



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

STATEMENT OF BASIS

U.S. EPA UNDERGROUND INJECTION CONTROL (UIC)
DRAFT CLASS II-D PERMIT VAS2D980BBUC

FOR

POCAHONTAS GAS LLC
PO BOX 570
POUNING MILL, VIRGINIA 24637

FOR

A project consisting of one Class II-D injection well used for the disposal of produced fluids (brine) associated with oil and gas production located at:

Well No. 25453
Oakwood Field, Garden District
Buchanan County, Virginia

On September 17, 2020, Pocahontas Gas LLC (“Pocahontas” or “the Permittee”) submitted a UIC permit application to the U.S. Environmental Protection Agency (“EPA” or the “Agency”), Region 3, for the issuance of a permit that would allow for the conversion and operation of a Class II-D brine disposal injection well, Well No. 25453, API # 45-027-02674, (hereinafter, “Injection Well,” Well No. 25453”, or the “Facility”), located in the Oakwood Field, in the Garden District of Buchanan County, Virginia. The coordinates for the Injection Well are: Latitude 37° 13' 51.6" Longitude -81° 46' 48". EPA Region 3 staff reviewed this permit application and deemed it complete on October 23, 2020. The Permittee’s September 17, 2020 submittal is hereinafter referred to in this Statement of Basis as the “Permit Application”.

Pursuant to the federal Safe Drinking Water Act, 42 U.S.C. §§ 300f *et. seq.*, and its implementing regulations, 40 C.F.R. §§ 144 -146, and 40 C.F.R. §§ 147.2350 - 2352, the EPA has developed a federal UIC Program and, through the issuance of permits, is responsible for regulating the construction, operation, monitoring and closure of injection wells that place fluids underground for disposal or enhanced recovery in oil and gas production. Today’s draft permit specifies conditions for Injection Well construction, operation, monitoring, reporting, and plugging and abandonment which are designed 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 regulations, 40 C.F.R. §§ 144.3 and 146.6(b), the “Area of Review” is an area surrounding the Injection Well for which the applicant must first research, and then develop, a program for corrective action to address any wells that penetrate the injection zone and which may provide conduits for fluid migration during the injection operation at the Facility. Pocahontas proposed a fixed radius Area of Review of one-quarter mile, which EPA has determined to be acceptable. In determining the fixed radius, EPA has considered the following information provided by the Permittee: chemistry of injected and formation fluids; hydrogeology, population and ground-water use and dependence; and historical practices in the area. Pocahontas has provided documentation identifying and describing the fluid to be injected, the ground-water use in the area, and on the well population within the one-quarter mile Area of Review. The injection formations are oil and gas bearing zones and therefore compatible with the injectate given that the fluids to be injected are byproducts of oil and gas production. There are no drinking water wells within a half mile radius of the Injection Well. The Permittee has reported the presence of six (6) springs within such radius but confirms that none of those springs are used as a drinking water source within the Area of Review. The Permittee also indicated that there are two (2) active coalbed methane (“CBM”) wells, L54 and L54A, within the Area of Review, but reports that neither of these wells penetrate any of the injection zones. There are no plugged wells, and no known unplugged/abandoned wells, within the Area of Review. If any unplugged/abandoned wells that penetrate the injection zone are found within the Area of Review at a later date, the draft permit requires the Permittee to perform corrective action.

Underground Sources of Drinking Water (USDW): An 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 notes that the deepest USDW zone reported by the driller of the proposed Injection Well is at approximately 85 feet deep. The Permittee determined that the lowermost USDW exists at 300 feet below ground surface, as evidenced by background water surveys conducted throughout Buchanan County by Pocahontas Gas for more than 4,000 CBM wells over a period of almost 30 years. Therefore, EPA has determined that the lowermost USDW is located at 300 feet below ground surface. Construction of the Injection Well requires the Permittee to install surface casing to a depth of approximately 330 feet and to cement that entire length of casing back to the surface. The Permittee must, among other requirements, also install intermediate casing from the ground surface to an approximate depth of 2,163 feet and cement that intermediate casing back to a depth of approximately 1,504 feet. Both the surface casing and the intermediate casing are required to protect ground-water.

Injection and Confining Zones: The draft permit limits the injection of fluids for disposal to the following sandstone formations and subsurface perforated intervals:

Upper Maxon Formation between approximately 2,954 feet to 2,968 feet below ground surface;
Berea Formation between approximately 5,098 feet to 5,108 feet below ground surface; and
Gordon Formation between approximately 5,184 feet to 5,216 feet below ground surface.

The lowermost USDW is separated from the injection zone by approximately 2,654 feet. The Upper Maxon Formation is preceded by 466 feet of unnamed shale. The confining zone for the Upper Maxon Formation sands are shales and siltstones that are interbedded with sandstones and considered to have low permeability. The Berea Formation sandstone is preceded by 18 feet of Coffee Shale and 110 feet of Sunbury Shale. The injection of disposal fluids into the Berea Formation interval represents injection into a more porous sandstone capped by a confining zone of the Coffee and Sunbury Shales that are

considered to be of low permeability. The Gordon Formation sandstone is preceded by 66 feet of unnamed shale and sandy shale. The injection of disposal fluids into the Gordon Formation interval represents injection into a more porous sandstone capped by a confining zone of unnamed shale that is considered to have little permeability.

Injection Fluid: The draft permit limits injection to treated fluids produced from Pocahontas's oil and gas production operations into the Injection Well. The draft permit also establishes a maximum monthly injection volume of 45,000 barrels per month of these disposal fluids into the Injection Well. One barrel of fluid is equal to 42 gallons.

The Permit Application includes analyses of the injection fluid that corresponds to the requirements stated in Paragraph II.C.3. in the draft permit. The parameters chosen for sampling reflect not only some of the typical constituents found in the injection fluid, but also in shallow ground water. Should a ground water contamination event occur during the operation of the Injection Well, EPA will be able to compare samples collected from groundwater with the injection fluid analysis to help determine whether operation of the Injection Well may be the cause of the contamination.

Maximum Injection Pressure: The maximum allowable surface injection pressure for the permitted operation of the Injection Well will be 960 pounds/square inch ("psi") with a bottom-hole pressure of 2,341 psi. The maximum surface injection pressure and bottom-hole pressure were developed using the injection pressure limitation calculation; a formula that considers the depth to the Upper Maxon Sandstone injection zone, the highest specific gravity Pocahontas's Virginia Oakwood Field operations expects to encounter (1.08) and a fracture gradient based on the results of step-rate testing of the three (3) permitted injection zones.

Potential for Seismicity: The SDWA regulations for Class II injection wells do not require consideration of the seismicity of the region, unlike the SDWA regulations for Class I injection wells for the injection of hazardous wastes. See regulations for Class I hazardous injection wells at 40 C.F.R. §§ 146.62(b)(1) and 146.68(f). Nonetheless, because of public concerns about injection-induced seismicity, EPA evaluated factors relevant to seismic activity as discussed below and addressed more fully in [*Region 3 framework for evaluating seismic potential associated with UIC Class II permits.*](#)

The final permit will provide that the Permittee shall only inject produced fluids through the Injection Well and into a formation which is overlain by a confining zone free of known open faults or fractures within the Area of Review, as required pursuant to 40 C.F.R. § 146.22. The injection zones are overlain by competent and dense quartz arenites that lie approximately 1,730 feet above the uppermost injection zone, and 2,200 feet below the surface. This sequence provides structural competence and relatively impermeable barriers that will limit the potential upward migration of fluids. No known faults exist in close proximity to the Injection Well that would allow movement of fluids. Additionally, the entire Appalachian Plateau, on which the Facility will be located, is considered geologically stable with no active faults.

EPA's review of published information of seismicity in Virginia reveals no evidence of faults that reach the land surface from basement rock. More information on seismicity can be found on a [website](#) about Earthquakes from the Virginia Department of Mines, Minerals, and Energy, Division of Geology and Minerals. The Permittee has indicated that the location of the Injection Well is roughly 5.5 miles northwest of the hinge of the Dry Fork Anticline and is also located within an unnamed parasitic syncline feature. Like the Dry Fork Anticline, the synclinal feature is slightly plunging.

Available geological information shows that the Appalachian Basin, including southwestern Virginia, which lies on the passive continental margin, is not seismically active because insufficient pressure exists to cause movement along ancient faults and fractures. These faults and fractures are closed and non-transmissive due, in large measure, to the tremendous downward pressure exerted by thousands of feet of overlying sediment deposited since their creation.

The United States Geologic Survey (“USGS”) has not recorded any seismic activity that originated in Buchanan County, Virginia from 1900 through the present day (USGS: “[Information by Region-Virginia-All Earthquakes-1900-Present](#)”). Virginia is located near the center of the North American Plate and experiences a much lower rate of seismicity than an area like California, which is located closer to a plate boundary and experiences shallower, more energetic seismic events due, in part, to less coherency in the basement rock. In contrast with California earthquakes, which often break the ground surface, earthquakes in Virginia usually occur on faults at depths from three to fifteen miles below the ground surface. The rare earthquakes felt in Virginia today generally have no relationship with faults or fractures seen at ground surface. Residual stresses from the formation of the Appalachian Range and the Piedmont Province hundreds of millions of years ago appear to be the mechanism for Virginia’s earthquakes. Earthquake activity in Virginia has been associated with basement rock, either from basement faulting or faulting at a shallower depth, caused by tectonic stresses that originated from the basement rock.

The final permit will include an injection pressure limit, the surface Maximum Allowable Injection Pressure (“MAIP”), to prevent the initiation or propagation of fractures that could create conduits for the injected fluid to flow to any existing faults. The MAIP is set at a level less than both the Instantaneous Shut-In Pressure, which is the wellhead pressure immediately after pumps are shut down following a fracture treatment or test, and the fracture pressure in order to prevent the initiation of new, or the propagation of existing, fractures as a result of injection activities. The formula used to calculate the surface MAIP can be found in Paragraph III.B.4. of the draft permit.

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 Class I or Class II injection wells, including this Injection Well, are constructed to withstand significant amounts of pressure. Well No. 25453 is constructed with multiple steel rings of casing that are cemented in place. Furthermore, the final permit will require Pocahontas to mechanically test the Injection Well to ensure integrity before operations begin and to continuously monitor the Injection Well during operations in order to identify any potential mechanical integrity concerns. The Injection Well is also designed to automatically cease operation in the event that the mechanical integrity of the well is compromised, including by a seismic event.

Testing, Monitoring and Reporting Requirements: The Permittee is required to conduct a mechanical integrity test (“MIT”) after construction of the Injection Well. The MIT consists of a pressure test and a fluid movement test. The pressure test will be conducted in order to ensure that the casing, tubing and packer in the Injection Well do not leak. The fluid movement test, which includes case cement record and cement bond log or temperature log reviews, will be conducted to ensure that fluid movement does not occur outside of the injection zone. In addition to the testing described above, additional pressure testing of the casing, tubing and packer will occur every five (5) years and whenever a rework on the Injection Well requires the tubing and packer to be released and reset.

The Permittee will be responsible for continuously monitoring the Injection Well for surface injection pressure, annular pressure, flow rate and cumulative volume from the date on which the Injection Well commences operation and until such date that the Injection Well is plugged and abandoned. The Permittee must submit an Annual Report to the EPA summarizing the results of the monitoring and testing activities required by the permit, including monthly monitoring records of the injection fluid, the results of any mechanical integrity testing and information identifying any major changes in the characteristics of the injected fluid. The Annual Report must be submitted to EPA by January 31 of each calendar year.

Plugging and Abandonment: The Permittee has submitted a Plugging and Abandonment Plan that will result in an environmentally protective Injection Well closure at the time of cessation of operations. The Permittee will secure a Surety Performance Bond along with a Standby Trust Agreement to ensure proper plugging of the Injection Well. The amount of the Surety Performance Bond shall cover the estimated cost to close, plug and abandon the Injection Well and shall be in the amount of at least \$36,465.00. The amount of the Surety Performance Bond, which is based upon an independent, third-party professional's estimate of the costs associated with the plugging and abandonment of the Injection Well, must also be sufficient to preclude the possibility of abandonment without proper plugging and closure. Authorization to construct and operate the Injection Well will not be given by EPA until financial assurance is in place.

Expiration Date: When issued, a final permit will be in effect for ten (10) years from the date of that final permit's effective date. EPA will conduct an annual review of the Permittee's Injection Well operation. The final permit will contain the same conditions as in this draft permit unless EPA receives information supporting and warranting alternative final permit conditions or actions on this Permit Application.

Additional Information: The Administrative Record for the draft permit is available for public inspection. All information submitted by the Permittee in support of the draft permit, unless deemed confidential, is included in the Administrative Record for the draft permit and is available to the public for review. Copies of the Permit Application, the draft permit, the Statement of Basis, and the Administrative Record index are available for review and inspection on EPA's [website](#). Please direct any questions, comments and requests for additional information to the contact listed below. **The Administrative Record for this action will remain open for public comment until April 5, 2021.**

Request for Public Hearing: Requests to hold this public hearing must be received by EPA, via email or telephone, on or before March 29, 2021. When requesting a public hearing, please state the nature of the issue(s) you propose to raise. EPA expressly reserves the right to not hold a hearing unless a significant degree of public interest is evidenced by March 29, 2021.

Submit comments or requests for a hearing or for additional information to:

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