Overview mining activities

Quarterly meeting

Frisia Zout B.V. -SODM

30th of October, 2017

Your Partners in Value Creation

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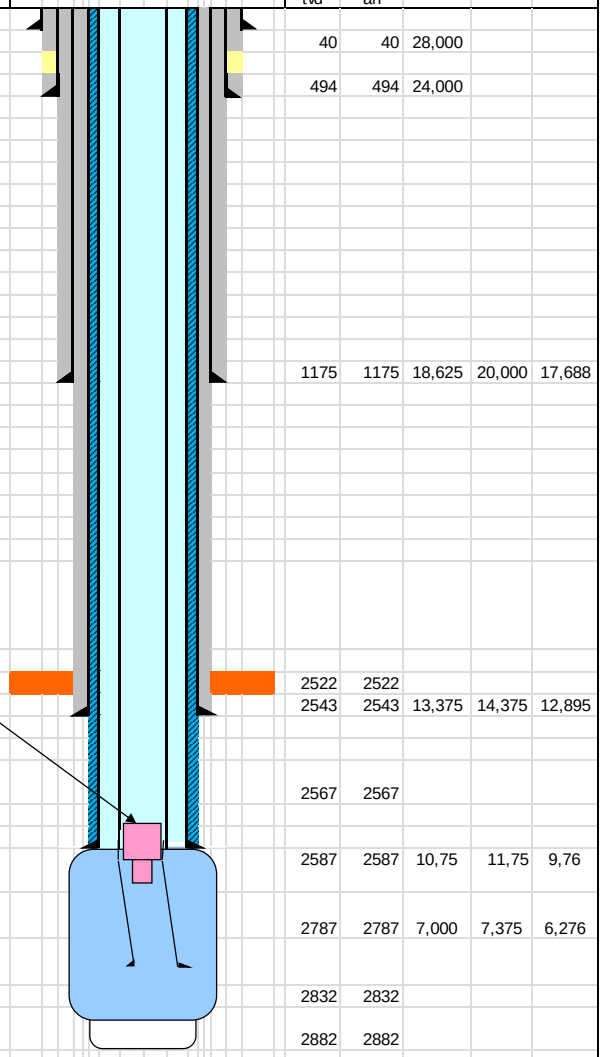
BAS-1

Item Description	Wellhead and Xmastree BAS 1 140527	Depth m tvd	Depth m ah	Pipe OD in	Collar OD in	Pipe ID in
36" stove pipe		40	40	28,000		
24" x 1/2" casing		494	494	24,000		
Top cement in 18 5/8 " x 13 3/8" annulus						
18 5/8" casing		1175	1175	18,625	20,000	17,688
13.3/8" Annulus filled with diesel/brine solution as of January 2013.						
Straddle Jan 2010; Top at; 2584md Minimum ID; 3.34" Bottom at;2589 md						
Base of Carnalite		2522	2522			
13 3/8" casing		2543	2543	13,375	14,375	12,895
Roof height from March 2011 neck echo measurement		2567	2567			
7" Leak at ~2586 m						
10 3/4" outer leaching string, internally coated		2587	2587	10,75	11,75	9,76
7" inner leaching string, internally coated		2787	2787	7,000	7,375	6,276
Sump Dec 2004		2832	2832			
Total Depth Cavern		2882	2882			



* All depths are from ground level

Status

- Maintain max pressure 10 3/4" at 232bar
- Bleed-off pressure every 4 wks
- 13 3/8" contains water, however at higher pressure then 10 ¾"

Planned

- HP-shut-in
- Optional: Frimakal injection

BAS-1

July 2017

24-26	Pressure Bleed-off
27,28	Re-pressurize 13 3/8” after pressure bleed-off

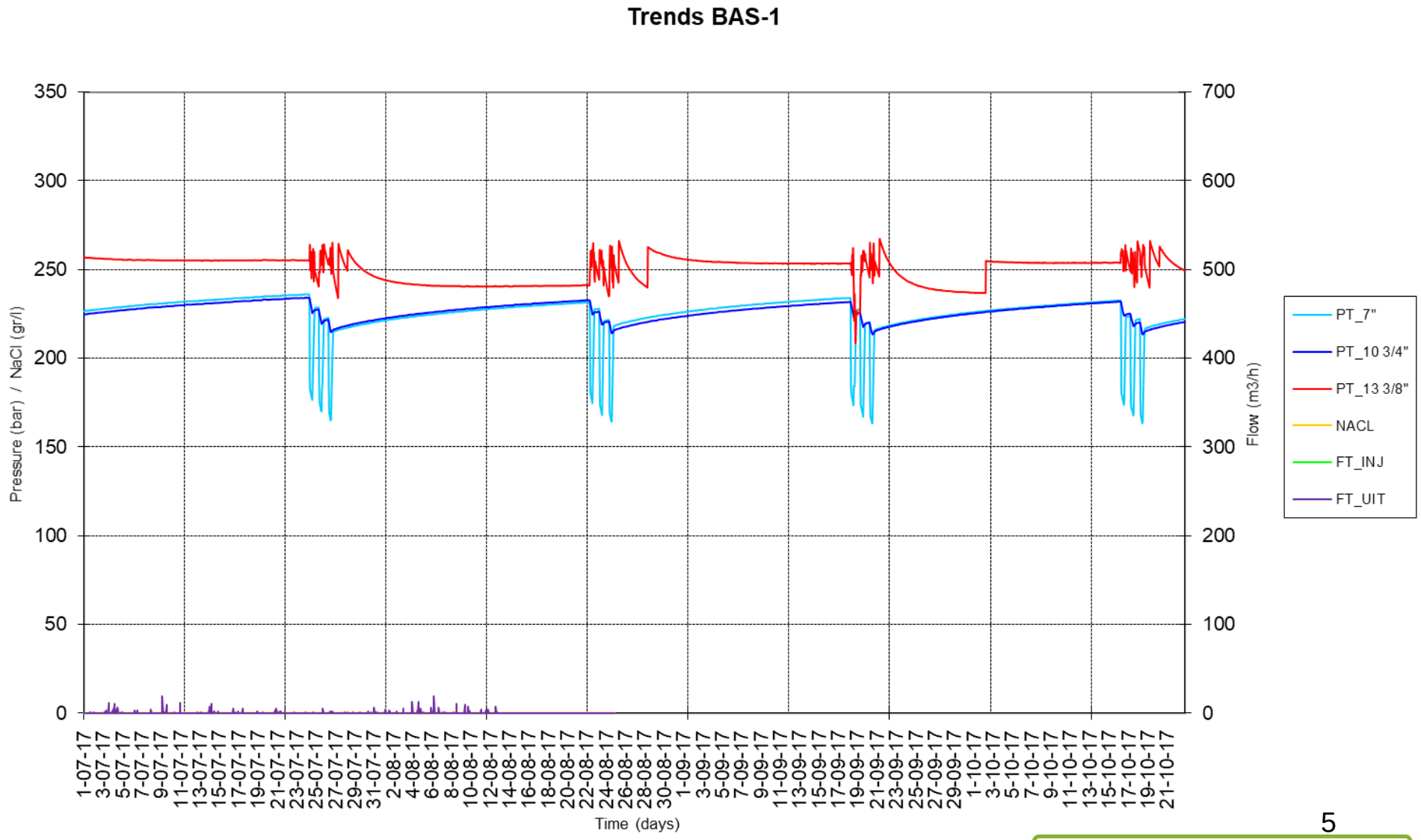
August 2017

22 - 24	Pressure Bleed-off
25,28	Re-pressurize 13 3/8” after pressure bleed-off

September 2017

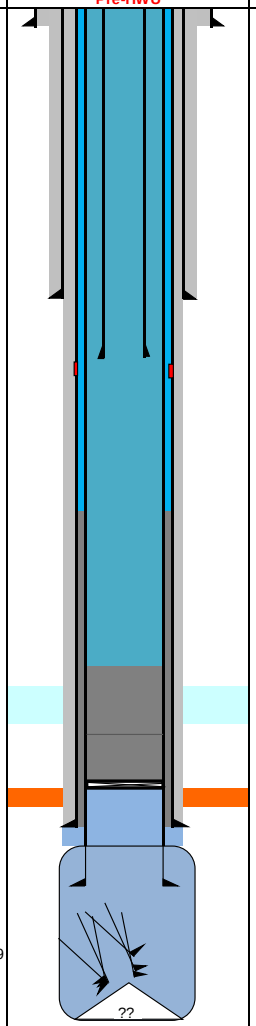
18-20	Pressure Bleed-off
21	Re-pressurize 13 3/8” after pressure bleed-off

BAS-1



BAS-2

Item Description	Wellhead and Xmastree BAS 2	Depth GL	Depth GL	Pipe OD	Collar OD	Pipe ID
Diesel in Wellhead		m	m	in	in	in
TVD = MD - 80 m	Pre-HWU	tvd	ah			
36" stove pipe			42	28,000		
Kick-off point		391	391			
End of 20° build up		875	885			
18 5/8" casing [K55-111#]		1133	1169	18,625	20,000	17,688
13 3/8" DV collar			1177			
7" inner leach string, internal coated						
Cut with mechanical cutter (10-05-2017)		1143	1179			
13 3/8" casing patch 1194,5-1200.5 (11jan97)		1164	1200			
Top cement in 13 3/8" x 10 3/4" , USIT log		1658	1738			
Start of drop		1719	1791			
End of drop		2040	2119			
TOC 10 3/4" cement		2158	2238			
Top Zechstein (Z4)		2189	2268			
TOC first 10 3/4" cement plug		2329	2409			
Inflatable BP		2439	2519			
Base of Carnalite		2501	2580,4			
13 3/8" casing		2522	2602	13,375	14,375	12,415
Possible roof			2602			
10 3/4" outer leaching string, internally coated		2549	2629	10,75		
Cut with severing shot						
Volume 208.283m³ EM 2009						
HUD 7" pipe		2734	2814			
Lowest point of Echo 2009		2785	2865			



KEY
1.18s.g brine
1.15s.g brine
1.20s.g. brine
Casing cement
Annuluar Cement
Carnalite

Status

Start operations planned: 6th of November

P&A as discussed with SodM on the 26th of October 2017

Documents

- 18May17:BAS-2 Work Program Final Abandonment, May17
- 14June17:Ontheffing 17077926, verwijderen spuitkruis en plaatsen BOP
- 25July17: Detail overzicht vloeistof migratie in BAS-2
- 22August17: Geo-mechanical and technical aspects of BAS-2 abandonment
- 9October17: BAS-2 Work Program Final Abandonment v1.3, Nov 2017
- 11October17: Onderbouwing haalbaarheid terug winning diesel BAS-2
- 24October17:BARMM akkoord

BAS-2

July 2017

19	Bleed-off of 10 ¾” annulus to 10,2 bar
25	Pressure distortion by touching sensor on location

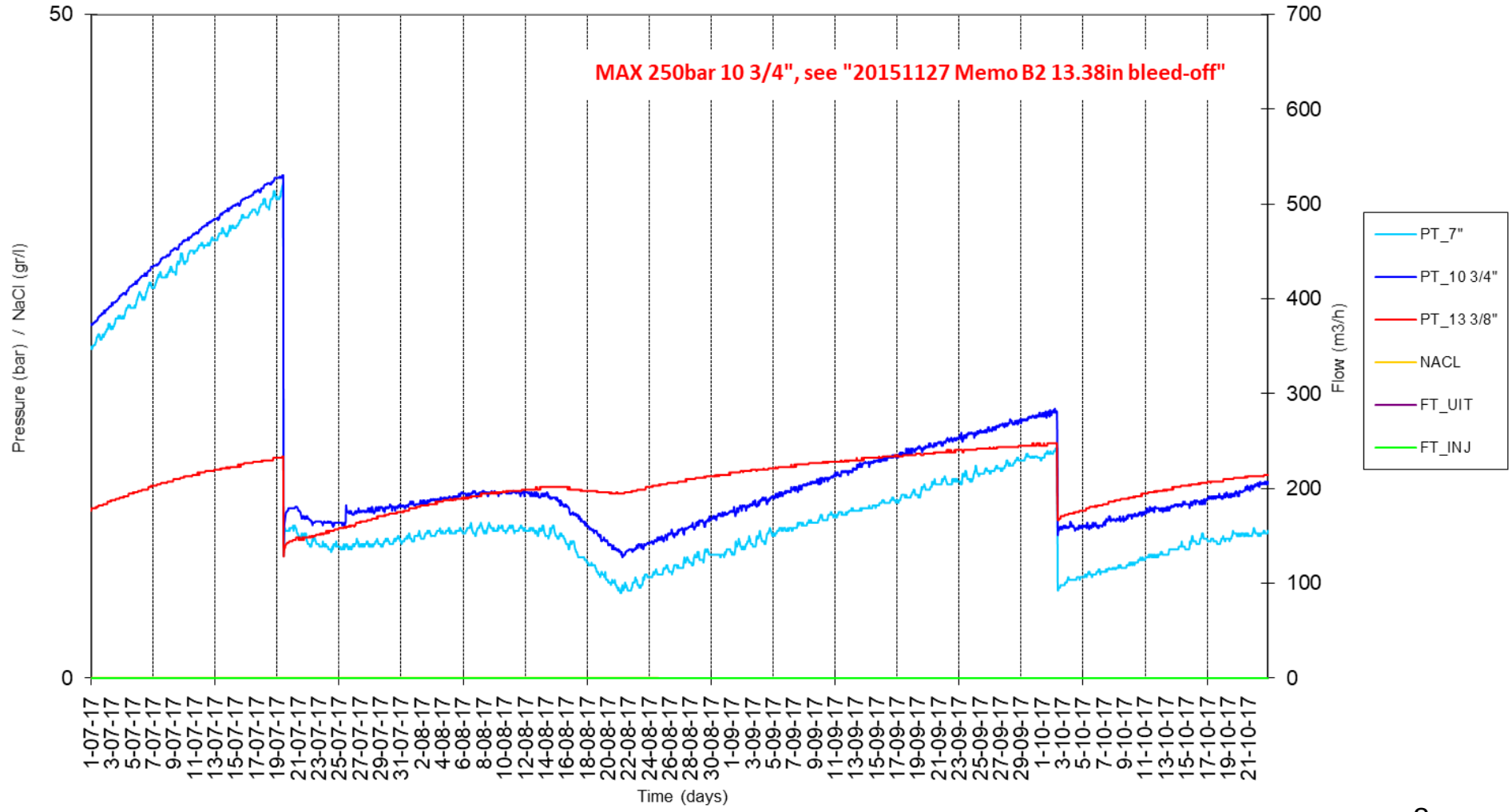
August 2017

11	Leaking needle valve
21	Closed leaking needle valve

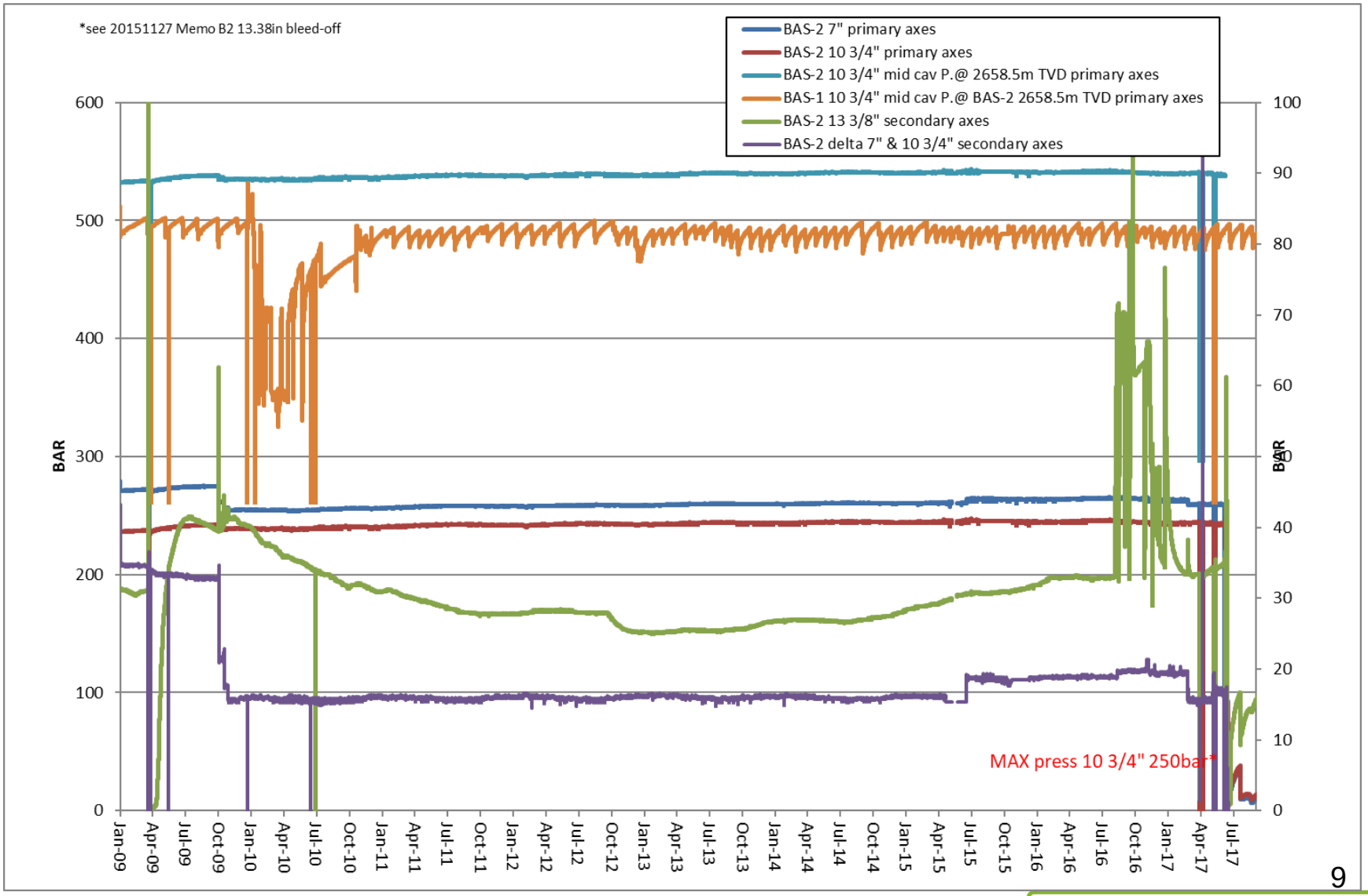
September 2017

BAS-2

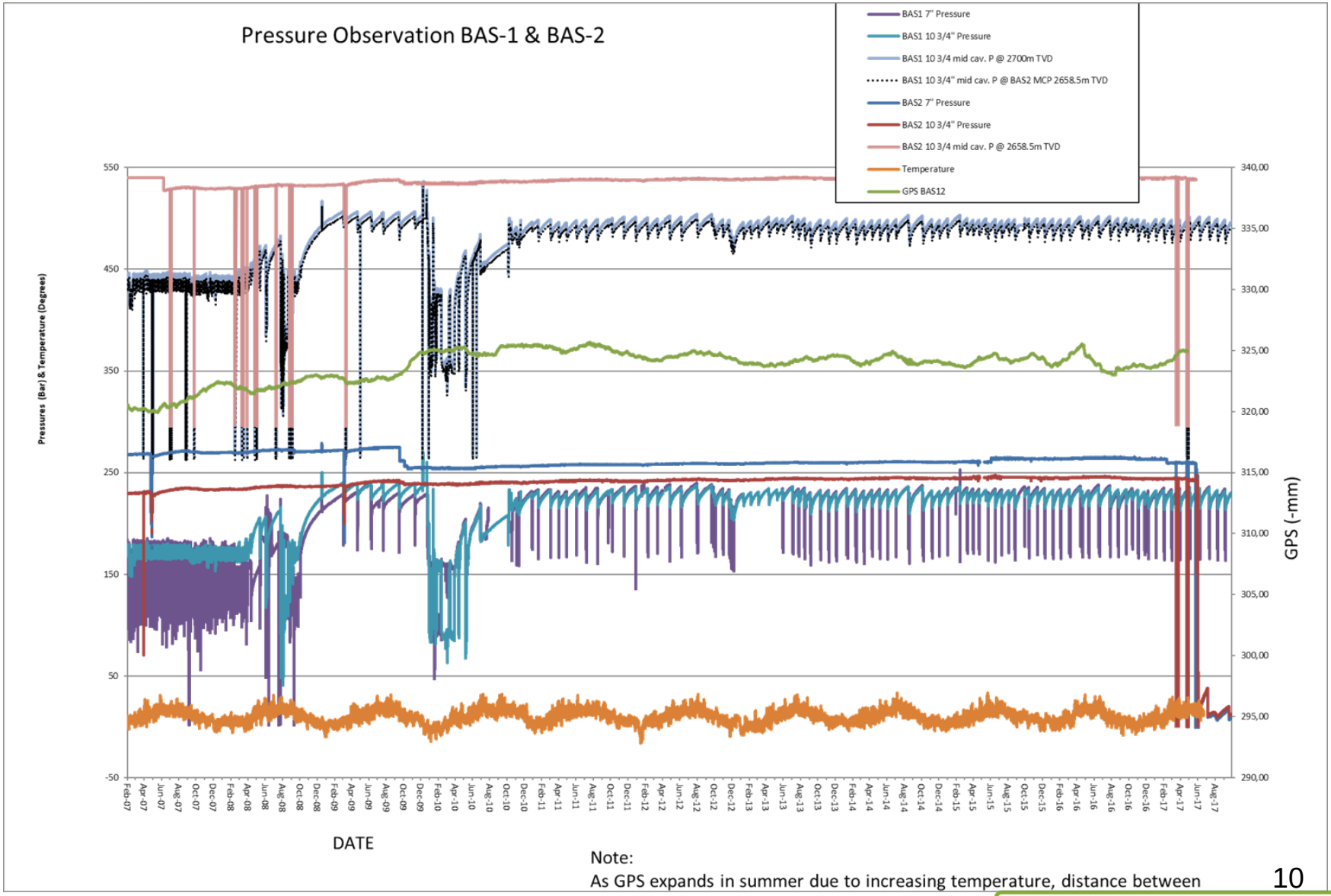
Trends BAS-2



BAS-2

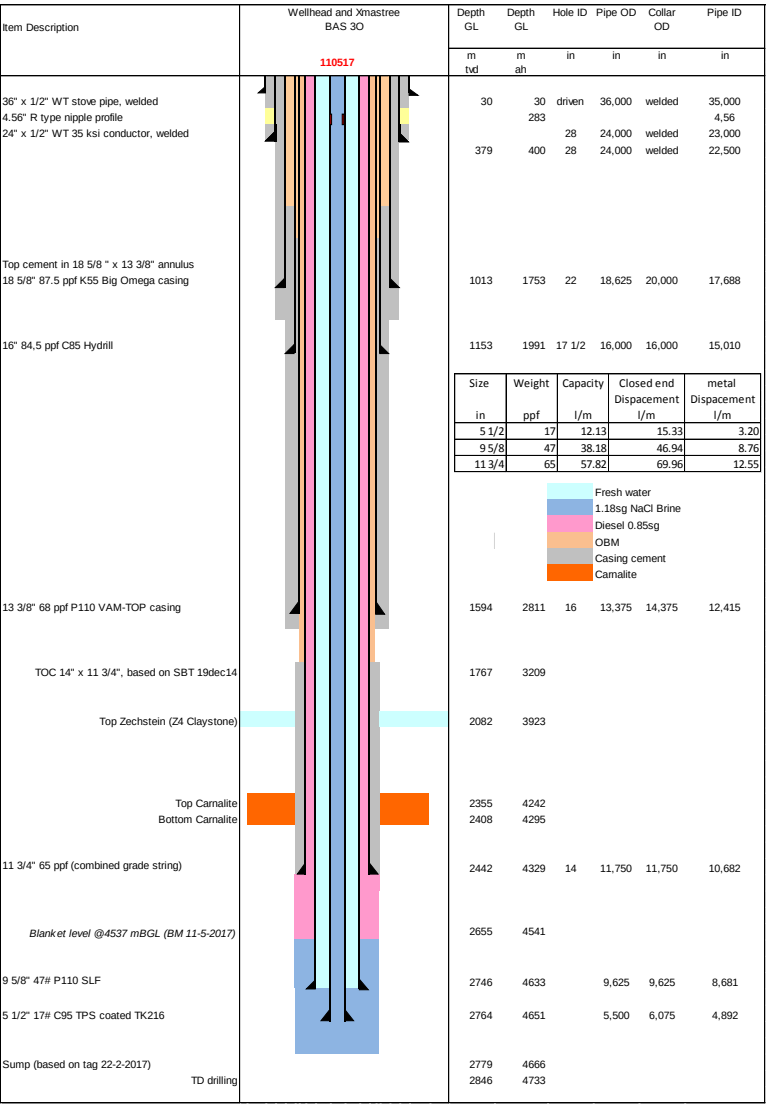


BAS-1&2



Offset BAS-12: ±460 m.

BAS-3 Original



Status

- Top injection mode since May 2016
- Last echo measurement in May 2017, measured cavern volume: 338.144 m^3
  - Estimated cavern volume October 2017: 462.000 m^3

Planned

- Continue top injection mode
- Blanket measurements every 4-8 weeks
- Workover → Change configuration inner/outer leaching string May 2018 for prolonged bottom injection mode

BAS-3O

July 2017

19	Wireline blanket measurement and factory boil-out
20	Injection stop due to pressure loss of pump
25	Injection stop due to blocked filter
28	Injection stop due to maintenance of pump

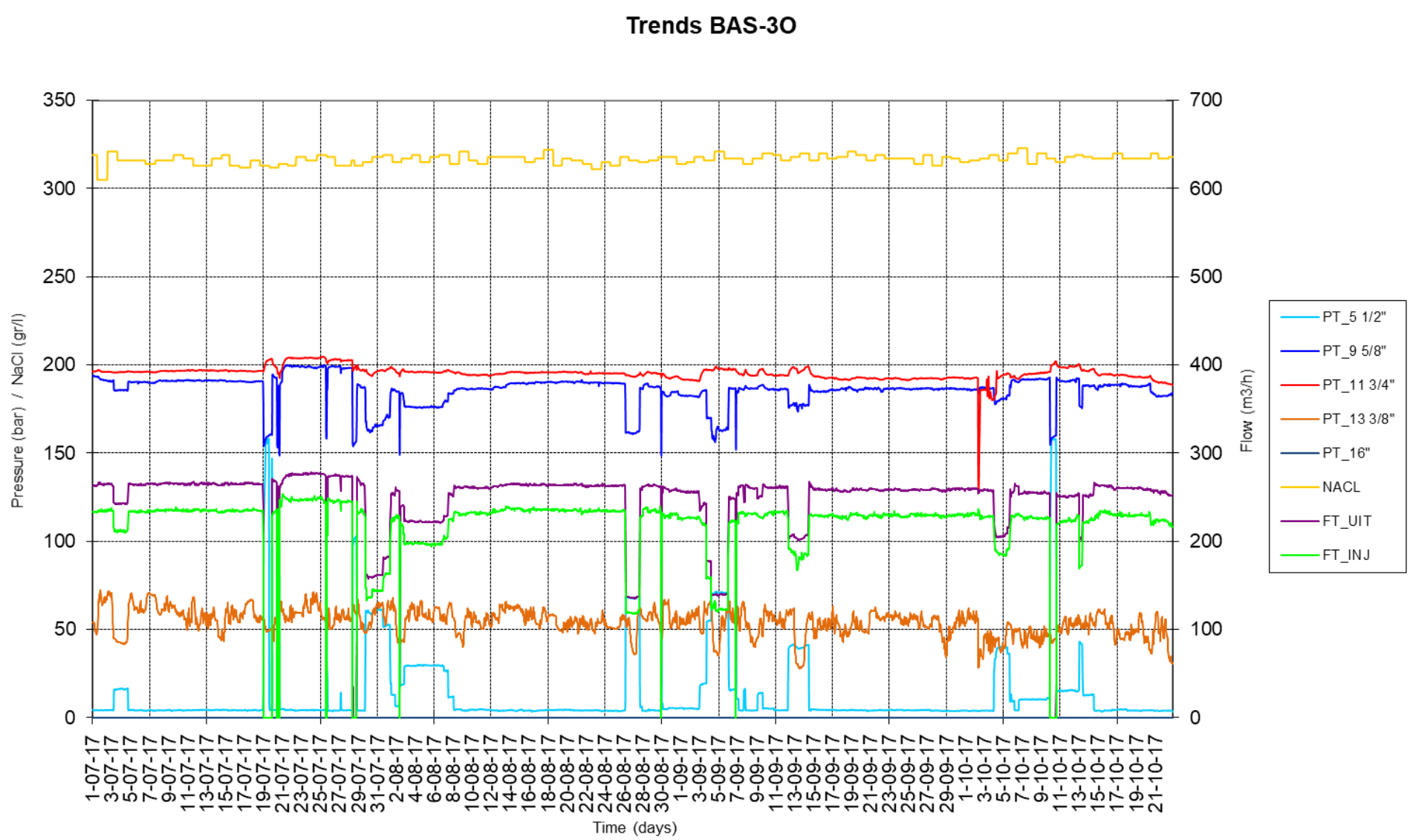
August 2017

2,29	Injection stop due to blocked pump filter

September 2017

6	Injection stop due to conservation of fresh water at factory

BAS-3O



BAS-4

Nr.	Item Description	Depth GL m tvd	Depth GL m ah	Hole ID in	Pipe OD in	Collar OD in	Pipe ID in
	Wellhead and Xmastree BAS 4						
	11052017						
1	28" x 1" X 52E conductor shoe	15	15	driven	28,000	welded	28,000
2	7" 29 ppf N80 VAM TOP inner leaching string, internally coated	139	139				
3	7" 26 ppf L80/N80Q VAM TOP inner leaching string, internally coated	168	168				
4	7" 29 ppf N80 VAM TOP inner leaching string, internally coated	405	405				
5	24" x 1/2" WT 35 ksi conductor, welded	279	279	26,00	24,000	welded	23,000
6	7" wireline profile 5.75" Otis 'RPT'	778	778				5,75
7	Top cement in 18 5/8 " x 13 3/8" annulus	916	916				
8	18 5/8" 87.5 ppf K55 Big Omega casing	1126	1126	22,00	18,625	20,000	17,688
	Freshwater						
	Brine 1.18 s.g.						
	Diesel 0.85 s.g.						
	Drilling Fluid						
	Casing cement						
	Carnalite						
9	13 3/8" 68 ppf P110 VAM-TOP casing	1980	1980	16,00	13,375	14,375	12,415
	Base of Carnalite	2382	2382				
10	14" heavy wall VAM TOP 106 ppf N80	2410	2410	16,00	14,000	14,000	12,500
	EM (Oct 2015, Roof = 2478m)						
	Mar 2012, Not possible to inject more diesel below 2496m ->indicating leak at that point in 11 3/4" connection.						
	BM 21-02-2017, (2472,5 m)	2473	2473				
11	11 3/4" 65 ppf VM 80HC, VAM FJL outer leaching string, internally coated	2508	2508	17 1/2"	11,750	11,965	10,682
	Observed HUD in 7" with Camera (11-May-2017)	2509	2509				
12	*29-9-2016: observed unusual CCL and inclination results (0-3 degrees) from 2530m to 2543m*	2530	2530				
13	7" 26 ppf N80 VAM TOP inner leaching string, internally coated.	2636	2636	17 1/2"	7,000	7,375	6,276
	Sump level Oct 2015 (EM)	2653	2653				
	Total Depth Cavern	2810	2810				

* All depths are from ground level

Remarks

- Leaking 'pekelleiding' repaired
  - Production restarted on the 20th of July after approval SodM
- Production to fit factory requirements
- HUD observed during WL operations
  - No access to cavern
- Last (partial) sonar measurement on 7 October 2016. Estimated volume: 880.567 m^3
- Current cavern volume (volume balance): 976.500 m^3

Planned

- Continue bottom injection mode
- Workover October 2017, incl.
  - Sonar measurement
  - Blanket measurement (every 6 months)
- Increase back-pressure

BAS-4

July 2017

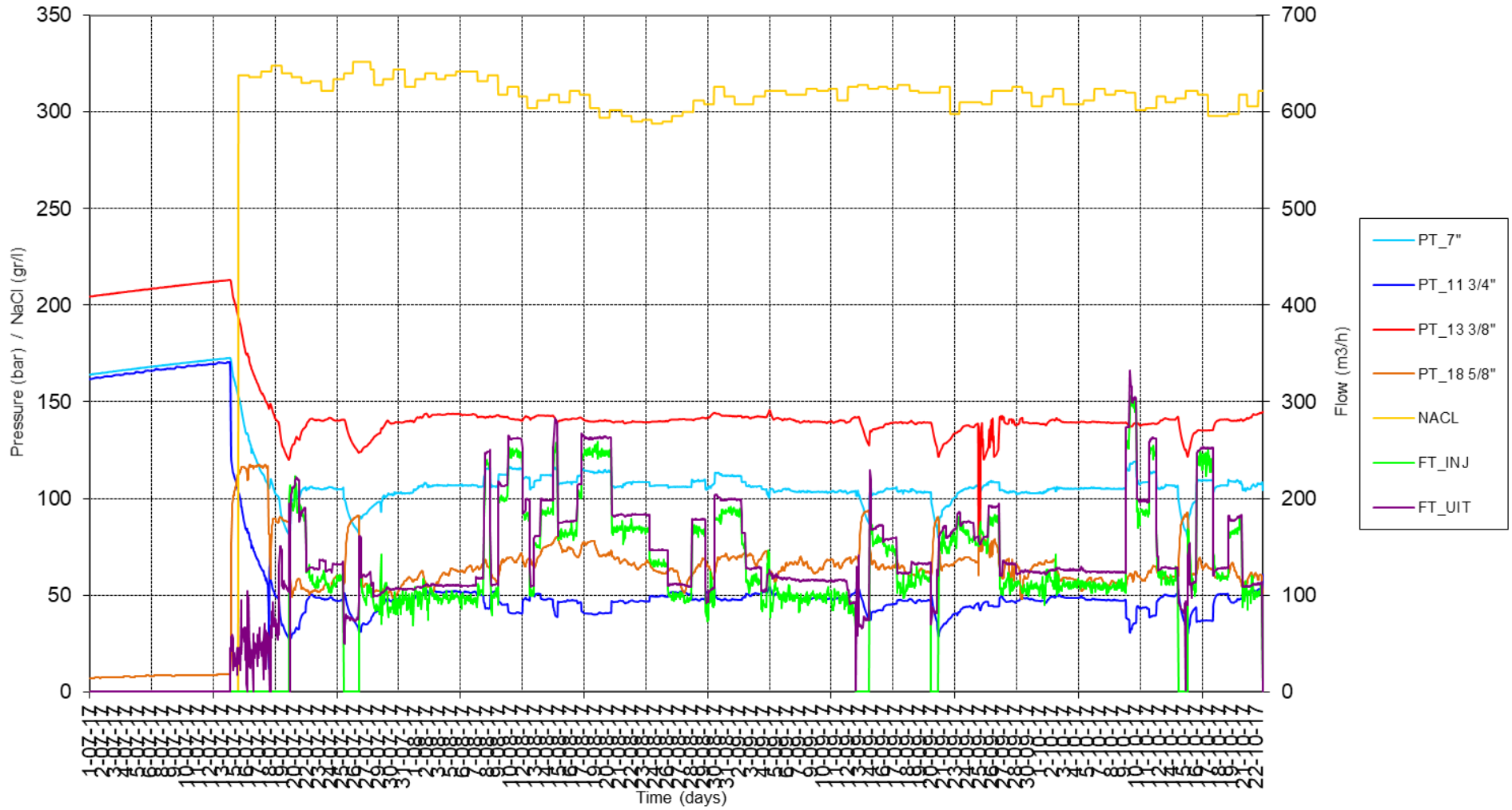
1-14	Production / injection stop due to repair on brine flow line
14-20	Pressure bleed-off to restart production
18	Partial blockage in production annulus due to high salt concentrations. Production annulus was counter flushed with fresh water
20	Restart production
26	Injection stop due to maintenance on injection pump

August 2017

September 2017

13, 20	Injection stop due to pump shut down

BAS-4



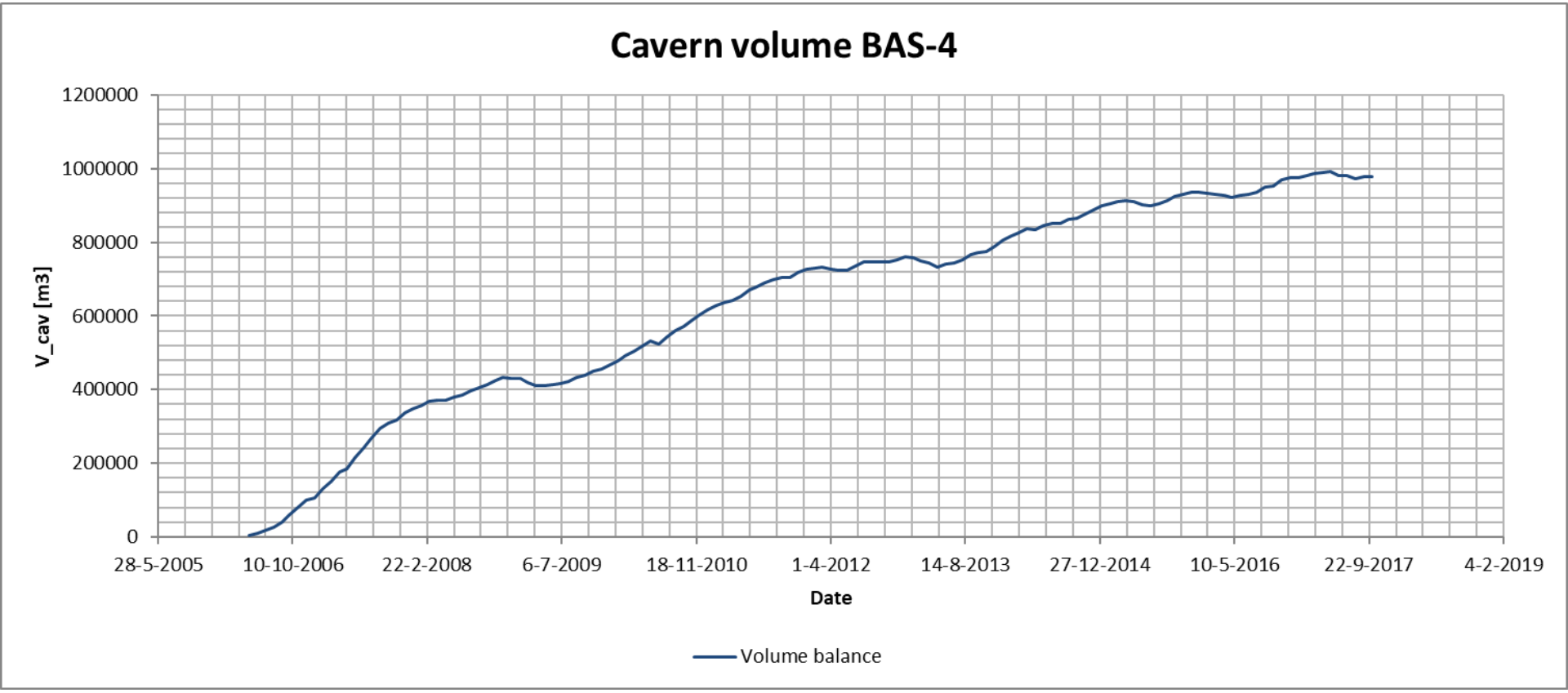
BAS-4
Cavern end volume

Concerns SodM (letter to Frisia: 28-8-2017)

- Larger cavern end volume of 1,3 mil m^3 (winningsplan Barradeel II states indicative end-volume of: 0,5 mil m^3 to 1,0 mil m^3)

- Significant change in mining method from squeeze mining at steady state cavern volume to solution mining with growing cavern volume.

Volume balance BAS-4



BAS-4 Cavern Pressures

- Mid cavern pressures
  - BAS-3O: 412 bar (1,53 s.g.)
  - BAS-4 current: 347 bar (1,38 s.g.)
  - BAS-4 planned: 397 bar (1,58 s.g.)

- Limited Leak-off test LCC BAS-4
  - 2,0 s.g.

Waterpassing

M&R

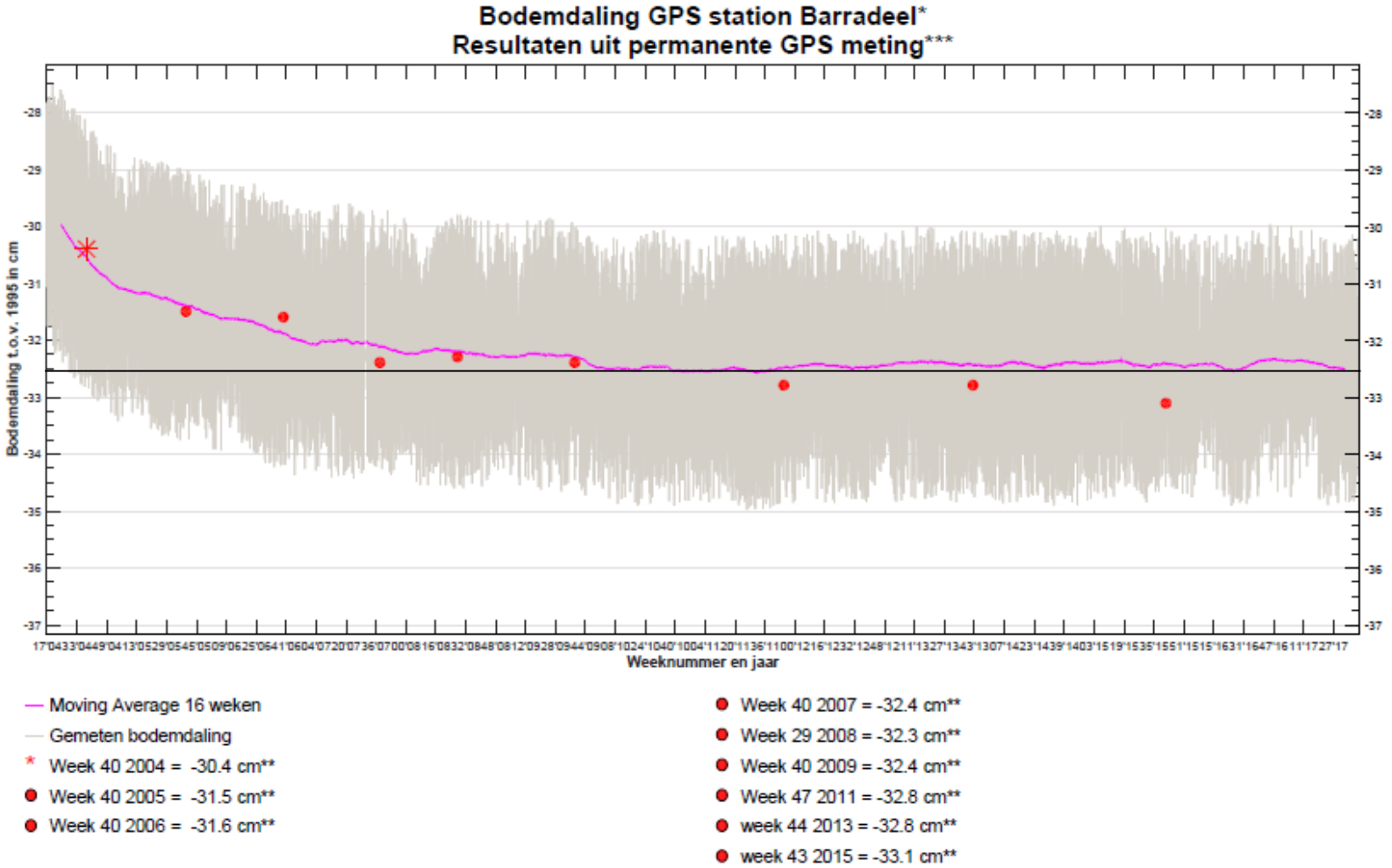
- Addendum autonome bodemdaling bij uitvoering beeheerscyclus M&R protocol 2015
  - BAS-12 ±1.0 mm/year
  - BAS-3O ± 2.8 mm/year
  - BAS-4 ± 0.7 mm/year.
- Next measurements October / November 2017

- **Subsidence winningsplan:**

	BAS-3O	**BAS-4**
Winningsplan (Barradeel II):	300 mm	300 mm
Current GPS:	157,5 mm	275,5 mm
Subsidence above the cavern:	177,0 mm	278,5 mm
Subsidence / year current*:	5,1 mm/y	15,0 mm/y

** Based on full previous year*

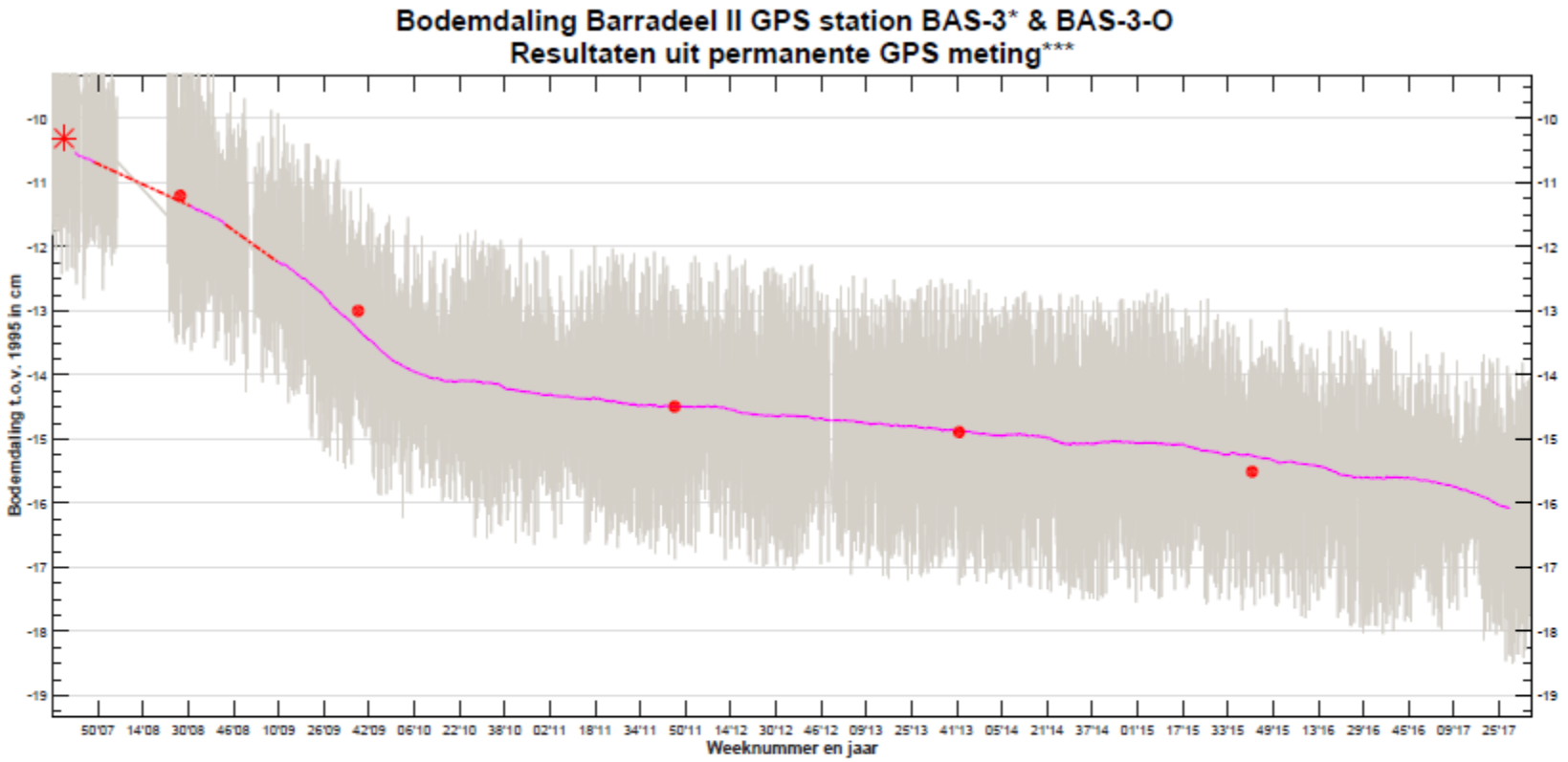
GPS BAS 1/2



* Op basis van WEP Analyse WP 2015 bedraagt in 2015 daling van diepste punt in winningsvergunning Barradeel 1,65 cm meer dan daling van GPS-station Barradeel.
** Daling GPS station berekend uit "best fit' dalingskommen. (ref. WP 2015 Zweins, glijdende PM, 3 kommen v1.2- Dkrit 13 mm, gamma 4,3)
*** GPS is een relatieve meting tussen station Barradeel en het station te Zweins. De relatieve GPS meting is gekoppeld aan de abolute daling vastgesteld in WP 2004 (rode ster)

Bleed-off volume BAS-1: 29.500 m^3 since Jan 2011

GPS BAS 3/3O

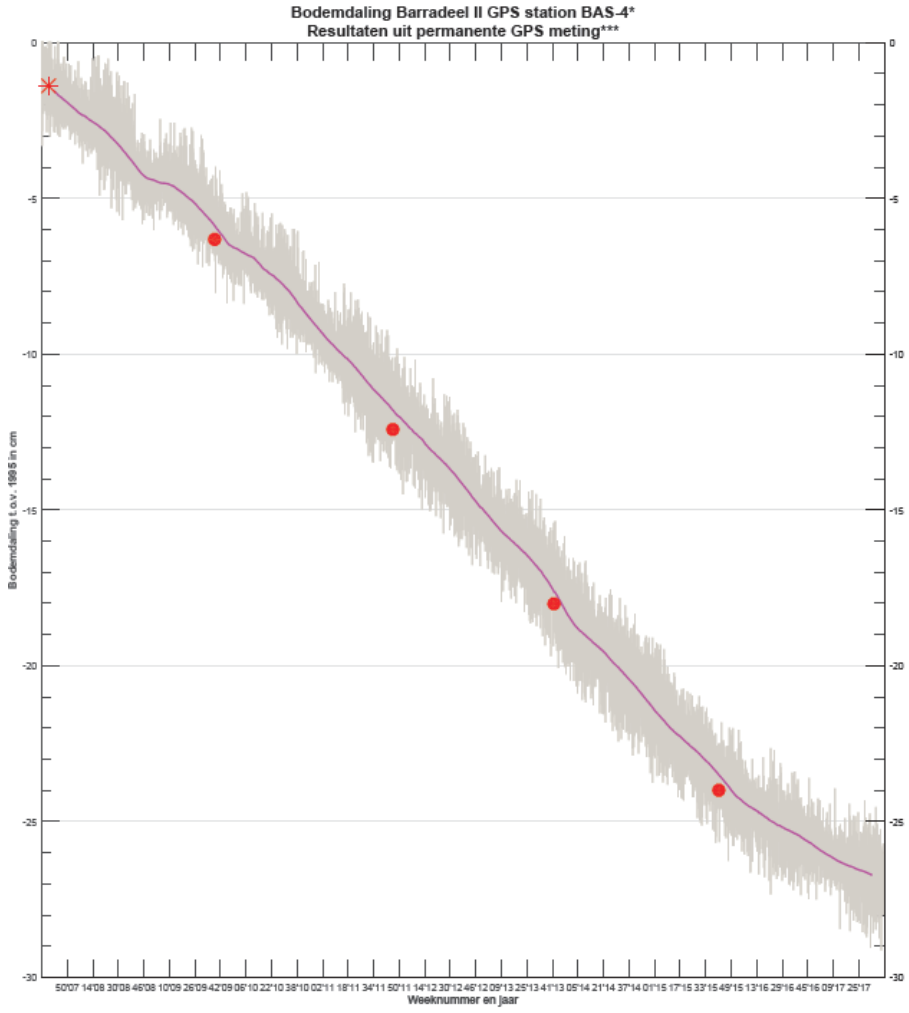


* week 40 2007 = -10.3 cm**
week 29 2008 = -11.2 cm**
week 40 2009 = -13.0 cm**
week 47 2011 = -14.5 cm**
week 44 2013 = -14.9 cm**
week 43 2015 = -15.5 cm**

Gemeten bodemdaling
uitval verbinding
Moving Average 16 weken

* Op basis van WEP Analyse WP 2015 bedraagt in 2015 bodemdaling boven caverne BAS-3 1,95 cm meer dan daling van GPS-station BAS-3.
** Daling GPS station berekend uit 'best fit' dalingskommen. (ref. WP 2015 Zweins, glijdende PM, 3 kommen v1.2- Dkrit 13 mm, gamma 4,3)
*** GPS is een relatieve meting tussen station BAS-3 en het station te Zweins. De relatieve GPS meting is gekoppeld aan de abolute daling vastgesteld in WP 2007 (rode ster)

GPS BAS-4



* Op basis van WEP Analyse WP 2015 bedraagt in 2015 bodemdaling boven caverne BAS-4 0,3 cm meer dan daling van GPS-station BAS-4.

** Daling GPS station berekend uit "best fit' dalingskrommen. (ref. WP 2015 Zweins, gijdende PM, 3 krommen v1.2- Dkrit 13 mm, gamma 4,3)

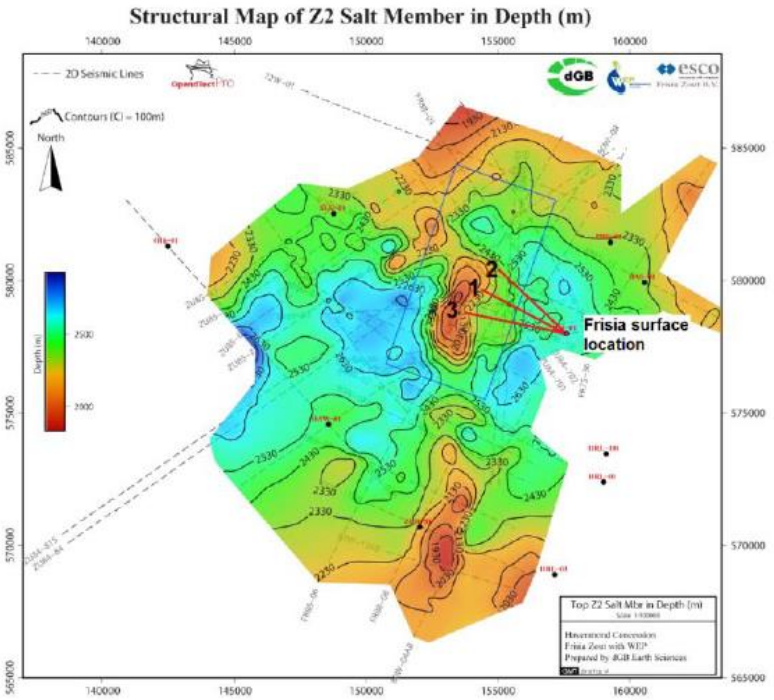
*** GPS is een relatieve meting tussen station BAS-4 en het station te Zweins. De relatieve GPS meting is gekoppeld aan de absolute daling vastgesteld in WP 2007 (rode ster)

GPS logbook

28-08-2017	*Alle*	*Storing station Zweins, 28-08-2017 09.00 uur t/m 29-08-2017 12.00 uur.*

Havenmond

- Nulmeting can start, install poles Q1 2018, licenses recieved
- Geological study by dGB
- Alternative blanket fluid, under investigation
- Finalize engineering end 2017
- Start drilling end 2018



Special topics

- Update M&R 2015 submitted
  - Addendum I submitted to SodM
  - Addendum II submitted to SodM, meeting to be scheduled to discuss
- M&R 2017 measurements ongoing
- Investigation into injection Frimakal into BAS-1
- Frisia self-assessment (“*gushing wells”*) submitted to SodM 23oct17
- RiskID zoutindustrie is ontvangen

WVTTK

Next meeting 9th of January 2018, 10:00-15:00 SODM