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

STATEMENT OF BASIS

FOR

U. S. EPA's UNDERGROUND INJECTION CONTROL (UIC) PROGRAM
DRAFT CLASS IID PERMIT NUMBER PAS2D013BIND

FOR

Pennsylvania General Energy Company, LLC
120 Market Street
Warren, Pennsylvania 16365

FOR

A project consisting of one Class II-D injection well, the Marjorie C. Yanity 1025 that will be converted from a production well and used for the disposal of fluids produced in association with oil and gas production operations. The proposed well will be located in:

Grant Township
Indiana County, Pennsylvania
Latitude 40°44'43.00" Longitude -78°55'34.00"

On February 7, 2013, Pennsylvania General Energy Company, LLC ("PGE" or "the Permittee") submitted a UIC pemit application for the construction and operation of the above referenced Injection Well. On March 4, 2013, EPA sent a Notice of Deficiency (NOD) to PGE requesting additional information. In response to the March 4, 2013 EPA request, PGE supplemented the original application with additional information on May 13, 2013. PGE's February 7, 2013 and May 13, 2013 submittals are collectively referred to in this Statement of Basis as the "permit application." EPA has deemed the permit application complete.

Pursuant to the federal Safe Drinking Water Act, 42 U.S.C.§§ 300f *et seq*., and its implementing regulations, 40 CFR Parts 144-146, and § 147.1955, the EPA UIC Program is responsible for regulating, through the issuance of permits, the construction, operation, monitoring and closure of injection wells that place fluids underground for enhanced recovery of oil or natural gas or disposal. Today's draft permit specifies conditions for injection well

construction, operation, monitoring, reporting, and plugging and abandonment which are specified so as to protect, and prevent the movement of fluids into, Underground Sources of Drinking Water (USDW). The Permittee's UIC project and the draft permit conditions specific to the project are described below:

Area of Review: Pursuant to the applicable regulation, 40 C.F.R. §§ 144.3 and 146.6(b), the "Area of Review" is an area surrounding the project or a well which the applicant must, first research, and then develop a program for corrective action to address any wells which penetrate the injection zone and which may provide conduits for fluid migration. PGE initially chose a one-quarter mile fixed-radius as the Area of Review around the proposed injection well. To determine whether the one-quarter mile fixed radius was acceptable, EPA conducted a zone of endangering influence (ZEI) calculation (a modified Theis equation flow model) using geologic information pertinent to the injection zone as well as anticipated operational parameters provided to EPA by PGE in its permit application. EPA determined, based on the ZEI calculation that after ten (10) years of operation, the zone of endangering influence would be approximately 1420 feet from the injection well bore or one hundred feet more than the one-quarter mile fixed-radius chosen by PGE. As a result of this calculation, PGE provided information on the well population within the ZEI by conducting reviews of Pennsylvania Department of Environmental Protection Bureau of Oil and Gas well records and conducting a field survey of the area. PGE indicated in its permit application that no wells were found which penetrate the injection zone within this ZEI. The draft permit also requires PGE to perform corrective action on any unplugged/abandoned wells that penetrate the injection zone within the Area of Review if they are identified at a future date.

Underground Sources of Drinking Water (USDWs): A USDW is defined by the UIC regulations as an aquifer or its portion which, among other things, contains a sufficient quantity of ground water to supply a public water system and which also contains fewer than 10,000 mg/l (milligrams per liter) Total Dissolved Solids, and which is also not an exempted aquifer. The Permittee has identified the depth of the lowermost USDW, in the vicinity of the Injection Well, to be approximately 520 feet below surface elevation. The geologic name of this formation is the Pottsville Group. The construction of the injection well, as provided in the permit application, was designed to meet the regulatory criteria of 40 CFR §§ 146.22 and 147.1955. This well has a 11 ¾ inch ground water protective string of casing (surface casing) running from the surface to approximately 568 feet which is cemented back to the surface as well as a 8 5/8 inch intermediate casing running from the surface to a depth of approximately 1539 feet and cemented back to the surface. In addition, the permit application indicates that 4 ½ inch long string casing was placed to a depth of 7788 feet and cemented back to a depth of 6850 feet as required by 40 C.F.R. § 147.1955(b)(5). Injection will occur through a 2 3/8 inch tubing string set on a packer installed above the injection perforations and located at a depth of approximately 7544 feet.

Injection and Confining Zones: Injection of fluids for disposal is limited by the permit to the Huntersville Chert Formation in the interval between approximately 7544 feet through 7620 feet

(top of perforations at 7544 feet). This injection zone is separated from the lowermost USDW by an interval of approximately 7024 feet, while the confining zone, immediately adjacent to the injection zone, is comprised of approximately 180 feet of limestone and shale. In addition, gamma ray logging information from this well shows additional confining units of shale and or limestone between the lowermost USDW and the confining units adjacent to the injection zone.

Maximum Injection Pressure: The maximum allowable surface injection pressure for the permitted operation will be 2933 pounds/square inch (psi) and the maximum bottom-hole pressure will be 6918 psi . These maximum pressures were developed using a specific gravity for the injection fluid of 1.22 and an injection well depth of 7544 feet. Injection pressure as well as annular pressure will be continuously monitored. EPA expects that the pressure limitation will meet the regulatory criteria of 40 CFR § 146.23(a). The maximum injection pressure has been calculated to prevent the initiation of new or the propagation of existing fractures in the injection zone during operation of the Injection Well.

Geologic and Seismic Review: 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, September, 2013."* EPA also established a maximum injection pressure in the draft permit designed to limit the potential for seismic events.

The permit provides that the Permittee shall inject through the Injection Well only into a formation which is free of known open faults or fractures within the Area of Review as required in 40 C.F.R. § 146.22. The Permittee submitted geologic information that indicates the absence of faults in the confining and injection zone. Although this does not conclusively demonstrate the absence of whether any faults exist, the probability of injection induced seismicity is low because of other considerations.

Earthquake activity in Pennsylvania has been associated with the Precambrian, crystalline, igneous/metamorphic bedrock, sometimes referred to as "basement rock", which is located below sedimentary bedrock, either from basement faulting or faulting at a shallower depth caused by tectonic stresses that originated from the basement rock. The available geophysical and seismic information researched by the Permittee, as well as through EPA's review of published information of seismicity in Pennsylvania (refer to information referenced below), shows no evidence of faults that reach the land's surface from basement rock. Basement rock, in the area of the proposed permit, is located at depths approximating 16,000 feet, almost 8500 feet below the proposed injection zone.

EPA's review of historic seismic events, from 1938 to the present, from seismometers located in

Clearfield and Venango Counties, Pennsylvania, indicates that minor seismic events (magnitude 0-3) have been recorded in this area of Pennsylvania. Nevertheless, the United States Geologic Survey (USGS) and the Pennsylvania Bureau of Topographic and Geologic Survey have not recorded any seismic activity that originated in Indiana County, Pennsylvania. See "Earthquake Epicenters in Pennsylvania", Pennsylvania Department of Conservation and Natural Resources website; and "Earthquakes Hazards Program, Pennsylvania Seismicity Map 1973 to Present", United States Geological Survey website.

In addition, the National Academy of Sciences report, "Induced Seismicity Potential in Energy Technologies", National Academy Press , 2013, indicates that oil and gas production in a reservoir can assist in preventing future impacts from seismicity due to injection because of the reduction in reservoir pore pressure during the years of gas production. PGE identified in the Permit Application significant gas production in the vicinity of the proposed Injection Well (both shallow gas production at depths of approximately 3500 feet as well as deeper gas production at depths similar to the proposed injection zone).

EPA developed the maximum injection pressure for the Injection Well using data submitted by PGE in the permit application. PGE provided to EPA fracture stimulation data it obtained when the well was completed for gas production that included an instantaneous shut-in pressure (ISIP). The ISIP is the minimum pressure necessary to begin to reopen any fractures created during the fracture stimulation process and is significantly lower than the pressure required to fracture the rock. EPA limited in the draft permit the surface injection pressure and the bottom-hole injection pressure to a level lower than both the ISIP and the fracture pressure to prevent the initiation of new or the propagation of existing fractures.

Finally, a number of factors help to prevent injection wells from failing in a seismic event and contributing to the contamination of a USDW. Most deep injection wells, those that are classified as Class I or Class II injection wells, such as the PGE proposed Injection Well, are constructed to withstand significant amounts of pressure. The PGE Injection Well will be constructed with multiple steel strings of casing that are cemented in place. Furthermore, the draft permit requires PGE to mechanically test the Injection Well to ensure integrity before operations begin and to continuously monitor the Injection Well during operations to detect any potential mechanical integrity concerns. The Injection Well will also be designed to automatically shut in and cease operation if a seismic event occurs that would affect the operation and/or mechanical integrity of the well. For the reasons above, the risk of seismic activity in Indiana County as a result of the PGE Injection Well operation would be very low.

Injection fluid: The permit limits this well to the disposal of produced fluids associated with oil and gas production activities with an expected maximum volume of 30,000 barrels per month. Since this is a proposed private disposal well, the sources of the disposal fluids will be solely from PGE's oil and gas production facilities. Analyses of injection fluid will be conducted as stated in Part II, paragraph C.3 of the draft permit. The parameters chosen for sampling reflect not only some of the typical constituents found in the injection fluid, but also shallow ground

water. Should a ground water contamination incident occur during the operation of the Injection Well, EPA will be able to compare samples collected from ground water with the injection fluid analysis to help determine whether operation of the Injection Well may be the cause for the contamination.

Testing, Monitoring and Reporting Requirements: The Permittee is required to conduct a two part mechanical integrity test (MIT) after completing construction of the well. The two part MIT consists of a pressure test to make sure the casing, tubing and packer in the well do not leak and a fluid movement test to make sure that the movement of fluid does not occur outside the injection zone. In addition to the monitoring described above, additional pressure testing of the casing, tubing and packer will occur every five years or whenever a rework on the well requires the tubing and packer to be released and reset. The Permittee will be responsible for monitoring injection pressure, annular pressure, flow rate and cumulative volume on a continuous basis and reporting this data to EPA on an annual basis. These tests as well as the monitoring will provide documentation as to the absence of fluid movement into or between USDWs and flow conditions that exist in the injection zone during operation, thus helping to assure that USDWs are protected.

Plugging and Abandonment: The Permittee has submitted a plugging and abandonment plan that will result in an environmentally protective well closure at the time of cessation of operations. The Permittee has also made a demonstration of financial responsibility that indicates adequate resources will be maintained for well closure. These provisions should preclude the possibility of abandonment without proper closure.

Expiration Date: Pursuant to 40 C.F.R. § 144.36, a final permit, when issued, will be in effect for ten years from the date of permit issuance. Also, pursuant to 40 C.F.R. § 146.36, EPA expects to review the permit at least once every five years to determine whether it should be modified, revoked and reissued, terminated or a minor modification made as provided in 40 C.F.R. §§ 144.39, 144.40 or 144.41. This proposed draft permit contains essentially the same conditions as the final permit will unless information is supplied to EPA which would warrant alternative conditions or actions on this permit application.

Additional Information: Questions, comments and requests for additional information may be directed to:

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A public hearing has been tentatively scheduled for Monday, October 28, 2013 at 7:00 PM, at the Grant Township Municipal Building, 100 East Run Road, Marion Center, Pennsylvania 15759. Requests to hold a public hearing must be received in the office listed above by Friday, October 18, 2013. When requesting a public hearing, please state the nature of issues proposed to be raised. EPA expressly reserves the right to cancel this hearing unless a significant degree of public interest, specific to the proposed UIC brine disposal injection operation, is evidenced by the above date. The Administrative Record for this action will remain open for public comment until Monday, October 28, 2013.