

April 30, 2007

**OIL AND GAS DOCKET NO. 08-0250873**

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**THE APPLICATION OF WHITING OIL AND GAS CORPORATION TO INJECT FLUID CONTAINING HYDROGEN SULPHIDE GAS INTO A RESERVOIR PRODUCTIVE OF OIL OR GAS PURSUANT TO STATEWIDE RULE 36 AND 46 FOR NUMEROUS WELLS ON THE G.W. O'BRIEN ET AL LEASE, WARD-ESTES, NORTH FIELD, WARD COUNTY, TEXAS**

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**HEARD BY:** Thomas H. Richter, P.E., Technical Examiner

**DATE OF HEARING:** April 26, 2007

**APPLICANT:**

Philip Whitworth, lawyer  
Mark Hanna, lawyer  
Pete Hagist

**REPRESENTING:**

Whiting Oil and Gas Corporation

**EXAMINERS' REPORT AND PROPOSAL FOR DECISION**  
**STATEMENT OF THE CASE**

Whiting Oil and Gas Corporation seeks authority pursuant to Statewide Rule 36(c)(10)(A) to inject H<sub>2</sub>S-CO<sub>2</sub> (hydrogen sulphide-carbon dioxide) gas for secondary recovery operations on the G.W. O'Brien et al Lease (07338). Production from the field includes gas and oil containing H<sub>2</sub>S and CO<sub>2</sub>. This application addresses H<sub>2</sub>S issues only, as the injection well permits shall be handled through the administrative review and approval process. Commission administrative approval of the Rule 46 injection well applications are dependent on the results of this hearing. The application is unprotested.

**DISCUSSION OF THE EVIDENCE**

The Ward-Estes, North Field was discovered in 1929 at 3,000' subsurface depth. Gas injection for pressure maintenance commenced in 1940. Waterflooding was commenced in 1955. Tertiary (CO<sub>2</sub>) flooding was initiated in the southwest portion of the field in 1989 but was not carried out effectively because of multiple operator changes. Whiting Oil acquired numerous leases in 2005. Cumulative production from these leases is 491 MMBO. The Ward-Estes, North Field does not have a defined correlative interval, however, all operators have recognized the established completion interval to be from the top of the Yates Formation through the Seven Rivers Formation and the Queen Formation to the top of the Grayburg Formation. Within these formations are numerous locally recognized sands. The most prolific of the sands is the "B-C" sand near the top of the Yates Formation. The "B-C" is the continuous and uniform across the entire field area.

The G.W. O'Brien Lease (07338) encompasses 22,000 acres. Currently there are 368 producing wells, 57 injection wells and 139 shut-in wells. Cumulative production from the O'Brien lease is 145 MMBO.

Whiting proposes a tertiary WAG (water-alternating-gas) H<sub>2</sub>S-CO<sub>2</sub> project on all its leases through 6 phases from 2007 through 2013. The southern portion of the O'Brien lease will be phase one and the results will determine commencement of the other phases. Phase I will consist of 192 injection wells.

The mechanical hook up of the system is as follows: Casinghead gas production from the O'Brien Lease is gathered/transported through an existing gas gathering system (20" main line and two-10" laterals) to the Gas Plant located in Section 20 where liquids and H<sub>2</sub>S-CO<sub>2</sub> are recovered. The produced casinghead gas contains 0.13 mole% H<sub>2</sub>S. The Gas Plant is manned 24 hours a day. The proposed injection system will consist of a main 10" trunk line and multiple 3" lateral lines to the injection wells for the delivery of the water-alternating-gas (H<sub>2</sub>S-CO<sub>2</sub>). With the assistance of the Commission's District Office, automatic low-pressure block valves are/will be strategically located on the gathering line and the injection system. All producing and proposed injection wells will be equipped with tubulars and wellhead equipment designed for H<sub>2</sub>S-CO<sub>2</sub> service and installed according to NACE MR-0175 standards. Each injection well will be equipped with a back-flow check valve. Located in the southwest corner of the O'Brien Lease is the City of Wickett. Seven H<sub>2</sub>S monitors have been located along the north and east sides of the town and H<sub>2</sub>S monitors have been placed around occupied ranch houses on the O'Brien Lease. All monitors (equipped with sensors for H<sub>2</sub>S detection from 0 to 25 ppm) will trigger at 10 ppm and are equipped with audible and visual alarms. The alarm is transmitted via the SCADA system to the control room at the Gas Plant.

The Commission District Office, in its letter dated March 27, 2007, states that the Certificate of Compliance Statewide Rule 36 (Form H-9) and the contingency plan has been reviewed and approved for the proposed injection that includes H<sub>2</sub>S. The approved H-9 shows an H<sub>2</sub>S concentration of 3,000 ppm (parts per million), a maximum escape volume of 200,000 MCFD, a 100 ppm radius of exposure (ROE) of 5,519' and a 500 ppm ROE of 2,522'. The various maximum volume escape rates were based on the tubulars at any given point i.e., production string casing, tubing, reservoir flow rate, line pipe, etc. The above is based on the maximum volume of the greatest segment of the transmission line supplying the individual injection wells which is 200,000 MCFD (injection well escape rate was determined at 15,000 MCFD). Also, the H<sub>2</sub>S concentration was assumed at 3,000 ppm instead of the measured 1,350 ppm. The individual injection well ROE's are 1,091' and 499' respectively. The ROE's include numerous residences and FM 1219 and State Hwys 18 and 57. The 100 ppm ROE includes approximately 70% of the City of Wickett. This area has been producing H<sub>2</sub>S hydrocarbons since field discovery. Security and sign provisions pursuant to Statewide Rule 36 are/shall be in place.

Notice of hearing of this application was published in the *Monahans News*, a newspaper of general circulation in Ward County, for four consecutive weeks on March 13, 20, 27 and April 3, 2007. Notice of hearing was provided to all affected parties on March 9, 2007. In addition, a town hall dinner meeting was held providing a copy of the Contingency Plan and H<sub>2</sub>S hazard training.

#### **EXAMINER'S OPINION**

The examiner recommends the application be approved. The application is in compliance pursuant to Statewide Rule 36(c)(10)(A)(ii) and the other relevant provisions of the rule.

### FINDINGS OF FACT

1. Statewide Rule 36 requires that all injection applications, pursuant to the rule, concerning hydrogen sulphide injection be presented at a public hearing. Notice of hearing of this application was published in the *Monahans News*, a newspaper of general circulation in Ward County, for four consecutive weeks on March 13, 20, 27 and April 3, 2007. Notice of hearing was provided to all affected parties (all persons within the 100 ppm ROE, and all primary responders) on March 9, 2007. In addition, a town hall dinner meeting was held providing a copy of the Contingency Plan and H<sub>2</sub>S hazard training.
2. The Ward-Estes, North Field was discovered in 1929 at 3,000' subsurface depth.
  - a. The G.W. O'Brien lease(07338) encompasses 22,000 acres.
  - b. Currently there are 368 producing wells, 57 injection wells and 139 shut-in wells.
  - c. Cumulative production from the O'Brien lease is 145 MMBO.
3. Whiting proposes a tertiary WAG (water-alternating-gas) H<sub>2</sub>S-CO<sub>2</sub> project onrough all its leases through 6 phases from 2007 through 2013. The southern portion of the O'Brien lease will be Phase I and will consist of 192 injection wells.
4. The Commission District Office, in its letter dated March 27, 2007, states that the Certificate of Compliance Statewide Rule 36 (Form H-9) and the contingency plan has been reviewed and approved for the proposed injection that includes H<sub>2</sub>S.
  - a. The approved H-9 shows an H<sub>2</sub>S concentration of 3,000 ppm (parts per million), a maximum escape volume of 200,000 MCFD, a 100 ppm radius of exposure (ROE) of 5,519' and a 500 ppm ROE of 2,522'.
  - b. The various maximum volume escape rates were based on the tubulars at any given point i.e., production string casing, tubing, reservoir flow rate, line pipe, etc. The above is based on the maximum volume of the greatest segment of the transmission line supplying the individual injection well supply lines.
5. The ROE's include numerous residences and FM 1219 and State Hwys18 and 57. The 100 ppm ROE includes approximately 70% of the City of Wickett.
6. Whiting proposes emergency/safety systems for all injection processes that are designed to prevent or detect an accidental release of H<sub>2</sub>S gas.

- a. The Gas Plant is manned 24 hours a day and all monitor/alarms are transmitted via the SCADA system to the control room at the Gas Plant.
  - b. With the assistance of the Commission's District Office, automatic lo-pressure block valves were strategically located on the gathering line and the injection system.
  - c. All producing and proposed injection wells will be equipped with tubulars and wellhead equipment designed for H<sub>2</sub>S-CO<sub>2</sub> service and installed according to NACE MR-0175 standards.
  - d. H<sub>2</sub>S monitors/alarms have been located along the north and east sides of the City of Wickett and H<sub>2</sub>S monitors/alarms have been placed around occupied ranch houses.
  - e. All monitors (equipped with sensors for H<sub>2</sub>S detection from 0 to 25 ppm) will trigger at 10 ppm and are equipped with audible and visual alarms.
  - f. There are check valves located at every injection well to prevent back flow.
7. All training, security and sign provisions of Rule 36 have been or will be complied with.
  8. The contingency plan contains the names and phone numbers of all law enforcement agencies and emergency services.

#### **CONCLUSIONS OF LAW**

1. Proper notice was timely given to all parties entitled to noticed pursuant to applicable statutes and rules.
2. All things have occurred and have been accomplished to give the Commission jurisdiction in this case.
3. Whiting Oil and Gas Corporation has complied with the safety provisions of Statewide Rule 36.

#### **EXAMINERS' RECOMMENDATION**

The examiners recommend that the application of Whiting Oil and Gas Corporation to inject gas containing hydrogen sulphide into the G.W. O'Brien et al Lease in the Ward-Estes, North Field be approved.

Respectfully submitted,

Thomas H. Richter, P.E.  
Technical Hearings Examiner  
Office of General Counsel