

December 30, 2002

OIL AND GAS DOCKET NO. 01-0231845

THE APPLICATION OF DAVID THALMANN VACUUM SERVICE TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION PRODUCTIVE OF OIL OR GAS, BRUNDAGE LEASE WELL NO. 1, PEARSALL (AUSTIN CHALK) FIELD, DIMMIT COUNTY, TEXAS

HEARD BY: Thomas H. Richter, P.E., Technical Examiner
Scott Petry, Hearings Examiner

APPLICANT:
George C. Neale, Attorney
Rick Johnston
David Thalmann

REPRESENTING:
David Thalmann Vacuum Service

PROTESTANT:
Kerry Pollard

WCS Oil & Gas Inc.

PROCEDURAL HISTORY

Date of Application:	July 3, 20021
Date of Notice:	July 19, 2002
Date of Hearing:	September 24, 2002
Date of Transcript:	October 9, 2002

EXAMINERS' REPORT AND PROPOSAL FOR DECISION
STATEMENT OF THE CASE

This is the application of David Thalmann Vacuum Service ("Thalmann") to dispose of field produced saltwater into its Brundage Lease Well No. 1 ("subject well") in the Pearsall (Austin Chalk) Field and operate as a commercial disposal well subject to the provisions of Statewide Rule 46. Thalmann believes that injection into the Austin Chalk Formation may improve oil production from its offsetting wells which also produce from the Austin Chalk Formation. The application is protested by WCS Oil & Gas ("WCS") because it has a producing well nearby which could potentially be adversely affected by the injection.

DISCUSSION OF THE EVIDENCE

APPLICANT'S EVIDENCE

Thalmann asserts that the proposed injection well is necessary for three reasons: 1. It will

lower the operating expense for his leases; 2. it may have beneficial effects by potentially increasing production of his offsetting leases; and 3. there is a need for a commercial disposal well in this immediate area for other operators to use.¹ The closest operating commercial disposal well is located 34 miles to the northeast in Derby, Texas. There were two other commercial disposal wells that received waste water from area operators, but these two wells now only dispose of their own lease produced saltwater.² A closer well permitted for commercial disposal is the Cross Winds Energy, Webb No. 1, however, the well has never been converted from production to disposal.³ Another well in the area that may be permitted for disposal is the Prime Operating, Bost Well No. 1, however, the status of the permit is unknown at the time of this hearing.

The subject well, currently a shut-in producer, is owned by Crystal Resources.⁴ The closest WCS well, Moore-Bush Well No. 1, is over 13,000 feet northeast from the proposed disposal well. Thalmann has four producing wells between the proposed injection well and the WCS well.

The subject well was completed as a horizontal drainhole well as the Tide West Oil Company, Brundage No. 1, in November 1990 in the Austin Chalk Formation. The Texas Natural Resources Conservation Commission recommends that usable quality water be protected down to a depth of 1,550'. Surface casing of 10-3/4" was set at 1,710' and cemented to the surface. Longstring of 7" was set at 5,680' TVD and cemented to the surface. The open hole horizontal drainhole is 3,497 feet in length. This represents a TVD from 5,680' to 6,268' in the Austin Chalk Formation. The proposed maximum injection volume is 4,000 BWPD (current anticipated average is 500 BWPD). The maximum proposed injection pressure is 2,800 psig (current anticipated average injection pressure is 200 psig). Injection will be through 2-3/8" tubing set on a packer at 5,580'.

A review was made of all well completions, producing or plugged, within the prescribed radius of review of the subject well. The wells within the area all have been completed or plugged in such a manner to prevent the vertical migration of fluids, thus removing the possibility of endangering usable quality water. All have sufficient surface casing cemented from below the base of the usable quality water to the ground surface. Well logs show that there is excess of 1,000 feet of shale overlying the Austin Chalk Formation which will prevent any upward fluid migration.

Thalmann asserts the subject disposal well is in the public's interest. First, it will lower the lease operating costs of Thalmann's wells which will allow them to produce longer because of a lower economic limit. It is estimated that an additional 13,210 BO and 15.1 MMCF of gas will be recovered from its leases because of the savings. This is an estimated gross value of \$370,000. Second, it would reduce the expense of delivering the waste water to Derby (round trip is 68 miles). Based on no changes in Thalmann's lease produced water volumes, this amounts to 2,584

¹ Thalmann Vacuum Services operates a fleet of water hauling trucks.

² The Cactus Lease Service, Standifer Well No. 1 and the R.C.L.J. Construction, Savannah Well No. 2W.

³ The Commission issued the commercial disposal permit in 1991.

⁴ If the proposed permit is approved, Thalmann will acquire the subject well from Crystal Resources.

miles/month or 31,008 miles/year saved.⁵ Also, reducing truck traffic on State Highways, i.e. the numerous trips to Derby, Texas, is in the public interest.

Generally, horizontal drainhole wells completed in the Austin Chalk Formation are capable of affecting other horizontal drainhole wells over great distances. The Austin Chalk Formation is composed of naturally occurring vertical fractures systems that have a natural strike orientation of North 40E- 60E East. Typically, horizontal drainhole wells are drilled as near perpendicular to this strike orientation in an effort to encounter as many fracture systems as possible. Indeed, there have been numerous accounts where a producing horizontal drainhole well was shut-in because it started producing drilling fluid from an offsetting well.⁶ In addition there have been numerous accounts of decreased production because of offsetting wells over a mile away being placed on production. However, Thalmann asserts that the subject area is on the far southwestern edge of the Pearsall (Austin Chalk) Field and the lateral extent of the fracture systems in this area is not as extensively connected as in the main portion of the field.

To substantiate this lesser natural fracture system quality, Thalmann investigated the completion and production characteristics of three nearby areas northeast of the subject well's location and generally on strike with the proposed disposal well's fracture system. See APPENDIX A for data and conclusions regarding the three areas investigated. Thalmann believes the data clearly indicates that the lateral extent of the fracture systems in this portion of the field is very limited. The production levels of some wells is high compared to other offsetting older wells. The cumulative production of some newer wells is greater than cumulative production of relatively older offsetting wells. If there had been good lateral fracture continuity, subsequent offsetting wells would have produced poorly.

The Austin Chalk is the deepest formation in this wellbore. If disposal into the Austin Chalk results in the injection pressure reaching the maximum permitted, the next available up-hole zone in the subject well is the Olmos Formation. This formation has also been used for disposal. It is prudent to complete in lower intervals first and come up the hole, if necessary, later.

The disposal site will be in compliance with all normal commercial facility provisions including fencing, manned during normal hours of operation (locked when not manned), tankage and other requirements as mandated by the Commission for a commercial facility.

There is nothing to show the likelihood/probability that injection into the subject well will adversely affect a well almost 2.5 miles away.

⁵ Calculations based on 38 loads of 125 BW each for 4,750 BW. Cost to dispose in Derby \$1.65/Bbl. Estimated cost to dispose in the proposed well is \$0.80/Bbl (\$0.15 to \$0.20/Bbl to operate the disposal well and the remainder to truck the water the shorter distance from each lease to the proposed disposal well).

⁶ Examiner's Note: This Austin Chalk Formation natural fracture system characteristic is substantiated in published oil and gas literature, published reservoir engineering/geological technical papers and Commission held hearings in reference to the Austin Chalk Formation in the State of Texas.

David Thalmann Vacuum Service, Inc. has a \$50,000 letter of credit on file with the Commission as its financial assurance. Notice of the subject application was published in *The Carrizo Springs Javelin*, a newspaper of general circulation in Dimmit County on March 7, 2002.

PROTESTANT'S EVIDENCE

The WCS Oil & Gas, Moore-Bush Well No. 1 currently produces 280 - 290 BOPM and is located on the same compass bearing fracture system strike orientation as the proposed injection well. WCS asserts that this places the well in jeopardy. Cumulative production for the well is 100,491 BO and 27.2 MMCF of gas. The proposed injection could potentially have an adverse effect on this well. As previously stated and documented, the lateral extent of the natural vertical fracture systems of the Austin Chalk are vast. There are many reasons why some offsetting wells (horizontal or vertical) are productive while others are not as productive.

In the area surrounding the proposed injection well, there are 10 Austin Chalk wells (which were all placed on production the first three years of the 1990's) and two Olmos Formation wells (1987 & 1988). Of these wells, three have made in excess of 100,000 BO, which shows good lateral connectivity of the fracture systems. However, the subject well only produced 15,000 barrels and 10MMCF of gas. If the well injects an average of 500 BWPD and the well has produced 15,266 barrels of oil, the fracture voidage will fill up in 30 days.⁷ If the maximum of 4,000 BWPD were injected, the fill-up would be in a little over three days. Alternatively, there may be fracture system connections to other wells in this area which may have caused depletion of the Brundage well. Once the oil pore space voidage is replaced in the reservoir, either the well will pressure up and not be a viable injection well or as the fracture gradient of the Austin Chalk Formation is reached, the formation will break down and connect to other natural occurring fractures. Thalmann has not performed a step-rate test. Thalmann admits it does not know what the Austin Chalk fracture pressure gradient is. It investigated wells thousands of feet away but not the leases/wells operated by Thalmann in the immediate area of the proposed well. Wells in the fractured Austin Chalk produce what is available and connected to the well's fracture system. Thalmann's four wells between the proposed injection well and the WCS well offer little if any protection.

If Thalmann amends its application for injection into the Olmos Formation, WCS would withdraw its protest. The Olmos Formation reservoir quality rock is in excess of 100 feet in thickness in this area. The two commercial wells that are no longer taking outside operator's water dispose into the Olmos Formation. The Prime Operating, Bost No. 1D was protested when the application was for injection into the Austin Chalk Formation. When the application was amended to dispose into the Olmos Formation, several of the protests to the application were withdrawn.

WCS believes every operator has the right to dispose of its own lease produced salt water. However, WCS asserts that Thalmann has failed to show an actual public need for another commercial disposal well. There is no evidence that other people will use this well. Additionally it has failed to show that a recovery of 15,000 BO is a substantial amount. WCS believes that if

⁷ These are stock tank barrels. Reservoir barrels would be greater.

Thalmann wants to dispose of lease produced salt water, the permit should be granted for injection into the Olmos Formation only. Alternatively, if a permit is granted for injection into the Austin Chalk, it should not authorize commercial status.

EXAMINERS' OPINION

The examiners recommend that this application be approved pursuant to §27.051 of the Texas Water Code and Commission Statewide Rule 46. The well is completed in such a manner as to prevent the migration of injected fluids to zones other than the intended zone. Well completions/plugged wells in the area will not provide avenues for the migration of fluids to zones other than the intended zone. Therefore, the usable quality water above and below the ground surface will not be placed at risk of pollution or contamination. The applicant has made a satisfactory showing of financial responsibility.

The use or installation of the proposed injection well is in the public interest. Thalmann's proposal provides extending the economic producing life of its wells by lowering the lease operating expenses which results in the recovery of additional oil and gas. Is an additional 13,000 BO and 15 MMCF of gas substantial? The examiners suggest that this argument depends on the economic parameters that all operators share. What is economic to one operator may not be economic to another. The examiners believe the estimated oil and gas volumes to be recovered are substantial. Additionally, the Commission does not require an operator to submit a list of potential customers that will use its commercial disposal well. The competitive nature of the system will dictate this.

The primary issue is whether the use of the injection well will endanger or injure any oil, gas, or mineral resources (§27.051 (b)(2) Texas Water Code). This issue not only involves possible likelihood of adverse effects to the WCS well, but also endangering oil and gas recovery from the wells closest to the subject injection well. WCS argues the scenario that the volume voidage of 15,000 to 25,000 reservoir barrels of oil that was produced from the subject well can only be refilled by a like volume of fluid by injection. It then argues that if this is a closed container, the reservoir pressure will build to the maximum permitted pressure and the well would have to be abandoned. In the alternative, it points out that the Commission maximum authorized pressure may be high enough to fracture the chalk formation.⁸ WCS then alleges this may connect the fracture systems of the subject well to the fracture systems of the other four or five wells surrounding the injection well. WCS further argues that these fracture systems may possibly be in communication with its well. The examiners believe these arguments are fatally flawed on several points.

First, if it is believed that the Commission's maximized permitted injection pressure is higher than the fracture gradient pressure of the chalk formation and fracturing occurred between the natural chalk fracture systems, WCS failed to take into account the reservoir volume voidage that

⁸ The Commission's standard permitted maximum surface injection pressure of .5 psi/ft of depth is based on the natural fracture gradient of all reservoir rock. Step rate testing is only required by the Commission when an operator requests a surface injection pressure which is in excess of .5 psi/ft of depth gradient.

has occurred through production of these other wells.⁹

Second, there are at least four producing Thalmann wells between the proposed injection well and the WCS well. If there is communication with the proposed injection well, these wells will either show increased oil production as believed by Thalmann or an increase in water production to the point of being uneconomic. This is further based on the premise that all the injected water would migrate in a northeast direction and none toward the southwest.

Third, the evidence presented establishes that the well is on the far southwestern edge of the Austin Chalk Formation reservoir and does not have the extensive lateral fracture systems of the more central portion of the field.

Fourth, there is no evidence or argument establishing that any of the wells in the vicinity of the subject well had adverse affects on the other wells in the area of investigation in the field. The WCS well is approximately 2.5 miles from the proposed injection well

The Olmos Formation is present in the subject well from 3,830' - 4,190' with over 100 feet of good, clean sand. From a well's mechanical completion stand point, the lower interval should always be staged first and future re-completions attempted up-hole.

The application meets the commercial injection well requirements pursuant to §27.051 of the Texas Water Code and Commission Statewide Rule 46.

FINDINGS OF FACT

1. Notice of this hearing was given to all persons required to be given notice by the provisions of Statewide Rule 46. Notice of this hearing was given to all affected persons, at least ten (10) days prior to the date of the hearing. Notice of the subject application was published in *The Carrizo Springs Javelin*, a newspaper of general circulation in Dimmit County on March 7, 2002.
2. The subject well was completed as a horizontal drainhole well as the Tide West Oil Company, Brundage Well No. 1, in November 1990 in the Austin Chalk Formation.
 - a. Surface casing of 10-3/4" was set at 1,710' and cemented to the surface. Longstring of 7" was set at 5,680' True Vertical Depth (TVD) and cemented to the surface.
 - b. The open hole horizontal drainhole is 3,497' in length. This represents a TVD from 5,680' to 6,268' in the Austin Chalk Formation.
3. David Thalmann Vacuum Service proposes to dispose of field produced saltwater into its

⁹ At the hearing, Thalmann was requested to file production/graph information on the wells that immediately surround the subject well. For the wells between the WCS well, the total "oil only" voidage is 230,000 Bbls (include the Ralph No. 1 and this becomes 460,700 Bbls). This volume does not include the produced gas or water that has been produced over the life of these wells.

Brundage Lease Well No. 1 in the Pearsall (Austin Chalk) Field and operate a commercial disposal well facility subject to the provisions of Statewide Rule 46.

- a. The proposed maximum injection volume is 4,000 BWPD (current anticipated average is 500 BWPD).
 - b. The maximum proposed injection pressure is 2,800 psig (current anticipated average injection pressure is 200 psig).
 - c. Injection will be through 2-3/8" tubing set on a packer at 5,580'.
4. A review has been made of all well completions, producing or plugged, within the prescribed radius of review of the subject well. The wells within the area all have been completed or plugged in such a manner to prevent the vertical migration of fluids, thus removing the possibility of endangering usable quality water (i.e., all have sufficient surface casing cemented from below the base of the usable quality water to the ground surface).
- a. The Texas Natural Resources Conservation Commission recommends that usable quality water be protected down to a depth of 1,550 feet.
 - b. Well logs show that there is excess of 1,000 feet of shale overlying the Austin Chalk Formation which will prevent any upward fluid migration.
5. The proposed injection operations into the Brundage Lease No. 1 will not endanger any oil, gas or other mineral formation and will not endanger usable quality water.
- a. Injection of Thalmann's lease produced water will lower the lease operating costs of Thalmann's wells which will allow them to produce longer because of a lower economic limit. It is estimated that an additional 13,210 BO and 15.1 MMCF of gas will be recovered from its leases because of the savings.
 - b. Injection of produced water into the Austin Chalk Formation may provide additional oil and gas production response in Thalmann's offsetting leases.
 - c. The proposed injection into the subject well will not adversely affect the production of any currently producing wells in the immediate vicinity.
6. Use of the proposed commercial disposal well is in the public interest because it will provide an alternative means of disposing produced salt water from producing wells in this particular area of the field, thereby potentially increasing the ultimate recovery from these wells.
- a. The disposal site will be in compliance with all normal commercial facility provisions: fencing, manned during normal hours of operation (locked when not manned), tankage and other requirements as mandated by the Commission for a

commercial facility.

7. David Thalmann Vacuum Service, Inc. has a \$50,000 letter of credit on file with the Commission as financial assurance.

CONCLUSIONS OF LAW

1. Proper notice was timely given to all parties entitled to notice pursuant to applicable statutes and rules.
2. All things have occurred and have been accomplished to give the Commission jurisdiction in this case.
3. The use of the proposed injection well will not endanger oil, gas, or geothermal resources or cause the pollution of surface water or fresh water strata unproductive of oil, gas, or geothermal resources.
4. The applicant has complied with the requirements for approval set forth in Statewide Rule 46 and the provisions of Sec. 27.051 of the Texas Water Code.
5. Approval of the application will prevent waste of hydrocarbons that otherwise would remain unrecovered.

EXAMINERS' RECOMMENDATION

Based on the above findings and conclusions, the examiners recommend that the application of David Thalmann Vacuum Service to dispose of field produced saltwater into its Brundage Lease Well No. 1 in the Pearsall (Austin Chalk) Field and operate a commercial disposal well facility be approved as set out in the attached Final Order.

Respectfully submitted,

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

Scott Petry
Hearings Examiner
Office of General Counsel

APPENDIX A

TORTUGA-CAMPBELL WELLS

The Tiza Inc., (Famcor Oil), Tortuga Well No. 1 and the Cox & Perkins, Campbell Well No. 1 are both horizontal drainhole wells that the nearest closure is $\pm 1,000'$ and were completed at approximately the same time (1990). The paths of the drainholes appear to overlap what should theoretically be the same fracture systems. The Campbell well in its best month produced 7,000 BO. The well produced 46,000 BO before being plugged in 1993. However, the Tortuga well in some months produced in excess of 10,000 BO and is still producing with cumulative oil of 406,000 BO.

DIMMIT WOODS-WOODS-AV-TECH BELL WELLS

The Hawthorne Energy, Woods Well No. 1A is a double lateral horizontal drainhole well (two laterals in opposite directions) completed in 1991. The UPRC, Av-Tech Bell Well No. 1, also a horizontal drainhole well, was completed in 1991 and at its nearest closure is $\pm 900'$ from the Woods Well No. 1A. The Av-Tech Bell well produced in excess of 38,000 BO before being plugged in 1993. The RME Petroleum, Woods Well No. 1, a horizontal drainhole well, was completed in 1990 and its nearest closure is $\pm 3,100'$ from the Woods Well No. 1A. The RME well produced in excess of 7,000 BO before being plugged in 1994. The Woods Well No. 1A continues to produce with cumulative production of 182,610 BO.

WILKERSON-NANCE WELLS

To the east of the Brundage well and the WCS, Moore-Bush well are several wells that appear to be on the same fracture system strike. These wells are the Sage Energy, Wilkerson Unit Well No. 1H, a horizontal drainhole well, completed in 1997 and approximately 22,000' from the subject disposal well and approximately 12,000' from the WCS well. This well has cumulative production of 95,560 BO and currently produces 15 BOPD. Likewise, the Sage Energy, Nance Well No. 2, a horizontal drainhole well, was completed in 1990 and is approximately 32,000' from the subject well and approximately 16,500' at its nearest closure to the WCS well. Cumulative production for this well is 26,330 BO. Further is the Sage Energy, Nance Unit Well No. 3H, a horizontal drainhole well, was completed in 1998 and is located 35,000' from the subject well and approximately 22,000' from the WCS well. Cumulative production for this well is 228,890 BO. This last well, the newest of the wells, clearly demonstrates the lesser lateral extent of the fracture systems in this area of the field. This well is approximately 2,300' from the Nance No. 2, 5,200' from the Sage Energy, Eldridge Well 1H, and 10,000' from the Wilkerson No. 1H well.