

THE APPLICATION OF ENBRIDGE PIPELINES (NE TEXAS) LP FOR A PERMIT TO INJECT ACID GAS INTO ITS PITTSBURG GAS INJECTION LEASE WELL NO. 1 IN THE PROPOSED PITTSBURG (PALUXY H₂S DISPOSAL) FIELD, CAMP COUNTY, TEXAS

Heard by: Donna Chandler on October 2, 2009

Appearances:

Kerry Pollard
David Billinger

Representing:

Enbridge Pipelines (NE Texas) LP

EXAMINER'S REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

Enbridge Pipelines (NE Texas) LP ("Enbridge") requests authority to inject acid gas in its Pittsburg Gas Injection Lease Well No. 1. Enbridge also requests that a new field, the Pittsburg (Paluxy H₂S Disposal) Field, be set up for this disposal well.

Statewide Rule 36(c)(10)(A) requires that a public hearing be held before the injection of fluid containing hydrogen sulfide ("H₂S" or "sour gas"), when "injection fluid is a gaseous mixture....where the 100 ppm radius of exposure is in excess of 50 feet and includes any part of a public area except a public road; or, if the 500 ppm radius of exposure is in excess of 50 feet and includes any part of a public road; or, if the 100 ppm radius of exposure is 3,000 feet or greater." In this case, the 100 ppm radius of exposure ("ROE") is greater than 50 feet and includes 8 residences.

The Commission's Field Operations section has reviewed the application and has approved the contingency plan which incorporates the injection well. The Commission's Technical Permitting staff recommends approval of the application contingent on a showing by applicant that the proposed disposal will not cause acid gas migration into productive horizons not known to contain hydrogen sulfide.

This application was unopposed and the examiner recommends approval of the Rule 36 and Rule 9 authority.

DISCUSSION OF THE EVIDENCE

Enbridge's Pittsburg Gas Processing Plant has been in operation for many years, removing carbon dioxide ("CO₂") and H₂S from the gas stream produced by wells in the

area. Currently, an amine unit on site removes the waste CO₂ and H₂S, converting it to sulfur. On occasion, if there is a plant upset, the emissions must be released into the atmosphere. Enbridge is proposing that this waste gas, or acid gas, be compressed into a liquid and disposed of into the proposed Pittsburg Gas Injection No. 1. The Pittsburg Gas Injection No. 1 has not yet been drilled, but is proposed to be located on the same property as the gas plant and a saltwater disposal well operated by Enbridge. The property is approximately 195 acres.

Enbridge requests authority to dispose of a maximum of 2,145 BPD of compressed acid gas. This is the equivalent of approximately 4,400 MCFD. The requested maximum surface injection pressure is 2,850 psig.

The Pittsburg Gas Injection No. 1 will be drilled to a total depth of approximately 6,500 feet. The well will have 8⁵/₈" surface casing set at 1,050 feet and cemented to surface. The 5¹/₂" long string will be set at approximately 6,350 feet, with top of cement estimated to be at 1,050 feet. The TCEQ recommends that useable quality water be protected to a depth of 1,050. Injection will be through tubing set on a packer no higher than 5,600 feet. All of the tubular equipment which may come in contact with H₂S are H₂S-resistant stainless steels and alloys that meet all Commission and industry standards for handling H₂S.

The proposed disposal interval is the non-productive Paluxy between 5,700 feet and 6,300 feet. The Paluxy is not productive for several miles in all directions. Establishing a new field designation called Pittsburg (Paluxy H₂S Disposal) Field will identify the proposed disposal zone as a formation now containing hydrogen sulfide. Any operators drilling in the area will be aware of the potential of H₂S existing in an otherwise non-sour formation.

There is one wellbore within ¼ mile of the proposed well. This well is the Delhi Disposal No. 1 operated by Enbridge. This well has a total depth of 4,600 feet and is an active saltwater disposal well. Because it does not penetrate the Paluxy, it will not be a conduit for migration of injected fluids.

The closest well to penetrate the Paluxy is the H. A. Dyer No. 1 located approximately 1 mile to the northeast of the proposed well. The Dyer No. 1 was drilled to 8,900 feet and the log of the well demonstrates hundreds of feet of shale both above and below the Paluxy disposal interval. These thick shale intervals will provide barriers to migration of injected fluids out of the Paluxy. A structure map demonstrates that the Paluxy is laterally extensive with little structural relief. The gross thickness of the Paluxy ranges from 115 feet to 190 feet in the area.

Computer simulations of pressure and fluid migration were performed to predict the maximum probable extent underground of waste migrations. The numerical model SWIFT was used for the predictions. Input data included the porosity and thickness determined from the Delhi Disposal well, a project life of 25 years, and an average daily rate of 2,145

BPD. This model has been accepted nationally for hazardous waste wells by the EPA and has been previously accepted by the Railroad Commission.

The waste being disposed of consists of approximately 30% hydrogen sulfide and 70% carbon dioxide. Acid gas concentrations were calculated and mapped based on the modeling. The outer edge of the underground injection plume is represented by a 1% contour line, where the fluid is 99% formation fluid and 1% acid gas. The maximum extent of this 1% line is less than 2,000 feet from the injection well after 25 years of injection. There are no wellbores within this area which penetrate the Paluxy. Therefore, no existing wellbore within the injection plume will be a conduit for migration of injected fluid outside the disposal interval.

The maximum escape rate is estimated to be 19 MMCFD, which assumes worst case conditions with escape through the 2⁷/₈" tubing. Enbridge employed Quest Consultants, Inc. to perform gas dispersion modeling based on the results of the 19 MMCFD maximum escape rate. Quest used a dispersion model called CANARY to determine the ROE to H₂S. This model calculates release conditions, initial dilution of the vapor, and subsequent vapor dispersion. The model accounts for thermodynamics, mixture behavior, transient release rates, gas cloud density, initial velocity of the gas and heat transfer effects. This model has been previously accepted by the Railroad Commission. The calculated ROE for 100 ppm H₂S, due to the maximum catastrophic release at the proposed injection well, is 2,000 feet. For 500 ppm, the calculated ROE is 945 feet. Both of these calculated ROE's are already within the area covered by the approved contingency plan for the Pittsburg Gas Plant.

Enbridge has modified the contingency plan for the Pittsburg Gas Processing Plant to incorporate the proposed disposal operations. There are 8 residences with the 100 ppm ROE for the disposal well. There are no residences or public roads within the 500 ppm ROE for the well. The modified contingency plan has been reviewed and approved by the Commission's Field Operations section.

The injection system is designed with numerous safeguards. The wellhead will be equipped with emergency shut-down controls. Pressures, temperature, flow rates and H₂S detection equipment will be continuously monitored. The gas processing plant is manned 24 hours a day with personnel trained in the recognition of and response to H₂S alarms.

FINDINGS OF FACT

1. Notice of the application and the hearing was issued to all persons entitled to notice. No protest was received.
2. Notice of the application was published in *The Pittsburg Gazette*, a newspaper of general circulation in Camp County, Texas, on May 14, 2009.
3. The proposed injection well, the Pittsburg Gas Injection Well No. 1, will be used to

dispose of waste gas containing H₂S. This waste gas is removed from hydrocarbon gas at Enbridge's Pittsburg Gas Processing Plant.

4. The Pittsburg Gas Injection No. 1 will inject at rates up to 2,145 BPD of compressed acid gas. This is the equivalent of approximately 4,000 MCFD. This acid gas contains approximately 30% hydrogen sulfide and 70% carbon dioxide.
5. The proposed Pittsburg Gas Injection No. 1 will be drilled, cased and cemented to confine the injected fluid to the proposed Wilcox disposal zone.
 - a. The requested injection interval is the non-productive Paluxy between 5,700 feet and 6,300 feet.
 - b. The TCEQ recommends that useable quality water be protected to a depth of 1,050 feet.
 - c. The well is proposed to have 8⁵/₈" surface casing set at 1,050 feet and cemented to surface, and 6,350 feet of 5¹/₂" casing, with top of cement behind the casing at 1,050 feet.
 - d. Injection will be through tubing set on a packer set no higher than 5,600 feet.
 - e. All of the equipment installed that might come in contact with H₂S will be stainless steel and alloys that meet all Commission and industry safety standards.
 - f. If the injection fluid is not confined to the approved strata, then the disposal well permit will be suspended and disposal cease until the fluid migration from such strata is eliminated.
6. The field name of Pittsburg (Paluxy H₂S Disposal) should be approved for the disposal interval to alert other operators in the area to the possibility of encountering sour gas in this otherwise non-sour formation.
7. The disposal well is located on the same property as the Pittsburg Gas Processing Plant.
8. The requested maximum surface injection pressure is 2,850 psig.
9. The injection well, compressor and flow lines transmitting sour gas, will be designed to contain the sour gas, and monitoring devices will immediately shut down the system if any leakage of sour gas is detected.
10. The proposed disposal well is within the area covered by the contingency plan for the processing plant.

11. The calculated ROE for 100 ppm H₂S due to a catastrophic release from the well is 2,000 feet. The calculated exposure radius ROE for 500 ppm H₂S due to a catastrophic release from the well is 945 feet.
12. There are no residences or public roads within the 500 ppm ROE for the disposal well. There are 8 residences within the 100 ppm ROE.
13. No existing well will be a conduit for migration of injected fluid outside the disposal interval because the only well within ¼ mile did not penetrate the disposal interval.
14. Enbridge has met the conditions for approval set forth by the Field Operations section of the Railroad Commission.

CONCLUSIONS OF LAW

1. Proper notice was issued as applicable in all statutes and regulatory codes.
2. All things have occurred and been accomplished to give the Commission jurisdiction in this matter.
3. The application of Enbridge FS LP to inject hydrogen sulfide gas into the Pittsburg Gas Injection Lease Well No. 1, Pittsburg (Paluxy H₂S Disposal) Field, Camp County, complies with the applicable provisions of Statewide Rules 36 and 9.

EXAMINER'S RECOMMENDATION

Based on the above findings and conclusions, the examiner recommends that the application of Enbridge Pipelines (NE Texas) LP be approved. A new field designation of Pittsburg (Paluxy H₂S Disposal) Field should be approved for the disposal interval.

Respectfully submitted,

Donna K. Chandler
Technical Examiner