

Casing and Cementing Plan
 Oakford Storage Field, Dominion Transmission, Westmoreland County, PA

Well Name: Fatur 11H (repermit) Storage Zones Penetrated: Fifth Sand, Dominion Oakford Field
 Location: Salem TWP, Westmoreland Co, PA Engineer:
 Prospect: Marcellus Shale Rig:
 Coords: (NAD83) Elevation:
 API: 911 Address: 617 Church St., Delmont PA 15626



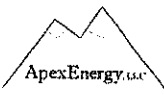
Formation	TVD	MD/Casing Set Depth	Hole Size	Casing	Cement	Centralizers & Wellbore Conditioning
Fresh Water	50'	50'		New 20" Conductor	Ready mix to surface	
Fresh Water (determined by offset wells)	725'	775'	17-1/2"	New 13-3/8" 54.5# J-55 BTC, 12.615" ID, .380" WT, 2,730 psi Burst	15.6 ppg Class A (1.19 cf/sk, 500 sks estimated) to surface (Additives: Antifoam Agent, LCM, Accelerator)	Cent - Above Shoe, Every 3rd jt to surface Load casing w/ water and circulate to surf, start cmt after circ established.
Murrysville Sand	1885'-2015'	2725'	12-3/8"	New 9 5/8" 36# J-55 LTC, 8.921" ID, .352" WT, 3,520 psi Burst	15.4 ppg Lead Class A to surface (1.25 cf/sk, 650 sks estimated), 15.9 ppg Tail Class A 300' above Murrysville Sand (1.14 cf/sk, 175 sks estimated) (Additives: Dispersant, LCM, Antifoam, Fluid Loss Add., Retarder)	Cent. 1st (10) jts then every 3rd jt. Swellable seals above storage zone & surface csg shoe. Load casing w/ water and circulate to surf, circ several times and start cement.
Fifth Sand (Storage Zone)	2515'-2575'					
Elk Group	5190'		8 3/4"			
Geneseo Tully	7410' 7431'		8-3/4"	New 5-1/2" 20# or 23# P-110 Premium Thread, 4.778"/4.67" ID, .361"/.415" WT, 12,640/14,520 psi Burst	Mudflush slurry 1 ppg over mud weight, 14.2 ppg Lead Class A f/ 30 deg Inc to 500' above 9-5/8" (1.32 cf/sk, 1250 sks estimated), 15.0 ppg Tail f/ TD to 30 deg Inc (1.23 cf/sk, 2975 sks estimated) (Additives: Retarder, Antifoam, Antisettling Agent, Fluid Loss, Extender)	Cent 1/jt in lateral & curve, then every 3rd jt up to +/-2000'. Once casing on bottom circ several bottoms up with mud, pump mudflush to clean wellbore and start cement.
Marcellus	7704'	(See Directional Plot - Casing to Total Depth)				
LP Target	7811' TVD	Vertical Section (See Directional Plot)				
Onondaga	7921'	No Pilot				

Black Print - Actuals
 Blue Print - Geology Estimates
 Red Print - Directional Estimates

Reviewed by: *Ronald Wade* 9/5/2018
 Dominion Transmission Date

WELL LOCATION PLAT
Page 4 Cross Section

Applicant/Well Operator Name Apex Energy, LLC	DEP ID# 307083	Well (Farm) Name Fatur Pad	Well # 11H
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Well Plan

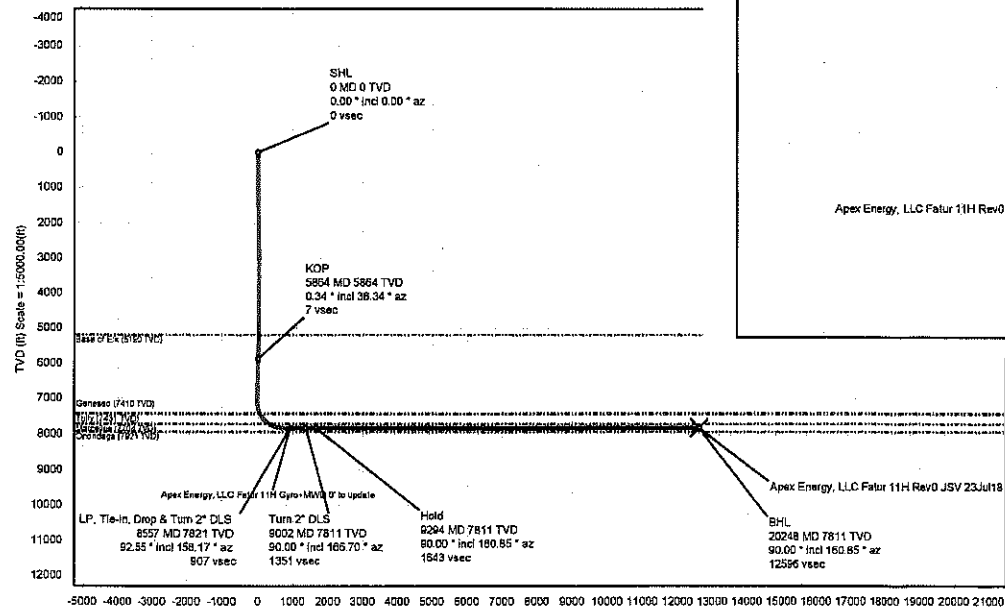
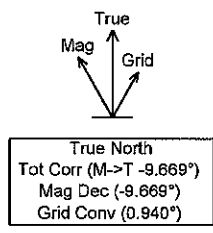
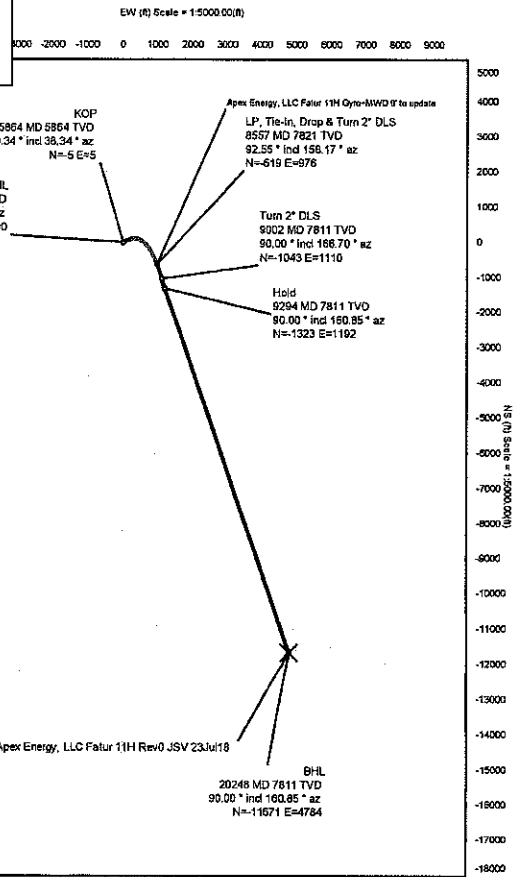
Operator Name: Apex Energy, LLC
Well/Farm name: Fatur Pad

DEP Use Only	Permit #
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Latitude Longitude
KOP: TVD: 5863.52 TMD: 5864.00 N 40° 25' 16.93" W 79° 33' 00.47"
Landing Point: TVD: 7821.27 TMD: 8557.00 N 40° 25' 10.86" W 79° 32' 47.91"

Notes:

Critical Point	MD	INCL	AZIM	TVD	VSEC	N(+)/S(-)	E(+)/W(-)	DLS
Base of Blk	5190.41	0.71	336.48	5190.00	14.19	-13.69	3.81	0.60
Genesee	7515.43	37.84	110.53	7410.00	55.80	97.57	451.08	11.35
Tully	7542.43	40.04	113.94	7431.00	67.03	91.14	466.77	11.35
Marcellus	7967.02	62.77	140.62	7704.00	341.77	-115.17	710.22	8.32
Tie-In, Drop & Turn 2" DLS	8557.00	92.55	158.17	7821.27	904.90	-619.02	975.90	
Turn 2" DLS	9002.01	90.00	166.70	7811.35	1349.19	-1042.76	1110.02	2.00
Hold	9284.28	90.00	160.85	7811.35	1640.95	-1323.27	1191.63	2.00
BHL	20247.62	90.00	160.85	7811.35	12594.29	-11670.77	4783.96	0.00
Onondaga	NaN			7921.00				



Vertical Section (ft) Azim = 160.72° Scale = 1:5000.00(ft) Origin = ON-S, OE-W



Apex Energy (PA), LLC Drilling Plan for Gas Storage Zones (Ref 78.87)

Well Name: Fatur 11H (repermit)

Storage Zone: Fifth Sand, Dominion Oakford Field

This plan will provide an over view of the drilling plan for the gas storage zone(s) located within the Dominion Oakford Storage Field. Apex Energy (PA), LLC entered into a Farmout Agreement with Dominion Transmission, Inc. on September 9th, 2014. The Farmout Agreement provided an Exhibit for "Gas Storage Protection Requirements for Marcellus Shale Wells" for which Apex is to consider and uphold during its drilling operations. Apex is obligated per this Farmout to respect all Dominion requirements and requests while drilling through either Oakford Storage Zone.

Apex has attempted to place pad and well permits so minimal contact with the storage zones occurs. In areas where topholes will penetrate an active storage zone we will operate as follows:

- Blow-out prevention equipment will be used and tested in accordance with Chapter 78, Section 72.
 - Blow-out prevention equipment (annular and pipe rams), rotating head, flare stack, and separation equipment will all be installed prior to drilling out of the surface casing string in preparation for the storage zone penetration.
 - Dominion is to provide up-to-date expected storage zone pressures based on drilling schedule and seasonal zone changes. Well control equipment will be sized appropriately per these figures.
 - No "Hard Shut-In" will be performed on the surface casing.
- Both storage zones will be drilled on air unless hole conditions require fluid.
 - Kill weight mud will be on standby and ready for use if needed.
 - In the event fluid is used, Dominion has provided recommended fluid parameters specific to each zone.

In the event gas is encountered it will be separated from the air/foam/mist returns and flared if necessary until the well

- is killed with fluid. If gas is encountered, drilling will stop and kill operations will commence immediately so that flared gas is at a minimum.

- Drilling will continue until the hole depth is approx. +/-150' below the bottom of the storage zone.
- If no gas is encountered, the hole will be drilled to total depth on air.
- The storage casing will be placed approximately +/-150' below the bottom of the storage zone.
 - The string will contain centralizers as per the Casing & Cementing Plan.
 - Swellable seals will also be placed (1 above the storage zone and 1 above the surface csg shoe).
 - Fluid will be circulated long enough to ensure there is no gas present in the wellbore before cementing operations begin. Fluid will also be checked for proper parameters at regular intervals during circulation to ensure properties are constant.
 - Cement will be placed from total depth to the surface on every storage string (Murrysville or Fifth Sands).
- Cement integrity will be confirmed prior to drilling out of the storage casing string.
 - Apex will wait on cement for 24 hours after landing the plug. At this time we will run a Cement Bond Log to verify cement integrity. We will send Dominion the cement bond log and verify that the log meets their standards before we proceed with any further drilling operations.

Reviewed by:

Ronald L. Walsh
Dominion Transmission

9/15/2018
Date

PROPOSAL TO DRILL WITHIN DOMINION TRANSMISSION STORAGE FIELD

FIELD/ZONES: Fifth Sand, Dominion Oakford Field

WELL NAME: Fatur 11H (repermit)

TWP/COUNTY/STATE: Salem TWP, Westmoreland Co, PA

Submitted by: 
Minh Nguyen, VP of Operations
Apex Energy (PA), LLC


Date August 31, 2018

Approved by: _____

Date _____

Approved by: 

Date 9/5/2018

Approved by: 

Date 9/5/2018

Dominion Transmission

Comments:

Apex Energy has submitted this Casing & Cementing Diagram and Drilling Plan to Dominion Transmission for review. This signed document acknowledges that Dominion has reviewed the proposed casing program and the well's location within the Oakford Storage Field. This acknowledgement also confirms the proposed casing program is accurate to the proper storage zone boundaries as provided to Apex by Dominion.