

Corrective Action Plan and Well Data

Two wells penetrated the same zone of injection within one-quarter mile of the subject well: Well #38281 and Well #01328. Both wells are owned by Seneca. Well #01328 is located approximately 1320 ft to the southeast and was properly plugged and abandoned in 1991. Well #38281 is located approximately 1030 ft to the southwest and is a gas producing well having productive intervals as shown in the table below.

Notched and Frac'd Intervals of Well #38281

Formation	Notched and Frac'd Interval	Thickness (h)	Comments
Speechley 6	1650 to 1662	12 feet	Gas producing interval
Speechley 7	1704 to 1719 feet	15feet	Gas producing interval
Tiona Sandstone	1728 to 1734 feet	6 feet	Gas producing interval
Kane 1	2123 feet	1 foot	Gas producing interval
Kane 2	2133 to 2151 feet	18 feet	Gas producing interval
Kane 3	2156	1 foot	Gas producing interval
Elk 3	2339 to 2390 feet	51 feet	Gas producing interval

Both wells are discussed further below.

Existing Oil and Gas Wells within the Area of Review

Well completion records are required to be submitted for all wells located within the area of review in order to evaluate the need for corrective action specific to each well. The well completion reports for the proposed injection well, Well #38268, and Well #38281 are attached. The well construction diagram for Well #38281 is included in Section 8, Monitoring Program. As discussed further in Section 8, Well #38281 will be utilized as a monitoring well and is properly constructed for that purpose.

Plugged and Abandoned Wells

As indicated above, there is one plugged and abandoned well (#01328) located within the ¼ mile area of review for Well #38268. This well has been properly plugged and abandoned; therefore, no additional corrective action is necessary within the AOR. The plugging report for this well is attached.



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil & Gas Management Program

Auth #	APF #
Site #	Facility #
FX Client #	Sub-fac #

WELL RECORD AND COMPLETION REPORT

Well Operator SENECA RESOURCES CORPORATION	DEP ID# 72993	Well API # (Permit / Reg) 37-047-23835-00	Project Number	Acres
Address 286 OLD 36 ROAD		Well Farm Name FEE SENECA RESOURCES WARRANT 3771	Well # 38268	Serial #
City SIGEL	State PA	Zip Code 15860	County Elk	Municipality Highland
Phone 814-725-2291	Fax 814-752-6204	USGS 7.5 min quadrangle map James City 2		

WELL RECORD Also complete Log of Formations on back (page 2)

Well Type <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Combination Oil & Gas <input type="checkbox"/> Injection <input type="checkbox"/> Storage <input type="checkbox"/> Disposal	Drilling Method <input checked="" type="checkbox"/> Rotary - Air <input type="checkbox"/> Rotary - Mud <input type="checkbox"/> Cable Tool	Date Drilling Started 3/20/07	Surface Elevation 2040'	Total Depth - Driller 2530'	Total Depth - Logger 2532'
--	---	----------------------------------	----------------------------	--------------------------------	-------------------------------

Casing and Tubing Cement returned on surface casing? Yes ~~None~~ See Driller's Log
Cement returned on coal protective casing? Yes No X N/A

Hole Size	Pipe Size	Wt. / Weld	Thread / Weld	Amount in Well (ft)	Material Behind Pipe Type and Amount	Packer / Hardware / Centralizers Type Size Depth	Date Run
6 1/4	2 3/8	T	T	2498	106 sks. Common Class A, 3%		7/03/07
11 1/4	9 5/8	26	T	63			7/03/07
8 3/4	7	17	T	553	CaCl ₂ 1/2#unicele		3/21/07
	5/8		T	2475			7/03/07

COMPLETION REPORT

Perforation Record		Stimulation Record						
Date	Interval Perforated From To	Date	Interval Treated	Fluid Type	Amount	Propping Agent Type	Amount	Average Injection Rate
		7/03/07	1667 0	Gel	8770 gal	sand 20/40	120 sks	19.8
			1671 5	Water	11,040 gal	sand 20/40	160 sks	20
			1676 0	Water	10,910 gal	sand 20/40	160 sks	20
			1721 0	Water	8910 gal	sand 20/40	120 sks	20
			1739 5	Water	9250 gal	sand 20/40	120 sks	20.3
				Water		sand		

Natural Open Flow Natural Rock Pressure Hours Days
mcfid
After Treatment Open Flow After Treatment Rock Pressure 125 Hours Days 2
Mcid 350

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

Name Dallas-Moms Drilling Co Address Worms Lane	Name Universal Well Services Address P O Box 180	Name Schlumberger Address 95 Rutherford Run
City - State - Zip Brookford, PA 16701	City - State - Zip Brookford, PA 16701	City - State - Zip Brookford, PA 16701
Phone (814) 362-6493	Phone (814) 368-6175	Phone (814) 362-7441

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AUG 06 2007

ENVIRONMENTAL PROTECTION
WARREN DISTRICT OFFICE

ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

LOG OF FORMATIONS

Well API#: 37-053-23835-00

Formation Name	Top	Bottom	Gas at	Oil at	Water at (Fresh or Brine)	Source of Data
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SEE ATTACHED

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ENVIRONMENTAL PROTECTION
WARREN DISTRICT OFFICE

Well Operator's Signature:

Ray A. Shuffert
Title: Superintendent / Prod. & Eng.

Date:

7/26/07

Reviewed by:

[Signature]

DEP USE ONLY

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Date:

6-4-08

Comments:

AUG 16 2007

DALLAS-MORRIS DRILLING, INC.

WELL OWNER: Seneca Resources Corporation
 EASE: Fee-SRC Warrant 3771
 OWNERSHIP: Highland
 COUNTY: Elk
 PERMIT NO.: 37-047-23835-00

WELL NO.: 38268
 SPUD DATE: 3/20/07
 T.D. DATE: 3/22/07
 TOTAL DEPTH: 2530'
 RIG NO.: RD-23

62.6	FT	CONDUCTOR CASING	9 5/8"	SIZE	CEMENT
	FT	CONDUCTOR CASING		SIZE	106 sks
553.2	FT	SURFACE CASING	7"	SIZE	7 bbl cement returns
275	FT	FRESH WATER DEPTH	5 GPM	SIZE	
290	FT	FRESH WATER DEPTH	10 GPM	SIZE	
325	FT	FRESH WATER DEPTH	15 GPM	SIZE	
415	FT	FRESH WATER DEPTH	20 GPM	SIZE	
Bits Used: 12 1/4", 8 3/4", 6 1/4"					
Fuel Use:		Spud: 8057	T. D.: 8916	Rig Hours:	5051 - 5093

TOP	BOTTOM	FORMATIONS	TOP	BOTTOM	FORMATIONS
0	5	Dirt & Rock	1910	1925	Gas
5	15	Sand	1925	1980	Cooper 4.0 & Sand
15	40	Sand	1980	2135	Cooper 6.0
40	55	Sand	2135	2275	Gas
55	70	Shale	2275	2295	Elk 1.0 (gas)
70	95	Sand	2295	2355	Sand (gas)
95	120	Sand & Shale	2355	2390	Gas
120	225	Sand	2390	2420	Elk 4.0
225	415	Sand & Shale	2420	2510	Sand (gas)
415	558	Sand	2510	2530	Sand
558	635	Red Rock	2530		Total Depth
635	650	Shale			
650	820	Red Rock			
820	865	Shale			
865	915	Red Rock			
915	1270	Sand & Shale			
1270	1345	Sand			
1345	1360	Red Rock			
1360	1385	Sand & Shale			
1385	1555	Base Warren 1.0			
1555	1565	Red Rock			
1565	1575	Sand			
1575	1598	T-12 Marker			
1598	1675	Speechley 2.0			
1675	1725	Gas			
1725	1750	Speechley 6.0 (gas)			
1750	1765	Gas			
1765	1875	Tiona 1.0			
1875	1890	Red Rock (gas)			
1890	1910	Sand			

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ENVIRONMENTAL PROTECTION
 WARREN DISTRICT OFFICE

RECEIVED

AUG 06 2007

GEOLOGIC DATA

38268 WELL RECORD

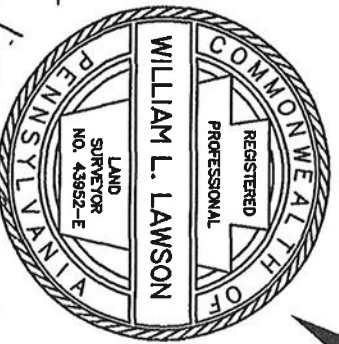
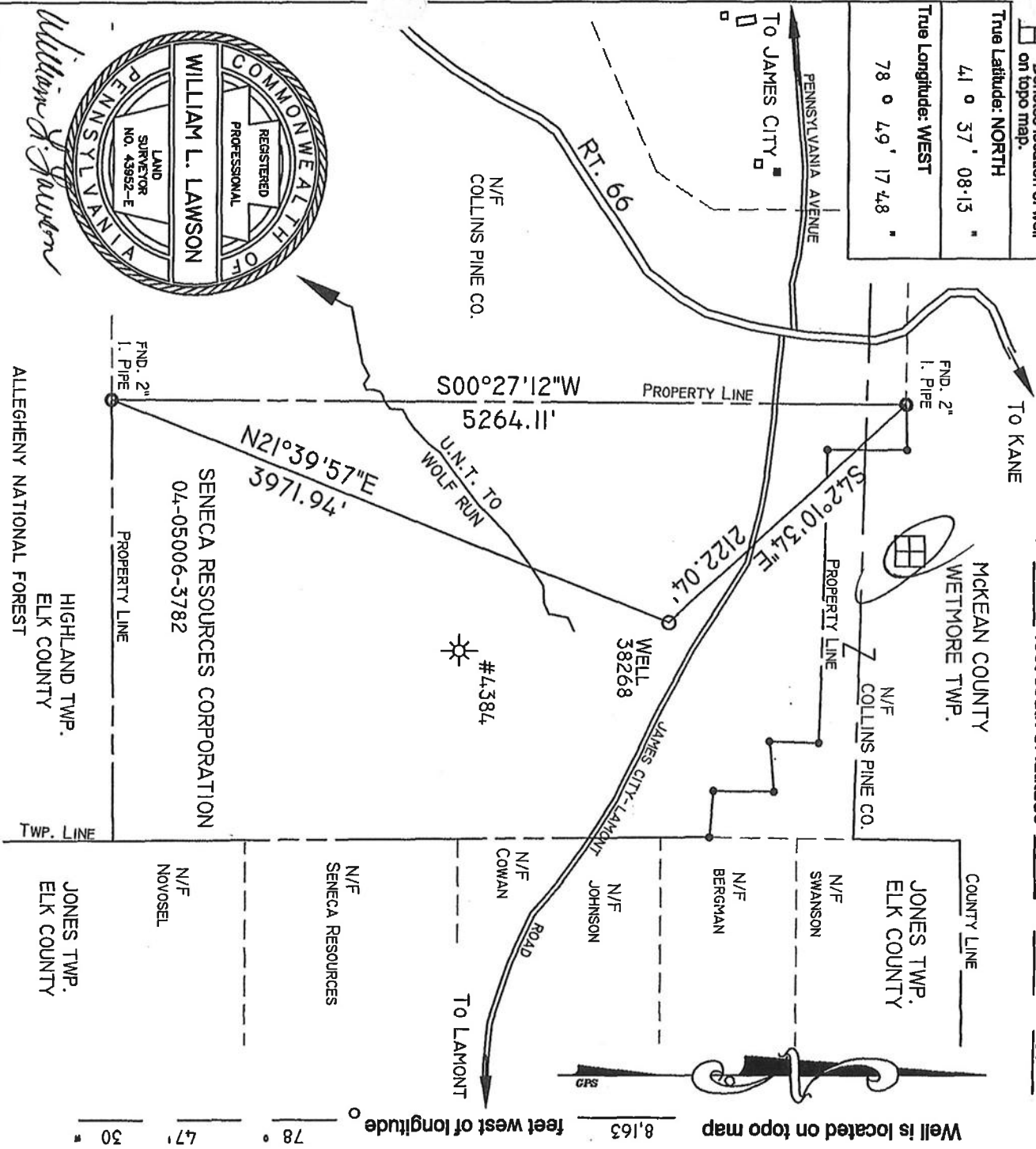


COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT *76c*

DEP Application Tracking #	657
DEP USE ONLY	20067
Permit #	247-23835
Project #	

Denotes location of well on topo map.
True Latitude: NORTH
41 ° 37 ' 08.13 "
True Longitude: WEST
78 ° 49 ' 17.48 "

Well is located on topo map 2.207 feet south of latitude 41 ° 37 ' 30 "



William L. Lawson

Surveyor or Engineer: WILLIAM L. LAWSON
Phone #: (814) 752-2291
Date: 02/09/07
Scale: 1" = 1000'

Lat. & Long. Method	Accuracy	ft. Datum	Elevation Method	Method	Accuracy	ft. Datum	Survey Date
GPSDF	+/- 3	NAD - 27	TOPO	TOPO	+/- 10	NGVD-29	01/30/07
Applicant/Well Operator Name	Seneca Resources Corporation		Well (Farm) Name	FEE-SRC WT. 3771		Well #	38268
Address	286 OLD 36 ROAD SIGEL, PA 15860		County - Code	ELK - 24		Serial #	
Surface Landowner	Seneca Resources Corporation		USGS 71/2 Quadrangle Map Name	JAMES CITY, PA		Municipality	HIGHLAND TOWNSHIP
Surface Lessor	NONE		Angle & Course of Deviation (Diplog)	VERTICAL		Surface Elevation	204.0
Surface Owner or Water Partner	NONE		Owner, Lessee, or Operator of Well	WATERSHED		Participated Total Depth	2530
With a Water Supply within 1,000'	NONE		Workable Coal Seam	NONE		Map Section	"2"

WATERSHED
MARTIN
RUA
FEB 14 2007
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

DALLAS-MORRIS DRILLING, INC.

WELL OWNER: Seneca Resources Corporation
 EASE: Fee-SRC Warrant 3771
 TOWNSHIP: Highland
 COUNTY: Elk
 PERMIT NO.: 37-047-23835-00

WELL NO.: 38268
 SPUD DATE: 3/20/07
 T.D. DATE: 3/22/07
 TOTAL DEPTH: 2530'
 RIG NO.: RD-23

62.6	FT	CONDUCTOR CASING	9 5/8"	SIZE	CEMENT
	FT	CONDUCTOR CASING		SIZE	106 sks
553.2	FT	SURFACE CASING	7"	SIZE	7 bbl cement returns
275	FT	FRESH WATER DEPTH	5 GPM	SIZE	
290	FT	FRESH WATER DEPTH	10 GPM	SIZE	
325	FT	FRESH WATER DEPTH	15 GPM	SIZE	
415	FT	FRESH WATER DEPTH	20 GPM	SIZE	
Bits Used:		12 1/4", 8 3/4", 6 1/4"			
Fuel Use:		Spud: 8057	T. D.: 8916	Rig Hours:	5051 - 5093

TOP	BOTTOM	FORMATIONS	TOP	BOTTOM	FORMATIONS
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5	15	Sand	1925	1980	Cooper 4.0 & Sand
15	40	Sand	1980	2135	Cooper 6.0
40	55	Sand	2135	2275	Gas
55	70	Shale	2275	2295	Elk 1.0 (gas)
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820	865	Shale			
865	915	Red Rock			
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1270	1345	Sand			
1345	1360	Red Rock			
1360	1385	Sand & Shale			
1385	1555	Base Warren 1.0			
1555	1565	Red Rock			
1565	1575	Sand			
1575	1598	T-12 Marker			
1598	1675	Speechley 2.0			
1675	1725	Gas			
1725	1750	Speechley 6.0 (gas)			
1750	1765	Gas			
1765	1875	Tiona 1.0			
1875	1890	Red Rock (gas)			
1890	1910	Sand			



INVOICE NO. 536463
 AGE NO. _____

JOB LOG

CUSTOMER Seneca Res

LEASE NAME 38268

DATE 3-21-07

CIRCULATE CEMENT TO SURFACE:

Yes No Not Applicable
 JOB TYPE **7 bbls return**
 Surface Longstring Acid
 Other 7" surface

CASING TUBING	NEW USED	SIZE	FROM	TO	WEIGHT	MAXIMUM PSI ALLOWANCE
	N	7"	0	553.2	17#	
OPEN HOLE		8 3/4"	553.2	568		
DISPLACEMENT CAPACITY						

TOTAL 131 125 22.2

DISPLACEMENT BBL 23.1 DISPLACEMENT DEPTH 557.2 FT.

TIME	RATE (BPM)	VOLUME (BBL)	PRESSURE (PSI)		DESCRIPTION OF STAGE OR EVENT
			TUBING	CASING	
1830					SPOT Truck, rig up
1 55					Safety meeting
1900	2-3	10		0-50	Start H ₂ O
1903	3	10		50-100	Start Gel unicorn
1906	3	5		100	Start spacer
1909	3-4	22.2		100-200	Start class A, 3% cells 2.5 sk unicorn
1916					STOP
1918	4-2	23.1		0-550	Start H ₂ O displacement
1925					Plug landed, closed manifold
1928				550-0	Relief pressure, wash up
1945					rig down
					Job complete

ER: IKS Ph 7 H₂O 38 W/D sample

SERVICE ENGINEER	<u>Everly</u>
CUSTOMER REPRESENTATIVE	<u>Ryan Rutherford</u>

2300

SEE SKL Partial 3110
Kerns City

- 1 Kerns City 1000 (1605) K3359
- 2 Kerns City K3358
- 3 Kerns City K3362.5
- 4 Kerns City K3366.5
- 5 Kerns City K3372
- 6 Kerns City K3377.5
- 7 Kerns City K3381.5
- 8 Kerns City (3055) K3385
- 9 Bldg, Kerns City K3389
- 10 Kerns City K3392.400
- 11 Kerns City (3005) K3395

filled up #1 4.27.74
 11w/3w/sks
 little to no flowback

FR GAMMA ->

38268

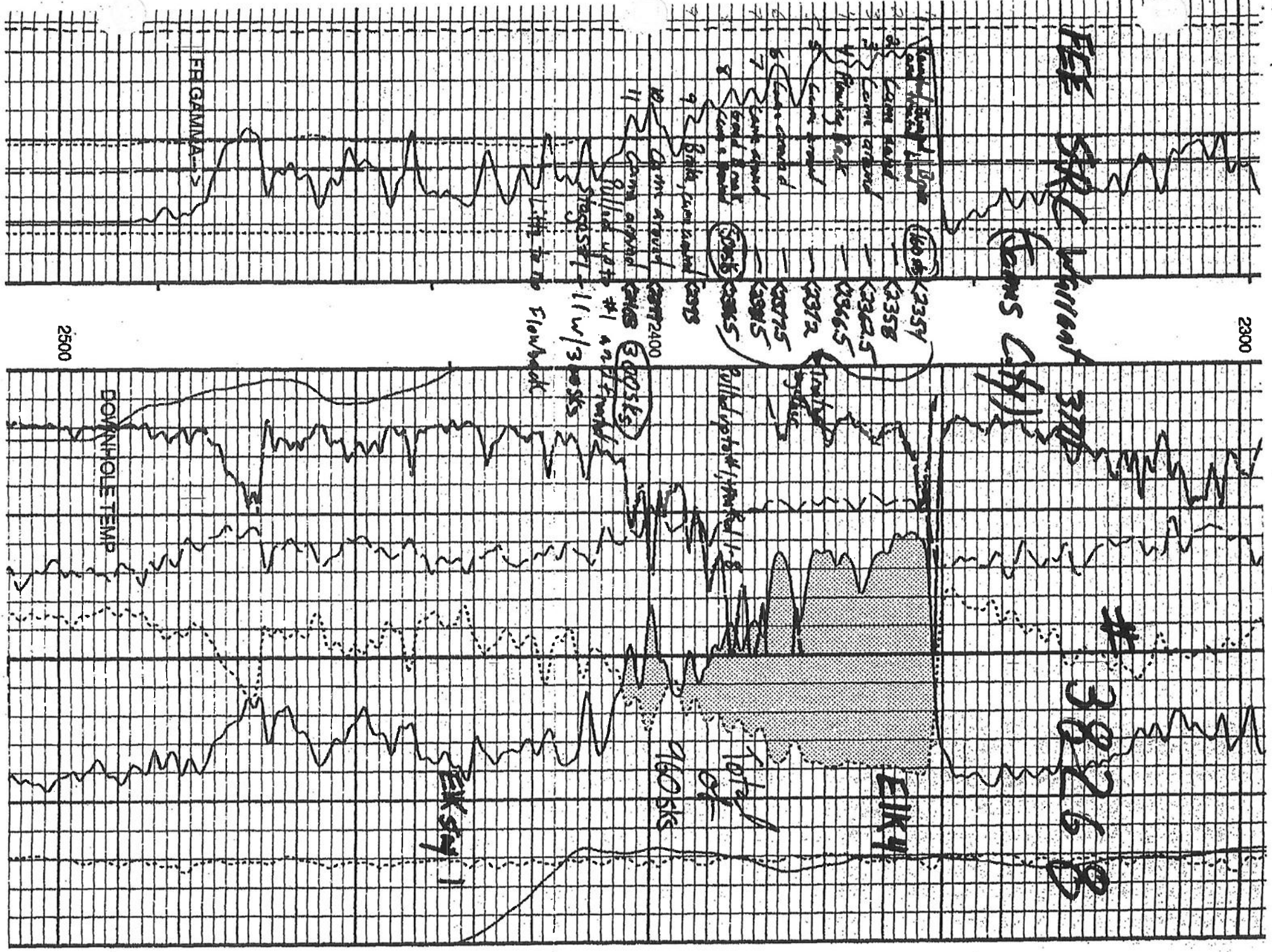
EIKY

total of 9605K

EIKY 1

DOWNHOLE TEMP

2500



RATE B

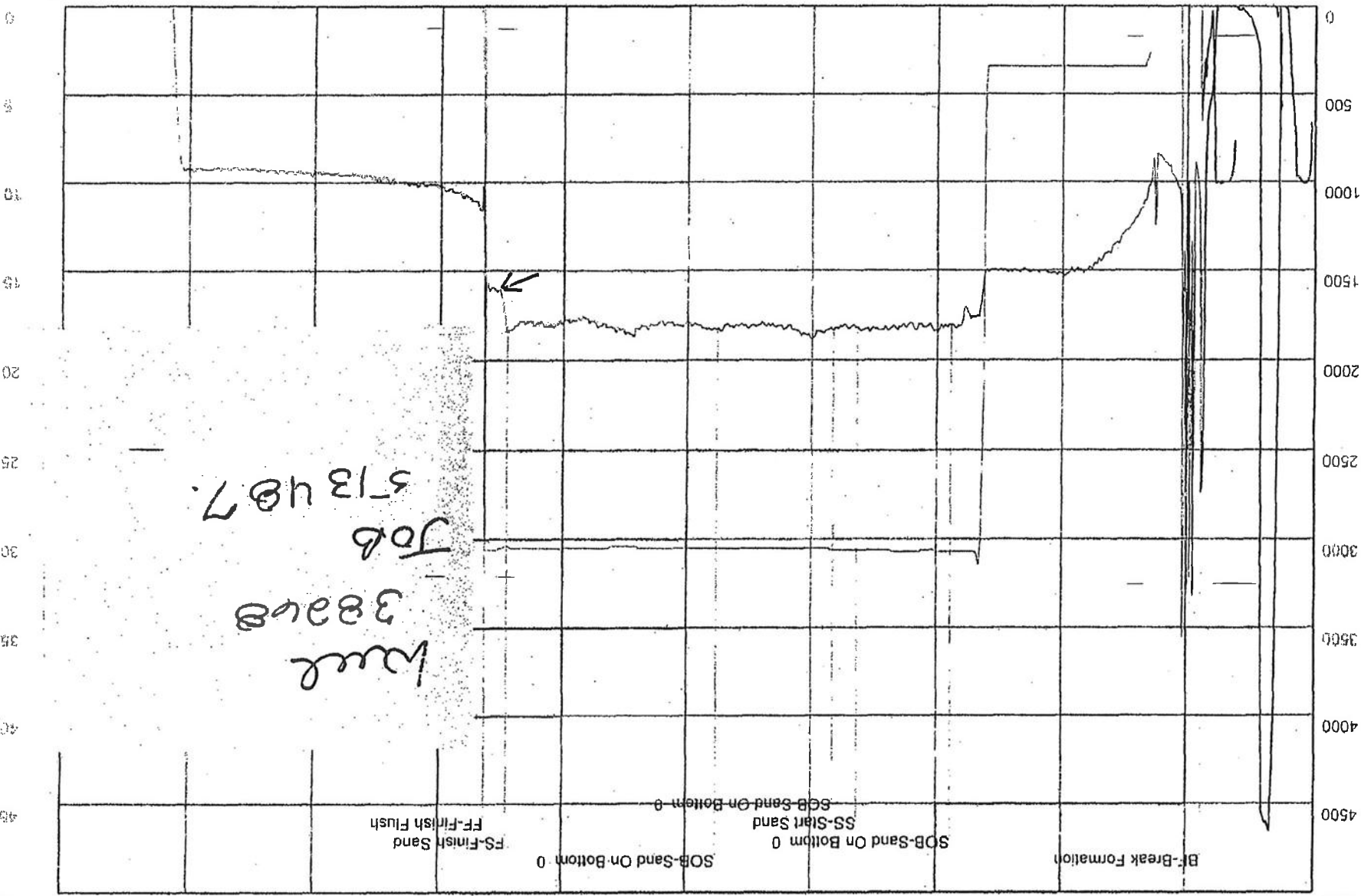
RATE A

DENSITY

PRESSURE

Time (min)

37.0 33.3 29.6 25.9 22.2 18.5 14.8 11.1 7.4 3.7 0.0



Vertical text on the left side of the graph.

Vertical text on the right side of the graph.

Job 38248
Well 513487

Frac Data

#1
160 CKD 4/5/07
E/K Y

GEOLOGIC DATA

38281 WELL RECORD

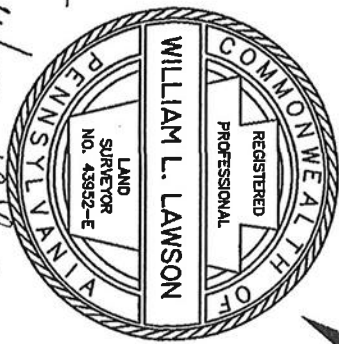
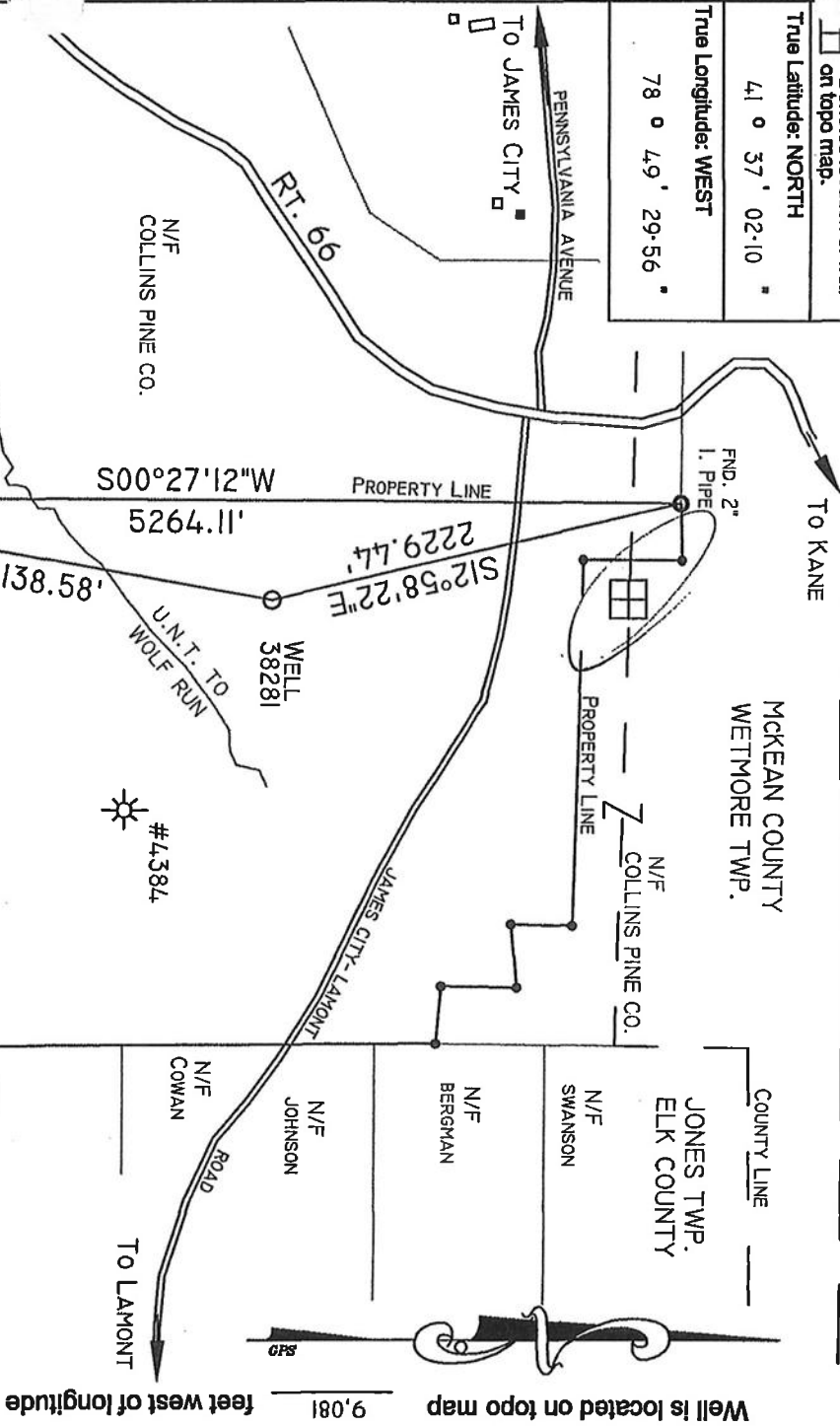


COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

DEP Application Tracking #	510107
DEP USE ONLY	Project # 24723884

Denotes location of well on topo map.
True Latitude: NORTH
41 ° 37 ' 02.10 "
True Longitude: WEST
78 ° 49 ' 29.56 "

Well is located on topo map 2.815 feet south of latitude 41 ° 37 ' 30 "



William L. Lawson

Surveyor or Engineer WILLIAM L. LAWSON
Phone # (814) 752-2291
Dwg. # P/WELLS/US/38281.DWG
Date 04/09/07
Scale 1" = 1000'

SENeca RESOURCES CORPORATION
04-05006-3782
HIGHLAND TWP.
ELK COUNTY
ALLEGHENY NATIONAL FOREST

JONES TWP.
ELK COUNTY
N/F NOVOSSEL
N/F SENeca RESOURCES

Lat. & Long. Method	GPSDF	Accuracy +/-	3	ft. Datum	NAD - 27	Elevation Method	TOPO	Accuracy +/-	10	ft. Datum	NGVD-29	Survey Date	02/30/07
Applicant / Well Operator Name	SENeca RESOURCES CORPORATION				Well/Farm Name	FEE - SRC WT. 3771		County - Code	ELK - 24		USGS 7 1/2 Quadrangle Map Name	JAMES CITY, PA	
Address	286 OLD 36 ROAD SIGEL, PA 15860				County - Code	ELK - 24		USGS 7 1/2 Quadrangle Map Name	JAMES CITY, PA		Applicant	0615	
Surface Landowner	SENeca RESOURCES CORPORATION				Applicant	0615		Surface Elevation	2020		Anticipated Total Depth	2570	
Surface Lessor	NONE				Applicant	0615		Surface Elevation	2020		Anticipated Total Depth	2570	
Surface Owner or Water Purveyor with a Water Supply within 1,000 ft.	NONE				Applicant	0615		Surface Elevation	2020		Anticipated Total Depth	2570	
Other	NONE				Applicant	0615		Surface Elevation	2020		Anticipated Total Depth	2570	
Watershed	Watershed Martin Run				Applicant	0615		Surface Elevation	2020		Anticipated Total Depth	2570	
Other	NONE				Applicant	0615		Surface Elevation	2020		Anticipated Total Depth	2570	



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil & Gas Management Program

WELL RECORD AND COMPLETION REPORT

Auth #	AP# #
Site #	Facility #
Fix Client #	Sub-fac #

Well Operator SENECA RESOURCES CORPORATION	DEP ID # 72993	Well API # (Permit / Reg) 37-047-9999- 2388 2388y	Project Number	Acres
Address 51 Zents Blvd		Well Farm Name FEE-SRC W# 3771	Well # 38281	Serial #
City Brookville	State PA	Zip Code 15825	County McKeon	Municipality Highland
Phone 814-849-4555	Fax 814-849-4795	USGS 7.5 min quadrangle map		

WELL RECORD Also complete Log of Formations on back (page 2)

Well Type: Gas Oil Combination Oil & Gas Injection Storage Disposal

Drilling Method: Rotary - Air Rotary - Mud Cable Tool

Date Drilling Started: 01/22/08 Date Drilling Completed: 01/24/08 Surface Elevation: 2020 Total Depth - Driller: 2544 Total Depth - Logger: 2540

Casing and Tubing

Cement returned on surface casing? Yes No
Cement returned on coal protective casing? Yes No N/A

Hole Size	Pipe Size	Wt. / Weld	Thread / Weld	Amount in Well (ft)	Material Behind Pipe Type and Amount	Packer / Hardware / Centralizers Type Size Depth	Date Run
12 1/4	9 5/8	26	T	47			01/22/08
8 3/4	7	17	T	602	124 sks Class A Cement, 3% CaCl, 1/2# unicele/sk		01/23/08
1/4	2 3/8	4.9	T	2482			03/11/08
	5/8		T	2475			03/11/08

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ENVIRONMENTAL PROTECTION
COMPLETION REPORT
DEPARTMENT OF ENVIRONMENTAL PROTECTION REGIONAL OFFICE

Perforation Record

Date	Interval Perforated From To	Date	Interval Treated	Fluid Type	Fluid Amount	Propping Agent Type	Propping Agent Amount	Average Injection Rate
		03/11/08	1650	Gel	8460	20/40	120	20
			1655	Water	9620	20/40	140	20
			1658	Water	10728	20/40	160	20
			1662	Water	8672	20/40	140	20
			1704	Water	7401	20/40	100	20
			1719	Water	9111	20/40	120	20

Stimulation Record

Natural Open Flow Mcfd: 1 After Treatment Open Flow Mcfd: 500

Natural Rock Pressure Hours: Days: After Treatment Rock Pressure Hours: Days:

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

Name Natural Oil and Gas	Name Kerme and Sons Drilling
Address 1410 W Warren Road	Address 12 Keane Lane
City - State - Zip Brookford, PA 16701	City - State - Zip Brookford, PA 16701
Phone 814-362-2543	Phone 814-362-2659

LOG OF FORMATIONS

Well API#: 37-047-32884

Formation Name	Top	Bottom	Gas at	Oil at	Water at (Fresh or Brine)	Source of Data
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SEE ATTACHED

Well Operator's Signatures

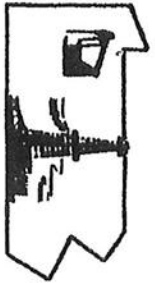
Greg A Hunt
Title: Superintendent / Prod & Eng. Date: 4/14/08

DEP USE ONLY

Reviewed by: *Curry*
Comments:

Date: 6-4-08

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APR 15 2008



NATURAL OIL & GAS CORP.

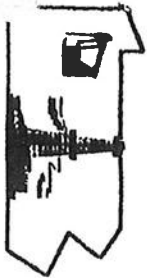
1410 WEST WARREN ROAD, BRADFORD, PENNSYLVANIA
Telephone: (814) 362-6890 Fax: (814) 362-6120

WELL # 38281 PERMIT # 37-047-23884
SPUD DATE 1/22/2008 COUNTY Elk
SPUD TIME 4:30 p.m. TOWNSHIP Highland
CONDUCTOR 47 ft. LEASE James City
CASING 603 ft. TD DATE 1/24/2008
TOTAL DEPTH 2544 ft. TD TIME 11:57 a.m.

PIPE TALLY

1	23.2 ft.	7	23.2 ft.	13	23.2 ft.	19	23.2 ft.	25	23.2 ft.
2	23.2 ft.	8	23.2 ft.	14	23.2 ft.	20	23.2 ft.	26	23.2 ft.
3	23.2 ft.	9	23.2 ft.	15	23.2 ft.	21	23.2 ft.	27	
4	23.2 ft.	10	23.2 ft.	16	23.2 ft.	22	23.2 ft.	28	
5	23.2 ft.	11	23.2 ft.	17	23.2 ft.	23	23.2 ft.	29	
6	23.2 ft.	12	23.2 ft.	18	23.2 ft.	24	23.2 ft.	30	

#JOINTS 26 CEMENT CO. Universal
SACKS 124 RETURNS 6 Barrels
PLUG DOWN 9:45 a.m. CEMENT DATE 1/23/2008



OPERATOR: Seneca

WELL NAME: Fee-SRC WT 377

WELL #: 38281

PERMIT #: 37-047-23884

NATURAL OIL & GAS CORP.

1410 WEST WARREN ROAD, BRADFORD, PENNSYLVANIA 167

Telephone: (814) 362-6890

Fax: (814) 362-6120

WELL DEPTH	TIME	MINUTES	FORMATION	WELL DEPTH	TIME	MINUTES	FORMATION
45	4:30		Gravel, Shale	645	10:40	10	Shale
75	4:56		Shale	675	8:02	12	Shale
105	6:00		Shale	705	8:11	9	Shale
135	6:11		SandStone	735	8:21	10	Shale
165	6:21		SS/Shale	765	8:31	10	RedRock
195	6:34		Shale	795	8:43	12	RR/Shale
225	6:45		Shale	825	8:53	10	Shale
5	6:58		Sand	855	9:04	11	Shale
285	7:10		Shale	885	9:16	12	Shale
315	7:25		Sand	915	9:27	11	Shale
345	7:37		Shale	945	9:40	13	Shale
375	8:49		RedRock	975	9:55	15	RedRock
405	9:00		RedRock	1005	10:05	10	Shale
435	9:12		RR/Shale	1035	10:15	10	Shale
465	9:26		Sand/Shale	1065	10:26	11	RedRock
495	9:40		Shale	1095	10:37	11	RedRock
525	9:52		Shale	1125	10:50	13	RedRock
555	10:04		Shale	1155	11:02	12	Shale
585	10:17		Sand/Shale	1185	11:13	11	RR/Shale
615	10:30		Shale	1215	11:23	10	Shale

COMMENTS:



NATURAL OIL & GAS CORP.

OPERATOR: Seneca

WELL NAME: Fee-SRC WT 37

WELL # : 38281

PERMIT # : 37-047-23884

1410 WEST WARREN ROAD, BRADFORD, PENNSYLVANIA 167

Telephone: (814) 362-6890 Fax: (814) 362-6120

WELL DEPTH	TIME	MINUTES	FORMATION	WELL DEPTH	TIME	MINUTES	FORMATION
1245	11:33	10	RedRock	1845	7:25	11	Shale
1275	11:43	10	Shale	1875	7:39	Sand (Cooper 4-0)	
1305	11:56	13	Shale	1905	7:52	13	Sand/Shale
1335	12:30		Shale	1935	8:03	11	Sand/Shale
1365	3:00		RR/Shale	1965	8:16	Sand (Cooper 6-0)	
1395	4:20		Shale	1995	8:28	12	Sand/Shale
1425	4:30	10	Shale	2025	8:38	10	Shale
1455	4:43	13	Shale	2055	8:49	11	Shale
1485	4:55	12	Shale	2085	9:00	11	Shale
1515	5:05	10	Shale	2115	9:12	12	Shale
1545	5:20	15	Shale	2145	9:22	10	Shale
1575	5:34	Sand (Speechley 2-0)		2175	9:33	11	Shale
1605	5:45	11	Sand/Shale	2205	9:43	10	Shale
1635	5:58	13	Shale	2235	9:56	13	Sand (Elk 1-0)
1665	6:12	Sand (Speechley 6-0)		2265	10:09	13	Sand/Shale
1695	6:25	13	Sand/Shale	2295	10:20	11	Shale
1725	6:40	15	Sand (Tiona 1-0)	2325	10:31	11	Shale
1755	6:53	13	Sand/Shale	2355	10:45	14	Sand (Elk 3-0)
1785	7:04	11	RR/Shale	2385	10:48	13	Sand/Shale
1815	7:14	10	RR/Shale	2415	11:00	12	Sand/Shale

COMMENTS:

**Underground Sources of Drinking Water – Seneca Well #38268/Highland Township,
Elk County, PA**

The site lies within the Glaciated High Plateau section of the Appalachian Plateaus Physiographic province. The High Plateau Section consists of broad, rounded to flat uplands cut by deep angular valleys. The uplands are underlain by flat-lying sandstones and conglomerates. Local relief between valley bottoms and adjacent uplands can be as much as 1,000 feet, but is generally in the area of half that amount. Elevations in the area range from 980 to 2,360 feet. Drainage of the area has a dendritic pattern. The western boundary of the area is the Late Wisconsin glacial border. The area between this border and the Allegheny River a few miles to the east was glaciated by pre-Wisconsin glaciers. The area occurs in northwestern Pennsylvania and includes all of Forest County, most of Venango, Warren, and Elk Counties, and small parts of McKean, Jefferson, and Clarion Counties (<http://www.dcnr.state.pa.us/topogeo/map13>).

Bedrock is generally used for potable water in the project area. The well log for Well #38268 indicates that the uppermost bedrock unit at the site is the Allegheny Group of Pennsylvanian Age. The Allegheny Group consists of limestone, sandstone, shale, and coal deposits. At a depth of 30 to 35 feet below ground surface (bgs) the Pennsylvanian Age Pottsville Group also consists of limestone, sandstone, shale, and coal deposits. At approximately 200 feet bgs lies the Mississippian-Devonian Age Shenango through Oswayo undivided, which consist of sandstone, siltstone, and shale. The Upper Devonian siltstones, shale, and sands are present beneath the site beginning from approximately 500 feet bgs to the total depth of the borehole at 2530 feet bgs. (<http://www.dcnr.state.pa.us/topogeo/index.aspx>). The units are described further in Section 5.

The Pennsylvania Geologic Survey's "Ground Water Information System (PaGWIS) and the Pennsylvania Department of Environmental Protection's Drinking Water Reporting System (DWRS) were accessed to determine the sources of drinking water in the site area. According to these publicly available sources, there are no groundwater wells within ¼ mile of Seneca well #38268.

According to records available through the DWRS, Highland Township maintains a public water supply (ID# 6240006) consisting of two springs (one active and one inactive) and two reserve water wells, which are all located between 0.5 and 0.7 miles from Seneca well #38268 (proposed injection well). PaGWIS indicates that a private water well, owned by Randy Klaber, is located 0.8 miles from Seneca well #38268. Construction information regarding water wells and springs within one mile of Seneca well #38268 is provided in Appendix A. Although PaGWIS lists only one well within one mile of well #38268, the well reporting requirement was established in 1968. PaGWIS is not considered to be a complete record of water wells in the vicinity and other wells

may be present (PaGWIS, May 23, 2012). It is noted that PaGWIS also references a National Fuel Gas Supply Corporation well, which is located approximately $\frac{3}{4}$ mile southeast of well #38268. According to PaGWIS, this well is 2389 feet deep and is classified as a test well. It is a natural gas well, operated by Seneca Resources.

Well # 38268 is located in the northeastern corner of Highland Township of Elk County. To better understand the underground sources of drinking water, the PaGWIS was searched for all wells within Highland Township and Jones Township (bordering east of Highland Township) of Elk County, and Wetmore Township (bordering north of Highland Township) of McKean County. The PaGWIS indicated that there are 49 recorded wells in Highland Township. Twelve of these wells are owned by National Fuel Gas and according to PaGWIS are listed as test wells (i.e., natural gas wells) ranging from 1176 to 2348 feet deep. The deepest water withdrawal well is listed as 320 feet deep, with reported well depths ranging from 58 to 320 feet deep. The PaGWIS indicated that there are 155 recorded wells in Jones Township. Four of these wells are owned by National Fuel Gas and are listed as test wells ranging from 2331 to 2389 feet deep. The deepest water well is listed as 320 feet deep, with reported well depths ranging from 60 to 320 feet deep. The PaGWIS indicated that there are 41 recorded water wells in Wetmore Township. The deepest well is listed as 245 feet deep, with reported well depths ranging from 55 to 245 feet deep. Based on the available information, the Allegheny Group, Pottsville Formation, and Shenango Group are utilized as underground sources of drinking water in the site area.

In summary, PaGWIS indicates that the deepest ground water wells in the site area are approximately 320 feet deep. Based on this information and the site geologic conditions, 400 feet bgs has been identified as a conservative estimate of the base of the lowermost USDW for the proposed injection well area. It is noted that surface casing for the proposed injection well extends to 553 feet, which is greater than 200 feet deeper than the deepest groundwater drinking source in the Tri-Township Area.

**Groundwater Wells And Springs Within 1 mile of Seneca Well #38268
Highland Township, Elk County, PA**

Water Wells Within 1 Mile Radius									
PA Well ID	Date Drilled	Owner	Well Depth	Depth To Bedrock (ft)	Well Use	Borehole Bottom (ft)	Bore Hole Diameter (inches)	Casing Bottom (ft)	Casing Diameter
100718	8/1/1987	KLAIBER RANDY	130	28	WITHDRAWAL				
DWRS6240006 Source 4		HIGHLAND TOWNSHIP WATER AUTHORITY	206		MUNICIPAL BACKUP	206	8	30	6 in., pump set at 170 ft
DWRS6240006 Source 5		HIGHLAND TOWNSHIP WATER AUTHORITY	161		MUNICIPAL BACKUP	161	8	28	6 in., pump set at 140 ft
Springs Within 1 Mile Radius									
PA ID	Owner	Comments							
DWRS6240006 Source 1	HIGHLAND TOWNSHIP WATER	Primary water supply for James City							
DWRS6240006 Source 3	HIGHLAND TOWNSHIP WATER	Backup water supply for James City							

Proposed Injection and Monitoring Wells									
Operator	Cmpl Date	API	WellID	Elevation (ft msl)	Total Depth (ft)	Last Csg (in)	Csg Depth (ft)	Completion	Comments
SENECA RESOURCES CORP	7/3/2007	37-047-23835	38268	2040	2530	7	553.2	Notched & Frac'd: 2354-2403'	Subject of UIC Class IID permit application
SENECA RESOURCES CORP	3/11/2008	37-047-23884	38281	2020	2544	7	602	Notched & Frac'd: 2338-2390'	Monitoring Well
Other Existing /Former Oil and Gas Wells Within Area of Review (1/4 Mile Radius)									
Operator	CmplDate	API	WellID	Elevation	Total Depth (ft)	Last Csg (in)	Csg Depth (ft)	Completion	Comments
SENECA RESOURCES CORP	11/21/1902	N/A	1328	2049	2433	6.25	460	Shot with 100 qts. Nitroglycerin: 2370-2400'	Plugged and Abandoned Feb. 12, 1991
Water Wells Within 1 Mile Radius									
PA Well ID	DateDrilled	Owner	WellDepth	Depth To Bedrock (ft)	Well Use	Borehole Bottom (ft)	Bore Hole Diameter (inches)	Casing Bottom (ft)	Casing Diameter
100718	8/1/1987	KLAIBER RANDY	130	28	WITHDRAWAL				
DWRS6240006 Source 4		HIGHLAND TOWNSHIP WATER AUTHORITY	206		MUNICIPAL BACKUP	206	8	30	6 in., pump set at 170 ft
DWRS6240006 Source 5		HIGHLAND TOWNSHIP WATER AUTHORITY	161		MUNICIPAL BACKUP	161	8	28	6 in., pump set at 140 ft
Springs Within 1 Mile Radius									
PA ID	Owner	Comments							
DWRS6240006 Source 1	HIGHLAND TOWNSHIP WATER AUTHORITY	Primary water supply for James City							
DWRS6240006 Source 3	HIGHLAND TOWNSHIP WATER AUTHORITY	Backup water supply for James City							

