



RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

SECOND AMENDED PROPOSAL FOR DECISION

OIL AND GAS DOCKET NO. 01-0295139

THE APPLICATION OF HIGH ROLLER WELLS, LLC PURSUANT TO STATEWIDE RULE 9 FOR A COMMERCIAL PERMIT TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL OR GAS, FASHING 99 SWD LEASE, WELL NO. 1, EAGLEVILLE (EAGLE FORD-1) FIELD, ATASCOSA COUNTY, TEXAS

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HEARD BY: Richard Eyster, P.G. -- Technical Examiner
Peggy Laird, P.G. -- Technical Examiner
Marshall Enquist -- Administrative Law Judge

APPEARANCES:

REPRESENTING:

Applicant: George Neale
Christopher Hotchkiss
Rick Johnston
Todd Reynolds
Luke Garrett
Doug White
Jeryl D. Hart, Jr

High Roller Wells, L.L.C.

Protestants:

Eric Opiela
Ronald Green
Keith Masters

Herman Kellner
Keith Kellner
Arthur Troell
Lucy Strum
Jack Anderson
Ralph Chapman
James Hierholzer
Robert Swierc
Jo Ann Stewart
Johnice Anderson
Ellen Ahreus
Josephine Kellner
Rhonda Miller
Leroy Weigand
Evergreen UWCD
Atascosa County Judge
Pro Se
Pro Se

Russell Labus
Honorable Robert Hurley
Raymond Lieke
Rhonda Miller

PROCEDURAL HISTORY:

Application Filed:	November 7, 2014
Protest Received:	November 14, 2014
Request for Hearing:	December 31, 2014
Notice of Hearing:	February 24, 2015
Dates of Hearing:	March 17, 2015
	April 16, 2015
	June 3, 2015
Transcripts Received:	April 2, 2015
	May 1, 2015
	June 17, 2015
Record closed	July 13, 2015
Proposal For Decision Issued:	June 10, 2016
Amended Proposal For Decision Issued:	June 28, 2016
Second Amended Proposal For Decision Issued:	June 29, 2016

STATEMENT OF THE CASE

High Roller Wells, LLC ("HRW") seeks authority to dispose of oil and gas waste by injection pursuant to Statewide Rule 9 (16 Tex. Admin. Code §3.9)¹ for the Fashing 99 SWD Lease, Well Nos. 1 and 2 (collectively, "proposed injection wells"). The proposed injection wells will be commercial disposal wells, and are located in the Eagleville (Eagle Ford-1) Field, Atascosa County, Texas. The wells will be newly drilled and will be located

¹ 16 Tex. Admin. Code § 3.9 (Disposal Wells).

on a 41-acre tract of land located 1.1 miles east of FashingTexas. Well No.1 will be a directionally-drilled well and Well No. 2 will be a vertical well. Both wells will utilize the same injection interval from 6,250 to 7,300 ft. In the Lower Wilcox and Midway Formations.

Notices for both applications were published on November 12, 2014, in the *Pleasanton Express*, a newspaper of general circulation in Atascosa County. HRW is the owner of record of the 41-acre surface tract. On November 6, 2014, notices for both applications were mailed to the Atascosa County Clerk, the owners of all adjoining surface tracts, and all operators of wells within a one-half mile radius of the proposed disposal wells' surface locations.

The applications are protested by Herman Kellner, Keith Kellner, surface owners of an adjacent tract. Raymond Lieke, owner of a nearby tract, and Russell Labus, an official with the Evergreen Underground Water Conservation District ("EUWCD").

The Examiners believe HRW has met its burden of proof pursuant to Statewide Rule 9 and Chapter 27 of the Texas Water Code and recommend that the Commission approve both applications.

MATTERS OFFICIALLY NOTICED

The Examiners have taken official notice of a letter from State Representative Ryan Guillen urging the Commission to "consider the concerns of the county while reviewing the application for a disposal well permit."

The Examiners have also taken official notice of a letter from Atascosa County Judge, The Honorable Robert Hurley, which was read into the record by Mr. Russel Labus, General Manager of the Evergreen Underground Water Conservation District. According to Mr. Labus, Judge Hurley's letter stated that "Excessive numbers of disposal facilities burden our county infrastructure by adding traffic to our already decaying roadways..."². He is also concerned of the impact the large number of disposal facilities are having on increased seismic activity in the Fashing area. Judge Hurley letter states that "I encourage the Commission to study this issue carefully, as required by your rules, to ensure the public is not harmed by more earthquakes"³.

APPLICABLE LAW

The Railroad Commission may grant an application for a disposal well permit under Texas Water Code § 27.051(b)⁴ and may issue a permit if it finds:

² Letter dated March 12, 2015 from the Honorable Robert Hurley, Atascosa County Judge.

³ . Id.

⁴ Tex. Water Code §27.051(b)(1-4).

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.

DISCUSSION OF THE EVIDENCE

APPLICANT'S EVIDENCE

The proposed injection wells will be located on a 41-acre tract of land on the south side of Highway 99 and on the east side of County Road 402, approximately 1.1 miles east of Fashing in Atascosa County, Texas. The wells will inject produced salt water and RCRA-exempt waste. Surface locations for both wells will be located in the northern end of the Subject Lease. Well No. 1 will be directionally drilled towards the southwestern corner of the tract, with the bottom-hole located about 1,000 ft. southwest of the surface location. Well No. 2 will be a vertical well located 200 ft. east of the surface location of Well No. 1. The bottom-hole locations of the proposed injection wells will be about 1,100 ft. apart.

Rick Johnston, P.E., HRW's expert engineering witness, testified that the two wells will be drilled, completed and operated as follows:

- Drilled to a depth of 7,400 ft. in the Lower Wilcox and Midway Formations.
- Surface casing (13 3/8-inch) will be set at a depth of 250 ft. with cement circulated to the surface.
- Intermediate surface casing (10 3/4-inch) will be set to a depth of 5,200 ft. with cement circulated to the surface.
- Long-string casing (7-inch) will be set at 7,400 ft. with cement circulated to 4,000 ft. inside the 10 3/4-inch surface casing.
- Injection tubing (4 1/2-inch) will be set with a packer at 6,150 ft.
- The injection interval will be from 6,250 ft. to 7,300 ft.

- The maximum daily injection volume will be 25,000 barrels per day (BPD) with an average daily injection volume of 7,500 BPD.
- The maximum surface injection pressure will be 2,775 pounds per square inch gauge (psig) with an average surface injection pressure of 750 psig.
- The wells will inject produced salt water and RCRA-exempt waste.

Commission staff determined the disposal well application to be administratively complete on December 8, 2014.

The Use or Installation of the Injection Well Is in the Public Interest:

Mr. White, Senior Vice President of NGL Water Solutions Eagle Ford ("NGL") testified that HRW and NGL have a contractual agreement to build and operate disposal facilities. HRW will complete the permitting process, drill the wells, and construct the facility. Once HRW has completed its development, NGL will purchase and fully own the disposal facility, and will assume responsibility for the operation and maintenance of the facility. NGL is prepared to spend approximately \$6 million to drill and complete the proposed injection wells, and construct the surface facility. Mr. White also stated that it was his opinion based on NGL's internal analysis, that there is sufficient disposal demand to justify the \$6 million expenditure.⁵ Mr. White testified that water is currently being trucked beyond a 10-mile radius of the proposed injection wells which increases disposal costs for area operators. Mr. White stated "this particular area, Fashing SWD, we believe is under-served on available capacity for the amount of produced and flowback water in the area. Mr. White testified that NGL is under contract with EOG Resources Inc. ("EOG") to dispose of 95% of EOG's produced water in the area. We believe there is less capacity available for injection than there is water that needs to be injected."⁶

He also testified that Marathon Oil Corporation ("Marathon") intends to construct a permanent pipeline to the proposed injection well surface facility, resulting in lowered costs of disposal for Marathon.⁷

The Use or Installation of the Injection Well Will Not Endanger or Injure Any Oil, Gas, or Other Mineral Formation:

There is no oil or gas production from the proposed injection interval from 6,250 ft. to 7,300 ft. in the Lower Wilcox Formation and Midway Formation within a two-mile radius of the proposed disposal wells. Hydrocarbon production in the area is from the Reclaw/Upper Wilcox Formation located at 4,008 ft. to 4,298 ft., and the Eagle Ford

⁵ Tr. Vol 1. pg. 216 Ins 7-23.

⁶ Tr. Vol 1. pg. 215, Ins 17-23.

⁷ Tr. Vol 1. pgs. 212-214, 216-218.

Formation at 10,700 ft. There are no well bores within the one-quarter mile area of review ("AOR") around the proposed injection wells.⁸ Within a one half-mile AOR there are a total of six horizontal wells that penetrate the proposed disposal interval. The horizontal wells are Marathon wells completed in the Eagle Ford Formation. The top of the Eagle Ford Formation is approximately 3,000 ft. below the base of the proposed injection zone.⁹ Mr. Johnston testified that he had looked at all wells within a one-mile radius of the proposed injection wells. He stated that all wells within the one mile radius are cased and cemented in such a fashion that they will not act as a conduit for the migration of fluid out of the proposed injection interval. Mr. Johnston further testified that "all of the horizontal wells that I have looked at in the area either have cement circulated to surface or have cement circulated up inside their surface casing. Additionally, all the wells in the area that are drilled deeper than the Carrizo Formation are required to have surface casing run to approximately 5,100 ft."¹⁰

Mr. Johnston introduced HRW Exhibit No. 14, an example set of completion papers for the horizontal wells drilled within one mile of the proposed injection wells. The example well is a Marathon well, the Heirholzer Seewald Unit No. 1 Well (API No.13-34341).

The example horizontal well was cased and cemented as follows:

1. Drilled to a total vertical depth (TVD) of 10,979 ft. and a measured depth of 15,015 ft.
2. Surface casing (10-3/4 inch) was set at 5,113 ft. with cement circulated to surface.
3. Long string (5-1/2 inch) casing was set at 15,015 ft. with cement circulated up to 2,325 ft. which is inside the surface casing.

Mr. Johnston testified that the Heirholzer Seewald Unit No. 1 Well is representative of how the other horizontal wells he looked at within a one-mile radius are completed. All the horizontal wells are cemented similarly to this or cement has actually been brought back to surface on the long string (5 ½ inch) casing.¹¹

HRW has reached an agreement with Marathon to shut in the injection wells while Marathon is drilling a well within one half-mile of the proposed injection wells.¹²

⁸ Tr. Vol 1., pg, 26, lns 23-25. HRW Exhibits No. 3 and 4.

⁹ Tr. Vol 1., pg., 46, lns 3-7.

¹⁰ Tr. Vol 1. pg., 31 lns 15-24.

¹¹ Tr. Vol .1. ,pg 44 lns 8-25, pg 45., lns 1-5.

¹²Tr. Vol. 1., pg, 27, lns 6-14.

There are three vertical wells, two dry holes and one plugged well within one-half mile of the proposed injection wells. None of the vertical wells were drilled deep enough to penetrate the proposed disposal zone.¹³ The deepest vertical well is the C. K. Resources Well No. 1 (API No. 13-31548) a dry hole with a TD of 4,212 ft.

HRW's Exhibit No. 30, a five-well cross section, shows the base of the proposed injection interval is in the Midway Formation, a thick shale formation extending a minimum of 800 ft. below the base of the proposed injection interval. The Midway Formation will seal the base of the injection interval and be protective of hydrocarbon production from the Eagle Ford Formations. There is a minimum of 350 ft. of shale above the top of the proposed injection interval.

With Proper Safeguards, Both Ground and Surface Fresh Water Can Be Adequately Protected from Pollution

Again, there are no wellbores within the required one-quarter mile areas of review. The Commission's Groundwater Advisory Unit ("GAU") identifies the base of usable quality water ("BUQW") is at 5,100 ft. The GAU advised that the interval from the land surface to a depth of 750 ft. and the Carrizo Formation from 4,100 to 5,100 ft. must be protected. The base of underground sources of drinking water ("USDW") is estimated to occur at a depth of 5,400 ft. at the site of the proposed injection wells.¹⁴

The GAU issued "no-harm" letters for the two proposed injection wells on November 6, 2014. Those letters state, "our review of the data contained in the application and of other available geologic data indicates that drilling and using this disposal well and injecting oil and gas waste into the subsurface stratum will not endanger the freshwater strata in that area."¹⁵

Based on the injection wells proposed completion programs, as previously mentioned, the proposed injection wells will be completed in such a manner as to be protective of fresh water. There are two shale layers above the top of the proposed injection interval which will prevent the injectate from migrating upwards into the USDW and BUQW. There is a shale layer from approximately 5,650 ft. to 5,750 ft. and another shale layer from approximately 5,850 ft. to 6,100 ft. These two shale layers provide over 350 ft. of shale separating the top of the proposed injection interval from the base of the Carrizo at 5,100 ft. The proposed injection wells will be cased and cemented in a manner that is protective of the BUQW and USDW.

HRW's Exhibit No. 30, a five-well cross section shows there is a fault in the area, the Fashing Fault. Mr. Reynolds stated that, "we have a shale on shale relationship. As

¹³ Tr. Vol. 1. pg 30, lns 18-20.

¹⁴ HRW Exhibit No. 3., pg 8.

¹⁵ Pg. 9. of HRW Exhibit No. 3.

this fault goes higher in the section, there's a shale above the Queen City that is 900 to 1,000 ft. thick. As you get up to the section along this fault, the fault has maybe 200 ft. of throw. That's still going to be a shale on shale relationship across the fault, even above the Queen City Formation."¹⁶

Mr. Johnston was asked by the Protestants why he did not depict any of the additional faults that are located in the area. He answered that Based on Mr. Reynolds study "We don't believe there are any others."¹⁷ Mr. Reynolds stated that he had looked at 30-40 well logs and didn't find any other faults in the area.¹⁸

The two proposed injection wells will share a surface facility. The facility will have covered unloading bays to accommodate trucks. Tankage, chemicals, and mechanical equipment will be located within a concrete secondary containment structure. The secondary containment is located within an earthen-bermed, tertiary containment area. Total containment is designed to hold 150 percent of the combined tank capacity. Monitoring alarm systems for hydrogen sulfide gas will be included in the design of the facility. Due to the northwest section of the subject tract being within the FEMA 100-year flood plain, Mr. Luke Garrett, HRW's operations officer testified that HRW will build up the pad in the northwest section of the tract so that the entire surface facility, including the loading and unloading area, tank battery, pumps, and other surface equipment are above the 100-year floodplain.¹⁹

HRW will construct the two proposed injection wells so that their wellheads, if they are located in the floodplain have pressure containment and are sealed.²⁰ The wellheads will also be constructed in a way that will allow well head pressure monitoring if the wellheads are submerged during flood events. The facilities are constructed so that if anything happens to the well head there are high/low pressure switches on the flow line pumps so that if a flow line is broken during a flood, the pumps will shut off and there will be no spillage, except for the volume of fluid in the line.²¹

FINANCIAL ASSURANCE

HRW has an active P-5 and financial assurance in the amount of \$25,000 in the form of a cash deposit, effective until September 30, 2016.

¹⁶ Tr. Vol 1. pgs 135-136.

¹⁷ Tr. Vol 3., pg 184. Ins.1-25.

¹⁸ Tr. Vol. 3 pg 192. Ins. 3-12.

¹⁹ .Tr. Vol 1. pg. 101, Ins.19-22..

²⁰ .Tr. Vol 1., pg 113, Ins. 8-15.

²¹ . Tr. Vol.1, pg., 113, Ins. 1-15.

SEISMIC ACTIVITY

Statewide Rule 9(3)(B) went into effect November 17, 2014, which states; the applicant for a disposal well permit under this section shall include with the permit application a printed copy or screenshot showing the results of a survey of information from the United States Geological Survey (USGS) regarding the locations of any historical seismic events within a circular area of 100 square miles (a circle with a radius of 9.08 kilometers, centered around the proposed disposal well location. 9.08 kilometers equals 5.64 miles.

SWR 9(3)(B) was not in effect at the time the applications were submitted. However, due to the seismic history in the Fashing area, and the Protestants belief that the proposed injection wells could cause seismic events in the area, HRW submitted information on seismic activity within a circle with a radius of 5.64 miles centered on the proposed injection wells. A review of U.S. Geological Survey ("USGS") data from 1973 to 2015 identify five seismic events within a 5.64 mile radius of the proposed injection wells, encompassing an area of 100 square miles.

HRW submitted their Exhibit No. 29, a map showing the locations of the five seismic events that the Protestants believe were possibly caused by injection wells within the 5.64 mile area.

The dates and magnitude (M) of the five events measured on the Richter Scale by the USGS are as follows:

1. 3.4 M event on July 23, 1983.
2. 4.1 M event on April 9, 1993.
3. 3.0 M event on May 16, 1993.
4. 4.8 M event on October 20, 2011.
5. 3.1 M event on January 31, 2015.

HRW's Exhibit No. 20 is a list of seven active commercial disposal wells within a 10 mile radius of the proposed injection wells. HRW stated they chose a ten mile radius because water haulers do not like to drive more than ten miles to an injection facility.

The active disposal wells are numbered as shown on HRW's Exhibit Nos. 18, 19, and 20.

1. Whitewater Resources, LLC's, FF Fashing No. 1A (API No. 013-34778), permitted on September 20, 2012. Started injection activities in 2014 and injected a total of 1,254,889 bbls in 2014.
2. Oilfield Waste Solutions, LLC's, Atascosa SWD No. 1, (API No.013-34430) permitted on January 19, 2012. Injection activities started in 2013 and through the end of 2014, 2,203,909 bbls were injected.
3. Cinco Operating Company, LLC's, H.E. Richter No. 2 (API No. 013-31029) permitted on July 29, 1994. Injection started in 1995 and injection stopped in 2005, injection resumed in 2011 when it injected 22,400 bbls. From 1995 through the end of 2014 a total of 551,097 bbls were injected.
4. C&E Production LLC's, Gerold SWD No. 1 (API No. 013-34700). The well was permitted on March 1, 2013 and did not start injection operation until 2014. Through the end of 2014 a total of 1,620366 bbls were injected.
5. Radack Services, Inc's. RSI Atascosa SWD No. 1 (API No. 013-34501). The was permitted on October 19, 2011 and started injection activities in 2013. Through the end of 2014 a total of 1,379,614 bbls were injected.
6. Nor-Tex Resources, Inc's, Nor-Tex SWD No. 1 (API No. 255-32654). The well was permitted on March 29, 2012. As of the end of December 2014, the well had not started injection activities.
7. Basic Energy Services, LP's, Burriss SWD No. 1, (API No. 255-32847). The well was permitted August 29, 2012. The well did not start injections until 2014 and as of the end of 2014 has injected 214,615 bbls.

The seven injection wells listed above had not started injection activities at the time of the July 23, 1983 event, the April 9, 1993 event or the May 16, 1993 event.

At the time of the 4.8 M event on October 20, 2011, there was only one active injection well in the 5.64 mile radius the H.E. Richter No. 2 Well, which injected a total of 528,697 bbls from 1995 to 2005. During 2011, the Richter well injected 22,400 bbls, which is approximately 1,866.6 bbls per month. The seven injection wells have injected a total of 7,224,490 bbls of water into the Lower Wilcox Formation.²²

HRW's geophysicist, Mr. Todd Reynolds, testified that the epicenter of the January 31, 2015 seismic event is located in the middle of a "cluster" of producing Eagle Ford wells

²² HRW Exhibit Nos.18-20.

that are being developed and he “doesn’t see anything in the data to suggest that these seismic events are related to the injection of fluids.”²³

HRW’s Exhibit No. 24, a document entitled “*Small Earthquakes in the Eagle Ford Region of Texas Correlate with Oil and Gas Extraction, Not Wastewater Injection.*”²⁴ The document states “Most of the earthquakes in the Eagle Ford region of South Texas are probably the result of extraction of large volumes of oil and associated water”. Dr. Frolich also stated that “Although there is a considerable amount of hydraulic fracturing activity in the Eagle Ford leading to a significant amount of waste fluid being injected in the Eagle Ford region, we don’t see a strong signal associated with that and earthquakes. However, the earthquakes seem to be associated with petroleum production, as in the past. We can’t say there aren’t any earthquakes induced by injection, but we can say that it’s just not the strong signal.”²⁵

HRW introduced Exhibit No. 27 another technical paper by Dr. Cliff Frohlich, and Michael Brunt titled a “*Two-year survey of earthquakes and injection/production wells in the Eagle Ford Shale, Texas, prior to the MW4.8 20 October 2011 earthquake.*” In that document, the authors opine that:

“A comparison of Fashing seismic activity with the 50 year record of production of petroleum and water in the MMI-V region of the 20 October 2011 earthquake suggests there is a relationship between seismic activity and the extraction of fluids (oil plus water). The first known Fashing earthquake occurred on December 25, 1973 and followed a marked increase in the production of water at nearby wells that began late in 1971 and first reached 300,000 barrels of water per month in November 1973. The magnitude (M) 3.4 earthquake of July 23, 1983 occurred during a nine-month period beginning in January 1983 when water production exceeded 400,000 BWPM. There is no apparent water-production anomaly associated with the M 4.3 Fashing earthquake of April 9, 1993. Finally, the M 4.8 20 October 2011 earthquake followed increases in the production of oil and water that began in 2010. In fact, it was in October 2011 that the sum of oil, plus water extraction, first exceeded its highest level of the previous three decades. Thus it is plausible that extraction of oil and water induced/triggered the M 4.8 20 October 2011 earthquake. This is consistent with the previous studies of the Fashing area earthquakes by Pennington et al. (1986) and Davis et al. (1995), who concluded that depressurizing of subsurface fluids associated with the extraction of oil and water caused the Fashing

²³ Tr. Vol.1, pg 130-133 lns, 1-25.

²⁴ HRW’s Exhibit No. 24. *Small Earthquakes in the Eagle Ford Region of Texas Correlate with Oil and Gas Extraction, Not Wastewater Injection.* by Dr. Cliff Frolich, Associate Director, at the University of Texas at Austin’s Institute for Geophysics.

²⁵ Tr. Vol 1., pgs.122 -124.

1973–1993 earthquakes activity.”²⁶ The Fashing gas field is in the Edwards formation at an approximate depth of 10,400 ft. at the site of the proposed injection wells.”²⁷

PROTESTANTS EVIDENCE

The Protestants are concerned that ground the proposed injection wells are not in the public interest and surface water cannot be adequately protected from pollution. They are also concerned the proposed injection wells will increase the risk of induced seismicity in the area. Mr. Raymond Lieke, a protestant with land approximately two miles north of the Fashing SWD testified that there was a five acre salt scar on his property dating back to the 1960s. He stated that in 1965 his father noticed the five acre salt scar on their property and brought in a petroleum engineer to look at the scar. The engineer stated he thought the scar was from salt water inundation. According to Mr. Lieke, the engineer told his father that he thought the saltwater was probably coming from a gas plant a mile north of his property. Mr. Lieke stated that during the 1960's the gas plant north of his property was pumping mud into a pasture but he didn't know where it went after that but he thought it might be to an injection well, but did not know for certain.²⁸

Public Interest

The Protestants believe the well is not in the public interest due to excess disposal capacity in the area. Mr. Opeila introduced Kellner Exhibit No.15, a map showing 43 permitted or active disposal wells within a 20 mile radius of the proposed injection wells. Kellner Exhibit No.16 is a graph indicating permitted and active disposal capacities, actual disposal volumes and horizontal completions. The graph shows that at the end of 2014 there were about 2,200 horizontal wells within a 20 mile radius of the proposed injection wells. The graph purportedly indicates that only 25% of permitted and actual disposal capacity is being utilized, thus indicating excess capacity in the area.

The Protestants introduced Kellner Exhibit No. 17, a copy of a Proposal For Decision (PFD) and Final Order for Oil and Gas Docket No. 02-0278758. In that docket, the application of US Liquids of LA., L.P. (“USLL”), was used as an example of the Commission denying a SWR 9 injection well application for not being in the public interest. In the US Liquids case, USLL was seeking a commercial disposal well permit for a well that was directly related to the operation of its proposed Eagle Ford East (“EFE”) Stationary Recycling Facility (“STR”). USLL’s testimony clearly and unequivocally stated that the proposed disposal well was an important component of the affiliated EFE STR facility, as it will allow for more economical disposal of decanted waste liquids, eliminating the need for these wastes to be trucked off-site for disposal. The Applicant’s claim of public interest

²⁶ HRW Exhibit No. 27. Two Year Survey of Earthquakes and Injection/production Wells in the Eagle Ford Shale, Texas, Prior to the Mw4 .8 20 October 2011 earthquake. By Dr. Cliff Frohlich and Michael Brunt.

²⁷ HRW Exhibit No.49, a five well cross section.

²⁸ Tr. Vol 2, pgs 9-11.

for the disposal well was based on its relationship to the EFE STR facility. The *prima facie* claim of public interest of the EFE STR facility was based primarily on the facility's recycling capabilities and the Applicant provided no evidence or information regarding the need for this facility apart from its connection to the EFE STR facility. The PFD further states on page nine, "USLL has withdrawn the 'recycling of oil and gas wastes' portion of the Eagle Ford East facility permit application. On July 16, 2014, USLL withdrew its application for the EFE STR facility; the Examiner in that matter dismissed the docket without prejudice on July 17, 2014. Since the purpose of USLL's proposed disposal well was to serve the EFE STR facility, the Examiners concluded the application should be denied because the well was not in the public interest."²⁹

The Protestants also introduced Kellner Exhibit No. 18, a table showing 44 commercial disposal wells (CDWs) within a 20 mile radius of the proposed injection wells. The table includes the two proposed injection wells. Of those 44 wells, the table indicates 18 wells have not been drilled; and the Protestants contend that 16 wells have excess capacity. Mr. Masters stated that he looked at the permitted volume and the maximum permitted pressure to calculate excess capacity for each well. Mr. Masters concluded a well has excess capacity if the maximum reported pressure was 500 lbs or less than the permitted pressure and the actual injection volumes were below the permitted volume.³⁰

Protection of Ground and Surface Fresh Water

The Protestants expert witness, Mr. Keith Masters, a petroleum engineer, introduced Protestants Exhibit No. 3, a FEMA 100-year flood plain map that shows that the northwest section of the facility is within the FEMA 100-year flood plain. The proposed wellheads may also be in the 100 year flood plain. Mr. Masters is concerned that if the well heads were under water, there would be no way to monitor the casing pressures on the wells which is required by Statewide Rule No. 9.

Mr. Masters introduced Kellner Exhibit No. 5, a photograph of the proposed disposal tract and a salt kill area on the Kellner's property. He also introduced Kellner Exhibit No. 6, a Commission District Office inspection report (Form D-O) from April 2005 following an inspection of the salt kill area on Mr. Kellner's tract. The Commission inspector, Mr. Steven Graham, took six soil samples and one water sample at seven sites in the salt kill area.³¹ The six soil sample results and the water sample results were introduced as Kellner Exhibit No. 8. One of the soil samples, Sample ID Kellner No. III, was taken away from the salt scar as a control sample. The sample indicated the chloride content to be 529 ppm with no detections for benzene, toluene, ethylbenzene, and xylenes, collectively BTEX. The other five soil samples indicated elevated chlorides (above 529 ppm), and one soil sample, the Kellner VII, indicated chlorides at 4,050 ppm, a Benzene level of 42.8 ppm and total

²⁹ Kellner Exhibit No. 17 Proposal for Decision 02-0278758

³⁰ Tr. Vol 2, pg., 79., Ins1-25. pg 81, Ins, 1-12.

³¹ Tr. Vol 2, pg 29, Ins 2-15.

Xylenes of 59.8 ppm. The Kellner VII sample was taken close to County Road 99, which separates the Kellner property from the proposed injection site. The single water sample showed high chlorides (39,400 ppm) but was not sampled for BETX.

Mr. Masters introduced Kellner Exhibit No. 1, a 2013 report titled *Evaluation of Salt Contamination, H.O. Kellner Property, FM 99, Fashing, Atascosa County, Texas*. Written by Dr. Lloyd E. Deuel, Jr., Ph.D., CPSS, PG, Soil Chemist, with Soil Analytical Services, Inc. In that report, Dr. Deuel stated on page one that the Kellner property had been severely impacted by a surface loading of salt, (Sodium Chloride, NaCl) estimated at a rate equivalent to 70,000lbs NaCl/acre.³² Dr. Deuel also states on page one of the report that the 10.5 acre impact area (salt scar) happened suddenly between 2001 and 2002 and on page three, paragraph three, he states "The data suggests that high salinity levels in the soil emanate from surface loading. Salinity contours also suggests that the likely source is the drainage feature sloping gently north to south. How it got there is still unknown." The second sentence in the last paragraph on page three of Mr. Deuel's report states test results confirm the EM survey findings with salinity levels highest in the surface and decreasing with depth.³³

The Protestants introduced Kellner Exhibit No. 22, a multi-page exhibit relating to faulting and seismic events that the Protestants are alleging is the result of injection activities in the area. Dr. Green testified that the exhibit "addresses data and observations relevant to the Fashing 99 site, and encompassing some presentation of that data in addition to calculations based on incremental pressure buildup under a number of assumptions."³⁴ Page 1 is a map showing the approximate locations of surface expressions of possible fault traces and seismic events. Page 2 is a close up shot of Page 1. Dr. Green stated that he used Bureau of Economic Geology publications and a publication from Hamlin to map the possible fault traces. He stated that "the data for the traces are a little different, and I think that highlights the fact that mapping faults is a bit of an art, not just science."³⁵ So the exact location of the faults may vary because its based upon interpretations from the field.³⁶ He stated he also plotted seismic events locations to the best of his ability, however, Dr. Green said "...there is not sufficient resolution to identify the depth. So they are estimates of the locations of these seismic events."³⁷ Page three of the exhibit is a graph plotting the withdrawal of oil (bbls) and gas mcf, and injection volumes in bbls, for all of Atascosa County. The graph also shows seismic events within 100 kilometers of the proposed injection wells. The graph shows there was increased seismic

³² Tr. Vol 2., pg 62., Ins,18-25, pg 64, Ins,1-25. Protestant Exhibit No.1.

³³ Tr. Vol 2., pg 65., Ins 1-25. Kellner Exhibit No. 1.

³⁴ Tr. Vol 2, pg 110, Ins, 10-15.

³⁵ Tr. Vol 2, pg,112, Ins, 13-20.

³⁶ Tr. Vol 2, pg 112, Ins 1-25.

³⁷ Tr. Vol 2, pg 112, Ins 1-25.

activity with an increase of oil and gas activities. Specifically, the seismic events correlate with the withdrawal of oil and gas.

Page 8, of Kellner Exhibit No. 22, is an aerial photograph of the 10.5 acre salt kill which, according to the Protestant's groundwater hydrologist, Dr. Ron Green, is not naturally occurring, but anthropogenic in nature and from "high salinity fluid emanating from depth".³⁸ Dr. Green testified that "there may be other possibilities of the source of the salt kill, but the most logical source is fluids moving up an established fault or fault zone to the surface. The pressure apparently reached the level necessary to push these fluids up that fault to the surface, and that occurred in the early 2000s."³⁹

Dr. Green testified that in 2009 and 2010, there was a marked increase in the number of seismic events recorded in the 100 km area. Dr. Green stated that is coincident with the increase of oil and gas production in the area. What is not clear, Dr. Green said, is the exact causation and outcome. "We have a number of factors active in the area and its not possible to say that any one of the events, (oil and gas withdrawals, and or injection activities) is the source".⁴⁰ Page 8, of Kellner Exhibit No. 22, shows an aerial photograph of the 10.5 acre salt kill which Dr. Green believes is not naturally occurring, but anthropogenic in nature and is from "high salinity fluid emanating from depth.

The Protestant noted that according to public testimony given during the hearing by Mr. Lieke there was another salt kill a mile or two north of the proposed injection well location, which according to Dr. Green "would suggest it was at a different fault that occurred at a different time. The suspicion is that it occurred in response to oil and gas activity, but there wasn't enough documentation given to know the exact cause of it. But it's another case of a salt spill occurring at the surface that doesn't appear to be anthropogenic and is potentially located along another fault."⁴¹

Dr. Green was asked by Mr. Opiela that "given the known faults that are immediately adjacent to the this well and the escape of fluids you just testified are from depth, is it your testimony that this well could result in the loss of confinement from the disposal interval?" Dr. Green testified that based on the salt kills there appears to be a loss of containment from the disposal interval.

Kellner Exhibit No. 23 presents pressure front calculations indicating pressure buildup over time at the proposed injection wells. Dr. Green used the Theis equation to predict what the pressure buildup would be over time periods of 1, 5, 10, 15, 20 and 30 year time frames at 1.02 ft. from the proposed injection well. Dr. Green testified that he used

³⁸ Tr. Vol 2., pg 131., lns 21-24

³⁹ Tr. Vol 2, pg 133, lns, 1-11.

⁴⁰ Tr. Vol 2, pg 116, lns 1-25.

⁴¹ Tr. Vol 2, pg 136., lns 12-24

available data including data taken from EPA examples when available, and made assumptions when data was not available. Dr. Green testified that he looked at existing injection wells, and new wells that have not yet come online out to 15 miles from the proposed Fashing SWD site. Dr. Green's pressure front calculations assumed that all the injection wells, existing and new, started injection activities at the same time, including the proposed HRW injection wells. Dr. Green calculated that after 30 years of injection activities there would be a maximum 260 psi buildup at a distance of 1.02 ft. from the proposed injection wells.⁴²

Kellner Exhibit No. 24 a December 1962 Texas Water Commission Bulletin 6216, Geology and Groundwater Resources of Kinney County, Texas as an example of a spring caused by fluid traveling up a fault through a shale horizon. Figure No. 6 in the bulletin is titled "Hypothetical section at Los Moras Spring in Kinney County". The diagram illustrates the path of water from the Edwards limestone at approximately 1,100 ft. up through the Grayson Shale, Buda Limestone and Eagle Ford Shale.

The Protestants introduced Kellner Exhibit Nos. 31, 32, and 33, which consist of maps of pressure buildup around the Fashing SWD site. Exhibit No. 31 is the five year pressure buildup. Exhibit No. 32 is a ten year buildup and Kellner Exhibit No. 33 is a map showing 30 year pressure buildup. Dr. Green stated that to prepare Exhibits 31, 32, and 33 he made the assumption that all the existing and proposed injection wells started injection at the same time. He further stated that he was not trying to imply that the pressures on the maps are accurate. Dr. Green testified that what the maps indicate is the cumulative impact of pressure buildup from all the wells operating together. He further stated that "...what we are saying is this general area is going to experience elevated pressures because of the density of injection wells at this location."⁴³

Dr. Green testified that "...when you look at things together, all the seismic events align along a single line. There is absolutely a fault there because you have seismic events happening along that line. So there is a fault there, and it goes down very close if you project down towards the Fashing SWD. We don't know exactly where the fault crosses that area, but these faults tend to splay."⁴⁴ Dr. Green states that he believes the seismic events that occurred in 1991, 2008, 2010, and 2011 moving from southwest to the northeast on Kellner Exhibit No. 33 are along a fault that hasn't been mapped.

Dr. Green concluded that based on the evidence the proposed injection wells have the potential to increase the risk of seismicity in this area. Additionally he concludes that there is already a loss of confinement based on the presence of the salt kill on the Kellner's

⁴² Tr. Vol. 2, pgs., 125-128.

⁴³ Tr. Vol 3., pg 54., lns 1-17

⁴⁴ Tr. Vol 3., pgs 47, 48 & 49.

property and the proposed injection wells will cause pollution of water resources due to the lack of confinement of fluids to the disposal interval.⁴⁵

HRW's Cross Examination and Rebuttal

The Protestant claimed that the proposed injection wells were not in the public interest. HRW referred to their contract with NGL and NGL's contract with EOG to dispose of 95% of EOG's water, along with Marathon's plans to build a pipeline to the facility as proof that the well is in the public interest.

Salt Scar due to Faulting and Seismic Events

During cross examination Mr. Neale asked Mr. Masters if he was familiar with Kellner Exhibit No.1, a soils report by Dr. Deuel stating that the 10.5 acre salt scar on Kellner property was severely impacted by surface loading of salt? He replied that he was familiar with the report. Mr. Masters was asked if the inspector was able to determine the source of the salt kill area. Mr. Masters replied no, the inspector was not able to determine the source of the salt kill.⁴⁶

Mr. Neale then asked Dr. Green to look at comment No. 2, on page 8, of Kellner Exhibit No. 22, which states, "Presence of breakout of salt discharge at surface is an indication of saline fluids at depth forced to surface by sufficiently high pressure to be able to migrate along zones of weakness from depth to the surface." Dr. Green was asked by Mr. Neale if he agreed that's occurring? Dr. Green previously testified that "there may be other possibilities of the source of the salt kill, but the most logical source is fluids moving up an established fault or fault zone to the surface. The pressure apparently reached the level necessary to push these fluids up that fault to the surface, and that occurred in the early 2000s."⁴⁷

Dr. Green was asked if he believed that the seismic activities in the area are related to oil and gas activities or injection? Dr. Green replied "I'm not able to discern which activity contributes to seismicity or which don't."⁴⁸ Dr. Green was asked if he knew where the outcrop of the fault where the fluids coming from depth was located. Dr. Green responded "The Commission field inspector suggested it was at the up-gradient extent of the salt kill, he wasn't able to identify a spring."⁴⁹ He was also asked if there was a surface expression of a fault at the point of the salt scar. Dr. Green replied "no there was no surface

⁴⁵ Tr. Vol 2,pg 142, ln 15 to pg 143, ln 3.

⁴⁶ Tr. Vol 2, pg 29, lns 19-21.

⁴⁷ Tr. Vol 2, pg 133, lns, 1-11.

⁴⁸ Tr. Vol.3 pg 89, lns, 14-23

⁴⁹ Tr. Vol. 3, pg 112, lns 12-18.

expression.”⁵⁰ Dr. Green was asked if he had an opinion on where the salt kill outcrop was located, he testified that he believed that it “came form the highest point of elevation and goes downstream down the creek from there.”⁵¹

Dr. Green was asked if the source of the salt kill could be somebody cleaning or discharging saltwater on the surface and that discharge traveling down the creek bed in a rain event and being deposited at the salt scar? Dr. Green answered that “ Well, I suspect that’s a possibility.”⁵²

Mr. Neale asked Dr. Green if he had any evidence that anybody’s water well in the area is being contaminated by saltwater from depth. He replied that he had no evidence.⁵³

Dr. Green was also asked that if the salt scar was the result of formation water from depth to the surface, did he know of any freshwater wells in the area that had been contaminated by produced saltwater, and in discussions with his client had anyone talked about the fact that any of their freshwater wells in the area have been contaminated by produced saltwater? Dr. Green replied “I’m not aware of that, but I did not look into it.”⁵⁴

During rebuttal, the Applicant asked Dr. Green to look at Kellner Exhibit No. 22, a map showing the approximate locations of surface expressions of possible fault traces, and seismic events. Dr. Green stated that he used a Bureau of Economic Geology publication to map the possible fault traces. He stated that “...the data for the traces are a little different, and I think that highlights the fact that mapping faults is a bit of an art, not just science. So the exact location of the faults may vary because its based upon interpretations from the field. He also plotted seismic events locations to the best of his ability, however, Dr. Green said “...there is not sufficient resolution to identify the depth. So they are estimates of the locations of these seismic events.”⁵⁵

HRW introduced HRW Exhibit No. 49, a cross section showing logs of the Edwards formation. The cross section goes through the Carrizo Formation, down through the proposed location and off to the south of the location. Mr. Reynolds stated that “I don’t see anything to suggest there’s a fault near our well or even to the south. Nor do the maps

⁵⁰ Tr. Vol. 3, pg 112, lns 7-19.

⁵¹ Tr. Vol. 3, pg 112, lns 20-25 pg 113., lns1-3.

⁵² Tr. Vol 3. pg.,113, lns12-17.

⁵³ TR. Vol 3., pg 19, lns1-25

⁵⁴ Tr. Vol. 3., pg 123, lns 1-25

⁵⁵ Tr. Vol 2, pg 112, lns 1-25.

provided by the Protestants, which are surface traces dipping to the northwest, show any indication of a fault near our proposed location.”⁵⁶

HRW introduced Applicant's Exhibit No. 43, pictures of the Acock/Anaqua Henderson Lease facility. The facility is located a little over two miles upstream from the salt kill and produced water is surface discharged. This facility serves oil wells producing from the Carrizo Wilcox. Mr. Johnston testified that ‘It doesn't surprise me that soil sample downstream of this discharge might show xylene or hydrocarbon components in the water because this water that's being discharged has low concentrations of hydrocarbons.’⁵⁷

Mr. Johnston was asked if he had performed pressure front equations similar to the Protestant's equations. Mr. Johnston stated that he did but “..it seems more appropriate to me that rather than doing pressure front calculations to figure out what the pressure increase is going to be one foot from the proposed injection wells, a more appropriate analysis would be what kind of pressure increase are you going to cause at the location of the fault at the Wilcox depth.”⁵⁸ Mr. Johnston then introduced HRW Exhibit No. 45, a multi- page exhibit showing his pressure front equations and what the pressures at the Fashing fault, at depth, will be over 5, 10, 15, 20 and 30 years of injection from the active and new wells that haven't come on line. After 10 years of injection which Mr. Johnston testified that he thinks is a more appropriate time frame for an injection well in this area than 30 years, the pressure increase at a depth of 6,200 ft. at the fault is 304 lbs. At 6,200 ft. a normal pressure at this depth is going to be on the order of 2,800 or 2,900 lbs.

Mr. Johnston testified that this injection activity, including the potential wells to be drilled, would increase the reservoir pressure by roughly 10%. If the new wells are not drilled the reservoir pressure would be 144 psi, a 5% increase. He also testified that the proposed injection wells would add another 24 psi of pressure to the reservoir and he did not consider these pressure increases to be significant.⁵⁹

Dr. Green stated in comment No. 2 on the bottom of page eight of the Protestant's Exhibit No. 22 that the “Presence of breakout of salt discharge at surface is an indication of saline fluids at depth forced to surface by sufficiently high pressure to be able to migrate along zones of weakness from depth to the surface”. During cross examination by Mr. Opiela, Mr. Johnston was asked what the pressure on the Edwards Formation is in this area. Mr. Johnston replied that it is low, around 1,000-1,500 psi due to depressurization of the formation. Mr. Opiela asked if 1,000 psi bottom hole pressure could cause an upward migration of fluids along a fault line? Mr. Johnston replied a 1,000 psi of bottom hole pressure is only going to support a column of saltwater up to 2,100 ft.

⁵⁶ Tr. Vol. 3, pg 193, lns 1-12

⁵⁷ Tr. Vol 3., pg 145, lns 2-25.

⁵⁸ Tr. Vol 3., pg 152., lns 15-21

⁵⁹ Tr. Vol 3., pgs 158-161, lns 1-25.

Mr. Reynolds introduced HRW Exhibit No. 57, a paper by Drs. Pennington, Davis, Dupree and Thomas Ewing. The paper is titled *The Evolution of Seismic Barriers and Asperities Caused by the Depressuring of Fault Planes in Oil and Gas Fields of South Texas*, a detailed paper of the seismicity in the Fashing area.

The Pennington paper's abstract on page one, states: Fluid pressures within some oil and gas fields of South Texas have dropped to less than 20 per cent of their original values, producing earthquakes with magnitudes up to 3.9 in recent years. Differential compaction of the depressurized region may be sufficient to result in the number and size of earthquakes generated, or the faults may have been creeping prior to depressurization. In either model, the depressurizing of fluids strengthens a fault and at first produces a "barrier" to slip. As strain accumulates due to compaction or the continued seismic slip of nearby portions of the fault, stress builds up along the locked portions, eventually forming high-stress regions or "asperities." The asperities ultimately fail and earthquakes occur. The process is repeated as long as the faults are active. As the fluid pressures continue to decrease, the barriers and subsequent asperities may increase in size and strength, resulting in increasingly large and frequent earthquakes. The Pennington, et al, paper also states the Fashing field is within the Edwards Limestone Formation which, at the site of the proposed injection wells, is located at an approximate depth of 10,400 ft.⁶⁰

Page No. 940 of Pennington's paper states structural traps are formed by the offset of the porous limestone along normal faults dipping to the NW or NNW at 40 to 60 degrees. Production from the Fashing gas field began in 1958. Pennington says at the start of production the reservoir (fluid) pressure was 35.2 Megapascals (MPa) or (5,105 psi) at 11,155 ft. which is near hydrostatic pressure. The first reported seismicity in the area was 1973. At that point in time the bottom hole pressure had been reduced by about 1,800 psi. By 1983 the lowest pressures in the field were found near the fault. The pressures were about 7.1 Mpa (1,029.7psi) which is about 20% of the original value.⁶¹

The Pennington paper states on page 943 that the seismicity of the Fashing area is clearly associated with the pressure drop in the Fashing field. The first sentence of the summary of conclusions, on page 947, states "The earthquakes in the Fashing and Pleasanton areas are due to the withdrawal of fluids from the Fashing gas field."⁶²

EXAMINERS' OPINION

The Railroad Commission may grant a permit for a commercial disposal well if the application meets the requirements of the Texas Water Code § 27.051(b)(1-4). The

⁶⁰ HRW Exhibit No.49. Abstract

⁶¹ *The Evolution of Seismic Barriers and Asperities Caused by the Depressuring of Fault Planes in Oil and Gas Fields of South Texas* by Drs. Pennington, Davis, Dupree and Thomas Ewing. Page No. 940.

⁶² Exhibit No. 57, *The Evolution of Seismic Barriers and Asperities Caused by the Depressuring of Fault Planes in Oil and Gas Fields of South Texas* by Drs. Pennington, Davis, Dupree and Thomas Ewing.

Examiners conclude High Roller has demonstrated the proposed well meets these requirements and recommend the permit be granted. A discussion of the required elements in the Texas Water Code § 27.051(b)(1-4) follows.

The Use or Installation of the Injection Well Is in the Public Interest

The Examiners conclude that the proposed wells are in the public interest as there is a continuing need for fluid disposal options in the area.

The Applicant has identified significant ongoing development in the Eagle Ford Trend in the area, and a continuing need for disposal capacity in the area. HRW and NGL have a contractual agreement to build and operate disposal facilities. NGL is under contract with EOG to dispose of 95% of EOG's produced water in the area, and the offset operator, Marathon intends to construct a permanent pipeline to the facility, resulting in lowered costs of disposal for Marathon.

The Protestants allege the proposed injection wells are not in the public interest due to excess disposal capacity within a 20 mile radius of the proposed injection well. Generally, a disposal well applicant makes a *prima facie* case that a well is in the public interest by evidence that there is a need for the well and that it will provide a more efficient and economical disposal option for nearby operators of producing wells. A more economical disposal option allows producing wells to lower their operating expenses, produce longer and thus increase cumulative hydrocarbon production to the benefit of the public and the State.

There are multiple issues associated with attempts to forecast the demand for fluid disposal and the supply of fluid disposal capacity in a given area. A disposal permit issued by the Commission stating the maximum volume the well is permitted to inject is a regulatory limit and not the volume that could actually be injected. This is true for several reasons. First, there is no guarantee that the permitted well will become operational, either because the operator may not construct the facility, or the facility may not be physically able to inject the permitted volume. This could be due to the way the operator constructed the well, for example. The size of the injection tubing may be restrictive, or the injection pumps may not be able to inject the permitted volumes. Additionally, the formation may not be able to accept the permitted volume of fluid. Also, operators are not required to report production of flow back and salt water from their wells, which is the source of most of the waste requiring disposal in commercial SWDs in Atascosa county. This impairs any estimation of current or potential future demand for wastewater disposal. Therefore, there is no reasonably accurate means of quantifying the supply (available capacity) of fluid disposal in an area.

Protecting Oil, Gas, or Other Mineral Formations

The Examiners conclude that any oil, gas, or other mineral formation will not be endangered or injured by the construction and operation of the proposed SWD facility. The Applicant has demonstrated that there is no Wilcox production within a two-mile radius of the proposed SWD. A two-mile area of review for current or historical production from the same or correlative interval is the current standard for review regarding determining whether a disposal well should be permitted under Statewide Rule 9 (injection into a non-productive formation). There are no wellbores within one-quarter mile area of review. A minimum of 350 ft. of shale isolates the top of the injection interval and a minimum of 800 ft. of shale is present between the bottom of the injection interval and the Edwards and Eagle Ford Formation.

The Protestants had no concerns that the proposed injection wells would not be protective of hydrocarbon bearing Formations.

Protecting Ground and Surface Fresh Water from Pollution

HRW has demonstrated that, with adequate safeguards, the proposed injection wells will not result in pollution of fresh surface or ground water. The proposed wellbore design and operational parameters will be protective of fresh groundwater at and above the BUQW, which is at a depth of 5,100 ft. The well will be cased and cemented to isolate the BUQW from the injection interval. Over 350 ft. of shale isolates the proposed injection interval from the BUQW and the USDW. The facility will be constructed above the 100 year flood plain and the proposed injection wells will have a mechanism to monitor wellhead pressures if the well heads are submerged during the 100 year flood event. Tanks and mechanical equipment will be located within a secondary containment structure with sufficient capacity to contain all received fluids on the site at any one time. The proposed disposal permit includes standard provisions for commercial surface facilities to protect ground and surface fresh water from pollution.

The Protestants position is that the presence of a 10.5 acre salt scar on the Protestant's and Applicant's property is an indication of faulting and a lack of containment of fluids. However, according to Protestant's Exhibit No. 1, Paragraph three, on Page three, of the exhibit, Dr. Deuel stated "The data suggests that high salinity levels in the soil emanate from surface loading. Salinity contours also suggest that the likely source is the drainage feature sloping gently north to south. How the salt scar got there is still unknown."⁶³

The Protestants were unable to identify a fault that would have to be present to allow the fluids to migrate upwards from the Edwards formation to the surface. More importantly, the Protestants could not provide an explanation of how the reservoir pressure

⁶³ Kellner Exhibit No. 1, pg 3, Paragraph 3.

in the Edwards Formation of 1,000 psi could suddenly increase to a level that would force fluids from a depth of approximately 10,000 ft. to the surface in a one time event which occurred sometime in 2001 or 2002.

Since neither of the Protestants expert witnesses was able to provide credible evidence that the salt scar was caused by pressurized fluids traveling up a fault to the surface, the Examiners give little weight to the Protestants contention that the salt scar is the result of pressurized fluids migrating upwards through an unmapped fault, at an unknown location, and then traveling down the creek bed to the Protestant's and HRW's property.

HRW presented two seismic studies, one by Dr. Cliff Frohlich and one by Dr. Pennington that concluded the seismic events in the area (Fashing) of the proposed injection wells were the result of oil, gas and water extraction and depressurization of the Edwards Formation, not injection activities. The Protestants did not provide credible evidence supporting their contention that injection activities in the area were responsible for seismic events, or that the proposed injection wells could cause additional seismic events.

The Examiners conclude HRW has demonstrated that, with adequate safeguards, the proposed injection wells will not result in pollution of fresh surface or ground water.

Financial Responsibility

HRW has an active Organization Report (Form P-5, Operator No. 385669). HRW has filed a \$25,000 cash deposit with the Commission for financial assurance. 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. Proper notice of the application was mailed to the Atascosa County Clerk, the surface owner of the subject tract, and to the surface owners of adjoining tracts.
 - a. Notice of the application was published on November 12, 2014, in the *Pleasanton Express*, a newspaper of general circulation in Atascosa County.
 - b. HRW is the owner of record of the 41-acre surface tract.
 - c. There is one offsetting operator of wells within a one-half mile radius of the proposed injection well.

2. The Application was protested by adjoining surface owners and the Evergreen Underground Water Conservation District.
3. Well No. 1 will be directionally drilled towards the southwestern corner of the tract, with the bottom-hole located about 1,000 ft. southwest of the surface location.
4. Well No. 2 will be a vertical well located 200 ft. east of the surface location of Well No. 1.
5. The bottom-hole locations of the proposed injection wells will be about 1,100 ft. apart.
6. The proposed injection wells will be completed and operated in the following manner;
 - a. The wells will be drilled to a total vertical depth ("TVD") of 7,400 ft. in the Wilcox and Midway Formations
 - b. Surface casing (13 3/8-inch) will be set to a depth of 250 ft. with cement circulated to the surface.
 - c. Surface casing (10 3/4-inch) will be set to a depth of 5,200 ft. with cement circulated to the surface.
 - d. Long-string casing (7-inch) set to a TVD of 7,400 ft. with cement circulated to 4,000 ft. inside the 10 3/4-inch surface casing.
 - e. Injection tubing (4 1/2-inch) set with a packer at 6,150 ft.
 - f. The maximum daily injection volume will be 25,000 barrels per day (BPD) with an average daily injection volume of 7,500 BPD.
 - g. The maximum surface injection pressure will be 2,275 pounds per square inch gauge (psig), with an average surface injection pressure of 750 psig.
 - h. The wells will inject produced salt water and RCRA-exempt oilfield waste.
7. There are no wellbores that penetrate the disposal interval within a one quarter mile radius of the proposed well.

8. The base of the quality groundwater (BUQW) is at a depth of 5,100 ft. The GAU advised that the interval from the land surface to a depth of 750 ft. and the Carrizo Formation from 4,100 ft. to 5,100 ft. must be protected.
9. The well will be cased and cemented from 7,400 ft. to surface to isolate the BUQW from the injection interval.
10. A minimum of 350 ft. of shale is present immediately above the disposal interval.
11. There is no production from the Lower Wilcox Formation within a two-mile radius of the proposed disposal well.
12. There is a minimum of 500 ft. of shale below the bottom of the proposed injection zone isolating the disposal zone from the Edwards and Eagle Ford Formations.
13. HRW has an active Form P-5 and a cash deposit in the amount of \$25,000 for financial assurance, effective until September 30, 2016.

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 installation and use of the proposed commercial disposal wells is in the public interest. Texas Water Code § 27.051(b)(1).
4. The installation and use of the proposed injection wells will not endanger or injure any oil, gas, or other mineral formation. Texas Water Code §27.051(b)(2).
5. With proper safeguards, as provided by terms and conditions in the attached final order, which are incorporated herein by reference, both ground and surface fresh water can be adequately protected from pollution. Texas Water Code § 27.051(b)(3).
6. HRW has made a satisfactory showing of financial responsibility. Texas Water Code § 27.051(b)(4).

7. High Roller Wells, LLC has met its burden of proof and satisfied the requirements of Chapter 27 of the Texas Water Code and the Railroad Commission's Statewide Rule 9.16 Tex. Admin. Code § 3.9.

RECOMMENDATION

Based on the above findings of fact and conclusions of law, the Examiners recommend the Commission enter an order approving High Roller Wells, LLC's application and issue a permit for the Fashing 99 SWD Lease, Well No. 1, and Well No. 2, Eagleville (Eagle Ford-1) Field, Atascosa County, Texas.

Respectfully submitted,



Richard Eyster, P. G.
Technical Examiner



Marshall Enquist
Administrative Law Judge