

OIL AND GAS DOCKET NO. 09-0246616

THE APPLICATION OF BASIC ENERGY SERVICES L.P. FOR A COMMERCIAL DISPOSAL PERMIT INTO A RESERVOIR PRODUCTIVE OF OIL OR GAS, BEAMAN LEASE WELL NO. 1, BOONESVILLE (BEND CONGLOMERATE, GAS) FIELD, WISE COUNTY, TEXAS

Heard by: Margaret Allen, Technical Hearings Examiner
James M. Doherty, Legal Examiner

Procedural history:

Form H-1 application received: October 24, 2005
Hearing held: May 23, 2006
Proposal for decision issued: August 14, 2006

Appearances

	Representing
<u>Applicant</u>	
George C. Neale	Basic Energy Services L.P.
Dale E. Miller	
Dale Doby	
<u>Protestant</u>	
Jamie Nielson	Ray Ritchie Management Company, Inc.
John Miller	
<u>Intervenor</u>	
Brian Sullivan	Devon Energy Production Company, L.P.
Sandra Bolz-Buch	

EXAMINERS' REPORT AND PROPOSAL FOR DECISION

STATEMENT OF THE CASE

Basic Energy Services L.P., ("Basic") is seeking to drill and use its Beaman Lease Well No. 1 as a commercial disposal well in Wise County. The application is protested by Ray Ritchie Management Company, Inc. ("Ray Ritchie"), which is an offset operator. Representatives of Devon Energy Production Company, L.P. ("Devon") appeared at the hearing as interveners.

The hearing notice on this application indicates that staff from the Environmental Services Section (“ES”) of the Commission had concerns on the following issues:

1. There are several wells within approximately ½ mile of the proposed injection well that may not have the proposed injection interval isolated with adequate cement plugs and/or cemented casing/borehole annuli. Applicant has consented to reduce the proposed maximum wellhead injection pressure to 827 psi (0.25 psi/ft). Reducing the proposed injection pressure reduces the risk of non-confinement, but does not eliminate these area wells as potential conduits to fluid flow from the proposed injection interval.
2. There are several nearby wells producing oil and/or gas from within the same depth interval proposed for injection. Applicant has not presented information to demonstrate that the proposed injection operation will not adversely affect production from these wells.

DISCUSSION OF THE EVIDENCE

Applicant’s evidence

Basic is proposing to use a new well for disposal of produced saltwater. Basic filed its application on a Form W-14¹ which is for wells disposing into non-productive formation. The permit was granted and Basic drilled the Beaman No. 1. When it was realized that the disposal interval is a productive one, the existing permit was withdrawn and Basic filed again on a Form H-1².

The proposed disposal interval is the Strawn Formation between 3310' and 3804'. These depths were amended from the originally applied for 3310'-5024' interval that was reduced at the request of Devon. The base of the amended interval will be at least 300' shallower than the producing formation in Devon’s Stockton Lease Well No. 2, which is just over a ½ mile distant. Basic plans three sets of perforations: 3340'-68', 3662'-50' and 3708'-14'. These Strawn sandstones are continuous across the area and should be able to accept the amount of fluid proposed. The perforations in Devon’s well, which is completed in the Lester-Rawle (Strawn 4200) Field, are from 4108' to 4158'.

According to the Texas Commission on Environmental Quality (“TCEQ”), usable-quality ground water should be protected to a depth of 250'. Basic set and cemented surface casing at 355', while the long string casing was cemented from the base of the well at 5221' with enough cement to reach the surface. Disposal will be through tubing set on a packer at 3300'.

¹ Application to Dispose Oil & Gas Waste by Injection into a Porous Formation Not Productive of Oil or Gas

² Application to Inject Fluid into a Reservoir Productive of Oil & Gas

The applicant originally requested approval to dispose of up to 5000 BWPD at a maximum surface pressure of 1650 psi. Basic has amended the requested maximum injection pressure to 827 psi. The procedures for administrative approval by the Environment Services Section of the Commission may approve applications in the Barnett Shale Trend, if the requested injection pressure is limited to a gradient of 0.25 psi per feet as Basic has done, as long as all wellbores within 1/4 mile are reviewed. An application for a higher injection pressure must show that all producing wells within 1/2 mile are sufficiently cemented for confinement of injection fluids within the injection zone. This standard generally requires a showing that the casing is cemented behind pipe across the disposal interval in all producing wells within 1/2 mile.

Basic reviewed all three wells within 1/4 mile of the Beaman No. 1. Two are wells that were plugged in the early 1990's, according to current Commission standards. The third is a Republic Energy well producing from the Morris (Consolidated Congl.) Field at depths below 5000'.

Basic also provided evidence on all wells within a 1/2 mile radius, though it is not able to show zonal confinement in all of the producing wells. There are five producing wells within the 1/2 mile radius (one of which is within 1/4 mile), and Basic believes their operators would notice any problem caused by an injection well because the producing wells would develop pressure on the bradenhead³. Two of the producing wells between 1/4 and 1/2 mile away are operated by Ray Ritchie. Its Carpenter, Houston Lease Well No. 1 produces from the Morris (Consolidated Congl.) Field between 5872' and 5909'; and its Hill, V.M. Lease Well No. 1 produces from the Boonesville (Bend Congl., Gas) Field between 6012' and 6017'.

Basic found a total of five plugged wells within the 1/2 mile radius of review (one of which was within around the Beaman No. 1. The Lester-Rawle (Strawn 4200) Field was the target of one of these wells but it was unsuccessful and was plugged immediately. Basic also checked all abandoned wells between 1/2 mile and a one mile radius and determined that all of these were plugged so as to prevent their becoming conduits for injected saltwater.

Basic does not believe that Ray Ritchie could recomplete its wells to the Lester-Rawle (Strawn 4200) Field as it claims it wants to do. The Carpenter well has no cement behind the production casing between 274' and 4200', while the top of the Strawn is at about 4077'. The Hill well has no cement between 260' and 4860', while the top of the Strawn is this well is about 4014'. The Commission requires setting cement at least 600' above any "potentially productive interval."⁴ According to Basic, when these wells were drilled in the late 1970's, the driller would have set cement at least 600' above the Strawn if it had considered the Strawn potentially productive.

In addition, Basic pointed out that the Lester-Rawle (Strawn 4200) Field is nearly depleted yet it would be difficult to install a pump in either of Ray Ritchie's wells. The production casing in the Hill well is only 3-1/2 inches, while in the Carpenter well it is only 3 inches. The Lester-Rawle (Strawn 4200)

³ Bradenhead (also known as casinghead) is a heavy steel fitting attached to the surface casing. It provides a place to install a gauge to detect pressure between the surface and production casing.

⁴ Technical Discussion of UIC Area of Review Requirements, Commission's website

Field has been producing since 1959 and Basic's evidence shows the only two wells left in the field, including Devon's well, produce less than 5 BOPD. Basic also showed that this field has already had a great deal of water injected into it due to a 1970's era waterflood from an injection well on the Carpenter Lease. Basic does not believe the Beaman well would have much further effect since it will be injecting down dip from the Ray Ritchie wells, into sandstones that are 300' shallower than the Lester-Rawle (Strawn 4200) Field.

Even if Ray Ritchie could physically recomplete its wells, Basic doesn't believe there is much more oil that could be recovered from the Lester-Rawle (Strawn 4200) Field. Based on Basic's volumetric calculations, the original recoverable reserves on the Carpenter Lease were 60,900 BO. The remaining reserves are only 4264 BO. Basic also submitted a log analysis from the Hill well which was drilled by Mote Resources in 1978. The interval between 4007' and 4070 was described with no mention of gas or oil being present. The Hill well was then completed deeper without cementing the production casing across Strawn.

The water to be disposed of in the Beaman No. 1 is produced by Barnett Shale development mostly in Johnson, Denton, Tarrant and Somervell Counties. Disposal trucks will drive 75 miles north to reach the proposed disposal site. However, the existing commercial facilities in Wise County are 30 to 60 miles farther to the north and west of the proposed disposal well. The applicant did not consider disposal closer to the sites where the saltwater is generated as the only suitable disposal formation there is the Ellenburger. Basic considers the Ellenburger too deep for a disposal well at 11,000'.

Basic operates a fleet of salt water hauling trucks. According to Basic, these trucks must frequently wait at the five permitted disposal wells in the area or travel from well to well to find one with spare capacity. Basic believes use of its proposed facility is in the public interest as this well will allow disposal closer to the sites where saltwater is produced. This reduces the miles waste-hauling trucks must travel and the time they wait before they can dispose of their loads. Reducing the cost of saltwater disposal for operators will encourage further oil and gas development in the Barnett Shale.

Basic performed pressure front calculations assuming a reservoir pressure of 894 psi based on the typical pressure gradient in the area. It assumed a permeability of 100 md. Calculations showed that after 25 years of injecting 5000 BWPD, the pressure increase in the disposal zone would be 363 psi at a distance of 1/4 mile. The abandoned wells within 1/4 mile are filled with mud which forms a significant barrier to vertical flow.

The proposed well will be a commercial disposal well and the applicant will comply with all Commission requirements for commercial wells. Prior to beginning operations, collecting and other pits will be permitted separately under the requirements of Statewide Rule 8. A catch basin will be installed to collect waste which may spill as a result of connecting or disconnecting hoses from hauling trucks. All fabricated storage and pretreatment facilities will be constructed of steel, concrete, fiberglass or other approved material and will be maintained to prevent waste discharges. All facilities will be surrounded by dikes 36 inches high which are capable of containing the maximum holding capacity of all such facilities, and any wastes that do accumulate will be removed within 24 hours. Access to the facility will be secured by a fence with a locked gate when unattended. Each storage tank will be equipped with a device to alert drivers when the tank is within 130 barrels of being full.

Basic has a currently active Form P-5 and has filed financial assurance as required by Statewide Rule 78.

Protestant's evidence

The Notice of Hearing states that the applicant has not presented information to demonstrate that the proposed injection operation will not adversely affect production from nearby wells producing oil and/or gas from within the same depth interval. Ray Ritchie has two wells that it believes would be adversely affected by the proposed disposal well. These wells are now completed at depths well below the disposal interval, but Ray Ritchie believes they could be recompleted in the Strawn.

The protestant also agrees with the assessment of ES that “[r]educing the proposed injection pressure reduces the risk of non-confinement, but does not eliminate...area wells as potential conduits to fluid flow from the proposed injection interval.” Thus even if the disposal interval is not exactly the same as the potentially productive sandstones in Ray Ritchie’s wells, disposal fluid could still reach the producing formation, jeopardizing remaining reserves.

Ray Ritchie’s map shows a number of the wells have produced from the Strawn sandstones within 2 miles of the Beaman No. 1. These wells have produced as much as 131,000 barrels of oil from a two-well lease. Ray Ritchie believes there are significant remaining reserves in the Lester-Rawle (Strawn 4200) Field that can be recovered by recompleting its Houston Carpenter No. 1 and Hill No. 1.

Ray Ritchie pointed out that regardless of the reduction in requested pressure, even the single producing well within the 1/4 mile radius review does not have zonal isolation (cement behind the production casing) across the proposed disposal interval. In fact, nine of the ten wells within 1/2 mile of the Beaman No. 1 do not have cemented casing across the disposal interval. Ray Ritchie strongly disagrees with Basic’s contention that mud behind production casing is sufficient to prevent migration of disposal fluid behind the pipe.

A number of plugged wells within 1/2 mile of the Beaman No. 1 no longer have even casing across the disposal interval as part of the production casing was pulled when the wells were plugged. Also, one of these abandoned wells has less than 250' of surface casing, though it does have a plug that covers the presumed base of usable-quality water at 250'.

Ray Ritchie believes that if disposal is allowed into the Beaman No. 1, injected water will find its way to the nearest wellbores without cemented casing across the disposal interval and then move up or down the wellbores. The injected saltwater could enter other Strawn sandstones and would no longer be confined to the disposal zone. It noted that when the Beaman No. 1 was being drilled it encountered a pressured zone at 2486' that was capable of flowing 25 gallons of saltwater per minute. This flow required 9.1 pound mud to be shut-off. If disposal fluids entered this charged zone it could further complicate drilling in the area.

Ray Ritchie assumed that injection rates would be 5000 barrels per day, that the injection thickness is 67', that the porosity is 11% and that the water saturation is 94%. Based on these assumptions it calculated that within 1 year the disposal well would affect other wells 1/2 mile away.

Within 20 years, this much disposal would affect a radius of 2.2 miles. The earlier waterflood injected a total of 1.4 million barrels of water, while the proposed disposal well could inject 1.8 million barrels within the first year.

The Shannon Harris Well No. 1 is a plugged well only 180' from the Beaman No. 1. The Shannon Harris No. 1 has plugs from 153'-310' and from 743'-900'. The production casing was cemented up to 4020'. The casing was cut off at about 3268' and all the casing above that depth was pulled from the wellbore before it was plugged.

Ray Ritchie assumed a permeability of 25 md, which is the value used in the Lester-Rawle (Strawn 4200) unitization hearing and a standard gradient pressure of 1433 psi. Based on these assumptions the formation pressure at the Shannon Harris No. 1 would increase from 1433 psi to 2794 psi after one year. This is equivalent to a column of freshwater 6453' high, pressurizing a formation only 3310' below the surface. In fact, after a few years of disposal several wells within $\frac{1}{2}$ radius would have pressure that could support fluid columns thousands of feet above the surface according to Ray Ritchie. Even if Ray Ritchie assumes the permeability numbers mentioned by Basic, its pressure front calculations show unacceptable pressure increases in wells near the Beaman No. 1.

The protestant pointed out that the Lester-Rawle (Strawn 4200) Field has been a prolific producer. At the time of unitization in 1967, the field had produced 548,000 barrels. At that time the permeability was estimated to be only 5 md, with a range from 0 to 25 md. The field's original reservoir pressure was 1140 psi, which had been depleted to 460 psi when the field was unitized. Injection was abandoned in 1972, and Ray Ritchie believes injection had little ultimate effect on the current recoverable reserves underneath its Houston Carpenter Lease.

Assuming a recovery factor of 10%, Ray Ritchie calculated the original reserves underneath its Houston Carpenter Lease to have been about 97,926 barrels. Wells on this lease have produced 56,681 barrels, leaving an estimated 41,245 barrels to be recovered should the existing well be recompleted to the Lester-Rawle (Strawn 4200) Field. Based on the current price of oil and cost of recompletion, these reserves are certainly economic to Ray Ritchie.

According to the protestant, Basic's bond log shows the cement behind the long casing in the Beaman No. 1 is inadequate. This bond log shows channeling through the cement above the proposed disposal interval. Thus even if all the offsetting wells did not provide conduits for disposal fluid, the Beaman No. 1 itself could allow disposal fluid to escape from the disposal interval.

EXAMINERS' OPINION

The examiners believe that this application should be granted. The proposed disposal well will not harm usable-quality water in the area. The casing and cementing program in this well will ensure that injected waste is confined to the interval between 3310' and 3804'. Usable-quality water appears to be 250' deep or less, and the 355' of surface casing will be adequate to protect fresh water.

The sandstones in this part of the Strawn Formation appear adequate to accept the requested maximum volume of 5000 barrels of salt water to be injected. The shale above these sandstones will

form a good seal. The maximum requested surface pressure of 827 psi will not exceed the fracture pressure of the overlying rock.

Basic did not prove that there are no remaining reserves under Ray Ritchie's tracts in the Lester-Rawle (Strawn 4200) Field, though the field is certainly largely depleted. Ray Ritchie could not recomplete its wells to this field in their current configuration. A block squeeze to put cement behind the production casing at least 600' above the Strawn would be required. If that were performed now, it would increase the protection for any reserves at that depth from any disposal.

It is difficult to understand Ray Ritchie's continued concern after Basic amended its disposal interval. If disposal fluid escaped from the disposal zone, it would rise rather than sink downward to the level of the Lester-Rawle (Strawn 4200) Field. Ray Ritchie actually pointed out the charged zone at 2500' in the Beaman No. 1. This zone has the potential now to flow 857 barrels of saltwater per day but this flow is no more likely to move downward to the Lester-Rawle (Strawn 4200) Field than is the disposal fluid.

There is not a uniformly good cement bond in the Beaman No. 1 but there is sufficient bond to insure disposal fluid will not rise to the level of fresh water and there is a good bond between the disposal interval and the underlying 4200' Strawn.

Ray Ritchie's pressure front calculations imply that a pressure increase of even a pound at any well offsetting a disposal well will cause fluid levels rising above the surface. Fortunately, disposal wells very rarely cause fluid break-outs through properly plugged wellbores. Ray Ritchie's calculations would work only if there are no cement plugs in the offsetting abandoned wells and they were empty of even saltwater.

Offsetting producing wells can provide a warning should disposal fluid escape from the disposal interval. Statewide Rule 17(a) states: "All wells shall be equipped with a Bradenhead. Whenever pressure develops between any two strings of casing, the district office shall be notified immediately." Should increased pressure be detected on the Bradenhead of any offset producing wells, the Commission can suspend disposal operations in Basic's Beaman No. 1.

There have been saltwater break-outs from shallow disposal wells in the Barnett Shale Trend, presumably due to unplugged wellbores. For this reason, UIC has adopted stricter limits for such shallow disposal wells. The Beaman No. 1 meets those restrictions by adopting a maximum pressure of only 0.25 psi per foot.

FINDINGS OF FACT

1. Disposal Permit No. 12061, issued to Basic Energy Services L.P. ("Basic") for its Beaman Well No. 1, was suspended by the Commission on July 19, 2005, due, in part, to insufficient notice.
 - a. This permit, issued for disposal of up to 5000 barrels of saltwater per day into the interval 3310'-5024', had been issued administratively by the Commission on May 3, 2005.

- b. Basic applied for this disposal permit on Form W-14 which is for disposal into non-productive formations.
 - c. The disposal interval granted in Permit No. 12061 included formations that are productive in the area.
2. Notice of this application to inject into a productive formation was issued to all interested persons at least ten (10) days prior to the hearing.
 - a. Notice of the application (Forms H-1 and H-1A) was mailed to operators of all offset wells within 1/2 mile, surface owners, offset surface owners, and the Wise County Clerk on October 17, 2005.
 - b. Notice of the application was published in *The Wise County Messenger*, a newspaper of general circulation in Wise County, on October 23, 2005.
 - c. Notice of this hearing was issued to all offset operators of wells within 1/2 mile and all offset surface owners on April 27, 2006.
3. The Beaman No. 1 will be used for disposal of oil and gas waste produced mostly by Barnett Shale wells in the surrounding area of Wise County.
4. Basic has modified its injection interval and while injection will be into the Strawn Formation, the particular sandstones between 3310' and 3804' are not productive in the immediate area.
5. The maximum injection volume will be limited to 5000 barrels per day.
6. A maximum surface injection pressure of 827 psi will not fracture the overlying rock nor endanger hydrocarbon reserves in the area.
 - a. The Environment Services Section of the Commission states that applicants in the Barnett Shale Trend who limit their requested injection pressure to a gradient of 0.25 psi per feet as Basic has done, can be approved administratively if they review all of the wellbores within 1/4 mile.
 - b. The closest producing sandstones to the disposal interval are in the Lester-Rawle (Strawn 4200) Field that is at least 300' deeper.
7. According to the Texas Commission on Environmental Quality, usable-quality water should be protected to a depth of 250'.
8. The Beaman Well No. 1 has surface casing cemented from 355' to the surface, while the long string casing was cemented from the base of the well at 5221' with enough cement to reach the surface.

9. Wellbores offsetting the Beaman No. 1 will not be conduits for disposal fluid to leave the disposal interval.
 - a. Two of the three wellbores within 1/4 mile are wells that were plugged in the early 1990's, according to current Commission standards. The third is a Republic Energy well producing from the Morris (Consolidated Congl.) Field at depths below 5000'.
 - b. The Republic Energy well, the only producing well within 1/4 mile, has adequate surface casing and produces from the Morris (Consolidated Congl.) Field at depths below 5000'.
 - c. There are three properly plugged wells between 1/4 and 1/2 mile of the Beaman No. 1.
 - d. All of the abandoned wells within a one mile radius are plugged so as to prevent their becoming conduits for injected saltwater.
 - e. There are four producing wells between 1/4 and 1/2 mile of the Beaman No. 1 that have adequate surface casing and are equipped to detect any increase in pressure.
10. Use of the proposed disposal well is in the public interest as it will reduce disposal costs, thus encouraging further oil and gas development.
11. There is a need for disposal facilities in southern Wise County because of the active development of Barnett Shale wells.
12. Basic has a currently active Form P-5 and has filed financial assurance as required by Statewide Rule 78.

CONCLUSIONS OF LAW

1. Proper notice was given to all necessary parties as required by Statewide Rules 9 and 46(5) [Tex. R.R. Comm'n, 16 TEX. ADMIN. CODE § 3.9(5)] and other applicable statutory and regulatory provisions.
2. All things necessary to give the Commission jurisdiction to decide this matter have been performed or have occurred.
3. Granting the application to dispose of oil and gas waste into the Basic Energy Services, L.P. Beaman Lease Well No. 1 under the terms and conditions set forth in the attached Final Order, will not endanger fresh water resources nor endanger oil or gas resources in the area.
4. No existing rights will be impaired by the use the Beaman Well No. 1 to dispose of up to 5000 barrels of saltwater at a maximum surface pressure of 827 psi.
5. Granting the application is in the public interest.

6. The application to dispose of oil and gas waste into the Beaman Well No. 1 meets the requirements for approval pursuant to Statewide Rule 46 and the Texas Water Code §27.051 and §27.073.
7. The terms and conditions set forth in the attached Final Order are reasonably necessary to protect usable-quality water from pollution.

EXAMINERS' RECOMMENDATION

Based on the above findings and conclusions, the examiners recommend that the application of Basic Energy Services L.P., to dispose of up to 5,000 barrels of saltwater per day by injection at a maximum surface pressure of 827 psi, into the interval between 3310' and 3804' in its Beaman Lease Well No. 1, in the Boonesville (Bend Congl., Gas) Field in Wise County, be **GRANTED**, with the conditions proposed in the attached Final Order.

Respectfully submitted,

James M. Doherty
Hearings Examiner

Margaret Allen
Technical Hearings Examiner