UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
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Responsiveness Summary for The Issuance of an Underground Injection Control (UIC) Permit for Pennsylvania General Energy Company, LLC

On September 18, 2013, the U.S. Environmental Protection Agency (EPA) Region III issued a public notice in the "Indiana Gazette" requesting comment and announcing the opportunity for a public hearing for the proposed issuance of a Class II-D Underground Injection Control (UIC) brine disposal permit, PAS2D013BIND, for Pennsylvania General Energy Company, Inc. (PGE). The proposed injection well, the Marjorie C. Yanity 1025, is located in Grant Township, Indiana County, PA. The public notice was also advertised on the EPA Region III website and citizens living within one-quarter mile of the well location were notified by mail. On the date mentioned above, EPA also made available to the public for review copies of the permit application, draft permit and statement of basis at the Indiana Free Library located at 845 Philadelphia Street, Indiana Pennsylvania. EPA received a number of requests to hold this hearing and the hearing was held on October 28, 2013, at the Grant Township Municipal Building in Marion Center, Pennsylvania. Approximately 40 people attended this public hearing. EPA received both oral and written comments related to this proposed permit. At the conclusion of the public hearing, EPA held an informal question and answer session which provided the public with answers to many of the questions they had raised during the hearing. EPA also extended the public comment period until November 4, 2013, and invited the submission of any additional written comments.

The responsiveness summary which follows consolidates and provides responses to questions and issues raised from people who either sent written public comment to the attention of EPA Region III during the public comment period, or who provided comments at the hearing. EPA wishes to thank the public for their informative and thoughtful comments and to thank the people from the Grant Township that assisted EPA in hosting the public hearing.

1) What does EPA's UIC program have jurisdiction and authority to regulate?

A few people raised concerns about matters that the EPA UIC program does not have jurisdiction under the Safe Drinking Water Act to address in the UIC permitting process. Some of the concerns mentioned were the potential for increased truck traffic, the potential for damage to the roads, the proposed location, or any relocation of the injection well and the possibility of surface spills. When making the decision whether to issue a UIC permit for PGE, EPA's jurisdiction rests solely in determining whether the proposed injection operation will safely protect underground sources of drinking water (USDWs) (i.e., aquifer systems containing less than 10,000 milligrams per liter total dissolved solids) from the subsurface emplacement of fluids. Although these other concerns listed may be relevant to residents, EPA is not authorized

under the SDWA to address them within a UIC permit. The public would need to seek assistance through local Township or County ordinances for truck traffic and road damages. The Pennsylvania Department of Environmental Protection (PADEP) is the agency responsible for all surface construction at the proposed well site as well as for surface spill prevention.

The final UIC permit contains several conditions that require the permittee to also meet all other local, state or federal laws that are in place. Part I. A. of the permit contains a clause that states, "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, an invasion of other property rights or any infringement of state or local law or regulations." In addition, 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." Therefore, EPA's UIC permit is only one of several authorizations that a permittee may be required to obtain before it is allowed to commence operation and it does not supersede local land use ordinances.

2) EPA should require the operator to find another location for disposal.

As stated in the response to the previous question, EPA does not have the jurisdiction to direct an operator to construct their injection well disposal facility in a particular geographic location. The location chosen by an operator is based on many factors: economics, property ownership and accessibility, geologic suitability, to name a few. EPA is responsible for reviewing each UIC permit application it receives and make a determination as to whether USDWs will be protected from the proposed operation, but is without authority to identify suitable injection sites. Likewise, EPA cannot deny a permit solely because of residents' opposition to the location, when the applicant meets the requirements of the UIC program.

3) Does the current well's construction create increased risk for rupture or collapse that could potentially impact underground sources of drinking water?

A provision of the UIC regulations, 40 CFR Section 147.1955(b)(1), requires an injection well's surface casing to be placed 50 feet below the determined lowermost USDW. The lowermost USDW where the proposed PGE injection well is located is found at a depth of approximately 520 feet. The well is constructed with 11 ¾ inch surface casing, placed to a depth of 568 feet and cemented back to the surface. It also contains 8 5/8 inch intermediate casing which has been placed to approximately 1539 feet and cemented back to the surface. Both of these casing strings are designed to protect USDWs as well as help prevent the rupture or collapse of the well. In addition 4 ½ inch long string casing has been placed to a depth of 7788 feet and has been cemented back to a depth of 6850 feet. The requirements of 40 C.F.R §147.1955(b)(5) outline the cementing provisions for the long string casing and do not require the long string casing to be cemented back to the surface. They were developed for the protection of USDWs as well as the stability of the down-hole wellbore. This casing also helps to support the well and prevent rupture or collapse. EPA will also be conducting a mechanical integrity test. The mechanical integrity test is a pressure test, run at ten percent above the permitted maximum injection pressure and held for thirty minutes. The pressure test is conducted between the 4 ½ inch long string casing and the tubing and packer which will be installed in the well. This test will determine whether the long string casing, tubing and packer have integrity and whether it will be able to withstand the maximum injection pressure permitted for the injection well. After the mechanical integrity test is conducted and the results are successful, the permit requires continuous monitoring of the injection well during its operation to

verify its on-going mechanical integrity.

4) A number of citizens expressed confusion between what information a permit applicant must submit for the area within one-quarter mile of the injection well versus what must be submitted for the area within one mile of the injection well and in which of those areas will drinking water wells be tested.

The UIC regulations do not require that drinking water wells be tested by the operator of an injection well. EPA recommends this testing because it provides the homeowner as well as the operator with background water quality information before an injection well is drilled or operated. PGE informed EPA that it tested private drinking water wells located within one-quarter mile of the proposed injection well, if it was given permission by the homeowner to conduct the test. PGE completed an in-field survey of the remaining private drinking wells located within one mile of the proposed injection well.

The distance of one-quarter mile typically refers to the area of review (AOR) around an injection well or wells. Within the one-quarter mile AOR, the permit applicant provides information of public record on the existence of all wells that penetrate the zone of injection. This includes the existence of all active injection and production wells, all inactive injection or production wells, and any wells that have been plugged and abandoned. This information is important because EPA uses it to determine whether any existing wells within the AOR, which penetrate the injection zone, could allow fluid to move out of the injection zone during operation and into USDWs. Other than the proposed injection well, PGE did not identify and other wells that penetrate the injection zone within one-quarter mile of the injection well.

In addition to the above requirement the applicant is also required to submit a topographic map, that extends one mile beyond the property boundary, showing the wells identified within the area of review as well as all intake and discharge structures, hazardous waste treatment storage or disposal facilities, producing wells, injection wells, abandoned wells, residences and roads, drinking water wells, springs, streams, quarries and other pertinent surface features. Only information of public record is required to be submitted by the permit applicant for both of these distances.

5) One concern raised was that leakage can come to the surface from old wells

The UIC regulations also allow the calculation of a zone of endangering influence (ZEI) to determine an acceptable AOR. Calculation of the ZEI considers pressure build-up in the injection zone over a given period of time based on geologic and operational parameters. The AOR or ZEI analyses are conducted to make sure that if old wells exist, they would not allow fluids to migrate upwards into USDWs during the injection well operation. If an applicant chooses to use a one-quarter mile AOR, as PGE did, EPA Region III verifies that this is acceptable by calculating a ZEI around the injection well. EPA used information such as the porosity and permeability of the injection zone, the existing reservoir pressure, and operational parameters such as injection rate and volume to calculate the ZEI. When EPA calculated the ZEI it determined that, after a ten year period, the ZEI would be a distance of 1450 feet away from the injection well, approximately 130 feet greater than the one-quarter mile AOR. This would mean that if any open conduits (i.e., abandoned wells) existed within this 1450 foot distance, they could potentially allow fluid to move upwards into USDWs after injection for ten years. No

wells were found to exist, that penetrated the injection zone, within 1450 feet of the proposed injection well.

6) Will a well failure expose USDWs to contamination before a problem is discovered and how does the continuous monitoring operate.

As discussed in response #3, the proposed injection well has multiple layers of casing designed to protect USDWs. The injection well currently has surface casing, cemented to the surface, intermediate casing, cemented to the surface, partially cemented long string casing, and will have installed injection tubing and packer. For a failure of this injection well to cause contamination of a USDW during the injection of fluids, simultaneous failures (leaks) in the tubing and packer, intermediate casing and surface casing would need to occur. In addition, a mechanical integrity test (MIT) of the injection well will be performed on the well before injection begins and every five years thereafter. The MIT is a pressure test, conducted at ten percent above the maximum injection pressure, and will test the well's casing tubing and packer for leaks. Cement bond logs have also been run on the cemented long string casing to verify that there is adequate cement bonded to both the casing and formation to prevent fluid movement up the well bore and to verify that the well is isolated from the injection zone. Once tested, the well will be monitored continuously for injection pressure, annular pressure and injection volume. As required by the permit, PGE will design the well to be continuously monitored to detect pressure changes. PGE will maintain a small amount of pressure in the well annulus and continuously monitor that pressure using a pressure gauge and chart recorder. If a leak were to develop in the tubing and packer or long string casing, the pressure in the annulus would change significantly and that change in pressure should be detected by the continuous monitor. The permit also requires that PGE equip the well with a device that will automatically shut down the well and prevent it from operating in the event of a mechanical integrity failure. The operator is required in the permit to conduct any necessary remedial action, an EPA inspector would witness the work, and the operator would retest the well for mechanical integrity, before it is placed back into operation. The permit also requires that operating personnel have appropriate training to properly operate and monitor the well. The permit further requires PGE to notify EPA if a mechanical problem develops during the operation of the well.

7) Are the fluids being injected toxic, hazardous and/or radioactive? Why don't you just treat the brine water and dispose of it another way?

Certain individual constituents contained within fluid produced from a oil or gas production reservoir are considered toxic or hazardous. These fluids, when produced in association with oil and gas production, however, are exempt from hazardous waste regulation and are not classified as hazardous wastes under the Resource Conservation and Recovery Act. 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 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, EPA's UIC program does not regulate fluids produced in association with oil and gas

production activities as hazardous waste. Disposal of these fluids underground through a Class II brine disposal injection well is permissible under EPA's UIC regulations.

Regarding radioactivity, not all oil and gas production fluids are radioactive. Whether a production fluid contains radioactive byproducts depends on the geologic formation from where the fluid has been produced. Fluids produced from shale tend to contain greater concentrations of natural radioactivity because of the clay content in the shale.

The public also raised the issue that the disposal of these fluids underground is not safe. If managed and operated properly, EPA believes the risk to the environment by injecting fluids deep underground can be considered 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, bromides and total dissolved solids. Discharges of these constituents to streams or rivers 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. One of the major functions of the UIC program is to provide a regulated alternative whereby, if an operator chooses to dispose of oil and gas related fluids deep underground, it can be done in an environmentally protective manner.

The permit requires certain injection fluid constituents to be analyzed and the results submitted to EPA every two years and whenever the operator anticipates any change in the injection fluid. The parameters which will be analyzed are listed on page six of the permit. EPA believes that the conditions found in Parts II, B.3. and B.4., within the permit, are sufficient to adequately characterize and monitor the wastewater for injection purposes. The purpose of this monitoring is to verify that the fluids injected in the well are the type of fluids authorized in the permit. In addition, many of the parameters that will be monitored in the injection fluid are also found in shallow ground water. Therefore, if any sample results 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 well 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).

8) When was public noticing done and who was notified?

The regulations at 40 C.F.R §124.10, "Procedures for Decision making," require EPA to provide for Class II UIC permits public notice for a period of 30 days and an opportunity for a public hearing. EPA prepared a public notice which appeared in the "Indiana Gazette" on September 18, 2013. This paper has the largest circulation for the area where the proposed injection well is located. This public notice provided information on when and where a public hearing (pending public interest) would occur (a hearing was subsequently held on October 28, 2013), where the public could obtain information about the proposed permit (the permit application, draft permit and statement of basis were made available at the Indiana Public Library), and where additional information, including all information of public record, could be

obtained. The draft permit and statement of basis which were made available to the public at the time of the public notice contain information about the well construction and operating requirements, including the permit term and the well operator training. This same public notice was also made available on EPA Region III's website. EPA Region III also mailed public notification information directly to residents that, according to available public record, lived within one-quarter mile of the facility property boundary. Public notification was also directly mailed to federal, state and local agencies that might have interest or other possible regulatory jurisdiction over the proposed injection well location. At the conclusion of the October 28, 2013 public hearing held in the Grant Township Municipal Building, based on the request of members of the public that attended this hearing, EPA provided an additional copy of the permit application to Grant Township officials.

9) Members of the public indicated that if other federal statutes are applicable, additional interagency coordination may be necessary. The public was most concerned about the Eastern Hellbender Salamander.

As mentioned in issue #8 above, during public notification, EPA directly mailed a public notice, statement of basis and draft permit to other federal, state and local agencies that might possibly have other applicable regulatory jurisdiction over the proposed injection well location. EPA Region III mailed information to U.S. Fish & Wildlife, Pennsylvania Fish & Boat Commission, Pennsylvania Division of Planning and Habitat Protection, Pennsylvania Historical & Museum Commission, Pennsylvania Bureau of Oil and Gas Management, Indiana County Commissioners, and Grant Township Supervisors. In addition, EPA Region III conducted a search of the U.S. Fish & Wildlife Service website for any threatened, endangered or candidate species and/or designated critical habitat in the area that could be affected by the proposed injection well. In Indiana County, the Indiana Bat is the only species identified on the threatened or endangered species list. EPA does not anticipate that the Indiana Bat will be affected by the proposed project. The proposed well is an existing well that will be converted for injection and it is located in an area where oil and gas development is occurring and has occurred in the past. EPA is not aware that any of the past or current oil and gas activity in the area of the proposed injection well has affected the habitat of the Indiana Bat.

The public raised concern about the Eastern Hellbender Salamander that can be found in the Little Mahoning Watershed. The Center for Biological Diversity has petitioned the U.S. Fish & Wildlife for federal protection under the Endangered Species Act. The U.S. Fish and Wildlife has until 2018 to render a decision on this petition. The Commonwealth of Pennsylvania does not currently recognize the Eastern Hellbender Salamander as a threatened or endangered species.

The UIC program regulates the injection of fluids from the wellhead down to the injection zone. Surface disturbance, fluid containment or spills which could occur on the injection well site are regulated by the Pennsylvania Department of Environmental Protection. The injection well site is located in the East Run Watershed. The closest stream to the injection well site, a tributary to East Run, is located approximately 1000 feet southwest of the injection well's location. A tributary to the Little Mahoning Creek is located approximately three-quarters

of a mile west of the injection well's location, but because this tributary is part of a different watershed, specifically the Little Mahoning Watershed, it would not be affected by any surface spill, if one occurred, at the well site.

10) What is the probability of the proposed Yanity 1025 injection well causing earthquakes like the ones in Braxton, WV, Youngstown, Ohio and other States?

Although EPA must consider appropriate geological data on the injection and confining zones when permitting Class II well, the SDWA regulations for Class II wells do not require consideration of seismicity; unlike the SDWA regulations for Class I wells used for the injection of hazardous waste. See regulations for Class I hazardous waste injection wells at 40 C.F.R. §§ 146.62(b)(1) and 146.68(f). Nevertheless, 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 Well as discussed below and addressed more fully in *"Region 3 framework for evaluating seismic potential associated with UIC Class II permits, updated September, 2013."*

Induced Seismicity Background

Under certain conditions, disposal of fluids through injection wells has the potential to cause induced seismicity. However, induced seismicity associated with brine injection is uncommon, as conditions necessary to cause 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 cause movement along the fault line (Induced Seismicity Potential in Energy Technologies, National Academy Press, 2013, at p. 6). There are approximately 144,000 wastewater injection wells operating in the United States and less than a dozen of these wells have triggered earthquakes of any significance and none of these earthquakes, which EPA Region III is aware of, have ever caused injected fluids to flow into and contaminate a 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. During a seismic event waves of energy are transmitted through bedrock from the origin of the earthquake.

No Known Fault Near the Proposed Injection Well

The United States Geologic Survey (USGS) tracks, records and maps faults and earthquake epicenters in certain areas throughout the United States. The history of seismic events recorded by the United States Geologic Survey (USGS) in Indiana County indicates that such events are extremely rare and there is no geologic evidence of the existence of a fault in the location of the proposed PGE injection well. 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 conduct geologic research in Pennsylvania, have not recorded any seismic activity that has originated in Indiana County. 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. Earthquakes that have been recorded, as well as felt in the area, were the result of seismic events that had their origins in other parts of the state or outside of the state's borders. What have been felt in the County are seismic waves that

were transmitted through the bedrock from the epicenter of the seismic event.

Seismic events which are centered elsewhere do not provide information about the geology of Indiana County, even if these events were felt there. During an earthquake, energy is radiated away from the area of the fault in the form of seismic waves. This energy causes the ground to move as the seismic waves travel away from the fault. However, the fault where the earthquake originated does not extend to the whole area that felt the earthquake. For this reason, history of seismicity that originates in areas other than the location of the injection well does not provide information about potential faults or formation pressures at the location of the well. For example, the earthquake in Youngstown, Ohio is believed to have been generated by injection into Precambrian crystalline bedrock. The seismic waves radiating away from this area were felt in locations at significant distances away from Youngstown, including western Pennsylvania, but they have no relevancy to the geologic setting in Indiana County or at the PGE location.

As discussed in greater detail below, the seismic event that occurred in Youngstown, Ohio, due to the Northstar 1 injection operation, is a good example to explain why injection-induced seismic activity is not likely during the operation of the PGE injection well. Injection fluid from the Northstar 1 injection well found its way into Precambrian crystalline bedrock with very low natural permeability and porosity. Where natural permeability and porosity is low, injected fluid cannot flow easily through or be readily stored in the pores in this rock and therefore flow becomes oriented mainly through existing fractures or faults in the rock. Fluid injected into the Northstar 1 injection well eventually found its way into a fault in the Precambrian rock, which reduced the frictional pressure in that fault, allowing the fault to slip, and causing an earthquake. At the location of the PGE injection well, the injection zone, the Huntersville Chert formation, is a sedimentary rock formation which has a higher natural porosity and greater interconnection of that pore space throughout the formation which will allow for greater storage of fluid and more uniform flow.

Factors Affecting Seismicity

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", and subsequent follow-up reports, has indicated that the seismic activity associated with the injection of fluid in the Northstar1 was likely due to the injected fluid coming into contact with a fault system located in deep Precambrian crystalline bedrock, sometimes referred to geologically as "basement" rock. This bedrock is located beneath the sedimentary bedrock structure. Fluid injected in crystalline basement rocks is essentially transmitted by a network of inter-connected fractures and joints. Because of the high transmissivity created by the fractures, allowing fluid to move through rock quickly, and minimal ability to store fluids in these kinds of rocks, the potential exists to create flow at considerable distances from the injection well. In addition, once flow reaches a fault, it allows the frictional forces that exist to be reduced thereby allowing the rocks to slip and cause seismic activity. The Huntersville Chert formation, a sedimentary rock of Lower Devonian age, is located at a depth of approximately 7500 feet below land surface (approximately 5900 feet below sea level) at the proposed injection well site. Precambrian crystalline basement rock in the area of the proposed injection well is located approximately 16,500 feet below sea level, a significant depth below the Huntersville Chert formation (Pennsylvania Geologic Survey – General Geology Open File Report 05-01.0). Consequently, the geologic setting and reservoir characteristics of the proposed injection well are entirely different than the circumstances encountered in Ohio. The PGE injection will not occur into the deeper Precambrian crystalline rocks since confinement exists below the Huntersville Chert

formation and there is no pathway for the fluids to flow to this deeper formation.

In Braxton, West Virginia, there is no definitive evidence, like the evidence produced for the Youngstown, Ohio earthquake, that supports a conclusion that injection was responsible for the seismicity in this area. However, operational information obtained from the West Virginia Department of Environmental Protection seems to indicate that when injection rate and volume were reduced in the injection well, seismic activity in the area ceased. The last recorded seismic event in this area was recorded in January, 2012 and the well that was suspected of causing the seismicity near Braxton, WV continues to operate.

The public also raised the matter of the relatively recent seismic events that have occurred in other states that were attributed to the underground injection of fluids produced from oil and gas extraction activities. EPA recognizes there is strong evidence that supports the underground injection of fluids as being the trigger that caused the seismic events in those other states. However, the National Academy of Sciences Report referenced above indicates that there were specific factors associated with triggering these seismic events. Specifically the geologic setting, the depth of the injection wells, the permeability of the relevant geologic layers, formation pore pressure and the rate and volume of injection, together or independently, likely led to the seismic activity in those states. As has been discussed, these factors differ significantly from what can be anticipated from the proposed PGE injection operation.

Reservoir Pressure Reduction

Significant quantities of natural gas have been produced from the Huntersville Chert, within the geologic structure where the Yanity 1025 well is located. Historically, over 3.7 billion cubic feet (BCF) of natural gas is estimated to have been produced from the formation in this area. The PADEP website provides the following production information from the Yanity 1025 well and the two closet production wells located near the Yanity 1025, the Edwards 1 (API 37-063-28720) and the Mamau 1 (API 37-063-31663). The following production data covers the period from 1986 to 2009 for the Edwards 1 and from 1997 for the Yanity 1025 and Mamau 1 wells.

Yanity 1025: 4,179,731 mcf plus 48,489 barrels of produced fluid
Edwards 1: 1,773,242 mcf plus 9,292 barrels of produced fluid
Mamau 1: 1,776,696 mcf plus 31,783 barrels of produced fluid

The production of all this natural gas and produced water from the Huntersville Chert formation in this area has lowered the formation's pore pressure and has created available storage capacity, making this formation a good candidate for the disposal of fluids. The National Academy of Sciences Report referenced above indicates that where fluids are injected into sites such as depleted oil, gas or geothermal reservoirs, they can make excellent disposal zones, because in those cases, pore pressures may not reach their original levels, or in some cases, may not increase at all due to the relative volumes of injection versus extracted fluid.

11) 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. There have not been any reports of earthquakes having affected the integrity of injection wells in the cases of induced-seismicity in the United States. 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 well should shutdown if a seismic event that affects its mechanical integrity were to occur, because the well will be designed to automatically cease operation if there is a mechanical integrity failure. Although water supplies could be affected by water supply infrastructure damaged at the surface due to an earthquake, it is not likely that fluid injected into a geologic formation over 7500 feet below the earth's surface or the injection well itself would affect the drinking water sources in this area which are at much shallower elevations. Furthermore, there is no fault system present that would allow for the migration of fluid out of the injection zone.

12) How will the existing fractures within the injection zone not be compromised by the injection operation?

The maximum injection pressure authorized by the permit was developed to prevent both the development of new fractures as well as the propagation of existing fractures in the injection zone. The geologic reservoir information used to develop the maximum injection pressure was obtained from information gathered when the well was drilled as a production well. This data indicates that the fracture pressure gradient for the Huntersville Chert (derived from using the instantaneous shut-in pressure, a value less than fracture breakdown pressure) obtained when the well was hydraulically fractured, is 0.9188 psi/foot. Using this gradient to calculate the maximum injection pressure in the final permit provides a conservative approach to prevent new fractures and the propagation of existing fractures in the injection zone during operation of the injection well. In addition, the specific gravity of the injection fluid used to calculate the hydrostatic bottom-hole pressure of the fluid in the injection well was 1.22. The specific gravity of 1.22, provided by PGE, represents heavy brine. Fresh water has a specific gravity of 1.00. Since the calculation of the maximum injection pressure limit in the permit used a specific gravity of 1.22 it is not anticipated that fluid coming to this injection well will exceed this value. Using a high specific gravity to calculate the maximum injection pressure is conservative because it reduces the surface injection pressure that the operator can use. Surface injection pressure, plus hydrostatic pressure, equals bottom-hole pressure. The permit condition in Part II, B.4. of the permit also requires PGE to monitor the specific gravity of the fluid coming into the facility and to report to EPA if the value exceeds 1.22.

13) What prevents the injection fluid from coming back up once it's injected? Will injecting fluids under pressure allow fluids to make its way back to the surface?

Some comments expressed concern that once the fluid is injected under pressure it will come back to the surface. There is a confining zone, the Onondaga formation, approximately 180 think, immediately above the injection zone. This geologic formation has a very low permeability giving it the ability to confine and trap fluids from migrating upwards. As noted in this document, the Huntersville Chert formation, the intended injection zone, has produced natural gas in this area for many decades. The confinement of this natural gas enabled successful

production. The natural gas and fluids in the formation were also under pressure prior to and during production. The confining units above the Huntersville Chert, as well as the geologic structure of the Chert itself, kept this natural gas in place. Natural gas was not able to migrate to the surface on its own from the Hunersville Chert. In order for gas to be produced from this formation gas production wells had to be drilled into the formation before the natural gas could be recovered.

There are also several other factors that will keep the injected fluid in place and not allow it to migrate out of the injection zone. One factor is that the permit limits the injection pressure to an amount that does not exceed the injection formation's fracture pressure, thereby preventing fracturing of both the injection zone and confining zone. In addition, no other artificial penetrations (e.g., abandoned wells) of the injection zone have been identified in the public records within the area of review. The absence of any other artificial penetrations into the injection zone within the area of review will prevent injection fluid from migrating out of the injection zone and into USDWs.

One commenter expressed concern that the increased pressure in the injection zone would have an affect on the pressure of water within the drinking water aquifers. There is no relationship between pressure increases in the injection zone due to injection with the pressure found in the shallow drinking water aquifers. Occasionally, during the drilling of a well, shallow aquifers can experience a temporary loss of water until the well is completed. EPA has taken steps that help to prevent a loss in water from shallow aquifer systems by requiring the permittee to install two shallow protective water casing strings during well construction.

14) Future gas production of the Marcellus Shale or the Utica Shale could lead to fluid flow out of the Huntersville Chert.

EPA Region III has no knowledge of whether the Marcellus Shale or Utica Shale will be produced in the future in the area of the proposed PGE injection well. The Pennsylvania Department of Environmental Protection regulates production well development in the Commonwealth of Pennsylvania. This includes the issuance of drilling permits for any production wells. Gas production operators are responsible under Pennsylvania regulations to account for their wells and other wells that operate in the area. This would include understanding the implications of drilling above (in the case of the Marcellus Shale) or below (in the case of the Utica Shale) the Huntersville Chert. The Huntersville Chert and the Oriskany formations have produced significant amounts of natural gas and brine water in the past. It is anticipated that production well operators will be aware of past or current oil and gas or injection activity taking place in the Huntersville Chert before commencing drilling operations in the Marcellus Shale or Utica Shale. If an operator produces gas from the Marcellus Shale or Utica Shale near the location of the brine dispoal well, fluid from the injection zone potentially could flow into the Marcellus Shale or Utica Shale. Flow into either of these two formations would depend on the reservoir pressures encountered in these formations versus the reservoir pressure encountered in the Huntersville Chert.

15) PGE must provide financial resources should a well failure occur.

Although a separate issue from the financial responsibility required for plugging and abandonment, the public also asked whether the operator is required to set money aside to remediate contamination of their drinking water if the injection operation fails and allows fluids to migrate into a USDW. The operator is not required to set money aside for ground water

remediation. However, EPA does have emergency authorities in place under the Safe Drinking Water Act (SDWA) if endangerment to USDWs should result from injection activities. Section 1431 under the SDWA allows EPA to take an action against a responsible party if the potential for endangerment exists. This action can include a requirement that the responsible party provide alternative drinking water to citizens affected by the endangerment.

Under the UIC regulations, owners and operators of injection wells are required to demonstrate financial responsibility sufficient to properly plug and abandon the injection well when the operation ceases and the well is no longer used for injection. The cost of plugging a well depends, among others things, upon the depth of the well and how the well was constructed. PGE has submitted a $60,000 letter of credit with a standby trust agreement for the plugging and abandonment of the injection well. The $60,000 cost to plug and abandon the well was determined by a third party plugging contractor. EPA Region III reviewed and approved this submission. In the future the Region under the permit terms can require the permittee to increase the financial responsibility if the Region determines the cost to plug and abandon the well has increased beyond what is currently projected.

Federal Underground Injection Control Program
Permit Appeals Procedures

The provisions governing procedures for the appeal of an EPA permitting decision are defined at 40 CFR 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 permit, either in writing during the comment period or orally at the public hearing, can appeal the final permit by filing a written petition for review with the Clerk of the EPA Environmental Appeals Board (EAB). Persons who have not previously been involved in the comment period are limited in their appeal rights to those points which have been changed between the draft and final permits. Appeals may be made by citizens, groups, organizations, governments and the permittee within this procedural framework.

A petition for review must be filed within thirty (30) days of the date of the notice announcing EPA's permit decision. The petition for review can be filed by regular mail sent to the address listed below with a copy sent to:

Environmental Appeals Board
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue N.W.
Mail Code 1103M
Washington, DC 20460-0001

and

U.S. Environmental Protection Agency
Ground Water & Enforcement Branch (3WP22)
Water Protection Division
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 for why the permit should be reviewed. It must specify the contested permit conditions or the specific challenge to the permit decision. 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, it should be so stated explicitly. The petitioner must also state whether, in his or her opinion, the permit decision or the permit's 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.

Within a reasonable time of receipt of the Appeals Petition, the Administrator will either grant or deny the appeal. Denials are considered final agency action, upon which the permit becomes effective, and the Agency will so notify the petitioner. The petitioner may, thereafter, challenge the permit decision in Federal District Court.

When a petition for review is granted, the permit conditions appealed are not deemed to be in effect and if these permit conditions are essential to the operation, the activity may not commence. Individually contested permit conditions are also stayed (not in effect) but other permit conditions are still in effect if they are legally severable from the contested condition.

The EAB will decide the appeal on the basis of the written briefs and the total administrative record of the permit action. If 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 decision back to the EPA Region III office for reconsideration. In either case, a final agency decision has occurred when the permit is issued, modified or denied and an Agency 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 District Court.