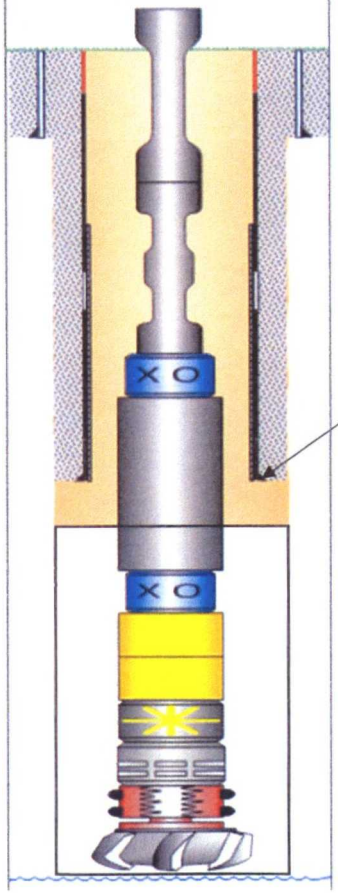
North Thistle 34 State Com 1H
Timeline and Explanation of Events

MD (ftKB)	TVD (ftKB)	Incl (°)
		0.0
24.9	24.9	0.1
29.5	29.5	0.1
200.1	200.1	0.4
413.7	413.7	0.9
1,390.1	1,389.9	0.6
1,390.4	1,390.3	0.6
1,391.7	1,391.6	0.6
1,408.5	1,408.3	0.7
1,417.0	1,416.8	0.7
1,433.1	1,432.9	0.7
1,435.0	1,434.9	0.7
1,444.9	1,444.7	0.8
1,710.6	1,710.4	1.0
1,713.3	1,713.1	1.0
1,744.4	1,744.2	1.0
1,778.2	1,778.0	0.9
1,781.8	1,781.6	0.9
1,788.7	1,788.5	0.9
1,818.6	1,818.4	0.9
1,819.9	1,819.7	0.9

Vertical schematic (actual)



13-3/8" Surface casing set at to cover fresh water bearing Rustler formation.

Surface Shoe set at 1,435'. Performed FIT to 11.0 ppge

9/3/15 @ 22:00 hrs
Encountered Flow at 1,820'.
Shut in Drillpipe Pressure: 585 psi
Calculated KWM = 16.0 ppge
Suspected H2S kick. Circulated utilizing drillers method and confirmed to be water flow.

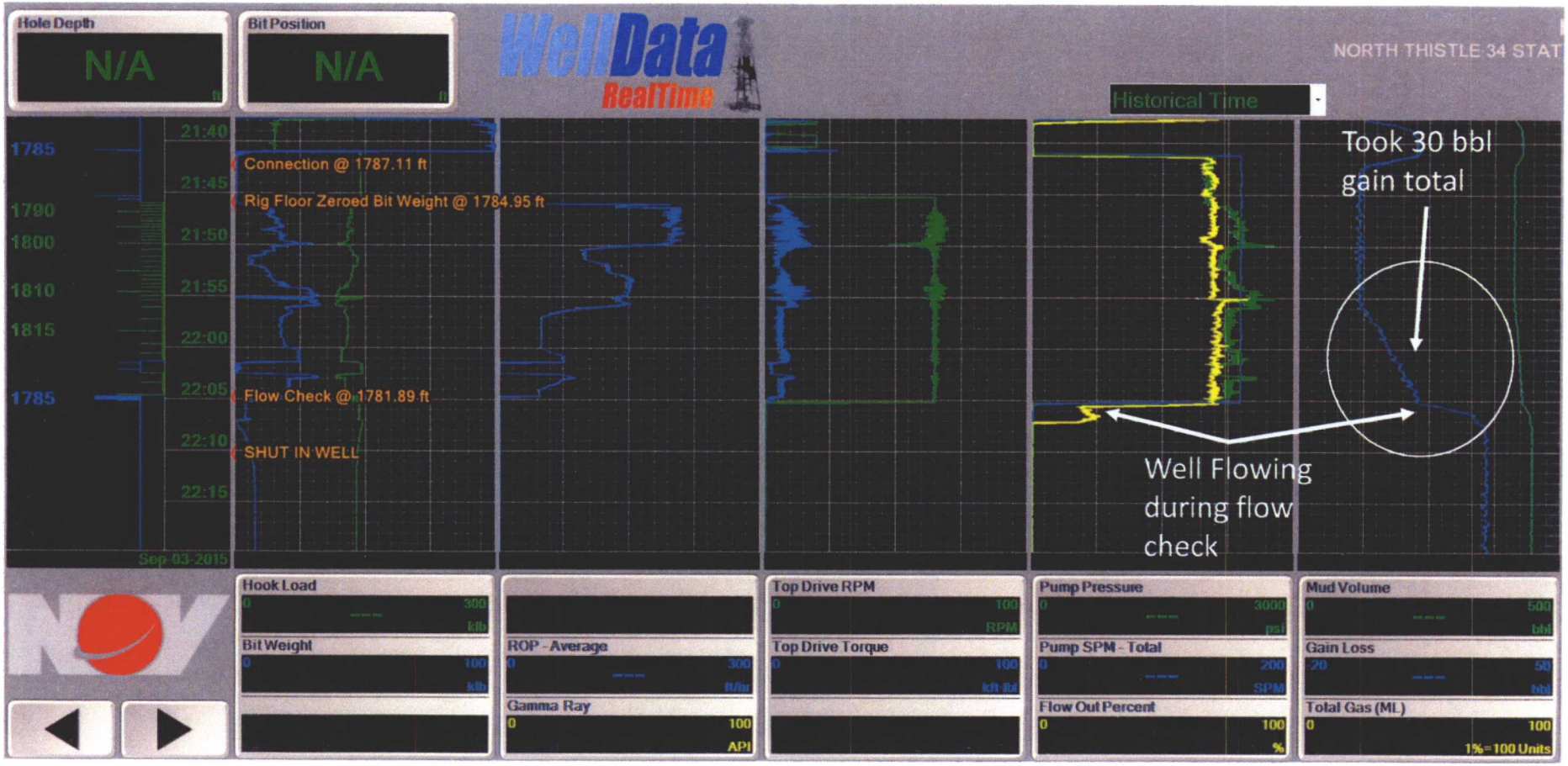
Confirmed Oxy SWD was shut in at time of kick with tubing pressure of ~620 psi

Hydrostatic Balance

At Time of Initial Kick (9/3/15 22:00)			
	Devon North Thistle	**Oxy SWD**	**Comments**
Surface Pressure, psi	585	620	Shut in pressure observed by PIC
Fluid Weight, ppg	9.8	9.4*	*Estimated injection fluid weight with specific gravity of 1.13
Depth of Interest, ft	1820	1820	
Pressure at Depth of Interest, psi	1512	1510	Utube calculations balance for both wells, suggesting they may be in communication
Equivalent Mud Weight at Depth of Interest	15.98	15.95	

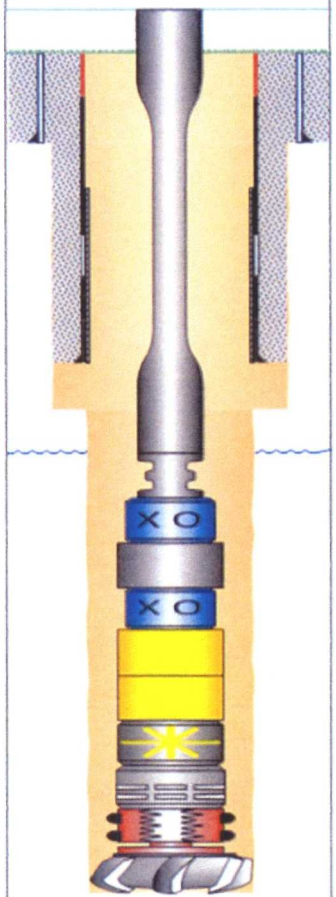
Bottomhole Pressure (psi) = Depth (ft, TVD) x .052 x Fluid Weight (ppg) + Surface Pressure (psi)

Equivalent Mud Weight = Bottomhole Pressure (psi)/(.052 x Depth(ft))


Hole Depth
N/A
Bit Position
N/A
WellData
RealTime
NORTH THISTLE 34 STAT
Historical Time
1785
1790
1800
1810
1815
1785
21:40
21:45
21:50
21:55
22:00
22:05
22:10
22:15
Connection @ 1787.11 ft
Rig Floor Zeroed Bit Weight @ 1784.95 ft
Flow Check @ 1781.89 ft
SHUT IN WELL
Sep-03-2015
Took 30 bbl
gain total
Well Flowing
during flow
check
Hook Load
Bit Weight
ROP - Average
Gamma Ray
Top Drive RPM
Top Drive Torque
Pump Pressure
Pump SPM - Total
Flow Out Percent
Mud Volume
Gain Loss
Total Gas (ML)
1%=100 Units

North Thistle 34 State Com 1H
Timeline and Explanation of Events

MD (ftKB)	TVD (ftKB)	Incl (°)	Vertical schematic (actual)
0.0	0.0	0.0	
24.9	24.9	0.1	
29.5	29.5	0.1	
200.1	200.1	0.4	
1,390.1	1,389.9	0.6	
1,390.4	1,390.3	0.6	
1,391.7	1,391.6	0.6	
1,433.1	1,432.9	0.7	
1,435.0	1,434.9	0.7	
1,444.9	1,444.7	0.8	
3,588.6	3,588.2	1.3	
4,583.7	4,582.9	2.9	
4,591.9	4,591.1	2.9	
4,885.8	4,884.7	2.8	
4,888.5	4,887.3	2.8	
4,919.3	4,918.1	2.7	
4,953.1	4,951.9	2.7	
4,956.7	4,955.5	2.7	
4,963.6	4,962.4	2.7	
4,993.4	4,992.2	2.6	
4,995.1	4,993.8	2.6	



<u>9/6/15 @20:30 hrs (3,398' – 3,504')</u>

Drilled ahead holding back pressure on choke to hold back flow with a 14.0 ppg MW. PIC noted that the required backpressure increased by ~200 psi. Decision made to increase mud weight to 15.0 ppg to decrease surface pressure on rotating head.

<u>Morning of 9/7/15 (Exact times undocumented)</u>

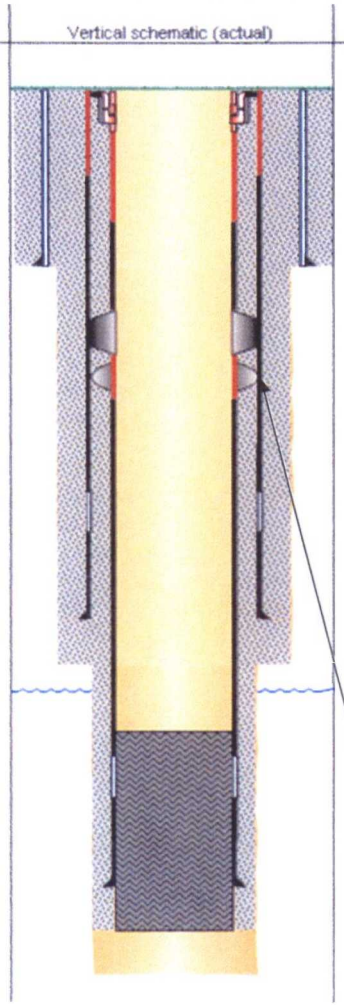
PIC visited OXY SWD and determined that the well had begun injecting. Around 9 am Kyle Johnson called oxy emergency line and requested the SWD to be shut in. Oxy complied and agreed to shut in the well. Exact shut in time of the SWD is unknown.

<u>9/7/15 @ ~13:00 hrs</u>

PIC noted that required backpressure was decreased by ~200 psi.

North Thistle 34 State Com 1H
Timeline and Explanation of Events

MD (ftKB)	TVD (ftKB)	Incl (°)
24.9	24.9	0.1
26.6	26.6	0.1
29.5	29.5	0.1
30.5	30.5	0.1
200.1	200.1	0.4
1,340.6	1,340.4	0.7
1,342.8	1,342.7	0.7
1,367.8	1,367.6	0.6
1,390.1	1,389.9	0.6
1,390.4	1,390.3	0.6
1,391.7	1,391.6	0.6
1,433.1	1,432.9	0.7
1,435.0	1,434.9	0.7
1,444.9	1,444.7	0.8
4,926.8	4,925.7	2.7
4,927.2	4,926.0	2.7
4,928.8	4,927.6	2.7
4,973.8	4,972.5	2.7
4,975.1	4,973.8	2.7
4,982.0	4,980.7	2.7
4,995.1	4,993.8	2.6



9/7/16 – 9/11/2016

Drilled well to revised TD of 4,985' while continuing to hold back pressure. Final mud weight was 15.3 ppg. We then stripped the bottom hole assembly out of the well. While running 9-5/8" casing, we were unable to control the well with mud weight alone. After a few attempts, we allowed the well to flow ~1400 bbl of saltwater during the casing run which took approximately 10 hours.

9/11/2016

The well was cemented with cement to surface and an external casing packer was placed inside of the Surface casing at 1,342' to provide additional isolation, as discussed and approved with the NMOCD office

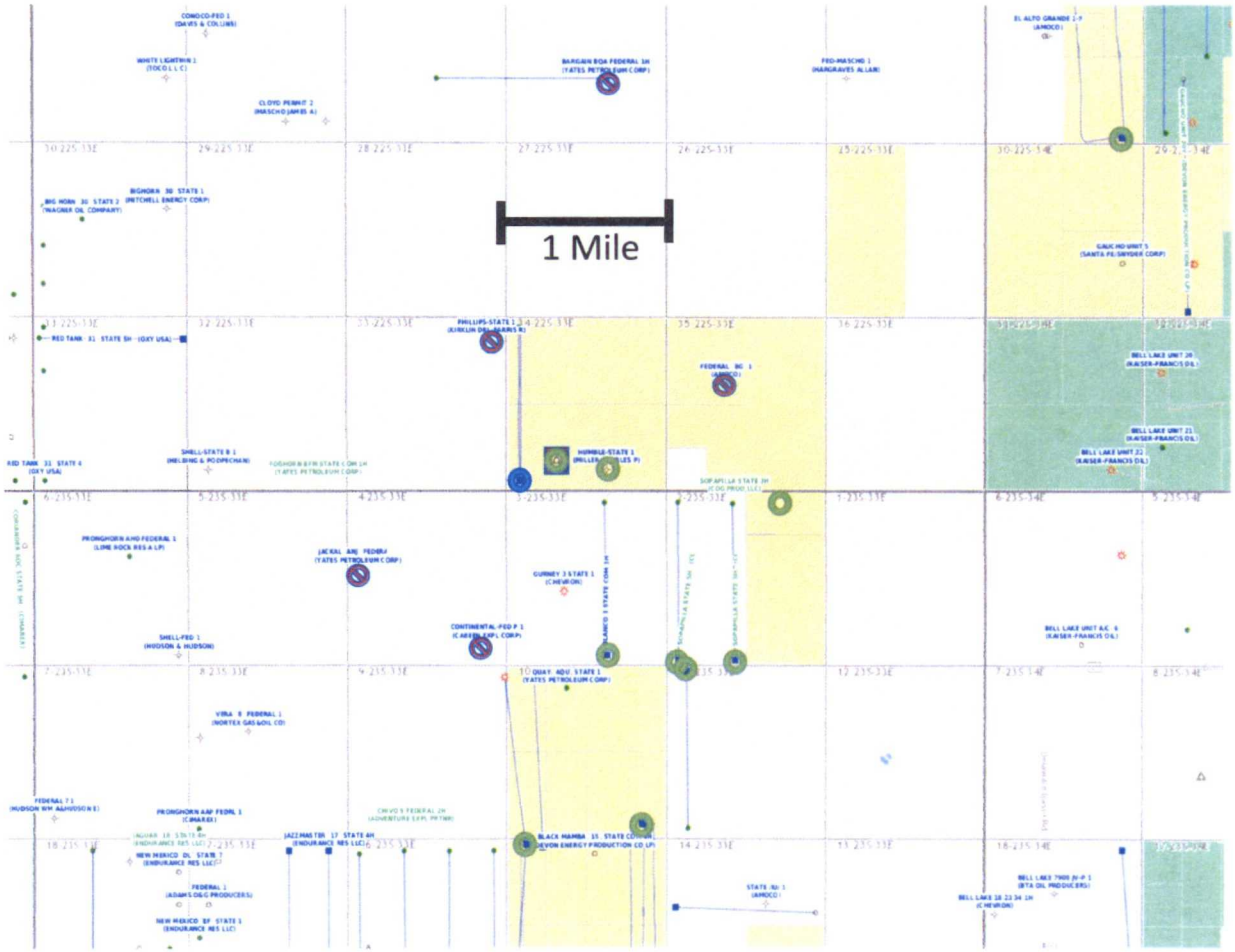
DV Tool & External Casing Packer. DV Tool cancelled due to getting good weight cement to surface

North Thistle 34 State Com 1H
Nearby Offset Mud Records

Surface Hole Legend

- Oxy Disposal Well
- North Thistle 34 State 1H
- Mud Records Not Accessible
- Mud Records Available

1 Mile



- No abnormal pressure, flows, or mud weights in excess of 10.4 ppg found in interval of 1400' to 5300' after reviewing available mud records in the adjacent sections.

Offset Review – Post Incident

- Reviewed all available well data within the surrounding sections of Section 34, including the Oxy Diamond SWD and nearby Humble State 1H data provided by Oxy
  - No abnormal water flows or pressure encountered on any of the wells reviewed
  - The Oxy Diamond SWD was drilled in 1996 Mud weight for the interval did not exceed 10 0 ppg according to reports No water flows were noted
  - Openhole log header of the Humble State 1H (Taken in 1964) in the same section shows a max 10 4 ppg MW for the openhole section of 363' to 5300' No water flows noted
- Research suggests that the shallow waterflow/pressure hazard did not exist prior to 1996 and was created after the SWD began injecting
- A further review of Devon drilled wells did not find any similar instances of water flows or abnormal pressure not related to H2S or air pockets
  - 163 wells review
  - 6 Township and Range Blocks T22 &23S + R32,33,34E (216 Section area)

Drilling Concerns

- North Thistle 34 State Com 1H
  - Sustained pressure on surface casing shoe from continued injection could result in surface casing or cement failure, causing
    - Contamination of protected fresh water zones (Base of Rustler at 1,410' TVD)
    - Uncontrolled release of water flow to surface
  - Temporarily canceled 2nd planned well on this pad due to hazard
- Future Development Wells in the Section
  - Added costs to deal with water flow and pressure
  - Additional Safety and Environmental Risks
    - Experience on this well indicates a surface shoe FIT of ~17 0 ppg would be required to drill ahead safely
  - Geographic extent of drilling hazard is unknown within at least 1 mile