



RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

PROPOSAL FOR DECISION

OIL & GAS DOCKET NO. 7C-0301468

THE APPLICATION OF APPROACH OPERATING LLC PURSUANT TO STATEWIDE RULE 9 FOR A PERMIT TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL AND GAS, BAKER "A" LEASE, WELL NO. 119, HOLT RANCH (CONSOLIDATED) FIELD, CROCKETT COUNTY, TEXAS

HEARD BY: Paul Dubois – Technical Examiner
Jennifer Cook – Administrative Law Judge

APPEARANCES:

APPLICANT:

George Neale
John Miller, P.E.
Ted Oldham
J. K. Brite

REPRESENTING:

Approach Operating LLC

PROTESTANTS:

Troupe Brewer
Slate Williams
Ronald Green

REPRESENTING:

Crockett County Groundwater Conservation District

PROCEDURAL HISTORY

Application Published:	July 6, 2016
Application Filed:	July 11, 2016
Protest Received:	July 18, 2016
Request for Hearing:	August 10, 2016
Notice of Hearing:	August 26, 2016
Hearing Held:	November 9, 2016
Transcript Received:	November 28, 2016
Record Closed:	November 28, 2016
Proposal for Decision Issued:	February 1, 2017

STATEMENT OF THE CASE

Approach Operating LLC (“Approach”) is seeking authority pursuant to Statewide Rule 9 (16 Tex. Admin. Code §3.9) to dispose of oil and gas waste by injection into a formation not productive of oil or gas at the Baker “A” Lease, Well No. 119, in the Holt Ranch (Consolidated) Field, Crockett County, Texas. The Baker “A” No. 119 is an existing well (API No. 42-105-41215) that will be converted to disposal service. Approach seeks non-commercial authority to dispose of 10,000 barrels per day (bpd) of its own produced saltwater and waste fluids exempt under the Resource Conservation and Recovery Act (“RCRA”) into the Clear Fork Formation in the depth interval from 2,720 feet to 3,750 feet. The application is protested by the Crockett County Groundwater Conservation District (the “District”). The District does not have any concern about the proposed disposal well itself, but is instead concerned about a nearby well, the presence of which may pose an unacceptable risk to the groundwater resources of Crockett County as a result of the proposed disposal activities.

The Technical Examiner and Administrative Law Judge (collectively, “Examiners”) recommend the application be granted and the non-commercial disposal permit issued. Approach has met its burden of proof under Chapter 27 of the Texas Water Code and the Commission’s Statewide Rule 9.

APPLICABLE LAW

The Railroad Commission may grant an application for a disposal well permit under Texas Water Code §27.051(b) and may issue a permit if it finds:

1. The use or installation of the injection well is in the public interest;
2. The use or installation of the injection well will not endanger or injure any oil, gas, or other mineral formation;
3. With proper safeguards, both ground and surface fresh water can be adequately protected from pollution; and
4. The applicant has made a satisfactory showing of financial responsibility as required by Section 27.073.

Additionally, Approach must comply with the requirements of Statewide Rule 9.

DISCUSSION OF THE EVIDENCE

Applicant’s Evidence

At the hearing, Approach offered evidence and testimony from John Miller, P.E., a consulting petroleum engineer with FTI Platt Sparks, and Theodore Oldham, Approach’s chief

operations geologist. The Baker “A” Lease (No. 17260) Well No. 119 (API No. 42-105-41215) is located on a 2,172-acre lease about 13 miles north of Ozona, Texas.

Notice

On July 6, 2016, notice of the application was published in the *Ozona Stockman*, a newspaper of general circulation in Crockett County, Texas. On July 6, 2016, Approach notified the owner of the surface tract and the Crockett County Clerk. Other than Approach, there are no operators of wells within one-half mile of the proposed disposal well. The proposed well is not located in the city limits or extra territorial jurisdiction of any city or town.

Facility Design and Operation

The Baker “A” Lease Well No. 119 was completed on April 14, 2011 at a depth of 7,982 feet and plugged back to 7,930 feet. The well was completed with three casing strings:

- Surface casing (13 3/8-inch) was set at 884 feet and cemented to the surface with Class C cement.
- Intermediate casing (8 5/8-inch) was set at 2,078 feet and cemented to the surface with Class C cement.
- Long-string casing (5 1/2-inch) was set to a depth of 7,963 feet and cemented with 925 sacks of Class H cement to a depth of 2,736 feet as determined by a cement bond log.

The cement behind the long-string casing does not fully cover the top of the proposed injection interval or extend into the intermediate casing annulus. The Baker “A” Well No. 119 was completed for production. The long-string casing was perforated from 7,636 feet to 7,790 feet. To convert the wellbore to injection service, Approach proposes the following wellbore modifications and operating parameters, three of which (as indicated below) are recommended by the Commission’s Underground Injection Control (“UIC”) Unit to be special permit conditions:

- Approach will set a cast iron bridge plug above the uppermost perforation at a depth of 7,636 feet and place 20 feet of cement on top of the plug *as a special permit condition*.
- Approach will set a cast iron bridge plug below the proposed injection interval at a depth of 3,830 feet and place 20 feet of cement on top of the plug *as a special permit condition*.
- Approach will perform a block squeeze in the long-string casing annulus immediately above the injection interval with 120 sacks of cement at a depth of 2,720 feet, *as a special permit condition* (this will raise the top of cement behind the production casing to a depth of about 1,830 feet).
- Approach will perforate the long-string casing in the injection interval from 2,320 feet to 3,750 feet.

- Approach will set 2 3/8-inch injection tubing with a packer at a depth of 2,290 feet, 30 feet above the top of the injection interval.
- The maximum injection volume will be 10,000 bpd and the estimated average injection volume will be 5,000 bpd.
- The maximum surface injection pressure will be 1,160 pounds per square inch gauge (“psig”) and the average surface injection pressure will be 800 psig.
- Injected waste will be limited to produced salt water and non-hazardous oil and gas waste exempt from regulation under RCRA that is produced on Approach’s various Holt Ranch (Consolidated) Field wells in the area. Approach is not seeking authority for commercial disposal.

Groundwater, Geology and Resource Development

The Commission’s Groundwater Advisory Unit (“GAU”) identifies the base of usable quality water (“BUQW”) requiring protection to be at a depth of 700 feet. The GAU requires protection of fresh water resources in the interval from the land surface to 20 feet below the base of the Cretaceous-age beds.¹ The base of the underground sources of drinking water (“USDW”) is estimated to be at approximately 925 at feet. The GAU concludes that, if otherwise compliant with Commission rules and guidance, drilling and using this disposal well and injecting oil and gas waste into the subsurface stratum will not endanger freshwater strata in the area.

A well log of the Baker “A” Lease Well No. 119 indicates shale strata immediately above and below the requested injection interval. The gamma ray log indicates shale above the injection interval from 2,320 feet to 2,110 feet, interrupted by a 10-foot thick sand interval at about 2,210 feet. The injection interval is underlain by shale from a depth of 3,750 feet to at least 4,000 feet.²

To address the District’s concerns that one or more fields in the area contain hydrogen sulfide (H₂S), which is a potentially corrosive agent, both Mr. Miller and Mr. Oldham described in detail the drilling methods used by Approach for more than 900 wells in the area. By air- or dust-drilling the wells, while sometimes employing a foaming agent, any fluids, gases or liquids in the rock are transmitted to the surface very quickly in identifiable quantities.³ The immediate transmission of these materials, combined with the installation of H₂S alarms (which would be triggered at the federally mandated levels of 10 parts per million) at the surface of each drilling location indicates to Approach that there is no H₂S in this area. Approach noted that air- or dust-drilling is only available for use when the formations that will be drilled through are not over-pressured. For instance, the proposed injection interval, from 2,320 to 3,750 was dust drilled and therefore not over-pressured.⁴

¹ Approach Ex. 7, 8, 12 and 13; Tr. 24: 15 – 20.

² Approach Ex. 22.

³ Tr. 65: 6 – 23.

⁴ Approach Ex. 24, 25 and 26.

Mr. Ted Oldham, Approach's Chief Operations Geologist, has personally set up and monitored the drilling of approximately 750-800 wells through the Grayburg and San Andres Formations in the area. Mr. Oldham stated that it was his opinion that the proposed operations will cause no harm to the freshwater resources in Crockett County, and that there is more than adequate confining rock to keep the fluids contained in the proposed injection interval. Furthermore, Approach testified that no H₂S was encountered during the drilling of the subject well.⁵

A review of the records of the U. S. Geologic Survey did not identify any seismic events with a magnitude greater than 1.0 within a 9.08 kilometer radius (100 square miles) of the proposed disposal well between January 1, 1973 and October 31, 2016.⁶

Area of Review

Three wellbores penetrate the disposal interval within a one-quarter mile area-of-review around the Baker "A" Lease Well No. 119. All three of those wellbores are nearly one-quarter mile (1,320 feet) from Well No. 119. Two of the wellbores are producing wells operated by Approach, and one is a dry hole (the Pan American Production Co, W.E. West Lease, Well No. 3, API No. 42-105-02113, hereafter the "West No. 3"). The West No. 3 wellbore was spud on December 31, 1954, and drilled to a depth of 9,230 feet (into the Wilburn Sand Formation). It was plugged on March 11, 1955. The available well records indicate that the well was cased and cemented as follows:

- 13 3/8-inch surface casing was set at a depth of 652 feet and cemented to the surface. This casing remains in the ground.
- 9 5/8-inch casing was set at a depth of 2,024 feet and cemented with 280 sacks of cement.⁷ The top of cement was not documented in the available plugging records. Mr. Miller testified that his rough calculation suggests in excess of 1,000 feet of cement between the 9 5/8-inch casing and the wellbore.⁸

The West No. 3 wellbore was tested in several intervals, determined to not be productive, and was ultimately plugged. The records indicate the following:

- The deep tests in the Wilburn Sand Formation were negative.
- A cement plug was placed from 7,900 to 8,200 feet with 100 sacks of cement.
- The 9 5/8-inch casing was perforated and tested several times from 1,570 feet to 1,275 feet in the San Andres and Grayburg Formations, which overlie the Clear Fork Formation

⁵ Approach Cross-Examination Ex. 1

⁶ Approach Ex. 23.

⁷ Some of the documentation indicates that only 2,010 feet of 9 5/8-inch casing was placed in West No. 3. The Examiners consider the difference between 2,024 and 2,010 to be immaterial, and it was not a matter of dispute.

⁸ Tr. 57: 2-10.

injection interval, and were found to contain saltwater and sulfur water, but no hydrocarbons.⁹ Although 'sulfur water' was documented on the test records of the West No. 3, Mr. Miller stated that sulfur is often present in forms other than H₂S, and those other forms can also impart odors to the produced fluids.¹⁰

- Three cast iron bridge plugs topped with 5 feet of cement and two cement retainers were set to isolate the shallow tested intervals in the Grayburg and San Andres Formations.
- 613 feet of the 9 5/8-inch casing was pulled from the well.
- A plug was set across the casing overlap from 563 feet to 663 feet with 60 sacks of cement.
- A 10-foot cement surface plug was placed at the top of the well.

Beyond the one-quarter mile area of review and within a one-half mile radius of the proposed disposal well, are six wellbores that penetrate the disposal interval. All six of these wells are currently producing wells that are operated by Approach. Approach is the only operator of wells within one-half mile of the proposed disposal well.

Public Interest and Need for Additional Disposal Capacity

Approach plans to use the proposed disposal well to dispose of produced water and fracture stimulation water generated as a result of production efforts from nearby wells. Mr. Oldham presented evidence and testimony with regard to the need for the proposed well. Currently, because of the limitation of its own disposal capacity, Approach is having to truck its produced water to third party commercial disposal wells. As a result, Mr. Oldham asserts that approval of the subject injection authority would greatly reduce its production and disposal costs, but would also reduce the number of tank truck miles on Texas roads, as waste liquids would be transported by pipeline. Mr. Oldham estimated that Approach would save, on average, about \$2,700 per day in disposal costs with the proposed well.¹¹

Financial Assurance

Approach has an active Organization Report (Form P-5, Operator No. 028625), and has filed a \$250,000 letter of credit for financial assurance.¹²

Protestant's Evidence

The District's direct case consisted of testimony from its General Manager, Mr. Slate Williams, and its expert geologist, Ronald Green, Ph.D., P.G. Mr. Williams testified that the

⁹ Approach Ex. 16.

¹⁰ Tr. 78 – 79.

¹¹ Approach Ex. 33.

¹² Approach Ex. 2.

District's duty is to prevent degradation of the quality of groundwater and manage and protect private property interests in the quantity and quality of groundwater in Crockett County. Dr. Green began his testimony discussing general concerns with disposal activities in fields containing old plugged and abandoned wells as such wells can be a conduit for the contamination of groundwater resources. Dr. Green stated that he did not agree with the testimony of Mr. Miller and Mr. Oldham when they expressed no concern over the possibility of H₂S corrosion of the West No. 3 well.

H₂S in the San Andres in Crockett County

Dr. Green compiled a table of average H₂S concentrations in various Crockett County fields. Dr. Green testified that the Holt Ranch (Consolidated) Field contains the San Andres Formation, and that the H₂S concentration is "relatively high" at 10,728 ppm in the Holt Ranch (San Andres) Field in Crockett County.¹³ Dr. Green stated that this table of Commission data contradicts the opinion of Mr. Miller and Mr. Oldham that H₂S is not a concern with this application. Based on this data and his personal knowledge of drill rigs and operations, Dr. Green further testified that it is his opinion that the fact that Approach has not once detected H₂S at the surface, as testified by Mr. Oldham, suggests that surface monitoring is not an effective method to determine whether or not H₂S is present at depth and in what concentration.¹⁴ On cross-examination, counsel for Approach questioned Dr. Green about his H₂S data table and asked him questions about formations in the Holt Ranch field other than the San Andres (i.e. the Clear Fork Formation where the disposal proposed by Approach's application would occur). Dr. Green acknowledged that the deeper formations of the Holt Ranch field do not contain H₂S; however, Dr. Green reiterated the fact that this data is not germane to the District's concern regarding the San Andres Formation and the potential for H₂S-caused well degradation therein.

Historical Completion Practices and Cement Quality

Dr. Green then discussed a technical article from the Texas Bureau of Economic Geology the "BEG article") that detailed the history of the procedures, technology, and regulations related to well plugging and abandonment in Texas oil and gas wells.¹⁵ Dr. Green said he prepared this exhibit to emphasize his concern over the West No. 3 well given its age and the well plugging procedures, technology, and regulations of the time. Dr. Green testified, with specific reference to the West No. 3, that the cement used in its casing and plugging (common cement) is not used today, and especially not used in an H₂S field given that type of cement's susceptibility to corrosion. Dr. Green stated that this point is reflected in one of the BEG article's conclusions that it cannot be assumed that plugging and abandonment during this time was done properly compared to modern plugging standards.

The BEG article notes that even though the 1950s marked the creation of national standards for cements used in oil and gas wells, the rules in place at the time were not fully followed or enforced.¹⁶ Further, while Approach noted that the BEG article referenced and discussed carbon

¹³ Tr. 93: 8-17.

¹⁴ Tr. 95-96; Tr. 97: 14-24.

¹⁵ District Ex. P-2.

¹⁶ *Id.* Page 1635.

storage, Dr. Green definitively testified that the discussion of the containment of carbon dioxide is not materially different than the containment of waste, noting that as to the integrity of a well “if it fails its going to fail for any fluid probably.”¹⁷ This point is directly relevant to the conclusion of the BEG article which states that an important factor to consider in siting a storage facility should be the “avoidance of well bores that represent the most direct conduit to fresh water aquifers” and that “injection levels should be as deep as feasibly possible.”¹⁸

West Well No. 3 Issues

Dr. Green then provided testimony regarding the records of the West No. 3 well (Approach Ex. 16 and 17). Specifically on the topic of the well’s completion, Dr. Green stated that because no cement bond log was run after the casing was cemented, he does not know where the 280 sacks of cement were placed behind the intermediate casing or how far the cement rose up from the toe of the well. Dr. Green noted the presence of three bridge plugs and the nominal amount of cement on top of each one, but observed that the integrity of those plugs and that cement is unknown.

Dr. Green maintained that those plugs and that casing and cement have been exposed to H₂S for over 60 years, and that there is no assurance from anything he has reviewed or that has been presented by Approach that the West No. 3 has maintained its integrity over time in terms of the plugs, its casing, or the cement that was placed behind the casing at depth. Even under the assumption that the bridge plugs remained intact, Dr. Green stated that if the casing is not protected by grout and/or exposed to H₂S there would no impediment to vertical flow through the borehole and pressurized fluids could bypass the bridge plugs all together.

Dr. Green then presented evidence in the form of a schematic diagram of the subject well and the West No. 3 that shows the San Andres Formation at a depth between 1,150 and 1,530 feet at the Holt Ranch (Consolidated) Field.¹⁹ The intermediate casing depth of West No. 3 is 2,024 feet, and the three cement plugs were set at depths of 1,330, 1,475, and 1,595 feet, respectively. This schematic and Dr. Green’s testimony illustrate that nearly 400 feet of the West No. 3’s casing has been potentially exposed to an H₂S-bearing formation for over 60 years, which could lead to corrosion of some or all of that casing. Dr. Green reiterated his point that only the “weakest link” needs to fail in order to have a pathway that allows for pressurized fluid to flow.²⁰

Dr. Green concluded his testimony by discussing the pressure calculation he performed to illustrate potential effects of the proposed injection activities.²¹ Dr. Green testified that, using very conservative figures—and figures more favorable to Approach—the underground pressure resulting from the proposed injection activities would be sufficient to move fluids from the injection interval at API No. 105-41215, to the open West No. 3 borehole 1,300 feet away, and back up through the West No. 3. If any of the plugs, casing, or cement have indeed failed or

¹⁷ Tr. 110: 14-22.

¹⁸ District Ex. P-2, Page 1638.

¹⁹ District Ex. P-3.

²⁰ Tr. 139: 20 – 140: 2.

²¹ District Ex. P-4.

corroded, Dr. Green testified that sufficient pressure would exist to push fluids from the West No. 3 borehole up into the base of the USDW at 925 feet and as well as into the BUQW at 700 feet. Dr. Green further testified that the conservative figures used in his calculations likely do not reflect reality, and the threat of fluid migration could be even higher.

EXAMINERS' ANALYSIS

The evidence in the record demonstrates Approach has met its burden of proof and that the proposed Baker "A" Lease Well No. 119 disposal well application meets the requirements of Chapter 27 of the Texas Water Code and Statewide Rule 9. There is no disagreement between the parties regarding Texas Water Code § 27.051(b)(1, 2, and 4) (i.e., public interest, protection of hydrocarbon resources, and financial assurance). The dispute in this case centers on Texas Water Code § 27.051(b)(3), which states:

With proper safeguards, both ground and surface fresh water can be adequately protected from pollution.

The Examiners conclude the proposed Approach Baker "A" Lease Well No. 119 will be constructed and operated in a manner that will protect ground and surface freshwater from pollution. Below, the four required elements of the Texas Water Code § 27.051(b) will be discussed sequentially.

Public Interest

Approach demonstrated that the proposed well will enable it to achieve operational efficiencies by reducing produced water disposal costs and these efficiencies are in the public interest. Approach is currently producing 10,000 bpd, and only able to inject approximately 5,000 bpd to 7,000 bpd, that leaves a minimum shortfall of 3,000 bpd that must be trucked and disposed of at commercial facilities. Approach estimates it will save, on average, more than \$121,000 per month, or \$1,452,000 in annual disposal costs. In addition, the disposal fluids would be piped to the proposed well, eliminating the need for transportation by truck.

The District provided no evidence to suggest the proposed disposal well was not in the public interest apart from its concerns with regard to the potential for harm to ground water. The Examiners conclude that the evidence in the record indicates the subject well is in the public interest pursuant to Texas Water Code § 27.051(b)(1).

Endanger or Injure Any Oil, Gas, or Other Mineral Formation

Approach proposes to inject water into the Clear Fork Formation, which is not productive in this area. The nearest production is from the Wolfcamp Formation, which is more than 1,000 feet below the proposed disposal interval. The proposed well is an existing well that will be recompleted for disposal service. The well has been completed and cased through the Wolfcamp Formation. A cast iron bridge plug topped with 20 feet of cement will be set to isolate the disposal interval from the lower reaches of the wellbore, and a second cast iron bridge plug topped with 20 feet of cement will be set to isolate the existing wellbore perforations below 7,636 feet. There is

also a minimum of 250 feet of shale below the injection interval to provide further protection of the deeper productive formations. The District provided no evidence to suggest the proposed disposal well would harm oil, gas or other mineral resources. The evidence in the record demonstrates the proposed disposal well will not endanger or injure any oil, gas, or other mineral formation pursuant to Texas Water Code § 27.051(b)(2).

Prevent Pollution of Ground and Surface Fresh Water

The District argues that the permit should not be granted because Approach cannot demonstrate compliance with Texas Water Code § 27.051(b)(3), which states:

With proper safeguards, both ground and surface fresh water can be adequately protected from pollution.

The issues and disputes are considered below.

Well Completion

The proposed disposal well will recompleted to be cased, cemented and plugged in such a way as to prevent the migration of injected fluids from the disposal interval at the subject well location. The surface and intermediate casing strings are set to depths of 884 feet and 2,078 feet, respectively. Both the surface and intermediate casing strings are cemented to the ground surface. The production casing was cemented to a depth of 2,736 feet, as confirmed by a cement bond log. Commission staff recommends, and the Examiners agree, that three special permit conditions should be implemented to ensure confinement of injected fluids to the disposal interval:

- Approach will set a cast iron bridge plug above the uppermost perforation at a depth of 7,636 feet and place 20 feet of cement on top of the plug as a special permit condition;
- Approach will set a cast iron bridge plug below the proposed injection interval at a depth of 3,830 feet and place 20 feet of cement on top of the plug as a special permit condition; and,
- Approach will perform a block squeeze in the long-string casing annulus immediately above the injection interval with 120 sacks of cement at a depth of 2,720 feet.

The evidence also indicates that there is adequate geologic confinement separating the disposal interval from the BUQW and USDW.

Area of Review and the West Well No. 3

The District is concerned about the potential for groundwater contamination through one wellbore, the West No. 3, located 1,300 feet from the subject well. The West No. 3 was a dry hole spud on December 31, 1954, drilled to a depth of 9,230 feet, and plugged in 1955. Approach's

evidence included plugging records received by the Commission on March 15, 1955: Form 2A, Application to Plug and Well Record; and Form 4, Plugging Record.²²

The District is concerned that saltwater may migrate uphole into the West No. 3 via: (1) an open wellbore; (2) the un-cemented annulus between the subsurface formation and the steel casing; or (3) un-plugged casing. The Commission received the plugging reports from the operator who drilled the dry hole, and on this basis the Examiners presume that the well was plugged in a manner consistent with the Commission requirements in place in March 1955. The well was completed with adequate cemented casing and plugged in such a way to prevent the migration of fluids uphole:

- 2,024 feet of 9 5/8-inch casing was set in the wellbore and cemented with 280 sacks of cement.
- The depth to which the cement rose in the casing annulus was not documented in the plugging reports. However, Mr. Miller testified that a rough estimated suggests there would be about 1,000 feet of cement behind the 9 5/8-inch casing (to a depth of about 1,000 feet).
- 613 feet of 9 5/8-inch casing was pulled during the plugging operation. The Examiners understand that, typically, when casing is pulled from a well being plugged, it is cut in segments and removed from the top of the well until the operator is no longer able to cut or remove segments. Typically, the length of casing successfully pulled from a well correlates to the un-cemented length of pipe; casing that is cemented cannot be pulled, but free-pipe can. This would suggest that cement may have risen in the 9 5/8-inch annulus as high as about 613 feet—otherwise, the operator would have pulled more of the casing out of the well to recover valuable materials. This is circumstantial evidence, in the record, of cement rising to a depth of about 613 feet. Because there is original documentation of 280 sacks of cement being placed behind the casing, the Examiners conclude this evidence merits some weight.

The Examiners conclude that the evidence in the record indicates the West No. 3 was cemented and plugged such that these pathways are not open to fluid migration from the injection interval. Specifically, the Examiners find it reasonable to conclude based on a preponderance of the evidence that enough cement was placed behind the 9 5/8-inch casing to prevent the casing annulus from acting as a conduit for the migration of injected fluids.

Age of Cement

The District argues that old cement, in and of itself, is sufficient cause to deem the fresh groundwater to be at risk. Especially, the District notes that the cement used in 1955 was probably a common surface cement, and not a type designed for use in corrosive environments. There is no evidence about the cement that was placed in this particular well, other than there were 280 sacks

²² Approach Ex. 16.

of it. The District offered no precedent and the Examiners are not aware of any case in which the Commission has found that the age of the cement, in and of itself, to be a factor in condemning casing integrity.

Hydrogen Sulfide in the Grayburg and San Andres Formations

The District alleges that the Grayburg and San Andres Formations in this area contain hydrogen sulfide. This assertion is based on a table of information obtained from the Commission's website regarding H₂S-bearing fields in Crockett County. The Holt Ranch (San Andres) Field was identified as H₂S-bearing, as were other Grayburg and San Andres Formation fields in Crockett County. The Holt Ranch (Consolidated) Field was not on the list.

H₂S, if present, could increase the corrosivity of formation fluids, which could, over time, harm the integrity of cement and steel casing. However, Approach's expert and fact witnesses testified that Approach has not encountered any H₂S in more than 900 wellbores drilled through the Grayburg and San Andres Formations in this area over the last few years. Further, Approach drills these wells in a manner that would facilitate the rapid identification and quantification of H₂S if it were to be present in formation fluids. Specifically, no H₂S was encountered while drilling the subject Baker "A" Lease Well No. 119. The Examiners concur with Approach, that the evidence in the record indicates H₂S has not been detected and therefore is not likely contributing to corrosion concerns at this location.

Pressure-Front Calculations

The District offered pressure-front calculations that it asserts will result in sufficient formation pressure to lift injected fluids that migrate to the West No. 3 above the USDW and BUQW. The District's calculations do, indeed, show sufficient pressure may be generated. However, the fluids cannot be lifted without an available migration pathway. For reasons stated above, the Examiners conclude that the evidence in the record demonstrates that such a pathway does not exist at the West No. 3, and therefore the reservoir pressure in the disposal interval will not harm freshwater resources.

The evidence in the record demonstrates that, with proper safeguards as described in the proposed special permit conditions, both ground and surface fresh water can be adequately protected from pollution as required by Texas Water Code § 27.073 pursuant to Texas Water Code § 27.051(b)(3).

Demonstrate Financial Responsibility

Approach has an active Organization Report (Form P-5, Operator No. 028625), and has filed a \$250,000 letter of credit for financial assurance. The District presented no testimony or evidence with regard to Approach's ability to meet its financial assurance obligations. The evidence in the record demonstrates the applicant has made a satisfactory showing of financial responsibility as required by Texas Water Code § 27.073 pursuant to Texas Water Code § 27.051(b)(4).

FINDINGS OF FACT

1. Notice of the application was published on July 6, 2016 in the *Ozona Stockman*, a newspaper of general circulation in Crockett County, Texas. On July 6, 2016, Approach notified the owner of the surface tract and the Crockett County Clerk. Other than Approach, there are no other operators of wells within one-half mile of the proposed disposal well. The proposed well is not located in the city limits or extra territorial jurisdiction of any city or town
2. The Baker "A" Lease Well No. 119 was completed on April 14, 2011 at a depth of 7,982 feet and plugged back to 7,930 feet.
 - a. The well was completed with three casing strings: Surface casing (13 3/8-inch) was set at 884 feet and cemented to the surface with Class C cement.
 - b. Intermediate casing (8 5/8-inch) was set at 2,078 feet and cemented to the surface with Class C cement.
 - c. Long-string casing (5 1/2-inch) was set to a depth of 7,963 feet and cemented with 925 sacks of Class H cement to a depth of 2,736 feet as determined by a cement bond log.
3. The proposed disposal well will be converted to non-commercial disposal service, completed and operated as follows:
 - a. Approach will set a cast iron bridge plug above the uppermost perforation at a depth of 7,636 feet and place 20 feet of cement on top of the plug as a special permit condition.
 - b. Approach will set a cast iron bridge plug below the proposed injection interval at a depth of 3,830 feet and place 20 feet of cement on top of the plug as a special permit condition.
 - c. Approach will perform a block squeeze in the long-string casing annulus immediately above the injection interval with 120 sacks of cement at a depth of 2,720 feet, as a special permit condition (this will raise the top of cement behind the production casing to a depth of about 1,830 feet).
 - d. Approach will perforate the long-string casing in the injection interval from 2,320 feet to 3,750 feet.
 - e. Approach will set 2 3/8-inch injection tubing with a packer at a depth of 2,290 feet, 30 feet above the top of the injection interval.
 - f. The maximum daily injection volume will be 10,000 bpd and the estimated average daily injection volume will be 5,000 bpd.

- g. The maximum surface injection pressure will be 1,160 pounds per square inch gauge (“psig”) and the average surface injection pressure will be 800 psig.
 - h. Injected waste will be limited to produced salt water and non-hazardous oil and gas waste exempt from regulation under the Resource Conservation and Recovery Act that is produced on Approach’s various wells in the area. Approach is not seeking authority for commercial disposal.
- 4. The use or installation of the injection well is in the public interest.
 - a. Approach generates about 2,000 barrels of water per day greater than its current disposal capacity in the Baker “A” Lease area.
 - b. The subject well will be used for the non-commercial disposal of produced water and waste liquids produced on Approach’s Baker “A” Lease.
 - c. The proposed disposal well, which will be connected to existing produced water infrastructure, will greatly reduce disposal costs, mostly from eliminated demand for truck transportation on public roadways.
- 5. The use or installation of the injection well will not endanger or injure any oil, gas, or other mineral formation.
 - a. The Clear Fork Formation is not productive of oil or gas in this area.
 - b. The nearest production is from the Wolfcamp Formation, which is more than 1,000 feet below the proposed disposal interval.
 - c. A cast iron bridge plug topped with 20 feet of cement will be set to isolate the disposal interval from the lower depths of the cased wellbore.
 - d. There is 250 feet of shale below the proposed disposal interval.
- 6. The base of usable quality groundwater (“BUQW”) occurs at a depth of 700 feet, and the base of the underground sources of drinking water (“USDW”) is 925 feet.
 - a. The Baker “A” Lease Well No. 119 is completed with surface casing cemented through the BUQW.
 - b. The Baker “A” Lease Well No. 119 is completed with intermediate casing cemented through the USDW.
- 7. With proper safeguards, as set out in the proposed special permit conditions, both ground and surface fresh water can be adequately protected from pollution.

- a. A thick shale stratum directly overlies the injection interval.
 - b. A block squeeze in the long-string casing annulus immediately above the injection interval with 120 sacks of cement at a depth of 2,720 feet, will raise the top of cement behind the production casing to a depth of about 1,830 feet, more than 100 feet inside the intermediate casing string.
 - c. Three wellbores penetrate the disposal interval within a one-quarter mile area-of-review around the Baker "A" Lease Well No. 119. Two of the wellbores are producing wells operated by Approach, and one was a dry hole (the Pan American Production Co, W.E. West Lease, Well No. 3, API No. 42-105-02113, the "West No. 3").
 - i. The West No. 3 wellbore was spud on December 31, 1954, drilled to a depth of 9,230 feet, and plugged on March 11, 1955.
 - ii. 13 3/8-inch surface casing was set at a depth of 652 feet and cemented to the surface. This casing remains in the ground.
 - iii. 9 5/8-inch casing was set at a depth of 2,024 feet and cemented with 280 sacks of cement. 613 feet of this casing string has been pulled.
 - iv. There is sufficient casing behind the 9 5/8-inch casing to isolate the proposed injection interval from the overlying freshwater strata.
 - v. Four plugs were placed in 9 5/8-inch casing.
 - d. There is no evidence of H₂S in the Grayburg or San Andres Formations at this location.
8. The applicant has made a satisfactory showing of financial responsibility as required by section 27.073 of the Texas Water Code. Approach has an active Organization Report (Form P-5, Operator No. 028625), and has filed a \$250,000 letter of credit for financial assurance.


CONCLUSIONS OF LAW

1. Resolution of the subject application is a matter committed to the jurisdiction of the Railroad Commission of Texas. Tex. Nat. Res. Code § 81.051.
2. All notice requirements have been satisfied. 16 Tex. Admin. Code § 3.9.
3. The use or installation of the proposed disposal well is in the public interest. Tex. Water Code § 27.051(b)(1).

4. The use or installation of the proposed disposal wells will not endanger or injure any oil, gas, or other mineral formation. Tex. Water Code § 27.051(b)(2).
5. With proper safeguards, both ground and surface fresh water can be adequately protected from pollution. Tex. Water Code § 27.051(b)(3).
6. Approach has made a satisfactory showing of financial responsibility. Tex. Water Code § 27.051(b)(4).
7. Approach has met its burden of proof and its application satisfies the requirements of Chapter 27 of the Texas Water Code and the Railroad Commission's Statewide Rule 9.

EXAMINERS' RECOMMENDATION

Based on the above findings of fact and conclusions of law, the Examiners recommend the Commission enter an order granting the application of Approach Operating LLC for a permit to dispose of oil and gas waste by injection into the Clear Fork Formation, a porous formation not productive of oil or gas, for the Baker "A" Lease, Well No. 119, in the Holt (Consolidated) Field, Crockett County, Texas.

 Respectfully,
Paul Dubois
Technical Examiner


Jennifer Cook
Administrative Law Judge