P-05-192

Oskarshamn site investigation

Hydraulic injection tests in borehole KLX03, 2005

Subarea Laxemar

Nils Rahm, Golder Associates AB

Cristian Enachescu, Golder Associates GmbH

November 2005

Svensk Kärnbränslehantering AB
Swedish Nuclear Fuel
and Waste Management Co
Box 5864
SE-102 40 Stockholm Sweden
Tel 08-459 84 00
+46 8 459 84 00
Fax 08-661 57 19
+46 8 661 57 19

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

Abstract

Hydraulic injection tests have been performed in borehole KLX03 at the Laxemar area, Oskarshamn. The tests are part of the general program for site investigations and specifically for the Laxemar sub-area. 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 KLX03 performed between 5th of May and 19th of May 2005.

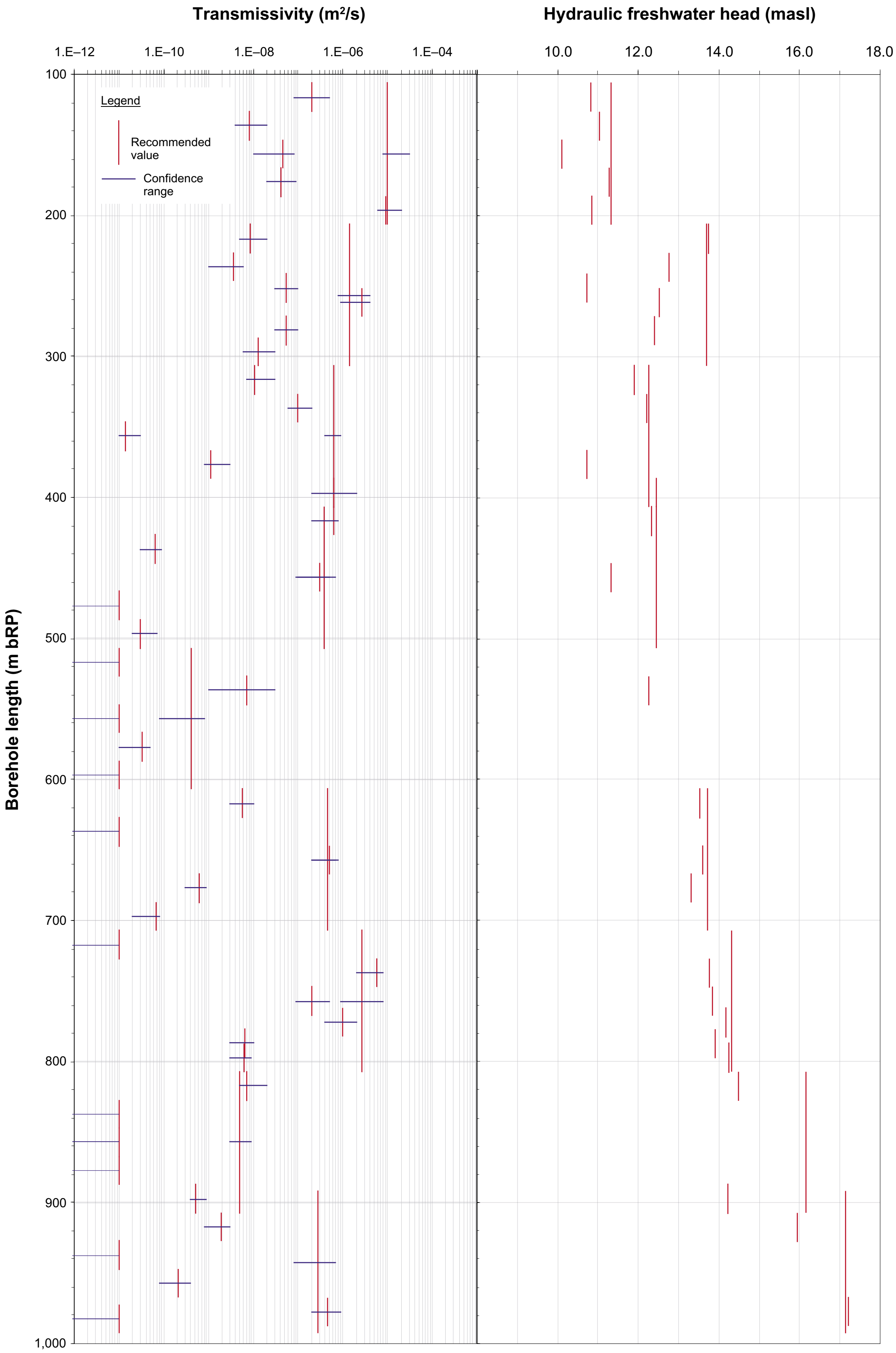
The objective of the hydrotests was to describe the rock around the borehole with respect of hydraulic parameters, mainly transmissivity (T) and hydraulic conductivity (K) at different measurement scales of 100 m and 20 m sections. Transient evaluation during flow and recovery period provided additional information such as flow regimes, hydraulic boundaries and cross-over flows. Constant pressure injection tests were conducted between 106.31–992.41 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 KLX03 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 KLX03. Testerna utfördes mellan den 5 maj till den 19 maj 2005.

Syftet med hydraultesterna var framförallt att beskriva bergets hydrauliska egenskaper runt borrhålet med avseende på hydrauliska parametrar, i huvudsak transmissivitet (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 106,31–992,41 m borrhålslängd. Resultaten av testutvärderingen presenteras som transmissivitet, hydraulisk konduktivitet och grundvattennivå uttryckt i ekvivalent sötvattenpelare (freshwater head).



Borehole KLX03 – 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 according in borehole KLX03 during 5th of May and 19th of May 2005 following the methodology described in SKB MD 323.001 and in the activity plan AP PS 400-05-031 (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 KLX03. The commission was conducted by Golder Associates AB and Golder Associates GmbH.

Borehole KLX03 is situated in the Laxemar area approximately 3.5 km west of the nuclear power plant of Simpevarp, Figure 1-1. The borehole was drilled from May 2004 to September 2004 at 1,000.42 m length with an inner diameter of 76 mm and an inclination of –74.93°. The upper 11.65 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 400-05-031. 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 KLX03.	AP PS 400-05-031	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

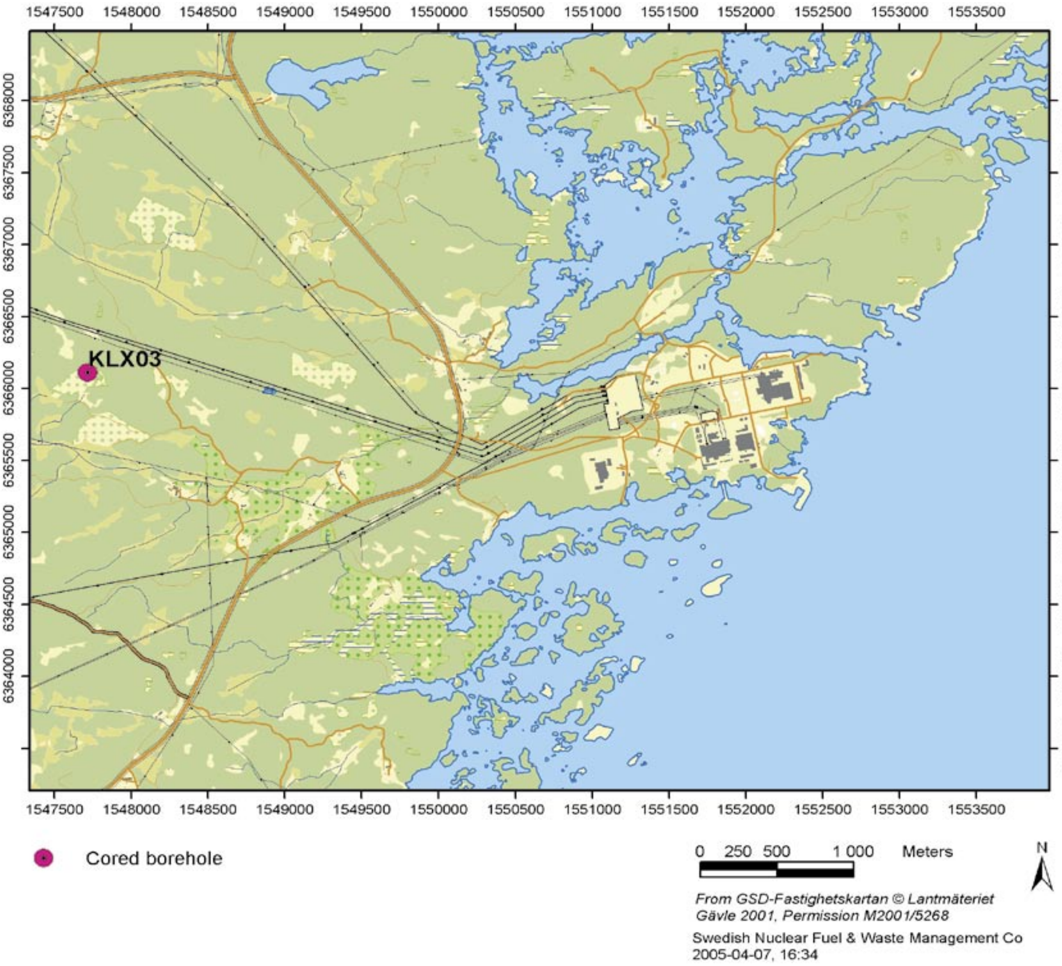


Figure 1-1. *The investigation area Laxemar, Oskarshamn with location of borehole KLX03.*

2 Objective

The objective of the hydrotests in borehole KLX03 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.

A further subactivity was optionally planned according to the activity plan AP PS 400-05-031 with pump tests including water chemistry investigations. These subactivity was not performed.

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 5th May and 19th May 2005.

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 3-1. Performed injection tests at borehole KLX03.

No of injection tests	Interval	Positions	Time/test	Total test time
10	100 m	106.31–992.31 m	125 min	20.8 hrs
47*	20 m	106.31–992.41 m	90 min	70.5 hrs
Total: 91.3 hrs				

*excluding additional overnight slug injection tests and repeated tests.

Table 3-2. Information about KLX03 (from SICADA 2005-04-01 15:22:50).

Title	Value				
Borehole length (m)	1,000.420				
Drilling period(s)	**From date**	**To date**	**Secup (m)**	**Seclow (m)**	**Drilling type**
	2004-05-03	2004-05-13	0.000	100.350	Percussion drilling
	2004-05-28	2004-09-07	100.350	1,000.420	Core drilling
Starting point coordinate	**Length (m)**	**Northing (m)**	**Easting (m)**	**Elevation (masl)**	**Coord system**
(centerpoint of TOC)	0.000	6366111.771	1547718.966	18.420	RT38-RH00 Transformed
	0.000	6366112.590	1547718.920	18.490	RT90-RHB70 Measured
	0.000	6373.037	–1842.659	18.462	ÄSPÖ96 Transformed
Angles	**Length (m)**	**Bearing**	**Inclination (– = down)**		
	0.000	199.040 RT90-RHB70 Measured	–74.930		
Borehole diameter	**Secup (m)**	**Seclow (m)**	**Hole diam (m)**		
	0.000	11.950	0.347		
	11.950	100.350	0.253		
	100.350	101.400	0.086		
	101.400	1,000.420	0.076		
Core diameter	**Secup (m)**	**Seclow (m)**	**Core diam (m)**		
	100.350	101.400	0.072		
	101.400	1,000.420	0.050		
Casing diameter	**Secup (m)**	**Seclow (m)**	**Case in (m)**	**Case out (m)**	
	0.000	100.000	0.200	0.208	
	0.100	11.650	0.311	0.323	
	100.100	100.050	0.170	0.208	
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			
	950.000	YES			

3.2 Injection tests

Injection tests were conducted according to the Activity Plan AP PS 400-05-031 and the method description for hydraulic injection tests, SKB MD 323.001 (SKB internal documents). Tests were done in 100 m test sections between 106.31–992.31 m below ToC and in 20 m test sections between 106.31–992.41 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.

No other additional measurements except the actual hydraulic tests and related measurements of packer position and water level in annulus of borehole KLX03 were conducted.

Table 3-3. Tests performed.

Bh ID	Test section (m bToC)	Test type[1]	Test no	Test start Date, time	Test stop Date, time
KLX03	106.31–206.31	3	1	2005.05.05 11:05	2005.05.05 15:38
KLX03	206.44–306.44	3	1	2005.05.05 17:25	2005.05.05 20:54
KLX03	306.58–406.58	3	1	2005.05.06 09:03	2005.05.06 11:02
KLX03	406.70–506.70	3	1	2005.05.06 12:36	2005.05.06 15:17
KLX03	506.71–606.71	4	1	2005.05.06 16:53	2005.05.07 01:45
KLX03	606.94–706.94	3	1	2005.05.07 08:53	2005.05.07 10:49
KLX03	707.09–807.09	3	1	2005.05.07 12:26	2005.05.07 14:24
KLX03	807.21–907.21	3	1	2005.05.07 16:19	2005.05.07 22:08
KLX03	892.31–992.31	3	1	2005.05.08 09:43	2005.05.08 11:40
KLX03	506.71–606.71	3	2	2005.05.08 15:36	2005.05.08 17:31
KLX03	106.31–126.31	3	1	2005.05.10 08:00	2005.05.10 09:49
KLX03	126.35–146.35	3	1	2005.05.10 10:39	2005.05.10 13:09
KLX03	146.39–166.39	3	1	2005.05.10 13:54	2005.05.10 15:47
KLX03	166.42–186.42	3	1	2005.05.10 16:43	2005.05.10 17:34
KLX03	166.42–186.42	3	2	2005.05.10 17:57	2005.05.10 19:08
KLX03	166.42–186.42	4	3	2005.05.10 19:10	2005.05.10 20:01
KLX03	186.42–206.42	3	1	2005.05.11 08:01	2005.05.11 09:37
KLX03	206.44–226.44	3	1	2005.05.11 10:16	2005.05.11 12:26
KLX03	226.44–246.44	3	1	2005.05.11 13:38	2005.05.11 15:19
KLX03	241.48–261.48	3	1	2005.05.11 16:06	2005.05.11 17:51
KLX03	251.49–271.49	3	1	2005.05.11 18:23	2005.05.11 21:31
KLX03	271.54–291.54	3	1	2005.05.12 07:53	2005.05.12 09:59
KLX03	286.56–306.56	4	1	2005.05.12 10:41	2005.05.12 13:02
KLX03	306.58–326.58	3	1	2005.05.12 13:43	2005.05.12 16:07
KLX03	326.60–346.60	3	1	2005.05.12 17:04	2005.05.12 18:29
KLX03	326.60–346.60	5	2	2005.05.12 18:31	2005.05.13 03:08
KLX03	346.62–366.62	4	1	2005.05.13 09:07	2005.05.13 10:43
KLX03	366.65–386.65	3	1	2005.05.13 11:25	2005.05.13 13:50
KLX03	386.68–406.68	3	1	2005.05.13 14:52	2005.05.13 16:18
KLX03	406.70–426.70	3	1	2005.05.13 17:00	2005.05.13 18:32

KLX03	426.71–446.71	4	1	2005.05.13 19:14	2005.05.14 03:57
KLX03	446.72–466.72	3	1	2005.05.14 08:09	2005.05.14 10:03
KLX03	466.71–486.71	4	1	2005.05.14 10:44	2005.05.14 11:50
KLX03	486.70–506.70	4	1	2005.05.14 12:38	2005.05.14 14:21
KLX03	506.71–526.71	3	1	2005.05.14 15:02	2005.05.14 16:02
KLX03	526.77–546.77	3	1	2005.05.14 16:44	2005.05.14 18:32
KLX03	526.77–546.77	5	2	2005.05.14 18:52	2005.05.15 05:50
KLX03	546.83–566.83	3	1	2005.05.15 09:51	2005.05.15 10:53
KLX03	566.87–586.87	4	1	2005.05.15 11:37	2005.05.15 13:21
KLX03	586.90–606.90	4	1	2005.05.15 14:04	2005.05.15 15:12
KLX03	606.94–626.94	3	1	2005.05.15 15:52	2005.05.15 17:47
KLX03	606.94–626.94	5	2	2005.05.15 20:19	2005.05.16 07:12
KLX03	626.97–646.97	4	1	2005.05.15 18:36	2005.05.15 19:41
KLX03	646.99–666.99	3	1	2005.05.16 08:32	2005.05.16 10:04
KLX03	667.02–687.02	3	1	2005.05.16 10:50	2005.05.16 13:29
KLX03	687.06–707.06	4	1	2005.05.16 14:22	2005.05.16 16:13
KLX03	707.09–727.09	3	1	2005.05.16 17:00	2005.05.16 17:59
KLX03	727.13–747.13	3	1	2005.05.16 18:39	2005.05.16 21:53
KLX03	747.15–767.15	3	1	2005.05.17 08:15	2005.05.17 09:48
KLX03	762.16–782.16	3	1	2005.05.17 10:32	2005.05.17 11:59
KLX03	777.17– 797.17	3	1	2005.05.17 12:47	2005.05.17 14:27
KLX03	787.19–807.19	3	1	2005.05.17 15:08	2005.05.17 16:53
KLX03	807.21–827.21	3	1	2005.05.17 17:44	2005.05.17 19:08
KLX03	807.21–827.21	5	2	2005.05.17 19:12	2005.05.18 03:44
KLX03	827.24–847.24	3	1	2005.05.18 08:16	2005.05.18 09:16
KLX03	847.26–867.26	3	1	2005.05.18 09:59	2005.05.18 11:02
KLX03	867.28–887.28	3	1	2005.05.18 11:43	2005.05.18 12:44
KLX03	887.31–887.31	3	1	2005.05.18 14:01	2005.05.18 16:16
KLX03	907.33–927.33	3	1	2005.05.18 17:04	1900.07.18 22:48
KLX03	927.33–947.33	3	1	2005.05.19 08:14	2005.05.19 09:24
KLX03	947.34–967.34	4	1	2005.05.19 10:03	2005.05.19 11:45
KLX03	967.39–987.39	3	1	2005.05.19 12:24	2005.05.19 13:54
KLX03	972.41–992.41	3	1	2005.05.19 14:26	2005.05.19 15:28

1: 3: Injection test; 4: Pulse injection test ; 5: Slug injection test.

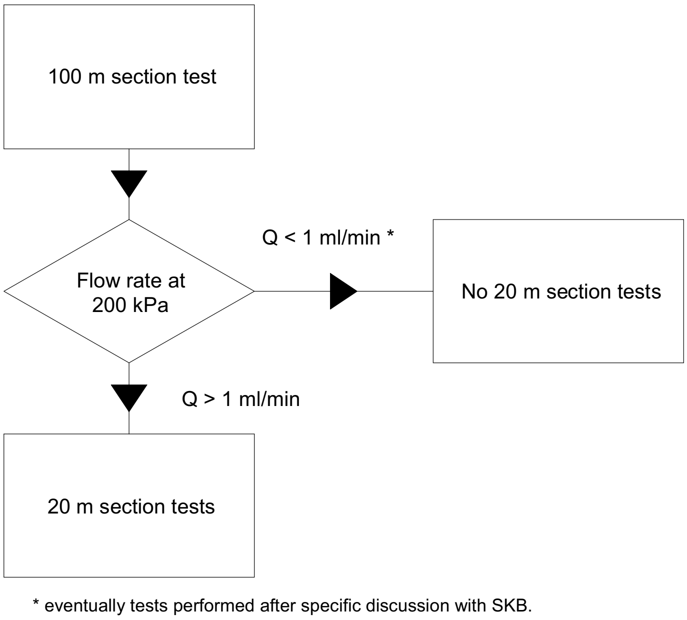


Figure 3-1. *Flow chart for test sections.*

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 "Mätssystem-beskrivning".

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.

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.

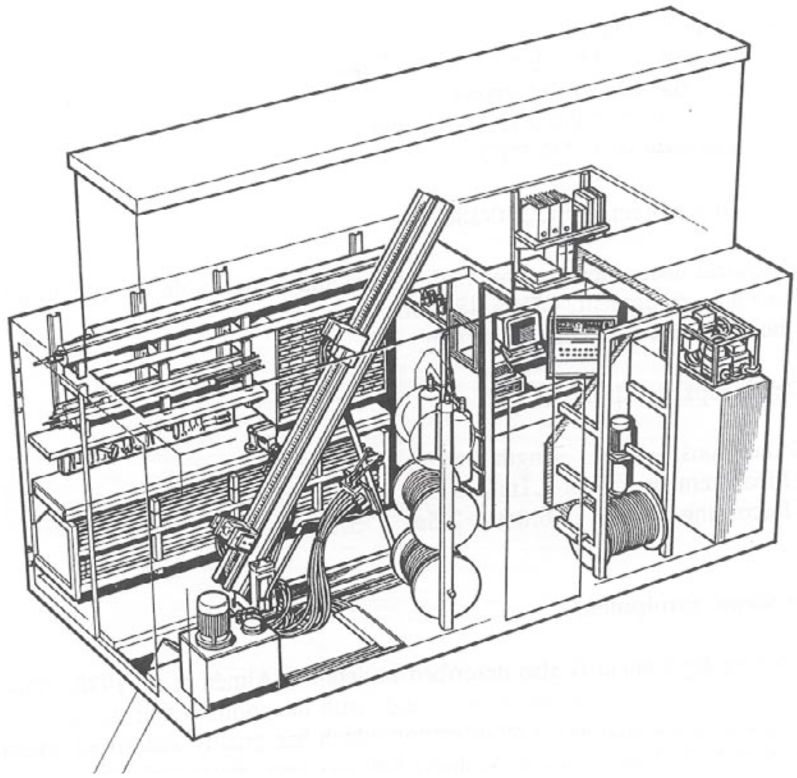


Figure 4-1. *A view of the layout and equipment of PSS2.*

Photo 1. *Hydraulic rig.*

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

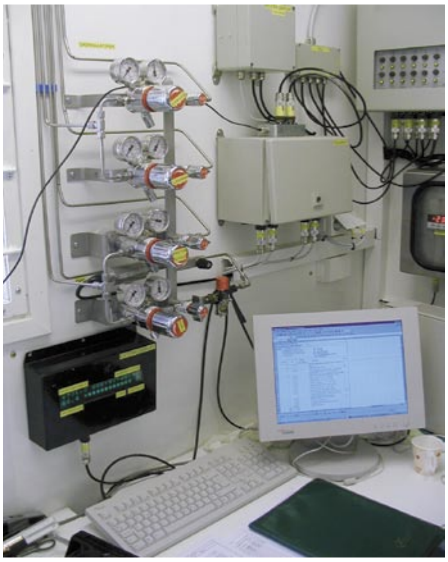


Photo 3. *Computer room, displays and gas regulators.*

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 3kPa/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 3kPa/m at 50 L/min.
- Contact carrier – SS 1.0 m carrying connections for sensors below and,
- 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.

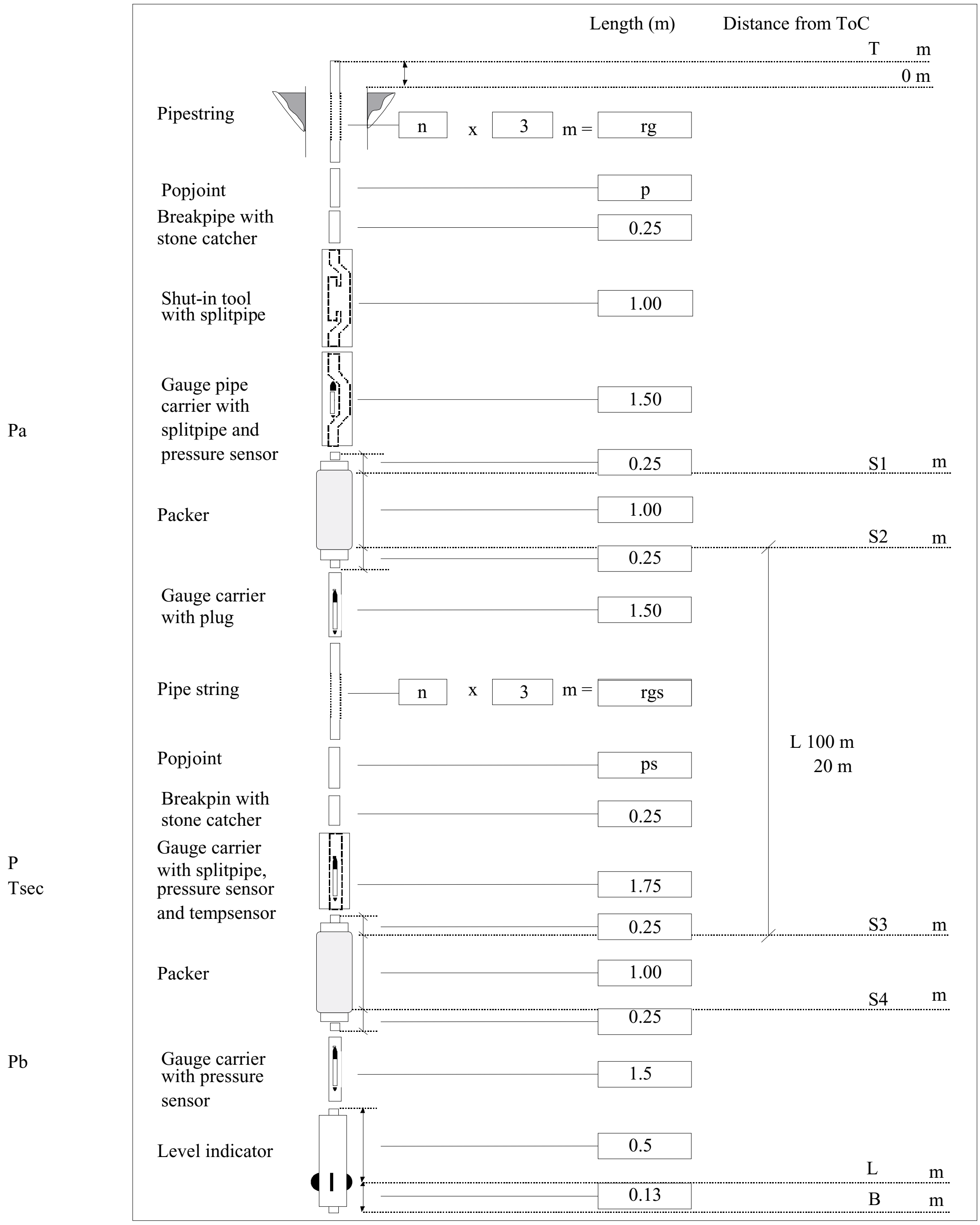


Figure 4-2. *Schematic drawing of the down-hole equipment in the PSS2 system.*

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-H1464abs	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)
KLX03	106.31–206.31	1	p_a p T p_b L	104.31 205.51 205.26 208.32 209.56	Test section	Signal cable Pump string Packer line	9.1 33 6
KLX03	106.31–126.31	1	p_a p T p_b L	104.31 125.51 125.26 128.32 129.56	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.

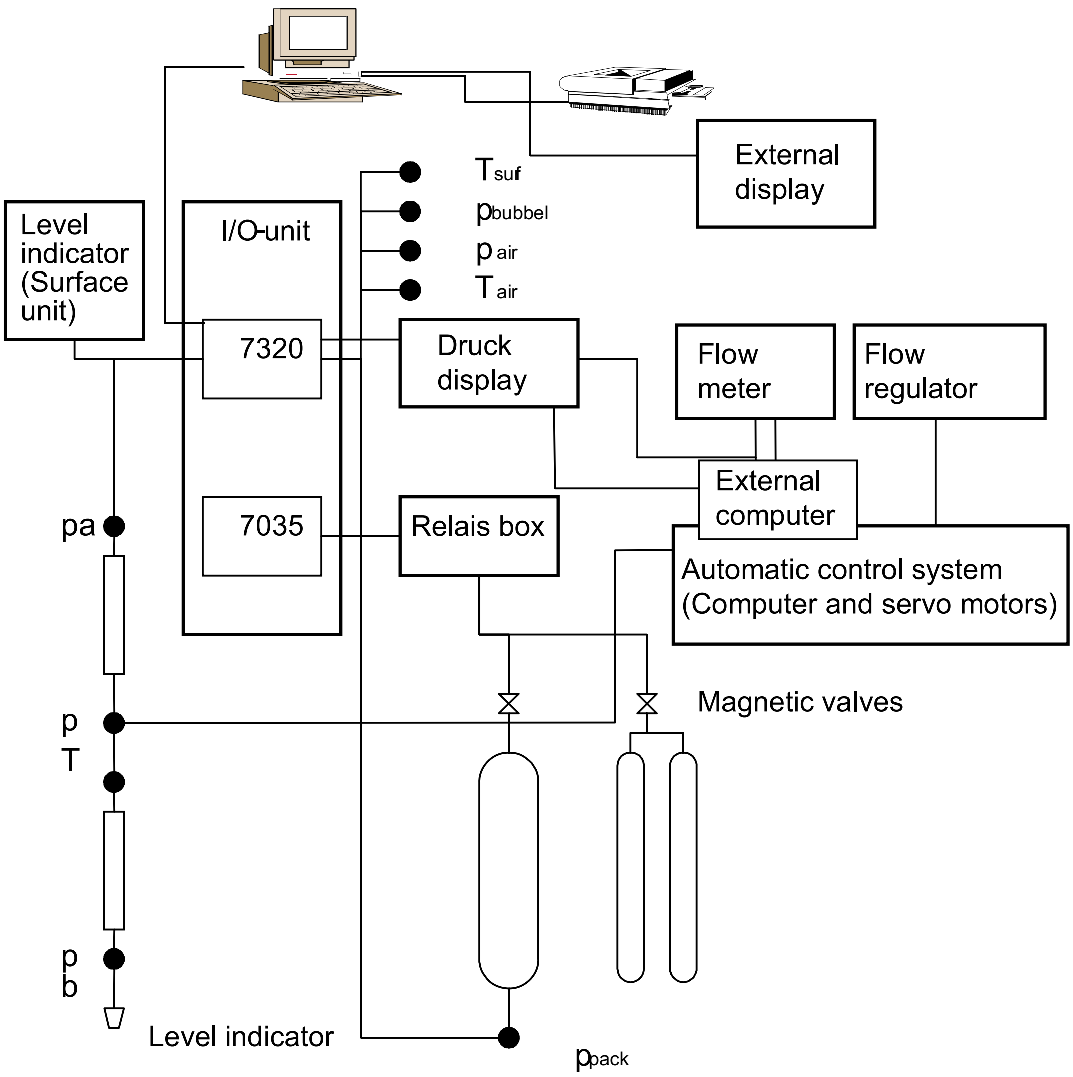


Figure 4-3. Schematic drawing of the data acquisition system and the flow regulation control system in PSS2.

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 KLX03.
- 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.

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.

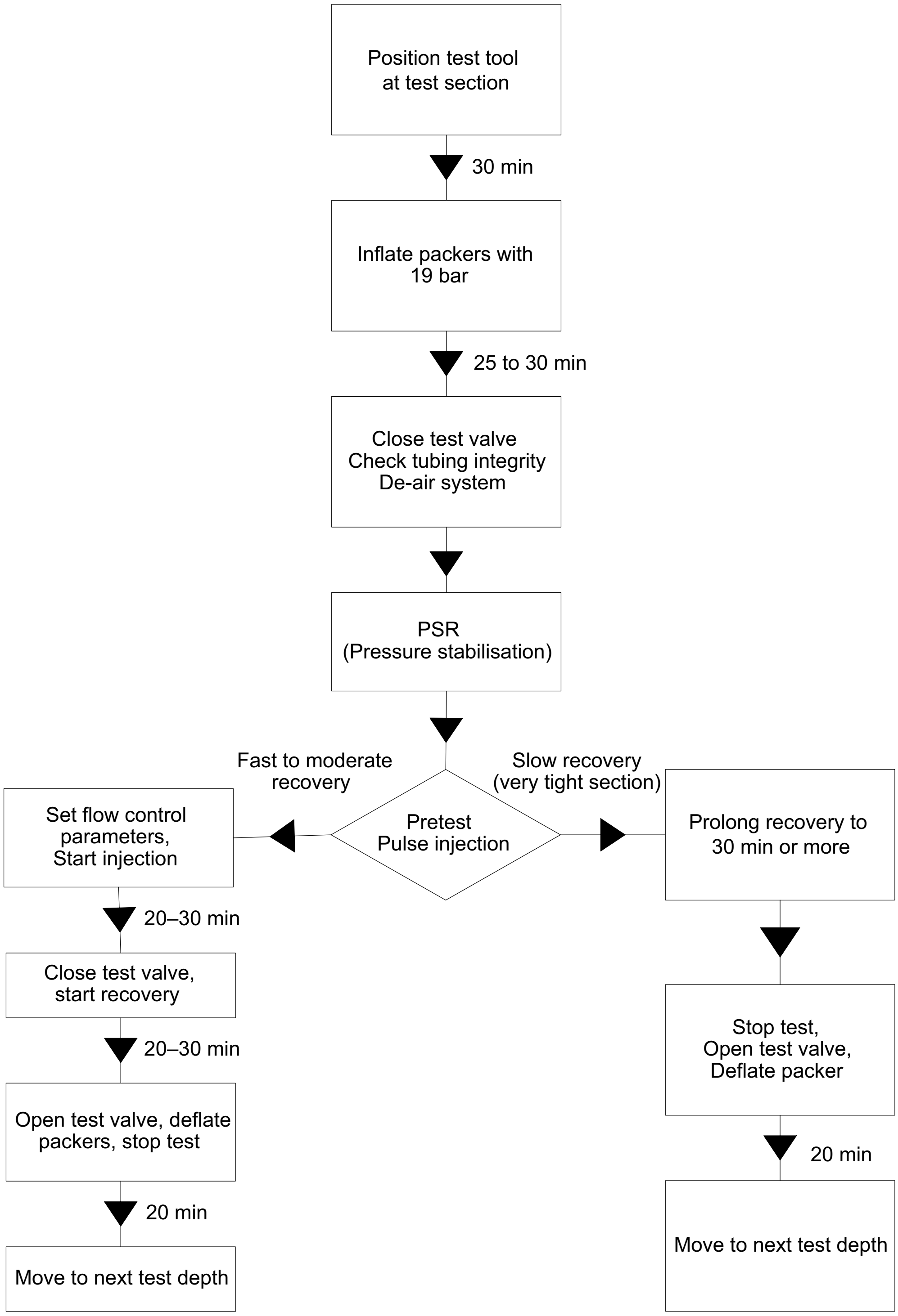


Figure 5-1. *Flow chart for test performance.*

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 KLX03 has been carried out by applying a constant injection pressure of appr 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. Additionally, in some cases, slug injection tests were conducted over night. The decision of performing a slug injection test was made on the basis of the transmissivity derived from the previous injection test.

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 KLX03.

• Position test tool to new test section (correct position using the borehole markers)	Approx 30 min
• Inflate packers with appr 1,900 kPa	25 min
• Close test valve	10 min
• Check tubing integrity with appr 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-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.

Slug and Pulse tests are analysed both 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/.

- Slug/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.

The performed slug injection tests are analysed using the same method as for the pulse tests. The wellbore storage coefficient is calculated using based on the radius of the test pipe.

- 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.

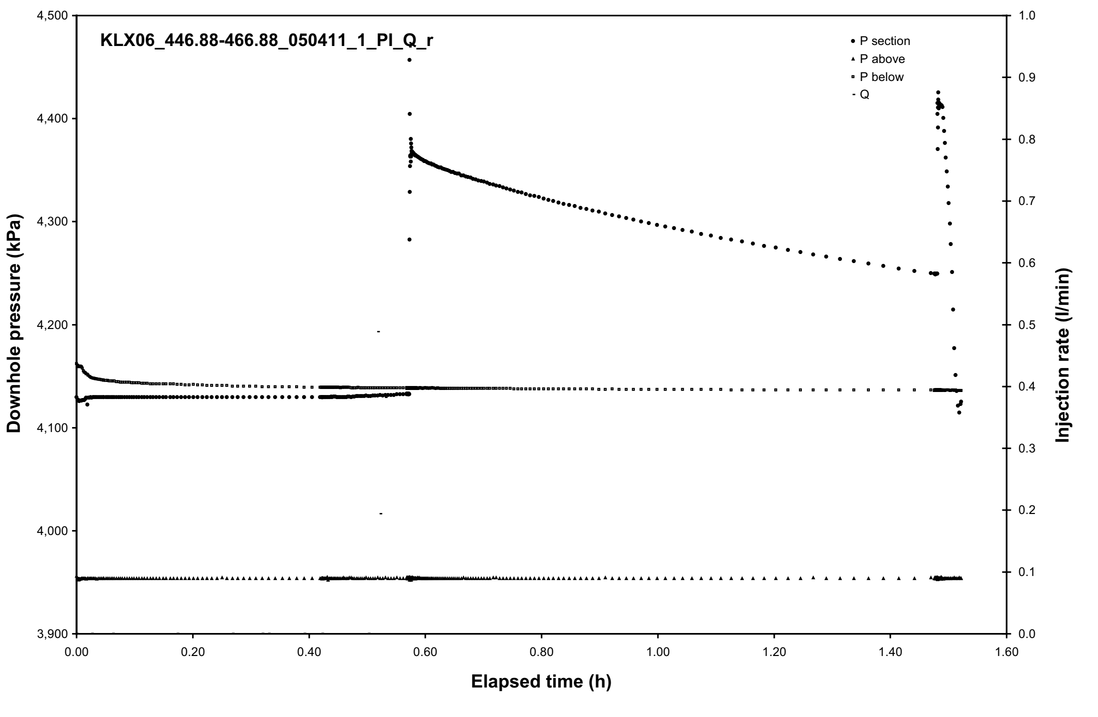


Figure 5-2. *Typical pressure versus time plot of a Pulse injection test.*

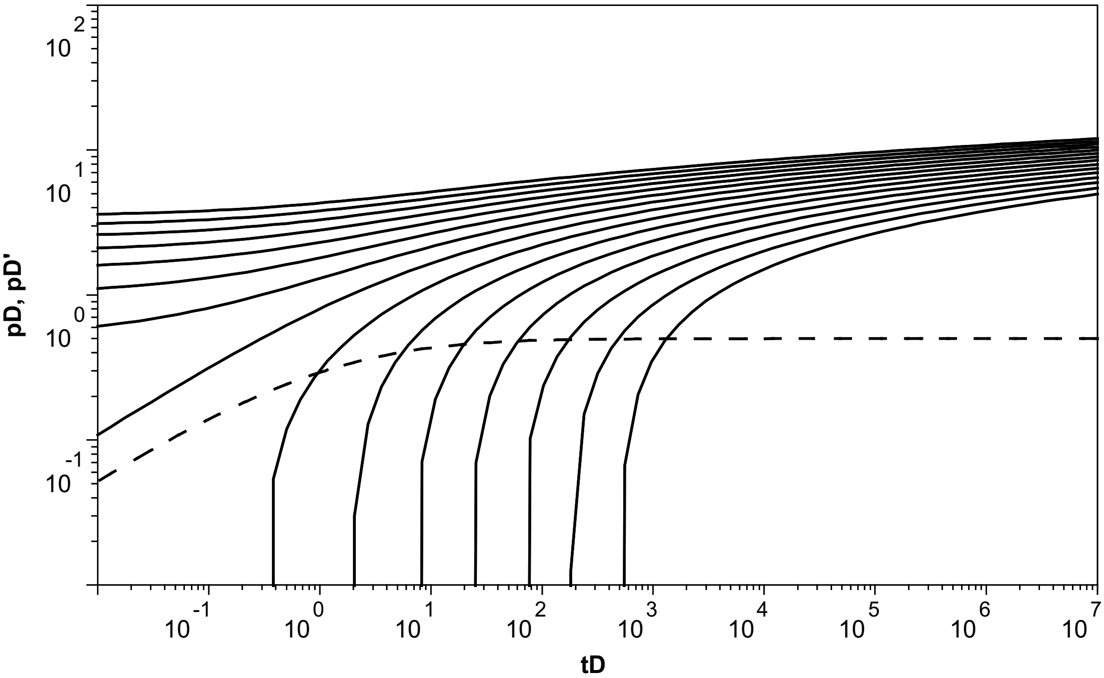


__Figure 5-3.__ Deconvolution type curve set for pulse and slug test analysis.

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.

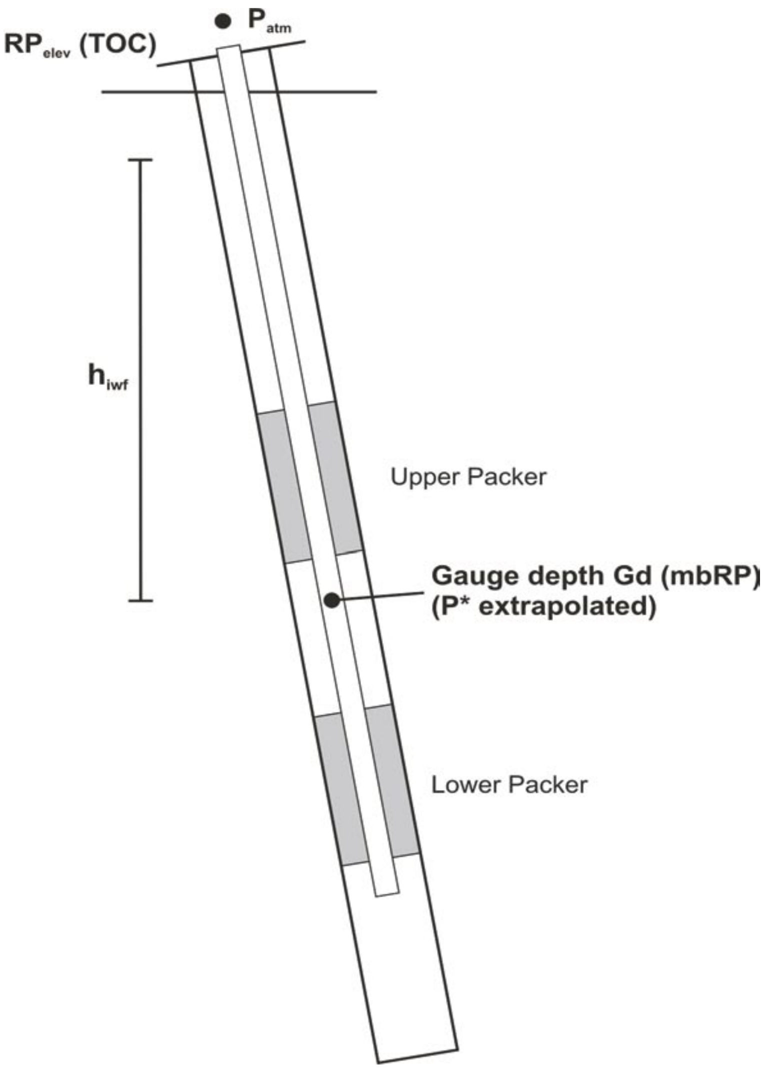


Figure 5-4. *Schematic methodologies for calculation of the freshwater head.*

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:

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

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 changing transmassivity with distance from the borehole (composite model) was diagnosted, the inner zone transmassivity (in borehole vicinity) was recommended. This is consistence with SKB’s standards.

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 and finally the parameters which are considered as most representative are chosen and justification is given. All results are also summarised in Table 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 KLX03 are presented and analysed.

6.1.1 Section 106.31–206.31 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 fast 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 201 kPa. The pressure in the bottom zone dropped by 7 kPa. The injection rate decreased from 35.8 L/min at start of the CHi phase to 16.8 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 CHi phase shows a flat derivative, which is indicative of a flow dimension of 2 (radial flow). The CHir phase derivative shows an upward trend at late times indicating a decrease of transmissivity at some distances from the borehole. An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi phase. For the analysis of the CHir phase a radial composite flow model was chosen. The analysis is presented in Appendix 2-1.

Selected representative parameters

The recommended transmissivity of 1.0E–5 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 8.0E–6 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 1,977.8 kPa.

The analysis of the CHi and CHir phases show some inconssistencies regarding the chosen flow model. However, regarding the derived transmissivity, both phases show good concistency. No further analysis is recommended.

6.1.2 Section 206.44–306.44 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 fast 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 198 kPa. No hydraulic connection between test interval and adjacent zones was observed. The injection rate decreased from 5.6 L/min at start of the CHi phase to 2.3 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, which is indicative of a flow dimension of 2 (radial flow). The CHir phase derivative shows a downward trend at late times indicating an increase of transmissivity at some distances from the borehole. An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi phase. For the analysis of the CHir phase a radial composite flow model was chosen. The analysis is presented in Appendix 2-2.

Selected representative parameters

The recommended transmissivity of 1.4E–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 8.0E–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 2,951.0 kPa.

The analysis of the CHi and CHir phases show some inconsistencies regarding the chosen flow model. However, regarding the derived transmissivity, both phases show good concistency. No further analysis is recommended.

6.1.3 Section 306.58–406.58 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. The pressure in the bottom zone rose by 3 kPa, indicating a connection to the interval. The injection rate decreased from 0.9 L/min at start of the CHi phase to 0.4 L/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 CHi phase shows a flat derivative, which is indicative of a flow dimension of 2 (radial flow). The CHir phase shows a flat derivative at late times. An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi and CHir phase. The analysis is presented in Appendix 2-3.

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 4.0E–7 to 9.0E–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 3,888.4 kPa.

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

6.1.4 Section 406.70–506.70 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 test interval and the adjacent zones was observed The injection rate decreased from 2.9 L/min at start of the CHi phase to 0.8 L/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 CHi phase shows a downward trend at middle times and flat part at late times, indicating a higher transmissivity at some distance from the borehole and a flow dimension of 2 (radial flow). The derivative of the CHir phase shows a downward trend at medium and late times, which is indicative for an increase of transmissivity or a change in flow dimension. A two shell radial composite flow model was chosen for the analysis of the CHi and CHir phase. The analysis is presented in Appendix 2-4.

Selected representative parameters

The recommended transmissivity of 3.9E–7 m^2/s was derived from the analysis of the CHi phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E–7 to 7.0E–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 4,843.6 kPa.

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

6.1.5 Section 506.71–606.71 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 recovery of the pulse test was very slow, indicating a very low formation transmissivity. Based on this result the recovery of the pulse injection was extended to about 8 hour.

During the brief injection phase a total volume of about 119 ml was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 183 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 3.6E–10 m^3/Pa. It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably on order of magnitude), which will implicitly translate 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 Pi phase shows an upward trend at middle and late times, which is indicative for a transition to a zone of lower transmissivity. Because the outer zone stabilisation was not observed, the derived transmissivity should be regarded as an upper limit. For the analysis a radial two shell composite flow model was used. The analysis is presented in Appendix 2-5.

Selected representative parameters

The recommended transmissivity of 2.5E–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 measurements 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 9E–11 m^2/s to 6e–10 m^2/s (the outer zone transmissivity is considered as most representative). The flow dimension displayed during the test is 2. No static pressure could be derived.

The analysis of the Pi phase show consistency with the later conducted CHi phase.

6.1.6 Section 506.71–606.71 m, test no 2, injection

Comments to test

The test was composed of a constant pressure injection test phase with a pressure difference of 196 kPa, followed by a pressure recovery phase. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate control during the CHi phase was good and the data of the Chi phase are adequate for quantitative analysis. The injection rate decreased from 1.1 L/min at start of the CHi phase to 0.002 L/min at the end, indicating a low interval transmissivity. The slow recovery of the CHir phase indicates the presents of a closed system (no flow boundary). The test could only see the near wellbore properties.

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 early times and an upward trend at middle and late times, indicating a decrease of transmissivity at some distance from the borehole. The derivative of the CHir phase shows an upward trend, too. A two shell radial composite flow model was chosen for the analysis of the CHi and CHir phase. The analysis is presented in Appendix 2-6.

Selected representative parameters

The recommended transmissivity of 4.1E–10 m^2/s was derived from the analysis of the CHi phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E–11 to 8.0E–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 CHi and CHir phases show consistency in general. No further analysis is recommended.

6.1.7 Section 606.94–706.94 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 210 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 0.7 L/min at start of the CHi phase to 0.4 L/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 CHi phase shows a flat derivative at late times, which is indicative of a flow dimension of 2 (radial flow). An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi phase. The CHir phase shows a downward trend at middle times and a flat derivative at late times indicating an increase of transmissivity at some distances from the borehole and a flow dimension of 2 (radial flow). A two shell composite flow model was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-7.

Selected representative parameters

The recommended transmissivity of 4.5E–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 2.0E–7 to 7.0E–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 6,763.8 kPa.

The analyses of the CHi and CHir phases show some inconsistencies regarding the chosen flow model. However, regarding the derived transmissivities, both phases show relatively good consistency. No further analysis is recommended.

6.1.8 Section 707.09–807.09 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 221 kPa. No hydraulic connection between test interval and the adjacent zones was observed The injection rate decreased from 19.1 L/min at start of the CHi phase to 7.5 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 downward trend at middle times and flat part at late times, indicating a higher transmissivity at some distance from the borehole and a flow dimension of 2 (radial flow). The derivative of the CHir phase shows a downward trend at, which is indicative for an increase of transmissivity or a change in flow dimension. A two shell radial composite flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-4.

Selected representative parameters

The recommended transmissivity of 2.7E–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 9.0E–7 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 7,725.7 kPa.

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

6.1.9 Section 807.21–907.21 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 relatively slow 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 191 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate control during the CHi phase was good and the Chi phase is adequate for quantitative analysis. The injection rate decreased from 18 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). 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 CHi phase shows a flat derivative at middle times and a downward trend at late times, indicating the transition to a zone of higher transmissivity at some distance from the borehole. A radial two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a downward trend at late times, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. Because the formation flow stabilization was not observed, a radial homogeneous flow model with wellbore storage was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-9.

Selected representative parameters

The recommended transmissivity of 5.0E–9 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 3.0E–9 to 9.0E–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 8,700.4 kPa.

The analyses of the CHi and CHir phases show some inconsistencies concerning the flow model. But the general results are very similar and no further analysis is recommended.

6.1.10 Section 892.31–992.31 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 rose by 129 kPa during the injection, indicating a connection to the interval. The injection rate decreased from 1.4 L/min at start of the CHi phase to 0.4 L/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 CHi phase shows a noisy but relatively flat derivative at the beginning, which is indicative of a flow dimension of 2 (radial flow). The downward trend of the derivative at late times indicating whether an increase of transmissivity at some distance from the borehole or a change in flow dimension. The CHir phase derivative shows a downward trend at late times, too. A two shell radial composite flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-10.

Selected representative parameters

The recommended transmissivity of 2.8E–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 8.0E–8 to 7.0E–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 9,523.2 kPa.

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

6.2 20 m single-hole injection tests

In the following, the 20 m section tests conducted in borehole KLX03 are presented and analysed.

6.2.1 Section 106.31–126.31 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 213 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. At the end of the injection phase, the system switched between the big and the small flowmeter, which seems to occur some misreadings. However, the CHi phase shows enough data points and is amenable for quantitative analysis. The injection rate decreased from 1.2 L/min at start of the CHi phase to 0.7 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 CHi phase shows a noisy but relatively flat derivative which is indicative for a flow dimension of 2 (radial flow). The CHir phase derivative shows a downward trend at late times indicating whether the transition to a zone of higher transmissivity at some distances from the borehole or a change in flow dimension. An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi phase. For the analysis of the CHir phase a radial composite flow model was chosen. The analysis is presented in Appendix 2-11.

Selected representative parameters

The recommended transmissivity of 2.1E–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 8.0E–8 to 5.0E–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 1,214.5 kPa.

The analysis of the CHi and CHir phases show some inconsistencies regarding the chosen flow model. However, regarding the derived transmissivity, both phases show consistency. No further analysis is recommended.

6.2.2 Section 126.35–146.35 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 202 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 16 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 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 noisy but flat derivative, indicating a flow dimension of 2 (radial flow). For the analysis of the CHi phase an infinite acting homogeneous radial flow model was chosen. The derivative of the CHir phase does not allow for a specific determination of the flow dimension. However, the analysis was conducted using a homogeneous flow model with a flow dimension of two. The analysis is presented in Appendix 2-12.

Selected representative parameters

The recommended transmissivity of 8.2E–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 4.0E–9 to 2.0E–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 1,406.5 kPa.

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

6.2.3 Section 146.39–166.39 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 relatively slow 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 201 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate decreased from 1.2 L/min at start of the CHi phase to 0.1 L/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 downward trend at middle times and a relatively flat part at late times indicating an increase of transmissivity at some distance from the borehole. The CHir phase derivative shows a downward trend at middle times and late times, which is indicative for an increase of transmissivity or a change of flow dimension. A two shell radial composite flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-13.

Selected representative parameters

The recommended transmissivity of 4.5E–8 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–8 to 8.0E–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 1,587.2 kPa.

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

6.2.4 Section 166.42–186.42 m, test no 1 and 2, 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 (test no 1). Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted (test no 2). Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 207 kPa. No hydraulic connection between test interval and the adjacent zones was observed. The injection rate control during the CHi phase was good and the CHi phase is adequate for quantitative analysis. The injection rate decreased from 328 mL/min at start of the CHi phase to 28 mL/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows relatively fast recovery, but it 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 derivative of the CHi phase shows a noisy but relatively flat derivative, which is typical for a flow dimension of 2 (radial flow). An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi phase. Mainly caused by the fast recovery and the resulting data quality, the derivative of the CHir phase does not allow for a specific determination of the flow dimension. The analysis was conducted using a homogeneous flow model with a flow dimension of two. The analysis is presented in Appendix 2-14.

Selected representative parameters

The recommended transmissivity of 4.1E–8 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 2.0E–8 to 9.0E–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 1,788.8 kPa.

The analysis of the CHi and CHir phases show little inconsistencies, mainly caused by the fast recovery. No further analysis is recommended.

6.2.5 Section 186.42–206.42 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 201 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 33.9 L/min at start of the CHi phase to 15.9 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 horizontal derivative at middle and late times, indicating homogeneous radial flow geometry. The CHi phase was matches using a radial homogeneous flow model. The CHir phase derivative shows a slight stabilization (inflexion) at middles times, followed by an upward trend, typical for a decrease of transmissivity at some distance from the test section. For the analysis of the CHir phase a radial composite flow model with wellbore storage and skin was chosen. The analysis is presented in Appendix 2-15.

Selected representative parameters

The recommended transmissivity of 9.2E–6 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–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 1,974.0 kPa.

The analysis of the CHi and CHir phases show some inconsistencies regarding the chosen flow model. However, regarding the derived transmissivity, both phases show good consistency. No further analysis is recommended.

6.2.6 Section 206.44–226.44 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 197 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 90 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). 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. The CHi phase derivative shows stabilization at early times, followed by an unit slope upward trend at middle times and a new stabilization at a higher lever at late times. This behaviour indicates radial flow with decreasing transmissivity away from the borehole. The CHir response is similar to the CHi response. The analysis for both phases was conducted using a radial two shell composite flow model. The analysis is presented in Appendix 2-16.

Selected representative parameters

The recommended transmissivity of 8.4E–9 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 5.0E–9 to 2.0E–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 2,192.3 kPa.

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

6.2.7 Section 226.48–246.48 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 208 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 35 mL/min at start of the CHi phase to 6 mL/min at the end, indicating a 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. The CHi phase derivative shows stabilization at early times, followed by a unit slope upward trend at middle times and a new stabilization at a higher lever at late times. This behaviour indicates radial flow with decreasing transmissivity away from the borehole. The derivative of the CHir phase is very similar to the CHi phase with the difference that the middle time upward trend is not so clear. Both phases were matched using a radial composite model with decreasing transmissivity away from the borehole. The analysis is presented in Appendix 2-17.

Selected representative parameters

The recommended transmissivity of 3.7E–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 6.0E–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 2,372.9 kPa.

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

6.2.8 Section 241.48–261.48 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 226 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. Due to the injection regulation unit, which switched between the pump and the pressure vessel at the beginning, the data of the first part of the CHi phase is very noisy. However, the second part of the CHi phase can be analysed quantitively. The injection rate decreased from 1.3 L/min at start of the CHi phase to 0.2 L/min at the end, indicating a 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 CHi phase shows a flat derivative at late times which is indicative of a flow dimension of 2 (radial flow). Due to the poor data quality at early times, the CHi phase was analysed using an infinite acting homogeneous flow model, which matches the late time only. The derivative of the CHir phase shows an upward trend at late times and 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 2-18.

Selected representative parameters

The recommended transmissivity of 5.5E–8 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 3.0E–8 to 1.0E–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 2,495.2 kPa.

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

6.2.9 Section 251.49–271.49 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 the test interval and the adjacent zones was observed. The injection rate decreased from 3.8 L/min at start of the CHi phase to 2.2 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 and middle times, followed by an upward trend at late times indicating whether a transition to a zone of lower transmissivity or a change in flow dimension. The derivative of the CHir phase shows a slight upward trend at middle times and stabilization at late times, which is typical for a flow dimension of 2 and a decrease of transmissivity away from the borehole. Both phases (CHi and CHir) were matched using a radial composite flow model. The analysis is presented in Appendix 2-19.

Selected representative parameters

The recommended transmissivity of 2.7E–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 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 2,607.7 kPa.

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

6.2.10 Section 271.54–291.54 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 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 1.2 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 CHi phase shows an upward trend at early and middle times, followed by a short part that shows slight stabilization at late times indicating 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 late times and 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 2-20.

Selected representative parameters

The recommended transmissivity of 5.3E–8 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 3.0E–8 to 1.0E–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 2,796.9 kPa.

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

6.2.11 Section 286.56–306.56 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 recovery of the pulse test was very slow, indicating 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.

During the brief injection phase a total volume of about 253 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 196 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 1.3E–09 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 an upward trend at middle and late times, which is consistent with the transition to a lower transmissivity away from the borehole. Because the outer zone stabilisation was not observed, the derived transmissivity should be regarded as an upper limit. For the analysis a radial two shell composite flow model was used. The analysis is presented in Appendix 2-21.

Selected representative parameters

The recommended transmissivity of 1.3E–08 m^2/s was derived from the analysis of the Pi phase (outer zone). 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–9 to 3E–8 m^2/s. The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.12 Section 306.58–326.58 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 207 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 61 mL/min at start of the CHi phase to 20 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 CHi phase shows a flat derivative, indicating a flow dimension of 2 (radial flow). The CHi phase was matched using a radial homogeneous flow model. The derivative of the CHir phase shows a radial flow stabilisation at late times. 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 2-22.

Selected representative parameters

The recommended transmissivity of 1.1E–8 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 7.0E–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 3,124.8 kPa.

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

6.2.13 Section 326.60–346.60 m, test no 1 and 2, injection and slug 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 207 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. During the injection phase some oscillations in the flow rate occurred, while the pressure stayed stable. The reason for this is unknown. However, the CHi phase is amenable for quantitative analysis. The injection rate decreased from 80 mL/min at start of the CHi phase to 54 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). The CHir phase shows very fast recovery and the results should be regarded as order of magnitude only.

Additionally, a slug injection test was performed over night (test no 2).

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 horizontal stabilization at early and middle times, followed by a unit slope upward trend, indicating a decrease of transmissivity. The CHi phase was matched using a two shell radial composite flow model. The derivative of the CHir phase shows a steep downward trend at middle times, which is consistent with the high positive skin factor followed by stabilisation at late times, indicating radial flow. The CHir phase was matched using a radial homogeneous flow model with wellbore storage and skin. The analysis is presented in Appendix 2-23.

Selected representative parameters

The recommended transmissivity of 9.9E–8 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 6.0E–8 to 2.0E–7 m^2/s. The flow dimension displayed during the test was 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 3,317.9 kPa.

The analysis of the CHi and CHir phases show inconsistencies, mainly caused by the fast recovery. No further analysis is recommended.

The analysis of the slug injection tests derived a transmissivity of 3.7E–8 m^2/s.

6.2.14 Section 346.62–366.62 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 recovery of the pulse test was very slow, indicating 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.

During the brief injection phase a total volume of about 19 mL was injected (derived from the replacement in the injection vessel). This injected volume produced a pressure increase of 218 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 8.7E–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 analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-24.

Selected representative parameters

The recommended transmissivity of 1.4E–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 3E–11 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.15 Section 366.65–386.65 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 220 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. Due to the low flowrate at the end of the injection phase, the data is noisy. However, the first part of the CHi phase can be analysed quantitively. The injection rate decreased from 28 mL/min at start of the CHi phase to 4 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. The CHi phase derivative shows stabilization at early times, followed by a unit slope upward trend at middle times and a noisy but relatively stable part at a higher lever at late times. This behaviour indicates radial flow with decreasing transmissivity away from the borehole. The derivative of the CHir phase is compatible with the CHi phase. Both phases were matched using a radial composite model with decreasing transmissivity away from the borehole. The analysis is presented in Appendix 2-25.

Selected representative parameters

The recommended transmissivity of 1.1E–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 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 3,684.0 kPa.

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

6.2.16 Section 386.68–406.68 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 203 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The CHi phase shows no problems and can be analysed quantitative. The injection rate decreased from 515 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). The CHir phase shows a fast recovery, but is still amenable for qualitative 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 horizontal stabilization at middle and late times. An infinite acting homogeneous radial flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a steep downward trend at middle times, which is consistent with the high positive skin factor followed by stabilisation at late times, indicating radial flow. The analysis of the CHir phase was conducted using a homogeneous flow model with a flow dimension of two. The analysis is presented in Appendix 2-26.

Selected representative parameters

The recommended transmissivity of 6.3E–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 2.0E–7 to 2.0E–6 m^2/s. The flow dimension displayed during the test was 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 3,891.2 kPa.

The analysis of the CHi and CHir phases show inconsistencies, mainly caused by the fast recovery. No further analysis is recommended.

6.2.17 Section 406.70–426.70 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 203 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 1.3 L/min at start of the CHi phase to 0.6 L/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 derivative of both phases show a downward trend at late times, indicating whether an increase of transmissivity at some distances from the borehole or a change in flow dimension. For the analysis of the CHi and CHir phase a two shell composite flow model with flow dimension of two was chosen. The analysis is presented in Appendix 2-27.

Selected representative parameters

The recommended transmissivity of 6.3E–7 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 2.0E–7 to 8.0E–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 4,080.5 kPa.

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

6.2.18 Section 426.71–446.71 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 recovery of the pulse test was slow, indicating 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.

During the brief injection phase a total volume of about 19 mL was injected (derived from the replacement in the injection vessel). This injected volume produced a pressure increase of 247 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 7.7E–09 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 an upward trend at early and middle times, followed by a slight stabilisation at late times, typical for a flow dimension of two. The Pi phase was analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-28.

Selected representative parameters

The recommended transmissivity of 6.4E–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 3.0E–11 to 9.0E–11 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.19 Section 446.72–466.72 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 210 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. Due to the regulation unit, which had difficulties to regulate the flow at the beginning, the first part of the CHi phase is very noisy. However, the second part of the CHi phase is amenable for quantitative analysis. The injection rate decreased from 1.5 L/min at start of the CHi phase to 0.2 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 CHi phase shows a relatively flat derivative at middle times and a downward trend at late times, which is indicative for the transition to a zone of higher transmissivity at some distance from the borehole. A radial two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a downward trend at late times, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. The formation flow stabilization was not observed, a radial homogeneous flow model with wellbore storage was used for the analysis of the CHir phase. The analysis is presented in Appendix 2-29.

Selected representative parameters

The recommended transmissivity of 3.0E–7 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–8 to 5.0E–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 4,451.7 kPa.

The analyses of the CHi and CHir phases show some inconsistencies regarding the chosen flow model. However, regarding the derived transmissivities, both phases show good consistency. No further analysis is recommended.

6.2.20 Section 466.71–486.71 m, test no 1, 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, the pressure kept rising and no pulse recovery was observed. 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 2-30.

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 486.70–506.70 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.

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 184 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 6.3E–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 2-31.

Selected representative parameters

The recommended transmissivity of 3.0E–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 7E–11 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.22 Section 506.71–526.71 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 2-32.

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.

6.2.23 Section 526.77–546.77 m, test no 1 and 2, injection and slug 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 176 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 227 mL/min at start of the CHi phase to 28 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.

Additionally, a slug injection test was performed over night.

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 horizontal stabilization (although noisy) at early times, followed by a unit slope upward trend and a new stabilisation at a higher level at late times. This behaviour indicates radial flow with decreasing transmissivity away from the borehole. The derivative of the CHir phase is very similar to the CHi phase with the difference that the late time stabilisation is not observed. Both phases were matched using a radial composite flow model with decreasing transmissivity away from the borehole. The analysis is presented in Appendix 2-33.

Selected representative parameters

The recommended transmissivity of 7.0E–9 m^2/s was derived from the analysis of the CHi 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 3.0E–8 m^2/s. The flow dimension displayed during the test was 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 5,223.3 kPa.

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

The analysis of the slug injection tests derived a transmissivity of 7.1E–9 m^2/s.

6.2.24 Section 546.83–566.83 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 2-34.

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.

6.2.25 Section 566.87–586.87 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 recovery of the pulse test was very slow, indicating 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.

During the brief injection phase a total volume of about 19 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 170 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 1.1E–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 an upward trend at middle times, followed by a stabilisation at late times, which is indicative for a flow dimension of two and a decrease of transmissivity at some distances from the borehole. The Pi phase was analysed using a two shell composite flow model with a flow dimension of 2. The analysis is presented in Appendix 2-35.

Selected representative parameters

The recommended transmissivity of 3.3E–11 m^2/s was derived from the analysis of the Pi phase (outer zone). 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 5E–11 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.26 Section 586.90–606.90 m, test no 1, 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 2-36.

Selected representative parameters

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

No further analysis recommended.

6.2.27 Section 606.94–626.94 m, test no 1 and 2, injection and slug 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 180 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 94 mL/min at start of the CHi phase to 20 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.

Additionally, a slug injection test was performed over night.

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 late times and was analysed using a infinite acting homogeneous flow model with a flow dimension of 2. The CHir phase derivative shows an upward trend at late times indicating a decrease of transmissivity at some distance from the borehole. A composite radial flow model was chosen for the analysis of the CHir phase. This is consistent with the negative skin derived from the CHi phase. The CHir phase was analysed using a composite radial flow model. The analysis is presented in Appendix 2-37.

Selected representative parameters

The recommended transmissivity of 5.7E–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 3.0E–9 to 1.0E–8 m^2/s. The flow dimension displayed during the test was 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 5,999.2 kPa.

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

The analysis of the slug injection test derived a transmissivity of 9.5E–9 m^2/s.

6.2.28 Section 626.97–646.97 m, test no 1, 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 2-38.

Selected representative parameters

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

No further analysis recommended.

6.2.29 Section 646.99–666.99 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 234 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. During the injection phase the pressure in the interval was slightly increasing. However, the CHi phase is amenable for quantitative analysis. The injection rate decreased from 0.6 L/min at start of the CHi phase to 0.4 L/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 derivative of the CHi phase show a flat derivative at middle and late times, which is typical for a flow dimension of two. The analysis of the CHi phase was conducted using an infinite acting homogeneous flow model. The derivative of the CHir phase shows a horizontal stabilization at middle times, followed by a downward trend at late times. This behaviour indicates whether a higher transmissivity away from the borehole or a change in flow dimension. For the analysis of the CHir phase a two shell composite flow model with flow dimension of two was chosen. The analysis is presented in Appendix 2-39.

Selected representative parameters

The recommended transmissivity of 4.9E–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 2.0E–7 to 8.0E–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 6,381.6 kPa.

The analyses of the CHi and CHir phases show some inconsistencies regarding the chosen flow model. However, regarding the chosen transmissivities, both phases show consistencies. No further analysis is recommended.

6.2.30 Section 667.02–687.02 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 slow 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 213 kPa. No hydraulic connection between the 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 amenable for qualitative analysis. The injection rate decreased from 9 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 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. The CHi phase derivative is noisy and does not allow flow model identification. The CHi phase was matched using a radial homogeneous flow model. The derivative of the CHir phase shows a unit slope downward trend at middle and late times. The formation flow stabilisation was not observed and a radial homogeneous flow model with wellbore storage and skin was used for the analyses of the CHir phase. The analysis is presented in Appendix 2-40.

Selected representative parameters

The recommended transmissivity of 6.1E–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 3.0E–10 to 9.0E–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 6,569.9 kPa.

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

6.2.31 Section 687.06–707.06 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 recovery of the pulse test was very slow, indicating 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.

During the brief injection phase a total volume of about 2 mL was injected (derived from the flowmeter readings). This injected volume produced a pressure increase of 178 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to 9.2E–12 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). Due to the tight section and the short pressure static recovery, the derived initial formation pressure (P_i) is uncertain. Both (wellbore storage and P_i) 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 stabilisation at early and middle times, followed by a steep downward trend at late times. Due to the uncertainties of the derived initial formation pressure, only the early and middle time data was matched by using an infinite acting radial homogeneous flow model. The analysis is presented in Appendix 2-41.

Selected representative parameters

The recommended transmissivity of 6.6E–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 8E–11 m^2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

No further analysis recommended.

6.2.32 Section 707.09–727.09 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 38 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.

6.2.33 Section 727.13–747.13 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 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 206 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 15 L/min at start of the CHi phase to 7 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. The CHi phase shows a noisy but relatively flat derivative, which is typical for a flow dimension of 2. The CHi phase was matched using an infinite acting radial homogeneous flow model. The derivative of the CHir phase shows stabilisation at middle times and a downward trends at late times, indicating whether a transition to a zone of higher transmissivity or a change in flow dimension. A composite flow model with a flow dimension of 2 was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-43.

Selected representative parameters

The recommended transmissivity of 5.9E–06 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 2.0E–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 7,147.9 kPa.

The analysis of the CHi and CHir phases show some inconsistency regarding the chosen flow model. However, regarding the derived transmissivities, both phases show consistencies. No further analysis is recommended.

6.2.34 Section 747.15–767.15 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 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 238 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 0.4 L/min at start of the CHi phase to 0.2 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows fast recovery and the results should be regarded as order of magnitude only.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. The CHi phase shows a relatively flat derivative at late times, indicating a flow dimension of 2. For the analysis of the CHi phase a radial homogeneous flow model was chosen. The CHir response shows a steep downward trend at middle times, which is consistent with a high positive skin factor followed by a slight indication of radial flow stabilisation. The CHir phase was matched using a radial homogeneous flow model with wellbore storage and skin. The analysis is presented in Appendix 2-44.

Selected representative parameters

The recommended transmissivity of 2.1E–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 9.0E–08 to 5.0E–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 7,339.7 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.

6.2.35 Section 762.16–782.16 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 200kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The CHi phase shows no problems and is adequate for quantitative analysis. The injection rate decreased from 0.8 L/min at start of the CHi phase to 0.5 L/min at the end, indicating a relatively medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows a fast recovery, which adds uncertainty to the derivative analysis.

Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. The CHi phase shows a horizontal stabilisation at early times and an upward trend at middle times, followed by slight indication of radial flow stabilization at a higher level at late times, which is typical for a decrease of transmissivity away from the borehole. The analysis of the CHi phase was conducted by using a two shell composite flow model with a flow dimension of 2.The CHir response is consistent with the presence of a very large positive skin factor, which, in turn is not consistent with the response of the CHi phase. The derivative of the CHir phase shows a flat derivative at late times, indicating radial flow. The CHir phase was matched using a radial homogeneous flow model with wellbore storage and skin. The analysis is presented in Appendix 2-45.

Selected representative parameters

The recommended transmissivity of 9.9E–7 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 4.0E–07 to 2.0E–6 m^2/s (encompasses the outer zone transmissivity value derived from the CHi phase). 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 7,486.4 kPa.

The analysis of the CHi and CHir phases shows inconsistency, regarding the chosen flow models and the very high skin derived from the CHir phase, which is likely caused by the fast recovery. However, regarding the derived transmissivities, both phases show consistencies. No further analysis is recommended.

6.2.36 Section 777.17–797.17 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 216 kPa. No hydraulic connection between the test interval and the adjacent zones was observed. The injection rate decreased from 41 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 stabilisation at early times and a slight indication of a downward trend at middle times, followed by radial flow stabilisation at late times, which is typical for a transition to a zone of higher transmissivity. The analysis of the CHi phase was conducted by using a radial composite flow model. The derivative of the CHir phase shows a downward trend at middle and late times, which is indicative for a change of transmissivity or flow dimension. The CHir phase was matched using a radial composite flow model with increasing transmissivity away from the borehole. The analysis is presented in Appendix 2-46.

Selected representative parameters

The recommended transmissivity of 6.4E–9 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 3.0E–09 to 2.0E–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 7,627.0 kPa.

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

6.2.37 Section 787.19–807.19 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 219 kPa. No hydraulic connection between the 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 12 mL/min at start of the CHi phase to 4 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 CHi phase is very noisy due to the low flowrate. 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 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 2-47.

Selected representative parameters

The recommended transmissivity of 6.2E–09 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 3.0E–9 to 9.0E–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 7,725.8 kPa.

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

6.2.38 Section 807.21–827.21 m, test no 1 and 2, injection and slug 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 216 kPa. No hydraulic connection between the 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 94 mL/min at start of the CHi phase to 20 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.

Additionally, a slug injection test was performed over night.

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 at middle times, followed by an upward trend a late times and was matched using a composite radial flow model with decreasing transmissivity at some distance form the borehole. The derivative of the CHir phase shows a unit slope downward trend at late times, which is consistent with a high positive skin factor. The CHir phase was analysed using an infinite acting homogeneous flow model with a flow dimension of 2. The analysis is presented in Appendix 2-48.

Selected representative parameters

The recommended transmissivity of 7.0E–9 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 5.0E–9 to 2.0E–8 m^2/s. The flow dimension displayed during the test was 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 7,919.6 kPa.

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

The analysis of the slug injection test derived a transmissivity of 8.2E–9 m^2/s.

6.2.39 Section 827.24–847.24 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 50 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 2-49.

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.

6.2.40 Section 847.26–867.26 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 58 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 2-50.

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.

6.2.41 Section 867.28–887.28 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 2-51.

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.

6.2.42 Section 887.31–907.31 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 slow 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 208 kPa. No hydraulic connection between the 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 1 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. For the analysis of the CHi phase a homogeneous radial flow model was chosen. Due The CHir response shows a unit slop downward trend of the derivative at late times, which is typical for the transition from wellbore storage and skin dominated flow to pure formation flow. The CHir phase was analysed using an infinite acting homogeneous flow model with a flow dimension of 2. The analysis is presented in Appendix 2-52.

Selected representative parameters

The recommended transmissivity of 5.1E–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 4.0E–10 to 9.0E–10 m^2/s. The flow dimension displayed during the test was 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 8,682.4 kPa.

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

6.2.43 Section 907.33–927.33 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 198 kPa. No hydraulic connection between the 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 4 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 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 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 2-53.

Selected representative parameters

The recommended transmissivity of 1.9E–09 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 8,890.7 kPa.

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

6.2.44 Section 927.33–947.33 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 100 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 2-54.

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.

6.2.45 Section 947.34–967.34 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 recovery of the pulse test was slow, indicating 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.

During the brief injection phase a total volume of about 5 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 2.7E–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 an upward trend at middle times, followed by a slight indication of stabilisation at late times, which is indicative for a flow dimension of two and a decrease of transmissivity at some distances from the borehole. The Pi phase was analysed using a two shell composite flow model with a flow dimension of 2. The analysis is presented in Appendix 2-55.

Selected representative parameters

The recommended transmissivity of 2.0E–10 m^2/s was derived from the analysis of the Pi phase (outer zone). 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.

6.2.46 Section 967.39–987.39 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 197 kPa. During the injection phase a reaction was observed in the bottom zone, indicating a connection to the test interval or a pressure travel through the bottom packer to the bottom zone. The injection rate decreased from 1.2 L/min at start of the CHi phase to 0.7 L/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. The CHi phase derivative shows stabilization at middle times, followed by a unit slope upward trend at late times. This behaviour indicates radial flow with decreasing transmissivity away from the borehole. The CHir response is similar to the CHi response. The analysis for both phases was conducted using a radial two shell composite flow model. The analysis is presented in Appendix 2-57.

Selected representative parameters

The recommended transmissivity of 4.6E–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 2.0E–7 to 9.0E–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 9,477.1 kPa.

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

6.2.47 Section 972.41–992.41 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 2-57.

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.

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

7.1 Summary of results

Table 7-1. General test data from constant head injection tests in KLX03.

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
106.31	206.31	20050505 11:05	20050505 15:38	2.81E–04	3.20E–04	1,800	1,800	1,965	1,984	2,185	2,010	9.8	**CHi/CHir**
206.44	306.44	20050505 17:25	20050505 20:54	3.78E–05	4.45E–05	1,800	7,200	2,939	2,939	3,137	2,951	11.3	**CHi/CHir**
306.58	406.58	20050506 09:03	20050506 11:02	6.37E–06	6.73E–06	1,800	1,800	3,891	3,889	4,094	3,890	12.8	**CHi/CHir**
406.70	506.70	20050506 12:36	20050506 15:17	1.25E–05	1.42E–05	1,800	3,600	4,849	4,847	5,065	4,848	14.4	**CHi /CHir**
506.71	606.71	20050508 15:36	20050508 17:31	2.50E–08	3.29E–07	1,800	2,100	5,802	5,808	6,004	5,988	16.0	**CHi/CHir**
606.94	706.94	20050507 08:53	20050507 10:49	6.10E–06	6.48E–06	1,800	1,800	6,765	6,765	6,975	6,767	17.5	**CHi/CHir**
707.09	807.09	20050507 12:26	20050507 14:24	1.25E–04	1.31E–04	1,800	1,800	7,728	7,727	7,948	7,730	19.0	**CHi/CHir**
807.21	907.21	20050507 16:19	20050507 22:08	1.43E–07	1.59E–07	1,800	14,400	8,705	8,707	8,898	8,702	20.6	**CHi/CHir**
892.31	992.31	20050508 09:43	20050508 11:40	9.87E–06	1.07E–05	1,800	1,800	9,527	9,523	9,723	9,532	22.0	**CHi/CHir**
106.31	126.31	20050510 08:00	20050510 09:49	1.19E–05	1.24E–05	1,200	1,200	1,217	1,215	1,428	1,218	8.5	**CHi/CHir**
126.35	146.35	20050510 10:39	20050510 13:09	1.50E–07	1.67E–07	1,200	2,400	1,408	1,411	1,613	1,411	8.8	**CHi/CHir**
146.39	166.39	20050510 13:54	20050510 15:47	1.40E–06	1.70E–06	1,200	1,200	1,600	1,602	1,803	1,609	9.1	**CHi/CHir**
166.42	186.42	20050510 17:57	20050510 19:08	4.83E–07	5.17E–07	1,200	600	1,790	1,790	1,997	1,789	9.4	**CHi/CHir**
186.42	206.42	20050511 08:01	20050511 09:37	2.62E–04	2.98E–04	1,200	1,200	1,979	1,980	2,181	1,990	9.7	**CHi/CHir**
206.44	226.44	20050511 10:16	20050511 12:26	1.83E–07	2.67E–07	1,200	2,400	2,173	2,176	2,373	2,204	10.0	**CHi/CHir**
226.48	246.48	20050511 13:38	20050511 15:19	1.17E–07	1.67E–07	1,200	1,200	2,363	2,367	2,575	2,400	10.3	**CHi/CHir**
241.48	261.48	20050511 16:06	20050511 17:51	2.73E–06	4.17E–06	1,200	1,200	2,506	2,509	2,735	2,556	10.5	**CHi/CHir**
251.49	271.49	20050511 18:23	20050511 21:31	3.70E–05	4.10E–05	1,200	7,200	2,603	2,603	2,803	2,610	10.7	**CHi/CHir**
271.54	291.54	20050512 07:53	20050512 09:59	2.17E–06	3.40E–06	1,200	2,400	2,791	2,797	2,998	2,832	11.0	**CHi/CHir**
286.56	306.56	20050512 10:41	20050512 13:02	#NV	#NV	1	5,820	2,936	2,943	3,139	2,946	11.2	**Pi**
306.58	326.58	20050512 13:43	20050512 16:07	3.17E–07	3.83E–07	1,200	1,800	3,127	3,137	3,344	3,140	11.6	**CHi/CHir**
326.60	346.60	20050512 17:04	20050512 18:29	9.00E–07	9.83E–07	1,200	1,200	3,319	3,318	3,524	3,321	11.9	**CHi/CHir**
346.62	366.62	20050513 09:07	20050513 10:43	#NV	#NV	1	3,060	3,508	3,514	3,731	3,691	12.2	**Pi**

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
366.65	386.65	20050513 11:25	20050513 13:50	6.67E–08	1.00E–07	1,200	3,600	3,701	3,708	3,928	3,705	12.5	**CHi/CHir**
386.68	406.68	20050513 14:52	20050513 16:18	4.97E–06	5.13E–06	1,200	900	3,893	3,891	4,094	3,891	12.8	**CHi/CHir**
406.70	426.70	20050513 17:00	20050513 18:32	9.28E–06	1.01E–05	1,200	1,200	4,085	4,084	4,287	4,086	13.2	**CHi/CHir**
426.71	446.71	20050513 19:14	20050514 03:57	#NV	#NV	1	28,800	4,278	4,280	4,527	4,272	13.5	**Pi**
446.72	466.72	20050514 08:09	20050514 10:03	3.83E–06	4.55E–06	1,200	1,800	4,464	4,461	4,671	4,461	13.8	**CHi/CHir**
466.71	486.71	20050514 10:44	20050514 11:50	0.00E+00	0.00E+00	0	0	4,657	#NV	#NV	#NV	14.1	#NV
486.70	506.70	20050514 12:38	20050514 14:21	#NV	#NV	1	3,660	4,849	4,850	5,034	4,852	14.4	**Pi**
506.71	526.71	20050514 15:02	20050514 16:02	0.00E+00	0.00E+00	0	0	5,041	#NV	#NV	#NV	14.7	#NV
526.77	546.77	20050514 16:44	20050514 18:32	4.17E–07	7.50E–07	1,200	1,200	5,233	5,236	5,412	5,291	15.0	**CHi/Chir**
546.83	566.83	20050515 09:51	20050515 10:53	0.00E+00	0.00E+00	0	0	5,423	#NV	#NV	#NV	15.3	#NV
566.87	586.87	20050515 11:37	20050515 13:21	#NV	#NV	1	3,600	5,615	5,625	5,796	5,733	15.6	**Pi**
586.90	606.90	20050515 14:04	20050515 15:12	0.00E+00	0.00E+00	0	0	5,809	#NV	#NV	#NV	15.9	#NV
606.94	626.94	20050515 15:52	20050515 17:47	3.00E–07	4.50E–07	1,200	1,800	6,001	6,005	6,185	6,032	16.3	**CHi/CHir**
626.97	646.97	20050515 18:36	20050515 19:41	0.00E+00	0.00E+00	0	0	6,192	#NV	#NV	#NV	16.6	#NV
646.99	666.99	20050516 08:32	20050516 10:04	6.80E–06	7.08E–06	1,200	1,200	6,380	6,381	6,615	6,381	16.9	**CHi/CHir**
667.02	687.02	20050516 10:50	20050516 13:29	1.67E–08	3.33E–08	1,200	1,800	6,572	6,580	6,793	6,584	17.2	**CHi/CHir**
687.06	707.06	20050516 14:22	20050516 16:13	#NV	#NV	1	3,600	6,766	6,809	6,988	6,805	17.5	**Pi**
707.09	727.09	20050516 17:00	20050516 17:59	0.00E+00	0.00E+00	0	0	6,959	#NV	#NV	#NV	17.8	#NV
727.13	747.13	20050516 18:39	20050516 21:53	1.17E–04	1.24E–04	1,200	7,200	7,153	7,149	7,355	7,149	18.2	**CHi/CHir**
747.15	767.15	20050517 08:15	20050517 09:48	3.62E–06	3.85E–06	1,200	1,200	7,340	7,339	7,577	7,339	18.4	**CHi/CHir**
762.16	782.16	20050517 10:32	20050517 11:59	8.83E–06	9.33E–06	1,200	900	7,486	7,485	7,685	7,485	18.6	**CHi/CHir**
777.17	797.17	20050517 12:47	20050517 14:27	2.17E–07	2.50E–07	1,200	1,200	7,633	7,634	7,850	7,635	18.9	**CHi/CHir**
787.19	807.19	20050517 15:08	20050517 16:53	6.67E–08	8.33E–08	1,200	1,800	7,730	7,731	7,950	7,732	19.0	**CHi/CHir**
807.21	827.21	20050517 17:44	20050517 19:08	1.33E–07	1.50E–07	1,200	900	7,925	7,924	8,140	7,923	19.4	**CHi/CHir**
827.24	847.24	20050518 08:16	20050518 09:16	0.00E+00	0.00E+00	0	0	8,116	#NV	#NV	#NV	19.7	#NV
847.26	867.26	20050518 09:59	20050518 11:02	0.00E+00	0.00E+00	0	0	8,311	#NV	#NV	#NV	20.0	#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
867.28	887.28	20050518 11:43	20050518 12:44	0.00E+00	0.00E+00	0	0	8,508	#NV	#NV	#NV	20.3	#NV
887.31	907.31	20050518 14:01	20050518 16:16	1.67E–08	3.33E–08	1,200	2,400	8,702	8,710	8,918	8,709	20.6	**CHi/CHir**
907.33	927.33	20050518 17:04	19000718 22:48	1.67E–08	3.33E–08	1,200	8,400	8,898	8,914	9,112	8,894	20.9	**CHi/CHir**
927.33	947.33	20050519 08:14	20050519 09:24	0.00E+00	0.00E+00	0	0	9,088	#NV	#NV	#NV	21.3	#NV
947.34	967.34	20050519 10:03	20050519 11:45	#NV	#NV	1	3,540	9,285	9,289	9,545	9,299	21.6	**Pi**
967.39	987.39	20050519 12:24	20050519 13:54	1.10E–05	1.15E–05	1,200	1,200	9,480	9,477	9,677	9,479	22.0	**CHi/CHir**
972.41	992.41	20050519 14:26	20050519 15:28	0.00E+00	0.00E+00	0	0	9,530	#NV	#NV	#NV	22.0	#NV

#NV: not analysed
CHi: Constant Head injection phase
CHir: Recovery phase following the constant head injection phase
Pi: Pulse injection
Si: Slug injection

Table 7-2. Results from analysis of constant head tests in KLX03.

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up	low	Q/s	T_M	Perturb phase	Recovery phase	T_{f1}	T_{f2}	T_{s1}	T_{s2}	T_T	T_{TMIN}	T_{TMAX}	C	ξ	dt_1	dt_2	p*	h_{wif}
m btoc	m btoc	m^2/s	m^2/s			m^2/s	m^2/s	m^2/s	m^2/s	m^2/s	m^2/s	m^2/s	m^3/Pa	–	min	min	kPa	masl
106.31	206.31	1.37E–05	1.78E–05	2	WBS22	1.0E–05	#NV	3.7E–05	1.1E–05	1.0E–05	8.0E–06	3.0E–05	5.4E–09	–4.1	1.63	26.57	1,977.8	11.34
206.44	306.44	1.87E–06	2.44E–06	2	WBS22	1.3E–06	#NV	1.4E–06	2.0E–06	1.4E–06	8.0E–07	4.0E–06	8.6E–10	–3.4	0.20	1.58	2,951.0	13.69
306.58	406.58	3.05E–07	3.97E–07	2	WBS2	6.2E–07	#NV	1.4E–06	#NV	6.2E–07	4.0E–07	9.0E–07	4.2E–10	5.5	1.00	27.33	3,888.4	12.26
406.70	506.70	5.62E–07	7.32E–07	22	WBS22	1.4E–07	3.9E–07	5.0E–07	9.1E–07	3.9E–07	1.0E–07	7.0E–07	4.4E–09	–4.3	6.55	21.34	4,843.6	12.44
506.71	606.71	1.25E–09	1.63E–09	22	WBS22	2.8E–08	4.1E–10	3.7E–08	1.5E–08	4.1E–10	8.0E–11	8.0E–10	3.7E–10	–2.0	#NV	#NV	#NV	#NV
606.94	706.94	2.85E–07	3.71E–07	2	WBS22	4.5E–07	#NV	2.2E–07	8.0E–07	4.5E–07	2.0E–07	7.0E–07	3.6E–10	2.8	1.32	28.10	6,763.8	13.71
707.09	807.09	5.56E–06	7.24E–06	22	WBS22	4.6E–06	1.1E–05	2.7E–06	1.0E–05	2.7E–06	9.0E–07	8.0E–06	2.3E–09	–3.9	0.19	0.85	7,725.7	14.32
807.21	907.21	7.36E–09	9.59E–09	22	WBS2	5.0E–09	9.9E–09	2.5E–08	#NV	5.0E–09	3.0E–09	9.0E–09	2.6E–10	–0.1	0.45	2.05	8,700.4	16.16
892.31	992.31	4.84E–07	6.30E–07	22	WBS22	4.6E–07	8.3E–07	2.8E–07	9.3E–07	2.8E–07	8.0E–08	7.0E–07	6.2E–11	–2.7	0.79	2.31	9,523.2	17.13
106.31	126.31	5.50E–07	5.75E–07	2	WBS22	6.2E–07	#NV	2.1E–07	9.9E–07	2.1E–07	8.0E–08	5.0E–07	1.0E–10	–3.0	0.19	0.65	1,214.5	10.82
126.35	146.35	7.28E–09	7.62E–09	2	WBS2	8.2E–09	#NV	1.5E–08	#NV	8.2E–09	4.0E–09	2.0E–08	6.0E–11	2.4	0.23	17.48	1,406.5	11.04
146.39	166.39	6.83E–08	7.15E–08	22	WBS22	3.6E–09	2.9E–08	1.3E–08	4.5E–08	4.5E–08	1.0E–08	8.0E–08	5.4E–10	–3.8	#NV	#NV	1,587.2	10.10
166.42	186.42	2.29E–08	2.40E–08	2	WBS2	4.1E–08	#NV	1.4E–07	#NV	4.1E–08	2.0E–08	9.0E–08	4.5E–11	5.8	1.15	15.49	1,788.8	11.29
186.42	206.42	1.28E–05	1.34E–05	2	WBS22	9.2E–06	#NV	3.3E–05	9.6E–06	9.2E–06	6.0E–06	2.0E–05	1.6E–09	–3.9	1.60	20.00	1,974.0	10.84
206.44	226.44	9.13E–09	9.55E–09	22	WBS22	8.8E–09	3.5E–09	8.4E–09	5.8E–09	8.4E–09	5.0E–09	2.0E–08	5.9E–11	–1.5	0.53	1.73	2,192.3	13.73
226.48	246.48	5.50E–09	5.76E–09	22	WBS22	8.2E–09	2.3E–09	6.6E–09	3.7E–09	3.7E–09	1.0E–09	6.0E–09	5.5E–11	0.3	2.90	17.89	2,372.9	12.76
241.48	261.48	1.19E–07	1.24E–07	2	WBS22	3.0E–08	#NV	4.2E–07	5.5E–08	5.5E–08	3.0E–08	1.0E–07	7.2E–10	–2.8	12.08	19.70	2,495.2	10.72
251.49	271.49	1.81E–06	1.90E–06	22	WBS22	2.1E–06	1.1E–06	2.7E–06	2.1E–06	2.7E–06	9.0E–07	4.0E–06	1.0E–09	–0.1	1.00	2.63	2,607.7	12.51
271.54	291.54	1.06E–07	1.11E–07	2	WBS2	1.6E–08	#NV	3.7E–07	5.3E–08	5.3E–08	3.0E–08	1.0E–07	2.8E–11	–2.9	#NV	#NV	2,796.9	12.40
286.56	306.56	#NV	#NV	#NV	WBS22	#NV	#NV	1.8E–07	1.3E–08	1.3E–08	6.0E–09	3.0E–08	1.3E–09	–3.5	#NV	#NV	#NV	#NV
306.58	326.58	1.50E–08	1.57E–08	2	WBS2	1.1E–08	#NV	1.4E–08	#NV	1.1E–08	7.0E–09	3.0E–08	1.2E–10	–0.2	0.97	17.92	3,124.8	11.91
326.60	346.60	4.29E–08	4.48E–08	22	WBS2	9.9E–08	2.7E–08	1.6E–07	#NV	9.9E–08	6.0E–08	2.0E–07	2.1E–11	7.5	0.19	1.69	3,317.9	12.20
346.62	366.62	#NV	#NV	#NV	WBS2	#NV	#NV	1.4E–11	#NV	1.4E–11	1.0E–11	3.0E–11	8.7E–11	–0.9	15.07	35.13	#NV	#NV
366.65	386.65	2.97E–09	3.11E–09	22	WBS2	2.0E–09	7.5E–10	3.8E–09	1.1E–09	1.1E–09	8.0E–10	3.0E–09	7.5E–11	–1.0	#NV	#NV	3,684.0	10.74

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up	low	Q/s	T_M	Perturb phase	Recovery phase	T_{f1}	T_{f2}	T_{s1}	T_{s2}	T_T	T_{TMIN}	T_{TMAX}	C	ξ	dt_1	dt_2	p*	h_{wif}
m btoc	m btoc	m²/s	m²/s			m²/s	m²/s	m²/s	m²/s	m²/s	m²/s	m²/s	m³/Pa	–	min	min	kPa	masl
386.68	406.68	2.40E–07	2.51E–07	2	WBS2	6.3E–07	#NV	1.1E–06	#NV	6.3E–07	2.0E–07	2.0E–06	1.5E–10	9.4	1.10	12.64	3,891.2	12.45
406.70	426.70	4.49E–07	4.69E–07	22	WBS22	2.4E–07	7.1E–07	3.9E–07	6.3E–07	6.3E–07	2.0E–07	8.0E–07	9.1E–10	–1.1	#NV	#NV	4,080.5	12.33
426.71	446.71	#NV	#NV	#NV	WBS2	#NV	#NV	6.4E–11	#NV	6.4E–11	3.0E–11	9.0E–11	7.7E–11	–1.8	89.48	210.58	#NV	#NV
446.72	466.72	1.79E–07	1.87E–07	22	WBS2	1.4E–07	4.4E–07	3.0E–07	#NV	3.0E–07	9.0E–08	5.0E–07	3.8E–09	2.6	#NV	#NV	4,451.7	11.33
466.71	486.71	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
486.70	506.70	#NV	#NV	#NV	WBS2	#NV	#NV	3.0E–11	#NV	3.0E–11	2.0E–11	7.0E–11	6.3E–11	–3.9	#NV	#NV	#NV	#NV
506.71	526.71	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
526.77	546.77	2.32E–08	2.43E–08	22	WBS22	6.8E–08	7.0E–09	1.1E–07	6.2E–09	7.0E–09	1.0E–09	3.0E–08	5.9E–11	–0.4	6.75	10.9	5,223.3	12.26
546.83	566.83	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
566.87	586.87	#NV	#NV	#NV	WBS22	#NV	#NV	3.4E–10	3.3E–11	3.3E–11	1.0E–11	5.0E–11	1.1E–10	–2.0	26.6	54.9	#NV	#NV
586.90	606.90	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
606.94	626.94	1.64E–08	1.71E–08	2	WBS22	5.7E–09	#NV	6.7E–09	5.0E–09	5.7E–09	3.0E–09	1.0E–08	1.6E–10	–2.9	5.77	9.43	5,999.2	13.53
626.97	646.97	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
646.99	666.99	2.85E–07	2.98E–07	2	WBS22	5.6E–07	#NV	4.9E–07	1.3E–06	4.9E–07	2.0E–07	8.0E–07	7.8E–11	4.7	0.32	0.68	6,381.6	13.59
667.02	687.02	7.68E–10	8.03E–10	2	WBS2	3.1E–10	#NV	6.1E–10	#NV	6.1E–10	3.0E–10	9.0E–10	3.0E–11	0.6	#NV	#NV	6,569.9	13.31
687.06	707.06	#NV	#NV	#NV	WBS2	#NV	#NV	6.6E–11	#NV	6.6E–11	2.0E–11	8.0E–11	9.1E–12	1.3	1.39	8.33	#NV	#NV
707.09	727.09	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
727.13	747.13	5.58E–06	5.84E–06	2	WBS22	9.3E–06	#NV	1.1E–06	5.9E–06	5.9E–06	2.0E–06	8.0E–06	7.5E–10	–5.1	#NV	#NV	7,147.9	13.76
747.15	767.15	1.5E–07	1.6E–07	2	WBS2	2.1E–07	#NV	9.5E–07	#NV	2.1E–07	9.0E–08	5.0E–07	5.2E–11	2.2	1.95	13.7	7,339.7	13.84
762.16	782.16	4.33E–07	4.53E–07	22	WBS2	9.9E–07	5.2E–07	2.8E–06	#NV	9.9E–07	4.0E–07	2.0E–06	5.5E–11	6.2	0.38	0.92	7,486.4	14.18
777.17	797.17	9.8E–09	1.0E–08	22	WBS22	6.4E–09	9.1E–09	5.2E–09	1.6E–08	6.4E–09	3.0E–09	1.0E–08	5.2E–11	–0.7	0.58	1.93	7,627.0	13.90
787.19	807.19	2.99E–09	3.12E–09	2	WBS2	2.6E–09	#NV	6.2E–09	#NV	6.2E–09	3.0E–09	9.0E–09	5.1E–11	6.0	#NV	#NV	7,725.8	14.23
807.21	827.21	6.06E–09	6.33E–09	22	WBS2	7.0E–09	3.9E–09	2.3E–08	#NV	7.0E–09	5.0E–09	2.0E–08	5.0E–11	1.5	0.33	1.4	7,919.6	14.49
827.24	847.24	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up	low	Q/s	T_M	Perturb phase	Recovery phase	T_{f1}	T_{f2}	T_{s1}	T_{s2}	T_T	T_{TMIN}	T_{TMAX}	C	ξ	dt_1	dt_2	p*	h_{wif}
m btoc	m btoc	m²/s	m²/s			m²/s	m²/s	m²/s	m²/s	m²/s	m²/s	m²/s	m³/Pa	–	min	min	kPa	masl
847.26	867.26	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
867.28	887.28	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
887.31	907.31	7.86E–10	8.22E–10	2	WBS2	5.1E–10	#NV	5.1E–10	#NV	5.1E–10	4.0E–10	9.0E–10	4.0E–11	0.0	#NV	#NV	8,682.4	14.22
907.33	927.33	8.26E–10	8.64E–10	2	WBS2	8.4E–10	#NV	1.9E–09	#NV	1.9E–09	8.0E–10	3.0E–09	3.8E–11	3.7	#NV	#NV	8,890.7	15.95
927.33	947.33	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
947.34	967.34	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–08	2.0E–10	2.0E–10	8.0E–11	4.0E–10	2.6E–11	1.5	#NV	#NV	#NV	#NV
967.39	987.39	5.4E–07	5.6E–07	22	WBS22	4.6E–07	1.3E–06	3.1E–07	1.3E–06	4.6E–07	2.0E–07	9.0E–07	5.0E–10	–1.0	0.3	1.75	9,477.1	17.22
972.41	992.41	#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.

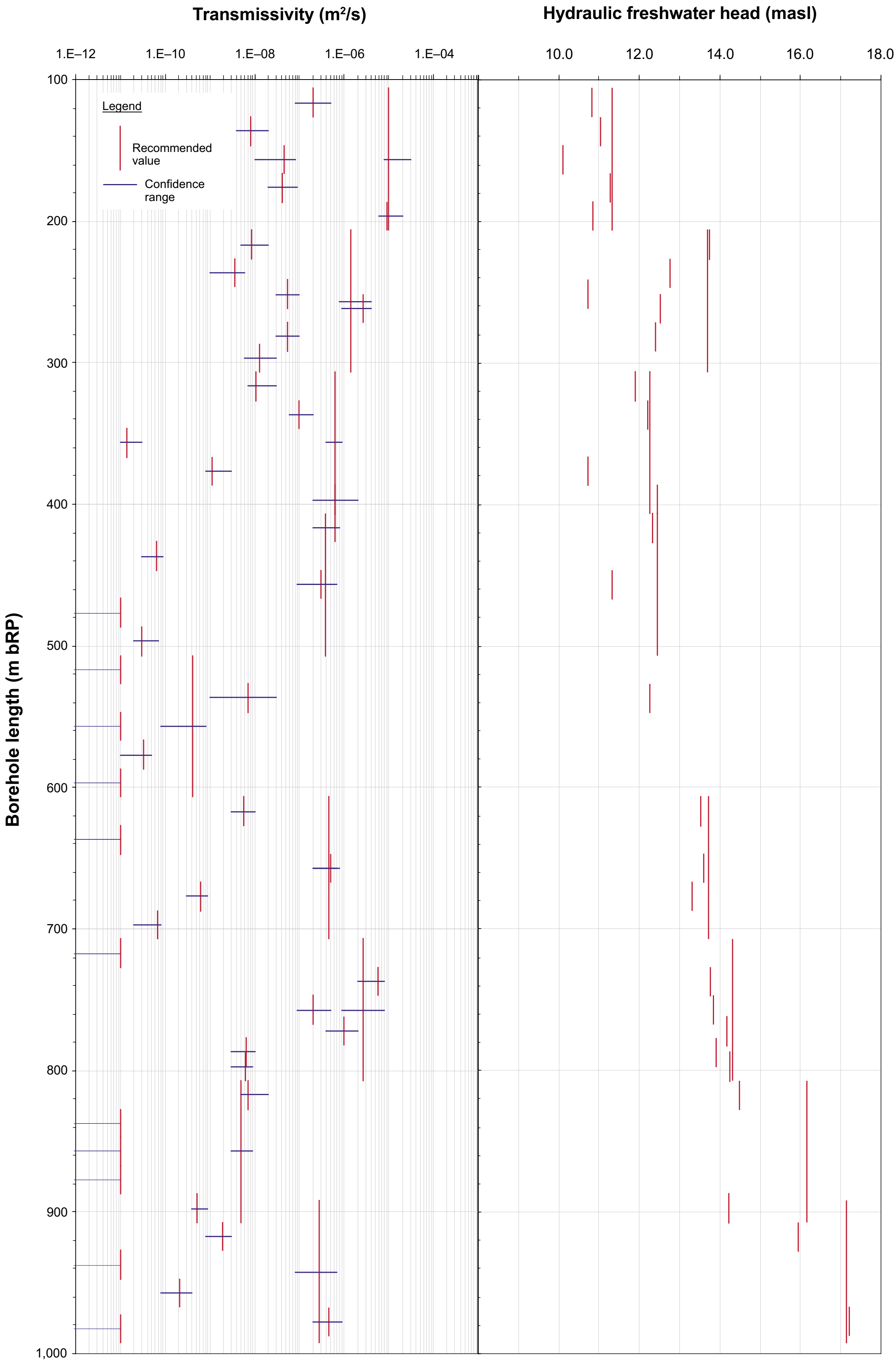


Figure 7-1. *Results summary – profiles of transmissivity and equivalent freshwater head, transmissivities derived from injectiontests, freshwater head extrapolated.*

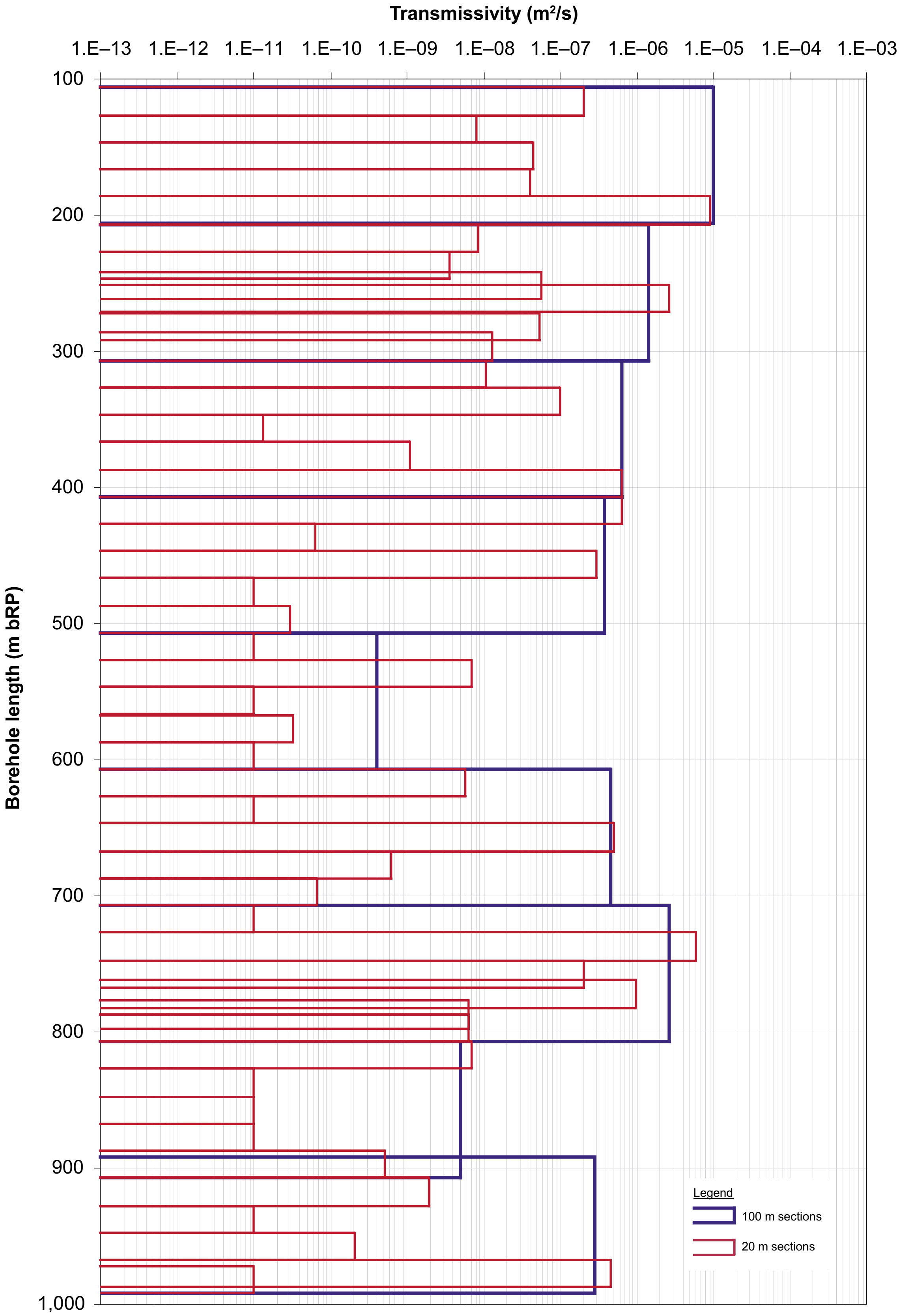


Figure 7-2. *Results summary – profile of transmissivity.*

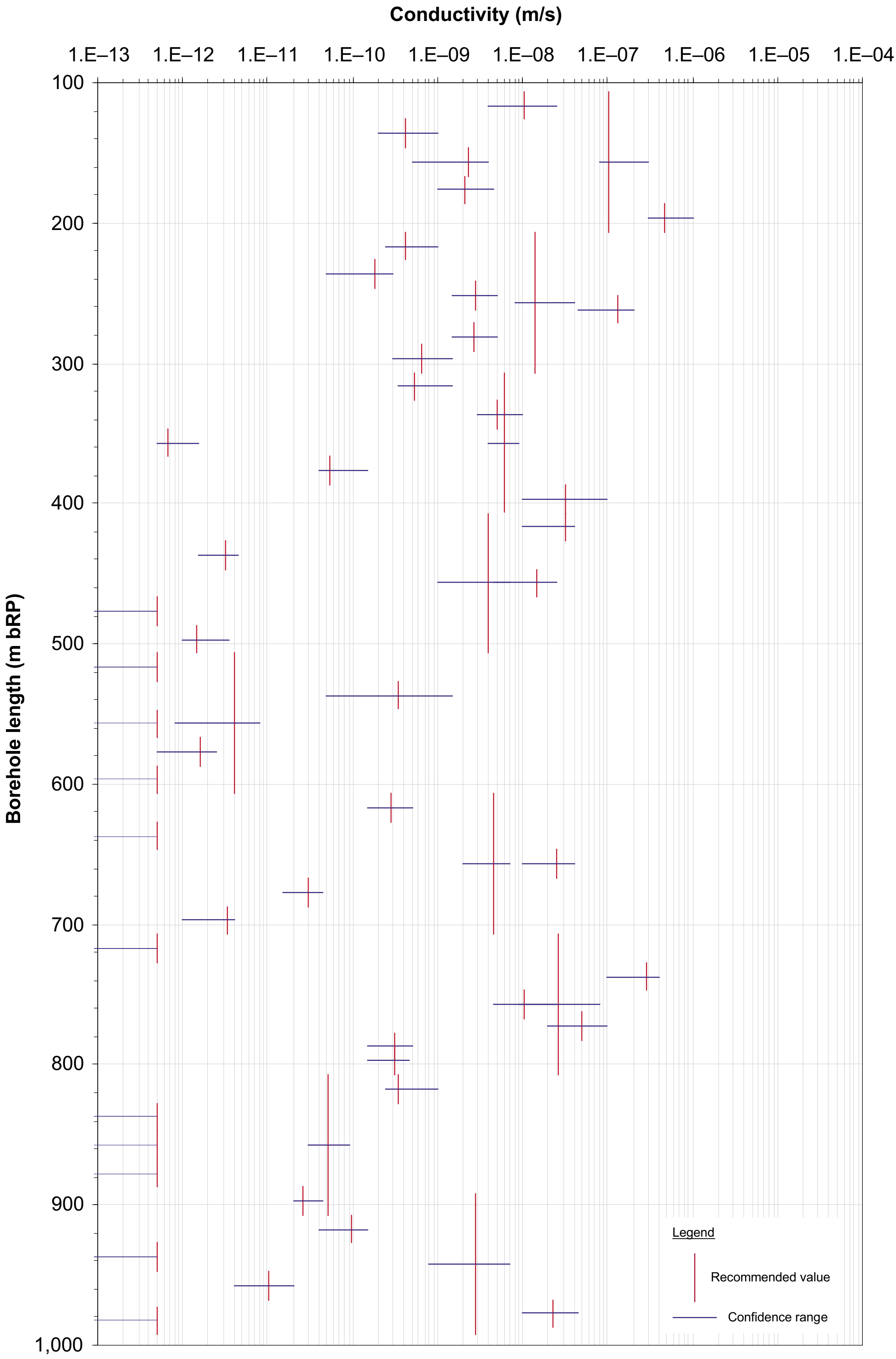


Figure 7-3. Results summary – profile of hydraulic conductivity.

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.

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

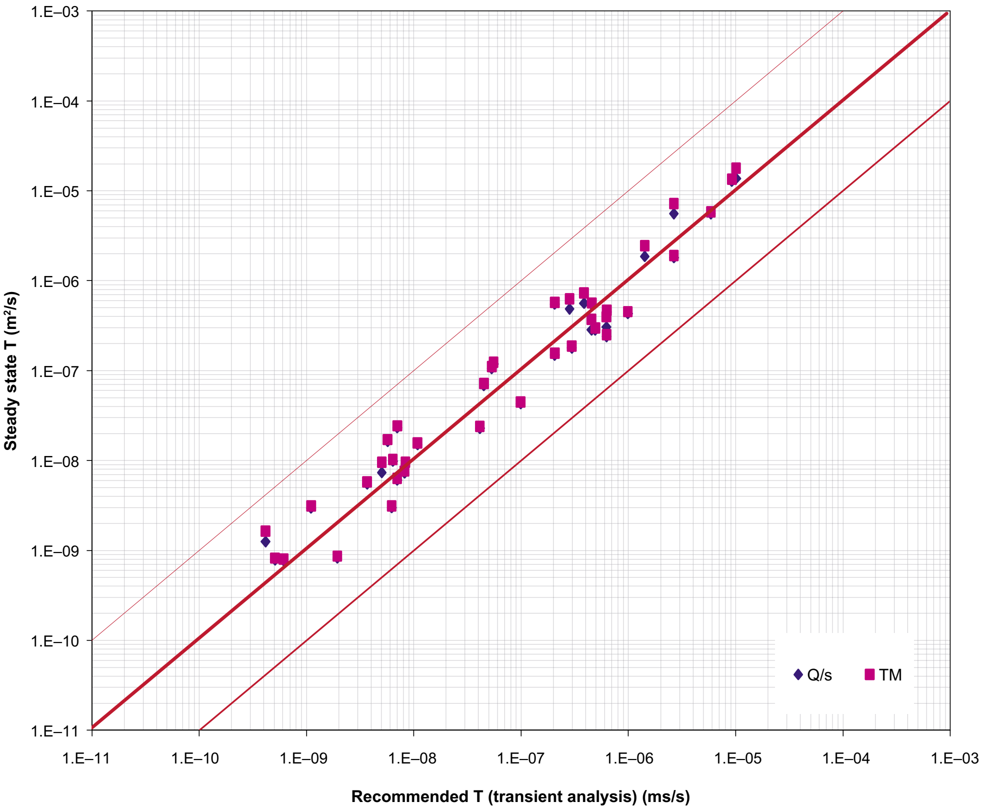


Figure 7-4. Correlation analysis of transmissivities derived by steady state and transient methods.

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 approx 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 two 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.

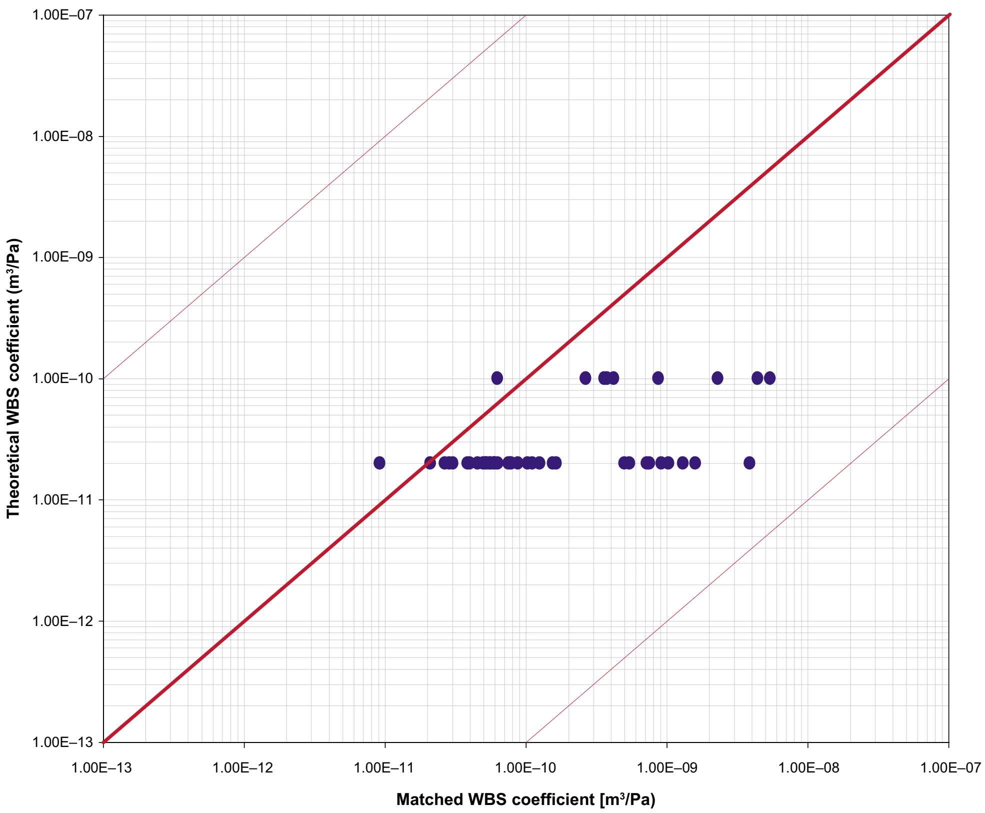


Figure 7-5. *Correlation analysis of theoretical and matched wellbore storage coefficients.*

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. Altogether 7 Pulse injection tests were performed and the recommended transmissivities of these sections range between 1.4E–11 m^2/s and 2.0E–10 m^2/s, excluding one transmissivity value of 1.3e–8 m^2/s. Recommended transmissivities of the injection tests range between 1.0E–5 m^2/s and 4.2E–10 m^2/s. Additionaly, 4 slug injection tests (Si) were performed in tight sections over night. The analyses of the Si-phases and the former conducted injection tests in the corresponding sections show in the most cases concistence.

The transmissivity profiles in Figures 7-1 and 7-2 show transmissivities that ranges between 2.8E–7 m^2/s and 1.0E–5 m^2/s. An exception are the intervals from 506.71–606.71 m and 807.21–907.21 m with a transmissivity of 4.2E–10 m^2/s and 5.0E–9 m^2/s, respectively. For the 20 m sections, the transmissivities range from 1.4E–11 m^2/s to 9.2E–6 m^2/s (excluding skip tests).

Five 20 m sections show larger transmissivities than the appropriate longer interval. In four of the five cases, the differences are small and are covered by the confidence range. This can be explained with crossflow and connections to the adjacant zones. The 20 m section from 526.77 m to 546.77 m shows a transmissivity one order of a magnitude higher than the covering 100 m section. For the analysis of both tests a composite flow model with decreasing transmissivity away from the test section was choosen. No radial flow was reached at late times and the derived transmissivities should be seen as an upper limit of the transmissivities.

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 at a depth from 106 m to 606 m a freshwater head oscillating between 10.1 and 13.7 masl. Down to the following 1,000 m the freshwater head increase from 13 m to 17 m. This can be explained by higher salinity of the water down from c 600 m.

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.

9 References

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APPENDIX 1

File Description Table

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX03				
TEST- AND FILEPROTOCOL					Testorder dated : 2005-05-05				
Teststart		Interval boundaries		Name of Datafiles		Testtype	Copied to	Plotted (date)	Sign.
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2005-05-05	11:05	106.31	206.31	___KLX03_0106.31_200505051105.ht2	KLX03_106.31-206.31_050505_1_CHir_Q_r.csv	CHir		2005-05-05	
2005-05-05	17:25	206.44	306.44	___KLX03_0206.44_200505051725.ht2	KLX03_206.44-306.44_050505_1_CHir_Q_r.csv	CHir		2005-05-06	
2005-05-06	09:03	306.58	406.58	___KLX03_0306.58_200505060903.ht2	KLX03_306.58-406.58_050506_1_CHir_Q_r.csv	CHir		2005-05-06	
2005-05-06	12:36	406.70	506.70	___KLX03_0406.70_200505061236.ht2	KLX03_406.70-506.70_050506_1_CHir_Q_r.csv	CHir		2005-05-06	
2005-05-06	16:53	506.71	606.71	___KLX03_0506.71_200505061653.ht2	KLX03_506.71-606.71_050506_1_Pi_Q_r.csv	Pi		2005-05-07	
2005-05-07	08:53	606.94	706.94	___KLX03_0606.94_200505070853.ht2	KLX03_606.94-706.94_050507_1_CHir_Q_r.csv	CHir		2005-05-07	
2005-05-07	12:26	707.09	807.09	___KLX03_0707.09_200505071226.ht2	KLX03_707.09-807.09_050507_1_CHir_Q_r.csv	CHir		2005-05-07	
2005-05-07	16:19	807.21	907.21	___KLX03_0807.21_200505071619.ht2	KLX03_807.21-907.21_050507_1_CHir_Q_r.csv	CHir		2005-05-08	
2005-05-08	09:43	892.31	992.31	___KLX03_0892.31_200505080943.ht2	KLX03_892.31-992.31_050508_1_CHir_Q_r.csv	CHir		2005-05-08	
2005-05-08	15:36	506.71	606.71	___KLX03_0506.71_200505081536.ht2	KLX03_506.71-606.71_050508_2_CHir_Q_r.csv	CHir		2005-05-08	
2005-05-10	08:00	106.31	126.31	___KLX03_0106.31_200505100800.ht2	KLX03_106.31-126.31_050510_1_CHir_Q_r.csv	CHir		2005-05-10	
2005-05-10	10:39	126.35	146.35	___KLX03_0126.35_200505101039.ht2	KLX03_126.35-146.35_050510_1_CHir_Q_r.csv	CHir		2005-05-10	
2005-05-10	13:54	146.39	166.39	___KLX03_0146.39_200505101354.ht2	KLX03_146.39-166.39_050510_1_CHir_Q_r.csv	CHir		2005-05-10	
2005-05-10	16:43	166.42	186.42	___KLX03_0166.42_200505101643.ht2	KLX03_166.42-186.42_050510_1_CHir_Q_r.csv	CHir		2005-05-10	
2005-05-10	17:57	166.42	186.42	___KLX03_0166.42_200505101757.ht2	KLX03_166.42-186.42_050510_2_CHir_Q_r.csv	CHir		2005-05-11	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX03				
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2005-05-10	19:10	166.42	186.42	___KLX03_0166.42_200505101910.ht2	KLX03_166.42-186.42_050510_3_Si_Q_r.csv	Si		2005-05-11	
2005-05-11	08:01	186.42	206.42	___KLX03_0186.42_200505110801.ht2	KLX03_186.42-206.42_050511_1_CHir_Q_r.csv	CHir		2005-05-11	
2005-05-11	10:16	206.44	226.44	___KLX03_0206.44_200505111016.ht2	KLX03_206.44-226.44_050511_1_CHir_Q_r.csv	CHir		2005-05-11	
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2005-05-11	16:06	241.48	261.48	___KLX03_0241.48_200505111606.ht2	KLX03_241.48-261.48_050511_1_CHir_Q_r.csv	CHir		2005-05-11	
2005-05-11	18:23	251.49	271.49	___KLX03_0251.49_200505111823.ht2	KLX03_251.49-271.49_050511_1_CHir_Q_r.csv	CHir		2005-05-12	
2005-05-12	07:53	271.54	291.54	___KLX03_0271.54_200505120753.ht2	KLX03_271.54-291.54_050512_1_CHir_Q_r.csv	CHir		2005-05-12	
2005-05-12	10:41	286.56	306.56	___KLX03_0286.56_200505121041.ht2	KLX03_286.56-306.56_050512_1_Pi_Q_r.csv	Pi		2005-05-12	
2005-05-12	13:43	306.58	326.58	___KLX03_0306.58_200505121343.ht2	KLX03_306.58-326.58_050512_1_CHir_Q_r.csv	CHir		2005-05-12	
2005-05-12	17:04	326.60	346.60	___KLX03_0326.60_200505121704.ht2	KLX03_326.60-346.60_050512_1_CHir_Q_r.csv	CHir		2005-05-12	
2005-05-12	18:31	326.60	346.60	___KLX03_0326.60_200505121831.ht2	KLX03_326.60-346.60_050512_2_Si_Q_r.csv	Si		2005-05-13	
2005-05-13	09:07	346.62	366.62	___KLX03_0346.62_200505130907.ht2	KLX03_346.62-366.62_050513_1_Pi_Q_r.csv	Pi		2005-05-13	
2005-05-13	11:25	366.65	386.65	___KLX03_0366.65_200505131125.ht2	KLX03_366.65-386.65_050513_1_CHir_Q_r.csv	CHir		2005-05-13	
2005-05-13	14:52	386.68	406.68	___KLX03_0386.68_200505131452.ht2	KLX03_386.68-406.68_050513_1_CHir_Q_r.csv	CHir		2005-05-13	
2005-05-13	17:00	406.70	426.70	___KLX03_0406.70_200505131700.ht2	KLX03_406.70-426.70_050513_1_CHir_Q_r.csv	CHir		2005-05-13	
2005-05-13	19:14	426.71	446.71	___KLX03_0426.71_200505131914.ht2	KLX03_426.71-446.71_050513_1_Pi_Q_r.csv	Pi		2005-05-14	

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2005-05-14	10:44	466.71	486.71	___KLX03_0466.71_200505141044.ht2	KLX03_466.71-486.71_050514_1_Pi_Q_r.csv	Pi		2005-05-14	
2005-05-14	12:38	486.7	506.7	___KLX03_0486.70_200505141238.ht2	KLX03_486.70-506.70_050514_1_Pi_Q_r.csv	Pi		2005-05-14	
2005-05-14	15:02	506.71	526.71	___KLX03_0506.71_200505141502.ht2	KLX03_506.71-526.71_050514_1_CHir_Q_r.csv	CHir		2005-05-14	
2005-05-14	16:44	526.77	546.77	___KLX03_0526.77_200505141644.ht2	KLX03_526.77-546.77_050514_1_CHir_Q_r.csv	CHir		2005-05-14	
2005-05-14	18:52	526.77	546.77	___KLX03_0526.77_200505141852.ht2	KLX03_526.77-546.77_050514_2_Si_Q_r.csv	Si		2005-05-15	
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2005-05-15	14:04	586.90	606.90	___KLX03_0586.90_200505151404.ht2	KLX03_586.90-606.90_050515_1_Pi_Q_r.csv	Pi		2005-05-15	
2005-05-15	15:52	606.94	626.94	___KLX03_0606.94_200505151552.ht2	KLX03_606.94-626.94_050515_1_CHir_Q_r.csv	CHir		2005-05-15	
2005-05-15	18:36	626.97	646.97	___KLX03_0626.97_200505151836.ht2	KLX03_626.97-646.97_050515_1_Pi_Q_r.csv	Pi		2005-05-15	
2005-05-15	20:19	606.94	626.94	___KLX03_0606.94_200505152019.ht2	KLX03_606.94-626.94_050515_2_Si_Q_r.csv	Si		2005-05-16	
2005-05-16	08:32	646.99	666.99	___KLX03_0646.99_200505160832.ht2	KLX03_646.99-666.99_050516_1_CHir_Q_r.csv	CHir		2005-05-16	
2005-05-16	10:50	667.02	687.02	___KLX03_0667.02_200505161050.ht2	KLX03_667.02-687.02_050516_1_CHir_Q_r.csv	CHir		2005-05-16	
2005-05-16	14:22	687.06	707.06	___KLX03_0687.06_200505161422.ht2	KLX03_687.06-707.06_050516_1_Pi_Q_r.csv	Pi		2005-05-16	

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2005-05-16	18:39	727.13	747.13	___KLX03_0727.13_200505161839.ht2	KLX03_727.13-747.13_050516_1_CHir_Q_r.csv	CHir		2005-05-17	
2005-05-17	08:15	747.15	767.15	___KLX03_0747.15_200505170815.ht2	KLX03_747.15-767.15_050517_1_CHir_Q_r.csv	CHir		2005-05-17	
2005-05-17	10:32	762.16	782.16	___KLX03_0762.16_200505171032.ht2	KLX03_762.16-782.16_050517_1_CHir_Q_r.csv	CHir		2005-05-17	
2005-05-17	12:47	777.17	797.17	___KLX03_0777.17_200505171247.ht2	KLX03_777.17-797.17_050517_1_CHir_Q_r.csv	CHir		2005-05-17	
2005-05-17	15:08	787.19	807.19	___KLX03_0787.19_200505171508.ht2	KLX03_787.19-807.19_050517_1_CHir_Q_r.csv	CHir		2005-05-17	
2005-05-17	17:44	807.21	827.21	___KLX03_0807.21_200505171744.ht2	KLX03_807.21-827.21_050517_1_CHir_Q_r.csv	CHir		2005-05-17	
2005-05-17	19:12	807.21	827.21	___KLX03_0807.21_200505171912.ht2	KLX03_807.21-827.21_050517_2_Si_Q_r.csv	Si		2005-05-18	
2005-05-18	08:16	827.24	847.24	___KLX03_0827.24_200505180816.ht2	KLX03_827.24-847.24_050518_1_CHir_Q_r.csv	CHir		2005-05-18	
2005-05-18	09:59	847.26	867.26	___KLX03_0847.26_200505180959.ht2	KLX03_847.26-867.26_050518_1_CHir_Q_r.csv	CHir		2005-05-18	
2005-05-18	11:43	867.28	887.28	___KLX03_0867.28_200505181143.ht2	KLX03_867.28-887.28_050518_1_CHir_Q_r.csv	CHir		2005-05-18	
2005-05-18	14:01	887.31	907.31	___KLX03_0887.31_200505181401.ht2	KLX03_887.31-907.31_050518_1_CHir_Q_r.csv	CHir		2005-05-18	
2005-05-18	17:04	907.33	927.33	___KLX03_0907.33_200505181704.ht2	KLX03_907.33-927.33_050518_1_CHir_Q_r.csv	CHir		2005-05-19	
2005-05-19	08:14	927.33	947.33	___KLX03_0927.33_200505190814.ht2	KLX03_927.33-947.33_050519_1_CHir_Q_r.csv	CHir		2005-05-19	
2005-05-19	10:03	947.34	967.34	___KLX03_0947.34_200505191003.ht2	KLX03_947.34-967.34_050519_1_Pi_Q_r.csv	Pi		2005-05-19	
2005-05-19	12:24	967.39	987.39	___KLX03_0967.39_200505191224.ht2	KLX03_967.39-987.39_050519_1_CHir_Q_r.csv	CHir		2005-05-19	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX03				
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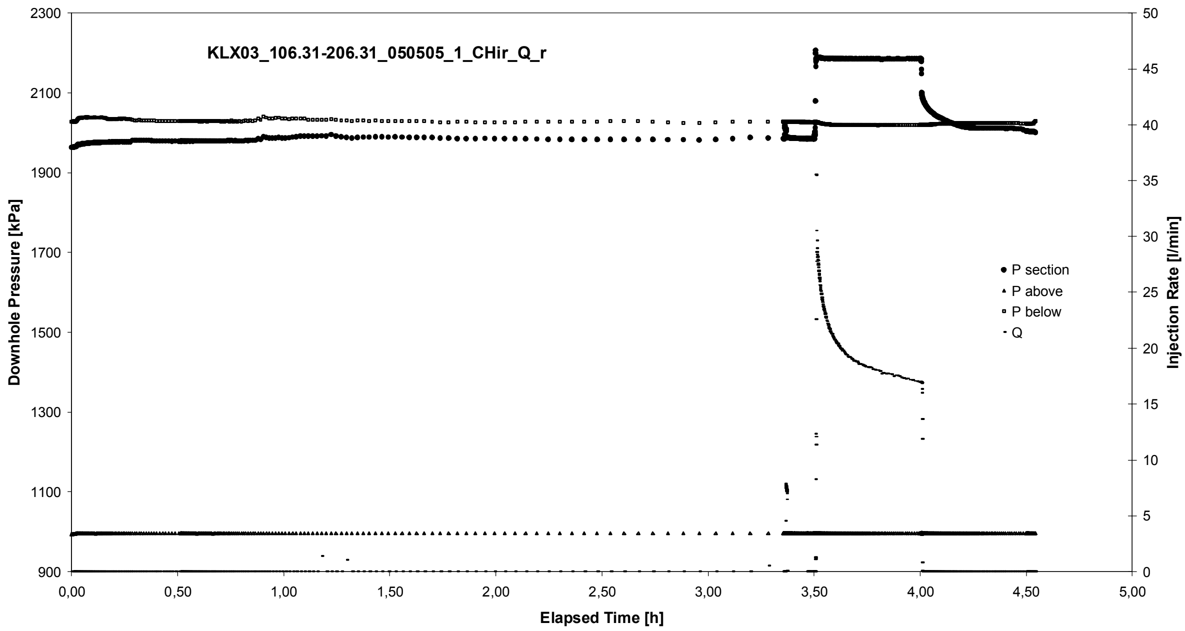
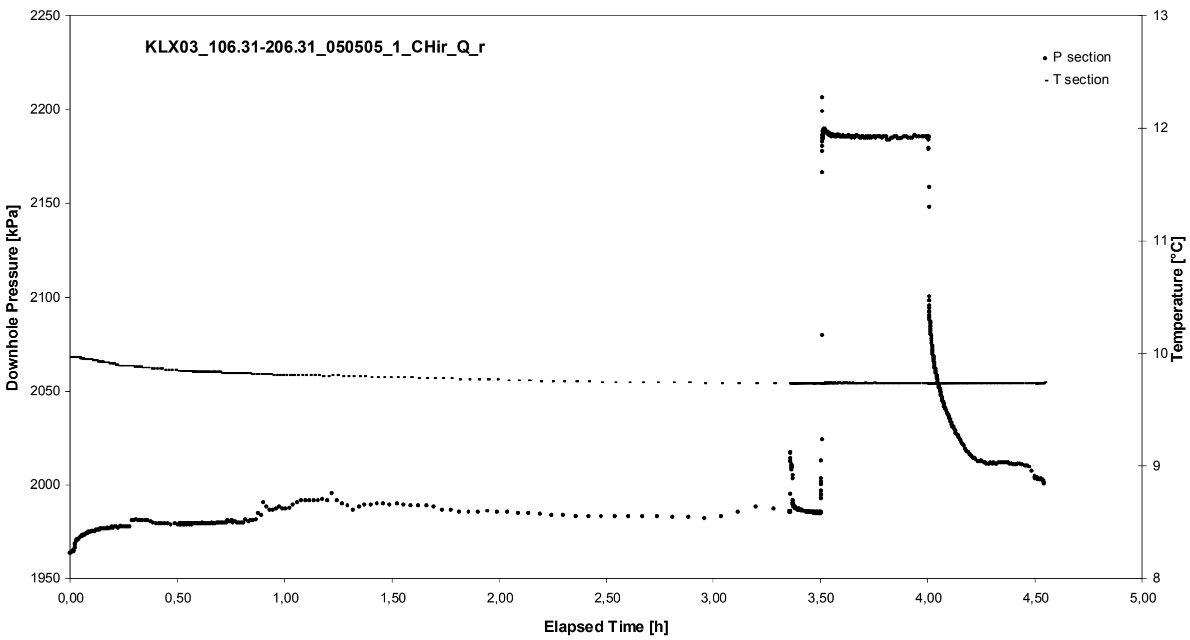
APPENDIX 2-1

Test 106.31 – 206.31 m

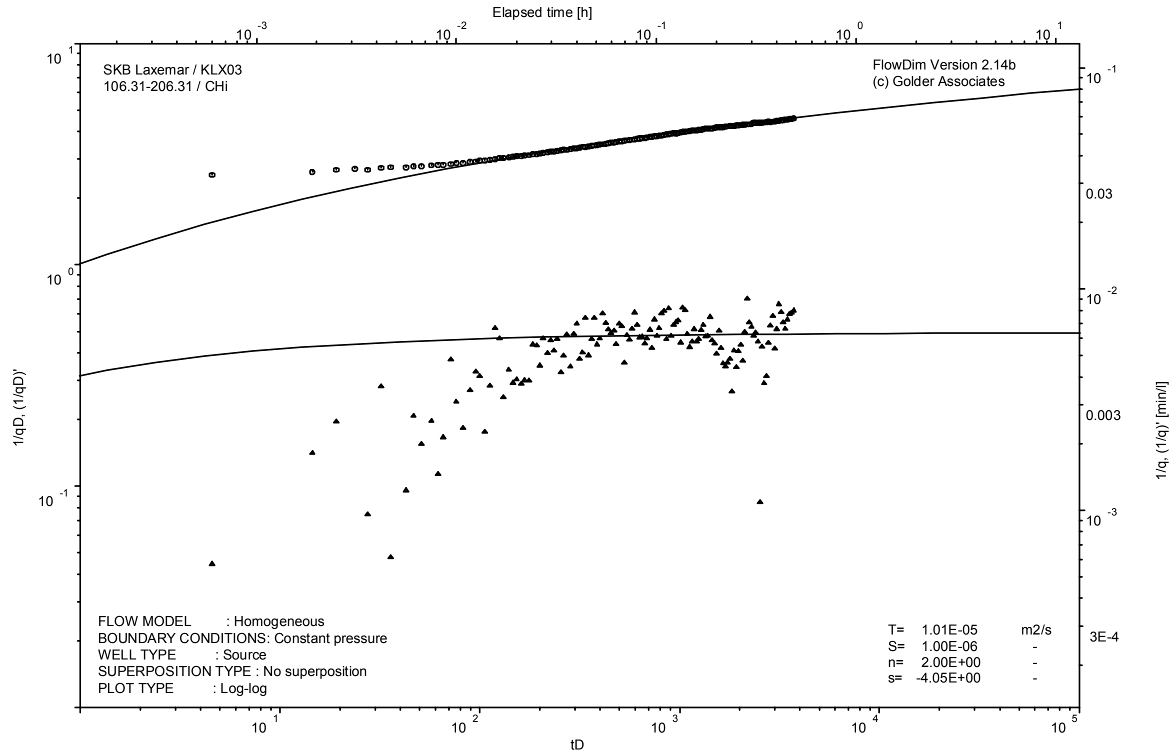
Analysis diagrams



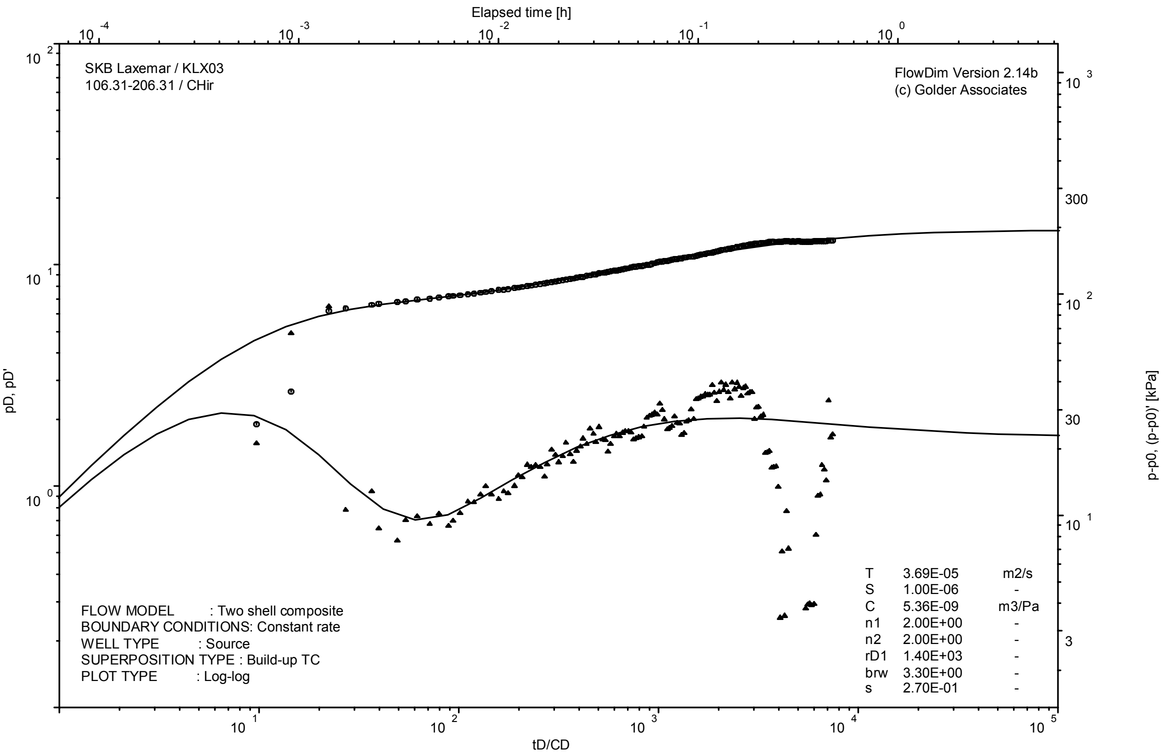
Pressure and flow rate vs. time; cartesian plot



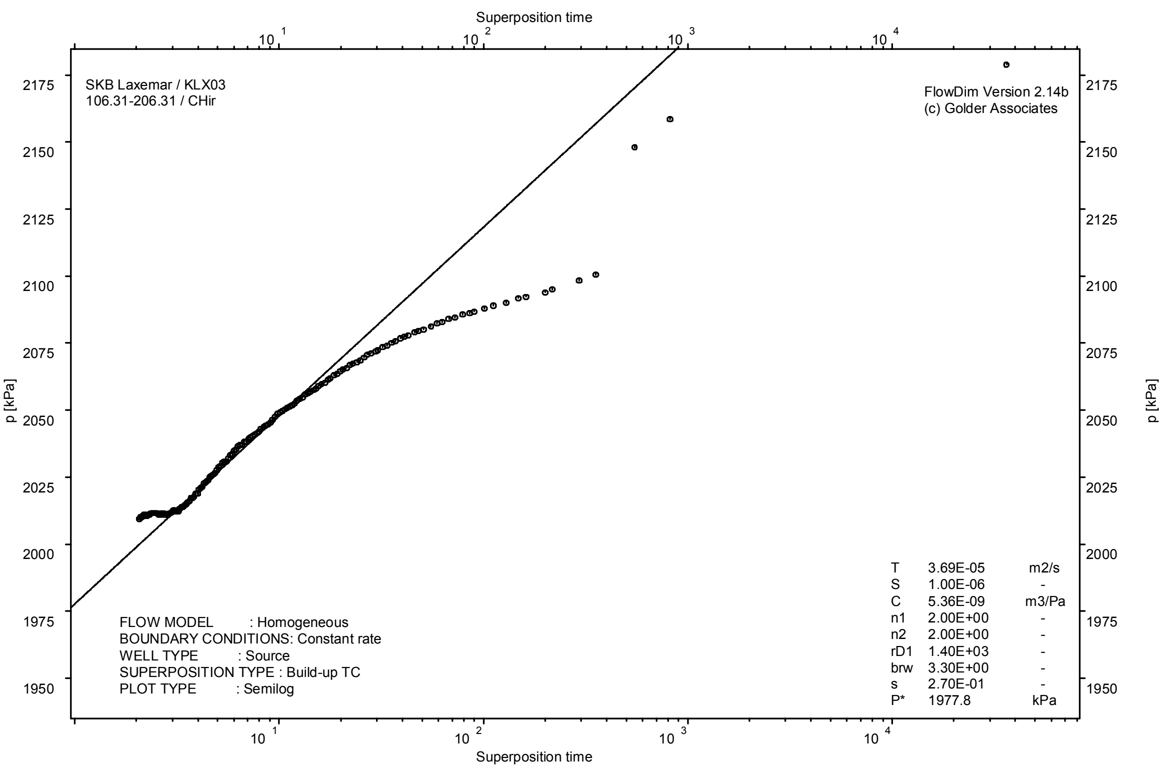
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

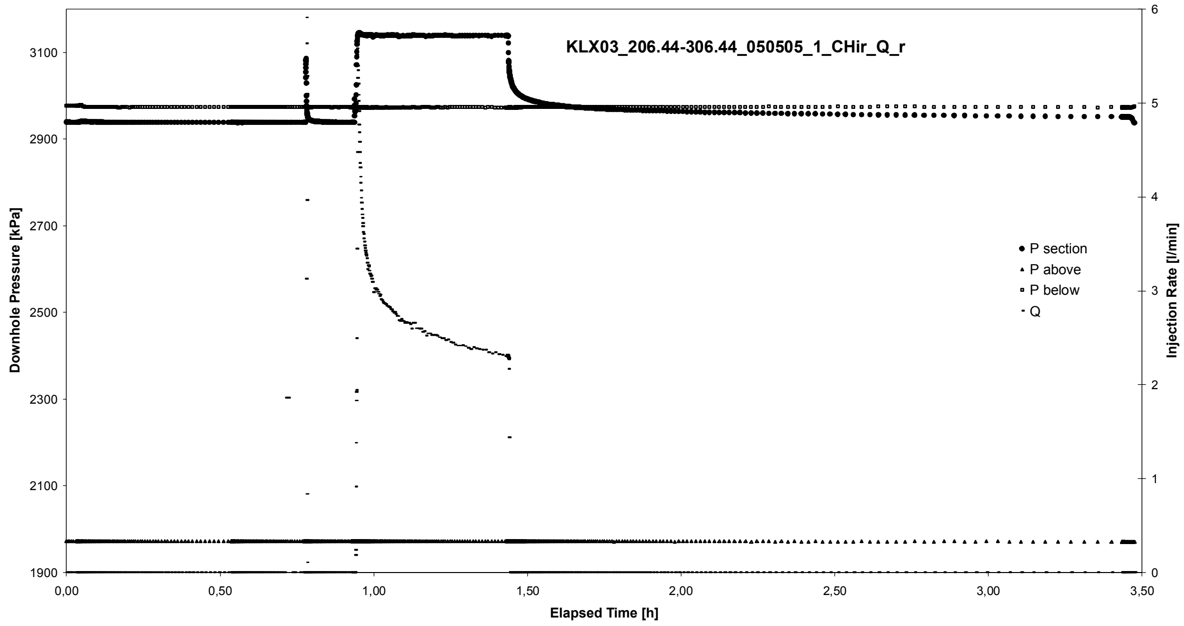


CHIR phase; HORNER match

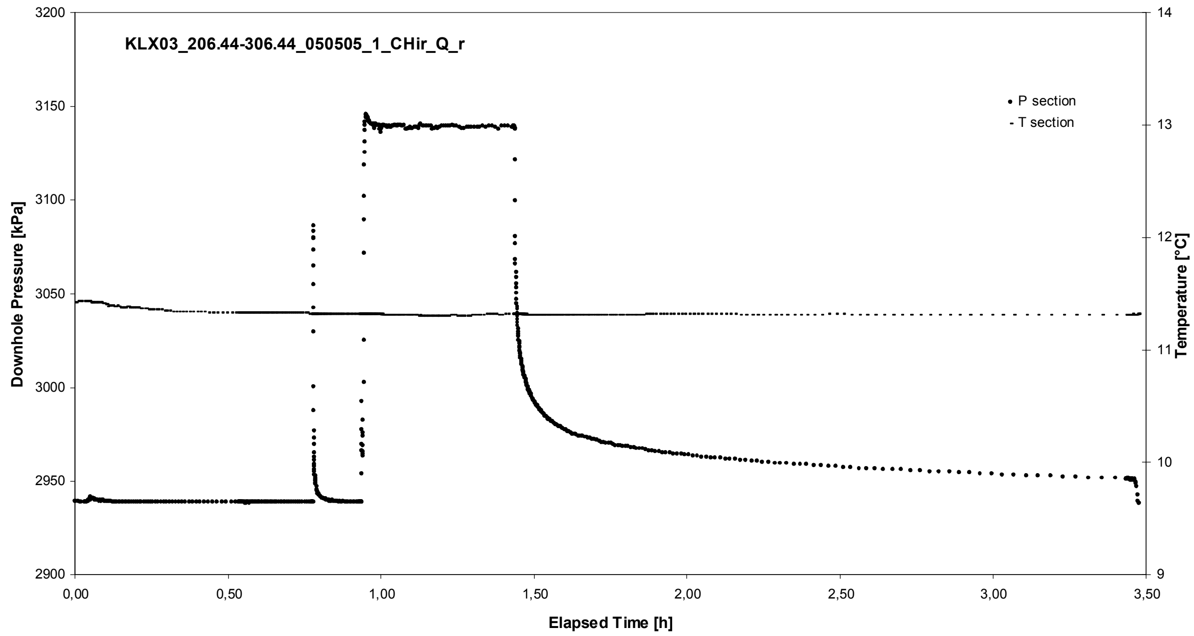
APPENDIX 2-2

Test 206.44 – 306.44 m

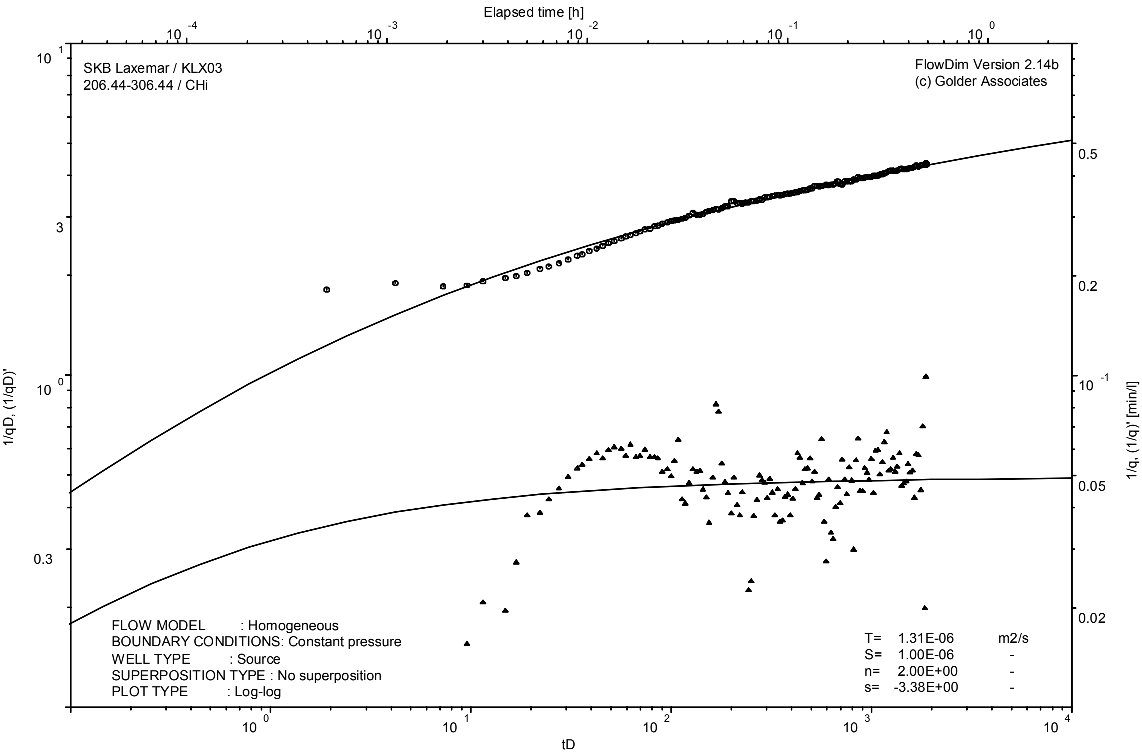
Analysis diagrams



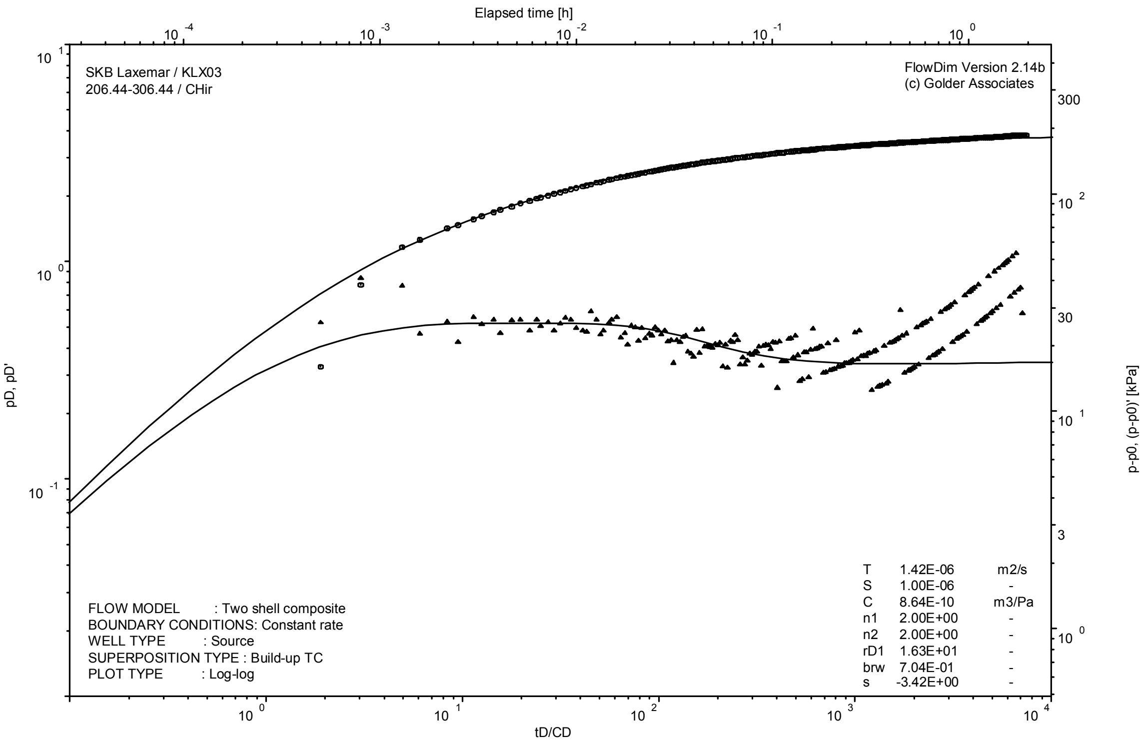
Pressure and flow rate vs. time; cartesian plot



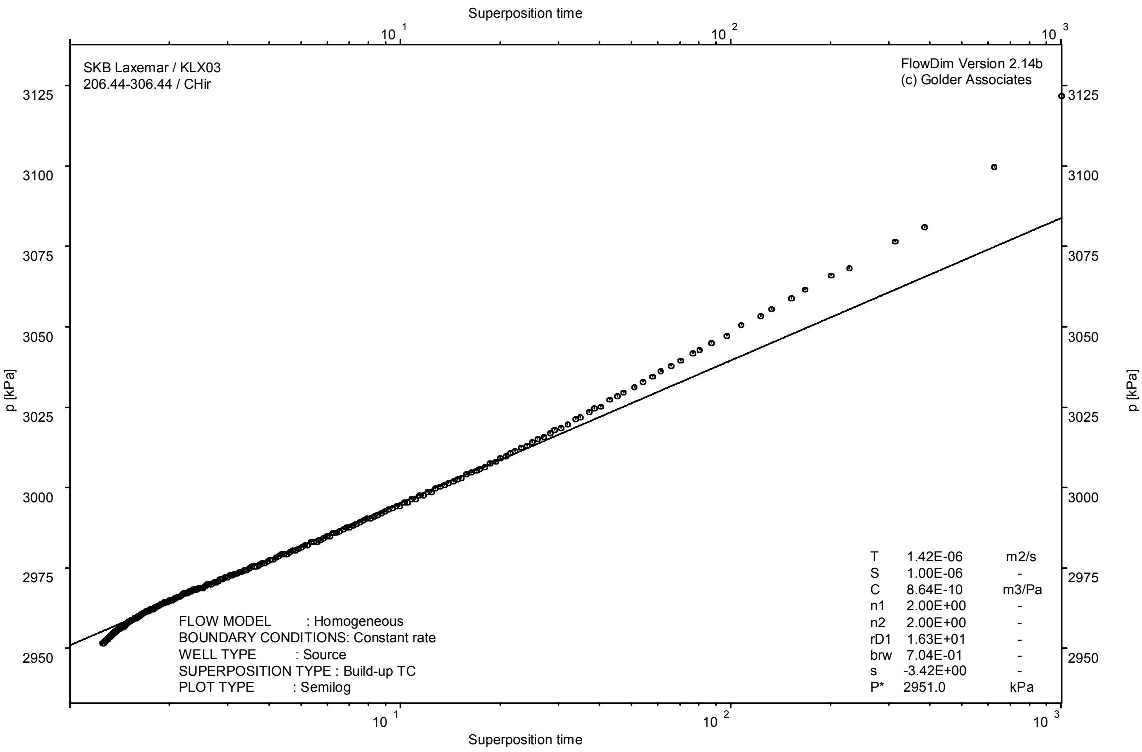
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

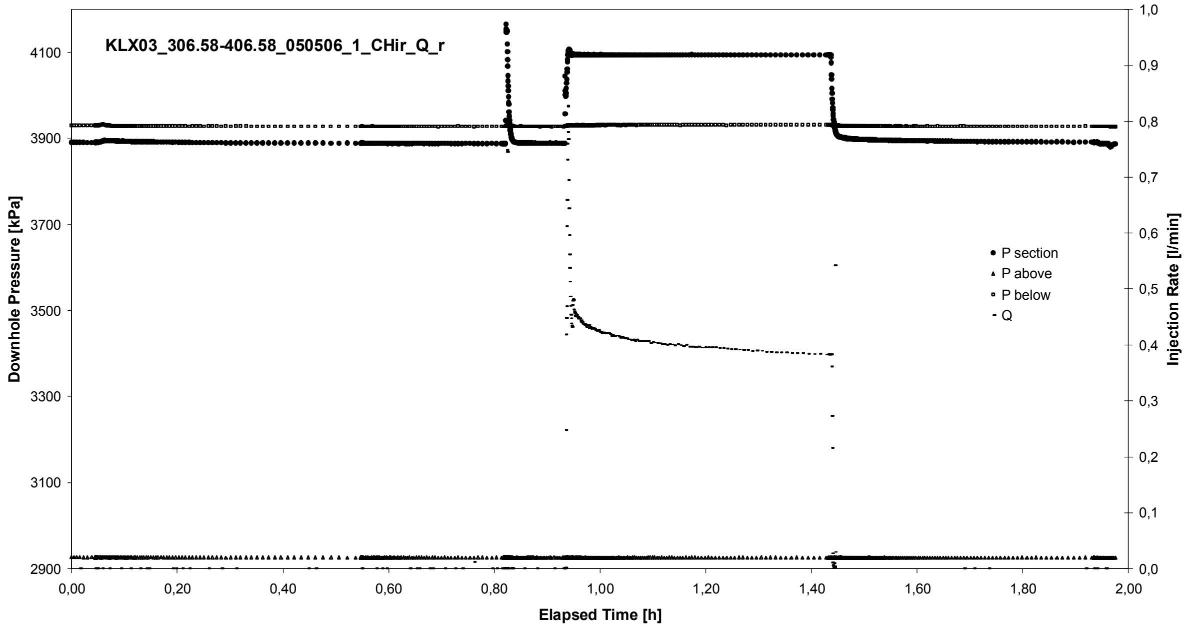


CHIR phase; HORNER match

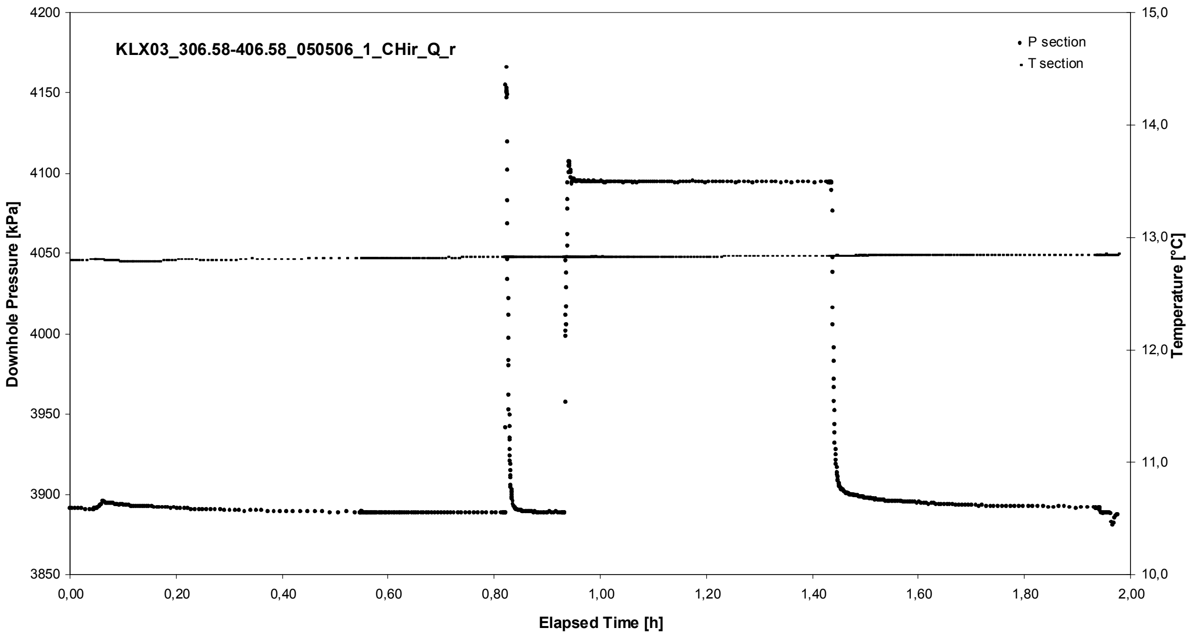
APPENDIX 2-3

Test 306.58 – 406.58 m

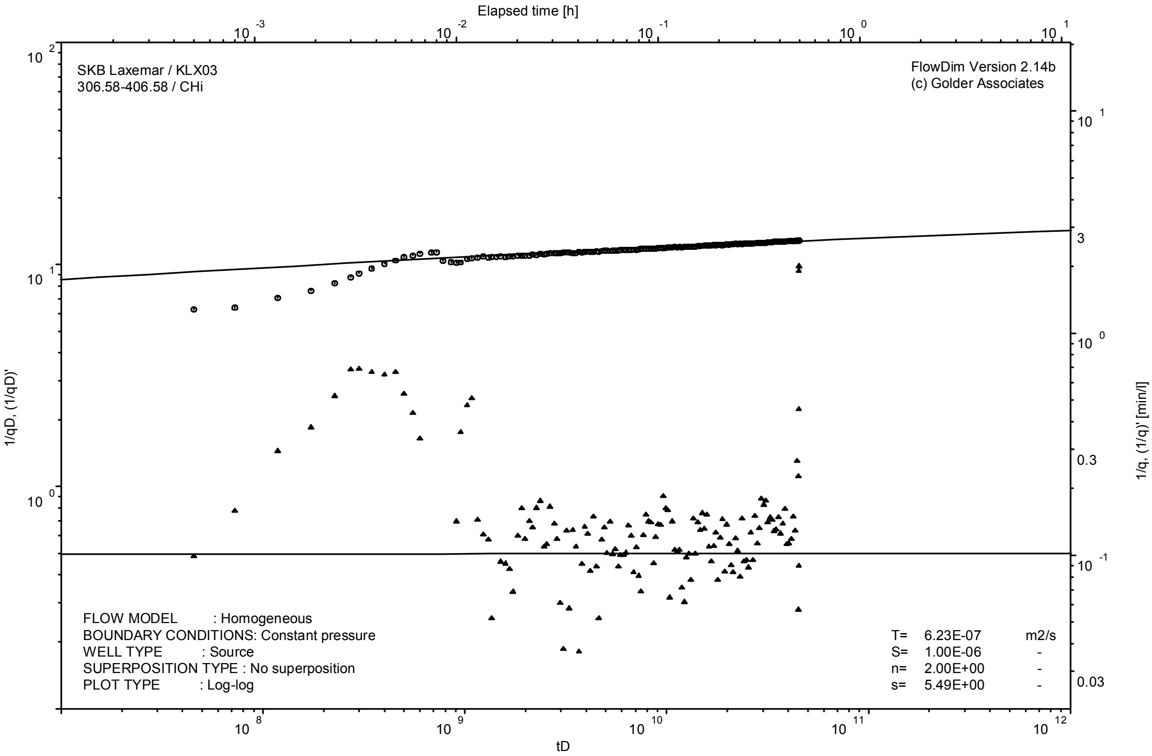
Analysis diagrams



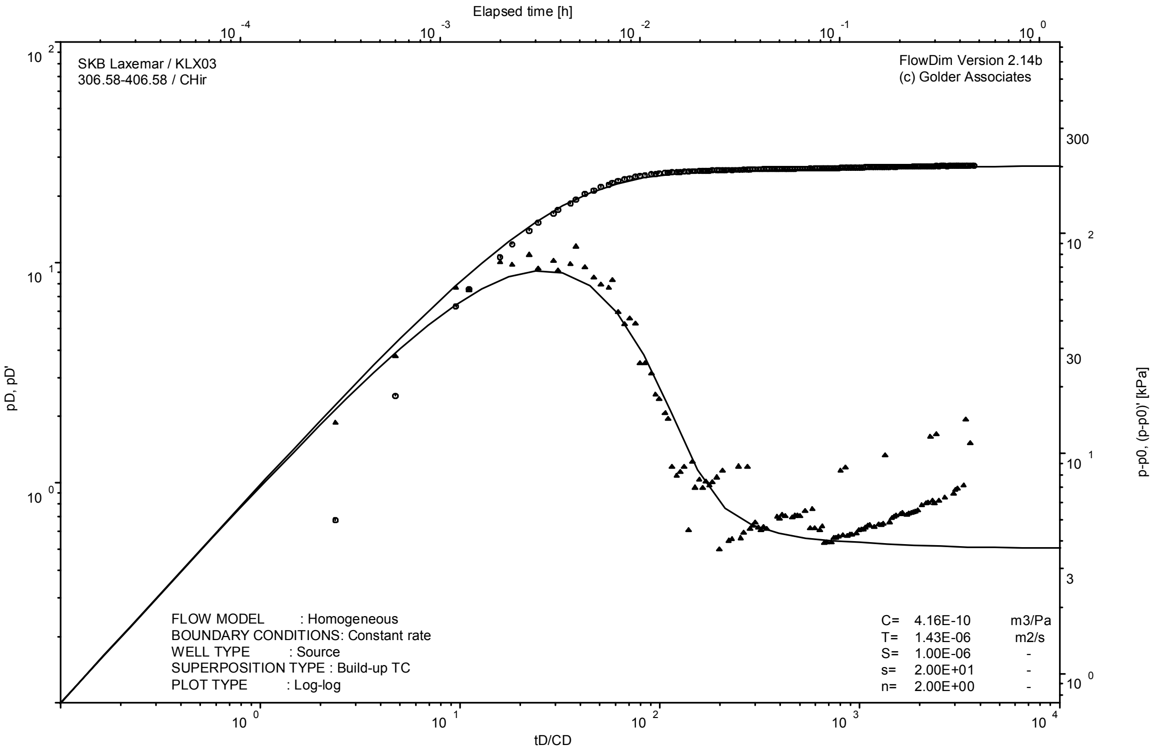
Pressure and flow rate vs. time; cartesian plot



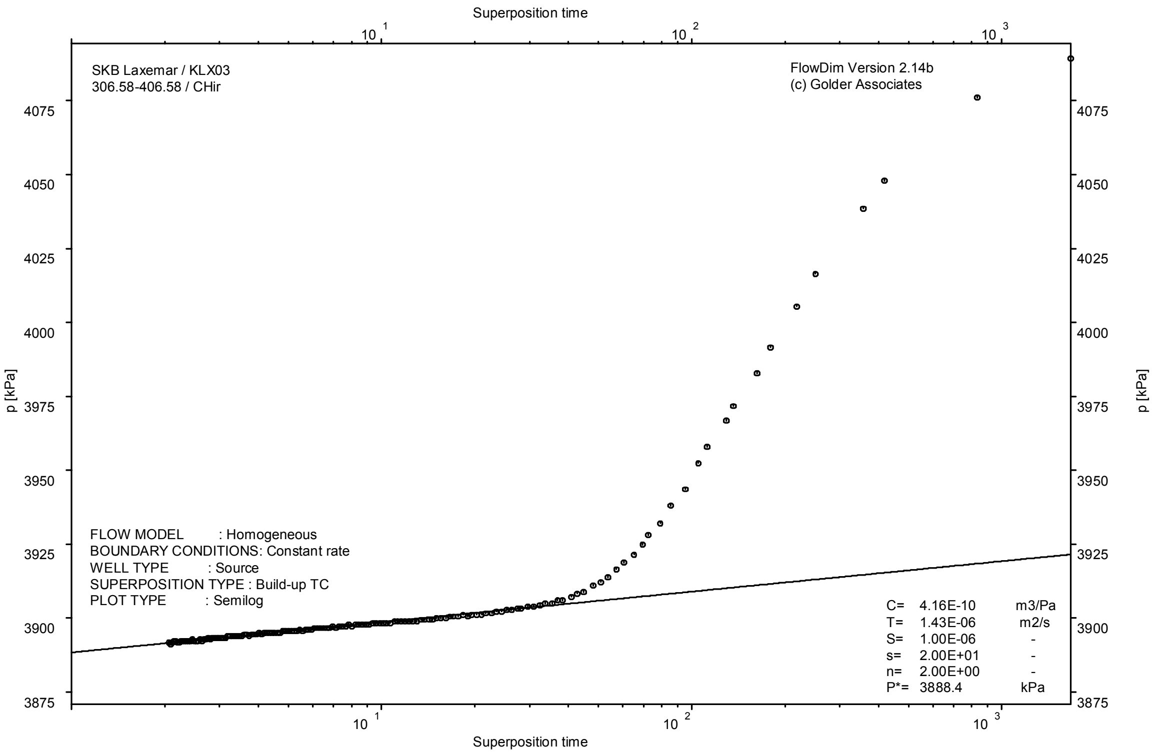
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

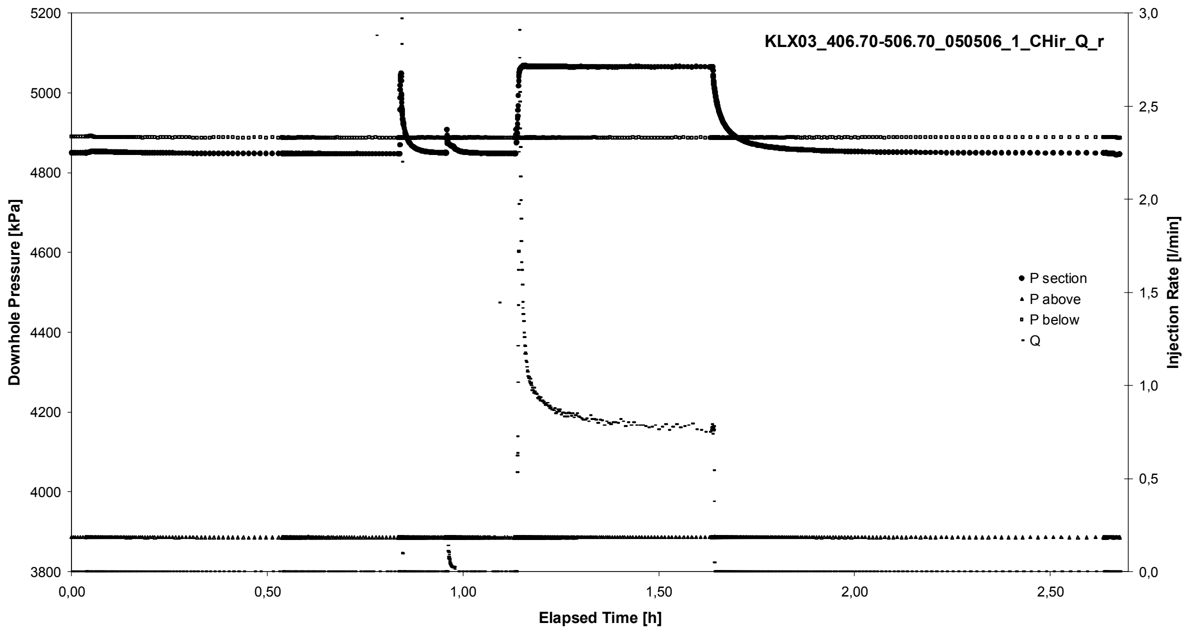


CHIR phase; HORNER match

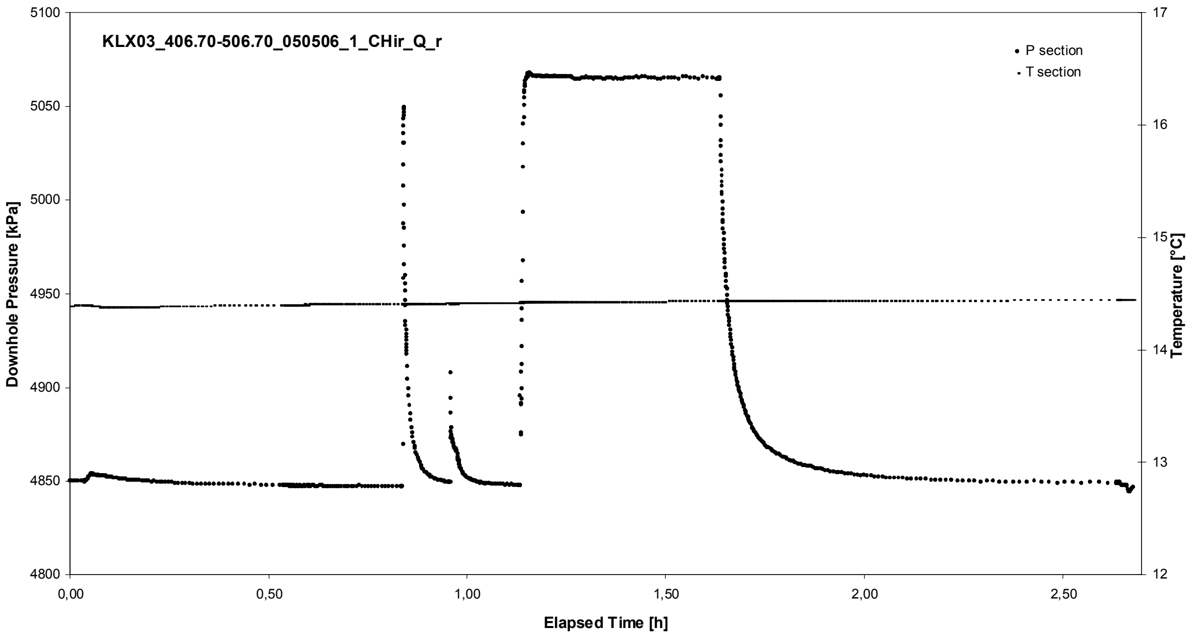
APPENDIX 2-4

Test 406.70 – 506.70 m

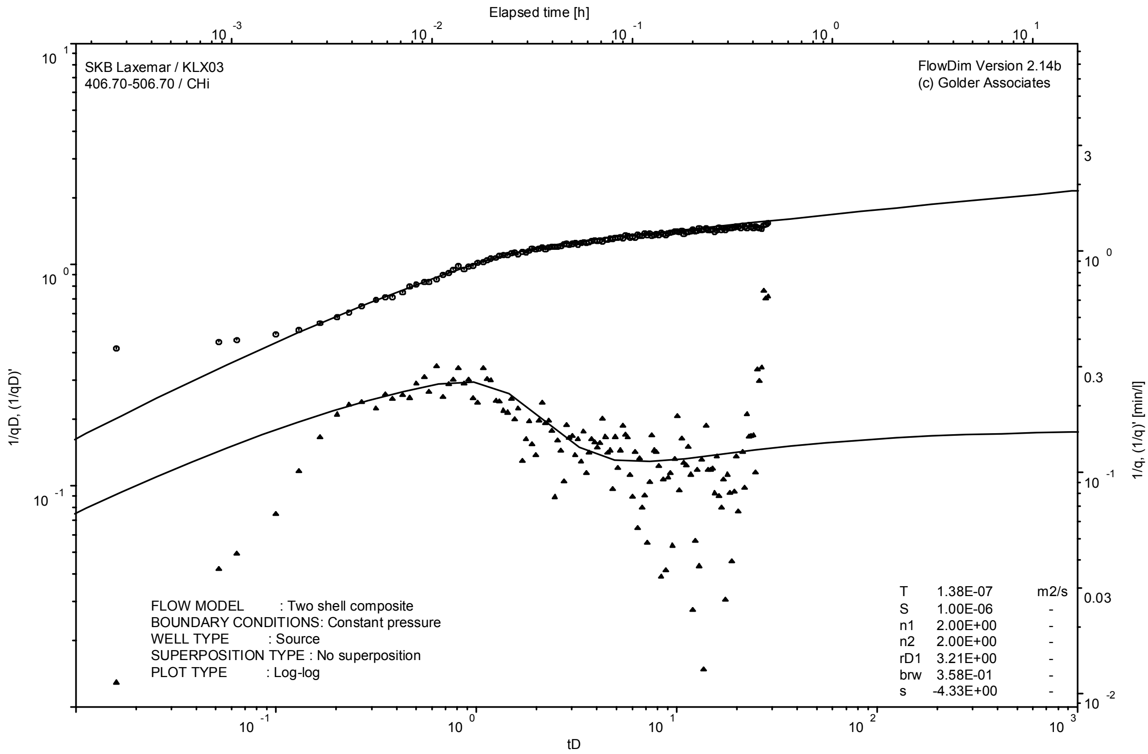
Analysis diagrams



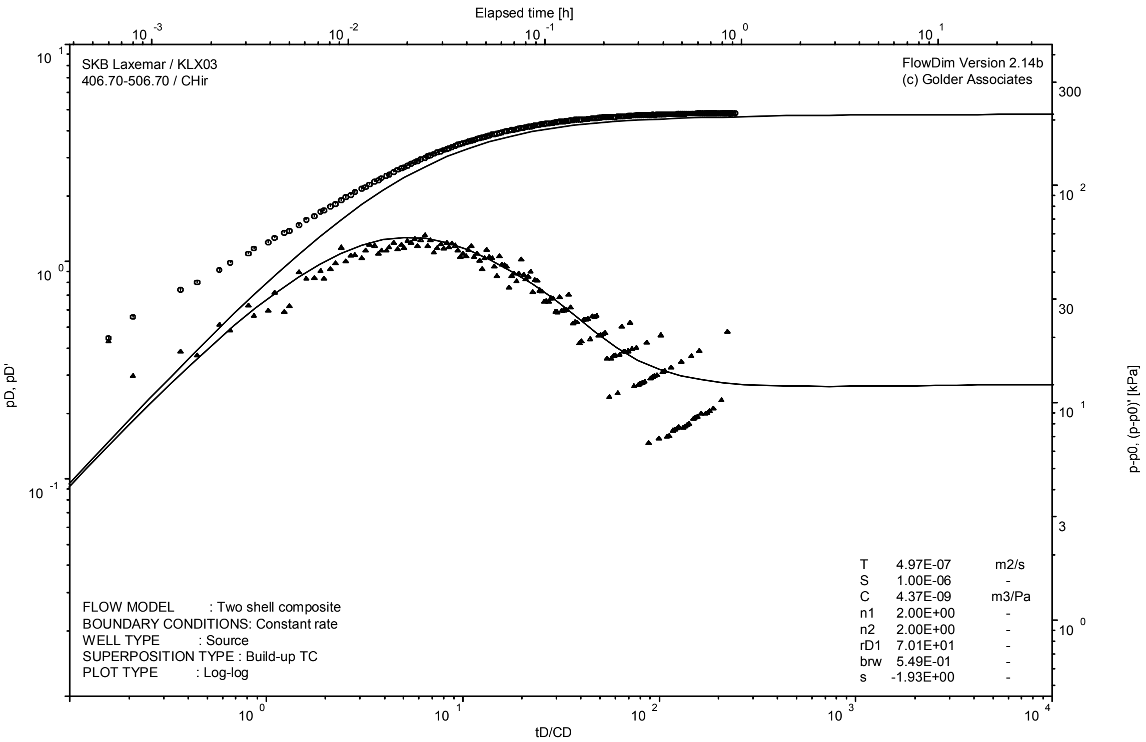
Pressure and flow rate vs. time; cartesian plot



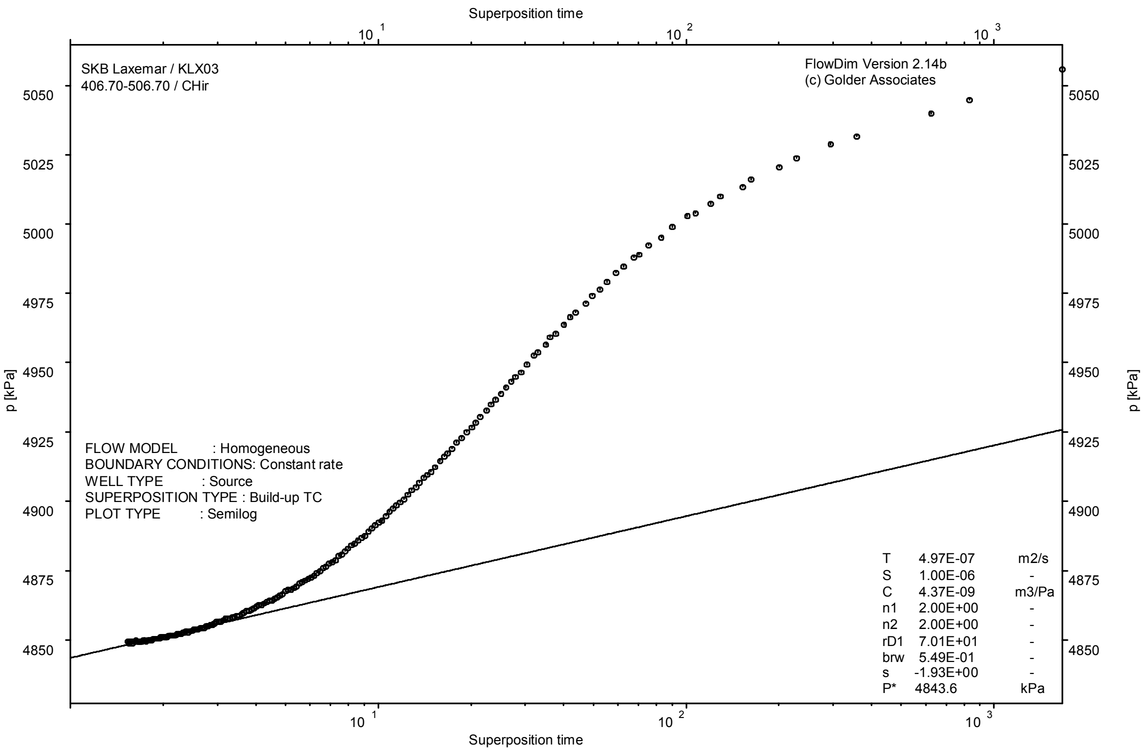
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

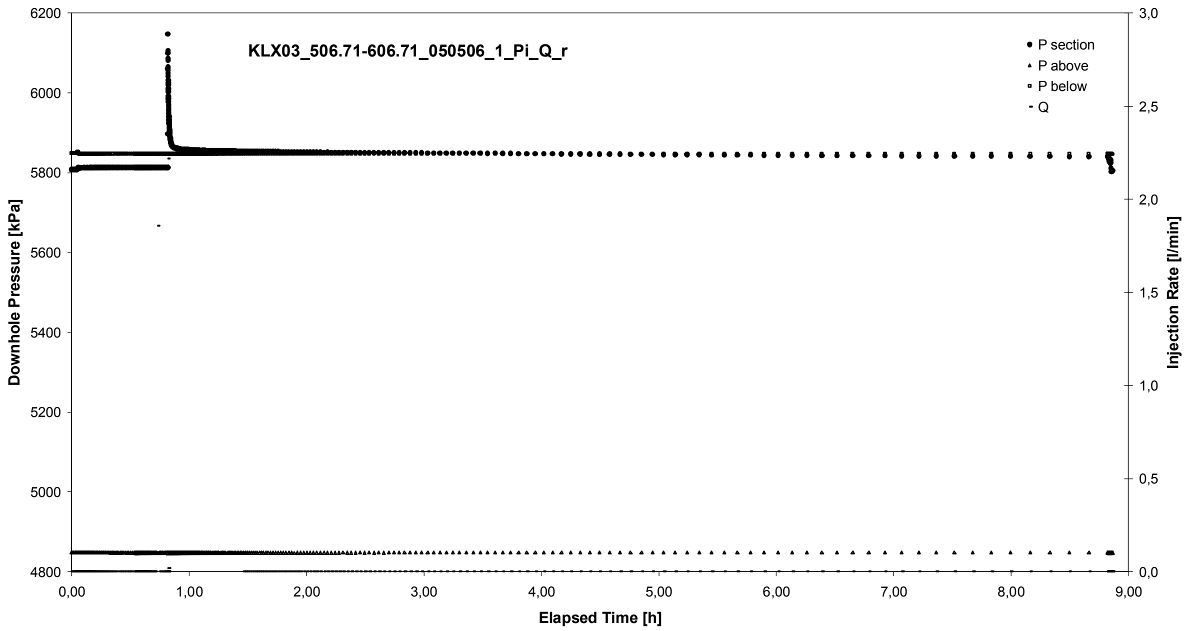


CHIR phase; HORNER match

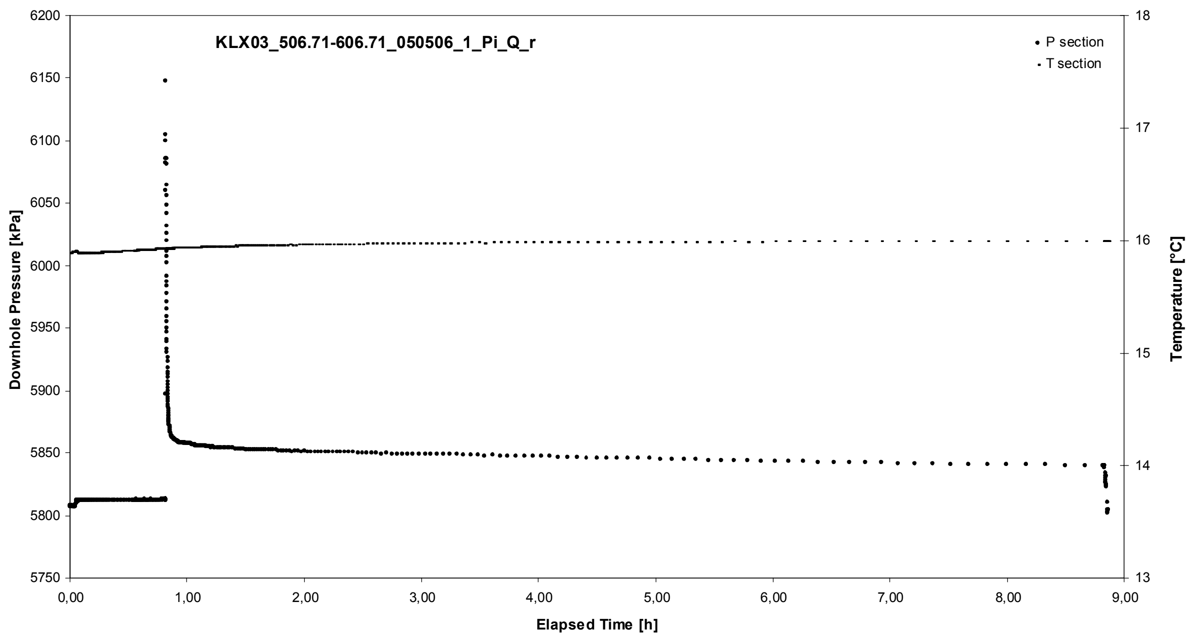
APPENDIX 2-5

Test 506.71 – 606.71 m

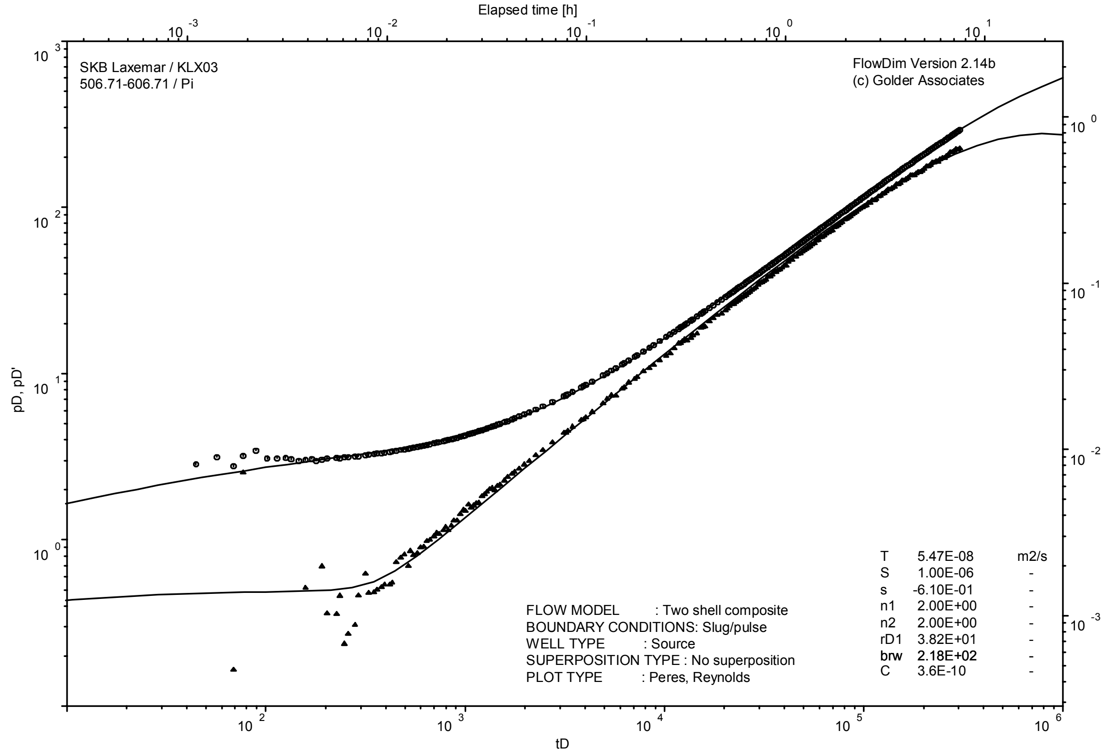
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

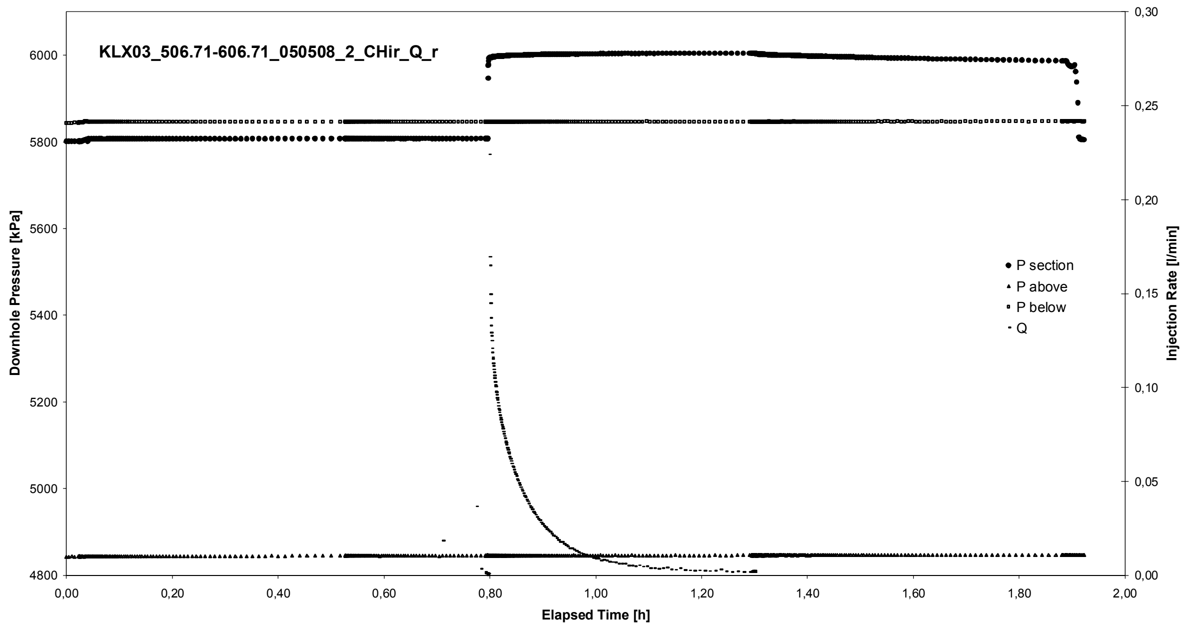


PI phase; log-log match

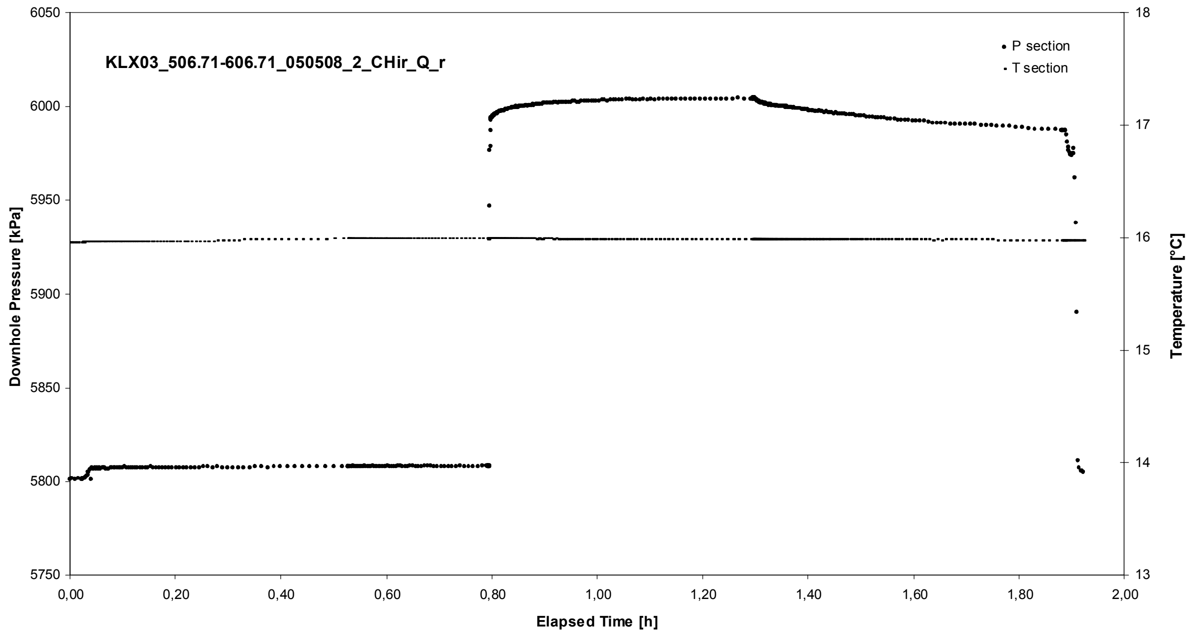
APPENDIX 2-6

Test 506.71 – 606.71 m

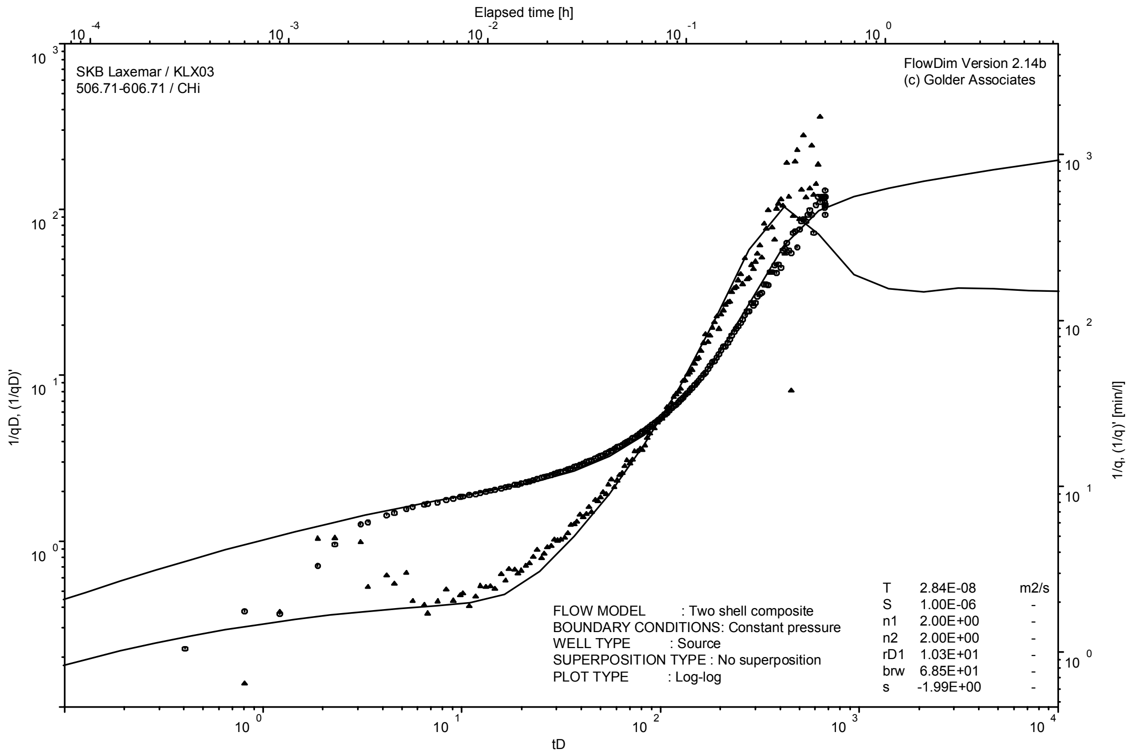
Analysis diagrams



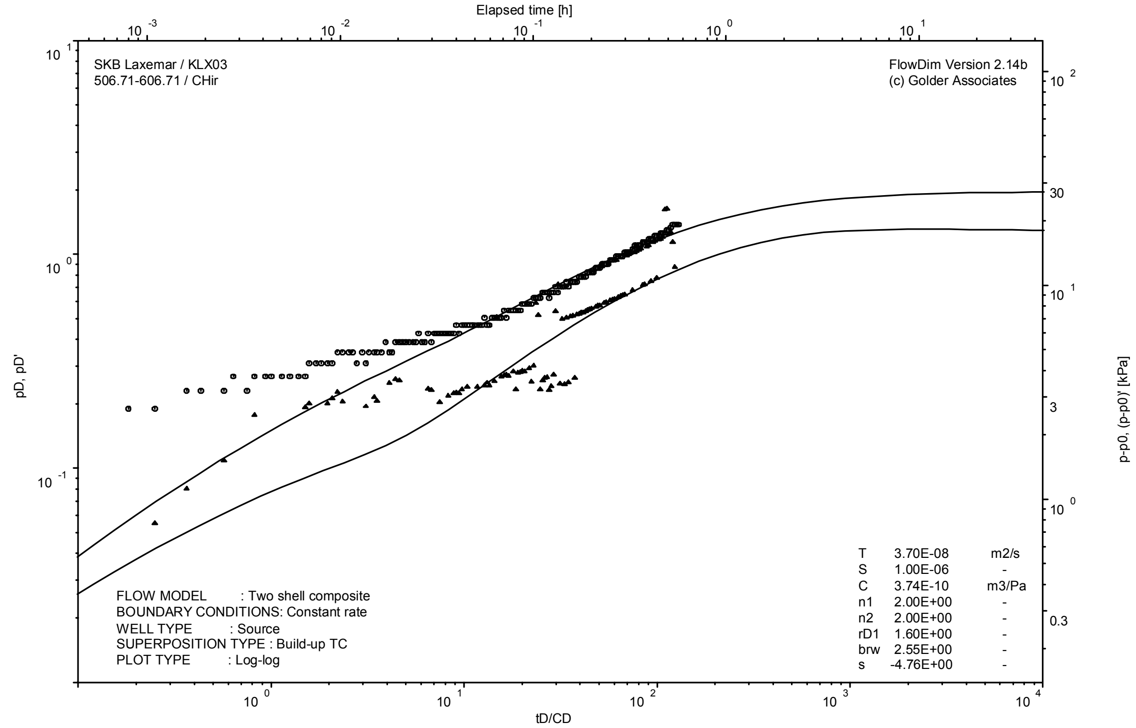
Pressure and flow rate vs. time; cartesian plot



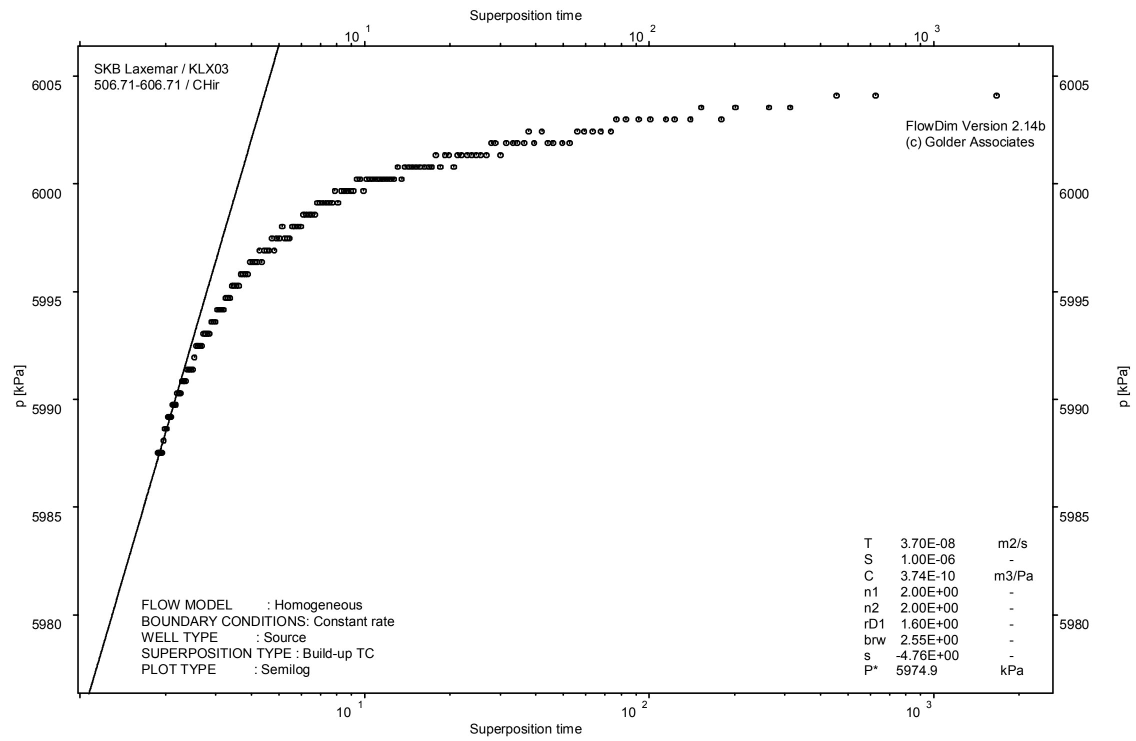
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

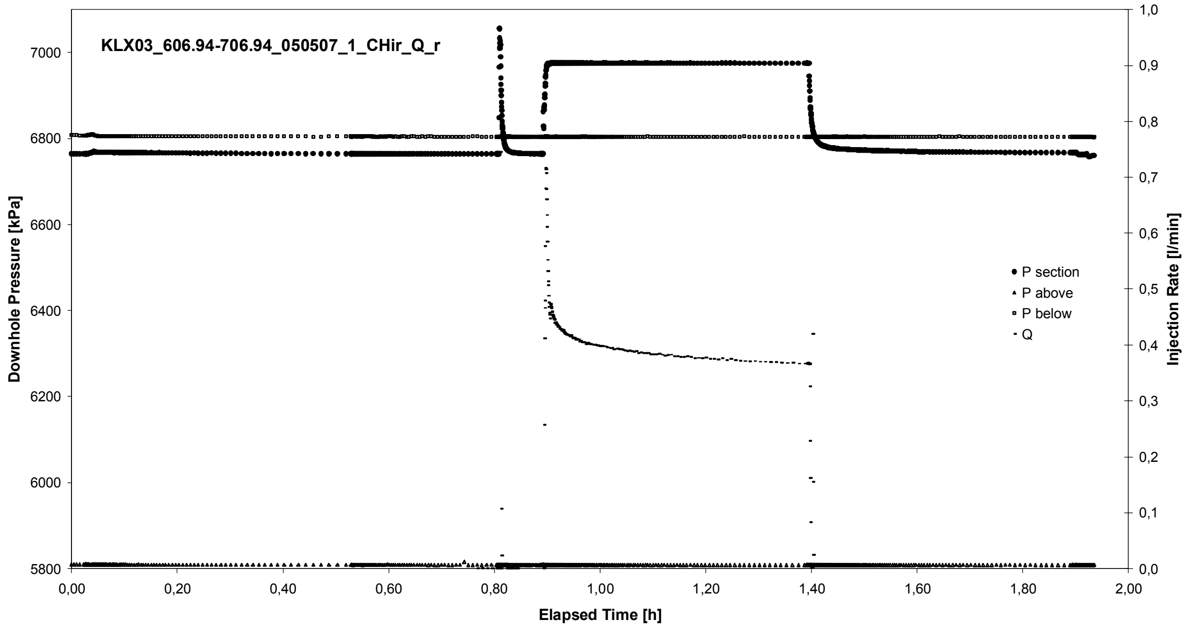


CHIR phase; HORNER match

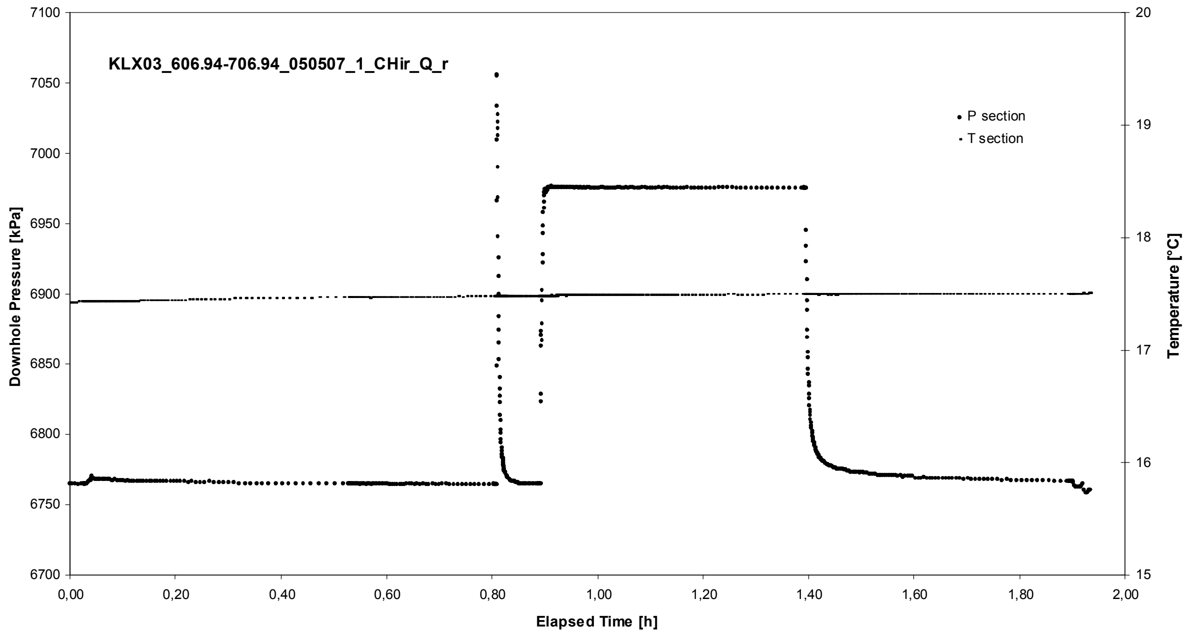
APPENDIX 2-7

Test 606.94 – 706.94 m

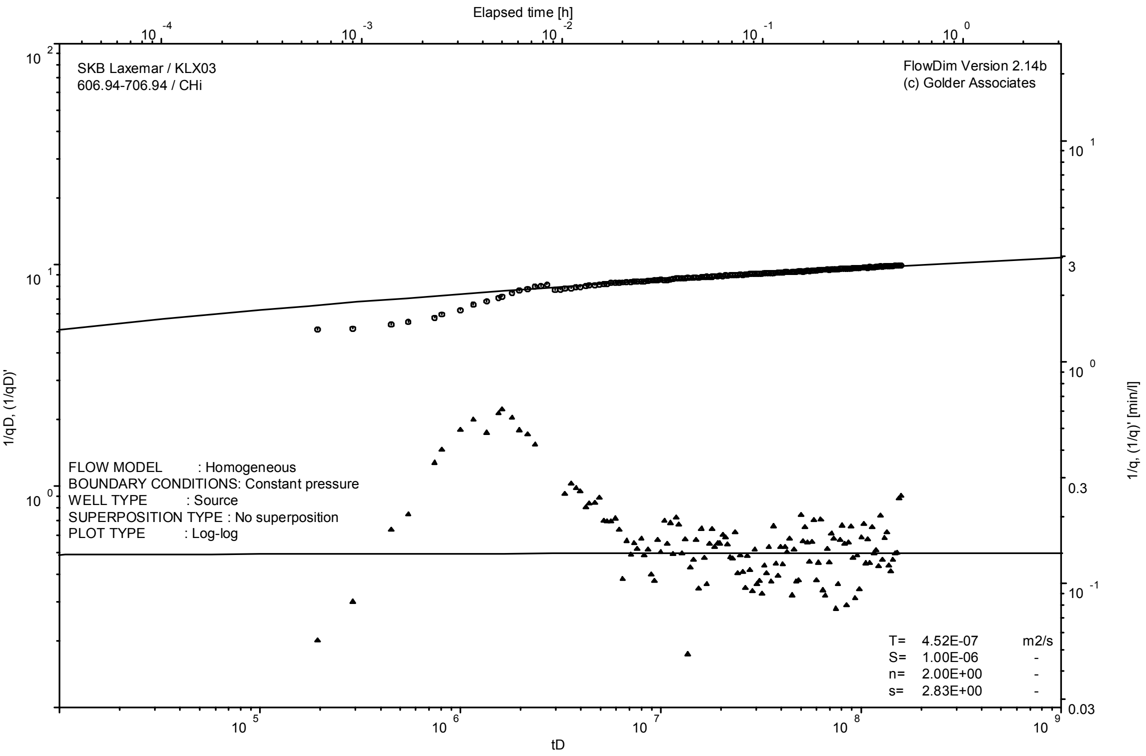
Analysis diagrams



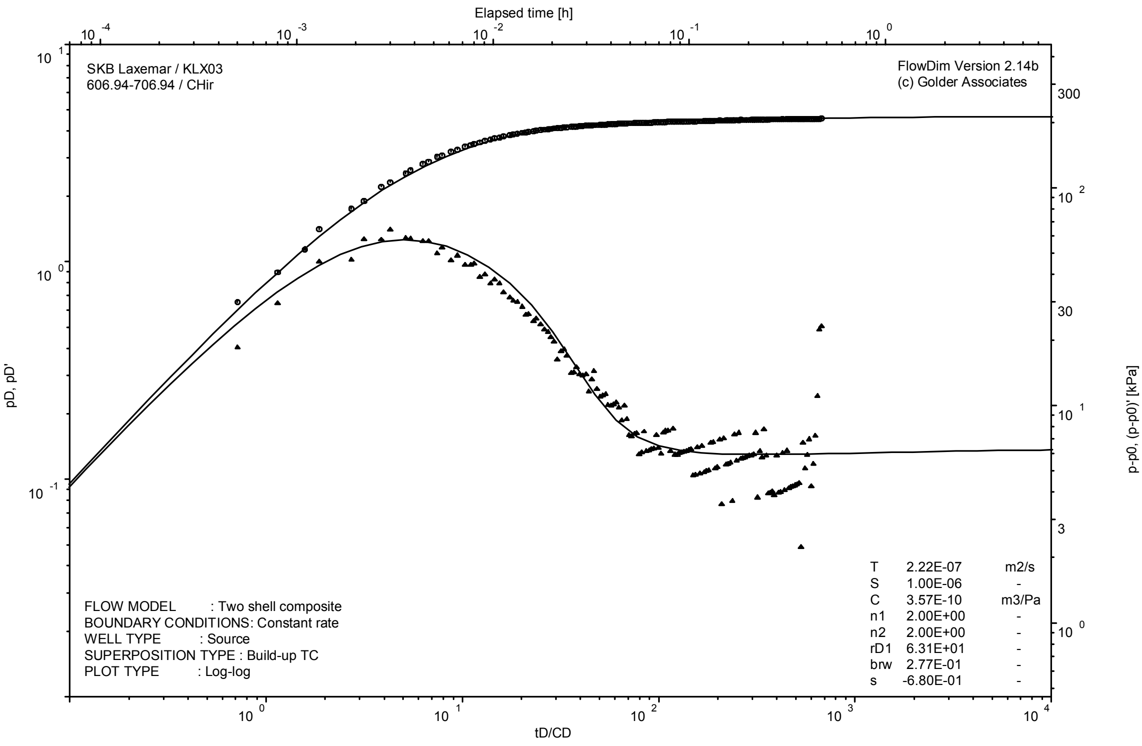
Pressure and flow rate vs. time; cartesian plot



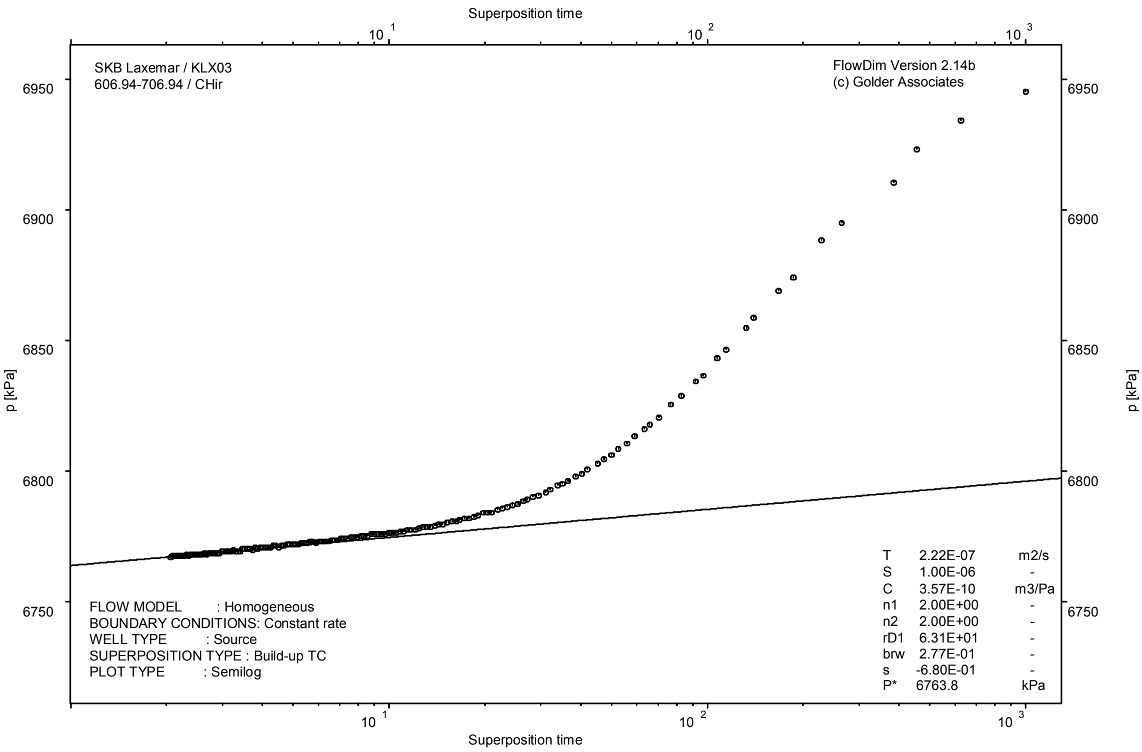
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

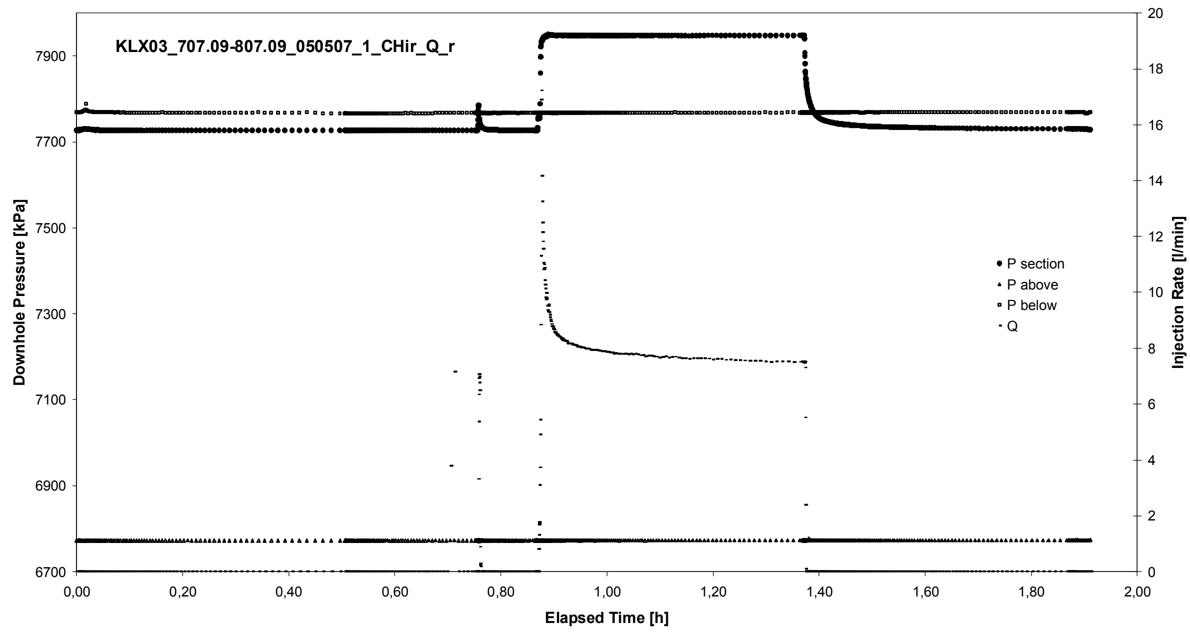


CHIR phase; HORNER match

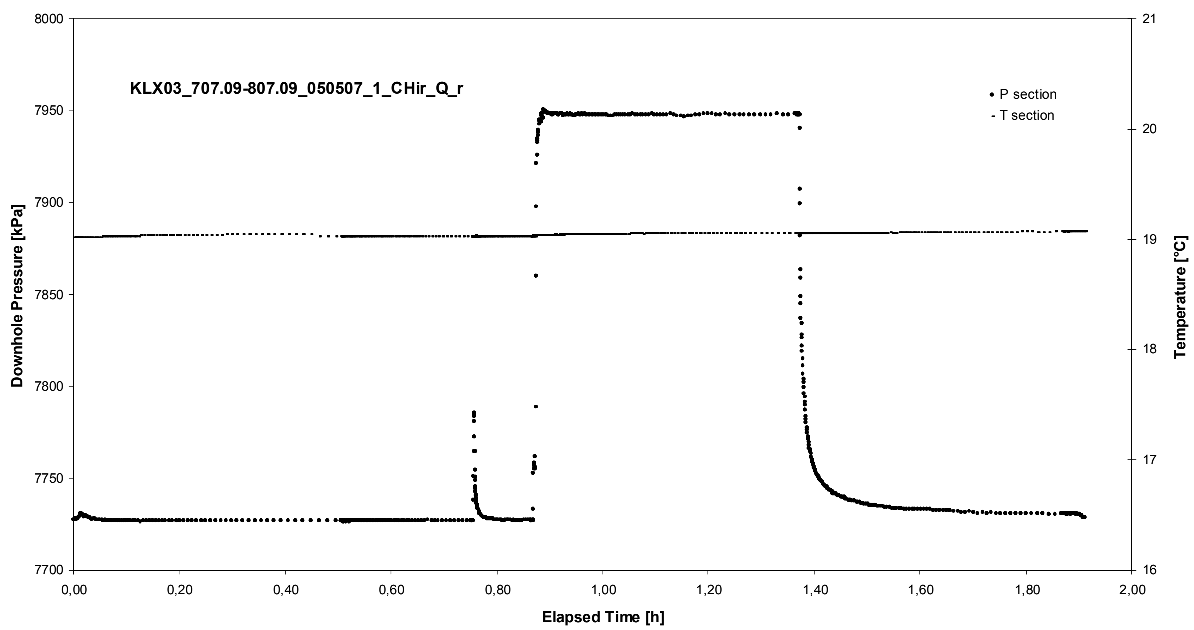
APPENDIX 2-8

Test 707.09 – 807.09 m

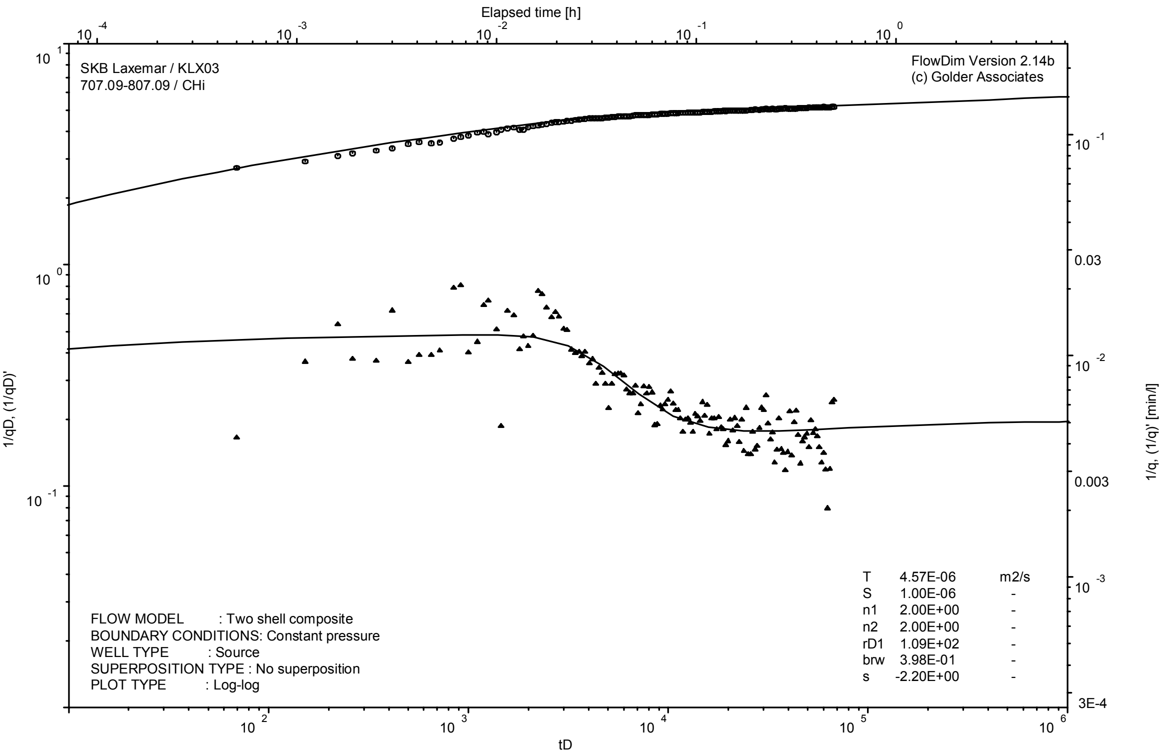
Analysis diagrams



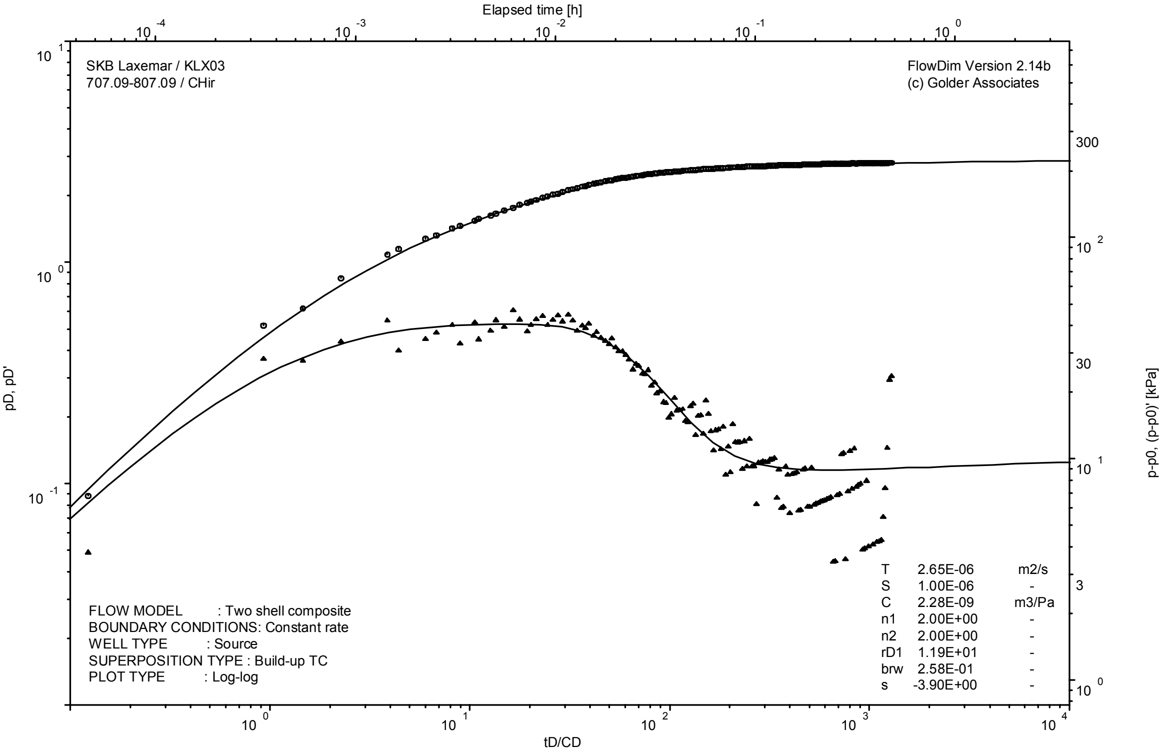
Pressure and flow rate vs. time; cartesian plot



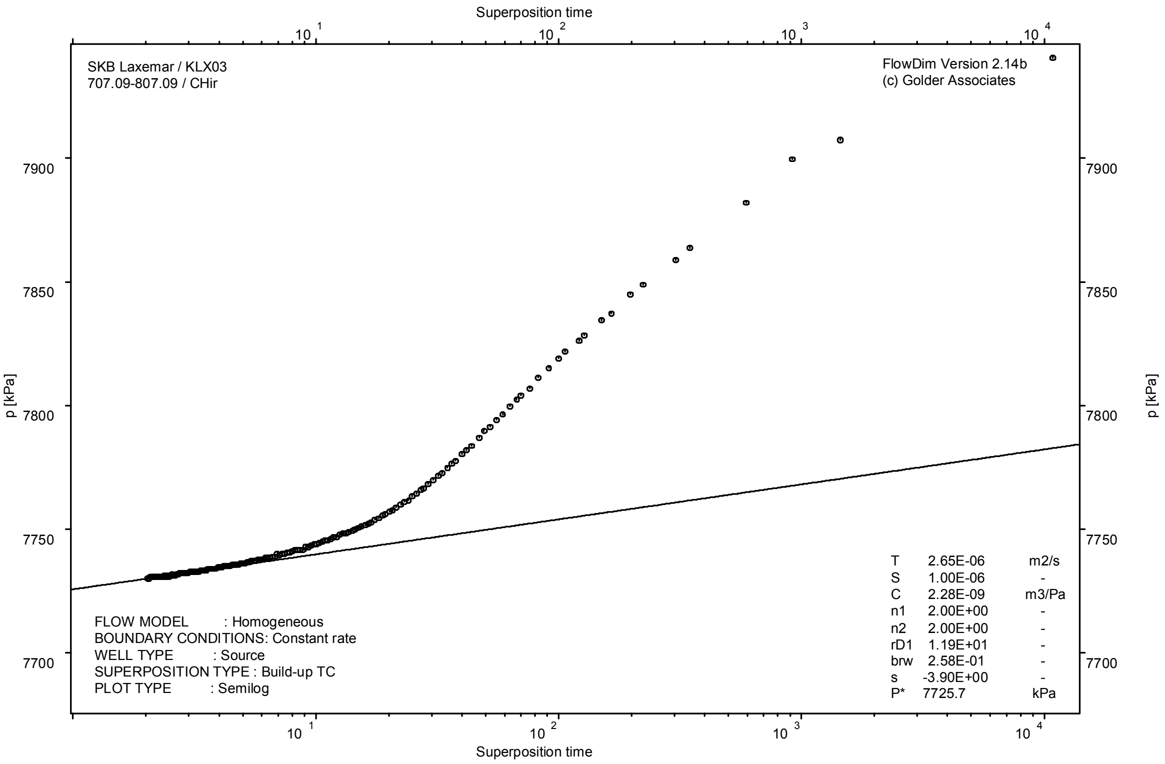
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

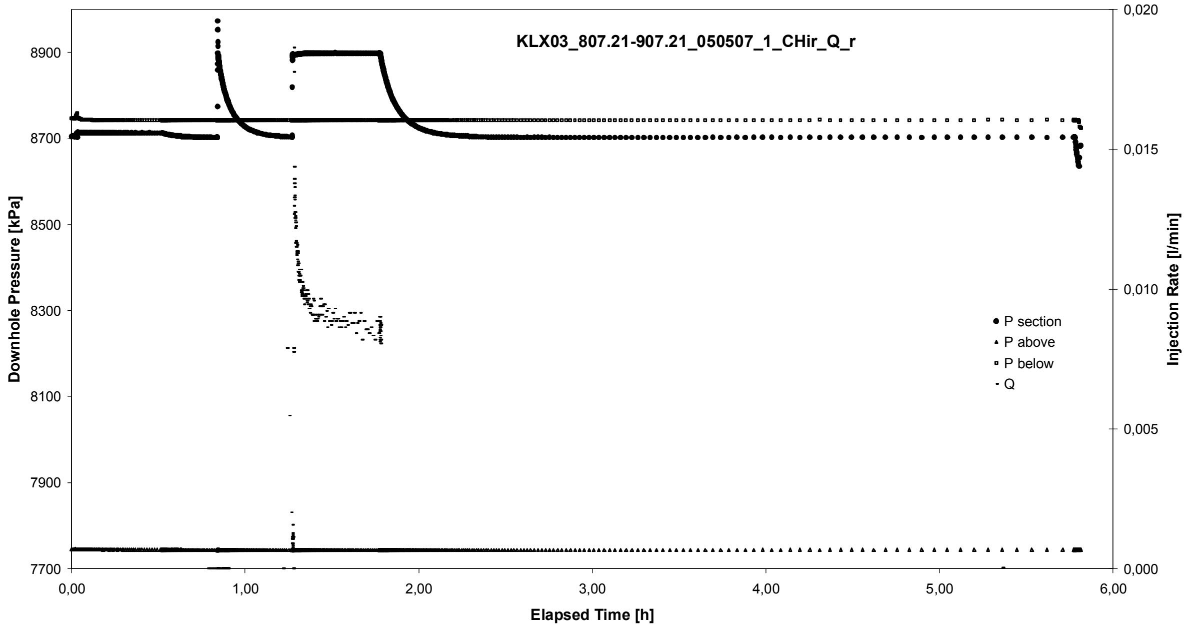


CHIR phase; HORNER match

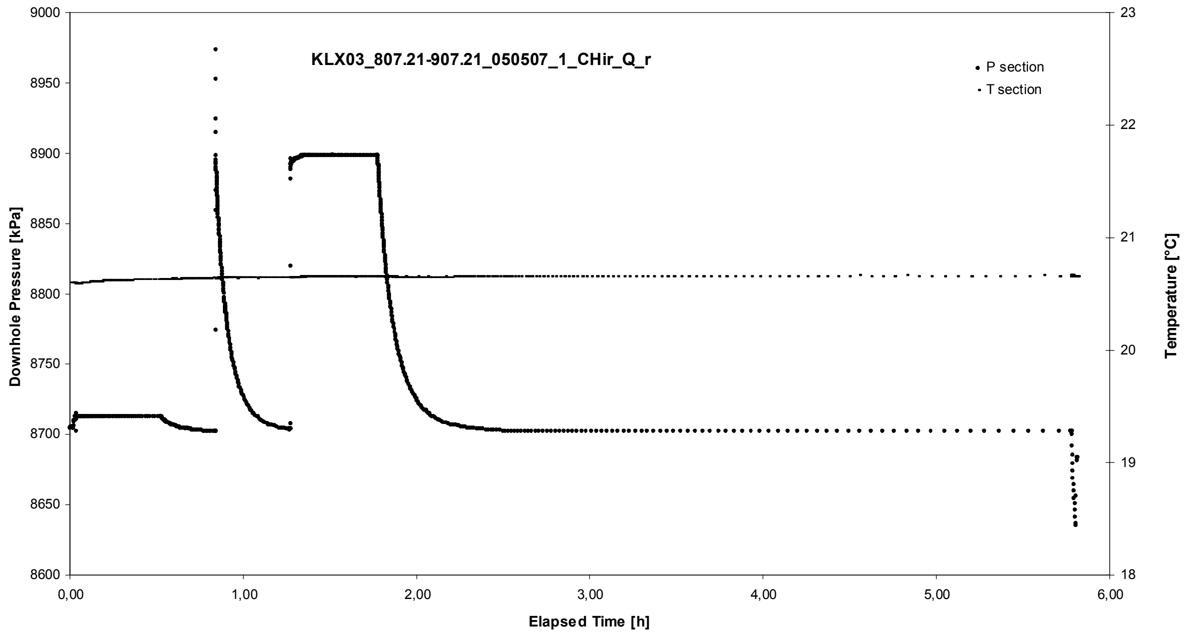
APPENDIX 2-9

Test 807.21 – 907.21 m

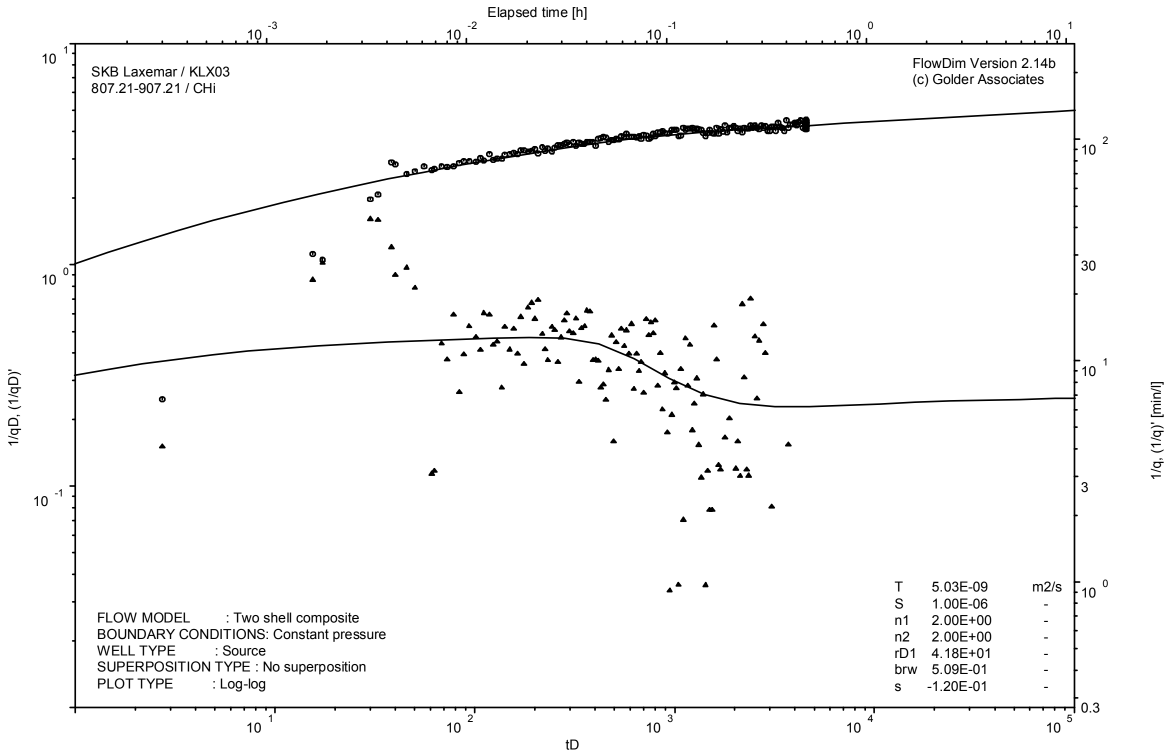
Analysis diagrams



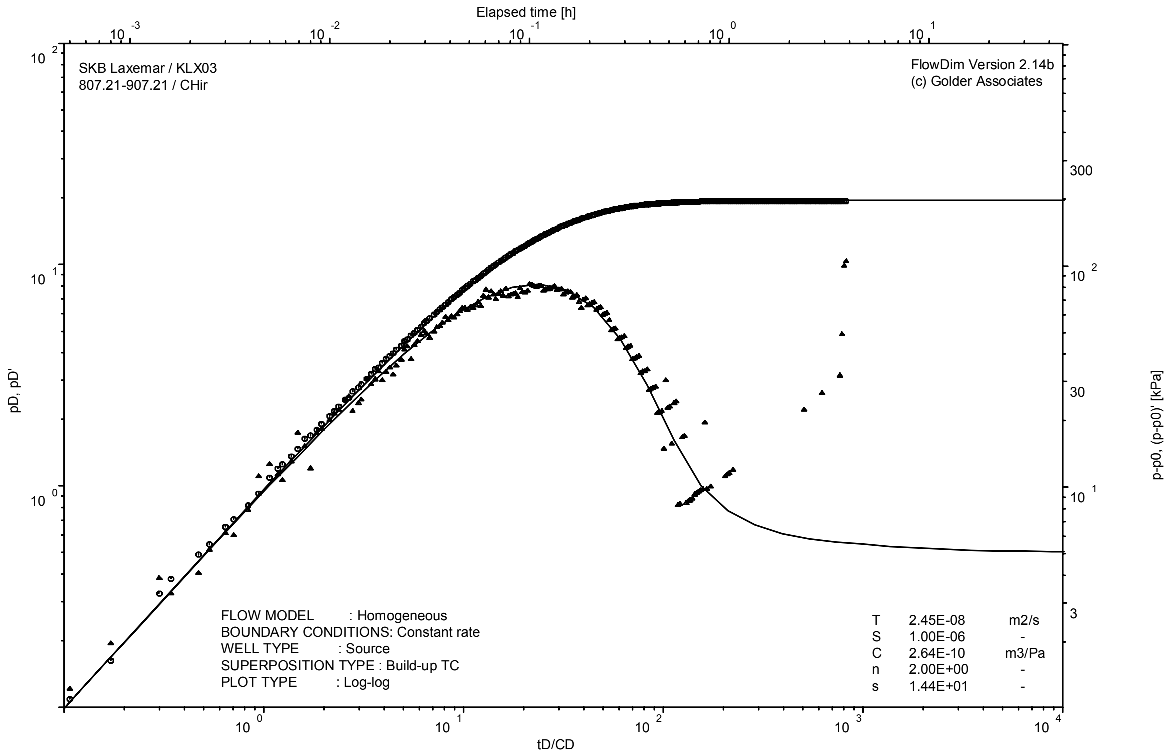
Pressure and flow rate vs. time; cartesian plot



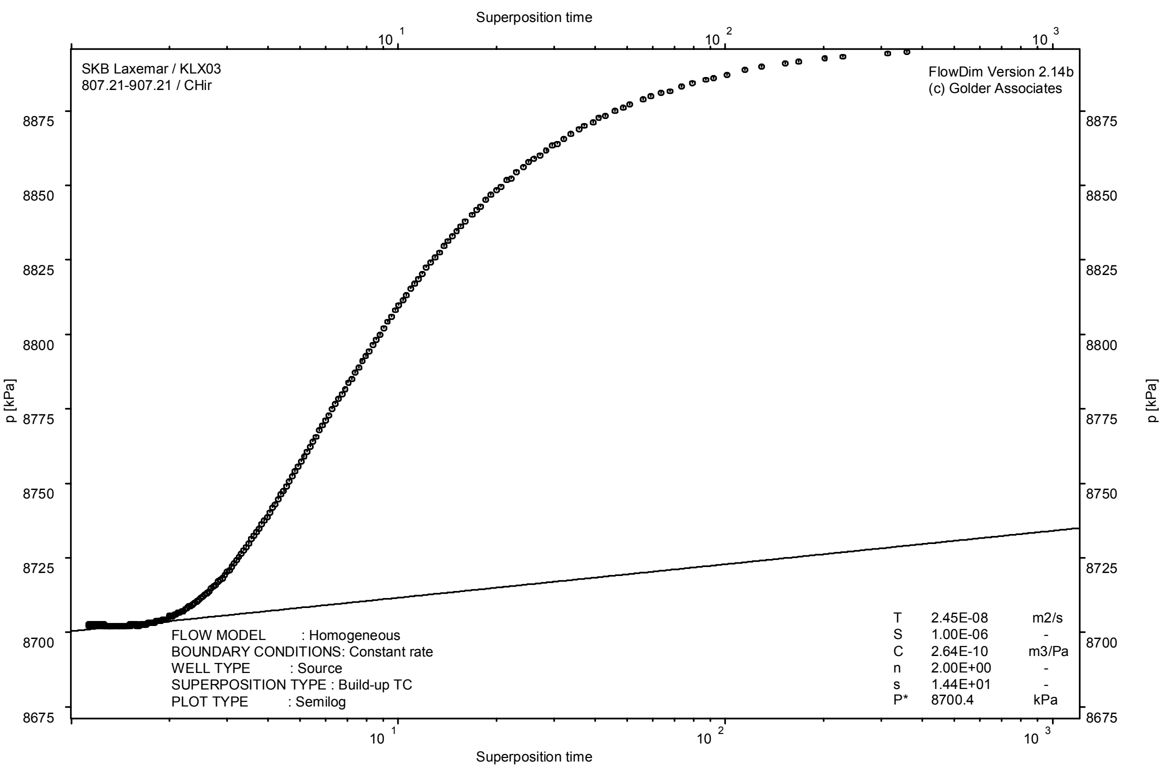
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

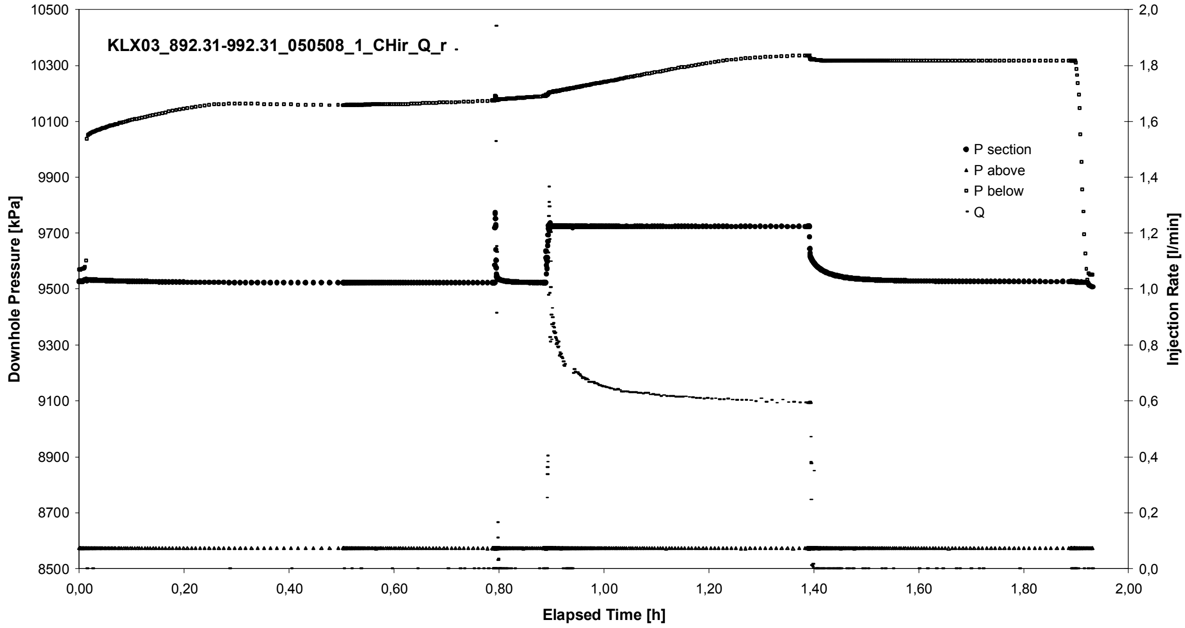


CHIR phase; HORNER match

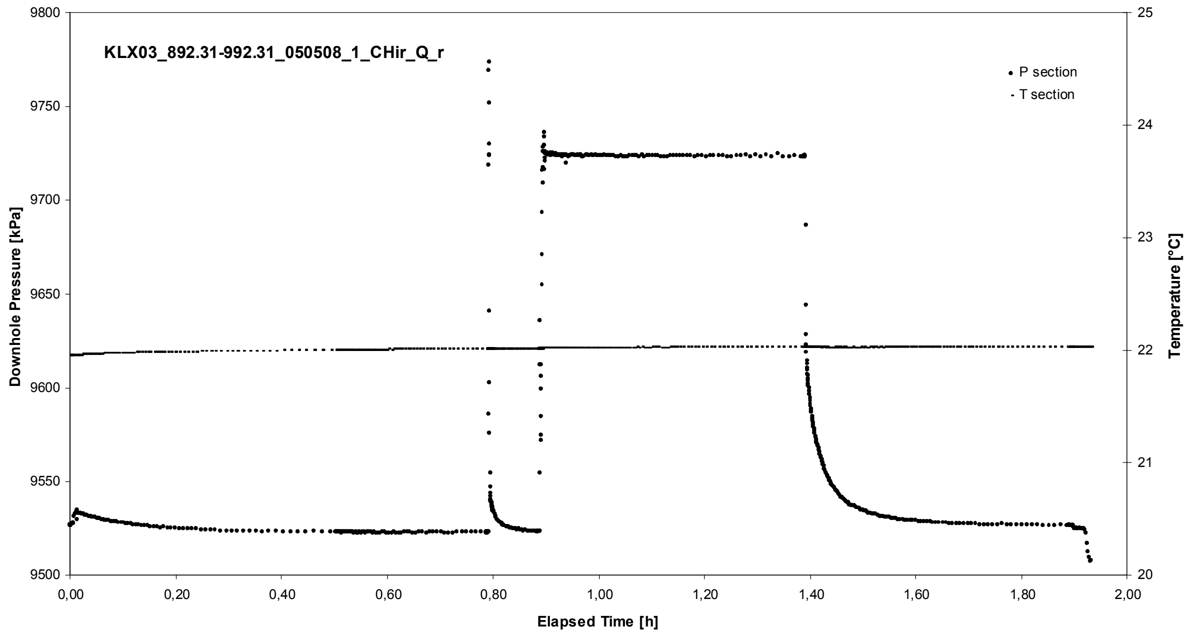
APPENDIX 2-10

Test 892.31 – 992.31 m

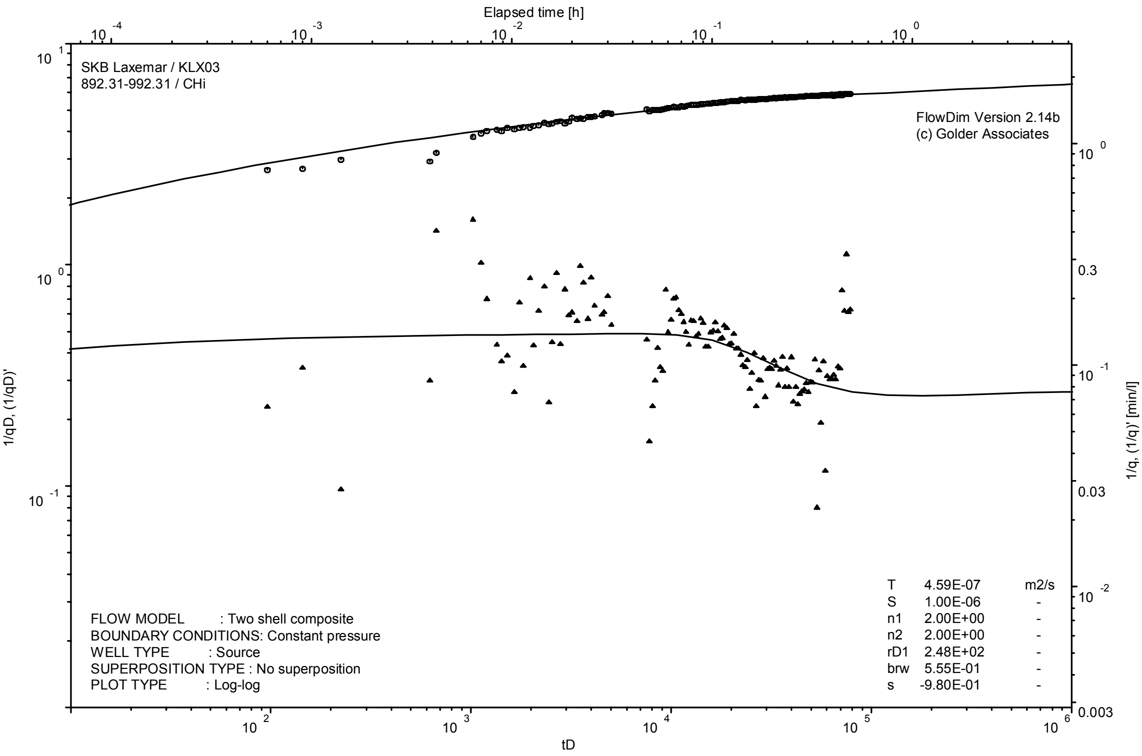
Analysis diagrams



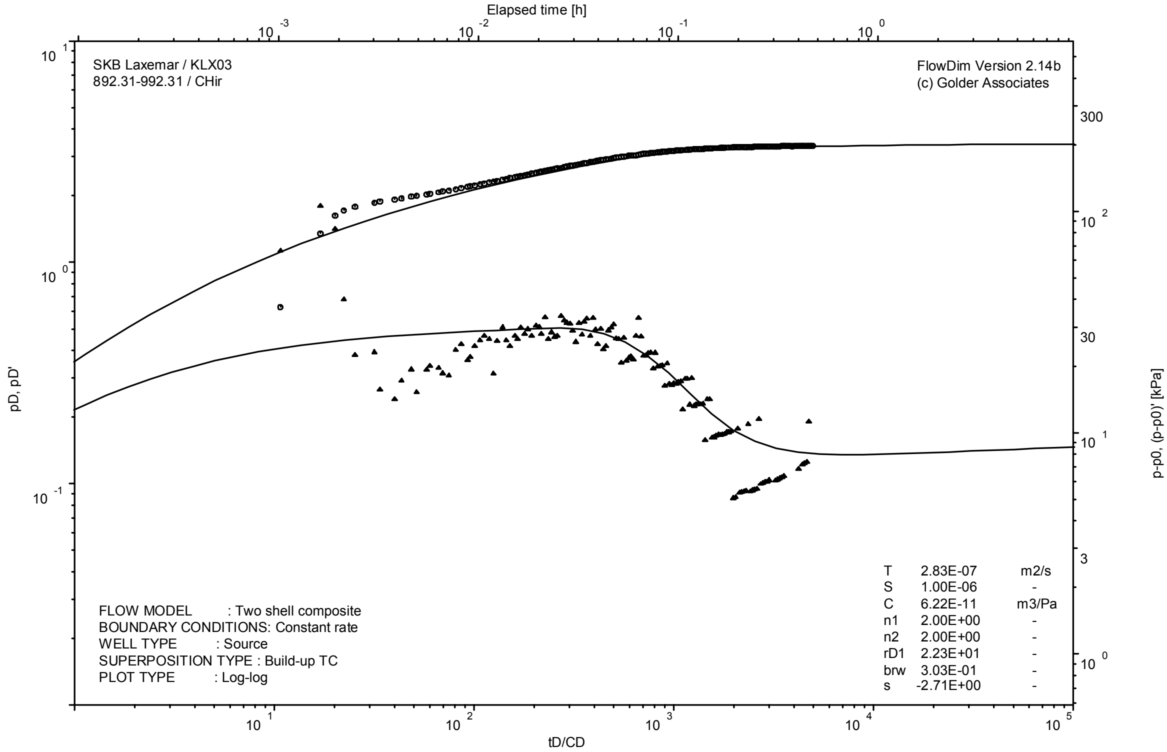
Pressure and flow rate vs. time; cartesian plot



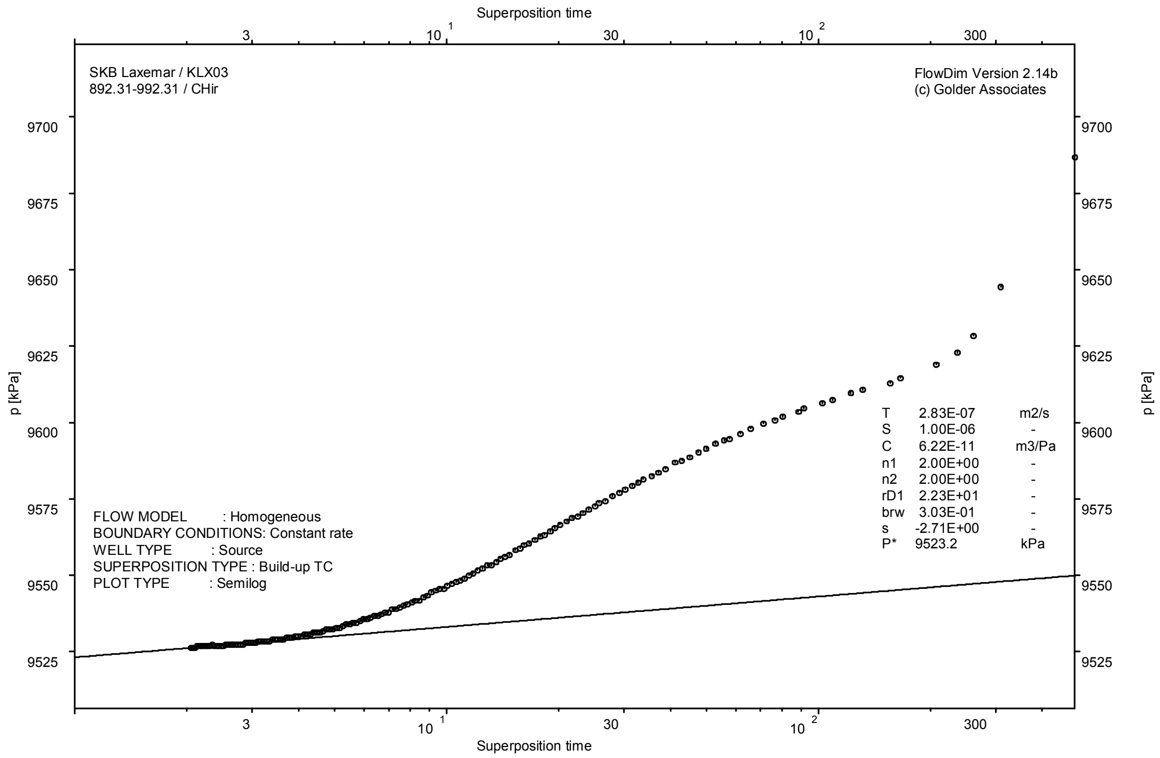
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

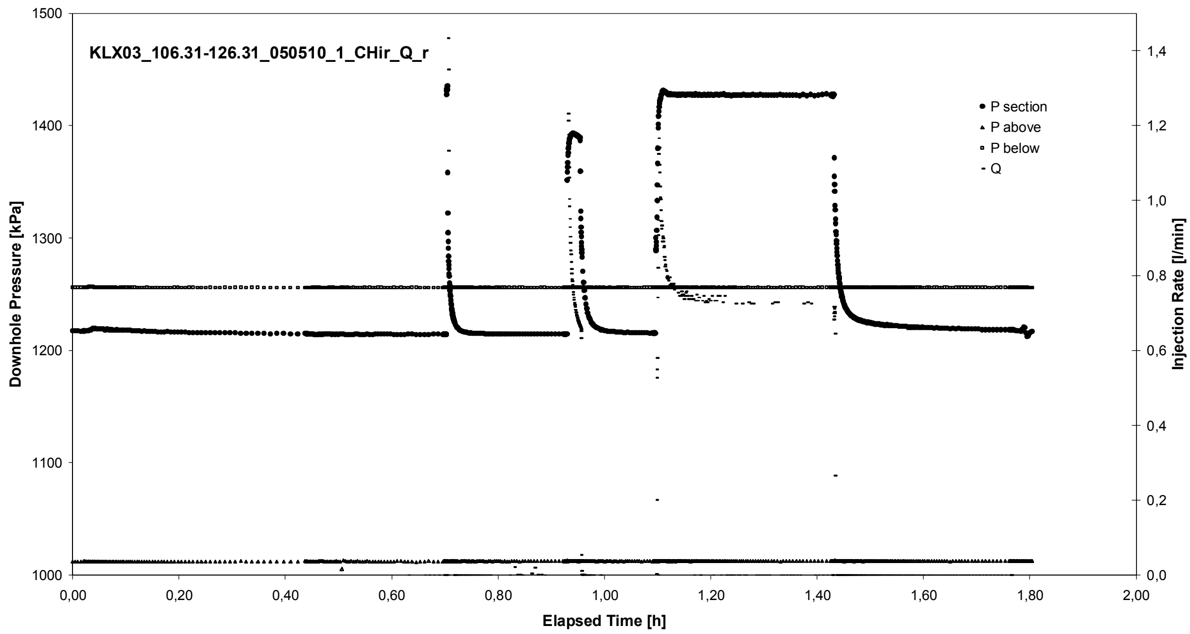


CHIR phase; HORNER match

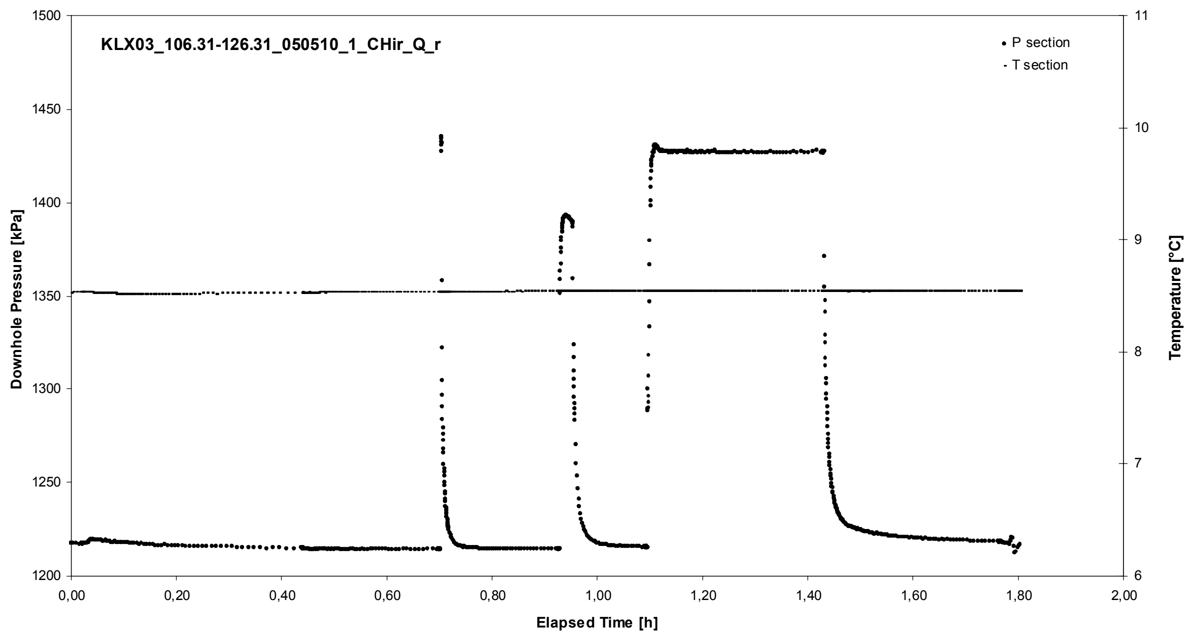
APPENDIX 2-11

Test 106.31 – 126.31 m

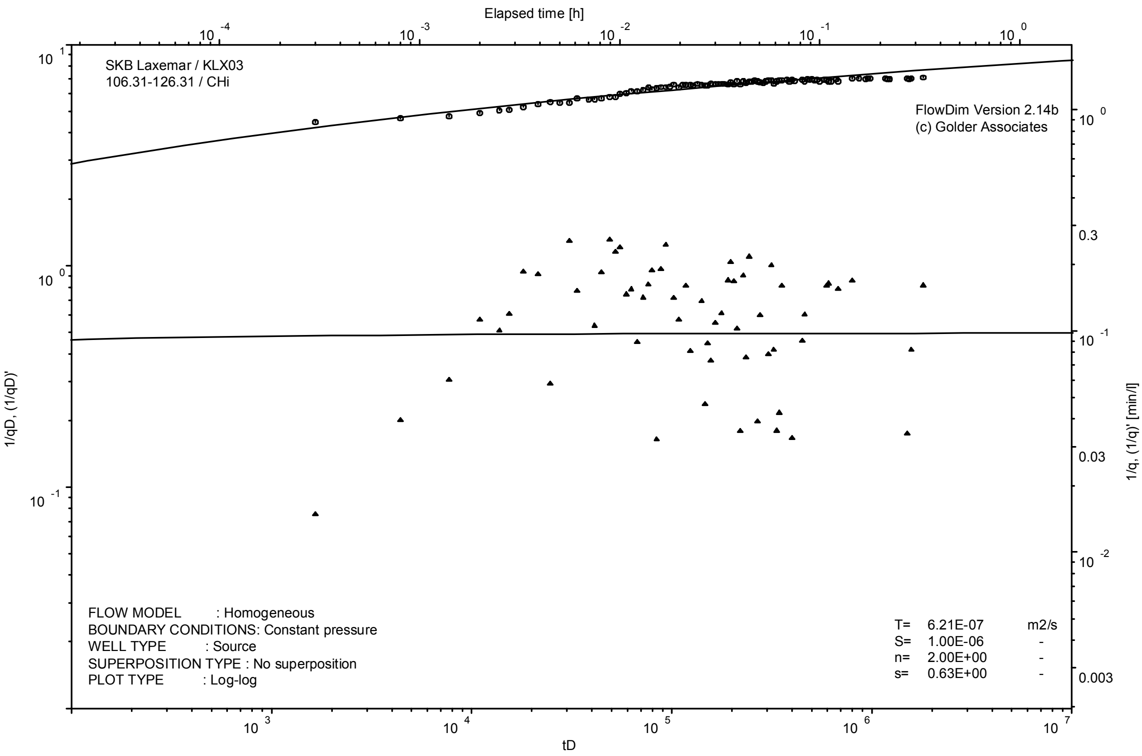
Analysis diagrams



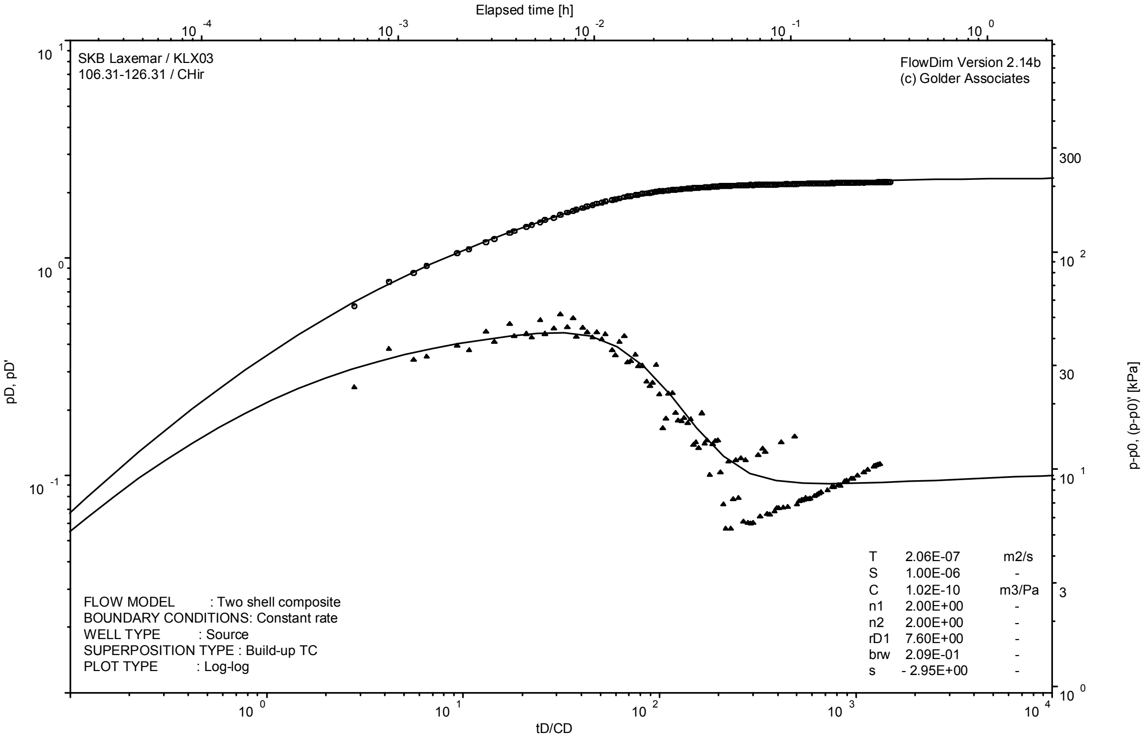
Pressure and flow rate vs. time; cartesian plot



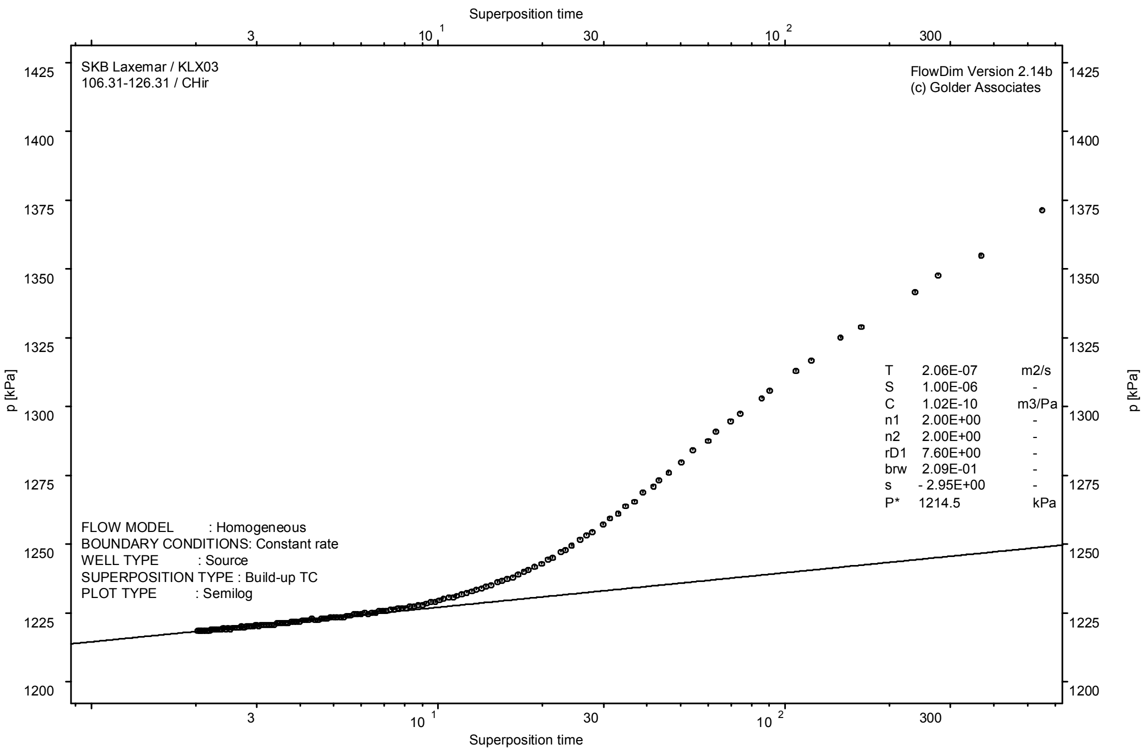
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

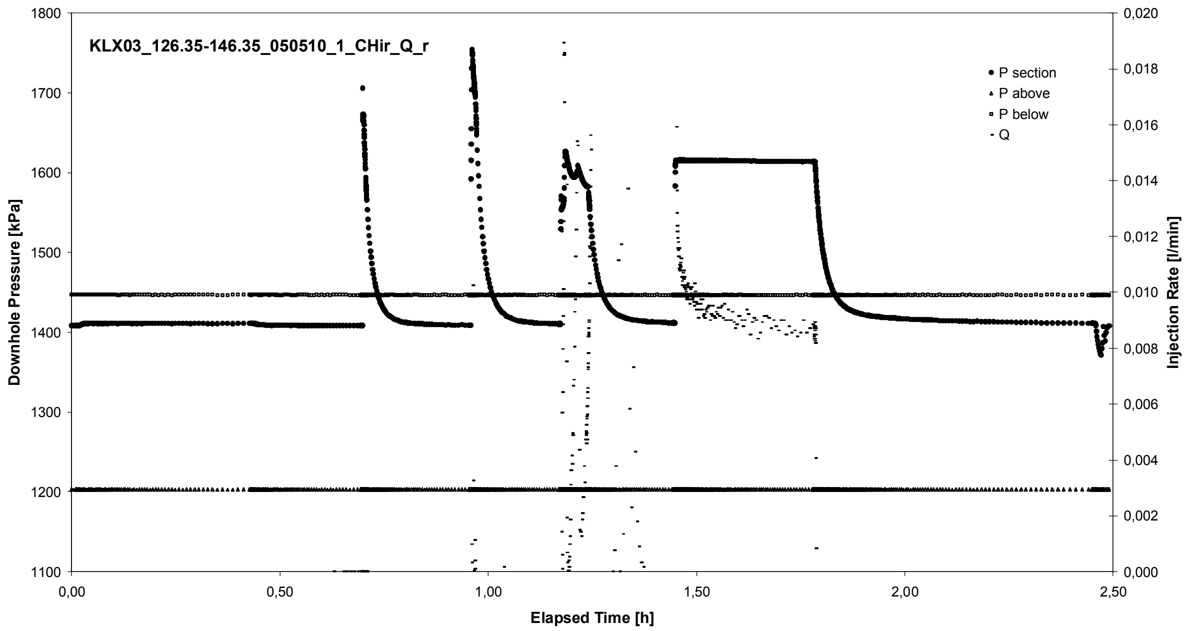


CHIR phase; HORNER match

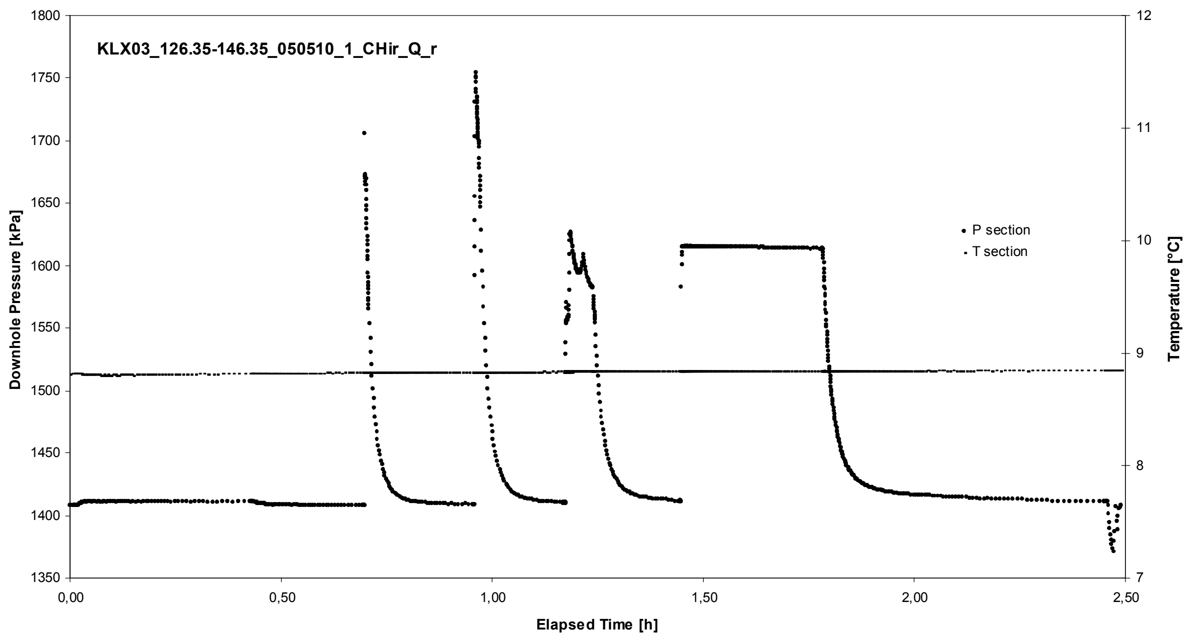
APPENDIX 2-12

Test 126.35 – 146.35 m

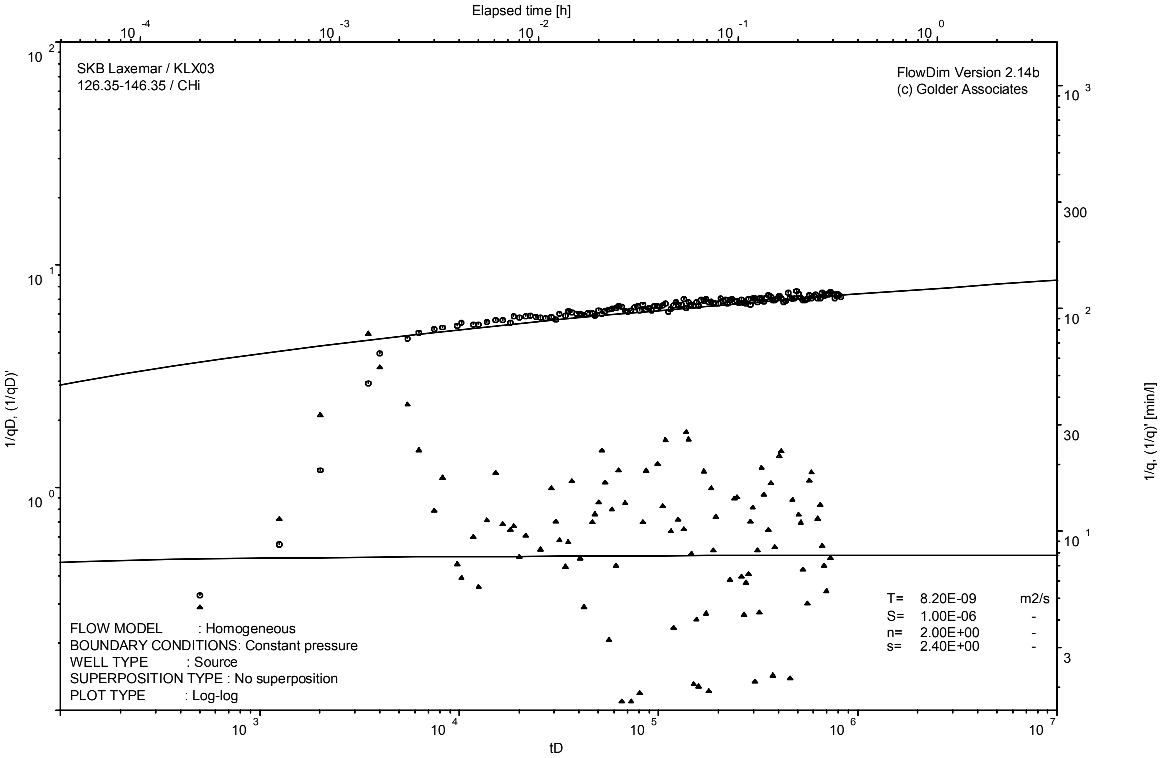
Analysis diagrams



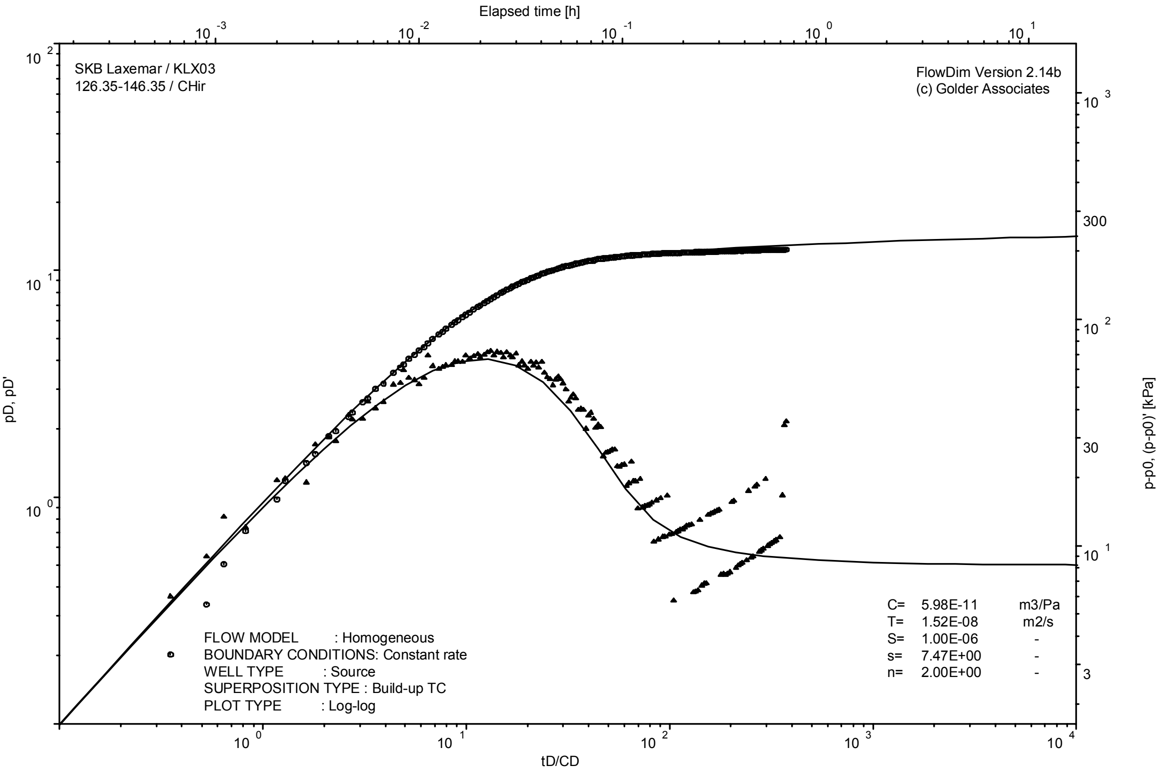
Pressure and flow rate vs. time; cartesian plot



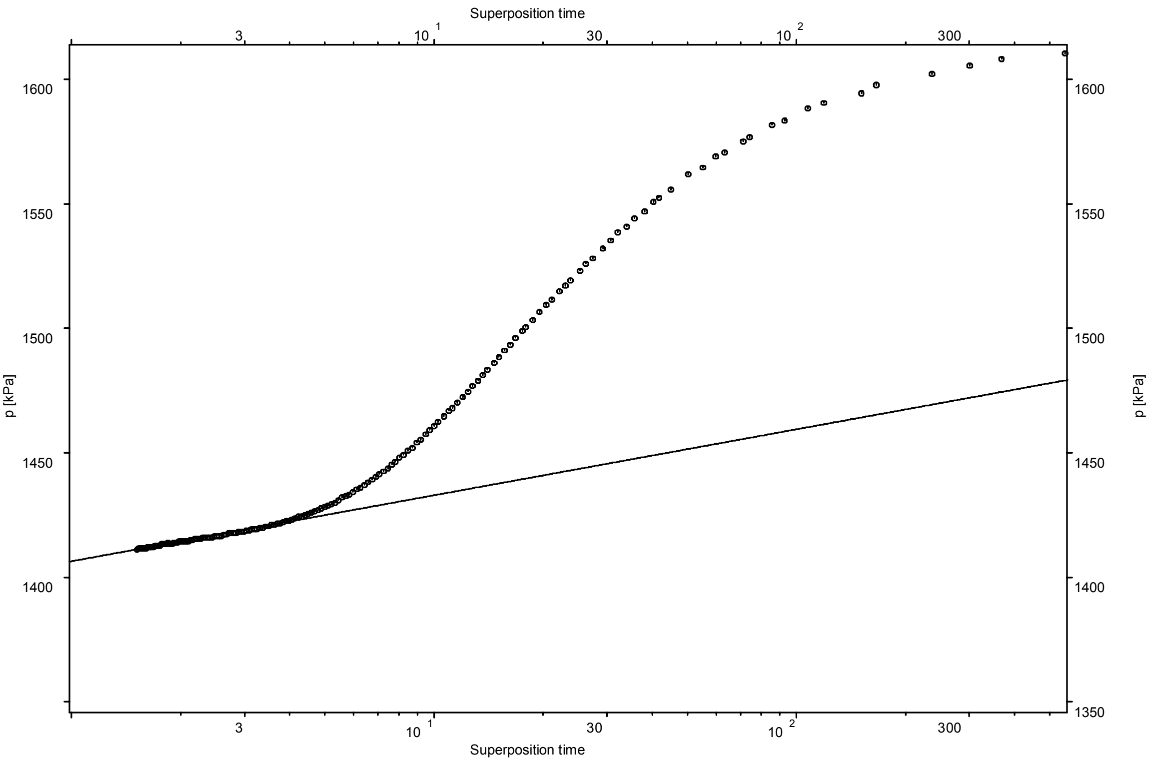
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

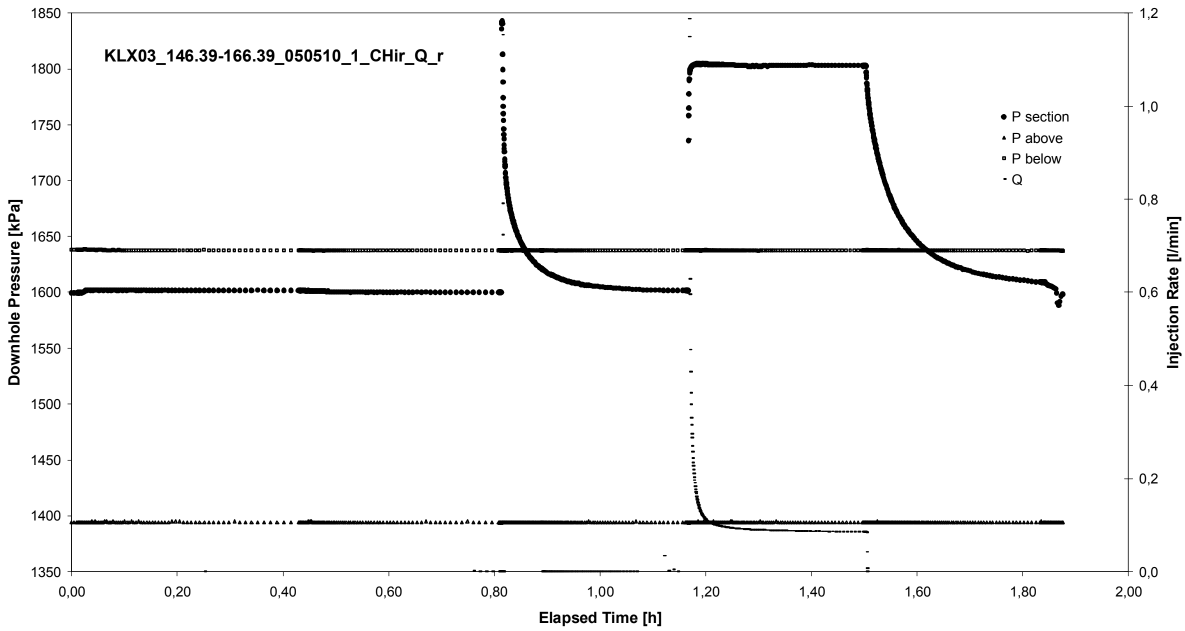


CHIR phase; HORNER match

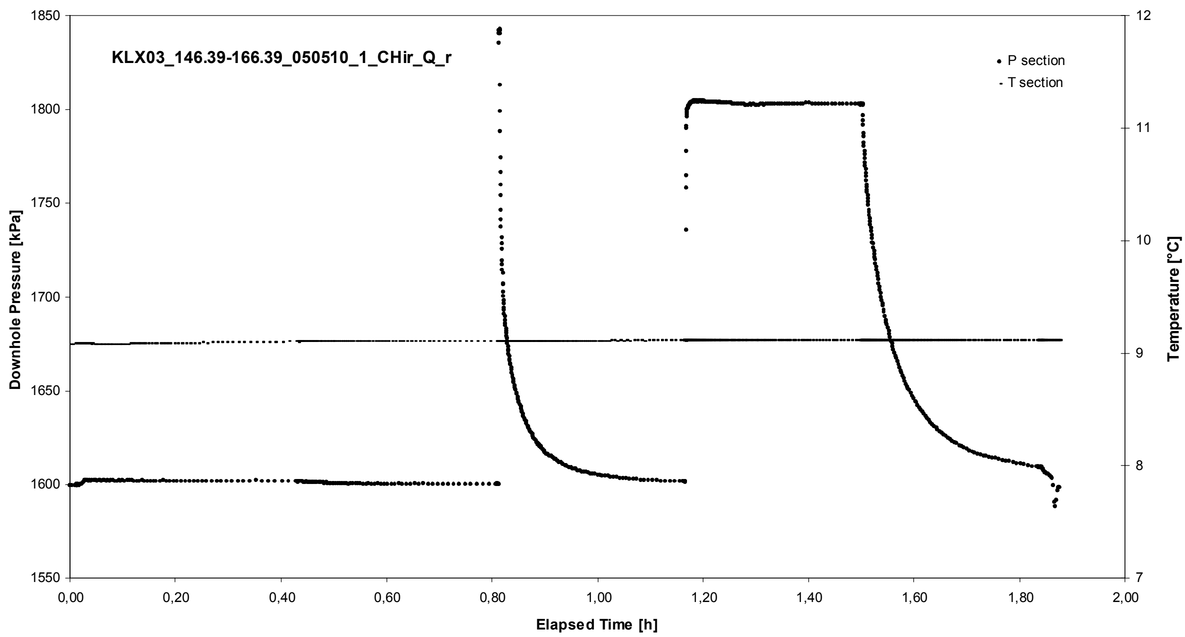
APPENDIX 2-13

Test 146.39 – 166.39 m

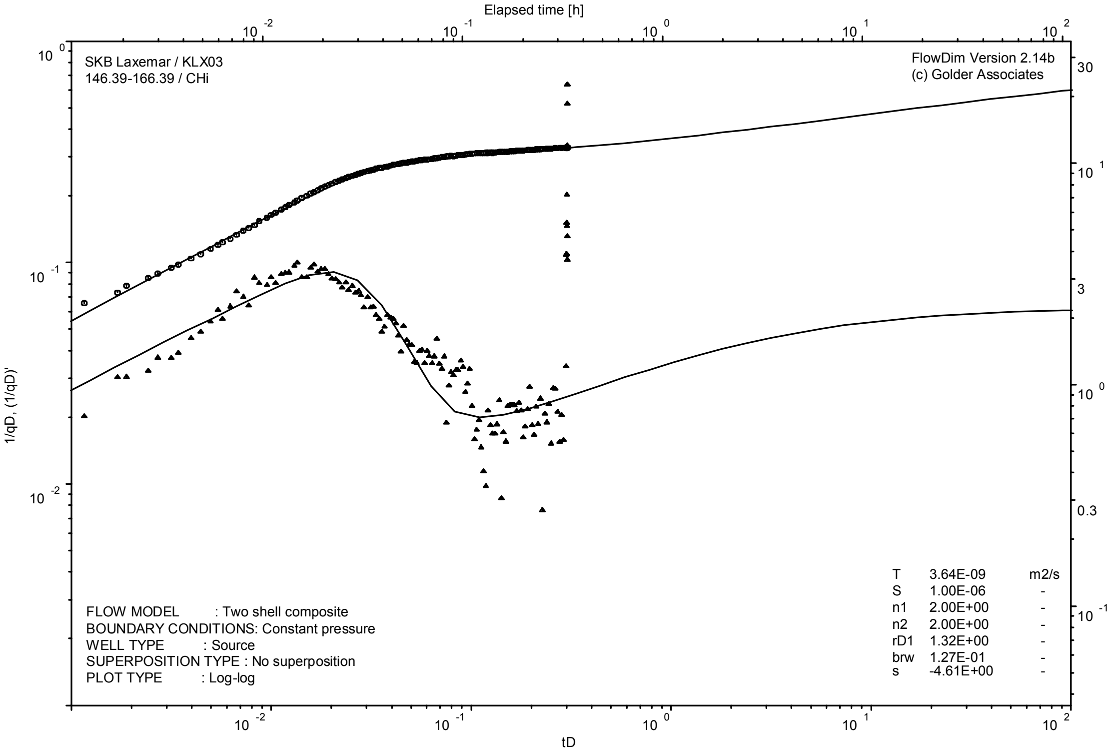
Analysis diagrams



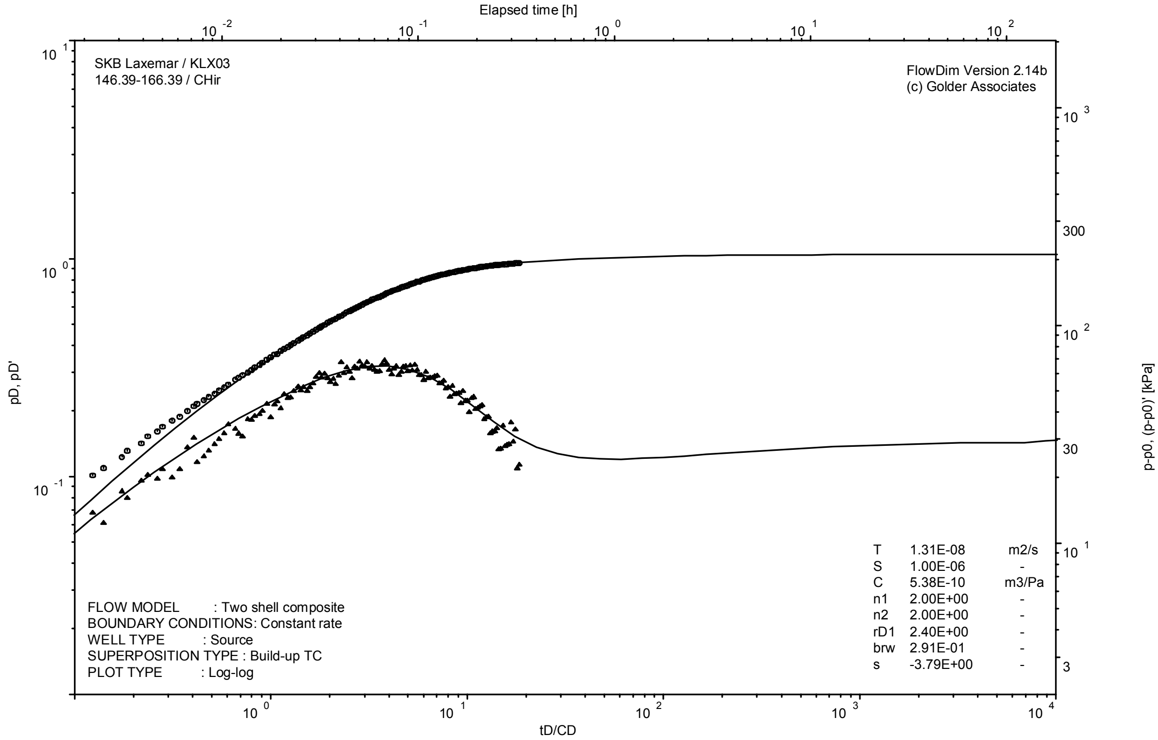
Pressure and flow rate vs. time; cartesian plot



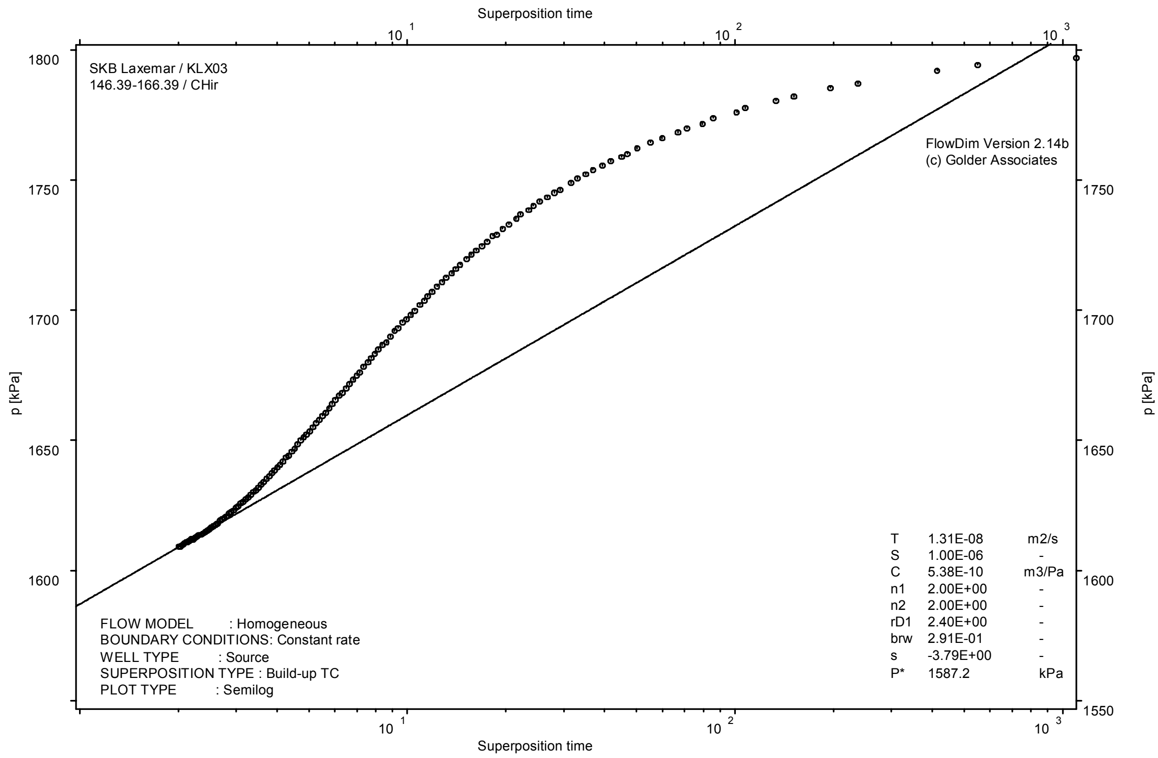
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

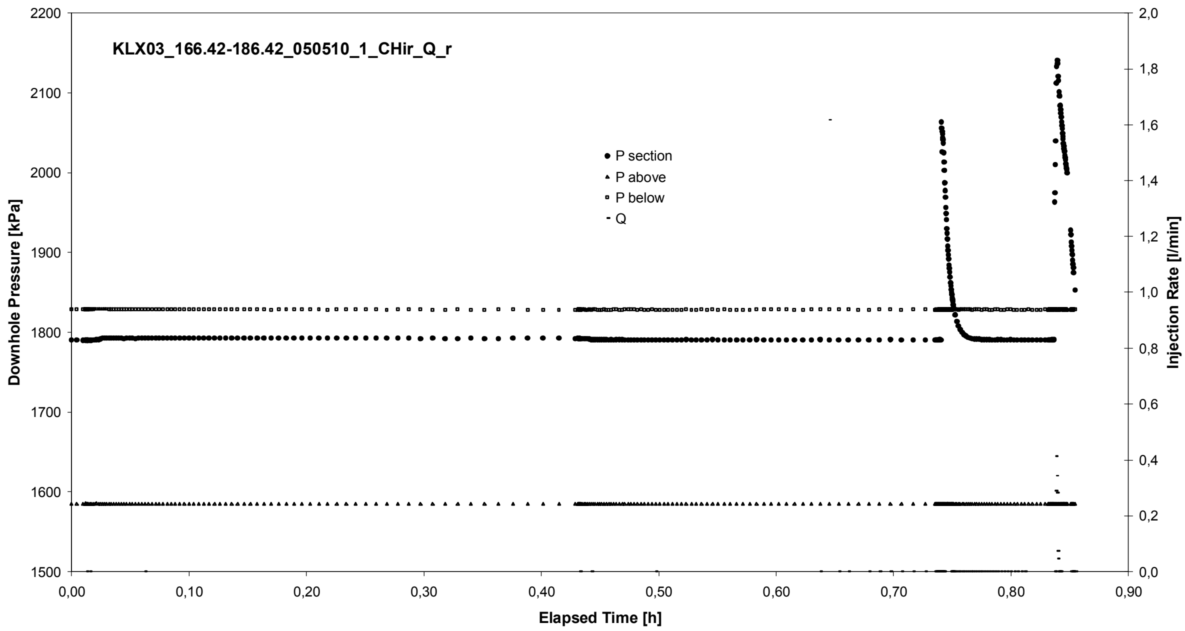


CHIR phase; HORNER match

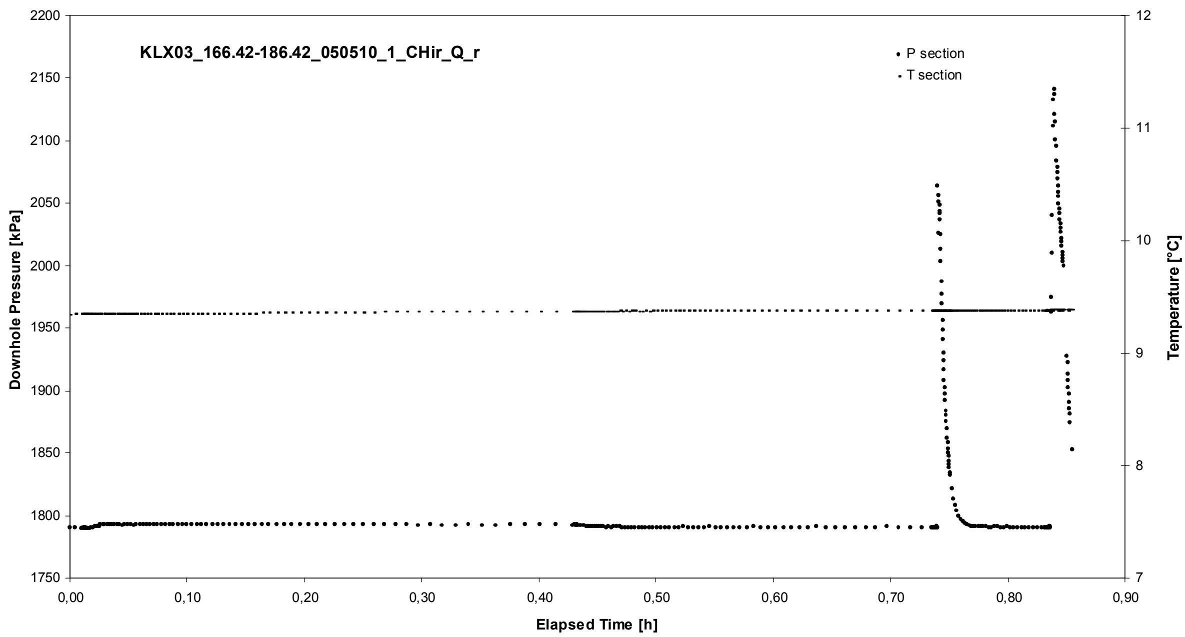
APPENDIX 2-14

Test 166.42 – 186.42 m

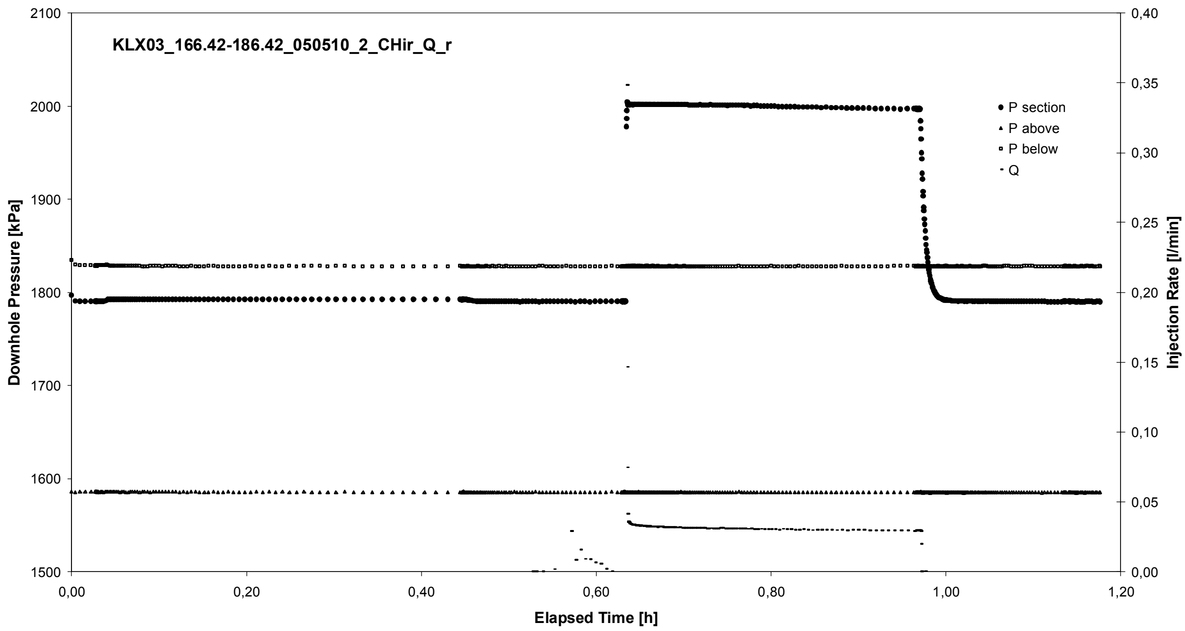
Analysis diagrams



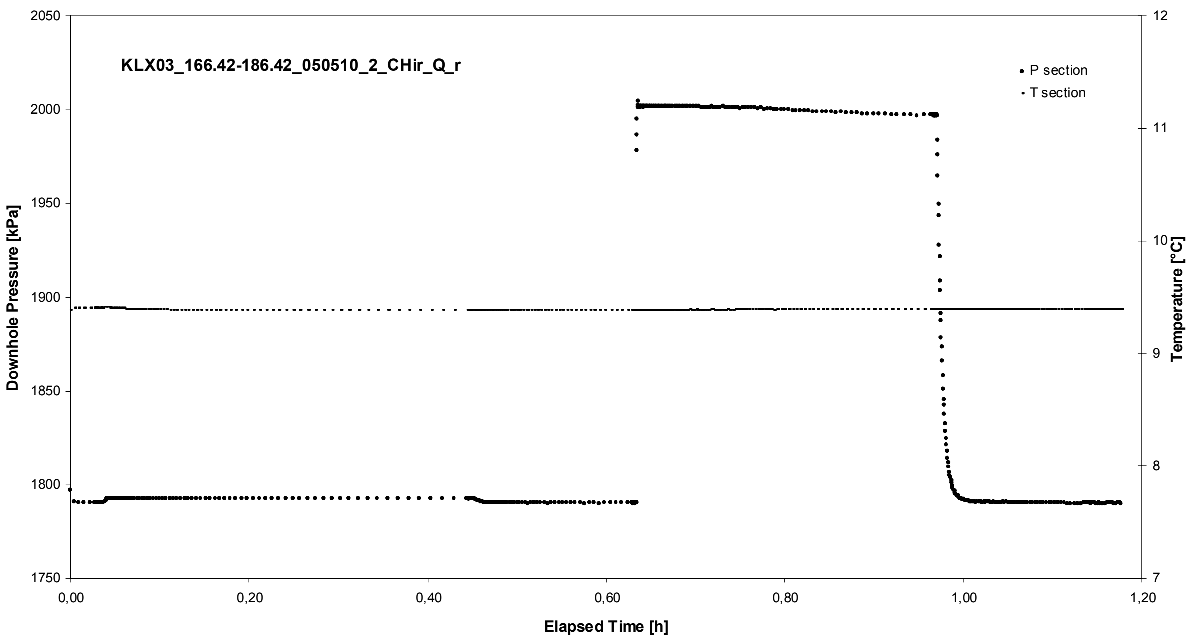
Pressure and flow rate vs. time; cartesian plot (test repeated)



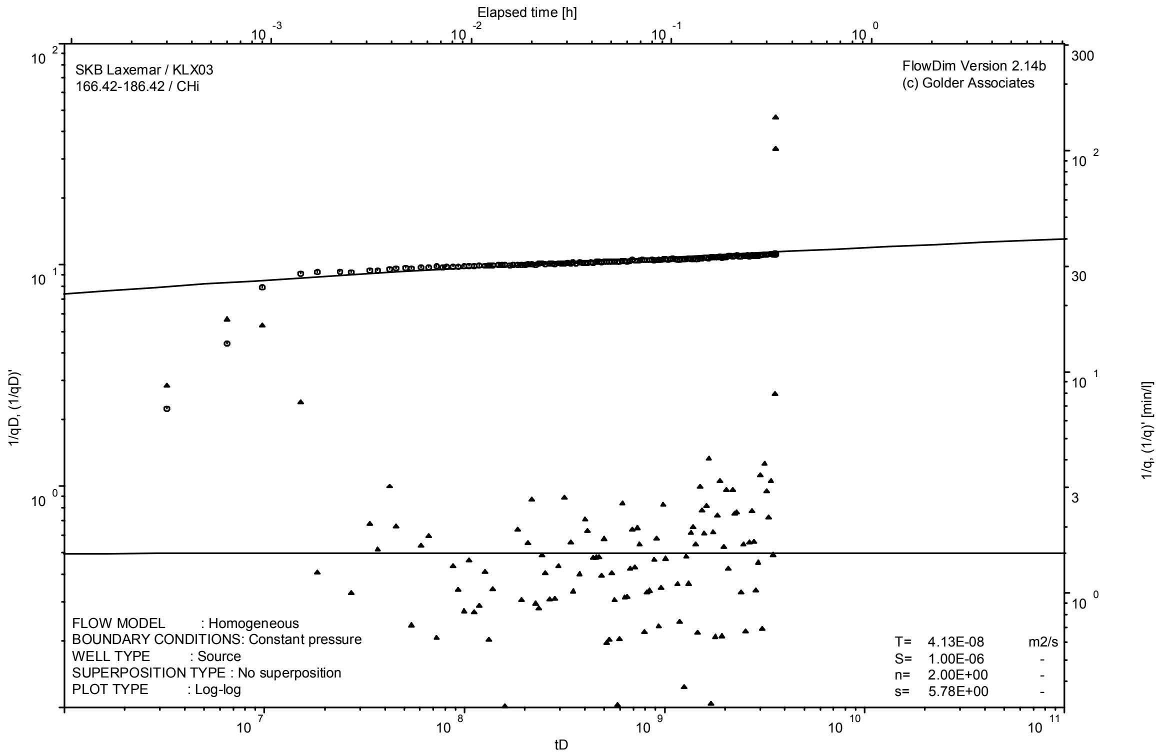
Interval pressure and temperature vs. time; cartesian plot (test repeated)



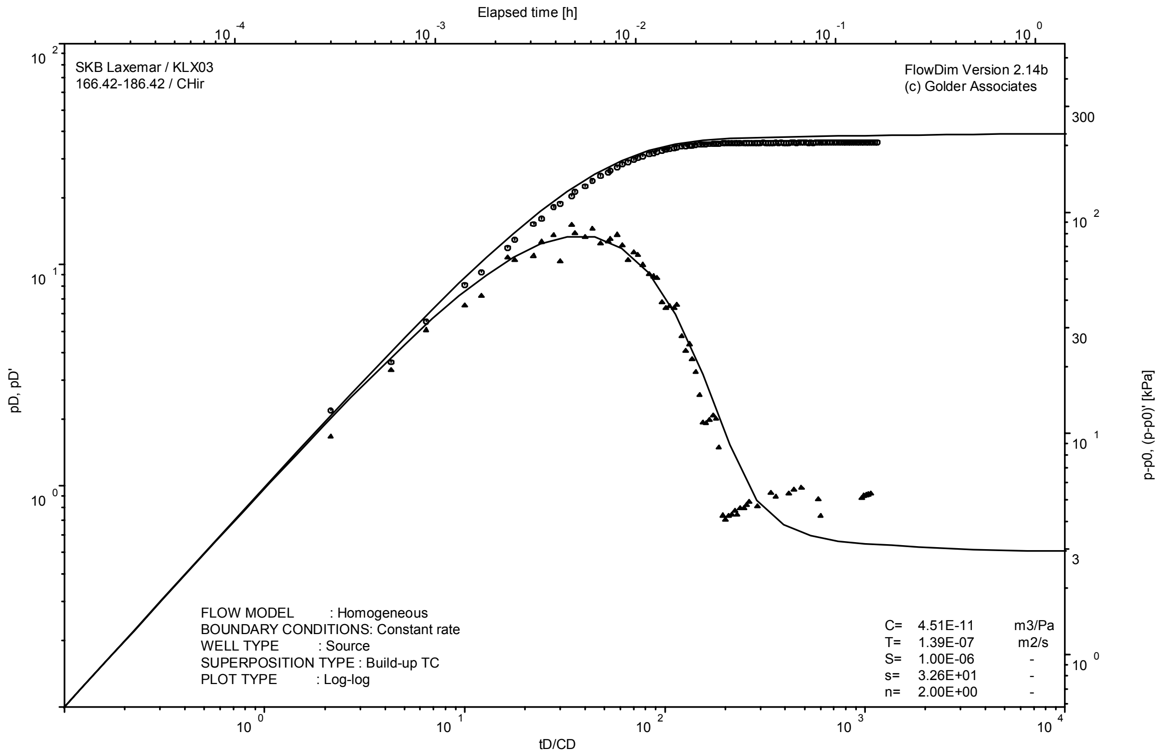
Pressure and flow rate vs. time; cartesian plot (analysed)



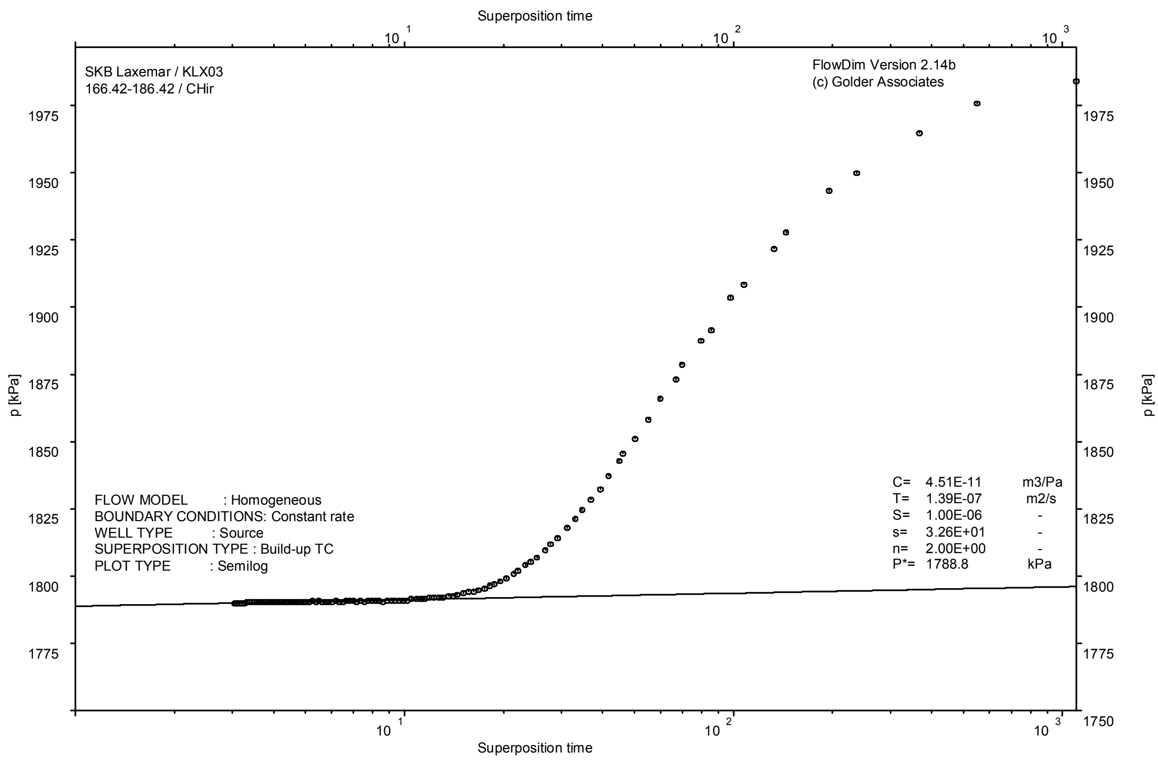
Interval pressure and temperature vs. time; cartesian plot (analysed)



CHI phase; log-log match



CHIR phase; log-log match

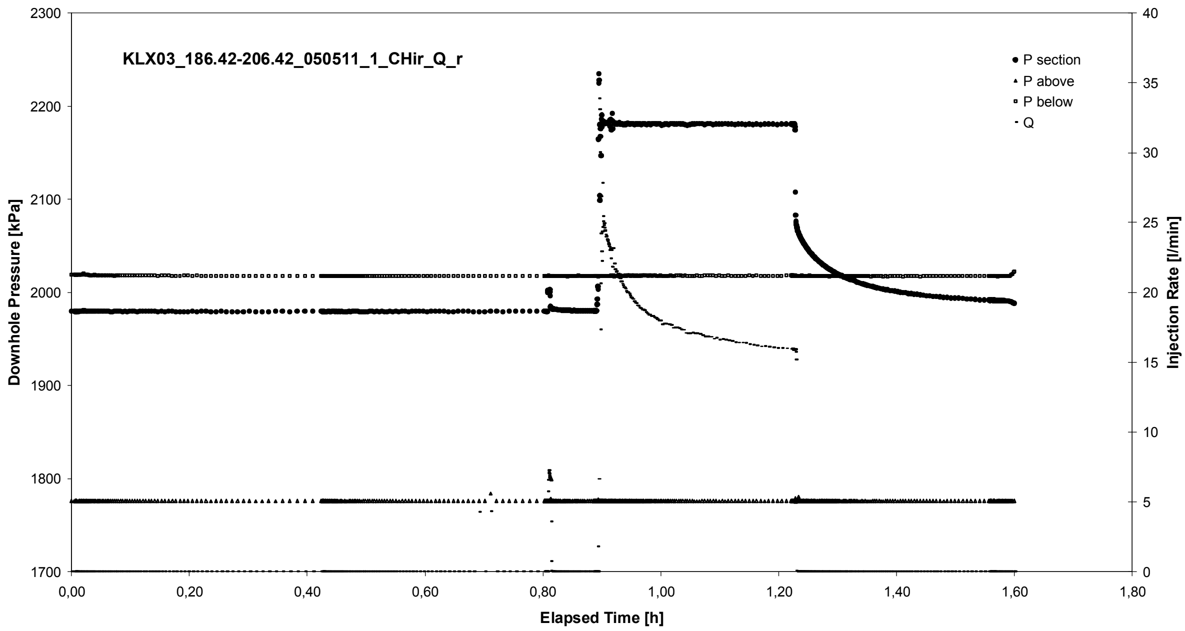


CHIR phase; HORNER match

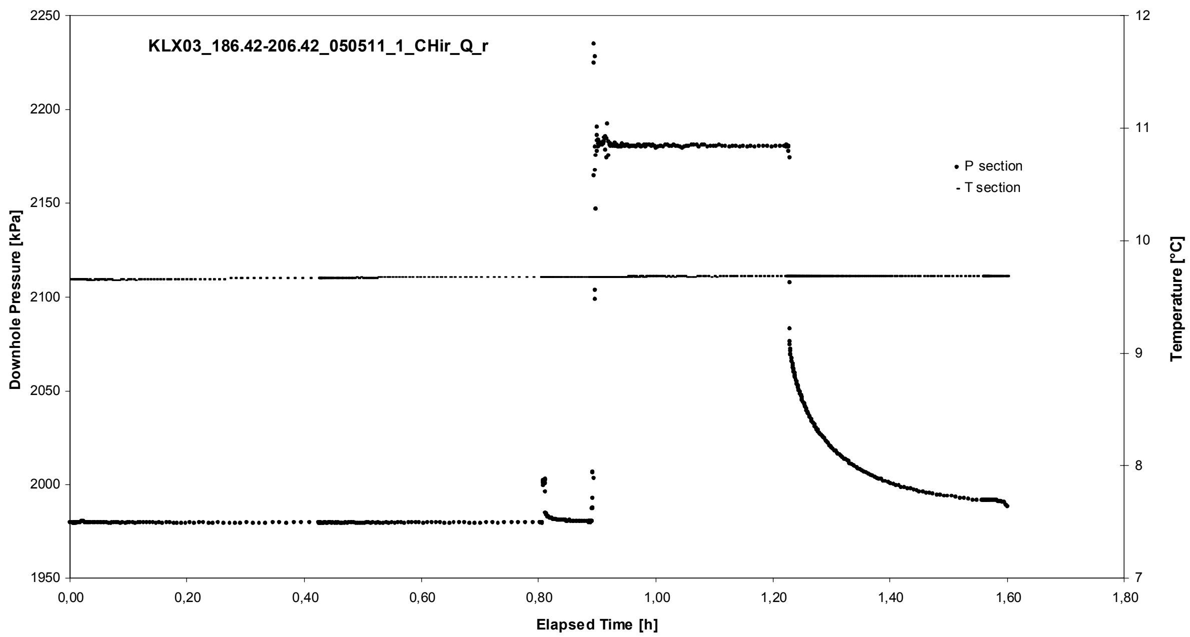
APPENDIX 2-15

Test 186.42 – 206.42 m

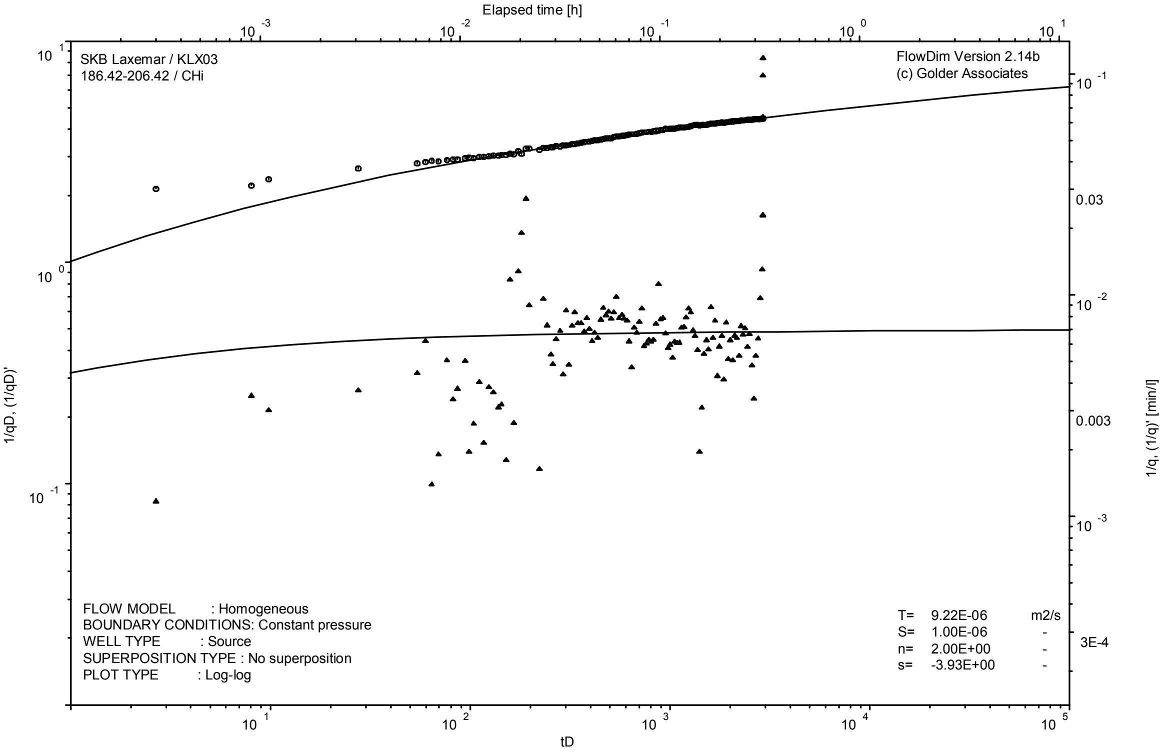
Analysis diagrams



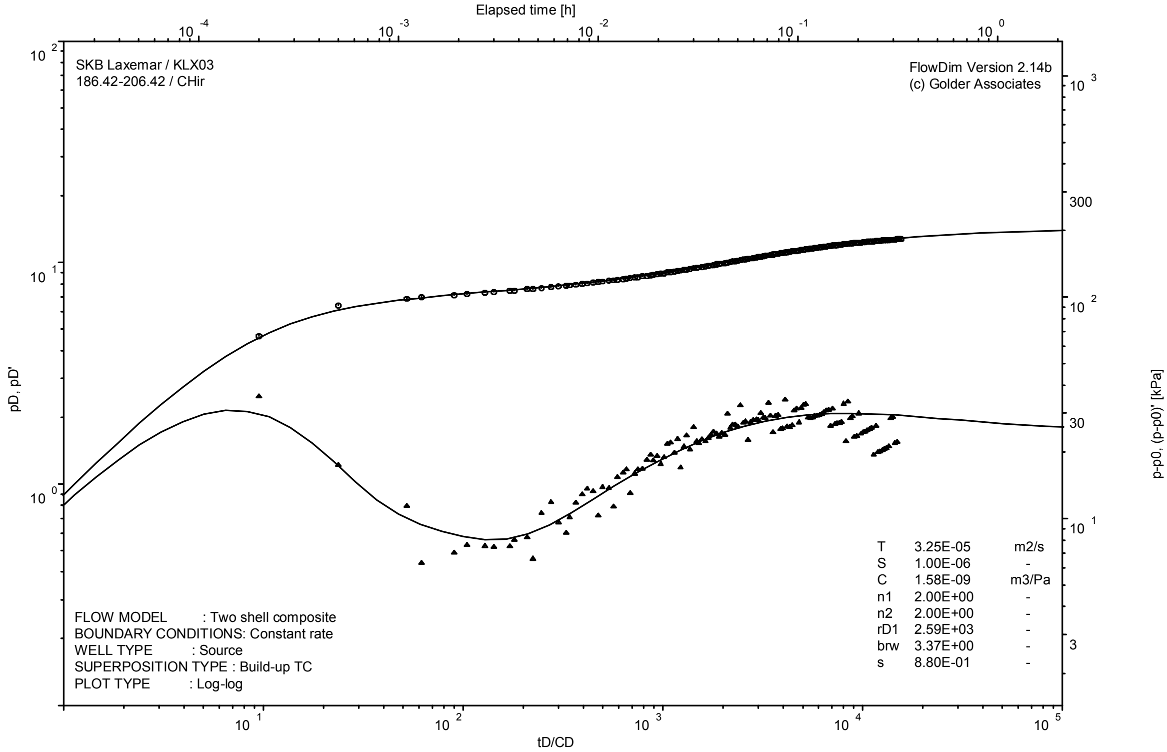
Pressure and flow rate vs. time; cartesian plot



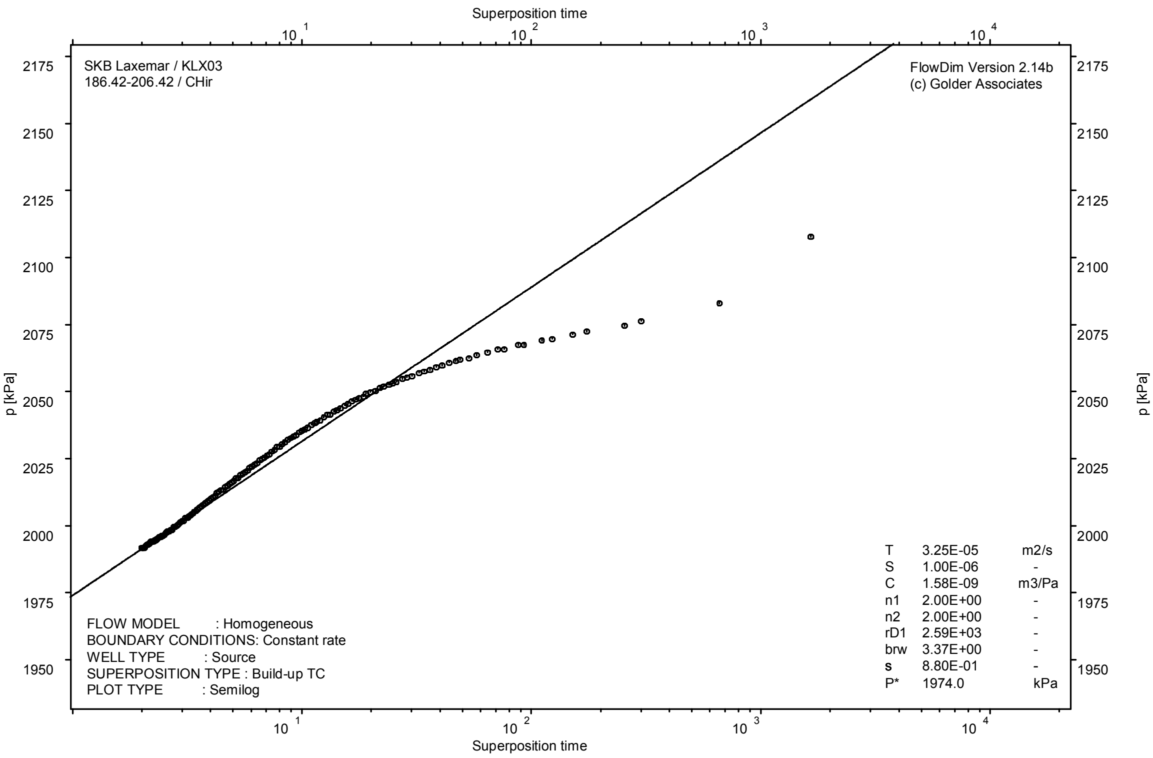
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

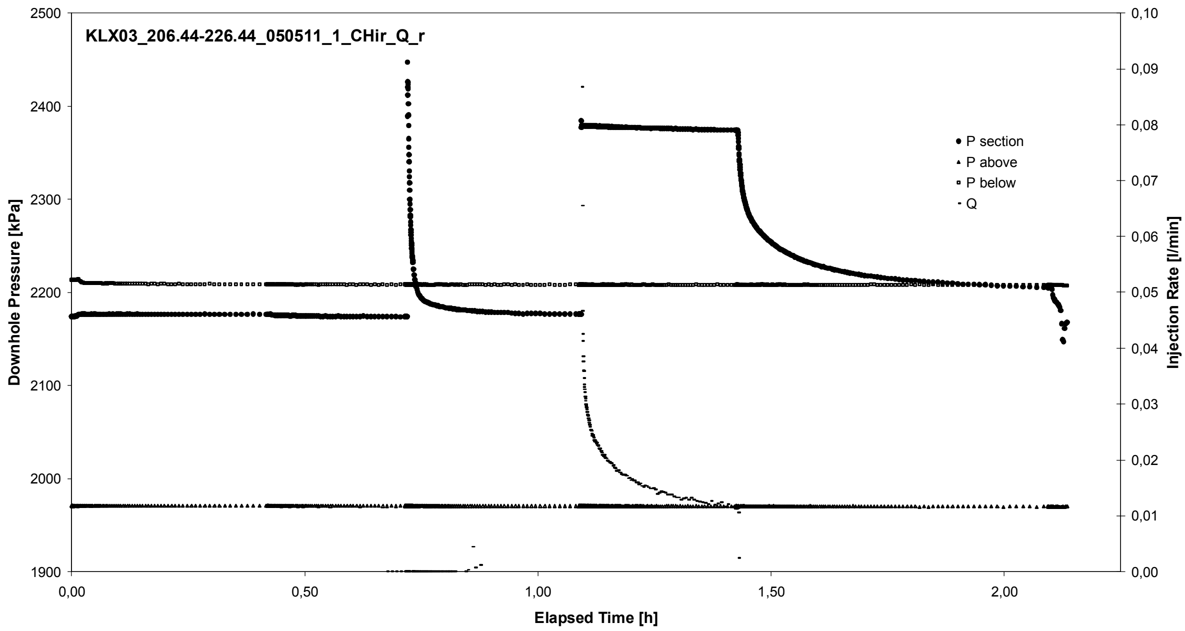


CHIR phase; HORNER match

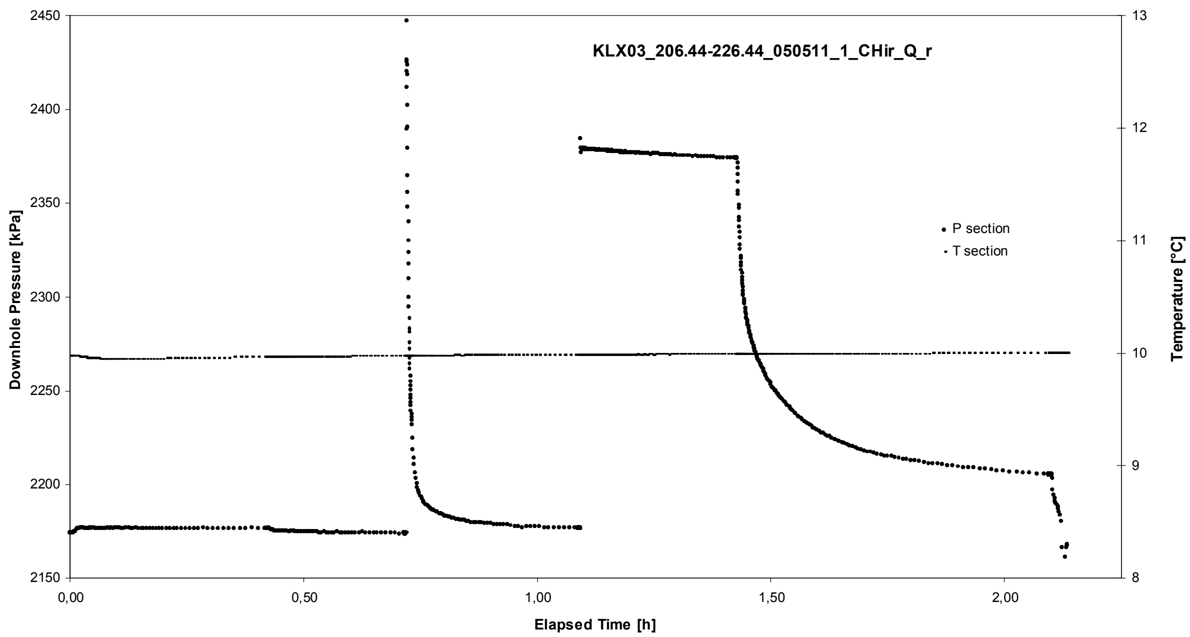
APPENDIX 2-16

Test 206.44 – 226.44 m

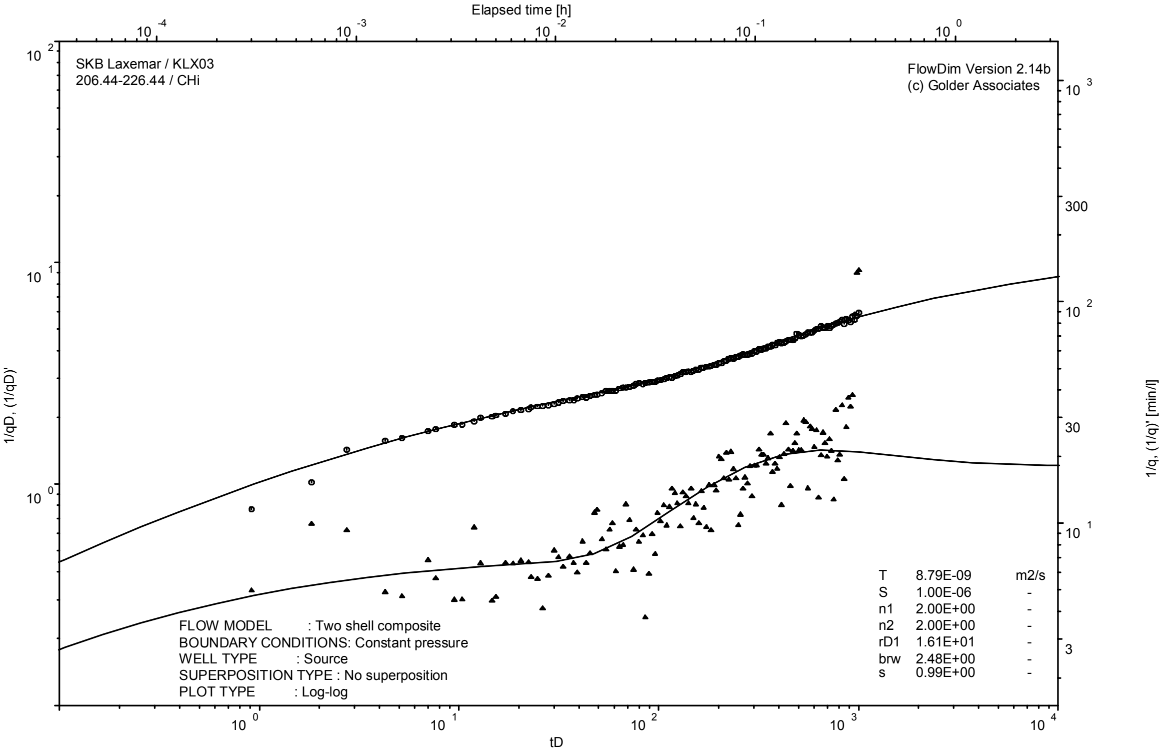
Analysis diagrams



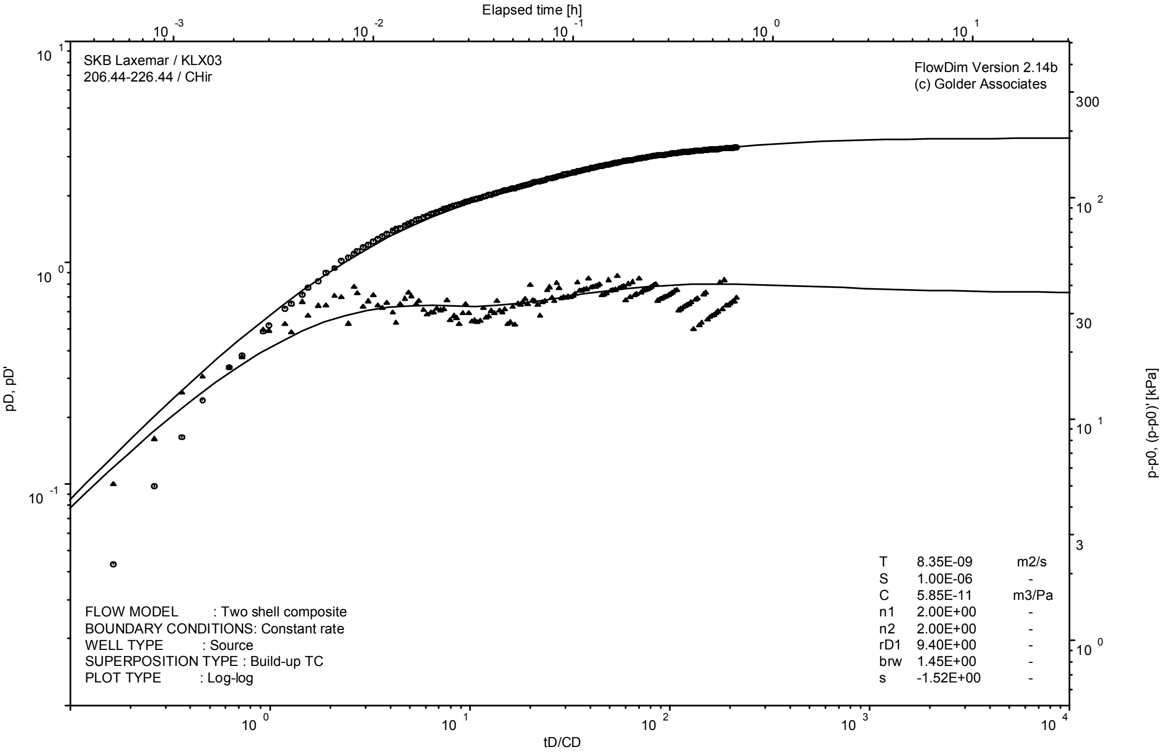
Pressure and flow rate vs. time; cartesian plot



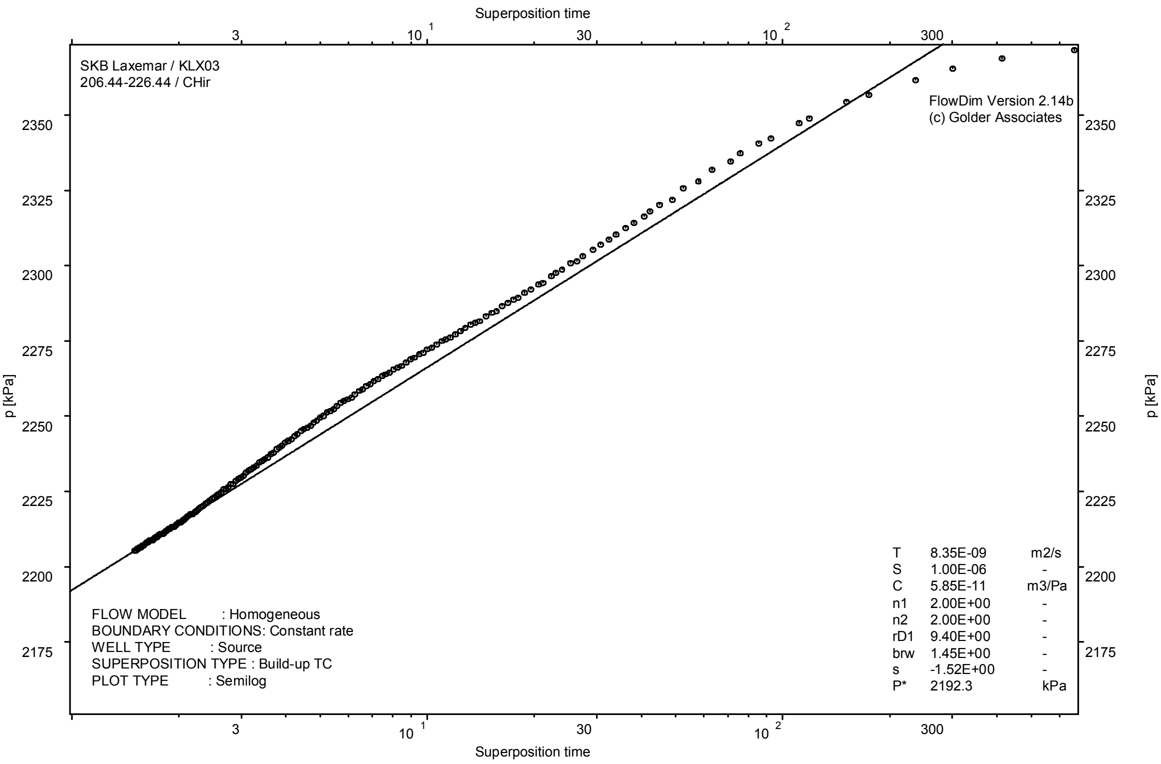
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

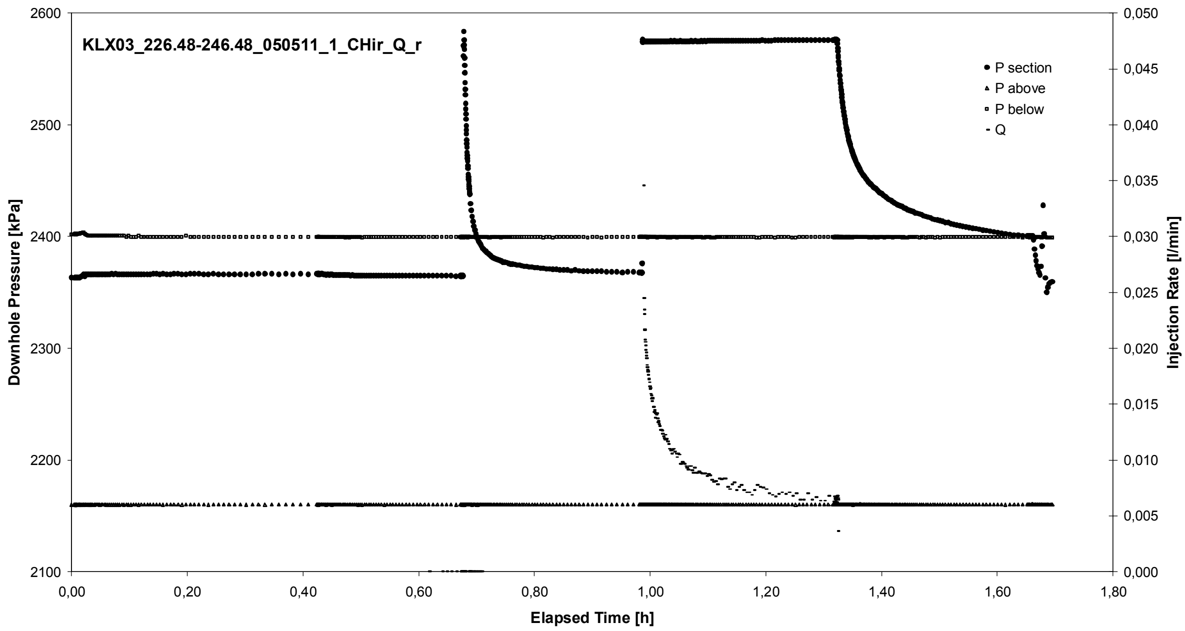


CHIR phase; HORNER match

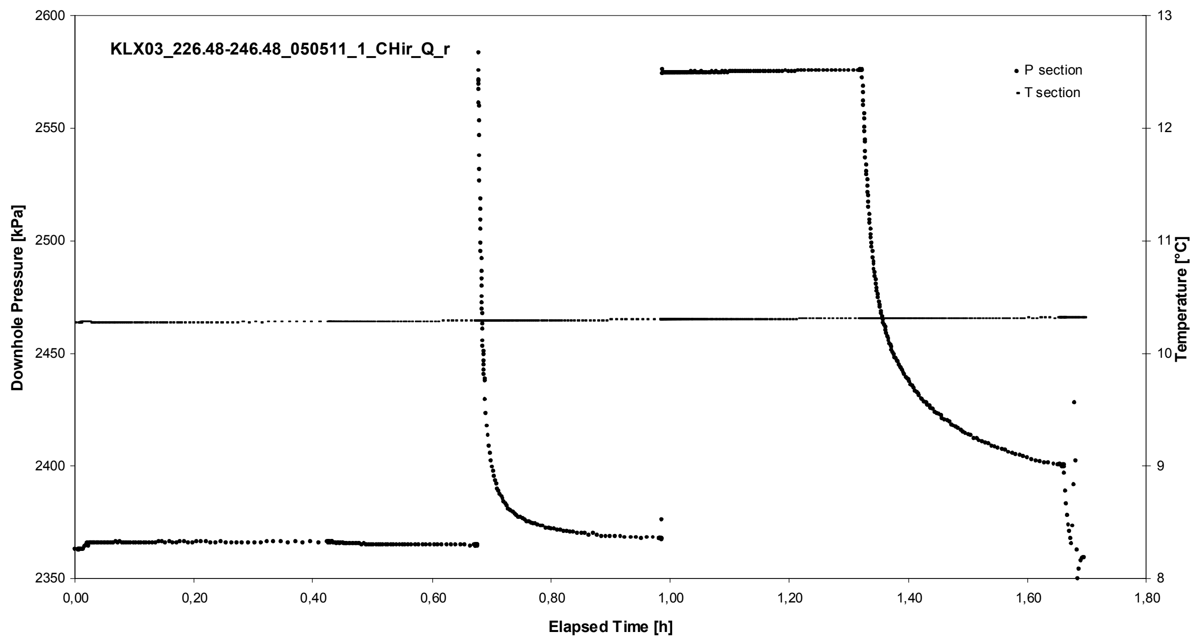
APPENDIX 2-17

Test 226.48 – 246.48 m

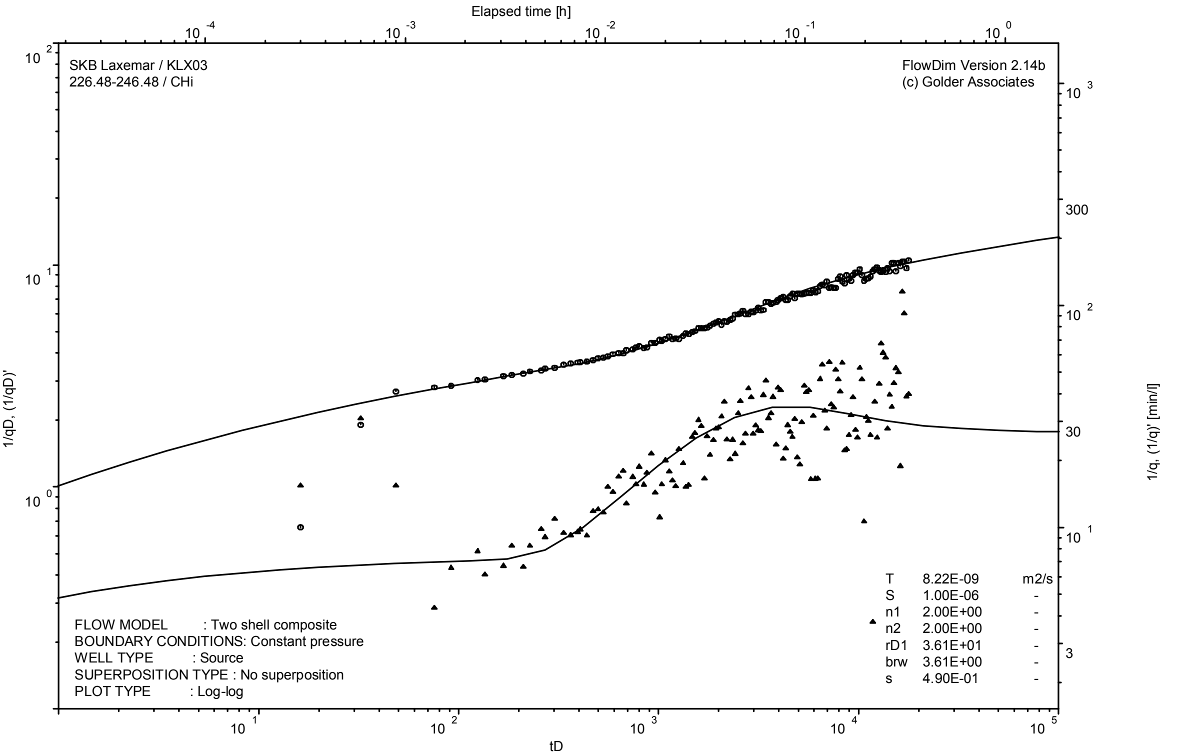
Analysis diagrams



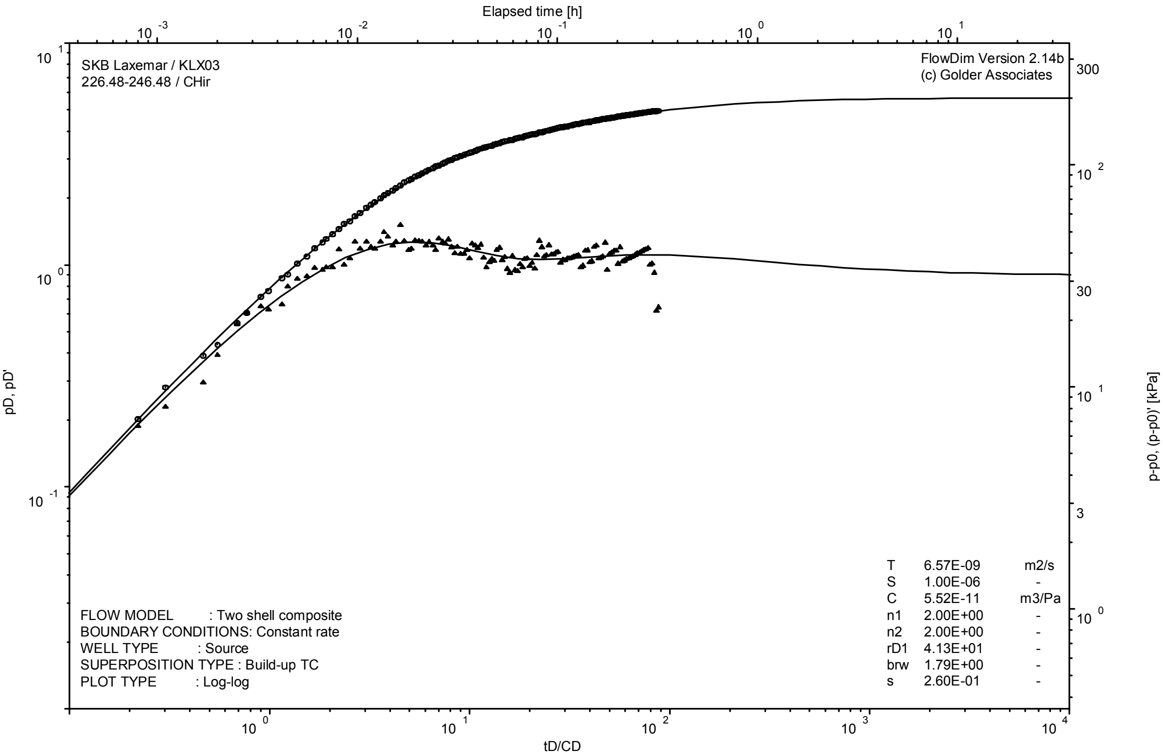
Pressure and flow rate vs. time; cartesian plot



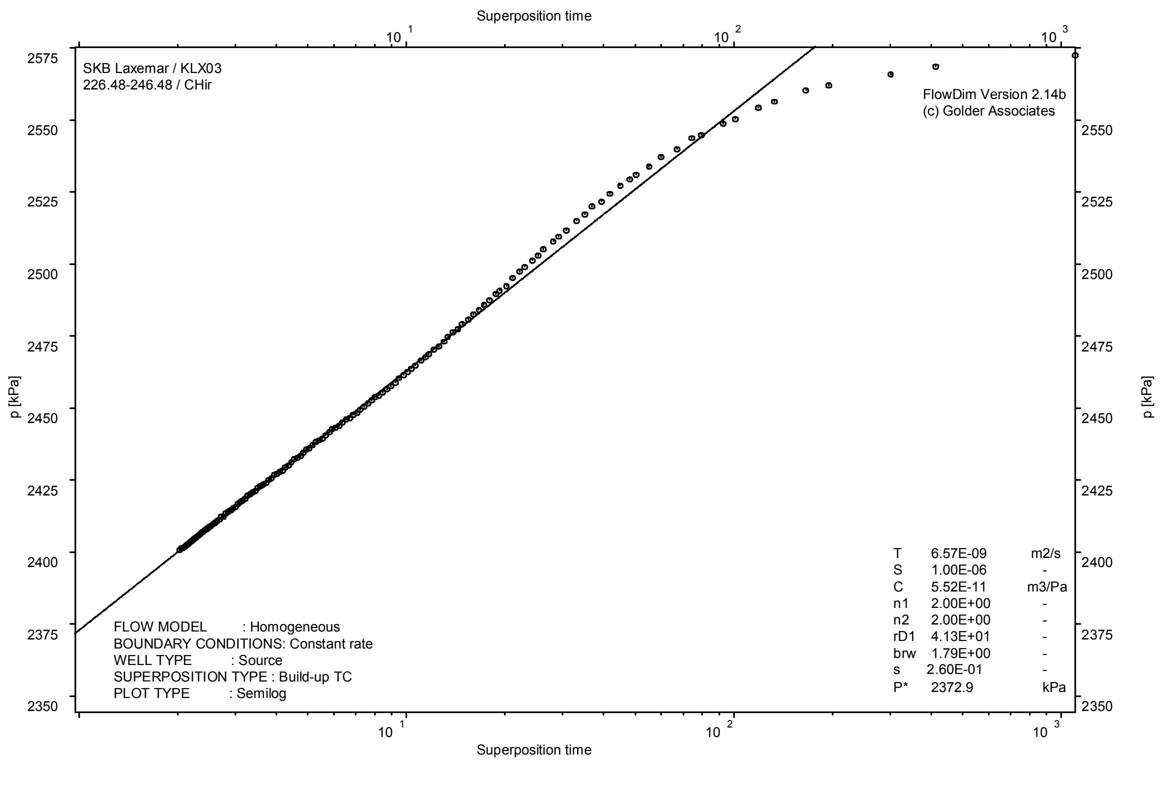
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

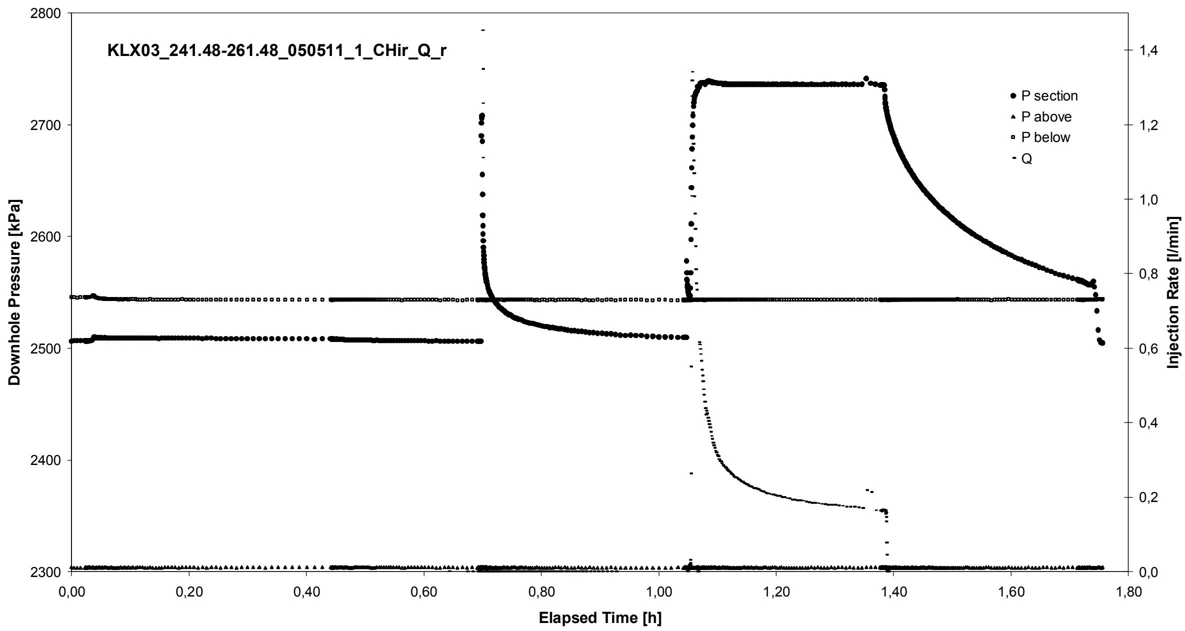


CHIR phase; HORNER match

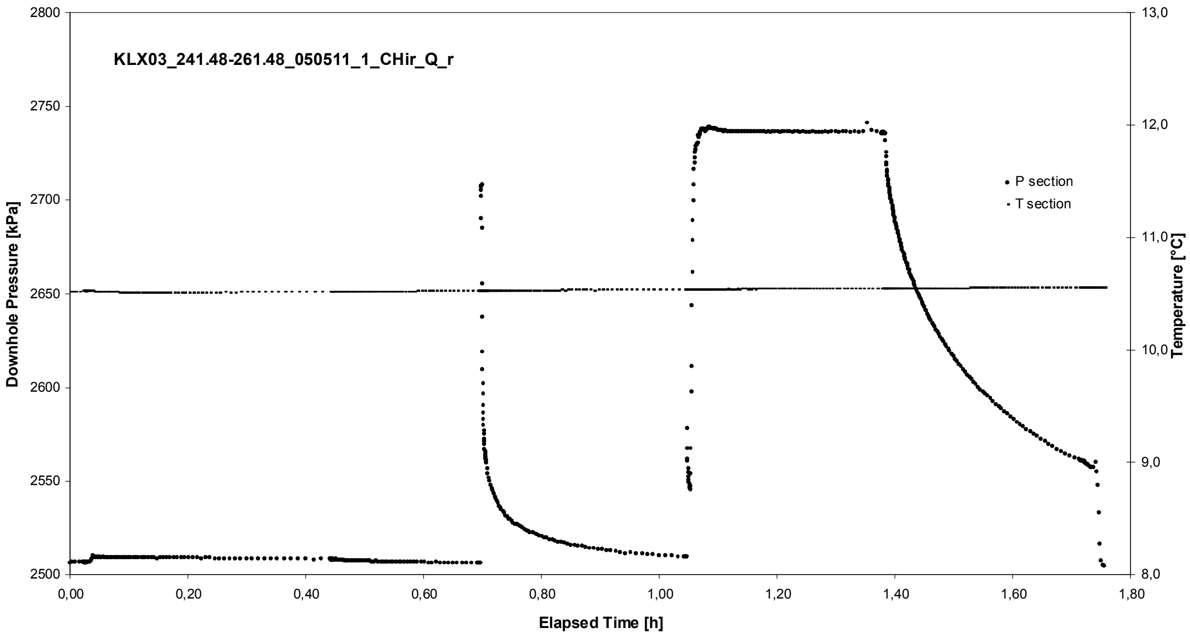
APPENDIX 2-18

Test 241.48 – 261.48 m

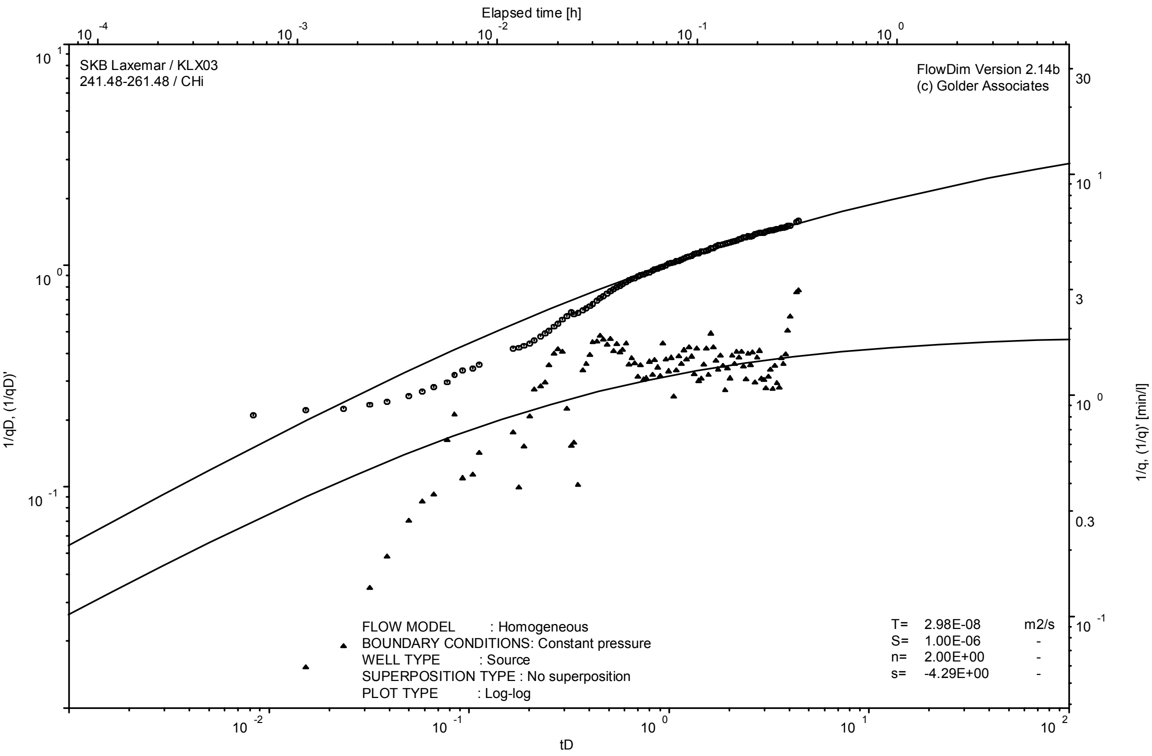
Analysis diagrams



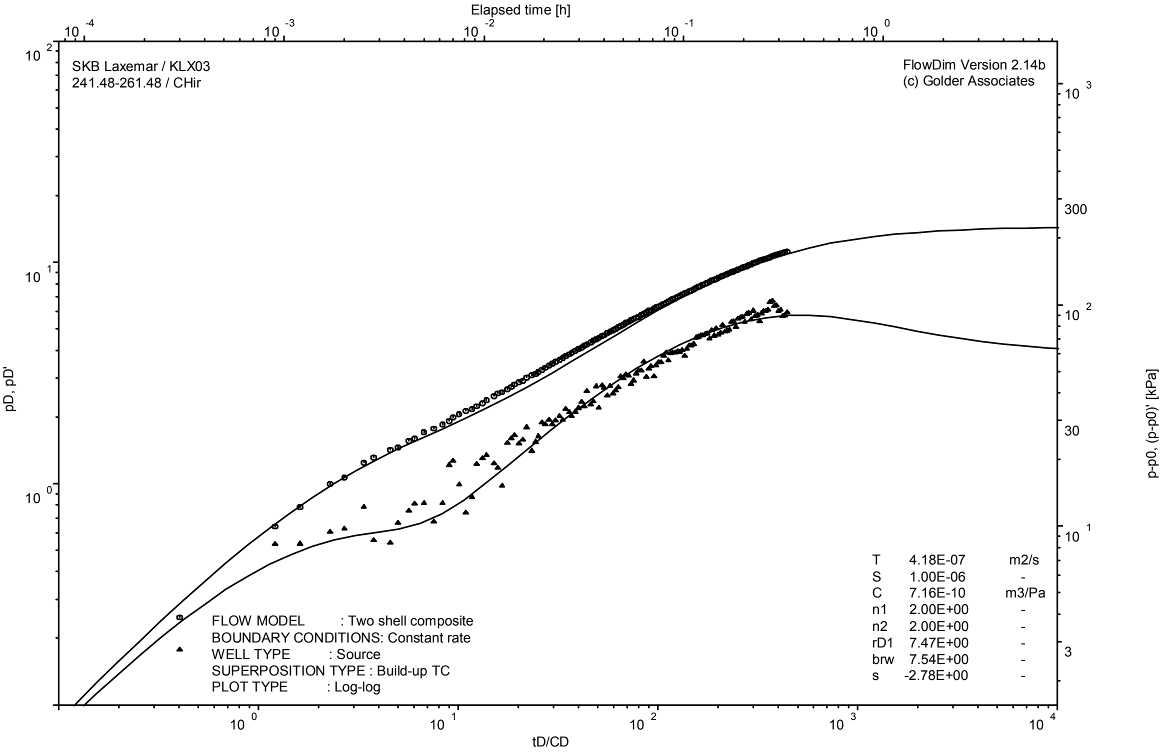
Pressure and flow rate vs. time; cartesian plot



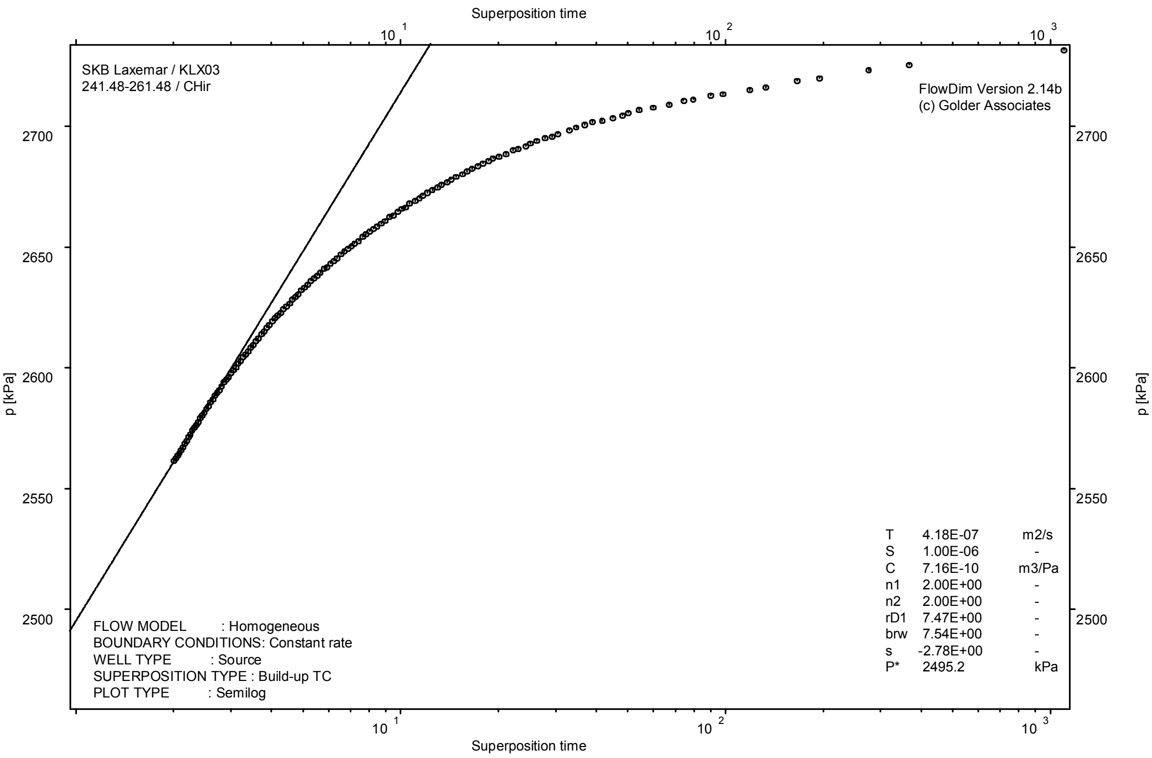
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

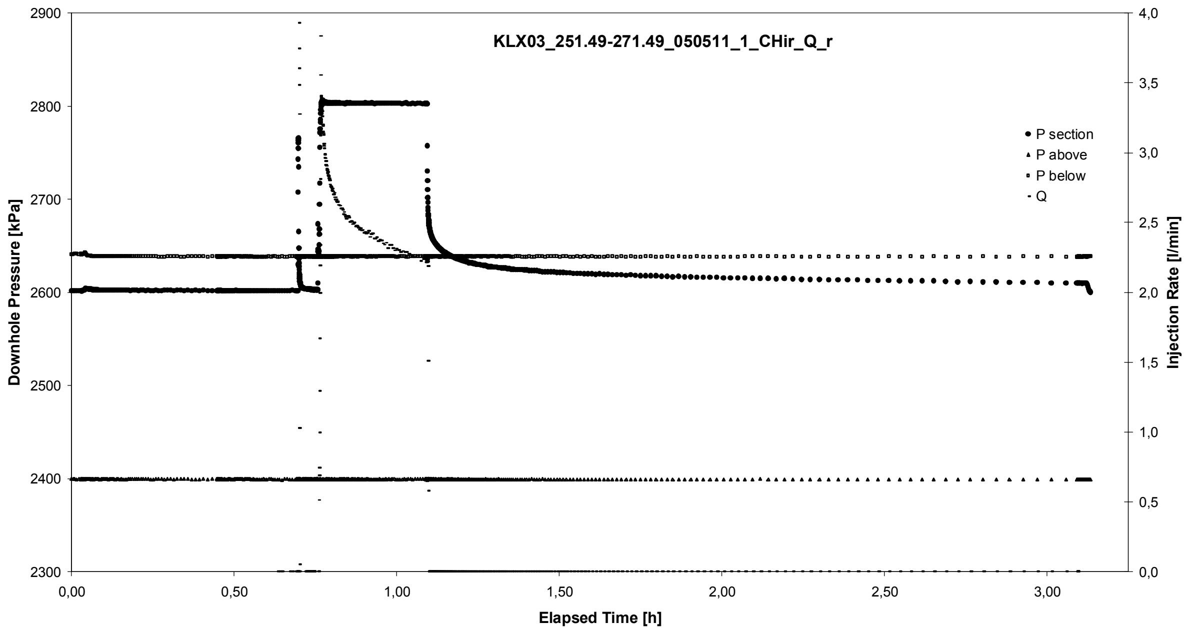


CHIR phase; HORNER match

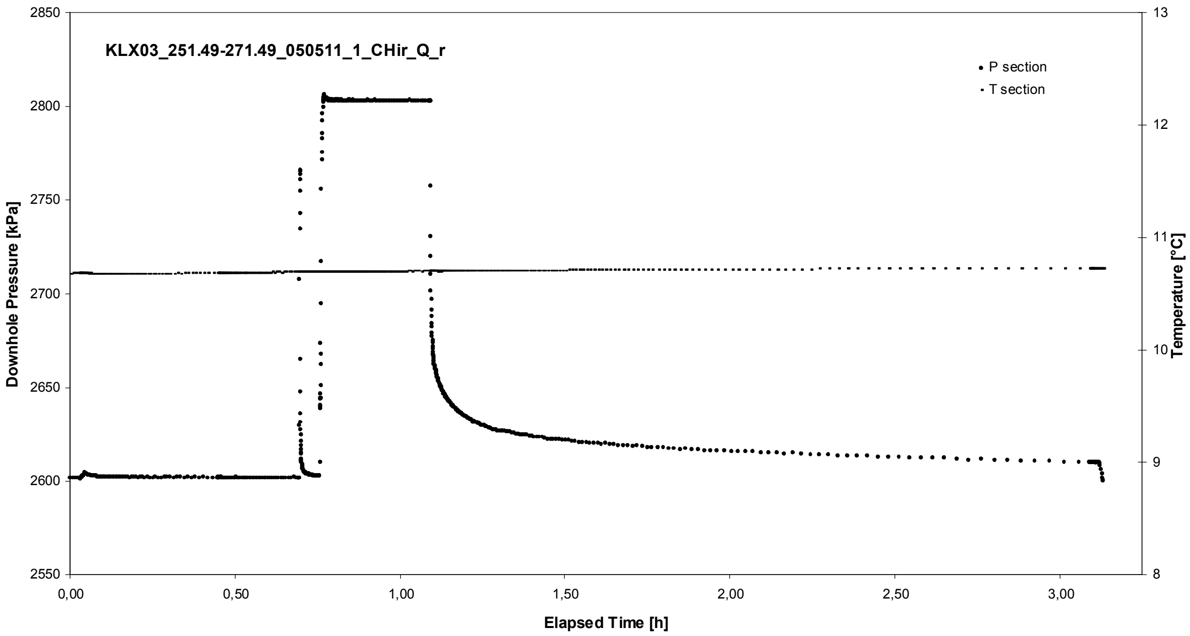
APPENDIX 2-19

Test 251.49 – 271.49 m

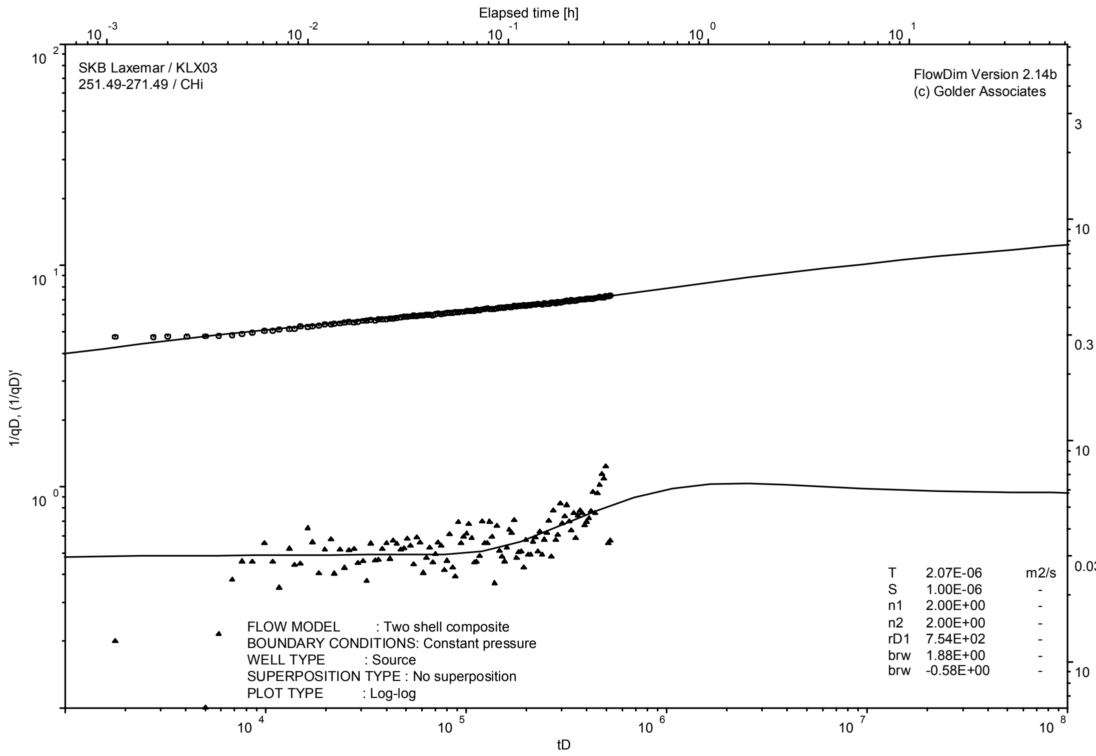
Analysis diagrams



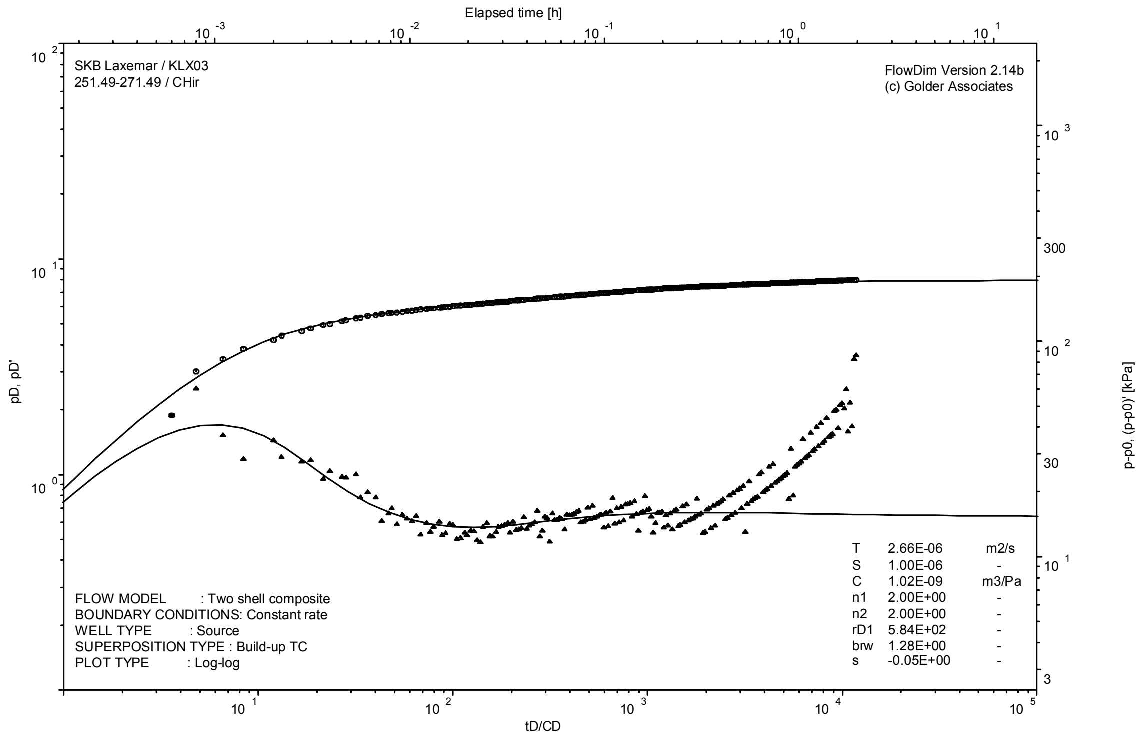
Pressure and flow rate vs. time; cartesian plot



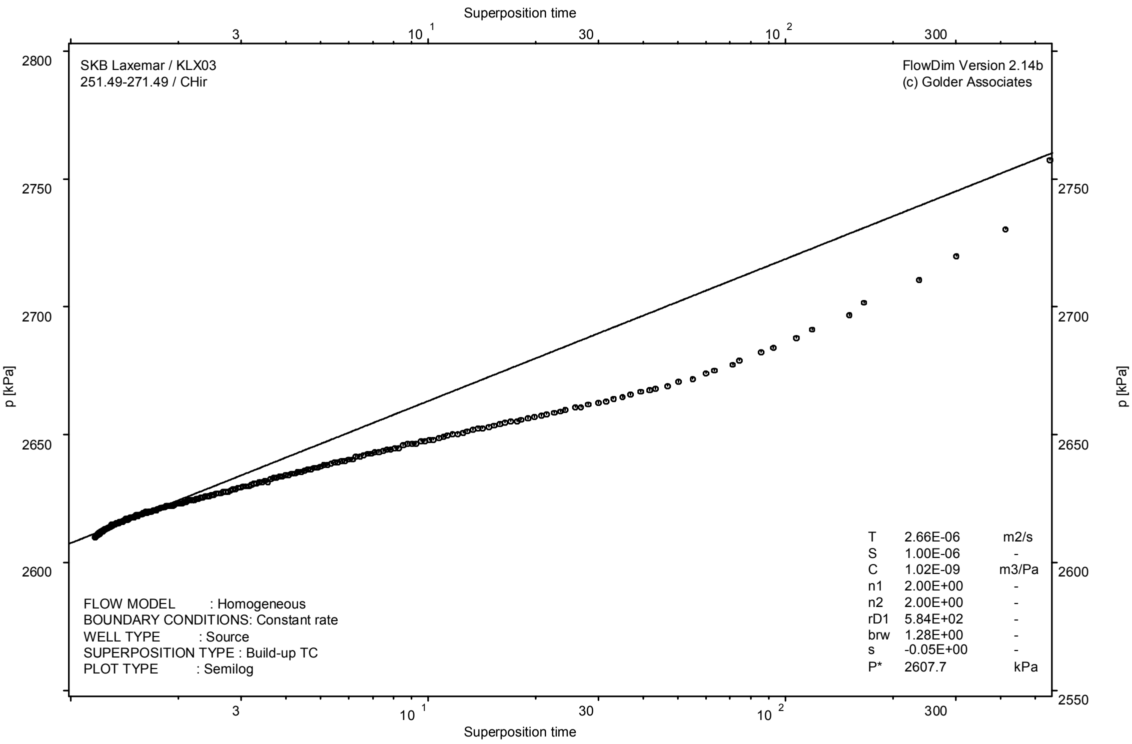
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

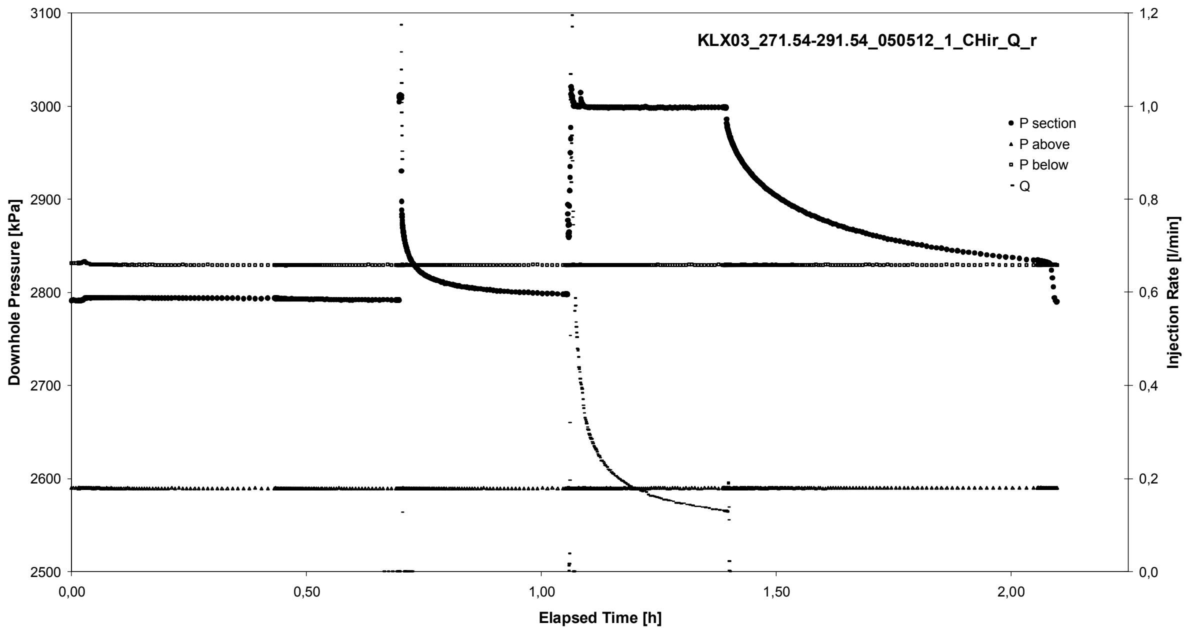


CHIR phase; HORNER match

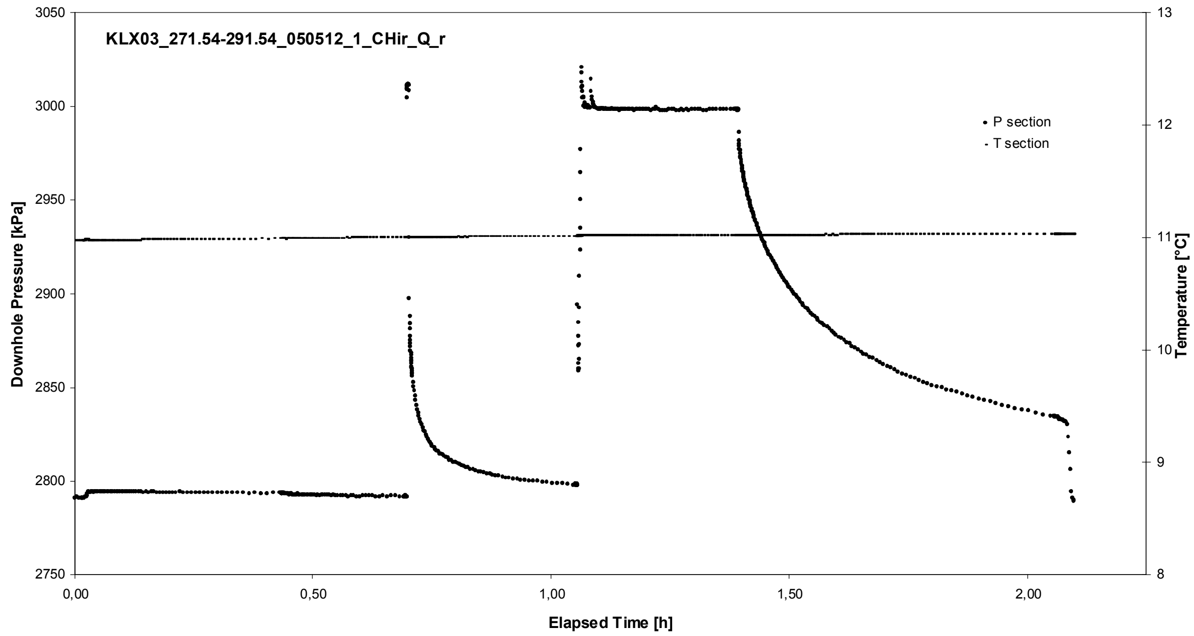
APPENDIX 2-20

Test 271.54 – 291.54 m

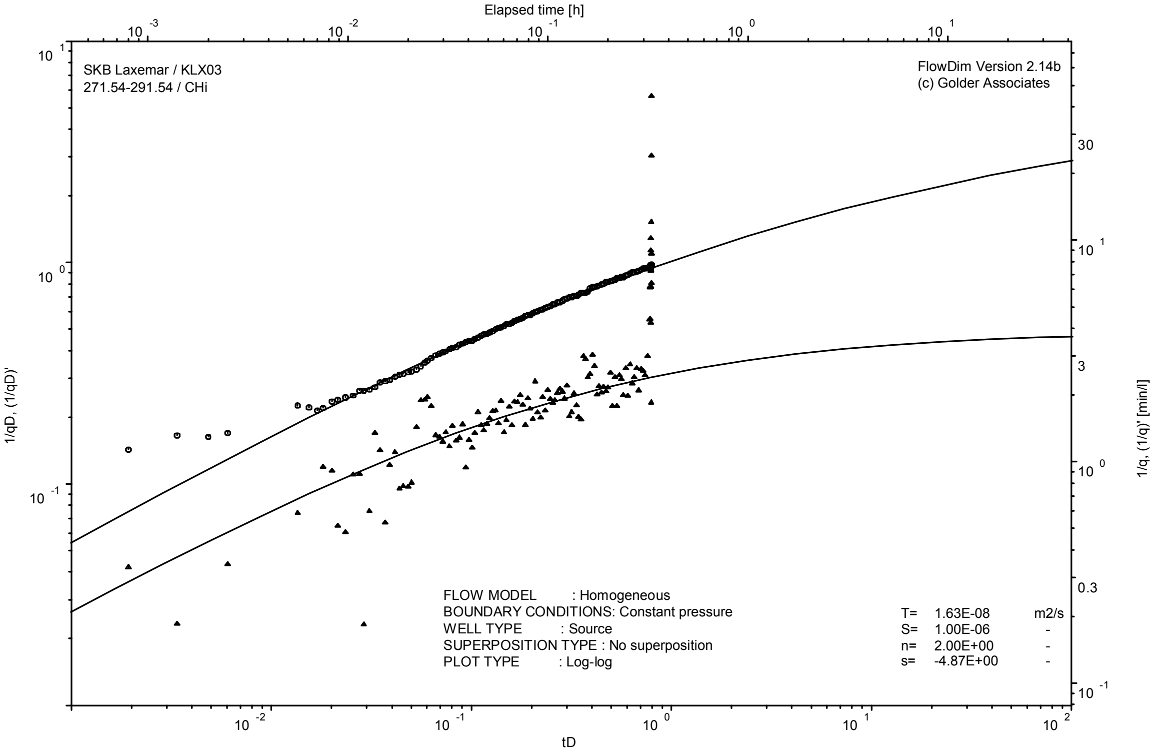
Analysis diagrams



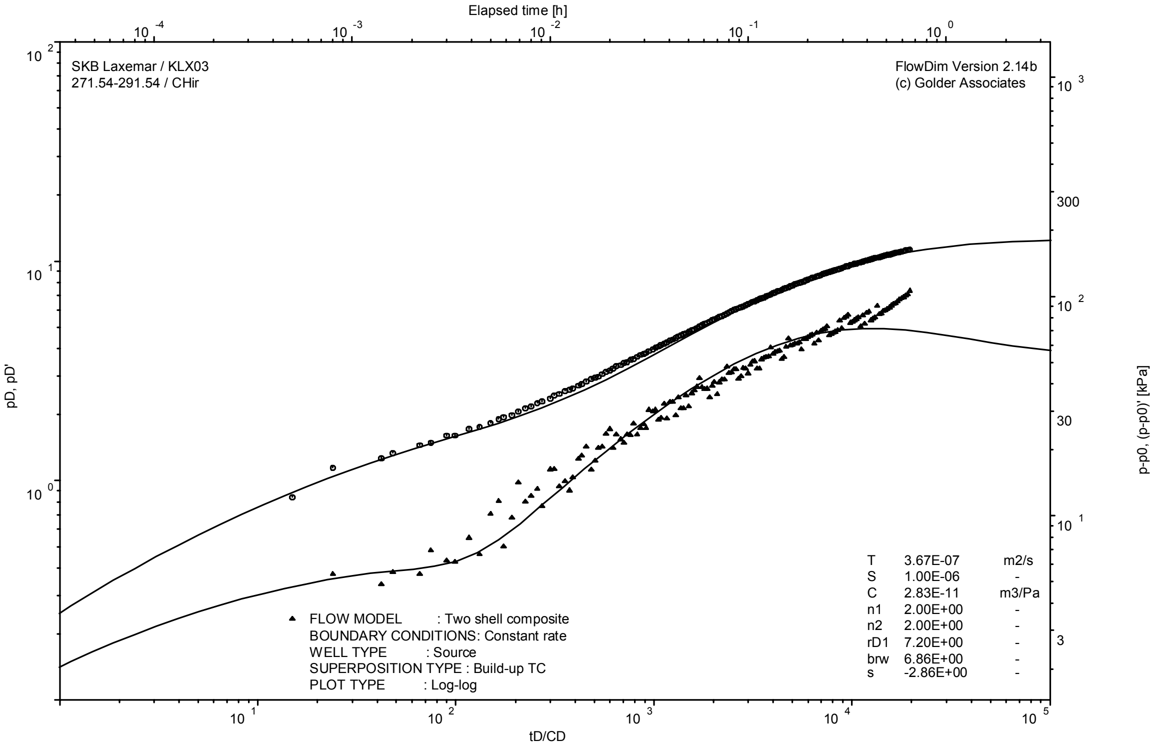
Pressure and flow rate vs. time; cartesian plot



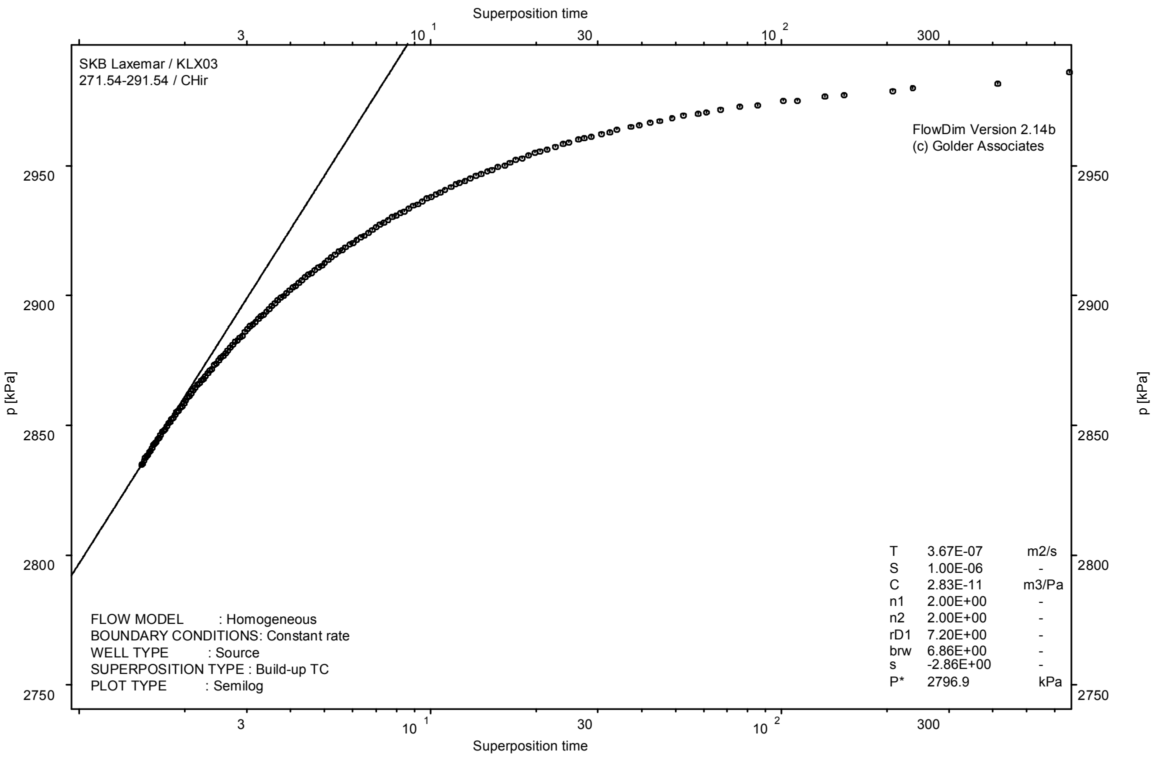
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

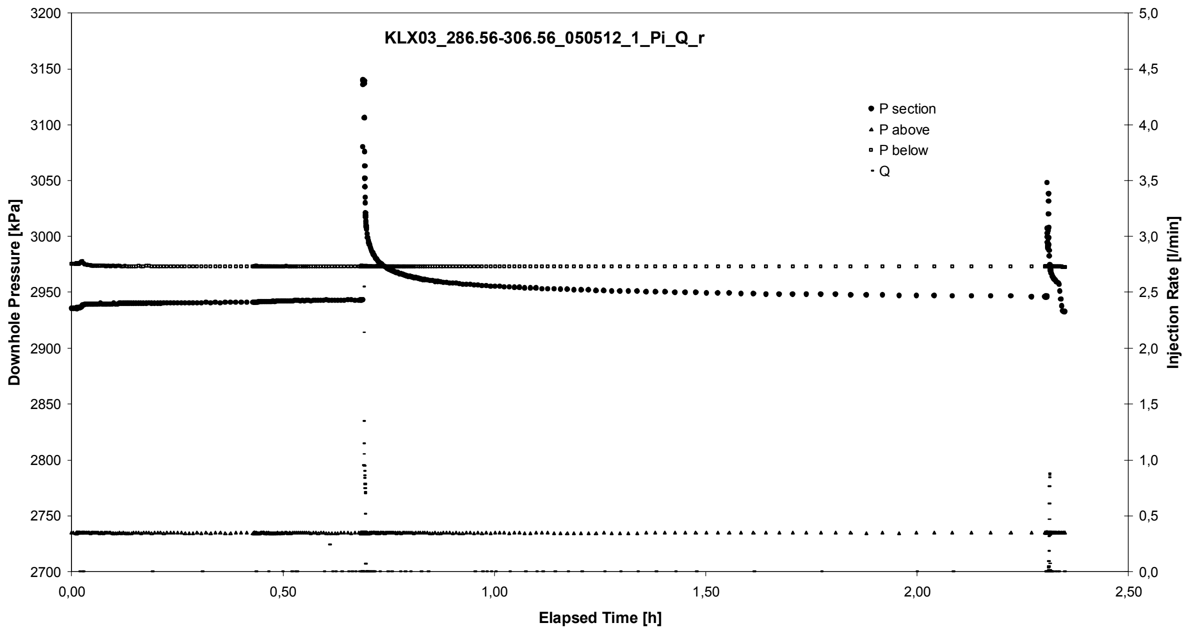


CHIR phase; HORNER match

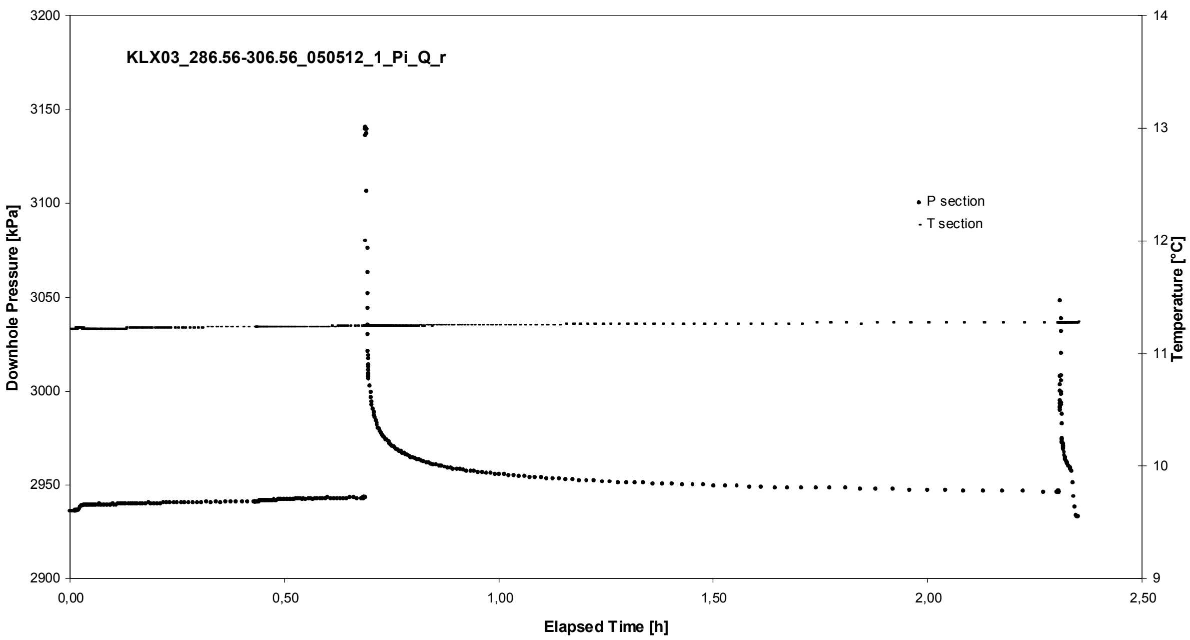
APPENDIX 2-21

Test 286.56 – 306.56 m

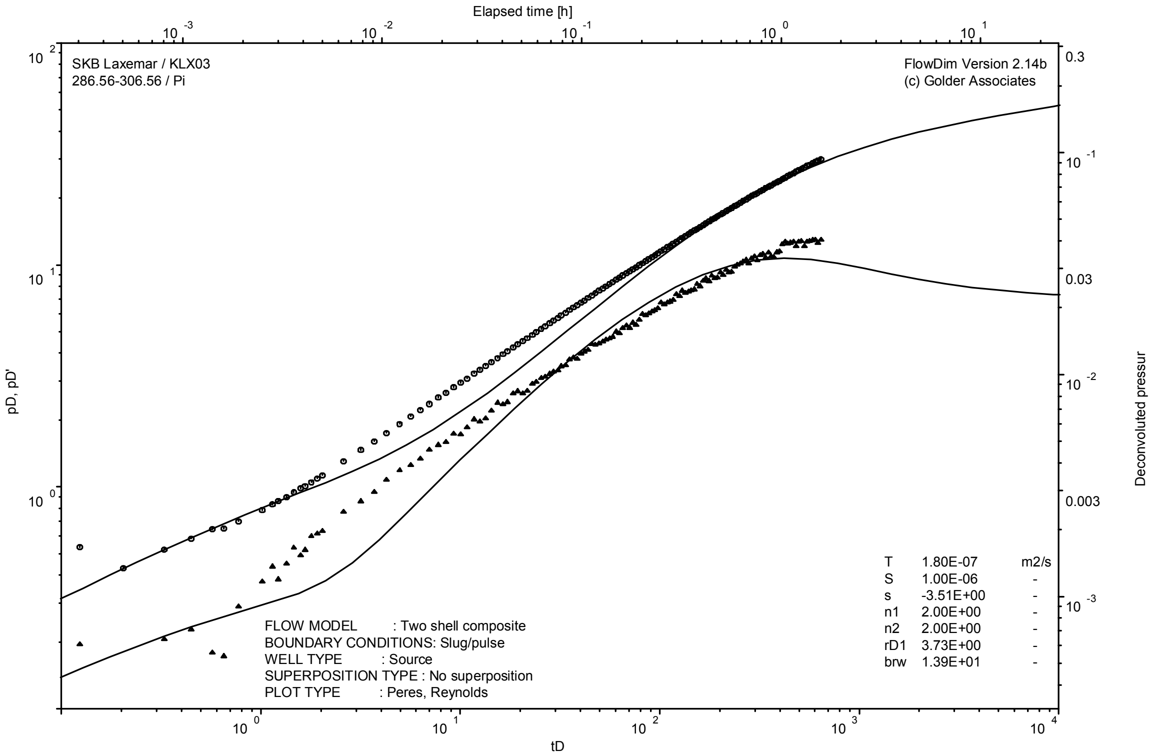
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

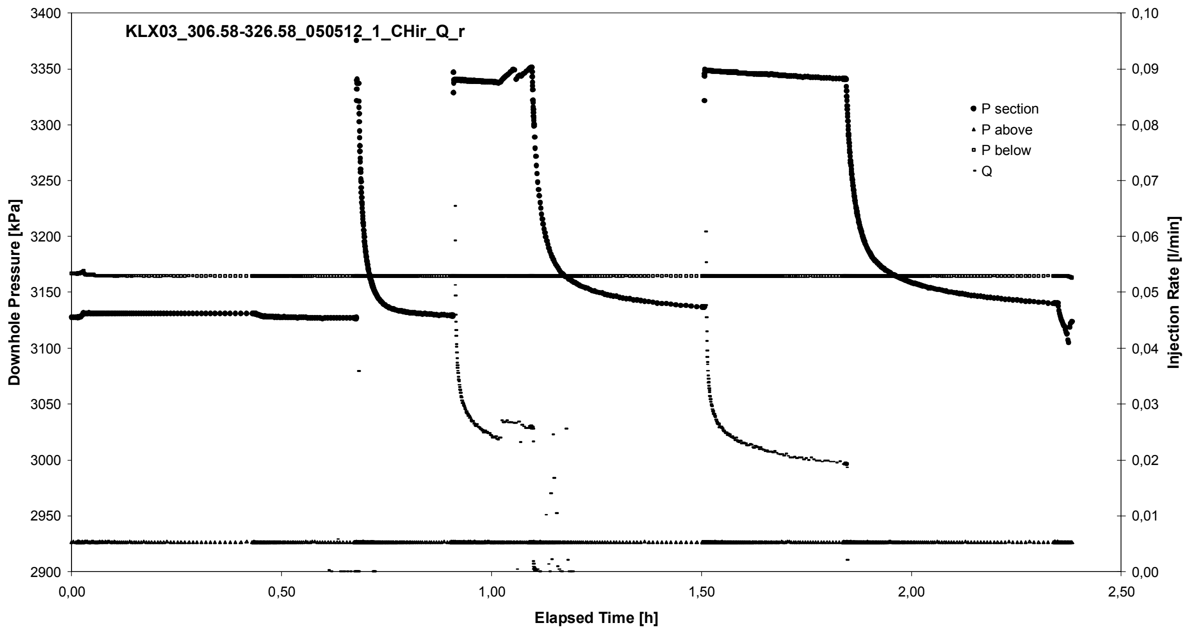


Pulse injection, deconvolution match

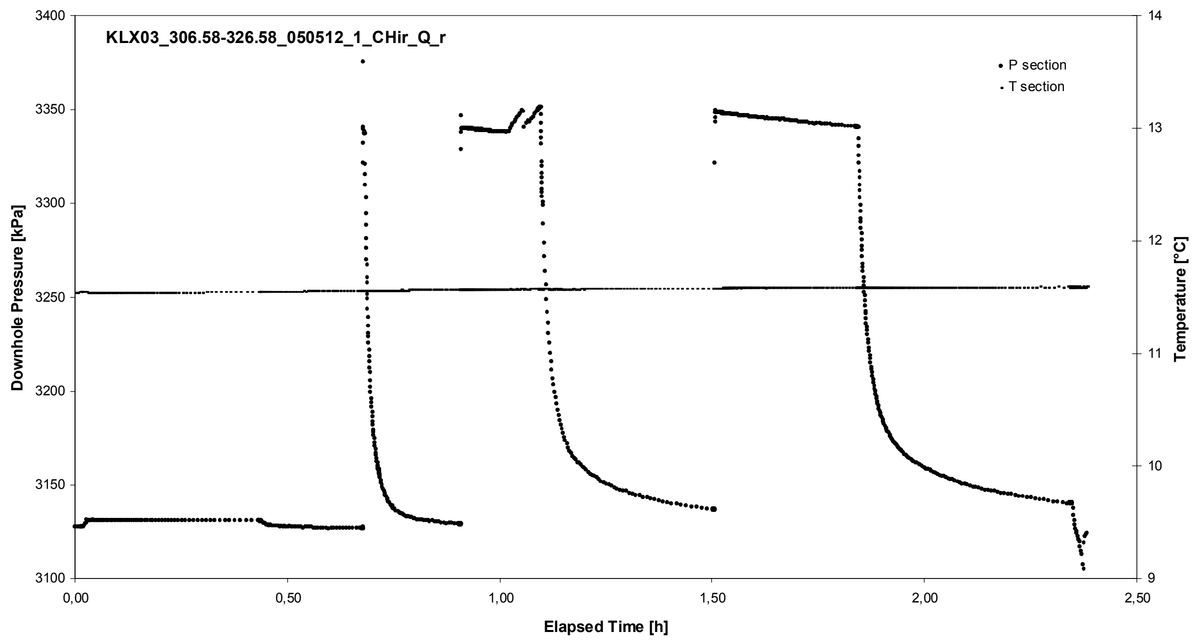
APPENDIX 2-22

Test 306.58 – 326.58 m

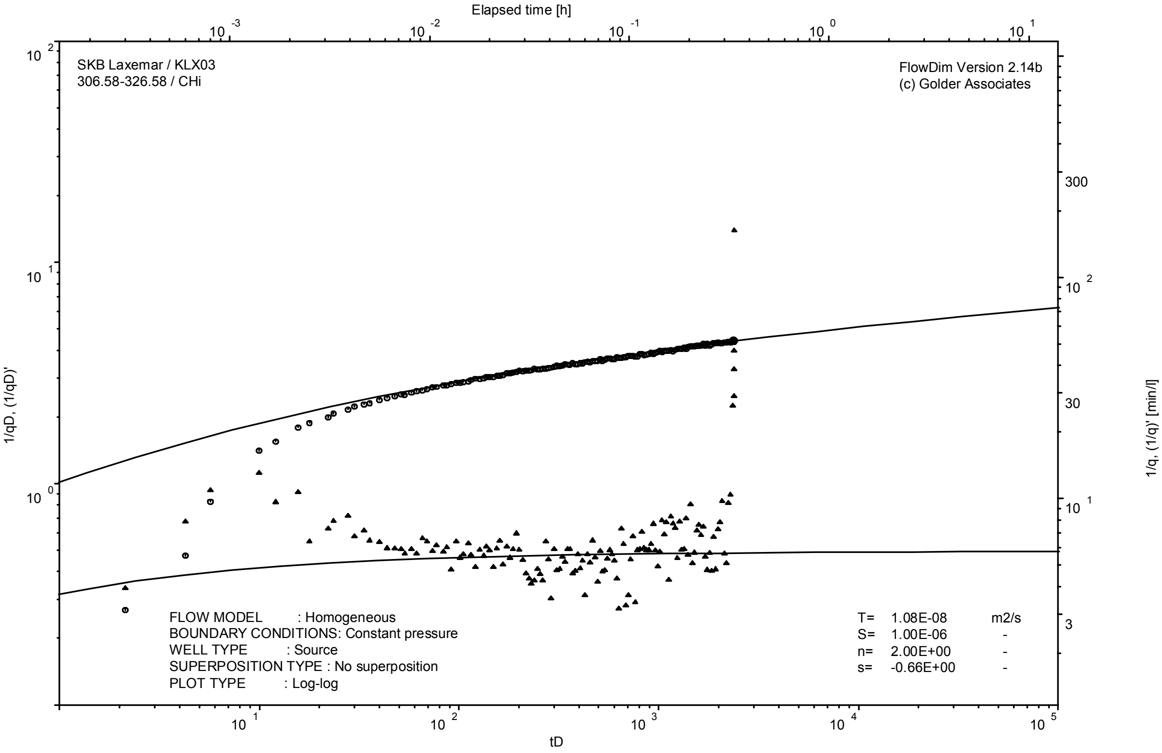
Analysis diagrams



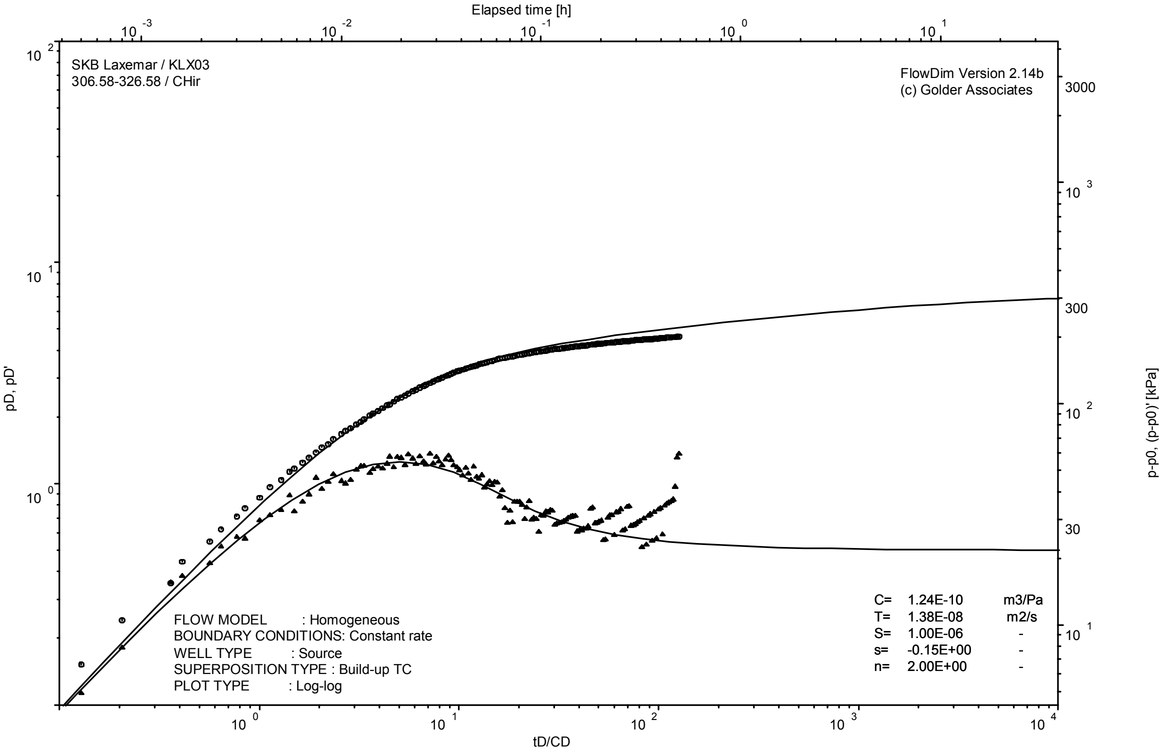
Pressure and flow rate vs. time; cartesian plot



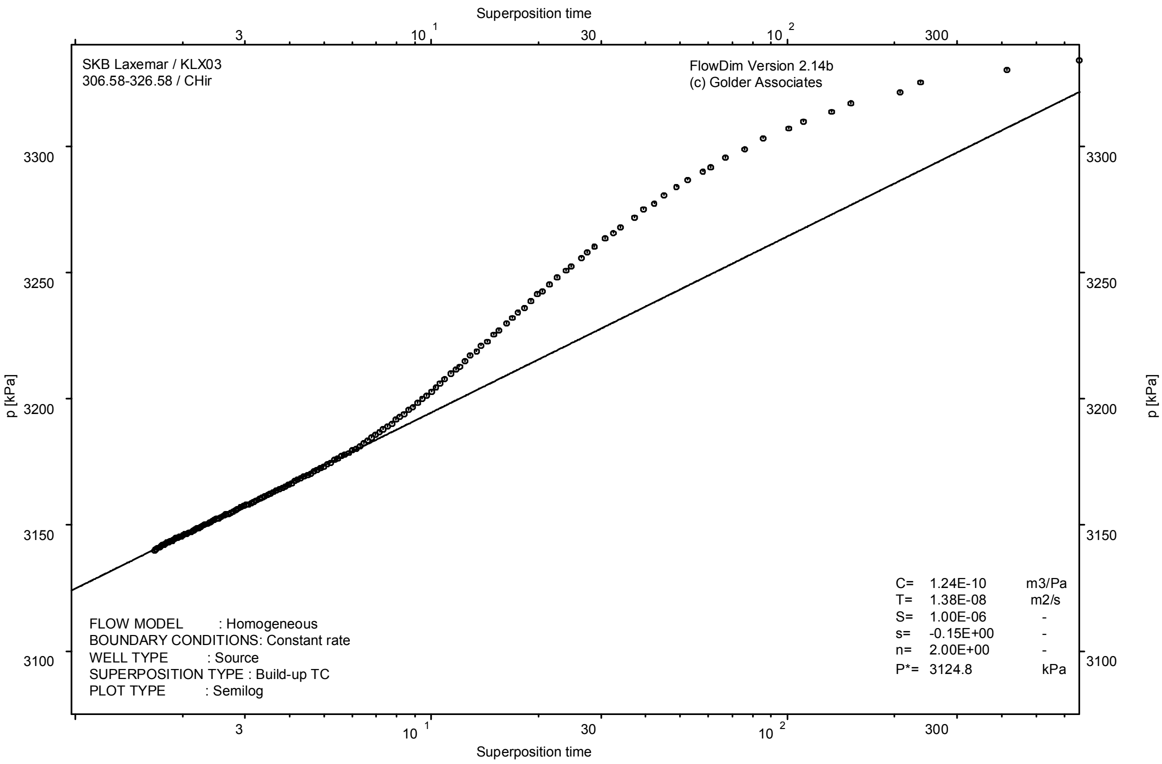
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

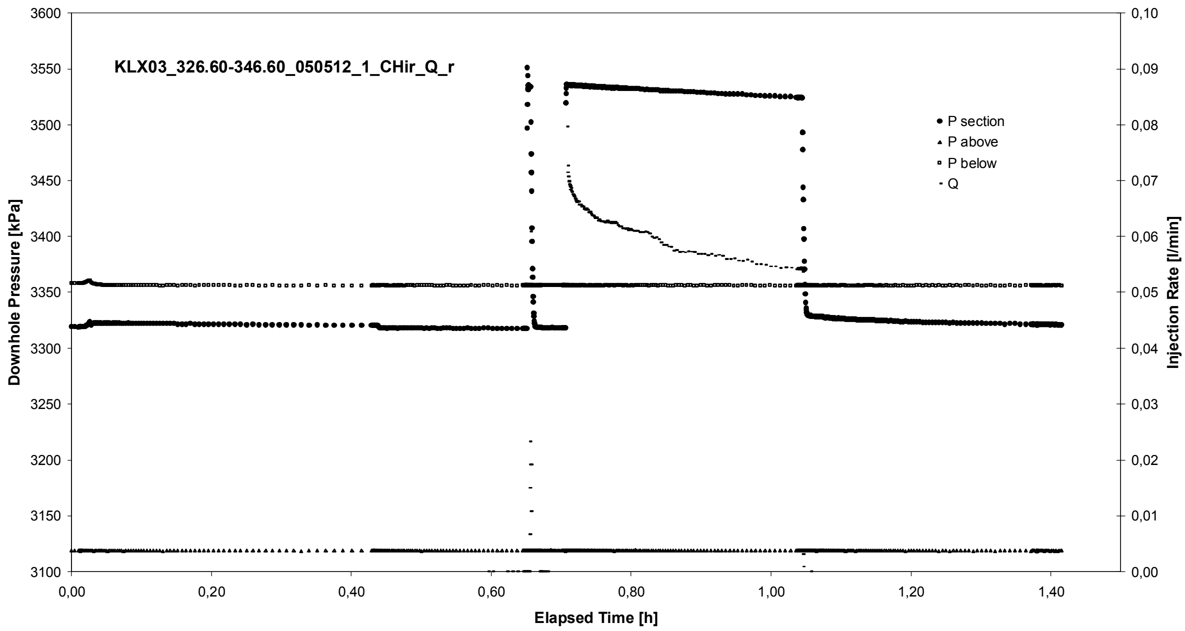


CHIR phase; HORNER match

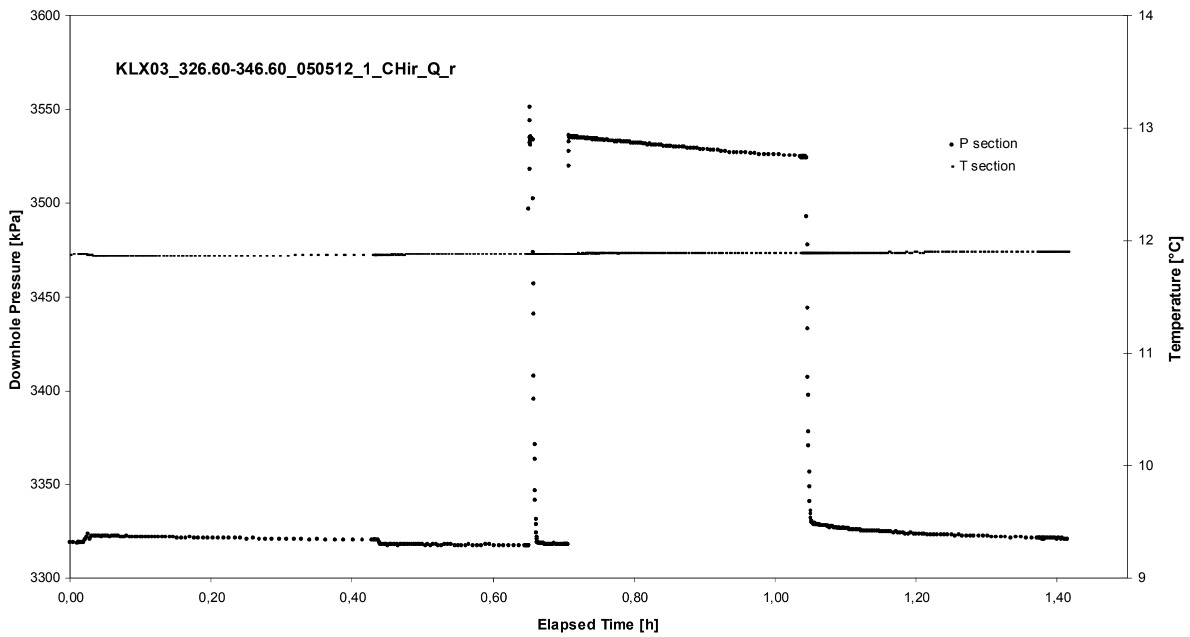
APPENDIX 2-23

Test 326.60 – 346.60 m

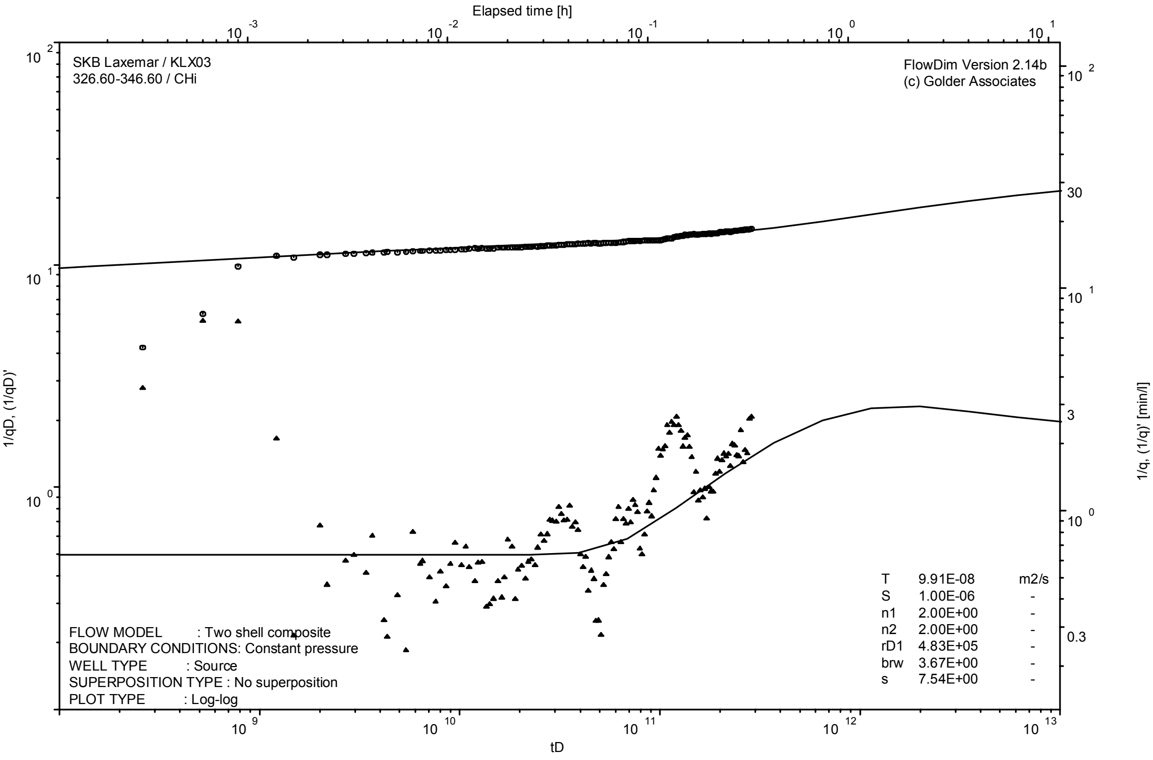
Analysis diagrams



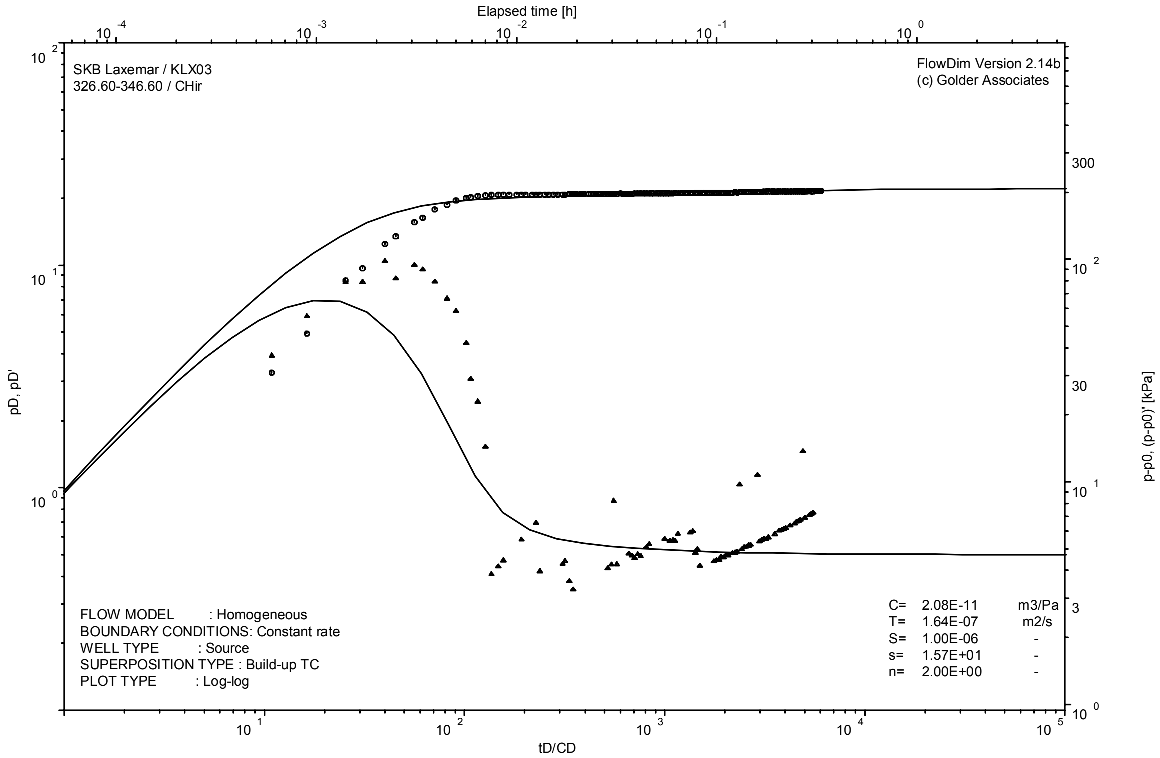
Pressure and flow rate vs. time; cartesian plot



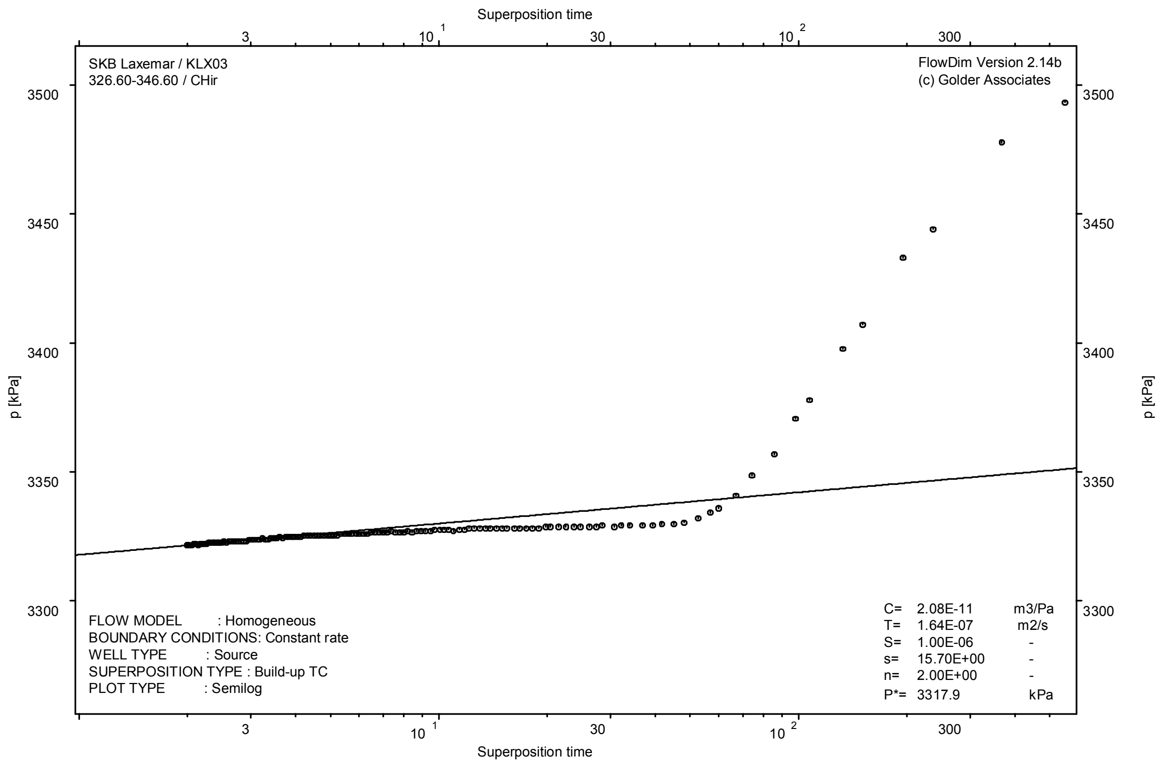
Interval pressure and temperature vs. time; cartesian plot



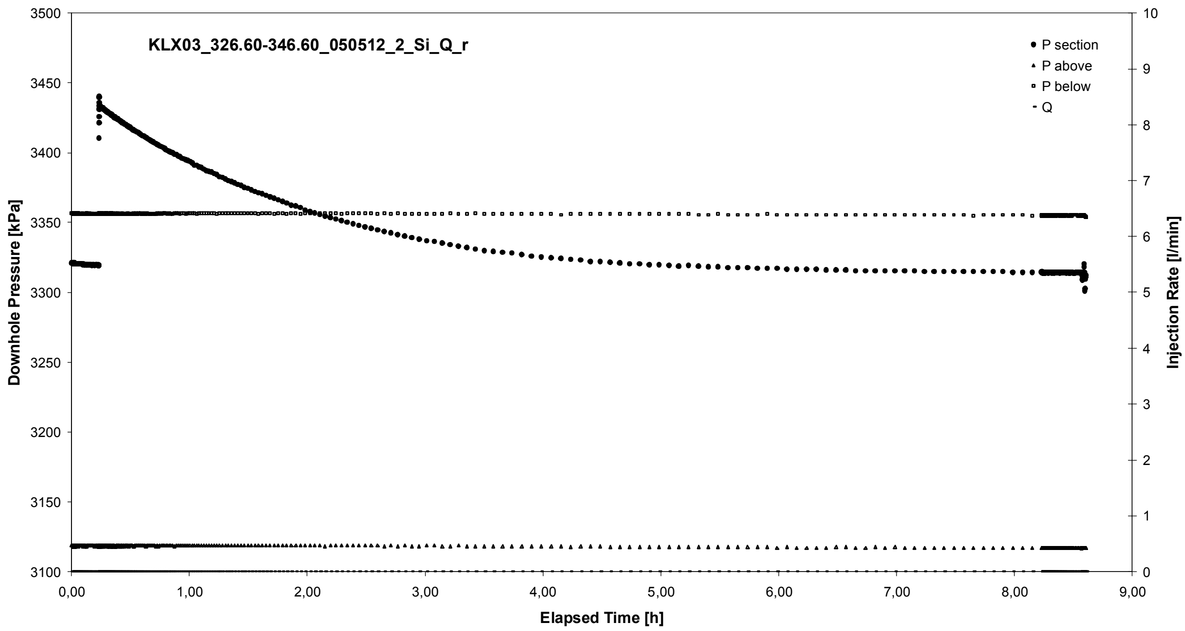
CHI phase; log-log match



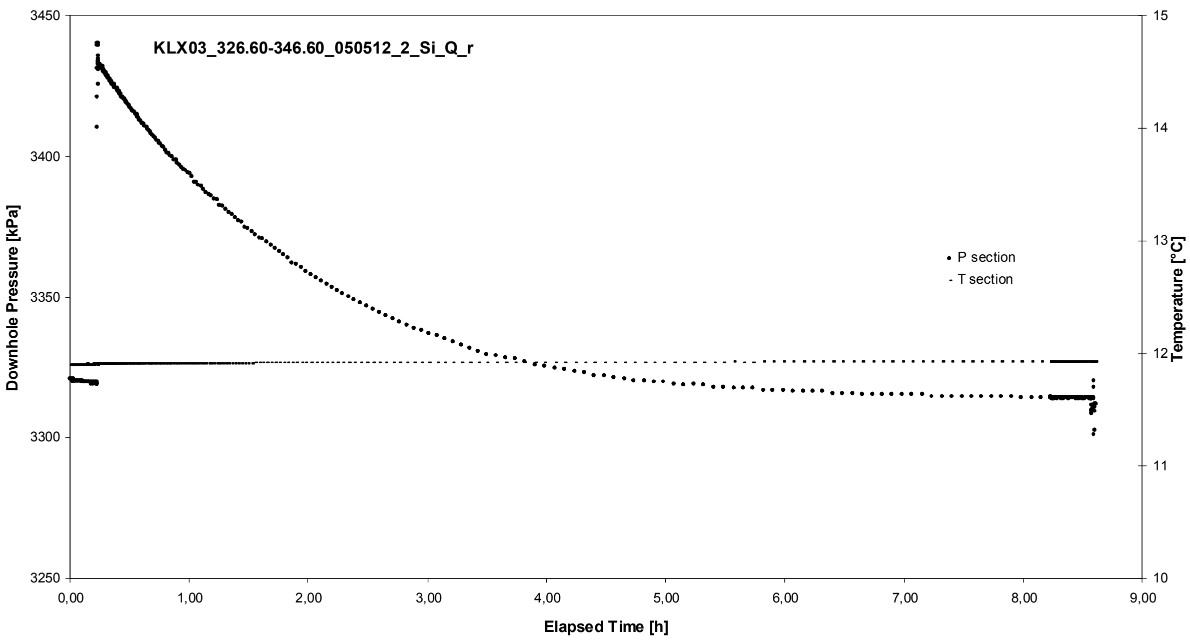
CHIR phase; log-log match



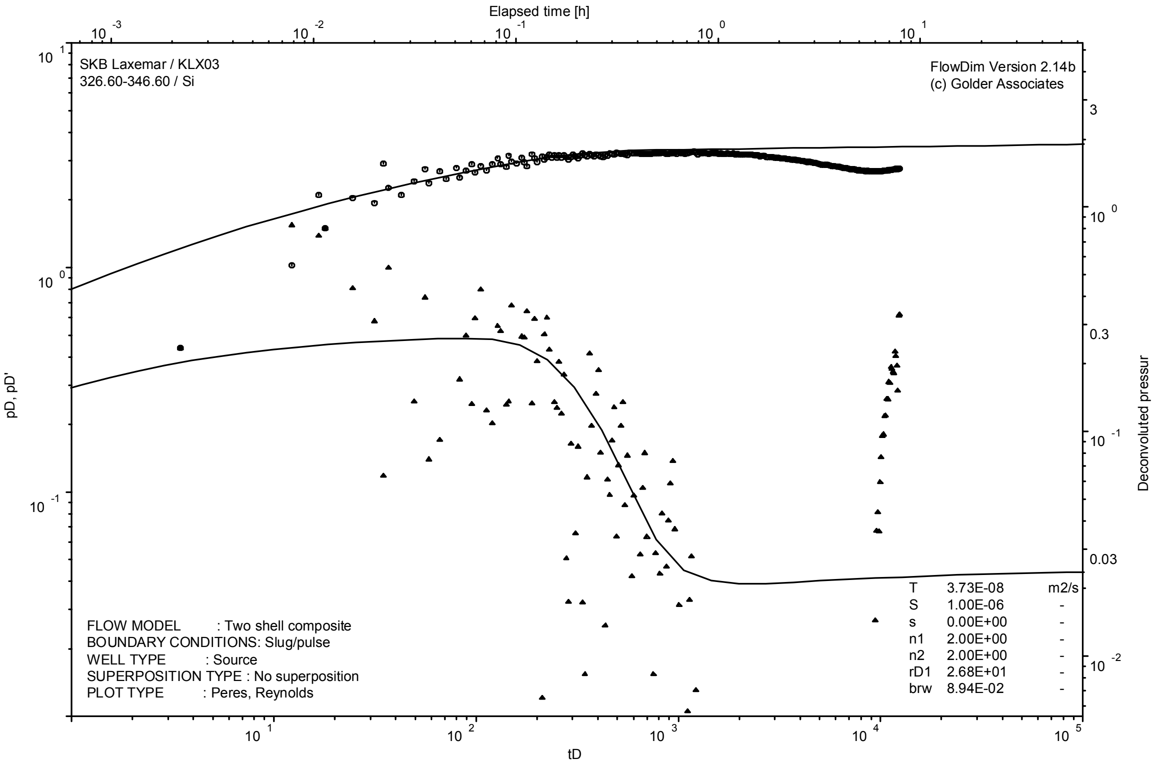
CHIR phase; HORNER match



Pressure and flow rate vs. time; cartesian plot, long term measured over night



Interval pressure and temperature vs. time; cartesian plot, long term measured over night

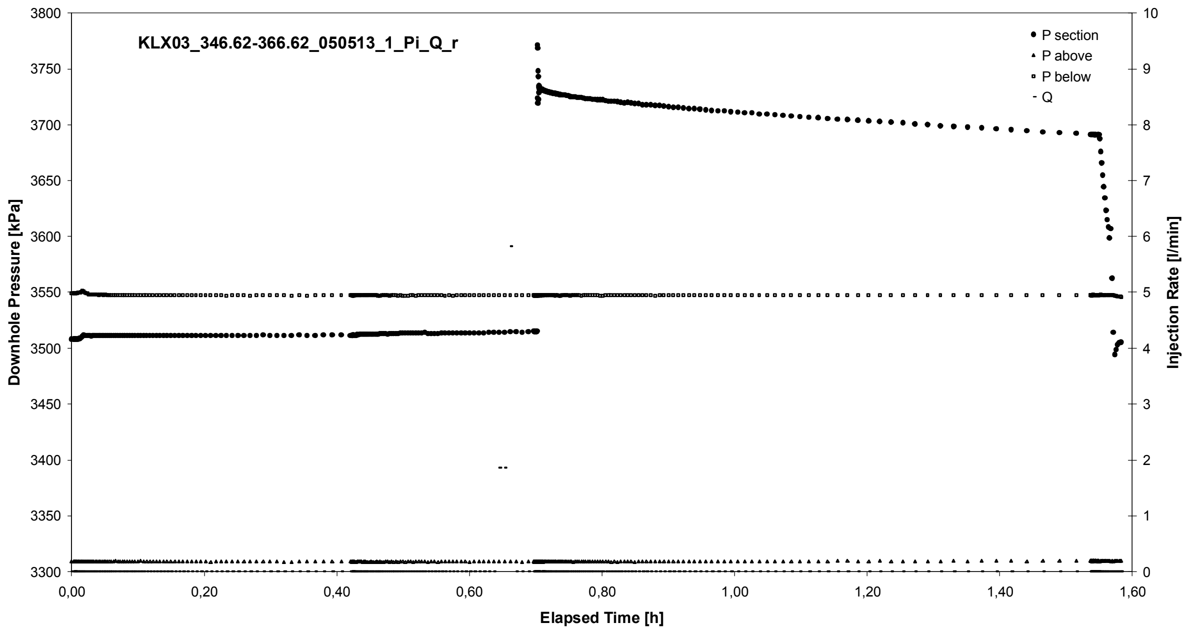


SI phase; log-log match, long term measured over night

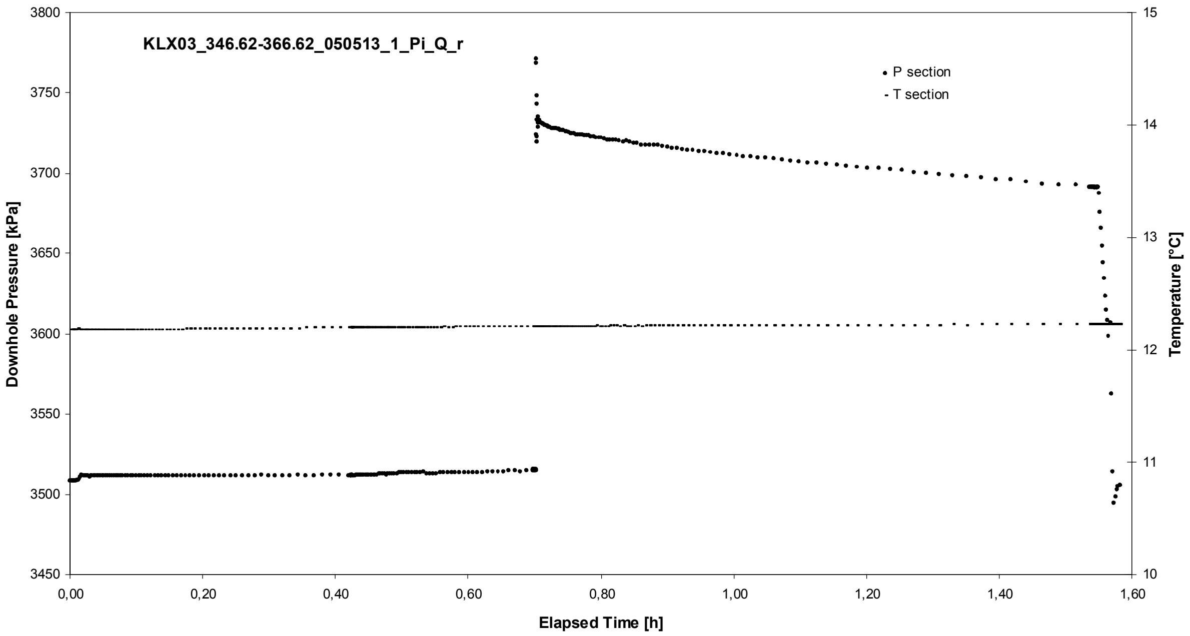
APPENDIX 2-24

Test 346.62 – 366.62 m

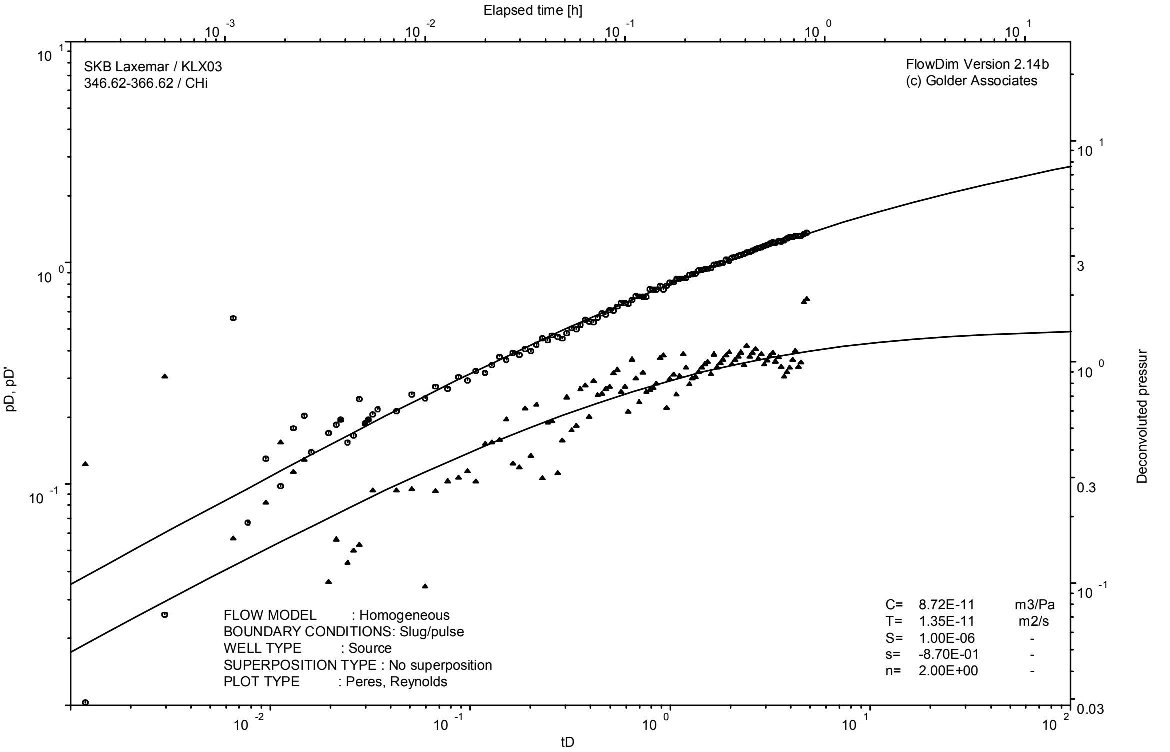
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

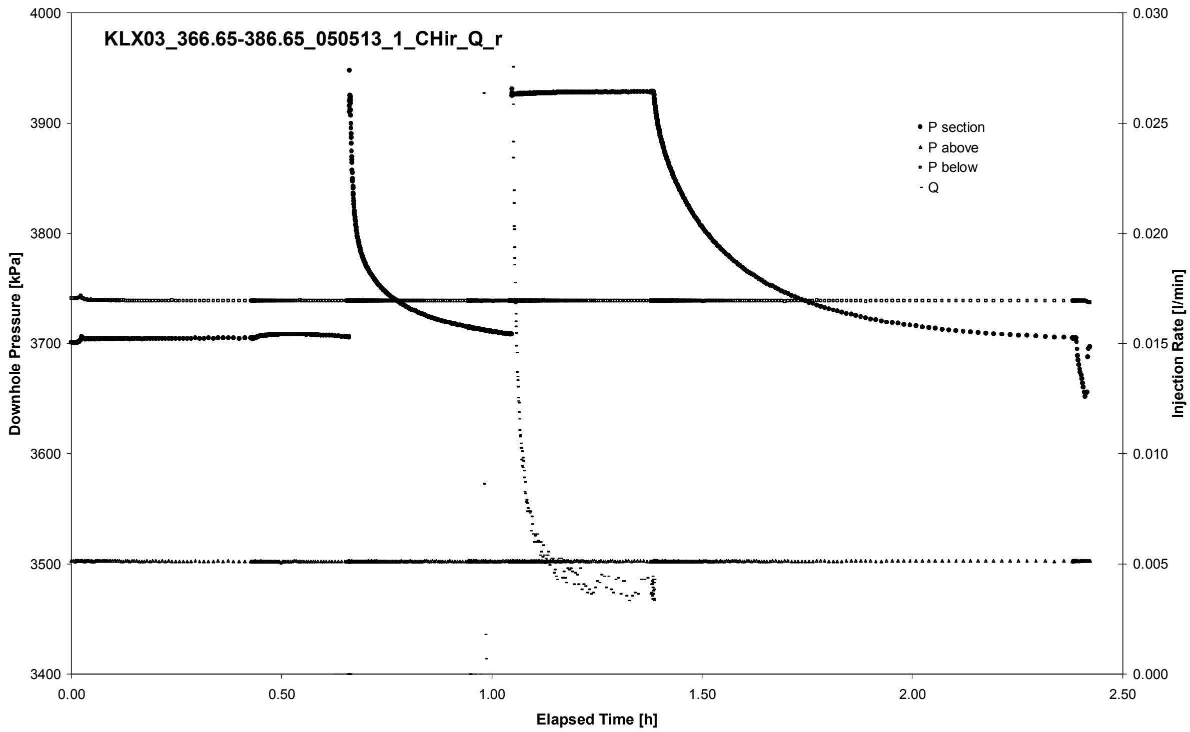


Pulse injection; deconvolution match

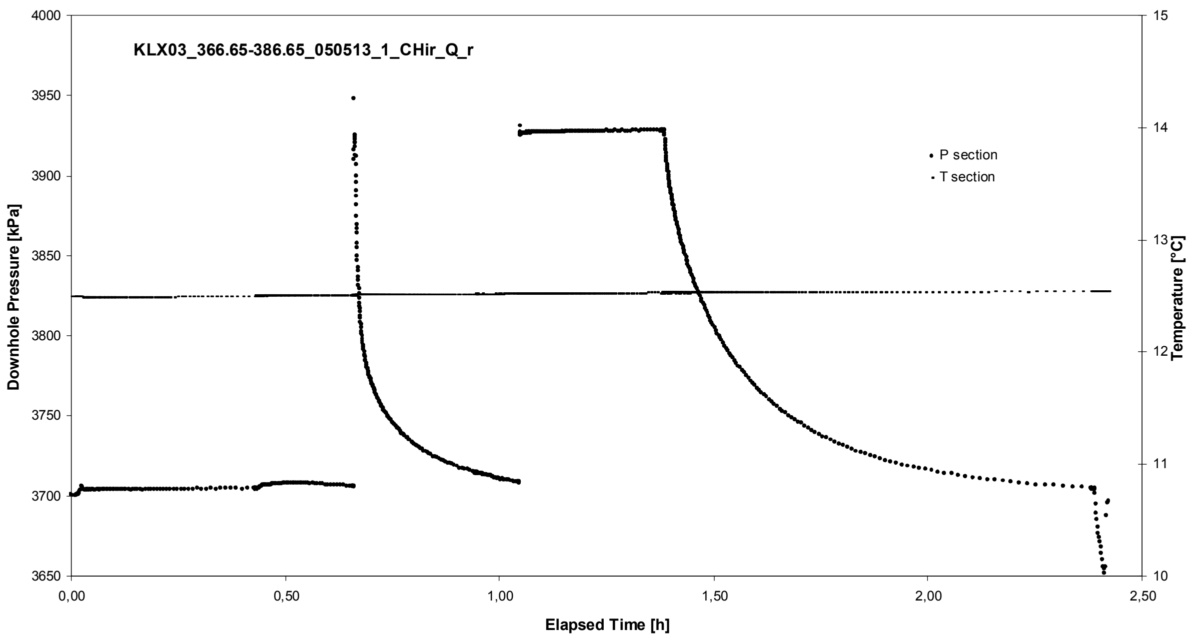
APPENDIX 2-25

Test 366.65 – 386.65 m

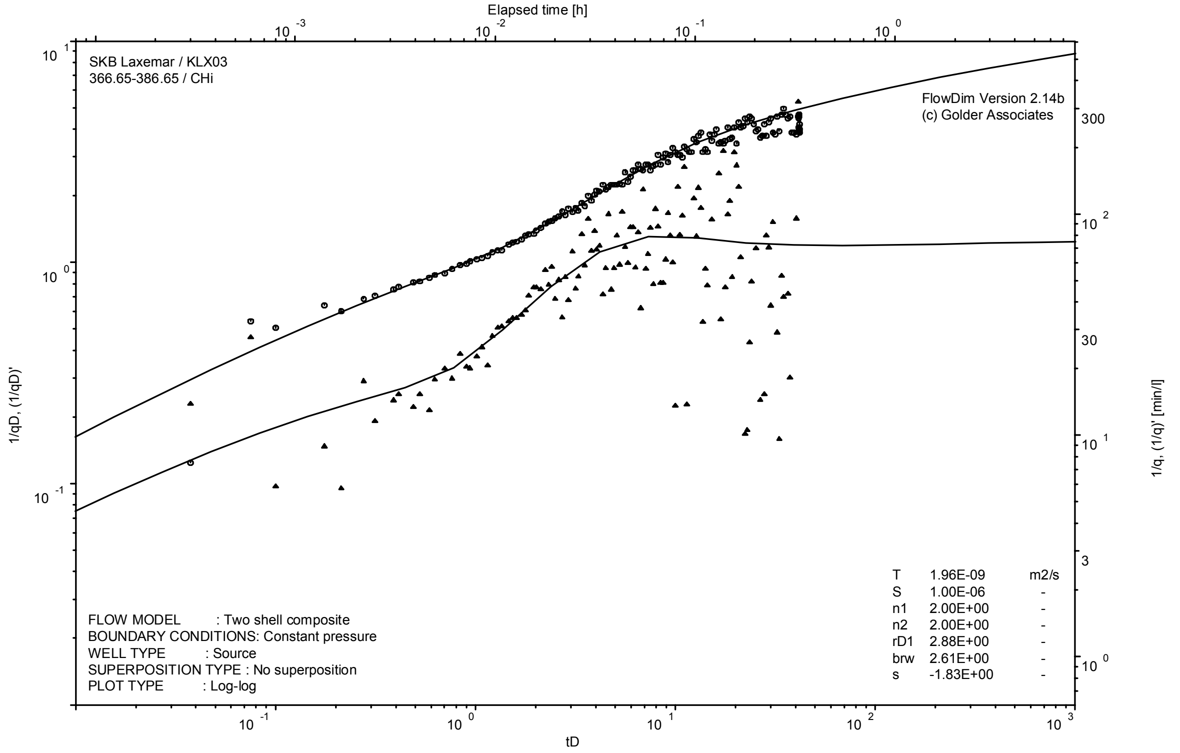
Analysis diagrams



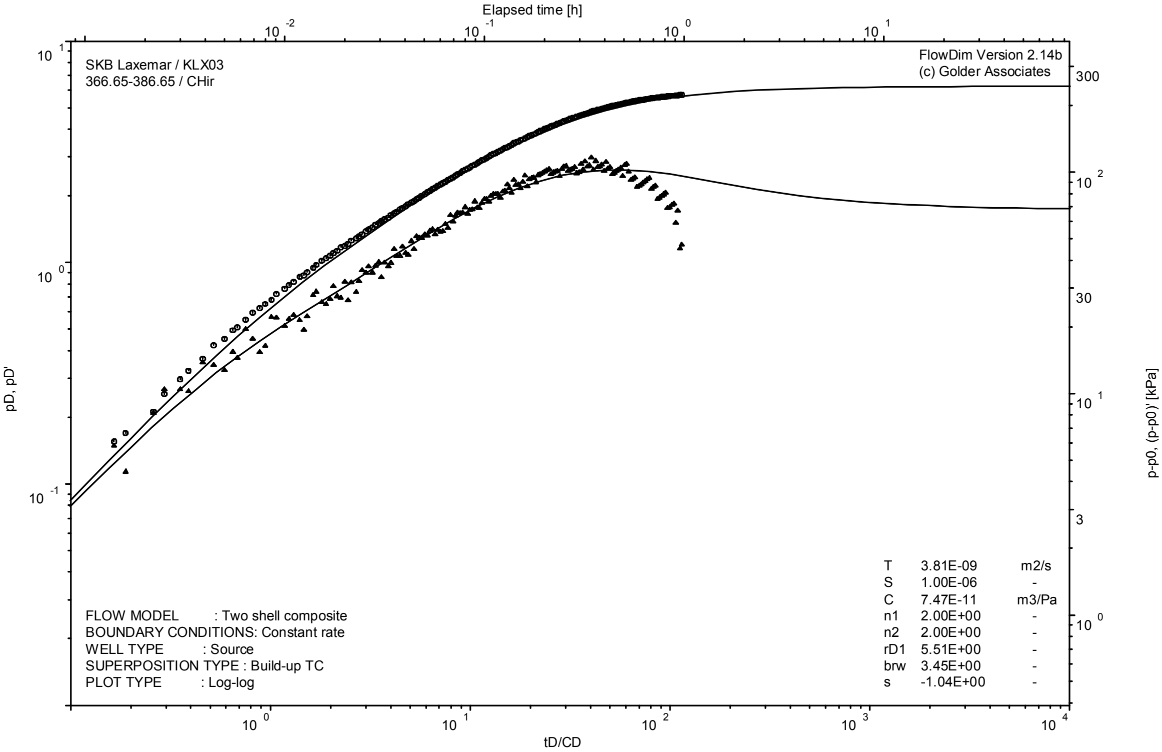
Pressure and flow rate vs. time; cartesian plot



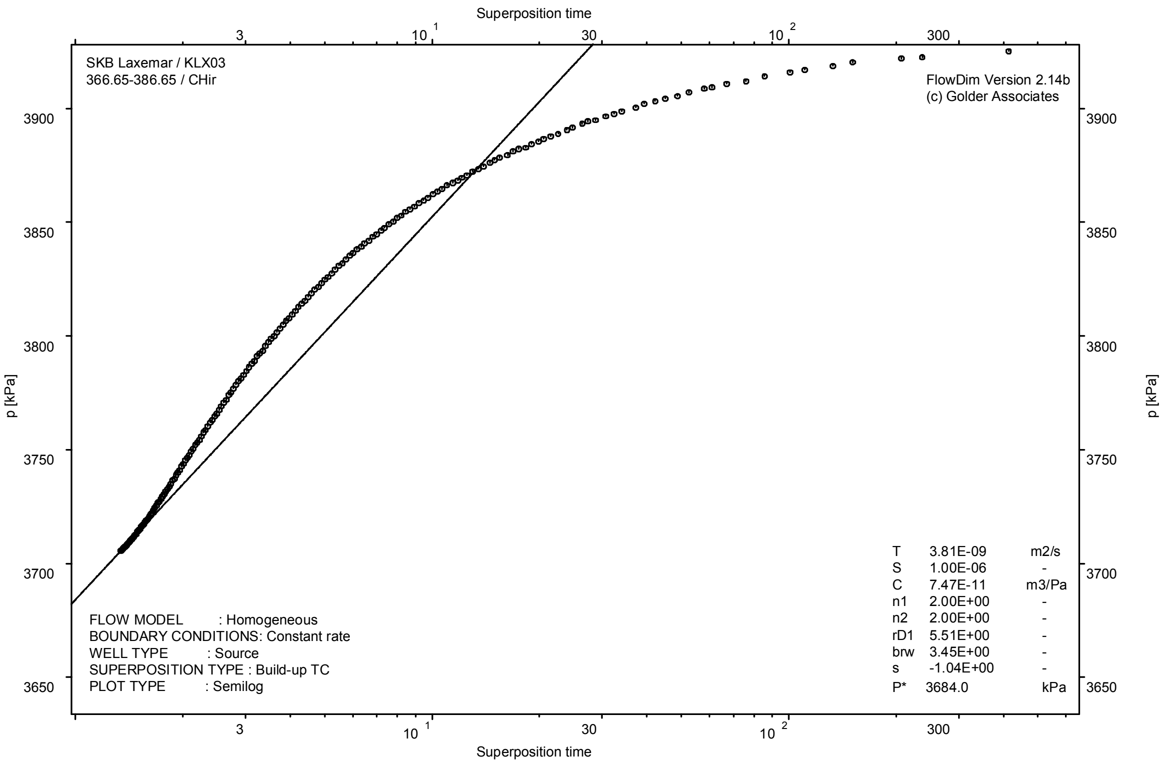
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

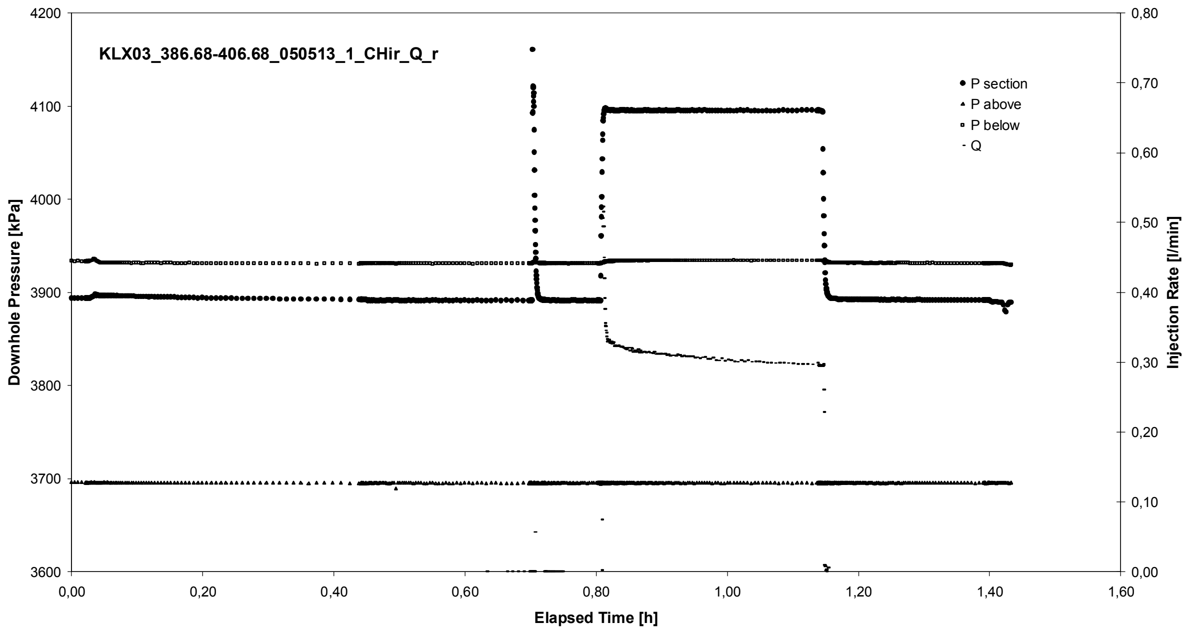


CHIR phase; HORNER match

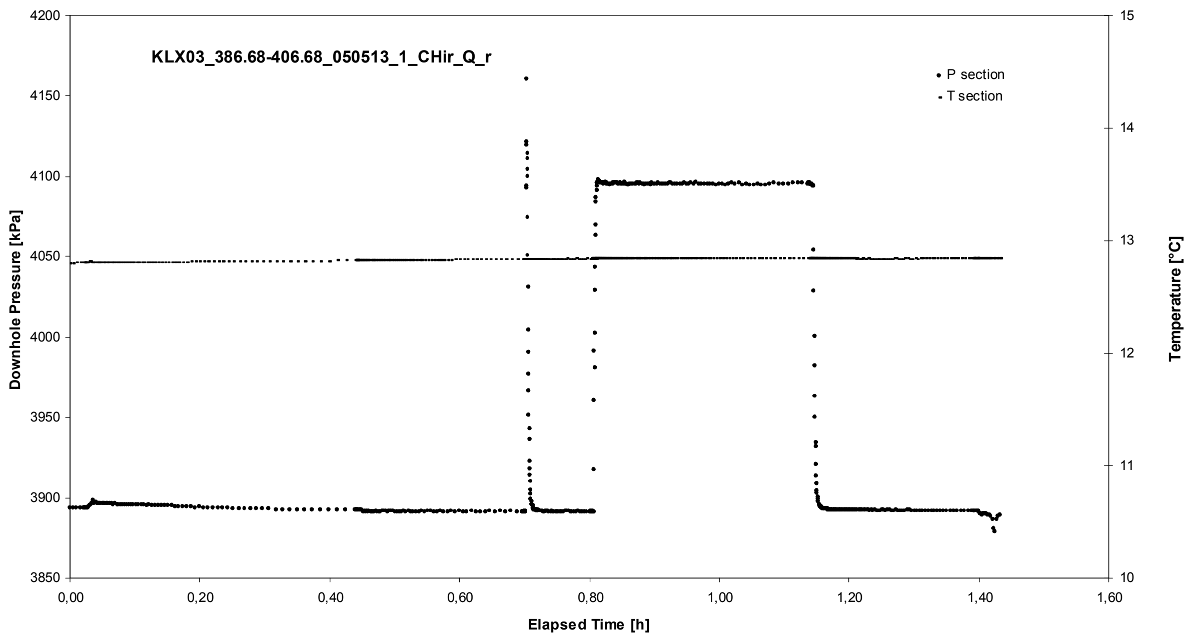
APPENDIX 2-26

Test 386.68 – 406.68 m

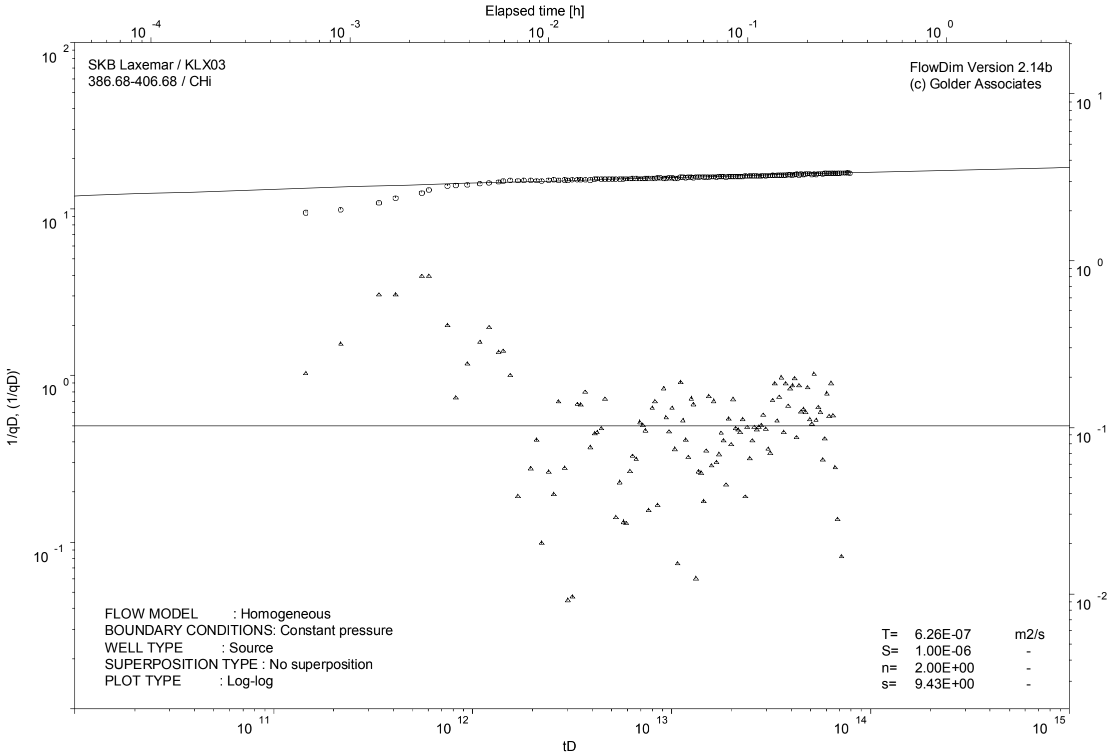
Analysis diagrams



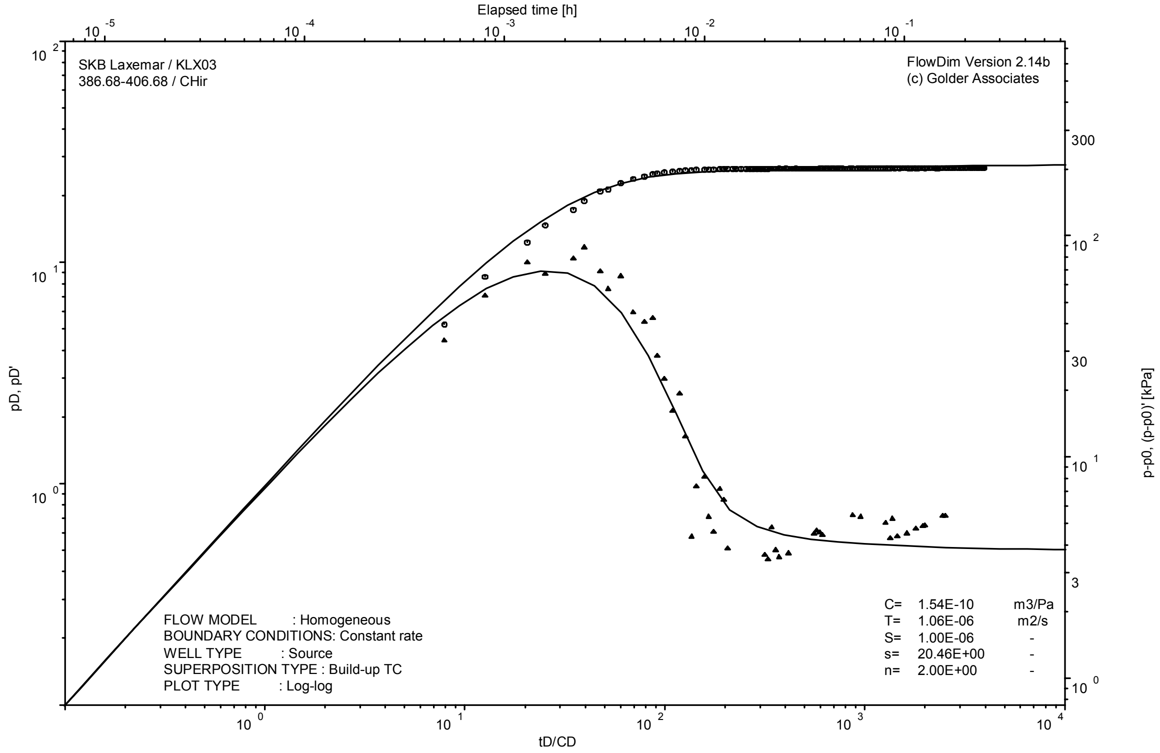
Pressure and flow rate vs. time; cartesian plot



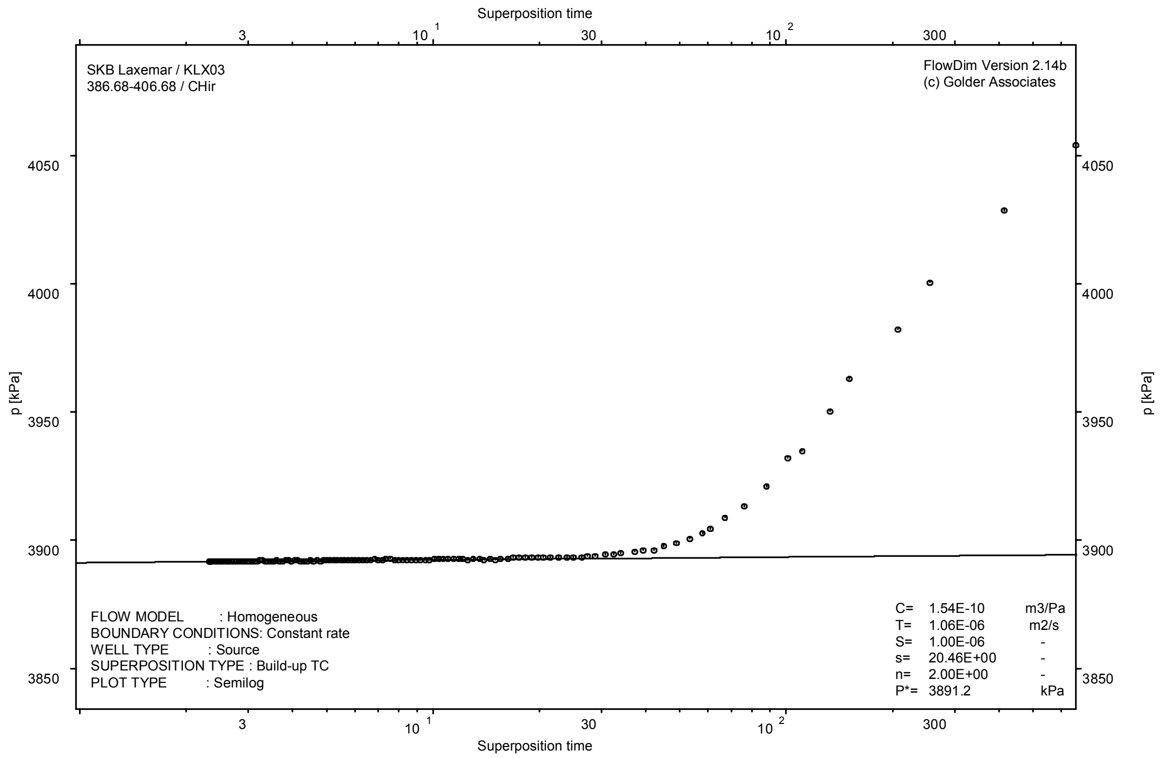
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

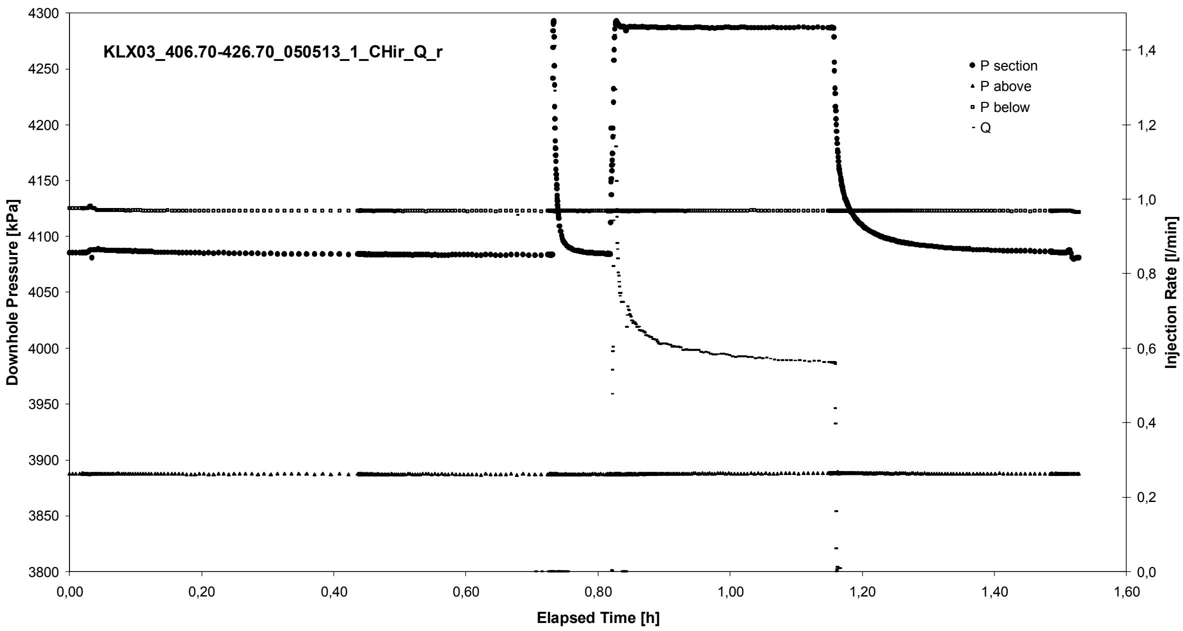


CHIR phase; HORNER match

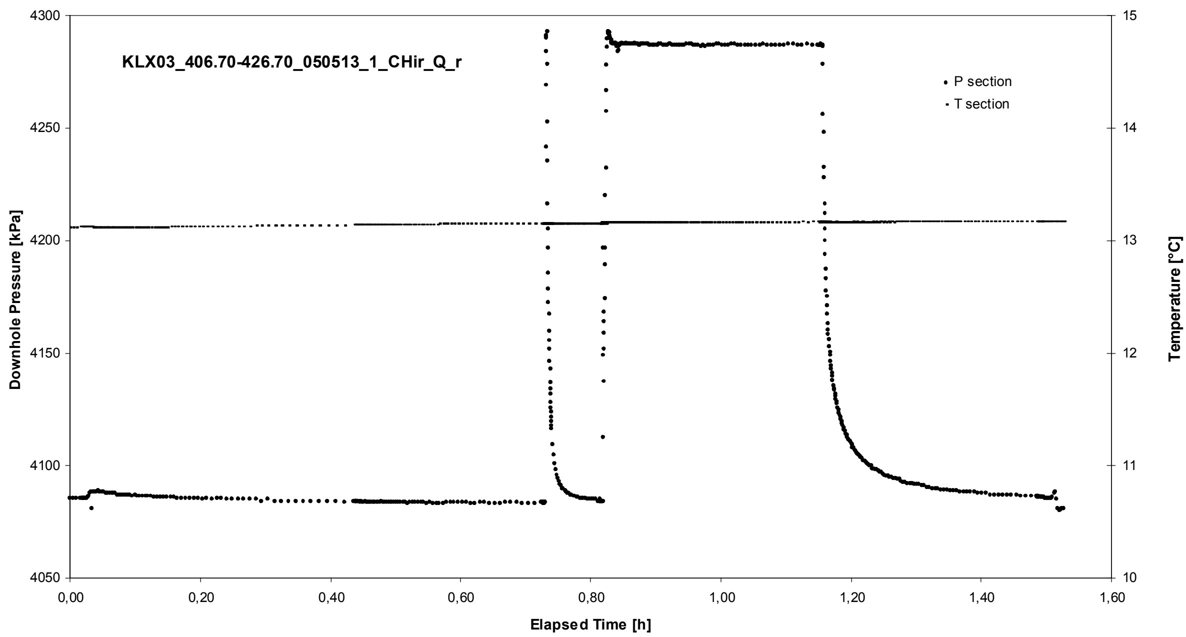
APPENDIX 2-27

Test 406.70 – 426.70 m

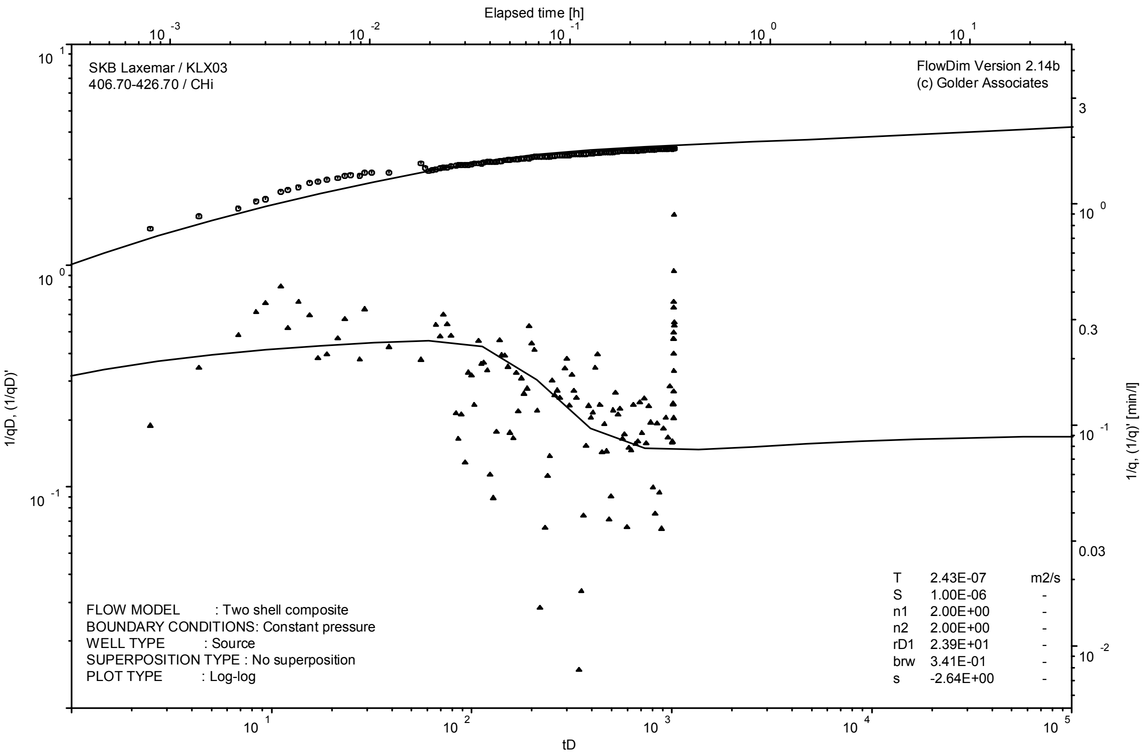
Analysis diagrams



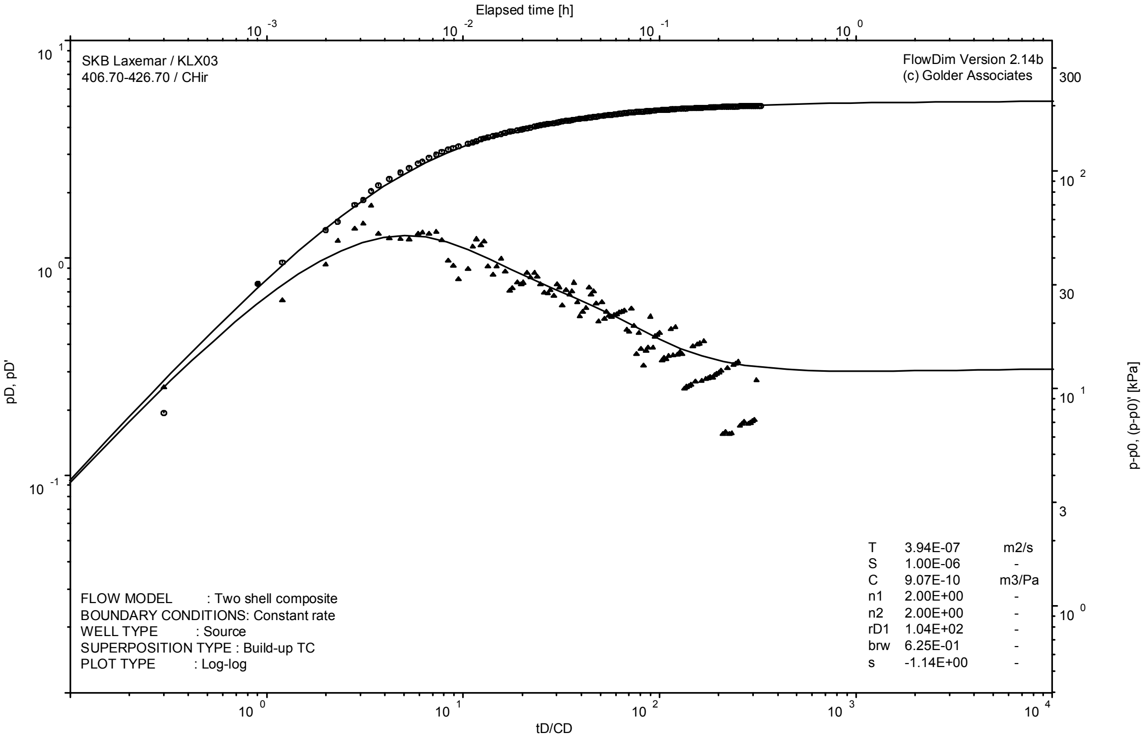
Pressure and flow rate vs. time; cartesian plot



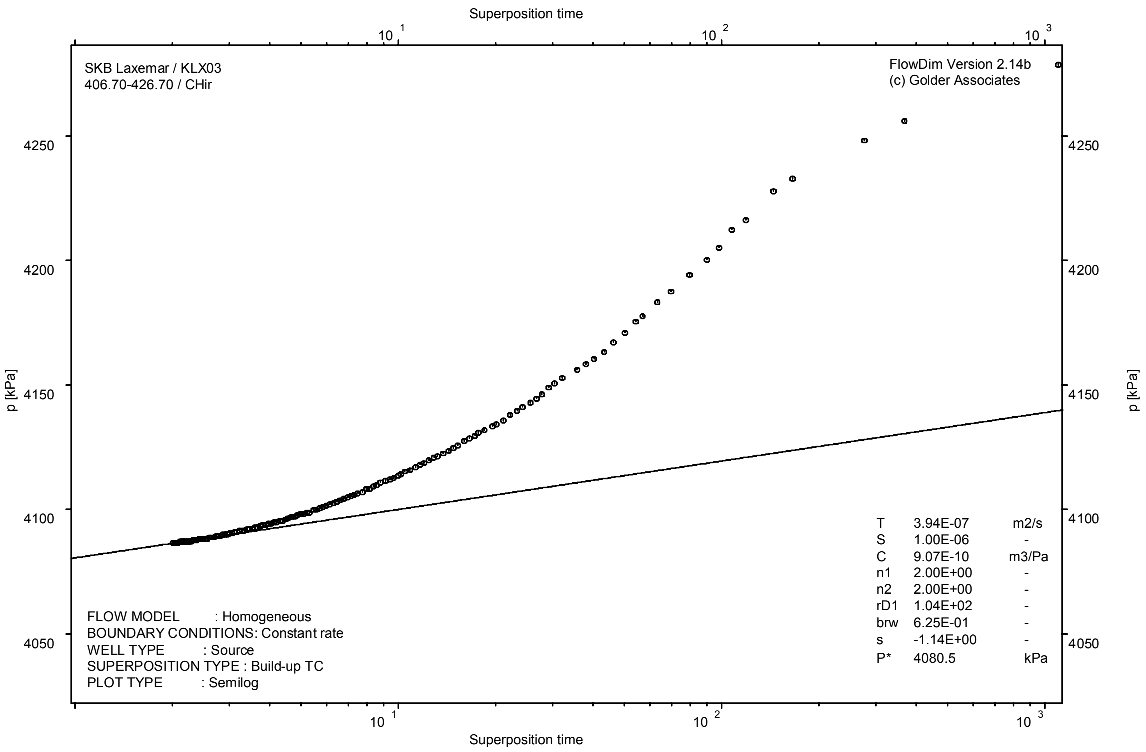
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

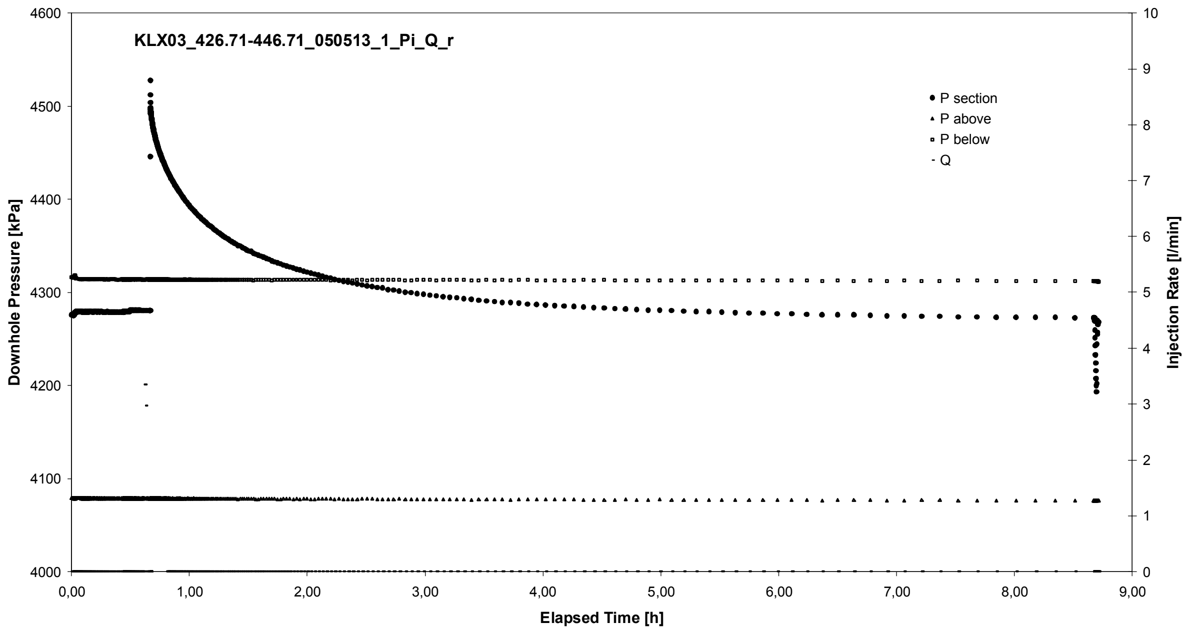


CHIR phase; HORNER match

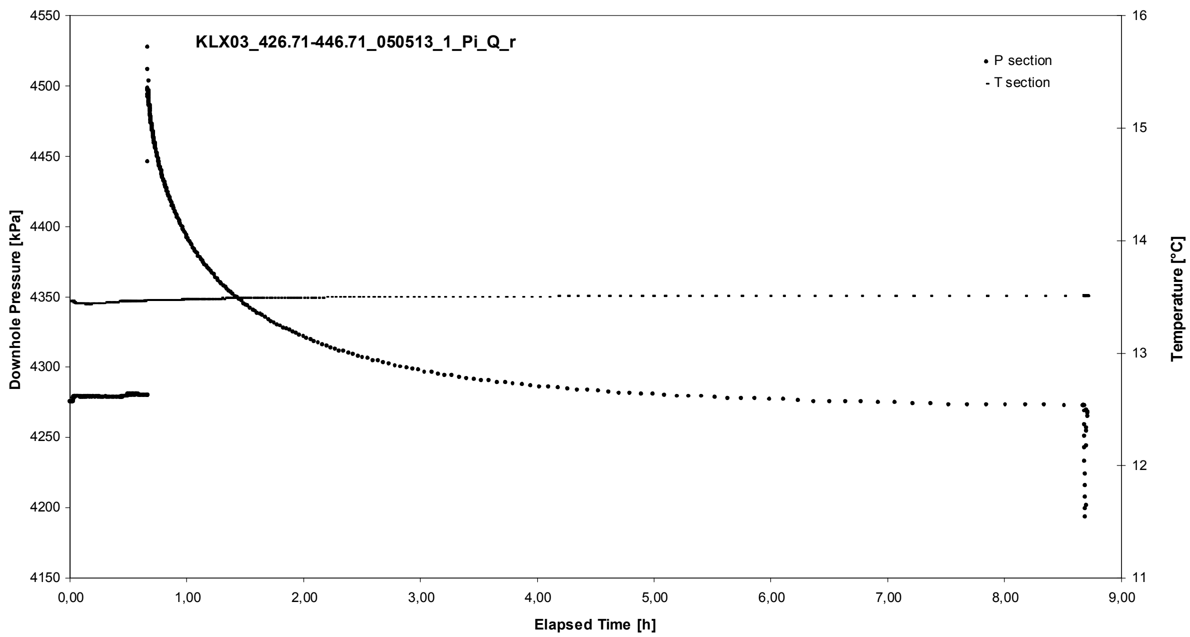
APPENDIX 2-28

Test 426.71 – 446.71 m

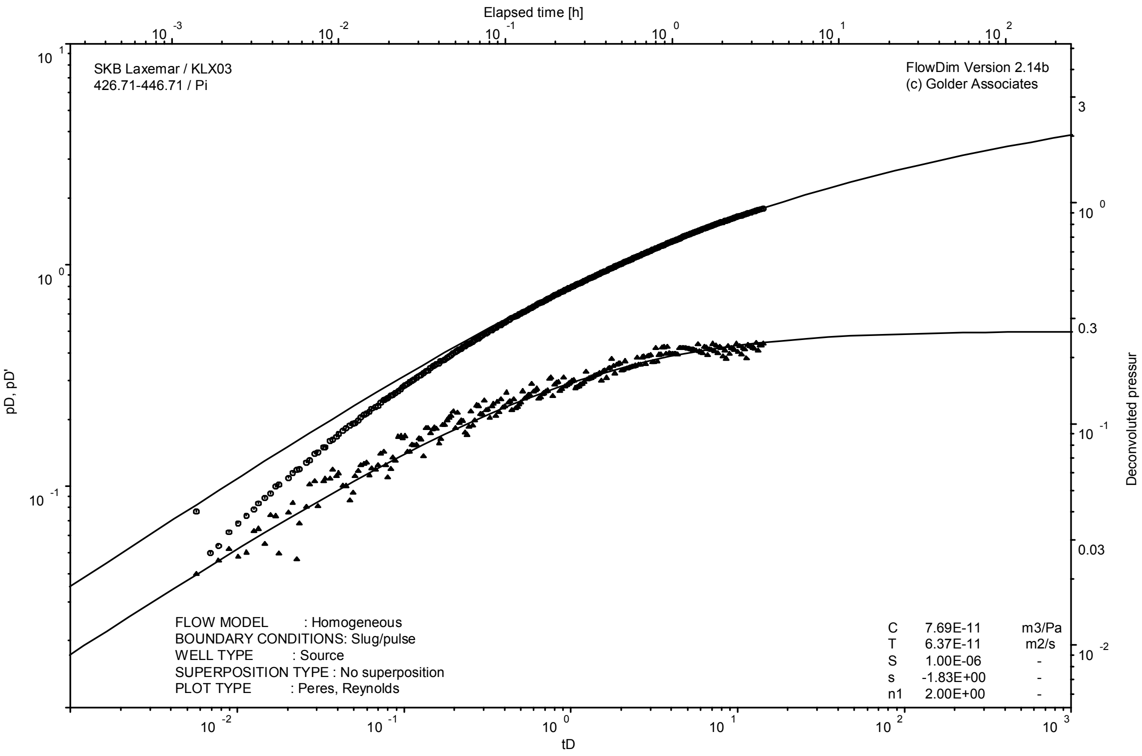
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

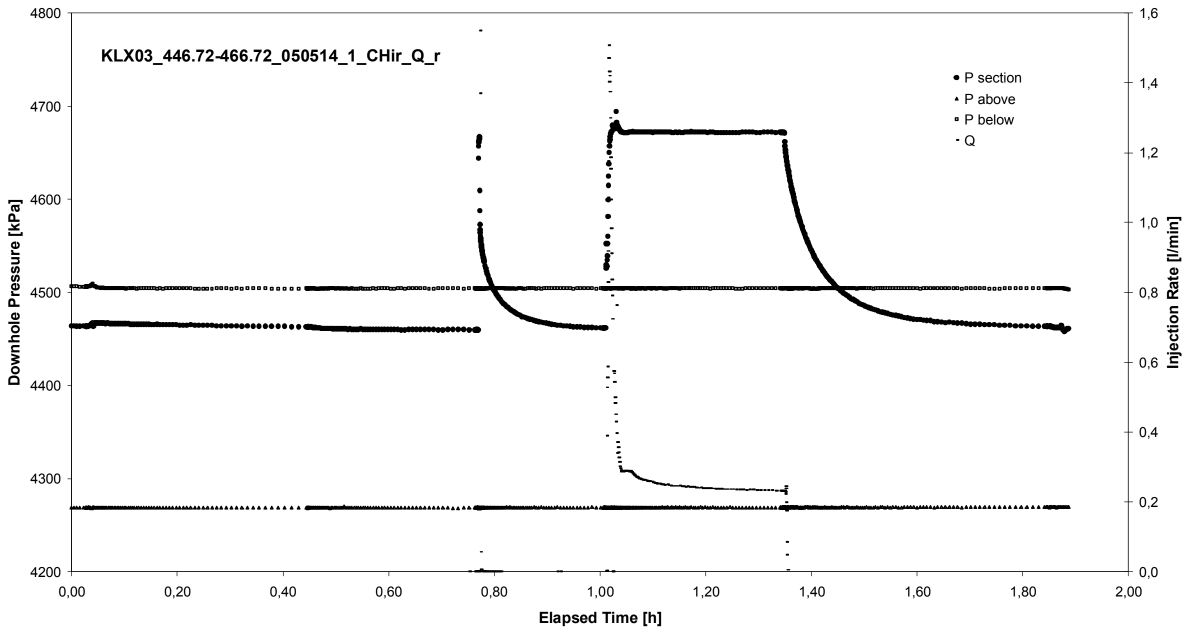


Pulse injection; deconvolution match

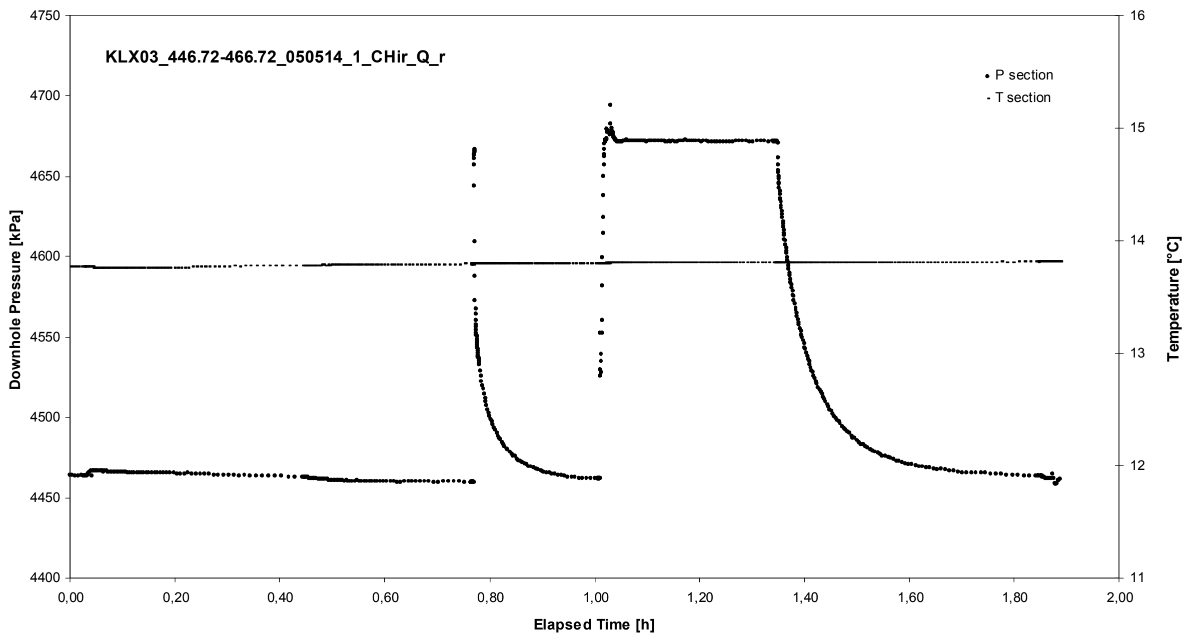
APPENDIX 2-29

Test 446.72 – 466.72 m

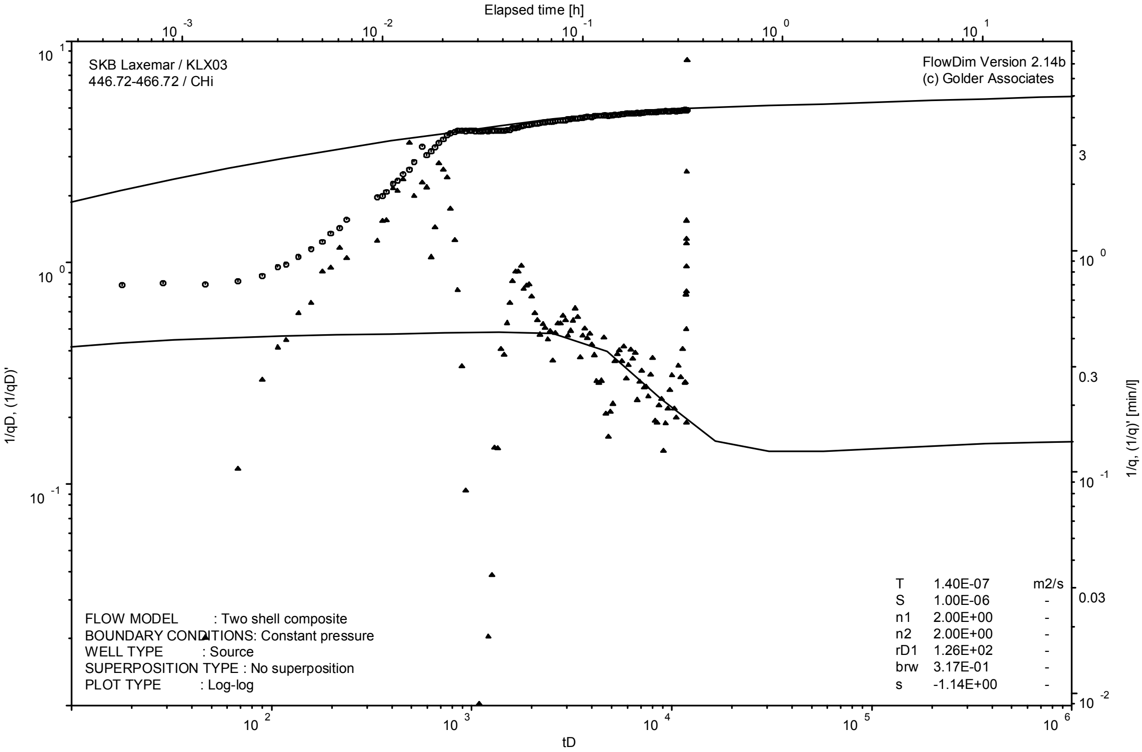
Analysis diagrams



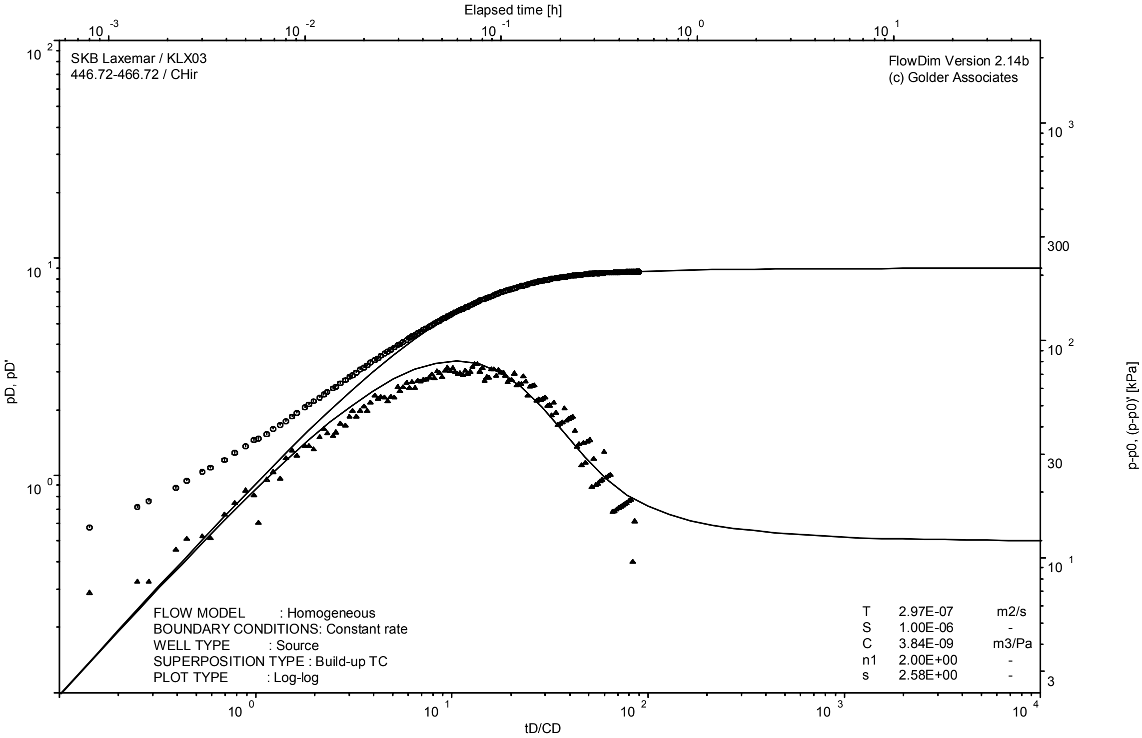
Pressure and flow rate vs. time; cartesian plot



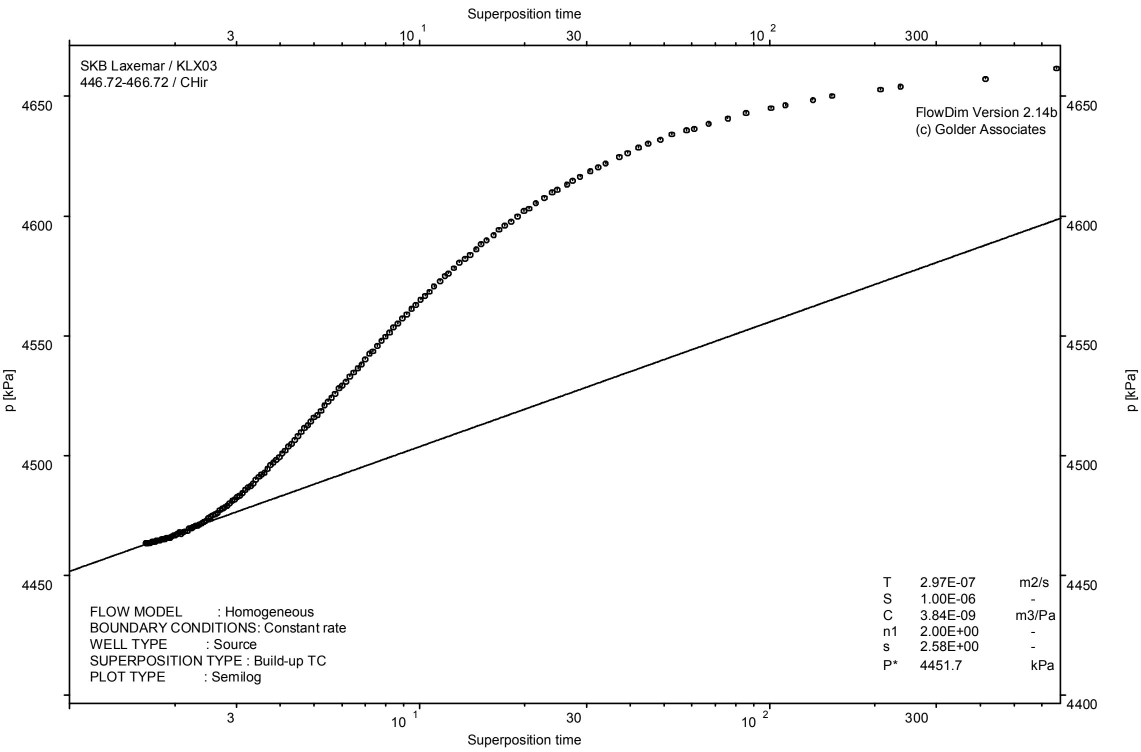
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

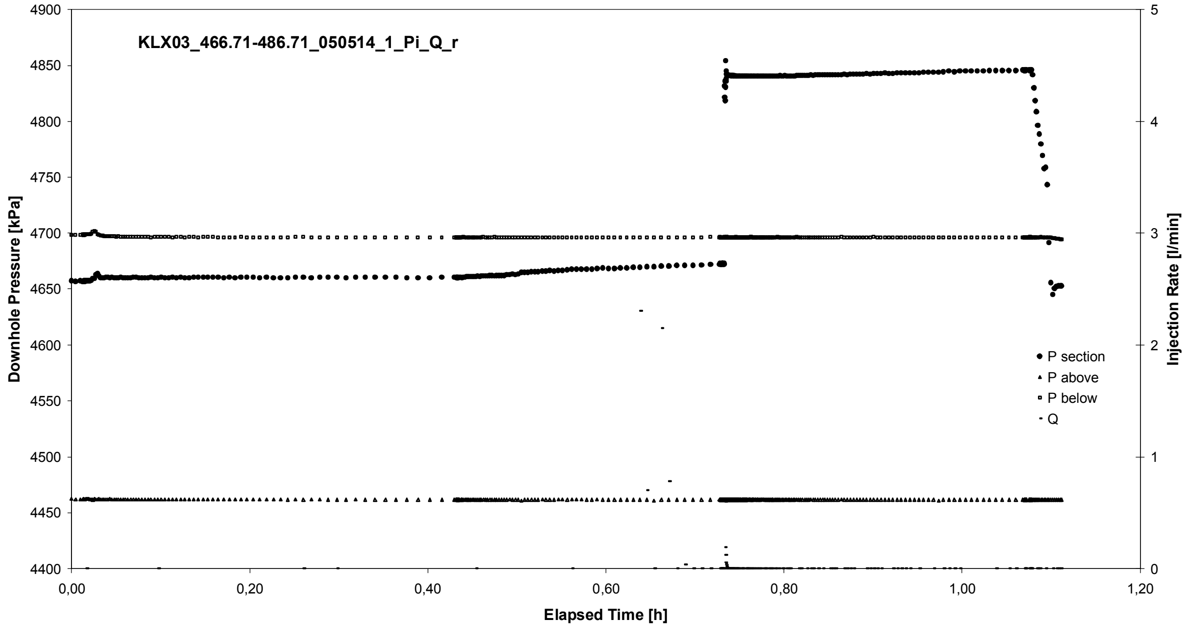


CHIR phase; HORNER match

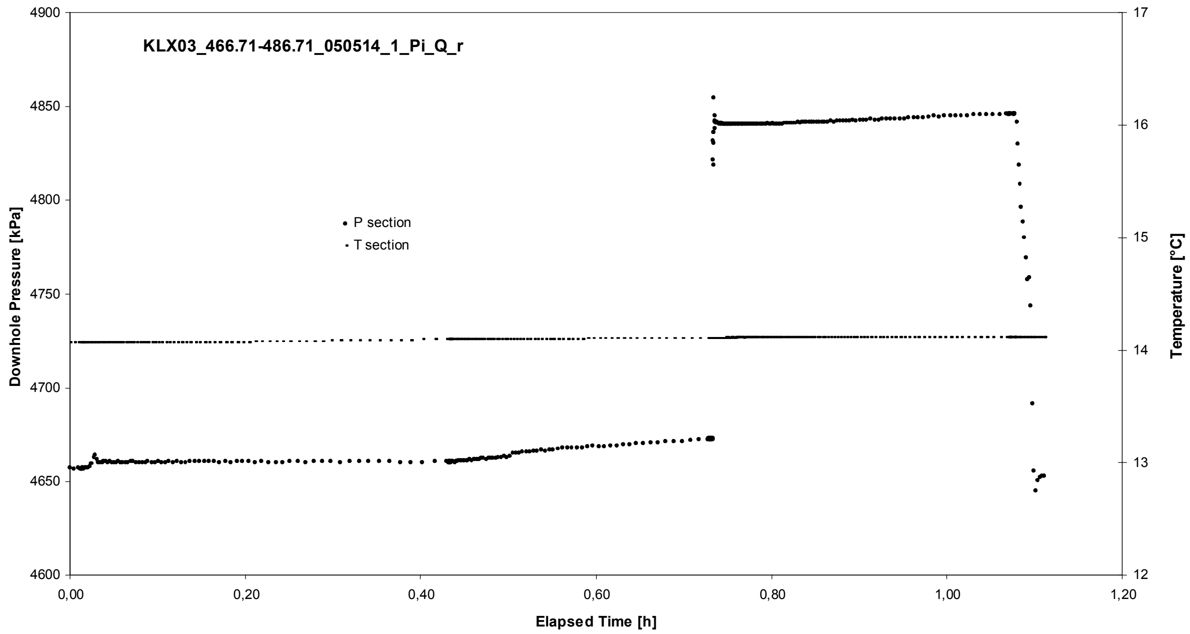
APPENDIX 2-30

Test 466.71 – 486.71 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

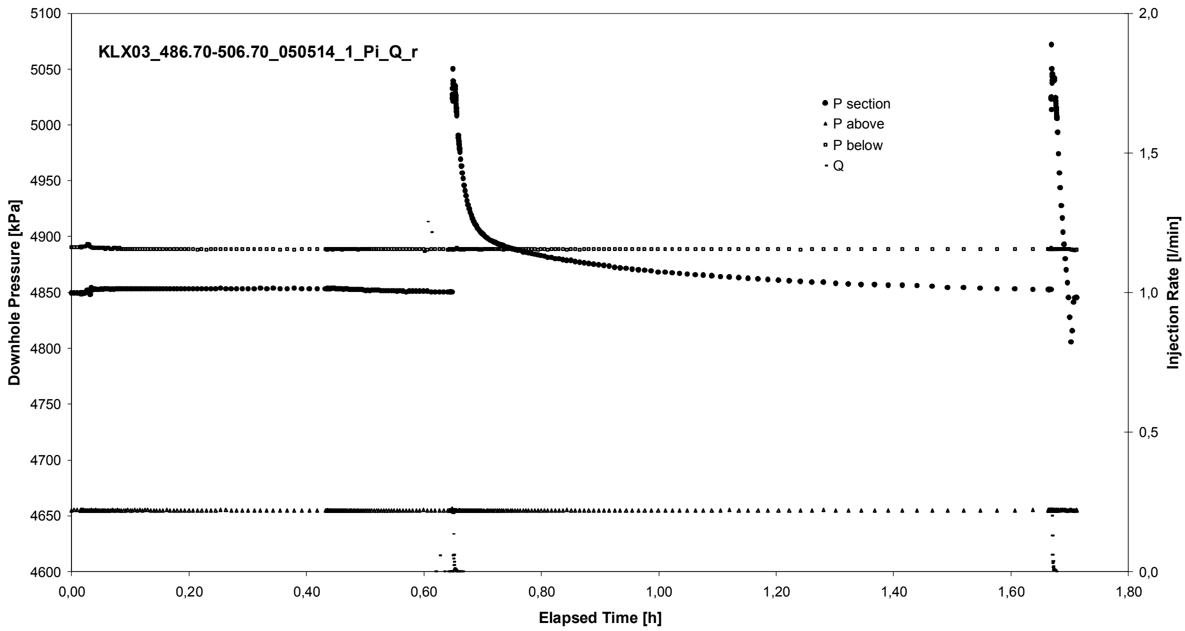
Not Analysed

CHIR phase; HORNER match

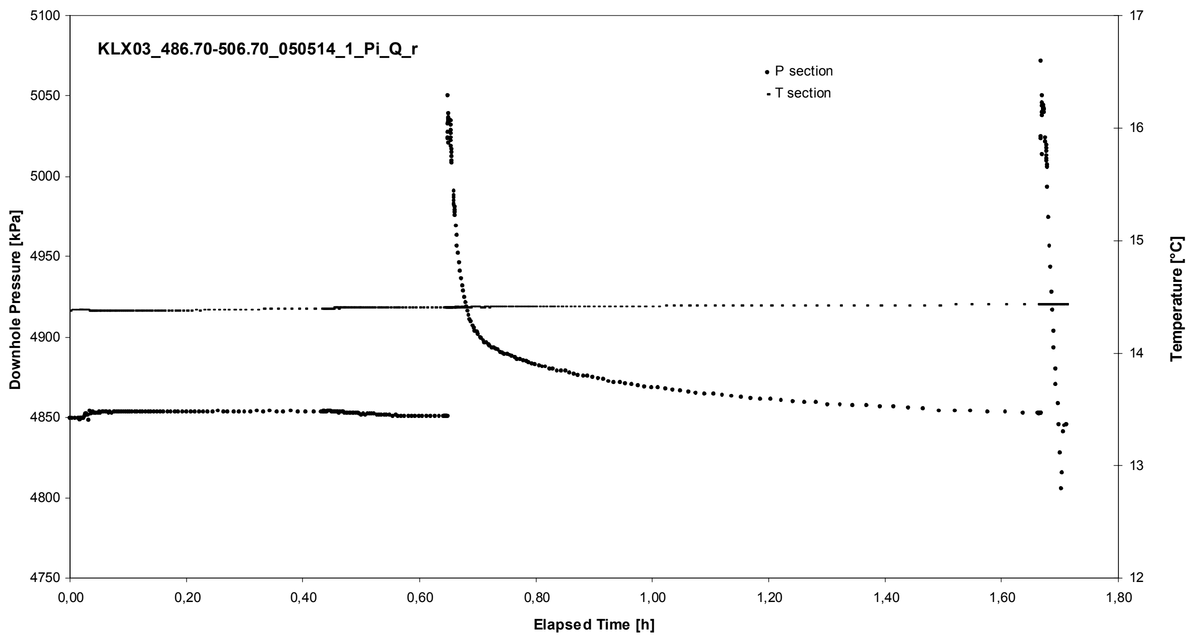
APPENDIX 2-31

Test 486.70 – 506.70 m

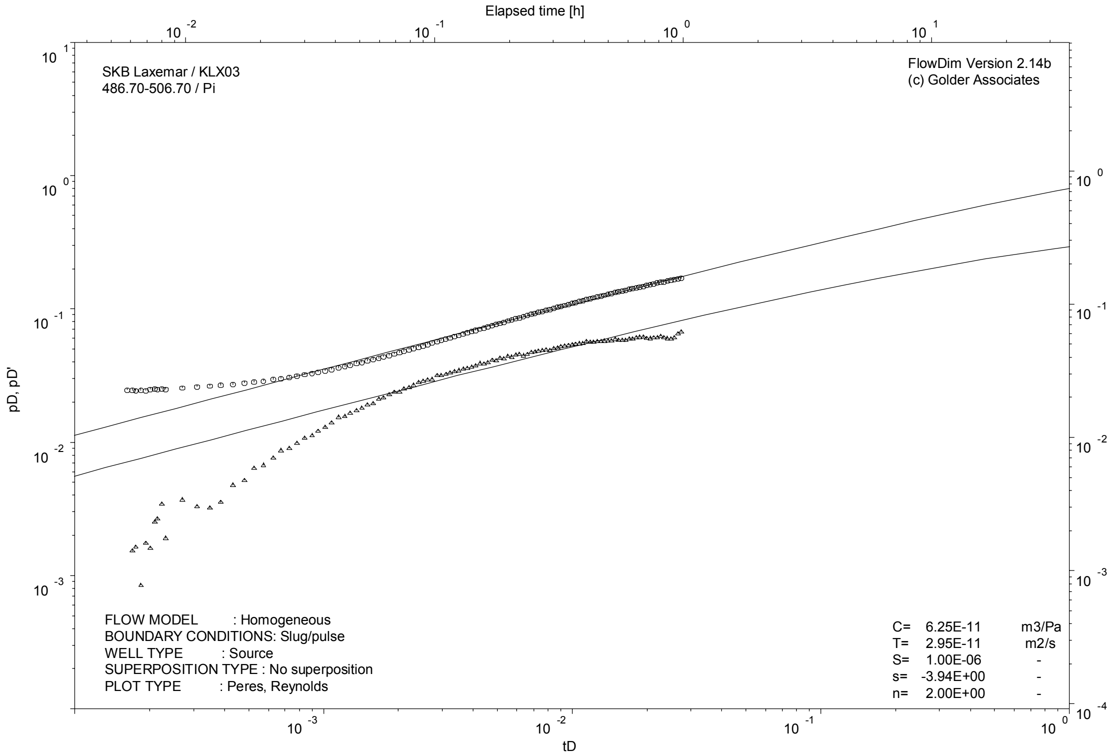
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

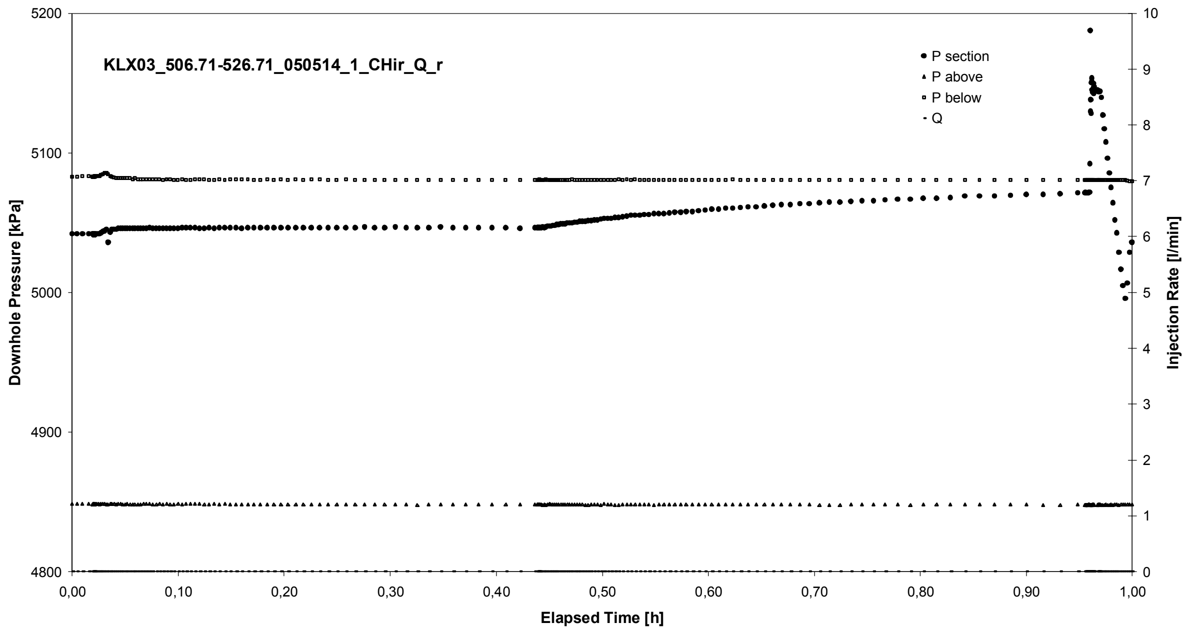


Pulse injection; deconvolution match

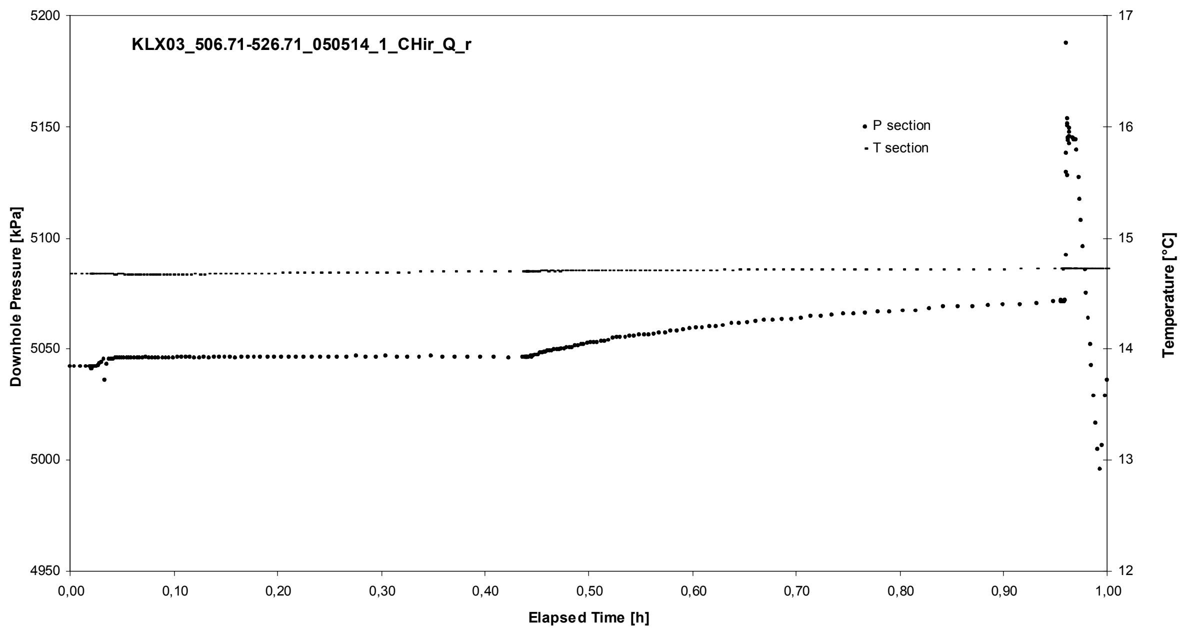
APPENDIX 2-32

Test 506.71 – 526.71 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

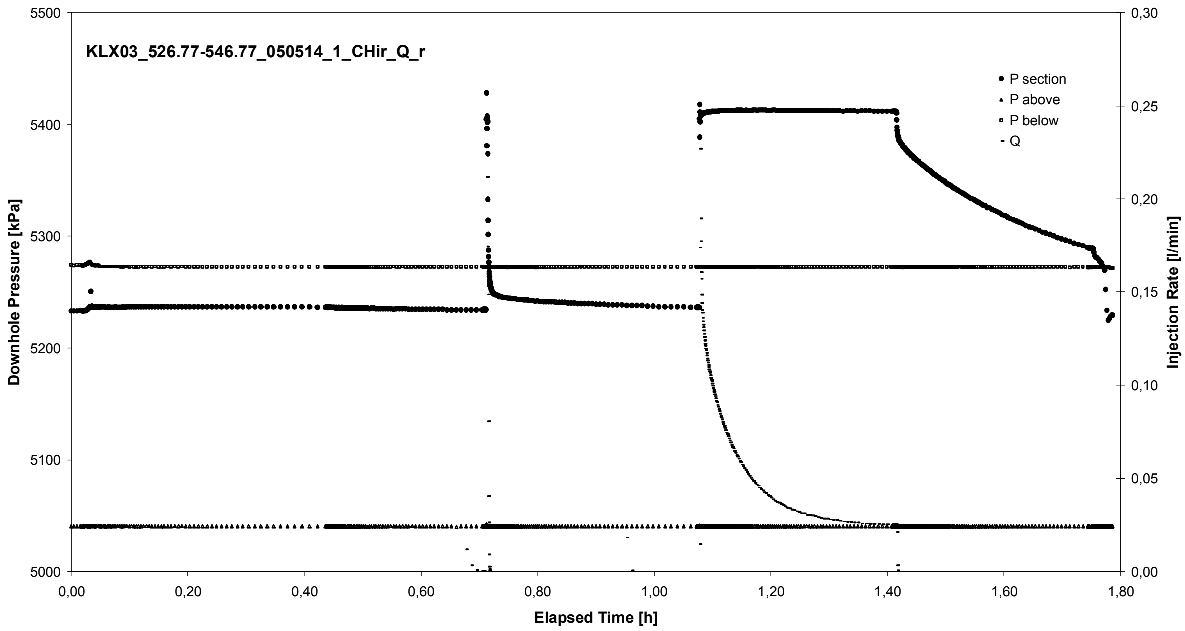
Not Analysed

CHIR phase; HORNER match

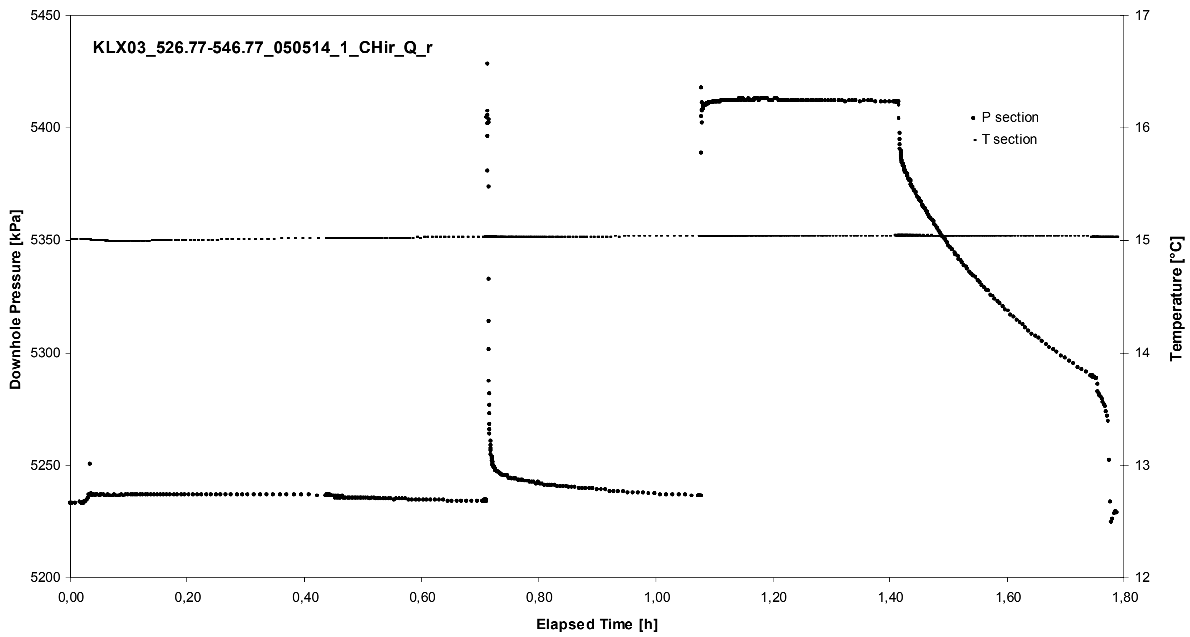
APPENDIX 2-33

Test 526.77 – 546.77 m

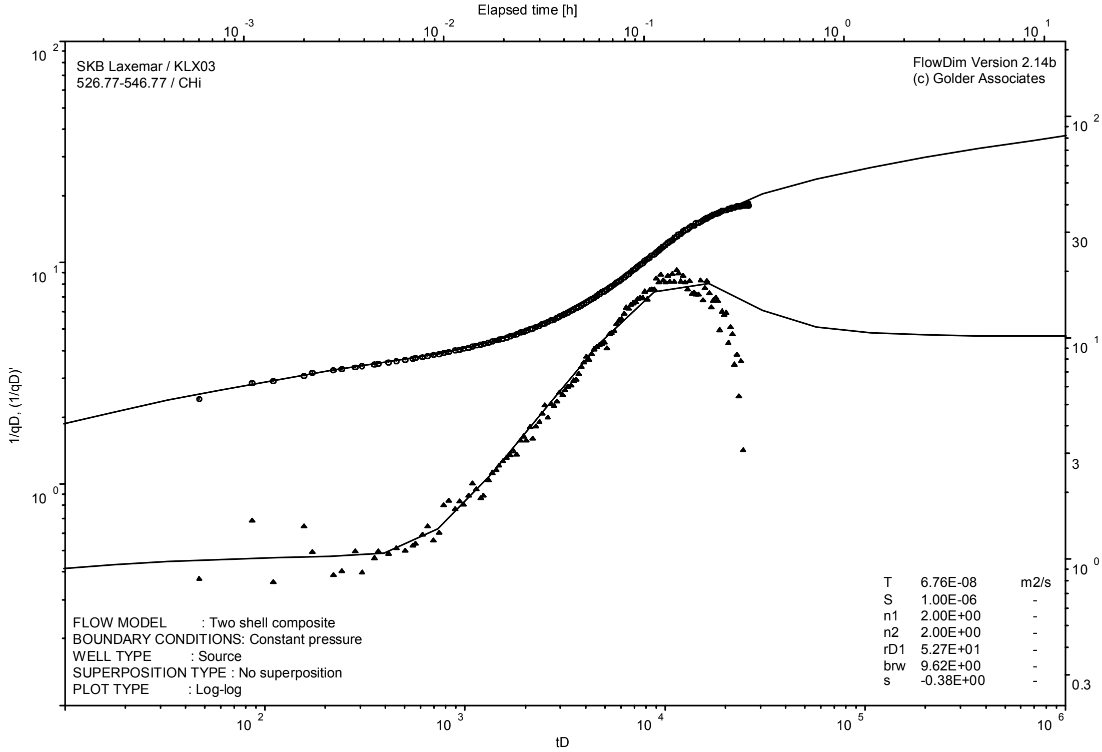
Analysis diagrams



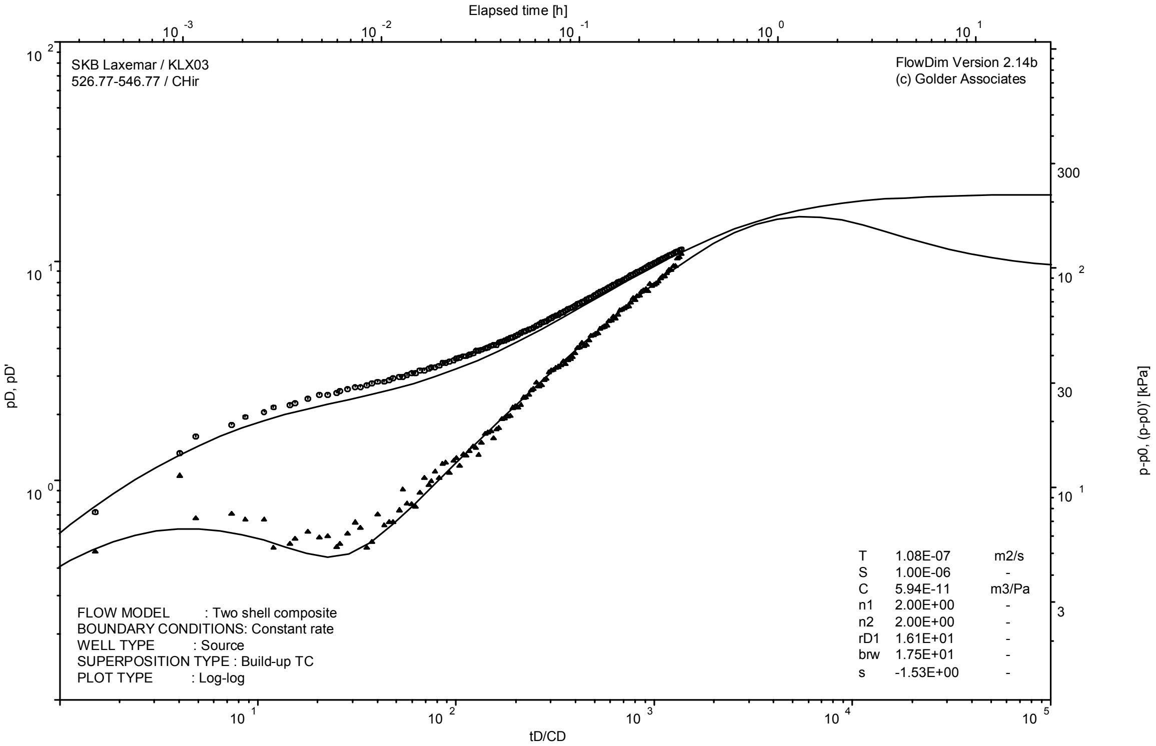
Pressure and flow rate vs. time; cartesian plot



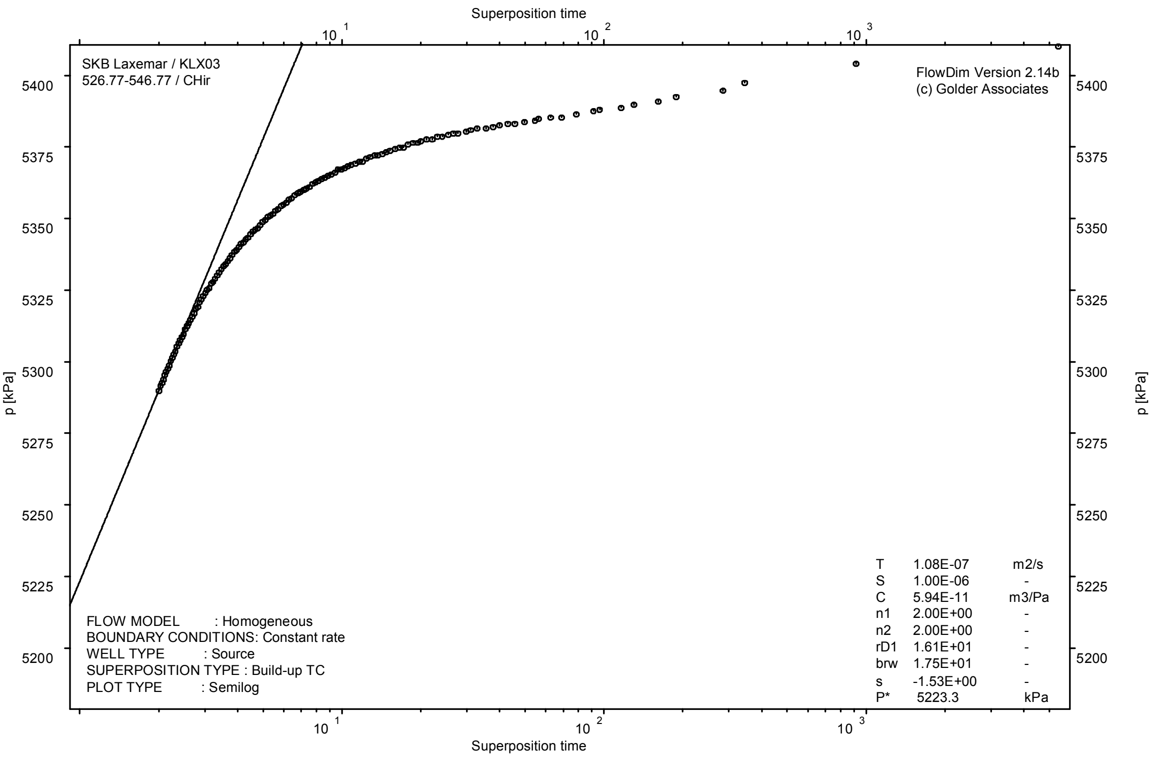
Interval pressure and temperature vs. time; cartesian plot



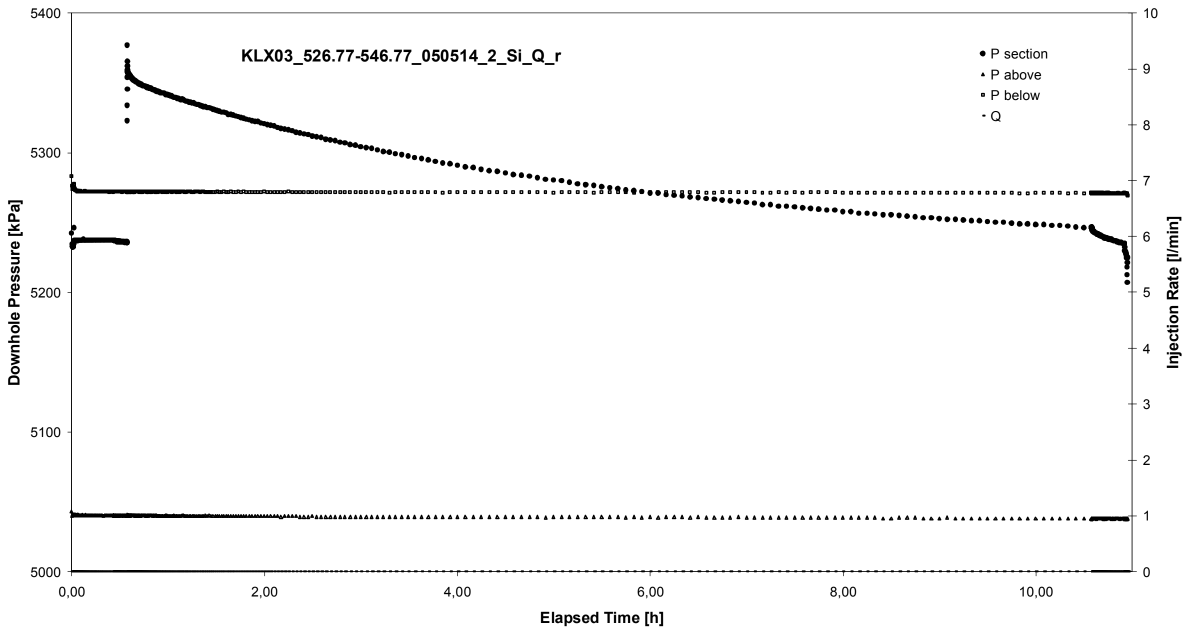
CHI phase; log-log match



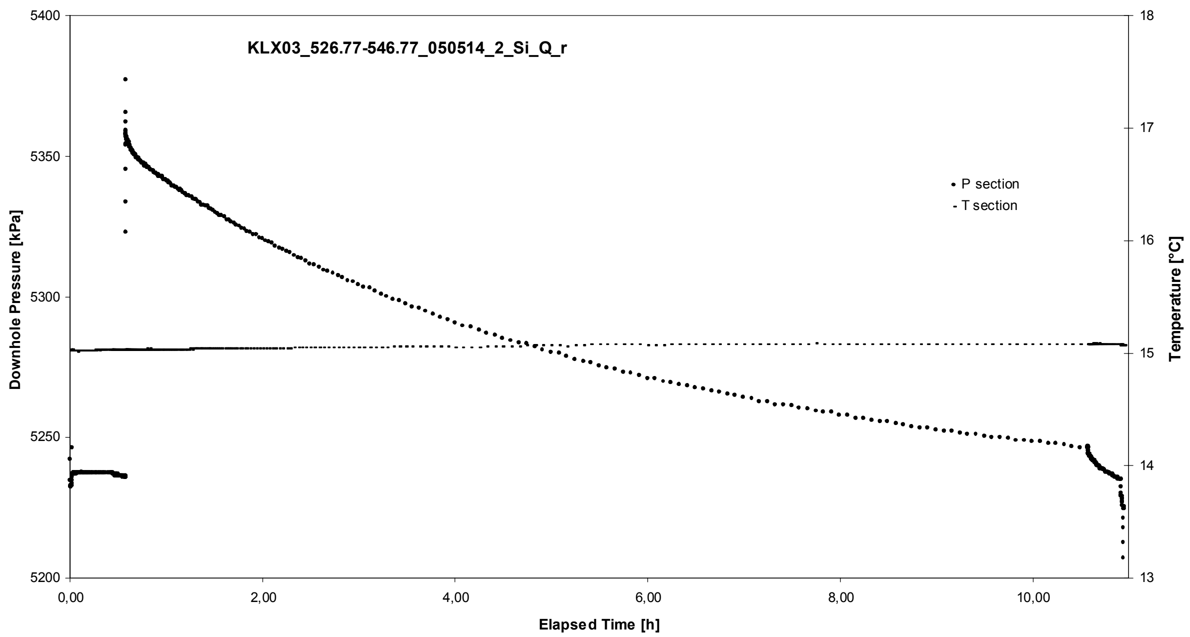
CHIR phase; log-log match



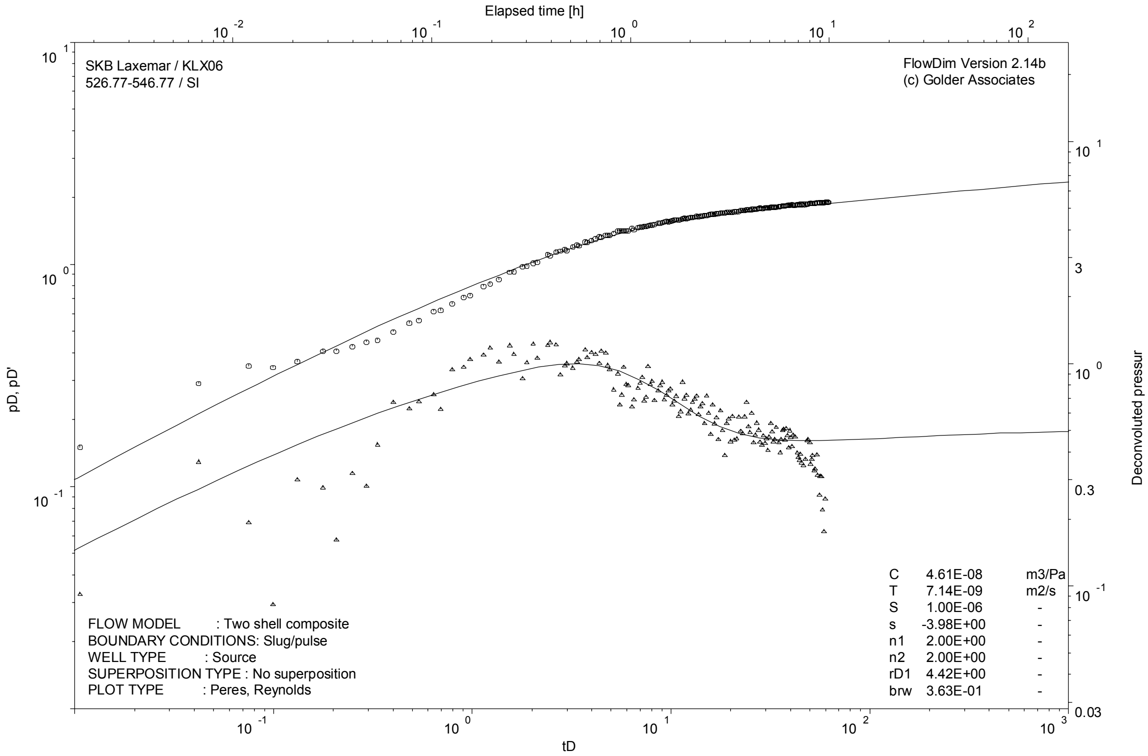
CHIR phase; HORNER match



Pressure and flow rate vs. time; cartesian plot, long term measured over night



Interval pressure and temperature vs. time; cartesian plot, long term measured over night

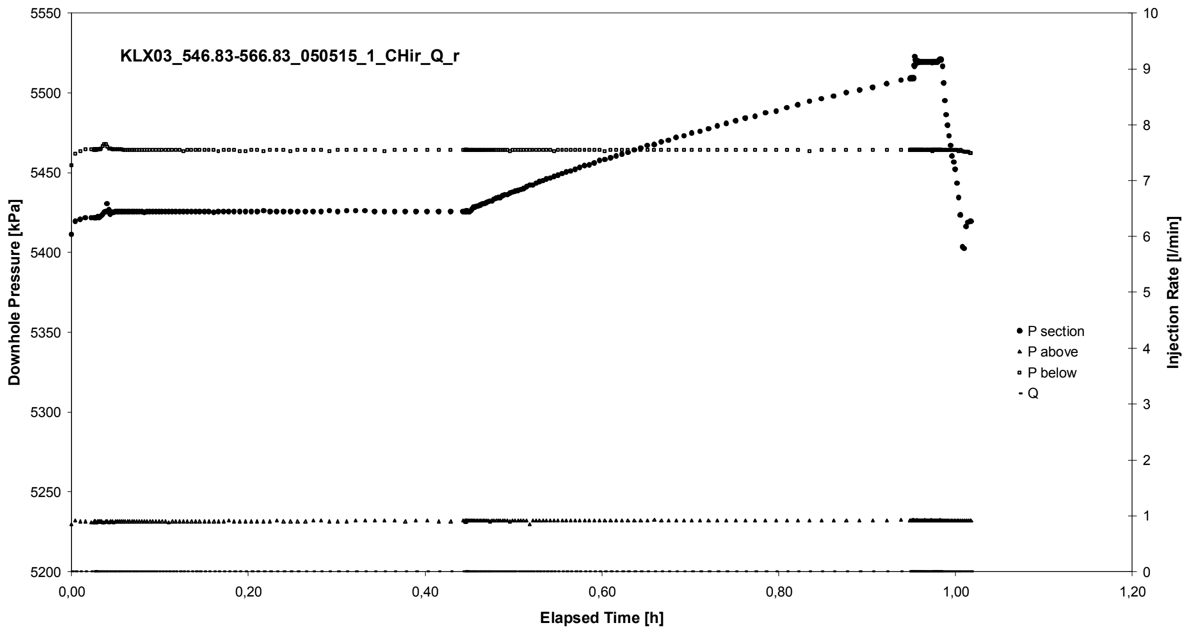


SI phase; log-log match, long term measured over night

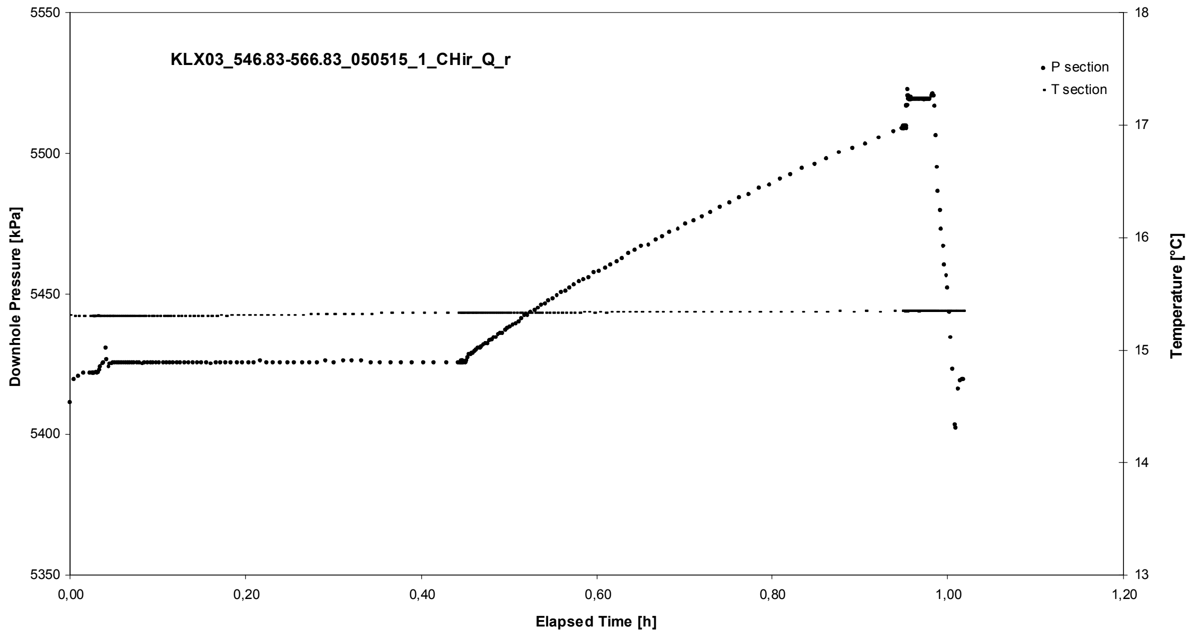
APPENDIX 2-34

Test 546.83 – 566.83 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

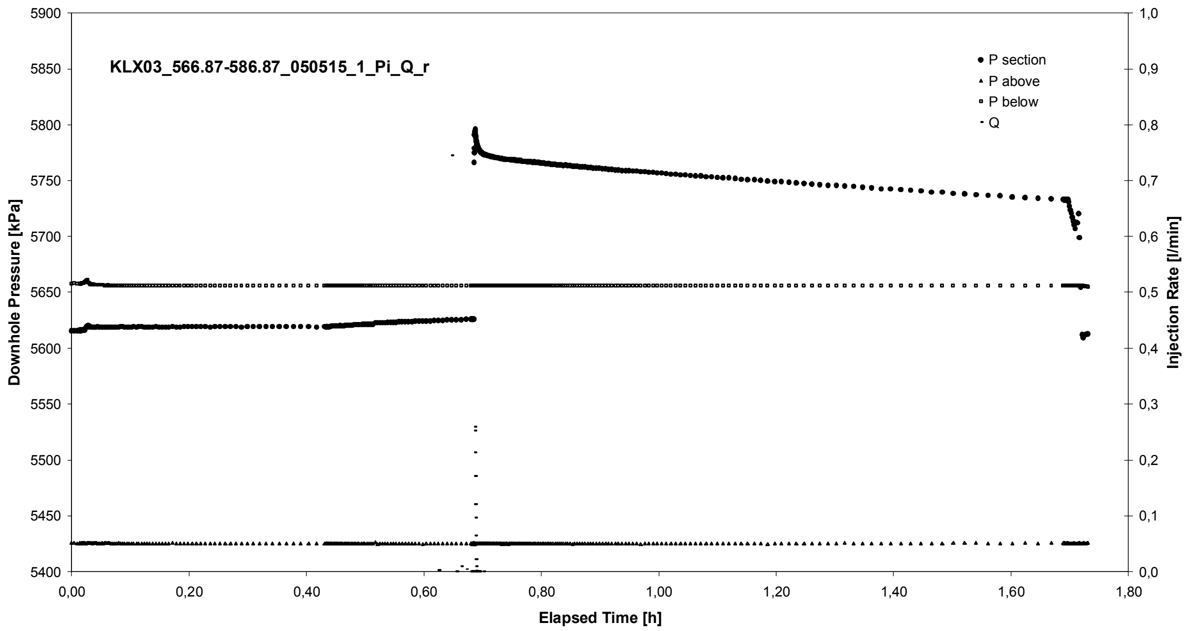
Not Analysed

CHIR phase; HORNER match

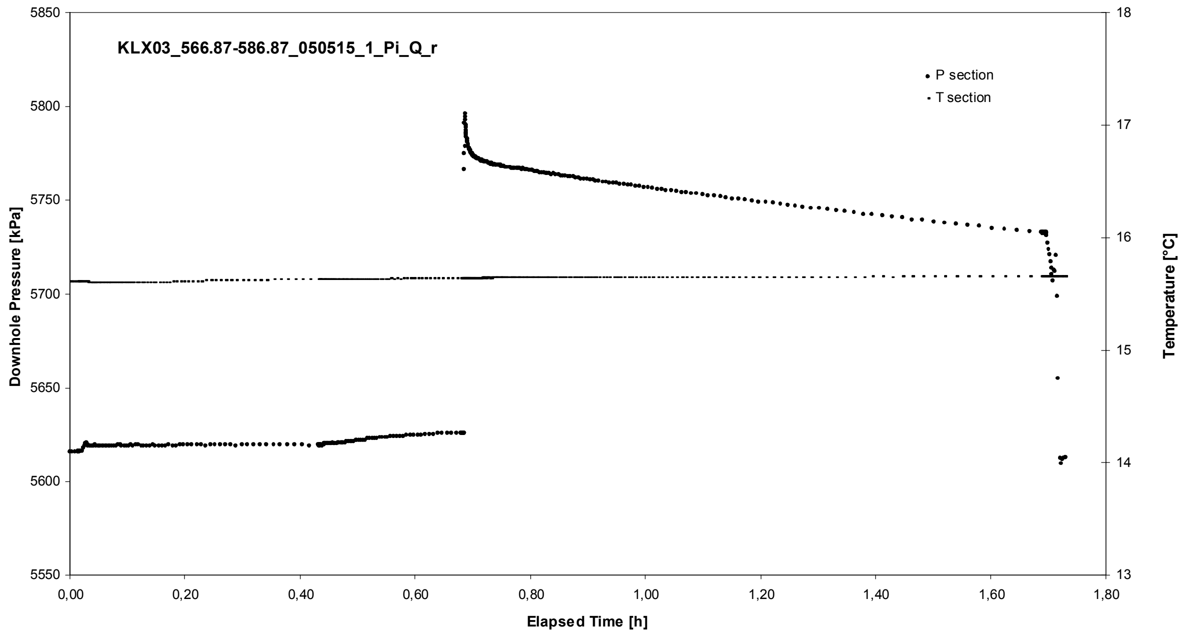
APPENDIX 2-35

Test 566.87 – 586.87 m

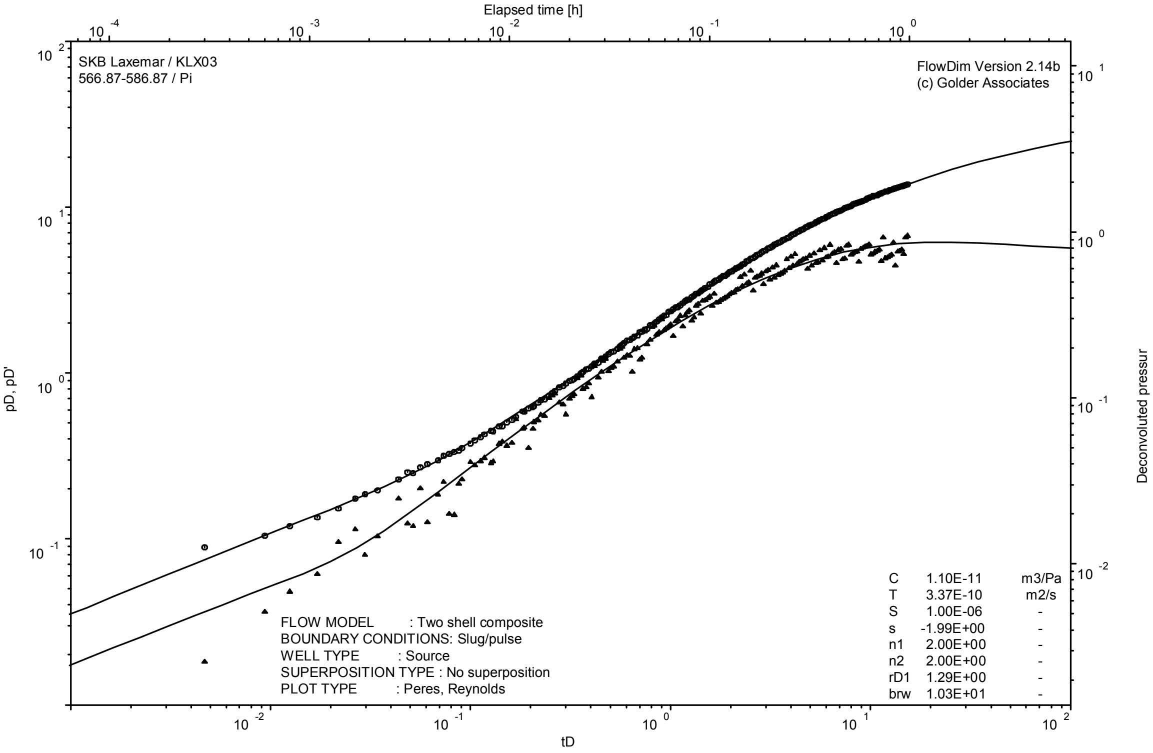
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

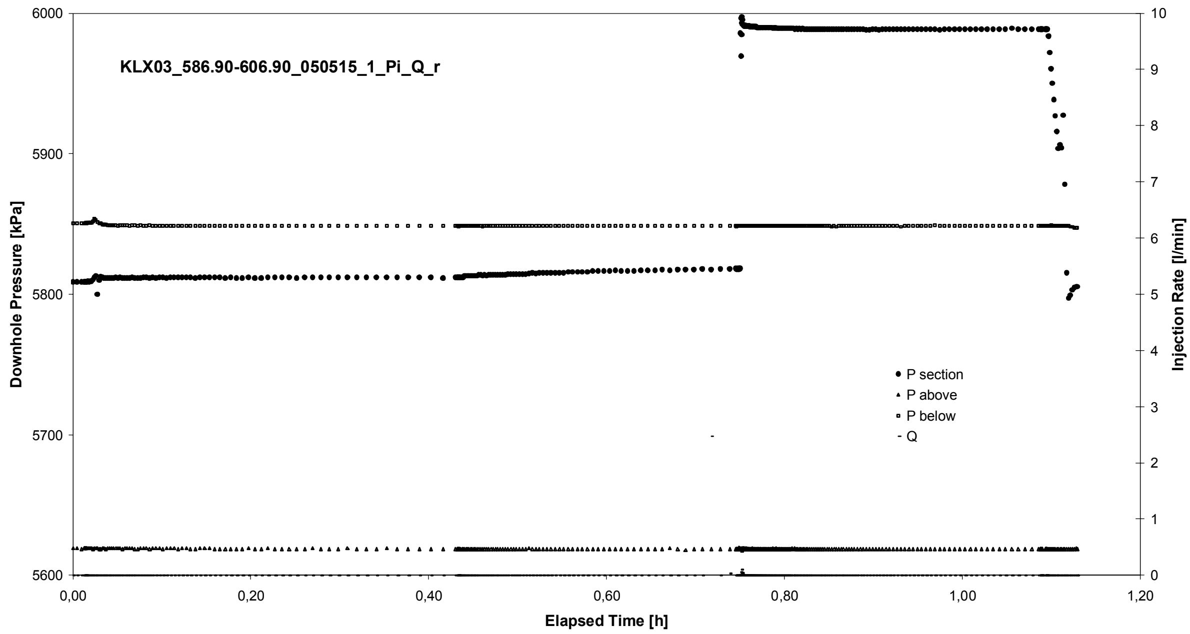


Pulse injection; deconvolution match

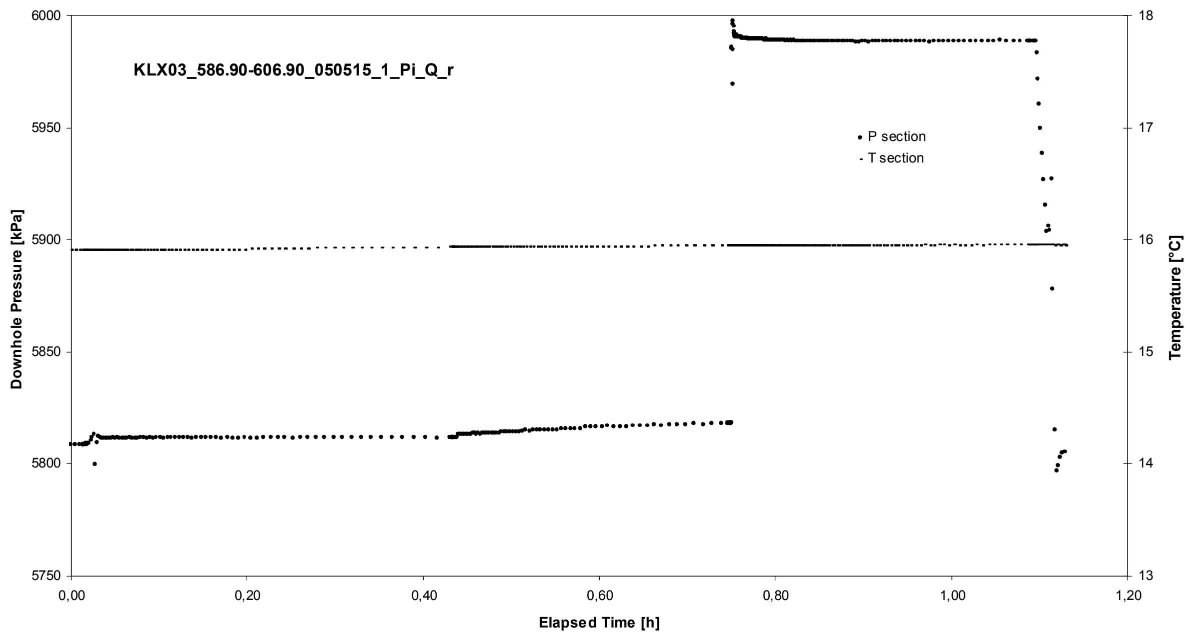
APPENDIX 2-36

Test 586.90 – 606.90 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

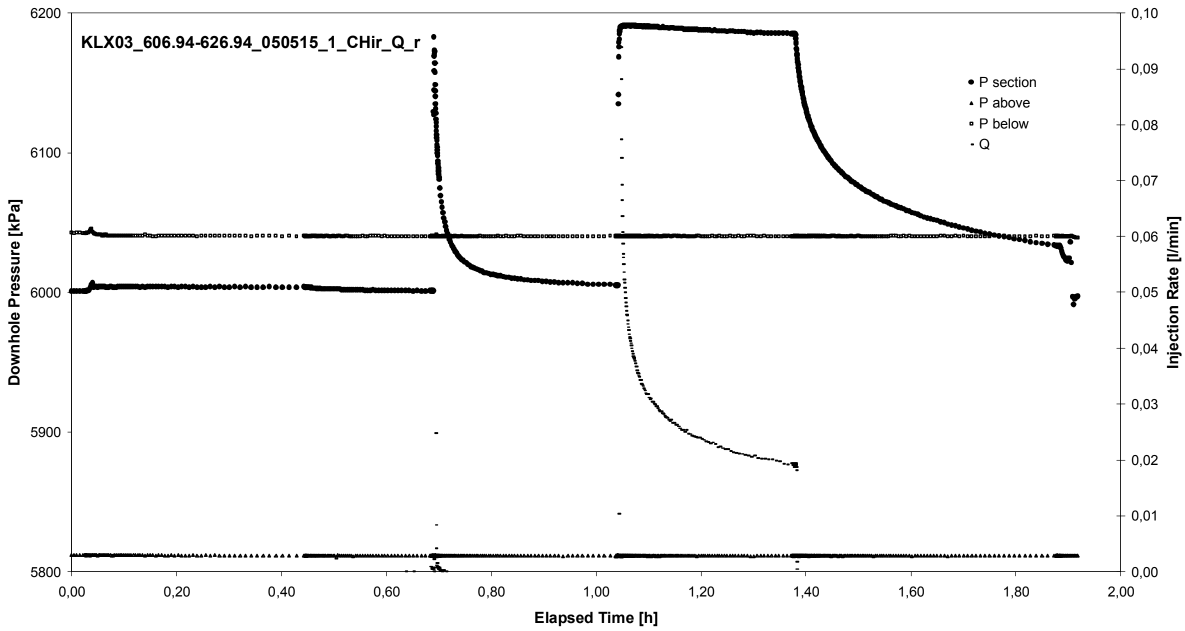
Not Analysed

CHIR phase; HORNER match

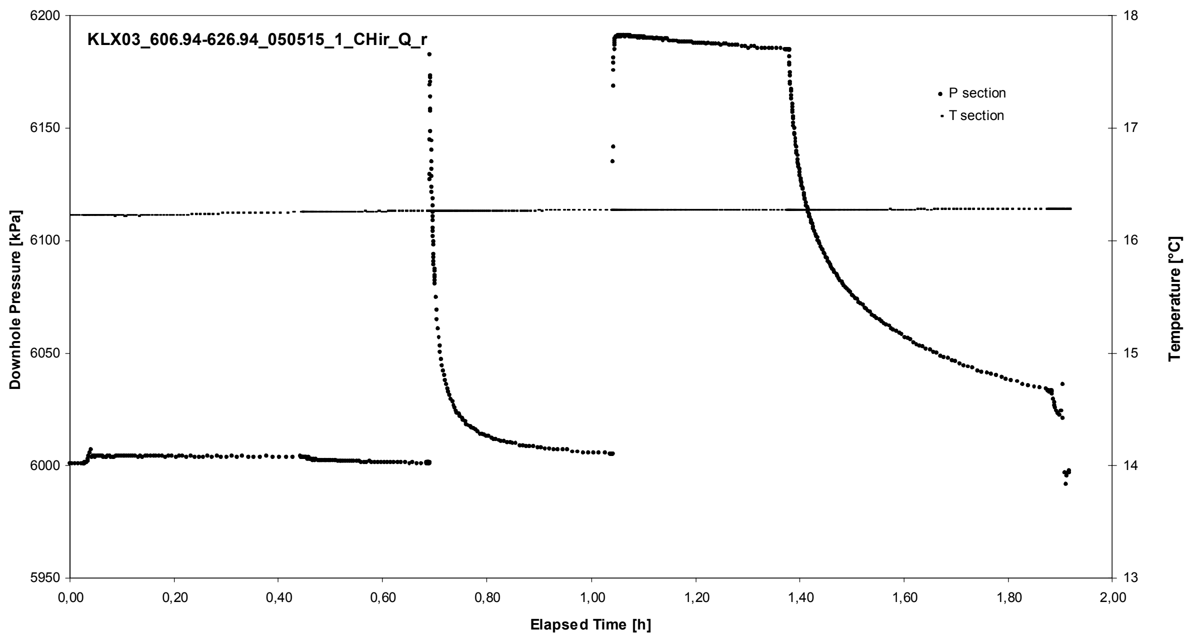
APPENDIX 2-37

Test 606.94 – 626.94 m

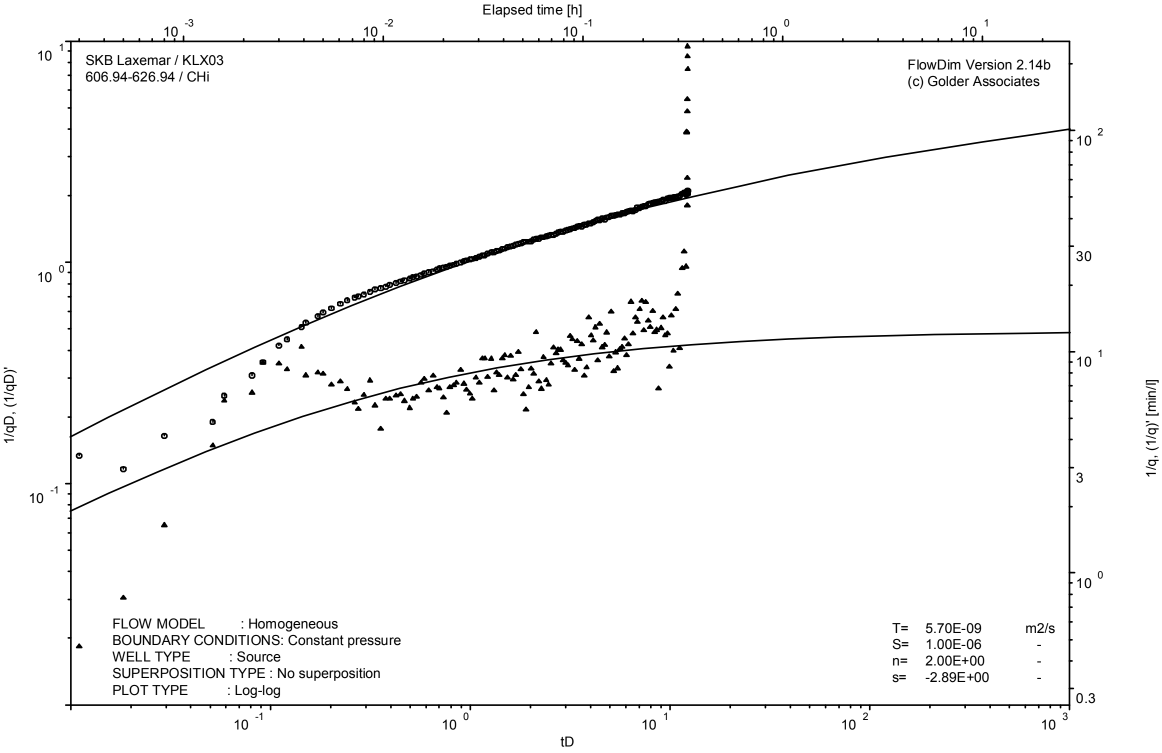
Analysis diagrams



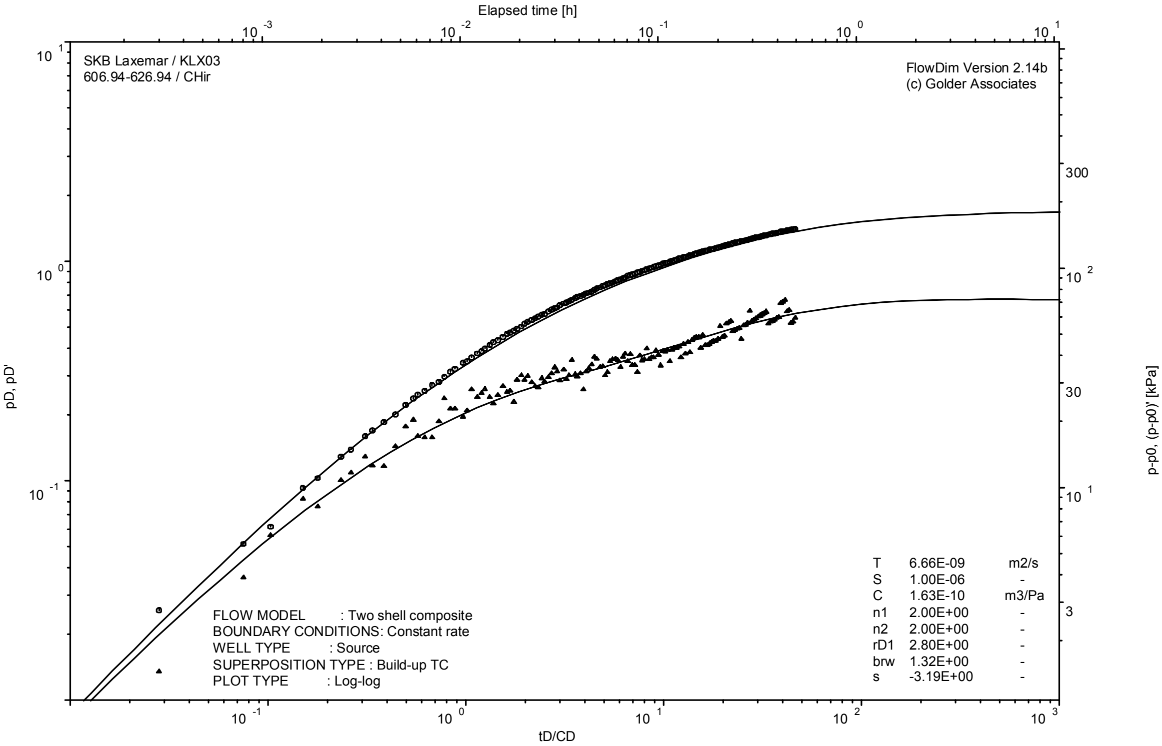
Pressure and flow rate vs. time; cartesian plot



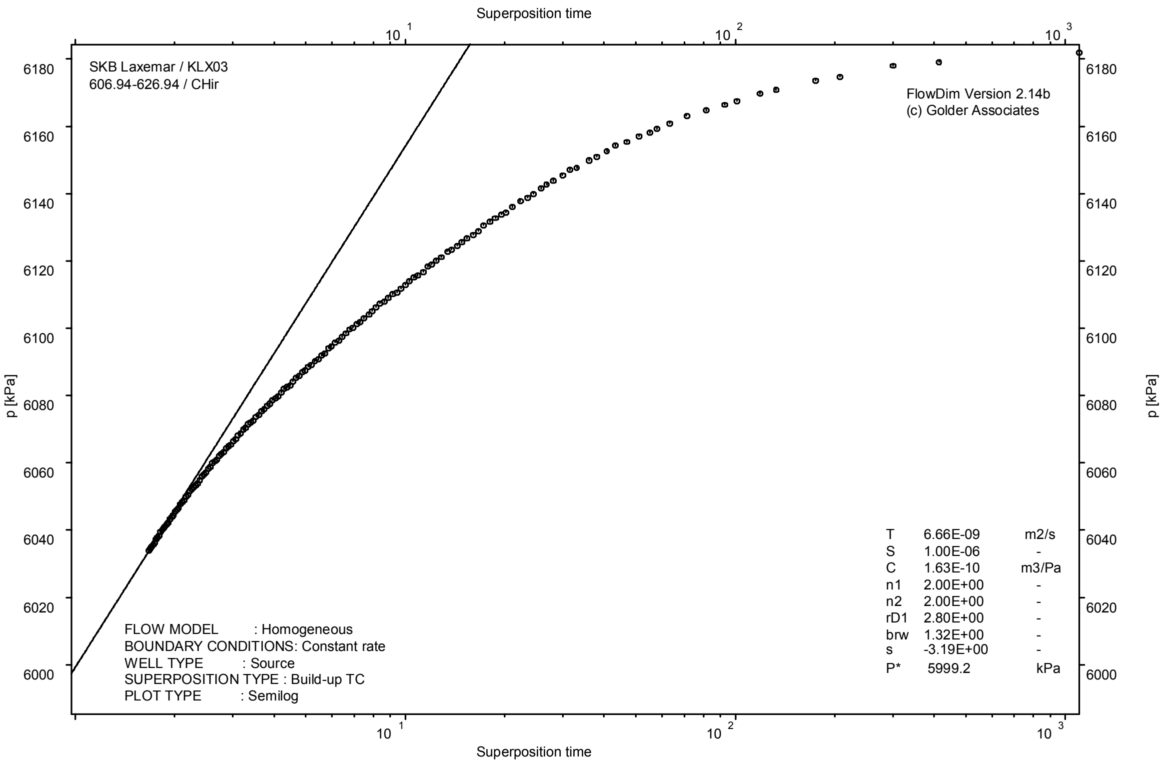
Interval pressure and temperature vs. time; cartesian plot



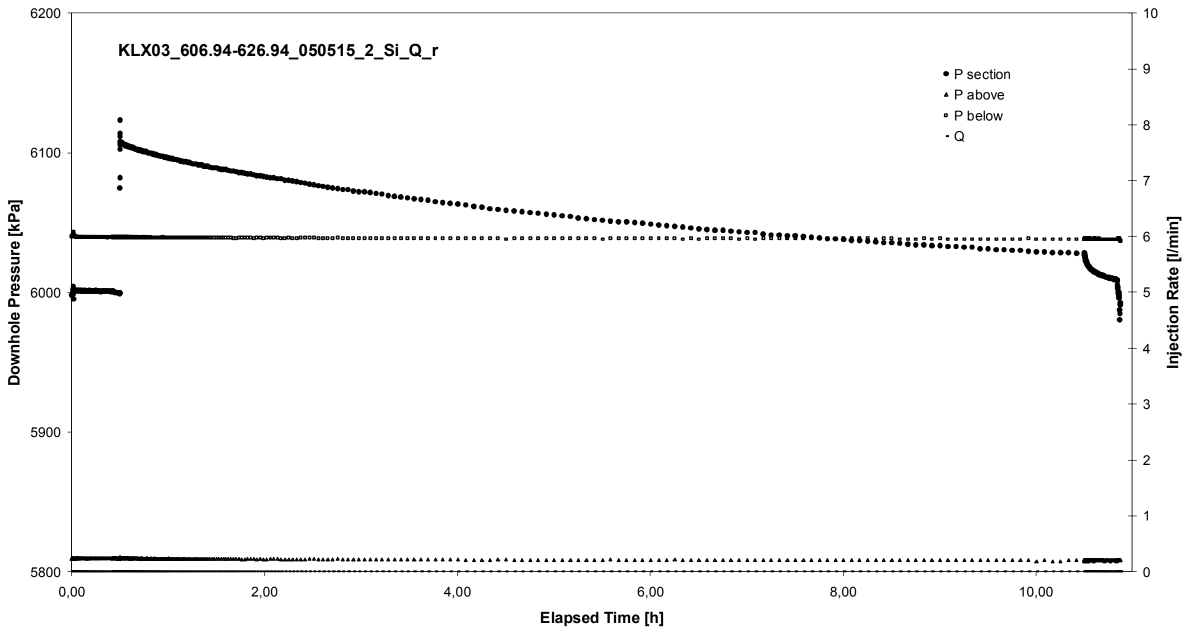
CHI phase; log-log match



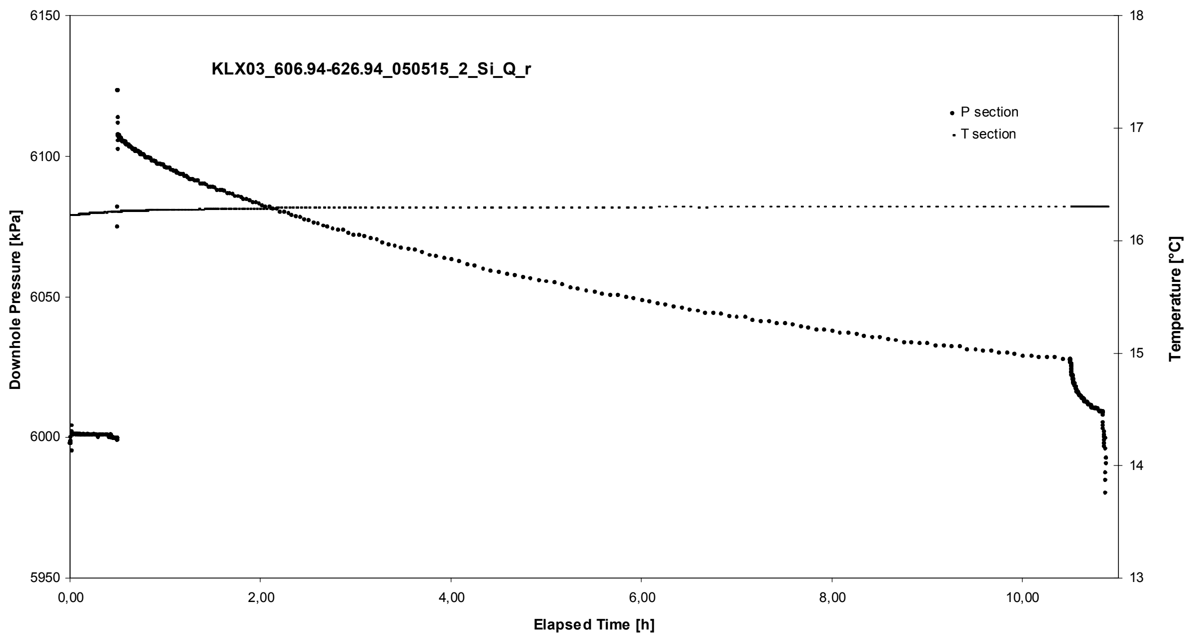
CHIR phase; log-log match



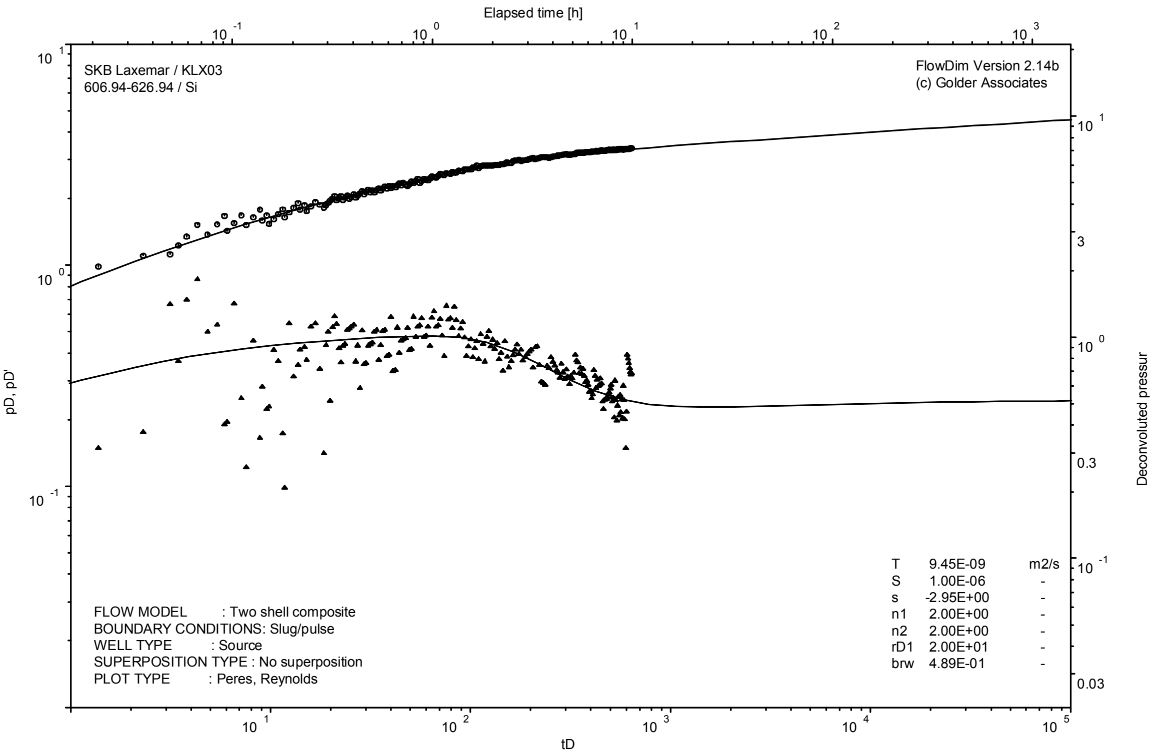
CHIR phase; HORNER match



Pressure and flow rate vs. time; cartesian plot, long term measured over night



Interval pressure and temperature vs. time; cartesian plot, long term measured over night

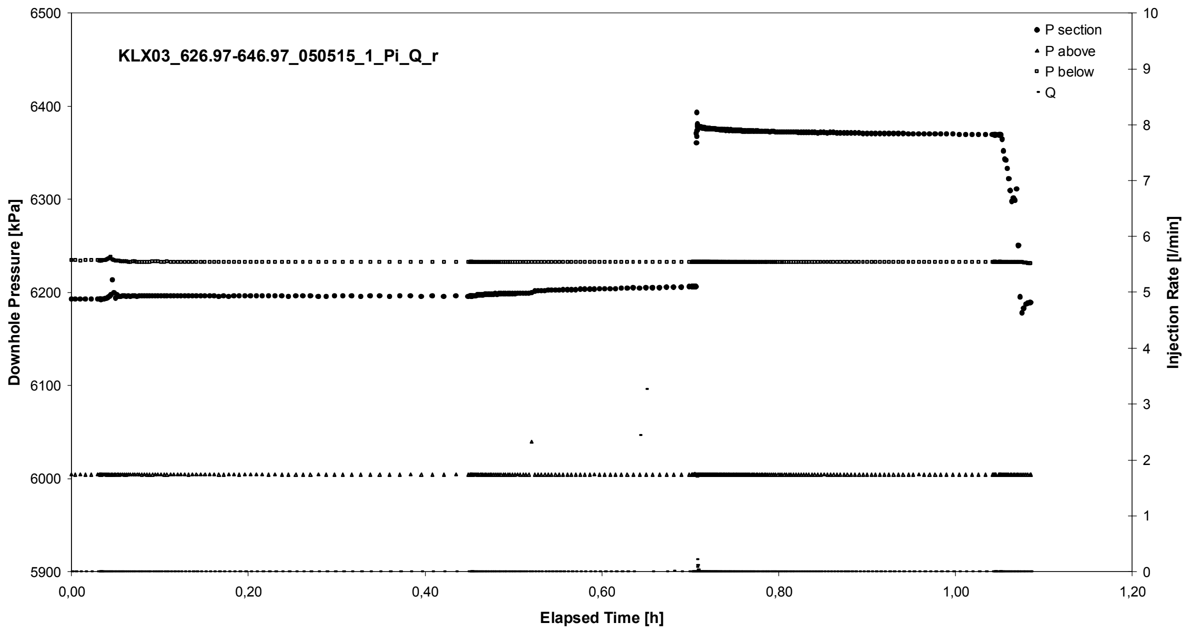


SI phase; log-log match, long term measured over night

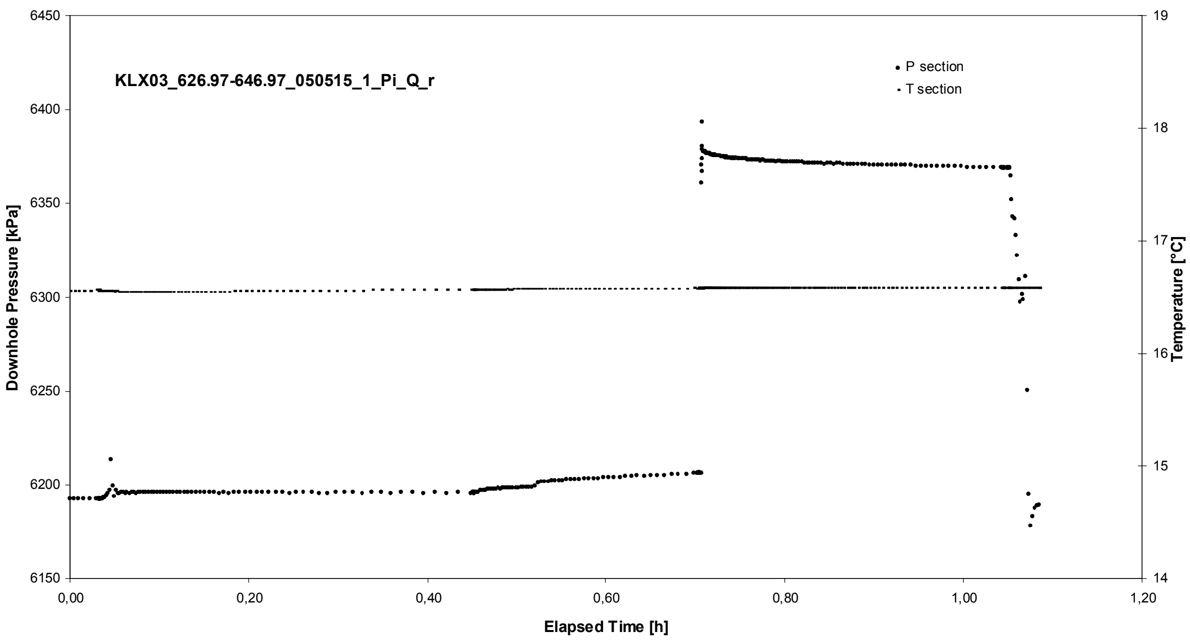
APPENDIX 2-38

Test 626.97 – 646.97 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

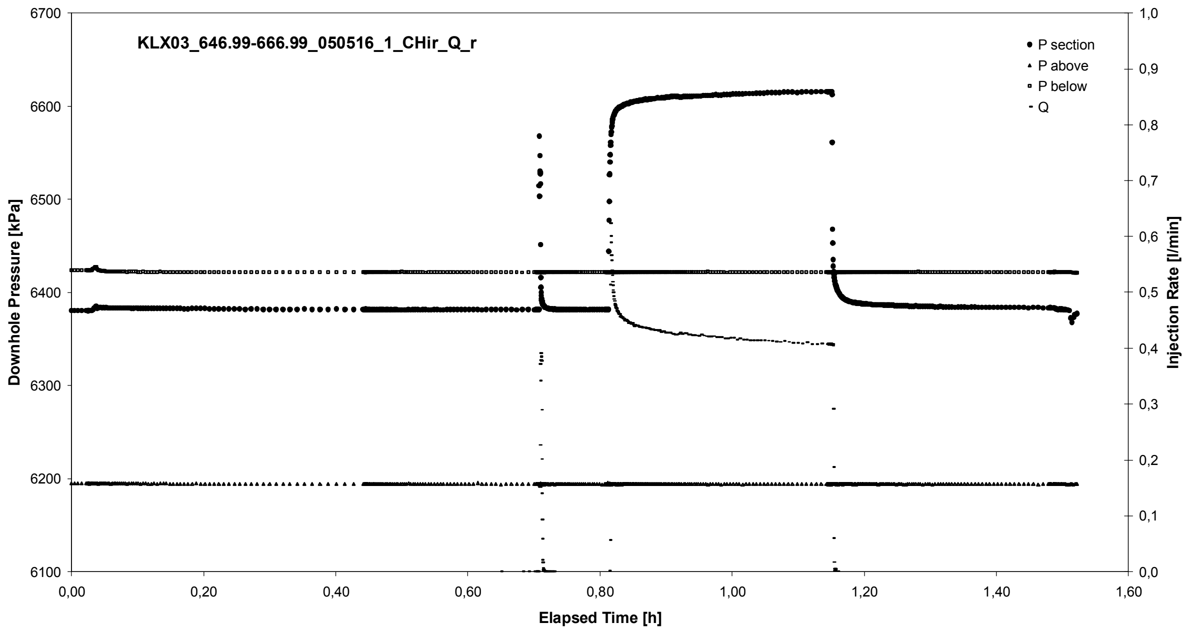
Not Analysed

CHIR phase; HORNER match

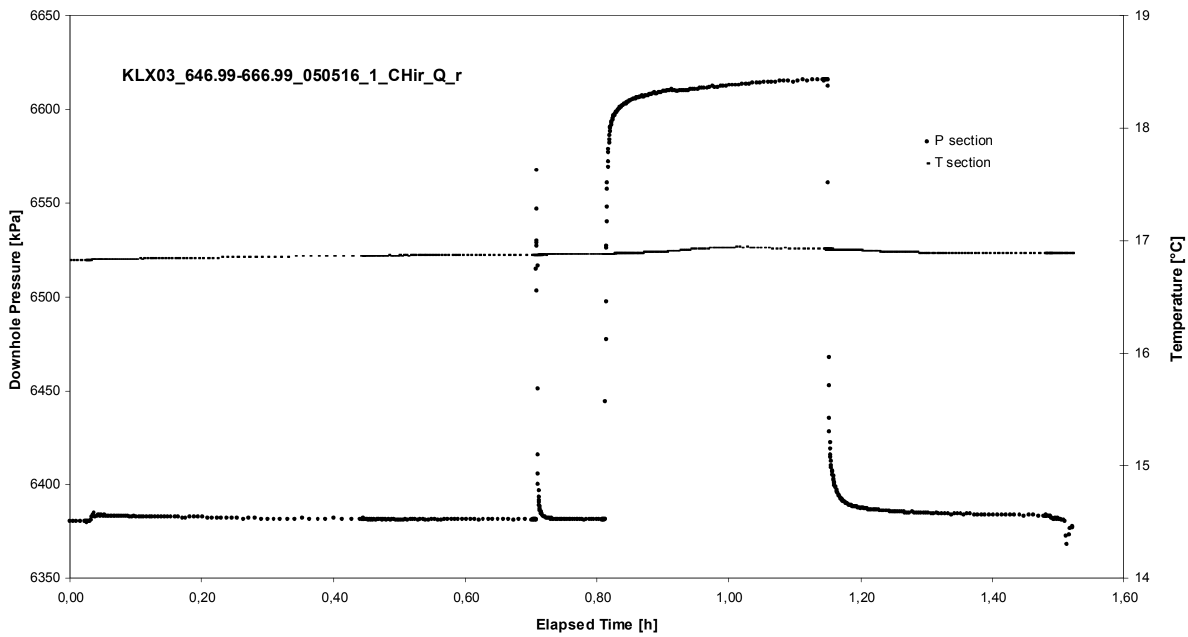
APPENDIX 2-39

Test 646.99 – 666.99 m

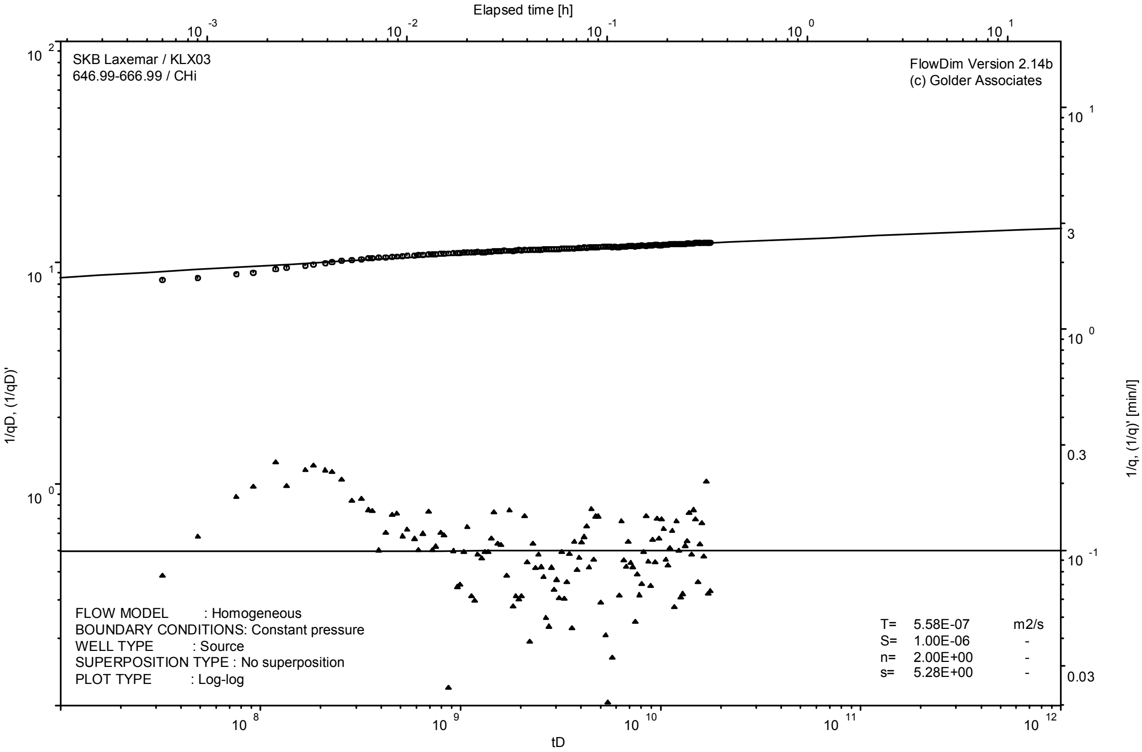
Analysis diagrams



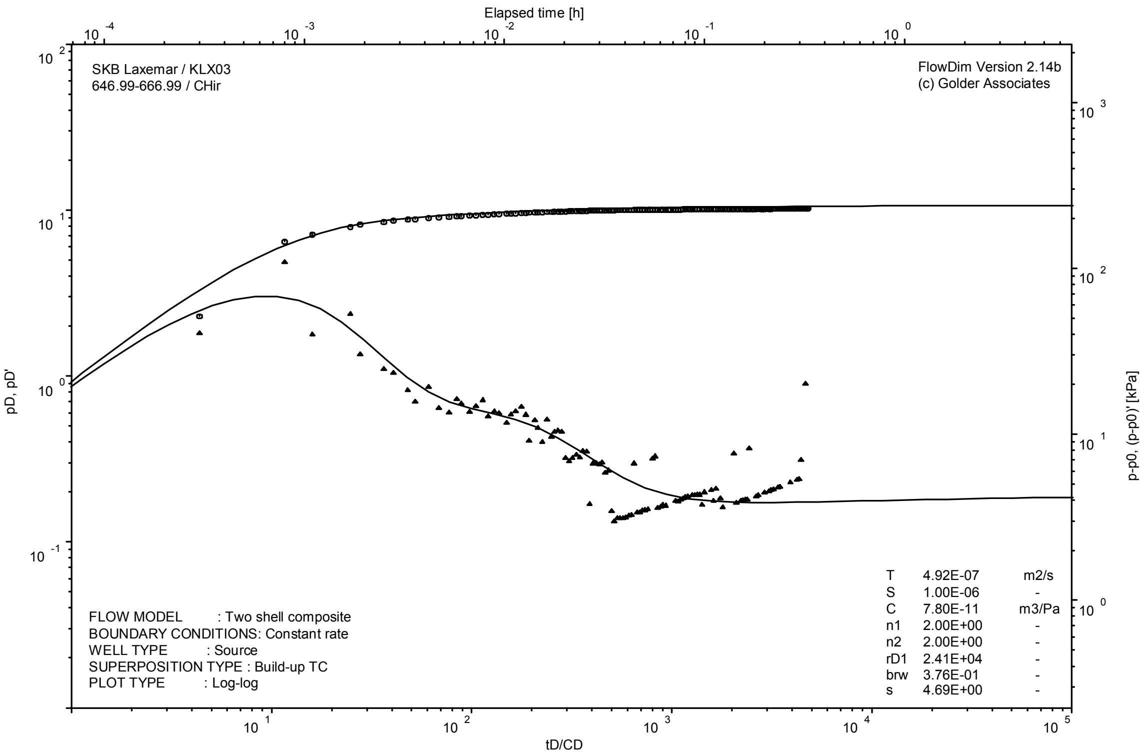
Pressure and flow rate vs. time; cartesian plot



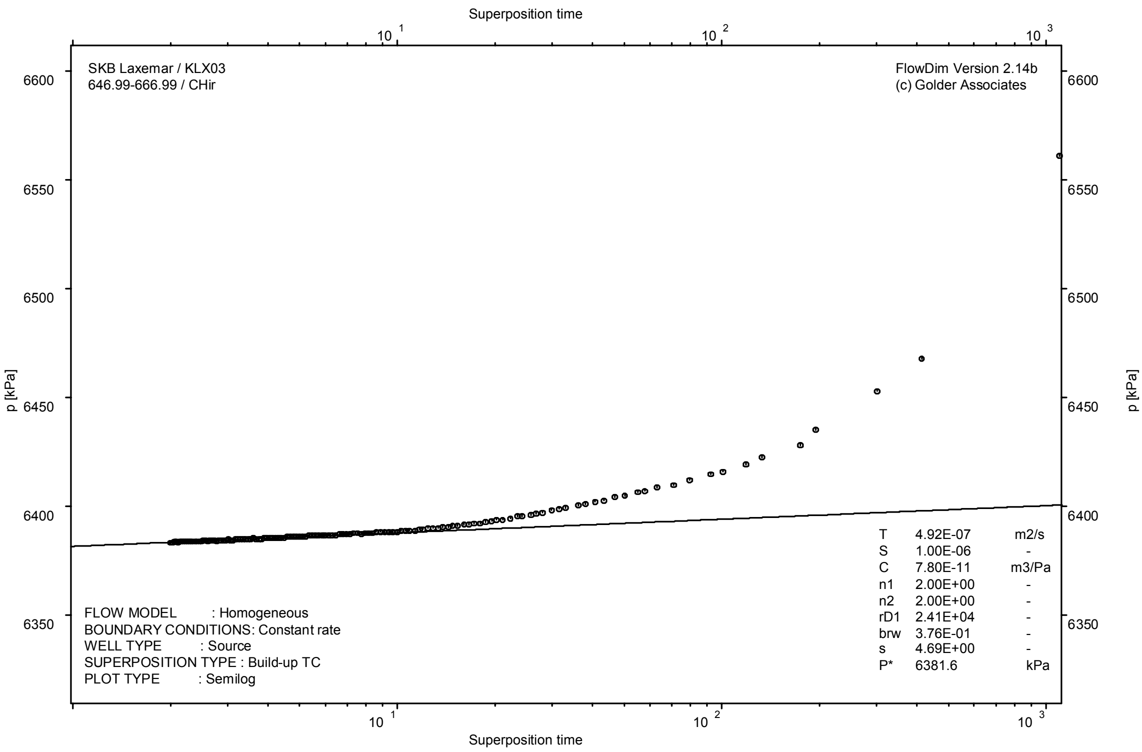
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

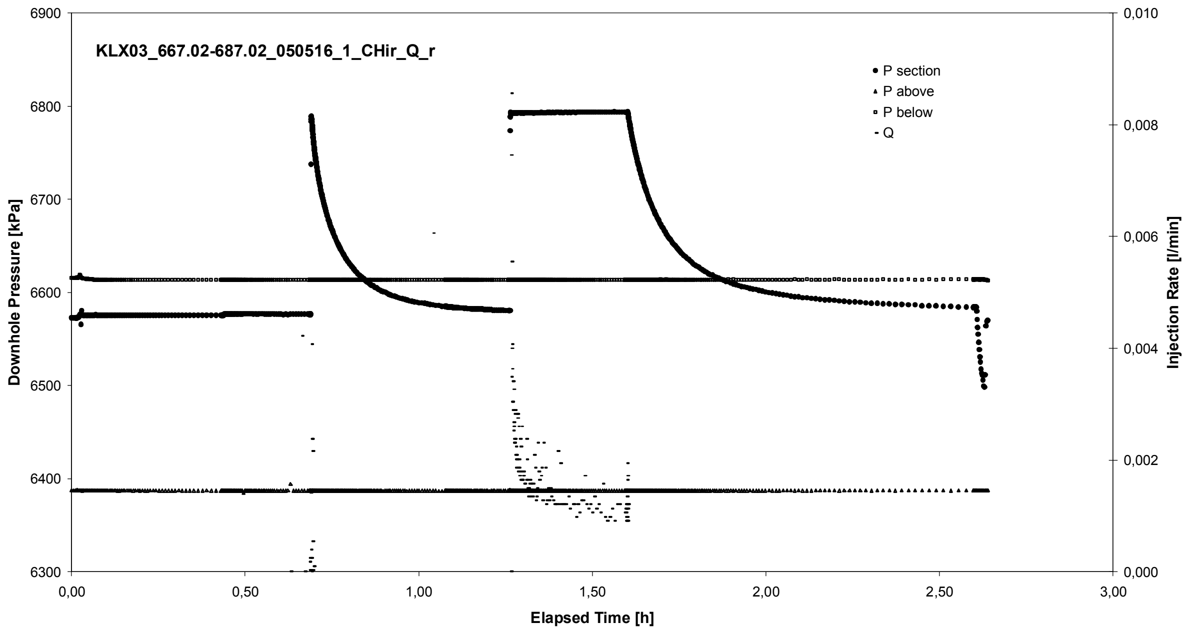


CHIR phase; HORNER match

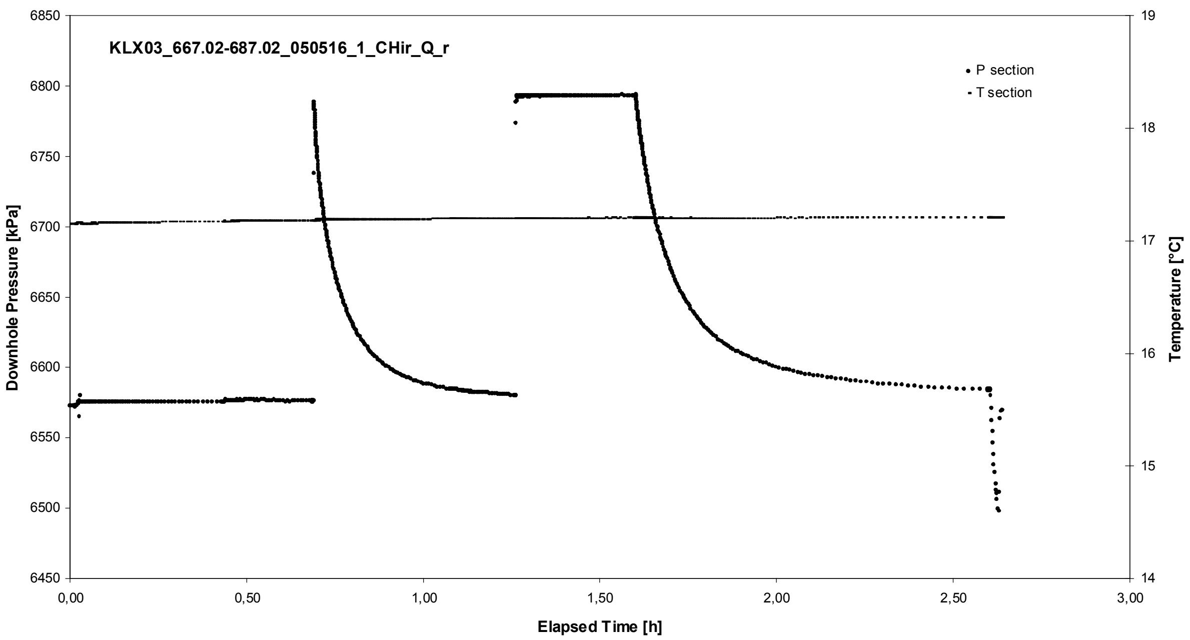
APPENDIX 2-40

Test 667.02 – 687.02 m

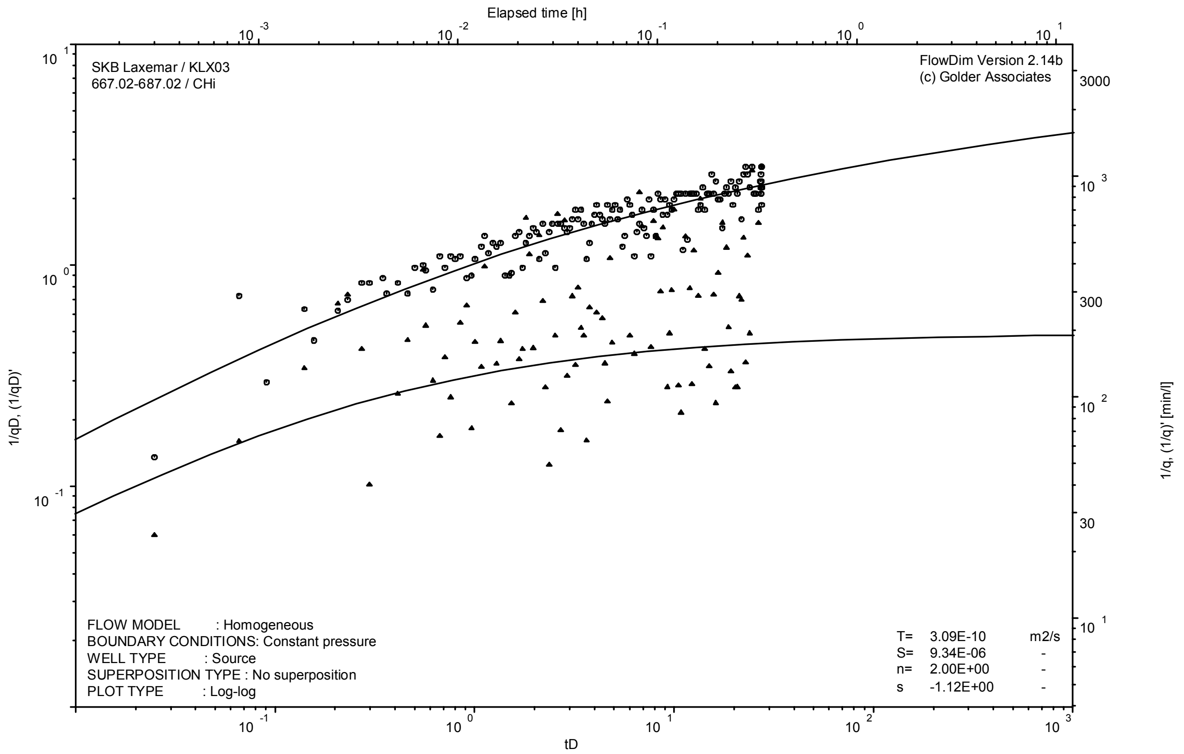
Analysis diagrams



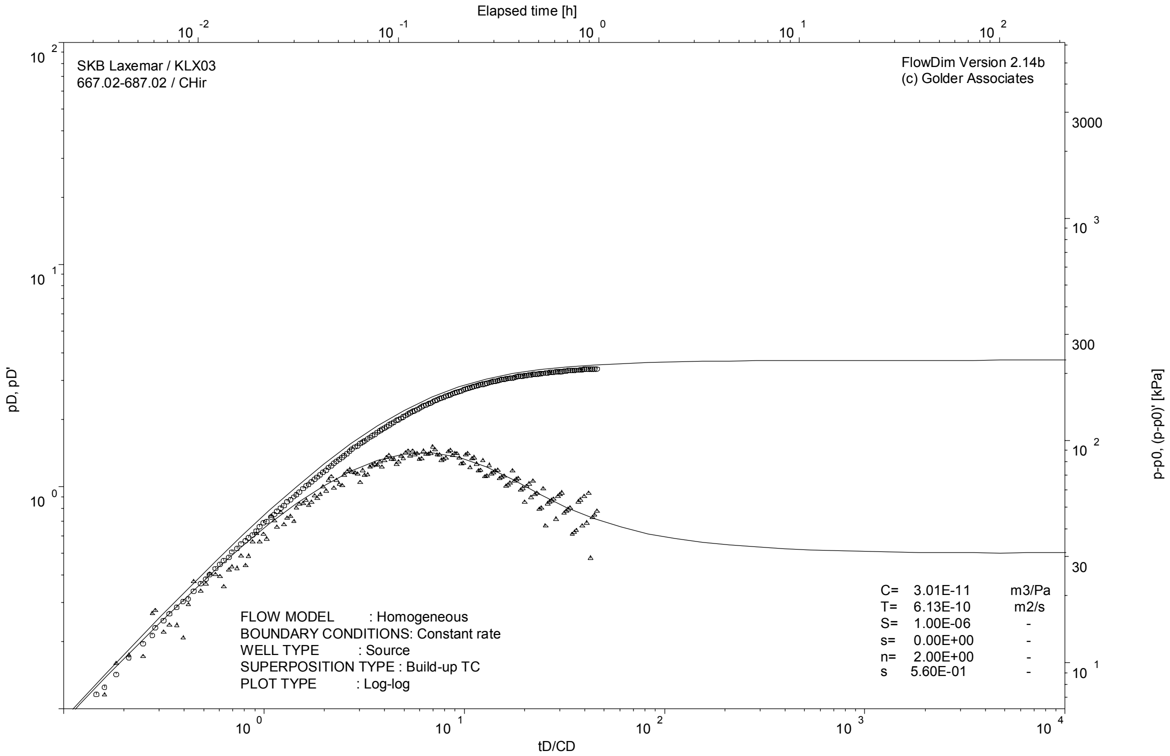
Pressure and flow rate vs. time; cartesian plot



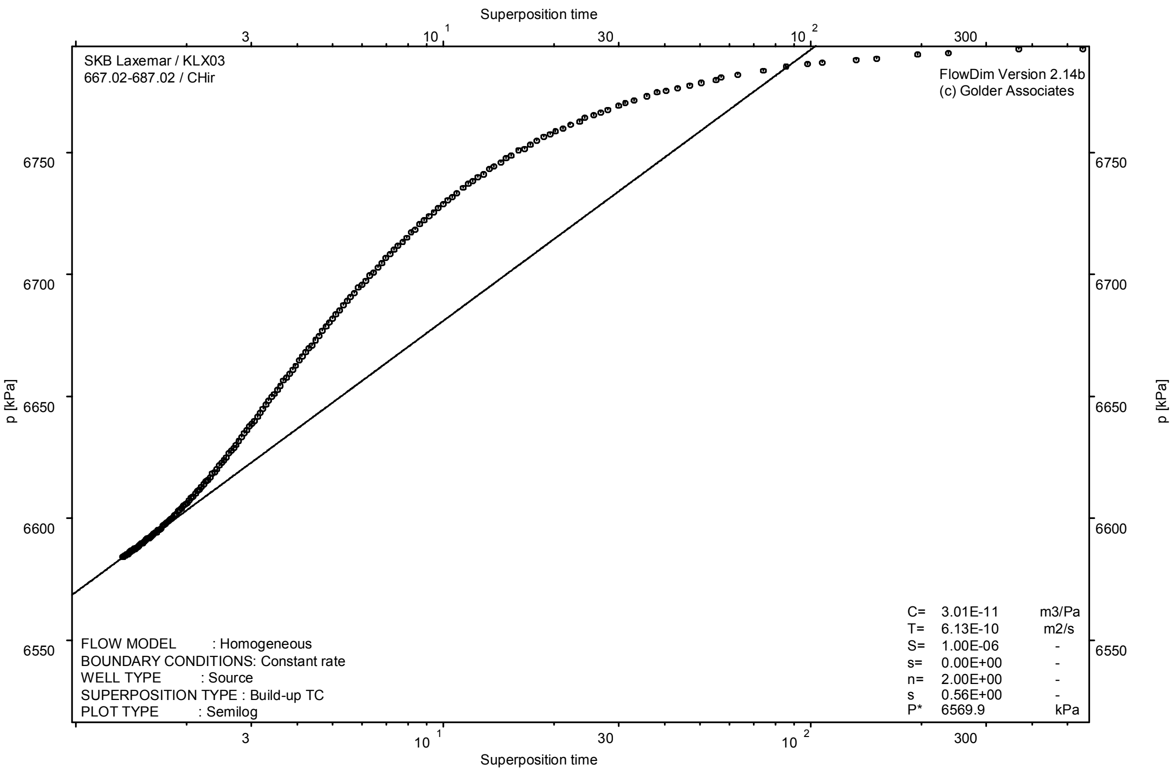
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

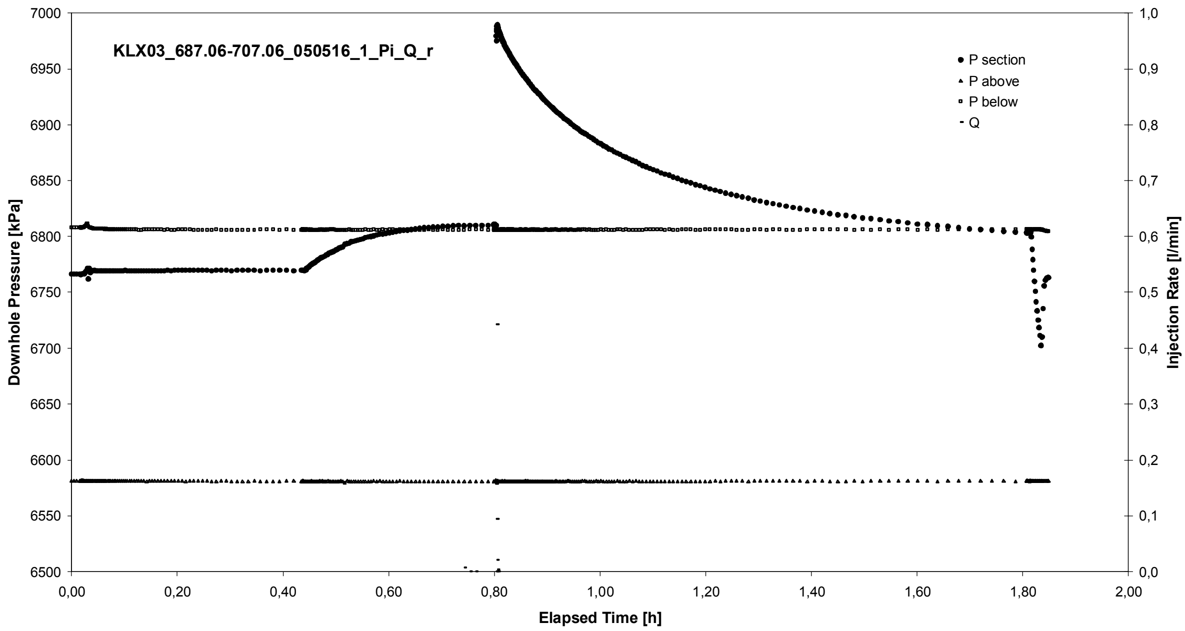


CHIR phase; HORNER match

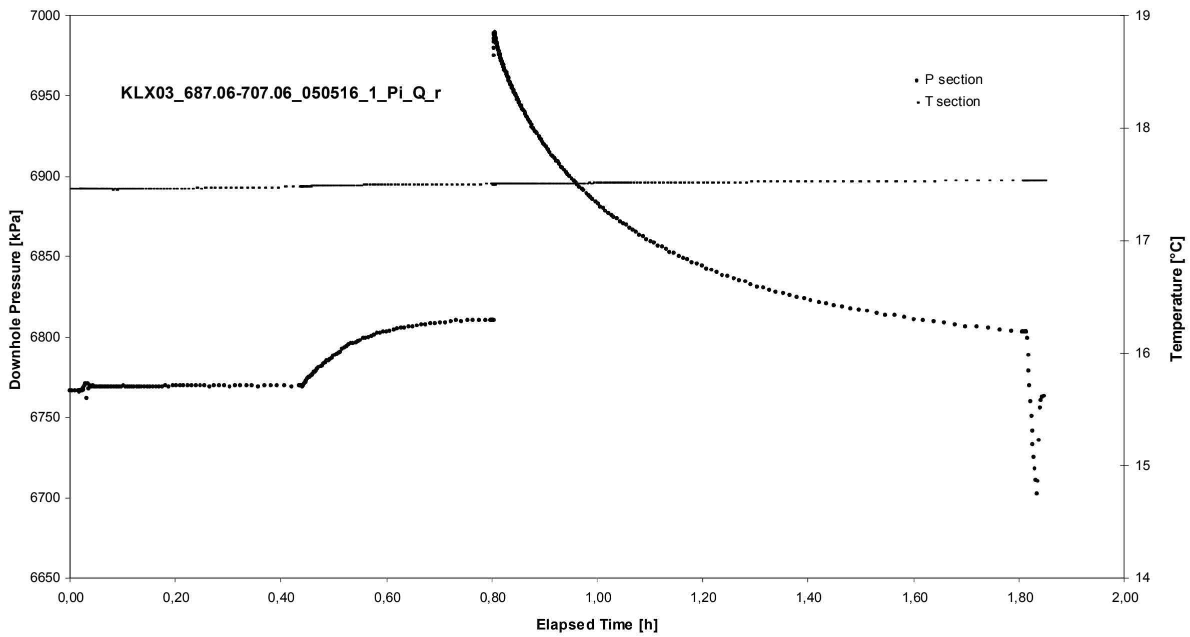
APPENDIX 2-41

Test 687.06 – 707.06 m

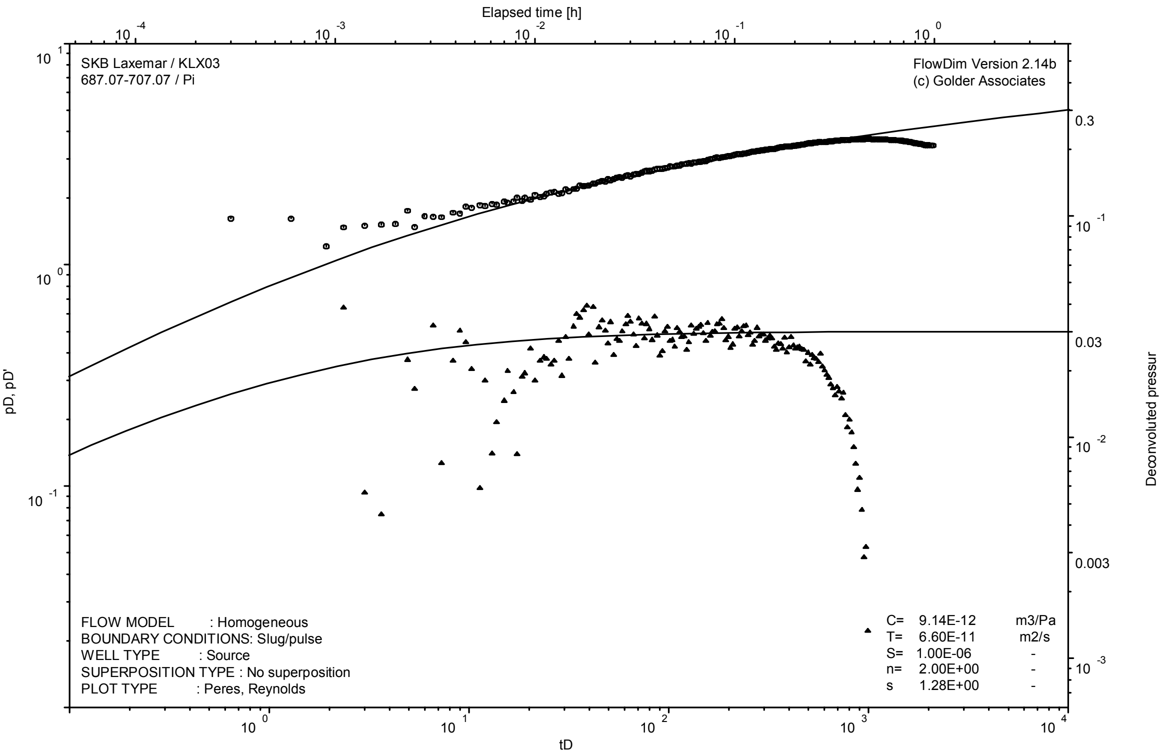
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

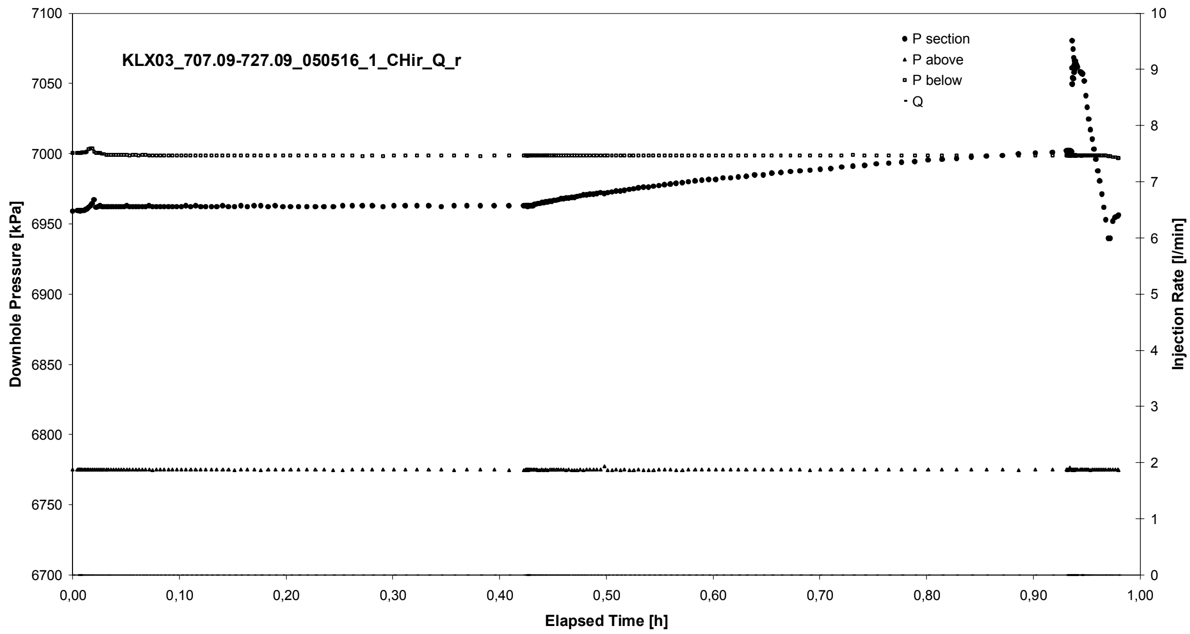


Pulse injection; deconvolution match

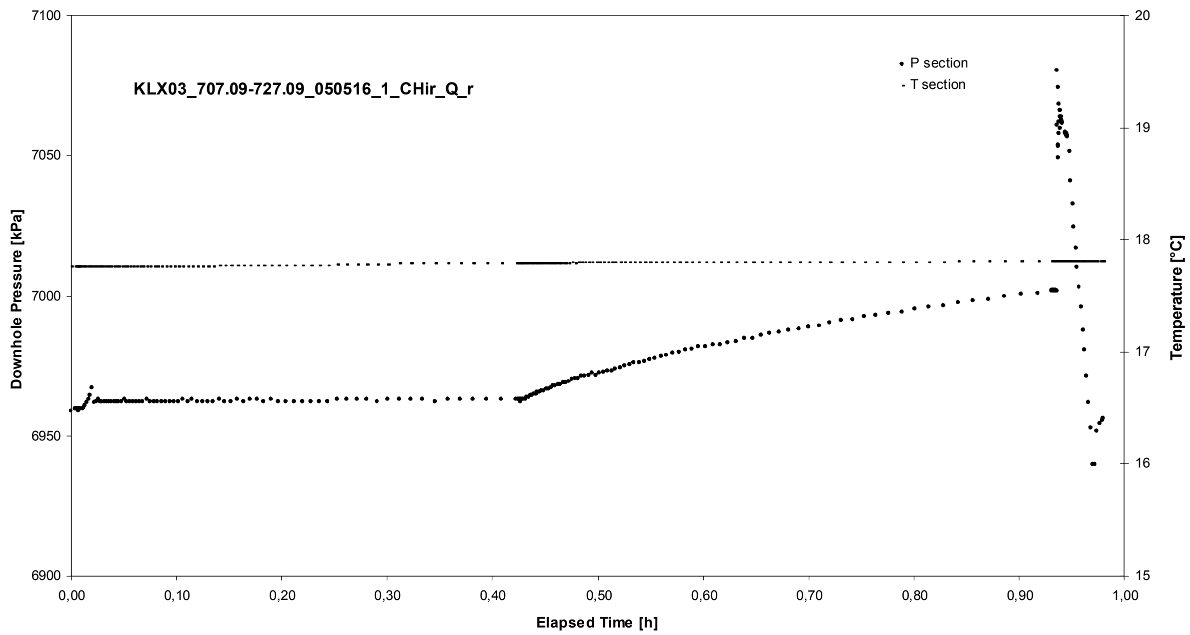
APPENDIX 2-42

Test 707.09 – 727.09 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

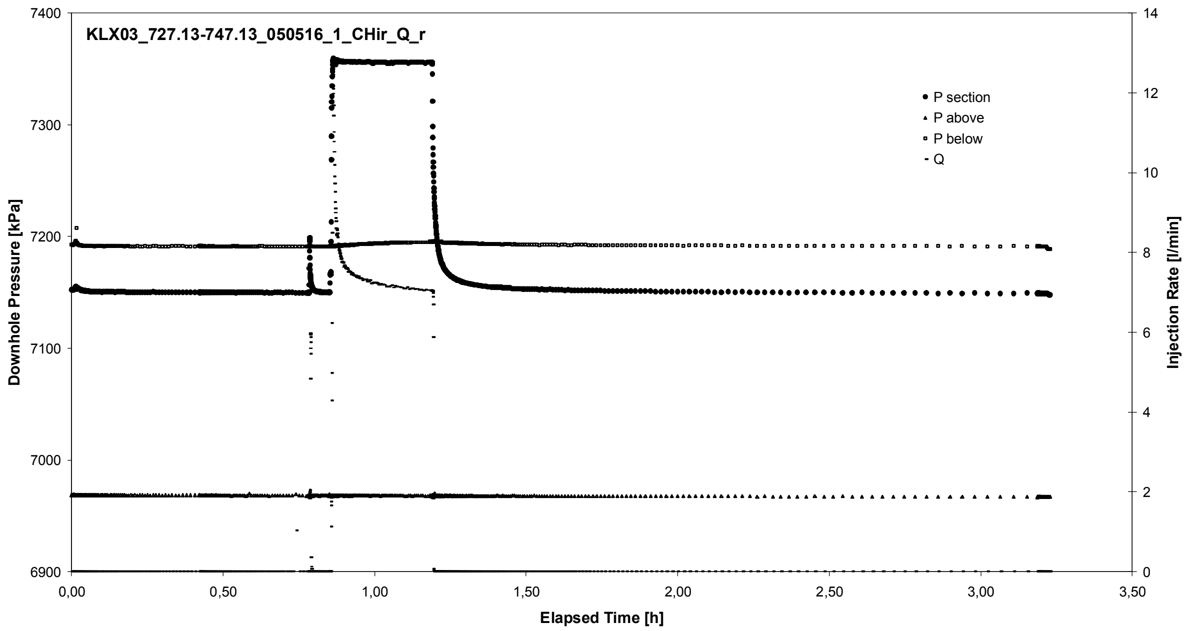
Not Analysed

CHIR phase; HORNER match

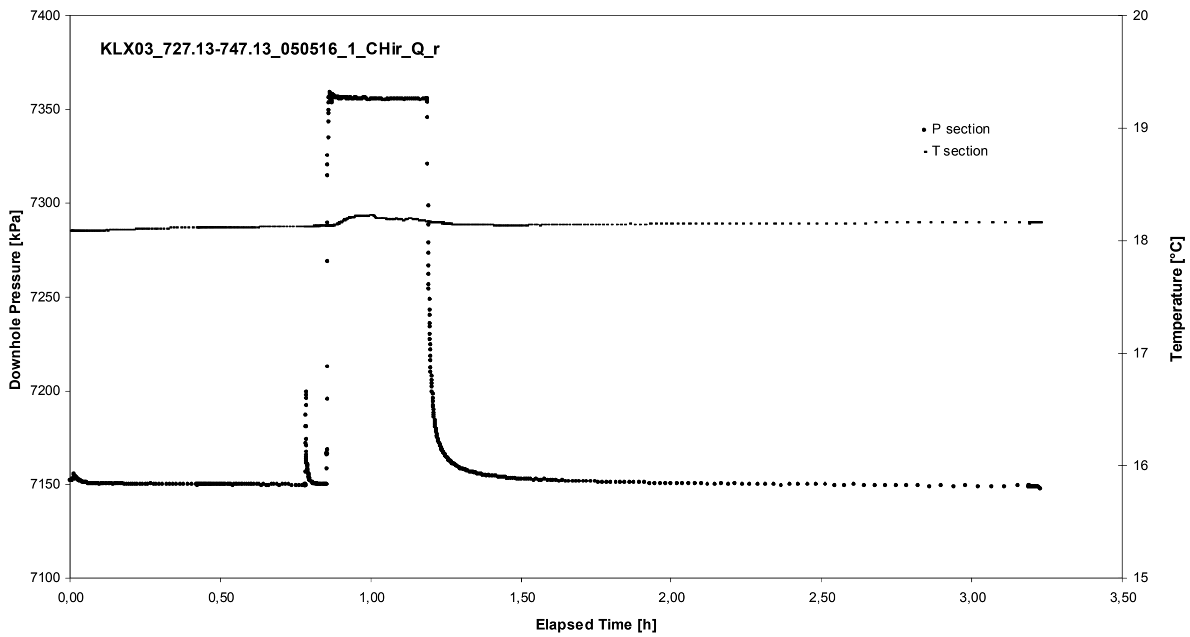
APPENDIX 2-43

Test 727.13 – 747.13 m

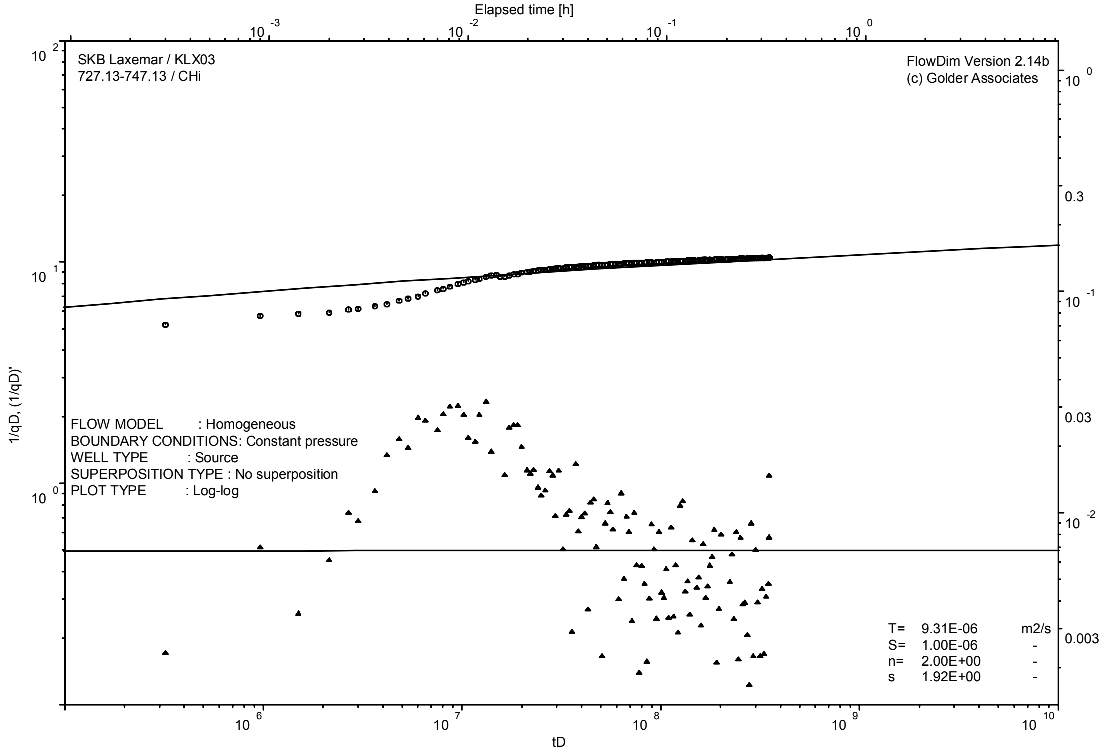
Analysis diagrams



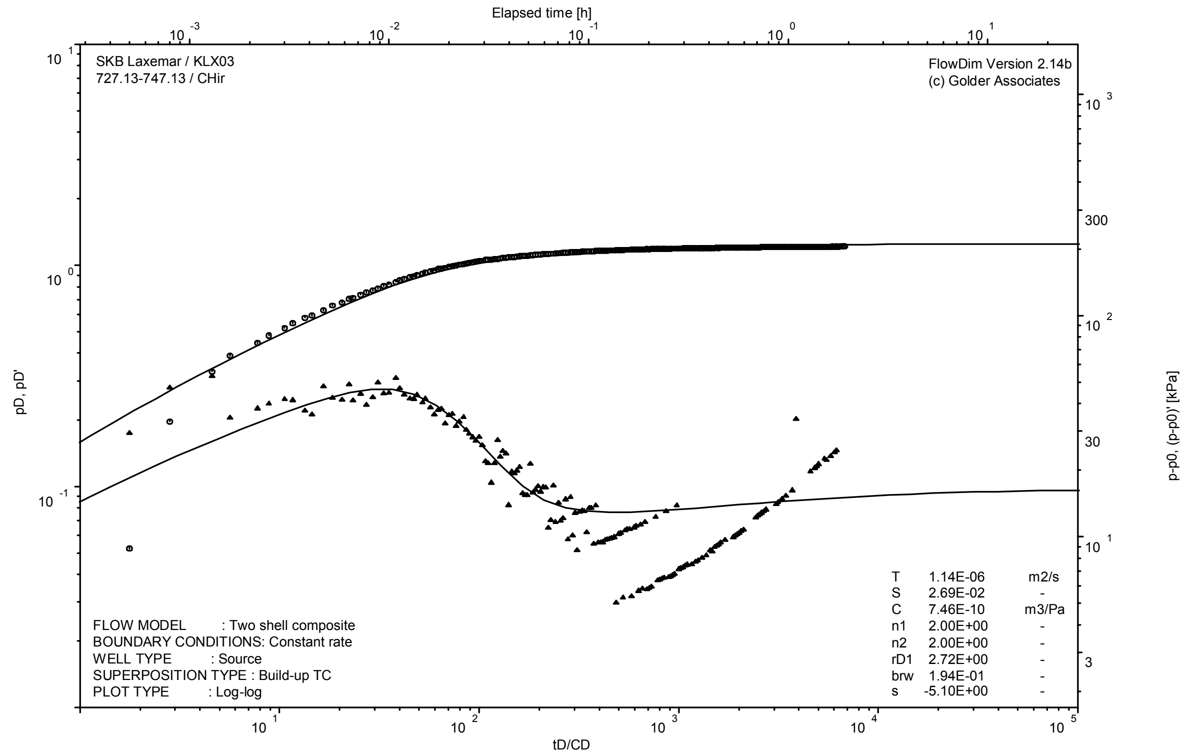
Pressure and flow rate vs. time; cartesian plot



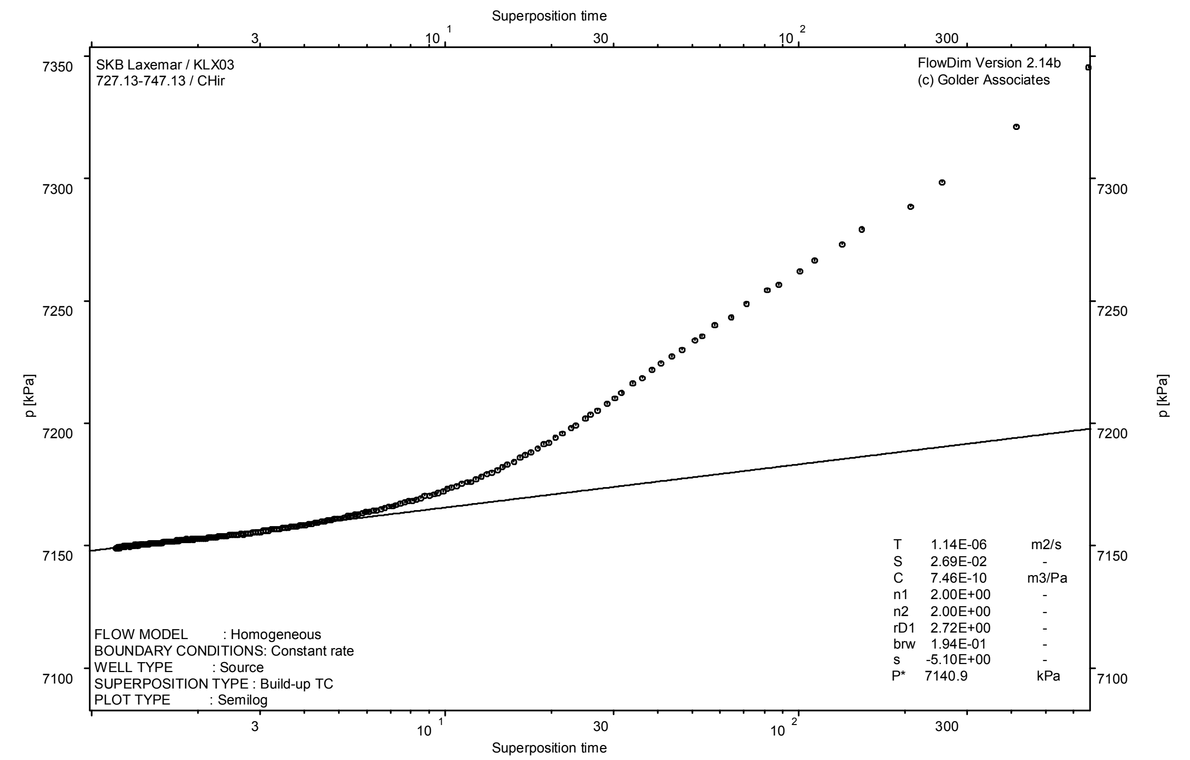
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

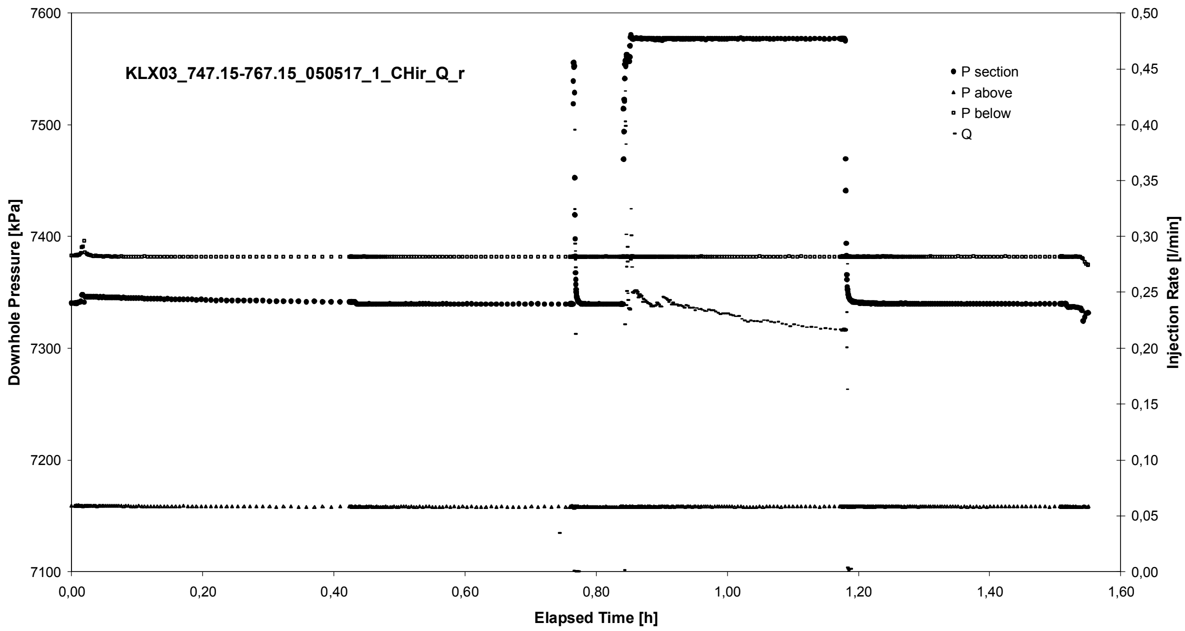


CHIR phase; HORNER match

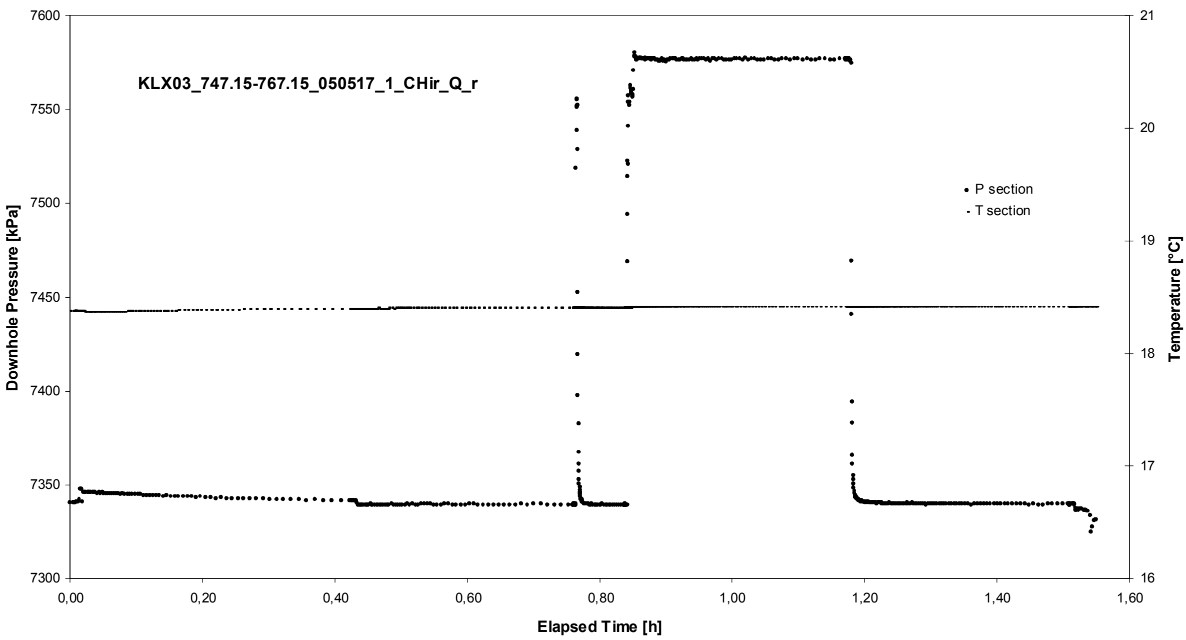
APPENDIX 2-44

Test 747.15 – 767.15 m

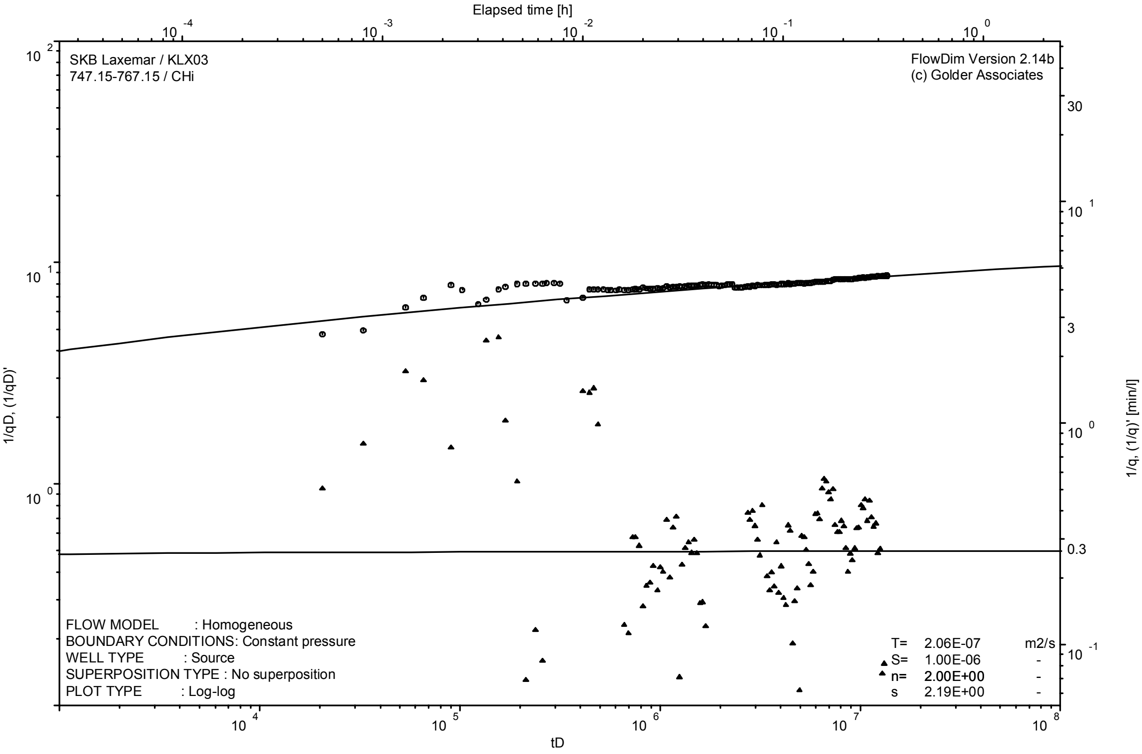
Analysis diagrams



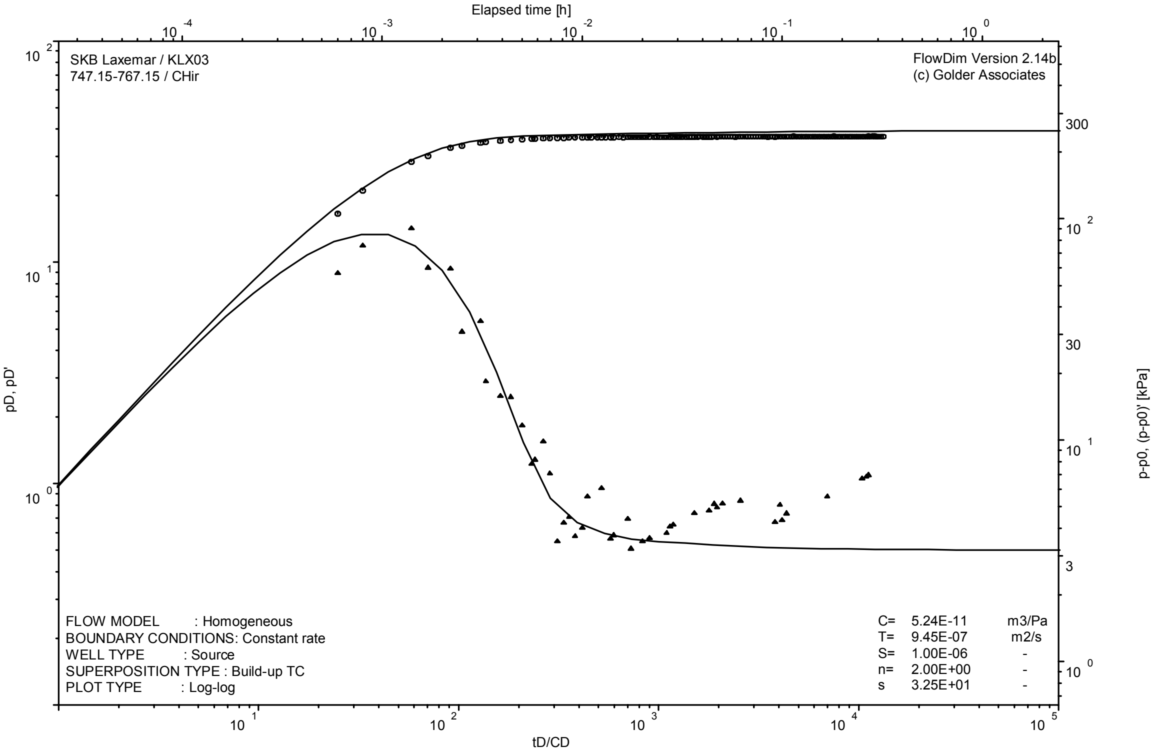
Pressure and flow rate vs. time; cartesian plot



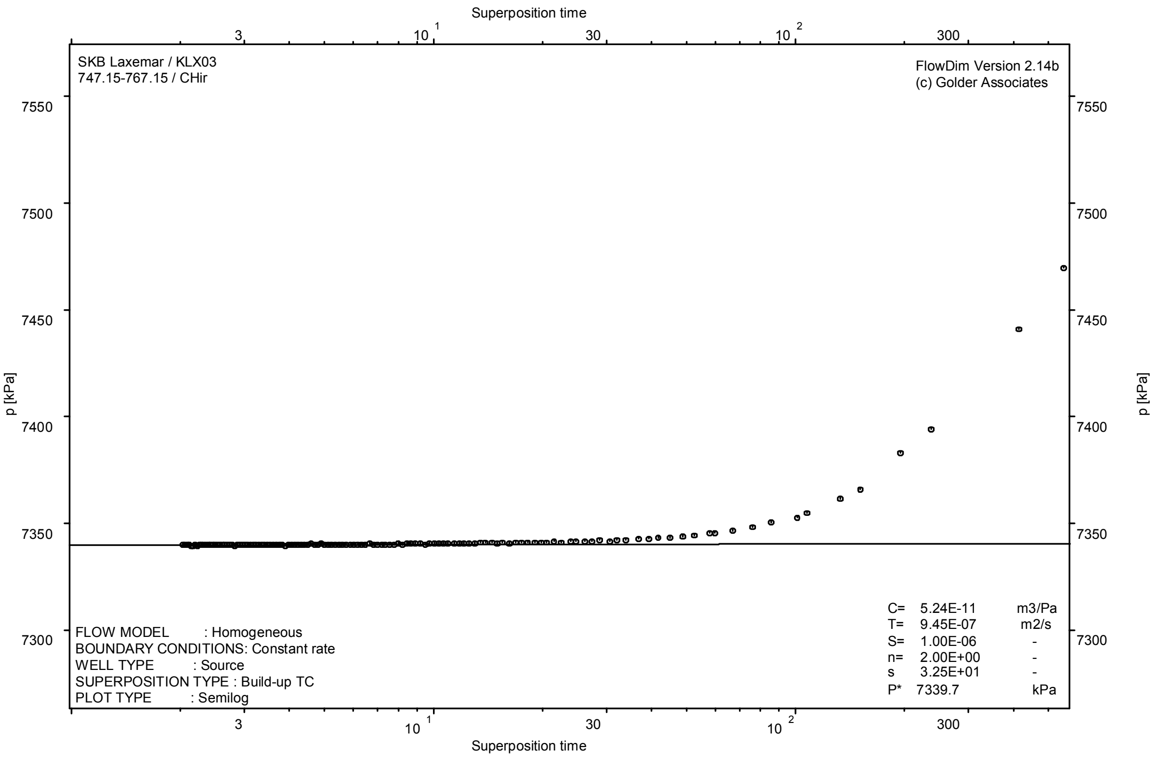
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

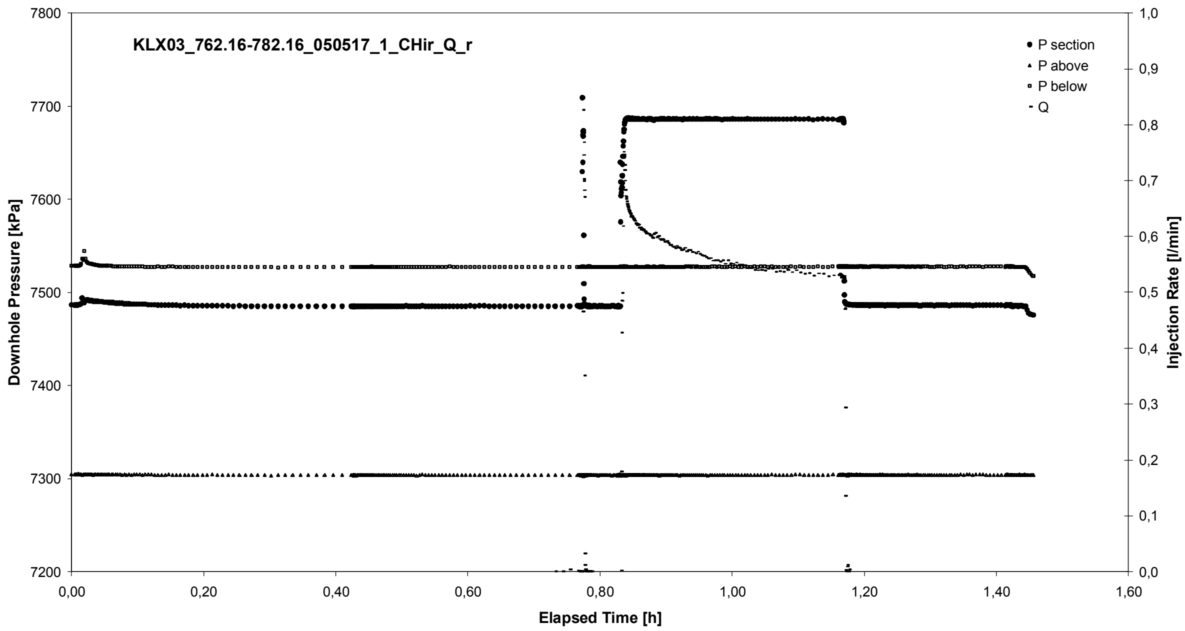


CHIR phase; HORNER match

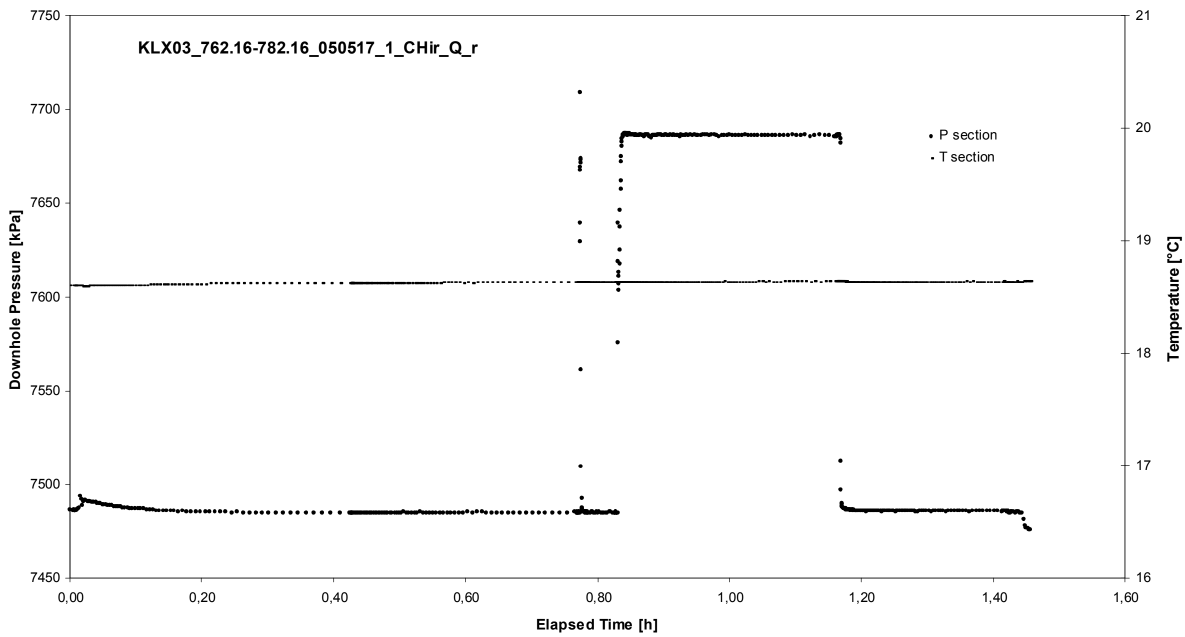
APPENDIX 2-45

Test 762.16 – 782.16 m

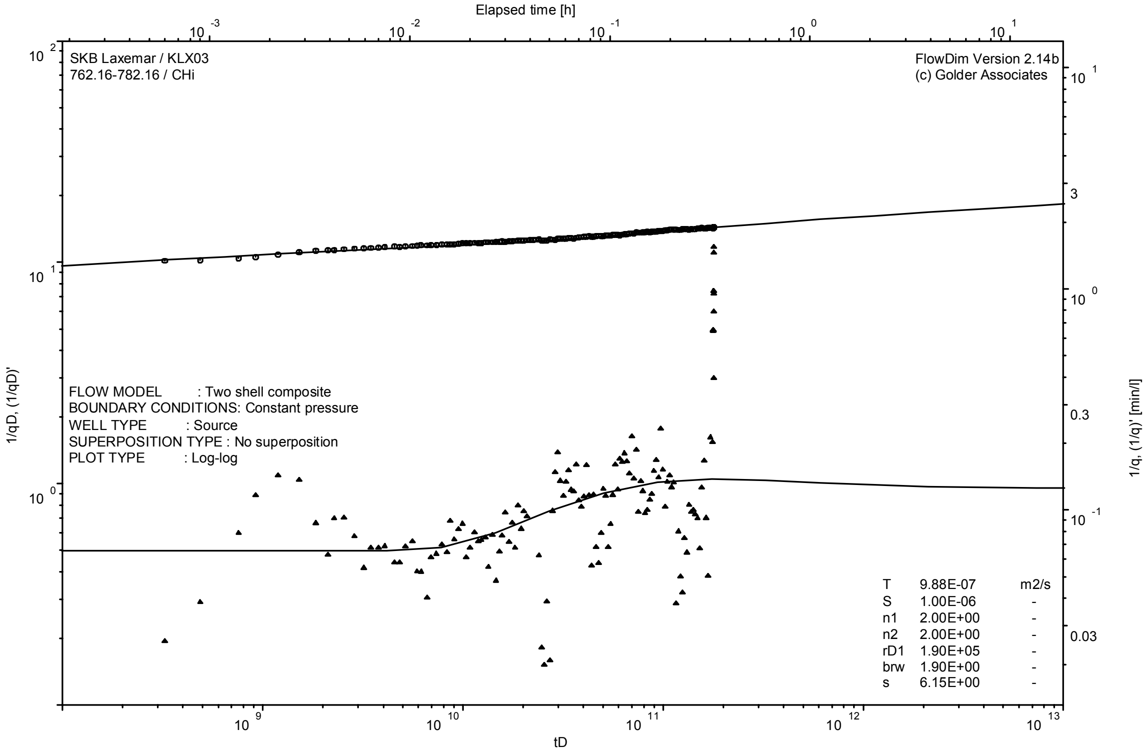
Analysis diagrams



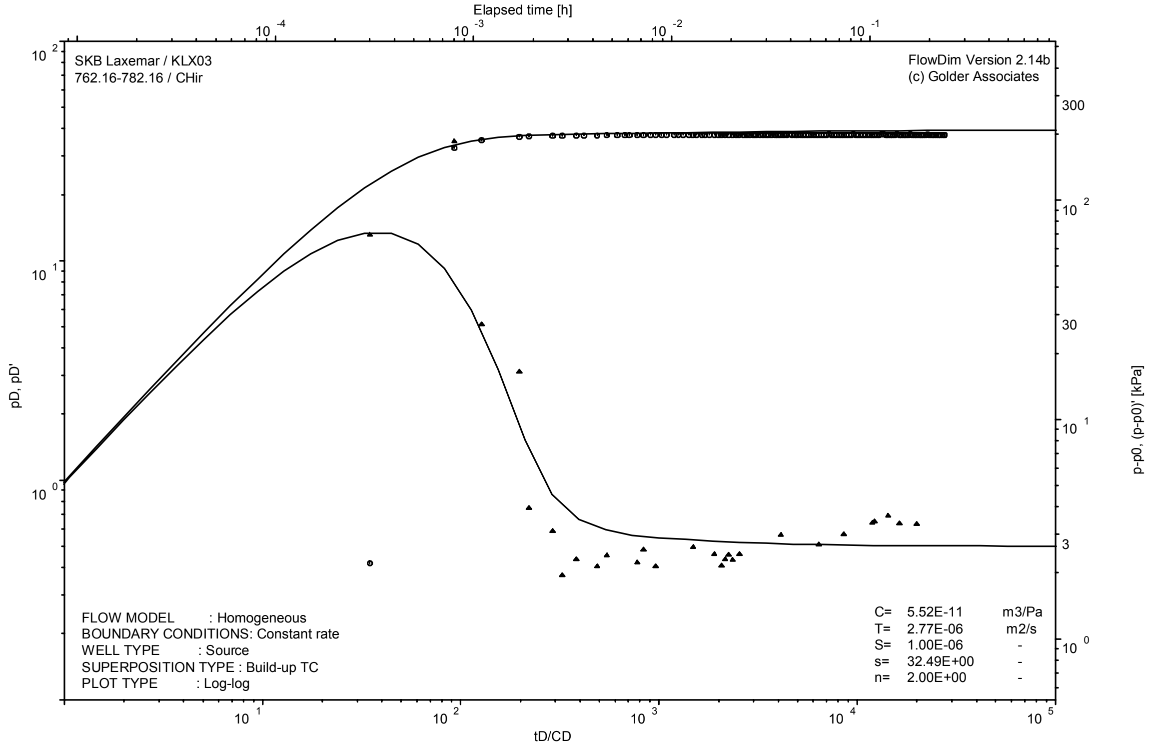
Pressure and flow rate vs. time; cartesian plot



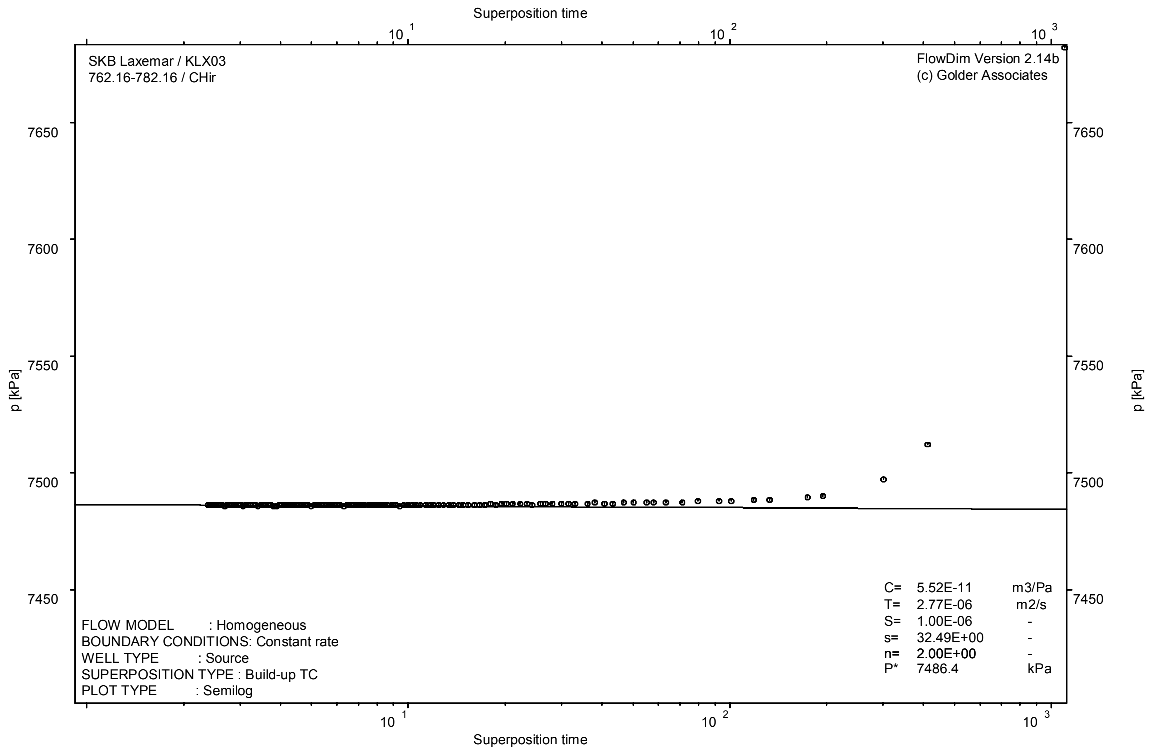
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

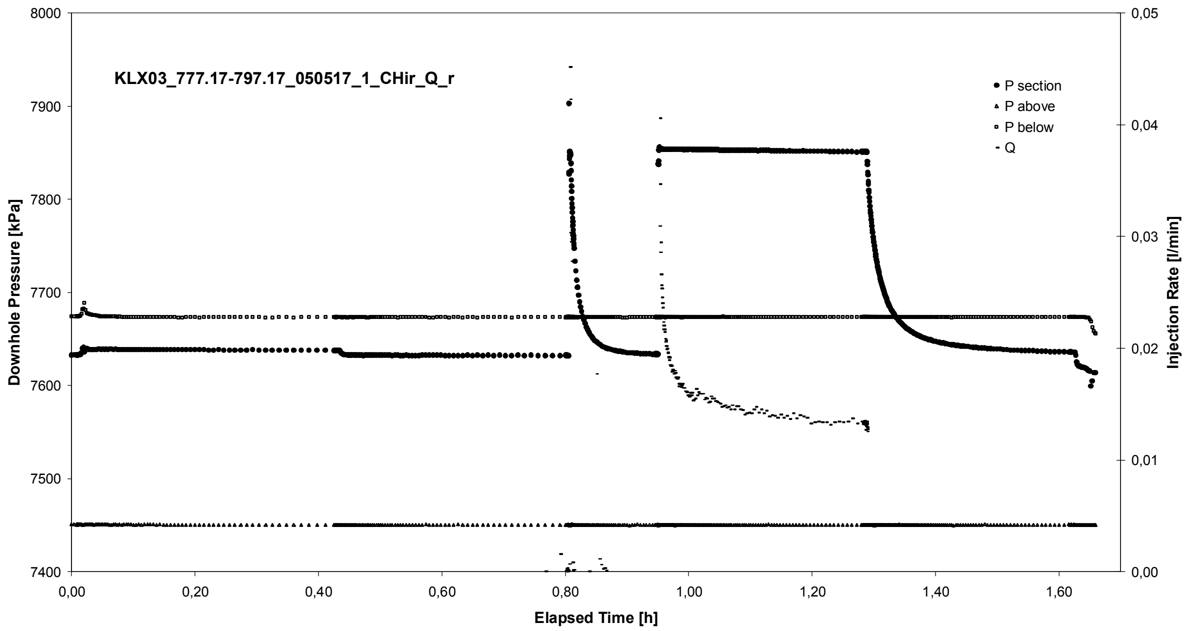


CHIR phase; HORNER match

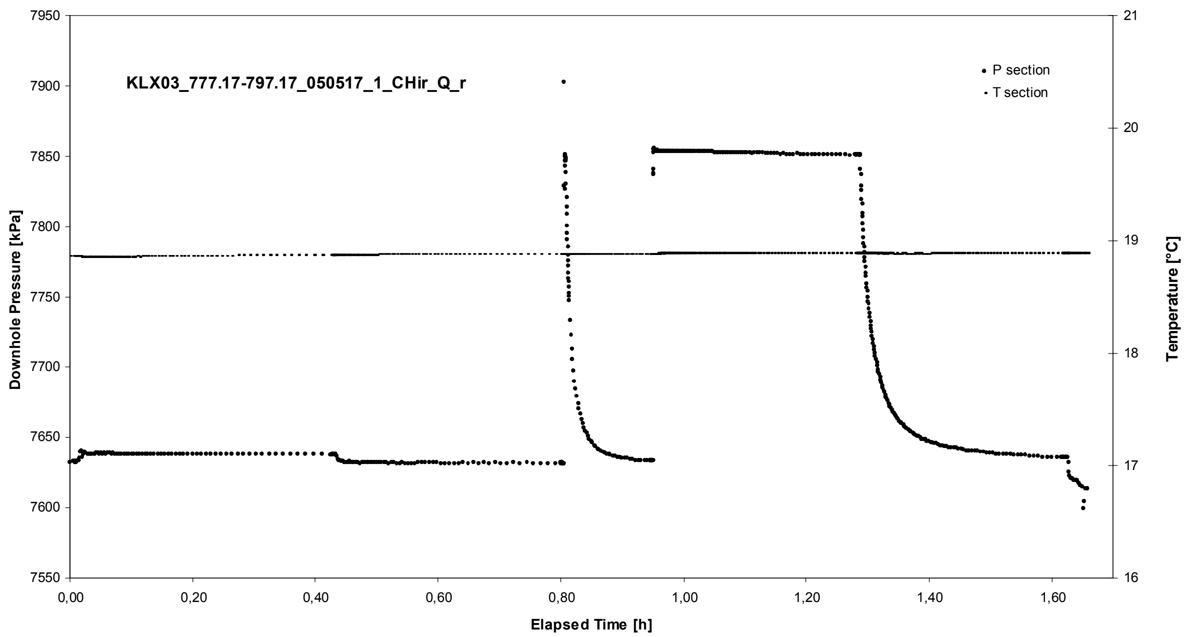
APPENDIX 2-46

Test 777.17 – 797.17 m

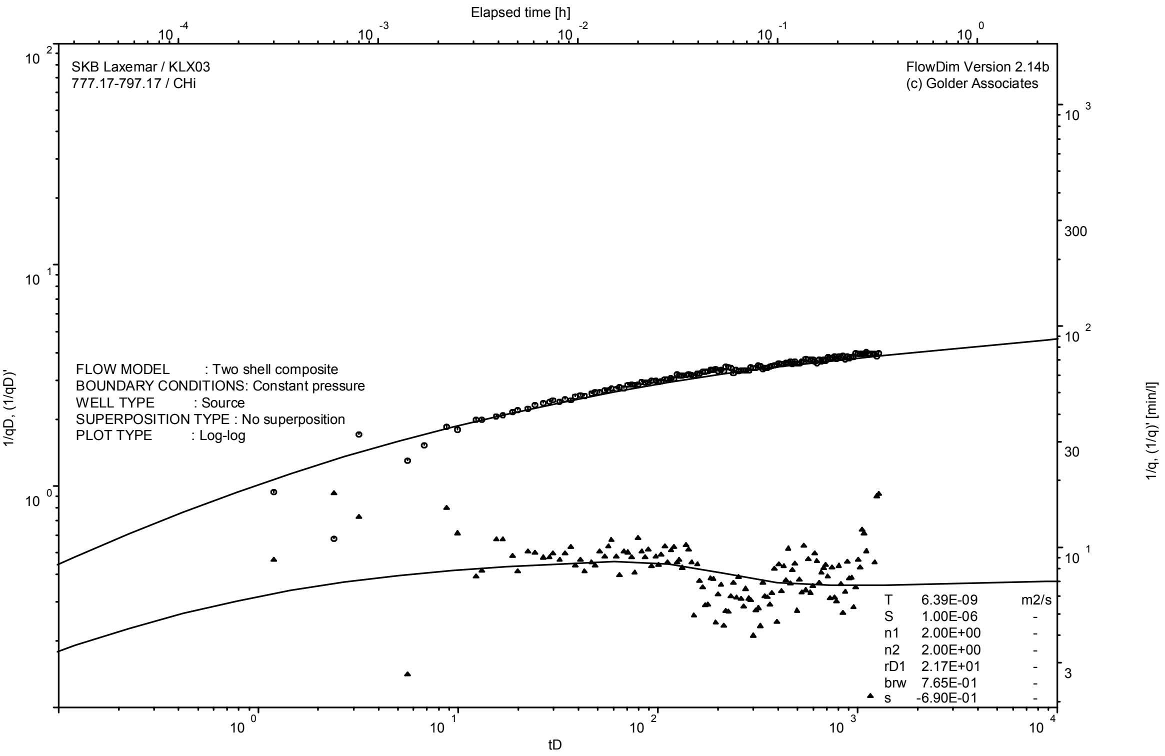
Analysis diagrams



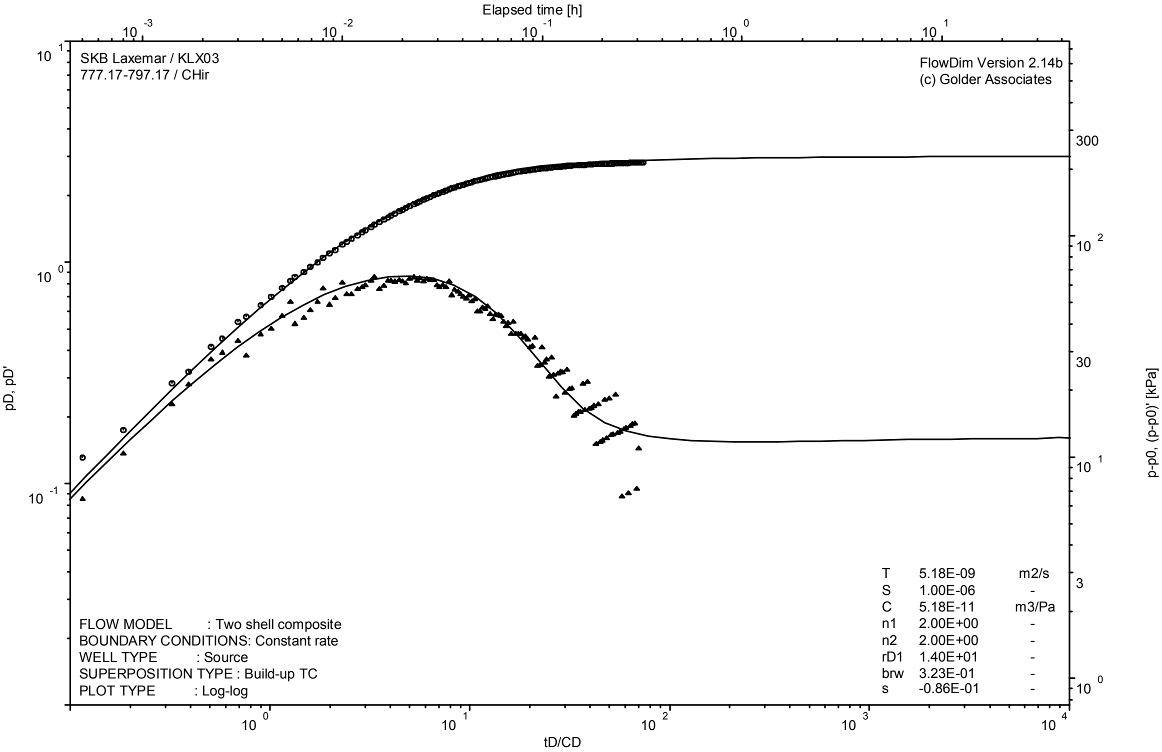
Pressure and flow rate vs. time; cartesian plot



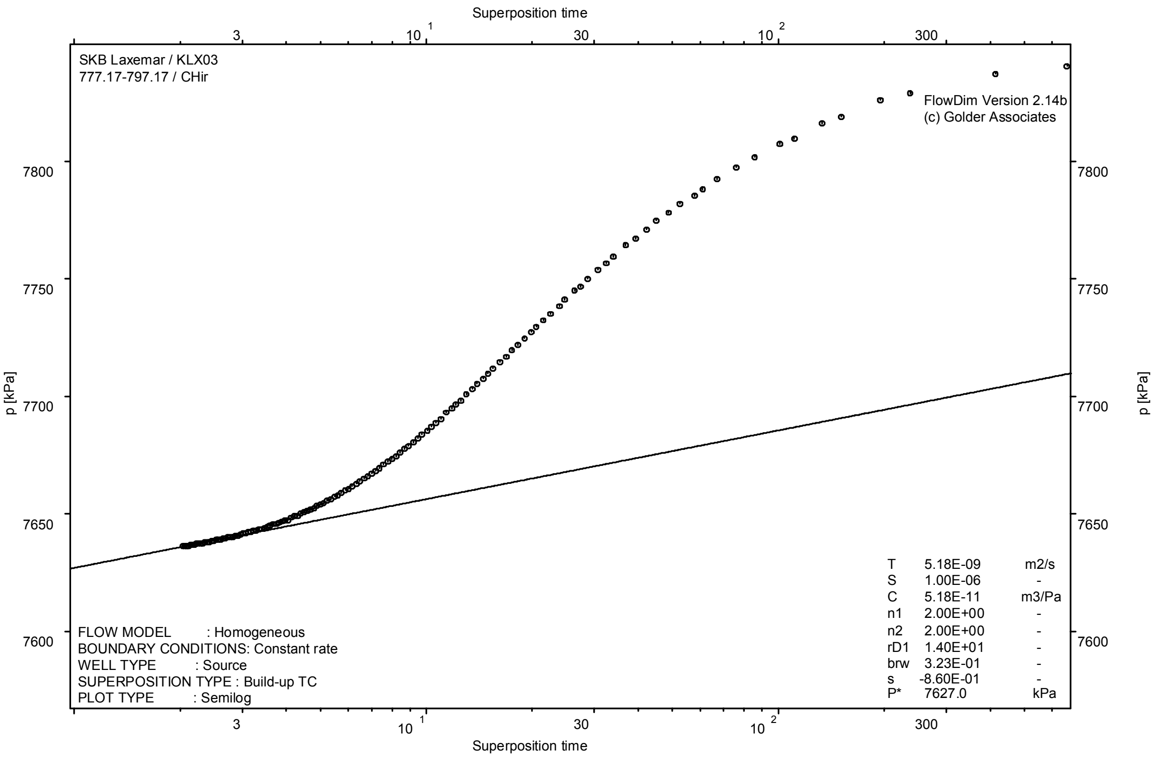
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

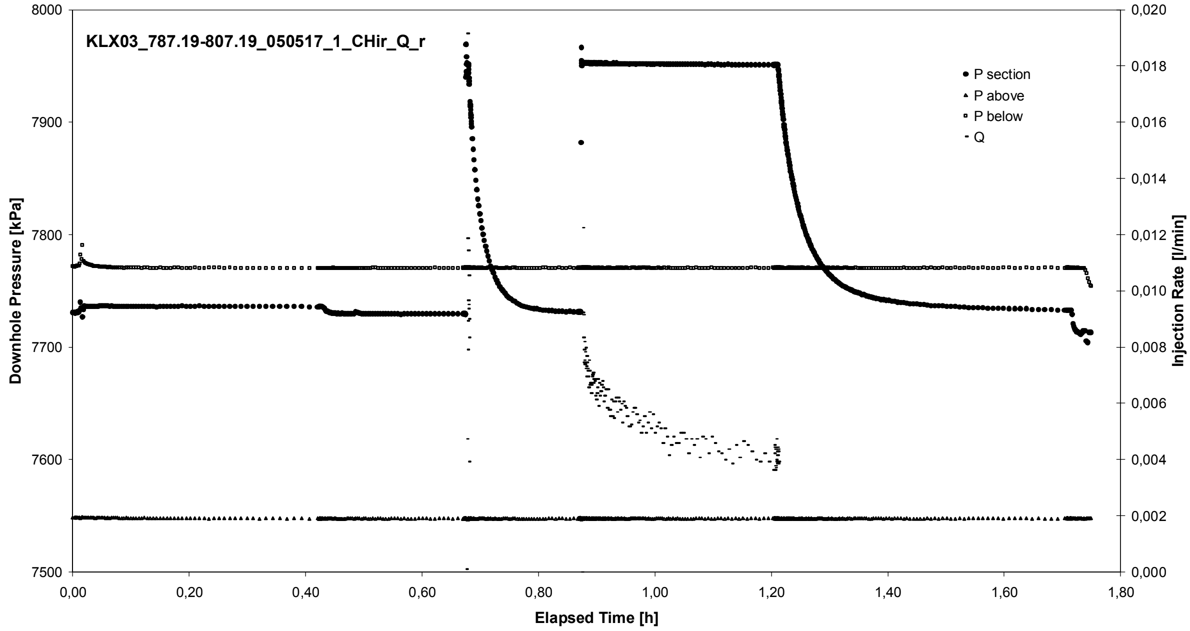


CHIR phase; HORNER match

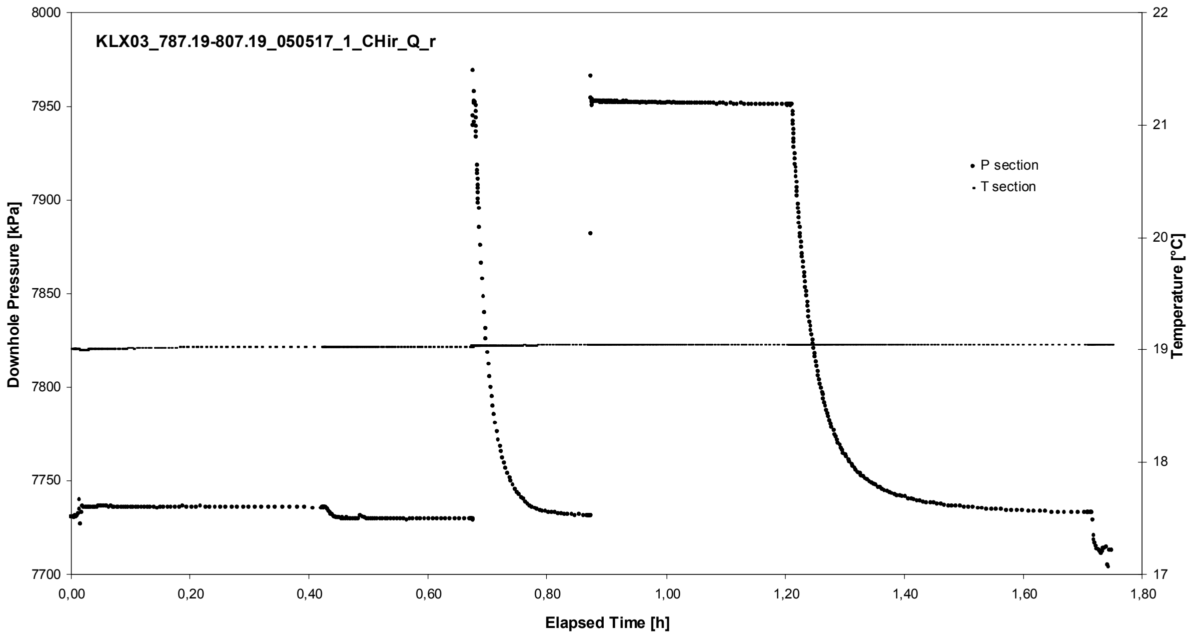
APPENDIX 2-47

Test 787.19 – 807.19 m

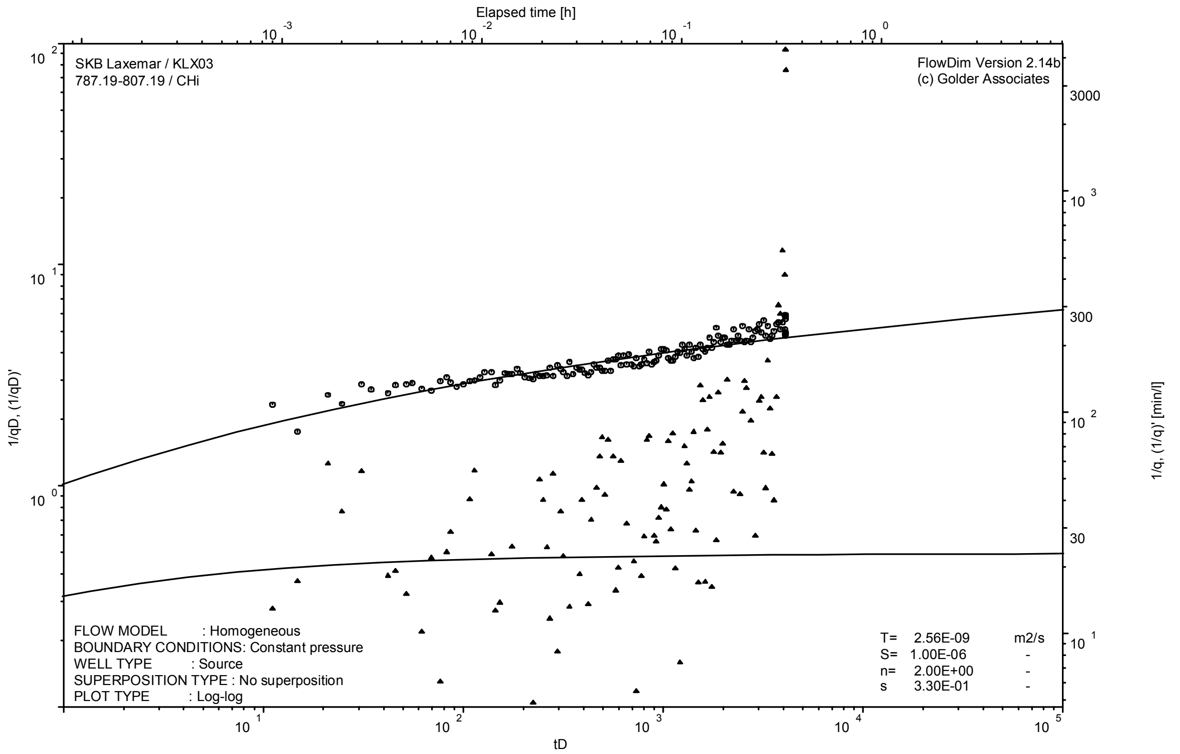
Analysis diagrams



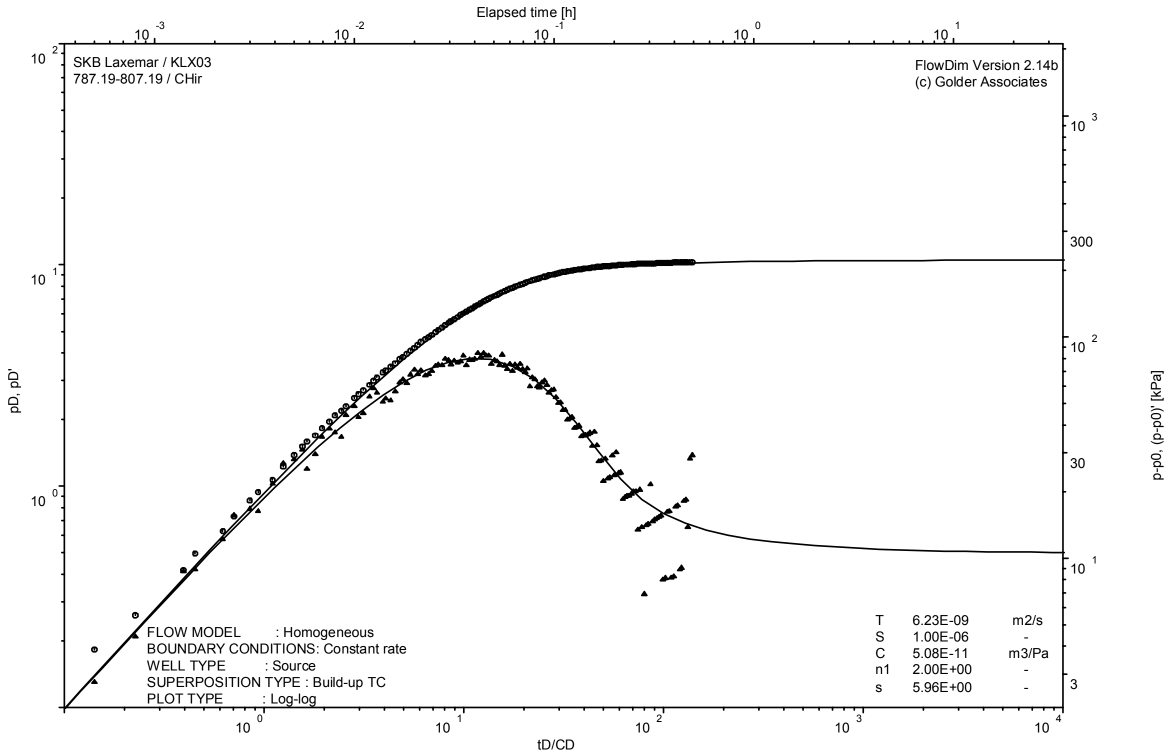
Pressure and flow rate vs. time; cartesian plot



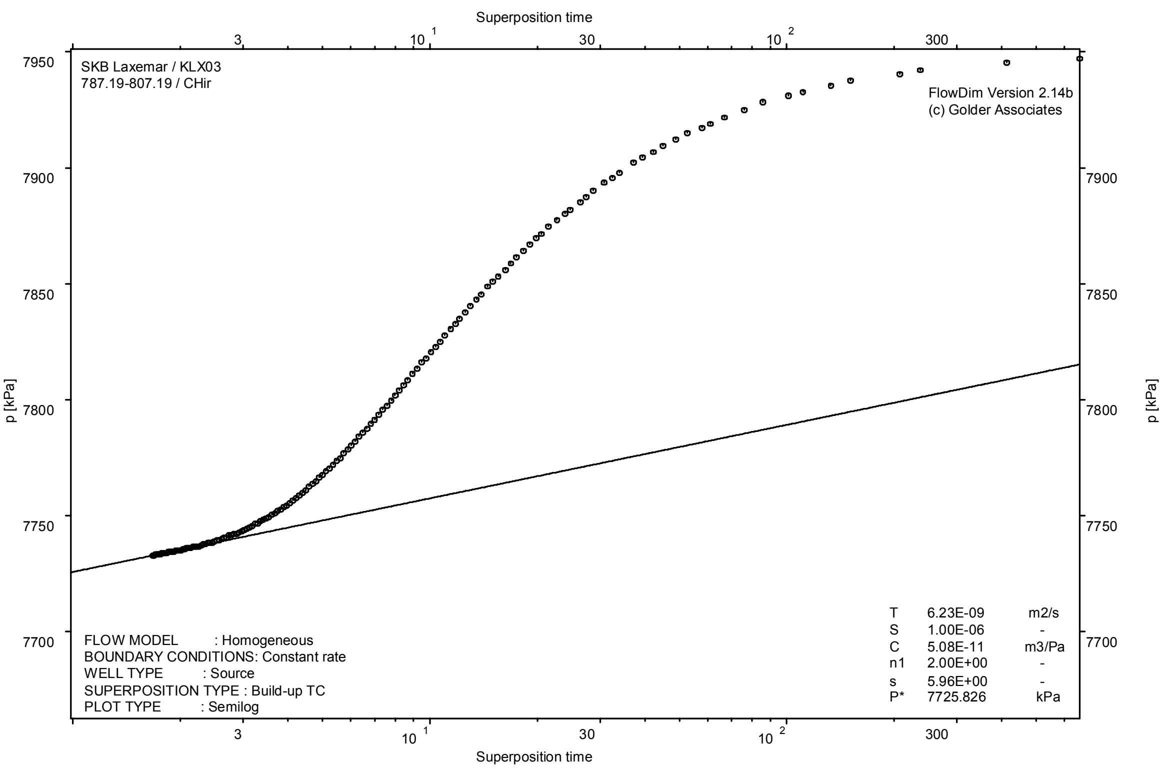
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

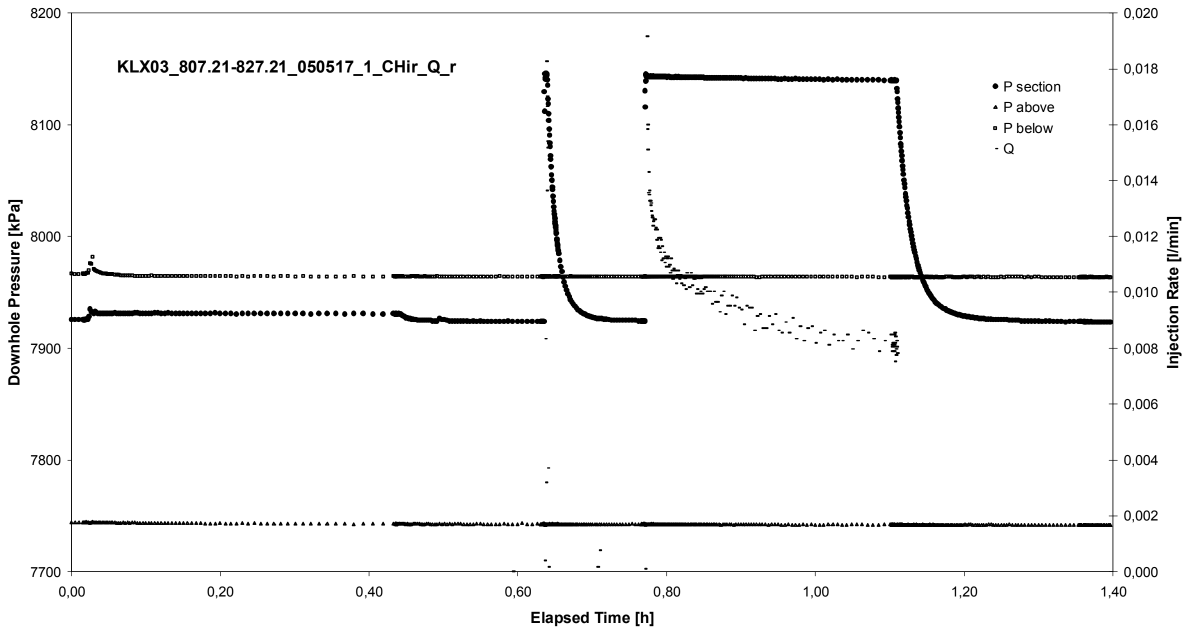


CHIR phase; HORNER match

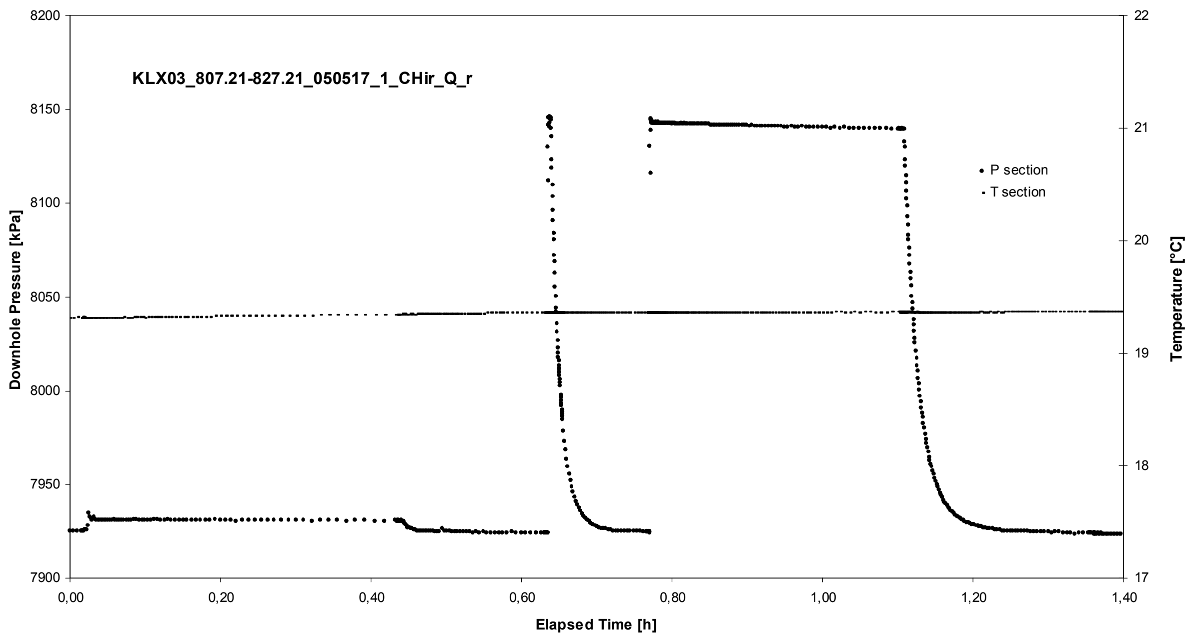
APPENDIX 2-48

Test 807.21 – 827.21 m

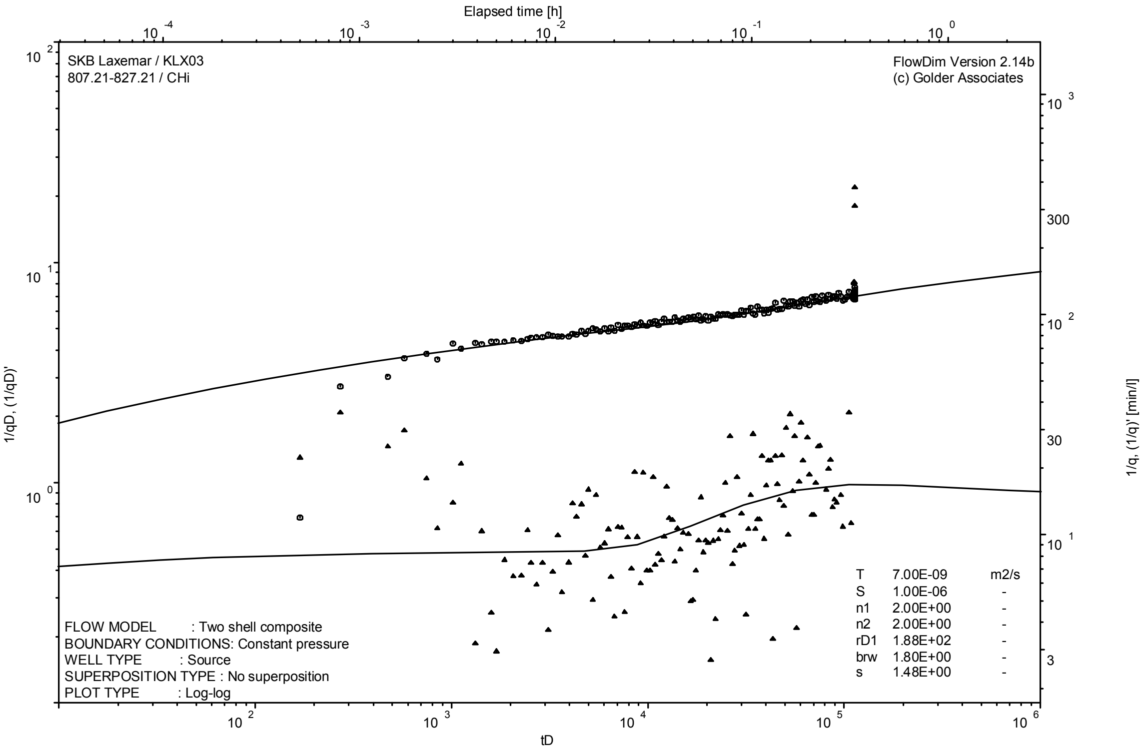
Analysis diagrams



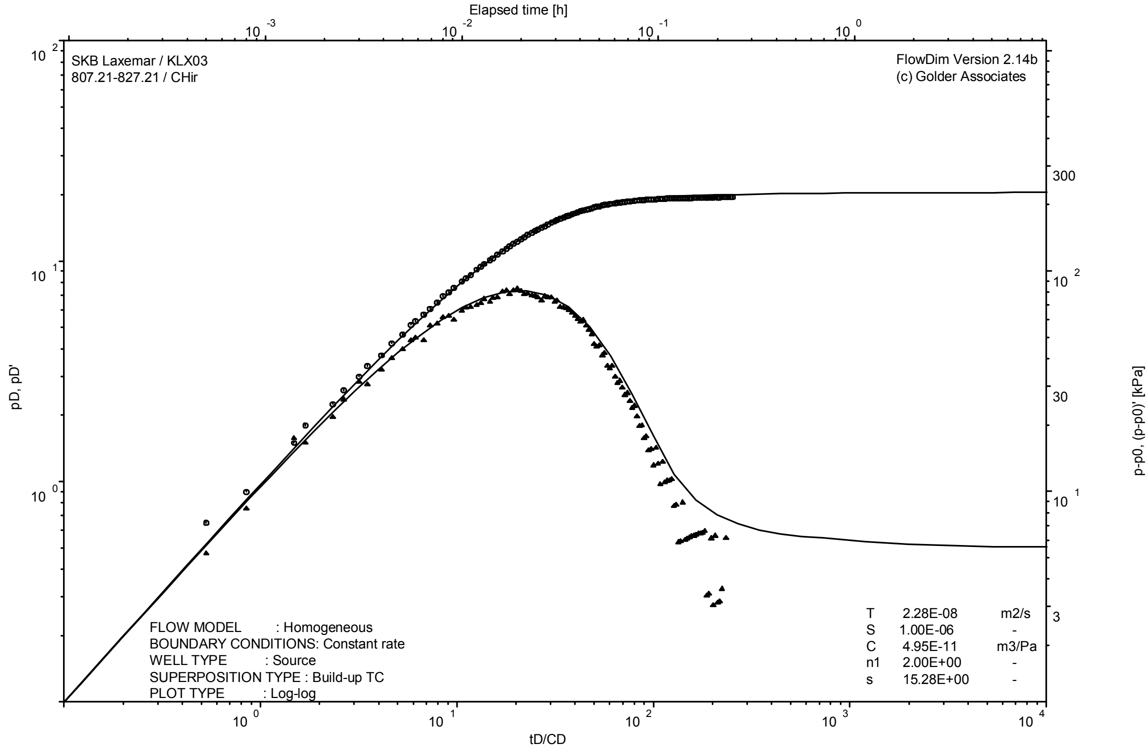
Pressure and flow rate vs. time; cartesian plot



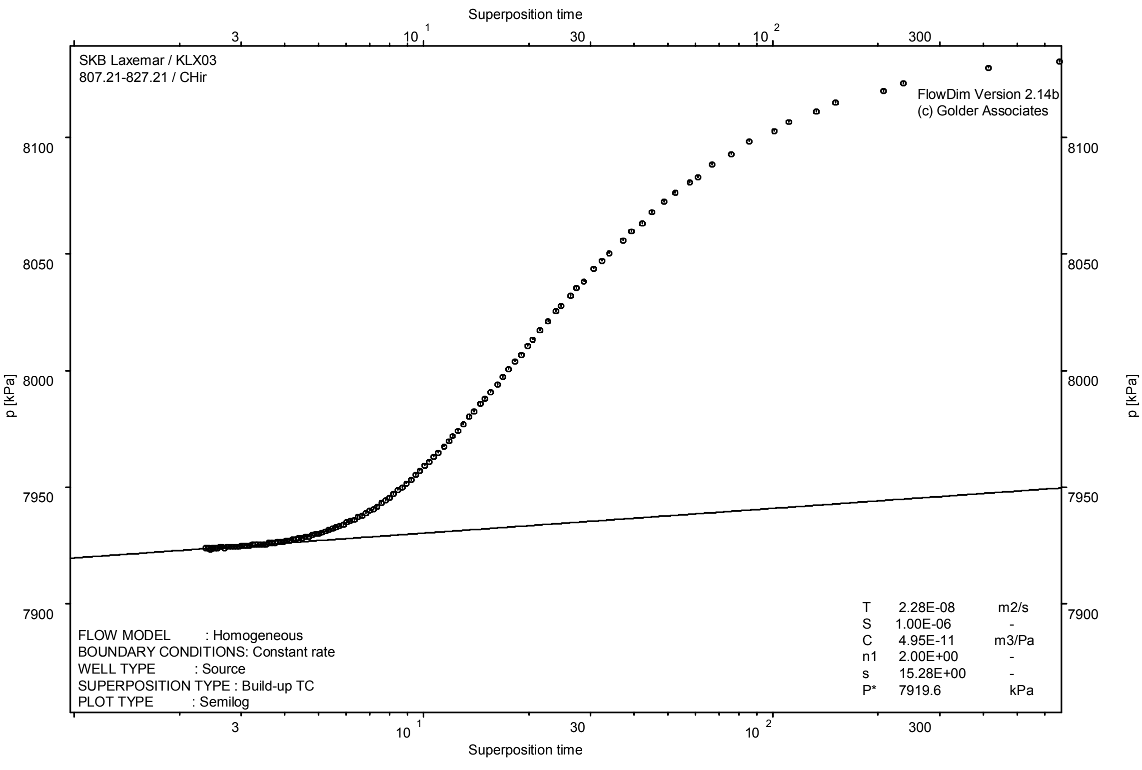
Interval pressure and temperature vs. time; cartesian plot



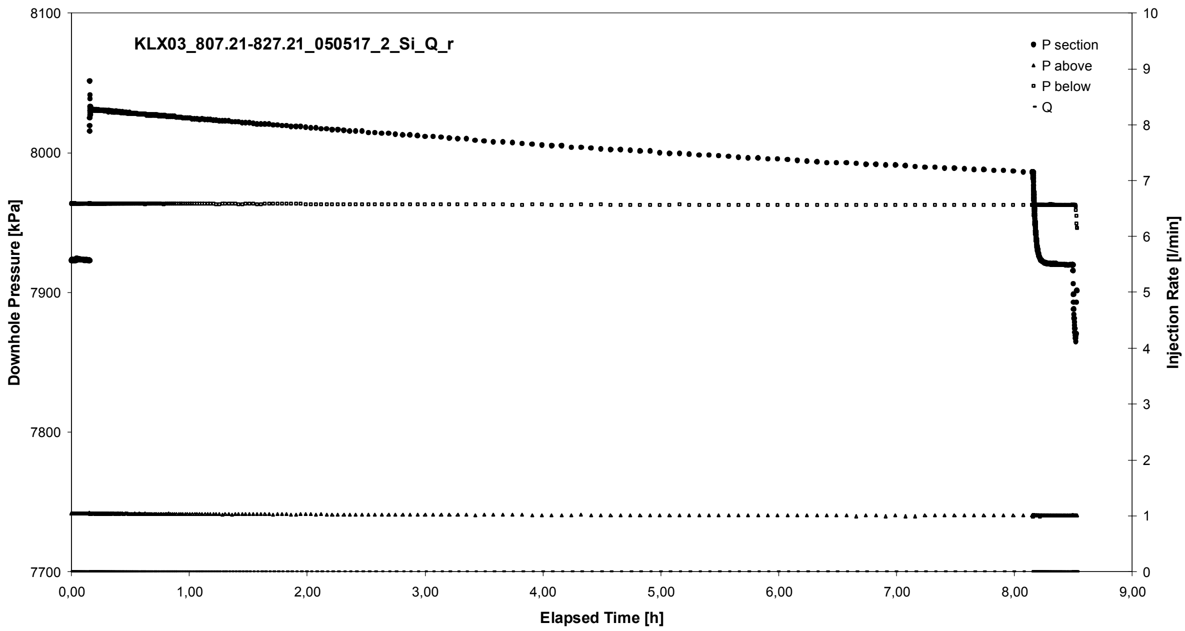
CHI phase; log-log match



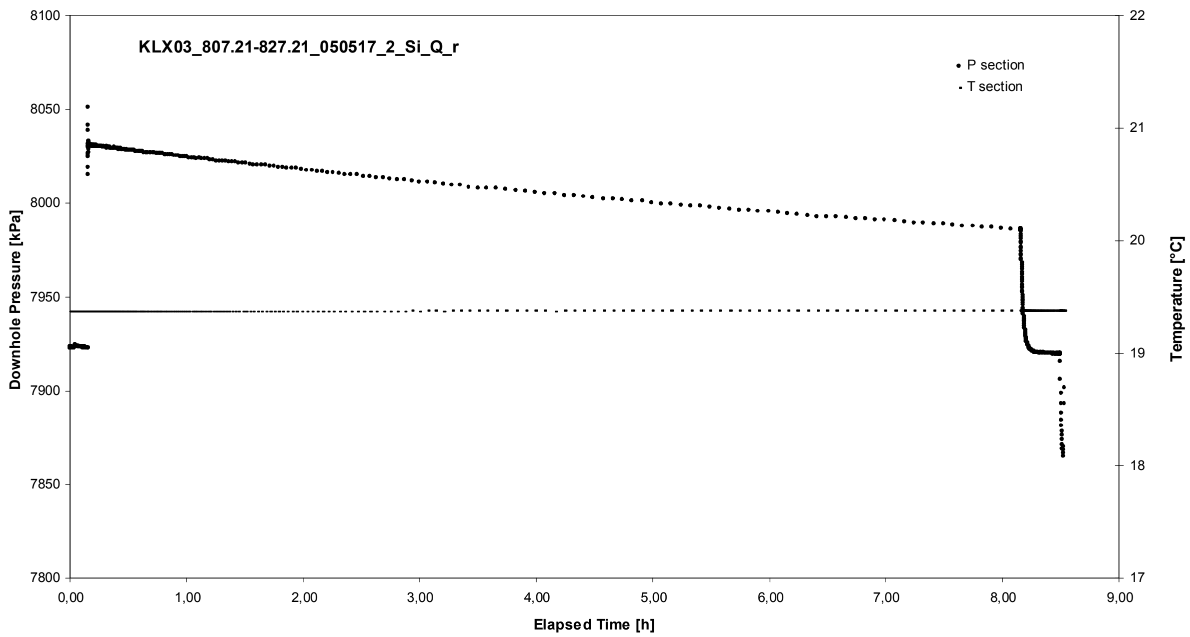
CHIR phase; log-log match



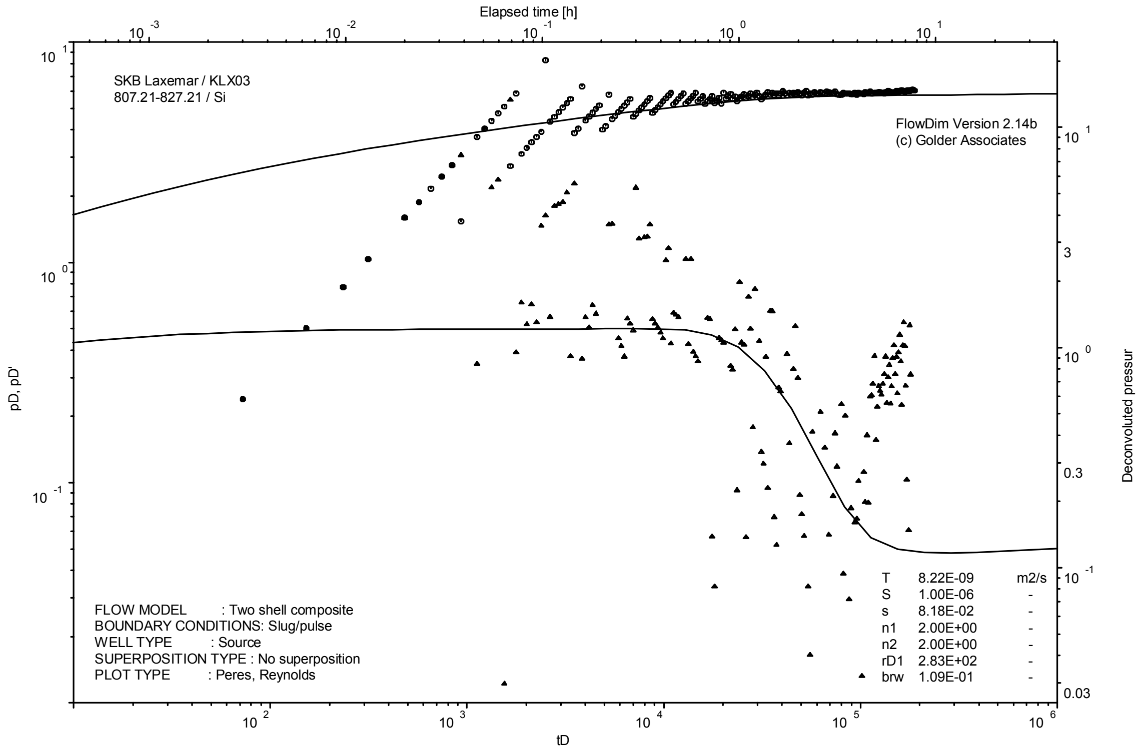
CHIR phase; HORNER match



Pressure and flow rate vs. time; cartesian plot, long term measured over night



Interval pressure and temperature vs. time; cartesian plot, long term measured over night

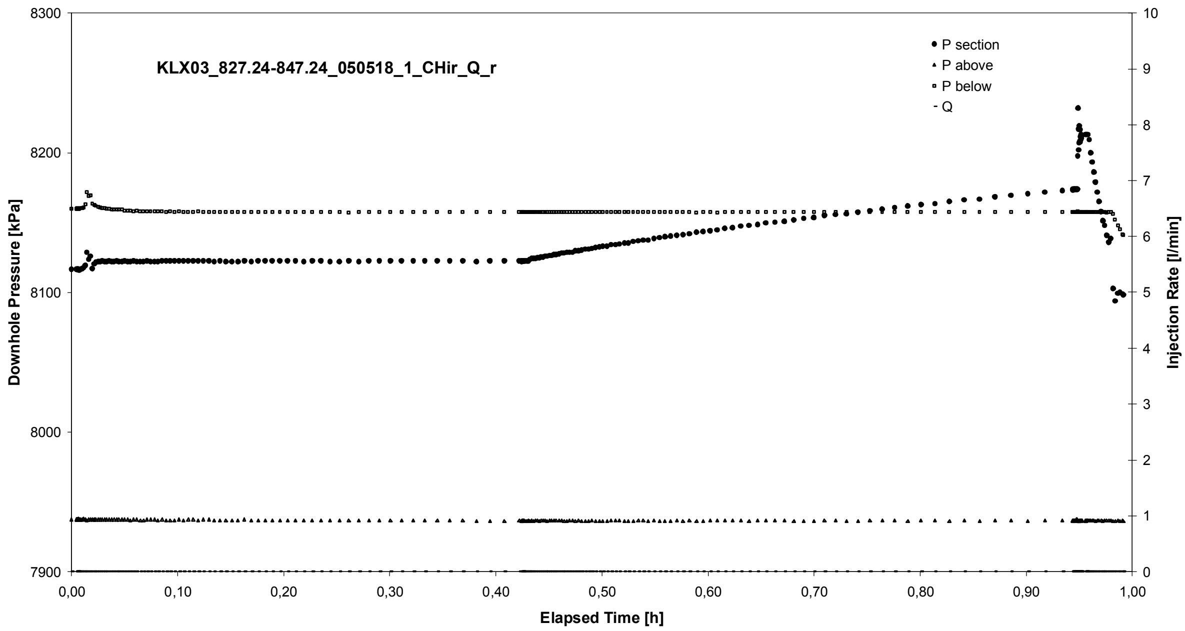


SI phase; log-log match, long term measured over night

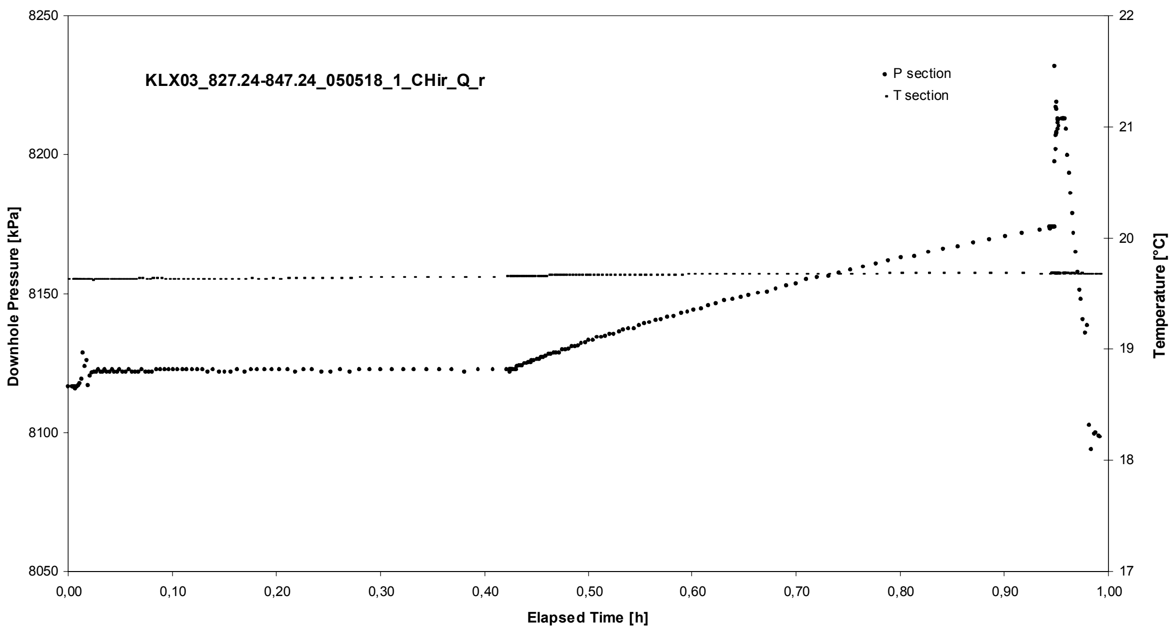
APPENDIX 2-49

Test 827.24 – 847.24 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

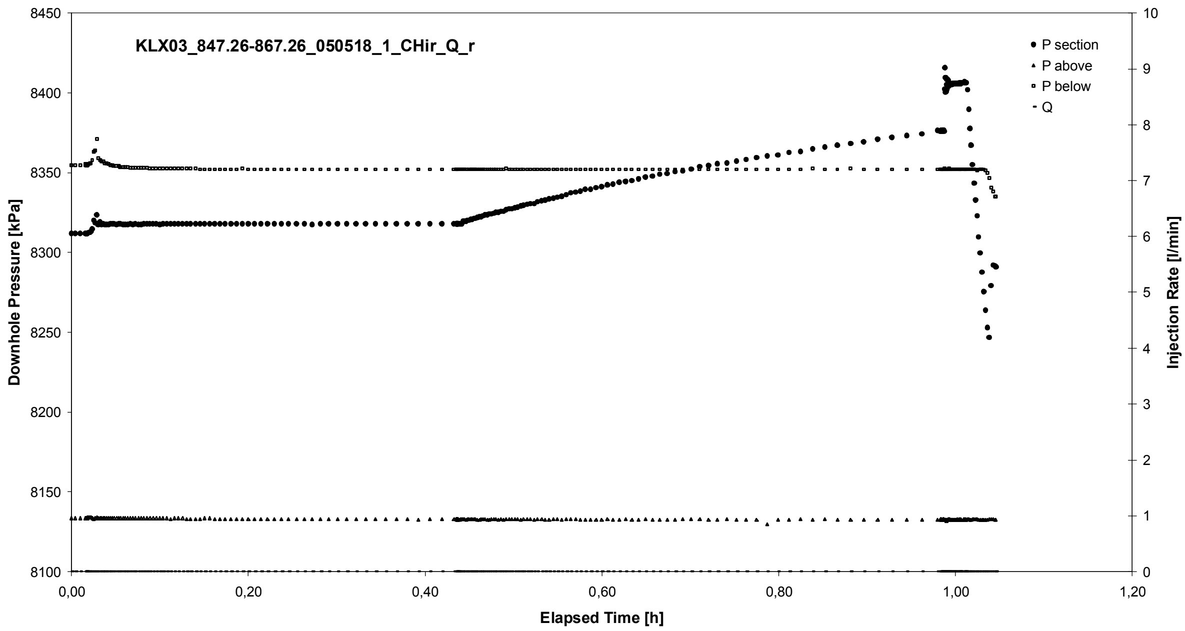
Not Analysed

CHIR phase; HORNER match

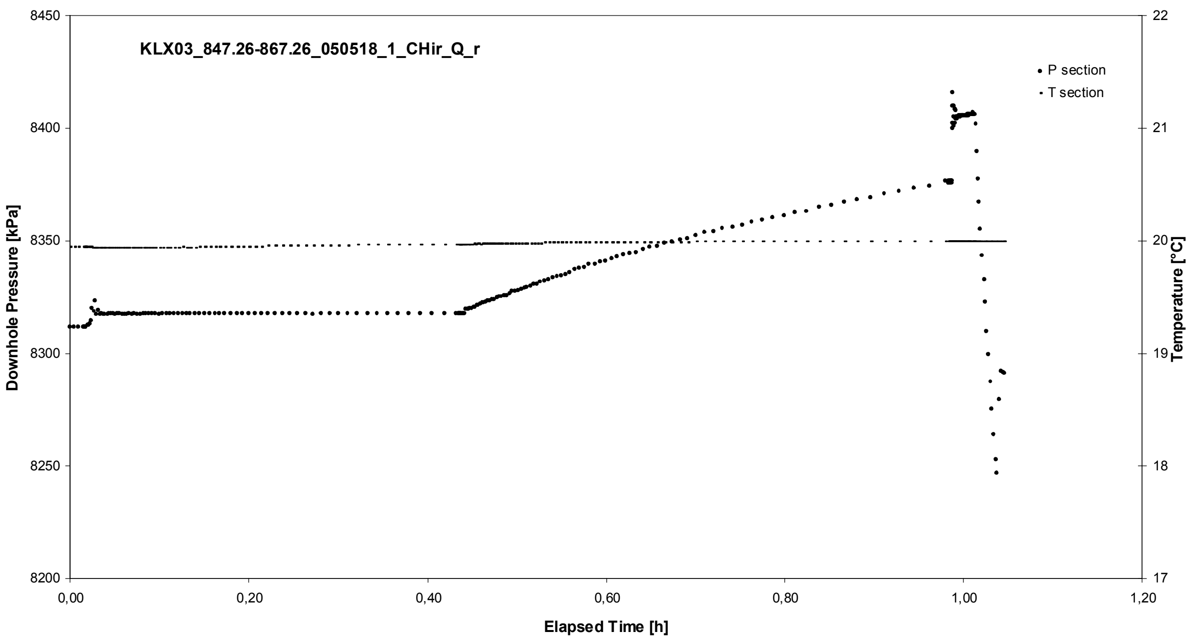
APPENDIX 2-50

Test 847.26 – 867.26 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

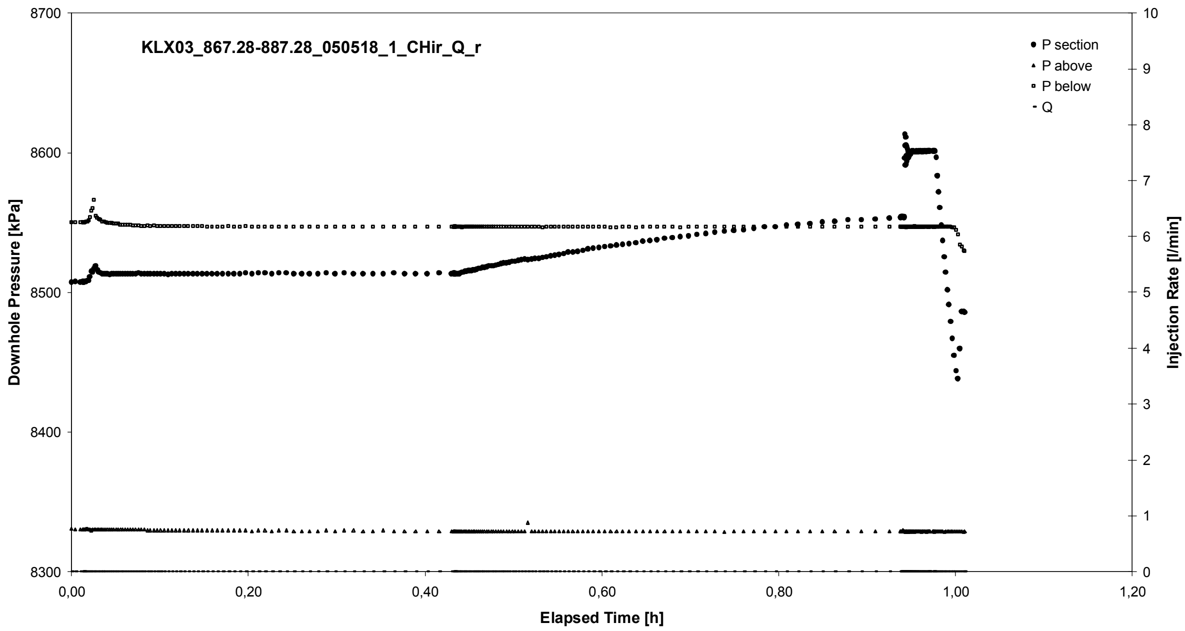
Not Analysed

CHIR phase; HORNER match

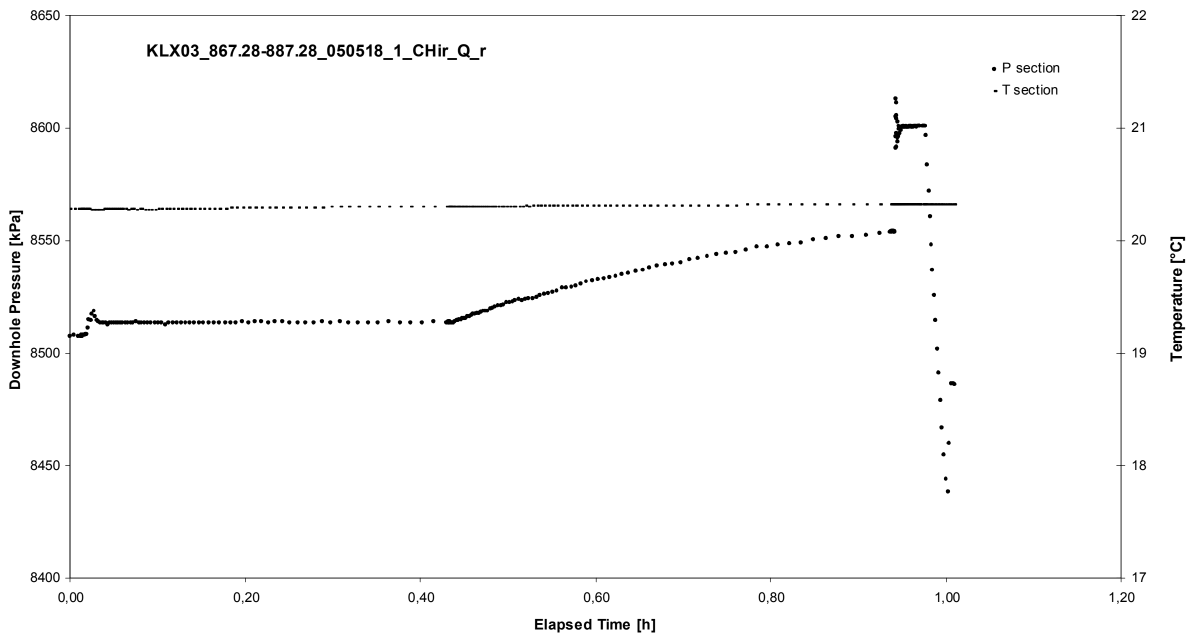
APPENDIX 2-51

Test 867.28 – 887.28 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

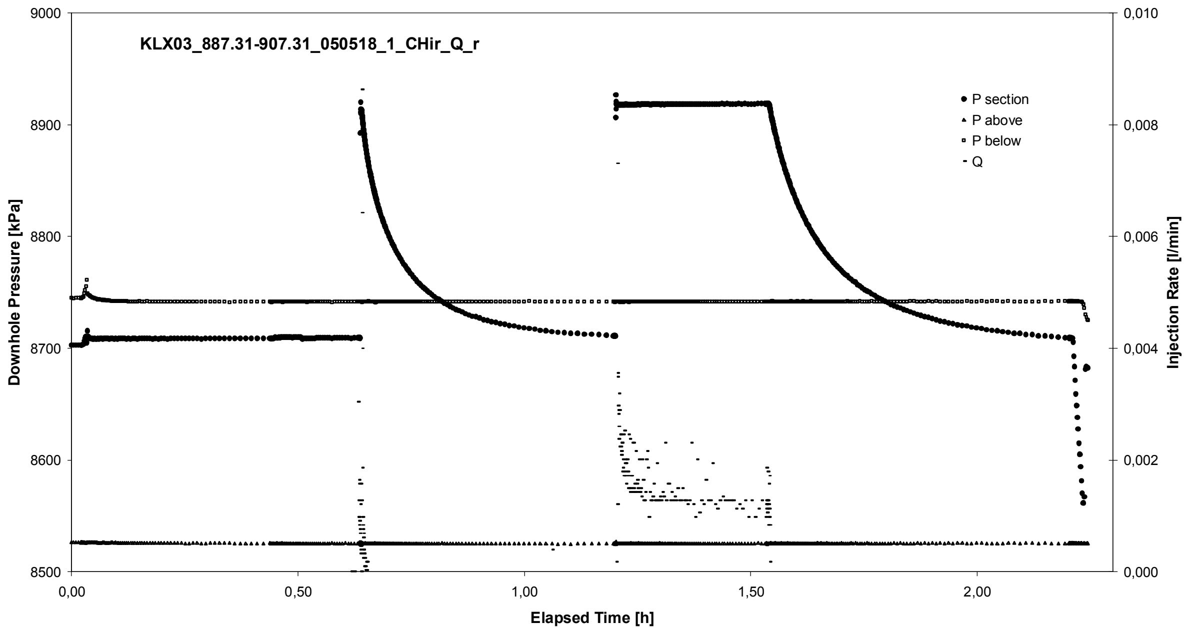
Not Analysed

CHIR phase; HORNER match

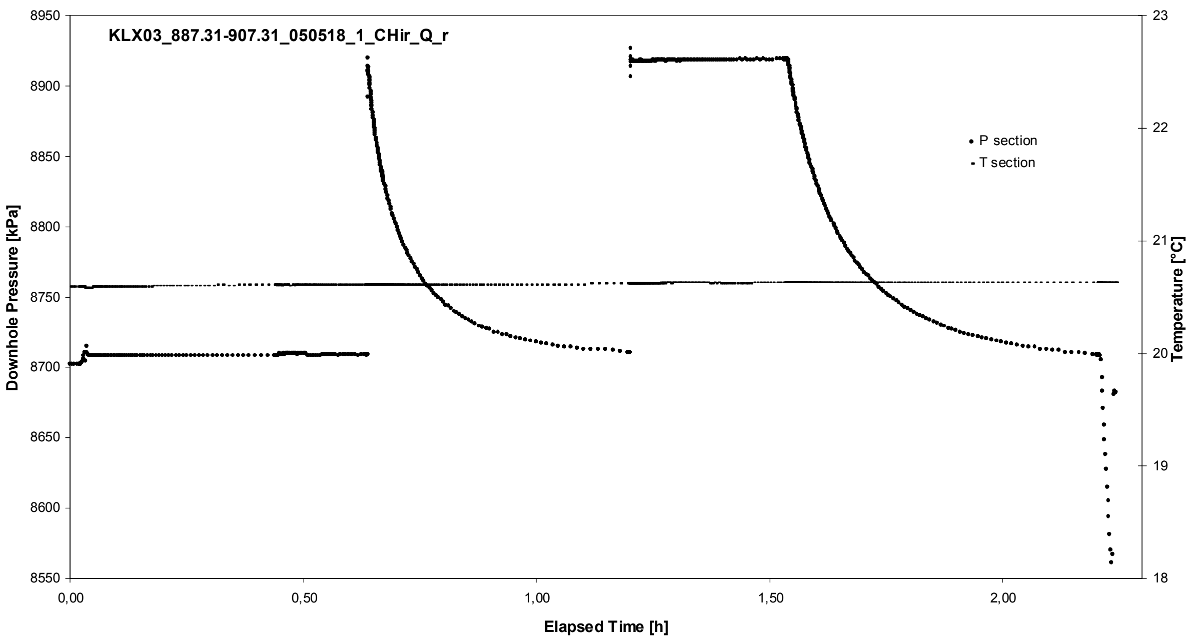
APPENDIX 2-52

Test 887.31 – 907.31 m

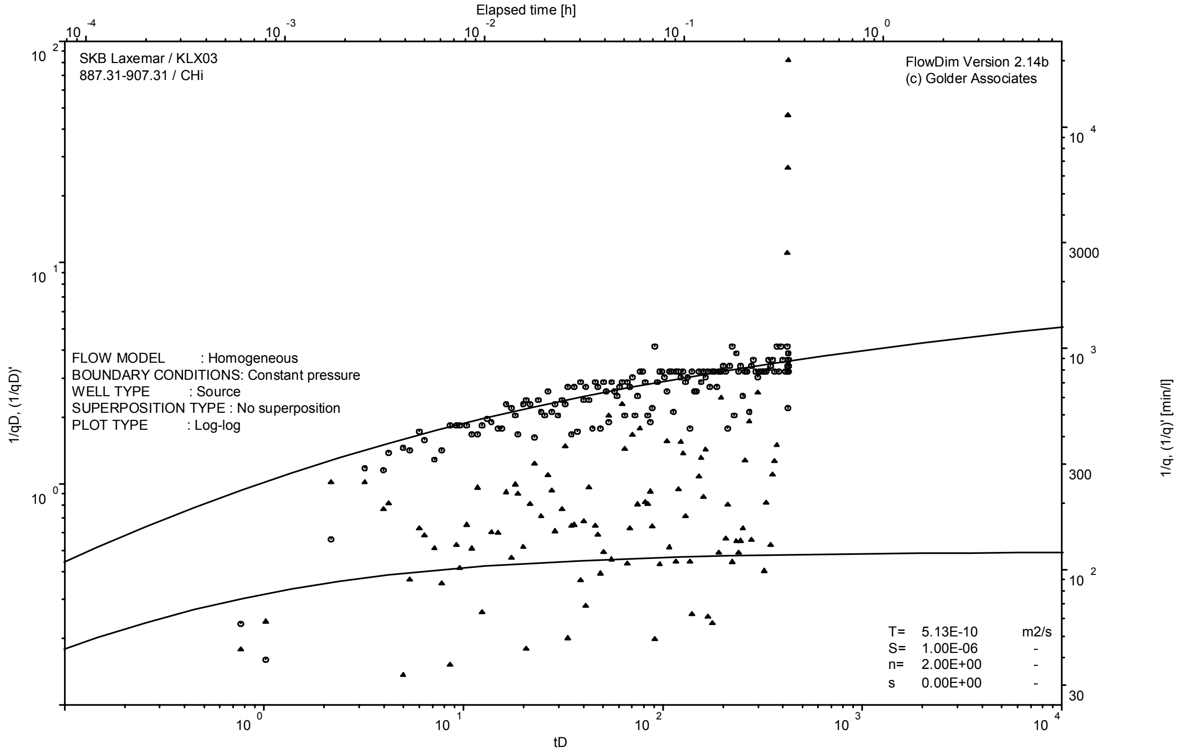
Analysis diagrams



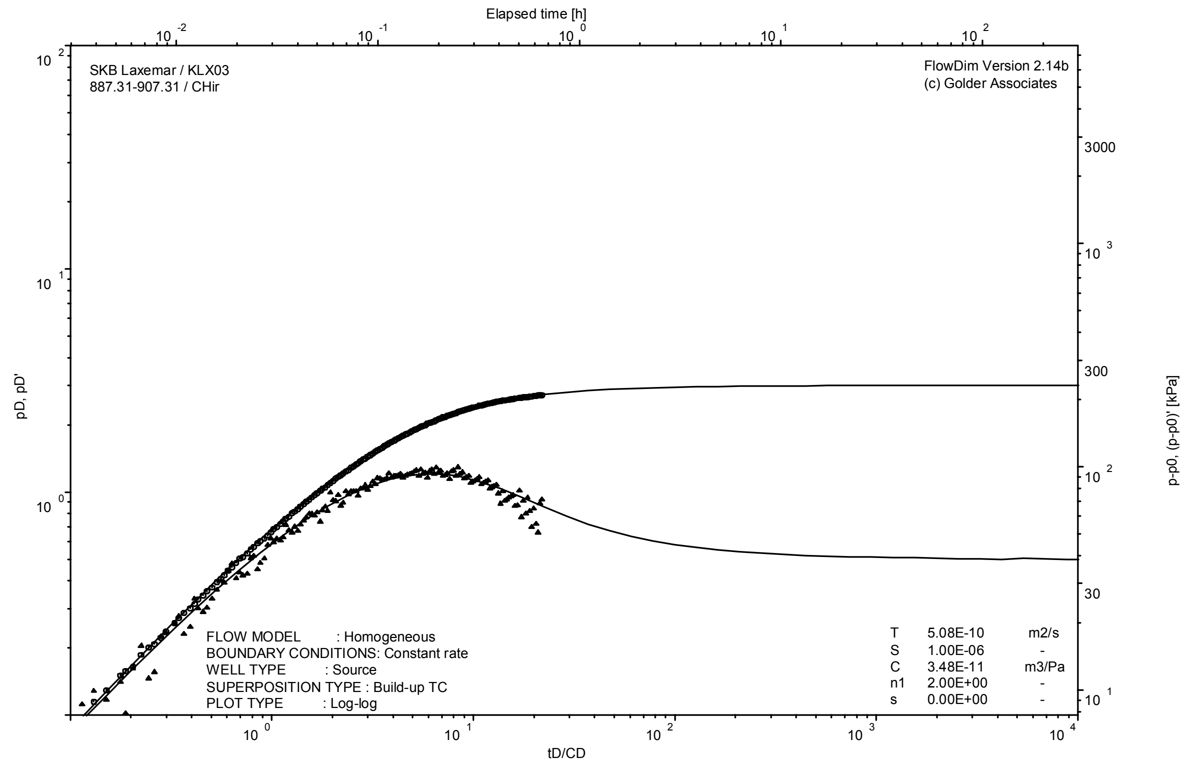
Pressure and flow rate vs. time; cartesian plot



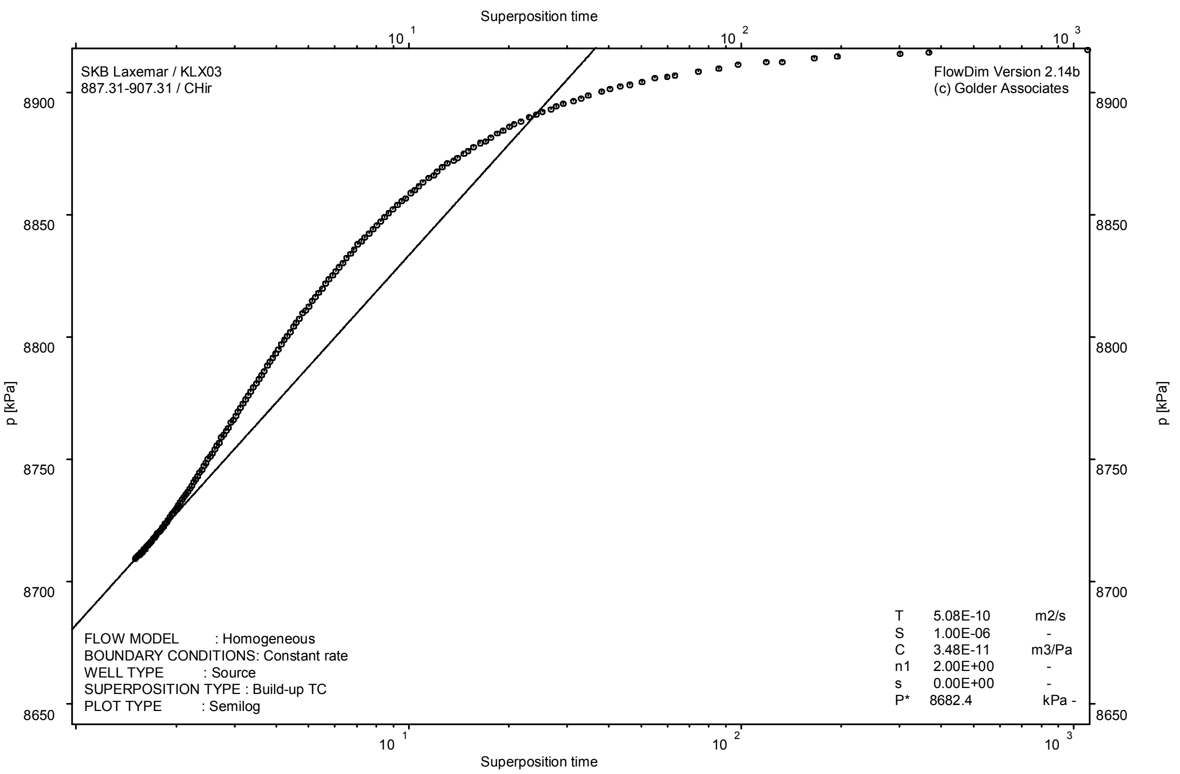
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

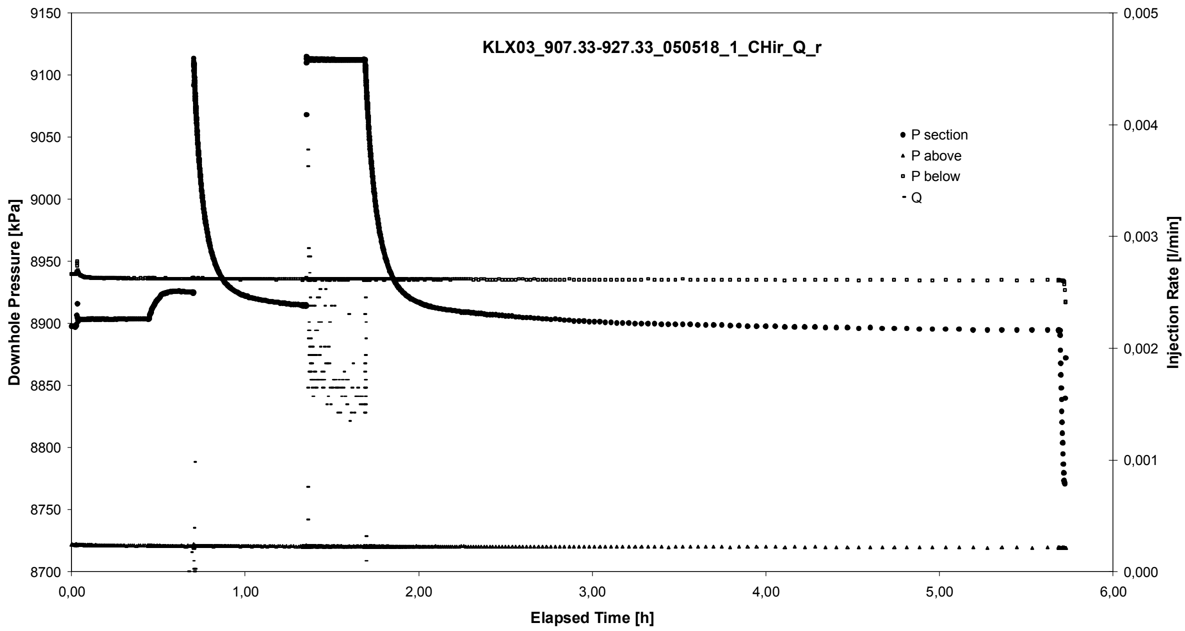


CHIR phase; HORNER match

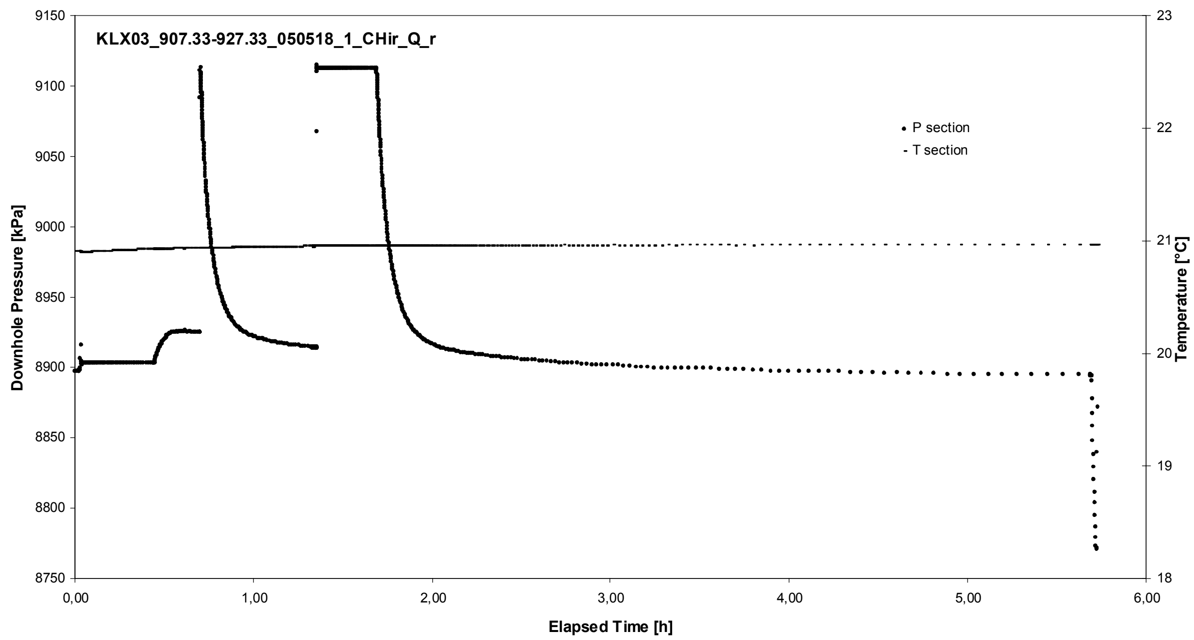
APPENDIX 2-53

Test 907.33 – 927.33 m

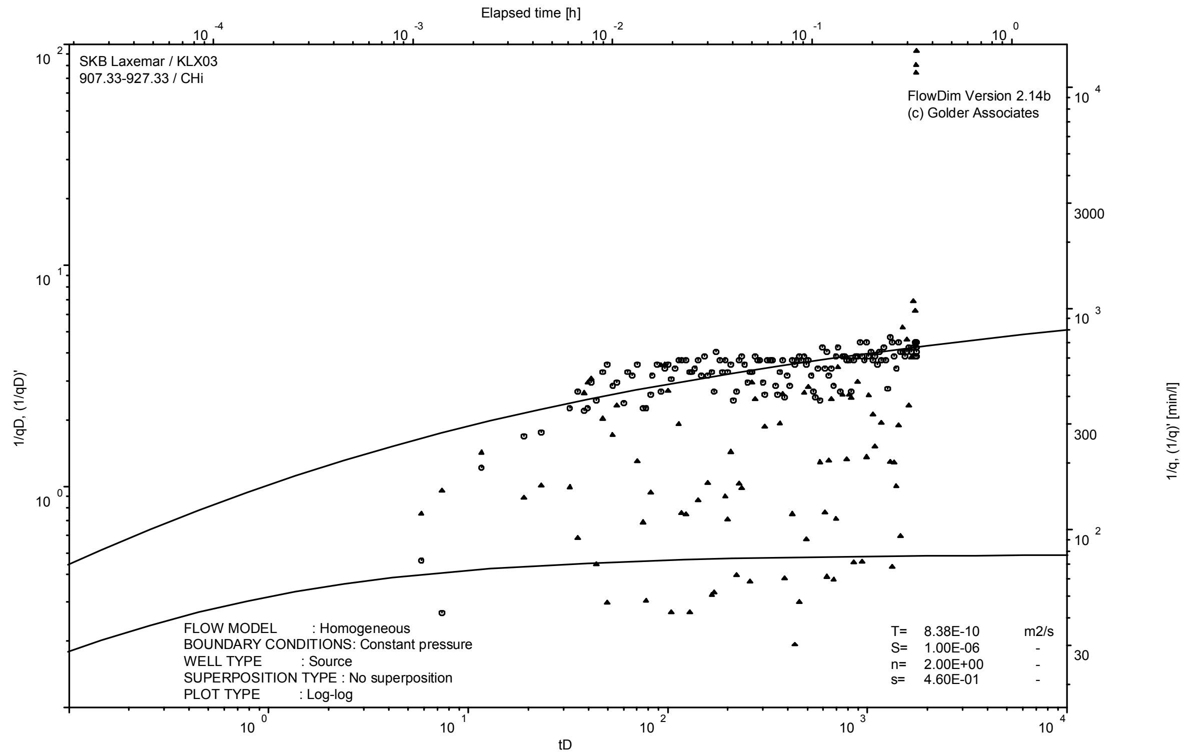
Analysis diagrams



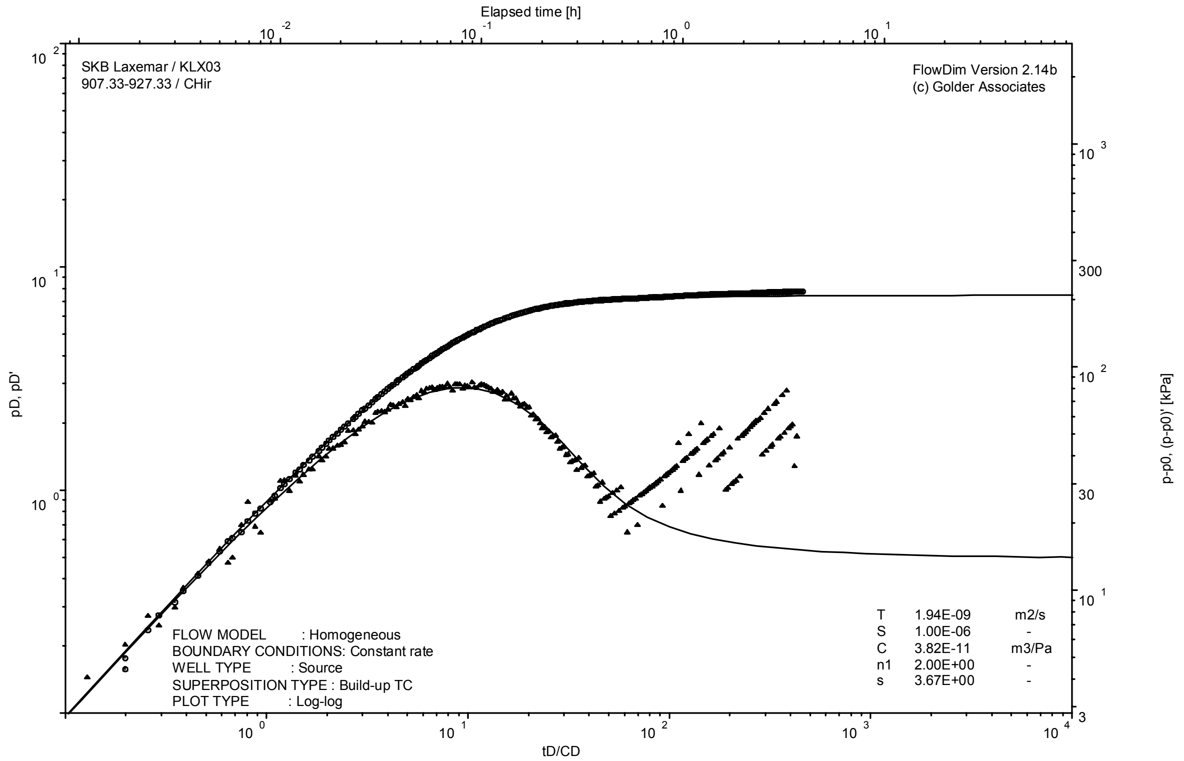
Pressure and flow rate vs. time; cartesian plot



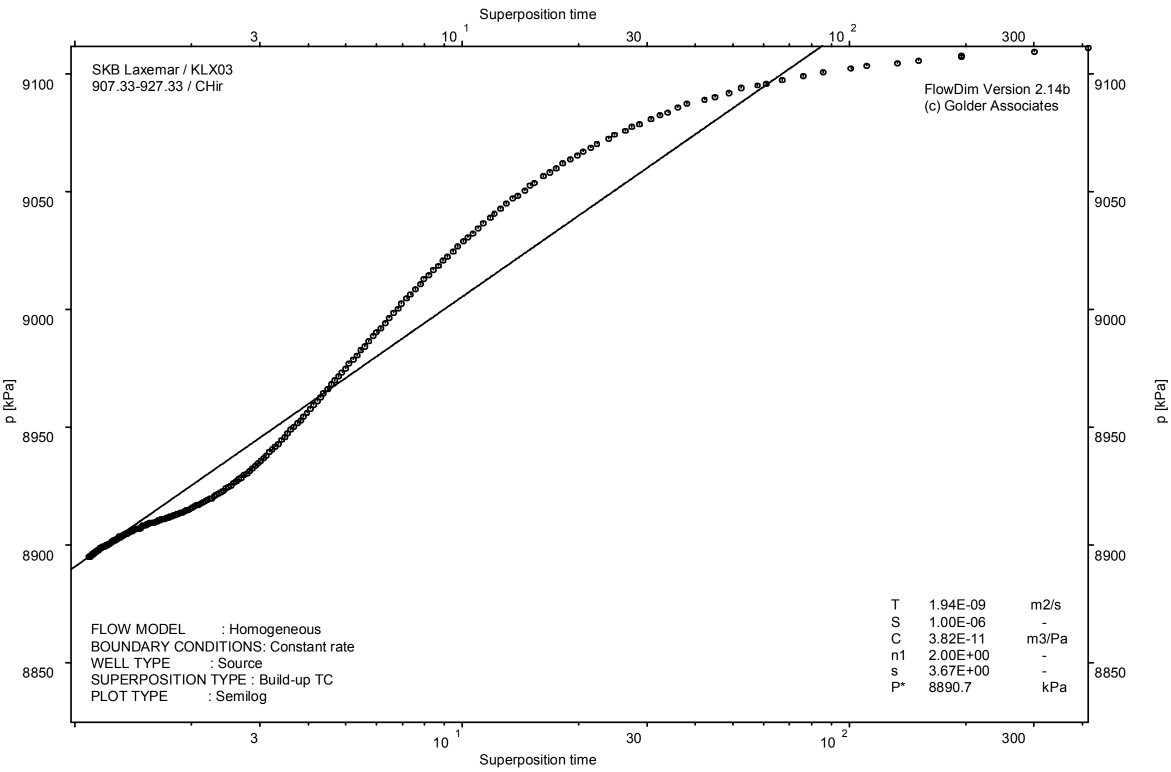
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

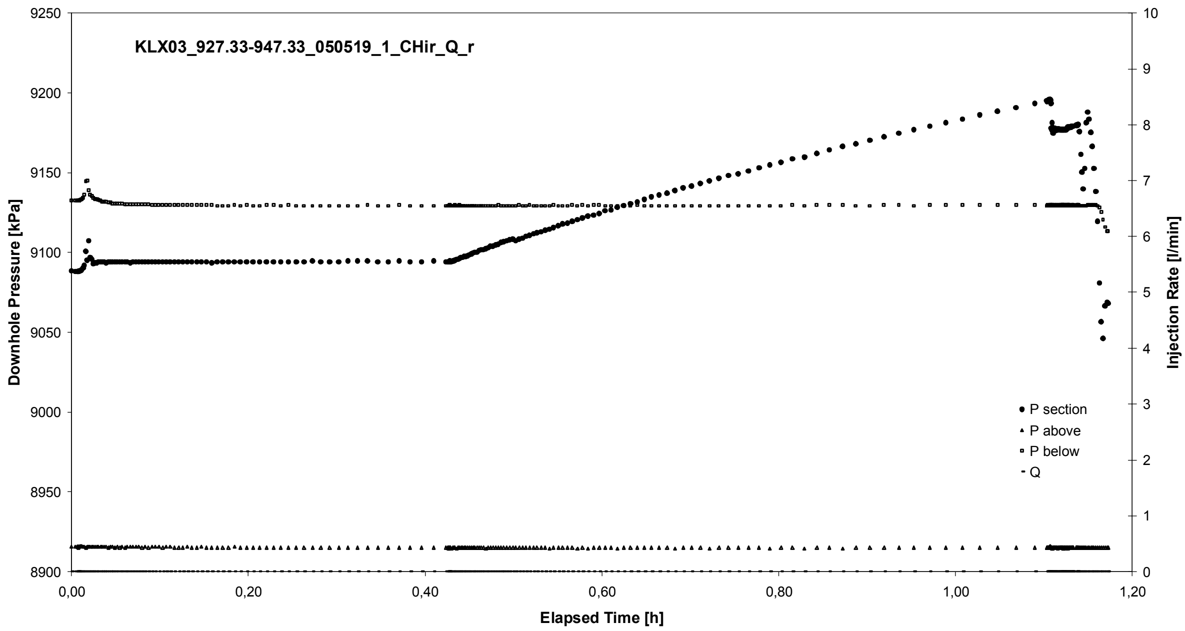


CHIR phase; HORNER match

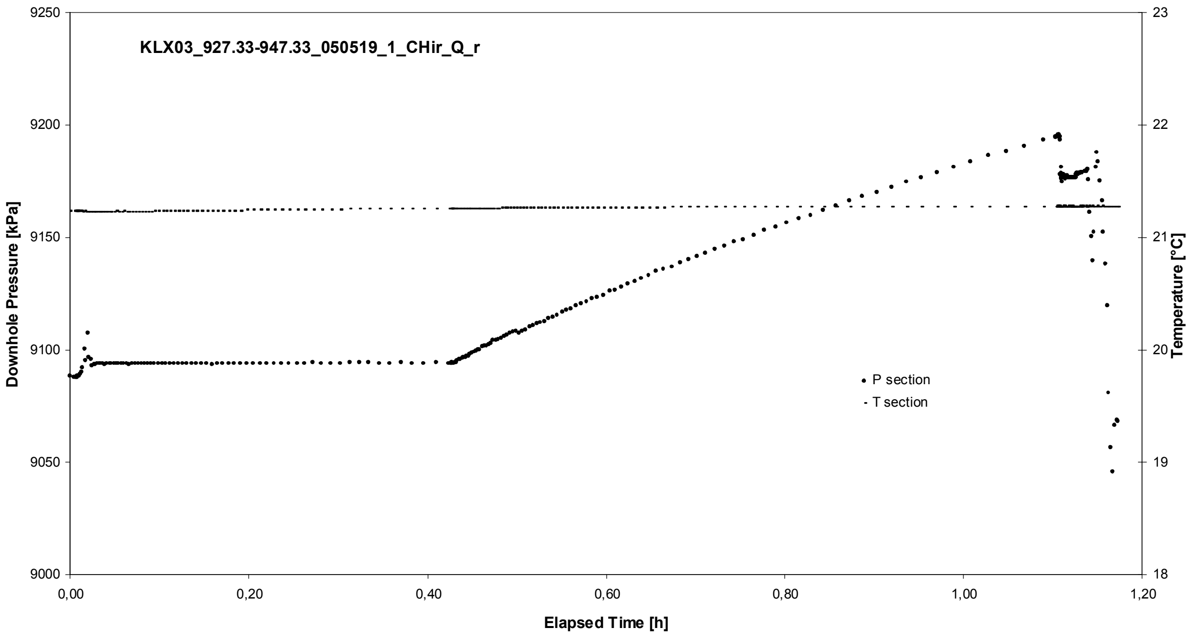
APPENDIX 2-54

Test 927.33 – 947.33 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

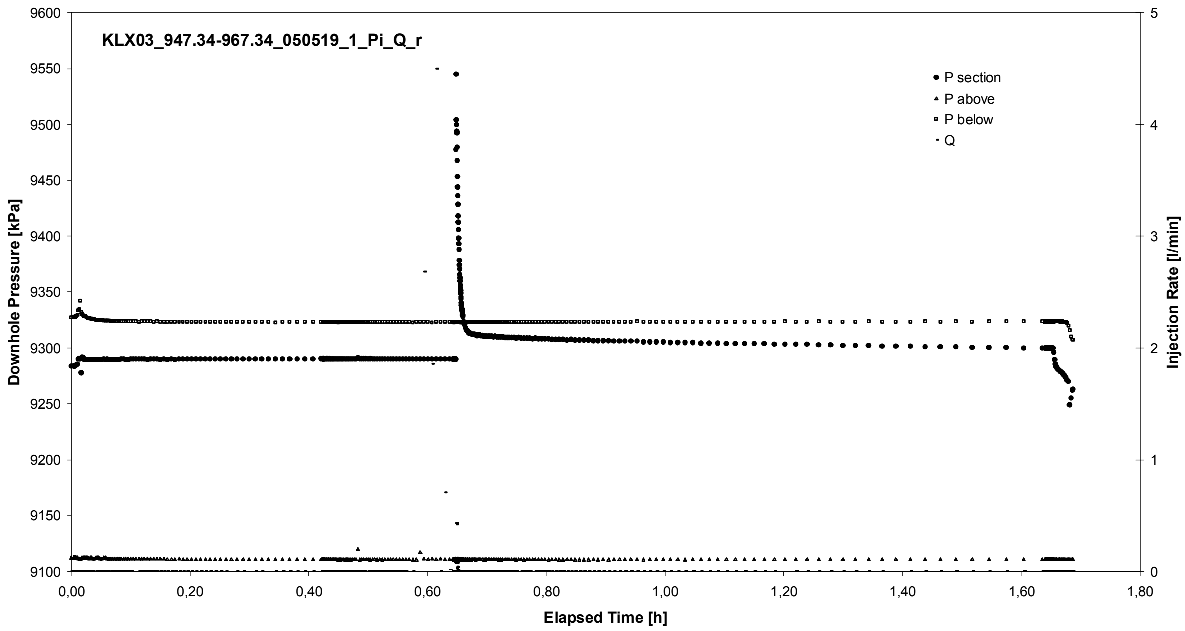
Not Analysed

CHIR phase; HORNER match

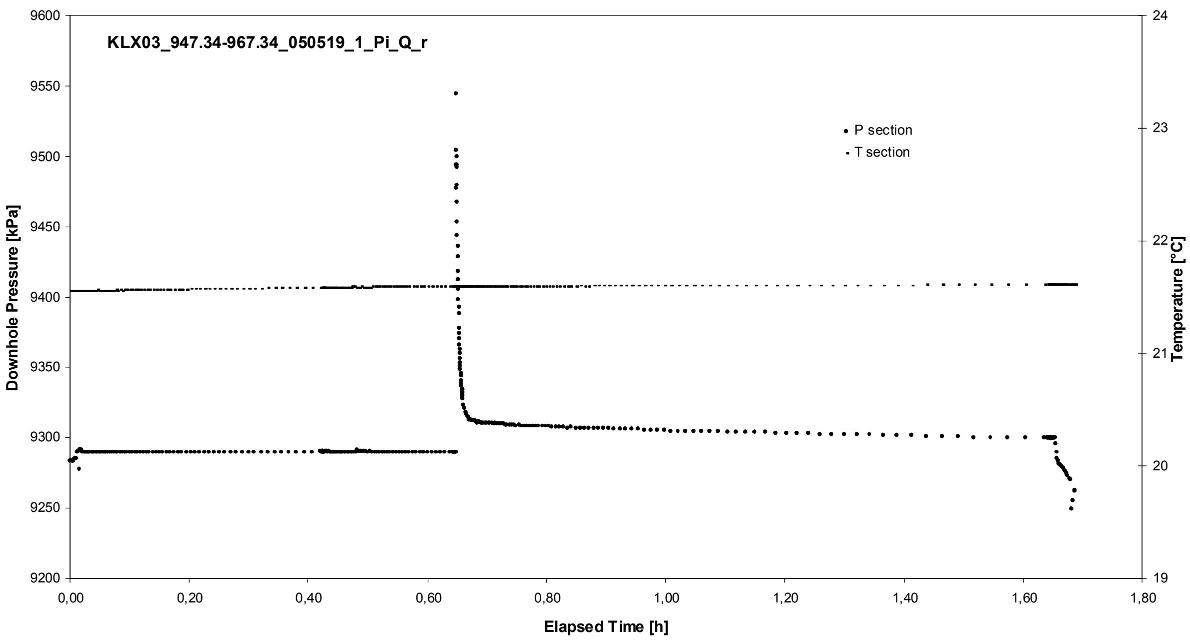
APPENDIX 2-55

Test 947.34 – 967.34 m

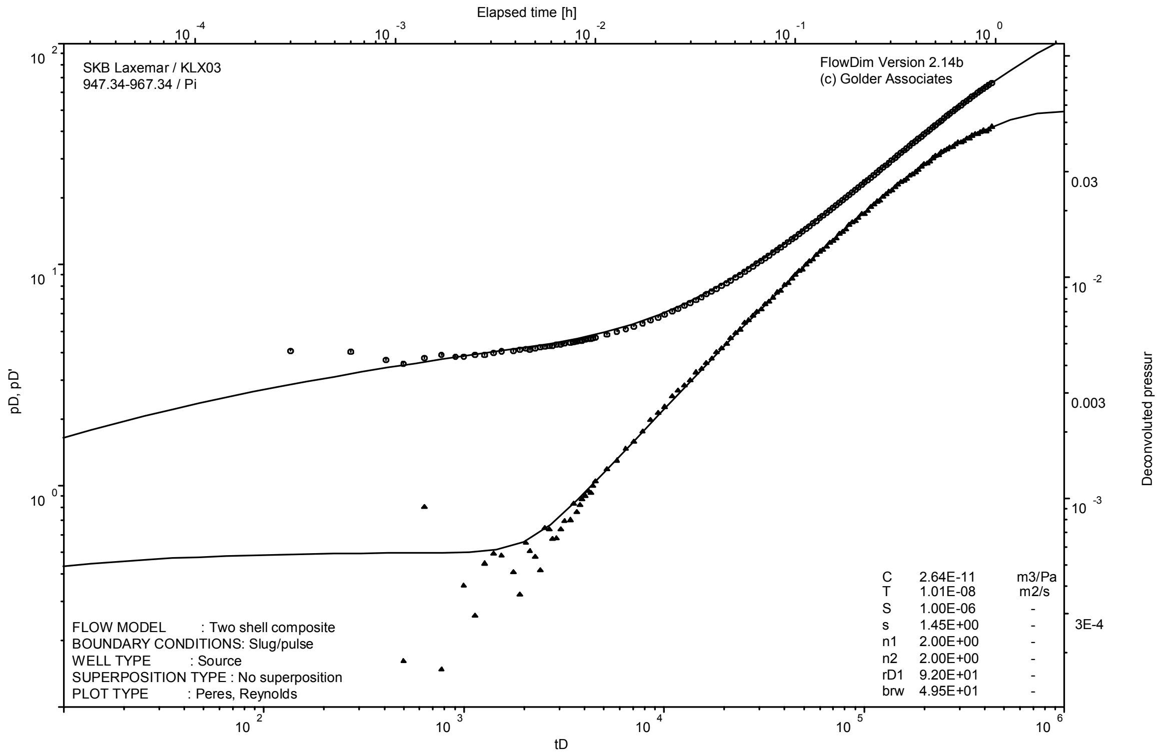
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

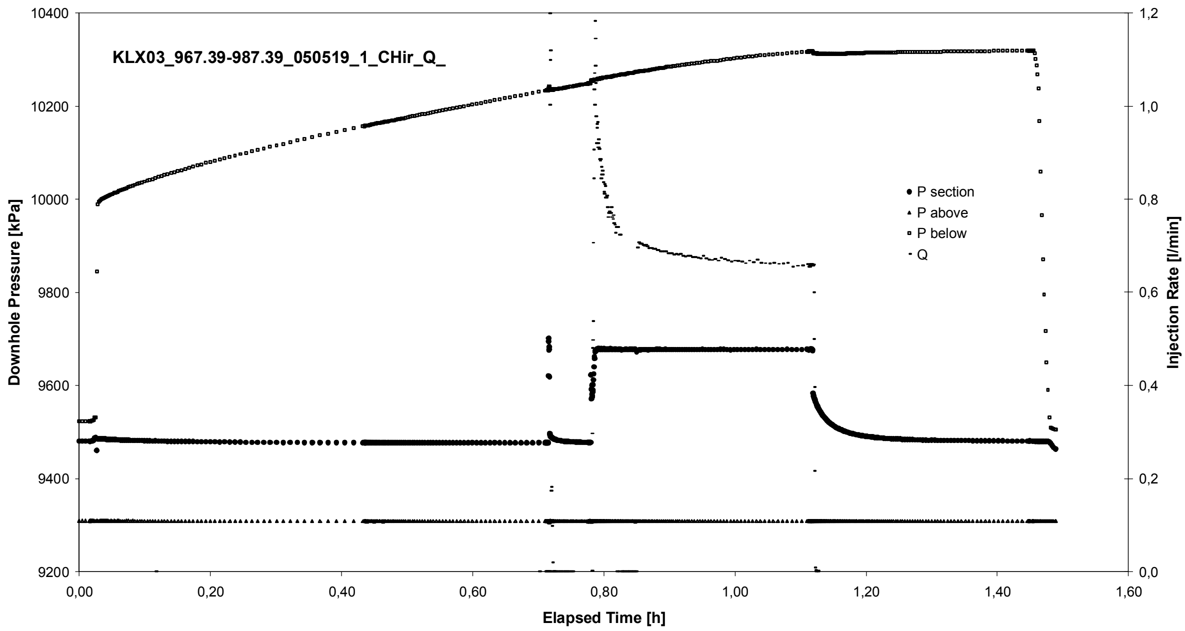


Pulse injection; deconvolution match

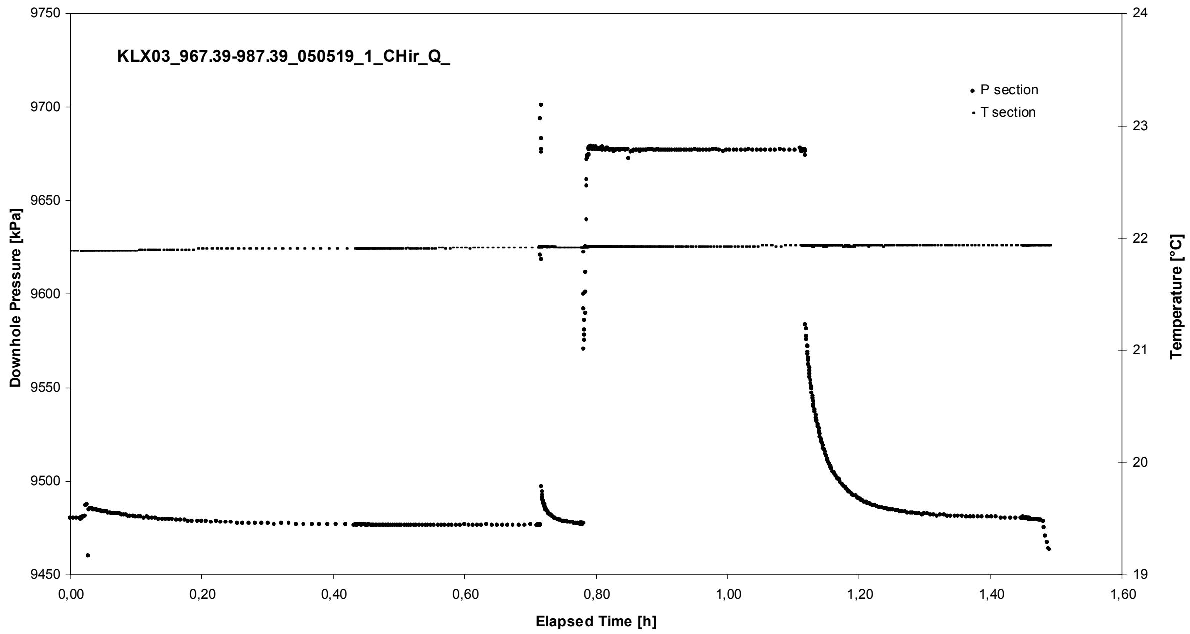
APPENDIX 2-56

Test 967.39 – 987.39 m

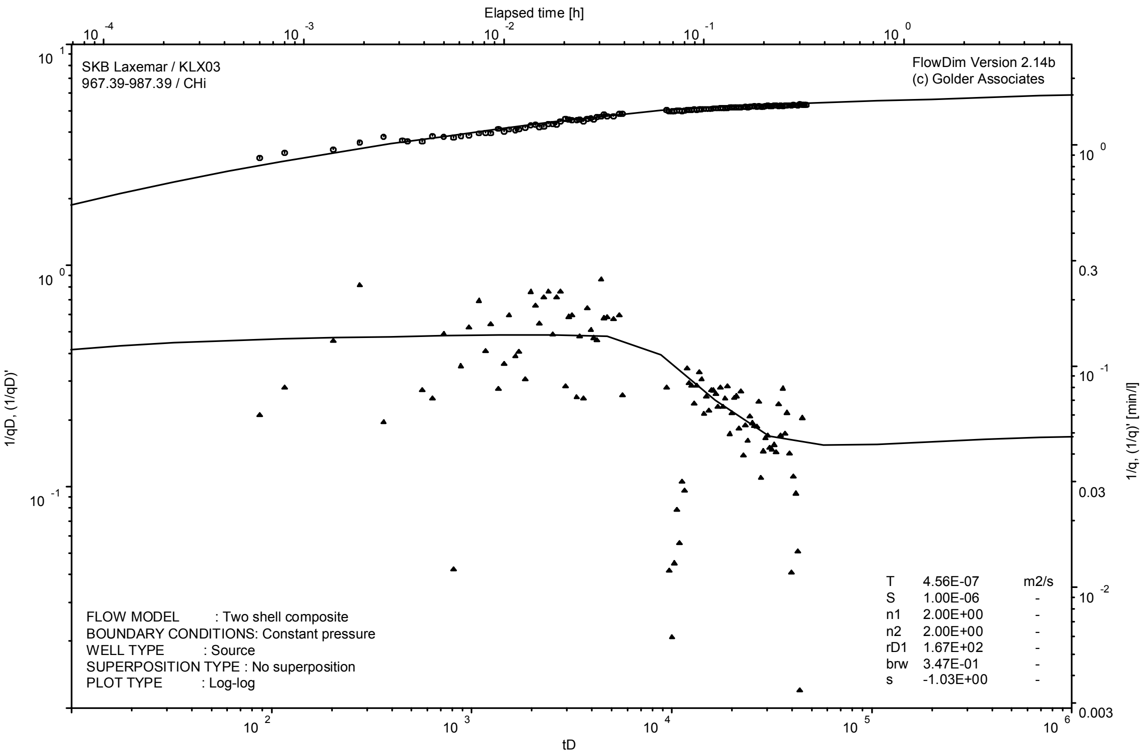
Analysis diagrams



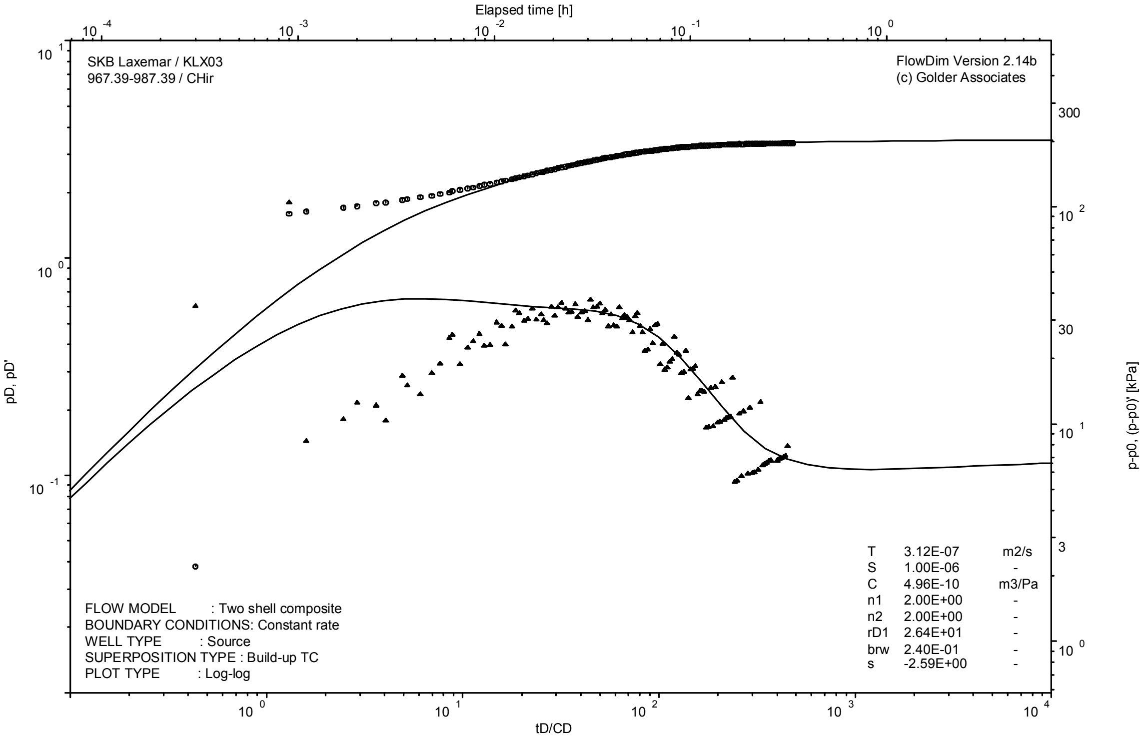
Pressure and flow rate vs. time; cartesian plot



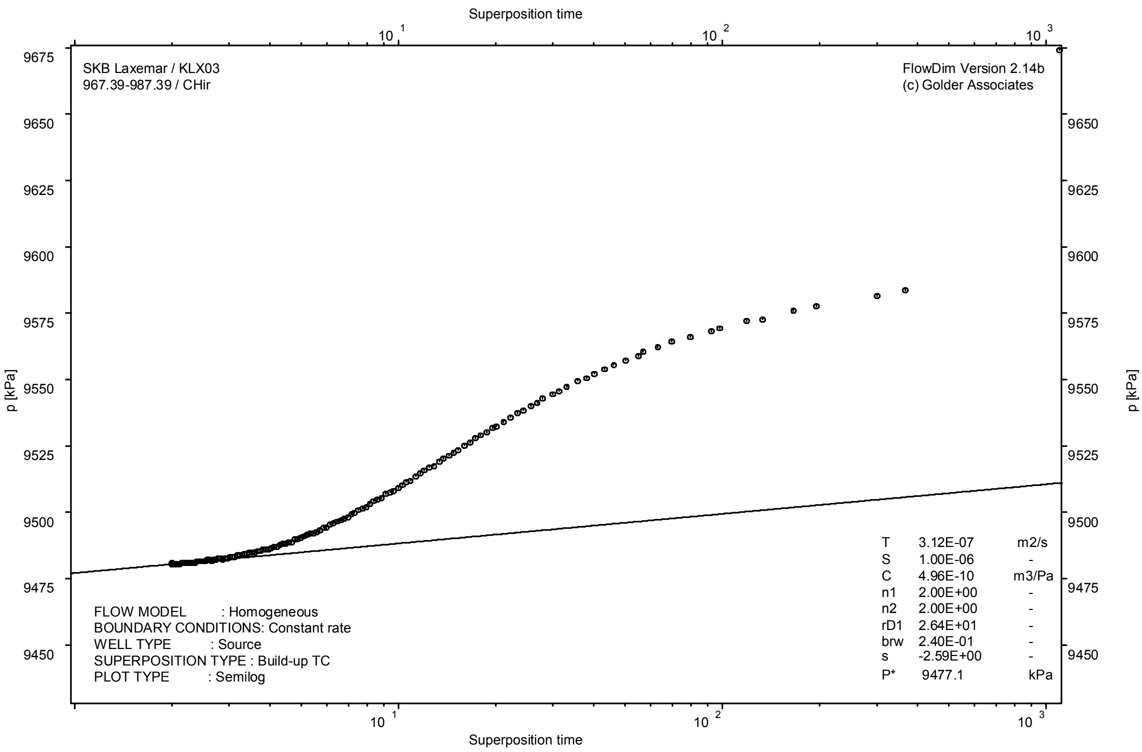
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

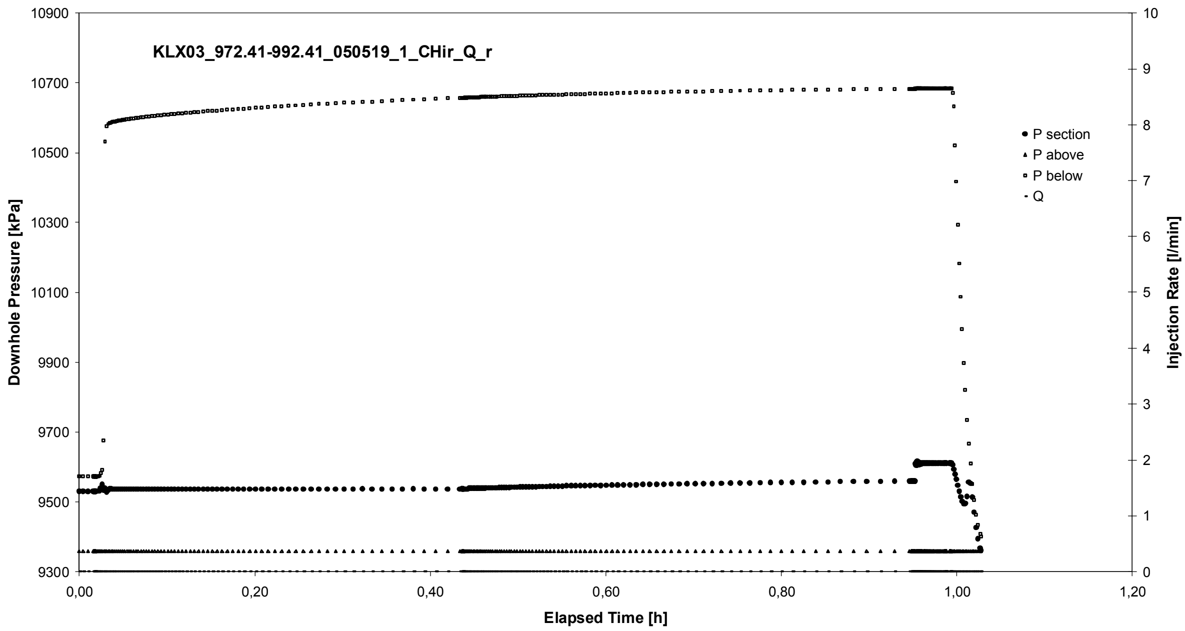


CHIR phase; HORNER match

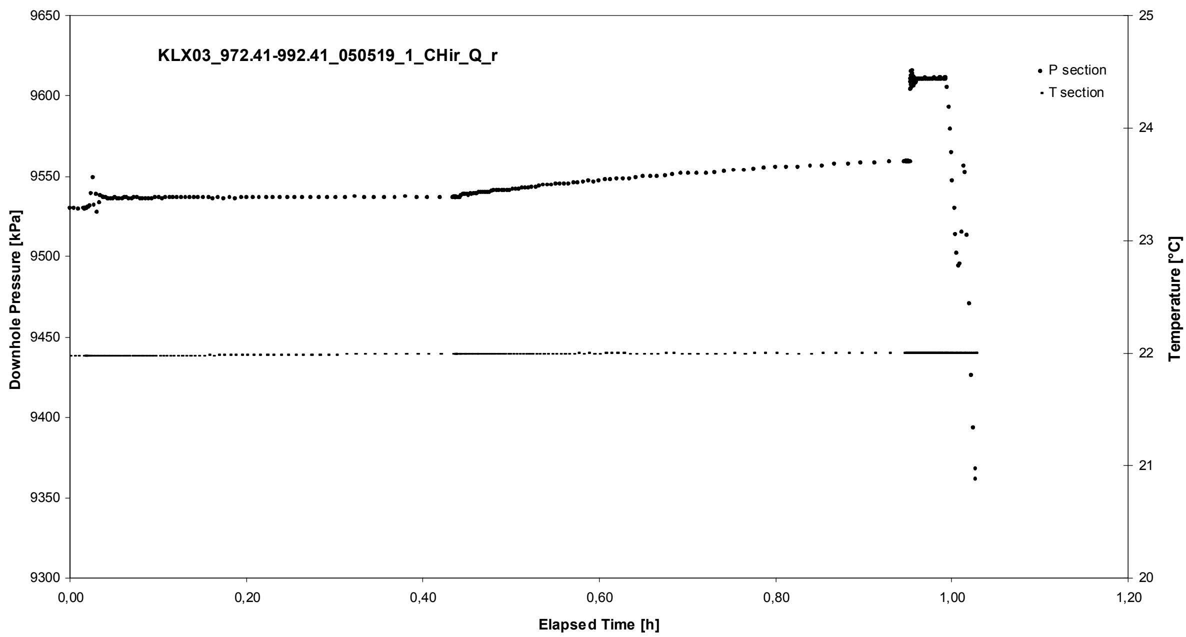
APPENDIX 2-57

Test 972.41 – 992.41 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

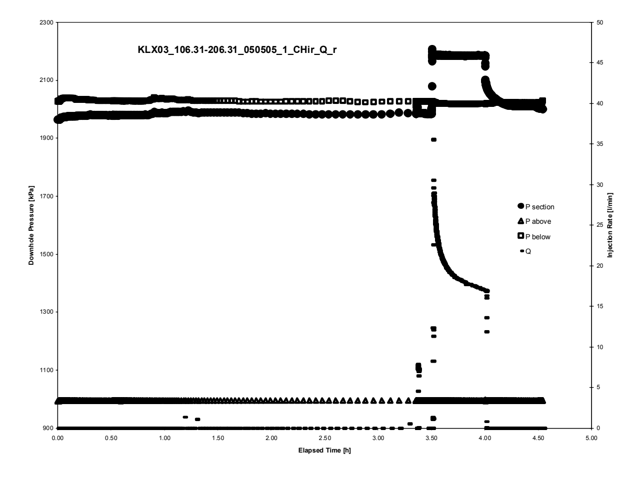
APPENDIX 3

Test Summary Sheets

Test Summary Sheet

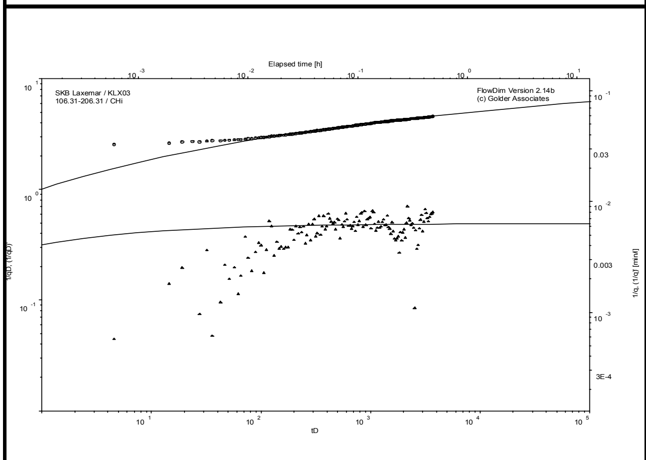
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050505 11:05
Test section from - to (m):	106.31-206.31 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

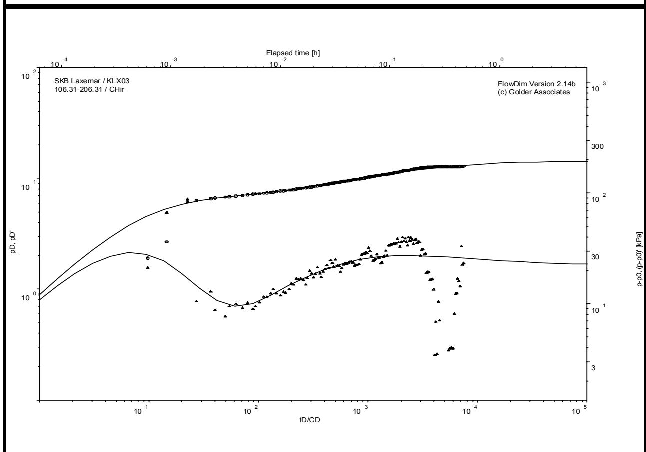


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1965		
p_i (kPa) =	1984		
p_p(kPa) =	2185	p_F (kPa) =	2010
Q_p (m^3/s)=	2.81E-04		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.8		
Derivative fact.=	0.02	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	1.4E-05		
T_M (m^2/s)=	1.8E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.63	dt_1 (min) =	3.20
dt_2 (min) =	26.57	dt_2 (min) =	5.67
T (m^2/s) =	1.0E-05	T (m^2/s) =	1.1E-05
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.0E-07	K_s (m/s) =	1.1E-07
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.4E-09
C_D (-) =	NA	C_D (-) =	6.0E-01
ξ (-) =	-4.10	ξ (-) =	0.27
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) =	1.63	C (m^3/Pa) =	5.4E-09
dt_2 (min) =	26.57	C_D (-) =	6.0E-01
T_T (m^2/s) =	1.0E-05	ξ (-) =	-4.10
S (-) =	1.0E-06		
K_s (m/s) =	1.0E-07		
S_s (1/m) =	1.0E-08		

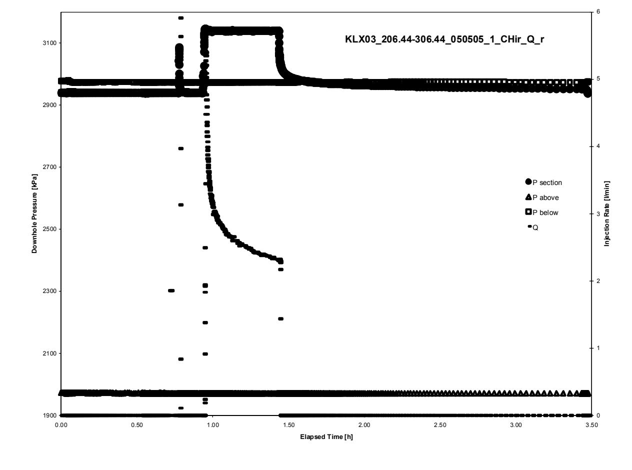
Comments:

The recommended transmissivity of 1.0E-5 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 8.0E-6 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 1977.8 kPa.

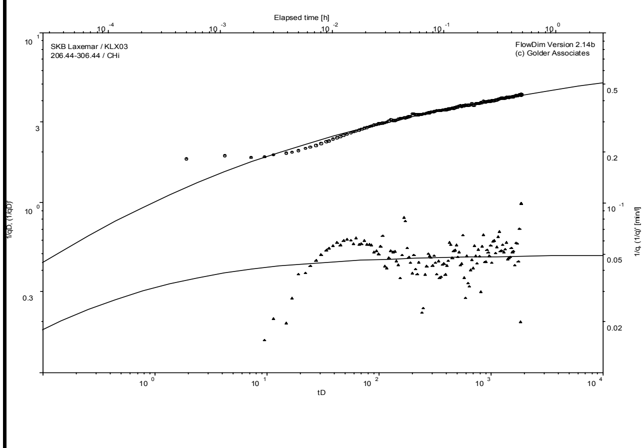
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050505 17:25
Test section from - to (m):	206.44-306.44	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

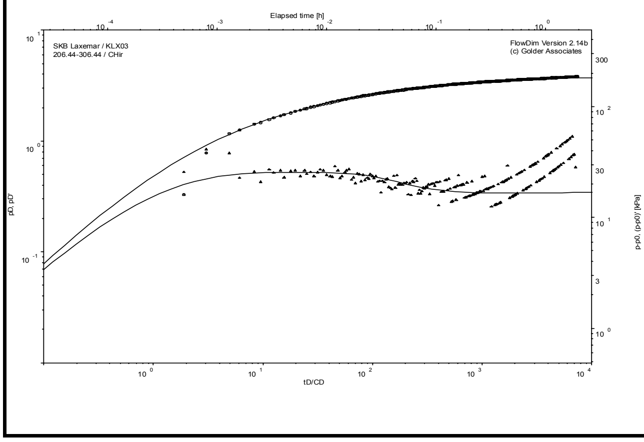
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	2939		
p_i (kPa) =	2939		
p_p(kPa) =	3137	p_F (kPa) =	2951
Q_p (m^3/s)=	3.78E-05		
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)=	11.3		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.9E-06		
T_M (m^2/s)=	2.4E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.93	dt_1 (min) =	0.20
dt_2 (min) =	23.32	dt_2 (min) =	1.58
T (m^2/s) =	1.3E-06	T (m^2/s) =	1.4E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.3E-08	K_s (m/s) =	1.4E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	8.6E-10
C_D (-) =	NA	C_D (-) =	9.5E-02
ξ (-) =	-3.38	ξ (-) =	-3.42
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) =	8.6E-10
dt_2 (min) =	1.58	C_D (-) =	9.5E-02
T_T (m^2/s) =	1.4E-06	ξ (-) =	-3.42
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-08		
S_s (1/m) =	1.0E-08		

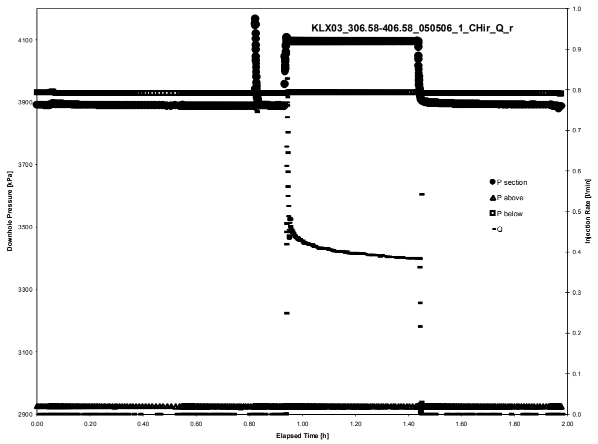
Comments:

The recommended transmissivity of 1.4E-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 8.0E-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 2951.0 kPa.

Test Summary Sheet

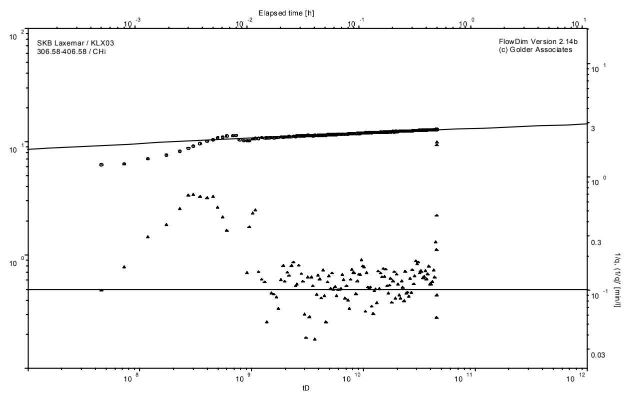
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050506 09:03
Test section from - to (m):	306.58-406.58	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

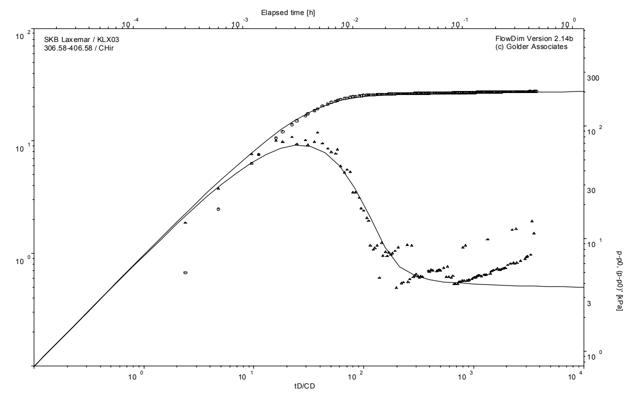


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3891		
p_i (kPa) =	3889		
p_p(kPa) =	4094	p_F (kPa) =	3890
Q_p (m^3/s)=	6.37E-06		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.8		
Derivative fact.=	0.05	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.0E-07		
T_M (m^2/s)=	4.0E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.00	dt_1 (min) =	0.14
dt_2 (min) =	27.33	dt_2 (min) =	0.27
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) =	6.2E-09	K_s (m/s) =	1.4E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.2E-10
C_D (-) =	NA	C_D (-) =	4.6E-02
÷ (-) =	5.50	÷ (-) =	20.00
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) =	1.00	C (m^3/Pa) =	4.2E-10
dt_2 (min) =	27.33	C_D (-) =	4.6E-02
T_T (m^2/s) =	6.2E-07	÷ (-) =	5.50
S (-) =	1.0E-06		
K_s (m/s) =	6.2E-09		
S_s (1/m) =	1.0E-08		

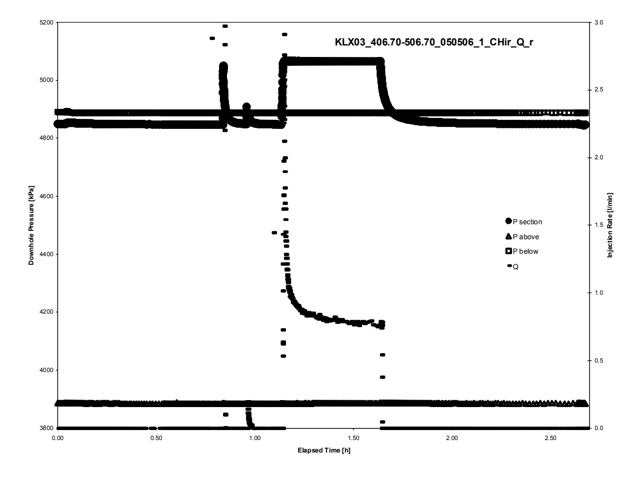
Comments:

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 4.0E-7 to 9.0E-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 3888.4 kPa.

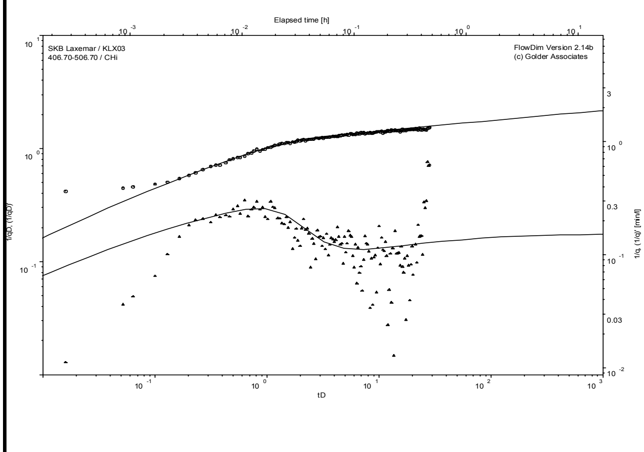
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050506 12:37
Test section from - to (m):	406.70-506.70	Responsible for test execution:	Stephan Rohs
Section diameter, 2·r_w (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

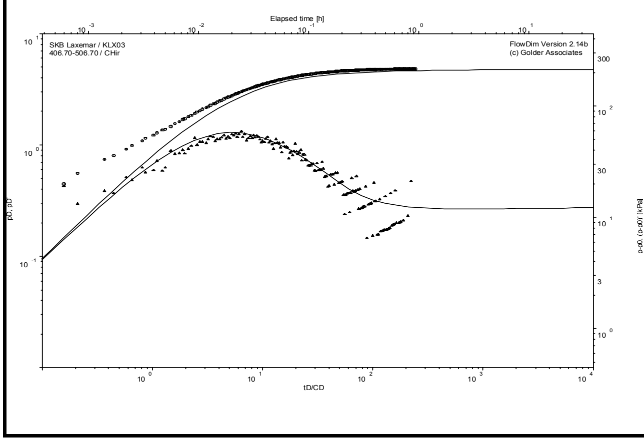
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4849		
p_i (kPa) =	4847		
p_p(kPa) =	5065	p_F (kPa) =	4848
Q_p (m^3/s)=	1.25E-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)=	14.4		
Derivative fact.=	0.1	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	5.6E-07		
T_M (m^2/s)=	7.3E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	6.55	dt_1 (min) =	0.77
dt_2 (min) =	21.34	dt_2 (min) =	2.10
T (m^2/s) =	3.9E-07	T (m^2/s) =	5.0E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.9E-09	K_s (m/s) =	5.0E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.4E-09
C_D (-) =	NA	C_D (-) =	4.8E-01
ξ (-) =	-4.30	ξ (-) =	-1.93
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	6.55	C (m^3/Pa) =	4.4E-09
dt_2 (min) =	21.34	C_D (-) =	4.8E-01
T_T (m^2/s) =	3.9E-07	ξ (-) =	-4.30
S (-) =	1.0E-06		
K_s (m/s) =	3.9E-09		
S_s (1/m) =	1.0E-08		

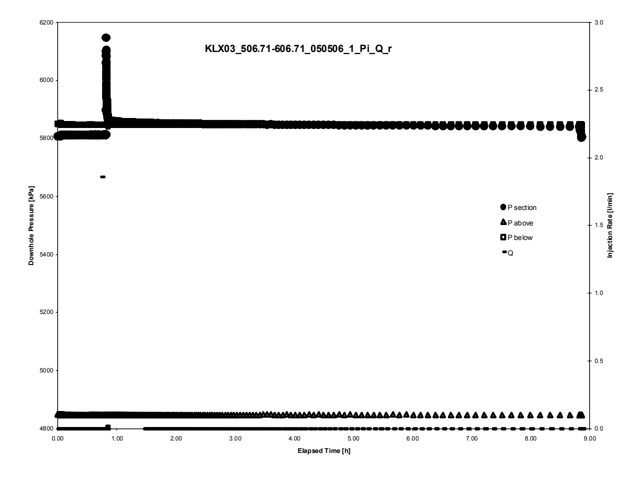
Comments:

The recommended transmissivity of 3.9E-7 m2/s was derived from the analysis of the CHi phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 1.0E-7 to 7.0E-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 4843.6 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050506 16:53
Test section from - to (m):	506.71-606.71 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

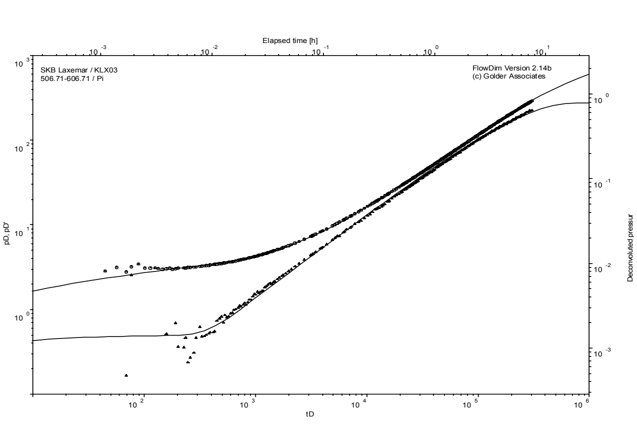


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5811		
p_i (kPa) =	5813		
p_p(kPa) =	6148	p_F (kPa) =	5847
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	28800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.9		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**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) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	2.5E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	5.5E-10
S_s (1/m) =	NA	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.6E-10
C_D (-) =	NA	C_D (-) =	4.0E-02
ξ (-) =	NA	ξ (-) =	-0.61
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

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	3.6E-10
dt_2 (min) =	NA	C_D (-) =	4.0E-02
T_T (m^2/s) =	5.5E-08	ξ (-) =	-0.61
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-10		
S_s (1/m) =	1.0E-08		

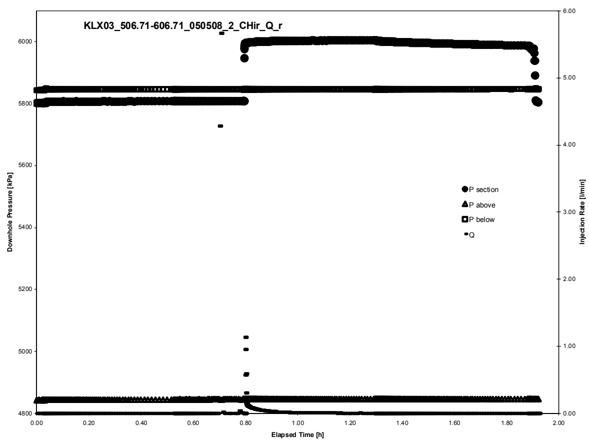
Comments:

The recommended transmissivity of 2.5E-10 m2/s was derived from the analysis of the Pi phase. Considering the inherent uncertainties related to the measurement (e.g. specially the measurements of the wellbore storage coefficient) and to the analysis process, the confidence range for the transmissivity is estimated to be 9E-11 m²/s to 6e-10 m²/s (the outer zone transmissivity is considered as most represantive). The flow dimension displayed during the test is 2. No static pressure could be derived.

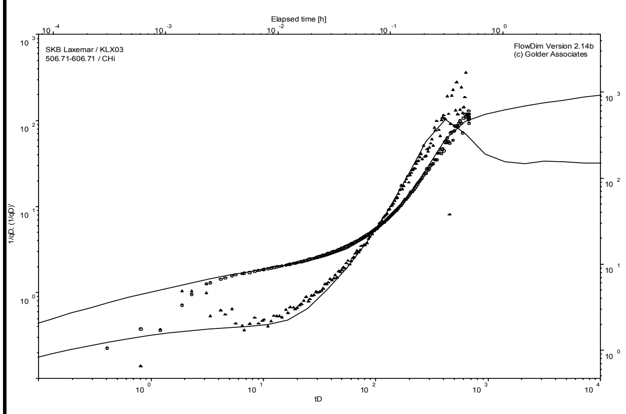
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX03	Test start:	050508 15:36
Test section from - to (m):	506.71-606.71 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

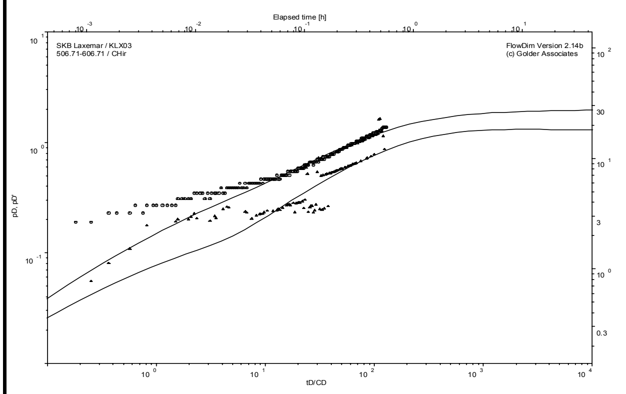
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5802		
p_i (kPa) =	5808		
p_p(kPa) =	6004	p_F (kPa) =	5988
Q_p (m^3/s)=	2.50E-08		
tp (s) =	1800	t_F (s) =	2100
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.0		
Derivative fact.=	0.02	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	1.3E-09		
T_M (m^2/s)=	1.6E-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) =	4.1E-10	T (m^2/s) =	3.7E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.1E-12	K_s (m/s) =	3.7E-10
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.7E-10
C_D (-) =	NA	C_D (-) =	4.1E-02
ξ (-) =	-2.00	ξ (-) =	-4.76
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) =	3.7E-10
dt_2 (min) =	NA	C_D (-) =	4.1E-02
T_T (m^2/s) =	4.1E-10	ξ (-) =	-2.00
S (-) =	1.0E-06		
K_s (m/s) =	4.1E-12		
S_s (1/m) =	1.0E-08		

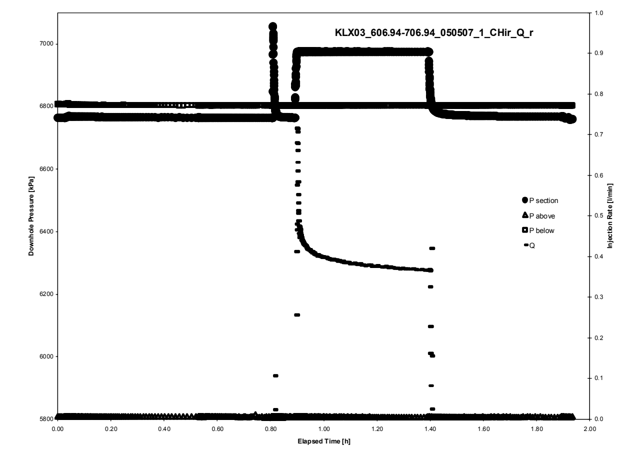
Comments:

The recommended transmissivity of 4.1E-10 m2/s was derived from the analysis of the CHi phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-11 to 8.0E-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.

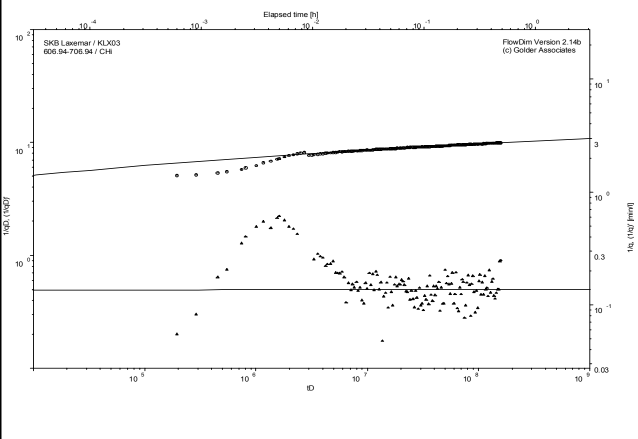
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050507 08:53
Test section from - to (m):	606.94-706.94	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

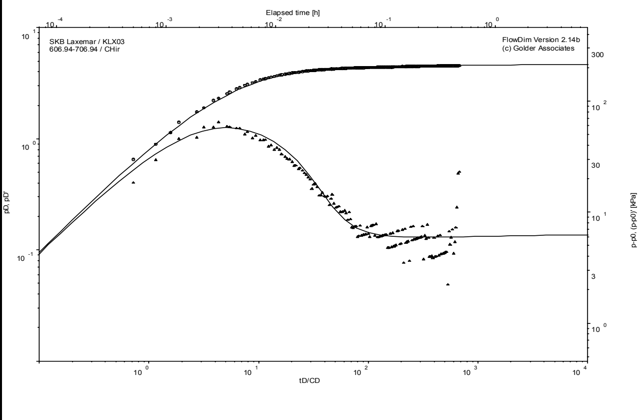
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	6765		
p_i (kPa) =	6765		
p_p(kPa) =	6975	p_F (kPa) =	6767
Q_p (m^3/s)=	6.10E-06		
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)=	17.5		
Derivative fact.=	0.05	Derivative fact.=	0.08
Results		**Results**	
Q/s (m^2/s)=	2.8E-07		
T_M (m^2/s)=	3.7E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.32	dt_1 (min) =	5.80
dt_2 (min) =	28.10	dt_2 (min) =	23.93
T (m^2/s) =	4.5E-07	T (m^2/s) =	8.0E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.5E-09	K_s (m/s) =	8.0E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.6E-10
C_D (-) =	NA	C_D (-) =	4.0E-02
ξ (-) =	2.83	ξ (-) =	-0.68
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	1.32	C (m^3/Pa) =	3.6E-10
dt_2 (min) =	28.10	C_D (-) =	4.0E-02
T_T (m^2/s) =	4.5E-07	ξ (-) =	2.83
S (-) =	1.0E-06		
K_s (m/s) =	4.5E-09		
S_s (1/m) =	1.0E-08		

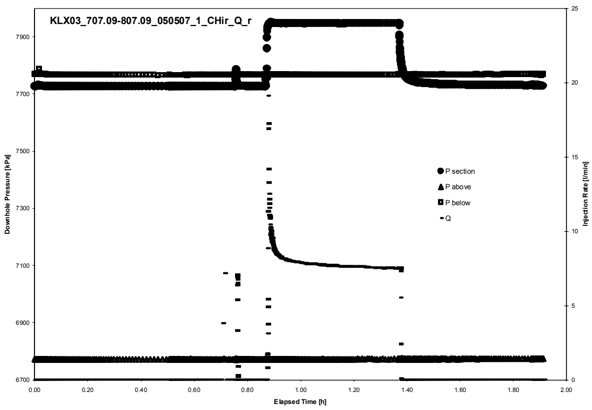
Comments:

The recommended transmissivity of 4.5E-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 2.0E-7 to 7.0E-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 6763.8 kPa

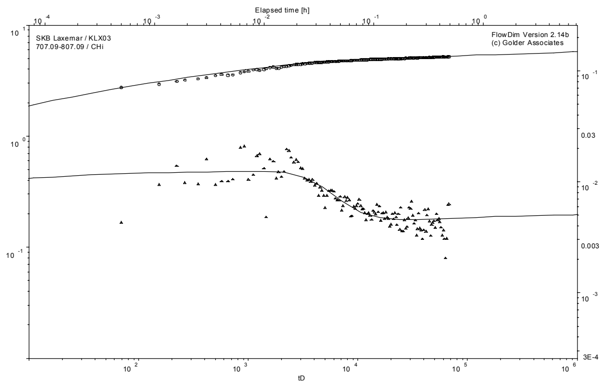
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050507 12:26
Test section from - to (m):	707.09-807.09	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

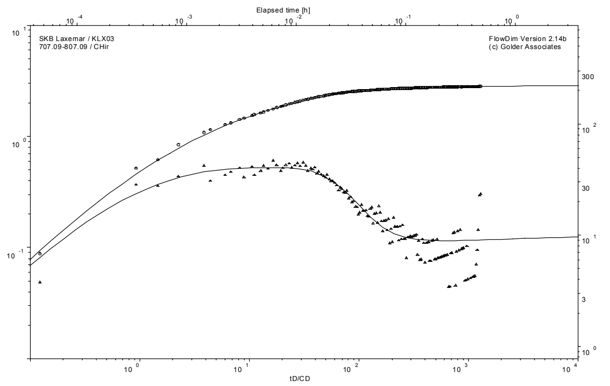
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	7728		
p_i (kPa) =	7727		
p_p(kPa) =	7948	p_F (kPa) =	7730
Q_p (m^3/s)=	1.25E-04		
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)=	19.0		
Derivative fact.=	0.09	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	5.6E-06		
T_M (m^2/s)=	7.2E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.10	dt_1 (min) =	0.19
dt_2 (min) =	0.91	dt_2 (min) =	0.85
T (m^2/s) =	4.6E-06	T (m^2/s) =	2.7E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.6E-08	K_s (m/s) =	2.7E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.3E-09
C_D (-) =	NA	C_D (-) =	2.5E-01
π (-) =	-2.20	π (-) =	-3.90
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	0.19	C (m^3/Pa) =	2.3E-09
dt_2 (min) =	0.85	C_D (-) =	2.5E-01
T_T (m^2/s) =	2.7E-06	π (-) =	-3.90
S (-) =	1.0E-06		
K_s (m/s) =	2.7E-08		
S_s (1/m) =	1.0E-08		

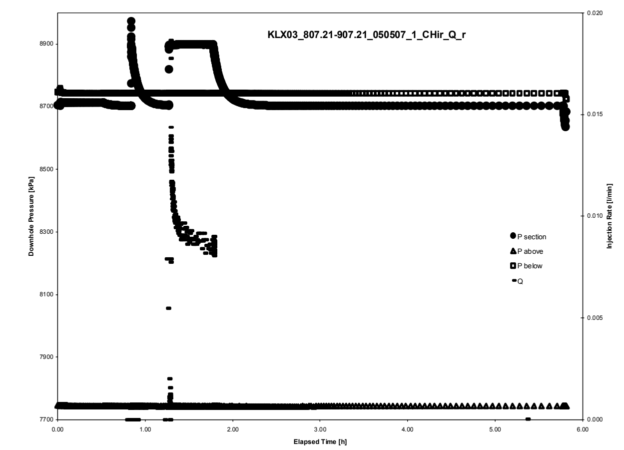
Comments:

The recommended transmissivity of 2.7E-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 9.0E-7 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 7725.7 kPa.

Test Summary Sheet

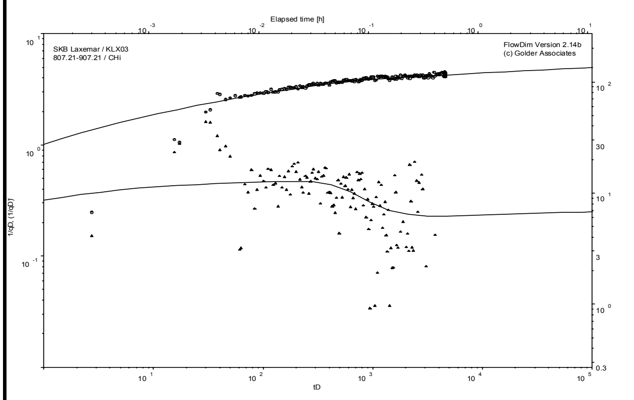
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050507 16:20
Test section from - to (m):	807.21-907.21	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

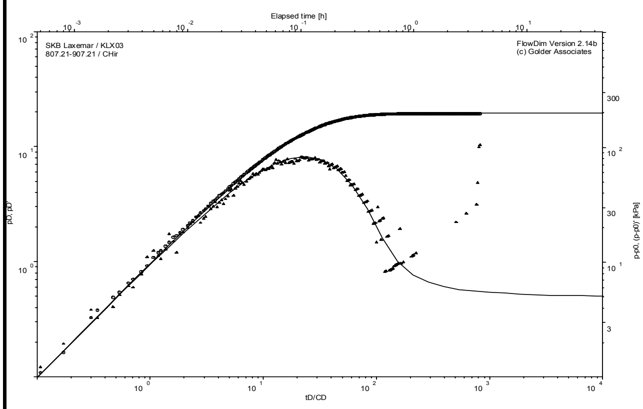


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	8705		
p_i (kPa) =	8707		
p_p(kPa) =	8898	p_F (kPa) =	8702
Q_p (m^3/s)=	1.43E-07		
tp (s) =	1800	t_F (s) =	14400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	20.6		
Derivative fact.=	0.18	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	7.4E-09		
T_M (m^2/s)=	9.6E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.45	dt_1 (min) =	4.57
dt_2 (min) =	2.05	dt_2 (min) =	9.11
T (m^2/s) =	5.0E-09	T (m^2/s) =	2.5E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.0E-11	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) =	2.6E-10
C_D (-) =	NA	C_D (-) =	2.9E-02
ξ (-) =	-0.10	ξ (-) =	14.40
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) =	0.45	C (m^3/Pa) =	2.6E-10
dt_2 (min) =	2.05	C_D (-) =	2.9E-02
T_T (m^2/s) =	5.0E-09	ξ (-) =	-0.10
S (-) =	1.0E-06		
K_s (m/s) =	5.0E-11		
S_s (1/m) =	1.0E-08		

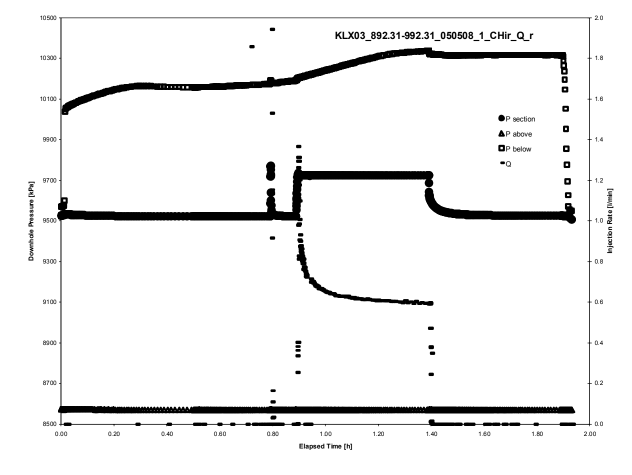
Comments:

The recommended transmissivity of 5.0E-9 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 3.0E-9 to 9.0E-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 8700.4 kPa.

Test Summary Sheet

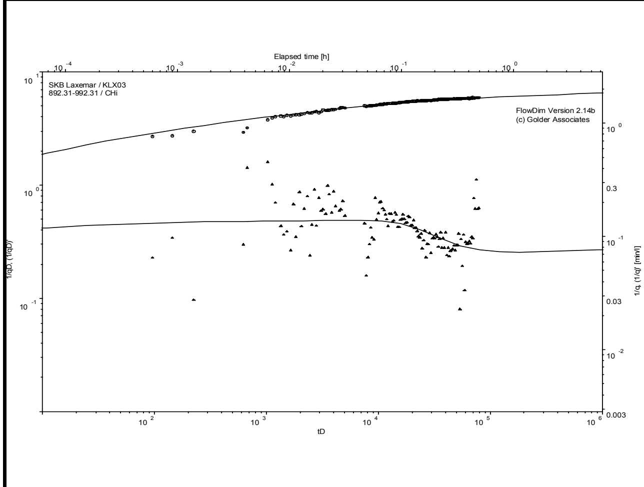
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050508 09:43
Test section from - to (m):	892.31-992.31	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

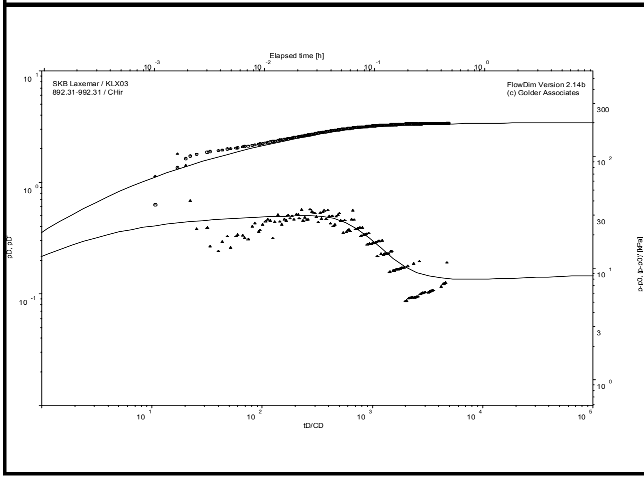


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	9527		
p_i (kPa) =	9523		
p_p(kPa) =	9723	p_F (kPa) =	9532
Q_p (m^3/s)=	9.87E-06		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	22.0		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	4.8E-07		
T_M (m^2/s)=	6.3E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.50	dt_1 (min) =	0.79
dt_2 (min) =	3.62	dt_2 (min) =	2.31
T (m^2/s) =	4.6E-07	T (m^2/s) =	2.8E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.6E-09	K_s (m/s) =	2.8E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.2E-11
C_D (-) =	NA	C_D (-) =	6.8E-03
ξ (-) =	-0.98	ξ (-) =	-2.71
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) =	0.79	C (m^3/Pa) =	6.2E-11
dt_2 (min) =	2.31	C_D (-) =	6.8E-03
T_T (m^2/s) =	2.8E-07	ξ (-) =	-2.71
S (-) =	1.0E-06		
K_s (m/s) =	2.8E-09		
S_s (1/m) =	1.0E-08		

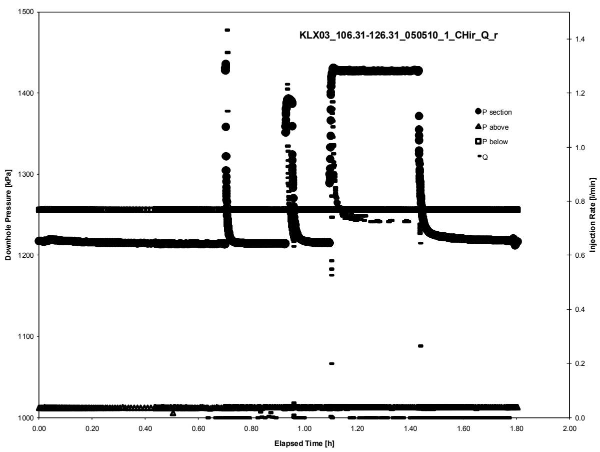
Comments:

The recommended transmissivity of 2.8E-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 8.0E-8 to 7.0E-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 9523.2 kPa.

Test Summary Sheet

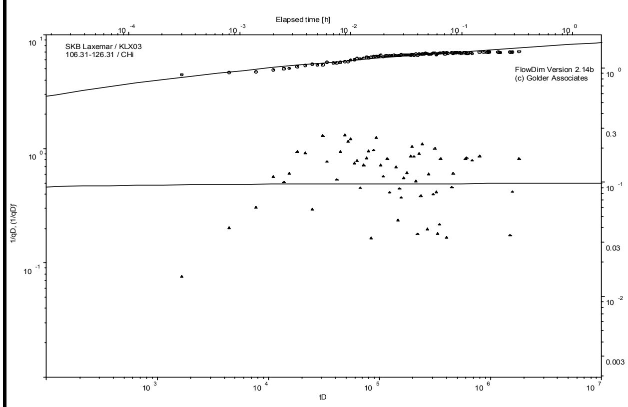
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050510 08:00
Test section from - to (m):	106.31-126.31	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

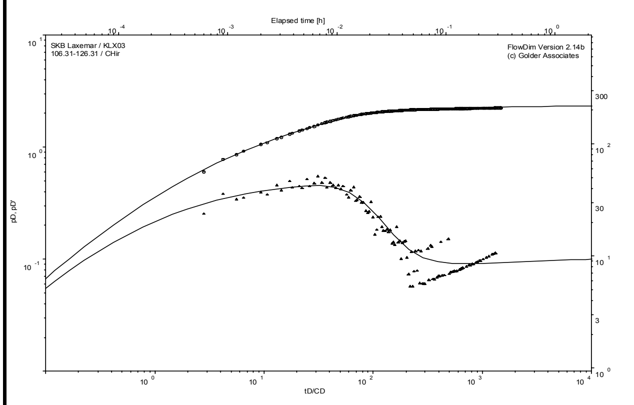


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1217		
p_i (kPa) =	1215		
p_p(kPa) =	1428	p_F (kPa) =	1218
Q_p (m^3/s)=	1.19E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	8.5		
Derivative fact.=	0.03	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	5.5E-07		
T_M (m^2/s)=	5.7E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.73	dt_1 (min) =	0.19
dt_2 (min) =	4.90	dt_2 (min) =	0.65
T (m^2/s) =	6.2E-07	T (m^2/s) =	2.1E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.1E-08	K_s (m/s) =	1.1E-08
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 (-) =	0.63	ξ (-) =	-3.00
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) =	0.19	C (m^3/Pa) =	1.0E-10
dt_2 (min) =	0.65	C_D (-) =	1.1E-02
T_T (m^2/s) =	2.1E-07	ξ (-) =	-3.00
S (-) =	1.0E-06		
K_s (m/s) =	1.1E-08		
S_s (1/m) =	5.0E-08		

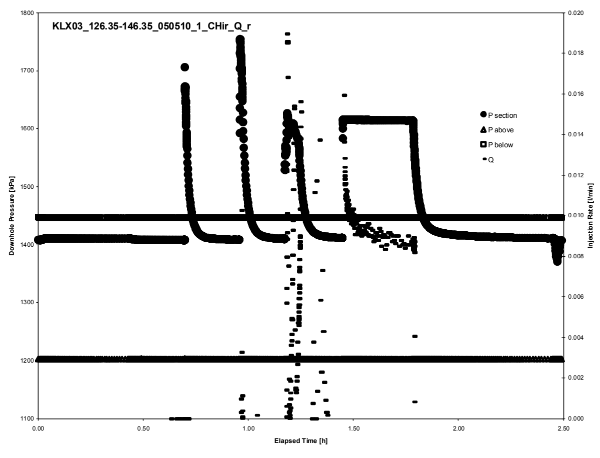
Comments:

The recommended transmissivity of 2.1E-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 8.0E-8 to 5.0E-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 1214.5 kPa.

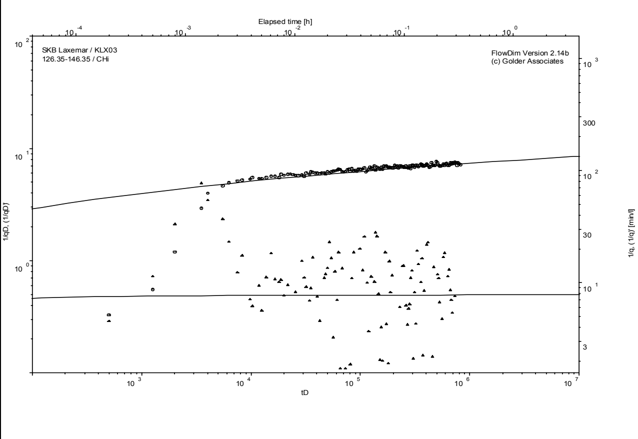
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050510 10:39
Test section from - to (m):	126.35-146.35	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

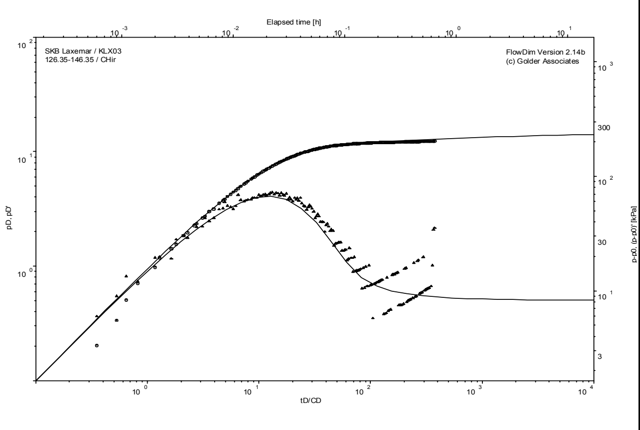
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1408		
p_i (kPa) =	1411		
p_p(kPa) =	1613	p_F (kPa) =	1411
Q_p (m^3/s)=	1.50E-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)=	8.8		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	7.3E-09		
T_M (m^2/s)=	7.6E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.23	dt_1 (min) =	NA
dt_2 (min) =	17.48	dt_2 (min) =	NA
T (m^2/s) =	8.2E-09	T (m^2/s) =	1.5E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.1E-10	K_s (m/s) =	7.5E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.0E-11
C_D (-) =	NA	C_D (-) =	6.6E-03
ξ (-) =	2.40	ξ (-) =	7.47
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) =	6.0E-11
dt_2 (min) =	17.48	C_D (-) =	6.6E-03
T_T (m^2/s) =	8.2E-09	ξ (-) =	2.40
S (-) =	1.0E-06		
K_s (m/s) =	4.1E-10		
S_s (1/m) =	5.0E-08		

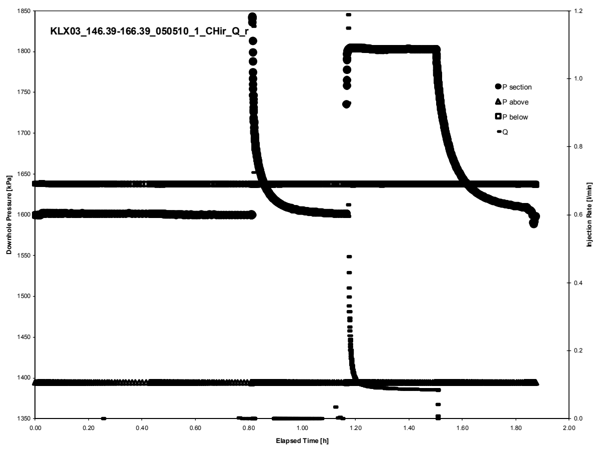
Comments:

The recommended transmissivity of 8.2E-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 4.0E-9 to 2.0E-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 1406.5 kPa.

Test Summary Sheet

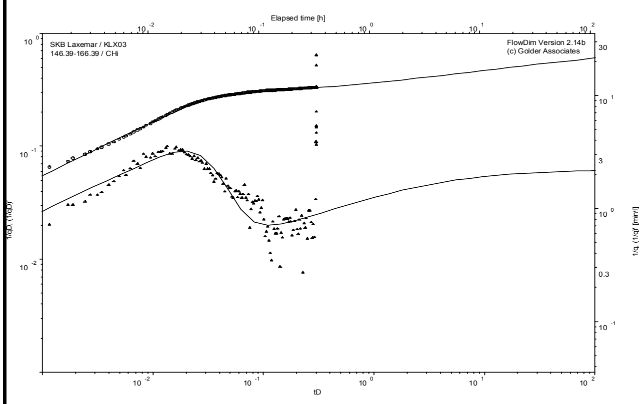
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050510 13:54
Test section from - to (m):	146.39-166.39	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1600		
p_i (kPa) =	1602		
p_p(kPa) =	1803	p_F (kPa) =	1609
Q_p (m^3/s)=	1.40E-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)=	9.1		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	6.8E-08		
T_M (m^2/s)=	7.1E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.23	dt_1 (min) =	NA
dt_2 (min) =	16.18	dt_2 (min) =	NA
T (m^2/s) =	2.9E-08	T (m^2/s) =	4.5E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.5E-09	K_s (m/s) =	2.3E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.4E-10
C_D (-) =	NA	C_D (-) =	6.0E-02
ξ (-) =	-4.61	ξ (-) =	-3.80
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

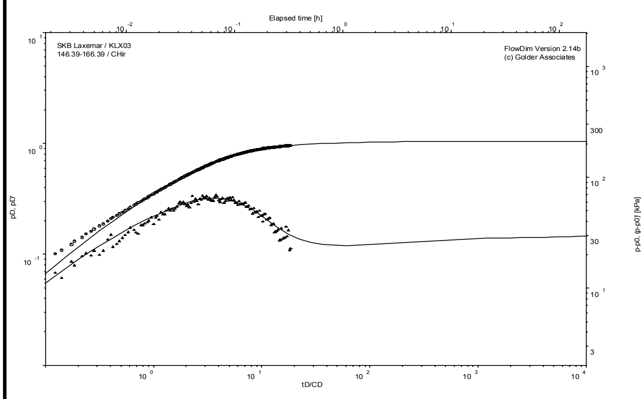
Log-Log plot incl. derivates- flow period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	5.4E-10
dt_2 (min) =	NA	C_D (-) =	6.0E-02
T_T (m^2/s) =	4.5E-08	ξ (-) =	-3.80
S (-) =	1.0E-06		
K_s (m/s) =	2.3E-09		
S_s (1/m) =	5.0E-08		

Log-Log plot incl. derivatives- recovery period



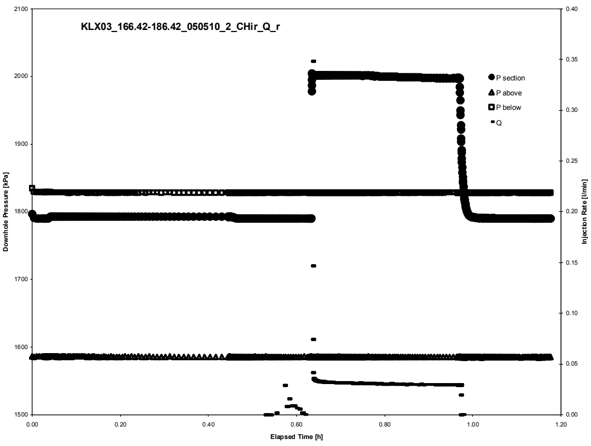
Comments:

The recommended transmissivity of 4.5E-8 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-8 to 8.0E-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 1587.2 kPa.

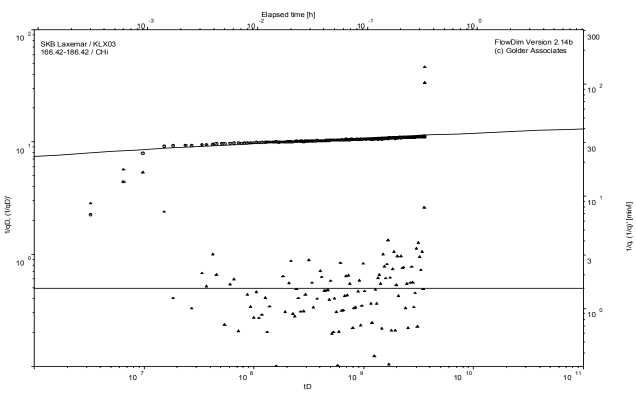
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX03	Test start:	050510 17:57
Test section from - to (m):	166.42-186.42	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

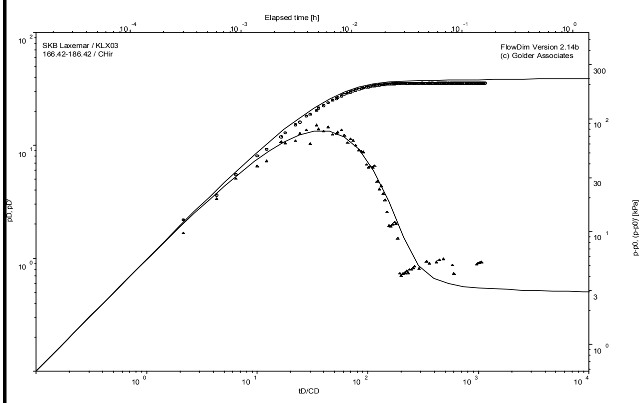
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1790		
p_i (kPa) =	1790		
p_p(kPa) =	1997	p_F (kPa) =	1789
Q_p (m^3/s)=	4.83E-07		
tp (s) =	1200	t_F (s) =	600
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.4		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.3E-08		
T_M (m^2/s)=	2.4E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.15	dt_1 (min) =	0.23
dt_2 (min) =	15.49	dt_2 (min) =	0.52
T (m^2/s) =	4.1E-08	T (m^2/s) =	1.4E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.1E-09	K_s (m/s) =	7.0E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.5E-11
C_D (-) =	NA	C_D (-) =	5.0E-03
ξ (-) =	5.80	ξ (-) =	32.60
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	1.15	C (m^3/Pa) =	4.5E-11
dt_2 (min) =	15.49	C_D (-) =	5.0E-03
T_T (m^2/s) =	4.1E-08	ξ (-) =	5.80
S (-) =	1.0E-06		
K_s (m/s) =	2.1E-09		
S_s (1/m) =	5.0E-08		

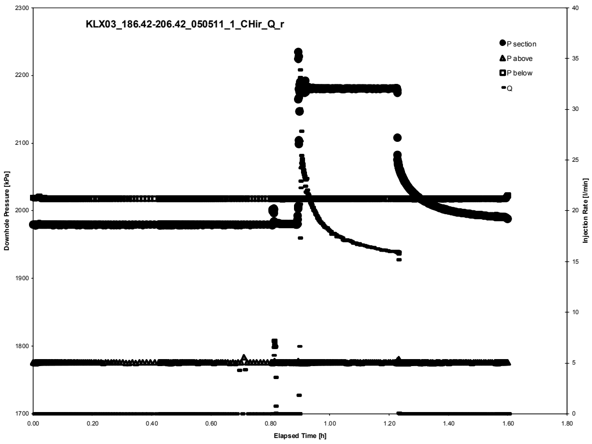
Comments:

The recommended transmissivity of 4.1E-8 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 2.0E-8 to 9.0E-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 1788.8 kPa.

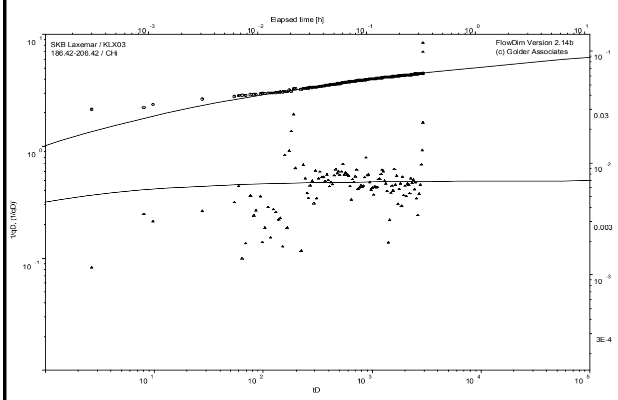
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050511 08:01
Test section from - to (m):	186.42-206.42 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

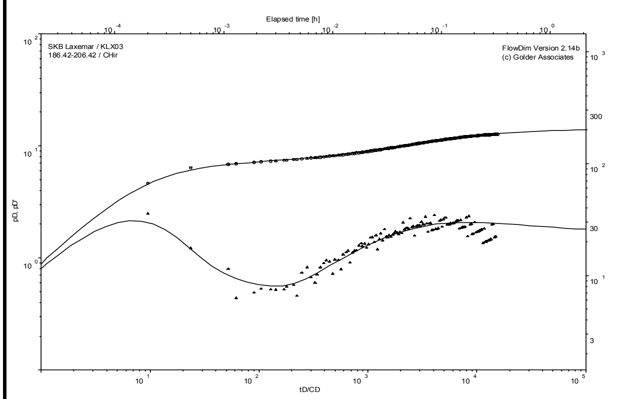
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1979		
p_i (kPa) =	1980		
p_p(kPa) =	2181	p_F (kPa) =	1990
Q_p (m^3/s)=	2.62E-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)=	9.7		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.3E-05		
T_M (m^2/s)=	1.3E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.63	dt_1 (min) =	4.76
dt_2 (min) =	19.80	dt_2 (min) =	12.10
T (m^2/s) =	9.2E-06	T (m^2/s) =	9.6E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.6E-07	K_s (m/s) =	4.8E-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-09
C_D (-) =	NA	C_D (-) =	1.8E-01
ξ (-) =	-3.93	ξ (-) =	0.90
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	1.63	C (m^3/Pa) =	1.6E-09
dt_2 (min) =	19.80	C_D (-) =	1.8E-01
T_T (m^2/s) =	9.2E-06	ξ (-) =	-3.93
S (-) =	1.0E-06		
K_s (m/s) =	4.6E-07		
S_s (1/m) =	5.0E-08		

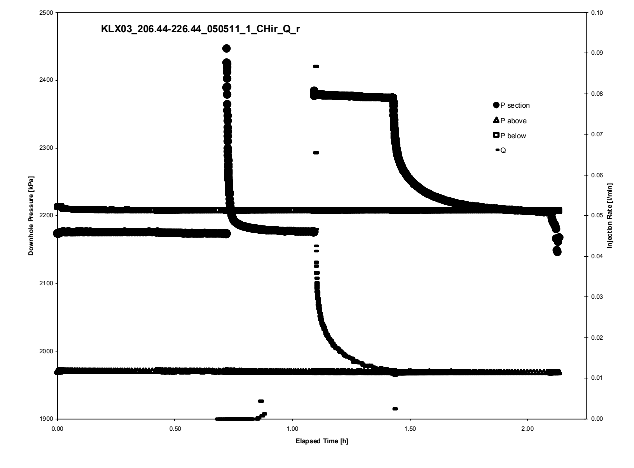
Comments:

The recommended transmissivity of 9.2E-6 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-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 1974.0 kPa.

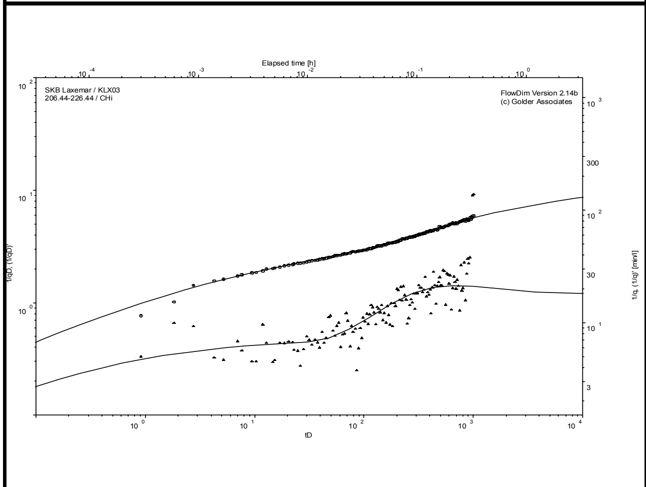
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050511 10:17
Test section from - to (m):	206.44-226.44 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

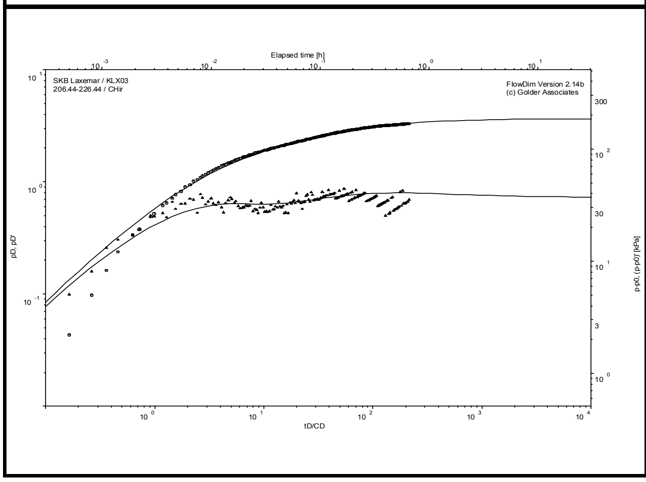
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2173		
p_i (kPa) =	2176		
p_p(kPa) =	2373	p_F (kPa) =	2204
Q_p (m^3/s)=	1.83E-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)=	10.0		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	9.1E-09		
T_M (m^2/s)=	9.6E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.34	dt_1 (min) =	0.53
dt_2 (min) =	0.89	dt_2 (min) =	1.73
T (m^2/s) =	8.8E-09	T (m^2/s) =	8.4E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.4E-10	K_s (m/s) =	4.2E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.9E-11
C_D (-) =	NA	C_D (-) =	6.5E-03
ξ (-) =	0.99	ξ (-) =	-1.50
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	0.53	C (m^3/Pa) =	5.9E-11
dt_2 (min) =	1.73	C_D (-) =	6.5E-03
T_T (m^2/s) =	8.4E-09	ξ (-) =	-1.50
S (-) =	1.0E-06		
K_s (m/s) =	4.2E-10		
S_s (1/m) =	5.0E-08		

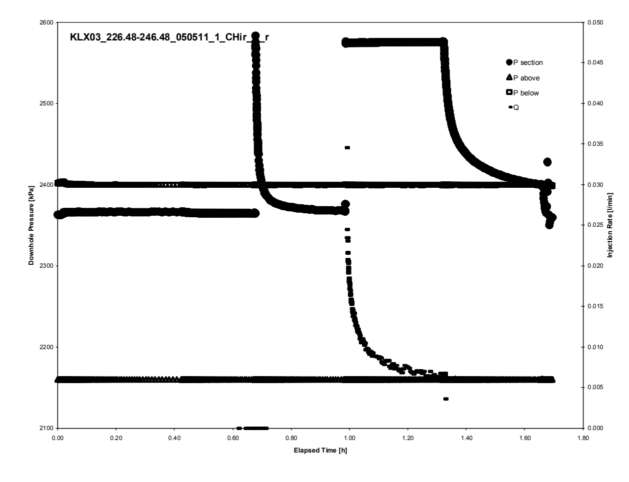
Comments:

The recommended transmissivity of 8.4E-9 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 5.0E-9 to 2.0E-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 2192.3 kPa.

Test Summary Sheet

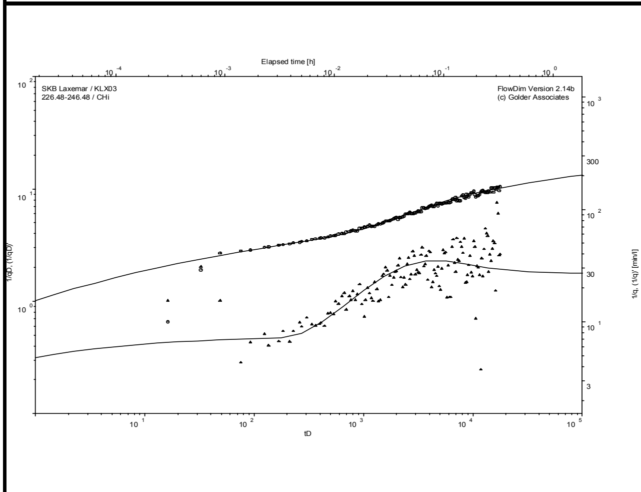
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050511 13:38
Test section from - to (m):	226.48-246.48	Responsible for test execution:	Stephan Rohs
Section diameter, 2·r_w (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2363		
p_i (kPa) =	2367		
p_p(kPa) =	2575	p_F (kPa) =	2400
Q_p (m^3/s)=	1.17E-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)=	10.3		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	5.5E-09		
T_M (m^2/s)=	5.8E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	6.59	dt_1 (min) =	2.90
dt_2 (min) =	10.17	dt_2 (min) =	17.89
T (m^2/s) =	2.3E-09	T (m^2/s) =	3.7E-09
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) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.5E-11
C_D (-) =	NA	C_D (-) =	6.1E-03
ξ (-) =	0.49	ξ (-) =	0.30
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

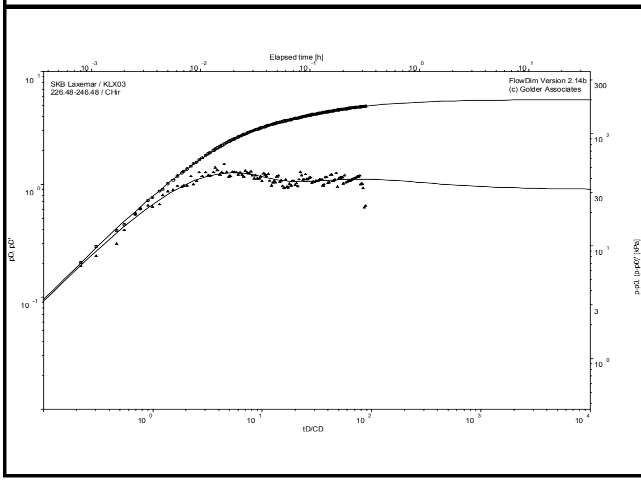
Log-Log plot incl. derivates- flow period



Selected representative parameters.

dt_1 (min) =	2.90	C (m^3/Pa) =	5.5E-11
dt_2 (min) =	17.89	C_D (-) =	6.1E-03
T_T (m^2/s) =	3.7E-09	ξ (-) =	0.30
S (-) =	1.0E-06		
K_s (m/s) =	1.9E-10		
S_s (1/m) =	5.0E-08		

Log-Log plot incl. derivatives- recovery period



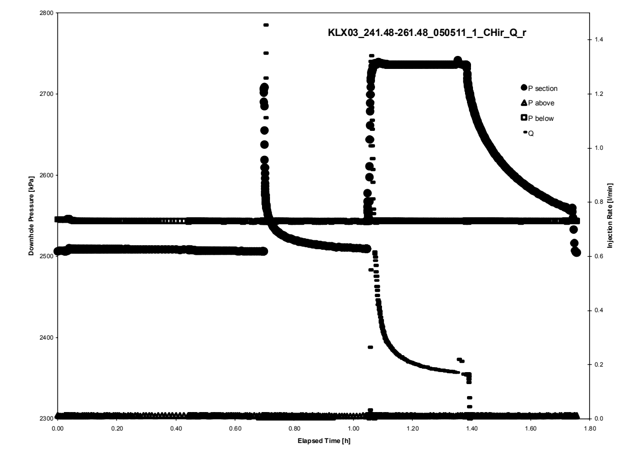
Comments:

The recommended transmissivity of 3.7E-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 6.0E-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 2372.9 kPa.

Test Summary Sheet

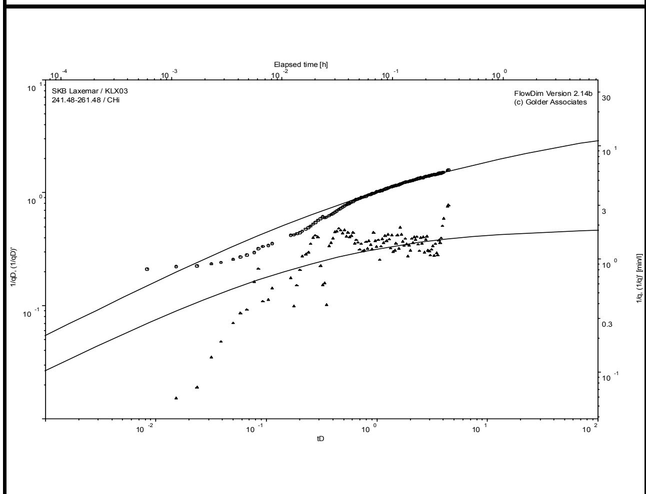
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050511 16:06
Test section from - to (m):	241.48-261.48	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

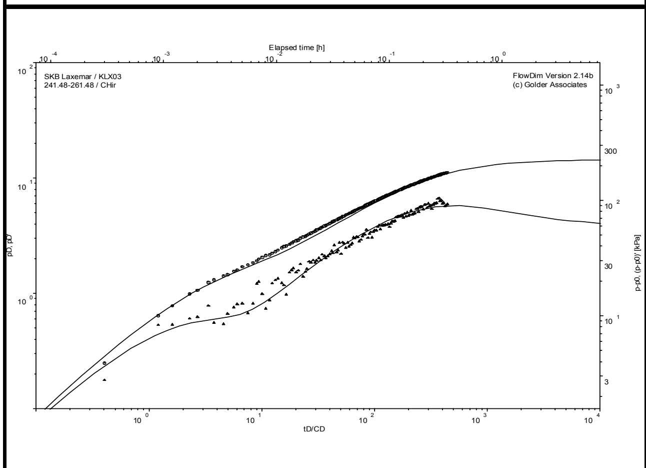


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2506		
p_i (kPa) =	2509		
p_p(kPa) =	2735	p_F (kPa) =	2556
Q_p (m^3/s)=	2.73E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.5		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.2E-07		
T_M (m^2/s)=	1.2E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	5.77	dt_1 (min) =	12.08
dt_2 (min) =	16.17	dt_2 (min) =	19.70
T (m^2/s) =	3.0E-08	T (m^2/s) =	5.5E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.5E-09	K_s (m/s) =	2.8E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.2E-10
C_D (-) =	NA	C_D (-) =	7.9E-02
ξ (-) =	-4.29	ξ (-) =	-2.80
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) =	12.08	C (m^3/Pa) =	7.2E-10
dt_2 (min) =	19.70	C_D (-) =	7.9E-02
T_T (m^2/s) =	5.5E-08	ξ (-) =	-2.80
S (-) =	1.0E-06		
K_s (m/s) =	2.8E-09		
S_s (1/m) =	5.0E-08		

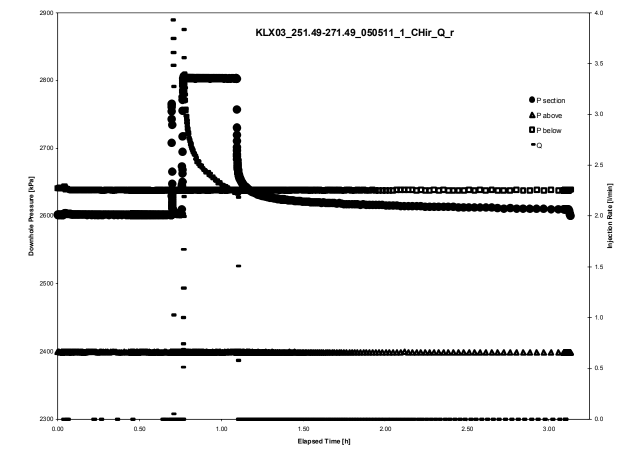
Comments:

The recommended transmissivity of 5.5E-8 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 3.0E-8 to 1.0E-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 2495.2 kPa.

Test Summary Sheet

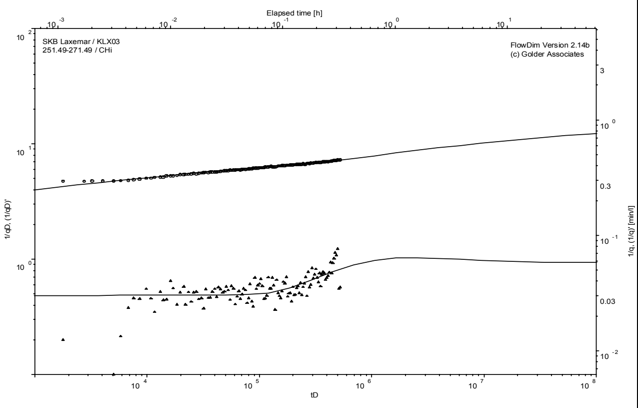
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX06	Test start:	050511 18:23
Test section from - to (m):	251.49-271.49	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

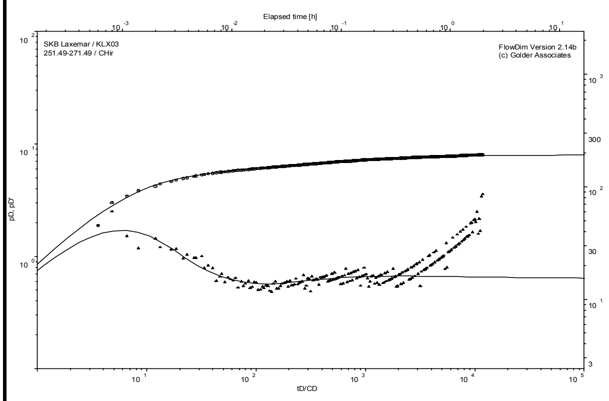


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2603		
p_i (kPa) =	2603		
p_p(kPa) =	2803	p_F (kPa) =	2610
Q_p (m^3/s)=	3.70E-05		
tp (s) =	1200	t_F (s) =	7200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.7		
Derivative fact.=	0.08	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	1.8E-06		
T_M (m^2/s)=	1.9E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.40	dt_1 (min) =	1.00
dt_2 (min) =	4.32	dt_2 (min) =	2.63
T (m^2/s) =	2.1E-06	T (m^2/s) =	2.7E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.1E-07	K_s (m/s) =	1.4E-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-09
C_D (-) =	NA	C_D (-) =	1.1E-01
ξ (-) =	-0.58	ξ (-) =	-0.10
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) =	1.00	C (m^3/Pa) =	1.0E-09
dt_2 (min) =	2.63	C_D (-) =	1.1E-01
T_T (m^2/s) =	2.7E-06	ξ (-) =	-0.10
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-07		
S_s (1/m) =	5.0E-08		

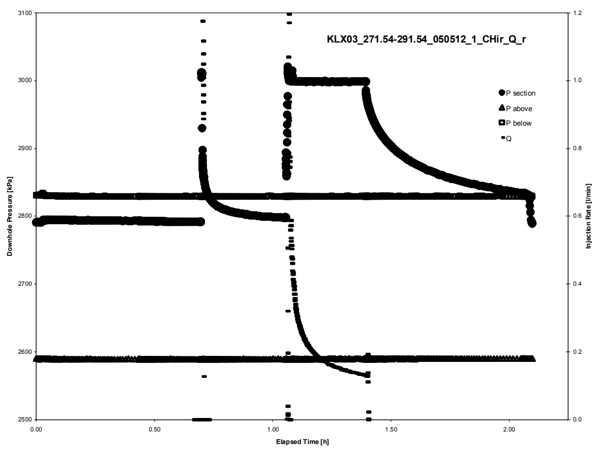
Comments:

The recommended transmissivity of 2.7E-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 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 2607.7 kPa.

Test Summary Sheet

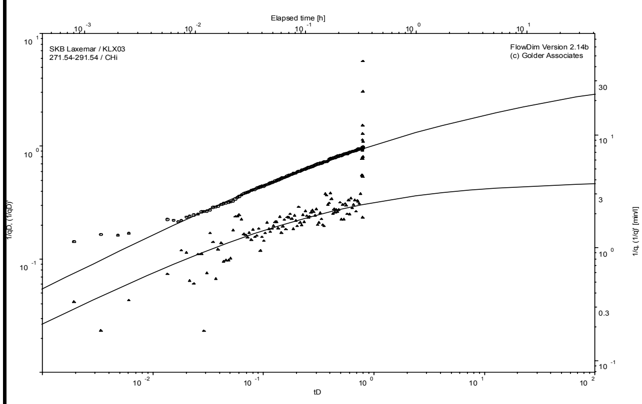
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050512 07:53
Test section from - to (m):	271.54-291.54	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



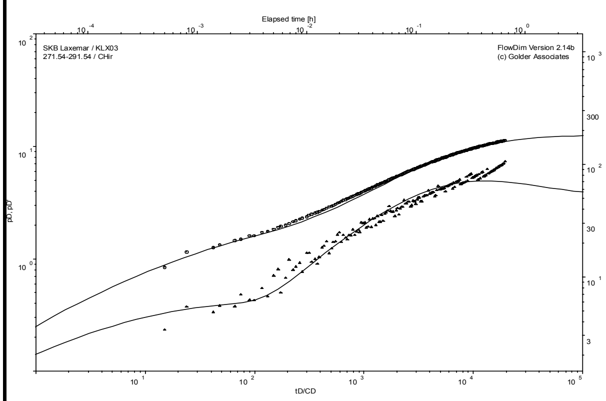
Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2791		
p_i (kPa) =	2797		
p_p(kPa) =	2998	p_F (kPa) =	2832
Q_p (m^3/s)=	2.17E-06		
tp (s) =	1200	t_F (s) =	2400
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.0		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.1E-07		
T_M (m^2/s)=	1.1E-07		

Log-Log plot incl. derivates- flow period



Flow period		Recovery period	
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) =	1.6E-08	T (m^2/s) =	5.3E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	8.0E-10	K_s (m/s) =	2.7E-09
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-11
C_D (-) =	NA	C_D (-) =	3.1E-03
ξ (-) =	-4.87	ξ (-) =	-2.90
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	2.8E-11
dt_2 (min) =	NA	C_D (-) =	3.1E-03
T_T (m^2/s) =	5.3E-08	ξ (-) =	-2.90
S (-) =	1.0E-06		
K_s (m/s) =	2.7E-09		
S_s (1/m) =	5.0E-08		

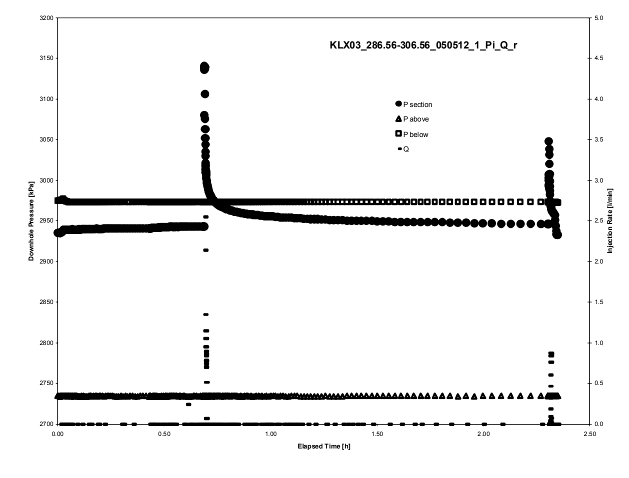
Comments:

The recommended transmissivity of 5.3E-8 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 3.0E-8 to 1.0E-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 2796.9 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050512 10:41
Test section from - to (m):	286.56-306.56	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

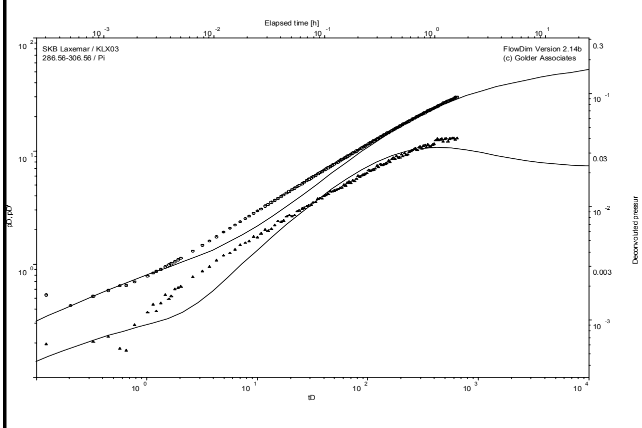


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2936		
p_i (kPa) =	2943		
p_p(kPa) =	3139	p_F (kPa) =	2946
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	5820
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.2		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**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) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	1.3E-08
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	6.5E-10
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.3E-09
C_D (-) =	NA	C_D (-) =	1.4E-01
ξ (-) =	NA	ξ (-) =	-3.50
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) =	1.3E-09
dt_2 (min) =	NA	C_D (-) =	1.4E-01
T_T (m^2/s) =	1.3E-08	ξ (-) =	-3.50
S (-) =	1.0E-06		
K_s (m/s) =	6.5E-10		
S_s (1/m) =	5.0E-08		

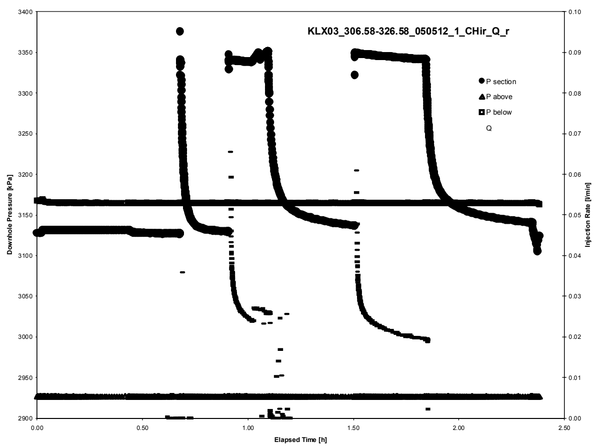
Comments:

The recommended transmissivity of 1.3E-08 m2/s was derived from the analysis of the Pi phase (outer zone). 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 6E-9 to 3E-8 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

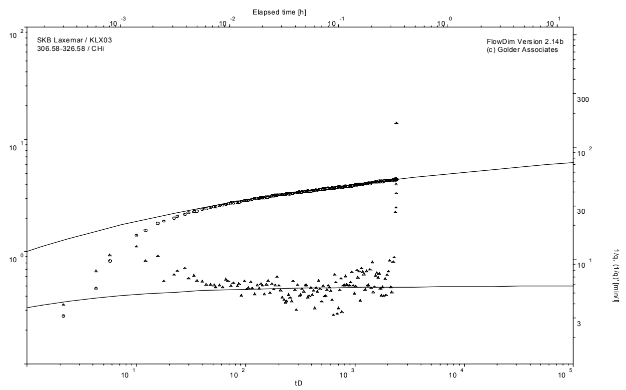
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050512 13:44
Test section from - to (m):	306.58-326.58 m	Responsible for test execution:	Stephan Rohs
Section diameter, 2·r_w (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

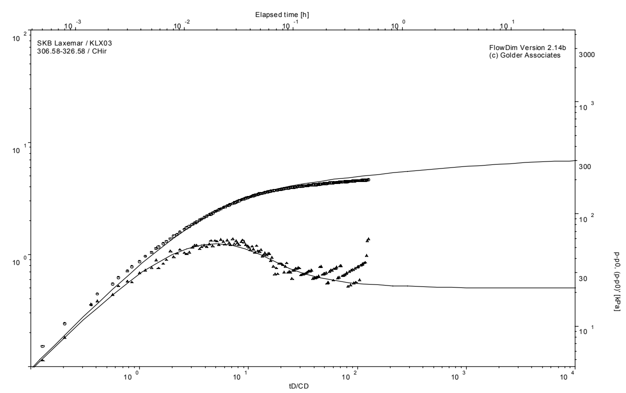
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3127		
p_i (kPa) =	3137		
p_p(kPa) =	3344	p_F (kPa) =	3140
Q_p (m^3/s)=	3.17E-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)=	11.6		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.5E-08		
T_M (m^2/s)=	1.6E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.97	dt_1 (min) =	1.01
dt_2 (min) =	17.92	dt_2 (min) =	1.73
T (m^2/s) =	1.1E-08	T (m^2/s) =	1.4E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.5E-10	K_s (m/s) =	7.0E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.2E-10
C_D (-) =	NA	C_D (-) =	1.3E-02
□(-) =	-0.20	□(-) =	-0.15
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	0.97	C (m^3/Pa) =	1.2E-10
dt_2 (min) =	17.92	C_D (-) =	1.3E-02
T_T (m^2/s) =	1.1E-08	□(-) =	-0.20
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-10		
S_s (1/m) =	5.0E-08		

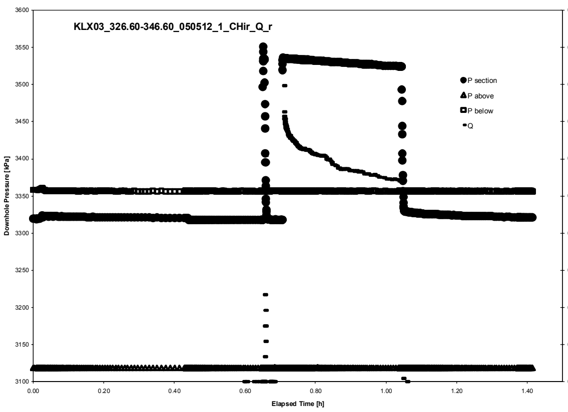
Comments:

The recommended transmissivity of 1.1E-8 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 7.0E-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 3124.8 kPa.

Test Summary Sheet

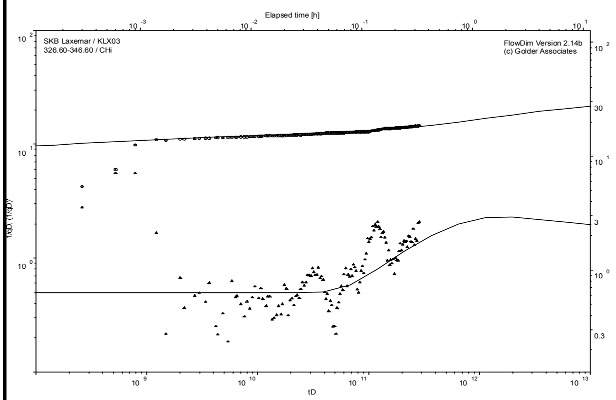
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050512 17:04
Test section from - to (m):	326.60-346.60 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

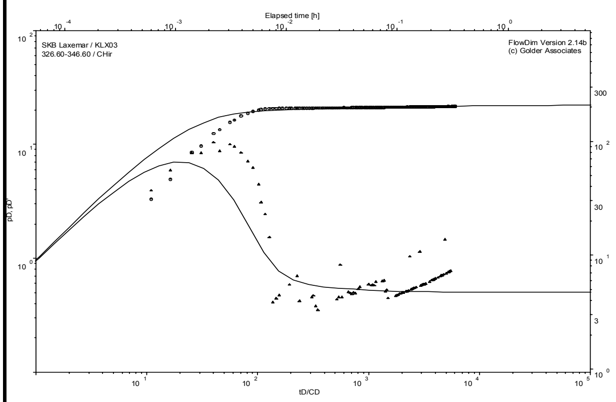


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3319		
p_i (kPa) =	3318		
p_p(kPa) =	3524	p_F (kPa) =	3321
Q_p (m^3/s)=	9.00E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.9		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	4.3E-08		
T_M (m^2/s)=	4.5E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.19	dt_1 (min) =	NA
dt_2 (min) =	1.69	dt_2 (min) =	NA
T (m^2/s) =	9.9E-08	T (m^2/s) =	1.6E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.0E-09	K_s (m/s) =	8.0E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.1E-11
C_D (-) =	NA	C_D (-) =	2.3E-03
ξ (-) =	7.50	ξ (-) =	15.70
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) =	0.19	C (m^3/Pa) =	2.1E-11
dt_2 (min) =	1.69	C_D (-) =	2.3E-03
T_T (m^2/s) =	9.9E-08	ξ (-) =	7.50
S (-) =	1.0E-06		
K_s (m/s) =	5.0E-09		
S_s (1/m) =	5.0E-08		

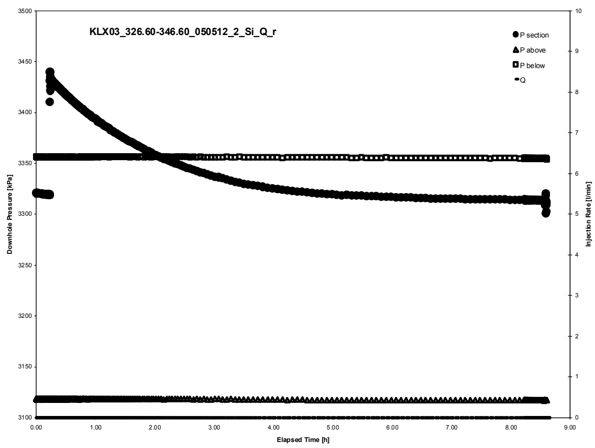
Comments:

The recommended transmissivity of 9.9E-8 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 6.0E-8 to 2.0E-7 m2/s. The flow dimension displayed during the test was 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 3317.9 kPa.

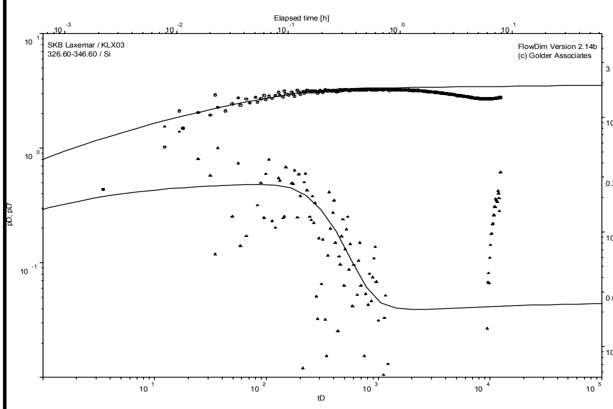
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Si
Area:	Laxemar	Test no:	2
Borehole ID:	KLX03	Test start:	050512 18:31
Test section from - to (m):	326.60-346.60	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

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3319		
p_i (kPa) =	3319		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	28800	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	11.9		
Derivative fact.=	0.09	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) =	8.50	dt_1 (min) =	NA
dt_2 (min) =	26.27	dt_2 (min) =	NA
T (m^2/s) =	3.7E-08	T (m^2/s) =	NA
S (-) =	1.0E-06	S (-) =	NA
K_s (m/s) =	0.0E+00	K_s (m/s) =	NA
S_s (1/m) =	5.0E-08	S_s (1/m) =	NA
C (m^3/Pa) =	4.6E-08	C (m^3/Pa) =	NA
C_D (-) =	5.1E-06	C_D (-) =	NA
ξ (-) =	0.00	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

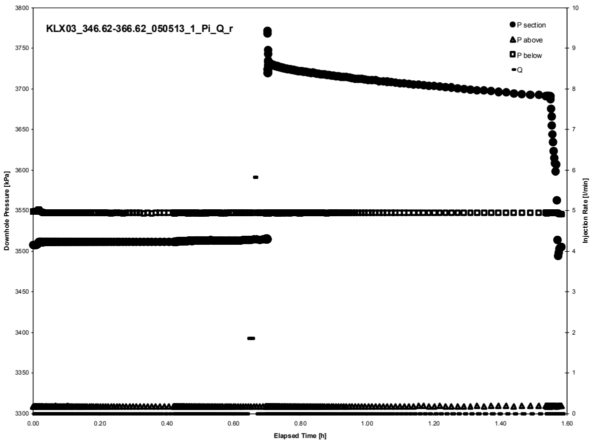
Selected representative parameters.			
dt_1 (min) =	8.50	C (m^3/Pa) =	4.6E-08
dt_2 (min) =	26.27	C_D (-) =	5.1E-06
T_T (m^2/s) =	3.7E-08	ξ (-) =	0.00
S (-) =	1.0E-06		
K_s (m/s) =	0.0E+00		
S_s (1/m) =	0.0E+00		

Comments:

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050513 09:07
Test section from - to (m):	346.62-366.62	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

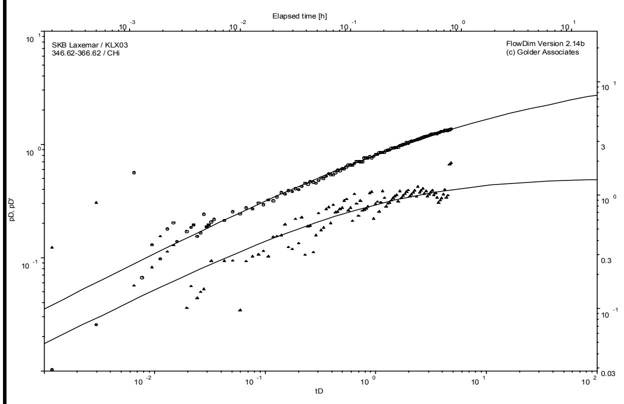


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3508		
p_i (kPa) =	3514		
p_p(kPa) =	3731	p_F (kPa) =	3691
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	3060
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.2		
Derivative fact.=	NA	Derivative fact.=	0.08
Results		**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) =	15.07
dt_2 (min) =	NA	dt_2 (min) =	35.13
T (m^2/s) =	NA	T (m^2/s) =	1.4E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	7.0E-13
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	8.7E-11
C_D (-) =	NA	C_D (-) =	9.6E-03
ξ (-) =	NA	ξ (-) =	-0.90
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) =	15.07	C (m^3/Pa) =	8.7E-11
dt_2 (min) =	35.13	C_D (-) =	9.6E-03
T_T (m^2/s) =	1.4E-11	ξ (-) =	-0.90
S (-) =	1.0E-06		
K_s (m/s) =	7.0E-13		
S_s (1/m) =	5.0E-08		

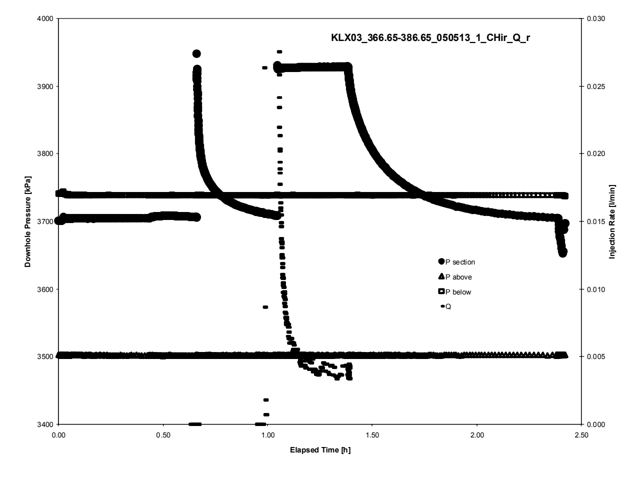
Comments:

The recommended transmissivity of 1.4E-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 1E-11 to 3E-11 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

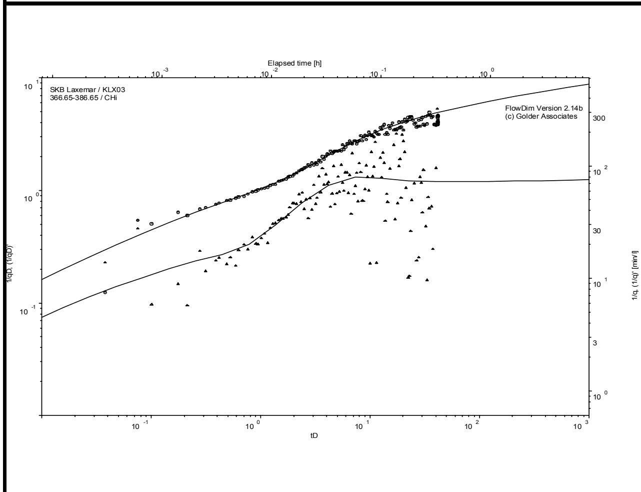
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050513 11:25
Test section from - to (m):	366.65-386.65 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

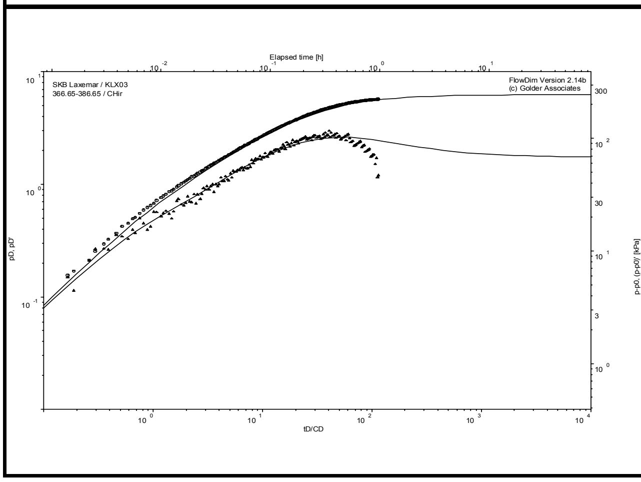
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3701		
p_i (kPa) =	3708		
p_p(kPa) =	3928	p_F (kPa) =	3705
Q_p (m^3/s)=	6.67E-08		
tp (s) =	1200	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.5		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.0E-09		
T_M (m^2/s)=	3.1E-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) =	2.0E-09	T (m^2/s) =	1.1E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.0E-10	K_s (m/s) =	5.5E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.5E-11
C_D (-) =	NA	C_D (-) =	8.3E-03
ξ (-) =	-1.83	ξ (-) =	-1.00
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) =	7.5E-11
dt_2 (min) =	NA	C_D (-) =	8.3E-03
T_T (m^2/s) =	1.1E-09	ξ (-) =	1.00
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-11		
S_s (1/m) =	5.0E-08		

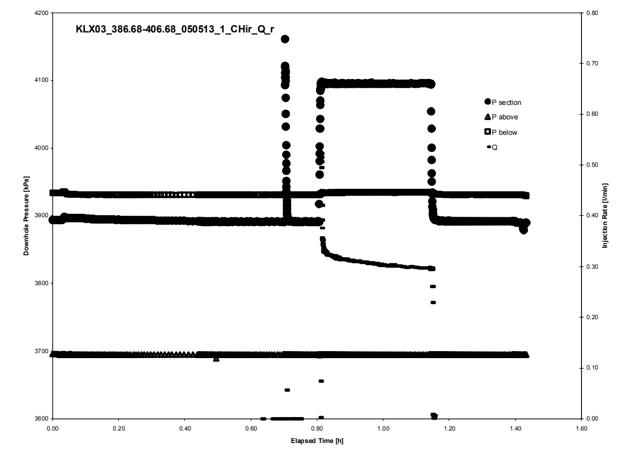
Comments:

The recommended transmissivity of 1.1E-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 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 3684.0 kPa.

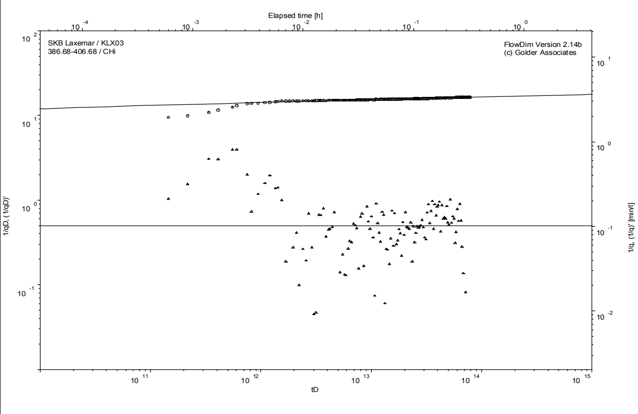
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050513 14:52
Test section from - to (m):	386.68-406.68	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

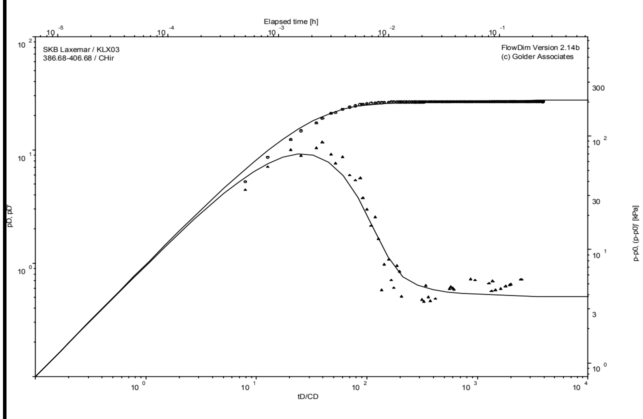
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3893		
p_i (kPa) =	3891		
p_p(kPa) =	4094	p_F (kPa) =	3891
Q_p (m^3/s)=	4.97E-06		
tp (s) =	1200	t_F (s) =	900
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.8		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.4E-07		
T_M (m^2/s)=	2.5E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.10	dt_1 (min) =	NA
dt_2 (min) =	12.64	dt_2 (min) =	NA
T (m^2/s) =	6.3E-07	T (m^2/s) =	1.1E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.2E-08	K_s (m/s) =	5.5E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.5E-10
C_D (-) =	NA	C_D (-) =	1.7E-02
ξ (-) =	9.40	ξ (-) =	20.46
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	1.10	C (m^3/Pa) =	1.5E-10
dt_2 (min) =	12.64	C_D (-) =	1.7E-02
T_T (m^2/s) =	6.3E-07	ξ (-) =	9.40
S (-) =	1.0E-06		
K_s (m/s) =	3.2E-08		
S_s (1/m) =	5.0E-08		

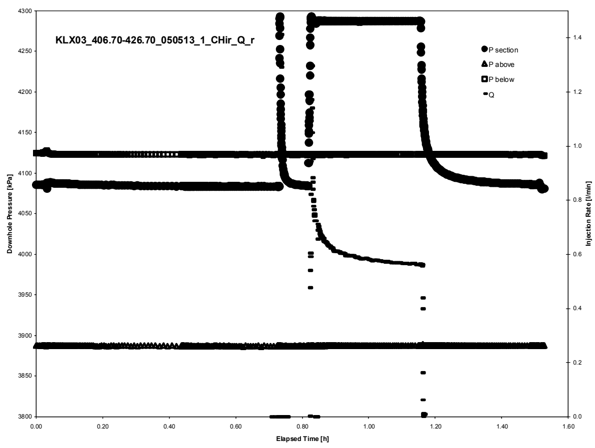
Comments:

The recommended transmissivity of 6.3E-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 2.0E-7 to 2.0E-6 m2/s. The flow dimension displayed during the test was 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 3891.2 kPa.

Test Summary Sheet

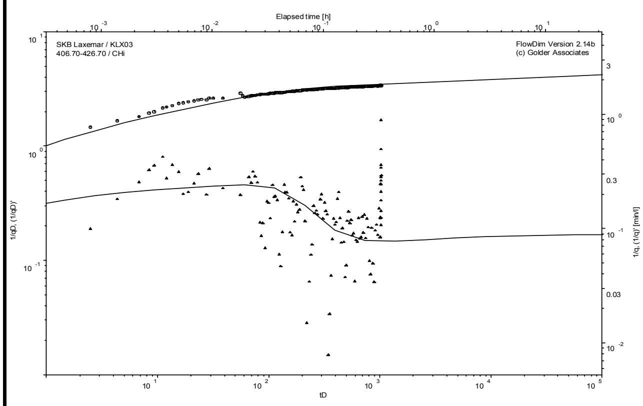
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050513 17:00
Test section from - to (m):	406.70-426.70	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

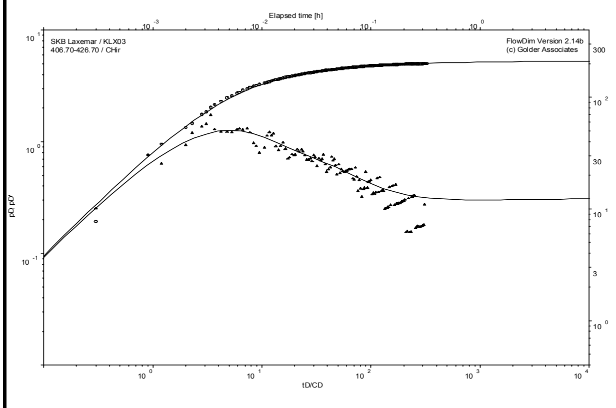


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4085		
p_i (kPa) =	4084		
p_p(kPa) =	4287	p_F (kPa) =	4086
Q_p (m^3/s)=	9.28E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.2		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	4.5E-07		
T_M (m^2/s)=	4.7E-07		
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) =	7.1E-07	T (m^2/s) =	6.3E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.6E-08	K_s (m/s) =	3.2E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	9.1E-10
C_D (-) =	NA	C_D (-) =	1.0E-01
ξ (-) =	-2.64	ξ (-) =	-1.10
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) =	9.1E-10
dt_2 (min) =	NA	C_D (-) =	1.0E-01
T_T (m^2/s) =	6.3E-07	ξ (-) =	-1.10
S (-) =	1.0E-06		
K_s (m/s) =	3.2E-08		
S_s (1/m) =	5.0E-08		

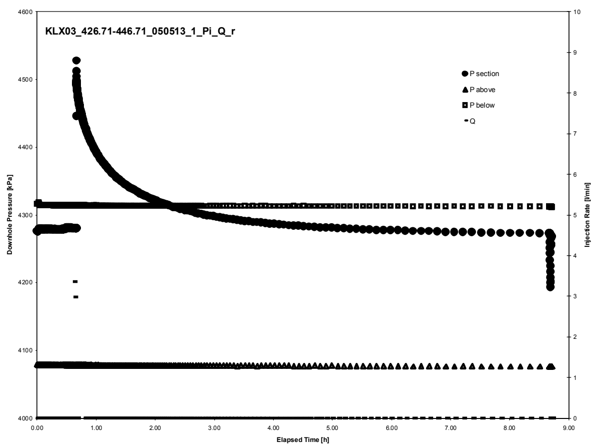
Comments:

The recommended transmissivity of 6.3E-7 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 2.0E-7 to 8.0E-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 4080.5 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050513 19:14
Test section from - to (m):	426.71-446.71	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

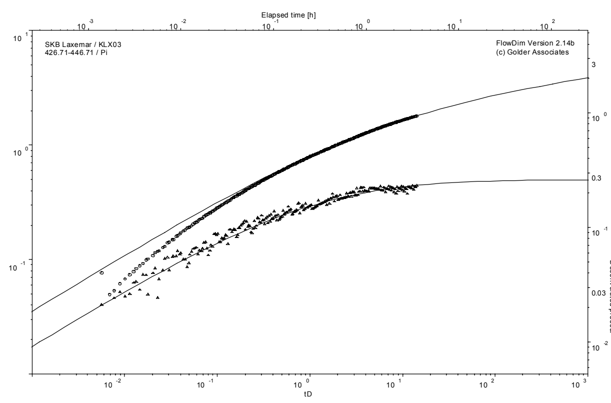


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4278		
p_i (kPa) =	4280		
p_p(kPa) =	4527	p_F (kPa) =	4272
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	28800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.5		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**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) =	89.48
dt_2 (min) =	NA	dt_2 (min) =	210.58
T (m^2/s) =	NA	T (m^2/s) =	6.4E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	3.2E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.7E-11
C_D (-) =	NA	C_D (-) =	8.5E-03
□ (-) =	NA	□ (-) =	-1.80
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) =	89.48	C (m^3/Pa) =	7.7E-11
dt_2 (min) =	210.58	C_D (-) =	8.5E-03
T_T (m^2/s) =	6.4E-11	□ (-) =	-1.80
S (-) =	1.0E-06		
K_s (m/s) =	3.2E-12		
S_s (1/m) =	5.0E-08		

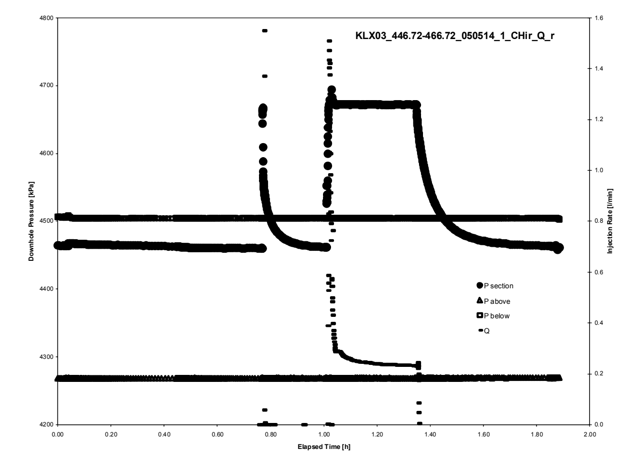
Comments:

The recommended transmissivity of 6.4E-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 3.0E-11 to 9.0E-11 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

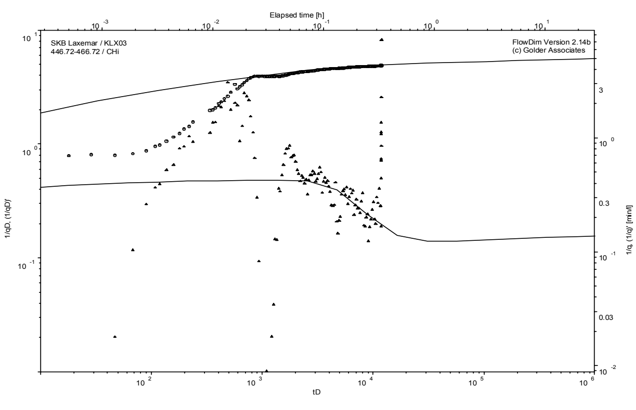
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050514 08:09
Test section from - to (m):	446.72-466.72	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

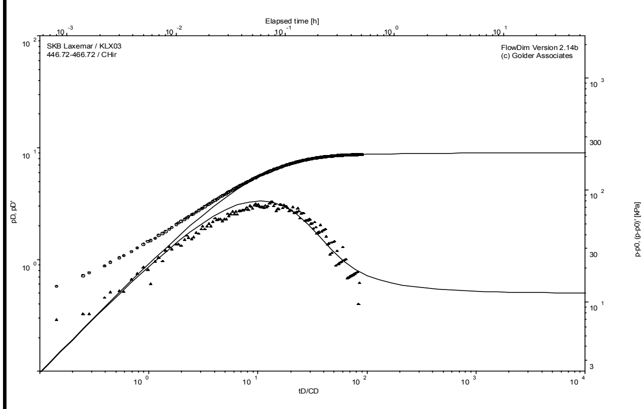
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4464		
p_i (kPa) =	4461		
p_p(kPa) =	4671	p_F (kPa) =	4461
Q_p (m^3/s)=	3.83E-06		
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)=	13.8		
Derivative fact.=	0.05	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.8E-07		
T_M (m^2/s)=	1.9E-07		
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) =	4.4E-07	T (m^2/s) =	3.0E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.2E-08	K_s (m/s) =	1.5E-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-09
C_D (-) =	NA	C_D (-) =	4.2E-01
ξ (-) =	-1.14	ξ (-) =	2.60
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) =	3.8E-09
dt_2 (min) =	NA	C_D (-) =	4.2E-01
T_T (m^2/s) =	3.0E-07	ξ (-) =	2.60
S (-) =	1.0E-06		
K_s (m/s) =	1.5E-08		
S_s (1/m) =	5.0E-08		

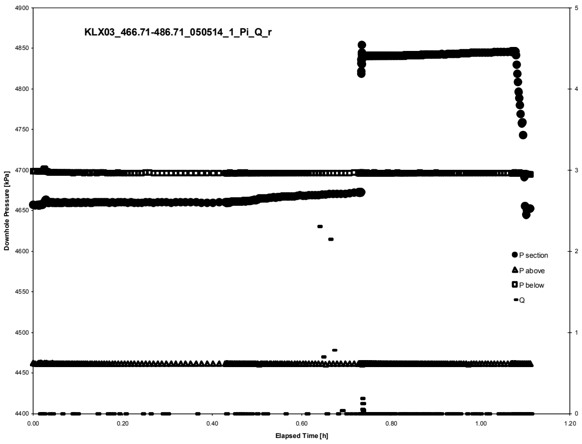
Comments:

The recommended transmissivity of 3.0E-7 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-8 to 5.0E-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 4451.7 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050514 10:44
Test section from - to (m):	466.71-486.71	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) =	4657		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.1		
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		

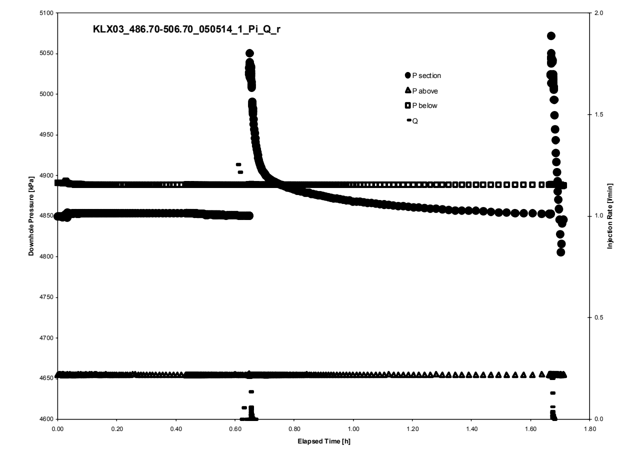
Comments:

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]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050514 12:38
Test section from - to (m):	486.70-506.70	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

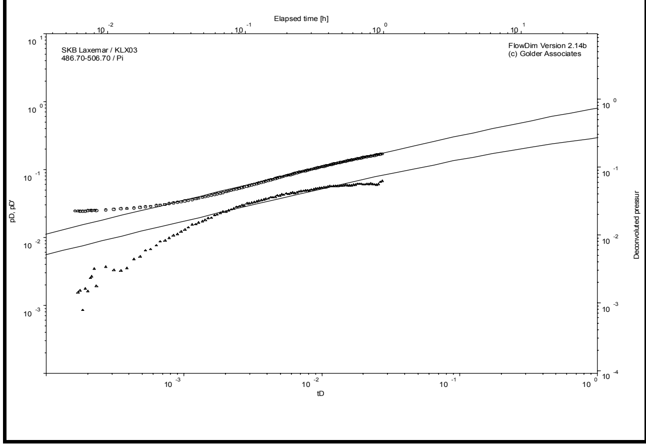


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4849		
p_i (kPa) =	4850		
p_p(kPa) =	5034	p_F (kPa) =	4852
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	3660
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.4		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**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) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	3.0E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.5E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.3E-11
C_D (-) =	NA	C_D (-) =	6.9E-03
ξ (-) =	NA	ξ (-) =	-3.94
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) =	6.3E-11
dt_2 (min) =	NA	C_D (-) =	6.9E-03
T_T (m^2/s) =	3.0E-11	ξ (-) =	-3.94
S (-) =	1.0E-06		
K_s (m/s) =	1.5E-12		
S_s (1/m) =	5.0E-08		

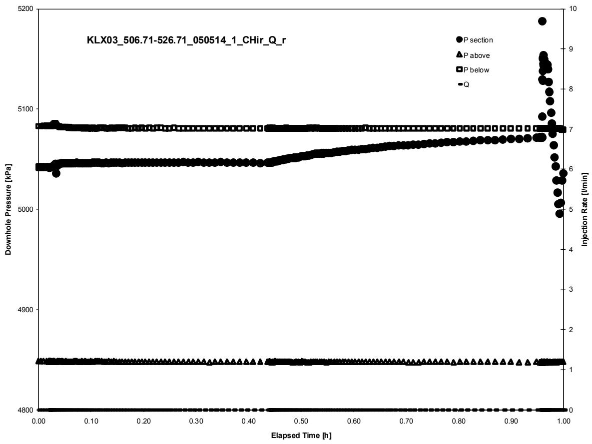
Comments:

The recommended transmissivity of 3.0E-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 7E-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:	KLX03	Test start:	050514 15:02
Test section from - to (m):	506.71-526.71	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) =	5041		
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)=	14.7		
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} (-) =	

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		

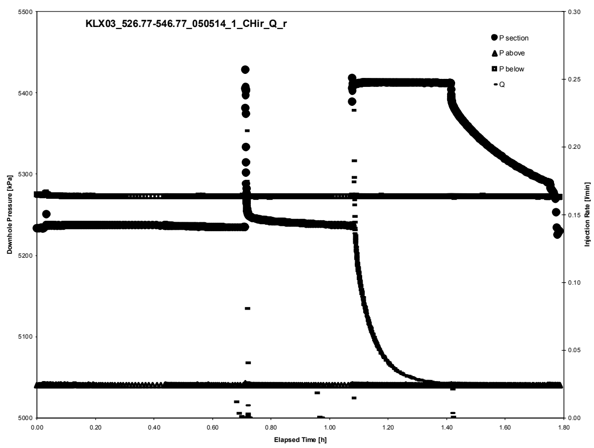
Comments:

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

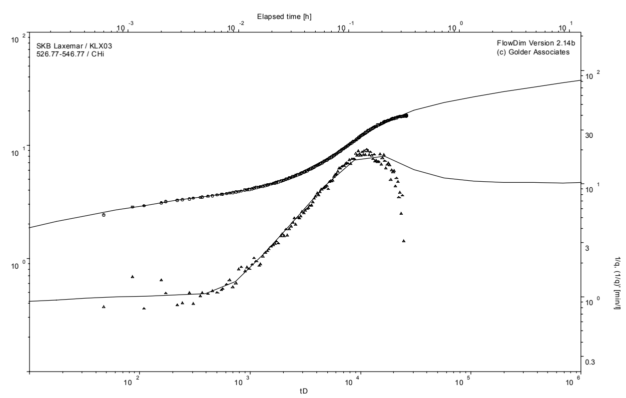
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050514 16:44
Test section from - to (m):	526.77-546.77 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

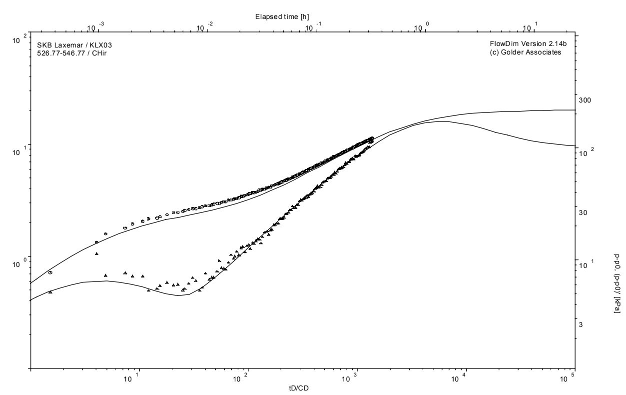
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5233		
p_i (kPa) =	5236		
p_p(kPa) =	5412	p_F (kPa) =	5291
Q_p (m^3/s)=	4.17E-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)=	15.0		
Derivative fact.=	0.02	Derivative fact.=	0.08
Results		**Results**	
Q/s (m^2/s)=	2.3E-08		
T_M (m^2/s)=	2.4E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	6.75	dt_1 (min) =	NA
dt_2 (min) =	10.88	dt_2 (min) =	NA
T (m^2/s) =	7.0E-09	T (m^2/s) =	6.2E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.5E-10	K_s (m/s) =	3.1E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.9E-11
C_D (-) =	NA	C_D (-) =	6.5E-03
÷ (-) =	-0.38	÷ (-) =	-1.53
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	6.75	C (m^3/Pa) =	5.9E-11
dt_2 (min) =	10.88	C_D (-) =	6.5E-03
T_T (m^2/s) =	7.0E-09	÷ (-) =	-0.38
S (-) =	1.0E-06		
K_s (m/s) =	3.5E-10		
S_s (1/m) =	5.0E-08		

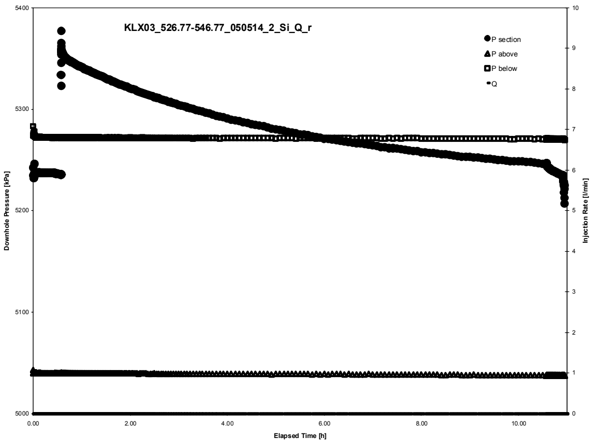
Comments:

The recommended transmissivity of 7.0E-9 m2/s was derived from the analysis of the CHi 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 3.0E-8 m2/s. The flow dimension displayed during the test was 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 5223.3 kPa.

Test Summary Sheet

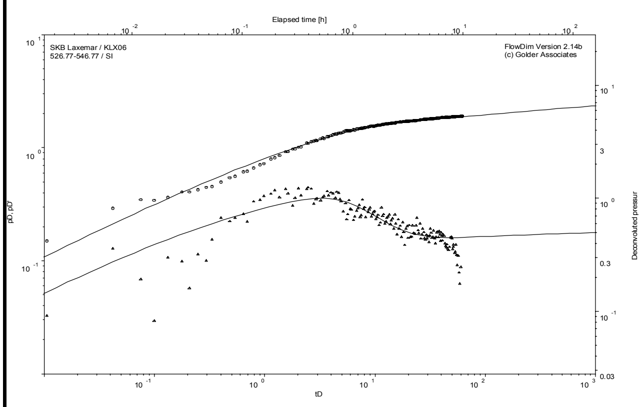
Project:	Oskarshamn site investigation	Test type:[1]	Si
Area:	Laxemar	Test no:	2
Borehole ID:	KLX03	Test start:	050514 18:52
Test section from - to (m):	526.77-546.77 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5236		
p_i (kPa) =	5236		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	36000	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.=	0.06	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) =	219.89	dt_1 (min) =	NA
dt_2 (min) =	389.89	dt_2 (min) =	NA
T (m^2/s) =	7.1E-09	T (m^2/s) =	NA
S (-) =	1.0E-06	S (-) =	NA
K_s (m/s) =	3.6E-10	K_s (m/s) =	NA
S_s (1/m) =	5.0E-08	S_s (1/m) =	NA
C (m^3/Pa) =	4.6E-08	C (m^3/Pa) =	NA
C_D (-) =	5.1E-06	C_D (-) =	NA
ξ (-) =	-3.98	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



Log-Log plot incl. derivatives- recovery period

Not Analysed

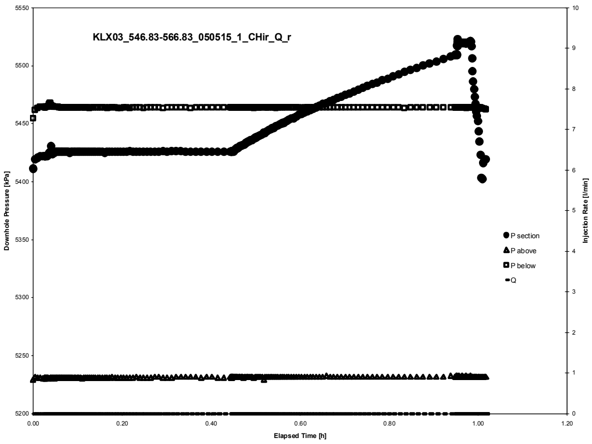
Selected representative parameters.			
dt_1 (min) =	219.89	C (m^3/Pa) =	4.6E-08
dt_2 (min) =	389.89	C_D (-) =	5.1E-06
T_T (m^2/s) =	7.1E-09	ξ (-) =	-3.98
S (-) =	1.0E-06		
K_s (m/s) =	3.6E-10		
S_s (1/m) =	5.0E-08		

Comments:

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050515 09:51
Test section from - to (m):	546.83-566.83	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) =	5423		
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)=	15.3		
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		

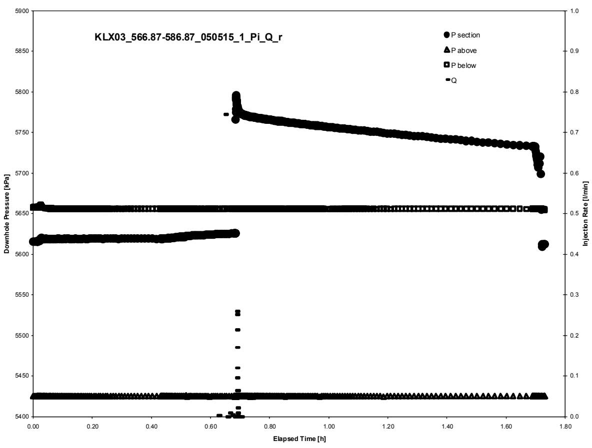
Comments:

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:	KLX03	Test start:	050515 11:37
Test section from - to (m):	566.87-586.87	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

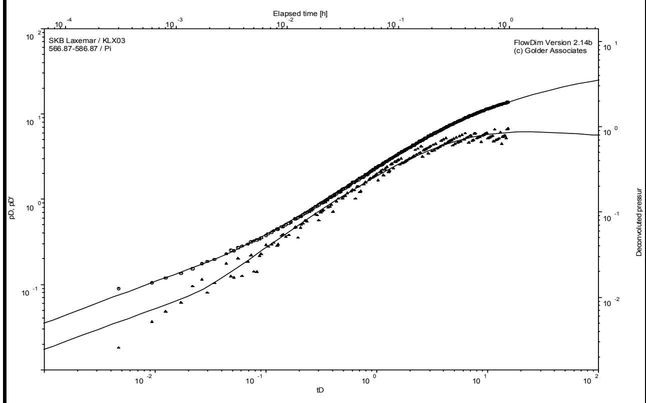


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5615		
p_i (kPa) =	5625		
p_p(kPa) =	5796	p_F (kPa) =	5733
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.6		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**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) =	26.57
dt_2 (min) =	NA	dt_2 (min) =	54.88
T (m^2/s) =	NA	T (m^2/s) =	3.3E-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) =	1.1E-10
C_D (-) =	NA	C_D (-) =	1.2E-02
ξ (-) =	NA	ξ (-) =	-2.00
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) =	26.57	C (m^3/Pa) =	1.1E-10
dt_2 (min) =	54.88	C_D (-) =	1.2E-02
T_T (m^2/s) =	3.3E-11	ξ (-) =	-2.00
S (-) =	1.0E-06		
K_s (m/s) =	1.7E-12		
S_s (1/m) =	5.0E-08		

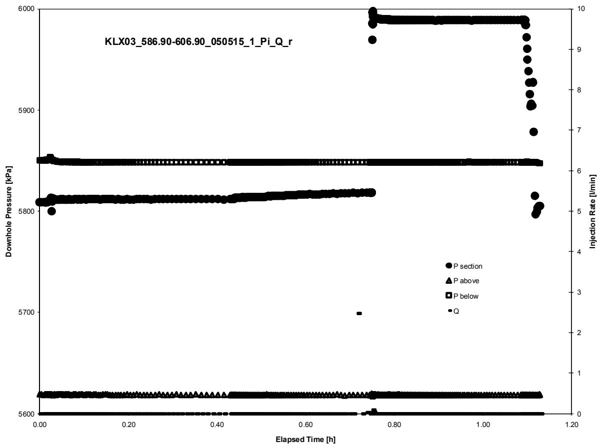
Comments:

The recommended transmissivity of 3.3E-11 m2/s was derived from the analysis of the Pi phase (outer zone). 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 5E-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:	KLX03	Test start:	050515 14:04
Test section from - to (m):	586.90-606.90	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) =	5809		
p_i (kPa) =	5818		
p_p(kPa) =	NA	p_F (kPa) =	5988
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.9		
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

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		

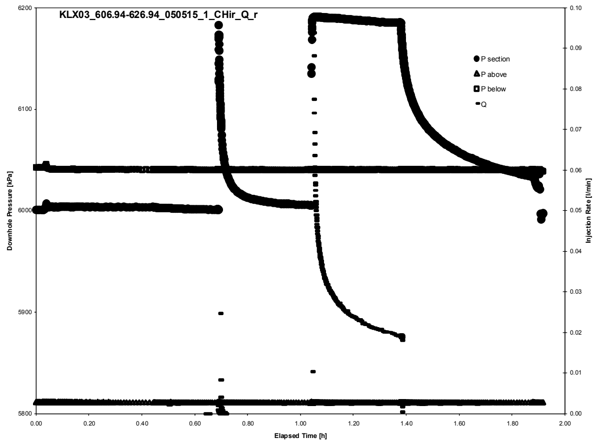
Comments:

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

Test Summary Sheet

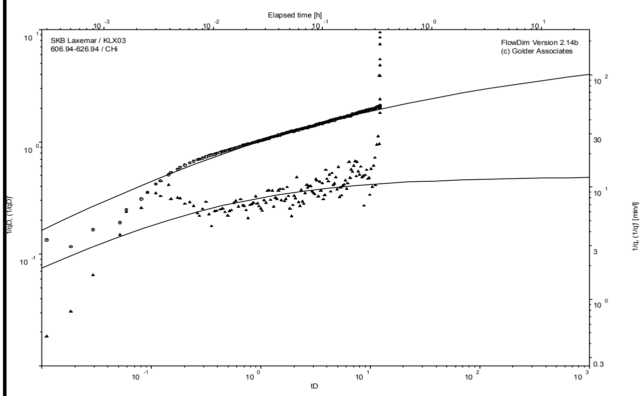
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050515 15:52
Test section from - to (m):	606.94-626.94	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

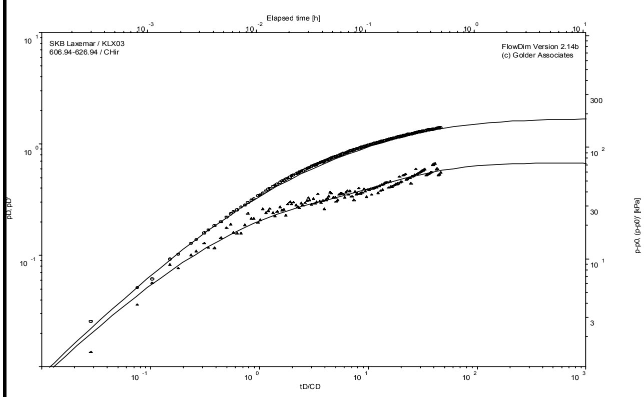


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6001		
p_i (kPa) =	6005		
p_p(kPa) =	6185	p_F (kPa) =	6032
Q_p (m^3/s)=	3.00E-07		
tp (s) =	1200	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.3		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.6E-08		
T_M (m^2/s)=	1.7E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	5.77	dt_1 (min) =	NA
dt_2 (min) =	9.43	dt_2 (min) =	NA
T (m^2/s) =	5.7E-09	T (m^2/s) =	5.0E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.9E-10	K_s (m/s) =	2.5E-10
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-10
C_D (-) =	NA	C_D (-) =	1.8E-02
ξ (-) =	-2.90	ξ (-) =	-3.19
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) =	5.77	C (m^3/Pa) =	1.6E-10
dt_2 (min) =	9.43	C_D (-) =	1.8E-02
T_T (m^2/s) =	5.7E-09	ξ (-) =	-2.90
S (-) =	1.0E-06		
K_s (m/s) =	2.9E-10		
S_s (1/m) =	5.0E-08		

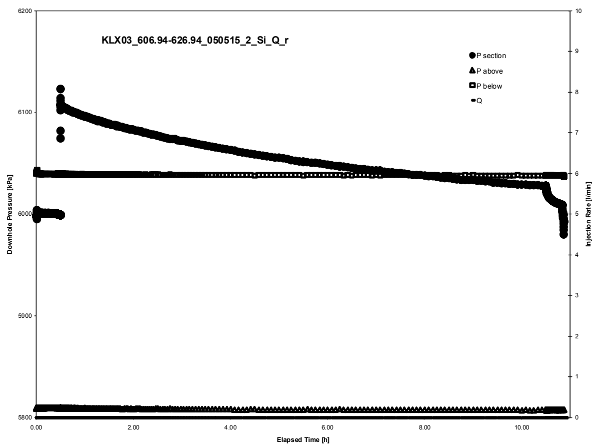
Comments:

The recommended transmissivity of 5.7E-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 3.0E-9 to 1.0E-8 m2/s. The flow dimension displayed during the test was 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 5999.2 kPa.

Test Summary Sheet

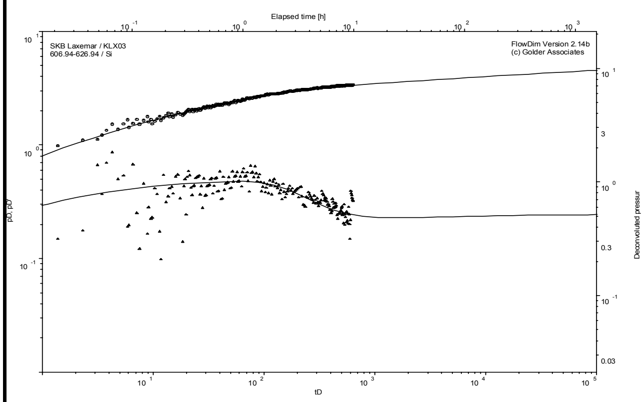
Project:	Oskarshamn site investigation	Test type:[1]	Si
Area:	Laxemar	Test no:	2
Borehole ID:	KLX03	Test start:	050515 20:19
Test section from - to (m):	606.94-626.94	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6001		
p_i (kPa) =	5299		
p_p(kPa) =	NA	p_F (kPa) =	6027
Q_p (m^3/s)=	NA		
tp (s) =	36000	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.3		
Derivative fact.=	0.12	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) =	17.63	dt_1 (min) =	NA
dt_2 (min) =	67.13	dt_2 (min) =	NA
T (m^2/s) =	9.5E-09	T (m^2/s) =	NA
S (-) =	1.0E-06	S (-) =	NA
K_s (m/s) =	4.7E-10	K_s (m/s) =	NA
S_s (1/m) =	5.0E-08	S_s (1/m) =	NA
C (m^3/Pa) =	4.6E-08	C (m^3/Pa) =	NA
C_D (-) =	5.1E-06	C_D (-) =	NA
ξ (-) =	-2.95	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



Log-Log plot incl. derivatives- recovery period

Not Analysed

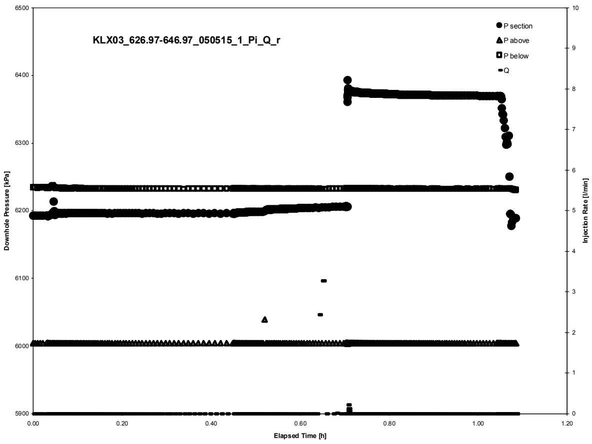
Selected representative parameters.			
dt_1 (min) =	17.63	C (m^3/Pa) =	4.6E-08
dt_2 (min) =	67.13	C_D (-) =	5.1E-06
T_T (m^2/s) =	9.5E-09	ξ (-) =	-2.95
S (-) =	1.0E-06		
K_s (m/s) =	4.8E-10		
S_s (1/m) =	5.0E-08		

Comments:

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050515 18:36
Test section from - to (m):	626.97-646.97	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) =	6192		
p_i (kPa) =	6206		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.6		
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		

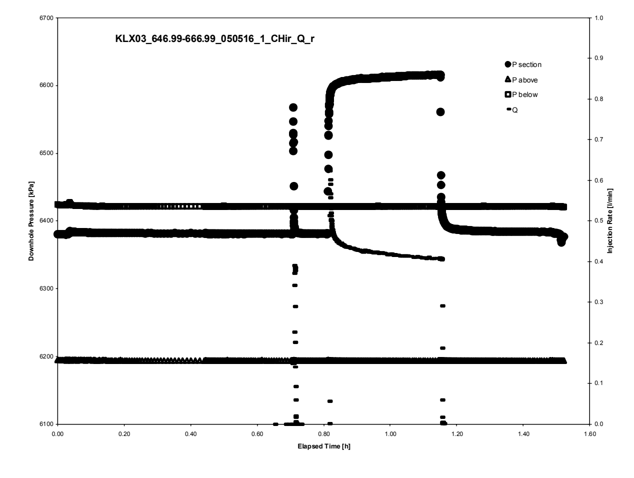
Comments:

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

Test Summary Sheet

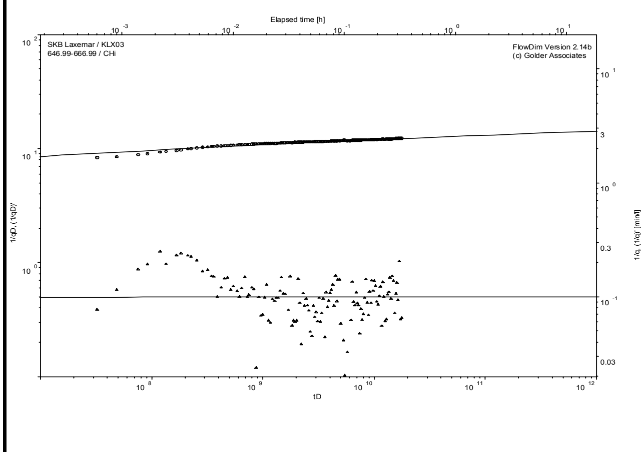
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050516 08:32
Test section from - to (m):	646.99-666.99	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

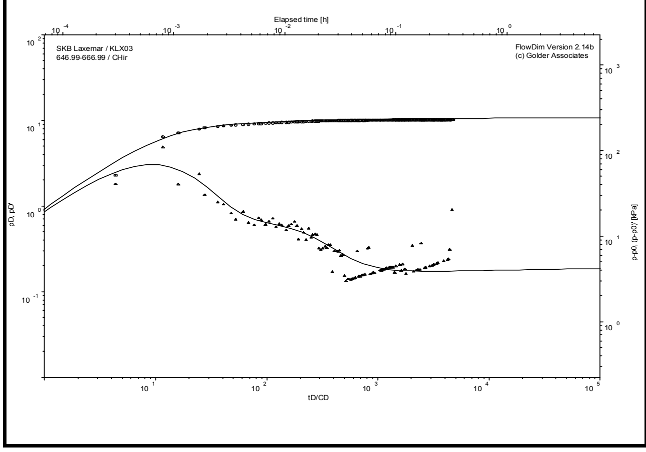


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6380		
p_i (kPa) =	6381		
p_p(kPa) =	6615	p_F (kPa) =	6381
Q_p (m^3/s)=	6.80E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.9		
Derivative fact.=	0.04	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	2.9E-07		
T_M (m^2/s)=	3.0E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.42	dt_1 (min) =	0.32
dt_2 (min) =	18.30	dt_2 (min) =	0.68
T (m^2/s) =	5.6E-07	T (m^2/s) =	4.9E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.8E-08	K_s (m/s) =	2.5E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.8E-11
C_D (-) =	NA	C_D (-) =	8.6E-03
ξ (-) =	5.28	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) =	0.32	C (m^3/Pa) =	7.8E-11
dt_2 (min) =	0.68	C_D (-) =	8.6E-03
T_T (m^2/s) =	4.9E-07	ξ (-) =	4.70
S (-) =	1.0E-06		
K_s (m/s) =	2.5E-08		
S_s (1/m) =	5.0E-08		

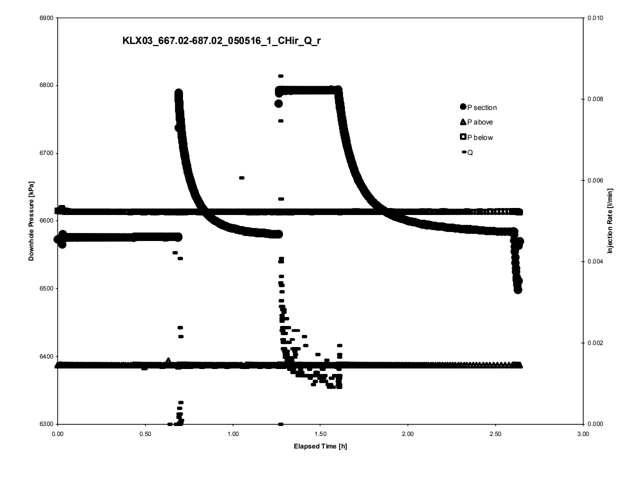
Comments:

The recommended transmissivity of 4.9E-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 2.0E-7 to 8.0E-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 6381.6 kPa.

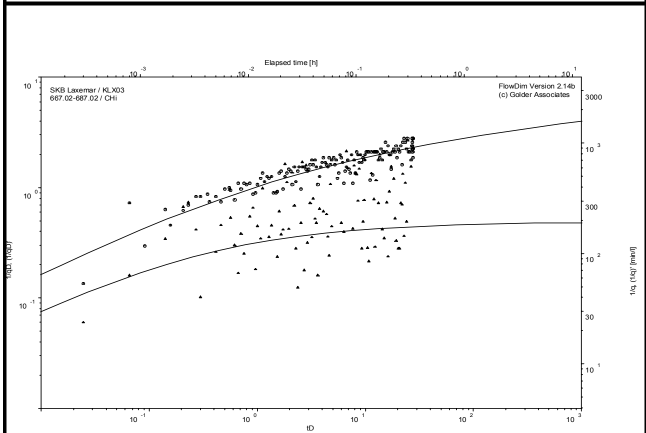
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX06	Test start:	050516 10:50
Test section from - to (m):	667.02-687.02	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

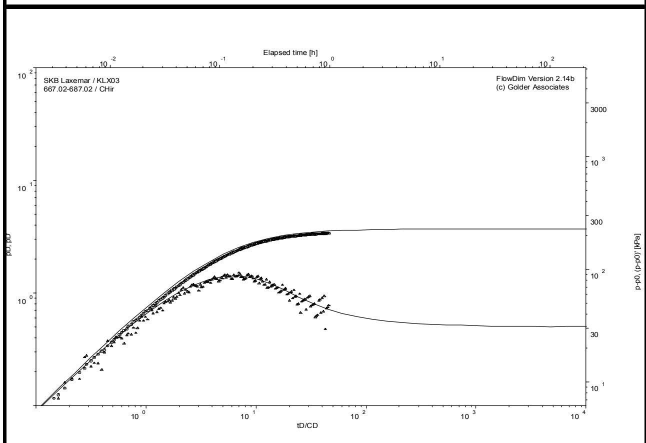
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	6572		
p_i (kPa) =	6580		
p_p(kPa) =	6793	p_F (kPa) =	6584
Q_p (m^3/s)=	1.67E-08		
tp (s) =	1200	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.2		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	7.7E-10		
T_M (m^2/s)=	8.0E-10		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	4.37	dt_1 (min) =	NA
dt_2 (min) =	17.45	dt_2 (min) =	NA
T (m^2/s) =	3.1E-10	T (m^2/s) =	6.1E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.6E-11	K_s (m/s) =	3.1E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.0E-11
C_D (-) =	NA	C_D (-) =	3.3E-03
ξ (-) =	-1.12	ξ (-) =	0.60
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) =	3.0E-11
dt_2 (min) =	NA	C_D (-) =	3.3E-03
T_T (m^2/s) =	6.1E-10	ξ (-) =	0.60
S (-) =	1.0E-06		
K_s (m/s) =	3.1E-11		
S_s (1/m) =	5.0E-08		

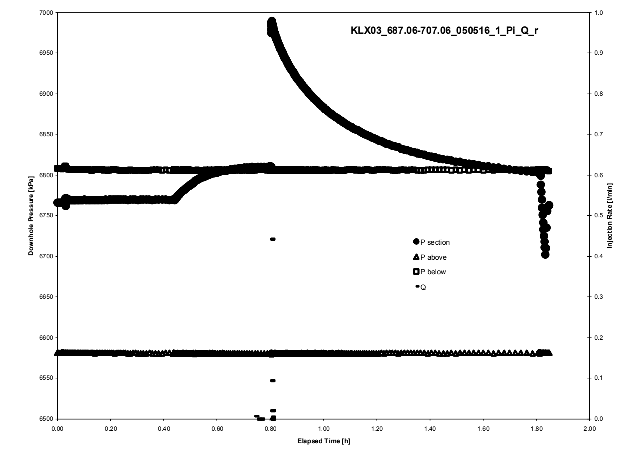
Comments:

The recommended transmissivity of 6.1E-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 3.0E-10 to 9.0E-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 6569.9 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050516 14:22
Test section from - to (m):	687.06-707.06	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

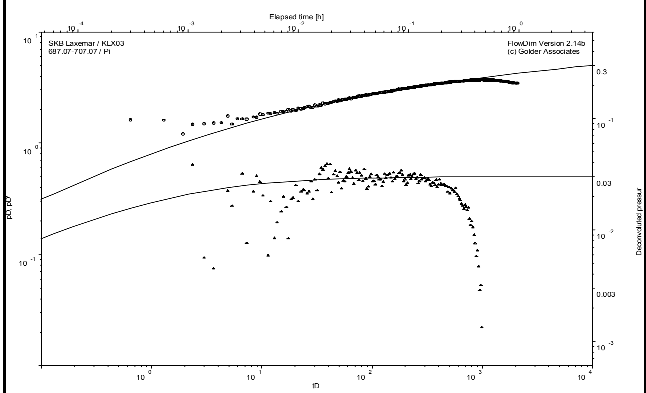


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6766		
p_i (kPa) =	6809		
p_p(kPa) =	6988	p_F (kPa) =	6805
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.5		
Derivative fact.=	NA	Derivative fact.=	0.07
Results		**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) =	1.39
dt_2 (min) =	NA	dt_2 (min) =	8.33
T (m^2/s) =	NA	T (m^2/s) =	6.6E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	3.3E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	9.1E-12
C_D (-) =	NA	C_D (-) =	1.0E-03
ξ (-) =	NA	ξ (-) =	1.30
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) =	1.39	C (m^3/Pa) =	9.1E-12
dt_2 (min) =	8.33	C_D (-) =	1.0E-03
T_T (m^2/s) =	6.6E-11	ξ (-) =	1.30
S (-) =	1.0E-06		
K_s (m/s) =	3.3E-12		
S_s (1/m) =	5.0E-08		

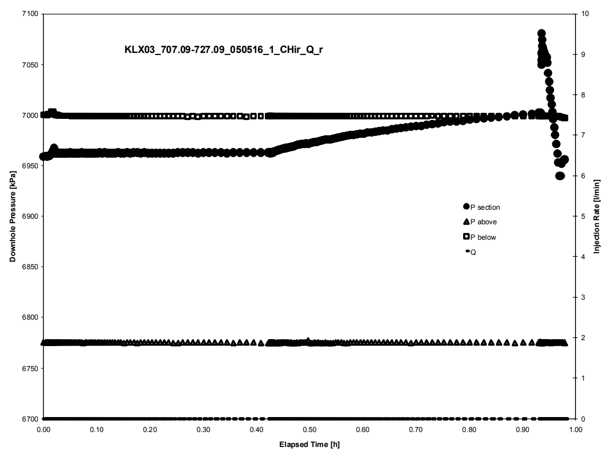
Comments:

The recommended transmissivity of 6.6E-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 (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 8E-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:	KLX03	Test start:	050516 17:00
Test section from - to (m):	707.09-727.09 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) =	6959		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	1.67E-04		
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)=	17.8		
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} (-) =	

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		

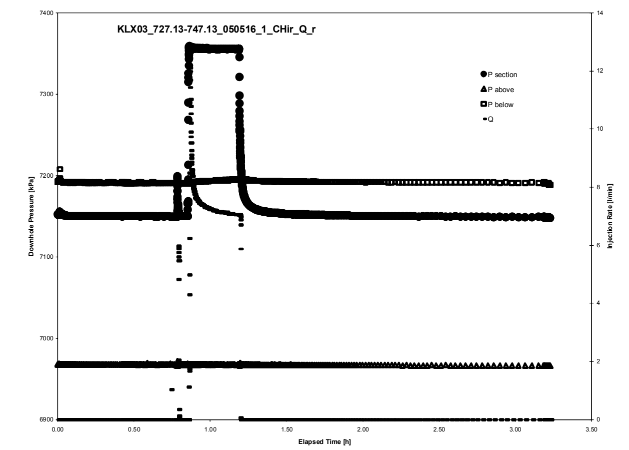
Comments:

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

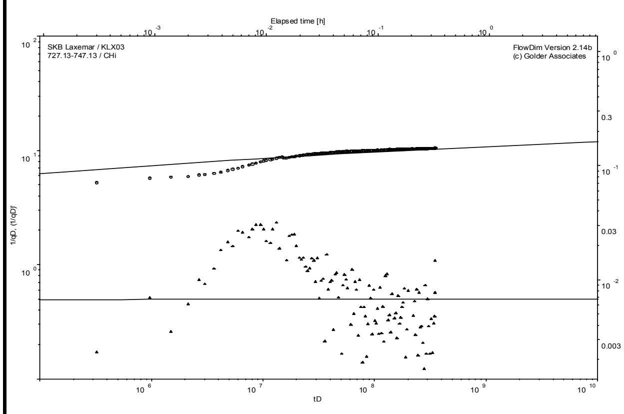
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050516 18:39
Test section from - to (m):	727.13-747.13	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

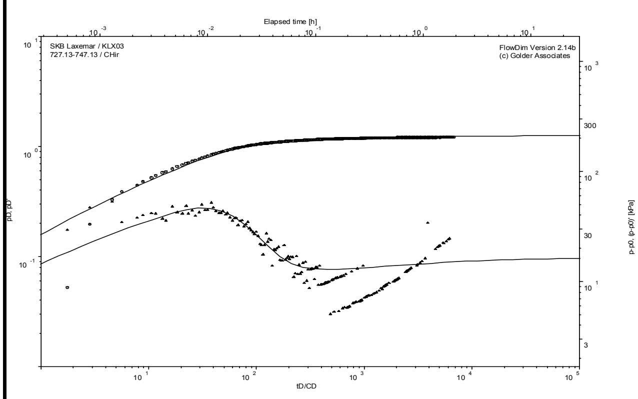
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	7153		
p_i (kPa) =	7149		
p_p(kPa) =	7355	p_F (kPa) =	7149
Q_p (m^3/s)=	1.17E-04		
tp (s) =	1200	t_F (s) =	7200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18.2		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	5.6E-06		
T_M (m^2/s)=	5.8E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	5.18	dt_1 (min) =	NA
dt_2 (min) =	16.79	dt_2 (min) =	NA
T (m^2/s) =	9.3E-06	T (m^2/s) =	5.9E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.7E-07	K_s (m/s) =	3.0E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	7.5E-10
C_D (-) =	NA	C_D (-) =	8.3E-02
ξ (-) =	1.92	ξ (-) =	-5.10
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	7.5E-10
dt_2 (min) =	NA	C_D (-) =	8.3E-02
T_T (m^2/s) =	5.9E-06	ξ (-) =	-5.10
S (-) =	1.0E-06		
K_s (m/s) =	3.0E-07		
S_s (1/m) =	5.0E-08		

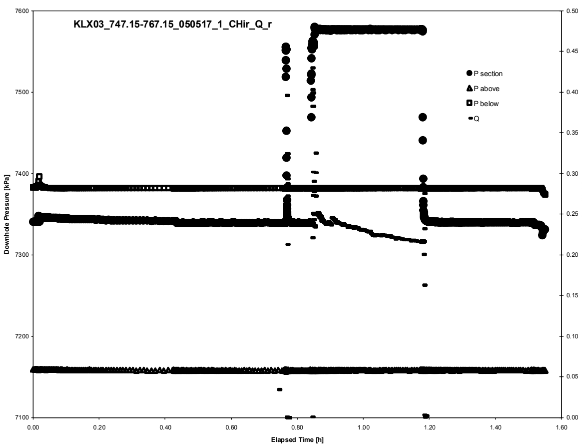
Comments:

The recommended transmissivity of 5.9E-06 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 2.0E-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 7147.9 kPa.

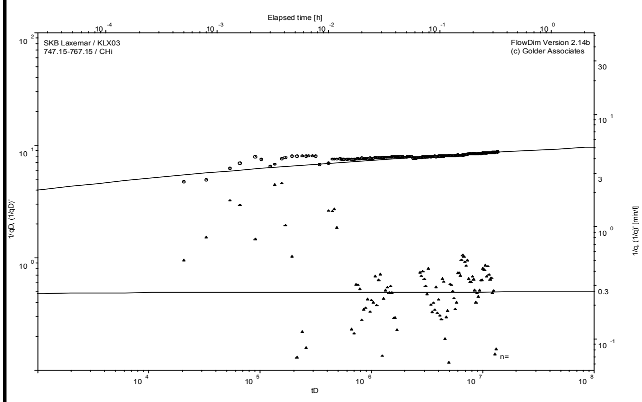
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050517 08:15
Test section from - to (m):	747.15-767.15	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

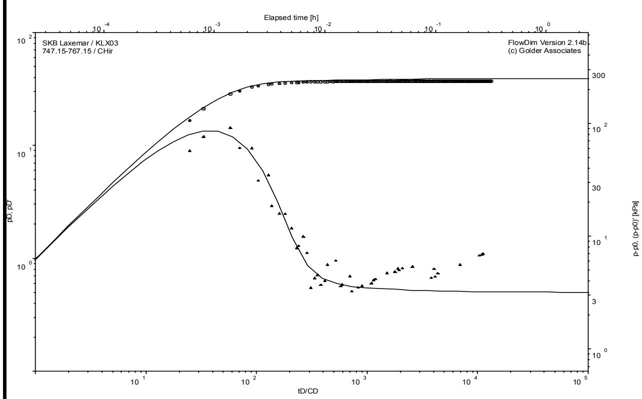
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	7340		
p_i (kPa) =	7339		
p_p(kPa) =	7577	p_F (kPa) =	7339
Q_p (m^3/s)=	3.62E-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)=	18.4		
Derivative fact.=	0.05	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.5E-07		
T_M (m^2/s)=	1.6E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.95	dt_1 (min) =	NA
dt_2 (min) =	13.65	dt_2 (min) =	NA
T (m^2/s) =	2.1E-07	T (m^2/s) =	9.5E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.1E-08	K_s (m/s) =	4.8E-08
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 (-) =	2.19	ξ (-) =	32.52
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	
Selected representative parameters.			
dt_1 (min) =	1.95	C (m^3/Pa) =	5.2E-11
dt_2 (min) =	13.65	C_D (-) =	5.7E-03
T_T (m^2/s) =	2.1E-07	ξ (-) =	2.19
S (-) =	1.0E-06		
K_s (m/s) =	1.1E-08		
S_s (1/m) =	5.0E-08		

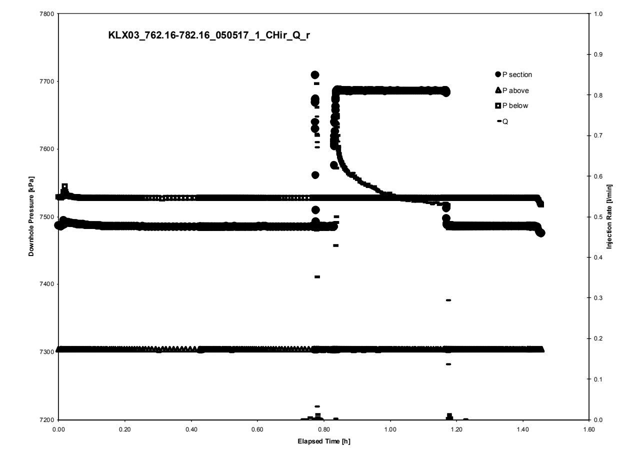
Comments:

The recommended transmissivity of 2.1E-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 9.0E-08 to 5.0E-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 7339.7 kPa.

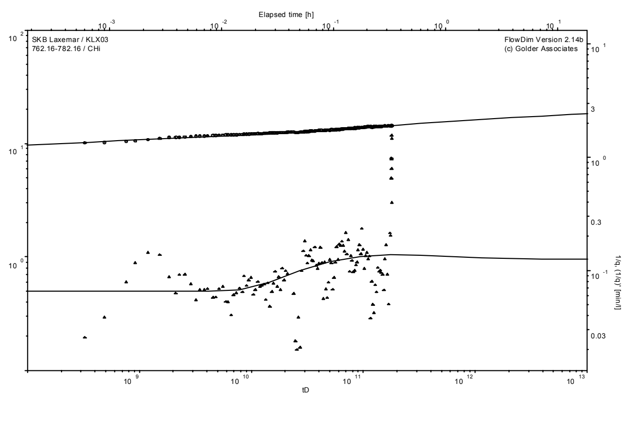
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050517 10:32
Test section from - to (m):	762.16-782.16	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

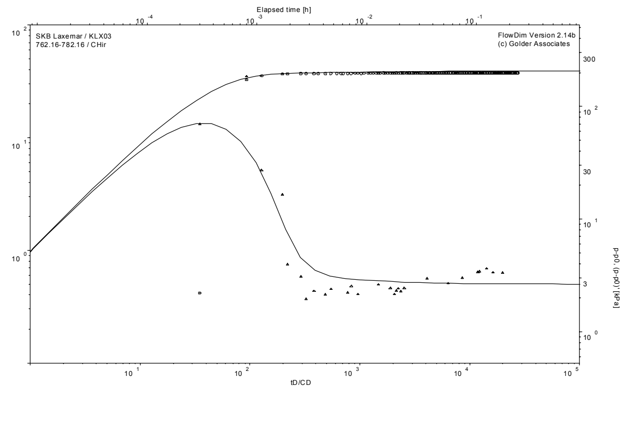
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7486		
p_i (kPa) =	7485		
p_p(kPa) =	7685	p_F (kPa) =	7485
Q_p (m^3/s)=	8.83E-06		
tp (s) =	1200	t_F (s) =	900
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	18.6		
Derivative fact.=	0.05	Derivative fact.=	0.04
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) =	0.38	dt_1 (min) =	NA
dt_2 (min) =	0.92	dt_2 (min) =	NA
T (m^2/s) =	9.9E-07	T (m^2/s) =	2.8E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.0E-08	K_s (m/s) =	1.4E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.5E-11
C_D (-) =	NA	C_D (-) =	6.1E-03
ﾉ (-) =	6.15	ﾉ (-) =	32.49
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	0.38	C (m^3/Pa) =	5.5E-11
dt_2 (min) =	0.92	C_D (-) =	6.1E-03
T_T (m^2/s) =	9.9E-07	ﾉ (-) =	6.15
S (-) =	1.0E-06		
K_s (m/s) =	5.0E-08		
S_s (1/m) =	5.0E-08		

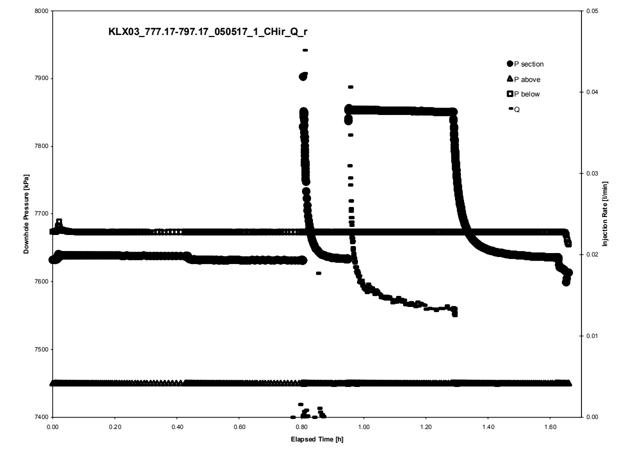
Comments:

The recommended transmissivity of 9.9E-7 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 4.0E-07 to 2.0E-6 m2/s (encompasses the outer zone transmissivity value derived from the CHi phase). 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 7486.4 kPa.

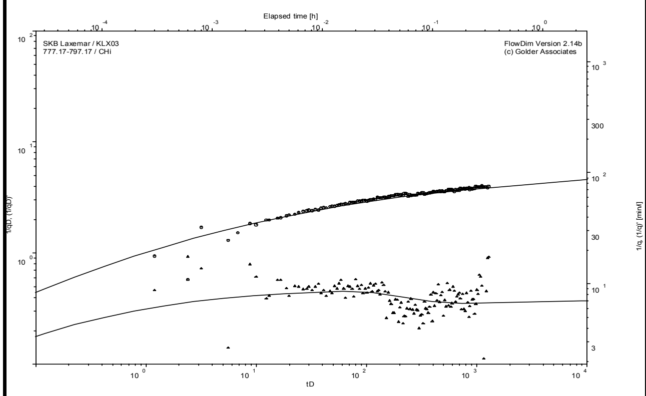
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050517 12:47
Test section from - to (m):	777.17-797.17 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

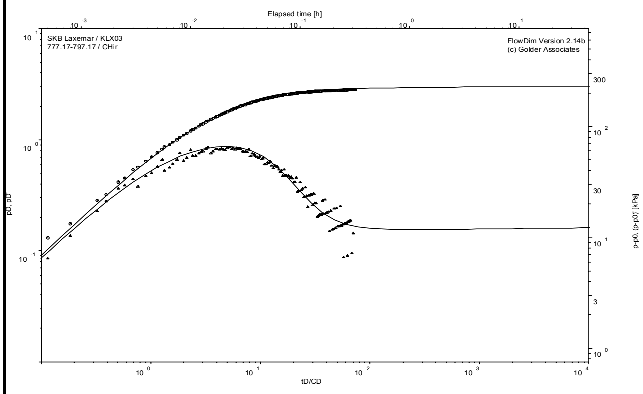
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7633		
p_i (kPa) =	7634		
p_p(kPa) =	7850	p_F (kPa) =	7635
Q_p (m³/s)=	2.17E-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.=	0.2	Derivative fact.=	0.02
Results		**Results**	
Q/s (m²/s)=	9.8E-09		
T_M (m²/s)=	1.0E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.58	dt_1 (min) =	0.83
dt_2 (min) =	1.93	dt_2 (min) =	1.72
T (m²/s) =	6.4E-09	T (m²/s) =	9.1E+09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.2E-10	K_s (m/s) =	4.6E+08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m³/Pa) =	NA	C (m³/Pa) =	5.2E-11
C_D (-) =	NA	C_D (-) =	5.7E-03
ξ (-) =	-0.69	ξ (-) =	-0.86
T_{GRF}(m²/s) =		T_{GRF}(m²/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.			
dt_1 (min) =	0.58	C (m³/Pa) =	5.2E-11
dt_2 (min) =	1.93	C_D (-) =	5.7E-03
T_T (m²/s) =	6.4E-09	ξ (-) =	-0.69
S (-) =	1.0E-06		
K_s (m/s) =	3.2E-10		
S_s (1/m) =	5.0E-08		

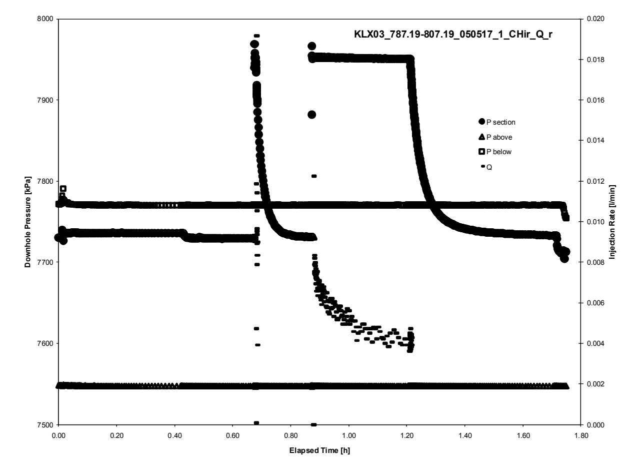
Comments:

The recommended transmissivity of 6.4E-9 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 3.0E-09 to 2.0E-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 7627.0 kPa.

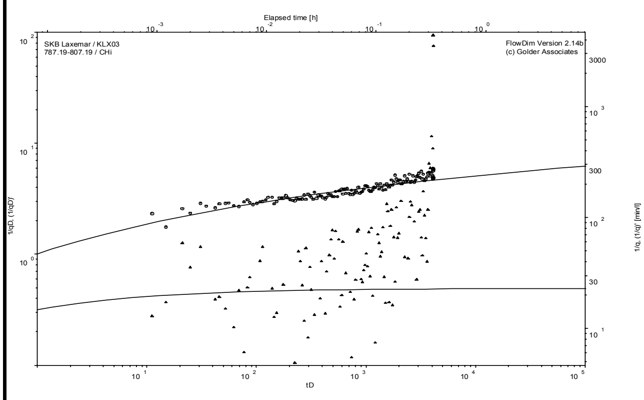
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050517 15:08
Test section from - to (m):	787.19-807.19 m	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

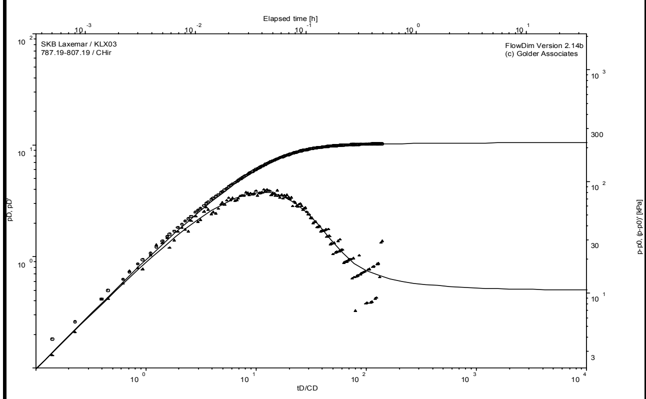
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7730		
p_i (kPa) =	7731		
p_p(kPa) =	7950	p_F (kPa) =	7732
Q_p (m^3/s)=	6.67E-08		
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)=	19.0		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.0E-09		
T_M (m^2/s)=	3.1E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.67	dt_1 (min) =	NA
dt_2 (min) =	5.29	dt_2 (min) =	NA
T (m^2/s) =	2.6E-09	T (m^2/s) =	6.2E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.3E-10	K_s (m/s) =	3.1E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.1E-11
C_D (-) =	NA	C_D (-) =	5.6E-03
ξ (-) =	0.33	ξ (-) =	5.96
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) =	5.1E-11
dt_2 (min) =	NA	C_D (-) =	5.6E-03
T_T (m^2/s) =	6.2E-09	ξ (-) =	5.96
S (-) =	1.0E-06		
K_s (m/s) =	3.1E-10		
S_s (1/m) =	5.0E-08		

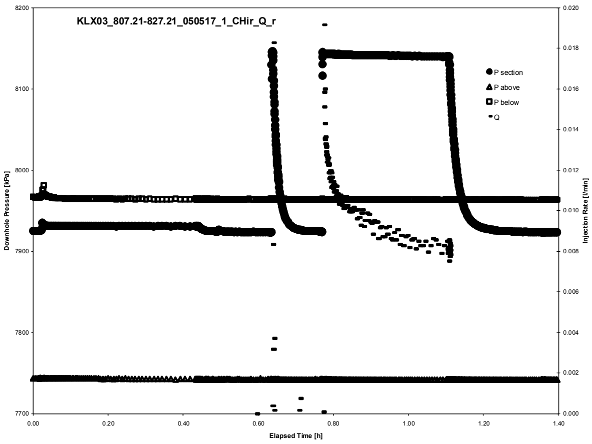
Comments:

The recommended transmissivity of 6.2E-09 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 3.0E-9 to 9.0E-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 7725.8 kPa.

Test Summary Sheet

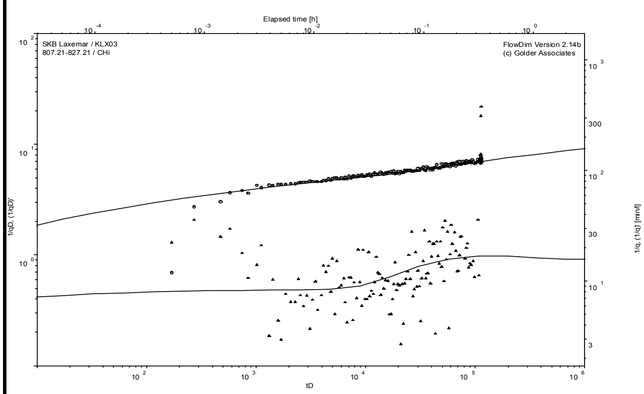
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050517 17:44
Test section from - to (m):	807.21-827.21	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

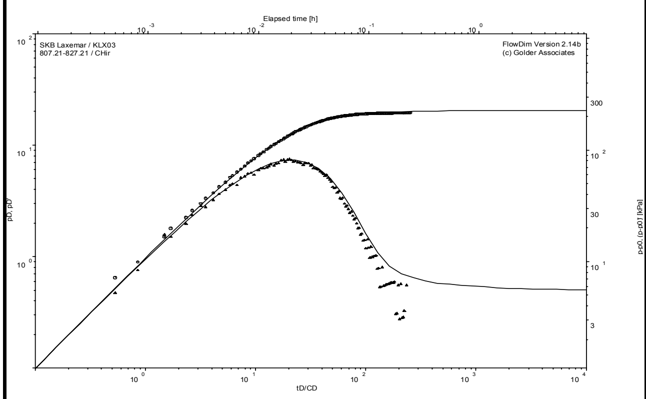


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	7925		
p_i (kPa) =	7924		
p_p(kPa) =	8140	p_F (kPa) =	7923
Q_p (m^3/s)=	1.33E-07		
tp (s) =	1200	t_F (s) =	900
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	19.4		
Derivative fact.=	0.1	Derivative fact.=	0.05
Results		**Results**	
Q/s (m^2/s)=	6.1E-09		
T_M (m^2/s)=	6.3E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.33	dt_1 (min) =	0.91
dt_2 (min) =	1.40	dt_2 (min) =	1.65
T (m^2/s) =	7.0E-09	T (m^2/s) =	2.3E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.5E-10	K_s (m/s) =	1.2E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.0E-11
C_D (-) =	NA	C_D (-) =	5.5E-03
ξ (-) =	1.48	ξ (-) =	15.28
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) =	0.33	C (m^3/Pa) =	5.0E-11
dt_2 (min) =	1.40	C_D (-) =	5.5E-03
T_T (m^2/s) =	7.0E-09	ξ (-) =	1.48
S (-) =	1.0E-06		
K_s (m/s) =	3.5E-10		
S_s (1/m) =	5.0E-08		

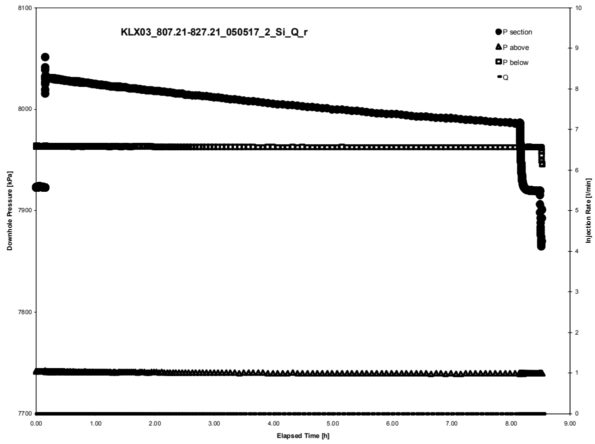
Comments:

The recommended transmissivity of 7.0E-9 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 5.0E-9 to 2.0E-8 m2/s. The flow dimension displayed during the test was 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 7919.6 kPa.

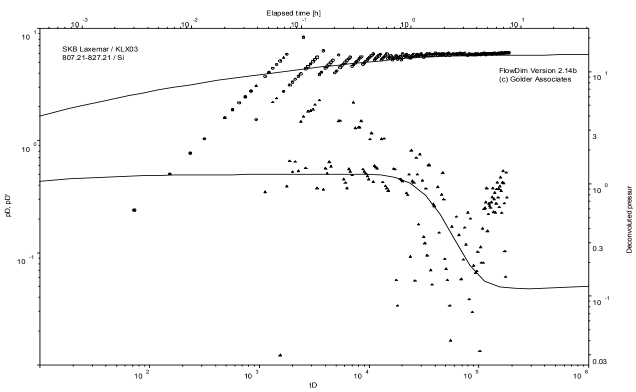
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Si
Area:	Laxemar	Test no:	2
Borehole ID:	KLX03	Test start:	050517 19:12
Test section from - to (m):	807.21-827.21	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

Not Analysed

Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	-		
p_i (kPa) =	7922		
p_p(kPa) =	8031	p_F (kPa) =	7986
Q_p (m^3/s)=	NA		
tp (s) =	28800	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.=	0.17	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) =	5.00	dt_1 (min) =	NA
dt_2 (min) =	42.63	dt_2 (min) =	NA
T (m^2/s) =	8.2E-09	T (m^2/s) =	NA
S (-) =	1.0E-06	S (-) =	NA
K_s (m/s) =	4.1E-10	K_s (m/s) =	NA
S_s (1/m) =	5.0E-08	S_s (1/m) =	NA
C (m^3/Pa) =	4.6E-08	C (m^3/Pa) =	NA
C_D (-) =	5.1E-06	C_D (-) =	NA
ξ (-) =	0.08	ξ (-) =	NA
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

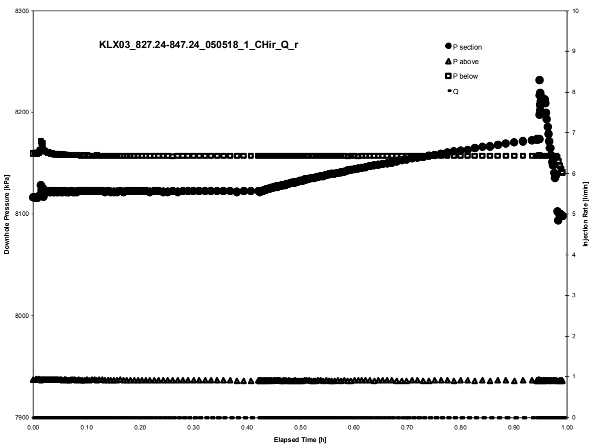
Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	4.6E-08
dt_2 (min) =	NA	C_D (-) =	5.1E-06
T_T (m^2/s) =	8.2E-09	ξ (-) =	0.08
S (-) =	1.0E-06		
K_s (m/s) =	4.1E-10		
S_s (1/m) =	5.0E-08		

Comments:

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050518 08:16
Test section from - to (m):	827.24-847.24	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) =	8116		
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)=	19.7		
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} (-) =	

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		

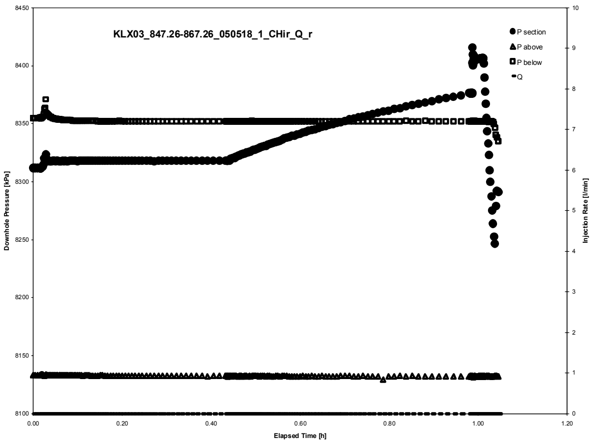
Comments:

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:	KLX03	Test start:	050518 09:59
Test section from - to (m):	847.26-867.26	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) =	8311		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
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)=	20.0		
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		

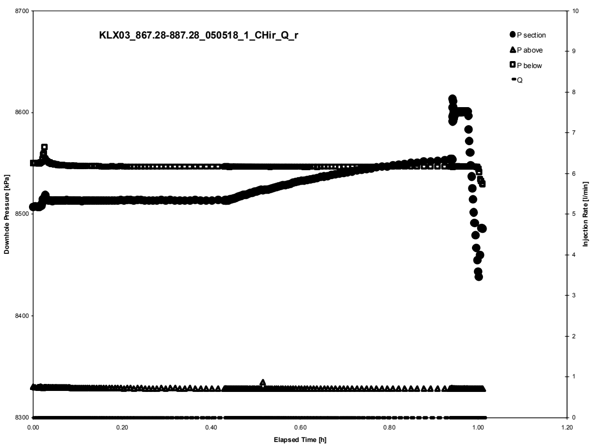
Comments:

Based on the test response (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:	KLX03	Test start:	050518 11:43
Test section from - to (m):	867.28-887.28	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) =	8508		
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)=	20.3		
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		

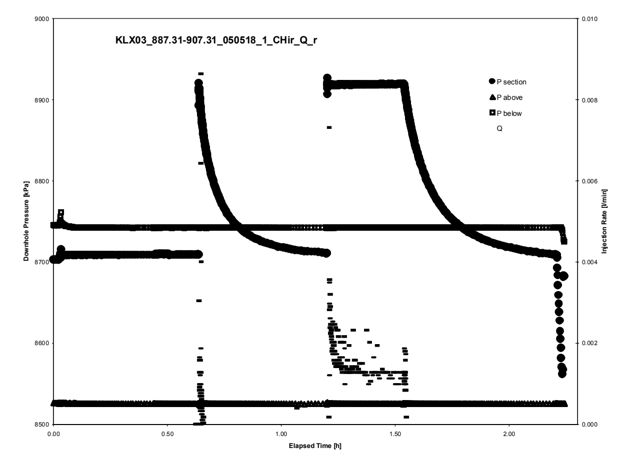
Comments:

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

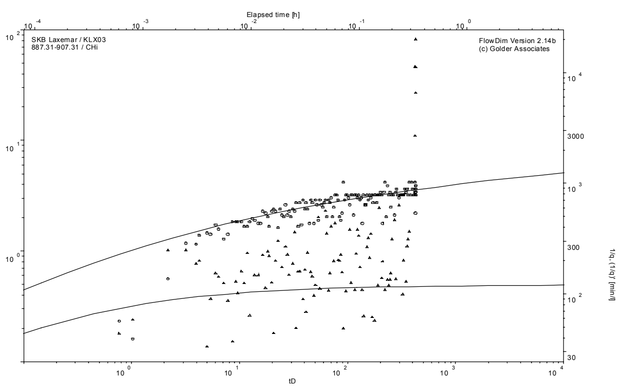
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050518 14:01
Test section from - to (m):	887.31-907.31	Responsible for test execution:	Stephan Rohs
Section diameter, 2·r_w (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

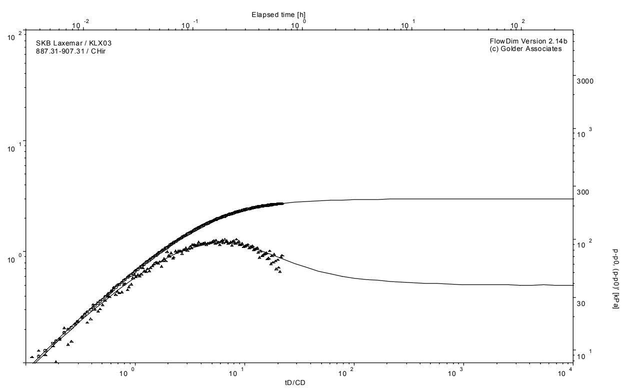
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	8702		
p_i (kPa) =	8710		
p_p(kPa) =	8918	p_F (kPa) =	8709
Q_p (m^3/s)=	1.67E-08		
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)=	20.6		
Derivative fact.=	0.15	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	7.9E-10		
T_M (m^2/s)=	8.2E-10		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.45	dt_1 (min) =	NA
dt_2 (min) =	11.25	dt_2 (min) =	NA
T (m^2/s) =	5.1E-10	T (m^2/s) =	5.1E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.6E-11	K_s (m/s) =	2.6E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.0E-11
C_D (-) =	NA	C_D (-) =	4.4E-09
丿 (-) =	0.00	丿 (-) =	0.00
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) =	4.0E-11
dt_2 (min) =	NA	C_D (-) =	4.4E-09
T_T (m^2/s) =	5.1E-10	丿 (-) =	0.00
S (-) =	1.0E-06		
K_s (m/s) =	2.6E-11		
S_s (1/m) =	5.0E-08		

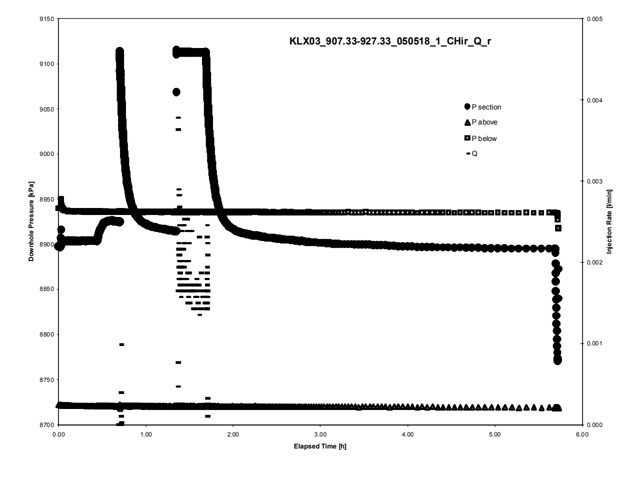
Comments:

The recommended transmissivity of 5.1E-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 4.0E-10 to 9.0E-10 m2/s. The flow dimension displayed during the test was 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 8682.4 kPa.

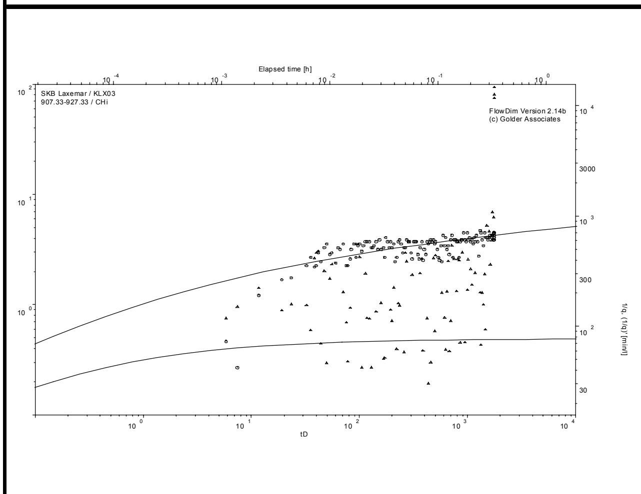
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050518 17:04
Test section from - to (m):	907.33-927.33	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

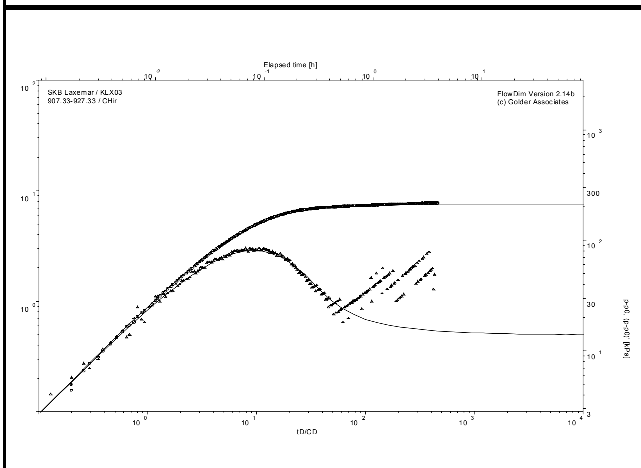
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	8898		
p_i (kPa) =	8914		
p_p(kPa) =	9112	p_F (kPa) =	8894
Q_p (m^3/s)=	1.67E-08		
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)=	20.9		
Derivative fact.=	0.08	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	8.3E-10		
T_M (m^2/s)=	8.6E-10		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.50	dt_1 (min) =	NA
dt_2 (min) =	10.68	dt_2 (min) =	NA
T (m^2/s) =	8.4E-10	T (m^2/s) =	1.9E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.2E-11	K_s (m/s) =	9.5E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.8E-11
C_D (-) =	NA	C_D (-) =	4.2E-09
ξ (-) =	0.46	ξ (-) =	3.67
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	3.8E-11
dt_2 (min) =	NA	C_D (-) =	4.2E-09
T_T (m^2/s) =	1.9E-09	ξ (-) =	3.67
S (-) =	1.0E-06		
K_s (m/s) =	9.5E-11		
S_s (1/m) =	5.0E-08		

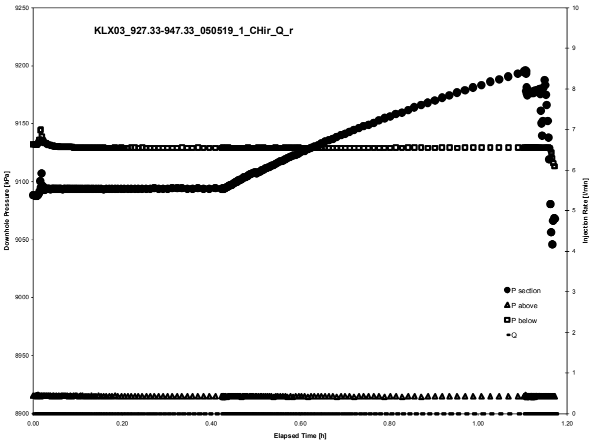
Comments:

The recommended transmissivity of 1.9E-09 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 8890.7 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050519 08:14
Test section from - to (m):	927.33-947.33 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) =	9088		
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)=	21.3		
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		

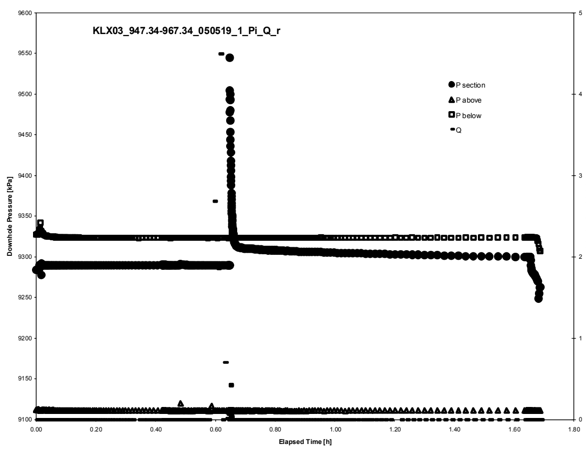
Comments:

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:	KLX03	Test start:	050519 10:03
Test section from - to (m):	947.34-967.34	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

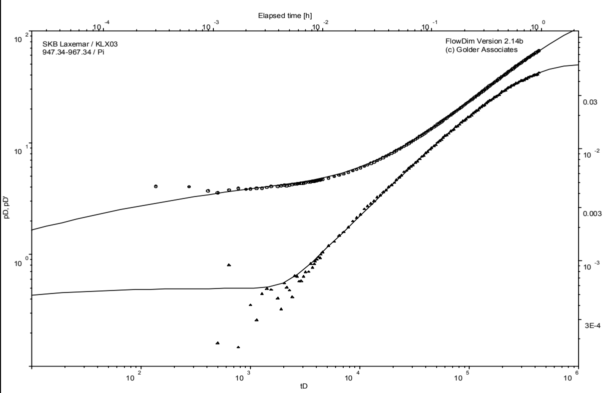
Linear plot Q and p



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) =	9285		
p_i (kPa) =	9289		
p_p(kPa) =	9545	p_F (kPa) =	9299
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	3540
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	21.6		
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) =	#NV
dt_2 (min) =	NA	dt_2 (min) =	#NV
T (m^2/s) =	NA	T (m^2/s) =	2.0E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.0E-11
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.6E-11
C_D (-) =	NA	C_D (-) =	2.9E-03
ξ (-) =	NA	ξ (-) =	1.45
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) =	2.6E-11
dt_2 (min) =	NA	C_D (-) =	2.9E-03
T_T (m^2/s) =	2.0E-10	ξ (-) =	1.45
S (-) =	1.0E-06		
K_s (m/s) =	1.0E-11		
S_s (1/m) =	5.0E-08		

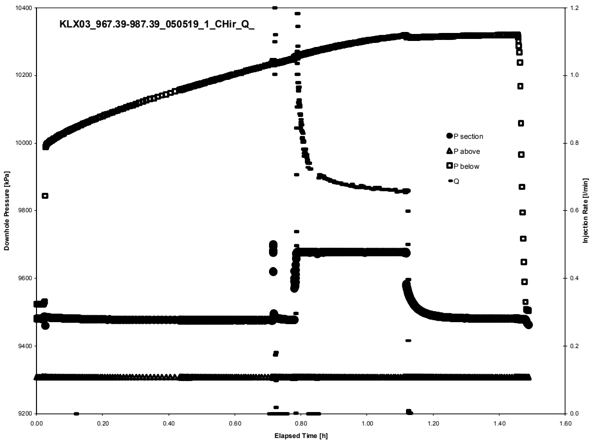
Comments:

The recommended transmissivity of 2.0E-10 m2/s was derived from the analysis of the Pi phase (outer zone). 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 8E-11 to 4E-10 m2/s.The flow dimension displayed during the test is 2. No static pressure could be derived.

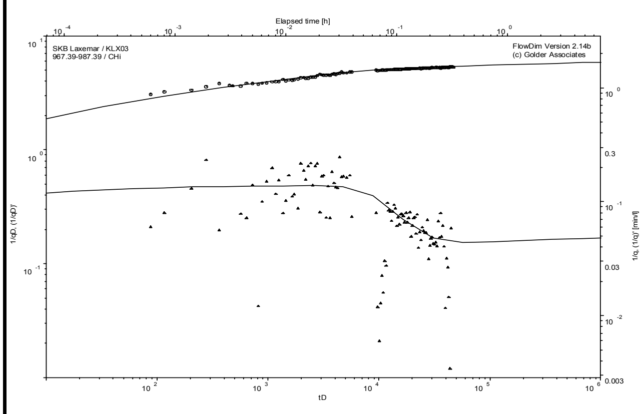
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050519 12:24
Test section from - to (m):	967.39-987.39	Responsible for test execution:	Stephan Rohs
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

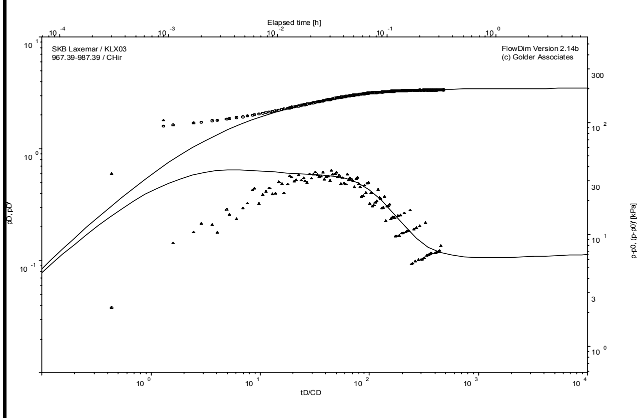
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	9480		
p_i (kPa) =	9477		
p_p(kPa) =	9677	p_F (kPa) =	9479
Q_p (m^3/s)=	1.10E-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)=	22.0		
Derivative fact.=	0.08	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	5.4E-07		
T_M (m^2/s)=	5.6E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.30	dt_1 (min) =	0.94
dt_2 (min) =	1.75	dt_2 (min) =	2.35
T (m^2/s) =	4.6E-07	T (m^2/s) =	3.1E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.3E-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) =	5.0E-10
C_D (-) =	NA	C_D (-) =	5.5E-02
ξ (-) =	-1.03	ξ (-) =	-2.59
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) =	5.0E-10
dt_2 (min) =	1.75	C_D (-) =	5.5E-02
T_T (m^2/s) =	4.6E-07	ξ (-) =	-1.03
S (-) =	1.0E-06		
K_s (m/s) =	2.3E-08		
S_s (1/m) =	5.0E-08		

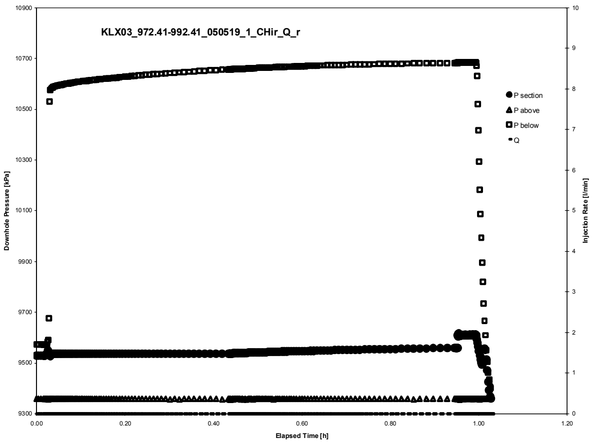
Comments:

The recommended transmissivity of 4.6E-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 2.0E-7 to 9.0E-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 9477.1 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX03	Test start:	050519 14:26
Test section from - to (m):	972.41-992.41	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) =	9530		
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)=	22.0		
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) =	8.50	dt_1 (min) =	10.02
dt_2 (min) =	26.27	dt_2 (min) =	14.04
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		$dt_e = (dt \cdot tp) / (dt + tp)$ 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		^{o}C

		logging). Temperature		
Te_{w0}		Temperature in the test section during undisturbed conditions (taken from temperature logging). Temperature		^oC
Te_o		Temperature in the observation section (taken from temperature logging). Temperature		^oC
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: $kb=k \cdot b$	$[L^3]$	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·n·c_t ; FC_S=ρ_w ·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

File Identity	
Created By	Stephan Rohs
Created	20.06.2006

Compiled By	
Quality Check For Delivery	
Delivery Approval	

Activity Type	KLX03 KLX03 - 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**
KLX03	2005.05.05 11:05	2005.05.19 15:28	106.31	992.31		Golder	Stephan Rohs	Stephan Rohs, Mesegena 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
KLX03	20050505 11:05	20050505 15:38	106.31	206.31		3	1	2005-05-05 14:35:52	2005-05-05 15:06:02	2.81E-04	0	3.20E-04	1.67E-08	8.33E-04	5.75E-01
KLX03	20050505 17:25	20050505 20:54	206.44	306.44		3	1	2005-05-05 18:22:21	2005-05-05 18:52:31	3.78E-05	0	4.45E-05	1.67E-08	8.33E-04	8.01E-02
KLX03	20050506 09:03	20050506 11:02	306.58	406.58		3	1	2005-05-06 10:00:38	2005-05-06 10:30:48	6.37E-06	0	6.73E-06	1.67E-08	8.33E-04	1.21E-02
KLX03	20050506 12:36	20050506 15:17	406.70	506.70		3	1	2005-05-06 13:45:19	2005-05-06 14:15:29	1.25E-05	0	1.42E-05	1.67E-08	8.33E-04	2.56E-02
KLX03	20050508 15:36	20050508 17:31	506.71	606.71		3	1	2005-05-08 16:24:16	2005-05-08 16:54:26	2.50E-08	0	3.29E-07	1.67E-08	8.33E-04	5.93E-04
KLX03	20050507 08:53	20050507 10:49	606.94	706.94		3	1	2005-05-07 09:47:08	2005-05-07 10:17:18	6.10E-06	0	6.48E-06	1.67E-08	8.33E-04	1.17E-02
KLX03	20050507 12:26	20050507 14:24	707.09	807.09		3	1	2005-05-07 13:21:46	2005-05-07 13:51:56	1.25E-04	0	1.31E-04	1.67E-08	8.33E-04	2.36E-01
KLX03	20050507 16:19	20050507 22:08	807.21	907.21		3	1	2005-05-07 17:36:17	2005-05-07 18:06:27	1.43E-07	0	1.59E-07	1.67E-08	8.33E-04	2.87E-04
KLX03	20050508 09:43	20050508 11:40	892.31	992.31		3	1	2005-05-08 10:38:21	2005-05-08 11:08:31	9.87E-06	0	1.07E-05	1.67E-08	8.33E-04	1.92E-02
KLX03	20050510 08:00	20050510 09:49	106.31	126.31		3	1	2005-05-10 09:07:07	2005-05-10 09:27:17	1.19E-05	0	1.24E-05	1.67E-08	8.33E-04	1.48E-02
KLX03	20050510 10:39	20050510 13:09	126.35	146.35		3	1	2005-05-10 12:06:57	2005-05-10 12:27:07	1.50E-07	0	1.67E-07	1.67E-08	8.33E-04	2.00E-04
KLX03	20050510 13:54	20050510 15:47	146.39	166.39		3	1	2005-05-10 15:05:17	2005-05-10 15:25:37	1.40E-06	0	1.70E-06	1.67E-08	8.33E-04	2.04E-03
KLX03	20050510 17:57	20050510 19:08	166.42	186.42		3	1	2005-05-10 18:36:10	2005-05-10 18:56:20	4.83E-07	0	5.17E-07	1.67E-08	8.33E-04	6.20E-04
KLX03	20050511 08:01	20050511 09:37	186.42	206.42		3	1	2005-05-11 08:55:30	2005-05-11 09:15:40	2.62E-04	0	2.98E-04	1.67E-08	8.33E-04	3.58E-01
KLX03	20050511 10:16	20050511 12:26	206.44	226.44		3	1	2005-05-11 11:24:08	2005-05-11 11:44:18	1.83E-07	0	2.67E-07	1.67E-08	8.33E-04	3.20E-04
KLX03	20050511 13:38	20050511 15:19	226.48	246.48		3	1	2005-05-11 14:37:44	2005-05-11 14:57:54	1.17E-07	0	1.67E-07	1.67E-08	8.33E-04	2.00E-04
KLX03	20050511 16:06	20050511 17:51	241.48	261.48		3	1	2005-05-11 17:09:28	2005-05-11 17:29:38	2.73E-06	0	4.17E-06	1.67E-08	8.33E-04	5.00E-03
KLX03	20050511 18:23	20050511 21:31	251.49	271.49		3	1	2005-05-11 19:08:56	2005-05-11 19:29:06	3.70E-05	0	4.10E-05	1.67E-08	8.33E-04	4.92E-02
KLX03	20050512 07:53	20050512 09:59	271.54	291.54		3	1	2005-05-12 08:57:10	2005-05-10 09:17:20	2.17E-06	0	3.40E-06	1.67E-08	8.33E-04	4.08E-03
KLX03	20050512 10:41	20050512 13:02	286.56	306.56		4	1	2005-05-12 11:23:34	2005-05-12 11:23:35	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050512 13:43	20050512 16:07	306.58	326.58		3	1	2005-05-12 15:14:57	2005-05-12 15:35:07	3.17E-07	0	3.83E-07	1.67E-08	8.33E-04	4.60E-04
KLX03	20050512 17:04	20050512 18:29	326.60	346.60		3	1	2005-05-12 17:47:42	2005-05-12 18:07:52	9.00E-07	0	9.83E-07	1.67E-08	8.33E-04	1.18E-03
KLX03	20050513 09:07	20050513 10:43	346.62	366.62		4	1	2005-05-13 09:50:04	2005-05-13 09:50:05	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050513 11:25	20050513 13:50	366.65	386.65		3	1	2005-05-13 12:28:27	2005-05-13 12:48:37	6.67E-08	0	1.00E-07	1.67E-08	8.33E-04	1.20E-04
KLX03	20050513 14:52	20050513 16:18	386.68	406.68		3	1	2005-05-13 15:41:22	2005-05-13 16:01:32	4.97E-06	0	5.13E-06	1.67E-08	8.33E-04	6.16E-03
KLX03	20050513 17:00	20050513 18:32	406.70	426.70		3	1	2005-05-13 17:50:35	2005-05-13 18:17:37	9.28E-06	0	1.01E-05	1.67E-08	8.33E-04	1.21E-02
KLX03	20050513 19:14	20050514 03:57	426.71	446.71		4	1	2005-05-13 19:54:31	2005-05-13 19:54:32	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050514 08:09	20050514 10:03	446.72	466.72		3	1	2005-05-14 09:11:08	2005-05-14 09:31:28	3.83E-06	0	4.55E-06	1.67E-08	8.33E-04	5.46E-03
KLX03	20050514 10:44	20050514 11:50	466.71	486.71		4	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050514 12:38	20050514 14:21	486.70	506.70		4	1	2005-05-14 13:17:56	2005-05-14 13:17:57	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050514 15:02	20050514 16:02	506.71	526.71		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050514 16:44	20050514 18:32	526.77	546.77		3	1	2005-05-14 17:50:06	2005-05-14 18:10:16	4.17E-07	0	7.50E-07	1.67E-08	8.33E-04	9.00E-04
KLX03	20050515 09:51	20050515 10:53	546.83	566.83		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050515 11:37	20050515 13:21	566.87	586.87		4	1	2005-05-15 12:19:17	2005-05-15 12:19:18	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050515 14:04	20050515 15:12	586.90	606.90		4	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050515 15:52	20050515 17:47	606.94	626.94		3	1	2005-05-15 16:55:04	2005-05-15 17:15:24	3.00E-07	0	4.50E-07	1.67E-08	8.33E-04	5.40E-04
KLX03	20050515 18:36	20050515 19:41	626.97	646.97		4	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050516 08:32	20050516 10:04	646.99	666.99		3	1	2005-05-16 09:21:49	2005-05-16 09:41:59	6.80E-06	0	7.08E-06	1.67E-08	8.33E-04	8.50E-03
KLX03	20050516 10:50	20050516 13:29	667.02	687.02		3	1	2005-05-16 12:07:06	2005-05-16 12:27:16	1.67E-08	0	3.33E-08	1.67E-08	8.33E-04	4.00E-05
KLX03	20050516 14:22	20050516 16:13	687.06	707.06		4	1	2005-05-16 15:11:11	2005-05-16 15:11:12	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050516 17:00	20050516 17:59	707.09	727.09		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050516 18:39	20050516 21:53	727.13	747.13		3	1	2005-05-16 19:31:04	2005-05-16 19:51:14	1.17E-04	0	1.24E-04	1.67E-08	8.33E-04	1.48E-01
KLX03	20050517 08:15	20050517 09:48	747.15	767.15		3	1	2005-05-17 09:06:24	2005-05-17 09:26:34	3.62E-06	0	3.85E-06	1.67E-08	8.33E-04	4.62E-03
KLX03	20050517 10:32	20050517 11:59	762.16	782.16		3	1	2005-05-10 11:22:44	2005-05-10 11:42:54	8.83E-06	0	9.33E-06	1.67E-08	8.33E-04	1.12E-02
KLX03	20050517 12:47	20050517 14:27	777.17	797.17		3	1	2005-05-17 13:44:54	2005-05-17 14:05:04	2.17E-07	0	2.50E-07	1.67E-08	8.33E-04	3.00E-04
KLX03	20050517 15:08	20050517 16:53	787.19	807.19		3	1	2005-05-17 16:01:47	2005-05-17 16:21:57	6.67E-08	0	8.33E-08	1.67E-08	8.33E-04	1.00E-04
KLX03	20050517 17:44	20050517 19:08	807.21	827.21		3	1	2005-05-17 18:31:42	2005-05-17 18:51:52	1.33E-07	0	1.50E-07	1.67E-08	8.33E-04	1.80E-04
KLX03	20050518 08:16	20050518 09:16	827.24	847.24		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050518 09:59	20050518 11:02	847.26	867.26		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050518 11:43	20050518 12:44	867.28	887.28		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050518 14:01	20050518 16:16	887.31	907.31		3	1	2005-05-18 15:14:34	2005-05-18 15:34:44	1.67E-08	0	3.33E-08	1.67E-08	8.33E-04	4.00E-05
KLX03	20050518 17:04	19000718 22:48	907.33	927.33		3	1	2005-05-18 18:25:57	2005-05-18 18:46:07	1.67E-08	0	3.33E-08	1.67E-08	8.33E-04	4.00E-05
KLX03	20050519 08:14	20050519 09:24	927.33	947.33		3	1	#NV	#NV	0.00E+00	-1	0.00E+00	1.67E-08	8.33E-04	0.00E+00
KLX03	20050519 10:03	20050519 11:45	947.34	967.34		4	1	2005-05-19 10:43:50	2005-05-19 10:43:51	#NV	-1	#NV	1.67E-08	8.33E-04	#NV
KLX03	20050519 12:24	20050519 13:54	967.39	987.39		3	1	2005-05-19 13:12:07	2005-05-19 13:32:17	1.10E-05	0	1.15E-05	1.67E-08	8.33E-04	1.38E-02
KLX03	20050519 14:26	20050519 15:28	972.41	992.41		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
KLX03	106.31	206.31	1800	1800			11.34	1984	2185	2010	9.8						156.31
KLX03	206.44	306.44	1800	7200			13.69	2939	3137	2951	11.3						256.44
KLX03	306.58	406.58	1800	1800			12.26	3889	4094	3890	12.8						356.58
KLX03	406.70	506.70	1800	3600			12.44	4847	5065	4848	14.4						456.70
KLX03	506.71	606.71	1800	2100			#NV	5808	6004	5988	16.0						556.71
KLX03	606.94	706.94	1800	1800			13.71	6765	6975	6767	17.5						656.94
KLX03	707.09	807.09	1800	1800			14.32	7727	7948	7730	19.0						757.09
KLX03	807.21	907.21	1800	14400			16.16	8707	8898	8702	20.6						857.21
KLX03	892.31	992.31	1800	1800			17.13	9523	9723	9532	22.0						942.31
KLX03	106.31	126.31	1200	1200			10.82	1215	1428	1218	8.5						116.31
KLX03	126.35	146.35	1200	2400			11.04	1411	1613	1411	8.8						136.35
KLX03	146.39	166.39	1200	1200			10.10	1602	1803	1609	9.1						156.39
KLX03	166.42	186.42	1200	600			11.29	1790	1997	1789	9.4						176.42
KLX03	186.42	206.42	1200	1200			10.84	1980	2181	1990	9.7						196.42
KLX03	206.44	226.44	1200	2400			13.73	2176	2373	2204	10.0						216.44
KLX03	226.48	246.48	1200	1200			12.76	2367	2575	2400	10.3						236.48
KLX03	241.48	261.48	1200	1200			10.72	2509	2735	2556	10.5						251.48
KLX03	251.49	271.49	1200	7200			12.51	2603	2803	2610	10.7						261.49
KLX03	271.54	291.54	1200	2400			12.40	2797	2998	2832	11.0						281.54
KLX03	286.56	306.56	1	5820			#NV	2943	3139	2946	11.2						296.56
KLX03	306.58	326.58	1200	1800			11.91	3137	3344	3140	11.6						316.58
KLX03	326.60	346.60	1200	1200			12.20	3318	3524	3321	11.9						336.60
KLX03	346.62	366.62	1	3060			#NV	3514	3731	3691	12.2						356.62
KLX03	366.65	386.65	1200	3600			10.74	3708	3928	3705	12.5						376.65
KLX03	386.68	406.68	1200	900			12.45	3891	4094	3891	12.8						396.68
KLX03	406.70	426.70	1200	1200			12.33	4084	4287	4086	13.2						416.70
KLX03	426.71	446.71	1	28800			#NV	4280	4527	4272	13.5						436.71
KLX03	446.72	466.72	1200	1800			11.33	4461	4671	4461	13.8						456.72
KLX03	466.71	486.71	0	0			#NV	#NV	#NV	#NV	14.1						476.71
KLX03	486.70	506.70	1	3660			#NV	4850	5034	4852	14.4						496.70
KLX03	506.71	526.71	0	0			#NV	#NV	#NV	#NV	14.7						516.71
KLX03	526.77	546.77	1200	1200			12.26	5236	5412	5291	15.0						536.77
KLX03	546.83	566.83	0	0			#NV	#NV	#NV	#NV	15.3						556.83
KLX03	566.87	586.87	1	3600			#NV	5625	5796	5733	15.6						576.87
KLX03	586.90	606.90	0	0			#NV	#NV	#NV	#NV	15.9						596.90
KLX03	606.94	626.94	1200	1800			13.53	6005	6185	6032	16.3						616.94
KLX03	626.97	646.97	0	0			#NV	#NV	#NV	#NV	16.6						636.97
KLX03	646.99	666.99	1200	1200			13.59	6381	6615	6381	16.9						656.99
KLX03	667.02	687.02	1200	1800			13.31	6580	6793	6584	17.2						677.02
KLX03	687.06	707.06	1	3600			#NV	6809	6988	6805	17.5						697.06
KLX03	707.09	727.09	0	0			#NV	#NV	#NV	#NV	17.8						717.09
KLX03	727.13	747.13	1200	7200			13.76	7149	7355	7149	18.2						737.13
KLX03	747.15	767.15	1200	1200			13.84	7339	7577	7339	18.4						757.15
KLX03	762.16	782.16	1200	900			14.18	7485	7685	7485	18.6						772.16
KLX03	777.17	797.17	1200	1200			13.90	7634	7850	7635	18.9						787.17
KLX03	787.19	807.19	1200	1800			14.23	7731	7950	7732	19.0						797.19
KLX03	807.21	827.21	1200	900			14.49	7924	8140	7923	19.4						817.21
KLX03	827.24	847.24	0	0			#NV	#NV	#NV	#NV	19.7						837.24
KLX03	847.26	867.26	0	0			#NV	#NV	#NV	#NV	20.0						857.26
KLX03	867.28	887.28	0	0			#NV	#NV	#NV	#NV	20.3						877.28
KLX03	887.31	907.31	1200	2400			14.22	8710	8918	8709	20.6						897.31
KLX03	907.33	927.33	1200	8400			15.95	8914	9112	8894	20.9						917.33
KLX03	927.33	947.33	0	0			#NV	#NV	#NV	#NV	21.3						937.33
KLX03	947.34	967.34	1	3540			#NV	9289	9545	9299	21.6						957.34
KLX03	967.39	987.39	1200	1200			17.22	9477	9677	9479	22.0						977.39
KLX03	972.41	992.41	0	0			#NV	#NV	#NV	#NV	22.0						982.41

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
KLX03	20050505 11:05	20050505 15:38	106.31	206.31		3	1	156.31	100	1.37E-05	0				1.78E-05	0	0	1.78E-07
KLX03	20050505 17:25	20050505 20:54	206.44	306.44		3	1	256.44	100	1.87E-06	0				2.44E-06	0	0	2.44E-08
KLX03	20050506 09:03	20050506 11:02	306.58	406.58		3	1	356.58	100	3.05E-07	0				3.97E-07	0	0	3.97E-09
KLX03	20050506 12:36	20050506 15:17	406.70	506.70		3	1	456.70	100	5.62E-07	0				7.32E-07	0	0	7.32E-09
KLX03	20050508 15:36	20050508 17:31	506.71	606.71		3	1	556.71	100	1.25E-09	0				1.63E-09	0	0	1.63E-11
KLX03	20050507 08:53	20050507 10:49	606.94	706.94		3	1	656.94	100	2.85E-07	0				3.71E-07	0	0	3.71E-09
KLX03	20050507 12:26	20050507 14:24	707.09	807.09		3	1	757.09	100	5.56E-06	0				7.24E-06	0	0	7.24E-08
KLX03	20050507 16:19	20050507 22:08	807.21	907.21		3	1	857.21	100	7.36E-09	0				9.59E-09	0	0	9.59E-11
KLX03	20050508 09:43	20050508 11:40	892.31	992.31		3	1	942.31	100	4.84E-07	0				6.30E-07	0	0	6.30E-09
KLX03	20050510 08:00	20050510 09:49	106.31	126.31		3	1	116.31	20	5.50E-07	0				5.75E-07	0	0	2.88E-08
KLX03	20050510 10:39	20050510 13:09	126.35	146.35		3	1	136.35	20	7.28E-09	0				7.62E-09	0	0	3.81E-10
KLX03	20050510 13:54	20050510 15:47	146.39	166.39		3	1	156.39	20	6.83E-08	0				7.15E-08	0	0	3.58E-09
KLX03	20050510 17:57	20050510 19:08	166.42	186.42		3	1	176.42	20	2.29E-08	0				2.40E-08	0	0	1.20E-09
KLX03	20050511 08:01	20050511 09:37	186.42	206.42		3	1	196.42	20	1.28E-05	0				1.34E-05	0	0	6.70E-07
KLX03	20050511 10:16	20050511 12:26	206.44	226.44		3	1	216.44	20	9.13E-09	0				9.55E-09	0	0	4.78E-10
KLX03	20050511 13:38	20050511 15:19	226.48	246.48		3	1	236.48	20	5.50E-09	0				5.76E-09	0	0	2.88E-10
KLX03	20050511 16:06	20050511 17:51	241.48	261.48		3	1	251.48	20	1.19E-07	0				1.24E-07	0	0	6.20E-09
KLX03	20050511 18:23	20050511 21:31	251.49	271.49		3	1	261.49	20	1.81E-06	0				1.90E-06	0	0	9.50E-08
KLX03	20050512 07:53	20050512 09:59	271.54	291.54		3	1	281.54	20	1.06E-07	0				1.11E-07	0	0	5.55E-09
KLX03	20050512 10:41	20050512 13:02	286.56	306.56		4	1	296.56	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050512 13:43	20050512 16:07	306.58	326.58		3	1	316.58	20	1.50E-08	0				1.57E-08	0	0	7.85E-10
KLX03	20050512 17:04	20050512 18:29	326.60	346.60		3	1	336.60	20	4.29E-08	0				4.48E-08	0	0	2.24E-09
KLX03	20050513 09:07	20050513 10:43	346.62	366.62		4	1	356.62	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050513 11:25	20050513 13:50	366.65	386.65		3	1	376.65	20	2.97E-09	0				3.11E-09	0	0	1.56E-10
KLX03	20050513 14:52	20050513 16:18	386.68	406.68		3	1	396.68	20	2.40E-07	0				2.51E-07	0	0	1.26E-08
KLX03	20050513 17:00	20050513 18:32	406.70	426.70		3	1	416.70	20	4.49E-07	0				4.69E-07	0	0	2.35E-08
KLX03	20050513 19:14	20050514 03:57	426.71	446.71		4	1	436.71	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050514 08:09	20050514 10:03	446.72	466.72		3	1	456.72	20	1.79E-07	0				1.87E-07	0	0	9.35E-09
KLX03	20050514 10:44	20050514 11:50	466.71	486.71		4	1	476.71	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050514 12:38	20050514 14:21	486.70	506.70		4	1	496.70	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050514 15:02	20050514 16:02	506.71	526.71		3	1	516.71	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050514 16:44	20050514 18:32	526.77	546.77		3	1	536.77	20	2.32E-08	0				2.43E-08	0	0	1.22E-09
KLX03	20050515 09:51	20050515 10:53	546.83	566.83		3	1	556.83	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050515 11:37	20050515 13:21	566.87	586.87		4	1	576.87	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050515 14:04	20050515 15:12	586.90	606.90		4	1	596.90	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050515 15:52	20050515 17:47	606.94	626.94		3	1	616.94	20	1.64E-08	0				1.71E-08	0	0	8.55E-10
KLX03	20050515 18:36	20050515 19:41	626.97	646.97		4	1	636.97	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050516 08:32	20050516 10:04	646.99	666.99		3	1	656.99	20	2.85E-07	0				2.98E-07	0	0	1.49E-08
KLX03	20050516 10:50	20050516 13:29	667.02	687.02		3	1	677.02	20	7.68E-10	0				8.03E-10	0	0	4.02E-11
KLX03	20050516 14:22	20050516 16:13	687.06	707.06		4	1	697.06	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050516 17:00	20050516 17:59	707.09	727.09		3	1	717.09	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050516 18:39	20050516 21:53	727.13	747.13		3	1	737.13	20	5.58E-06	0				5.84E-06	0	0	2.92E-07
KLX03	20050517 08:15	20050517 09:48	747.15	767.15		3	1	757.15	20	1.49E-07	0				1.56E-07	0	0	7.80E-09
KLX03	20050517 10:32	20050517 11:59	762.16	782.16		3	1	772.16	20	4.33E-07	0				4.53E-07	0	0	2.27E-08
KLX03	20050517 12:47	20050517 14:27	777.17	797.17		3	1	787.17	20	9.84E-09	0				1.03E-08	0	0	5.15E-10
KLX03	20050517 15:08	20050517 16:53	787.19	807.19		3	1	797.19	20	2.99E-09	0				3.12E-09	0	0	1.56E-10
KLX03	20050517 17:44	20050517 19:08	807.21	827.21		3	1	817.21	20	6.06E-09	0				6.33E-09	0	0	3.17E-10
KLX03	20050518 08:16	20050518 09:16	827.24	847.24		3	1	837.24	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050518 09:59	20050518 11:02	847.26	867.26		3	1	857.26	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050518 11:43	20050518 12:44	867.28	887.28		3	1	877.28	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050518 14:01	20050518 16:16	887.31	907.31		3	1	897.31	20	7.86E-10	0				8.22E-10	0	0	4.11E-11
KLX03	20050518 17:04	19000718 22:48	907.33	927.33		3	1	917.33	20	8.26E-10	0				8.64E-10	0	0	4.32E-11
KLX03	20050519 08:14	20050519 09:24	927.33	947.33		3	1	937.33	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050519 10:03	20050519 11:45	947.34	967.34		4	1	957.34	20	#NV	-1				#NV	0	-1	#NV
KLX03	20050519 12:24	20050519 13:54	967.39	987.39		3	1	977.39	20	5.40E-07	0				5.64E-07	0	0	2.82E-08
KLX03	20050519 14:26	20050519 15:28	972.41	992.41		3	1	982.41	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
KLX03	106.31	206.31									1.01E-05	0	1	8.00E-06	3.00E-05	1.00E-06	1.00E-06		170.86	0
KLX03	206.44	306.44									1.42E-06	0	1	8.00E-07	4.00E-06	1.00E-06	1.00E-06		25.12	-1
KLX03	306.58	406.58									6.23E-07	0	1	4.00E-07	9.00E-07	1.00E-06	1.00E-06		85.15	0
KLX03	406.70	506.70									3.85E-07	0	1	1.00E-07	7.00E-07	1.00E-06	1.00E-06		75.52	-1
KLX03	506.71	606.71									4.15E-10	0	1	8.00E-11	8.00E-10	1.00E-06	1.00E-06		13.68	1
KLX03	606.94	706.94									4.52E-07	0	1	2.00E-07	7.00E-07	1.00E-06	1.00E-06		78.58	0
KLX03	707.09	807.09									2.65E-06	0	1	9.00E-07	8.00E-06	1.00E-06	1.00E-06		20.58	-1
KLX03	807.21	907.21									5.03E-09	0	1	3.00E-09	9.00E-09	1.00E-06	1.00E-06		6.67	-1
KLX03	892.31	992.31									2.83E-07	0	1	8.00E-08	7.00E-07	1.00E-06	1.00E-06		19.40	-1
KLX03	106.31	126.31									2.06E-07	0	1	8.00E-08	5.00E-07	1.00E-06	1.00E-06		9.50	-1
KLX03	126.35	146.35									8.20E-09	0	1	4.00E-09	2.00E-08	1.00E-06	1.00E-06		23.55	0
KLX03	146.39	166.39									4.50E-08	0	1	1.00E-08	8.00E-08	1.00E-06	1.00E-06		36.05	-1
KLX03	166.42	186.42									4.13E-08	0	1	2.00E-08	9.00E-08	1.00E-06	1.00E-06		35.28	0
KLX03	186.42	206.42									9.22E-06	0	1	6.00E-06	2.00E-05	1.00E-06	1.00E-06		135.68	0
KLX03	206.44	226.44									8.35E-09	0	1	5.00E-09	2.00E-08	1.00E-06	1.00E-06		6.96	1
KLX03	226.48	246.48									3.67E-09	0	1	1.00E-09	6.00E-09	1.00E-06	1.00E-06		19.26	1
KLX03	241.48	261.48									5.54E-08	0	1	3.00E-08	1.00E-07	1.00E-06	1.00E-06		37.97	1
KLX03	251.49	271.49									2.66E-06	0	1	9.00E-07	4.00E-06	1.00E-06	1.00E-06		36.24	1
KLX03	271.54	291.54									5.33E-08	0	1	3.00E-08	1.00E-07	1.00E-06	1.00E-06		53.18	1
KLX03	286.56	306.56									1.29E-08	0	1	6.00E-09	3.00E-08	1.00E-06	1.00E-06		58.14	1
KLX03	306.58	326.58									1.08E-08	0	1	7.00E-09	3.00E-08	1.00E-06	1.00E-06		25.23	0
KLX03	326.60	346.60									9.91E-08	0	1	6.00E-08	2.00E-07	1.00E-06	1.00E-06		12.76	1
KLX03	346.62	366.62									1.35E-11	0	1	1.00E-11	3.00E-11	1.00E-06	1.00E-06		7.57	0
KLX03	366.65	386.65									1.10E-09	0	1	8.00E-10	3.00E-09	1.00E-06	1.00E-06		24.71	1
KLX03	386.68	406.68									6.26E-07	0	1	2.00E-07	2.00E-06	1.00E-06	1.00E-06		69.61	0
KLX03	406.70	426.70									6.30E-07	0	1	2.00E-07	8.00E-07	1.00E-06	1.00E-06		69.73	-1
KLX03	426.71	446.71									6.37E-11	0	1	3.00E-11	9.00E-11	1.00E-06	1.00E-06		34.25	0
KLX03	446.72	466.72									2.97E-07	0	1	9.00E-08	5.00E-07	1.00E-06	1.00E-06		70.75	-1
KLX03	466.71	486.71									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	486.70	506.70									2.95E-11	0	1	2.00E-11	7.00E-11	1.00E-06	1.00E-06		10.07	0
KLX03	506.71	526.71									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	526.77	546.77									7.03E-09	0	1	1.00E-09	3.00E-08	1.00E-06	1.00E-06		16.71	1
KLX03	546.83	566.83									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	566.87	586.87									3.27E-11	0	1	1.00E-11	5.00E-11	1.00E-06	1.00E-06		10.25	1
KLX03	586.90	606.90									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	606.94	626.94									5.70E-09	0	1	3.00E-09	1.00E-08	1.00E-06	1.00E-06		21.50	0
KLX03	626.97	646.97									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	646.99	666.99									4.92E-07	0	1	2.00E-07	8.00E-07	1.00E-06	1.00E-06		12.08	-1
KLX03	667.02	687.02									6.13E-10	0	1	3.00E-10	9.00E-10	1.00E-06	1.00E-06		15.08	-1
KLX03	687.06	707.06									6.60E-11	0	1	2.00E-11	8.00E-11	1.00E-06	1.00E-06		12.22	0
KLX03	707.09	727.09									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	727.13	747.13									5.88E-06	0	1	2.00E-06	8.00E-06	1.00E-06	1.00E-06		298.44	-1
KLX03	747.15	767.15									2.06E-07	0	1	9.00E-08	5.00E-07	1.00E-06	1.00E-06		52.72	0
KLX03	762.16	782.16									9.88E-07	0	1	4.00E-07	2.00E-06	1.00E-06	1.00E-06		16.73	1
KLX03	777.17	797.17									6.39E-09	0	1	3.00E-09	1.00E-08	1.00E-06	1.00E-06		6.87	1
KLX03	787.19	807.19									6.23E-09	0	1	3.00E-09	9.00E-09	1.00E-06	1.00E-06		26.93	-1
KLX03	807.21	827.21									7.00E-09	0	1	5.00E-09	2.00E-08	1.00E-06	1.00E-06		5.99	1
KLX03	827.24	847.24									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	847.26	867.26									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	867.28	887.28									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	887.31	907.31									5.08E-10	0	1	4.00E-10	9.00E-10	1.00E-06	1.00E-06		16.61	-1
KLX03	907.33	927.33									1.94E-09	0	1	8.00E-10	3.00E-09	1.00E-06	1.00E-06		43.45	-1
KLX03	927.33	947.33									1.00E-11	-1	1	1.00E-13	1.00E-11	1.00E-06	1.00E-06		#NV	#NV
KLX03	947.34	967.34									2.04E-10	0	1	8.00E-11	4.00E-10	1.00E-06	1.00E-06		16.06	1
KLX03	967.39	987.39									4.56E-07	0	1	2.00E-07	9.00E-07	1.00E-06	1.00E-06		19.02	-1
KLX03	972.41	992.41									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_co nd_ksf	ype_ks f	l_measl _ksf	u_mea sl_ksf	spec_sto rage_ssf	assum ed_ssf	c	cd	skin	dt1	dt2	t1	t2	dte1	dte2	p_horner	transmiss ivity_t_nlr	storativit y_s_nlr	value_ty pe_t_nlr	bc_t _nlr	c_ nlr	cd_ nlr	skin _nlr	transmiss ivity_t_grf	value_ty pe_t_grf	bc_t_ grf	storativit y_s_grf	flow_di m_grf	commen t
KLX03	106.31	206.31								5.36E-09	5.91E-01	-4.1	97.8	1594.2					1977.8													
KLX03	206.44	306.44								8.64E-10	9.52E-02	-3.4	12	94.8					2951.0													
KLX03	306.58	406.58								4.16E-10	4.59E-02	5.5	60	1639.8					3888.4													
KLX03	406.70	506.70								4.37E-09	4.82E-01	-4.3	393	1280.4					4843.6													
KLX03	506.71	606.71								3.74E-10	4.12E-02	-2.0	#NV	#NV					5974.9													
KLX03	606.94	706.94								3.57E-10	3.93E-02	2.8	79.2	1686					6763.8													
KLX03	707.09	807.09								2.28E-09	2.51E-01	-3.9	11.4	51					7725.7													
KLX03	807.21	907.21								2.64E-10	2.91E-02	-0.1	27	123					8700.4													
KLX03	892.31	992.31								6.22E-11	6.86E-03	-2.7	47.4	138.6					9523.2													
KLX03	106.31	126.31								1.02E-10	1.12E-02	-3.0	11.4	39					1214.5													
KLX03	126.35	146.35								5.98E-11	6.59E-03	2.4	13.8	1048.8					1406.5													
KLX03	146.39	166.39								5.38E-10	5.93E-02	-3.8	#NV	#NV					1587.2													
KLX03	166.42	186.42								4.51E-11	4.97E-03	5.8	69	929.4					1788.8													
KLX03	186.42	206.42								1.58E-09	1.74E-01	-3.9	96	1200					1974.0													
KLX03	206.44	226.44								5.85E-11	6.45E-03	-1.5	31.8	103.8					2192.3													
KLX03	226.48	246.48								5.52E-11	6.08E-03	0.3	174	1073.4					2372.9													
KLX03	241.48	261.48								7.16E-10	7.89E-02	-2.8	724.8	1182					2495.2													
KLX03	251.49	271.49								1.02E-09	1.12E-01	-0.1	60	157.8					2607.7													
KLX03	271.54	291.54								2.83E-11	3.12E-03	-2.9	#NV	#NV					2796.9													
KLX03	286.56	306.56								1.29E-09	1.42E-01	-3.5	#NV	#NV					#NV													
KLX03	306.58	326.58								1.24E-10	1.37E-02	-0.2	58.2	1075.2					3124.8													
KLX03	326.60	346.60								2.08E-11	2.29E-03	7.5	11.4	101.4					3317.9													
KLX03	346.62	366.62								8.72E-11	9.61E-03	-0.9	904.2	2107.8					#NV													
KLX03	366.65	386.65								7.47E-11	8.23E-03	-1.0	#NV	#NV					3684.0													
KLX03	386.68	406.68								1.54E-10	1.70E-02	9.4	66	758.4					3891.2													
KLX03	406.70	426.70								9.07E-10	1.00E-01	-1.1	#NV	#NV					4080.5													
KLX03	426.71	446.71								7.69E-11	8.48E-03	-1.8	5368.8	12634.8					#NV													
KLX03	446.72	466.72								3.84E-09	4.23E-01	2.6	#NV	#NV					4451.7													
KLX03	466.71	486.71								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	486.70	506.70								6.25E-11	6.89E-03	-3.9	#NV	#NV					#NV													
KLX03	506.71	526.71								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	526.77	546.77								5.94E-11	6.55E-03	-1.5	405	652.8					5223.3													
KLX03	546.83	566.83								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	566.87	586.87								1.10E-10	1.21E-02	-2.0	1594.2	3292.8					#NV													
KLX03	586.90	606.90								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	606.94	626.94								1.63E-10	1.80E-02	-2.9	346.2	565.8					5999.2													
KLX03	626.97	646.97								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	646.99	666.99								7.80E-11	8.60E-03	4.7	19.2	40.8					6381.6													
KLX03	667.02	687.02								3.01E-11	3.32E-03	0.6	#NV	#NV					6569.9													
KLX03	687.06	707.06								9.12E-12	1.01E-03	1.3	83.4	499.8					#NV													
KLX03	707.09	727.09								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	727.13	747.13								7.46E-10	8.22E-02	-5.1	#NV	#NV					7147.9													
KLX03	747.15	767.15								5.24E-11	5.78E-03	2.2	117	819					7339.7													
KLX03	762.16	782.16								5.52E-11	6.08E-03	6.2	22.8	55.2					7486.4													
KLX03	777.17	797.17								5.18E-11	5.71E-03	-0.7	34.8	115.8					7627.0													
KLX03	787.19	807.19								5.08E-11	5.60E-03	6.0	#NV	#NV					7725.8													
KLX03	807.21	827.21								4.95E-11	5.46E-03	1.5	19.8	84					7919.6													
KLX03	827.24	847.24								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	847.26	867.26								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	867.28	887.28								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	887.31	907.31								3.96E-11	4.36E-03	0.0	#NV	#NV					8682.4													
KLX03	907.33	927.33								3.82E-11	4.21E-03	3.7	#NV	#NV					8890.7													
KLX03	927.33	947.33								#NV	#NV	#NV	#NV	#NV					#NV													
KLX03	947.34	967.34								2.64E-11	2.91E-03	1.5	#NV	#NV					#NV													
KLX03	967.39	987.39								4.96E-10	5.47E-02	-1.0	18	105					9477.1													
KLX03	972.41	992.41								#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
KLX03	20050505 11:05	20050505 15:38	106.31	206.31				996	996	996	2026	2020	2023	
KLX03	20050505 17:25	20050505 20:54	206.44	306.44				1972	1971	1971	2974	2973	2973	
KLX03	20050506 09:03	20050506 11:02	306.58	406.58				2925	2925	2925	3928	3931	3928	
KLX03	20050506 12:36	20050506 15:17	406.70	506.70				3886	3887	3886	4888	4888	4888	
KLX03	20050508 15:36	20050508 17:31	506.71	606.71				4845	4846	4846	5847	5847	5847	
KLX03	20050507 08:53	20050507 10:49	606.94	706.94				5809	5808	5809	6804	6804	6804	
KLX03	20050507 12:26	20050507 14:24	707.09	807.09				6772	6774	6774	7768	7768	7769	
KLX03	20050507 16:19	20050507 22:08	807.21	907.21				7743	7743	7744	8742	8742	8743	
KLX03	20050508 09:43	20050508 11:40	892.31	992.31				8573	8573	8573	10202	10331	10310	
KLX03	20050510 08:00	20050510 09:49	106.31	126.31				1013	1013	1013	1256	1256	1256	
KLX03	20050510 10:39	20050510 13:09	126.35	146.35				1203	1203	1203	1446	1446	1446	
KLX03	20050510 13:54	20050510 15:47	146.39	166.39				1394	1394	1394	1637	1637	1637	
KLX03	20050510 17:57	20050510 19:08	166.42	186.42				1585	1585	1585	1829	1828	1829	
KLX03	20050511 08:01	20050511 09:37	186.42	206.42				1776	1776	1776	2018	2018	2018	
KLX03	20050511 10:16	20050511 12:26	206.44	226.44				1970	1970	1969	2208	2208	2208	
KLX03	20050511 13:38	20050511 15:19	226.48	246.48				2160	2160	2160	2340	2340	2399	
KLX03	20050511 16:06	20050511 17:51	241.48	261.48				2304	2303	2303	2543	2543	2543	
KLX03	20050511 18:23	20050511 21:31	251.49	271.49				2399	2340	2399	2638	2639	2638	
KLX03	20050512 07:53	20050512 09:59	271.54	291.54				2590	2590	2590	2829	2829	2829	
KLX03	20050512 10:41	20050512 13:02	286.56	306.56				2734	2734	2735	2973	2973	2973	
KLX03	20050512 13:43	20050512 16:07	306.58	326.58				2926	2926	2926	3164	3164	3164	
KLX03	20050512 17:04	20050512 18:29	326.60	346.60				3119	3118	3118	3356	3357	3357	
KLX03	20050513 09:07	20050513 10:43	346.62	366.62				3309	3309	3310	3547	3547	3548	
KLX03	20050513 11:25	20050513 13:50	366.65	386.65				3502	3503	3502	3739	3739	3739	
KLX03	20050513 14:52	20050513 16:18	386.68	406.68				3695	3695	3695	3931	3934	3931	
KLX03	20050513 17:00	20050513 18:32	406.70	426.70				3887	3888	3888	4123	4123	4123	
KLX03	20050513 19:14	20050514 03:57	426.71	446.71				4079	4078	4076	4313	4313	4312	
KLX03	20050514 08:09	20050514 10:03	446.72	466.72				4269	4269	4269	4505	4505	4505	
KLX03	20050514 10:44	20050514 11:50	466.71	486.71				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050514 12:38	20050514 14:21	486.70	506.70				4655	4655	4655	4889	4889	4889	
KLX03	20050514 15:02	20050514 16:02	506.71	526.71				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050514 16:44	20050514 18:32	526.77	546.77				5040	5040	5040	5272	5272	5272	
KLX03	20050515 09:51	20050515 10:53	546.83	566.83				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050515 11:37	20050515 13:21	566.87	586.87				5425	5425	5425	5656	5656	5656	
KLX03	20050515 14:04	20050515 15:12	586.90	606.90				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050515 15:52	20050515 17:47	606.94	626.94				5811	5811	5811	6040	6040	6040	
KLX03	20050515 18:36	20050515 19:41	626.97	646.97				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050516 08:32	20050516 10:04	646.99	666.99				6194	6194	6194	6422	6422	6422	
KLX03	20050516 10:50	20050516 13:29	667.02	687.02				6387	6387	6387	6614	6614	6614	
KLX03	20050516 14:22	20050516 16:13	687.06	707.06				6581	6581	6581	6806	6806	6806	
KLX03	20050516 17:00	20050516 17:59	707.09	727.09				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050516 18:39	20050516 21:53	727.13	747.13				6968	6967	6967	7191	7195	7191	
KLX03	20050517 08:15	20050517 09:48	747.15	767.15				7158	7158	7158	7382	7383	7382	
KLX03	20050517 10:32	20050517 11:59	762.16	782.16				7304	7304	7304	7527	7528	7527	
KLX03	20050517 12:47	20050517 14:27	777.17	797.17				7450	7450	7450	7673	7673	7673	
KLX03	20050517 15:08	20050517 16:53	787.19	807.19				7548	7548	7548	7771	7771	7770	
KLX03	20050517 17:44	20050517 19:08	807.21	827.21				7743	7742	7742	7964	7964	7964	
KLX03	20050518 08:16	20050518 09:16	827.24	847.24				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050518 09:59	20050518 11:02	847.26	867.26				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050518 11:43	20050518 12:44	867.28	887.28				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050518 14:01	20050518 16:16	887.31	907.31				8525	8525	8526	8742	8742	8742	
KLX03	20050518 17:04	19000718 22:48	907.33	927.33				8721	8720	8719	8936	8936	8935	
KLX03	20050519 08:14	20050519 09:24	927.33	947.33				#NV	#NV	#NV	#NV	#NV	#NV	
KLX03	20050519 10:03	20050519 11:45	947.34	967.34				9111	9111	9111	9324	9324	9324	
KLX03	20050519 12:24	20050519 13:54	967.39	987.39				9308	9308	9309	10256	10318	10314	
KLX03	20050519 14:26	20050519 15:28	972.41	992.41				#NV	#NV	#NV	#NV	#NV	#NV	