



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III**

Four Penn Center
1600 John F. Kennedy Boulevard
Philadelphia, Pennsylvania 19103-2852

STATEMENT OF BASIS

U.S. EPA UNDERGROUND INJECTION CONTROL (UIC)
DRAFT CLASS II-D PERMIT PAS2D061BFAY

FOR

G2 STEM LLC
4826 Piney Branch Road, Suite 200
Fairfax, VA 22030

FOR

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

Orville Higinbotham #1 Injection Well
Nicholson Township
Fayette County, Pennsylvania

On June 30, 2022, G2 STEM LLC (“G2 STEM” 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 construction and operation of a Class II-D commercial brine disposal injection well, Orville Higinbotham #1, (hereinafter, “Injection Well”, “Higinbotham well”, or the “Facility”), located in Nicholson Township, Fayette County, Pennsylvania. The coordinates for the Injection Well are: Latitude 39° 50’ 6.00” Longitude -79° 51’ 14.00”. EPA Region 3 staff reviewed this permit application and deemed it complete on February 6, 2023. The Permittee’s June 30, 2022 submittal is 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. § 147.1950-1955, 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. G2 STEM 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 the injection and formation fluids, hydrogeology, population and ground water use and dependence; and historical practices in the area. G2 STEM has provided documentation on the fluid to be injected, ground water use in the area, and the well population within the one-quarter mile Area of Review. The injection formation is an oil and gas bearing zone and therefore compatible with the injectate, which is a byproduct of oil and gas production. There are no drinking water wells within the Area of Review. The only well within the Area of Review is the Dominick Diamond G915 well (API No. 37-051-00076), a plugged oil and gas production well. If any unplugged/abandoned wells that penetrate the injection zone are found within the Area of Review later 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 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 reported that the lowermost USDW in the area of the proposed Injection Well to be at 660 feet below ground surface. 40 C.F.R. § 147.1955 requires surface casing in the Injection Well to be installed from the surface to a depth of at least 50 feet below the base of the lowermost USDW and cemented back to the surface. The surface casing for the Higinbotham #1 well will be installed at an approximate depth of 1,310 feet below ground surface and cemented back to the surface to protect ground water.

Injection and Confining Zones: The draft permit limits injection of fluids for disposal to the Balltown Sandstone Formation at a depth of approximately 3,407 to 3,417 feet below ground surface.

The lowermost USDW is separated from the injection zone by approximately 2,747 feet. The injection formation is overlain by the approximately 2,014 feet of intermittent sandstone and shale formations that will act as confining units and prohibit the movement of fluids from the injection zone into a USDW.

Injection Fluid: The draft permit establishes a monthly maximum injection volume of 77,500 barrels, and limits injection to fluids produced solely in association with oil and gas production. One barrel of fluid is equal to 42 gallons.

The Permit Application includes analyses of the injection fluid. The parameters chosen for sampling in Paragraph II.C.3. in the draft permit 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 ground water with the injection fluid analysis to help determine whether operation of the Injection Well may be the cause of the contamination.

Maximum Injection Pressure: To determine the Maximum Allowable Injection Pressure (MAIP), the Permittee shall conduct formation testing and shall submit in writing to EPA, the following information prior to commencing injection: Instantaneous Shut-In Pressure (ISIP) data and the range of specific gravity of the injection fluid that the Permittee expects to encounter during

normal operation of the Injection Well. The MAIP determined by the formation testing will be reviewed and must be approved by EPA before authorization to injection is granted.

Potential for Seismicity: The SDWA regulations for Class II wells do not require consideration of the seismicity of the region, unlike the SDWA regulations for Class I 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 permit provides that the Permittee shall only inject produced fluids 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 depth to the top of the crystalline basement from the surface elevation of the Higinbotham #1 well is approximately 26,000 feet below sea level, according to the PA DCNR “*Precambrian Basement Map of the Appalachian Basin and Piedmont Province in Pennsylvania*”. The base of the Balltown Sandstone Formation at the Higinbotham #1 well is approximately 22,400 feet above the estimated top of the Precambrian basement.

The USGS Seismic Hazards Map for Pennsylvania indicates the Higinbotham #1 well is situated in the lowest seismic risk area in the state. In addition, according to USGS, the closest earthquake epicenter occurred approximately 30 miles away from the proposed Injection Well near Green Hills in Washington County. This earthquake occurred on October 15, 2019 and had a magnitude of 2.2 which is considered relatively low and generally cannot be felt by humans.

Prior to authorization to inject is given, EPA will review and approve an injection pressure limit to prevent the initiation or propagation of fractures that could create conduits for the injected fluid to flow to any existing faults. The surface MAIP for this permit will be calculated by the ISIP of the injection zone, the Balltown Sandstone Formation. 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. The surface MAIP will be less than both the ISIP and the fracture pressure to prevent the initiation of new, or the propagation of existing fractures. The formula used to calculate the surface MAIP can be found in Paragraph III.B.4. of the draft permit.

Finally, several factors help to prevent injection wells from failing in a seismic event and contributing to the contamination of an USDW. Most Class I or Class II injection wells, including the proposed Injection Well, are constructed to withstand significant amounts of pressure. The Higinbotham #1 well will be constructed with multiple concentric strings of casing that are cemented in place. Furthermore, the draft permit requires G2 STEM to mechanically test the Injection Well to ensure integrity before operations begin and to continuously monitor the Injection Well during operations to identify any potential mechanical integrity concerns. The Injection Well will also be 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 casing 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 two (2) years and whenever a rework on the Injection Well requires the tubing and packer to be released and reset.

The Permittee will be required to maintain a record of every load of produced fluid received. The record will include the hauler's name, the operator's name, and the location from where the produced fluid was obtained and the volume of the load and whether the load was a split load or not.

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 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 31st 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 must provide a demonstration of financial responsibility assuring the plugging costs for the Injection Well prior to any construction or commencement of injection operations. The Permittee must continuously maintain financial responsibility and resources to close, plug and abandon the Injection Well in the amount of at least one hundred and thirty-five thousand seven hundred and fifty U.S. dollars (\$135,750). The amount of the financial responsibility demonstration, 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. The Permittee intends on securing a Standby Trust Agreement along with a third-party financial instrument such as a letter of credit or surety performance bond.

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 July 12, 2023.**

Tentative Public Hearing: EPA has tentatively scheduled a virtual public hearing on July 11, 2023. An in-person hearing will not take place. The call-in and log-in information for the virtual meeting is listed below:

Call-in Number: (484) 352-3221 6:00 – 8:00 PM Eastern Standard Time
Conference ID: 138 108 152#

MS Teams Link: <https://msteams.link/8JOG>

There is no need to register in advance for the virtual hearing. Attendees may utilize MS Teams by calling via telephone or entering the URL into a web browser. During the hearing, callers will receive instructions on how to join the queue to make a comment. The meeting organizer will call on people to deliver their oral comments. Participants who want to supply written or printed materials can do so using the information listed below.

Requests to hold this public hearing must be received via email or telephone to EPA by July 4, 2023. When requesting a public hearing, please state the nature of the issues you propose to raise. EPA expressly reserves the right to cancel this hearing unless a significant degree of public interest is evidenced by July 4, 2023.

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

Kevin Rowsey
Water Division (Mail Code: 3WD22)
U.S. Environmental Protection Agency Region 3
Four Penn Center
1600 John F Kennedy Blvd.
Philadelphia, PA 19103
215-814-5463
R3_UIC_Mailbox@epa.gov