May 7, 2019

CERTIFIED MAIL NO. █████████████████████

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███████████████

Re: Request for Investigation 313247
        Stray Gas Migrating into Water Supply – Positive Determination
        Limestone Township, Clarion County

Dear ██████████████

The Pennsylvania Department of Environmental Protection (Department) has been investigating the possible degradation of your water supply located at the above referenced address ("Water Supply"), in response to a complaint received on June 30, 2015. The Department has determined that your Water Supply was adversely affected by oil and gas activities, including but not limited to the drilling, alteration, or operation of an oil or gas well.

The case information is summarized below.

CASE INFORMATION:

Date of Complaint	Nature of Complaint (odor, taste, quantity, use, color)	Pollution
June 30, 2015	Natural gas venting from water well	Free and dissolved natural gas in private water well

WATER SAMPLE RESULTS:

Parameter/Description	Statewide Standards or recommended levels	DEP Sample 6/30/15	DEP Sample 7/13/15	DEP Sample 11/2/2015 Pre-treatment	DEP Sample 11/2/2015 Post-treatment	DEP Sample 4/13/2016	DEP Sample 5/23/2017	DEP Sample 5/22/2018	DEP Sample 10/24/2018 Post-treatment
Alkalinity (mg/l)		0.0	1.0	0	4.4	12.6	1.6	0	10.6
Aluminum (ug/l)	200	30300	7020	1848	<200	2133	1806	3949	<200
Arsenic (ug/l)	10	1330	346	15.9	22.9	33.096	139	139	25.3
Barium (mg/l)	2	0.570	3.094	0.024	<0.01	0.146	0.072	0.171	<0.010
Bromide (mg/l)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium (mg/l)		59.600	29.700	18.300	<0.03	16.700	14.838	18.920	<0.03
Hardness (mg/l)		310	152	91	0	77	75	93	0
Iron (mg/l)	0.3	488.00	212.00	85.10	0.08	53.300	73.391	99.750	<0.02
Lithium (ug/l)		131.000	77.000	50.000	<25	39.000	30.000	34.000	<25.0
Magnesium (mg/l)		39.000	19.000	11.100	<0.04	8.564	9.128	11.000	<0.01
Manganese (mg/l)	0.05	5.926	3.065	1.922	<0.01	1.254	1.422	1.766	<0.01
pH	6.5-8.5	4.0	4.9	4.8	5.3	6.4	4.9	4.1	5.6

Parameter									
Potassium (mg/l)		7.273	5.165	3.687	<1.00	2.984	2.994	3.223	<1.0
Selenium (ug/l)	50	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Sodium (mg/l)		3.427	2.499	1.943	120.000	4.604	2.327	2.883	95.90
Conductivity (umhos/cm)		1514.00	809.00	551.00	678.00	349.00	431.00	595.00	481.00
Strontium (mg/l)		0.12	0.08	0.04	<0.01	0.05	0.04	0.054	<0.01
Chloride (mg/l)	250	1.8	1.5	1.37	1.09	4.26	1.64	1.76	1.54
TDS (mg/l)	500	1716	738	472	432	258	300	470	312
Sulfate (mg/l)	250	895.2	483.5	276	368	124.8	216.00	290.96	195.00
TSS (mg/l)		438	<5	<5	<5	<5	<5	26	<5
Turbidity (ntu)		573.76	<1	6.02	<1	14.20	1.68	59.10	<1
Zinc (ug/l)	500	5955.000	2088.000	774.000	<10.0	396.00	572.000	803.000	<10.0
Ethane (mg/l)		1.51	1.62	0.937	1.040	0.329	0.870	0.414	0.598
Methane (mg/l)	7 (action level)	8.34	9.72	7.190	7.940	2.500	6.630	3.940	5.770
Propane (mg/l)		0.265	0.297	Not detected	0.0156	Not detected	0.0449	Not detected	Not detected
E. coli MPN			<1/100ml			<1/100ml			
Total Coliform MPN			70/100ml			<1/100ml			
UVIR						Not detected			

The Department was notified that natural gas was discovered in your water well during the cleanout of the well prompting our investigation. The Department's investigation involved six private water supplies, twenty-six gas wells, and spanned over three years.
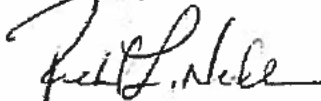
During the investigation, the Department identified four separate water wells that were venting natural gas. The Department monitored the four wells for natural gas throughout the investigation. Specifically, the Department collected and analyzed numerous water samples and gas samples. In addition, the Department collected and analyzed gas samples from several gas wells in the area and compared the results to those from the water wells. The gas sample results indicated that the natural gas entering the water wells is thermogenic and from the same source as the natural gas in nearby gas wells. Multiple gas wells were vented, plugged, and repaired during the investigation.

Based on the isotopic analysis of the gas collected from the water supplies and gas wells, water sample results, monitoring results from the headspace of water wells, and the sequence of plugging and repairs made to gas wells, the Department has determined that the four water supplies were impacted by oil and gas activity, and that the plugging and repairs to gas wells during the investigation eliminated most of the natural gas from the water supplies.

Dissolved methane gas was detected in your water well and ranged from 2.50 mg/l to 9.72 mg/l. Free gas levels in the Water Supply ranged from zero to 100% by volume. The free gas level in your water well was measured at zero from December 2017 to December 2018. The latest measured dissolved methane level was 5.77 mg/l. This level should continue to decrease. In addition, the Department will continue to address oil and gas wells in the area of investigation that are not in compliance with regulatory requirements. The Department also recommends that your water well continue to be equipped with a working vent.

During the Department's investigation, several water samples were collected from your water supply. The sample results indicate that your water quality exceeds several health and/or aesthetic statewide standards. Please see bolded parameter levels in the water sample results table. The most likely source of these elevated parameters is the coal seam(s) and other types of rock encountered by the wellbore of your Water Supply. The most recent sampling data collected after the previously installed water treatment system indicates that these constituents are being reduced by the treatment. The Department recommends that you continue to use and maintain the previously installed treatment system as concentrations of the parameters provided in tables above can fluctuate over time. If you have any questions about any of the above, please contact Aaron O'Hara at 814-332-6199.

Sincerely,

Richard L. Neville
Northwest District Oil and Gas Manager
District Oil and Gas Operations

c: Joe Lichtinger (email)
       Steve Lencer (email)
       Dave Adams (email)
       Chad Meyer (email)
       Ruth Taylor (email)
       Michael Braymer (email)
       Kayla Despenes (email)
File through Aaron O'Hara