UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Response to Public Comments for The Issuance of two Underground Injection Control Permits and three major modifications to UIC Permits for Bear Lake Properties, LLC

On February 12, 2016, the U.S. Environmental Protection Agency Region III (EPA) issued a public notice in Corry, Pennsylvania's Corry Journal and via the internet on EPA's website requesting comment and announcing the opportunity for a public hearing on the proposed issuance of two new Underground Injection Control (UIC) permits, PAS2D218BWAR (Bittinger #3) and PAS2D219BWAR (Smith-Ras #1), and on the proposed major modifications to three existing permits, PAS2D215BWAR (Bittinger #4), PAS2D216BWAR (Bittinger #1), and PAS2D217BWAR (Bittinger #2). Bear Lake Properties, LLC (BLP) is the permittee in each of these permits. The three existing permits being modified were initially issued as follows: Bittinger #4 and Bittinger #1 became effective on November 29, 2012 for a term of five years; the Bittinger #2 permit became effective on November 10, 2014 for a term of five years.

EPA received notice of sufficient public interest to hold a hearing, and a public hearing was held on March 16, 2016 at the Columbus Fire Hall in Columbus, Pennsylvania. The public comment period was extended until March 22, 2016 to accommodate any additional public comments. EPA received comments on the draft permits via mail and email, and also heard comments via testimony at the public hearing, which was well attended.

All of the information submitted by BLP as part of the applications for new UIC permits for Bittinger #3 and Smith-Ras #1, as well as the Draft Permits and the Statements of Basis for the new permits and proposed modifications, as prepared by EPA, were available for review at the Corry Public Library and at the EPA regional office in Philadelphia, PA.

EPA received comments during the public comment period and at the public hearing concerning: the potential for induced seismicity; ground water contamination; monitoring well integrity; impact on surface waters, including wetlands, and on the local flora and fauna; radioactivity: spill prevention; past permit application availability; fire training and response; the hydraulic fracturing and its waste products; the condition of the casing and cementing of the injection wells; and effect on property values. This response to comments consolidates and provides responses to questions and issues raised by those who commented during the public comment period. EPA thanks the public for their informative and thoughtful comments, the Corry Public Library for allowing EPA to house documentation at its location, and the Columbus Volunteer Fire Company and its staff for allowing us to hold a hearing at its fire hall.

1) Seismicity may result from the operation of injection wells.

As explained in the Statement of Basis, although EPA must consider appropriate geological data on the injection and confining zones when permitting Class II wells, the Safe Drinking Water Act (SDWA) regulations for Class II wells do not require specific consideration of seismicity. (In contrast, SDWA regulations for Class I wells used for the injection of hazardous waste require consideration of seismicity, see 40 C.F.R. §§ 146.62(b)(1) and 146.68(f).) Nonetheless, for the BLP permits EPA evaluated factors relevant to seismic activity such as the existence of any known faults and/or fractures and any history of, or potential for, seismic events in the area of the injection wells as discussed below. See *"Region 3 framework for evaluating seismic potential associated with UIC Class II permits, updated September, 2013"* for a discussion of factors bearing on induced seismicity.

An EPA report that looks at injection-induced seismicity ("Minimizing and Managing Potential Impacts of Induced-Seismicity from Class II Disposal Wells: A Practical Approach," EPA UIC National Technical Workgroup, February 5, 2015[1]) provides a standard operating procedure for assessing regional and local seismicity when reviewing permit applications. This procedure correlates any area seismicity with past injection practices; evaluates geological information to assess the likelihood of activating any faults; evaluates storage capacity of the formation with consideration of porosity and permeability; includes operational parameters to limit injection rates and volumes to maintain below existing fracture pressures; and requires continuous monitoring of injection pressure and volumes. EPA followed this procedure to evaluate how the addition of Bittinger #3 and Smith-Ras #1 into BLP's overall injection well network would impact the factors that influence potential seismicity, most importantly, pressure underground. We reviewed USGS information on seismicity in the area of the injection wells[2], evidence of faults and known faults within the area of review around each well site via GIS mapping analysis[3], history of production from the receiving formation, and incorporated all results into operational parameters in each permit to limit the volume and the injection rates into the wells.

Induced seismicity background

Under certain conditions, disposal of fluids through injection wells has the potential to trigger seismicity. However, induced seismicity associated with brine injection is uncommon, as conditions necessary to trigger seismicity often are not present. Seismic activity induced by Class II wells is likely to occur only where all of the following conditions are present: (1) there is a fault in a near-failure state of stress; (2) the fluid injected has a path of communication to the fault; and (3) the pressure exerted by the fluid is high enough and lasts long enough to allow movement along the fault line. (Induced Seismicity Potential in Energy Technologies, National Academy Press, 2013, at p. 10-11.) Although there are approximately 30,000 Class II-D wastewater disposal wells operating in the United States, only a few of these wells have been documented to have triggered earthquakes of significance and none of these earthquakes, which EPA Region III is aware of, has caused injected fluids to flow into or contaminate an underground source of drinking water (USDW).

The presence of a fault in a receiving formation potentially creates a more vulnerable condition for a future seismic event. A fault is a fracture or a crack in the rocks that make up the Earth's crust, along which displacement has occurred. Where a fault is present near an injection site, scientists believe that injection can trigger seismicity when the pore pressure (pressure of fluid in the pores of the

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[1] EPA's national UIC Technical Workgroup finalized this report on February 5, 2015.
[2] USGS Search performed via the "All Earthquakes 1900-Present" tool. Reference: http://earthquake.usgs.gov/earthquakes/byregion/pennsylvania.php
[3] Bear Lake Applications PAS2D218BWAR and PAS2D219BWAR, submitted March 24, 2015. Analysis was also redone on the areas where permitted wells PAS2D215BWAR, PAS2D216BWAR, and PAS2D217BWAR are located.

subsurface rocks) in the formation increases to such levels as to overcome the frictional force that keeps the fault stable. Pore pressure increases with increases in the volume and rate of injected fluid. Thus, the probability of triggering a significant seismic event due to injection, where the injection fluid reaches an active fault, increases with the volume and the rate of fluid injected. In addition, the larger the volume injected over time, the more likely a fault could be intersected, because the fluid will travel farther within a formation. When injected fluid reaches a fault, frictional forces that have been maintained within that fault can be reduced by the fluid. At high enough pore pressure, the reduction in frictional forces can result in the formation shifting along the fault line, resulting in a seismic event.

Because increases in pore pressure due to the rate and the volume of injected fluid can act on existing faults and provide a mechanism for induced seismicity, most examples of injection-induced seismicity are in cases where the receiving formation has low permeability and/or the pressure or volume of fluid injected over time is quite large. Formations such as crystalline basement rock (deeper geological formations of igneous or metamorphic rock that underlie layers of sedimentary rock) have very low permeability. Permeability is the ease with which a fluid can flow through the pores in a rock layer. Where permeability is low, injected fluid cannot flow easily through the pores in this rock and therefore flow is oriented mainly through existing fractures or faults in the rock (secondary permeability). These kinds of rock formations have high transmissivity and low storativity. This means that the formation cannot store a lot of fluid; rather fluid moves farther and faster in these formations than in more porous formations. Because of the high transmissivity and low storativity of these kinds of rocks, the potential exists to induce pore pressure increases at considerable distances away from the injection well.

Conditions relevant to seismicity at the BLP wells

The information on seismicity in Pennsylvania shows that the area of these injection operations is not an earthquake prone area[4]. The history of seismic events recorded by the United States Geologic Survey (USGS) in Warren County indicates that such events are extremely rare. Please refer to the PA DCNR website which has an interactive seismicity map and catalog of all recorded seismic events in or near Pennsylvania from 1724-present. The closest recorded Pennsylvania earthquake to the BLP site is over 20 miles from the site, a 2.4 magnitude earthquake which occurred in 1995[5].

The International Federation of Digital Seismograph Networks identifies 22 seismograph stations in Pennsylvania, with the closest one to BLP, located approximately 25 miles to the Southeast in Chapman State Park, Warren County.[6] The seismograph stations track, record and map faults and earthquake epicenters in certain areas throughout the United States. The USGS as well as the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) which includes the Bureau of Topographic and Geologic Survey, the principal organizations that conducts geologic research in Pennsylvania, have only recorded one seismic activity that originated in Warren County, which was the 2.4 magnitude earthquake in 1995 mentioned above.

[4] USGS Search performed via the "All Earthquakes 1900-Present" tool. Reference: http://earthquake.usgs.gov/earthquakes/byregion/pennsylvania.php

[5] Reference: http://www.gis.dcnr.state.pa.us/maps/index.html?geology=true

[6] Reference: http://www.fdsn.org/networks/detail/XY_2013/

Furthermore, research on recent earthquake activity in Pennsylvania concluded that none of that activity was a result of induced seismicity via injection wells.[7][8] One commenter remarked during the public hearing that Pymatuning, Waterford, and Warren, all cities in Pennsylvania in proximity of the BLP injection well sites, have experienced earthquakes. The 1998 Pymatuning earthquake referred to was a magnitude 4.5[9] and the epicenter occurred 56 miles from the proposed Bittinger 3 injection site. The 1990 Waterford earthquake referred to was a magnitude 2.5[10] and the epicenter occurred 30 miles from the proposed Bittinger 3 injection site. The 1995 Warren earthquake referred to was a magnitude 2.4[11] and the epicenter occurred 25 miles from the proposed Bittinger 3 injection site. Each of the earthquakes mentioned by the commenter were investigated, and all were unrelated to injection activity[12].

Geological information on the area which BLP submitted in the applications indicates that there is no evidence of deep-seated transmissive faults that intersect the proposed injection zone or that could be influenced by the proposed injection operation in the future. Evidence of faulting, such as unusual thickening or thinning of geological intervals, or unusual displacement in the geological formations in nearby wells, is not present for this area. The fact that the Medina formation, which is the injection zone for the BLP wells, has produced and continues to produce natural gas is itself evidence that there are no transmissive faults, that is, faults that allow fluids to flow along the fault and between formations, in the area that would have allowed the gas to escape.

Over the past three decades, natural gas has been removed from the pore space within the Medina formation, depleting the formation of much of the natural gas it contained as well as reducing the formation's reservoir pressure. Earthquakes can occur when a geologic formation becomes under-pressurized (i.e., through geologic formation collapse causing the structure of the formation to shift) or when it becomes over-pressurized. The Medina formation in this location is presently under-pressurized from decades of natural gas production and there has been no evidence of earthquakes due to the removal of this natural gas. Because of the removal of millions of cubic feet of natural gas, pore space has been created to accept the injection of fluid from BLP's injection operations without over-pressurizing the formation.

Research indicates that continuous very high rate of injection or over-pressurization of a geologic formation can contribute to the possibility of seismic activity. The BLP permit limits for the surface injection pressure and the bottom-hole injection pressure were calculated to ensure that, during operation, the injection will not propagate existing fractures or create new fractures in the receiving formation. Limiting the pressure not only prevents the propagation of fractures that could become potential channels for fluid movement into USDWs but that could also serve as conduits for fluids to travel from the injection zone to known or unknown faults. The permits also limit the amount of fluid

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[7] Fleeger, G. M., & Goode, D. J. (1999, August). Hydrologic Effects of the Pymatuning Earthquake of September 25, 1998, in Northwest Pennsylvania. USGS WRIR, 99(4170). Retrieved August 06, 2016, from http://pa.water.usgs.gov/reports/wrir_99-4170.pdf

[8] Research on April 18, 2016 magnitude 2.1 Titusville, PA seismic activity conducted via: http://aqms.ldeo.columbia.edu/recent.html , http://earthquake.usgs.gov/earthquakes/eventpage/ld60111911#executive

[9] http://earthquake.usgs.gov/earthquakes/eventpage/usp0008vh3#executive

[10] http://earthquake.usgs.gov/earthquakes/eventpage/usp0004j8f#executive

[11] http://www.gis.dcnr.state.pa.us/maps/index.html?geology=true

[12] Homman, Kyle A. (2015) *Seismicity in Pennsylvania* (Masters Thesis) Retrieved from the Penn State eTD Database. Ref: P.67.

that can be injected into each well to 30,000 barrels per month, except for the Smith-Ras 1 well which is limited to 22,500 barrels per month.[13]

Another commenter remarked that, given the amount BLP will be permitted to inject, an area the size of a large underground cavern would be needed for the injected fluid. This comment is misleading. While a specific volume of fluid will be injected into the formation, it will not occupy a "cavern" or "room" of space. As stated above, the Medina formation has a high transmissivity rate. The fluid will move through pore space in the formation rock, spreading out as additional fluid is added. The permit parameters limit the spread of the fluid to make sure the volume injected does not cause the pressure in the formation to increase to a point to allow the fluid to rise to the base of the lowermost USDW (see answer to Question 2), and or to a point which would cause fractures.

Comparison to other wells linked to injection-induced seismicity

Several commenters remarked that studies on earthquakes which have occurred in Ohio, Arkansas, Oklahoma, Kansas and Alabama have linked those earthquakes to underground injection. One commenter provided EPA with copies of articles or studies as reference material. Major geologic differences between each of these earthquake occurrences and the operational parameters BLP will be operating under exist. Scientific evidence indicates that seismic activity is most likely associated with the depth of a well, the volume and rate of injection, and the injection pressure. In these aspects the BLP wells contrast greatly with the wells in known cases of induced-seismicity.

In the case of the Northstar 1 injection well in Youngstown, Ohio, the earthquakes associated with that well are believed to have been generated by injection into Precambrian crystalline bedrock. This is a deeper receiving formation, with different geology, than that for the BLP wells. The "Preliminary Report on the Northstar1 Class II Injection Well and the Seismic Events in Youngstown, Ohio Area, Ohio Department of Natural Resources, March 2012", has indicated that the seismic activity associated with the injection of fluid in the Northstar 1 was likely due to the injected fluid coming into contact with a fault system located in deep Precambrian basement crystalline bedrock. This bedrock is located beneath the sedimentary bedrock structure and has very low permeability.

Fluid injected in crystalline basement rocks is essentially transmitted by a network of inter-connected fractures and joints. Because of the high transmissivity (the ability of fluids to move through rock) and minimal ability to store fluids in these kinds of rocks, the potential exists to create flow at considerable distances from the injection well. Once flow reaches a fault, it allows the frictional forces that exist to be reduced thereby allowing the rocks to slip, leading to seismic activity. BLP wells will inject into Lower Silurian age Medina formation, which consists of sandstone and shale. These rock layers have much greater porosity and permeability than the bedrock into which Northstar 1 injected. The receiving formation for the BLP wells is about 5400 feet above the Precambrian basement bedrock at the location of the BLP wells.

As of 2013, gas and oil bearing regions of Texas, Oklahoma and Kansas have three of the top four largest concentrations of Class II wastewater disposal wells in the United States[14]. Researchers

[13] The Smith-Ras 1 has a lower volume limit because using conservative assumptions for the permeability of the receiving formation, a lower limit was necessary to maintain a lower injection pressure at this well. See memo to file "Explanation for Difference Injection Volumes– Bear Lakes – Smith-Ras #1" for full explanation.

[14] https://www.epa.gov/sites/production/files/2015-10/documents/uicinventorybystate2013_508c_0.pdf

studying the circumstances that led to the seismic events in Oklahoma and Arkansas believe that over-pressurization of a nearby fault after years of injection may have led to the seismicity. Similar to what happened in Ohio, injected fluid migrated into Precambrian rocks, which in the case of those wells were found just below the injection zone, and came into contact with a fault ("Science", Volume 335, March 23, 2012). It is believed that the reduction of the frictional stress in the faults led to slippage along the faults (from the journal "Geology", co-authored by researchers with USGS and Oklahoma Geologic Survey, March 3, 2013). Recent research has correlated induced seismicity in Texas and Oklahoma to high-rate injection wells that were receiving between 150,000 and 300,000 barrels per month individually, significantly higher than that for the BLP wells.

Endangerment of USDWs due to earthquakes

Of the hundreds of thousands of injection wells operating in the United States, EPA is not aware of any case where a seismic event caused an injection well to contaminate an USDW. An inquiry through EPA regional offices did not reveal any reports of earthquakes having affected the integrity of injection wells in the cases of induced-seismicity in Ohio, Texas, Oklahoma, West Virginia or Arkansas. A number of factors help to prevent injection wells from failing in a seismic event and contributing to the contamination of an USDW. Most deep injection wells, those that are classified as Class I or Class II injection wells, are constructed to withstand significant amounts of pressure. They are typically constructed with multiple steel strings of casing that are cemented in place. The casing in these wells is designed to withstand both significant internal and external pressure. The American Petroleum Institute (API) (see www.api.org) and oil and gas service companies such as Halliburton Services (see Halliburton Cementing Tables, 1980), have developed industry standards for casing and cementing wells. Furthermore, brine disposal injection wells are required to be mechanically tested to ensure integrity before they are operated and many are continuously monitored after testing to ensure that mechanical integrity is maintained. The new BLP wells will have multiple steel strings of casing that are cemented in place. The permits require BLP to mechanically test the new wells to ensure integrity before operations begin and to continuously monitor the wells during operations to detect any potential mechanical integrity concerns. The wells will be designed to automatically shut in and cease operation if a seismic event occurs that would affect the mechanical integrity of the well.

A commenter remarked that injecting close to 30,000 barrels per month into each of the two new wells is more than twice the amount of fluid the existing permitted BLP wells have been injecting, and because of this there is the possibility for seismicity to be induced. However, all three currently permitted wells are each permitted to inject up to 30,000 barrels per month, and have been permitted to do so since their original permitting. As discussed above the earthquakes in Texas and Oklahoma were the result of high rate of injection, more than five times the permitted injection volume of the BLP wells. The injection volume is further limited by the maximum injection pressure set in the permits, which is set to prohibit fracturing of the injection formation. If the formation pressure increases then BLP will have to reduce the volume injected in order to comply with the permitted injection pressure.

2) Groundwater contamination is possible through operation of UIC wells.

Commenters inquired as to whether EPA knows where all aquifers are and how close injection well fluid will get to those aquifers. EPA staff reviewing UIC applications evaluate applications for the potential impacts that an injection well could have on USDWs and groundwater aquifers. Based on EPA experience with the construction of other UIC wells in Pennsylvania, water bearing formations that meet the definition of a USDW (i.e., aquifers supplying any public water system or containing a sufficient quantity of ground water to supply a public water system and containing less than 10,000 milligrams per liter total dissolved solids) are limited generally to within 500 to 800 feet below the land's surface. Generally below 1000 feet deep, Pennsylvania geology does not provide for aquifer systems that would be categorized as USDWs. Geologic formations at these depths are generally tight shale and limestone formations, which do not typically bear water. The tight shale and limestone formations can be followed by deeper oil and gas bearing formations, which may bear water, but due to the high levels of total dissolved solids, would not qualify as USDWs.

In the area of the BLP wells, the lowermost USDW has been identified at a depth of 300 feet. The injection zone for the Bittinger #3 and the Smith-Ras #1 begins at more than 4200 feet below ground. Over 3900 feet separate the injection zone from the lowermost USDW, with several confining layers in between, including over 600 feet of dolomite right above the injection zone. The UIC regulations required that Class II wells have surface casing down to at least 50 feet below the lowermost USDW. See 40 C.F.R. §147.1955(b)(1). The existing and new permits require surface casing to the following depths, which exceed the regulatory requirement:

Bittinger #1	401 ft
Bittinger #2	428 ft
Bittinger #3	405 ft
Bittinger #4	506 ft
Smith-Ras #1	406 ft

The surface casing must be cemented to the surface. In addition, the permits require production casing (also referred to as long string casing) to be set through, or above, the injection zone and cemented back at least 100 feet above the injection zone. Injection tubing and packer is then set inside the production casing and injection occurs through the tubing and packer. This construction provides three layers of protection for the USDWs.

As explained in the Statement of Basis, the Area of Review for a UIC well is an area surrounding the project or a well which the applicant must first research then develop a program for corrective action to address any wells which penetrate the injection zone and which may provide conduits for fluid migration. BLP proposed a one-quarter mile fixed-radius as the Area of Review around each of the proposed injection wells. EPA reviewed and evaluated the Areas of Review proposed by BLP to ensure that no aquifers or other USDWs will be impacted by operation of BLP wells, and that any abandoned wells are plugged prior to injection beginning. Although not required when applying a fixed-radius Area of Review, EPA performed a zone of endangering influence (ZEI) calculation for each well based on the well locations, under the operating parameters of all the permits, assuming injection of the maximum volume at all wells for the duration of the permit. The ZEI measures the distance fluid will spread out underground based on injection parameters. This calculation is based on the operation of all of the BLP wells under the maximum permit parameters for 10 years. The ZEI calculations identified that after ten years of operation, the ZEI will only extend several hundred feet from the proposed injection wells' wellbores. Taking into account the population, ground water use, and the historical practices in the area, EPA chose to base the area of review on the fixed radius method because the proposed quarter-mile area of review is more protective than an area of review based on the ZEI calculation.

There are no records of abandoned wells in the Areas of Reviews for the Bittinger #3 or the Smith-Ras #1 that penetrate the injection well and could serve as conduits for fluid migration. There are several drinking water wells in the Area of Review of Bittinger #3. However, all of these wells are much shallower than the injection zone. The UIC regulations do not prohibit locating Class II injection wells near drinking water wells. Instead the regulations and the construction requirements within the permits establish the requirements to protect the water source for these wells from endangerment by the injection operation. See 146 C.F.R. Subpart C.

One of the commenters requested that the permittee test the drinking water wells regulary. Class II regulations do not require permittees to test drinking water wells, however the permits also include fluid monitoring requirements to track compliance and to protect ground water. The permits require analysis of specific parameters in the injection fluid every two years and whenever the operator anticipates any change in the injection fluid. See Part II.C.4. The purpose of fluid monitoring requirement is to characterize the fluids to be injected and to verify that the fluids injected in the well are the type of fluids authorized in the permits. Many of the constituents that will be monitored in the injection fluid are also found in shallow ground water. If any sample results were to show shallow ground water contamination, those results can be compared against the injection fluid analyses conducted by the injection well operator to determine whether the injection fluid may be the cause of that contamination. Any wastewater stored on site, prior to injection, is subject to regulation by the Pennsylvania Department of Environmental Protection (PADEP)[15]. See generally Pennsylvania's Oil and Gas Wells regulations, at Title 25 of the Pennsylvania Administrative Code, Chapter 78, Subchapter C.

One commenter expressed concerns that the R. Craker #1 gas well might have collapsed and thus could provide a conduit for fluid migration into groundwater. The Craker gas well is outside the Area of Review of all the BLP wells. Even if the Craker well indeed has collapsed or does not otherwise have mechanical integrity and it reached the injection formation, it is not close enough to serve as conduit for fluid migration under the operational parameters of the permit. Furthermore, EPA's UIC field inspector visited the Craker #1 well on August 17, 2016, to measure the fluid level in the well. The UIC program's Echometer Model M Fluid Level Instrument was used to determine the fluid depth. The echometer is an acoustic device which consists of an acoustic pulse generator, a microphone and a pressure gauge. An acoustic pulse is generated at the well head and the microphone within the echometer converts the reflected acoustic signal into an electrical signal consisting of pulses, which correspond to the characteristics of the initial pulse, the pressure of the gas, the distance traveled and the type of cross sectional area change. The depth to fluid level was calculated to be approximately 4,376 feet, which is near the bottom of the well. If the well was collapsed the echometer signal would not have reached the fluid level near the bottom of the well.

3) Tamarack Swamp, New York state lands, wetlands, and other area surface waters along with flora and fauna will be negatively impacted as a result of the nearby injection of produced fluid. Surface spills could negatively impact land or nearby surface waters.

When making the decision on whether to issue a UIC permit, EPA's jurisdiction rests solely in determining whether the proposed injection operation will safely protect underground sources of

[15] Reference: http://files.dep.state.pa.us/PublicParticipation/Public%20Participation%20Center/PubPartCenterPortalFiles/Environmental%20Quality%20Board/2013/August%2027%20EQB/Proposed%20Rulemaking%20-%20Ch%2078/Annex.pdf

drinking water (USDWs) from the subsurface emplacement of fluids. Land use regulation, impact of local wildlife or control of spills are not covered by the UIC regulations, and thus do not bear on the issuance of a UIC permit. These issues are addressed by state and local regulation, or by other federal laws.

EPA's UIC permit is only one of several authorizations that a permittee may be required to obtain before it is allowed to commence construction and/or operation of the injection well. Part I.D.12 of the permit states, "Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation." The operator must also receive a permit from the Pennsylvania Department of Environmental Protection (PADEP) prior to initiating construction and operation of the injection well. One of the PADEP requirements for disposal wells is that permittees must have a plan to prevent spills. See 25 Pa. Code §§ 78.18, 91.34.

As part of the public notice process, EPA provides copies of the Statement of Basis and the draft permit to the U.S. Fish & Wildlife, the Nature Conservancy, the PA Fish & Boat Commission, the Pennsylvania Game Commission, and the Allegheny National Forest for their review and comment. No comments were received by any of these organizations. EPA searched Fish and Wildlife's website, http://ecos.fws.gov/ipac/, for endangered species located in Warren County, Pennsylvania and Chautauqua County, NY and received official species lists. The lists identified one (1) threatened, endangered, or candidate species, the Northern long-eared bat. There are no critical habitats for the Northern long-eared bat within the project area. The injection wells are being converted from existing production wells, so surface disruption at the site will be minimal.

A commenter claimed that a possible connection between the Trisket #1 proposed monitoring well and Tamarack Swamp could potentially exist as a result of a black, sulfur-smelling swab sample he obtained at Tamarack Swamp. Without analysis of the sample being referred to, EPA is unable to verify any connection between the petroleum characteristics of oil produced from Trisket #1 and the sample obtained from Tamarack Swamp. Given the depth of the injection zone for these injection wells, and the confining geological layers above it, as described in the response to Question 2, communication between Tamarack Swamp and the layer of injection is highly unlikely.

4) **Toxic and radioactive waste should not be disposed of underground. Workers unloading tank trucks should wear dosimeters. Fire training should be provided to ensure protection. Each truckload of fluid should be tested for its level of radioactivity, and there should be testing for VOC.**

The rate of naturally occurring radioactive material (NORM) production fluid may contain depends on the geologic formation from where the fluid has been produced. Fluids produced from shale tend to contain greater concentrations of NORM because of the clay content in the shale.[16] NORM may become more concentrated during the oil/gas extraction process and thus produced fluid can be Technologically Enhanced Naturally Occurring Radioactive Material (TENORM).[17] Individual constituents contained within fluid produced from an oil or gas production reservoir could be determined to be toxic, hazardous or radioactive. However, these fluids, when produced in association with oil and gas production, are exempt from hazardous waste regulation and are not classified as hazardous under

[16] See http://wvwri.org/research-wvu-concludes-waste-test-fracking-wells-safe-highways/ summarizing ongoing research by Dr. Paul Ziemkiewicz at the Marcellus Shale Energy and Environment Laboratory.
[17] Further resources available at: https://www.epa.gov/radiation/tenorm-oil-and-gas-production-wastes.

the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 et seq. In December 1978, EPA proposed hazardous waste management standards that included reduced requirements for several types of large volume wastes. Generally, EPA believed these large volume "special wastes" were lower in toxicity than other RCRA regulated hazardous wastes. Subsequently, Congress exempted the wastes associated with oil and gas exploration and production from RCRA Subtitle C pending a study and regulatory determination by EPA. In 1988, EPA issued a regulatory determination that the control of exploration and production wastes under RCRA Subtitle C was not warranted. Therefore, the UIC program does not regulate fluids produced in association with oil and gas production activities as hazardous waste. Disposal of these fluids is permissible down a Class II brine disposal injection well.

If managed and operated properly, EPA believes the risk to the environment by injecting fluids deep underground is safer than other methods of disposal, such as allowing them to be discharged into a stream, disposed of in a landfill or treated and stored in containment pits or storage tanks. EPA also believes that the reuse or recycling of produced fluid is a sound environmental management practice. Although produced brine can be treated, recycled and reused in the hydraulic fracturing process or for the enhanced recovery of oil, the byproduct of this continued reuse of the produced fluid eventually becomes very concentrated and must still be disposed of in some manner. Public and privately owned wastewater treatment facilities are unable to adequately remove many constituents found in brine, for example, chlorides and bromides. When these constituents are discharged to streams or rivers they can pose serious risk to fish and other aquatic organisms living in the stream as well as contribute to serious health effects for people who obtain their drinking water from these streams and rivers. The UIC permitting program is designed to ensure that injection covered by the UIC permits can occur in an environmentally protective manner.

Although the UIC program does not regulate air emissions, worker protection or trucking-related issues, BLP does have an extensive radiation protection action plan (RPAP) in place that addresses a comprehensive set of risk factors. These include personnel responsibilities, task-specific hazard analysis and controls, and record keeping. The plan details requirements for radiation monitoring and actions to be taken that limit potential exposure to radiation as a result of injection well transport, transfer, and eventual injection. Under the RPAP, sludge produced as a solid via precipitation at the BLP transfer facility is evaluated for radioactivity on two designated action levels. Action level one includes a waste alarm which will be triggered if a waste load exceeds a set µR (micro roentgen) amount. Triggering of this alarm relays notification of the exceedance to the PADEP and the Department of Transportation (DOT). Action level two measures any potential radiation doses throughout the cab, outside, and on any surface of the vehicle. Should an action level be exceeded, PADEP is notified and the vehicle is isolated. This standard operating procedure in dealing with any naturally occurring radioactivity will help BLP transfer fluid to its injection wells with minimal chance for spillage or other exposure to radioactive material.

5) **There is a discrepancy between records and PADEP well ID's for the wells being considered for permits/permit modifications. PADEP records show Bittinger #1, 2, and 4 listed as injection wells but not Bittinger #3.**

BLP provided EPA with all necessary documentation of well records, including casing and cementing, in order for EPA to comprehensively evaluate BLP's application for the two new UIC permits and the monitoring well network for the three existing permits which are to be modified. All this information was made available to the public during the comment period, and EPA's UIC program has its own tracking system which insures accountability and recordkeeping for each UIC well in the UIC network.

Bittinger #3 and Smith-Ras #1 will not be listed with PADEP as injection wells until they are permitted at both a federal and state level. Typically, until the permitting process is finalized, both wells would not show up in PADEP records as injection wells.

6) **A commenter remarked that the application for Bittinger #2 was not available when it was originally permitted as a UIC well, and asked if there were records of pressure tests available for Bittinger #2.**

Copies of the permit application, draft permit, public notice, and statement of basis were mailed to the Corry Library, on September 23, 2014. The package was sent with USPS tracking and verified as delivered on September 24, 2014. All these documents are public records. The Bittinger #2 well passed a mechanical integrity test (MIT) on December 8, 2014, after receiving its permit but prior to beginning injection. The test was witnessed by an EPA Region 3 UIC Field Inspector. The well is not due for another MIT until December 8, 2016 per UIC regulations and the permit requirements.

7) **How can the mechanical integrity of the monitoring well network be ensured, and how can deterioration of currently permitted wells and monitoring wells be evaluated?**

The injection wells must pass a mechanical integrity test prior to authorization to inject and every two years thereafter. Also, cementing records and logs are required to show that each well has adequate cement to prevent fluid migration out of the injection zone. The required mechanical integrity test must show that there are no internal failures in the tubing, casing or packer installed within the well. EPA requires that every injection well be tested before it operates to make sure that the casing, tubing and packer placed in the well do not leak. In addition to requiring the mechanical integrity test before operation, the existing three permits and two proposed UIC permits require that the wells be tested for mechanical integrity every two years. The permittee has to notify EPA 30 days prior to conducting a mechanical integrity test, which gives EPA inspectors the opportunity to witness the test. The results of any mechanical integrity test must be included in the annual report required by the permits. The reports are public records.

In between the testing, the wells are continuously monitored for injection pressure, annular pressure and injection volume to ensure that the wells maintain mechanical integrity continuously and operate in accordance with their permit conditions. Should a problem occur during the operation of a BLP well, each well is designed with an automatic pressure shut-down device that will discontinue operation of the well. The continuous monitoring of the wells, as well as the presence of company employees on site, ensures that the wells operate in a safe and protective manner. EPA will also be conducting periodic routine compliance inspections between mechanical integrity testing cycles to verify all operating and recording devices are operational.

The UIC regulations do not require mechanical integrity tests of monitoring wells and BLP has not been required to conduct tests on those wells. Although the monitoring wells are outside the area of review and are being monitored to ensure that the area of review is adequate over the life of the injection wells, EPA has decided to include additional permit requirements for the monitoring wells based on comments received from the public. The five BLP permits will require MIT testing in the monitoring wells under the conditions specified below.

If the fluid level in a monitoring well is observed to rise within 100 feet of the top of cement of the long-string casing, that is, it rises to the depth listed in the table below, the permittee shall stop injection operations immediately, and shall notify the EPA orally (phone numbers: (215) 814-5445 or (215) 814-5498) within 24 hours of the observation and shall send written notification to EPA within 5 days of the observation. The permittee shall demonstrate mechanical integrity of the monitoring well where fluid reached the trigger depth prior to resuming injection. The MIT test will be required on that monitoring well every two years thereafter.

Monitor Well	Depth of Well (ft)	Top of Cement (Depth - Thickness) (ft)	MIT Trigger Depth(ft)
Craker 1	4584	3418	3318
Hammond 1	4676	3510	3410
Reed 2	4553	3387	3287
Reed 4	4566	3530	3430
Trisket 1	4432	2956	2856
Trisket 2	4429	3082	2982
Wright 1	4479	3313	3213

To date, the fluid level in the monitoring wells has not risen during the operation of the three permitted injection wells.

8) **BLP holding tanks and pipelines should be tested for deterioration, and excess gas should not be vented to the air as it could cause airborne contamination.**

BLP is responsible for maintaining all equipment that comprises its injection operation. Part 1.D.4 of all the BLP permits require:

> The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control and related appurtenances which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, adequate security to prevent unauthorized access and operation of the Injection Well and adequate laboratory and process controls, including appropriate quality assurance procedures.

As such, holding tanks and pipelines must be maintained in order to comply with this permit.

Venting of gas is related to the production of oil and gas, and therefore is not related to nor regulated by the UIC program. UIC injection wells inject fluid *into* the ground as opposed to drawing material *out of* the ground, meaning no gas is vented.

9) **A commenter stated that the Clean Water Act (CWA) mandates that UIC wells that are injected into must be injected into at the same depth as fluid is extracted, and asked if the exemption oil and gas has from the CWA is still in place.**

The UIC program is regulated under the SDWA at 42 U.S.C. Subpart C, not the CWA as commenter stated. The SDWA does not have a requirement to inject at the same depth as fluid is extracted. As stated earlier EPA views subsurface emplacement of fluids as the safest means for disposal of oil and gas wastewater. EPA believes that the comment regarding an exemption was referring to the determination under RCRA not to regulated fluids associated with oil and gas productions as hazardous. See the answer to Question 4.

10) Property resale values will be lower as a result of injection wells being installed.

EPA does not have the jurisdictional authority to require operators to construct an injection well in any particular geographic location. The location chosen by an operator is based on many factors such as: economics, property ownership and accessibility, and geologic suitability. EPA's statutory and regulatory responsibility is to review each UIC permit application it receives to determine whether USDWs will be protected from the proposed injection well operation and whether the operation will be in compliance with the UIC regulations. Likewise, EPA cannot deny a permit solely because of residents' opposition to the location, if the applicant otherwise meets the requirements of the UIC program.

As stated in Part 1, Section A of all BLP permits, "Issuance of this permit does not convey property rights or mineral rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations." Therefore, permittee is granted no additional privileges as a result of being issued a permit.

Federal Underground Injection Control Program
Permit Appeals Procedures

The provisions governing procedures for the appeal of an EPA permitting decision are specified at 40 C.F.R. Part 124.19. (Please note that the changes to this regulation became effective on March 26, 2013. See 78 Federal Register 5281, Friday, January 25, 2013.) Any person who commented on the draft permits or permit modifications, either in writing during the comment period or orally at the public hearing, can appeal the final new permits and/or the modified permits by filing a written petition for review with the Clerk of the EPA Environmental Appeals Board (EAB). Persons who have not previously provided comments are limited in their appeal rights to those points which have been changed between the draft and final permits, or between draft modified permits and the final modified permits. Petitions for review may be filed by citizens, groups, organizations, governments and the permittee.

A petition for review must be filed within thirty (30) days of the date of the notice announcing EPA's permit decisions. This means that the EAB must receive the petition within 30 days. (Petitioners receiving notice of the final permits by mail have 3 additional days in accordance with 40 C.F.R. § 124.20(d).) The petition for review can be filed by regular mail sent to the address listed below with a copy sent to EPA Region III at the address listed below.

Environmental Appeals Board
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue N.W.

Mail Code 1103M
Washington, DC 20460-0001

U.S. Environmental Protection Agency
Region III Ground Water & Enforcement Branch (3WP22)
Water Protection Branch
1650 Arch Street
Philadelphia, PA 19103

See the Federal Register notice cited above or the EAB website: http://yosemite.epa.gov/oa/EAB_Web_Docket.nsf/) for how to file with the EAB electronically or by hand delivery.

The petition must clearly set forth the petitioner's contentions as to why the permit (or permits or permit modifications) should be reviewed. It must identify the contested permit conditions or the specific challenge to the permit decision. (In the case of the permit modifications, only the conditions relating to the terms of the permit and monitoring wells have been reopened and are subject to this permit modification proceeding.) The petitioner must demonstrate the issues raised in the petition had been raised previously during the comment period or at the hearing. If the appeal is based on a change between the draft and final permit conditions, the petition should state so explicitly. The petitioner must also state whether, in his or her opinion, the permit decisions or the permits' conditions appealed are objectionable because of:

1. Factual or legal error, or

2. The incorporation of a policy consideration which the EAB should, at its discretion, review.

If a petition for review of the new permits is filed, the new permits are not in effect pending final agency action. If a petition for review of the permit modifications is filed, the permit conditions subject to the modification would be deemed not to be in effect pending a final agency action.

Within a reasonable time of receipt of the petition for review, the EAB will either grant or deny the appeal. The EAB will decide the appeal on the basis of the written briefs and the total administrative record of the permit actions. If the EAB denies the petition, EPA will notify the petitioner of the final permit decisions. The petitioner may, thereafter, challenge the permit decisions in Federal Court. If the EAB grants the appeal, it may direct the Region III office to implement its decision by permit issuance, modification or denial. The EAB may order all or part of the permit decisions back to the EPA Region III office for reconsideration. In either case, a final agency decision has occurred when a permit is issued, modified or denied and that decision is announced. After this time, all administrative appeals have been exhausted, and any further challenges to the permit decision must be made to Federal Court.