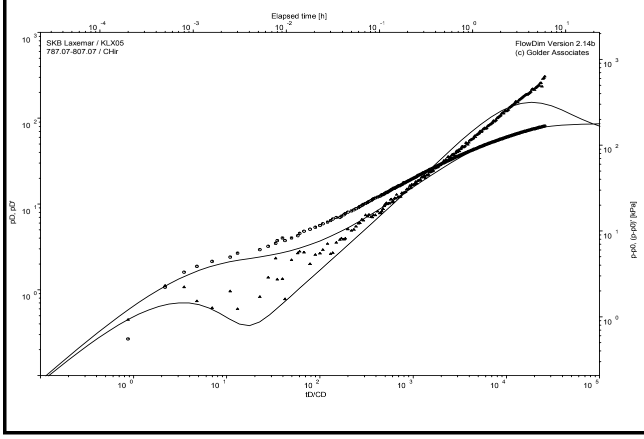


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	7203		
p_i (kPa) =	7267		
p_p(kPa) =	7407	p_F (kPa) =	7239
Q_p (m^3/s)=	2.00E-07		
tp (s) =	1200	t_F (s) =	21600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18.1		
Derivative fact.=	0.09	Derivative fact.=	0.07
Results		**Results**	
Q/s (m^2/s)=	1.4E-08		
T_M (m^2/s)=	1.5E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	4.3E-09	T (m^2/s) =	3.3E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.2E-10	K_s (m/s) =	1.7E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.0E-10
C_D (-) =	NA	C_D (-) =	2.2E-02
ξ (-) =	-2.96	ξ (-) =	-1.53
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	2.0E-10
dt_2 (min) =	NA	C_D (-) =	2.2E-02
T_T (m^2/s) =	4.3E-09	ξ (-) =	-2.96
S (-) =	1.0E-06		
K_s (m/s) =	2.2E-10		
S_s (1/m) =	5.0E-08		

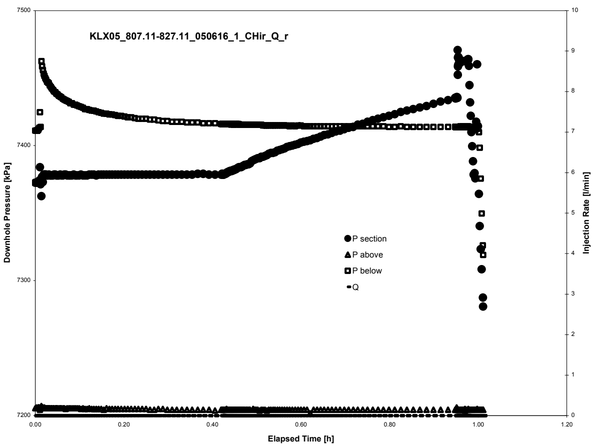
Comments:

The recommended transmissivity of 4.3E-9 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E-9 to 7.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7200.4 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050616 08:05
Test section from - to (m):	807.11-827.11 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7372		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18.3		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

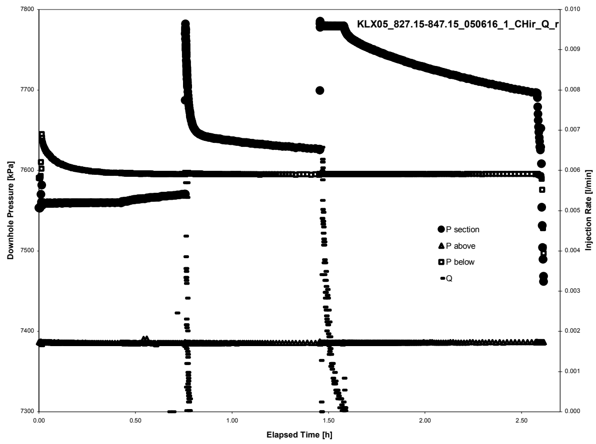
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

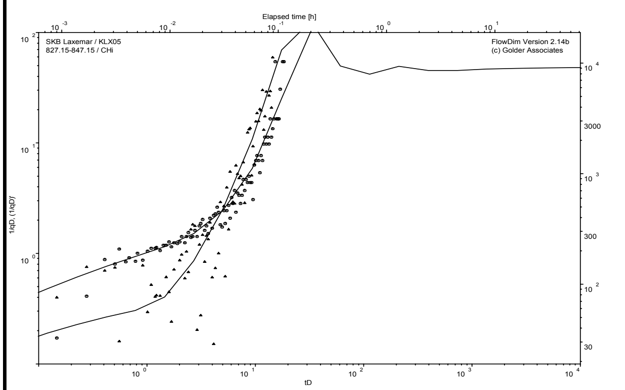
Project:	Oskarshamn site investigation	Test type:[1]	Chir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050616 09:52
Test section from - to (m):	827.15-847.15 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

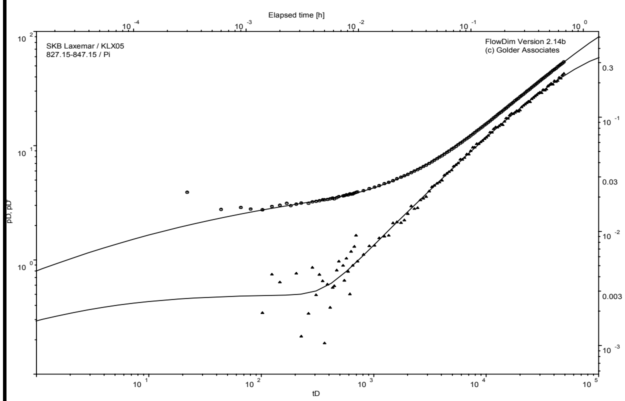


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7556		
p_i (kPa) =	7625		
p_p(kPa) =	7778	p_F (kPa) =	7696
Q_p (m^3/s)=	1.67E-08		
tp (s) =	420	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18.6		
Derivative fact.=	0.06	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.1E-09		
T_M (m^2/s)=	1.1E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	9.0E-10	T (m^2/s) =	4.3E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.5E-11	K_s (m/s) =	2.2E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.6E-11
C_D (-) =	NA	C_D (-) =	6.1E-03
ξ (-) =	-1.31	ξ (-) =	0.96
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. pulse recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	5.6E-11
dt_2 (min) =	NA	C_D (-) =	6.1E-03
T_T (m^2/s) =	4.3E-09	ξ (-) =	0.96
S (-) =	1.0E-06		
K_s (m/s) =	2.2E-10		
S_s (1/m) =	5.0E-08		

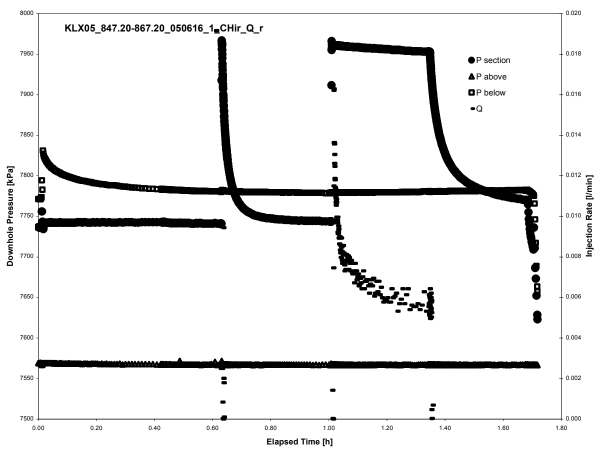
Comments:

The recommended transmissivity of 4.3E-9 m2/s was derived from the analysis of the Pi phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-10 to 7.0E-9 m2/s (which includes the values derived from inner zones of the CHi and CHir phase). The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the ver low interval transmissivity.

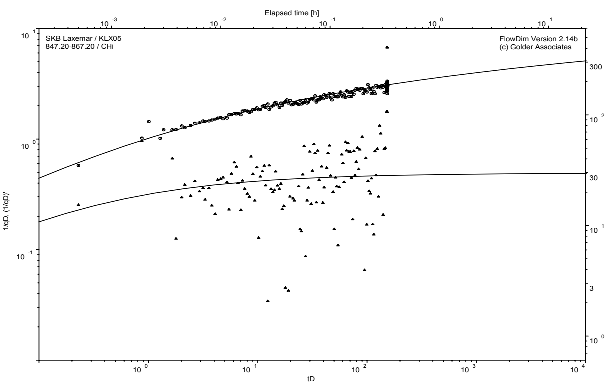
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050616 13:09
Test section from - to (m):	847.20-867.20 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

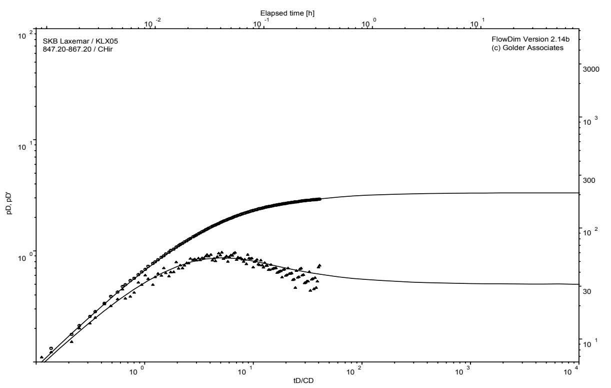
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	7737		
p_i (kPa) =	7744		
p_p(kPa) =	7953	p_F (kPa) =	7770
Q_p (m^3/s)=	1.00E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18.9		
Derivative fact.=	0.09	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	4.7E-09		
T_M (m^2/s)=	4.9E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	3.38	dt_1 (min) =	9.79
dt_2 (min) =	15.85	dt_2 (min) =	17.78
T (m^2/s) =	2.1E-09	T (m^2/s) =	2.8E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.1E-10	K_s (m/s) =	1.4E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.2E-11
C_D (-) =	NA	C_D (-) =	5.7E-03
ξ (-) =	-1.21	ξ (-) =	-0.86
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	9.79	C (m^3/Pa) =	5.2E-11
dt_2 (min) =	17.78	C_D (-) =	5.7E-03
T_T (m^2/s) =	2.8E-09	ξ (-) =	-0.86
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-10		
S_s (1/m) =	5.0E-08		

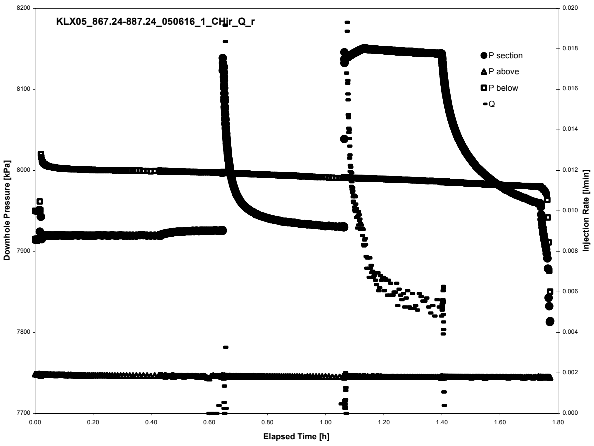
Comments:

The recommended transmissivity of 2.8E-9 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-10 to 5.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7747.4 kPa.

Test Summary Sheet

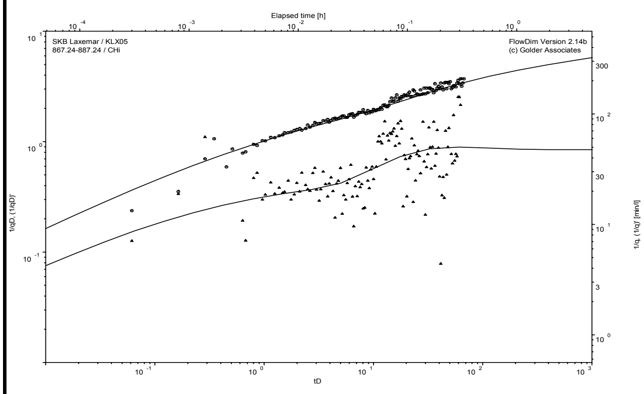
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050616 15:39
Test section from - to (m):	867.24-887.24 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

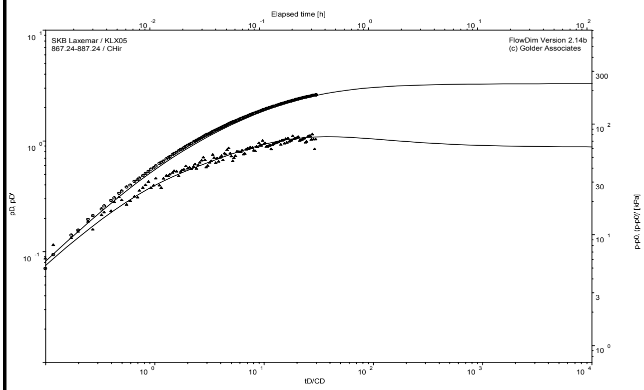


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7914		
p_i (kPa) =	7930		
p_p(kPa) =	8144	p_F (kPa) =	7960
Q_p (m^3/s)=	8.33E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	19.2		
Derivative fact.=	0.1	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.8E-09		
T_M (m^2/s)=	4.0E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.50	dt_1 (min) =	8.56
dt_2 (min) =	14.05	dt_2 (min) =	19.76
T (m^2/s) =	1.2E-09	T (m^2/s) =	1.5E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.0E-11	K_s (m/s) =	7.5E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.9E-11
C_D (-) =	NA	C_D (-) =	7.6E-03
ξ (-) =	-1.64	ξ (-) =	-1.61
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	8.56	C (m^3/Pa) =	6.9E-11
dt_2 (min) =	19.76	C_D (-) =	7.6E-03
T_T (m^2/s) =	1.5E-09	ξ (-) =	-1.61
S (-) =	1.0E-06		
K_s (m/s) =	7.5E-11		
S_s (1/m) =	5.0E-08		

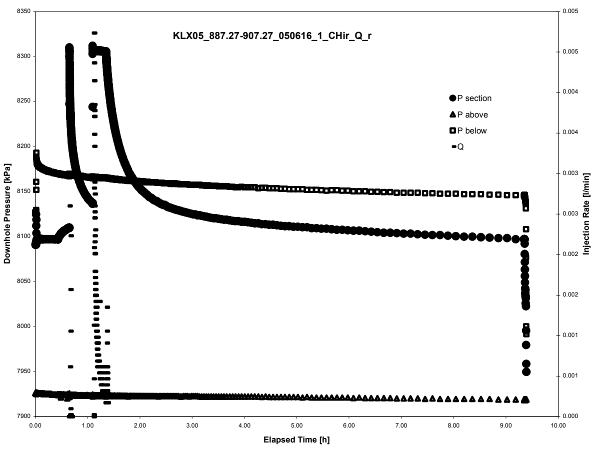
Comments:

The recommended transmissivity of 1.5E-9 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-10 to 4.0E-9 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 7907.0 kPa.

Test Summary Sheet

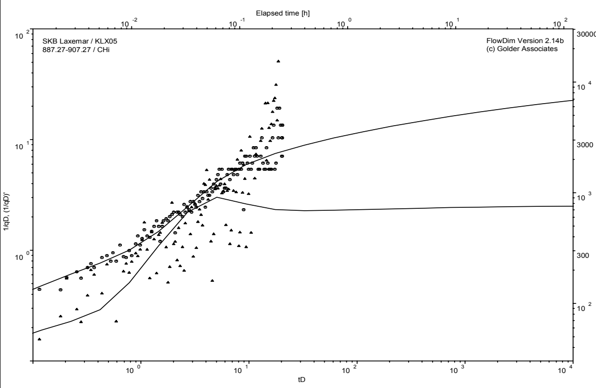
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050616 18:07
Test section from - to (m):	887.27-907.27 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

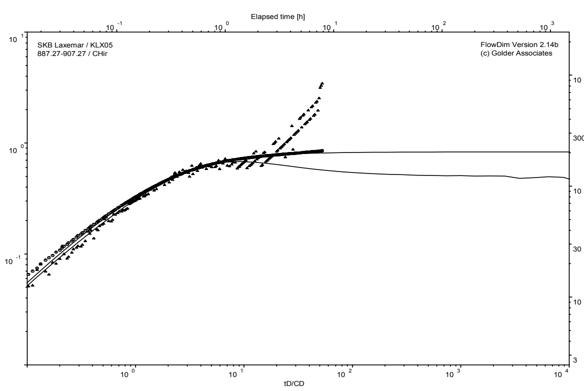


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	8094		
p_i (kPa) =	8137		
p_p(kPa) =	8306	p_F (kPa) =	8097
Q_p (m^3/s)=	1.67E-08		
tp (s) =	1200	t_F (s) =	28800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	19.5		
Derivative fact.=	0.1	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	9.7E-10		
T_M (m^2/s)=	1.0E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	37.39
dt_2 (min) =	NA	dt_2 (min) =	112.37
T (m^2/s) =	5.1E-10	T (m^2/s) =	1.1E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.6E-11	K_s (m/s) =	5.5E-12
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.6E-11
C_D (-) =	NA	C_D (-) =	4.0E-03
ξ (-) =	-1.37	ξ (-) =	-1.29
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	37.39	C (m^3/Pa) =	3.6E-11
dt_2 (min) =	112.37	C_D (-) =	4.0E-03
T_T (m^2/s) =	1.1E-10	ξ (-) =	-1.29
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-12		
S_s (1/m) =	5.0E-08		

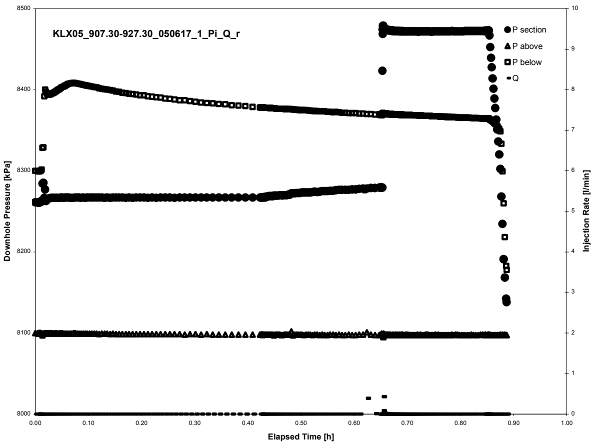
Comments:

The recommended transmissivity of 1.1E-10 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 6.0E-11 to 4.0E-10 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 8087.3 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050617 07:33
Test section from - to (m):	907.30-927.30 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	8261		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	19.8		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	
Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

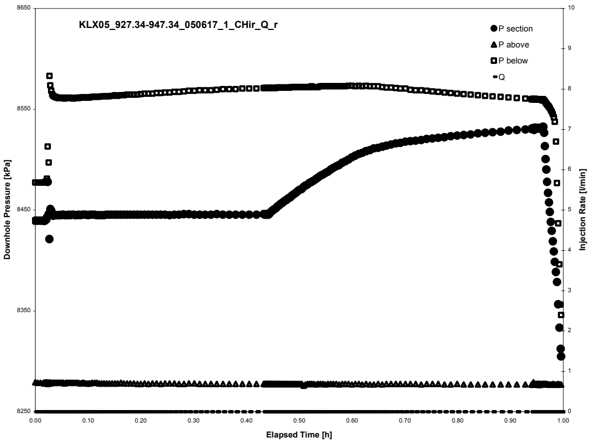
Comments:

Based on the test response the interval transmissivity is lower than 1E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX05	Test start:	050617 09:13
Test section from - to (m):	927.34-947.34 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	8439		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	20		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	NA	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1E-11 m2/s.

APPENDIX 4

Nomenclature

Character	SICADA designation	Explanation	Dimension	Unit
Variables, constants				
A_w		Horizontal area of water surface in open borehole, not including area of signal cables, etc.	$[L^2]$	m^2
b		Aquifer thickness (Thickness of 2D formation)	[L]	m
B		Width of channel	[L]	m
L		Corrected borehole length	[L]	m
L_0		Uncorrected borehole length	[L]	m
L_p		Point of application for a measuring section based on its centre point or centre of gravity for distribution of transmissivity in the measuring section.	[L]	m
L_w		Test section length.	[L]	m
dL		Step length, Positive Flow Log - overlapping flow logging. (step length, PFL)	[L]	m
r		Radius	[L]	m
r_w		Borehole, well or soil pipe radius in test section.	[L]	m
r_{we}		Effective borehole, well or soil pipe radius in test section. (Consideration taken to skin factor)	[L]	m
r_s		Distance from test section to observation section, the shortest distance.	[L]	m
r_t		Distance from test section to observation section, the **interpreted** shortest distance via conductive structures.	[L]	m
r_D		Dimensionless radius, $r_D=r/r_w$	-	-
z		Level above reference point	[L]	m
z_r		Level for reference point on borehole	[L]	m
z_{wu}		Level for test section (section that is being flowed), upper limitation	[L]	m
z_{wl}		Level for test section (section that is being flowed), lower limitation	[L]	m
z_{ws}		Level for sensor that measures response in test section (section that is flowed)	[L]	m
z_{ou}		Level for observation section, upper limitation	[L]	m
z_{ol}		Level for observation section, lower limitation	[L]	m
z_{os}		Level for sensor that measures response in observation section	[L]	m
E		Evaporation: hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
ET		Evapotranspiration hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
P		Precipitation hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
R		Groundwater recharge hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
D		Groundwater discharge hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
Q_R		Run-off rate	$[L^3/T]$	m^3/s
Q_p		Pumping rate	$[L^3/T]$	m^3/s
Q_I		Infiltration rate	$[L^3/T]$	m^3/s
Q		Volumetric flow. Corrected flow in flow logging ($Q_1 - Q_0$) (Flow rate)	$[L^3/T]$	m^3/s
Q_0		Flow in test section during undisturbed conditions (flow logging).	$[L^3/T]$	m^3/s

Q_p		Flow in test section immediately before stop of flow. Stabilised pump flow in flow logging.	[L^3/T]	m^3/s
Q_m		Arithmetical mean flow during perturbation phase.	[L^3/T]	m^3/s
Q_1		Flow in test section during pumping with pump flow Q_{p1}, (flow logging).	[L^3/T]	m^3/s
Q_2		Flow in test section during pumping with pump flow Q_{p1}, (flow logging).	[L^3/T]	m^3/s
ΣQ	SumQ	Cumulative volumetric flow along borehole	[L^3/T]	m^3/s
ΣQ_0	SumQ0	Cumulative volumetric flow along borehole, undisturbed conditions (ie, not pumped)	[L^3/T]	m^3/s
ΣQ_1	SumQ1	Cumulative volumetric flow along borehole, with pump flow Q_{p1}	[L^3/T]	m^3/s
ΣQ_2	SumQ2	Cumulative volumetric flow along borehole, with pump flow Q_{p2}	[L^3/T]	m^3/s
ΣQ_{C1}	SumQC1	Corrected cumulative volumetric flow along borehole, ΣQ_1-ΣQ_0	[L^3/T]	m^3/s
ΣQ_{C2}	SumQC2	Corrected cumulative volumetric flow along borehole, ΣQ_2-ΣQ_0	[L^3/T]	m^3/s
q		Volumetric flow per flow passage area (Specific discharge (Darcy velocity, Darcy flux, Filtration velocity)).	([L^3/T*L^2]	m/s
V		Volume	[L^3]	m^3
V_w		Water volume in test section.	[L^3]	m^3
V_p		Total water volume injected/pumped during perturbation phase.	[L^3]	m^3
v		Velocity	([L^3/T*L^2]	m/s
v_a		Mean transport velocity (Average linear velocity (Average linear groundwater velocity, Mean microscopic velocity));. v_a=q/n_e	([L^3/T*L^2]	m/s
t		Time	[T]	hour,min,s
t_0		Duration of rest phase before perturbation phase.	[T]	s
t_p		Duration of perturbation phase. (from flow start as far as p_p).	[T]	s
t_F		Duration of recovery phase (from p_p to p_F).	[T]	s
t_1, t_2 etc		Times for various phases during a hydro test.	[T]	hour,min,s
dt		Running time from start of flow phase and recovery phase respectively.	[T]	s
dt_e		dt_e = (dt · tp) / (dt + tp) Agarwal equivalent time with dt as running time for recovery phase.	[T]	s
t_D		$t_D = T \cdot t / (S \cdot r_w^2)$. Dimensionless time	-	-
p		Static pressure; including non-dynamic pressure which depends on water velocity. Dynamic pressure is normally ignored in estimating the potential in groundwater flow relations.	[M/$(LT)^2$]	kPa
p_a		Atmospheric pressure	[M/$(LT)^2$]	kPa
p_t		Absolute pressure; p_t=p_a+p_g	[M/$(LT)^2$]	kPa
p_g		Gauge pressure; Difference between absolute pressure and atmospheric pressure.	[M/$(LT)^2$]	kPa
p_0		Initial pressure before test begins, prior to packer expansion.	[M/$(LT)^2$]	kPa
p_i		Pressure in measuring section before start of flow.	[M/$(LT)^2$]	kPa
p_f		Pressure during perturbation phase.	[M/$(LT)^2$]	kPa
p_s		Pressure during recovery.	[M/$(LT)^2$]	kPa
p_p		Pressure in measuring section before flow stop.	[M/$(LT)^2$]	kPa
p_F		Pressure in measuring section at end of recovery.	[M/$(LT)^2$]	kPa
p_D		$p_D = 2\pi \cdot T \cdot p / (Q \cdot \rho_w g)$, Dimensionless pressure	-	-

dp		Pressure difference, drawdown of pressure surface between two points of time.	$[M/(LT)^2]$	kPa
dp_f		$dp_f = p_i - p_f$ or $= p_f - p_i$, drawdown/pressure increase of pressure surface between two points of time during perturbation phase. dp_f usually expressed positive.	$[M/(LT)^2]$	kPa
dp_s		$dp_s = p_s - p_p$ or $= p_p - p_s$, pressure increase/drawdown of pressure surface between two points of time during recovery phase. dp_s usually expressed positive.	$[M/(LT)^2]$	kPa
dp_p		$dp_p = p_i - p_p$ or $= p_p - p_i$, **maximal** pressure increase/drawdown of pressure surface between two points of time during perturbation phase. dp_p expressed positive.	$[M/(LT)^2]$	kPa
dp_F		$dp_F = p_p - p_F$ or $= p_F - p_p$, **maximal** pressure increase/drawdown of pressure surface between two points of time during recovery phase. dp_F expressed positive.	$[M/(LT)^2]$	kPa
H		Total head; (potential relative a reference level) (indication of h for phase as for p). $H=h_e+h_p+h_v$	[L]	m
h		Groundwater pressure level (hydraulic head (piezometric head; possible to use for level observations in boreholes, static head)); (indication of h for phase as for p). $h=h_e+h_p$	[L]	m
h_e		Height of measuring point (Elevation head); Level above reference level for measuring point.	[L]	m
h_p		Pressure head; Level above reference level for height of measuring point of stationary column of water giving corresponding static pressure at measuring point	[L]	m
h_v		Velocity head; height corresponding to the lifting for which the kinetic energy is capable (usually neglected in hydrogeology)	[L]	m
s		Drawdown; Drawdown from undisturbed level (same as dh_p, positive)	[L]	m
s_p		Drawdown in measuring section before flow stop.	[L]	m
			[L]	
h_0		Initial above reference level before test begins, prior to packer expansion.	[L]	m
h_i		Level above reference level in measuring section before start of flow.	[L]	m
h_f		Level above reference level during perturbation phase.	[L]	m
h_s		Level above reference level during recovery phase.	[L]	m
h_p		Level above reference level in measuring section before flow stop.	[L]	m
h_F		Level above reference level in measuring section at end of recovery.	[L]	m
dh		Level difference, drawdown of water level between two points of time.	[L]	m
dh_f		$dh_f = h_i - h_f$ or $= h_f - h_i$, drawdown/pressure increase of pressure surface between two points of time during perturbation phase. dh_f usually expressed positive.	[L]	m
dh_s		$dh_s = h_s - h_p$ or $= h_p - h_s$, pressure increase/drawdown of pressure surface between two points of time during recovery phase. dh_s usually expressed positive.	[L]	m
dh_p		$dh_p = h_i - h_p$ or $= h_p - h_i$, maximal pressure increase/drawdown of pressure surface between two points of time during perturbation phase. dh_p expressed positive.	[L]	m
dh_F		$dh_F = h_p - h_F$ or $= h_F - h_p$, maximal pressure increase/drawdown of pressure surface between two points of time during perturbation phase. dh_F expressed positive.	[L]	m
Te_w		Temperature in the test section (taken from temperature		^oC

		logging). Temperature		
Te_{w0}		Temperature in the test section during undisturbed conditions (taken from temperature logging). Temperature		°C
Te_o		Temperature in the observation section (taken from temperature logging). Temperature		°C
EC_w		Electrical conductivity of water in test section.		mS/m
EC_{w0}		Electrical conductivity of water in test section during undisturbed conditions.		mS/m
EC_o		Electrical conductivity of water in observation section		mS/m
TDS_w		Total salinity of water in the test section.	$[M/L^3]$	mg/L
TDS_{w0}		Total salinity of water in the test section during undisturbed conditions.	$[M/L^3]$	mg/L
TDS_o		Total salinity of water in the observation section.	$[M/L^3]$	mg/L
g		Constant of gravitation ($9.81\ m{*}s^{-2}$) (Acceleration due to gravity)	$[L/T^2]$	m/s^2
π	pi	Constant (approx 3.1416).	[-]	
r		Residual. $r= p_c-p_m$, $r= h_c-h_m$, etc. Difference between measured data (p_m, h_m, etc) and estimated data (p_c, h_c, etc)		
ME		Mean error in residuals. $ME = \frac{1}{n}\sum_{i=1}^{n} r_i$		
NME		Normalized ME. $NME=ME/(x_{MAX}-x_{MIN})$, x: measured variable considered.		
MAE		Mean absolute error. $MAE = \frac{1}{n}\sum_{i=1}^{n} \lvert r_i \rvert$		
NMAE		Normalized MAE. $NMAE=MAE/(x_{MAX}-x_{MIN})$, x: measured variable considered.		
RMS		Root mean squared error. $RMS = \left(\frac{1}{n}\sum_{i=1}^{n} r_i^2\right)^{0.5}$		
NRMS		Normalized RMR. $NRMR=RMR/(x_{MAX}-x_{MIN})$, x: measured variable considered.		
SDR		Standard deviation of residual. $SDR = \left(\frac{1}{n-1}\sum_{i=1}^{n} (r_i - ME)^2\right)^{0.5}$		
SEMR		Standard error of mean residual. $SEMR = \left(\frac{1}{n(n-1)}\sum_{i=1}^{n} (r_i - ME)^2\right)^{0.5}$		
Parameters				
Q/s		Specific capacity $s=dp_p$ or $s=s_p=h_0-h_p$ (open borehole)	$[L^2/T]$	m^2/s
D		Interpreted flow dimension according to Barker, 1988.	[-]	-
dt_1		Time of starting for semi-log or log-log evaluated characteristic counted from start of flow phase and recovery phase respectively.	[T]	s
dt_2		End of time for semi-log or log-log evaluated characteristic counted from start of flow phase and recovery phase respectively.	[T]	s

dt_L		Response time to obtain 0.1 m (or 1 kPa) drawdown in observation section counted from start of recovery phase.	[T]	s
TB		Flow capacity in a one-dimensional structure of width B and transmissivity T. Transient evaluation of one-dimensional structure	$[L^3/T]$	m^3/s
T		Transmissivity	$[L^2/T]$	m^2/s
T_M		Transmissivity according to Moye (1967)	$[L^2/T]$	m^2/s
T_Q		Evaluation based on Q/s and regression curve between Q/s and T, as example see Rhén et al (1997) p. 190.	$[L^2/T]$	m^2/s
T_S		Transmissivity evaluated from slug test	$[L^2/T]$	m^2/s
T_D		Transmissivity evaluated from PFL-Difference Flow Meter	$[L^2/T]$	m^2/s
T_I		Transmissivity evaluated from Impeller flow log	$[L^2/T]$	m^2/s
T_{Sf}, T_{Lf}		Transient evaluation based on semi-log or log-log diagram for perturbation phase in injection or pumping.	$[L^2/T]$	m^2/s
T_{Ss}, T_{Ls}		Transient evaluation based on semi-log or log-log diagram for recovery phase in injection or pumping.	$[L^2/T]$	m^2/s
T_T		Transient evaluation (log-log or lin-log). Judged best evaluation of T_{Sf}, T_{Lf}, T_{Ss}, T_{Ls}	$[L^2/T]$	m^2/s
T_{NLR}		Evaluation based on non-linear regression.	$[L^2/T]$	m^2/s
T_{Tot}		Judged most representative transmissivity for particular test section and (in certain cases) evaluation time with respect to available data (made by SKB at a later stage).	$[L^2/T]$	m^2/s
K		Hydraulic conductivity	[L/T]	m/s
K_s		Hydraulic conductivity based on spherical flow model	[L/T]	m/s
K_m		Hydraulic conductivity matrix, intact rock	[L/T]	m/s
k		Intrinsic permeability	$[L^2]$	m^2
kb		Permeability-thickness product: kb=k·b	$[L^3]$	m^3
SB		Storage capacity in a one-dimensional structure of width B and storage coefficient S. Transient evaluation of one-dimensional structure	[L]	m
SB*		Assumed storage capacity in a one-dimensional structure of width B and storage coefficient S. Transient evaluation of one-dimensional structure	[L]	m
S		Storage coefficient, (Storativity)	[-]	-
S*		Assumed storage coefficient	[-]	-
S_y		Theoretical specific yield of water (Specific yield; unconfined storage. Defined as total porosity (n) minus retention capacity (S_r)	[-]	-
S_{ya}		Specific yield of water (Apparent specific yield); unconfined storage, field measuring. Corresponds to volume of water achieved on draining saturated soil or rock in free draining of a volumetric unit. S_{ya}= S_y (often called S_y in literature)	[-]	-
S_r		Specific retention capacity, (specific retention of water, field capacity) (Specific retention); unconfined storage. Corresponds to water volume that the soil or rock has left after free draining of saturated soil or rock.	[-]	-
S_f		Fracture storage coefficient	[-]	-
S_m		Matrix storage coefficient	[-]	-
S_{NLR}		Storage coefficient, evaluation based on non-linear regression	[-]	-
S_{Tot}		Judged most representative storage coefficient for particular test section and (in certain cases) evaluation	[-]	-

		time with respect to available data (made by SKB at a later stage).		
S_s		Specific storage coefficient; confined storage.	[1/L]	1/m
S_s*		Assumed specific storage coefficient; confined storage.	[1/L]	1/m
c_f		Hydraulic resistance: The hydraulic resistance is an aquitard with a flow vertical to a two-dimensional formation. The inverse of c is also called Leakage coefficient. c_f=b´/K´ where b´ is thickness of the aquitard and K´ its hydraulic conductivity across the aquitard.	[T]	s
L_f		Leakage factor: $L_f =(K\cdot b\cdot c_f)^{0.5}$ where K represents characteristics of the aquifer.	[L]	m
ξ	Skin	Skin factor	[-]	-
ξ*	Skin	Assumed skin factor	[-]	-
C		Wellbore storage coefficient	$[(LT^2)\cdot M^2]$	m^3/Pa
C_D		$C_D = C\cdot\rho_w g /(2\pi\cdot S\cdot r_w^2)$, Dimensionless wellbore storage coefficient	[-]	-
ω	Stor-ratio	$\omega= S_f /(S_f + S_m)$, storage ratio (Storativity ratio); the ratio of storage coefficient between that of the fracture and total storage.	[-]	-
λ	Interflow-coeff	$\lambda= \alpha\cdot (K_m / K_f) \cdot r_w^2$ interporosity flow coefficient.	[-]	-
T_{GRF}		Transmissivity interpreted using the GRF method	$[L^2/T]$	m^2/s
S_{GRF}		Storage coefficient interpreted using the GRF method	[1/L]	1/m
D_{GRF}		Flow dimension interpreted using the GRF method	[-]	-
c_w		Water compressibility; corresponding to β in hydrogeological literature.	$[(LT^2)/M]$	1/Pa
c_r		Pore-volume compressibility, (rock compressibility); Corresponding to α/n in hydrogeological literature.	$[(LT^2)/M]$	1/Pa
c_t		$c_t = c_r + c_w$, total compressibility; compressibility per volumetric unit of rock obtained through multiplying by the total porosity, n. (Presence of gas or other fluids can be included in c_t if the degree of saturation (volume of respective fluid divided by n) of the pore system of respective fluid is also included)	$[(LT^2)/M]$	1/Pa
nc_t		Porosity-compressibility factor: $nc_t= n\cdot c_t$	$[(LT^2)/M]$	1/Pa
nc_tb		Porosity-compressibility-thickness product: $nc_tb= n\cdot c_t\cdot b$	$[(L^2T^2)/M]$	m/Pa
n		Total porosity	-	-
n_e		Kinematic porosity, (Effective porosity)	-	-
e		Transport aperture. $e = n_e\cdot b$	[L]	m
ρ	Density	Density	$[M/L^3]$	$kg/(m^3)$
ρ_w	Density-w	Fluid density in measurement section during pumping/injection	$[M/L^3]$	$kg/(m^3)$
ρ_o	Density-o	Fluid density in observation section	$[M/L^3]$	$kg/(m^3)$
ρ_{sp}	Density-sp	Fluid density in standpipes from measurement section	$[M/L^3]$	$kg/(m^3)$
μ	my	Dynamic viscosity	[M/LT]	Pa s
μ_w	my	Dynamic viscosity (Fluid density in measurement section during pumping/injection)	[M/LT]	Pa s
FC_T		Fluid coefficient for intrinsic permeability, transference of k to K; $K=FC_T\cdot k$; $FC_T=\rho_w\cdot g/\mu_w$	[1/LT]	1/(ms)
FC_S		Fluid coefficient for porosity-compressibility, transference	$[M/T^2L^2]$	Pa/m

		of c_t to S_s ; S_s=$FC_S \cdot n \cdot c_t$; FC_S=$\rho_w \cdot g$		
Index on K, T and S				
S		S: semi-log		
L		L: log-log		
f		Pump phase or injection phase, designation following S or L (withdrawal)		
s		Recovery phase, designation following S or L (recovery)		
NLR		NLR: Non-linear regression. Performed on the entire test sequence, perturbation and recovery		
M		Moye		
GRF		Generalised Radial Flow according to Barker (1988)		
m		Matrix		
f		Fracture		
measl		Measurement limit. Estimated measurement limit on parameter being measured (T or K)		
T		Judged best evaluation based on transient evaluation.		
Tot		Judged most representative parameter for particular test section and (in certain cases) evaluation time with respect to available data (made by SKB at a later stage).		
b		Bloch property in a numerical groundwater flow model		
e		Effective property (constant) within a domain in a numerical groundwater flow model.		
Index on p and Q				
0		Initial condition, undisturbed condition in open holes		
i		Natural, "undisturbed" condition of formation parameter		
f		Pump phase or injection phase (withdrawal, flowing phase)		
s		Recovery, shut-in phase		
p		Pressure or flow in measuring section at end of perturbation period		
F		Pressure in measuring section at end of recovery period.		
m		Arithmetical mean value		
c		Estimated value. The index is placed last if index for “where” and “what” are used. Simulated value		
m		Measured value. The index is placed last if index for “where” and “what” are used. Measured value		
Some miscellaneous indexes on p and h				
w		Test section (final difference pressure during flow phase in test section can be expressed dp_{wp}; First index shows “where” and second index shows “what”)		
o		Observation section (final difference pressure during flow phase in observation section can be expressed dp_{op}; First index shows “where” and second index shows “what”)		
f		Fresh-water head. Water is normally pumped up from section to measuring hoses where pressure and level are observed. Density of the water is therefore approximately the same as that of the measuring section. Measured groundwater level is therefore normally represented by what is defined as point-water head. If pressure at the measuring level is recalculated to a level for a column of water with density of fresh water above the measuring point it is referred to as fresh-water head and h is indicated last by an f. Observation section (final level during flow phase in observation section can be expressed h_{opf}; the first index shows “where” and the second index shows “what” and the last one “recalculation”)		

APPENDIX 5

SICADA data tables

(Simplified version v1.4)

SICADA/Data Import Template

SKB & Ergodata AB 2004

File Identity	
Created By	Stephan Rohs
Created	2005-07-07

Compiled By	
Quality Check For Delivery	
Delivery Approval	

Activity Type	KLX05 KLX05 - Injection test

Project	AP PS 400-05-031

Activity Information						**Additional Activity Data**				
						C10	P20	P200	P220	R25
Idcode	**Start Date**	**Stop Date**	**Secup (m)**	**Seclow (m)**	**Section No**	**Company**	**Field crew manager**	**Field crew**	**evaluating data**	**Report**
KLX05	2005-06-01 17:37	2005-06-17 10:14	111.30	987.27		Golder	Stephan Rohs	Stephan Rohs, Mesgena Gebrezghi	Cristian Enachescu, Jörg Böhner, Stephan Rohs	Cristian Enachescu, Jörg Böhner, Stephan Rohs

Table	plu_s_hole_test_d PLU Injection and pumping, General information

Column	Datatype	Unit	Column Description
site	CHAR		Investigation site name
activity_type	CHAR		Activity type code
start_date	DATE		Date (yymmdd hh:mm:ss)
stop_date	DATE		Date (yymmdd hh:mm:ss)
project	CHAR		project code
idcode	CHAR		Object or borehole identification code
secup	FLOAT	m	Upper section limit (m)
seclow	FLOAT	m	Lower section limit (m)
section_no	INTEGER	number	Section number
test_type	CHAR		Test type code (1-7), see table description
formation_type	CHAR		1: Rock, 2: Soil (superficial deposits)
start_flow_period	DATE	yyyymmdd	Date & time of pumping/injection start (YYYY-MM-DD hh:mm:ss)
stop_flow_period	DATE	yyyymmdd	Date & time of pumping/injection stop (YYYY-MM-DD hh:mm:ss)
flow_rate_end_qp	FLOAT	m**3/s	Flow rate at the end of the flowing period
value_type_qp	CHAR		0:true value,-1<lower meas.limit1:>upper meas.limit
mean_flow_rate_qm	FLOAT	m**3/s	Arithmetic mean flow rate during flow period
q_measl__l	FLOAT	m**3/s	Estimated lower measurement limit of flow rate
q_measl__u	FLOAT	m**3/s	Estimated upper measurement limit of flow rate
tot_volume_vp	FLOAT	m**3	Total volume of pumped or injected water
dur_flow_phase_tp	FLOAT	s	Duration of the flowing period of the test
dur_rec_phase_tf	FLOAT	s	Duration of the recovery period of the test
initial_head_hi	FLOAT	m	Hydraulic head in test section at start of the flow period
head_at_flow_end_h	FLOAT	m	Hydraulic head in test section at stop of the flow period.
final_head_hf	FLOAT	m	Hydraulic head in test section at stop of recovery period.
initial_press_pi	FLOAT	kPa	Groundwater pressure in test section at start of flow period
press_at_flow_end_p	FLOAT	kPa	Groundwater pressure in test section at stop of flow period.
final_press_pf	FLOAT	kPa	Ground water pressure at the end of the recovery period.
fluid_temp_tew	FLOAT	oC	Measured section fluid temperature, see table description
fluid_elcond_ecw	FLOAT	mS/m	Measured section fluid el. conductivity,see table descr.
fluid_salinity_tdsw	FLOAT	mg/l	Total salinity of section fluid based on EC,see table descr.
fluid_salinity_tdswm	FLOAT	mg/l	Tot. section fluid salinity based on water sampling,see...
reference	CHAR		SKB report No for reports describing data and evaluation
comments	VARCHAR		Short comment to data
error_flag	CHAR		If error_flag = "*" then an error occured and an error
in_use	CHAR		If in_use = "*" then the activity has been selected as
sign	CHAR		Signature for QA data accknowledge (QA - OK)
lp	FLOAT	m	Hydraulic point of application

idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_type	start_flow_period	stop_flow_period	flow_rate_end_qp	value_type_qp	mean_flow_rate_qm	q_measl__l	q_measl__u	tot_volume_vp
KLX05	050601 17:37	050601 21:07	111.30	211.30		3	1	2005-06-01 18:35:44	2005-06-01 19:05:54	2.63E-04	0	2.87E-04	1.67E-08	8.33E-04	5.16E-01
KLX05	050602 09:21	050602 11:45	211.14	311.14		3	1	2005-06-02 10:13:24	2005-06-02 10:43:34	5.80E-05	0	6.63E-05	1.67E-08	8.33E-04	1.19E-01
KLX05	050602 13:30	050602 16:22	306.37	406.37		3	1	2005-06-02 13:30:00	2005-06-02 16:22:00	5.00E-08	0	8.33E-08	1.67E-08	8.33E-04	1.50E-04
KLX05	050602 17:49	050602 23:32	406.54	506.54		3	1	2005-06-02 18:59:51	2005-06-02 19:30:01	2.33E-07	0	3.17E-07	1.67E-08	8.33E-04	5.70E-04
KLX05	050603 09:11	050603 11:11	506.63	606.63		4	1	2005-06-03 09:59:29	2005-06-03 09:59:30	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050603 12:41	050603 15:26	606.82	706.82		3	1	2005-06-03 13:54:22	2005-06-03 14:24:32	3.83E-07	0	4.67E-07	1.67E-08	8.33E-04	8.40E-04
KLX05	050603 16:56	050604 00:46	706.83	806.83		3	1	2005-06-03 18:14:16	2005-06-03 18:44:26	3.33E-07	0	8.33E-07	1.67E-08	8.33E-04	1.50E-03
KLX05	050604 09:20	050604 12:18	807.11	907.11		3	1	2005-06-04 10:46:20	2005-06-04 11:16:30	1.67E-07	0	1.67E-07	1.67E-08	8.33E-04	3.00E-04
KLX05	050604 14:00	050604 17:10	887.27	987.27		3	1	2005-06-04 16:08:15	2005-06-04 16:38:15	1.67E-08	0	6.67E-08	1.67E-08	8.33E-04	1.20E-04
KLX05	050610 13:12	050610 14:40	111.30	131.30		3	1	2005-06-10 13:57:50	2005-06-10 14:18:00	2.22E-04	0	2.37E-04	1.67E-08	8.33E-04	2.85E-01
KLX05	050610 15:35	050610 17:02	126.02	146.02		3	1	2005-06-10 16:20:30	2005-06-10 16:40:40	1.87E-05	0	1.90E-05	1.67E-08	8.33E-04	2.28E-02
KLX05	050610 17:47	050610 20:20	146.10	166.10		3	1	2005-06-10 19:08:02	2005-06-10 19:38:22	2.28E-05	0	2.35E-05	1.67E-08	8.33E-04	4.23E-02
KLX05	050611 08:54	050611 10:27	166.12	186.12		3	1	2005-06-11 09:44:53	2005-06-11 10:05:03	4.50E-07	0	5.33E-07	1.67E-08	8.33E-04	6.40E-04
KLX05	050611 11:14	050611 13:04	181.13	201.13		3	1	2005-06-11 12:02:34	2005-06-11 12:22:44	8.83E-06	0	9.33E-06	1.67E-08	8.33E-04	1.12E-02
KLX05	050611 13:38	050611 15:11	191.14	211.14		3	1	2005-06-11 14:29:04	2005-06-11 14:49:14	1.15E-05	0	1.40E-05	1.67E-08	8.33E-04	1.68E-02
KLX05	050611 15:55	050611 17:23	211.14	231.14		3	1	2005-06-11 16:41:20	2005-06-11 17:01:30	2.00E-06	0	2.17E-06	1.67E-08	8.33E-04	2.60E-03
KLX05	050611 18:10	050611 19:59	226.14	246.14		3	1	2005-06-11 18:57:09	2005-06-11 19:17:19	6.33E-06	0	6.50E-06	1.67E-08	8.33E-04	7.80E-03
KLX05	050612 08:10	050612 09:44	246.15	266.15		3	1	2005-06-12 09:01:51	2005-06-12 09:22:01	6.08E-05	0	7.00E-05	1.67E-08	8.33E-04	8.40E-02
KLX05	050612 10:21	050612 11:49	266.21	286.21		4	1	2005-06-12 11:02:01	2005-06-12 11:02:02	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050612 12:29	050612 13:58	286.28	306.28		3	1	2005-06-12 13:16:13	2005-06-12 13:36:23	5.00E-07	0	5.00E-07	1.67E-08	8.33E-04	6.00E-04
KLX05	050612 14:39	050612 16:22	306.37	326.37		3	1	2005-06-12 15:40:08	2005-06-12 16:00:18	5.00E-08	0	6.67E-08	1.67E-08	8.33E-04	8.00E-05
KLX05	050612 17:03	050612 18:05	326.38	346.38		4	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050612 18:38	050612 19:40	341.40	361.40		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050613 07:26	050613 08:31	356.42	376.42		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050613 09:17	050613 10:23	376.47	396.47		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050613 11:00	050613:12:27	386.50	406.50		4	1	2005-06-13 11:45:32	2005-06-13 11:45:33	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050613 13:04	050613 14:46	406.54	426.54		3	1	2005-06-13 13:54:05	2005-06-13 14:14:15	2.33E-07	0	3.00E-07	1.67E-08	8.33E-04	3.60E-04
KLX05	050613 15:32	050613 16:53	426.55	446.55		4	1	2005-06-13 16:11:48	2005-06-13 16:11:49	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050613 17:33	050613 18:38	446.57	466.57		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050613 19:13	050614 01:56	466.58	486.58		4	1	2005-06-13 19:54:23	2005-06-13 19:54:23	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050614 07:40	050614 09:27	486.59	506.59		3	1	2005-06-14 08:45:37	2005-06-14 09:05:47	3.33E-08	0	3.33E-08	1.67E-08	8.33E-04	4.00E-05
KLX05	050614 11:09	050614 12:33	606.82	626.82		4	1	2005-06-14 11:51:03	2005-06-14 11:51:04	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050614 13:16	050614 15:26	626.85	646.85		3	1	2005-06-14 14:24:25	2005-06-14 14:54:35	1.67E-07	0	1.67E-07	1.67E-08	8.33E-04	3.00E-04
KLX05	050614 16:07	050614 17:12	646.85	666.85		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050614 17:56	050614 18:57	666.85	686.85		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050614 19:48	050615 00:58	686.83	706.83		3	1	2005-06-14 20:36:20	2005-06-14 20:56:30	2.17E-07	0	2.50E-07	1.67E-08	8.33E-04	3.00E-04
KLX05	050615 08:02	050615 09:58	706.83	726.83		3	1	2005-06-15 08:56:18	2005-06-10 09:16:28	1.67E-07	0	2.17E-07	1.67E-08	8.33E-04	2.60E-04
KLX05	050615 10:40	050615 11:52	726.91	746.91		4	1	2005-06-15 11:20:36	2005-06-15 11:20:37	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050615 12:45	050615 14:11	747.00	767.00		4	1	2005-06-15 13:29:19	2005-06-15 13:29:20	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX05	050615 14:50	050615 16:25	767.06	787.06		3	1	2005-06-15 15:43:10	2005-06-15 16:03:20	1.83E-07	-1	2.00E-07	1.67E-08	8.33E-04	2.40E-04
KLX05	050615 17:07	050616 01:36	787.07	807.07		3	1	2005-06-15 19:04:04	2005-06-15 19:34:14	2.00E-07	0	4.83E-07	1.67E-08	8.33E-04	5.80E-04
KLX05	050616 08:05	050616 09:07	807.11	827.11		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050616 09:52	050616 12:29	827.15	847.15		3	1	2005-06-16 11:20:13	2005-06-16 11:27:23	1.67E-08	0	5.00E-08	1.67E-08	8.33E-04	2.10E-05
KLX05	050616 13:09	050616 00:00	847.20	867.20		3	1	2005-06-16 14:10:58	2005-06-16 14:31:08	1.00E-07	0	1.17E-07	1.67E-08	8.33E-04	1.40E-04
KLX05	050616 15:39	050616 17:25	867.24	887.24		3	1	2005-06-16 16:43:46	2005-06-16 17:03:56	8.33E-08	0	1.17E-07	1.67E-08	8.33E-04	1.40E-04
KLX05	050616 18:07	050617 03:30	887.27	907.27		3	1	2005-06-16 19:13:43	2005-06-16 19:28:53	1.67E-08	0	1.67E-08	1.67E-08	8.33E-04	2.00E-05
KLX05	050617 07:33	050617 08:27	907.30	927.30		4	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX05	050617 09:13	050617 10:14	927.34	947.34		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00

idcode	secup	seclow	dur_flow_phase_tp	dur_rec_phase_tf	initial_head_hi	head_at_flow_end_hp	final_head_hf	initial_press_pi	press_at_flow_end_pp	final_press_pf	fluid_temp_tew	fluid_elcond_ecw	fluid_salinity_tdsw	fluid_salinity_tdswm	reference	comments	lp
KLX05	111.30	211.30	1800	7200			10.49	1884	2099	1885	10.0						161.30
KLX05	211.14	311.14	1800	3600			11.37	2772	2972	2777	11.2						261.14
KLX05	306.37	406.37	1800	1800			12.90	3630	3823	3673	12.5						356.37
KLX05	406.54	506.54	1800	14400			13.04	4528	4720	4529	13.9						456.54
KLX05	506.63	606.63	1	3840			#NV	5421	5623	5529	15.2						556.63
KLX05	606.82	706.82	1800	3600			15.34	6305	6500	6313	16.6						656.82
KLX05	706.83	806.83	1800	21600			15.42	7201	7382	7196	18.0						756.83
KLX05	807.11	907.11	1800	3600			17.23	8086	8269	8108	19.5						857.11
KLX05	887.27	987.27	1800	1800			#NV	8847	9022	8938	20.6						937.27
KLX05	111.30	131.30	1200	1200			10.86	1188	1398	1192	8.9						121.30
KLX05	126.02	146.02	1200	1200			11.19	1318	1518	1318	9.1						136.02
KLX05	146.10	166.10	1800	2400			11.18	1494	1694	1494	9.4						156.10
KLX05	166.12	186.12	1200	1200			10.53	1669	1866	1674	9.6						176.12
KLX05	181.13	201.13	1200	2400			10.94	1801	2001	1802	9.8						191.13
KLX05	191.14	211.14	1200	1200			10.22	1892	2093	1914	9.9						201.14
KLX05	211.14	231.14	1200	1200			11.06	2067	2268	2067	10.2						221.14
KLX05	226.14	246.14	1200	2400			11.61	2200	2401	2200	10.4						236.14
KLX05	246.15	266.15	1200	1200			11.15	2376	2586	2387	10.6						256.15
KLX05	266.21	286.21	1	2700			#NV	2565	2773	2613	10.9						276.21
KLX05	286.28	306.28	1200	1200			12.01	2736	2941	2743	11.1						296.28
KLX05	306.37	326.37	1200	1200			13.82	2926	3131	2956	11.4						316.37
KLX05	326.38	346.38	0	0			#NV	#NV	#NV	#NV	11.7						336.38
KLX05	341.40	361.40	0	0			#NV	#NV	#NV	#NV	11.9						351.40
KLX05	356.42	376.42	0	0			#NV	#NV	#NV	#NV	12.1						366.42
KLX05	376.47	396.47	0	0			#NV	#NV	#NV	#NV	12.3						386.42
KLX05	386.50	406.50	1	2400			#NV	3642	3837	3668	12.5						396.50
KLX05	406.54	426.54	1200	1800			13.46	3812	4008	3849	12.8						416.54
KLX05	426.55	446.55	1	2400			#NV	3999	4204	4030	13.1						436.55
KLX05	446.57	466.57	0	0			#NV	#NV	#NV	#NV	13.3						456.57
KLX05	466.58	486.58	1	21600			#NV	4351	4563	4337	13.6						476.58
KLX05	486.59	506.59	1200	1200			12.82	4533	4735	4539	13.9						496.59
KLX05	606.82	626.82	1	2400			#NV	5608	5811	5610	15.5						616.82
KLX05	626.85	646.85	1800	1800			14.82	5777	5947	5782	15.9						636.85
KLX05	646.85	666.85	0	0			#NV	#NV	#NV	#NV	16.1						656.85
KLX05	666.85	686.85	0	0			#NV	#NV	#NV	#NV	16.4						676.85
KLX05	686.83	706.83	1200	14400			15.31	6315	6519	6312	16.7						696.83
KLX05	706.83	726.83	1200	2400			15.92	6488	6696	6505	16.9						716.83
KLX05	726.91	746.91	1	2400			#NV	6679	6889	6705	17.2						736.91
KLX05	747.00	767.00	1	2400			#NV	6868	7069	7034	17.5						757.00
KLX05	767.06	787.06	1200	1200			18.33	7027	7250	7046	17.8						777.06
KLX05	787.07	807.07	1200	21600			16.89	7267	7407	7239	18.1						797.07
KLX05	807.11	827.11	0	0			#NV	#NV	#NV	#NV	18.3						817.11
KLX05	827.15	847.15	420	3600			#NV	7625	7778	7696	18.6						837.15
KLX05	847.20	867.20	1200	1200			18.75	7744	7953	7770	18.9						857.20
KLX05	867.24	887.24	1200	1200			17.07	7930	8144	7960	19.2						877.24
KLX05	887.27	907.27	1200	28800			17.53	8137	8306	8097	19.5						897.27
KLX05	907.30	927.30	0	0			#NV	#NV	#NV	#NV	19.8						917.30
KLX05	927.34	947.34	0	0			#NV	#NV	#NV	#NV	20.0						937.34

Table	plu_s_hole_test_ed1		
	PLU Single hole tests, pumping/injection. Basic evaluation		
Column	**Datatype**	**Unit**	**Column Description**
site	CHAR		Investigation site name
activity_type	CHAR		Activity type code
start_date	DATE		Date (yymmdd hh:mm:ss)
stop_date	DATE		Date (yymmdd hh:mm:ss)
project	CHAR		project code
idcode	CHAR		Object or borehole identification code
secup	FLOAT	m	Upper section limit (m)
seclow	FLOAT	m	Lower section limit (m)
section_no	INTEGER	number	Section number
test_type	CHAR		Test type code (1-7), see table description!
formation_type	CHAR		Formation type code. 1: Rock, 2: Soil (superficial deposits)
lp	FLOAT	m	Hydraulic point of application for test section, see descr.
seclen_class	FLOAT	m	Planned ordinary test interval during test campaign.
spec_capacity_q_s	FLOAT	m**2/s	Specific capacity (Q/s) of test section, see table descript.
value_type_q_s	CHAR		0:true value,-1:Q/s<lower meas.limit,1:Q/s>upper meas.limit
transmissivity_tq	FLOAT	m**2/s	Tranmissivity based on Q/s, see table description
value_type_tq	CHAR		0:true value,-1:TQ<lower meas.limit,1:TQ>upper meas.limit.
bc_tq	CHAR		Best choice code. 1 means TQ is best choice of T, else 0
transmissivity_moye	FLOAT	m**2/s	Transmissivity,TM, based on Moye (1967)
bc_tm	CHAR		Best choice code. 1 means Tmoye is best choice of T, else 0
value_type_tm	CHAR		0:true value,-1:TM<lower meas.limit,1:TM>upper meas.limit.
hydr_cond_moye	FLOAT	m/s	K_M: Hydraulic conductivity based on Moye (1967)
formation_width_b	FLOAT	m	b:Aquifer thickness repr. for T(generally b=Lw) ,see descr.
width_of_channel_b	FLOAT	m	B:Inferred width of formation for evaluated TB
tb	FLOAT	m**3/s	TB:Flow capacity in 1D formation of T & width B, see descr.
l_measl_tb	FLOAT	m**3/s	Estimated lower meas. limit for evaluated TB,see description
u_measl_tb	FLOAT	m**3/s	Estimated upper meas. limit of evaluated TB,see description
sb	FLOAT	m	SB:S=storativity,B=width of formation,1D model,see descript.
assumed_sb	FLOAT	m	SB* : Assumed SB,S=storativity,B=width of formation,see...
leakage_factor_lf	FLOAT	m	Lf:1D model for evaluation of Leakage factor
transmissivity_tt	FLOAT	m**2/s	TT:Transmissivity of formation, 2D radial flow model,see...
value_type_tt	CHAR		0:true value,-1:TT<lower meas.limit,1:TT>upper meas.limit,
bc_tt	CHAR		Best choice code. 1 means TT is best choice of T, else 0
l_measl_q_s	FLOAT	m**2/s	Estimated lower meas. limit for evaluated TT,see table descr
u_measl_q_s	FLOAT	m**2/s	Estimated upper meas. limit for evaluated TT,see description
storativity_s	FLOAT		S:Storativity of formation based on 2D rad flow,see descr.
assumed_s	FLOAT		Assumed Storativity,2D model evaluation,see table descr.
bc_s	FLOAT		Best choice of S (Storativity) ,see descr.
ri	FLOAT	m	Radius of influence
ri_index	CHAR		ri index=index of radius of influence :-1,0 or 1, see descr.
leakage_coeff	FLOAT	1/s	K'/b':2D rad flow model evaluation of leakage coeff,see desc
hydr_cond_ksf	FLOAT	m/s	Ksf:3D model evaluation of hydraulic conductivity,see desc.
value_type_ksf	CHAR		0:true value,-1:Ksf<lower meas.limit,1:Ksf>upper meas.limit,
l_measl_ksf	FLOAT	m/s	Estimated lower meas.limit for evaluated Ksf,see table desc.
u_measl_ksf	FLOAT	m/s	Estimated upper meas.limit for evaluated Ksf,see table descr
spec_storage_ssf	FLOAT	1/m	Ssf:Specific storage,3D model evaluation,see table descr.
assumed_ssf	FLOAT	1/m	Ssf*:Assumed Spec.storage,3D model evaluation,see table des.
c	FLOAT	m**3/pa	C: Wellbore storage coefficient; flow or recovery period
cd	FLOAT		CD: Dimensionless wellbore storage coefficient
skin	FLOAT		Skin factor;best estimate of flow/recovery period,see descr.
dt1	FLOAT	s	Estimated start time of evaluation, see table description
dt2	FLOAT	s	Estimated stop time of evaluation. see table description
t1	FLOAT	s	Start time for evaluated parameter from start flow period
t2	FLOAT	s	Stop time for evaluated parameter from start of flow period
dte1	FLOAT	s	Start time for evaluated parameter from start of recovery
dte2	FLOAT	s	Stop time for evaluated parameter from start of recovery
p_horner	FLOAT	kPa	p*:Horner extrapolated pressure, see table description
transmissivity_t_nlr	FLOAT	m**2/s	T_NLR Transmissivity based on None Linear Regression...
storativity_s_nlr	FLOAT		S_NLR=storativity based on None Linear Regression,see..
value_type_t_nlr	CHAR		0:true value,-1:T_NLR<lower meas.limit,1:>upper meas.limit
bc_t_nlr	CHAR		Best choice code. 1 means T_NLR is best choice of T, else 0
c_nlr	FLOAT	m**3/pa	Wellbore storage coefficient, based on NLR, see descr.
cd_nlr	FLOAT		Dimensionless wellbore storage constant, see table descrip.
skin_nlr	FLOAT		Skin factor based on Non Linear Regression,see desc.
transmissivity_t_grf	FLOAT	m**2/s	T_GRF:Transmissivity based on Genelized Radial Flow,see...
value_type_t_grf	CHAR		0:true value,-1:T_GRF<lower meas.limit,1:>upper meas.limit
bc_t_grf	CHAR		Best choice code. 1 means T_GRF is best choice of T, else 0
storativity_s_grf	FLOAT		S_GRF:Storativity based on Generalized Radial Flow, see des.
flow_dim_grf	FLOAT		Inferred flow dimesion based on Generalized Rad. Flow model
comment	VARCHAR	no_unit	Short comment to the evaluated parameters
error_flag	CHAR		If error_flag = "*" then an error occured and an error
in_use	CHAR		If in_use = "*" then the activity has been selected as
sign	CHAR		Signature for QA data accknowledge (QA - OK)

idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_type	lp	seclen_class	spec_capacity_q_s	value_type_q_s	transmissivity_tq	value_type_tq	bc_tq	transmissivity_moye	bc_tm	value_type_tm	hydr_cond_moye
KLX05	050601 17:37	050601 21:07	111.30	211.30		3	1	161.30	100	1.20E-05	0				1.56E-05	0	0	1.56E-07
KLX05	050602 09:21	050602 11:45	211.14	311.14		3	1	261.14	100	2.84E-06	0				3.70E-06	0	0	3.70E-08
KLX05	050602 13:30	050602 16:22	306.37	406.37		3	1	356.37	100	2.54E-09	0				3.31E-09	0	0	3.31E-11
KLX05	050602 17:49	050602 23:32	406.54	506.54		3	1	456.54	100	1.19E-08	0				1.55E-08	0	0	1.55E-10
KLX05	050603 09:11	050603 11:11	506.63	606.63		4	1	556.63	100	#NV	-1				#NV	0	-1	#NV
KLX05	050603 12:41	050603 15:26	606.82	706.82		3	1	656.82	100	1.93E-08	0				2.51E-08	0	0	2.51E-10
KLX05	050603 16:56	050604 00:46	706.83	806.83		3	1	756.83	100	1.81E-08	0				2.35E-08	0	0	2.35E-10
KLX05	050604 09:20	050604 12:18	807.11	907.11		3	1	857.11	100	8.93E-09	0				1.16E-08	0	0	1.16E-10
KLX05	050604 14:00	050604 17:10	887.27	987.27		3	1	937.27	100	9.34E-10	0				1.22E-09	0	0	1.22E-11
KLX05	050610 13:12	050610 14:40	111.30	131.30		3	1	121.30	20	1.04E-05	0				1.08E-05	0	0	5.40E-07
KLX05	050610 15:35	050610 17:02	126.02	146.02		3	1	136.02	20	9.16E-07	0				9.58E-07	0	0	4.79E-08
KLX05	050610 17:47	050610 20:20	146.10	166.10		3	1	156.10	20	1.12E-06	0				1.17E-06	0	0	5.85E-08
KLX05	050611 08:54	050611 10:27	166.12	186.12		3	1	176.12	20	2.24E-08	0				2.34E-08	0	0	1.17E-09
KLX05	050611 11:14	050611 13:04	181.13	201.13		3	1	191.13	20	4.33E-07	0				4.53E-07	0	0	2.27E-08
KLX05	050611 13:38	050611 15:11	191.14	211.14		3	1	201.14	20	5.61E-07	0				5.87E-07	0	0	2.94E-08
KLX05	050611 15:55	050611 17:23	211.14	231.14		3	1	221.14	20	9.76E-08	0				1.02E-07	0	0	5.10E-09
KLX05	050611 18:10	050611 19:59	226.14	246.14		3	1	236.14	20	3.09E-07	0				3.23E-07	0	0	1.62E-08
KLX05	050612 08:10	050612 09:44	246.15	266.15		3	1	256.15	20	2.84E-06	0				2.97E-06	0	0	1.49E-07
KLX05	050612 10:21	050612 11:49	266.21	286.21		4	1	276.21	20	#NV	-1				#NV	0	-1	#NV
KLX05	050612 12:29	050612 13:58	286.28	306.28		3	1	296.28	20	2.39E-08	0				2.50E-08	0	0	1.25E-09
KLX05	050612 14:39	050612 16:22	306.37	326.37		3	1	316.37	20	2.39E-09	0				2.50E-09	0	0	1.25E-10
KLX05	050612 17:03	050612 18:05	326.38	346.38		4	1	336.38	20	#NV	-1				#NV	0	-1	#NV
KLX05	050612 18:38	050612 19:40	341.40	361.40		3	1	351.40	20	#NV	-1				#NV	0	-1	#NV
KLX05	050613 07:26	050613 08:31	356.42	376.42		3	1	366.42	20	#NV	-1				#NV	0	-1	#NV
KLX05	050613 09:17	050613 10:23	376.47	396.47		3	1	386.42	20	#NV	-1				#NV	0	-1	#NV
KLX05	050613 11:00	050613:12:27	386.50	406.50		4	1	396.50	20	#NV	-1				#NV	0	-1	#NV
KLX05	050613 13:04	050613 14:46	406.54	426.54		3	1	416.54	20	1.17E-08	0				1.22E-08	0	0	6.10E-10
KLX05	050613 15:32	050613 16:53	426.55	446.55		4	1	436.55	20	#NV	-1				#NV	0	-1	#NV
KLX05	050613 17:33	050613 18:38	446.57	466.57		3	1	456.57	20	#NV	-1				#NV	0	-1	#NV
KLX05	050613 19:13	050614 01:56	466.58	486.58		4	1	476.58	20	#NV	-1				#NV	0	-1	#NV
KLX05	050614 07:40	050614 09:27	486.59	506.59		3	1	496.59	20	1.62E-09	0				1.69E-09	0	0	8.45E-11
KLX05	050614 11:09	050614 12:33	606.82	626.82		4	1	616.82	20	#NV	-1				#NV	0	-1	#NV
KLX05	050614 13:16	050614 15:26	626.85	646.85		3	1	636.85	20	9.62E-09	0				1.01E-08	0	0	5.05E-10
KLX05	050614 16:07	050614 17:12	646.85	666.85		3	1	656.85	20	#NV	-1				#NV	0	-1	#NV
KLX05	050614 17:56	050614 18:57	666.85	686.85		3	1	676.85	20	#NV	-1				#NV	0	-1	#NV
KLX05	050614 19:48	050615 00:58	686.83	706.83		3	1	696.83	20	1.04E-08	0				1.09E-08	0	0	5.45E-10
KLX05	050615 08:02	050615 09:58	706.83	726.83		3	1	716.83	20	7.86E-09	0				8.22E-09	0	0	4.11E-10
KLX05	050615 10:40	050615 11:52	726.91	746.91		4	1	736.91	20	#NV	-1				#NV	0	-1	#NV
KLX05	050615 12:45	050615 14:11	747.00	767.00		4	1	757.00	20	#NV	-1				#NV	0	-1	#NV
KLX05	050615 14:50	050615 16:25	767.06	787.06		3	1	777.06	20	8.07E-09	0				8.44E-09	0	0	4.22E-10
KLX05	050615 17:07	050616 01:36	787.07	807.07		3	1	797.07	20	1.40E-08	0				1.47E-08	0	0	7.35E-10
KLX05	050616 08:05	050616 09:07	807.11	827.11		3	1	817.11	20	#NV	-1				#NV	0	-1	#NV
KLX05	050616 09:52	050616 12:29	827.15	847.15		3	1	837.15	20	1.07E-09	0				1.12E-09	0	0	5.60E-11
KLX05	050616 13:09	050616 00:00	847.20	867.20		3	1	857.20	20	4.69E-09	0				4.91E-09	0	0	2.46E-10
KLX05	050616 15:39	050616 17:25	867.24	887.24		3	1	877.24	20	3.82E-09	0				4.00E-09	0	0	2.00E-10
KLX05	050616 18:07	050617 03:30	887.27	907.27		3	1	897.27	20	9.67E-10	0				1.01E-09	0	0	5.05E-11
KLX05	050617 07:33	050617 08:27	907.30	927.30		4	1	917.30	20	#NV	-1				#NV	0	-1	#NV
KLX05	050617 09:13	050617 10:14	927.34	947.34		3	1	937.34	20	#NV	-1				#NV	0	-1	#NV

idcode	secup	seclow	formation_width_b	width_of_channel_b	tb	l_measl_tb	u_measl_tb	sb	assumed_sb	leakage_factor_lf	transmissivity_tt	value_type_tt	bc_tt	l_measl_q_s	u_measl_q_s	storativity_s	assumed_s	bc_s	ri	ri_index
KLX05	111.30	211.30									9.10E-06	0	1	7.00E-06	2.00E-05	1.00E-06	1.00E-06		24.69	-1
KLX05	211.14	311.14									1.90E-06	0	1	9.00E-07	4.00E-06	1.00E-06	1.00E-06		42.45	-1
KLX05	306.37	406.37									1.79E-09	0	1	8.00E-10	3.00E-09	1.00E-06	1.00E-06		19.71	1
KLX05	406.54	506.54									1.85E-08	0	1	8.00E-09	4.00E-08	1.00E-06	1.00E-06		13.19	1
KLX05	506.63	606.63									9.40E-11	0	1	6.00E-11	2.00E-10	1.00E-06	1.00E-06		13.78	0
KLX05	606.82	706.82									2.51E-08	0	1	9.00E-09	4.00E-08	1.00E-06	1.00E-06		53.95	0
KLX05	706.83	806.83									7.91E-09	0	1	4.00E-09	3.00E-08	1.00E-06	1.00E-06		99.02	1
KLX05	807.11	907.11									3.36E-09	0	1	1.00E-09	7.00E-09	1.00E-06	1.00E-06		32.63	0
KLX05	887.27	987.27									1.20E-10	0	1	9.00E-11	4.00E-10	1.00E-06	1.00E-06		10.03	1
KLX05	111.30	131.30									1.60E-05	0	1	8.00E-06	3.00E-05	1.00E-06	1.00E-06		78.49	-1
KLX05	126.02	146.02									9.26E-07	0	1	7.00E-07	3.00E-06	1.00E-06	1.00E-06		76.76	-1
KLX05	146.10	166.10									5.08E-06	0	1	1.00E-06	8.00E-06	1.00E-06	1.00E-06		121.04	0
KLX05	166.12	186.12									2.70E-08	0	1	1.00E-08	4.00E-08	1.00E-06	1.00E-06		7.51	1
KLX05	181.13	201.13									3.14E-07	0	1	9.00E-08	6.00E-07	1.00E-06	1.00E-06		13.43	-1
KLX05	191.14	211.14									2.41E-07	0	1	9.00E-08	4.00E-07	1.00E-06	1.00E-06		54.82	1
KLX05	211.14	231.14									2.46E-08	0	1	9.00E-09	5.00E-08	1.00E-06	1.00E-06		9.25	-1
KLX05	226.14	246.14									6.24E-07	0	1	1.00E-07	1.00E-06	1.00E-06	1.00E-06		69.55	0
KLX05	246.15	266.15									2.22E-06	0	1	9.00E-07	4.00E-06	1.00E-06	1.00E-06		95.51	-1
KLX05	266.21	286.21									7.61E-11	0	1	2.00E-11	2.00E-10	1.00E-06	1.00E-06		10.96	-1
KLX05	286.28	306.28									1.98E-08	0	1	9.00E-09	4.00E-08	1.00E-06	1.00E-06		29.34	-1
KLX05	306.37	326.37									2.18E-09	0	1	9.00E-10	4.00E-09	1.00E-06	1.00E-06		16.91	-1
KLX05	326.38	346.38									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	341.40	361.40									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	356.42	376.42									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	376.47	396.47									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	386.50	406.50									4.35E-10	0	1	1.00E-10	7.00E-10	1.00E-06	1.00E-06		15.98	0
KLX05	406.54	426.54									1.79E-08	0	1	9.00E-09	3.00E-08	1.00E-06	1.00E-06		13.58	1
KLX05	426.55	446.55									3.36E-11	0	1	1.00E-11	6.00E-11	1.00E-06	1.00E-06		8.43	0
KLX05	446.57	466.57									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	466.58	486.58									3.67E-10	0	1	9.00E-11	6.00E-10	1.00E-06	1.00E-06		6.35	1
KLX05	486.59	506.59									2.71E-09	0	1	9.00E-10	5.00E-09	1.00E-06	1.00E-06		17.85	-1
KLX05	606.82	626.82									4.12E-10	0	1	1.00E-10	8.00E-10	1.00E-06	1.00E-06		15.77	0
KLX05	626.85	646.85									1.20E-08	0	1	9.00E-09	6.00E-08	1.00E-06	1.00E-06		31.72	-1
KLX05	646.85	666.85									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	666.85	686.85									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	686.83	706.83									1.15E-08	0	1	9.00E-09	3.00E-08	1.00E-06	1.00E-06		9.81	1
KLX05	706.83	726.83									4.49E-09	0	1	1.00E-09	7.00E-09	1.00E-06	1.00E-06		28.64	1
KLX05	726.91	746.91									1.55E-10	0	1	8.00E-11	4.00E-10	1.00E-06	1.00E-06		12.35	0
KLX05	747.00	767.00									3.64E-12	0	1	1.00E-12	6.00E-12	1.00E-06	1.00E-06		4.83	1
KLX05	767.06	787.06									9.18E-09	0	1	6.00E-09	5.00E-08	1.00E-06	1.00E-06		24.22	-1
KLX05	787.07	807.07									4.34E-09	0	1	1.00E-09	7.00E-09	1.00E-06	1.00E-06		11.82	1
KLX05	807.11	827.11									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	827.15	847.15									4.29E-09	0	1	8.00E-10	7.00E-09	1.00E-06	1.00E-06		#NV	1
KLX05	847.20	867.20									2.82E-09	0	1	9.00E-10	5.00E-09	1.00E-06	1.00E-06		18.03	0
KLX05	867.24	887.24									1.53E-09	0	1	8.00E-10	4.00E-09	1.00E-06	1.00E-06		15.47	1
KLX05	887.27	907.27									1.06E-10	0	1	6.00E-11	4.00E-10	1.00E-06	1.00E-06		38.90	0
KLX05	907.30	927.30									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX05	927.34	947.34									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV

idcode	secup	seclow	leakage_coeff	hydr_cond_ksf	value_type_ksf	l_measl_ksf	u_measl_ksf	spec_storage_ssf	assumed_ssf	c	cd	skin	dt1	dt2	t1	t2	dte1	dte2	p_horner	transmissivity_t_nlr	storativity_s_nlr	value_type_t_nlr	bc_t_nlr	c_nlr	cd_nlr	skin_nlr	transmissivity_t_grf	value_type_t_grf	bc_t_grf	storativity_s_grf	flow_dim_grf	comment
KLX05	111.30	211.30								1.35E-08	1.49E+00	-3.64	18	40					1882.8													
KLX05	211.14	311.14								7.31E-10	8.06E-02	3.39	112	256					2770.3													
KLX05	306.37	406.37								2.48E-10	2.73E-02	-0.69	1016	1769					3613.2													
KLX05	406.54	506.54								3.08E-10	3.39E-02	0.55	107	251					4517.7													
KLX05	506.63	606.63								2.02E-10	2.23E-02	-1.46	#NV	#NV					#NV													
KLX05	606.82	706.82								3.54E-10	3.90E-02	1.18	110	243					6306.5													
KLX05	706.83	806.83								7.86E-10	8.66E-02	-2.22	#NV	#NV					7183.9													
KLX05	807.11	907.11								3.05E-10	3.36E-02	-2.82	670	2043					8082.9													
KLX05	887.27	987.27								2.85E-10	3.14E-02	-2.32	#NV	#NV					#NV													
KLX05	111.30	131.30								1.58E-08	1.74E+00	-0.27	165	302					1185.4													
KLX05	126.02	146.02								3.20E-10	3.53E-02	1.68	#NV	#NV					1317.5													
KLX05	146.10	166.10								1.02E-10	1.12E-02	20.70	14	575					1492.6													
KLX05	166.12	186.12								5.20E-11	5.73E-03	1.05	9	67					1662.1													
KLX05	181.13	201.13								2.40E-10	2.65E-02	-1.63	28	63					1797.9													
KLX05	191.14	211.14								3.82E-10	4.21E-02	-3.61	381	1096					1878.7													
KLX05	211.14	231.14								1.32E-10	1.45E-02	-3.08	40	107					2062.5													
KLX05	226.14	246.14								7.33E-11	8.08E-03	5.53	12	877					2199.8													
KLX05	246.15	266.15								2.79E-09	3.08E-01	-5.16	519	1095					2371.3													
KLX05	266.21	286.21								6.92E-11	7.63E-03	-2.43	1132	2175					#NV													
KLX05	286.28	306.28								7.88E-11	8.69E-03	-0.78	114	525					2733.6													
KLX05	306.37	326.37								5.00E-11	5.51E-03	0.31	#NV	#NV					2929.0													
KLX05	326.38	346.38								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	341.40	361.40								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	356.42	376.42								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	376.47	396.47								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	386.50	406.50								7.01E-11	7.73E-03	0.74	37	657					#NV													
KLX05	406.54	426.54								5.80E-11	6.39E-03	0.52	119	270					3827.3													
KLX05	426.55	446.55								5.59E-11	6.16E-03	0.59	67	441					#NV													
KLX05	446.57	466.57								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	466.58	486.58								6.08E-11	6.70E-03	0.58	27	413					#NV													
KLX05	486.59	506.59								4.80E-11	5.29E-03	5.01	#NV	#NV					4516.0													
KLX05	606.82	626.82								5.20E-11	5.73E-03	-0.57	85	327					#NV													
KLX05	626.85	646.85								9.46E-11	1.04E-02	2.29	761	1538					5774.7													
KLX05	646.85	666.85								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	666.85	686.85								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	686.83	706.83								7.63E-11	8.41E-03	1.15	24	176					6306.3													
KLX05	706.83	726.83								3.94E-11	4.34E-03	-0.73	794	2089					6487.4													
KLX05	726.91	746.91								4.15E-11	4.57E-03	-1.10	443	2102					#NV													
KLX05	747.00	767.00								6.80E-11	7.49E-03	-1.57	#NV	#NV					#NV													
KLX05	767.06	787.06								4.12E-11	4.54E-03	2.17	33	863					7038.9													
KLX05	787.07	807.07								1.95E-10	2.15E-02	-2.96	#NV	#NV					7200.4													
KLX05	807.11	827.11								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	827.15	847.15								5.57E-11	6.14E-03	0.96	#NV	#NV					#NV													
KLX05	847.20	867.20								5.20E-11	5.73E-03	-0.86	587	1067					7747.4													
KLX05	867.24	887.24								6.88E-11	7.58E-03	-1.61	514	1186					7907.0													
KLX05	887.27	907.27								3.63E-11	4.00E-03	-1.29	2243	6742					8087.3													
KLX05	907.30	927.30								#NV	#NV	#NV	#NV	#NV					#NV													
KLX05	927.34	947.34								#NV	#NV	#NV	#NV	#NV					#NV													

Table	plu_s_hole_test_obs Data of observation sections of single hole test		
Column	**Datatype**	**Unit**	**Column Description**
site	CHAR		Investigation site name
activity_type	CHAR		Activity type code
idcode	CHAR		Object or borehole identification code
start_date	DATE		Date (yymmdd hh:mm:ss)
secup	FLOAT	m	Upper section limit (m)
seclow	FLOAT	m	Lower section limit (m)
obs_secup	FLOAT	m	Upper limit of observation section
obs_seclow	FLOAT	m	Lower limit of observation section
pi_above	FLOAT	kPa	Groundwater pressure above test section,start of flow period
pp_above	FLOAT	kPa	Groundwater pressure above test section,at stop flow period
pf_above	FLOAT	kPa	Groundwater pressure above test section at stop recovery per
pi_below	FLOAT	kPa	Groundwater pressure below test section at start flow period
pp_below	FLOAT	kPa	Groundwater pressure below test section at stop flow period
pf_below	FLOAT	kPa	Groundwater pressure below test section at stop recovery per
comments	VARCHAR		Comment text row (unformatted text)

idcode	start_date	stop_date	secup	seclow	section_no	obs_secup	obs_seclow	pi_above	pp_above	pf_above	pi_below	pp_below	pf_below	comments
KLX05	050601 17:37	050601 21:07	111.30	211.30		212.30	1000.16	996	999	997	1920	1924	1922	
KLX05	050602 09:21	050602 11:45	211.14	311.14		312.14	1000.16	1876	1876	1876	2808	2807	2810	
KLX05	050602 13:30	050602 16:22	306.37	406.37		407.37	1000.16	2722	2722	2722	3658	3658	3655	
KLX05	050602 17:49	050602 23:32	406.54	506.54		507.54	1000.16	3618	3618	3618	4556	4556	4552	
KLX05	050603 09:11	050603 11:11	506.63	606.63		607.63	1000.16	4516	4516	4516	5448	5448	5443	
KLX05	050603 12:41	050603 15:26	606.82	706.82		707.82	1000.16	5415	5415	5415	6344	6347	6347	
KLX05	050603 16:56	050604 00:46	706.83	806.83		807.83	1000.16	6310	6310	6309	7231	7230	7228	
KLX05	050604 09:20	050604 12:18	807.11	907.11		908.11	1000.16	7200	7200	7201	8148	8147	8142	
KLX05	050604 14:00	050604 17:10	887.27	987.27		988.27	1000.16	7920	7920	7920	9313	9299	9269	
KLX05	050610 13:12	050610 14:40	111.30	131.30		132.30	1000.16	1000	1002	1003	1222	1237	1226	
KLX05	050610 15:35	050610 17:02	126.02	146.02		147.02	1000.16	1129	1130	1129	1353	1355	1352	
KLX05	050610 17:47	050610 20:20	146.10	166.10		167.10	1000.16	1304	1306	1305	1529	1529	1529	
KLX05	050611 08:54	050611 10:27	166.12	186.12		187.12	1000.16	1478	1478	1478	1703	1703	1700	
KLX05	050611 11:14	050611 13:04	181.13	201.13		202.13	1000.16	1611	1611	1611	1836	1845	1336	
KLX05	050611 13:38	050611 15:11	191.14	211.14		212.14	1000.16	1699	1699	1699	1924	1927	1926	
KLX05	050611 15:55	050611 17:23	211.14	231.14		232.14	1000.16	1877	1877	1876	2101	2102	2101	
KLX05	050611 18:10	050611 19:59	226.14	246.14		247.14	1000.16	2010	2010	2010	2235	2240	2236	
KLX05	050612 08:10	050612 09:44	246.15	266.15		267.15	1000.16	2186	2187	2187	2411	2411	2411	
KLX05	050612 10:21	050612 11:49	266.21	286.21		287.21	1000.16	2366	2366	2366	2591	2591	2589	
KLX05	050612 12:29	050612 13:58	286.28	306.28		307.28	1000.16	2543	2544	2544	2770	2769	2768	
KLX05	050612 14:39	050612 16:22	306.37	326.37		327.37	1000.16	2724	2724	2724	2949	2948	2950	
KLX05	050612 17:03	050612 18:05	326.38	346.38		347.38	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050612 18:38	050612 19:40	341.40	361.40		362.40	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050613 07:26	050613 08:31	356.42	376.42		377.42	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050613 09:17	050613 10:23	376.47	396.47		397.42	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050613 11:00	050613:12:27	386.50	406.50		407.50	1000.16	3440	3440	3440	3663	3663	3662	
KLX05	050613 13:04	050613 14:46	406.54	426.54		427.54	1000.16	3620	3620	3620	3843	3842	3841	
KLX05	050613 15:32	050613 16:53	426.55	446.55		447.55	1000.16	3800	3800	3800	4023	4022	4020	
KLX05	050613 17:33	050613 18:38	446.57	466.57		467.57	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050613 19:13	050614 01:56	466.58	486.58		487.58	1000.16	4159	4159	4157	4381	4380	4379	
KLX05	050614 07:40	050614 09:27	486.59	506.59		507.59	1000.16	4338	4338	4338	4559	4559	4558	
KLX05	050614 11:09	050614 12:33	606.82	626.82		627.82	1000.16	5419	5418	5418	5637	5636	5636	
KLX05	050614 13:16	050614 15:26	626.85	646.85		647.85	1000.16	5599	5599	5599	5816	5816	5815	
KLX05	050614 16:07	050614 17:12	646.85	666.85		667.85	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050614 17:56	050614 18:57	666.85	686.85		687.85	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050614 19:48	050615 00:58	686.83	706.83		707.83	1000.16	6136	6135	6133	6350	6352	6347	
KLX05	050615 08:02	050615 09:58	706.83	726.83		727.83	1000.16	6311	6311	6312	6523	6523	6523	
KLX05	050615 10:40	050615 11:52	726.91	746.91		747.91	1000.16	6491	6491	6492	6703	6702	6701	
KLX05	050615 12:45	050615 14:11	747.00	767.00		768.00	1000.16	6672	6672	6672	6883	6882	6881	
KLX05	050615 14:50	050615 16:25	767.06	787.06		788.06	1000.16	6852	6852	6852	7063	7063	7062	
KLX05	050615 17:07	050616 01:36	787.07	807.07		808.07	1000.16	7030	7030	7025	7240	7236	7230	
KLX05	050616 08:05	050616 09:07	807.11	827.11		828.11	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050616 09:52	050616 12:29	827.15	847.15		848.15	1000.16	7385	7385	7386	7594	7595	7594	
KLX05	050616 13:09	050616 00:00	847.20	867.20		868.20	1000.16	7567	7567	7567	7779	7780	7782	
KLX05	050616 15:39	050616 17:25	867.24	887.24		888.24	1000.16	7745	7745	7745	7990	7985	7980	
KLX05	050616 18:07	050617 03:30	887.27	907.27		908.27	1000.16	7923	7923	7919	8165	8164	8141	
KLX05	050617 07:33	050617 08:27	907.30	927.30		928.30	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	
KLX05	050617 09:13	050617 10:14	927.34	947.34		948.34	1000.16	#NV	#NV	#NV	#NV	#NV	#NV	