pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 20, 2018

CERTIFIED MAIL NO. [redacted]

[redacted]

Subject Address: 9923 SR 706
Montrose, PA 18801

Re: Water Supply Request for Investigation ID 292425
Jessup Township, Susquehanna County

Dear [redacted]

The Department of Environmental Protection (Department) has completed its investigation of your water supply located at the above referenced subject address ("Water Supply"), in response to a complaint received on July 5, 2012, that recent oil and gas activities affected the Water Supply. Based on the sample results reviewed and supplementary information obtained to date, the Department has determined that the Water Supply was temporarily affected by oil and gas activities but has returned to background conditions. Nevertheless, please note that, in the absence of any treatment, your water quality does not meet (*i.e.*, is worse than) the following health and/or aesthetic statewide standards:

Parameters	Unit	Statewide Standards or Recommended Levels	Your Sample Results that Are Above Statewide Standards/Levels
Barium	mg/L	2	**2.109**
Manganese	mg/L	0.05	**0.08**

Based on the Department's most recent post-treatment system sampling, the treatment system that was previously installed, and is currently operating on the Water Supply, appears to be effectively reducing the levels of the above contaminants to below detection limits. The Department's investigation into your complaint is set forth below.

Summary of Investigation

The Department determined on January 14, 2013 that the Water Supply was presumed to have been impacted by oil and gas activity pursuant to Section 3218 of the 2012 Oil and Gas Act. The Department's investigation, including the review of a final technical report submitted as required

by section 78a.89 of Title 25 of the PA Code, leads the Department to conclude at this time, that the Water Supply was temporarily affected by oil and gas activities including but not limited to the drilling, alteration, or operation of an oil and gas well but has since returned to background conditions.

Samples were collected from the Water Supply on multiple occasions and submitted to the Department's laboratory in Harrisburg for analysis. The Department's results were previously submitted to the prior property owner but are being resent to you for your information, and are also summarized in the attached table for your convenience. An additional table of water sample results for the Water Supply collected by a consultant, included in the aforementioned technical report, have also been attached. Please note that primary Maximum Contaminant Levels (MCLs) are intended to reflect dangers to human health, while secondary MCLs reflect the aesthetics of the water (i.e. taste, smell, etc.)

Dissolved methane was detected at 2.5 milligrams per liter (mg/L) in the pre-drill samples at the Water Supply. The post-complaint concentration was found to have increased to 14.6 mg/L. The dissolved methane in subsequent post-complaint samples ranged from 2.41 mg/L to 3.49 mg/L. Evaluation of pre-drill sample results in the area of the Water Supply reveals that pre-drill dissolved methane ranged from 0.32 mg/L to 10 mg/L. Concentrations of dissolved methane collected during the Department's most recent rounds of sampling at the Water Supply are consistent with the pre-drill dissolved methane concentrations. Isotopic analysis and comparison of the methane detected in the Water Supply to samples collected from the adjacent gas wells found that the gas from the gas wells was more thermally mature than the methane detected in the Water Supply. The Department's investigation indicates that the dissolved methane levels in the Water Supply have returned to background.

The pre-drill concentration of barium in the Water Supply was 1.87 mg/L. An increase in barium was measured in the Water Supply well post-complaint at 2.39 mg/L on July 9, 2012 after it was discovered that the well was exhibiting artesian conditions. This exceeds the primary MCL of 2 mg/L for barium. Barium elevations above the primary MCL were also detected in several unimpacted water supplies in the vicinity of the subject Water Supply, both in the pre-drill and post-complaint water sampling. For example, a nearby, unimpacted water supply had a pre-drill barium concentration of 2.06 mg/L. Department sampling found post-complaint barium concentrations at the subject Water Supply ranged from 2.39 mg/L on July 9, 2012 to 1.52 mg/L on September 5, 2012. The Department's investigation indicates that these ranges represent background conditions for the aquifer in the area. Based on the results of samples collected, it was further noted by the Department that the installed treatment system is adequately removing barium from the Water Supply.

Manganese, a common metal associated with groundwater in the region, remains elevated above its secondary MCL. The most recent concentration detected (0.08 mg/L) is consistent with manganese concentrations observed during pre-drill sampling (0.07 mg/L). The treatment system installed on the Water Supply is also effectively reducing manganese levels.

The excess groundwater discharge generated by the artesian conditions in the Water Supply is being addressed through a buried line which empties into a tank for agricultural use on an adjacent property. Similar artesian conditions were documented in the vicinity of the Water Supply prior to the drilling of gas wells at two adjacent water supplies. It is the Department's understanding that the discharge from the Water Supply well and the maintanence of the treatment system are addressed in your purchase agreement with Carrizo.

Based on the Department's investigation, the Department has determined that the impacts to the Water Supply were temporary and that the quality of the Water Supply is comparable to background conditions. In addition, as noted above, the treatment system installed on the Water Supply is addressing the slightly elevated barium and manganese. As a result, the Department does not plan to require further action regarding the Water Supply.

Please contact Eric Rooney, P.G. at 570-346-5543 if you have any questions about the Department's determination regarding the subject Water Supply.

Sincerely,

Jennifer W. Means
Environmental Program Manager
Eastern Oil and Gas District

Enclosures:
Sample Results
Results Table (DEP)
[redacted]

cc:

Michael O'Donnell (email)
Briana Cunningham (email)
Eric Rooney, P.G. (email)
Complaint File # 292425

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DISTRICT OIL AND GAS OPERATIONS

January 14, 2013

[redacted]

CERTIFIED MAIL #[redacted]

Re: 58 Pa.C.S. § 3218 Determination
Complaint No. 29[redacted]5
Jessup Township, Susquehanna County

Dear [redacted]

The Department has investigated the possible degradation of your water supply well located at [redacted] in response to a 7/5/2012 complaint that recent gas well drilling activities may have affected your water supply well. On 7/9/2012, 7/23/2012, 8/23/2012, 10/4/2012, and 12/5/2012, the Department collected samples from your home water supply. The samples were submitted to the Department's laboratory in Harrisburg for analysis. The analytical reports for the samples are included, as well as documents that will assist you with interpreting the sample results.

The sample results showed barium elevated above Department standards. Barium was present at 2.541 mg/L on 7/9/12, 2.495 mg/L on 7/23/12, 2.242 mg/L on 8/23/12, 2.280 mg/L on 10/4/12 (Barium was detected at 0.014 mg/L in the post filtration sample on 10/4/12), which exceeds the primary maximum contaminate level (MCL) of 2 mg/L, and Manganese exceeded the secondary MCL of 0.05 mg/L. Manganese was detected at 0.09 mg/L on 7/9/12, 0.09 mg/L on 7/23/12, 0.08 mg/L on 8/23/12, and 0.08 mg/L on 10/4/12 (Manganese was reported at <0.01 mg/L in the post filtration sample on 10/4/12). Primary MCLs are intended to reflect potential dangers to human health, while secondary MCLs reflect the aesthetics of the water (i.e. taste, smell, etc.). Additionally, the sample results showed methane is present at 10.8 mg/L on 7/9/12, 14.6 mg/L on 7/23/12, 14.2 mg/L on 8/23/12, 10.9 mg/L on 10/4/12 (Methane was detected at 1.721 mg/L on 10/4/12 in your post methane separator sample), and 12.6 mg/L on 12/5/2012 in your water supply.

The Department investigation indicates that gas well drilling has impacted your water supply. Based on the Department's investigation your water well has been impacted by gas drilling activity. Because drilling activities occurred at a gas well within two thousand five hundred feet of the your water supply, and the pollution occurred and was reported within one year after completion of the well, under Section 3218 of the Oil and Gas Act (58 Pa C.S. §3218), the gas well operator is presumed to be responsible for the degradation of your water supply.

When the Department is made aware of methane levels greater than 7 mg/l, we notify the water supply owner of the hazards associated with methane in their water supply. Please be aware however, that the methane levels can fluctuate. This means that even with a relatively low level of methane, you should be vigilant of changes in your water that could indicate an increase in methane concentration.

It is the Department's recommendation that all water wells should be equipped with a working vent. This will help alleviate the possibility of concentrating these gases in areas where ignition would pose a threat

to life or property. Please note that it is not possible to completely eliminate the hazards of having natural gas in your water supply by simply venting your well.

The Department is continuing to work to permanently resolve this issue. Should you have any questions concerning this matter, please feel free to contact Eric Rooney at 570-346-5543.

Sincerely,

Jennifer Means
Environmental Program Manager
Oil and Gas Management

Enclosures:
Laboratory Analytical Results
"How to Interpret A Water Analysis Report"

cc:
Jennifer Means
Marc B. Cooley
Mike O'Donnell
William Kosmer P.G.
Briana Cunningham
Eric Rooney P.G.
Complaint File # 29[illegible]95
Carrizo Marcellus, LLC