

**Stonehaven Energy Management, LLC
Class II Produced Water Disposal Application
Tippery Field
Cranberry Township, Venango County, Pennsylvania**



**Prepared By: HAVCO Oil and Gas, Inc.
Thomas F. Havranek
Consulting Petroleum Engineer
1842 Eastbrook Road
New Castle, PA 16101**

**EPA UIC Permit Application - Class II
Produced Fluid Disposal Project
Tippery Field
Cranberry Township, Venango County, Pennsylvania**

**Prepared for: Stonehaven Energy Management, LLC
1251 Waterfront Place
Suite 540
Pittsburgh, Pennsylvania 15222
412-745-7770 Phone
412-391-7220 Fax**

**Prepared by: HAVCO Oil and Gas, Inc.
Thomas F. Havranek
Consulting Petroleum Engineer
1842 Eastbrook Road
New Castle, PA 16101
412 - 999-3958 Phone
724-654-0093 Fax**

**Submitted to: S. Stephen Platt
U.S. Environmental Protection Agency Region III
Ground Water and Enforcement Branch (3WP22)
Office of Drinking Water and Source Water Protection
1650 Arch Street
Philadelphia, PA 19103-2029**

June, 2011

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A. Area of Review

Stonehaven Energy Management, LLC (Stonehaven) is applying for an EPA Class II "D" Produced Fluid Disposal Well permit. Their goal is to facilitate their oil production operations on their B.Stover, M. Latshaw, and J. Ahrens leases located in Cranberry township, Venango County, Pennsylvania. The Latshaw #9 well has been selected as the candidate for the produced water disposal and a fixed radius of ¼ mile around that well will be the Area of Review (AOR) for this application. The produced water will be disposed into the Speechley sand formation at an interval of 1934 – 1995 feet.

This area is located approximately 25 miles south of the Drake Well located in Titusville, Pennsylvania. That well is given credit for being the first commercial oil well ever drilled and the birthplace of the oil and gas industry. The industry spread rapidly throughout the Appalachian basin after the Drake discovery and many wells were drilled through the Oil Creek valley into Venango county. The Venango group of formations were the primary target of the early oil drillers. This group includes the Venango 1st, Red Valley, Venango 2nd, Grey, and Venango 3rd sandstone formations. These formations range between 750 – 1100 feet of depth on Stonehaven's properties.

Many of the old wells left over from the early oil boom have been located on these leases and have been plugged by Stonehaven. Four wells were developed on the Stover lease in 1985 through the Venango sands by a previous operator. They are now owned and operated by Stonehaven. In 2007, Stonehaven developed 21 wells on the Stover lease through the Venango sands.. In 2008, 17 wells were developed on the Stover lease, 6 on the Latshaw, and 7 on the Ahrens. These wells penetrated the Venango sands only. In 2009, they developed 8 wells on the Latshaw lease with 3 of them drilled through the Speechley sand which included the Latshaw #9 subject well. In 2010, 5 more wells were developed on the Latshaw lease with one of them drilled through the Speechley. This development is shown on Map B-1

In summary, Stonehaven is operating 68 producing wells on the three leases with four of them drilled through the Speechley sand. It should be noted that 16 additional Venango sand wells are located on the Ahrens property that are not operated by Stonehaven.

B. Maps

Map B-1

This is a 1" = 400' scale map that shows the chronological development of the 68 wells operated by Stonehaven as outlined in the Area of Review portion of this application.

Map B-2

This is a 1"=2000' scale USGS topographic map showing all existing producing wells operated by Stonehaven and others, all known plugged wells, all known water wells, located old wells that have not been plugged, the Latshaw #9 proposed disposal well with the ¼ mile AOR radius around it, and a one mile radius around the properties.

There are no hazardous waste treatment, storage, or disposal facilities on the property, Map B-3 shows in greater detail the location of the collection and distribution facilities for the produced water.

Map B-3

This is a 1" = 300 ' scale map that shows all of the wells within the ¼ mile AOR. It shows the location of the tank batteries for storing produced water and oil and the pipeline system that will be used to deliver produced water to the injection well.

Map B-4

This is a 1" = 200' showing the four Speechley wells and their distance from the Latshaw #9 injection candidate in greater detail.

C. Corrective Action Plan and Well Data

Excluding the M. Latshaw #9, the proposed injection well, only two other wells within the AOR penetrate the Speechley formation. They are the M. Latshaw #12 and the M. Latshaw #25. The M. Latshaw #12 is 1035 feet away from the M. Latshaw #9 while the M. Latshaw #25 is 1263 feet away. The M. Latshaw #25 was completed in the Speechley while the M. Latshaw #12 was not. The M. Latshaw #15 was completed in the Speechley but is outside the AOR at 1594 feet away. Despite its location it will be utilized along with the other two wells as the primary monitoring wells for fluid migration.

There are twenty two Venango sand wells drilled through the Grey sand at an approximate depth of 1200 feet that are within the AOR. Eleven are located on the Stover lease and eleven on the Latshaw lease. Map B-3 displays their location the best.

There are four old wells that have been located within the AOR that have been plugged and four that have not. The four plugged wells are 4X, 6X, 7X, and 9X. The four that have not are 5X, 8X and two that have not yet been registered with the PADEP. These were all orphan wells that have been left over from the early days of the oil industry. They had no known records or current operator. Most often they are discovered while completing a new well. They were plugged by the old operators either very poorly or not at all. When they are discovered the criteria for plugging is made based on whether they are adversely affecting the production of a new well. This is usually due to failed casing dumping fresh water into the producing formations. When they are entered they are found drilled through the Venango sands only.

Water wells within the AOR exist on the M. Latshaw, Kimberly D. Heeter, and Robert A. Hoover properties.

All of the wells developed by Stonehaven were drilled by spudding the well with a 12 ¼" bit and setting approximately 22'-42' of 9 5/8" – 26 #/ft conductor pipe depending on surface conditions.. Next an 8 ¾" bit is run and drilled to a depth of 60' below the deepest known aquifer. Depending on surface elevation this is usually between a depth of 450' to 525'. A surface casing string of 7" – 17 #/ft is run and cemented to surface. Finally a 6 ¼" bit is run and drilled to the pre-determined total depth. The only difference between wells drilled to the Speechley from wells drilled through the Venango sand wells is the depth of the 6 ¼" hole.

Every producing well operated by Stonehaven is equipped with a pump off control device that monitors the daily pump time of every well. In the event that injected produced water is migrating in some manner to cause risk to the environment or welfare of the residents in the area it will be detected quickly and steps to remedy the situation will be enacted. No wells within the AOR would be operating over the fracture pressure of the Speechley.

Table C-1 on the next below displays the date drilled, well type, casing data, total depth, deepest producing formation, and completion date of all the wells within the AOR:

Table C-1

<u>Well</u>	<u>Type</u>	<u>Date</u>	<u>9 5/8"</u>	<u>7"</u>	<u>Total Depth</u>	<u>Completion Date</u>
Stover #5	Venango	2/17/07	21'	467'	1210'	7/13/07
Stover #6	Venango	1/12/07	21'	469'	1198'	7/20/07
Stover #7	Venango	2/20/07	23'	503'	1258'	7/27/07
Stover #8	Venango	1/05/07	21'	482'	1205'	5/22/07
Stover #9	Venango	4/04/07	24'	454'	1202'	6/27/07
Stover #13	Venango	4/18/07	23'	480'	1202'	6/01/07
Stover #14	Venango	2/29/07	22'	485'	1260'	5/16/07
Stover #15	Venango	3/26/07	21'	500'	1210'	7/06/07
Stover #16	Venango	3/08/07	22'	508'	1263'	8/07/07
Stover #24	Venango	3/01/07	20'	531'	1243'	4/25/07
Stover #41	Venango	3/10/07	22'	454'	1226'	8/24/07
Latshaw #3	Venango	8/06/08	22'	418'	1108'	8/28/08
Latshaw #4	Venango	8/01/08	22'	428'	1106'	8/06/08
Latshaw #5	Venango	8/10/08	22'	420'	1109'	8/12/08
Latshaw #6	Venango	8/13/08	22'	418'	1109'	9/24/08
Latshaw #9	Speechley	3/21/09	22'	396'	2206'	10/14/09
Latshaw #10	Venango	3/25/09	22'	400'	1104'	10/21/09
Latshaw #11	Venango	3/27/09	21'	400'	1104'	10/26/09
Latshaw #12	Speechley	4/03/09	42'	400'	2108'	12/02/09
Latshaw #15	Speechley	5/02/09	42'	400'	2359'	12/10/09
Latshaw #16	Venango	4/27/09	42'	400'	1054'	12/18/09
Latshaw #23	Venango	1/02/10	42'	420'	1114'	3/09/10
Latshaw #24	Venango	12/23/09	42'	410'	1104'	1/04/10
Latshaw #25	Speechley	2/03/10	40'	410'	2107'	4/29/10
Latshaw #26	Venango	1/18/10	42'	411'	1057'	3/16/10
Latshaw #31	Venango	1/15/10	41'	415'	1128'	3/03/10

E. Name and Depth of USDWs

When Stonehaven began development in January 2007 of the Stover lease one of the first tasks was to drill a water well on the property. Its purpose was to provide fresh water for the completion of the new wells to be drilled. It was located within 50' of the Stover #24 well and is within the AOR. Small veins of water were encountered within 50-75 of depth and again in the 100'- 125' range.

The only named aquifer in this area is the Mountain sand which was encountered between 440' and 470'. The Stover #24 is the highest elevation well on the property. The Surface casing depths were adjusted for elevation and set 60' below the Mountain sand in all the developed wells.

G. Geological Data on Injection and Confining Zones

The Speechley sandstone is an Upper Devonian formation within the Bradford series. In this area the Speechley is encased in gray shale in excess of over 200' above and below the formation. The table below shows the gross thickness, the net pay, average porosity of the net pay, and the fracture pressures for the three wells completed in the Speechley:

<u>Well</u>	<u>Depth</u>	<u>Gross</u>	<u>Net Pay</u>	<u>Avg. Porosity</u>	<u>Frac Press.</u>
Latshaw #9	1977-1992	15'	8'	12%	3250 psi
Latshaw #12	1977-1993	16'	7'	7%	
Latshaw #15	1963-1982	19'	5'	10%	3734 psi
Latshaw #25	1980-1998	18'	6'	9%	4018 psi

The openhole logs of the four wells are shown in Figures G1, G2, G3, and G4. The treatment reports for the three wells fractured in the Speechley are shown in Figures G5, G6 and G7.

Figure G1

#9

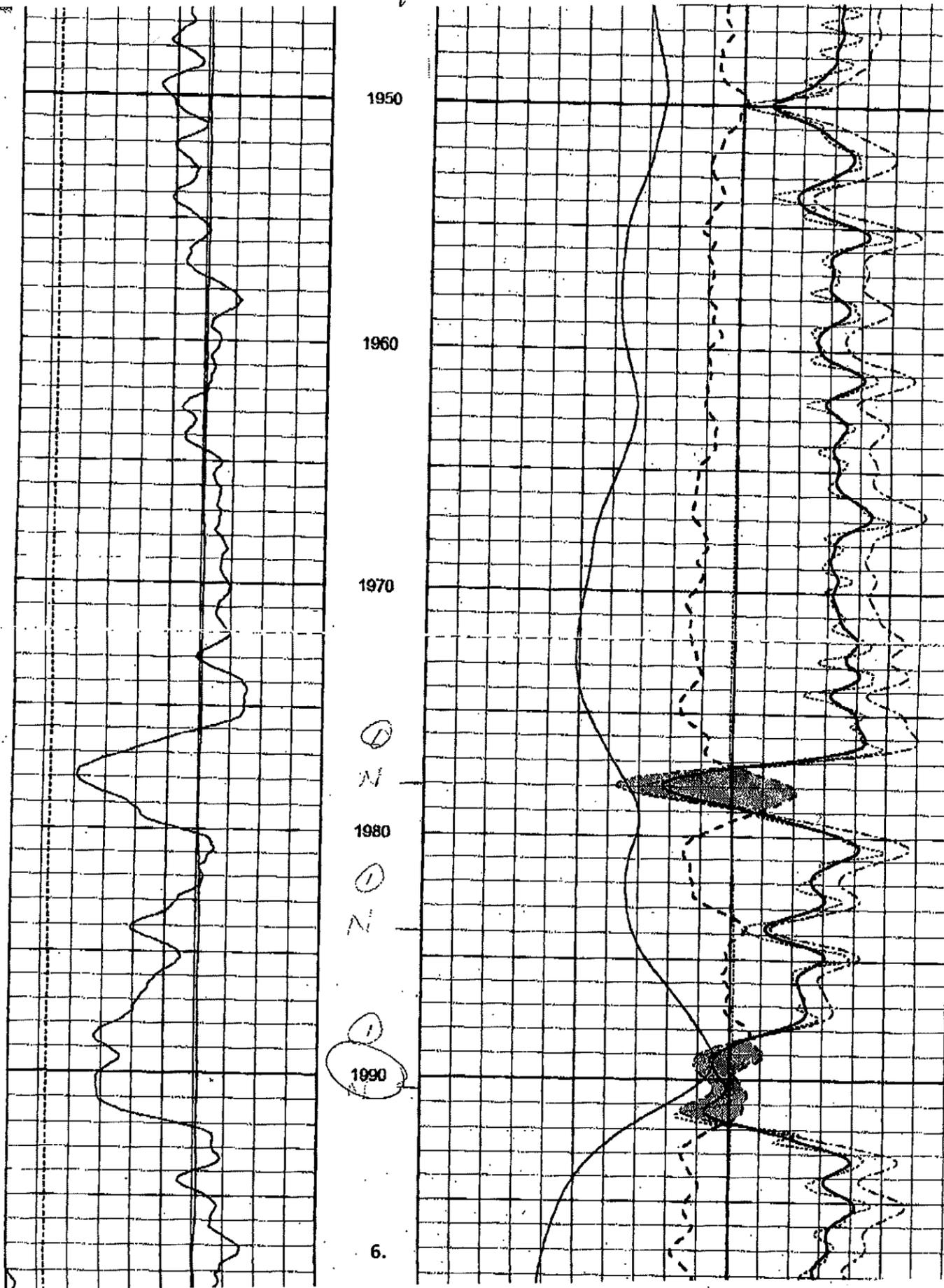
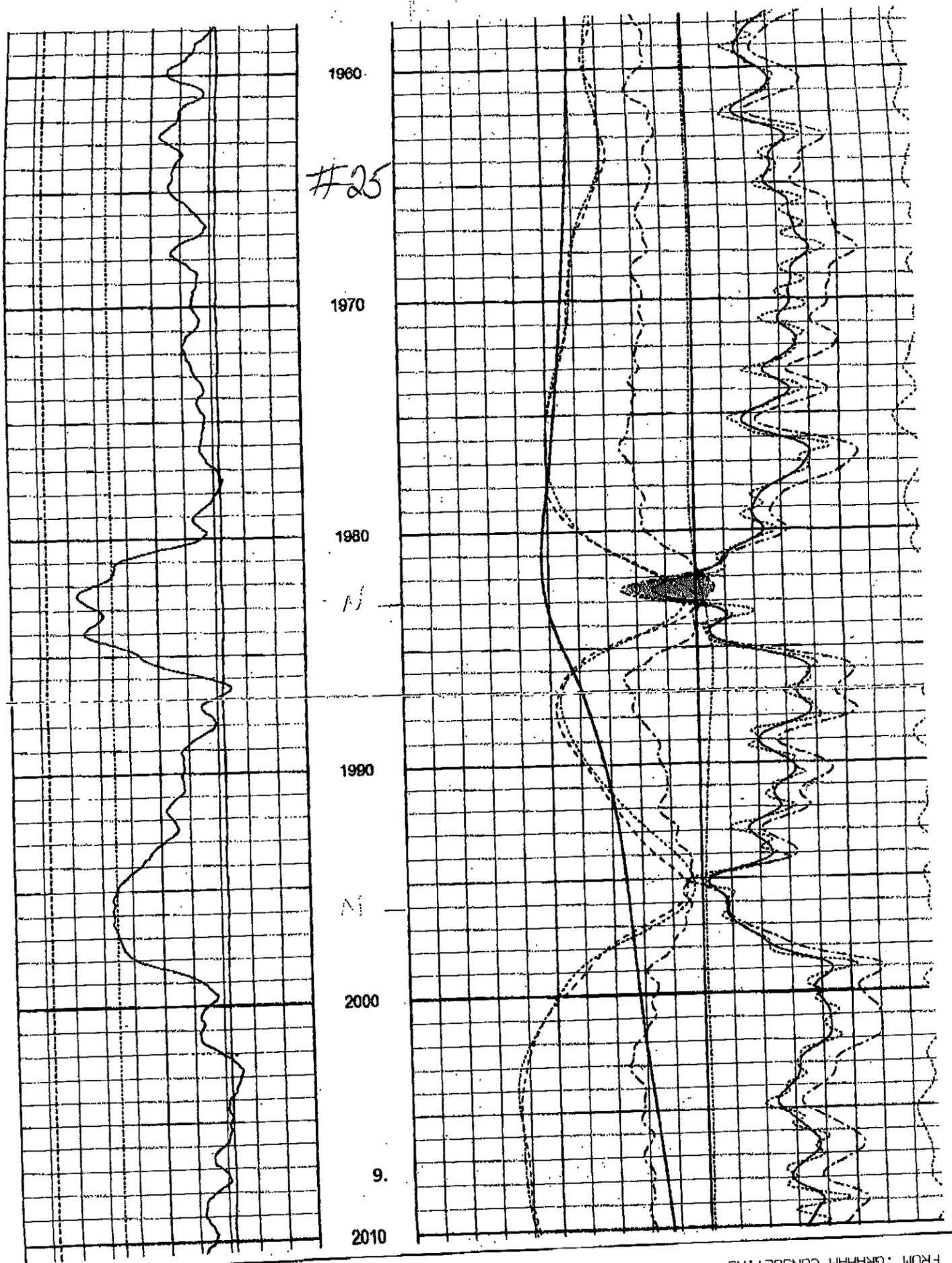


Figure G4



FROM: GRAHAM CONSULTING

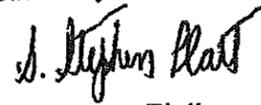
FAX NO.: 814 768 7672

JUN. 08 2011 09:00 AM

6. **Monitoring** - Injection volume and pressure shall be monitored and recorded on a continuous basis. We encourage you to continue to monitor formation pressure decline after injection has concluded. This data should further enhance your analysis of the transmissivity and storage capacity of the proposed injection formation and allow for an estimation of the protracted effects on the formation. A final report must be submitted to EPA within 30 days of the conclusion of the test.

The authorization for this test will expire on May 15, 2011. Please contact Dave Rectenwald, our UIC field inspector, at 814-827-1952 (office) or 814-449-9577 (cell) when you are ready to schedule the injectivity testing. If you should have any questions, please give me a call at 215-814-5464.

Sincerely,



S. Stephen Platt
Ground Water and Enforcement Branch (3WP22)
Office of Drinking Water and Source Water Protection

cc: Dave Rectenwald
S. Craig Lobins, PADEP Meadville

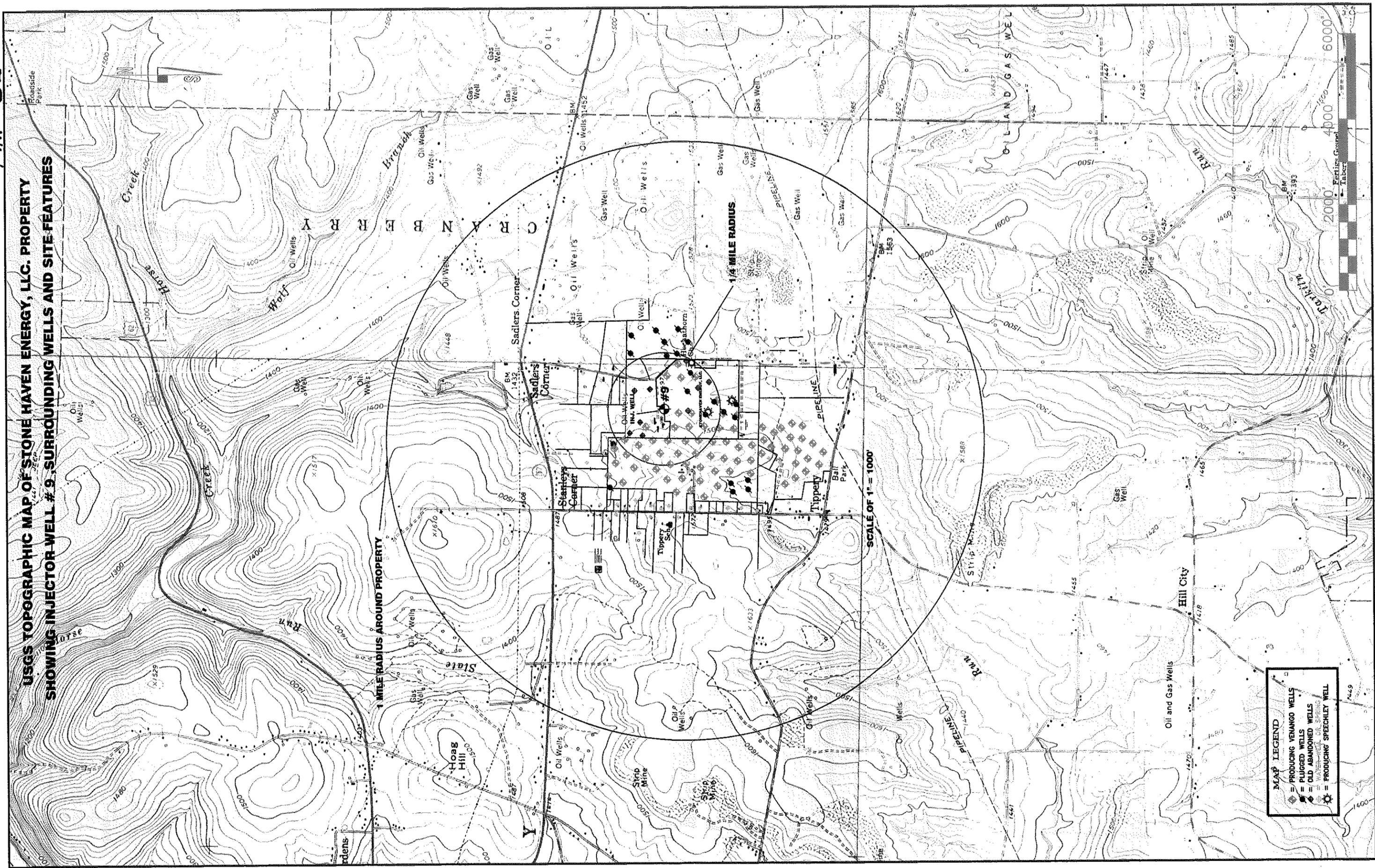
Figure H2

Latshaw #9 Injection Well Test Results
 Meter #7964980

Date:	Meter Reading	PSI	Gallons Disposed	BBLs Disposed	Total BBLs Disposed
4/15/2011	120	39	120	3	3
4/16/2011	3860	39	3,740	89	92
4/17/2011	7650	39	3,790	90	182
4/18/2011	11460	39	3,810	91	273
4/19/2011	15010	39	3,550	85	357
4/20/2011	15270	0	260	6	364
4/21/2011	18600	4	3,330	79	443
4/22/2011	21720	3	3,120	74	517
4/23/2011	24940	3	3,220	77	594
4/24/2011	28040	0	3,100	74	668
4/25/2011	31150	0	3,110	74	742
4/26/2011	34120	0	2,970	71	812
4/27/2011	36900	0	2,780	66	879
4/28/2011	39850	0	2,950	70	949
4/29/2011	42540	0	2,690	64	1,013
4/30/2011	45770	32	3,230	77	1,090
5/1/2011	48870	32	3,100	74	1,164
5/2/2011	51960	32	3,090	74	1,237
5/3/2011	54870	27.5	2,910	69	1,306
5/4/2011	57780	35	2,910	69	1,376
5/5/2011	60600	36	2,820	67	1,443
5/6/2011	63370	35	2,770	66	1,509
5/7/2011	66030	35	2,660	63	1,572
5/8/2011	68790	35	2,760	66	1,638
5/9/2011	71410	35	2,620	62	1,700
5/10/2011	73490	4	2,080	50	1,750
5/11/2011	75640	3	2,150	51	1,801
5/12/2011	77820	2	2,180	52	1,853
5/13/2011	80020	0	2,200	52	1,905
5/14/2011	82110	0	2,090	50	1,955
Totals			82,110	1,955	

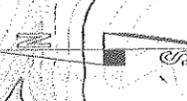
Average PSI for test 18.3

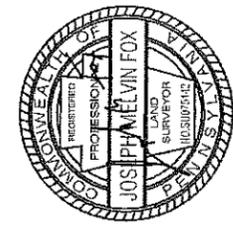
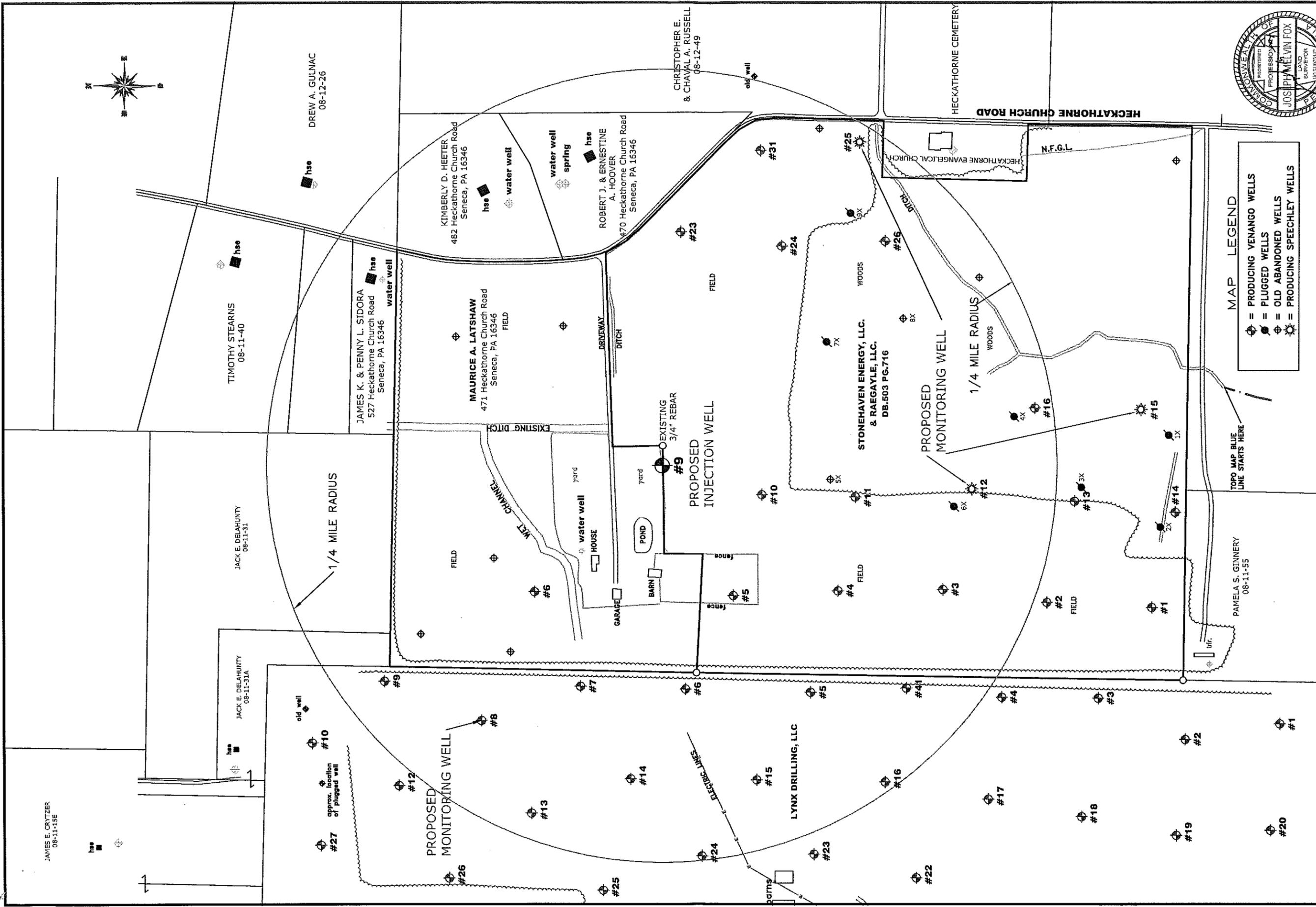
**USGS TOPOGRAPHIC MAP OF STONE HAVEN ENERGY, LLC. PROPERTY
SHOWING INJECTOR WELL #9, SURROUNDING WELLS AND SITE FEATURES**



MAP LEGEND

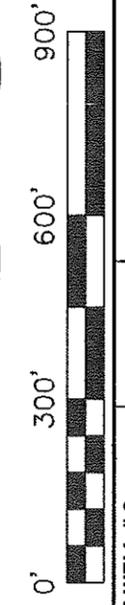
- ◆ = PRODUCING VENANGO WELLS
- = PLUGGED WELLS
- = OLD ABANDONED WELLS
- ⊙ = WATERSHED DR. SPRING
- ⊛ = PRODUCING SPEECHLEY WELL





MAP LEGEND

- ☉ = PRODUCING VENANGO WELLS
- ☉ = PLUGGED WELLS
- ☉ = OLD ABANDONED WELLS
- ☉ = PRODUCING SPEECHLEY WELLS



TOP MAP BLUE LINE STARTS HERE

WELL # 9
JOHN E. AHRENS
08-11-61
DB.938 PG.858

WELL # 3
EDITH R. EUSTICE
08-11-61B

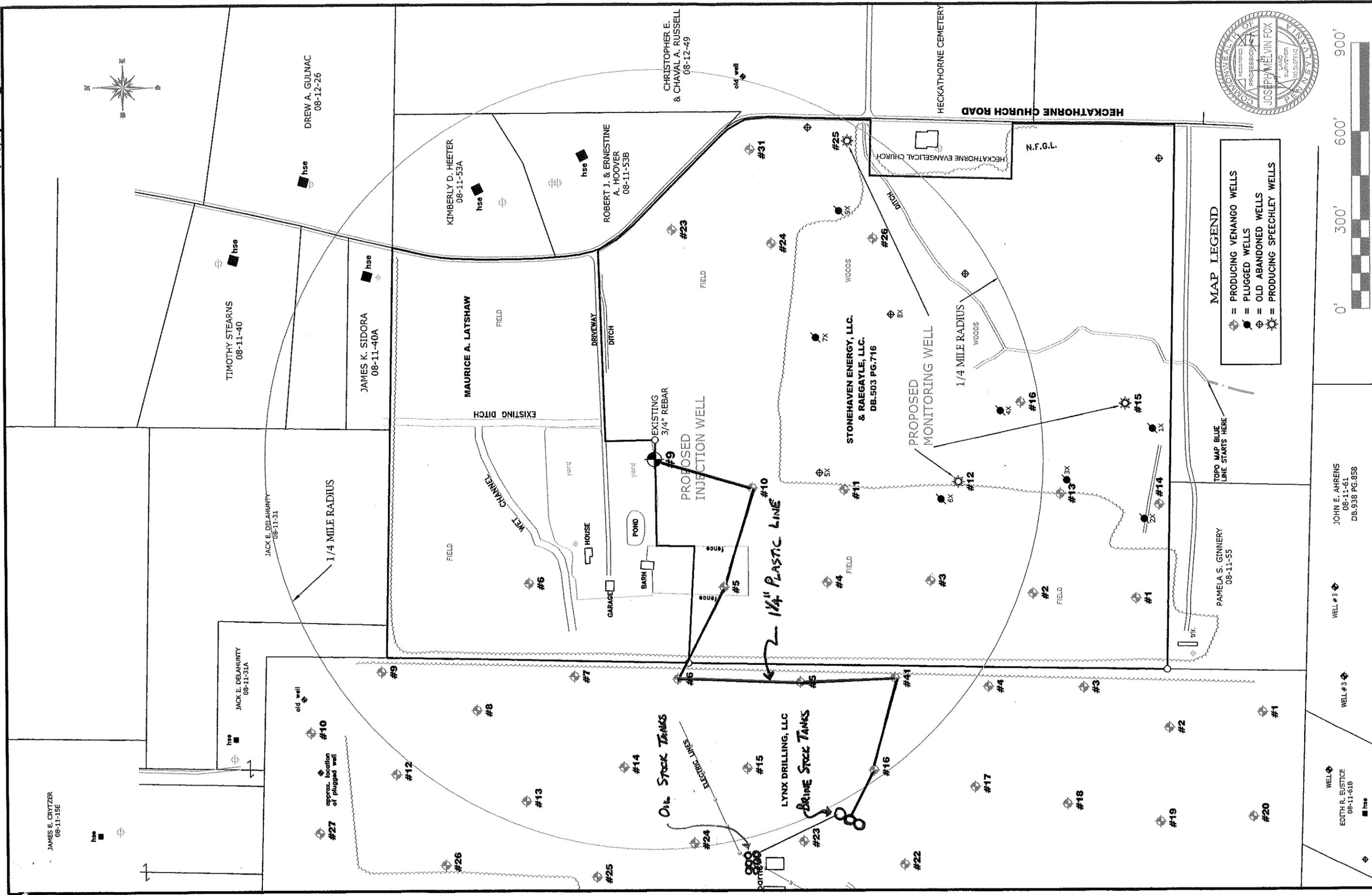
WELL # 20
WELL # 19
WELL # 18
WELL # 17
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WELL # 10
WELL # 9
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WELL # 5
WELL # 4
WELL # 3
WELL # 2
WELL # 1

FOX SURVEYING 2@YAHOO.COM
 FOX LAND SURVEYING 814 657-4361-voice
 9161 U.S. 322 814 677 2297-fax
 CRANBERRY, PA 16319

MAP OF LATSHAW LEASE SHOWING PROPOSED INJECTION WELL # 9 AND WELLS # 12, #15 AND #25 PENETRATING SAME ZONE AS INJECTION WELL

CRANBERRY TOWNSHIP, VENANGO COUNTY, PA

DWN. BY: JMF DATE: JUNE 06, 2011
 LN:SU075142 SCALE: 1" = 300



MAP LEGEND
 ☉ = PRODUCING VENANGO WELLS
 ⦿ = PLUGGED WELLS
 ⊕ = OLD ABANDONED WELLS
 ☼ = PRODUCING SPEECHLEY WELLS



FOX SURVEYING 9161 U.S. 322 CRANBERRY, PA 16319 814.657-4361-voice 814.677.2297-fax FOXSURVEYING2@YAHOO.COM		JOHN E. AHRENS 08-11-61 DB.938 PG.858	DATE: JUNE 06, 2011 DWN. BY: JMF LN:SU075142 SCALE: 1" = 300
WELLS # 9 & 25 EDITH R. EUSTICE 08-11-61B		WELLS # 12, #15 AND #25 JOHN E. AHRENS 08-11-61 DB.938 PG.858	MAP OF LATSHAW LEASE SHOWING PROPOSED INJECTION WELL # 9 AND WELLS # 12, #15 AND #25 PENETRATING SAME ZONE AS INJECTION WELL CRANBERRY TOWNSHIP, VENANGO COUNTY, PA