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RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

AMENDED PROPOSAL FOR DECISION

OIL AND GAS DOCKET NO. 08-0286963

THE APPLICATION OF PROBITY SWD, LLC PURSUANT TO STATEWIDE RULE 9 FOR A COMMERCIAL PERMIT TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A RESERVOIR NOT PRODUCTIVE OF OIL OR GAS NORTH PECOS 2119 LEASE, WELL NO. 1 REEVES-BLOCK 4 (DEL. 4430) FIELD, REEVES COUNTY, TEXAS

HEARD BY: Karl Caldwell - Technical Examiner
Terry Johnson - Hearings Examiner

PROCEDURAL HISTORY

Application Filed:	September 30, 2013, January 10, 2014
Protest Received:	October 9, 2013
Request for Hearing:	January 13, 2014
Notice of Hearing:	February 3, 2014
Hearing Held:	April 16, 2014
Transcript Received:	May 1, 2014
Initial Proposal for Decision Issued:	June 16, 2015
Exceptions Filed:	July 10, 2015
Replies Filed:	July 20, 2015
Amended Proposal for Decision Issued:	August 4, 2015

APPEARANCES:	REPRESENTING:
APPLICANT:	Probity SWD LLC.
Paul Tough Michael Choate Rick Johnston Charlie Howard, Jr. Paul Manley	
PROTESTANTS:	John Jefferson Rogers, Alfredo Herrera, Judy Clark, David Switzer, Amanda Renteria, Ysidro Renteria, Jr., Danny Raspberry, Phyllis Brisbin

Jay Stewart
Ryan McNeel
Wes McGuffey
Carter Davis
Charles Thomas

OBSERVER:

James Corbitt

STATEMENT OF THE CASE

Probity SWD LLC ("Probity") requests authority pursuant to Statewide Rule 9[1] for the North Pecos 2119 Lease, Well No. 1, Reeves-Block 4 (Del. 4430) Eagleville (Eagle Ford-2) Field, Reeves County, Texas.

Notice of Probity's original application[2] was published in the *Pecos Enterprise* a newspaper of general circulation, in Reeves County, Texas, on September 10, 2014. Notice of the application was mailed to the Reeves County Clerk, the owner of the surface tract where the proposed disposal well will be located, and adjacent surface owners to the tract where the proposed disposal well will be located. No offset operators were determined to be within one-half mile of the proposed disposal well location. On January 20, 2014, notice of Probity's amended application[3] was published in the *Odessa America,* a newspaper of general circulation in Reeves County, Texas.

The application is protested by adjacent surface owners John Jefferson Rogers and Alfredo Herrera, represented by attorneys Jay Stewart, Wes McGuffey, and Ryan McNeel. Mr. Stewart, Mr. McGuffey, and Mr. McNeel are also representing several nearby land and mineral owners in protest of the application.

CASE SUMMARY

The Applicant is requesting to drill a new commercial disposal well pursuant to Statewide Rule 9 with a disposal interval from 5,400 feet to 6,500 feet in the Cherry Canyon and Brushy

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

[2] The original application was filed on Form H-1 and H-1A, an Application to Inject Fluid into a Reservoir Productive of Oil or Gas, pursuant to Statewide Rule 46, with an injection interval from 4,200 feet to 6,200 feet with the formation identified as Delaware Sands.

[3] On January 10, 2014 the Commission received an Application to Dispose of Oil and Gas Waste by Injection into a Formation Not Productive of Oil or Gas, pursuant to Statewide Rule 9. The Form-W-14 listed an amended injection interval, 5,400 feet to 6,500 feet. See ***Commercial Disposal Well Application***, pg. 3.

Canyon Formations. The original application was filed pursuant to Statewide Rule 46 with a disposal interval from 4,200 feet to 6,200 feet in the Delaware Sands Formation. The application was re-filed to inject fluids into non-productive formations after it was determined that the Applicant has a surface lease that does not include a mineral lease agreement with the mineral owner at the proposed disposal well location.

Both the Applicant's witness and the Protestants' witness provided evidence that the proposed disposal interval includes the Cherry Canyon Formation. The Cherry Canyon Formation is listed as a productive interval in a well located approximately 1.1 miles south of the proposed disposal well location. The top of the proposed disposal interval is approximately 46 feet below the interval completed in this productive well.

The Examiners issued the original Proposal for Decision (PFD) on June 16, 2015. The Examiners did not recommend approval of the application as applied-for by the Applicant. The original PFD recommended approval of the application, but only if the top of the injection interval was lowered. Applicant filed exceptions claiming that the applied-for interval is supported by the record. Protestant filed exceptions claiming that the record does not support lowering the top of the interval. After considering exceptions and replies, the Examiners conclude that the scope of the recommendation should be confined to the scope of the application. Accordingly, it is recommended that the subject application be denied.

DISCUSSION OF THE EVIDENCE

Probity's Evidence

Local Geology

The Delaware Mountain Group, or Delaware sandstones ("Delaware Sands") are comprised of the Bell Canyon, Cherry Canyon, and Brushy Canyon Formations. The majority of production from the Delaware Sands occurs from the Bell Canyon section, which is described as the upper member, located near the base of a salt anhydrite section. According to Rick Johnston, the Applicant's engineering witness, "our disposal interval is going to be predominantly in the Cherry Canyon and the Brushy Canyon section." [4] Mr. Johnston stated that this commercial disposal well application was originally filed on Forms H-1 and H-1A as the injection interval included the upper members... it was revised earlier this year. We dropped the top of the interval and we re-filed it on a Form W-14 to get out of the productive section." [5]

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[4] Tr. 36.

[5] Tr. 37.

On cross-examination, Mr. Johnston explained that the application was changed from injection into a productive interval to injection into a non-productive interval because the Applicant did not have "minerals" [6] at the location of the proposed disposal well.[7] The proposed disposal interval on the original application was from 4,200 feet to 6,200 feet, while the proposed disposal interval in the current application is from 5,400 feet to 6,500 feet. Mr. Johnston expressed a concern with the "portions above 5,400 feet. Not entirely above 5,400 feet, but certainly near the base of the salt anhydrite, which is where the production is in the Delaware section." [8] Mr. Johnston also stated that the application was later filed on Form W-14 as opposed to Form H-1/H-1A "to drop the top of the (disposal) interval substantially over what was on the H-1...to get down below a tight interval that I was able to correlate across the area...and say there is your confining interval." [9]

Well Construction

The Commission's Groundwater Advisory Unit (GAU) identified both the base of usable-quality groundwater (BUQW) and the base of the usable sources of drinking water (USDW) at a depth of 2,150 feet at the proposed disposal well location. The proposed disposal well has not yet been drilled, but the proposed well construction is to run 9 5/8-inch surface casing to a depth of 2,200 feet and to circulate cement to the surface, which will adequately protect both the BUQW and USDW. The well will be drilled to a total depth (TD) of 6,600 feet. A 7-inch string of casing will be run from the surface to a depth of 6,500 feet and cement will be circulated to surface. Tubing will be run inside the 7-inch casing to a depth of 5,300 feet (Attachment A). Mr. Johnston stated that it will require more cement than was originally reported on W-14 to circulate cement to the surface and provided revised calculations to ensure the cement volumes included with the application are sufficient to circulate cement to the surface behind both the surface and long string casing.[10]

Injection Interval

The proposed disposal interval is from 5,400 feet to 6,500 feet into the Canyon Sands Formation. Mr. Johnston stated that the Canyon Sands Formation are also referred to as Delaware Sands because the formation is composed of sandstone that was deposited immediately below the

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[6] Mr. Johnston defined having the minerals as an agreement with the mineral owner or whoever holds the lease of the minerals to allow you to perform the disposal operation into an interval that is considered productive. Tr. 54-55.

[7] The mineral owner of the disposal well tract was not identified at the hearing. It is unknown if the mineral owner of the tract received a notice of the application.

[8] Tr. 56.

[9] Tr. 65.

[10] Probity Exhibit No. 3.

salt anhydrite in the Delaware Basin.[11] In terms of specific formations, the disposal interval is in the Cherry Canyon and the Brushy Canyon Formations. In Mr. Johnston's opinion, based on experience in the Delaware Basin and the study of the nearby well logs, the proposed injection interval has adequate geologic confinement to prevent the migration of injected fluids from the injection interval, and other disposal well operators are using a similar interval for disposal. Probity proposes to inject a maximum daily volume of 35,000 barrels of salt water and RCRA-exempt waste.[12] The requested maximum surface injection pressure is 2,700 psi.[13]

Confining Intervals

A four well log cross-section was used to show the injection interval and confining intervals at the proposed disposal well location.

(1) The Thornton Trust Lease, Well No. 1, ("Thornton Trust No. 1"), API No. 42-389-32646, located approximately 2.1 miles north-northwest of the proposed disposal well location. This well was drilled to a TD of 12, 515 feet and was perforated from 10,092 feet to 12,412 feet;

(2) The Yost Trust Lease, Well No. 1 ("Yost Trust No. 1"), API No. 42-389-31552, located approximately 1.1 miles south of the proposed disposal well location. This well was drilled to a TD of 6,020 feet and was perforated from 4,353 feet to 5,354 feet;

(3) The Hermosa Unit, Well No. 1, ("Hermosa No. 1"), API No. 42-389-30239, located approximately 1.3 miles south-southeast of the proposed disposal well location. This well was drilled to a TD of 20,800 feet and was perforated from 11,805 feet to 14,866 feet;

(4) The Reeves 43 Lease, Well No. 1 ("Reeves 43-1"), API No. 42-389-31055, located approximately 0.9 miles southeast of the proposed disposal well location. This well

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[11] Tr. 35.

[12] Resource Conservation and Recovery Act: Examples of RCRA exempt oil and gas waste includes produced water, drilling fluids, hydraulic fracturing flow back fluids, rig wash and workover wastes.

[13] The permitted pressure will not exceed 0.5 psi per foot of depth to the top of the injection/disposal interval, unless the results of a fracture pressure step-rate test support a higher pressure. (http://www.rrc.state.tx.us/oil-gas/publications-and-notices/manuals/injectiondisposal-well-manual/summary-of-standards-and-procedures/technical-review/)

was drilled to a TD of 5,700 feet and was perforated from 4,339 feet to 5,320 feet.[14] This well has been converted to a disposal well.

In Mr. Johnston's opinion, "immediately above the disposal interval there's a high resistivity section that there's some variation in the thickness of it, but this high resistive interval, which also has low porosity, ...it correlates across this cross section...this cross section covers... about two miles to the north and then the other three wells are a mile to a little over a mile to the south. So this tight interval ...correlates over a four mile area. We believe it's got good areal extent, will act as an upper confining interval." [15] "It's going to be some shale intervals and some low porosity probably sandstone, maybe with interspersed shale... the logs show a very high resistivity and low porosity. Gamma Ray is not real shaley. There are some shale streaks, but bottom line is the real high resistivity and low porosity indicates it is going to be a confining interval." [16] The upper confining interval directly above the proposed disposal interval was identified to be from a depth of 5,370 feet to 5,420 feet for a thickness of 50 feet in the log of the Yost Trust No. 1, and from a depth of 5,350 feet to 5,390 feet in the log of the Thornton Trust No. 1, for a thickness of 40 feet.[17]

Directly below the upper confining interval is a sand interval, 80 to 90 feet in thickness. In addition, according to Mr. Johnston, there are "some other sands down the hole that we hope to encounter that also have good development for disposal, and then down at the bottom, at the base of the disposal interval...you're getting down into the lower portion of the Canyon series where things are getting shalier... to act as a lower confining interval." [18]

There is a salt anhydrite interval that is more than 2,000 feet thick in this area of the Delaware Basin which will act as a secondary confining layer to protect the BUQW. The bottom of this salt anhydrite section is at a depth of 4,300 feet.

Nearby Wellbores

The proposed disposal well will be located approximately five miles west-northwest from Pecos, Texas. There are no wells within a one-half mile radius of the proposed disposal well location. There is one existing well that is located approximately 0.9 miles away that penetrates the proposed disposal interval. This well is the Reeves 43-1, which was drilled to a TD of 5,700 feet

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[14] The Protestants' geology witness testified that the Reeves 43-1 was perforated in the Cherry Canyon Formation from 5,310 feet to 5,357 feet , Tr. 137.

[15] Testimony of Mr. Johnston, Tr. 24.

[16] Tr. 75.

[17] Tr. 79-80.

[18] Tr. 25.

and was originally drilled as a producing well but was converted to a disposal well. The injection interval for this well is from 4,339 feet to 5,320 feet and was approved for injection operations pursuant to Statewide Rule 46.

There is a permitted horizontal well location (API No. 42-389-33503), between one-half mile to one mile from the proposed disposal well location. However, this wellbore will penetrate the proposed disposal interval more than one mile away, although the terminus location for this well will be located between one-half mile and one-mile from proposed disposal well. There is also a permitted location for another well, (API No. 42-389-32580), located between one-half mile and one mile from the proposed disposal well location.

Area Production

Mr. Johnston stated that a review of producing wells within a two-mile radius shows that "there is a fair amount of production up in the 4,400 (foot), 4,300 (foot) interval, which is just below the salt anhydrite." [19] According to Mr. Johnston, there is no production from the proposed disposal interval, except that production data indicates the Brown Lease, Well No. 1, API No. 42-389-31576, ("Well 31576") produced from an interval from 5,800 feet to 6,000 feet, "which is in our interval".[20,21] In Mr Johnston's opinion, this information is incorrect. [22]

The Form W-3 for Well 31576 indicates a total of three open hole intervals (5,800 feet to 6,000 feet, 5,400 feet to 5,644 feet, and 4,622 feet to 5,400 feet) and one perforated interval (4,317 feet to 4,324 feet) in this well. However, the remarks section of this form contains the following information:

Prior to running casing the following plugs were set:

# of Sacks	Depth in Feet (top & bottom)
40	5644-5800
40	5241-5400
40	4519-4622

[19] Tr. 45.

[20] Tr. 47.

[21] The well identified by API No. 42-389-31576 is located approximately 1.7 miles northwest of the proposed disposal well location.

[22] The Applicant used production data from Lasser Production Services to compile information on wells within a two mile radius of the proposed disposal well location.

The casing information for Well 31576 shows 8 5/8-inch surface casing was set at a depth of 2,161 feet, and 4.5-inch production casing was set at a depth of 4,516 feet and cemented. In Mr. Johnston's opinion, it "appears that after they tested each one of these (open hole) intervals ...they spotted ...open hole cement plugs to isolate that portion, so they plugged those sections off, and they just worked their way up the hole until the top of the last plug at 4,519 (feet) and then they came in and ran casing down to 4,516 (feet)...The interval not plugged is the perforated interval and is well above where we propose to dispose." [23] This well was completed in December 1984, and produced 101 barrels of oil before it was plugged in May 1985. Mr. Johnston's position is that it has not been established that the portion of the proposed disposal interval that may have been tested at one time in Well 31576 is actually productive.[24]

Productive formations deeper than the proposed disposal interval are the Bone Spring Formation, at a depth of 9,000 feet, and the Wolfcamp Formation, at a depth of 10,000 feet. The proposed disposal well will not be drilled deep enough to reach either of these deeper productive intervals. Both the Bone Spring and Wolfcamp Formations are located below the Avalon Shale Formation which will act as a lower confining interval to prevent injected fluids from impacting the deeper productive intervals.

The Protestants questioned Mr. Johnston's statement that production in the Delaware Sands is near the salt anhydrite interval between 4,300 feet and 4,400 feet, as the Yost Trust No. 1 shows the lower perforated interval in this well is at a depth of 5,354 feet, within 50 feet of requested disposal interval. In response, Mr. Johnston stated that this particular well has two sets of perforations. One set of perforations is from 4,353 feet to 4,365 feet, and the second set is from 5,344 feet to 5,354 feet. In Mr. Johnston's opinion, "where you've got two sets of perforations, you really don't know where the production is coming from...(at the perforated interval at 5,340 feet) the log indicates very low resistivity, which is an indication of a non-productive interval." [25] Mr. Johnston also pointed out that the lower set of perforations in the Yost Trust No. 1 are located above the upper confining interval, which is directly above the top of the proposed injection interval, as identified by the Applicant on the Yost Trust No. 1 log.

The Need for Additional Disposal in the Area

The proposed disposal well location is near where I-20 intersects the Reeves County line. The target area to be serviced by this disposal well is an area within a twenty to thirty mile radius, which includes Reeves County, as well as Ward County, located to the east. Activity in the vicinity of the proposed disposal well location includes horizontal well completions within the Bone Spring

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[23] Tr. 48-49.

[24] Tr. 48. ("we believe it is not productive")

[25] Tr. 64.

and Wolfcamp Formations. These horizontal well completions require multiple hydraulic fracture stimulation stages which require large volumes of water, resulting in large volumes of flowback water.

Charlie Don Howard, Jr., is the Area Manger for Select Energy Services, ("Select") a company with a total of 13 to 14 different service lines. Select's main business is transporting water, and oil and gas waste for disposal. Select has a partnership with Probity and shares information with Probity regarding "where operators and Select are needing salt water disposal wells to be able to haul to." [26] For example, Select's largest customer, Shell, is seeking another disposal well on the north side of Pecos, Texas, According to Mr. Howard, Shell has certain requirements that a disposal facility must meet before the facility is authorized by Shell for the disposal of its water. "If the disposal site is not approved by Shell, you can't haul any of their water to that disposal." [27]

Select considers additional information in determining potential locations for disposal wells, which includes active producing wells, rig counts, and unspudded drilling permits. In 2014, within a 30-mile radius of the proposed disposal well location, there were 1,456 active producing wells and a total of 57 drilling rigs (5 vertical, 52 horizontal). In addition there were 160 unspudded drilling permits issued over a three month period. Select uses such information to determine where oilfield activity is occurring and in determining asset allocation. Select hauls water, and oil and gas waste for disposal within this 30 mile area and experiences wait time and capacity issues. In Mr. Howard's opinion, "the biggest issue in the Pecos area as far as trucking goes, is getting the quantity of trucks it takes to do the work...and drivers... and that is not just Select, that is everybody." [28] If the proposed application were approved, it would decrease the truck volume traveling south of Pecos. "When you start extending the range that a truck has to travel for disposal, you need more trucks to be able to handle the needs...this disposal well located north of Pecos would decrease the time required to dispose of waste and result in less trucks required to do the same amount of work." [29]

Although Select works with numerous clients, Select communicates with both Shell and Conoco on a daily basis. According to Mr. Howard, both of these companies brought the north side of Pecos to the attention of Select. The location of the proposed disposal well was also chosen, in part, due to its proximity to Shell and Conoco activity in the area. Mr. Howard testified that Shell has requested Select to construct a disposal well on the north side of Pecos to help with issues encountered further east. With both the current amount of drilling and the potential for increased

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[26] Tr. 87.

[27] Tr. 88.

[28] Tr. 96.

[29] Tr. 95.

drilling in the area in the future, additional disposal is needed in this area. Mr. Howard stated that Shell and Conoco are trying to get the infrastructure set up in this area before ramping up activity.

On cross-examination, Mr. Howard stated that Select uses various salt water disposal wells and several factors in determining which disposal well to utilize. "Number one it's according to where the customers tells you to take it. If it's an hourly haul...they want you to go to the closest one... the closest approved one. Unless it's down, or full...or something like that, then you can go further out where ever. So the first determination is where the customer wants you to go, on an hourly charge. Now if it's a barrel haul, or per truck load type situation, normally as long as it's approved disposal, you can go to whichever one you want because that's on you then." [30]

In Mr. Howard's opinion, there is a need for additional disposal capacity in this area even though Select has a mobile recycling division. "You can't do 24/7 recycle operation because you run out of storage capacity. That's the issue with recycling is you have a certain size pit, say a 300,000 barrel pit, once that pit is full, the recycling shuts down because there's nowhere to go with the volume. Once it's full, they shut the recycle down and you go to disposal until they pump it down enough you can put more water in it" [31] Mr. Howard stated that "Devon Energy try to recycle every drop of water they have but we still, on an average month, we're still hauling 14-15,000 barrels a day to disposal just because there's no storage capacity for those huge quantities."[32]

Based on Mr. Howard's experience, an operator considers a wait time that exceeds one hour to be too long. In hauling water for Shell, Select communicates with Shell logistics, "so they know ...this load should have been a four-hour load took five and a half, and they will call and ask what the deal was, and they get the information...they make the determination...you have over an hour wait time, you need to go find another disposal." [33]

Protestants' Evidence

The Protestants believe that Probity's commercial disposal well application has been confusing. The original application was submitted as injection into a productive reservoir pursuant to Statewide Rule 46, while the current application is a Statewide Rule 9 commercial disposal well application. The Protestants are concerned whether the geologic confining layer identified by the Applicant will prevent injected fluids from migrating into a productive zone. In addition, the Protestants do not believe there is a need for another injection well in Reeves County.

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[30] Tr. 101.

[31] Tr. 104.

[32] Tr. 105.

[33] Tr. 110.

Protestants' Analysis of Local Geology and Productive Zones

The Protestants take issue with the Applicant listing the productive zone within two miles on Form W-14 as the Upper Delaware Sands, yet do not indicate that disposal will be in the Delaware Sands. The Form W-14 lists the disposal formation as the Canyon Sands, which Mr. Johnston stated are also referred to as Delaware Sands.[34] Carter Davis, the Protestants' consulting petroleum engineer, believes the disposal formation is labeled incorrectly on the disposal well application. Based on the Applicant listing the disposal formation as the Canyon Sands, Mr. Davis would think the Applicant was referring to the Pennsylvanian Canyon. "The problem I have when you ask me if this is correct, it doesn't seem correct because it doesn't seem to be naming properly the depth of the formation that we are talking about injecting into." [35] In response to the Protestants' claim that listing the Canyon Sands as the disposal formation on Form W-14 is misleading, the Applicant provided the Form W-14 for the American Quasar Monroe Unit, Well No. 1 (API No. 42-475-30314) disposal well that listed the disposal formation as the Canyon Formation, at a depth of 5,000 feet to 6,000 feet in Ward County.

Charles Thomas, the Protestants' consulting geologist, has never heard of the Canyon Sand in this area and stated that a well completed in the Delaware Sands could be in the Bell Canyon, Cherry Canyon, or Brushy Canyon Formations. The "only Canyon I've ever experienced is up on the Midland Basin in the Pennsylvanian System...I've never heard them without the Bell, Cherry, or Brushy...I've never seen the Canyon in Reeves County." [36]

In Mr. Thomas' experience in the area, the top of the Bell Canyon Formation is a big producer, and to the east there are some big Cherry Canyon Formation fields. The Brushy Canyon Formation is productive in New Mexico, but not in Texas. In Mr. Thomas's opinion, the Bell Canyon, Cherry Canyon, and Brushy Canyon are three separate zones, and the requested injection interval is in the Cherry Canyon Formation. The Cherry Canyon Formation is four hundred to five hundred feet in thickness, while the total thickness for all the sands is 2,000 feet. Since the well has not been drilled, the Applicant does not have a depth to the top of the Cherry Canyon Formation at the proposed disposal well location.

Mr. Thomas has experience drilling wells in the Cherry Canyon Formation to the southeast of the proposed disposal well location. In Mr. Thomas' review of well logs in the area, he did not notice any real structure and, based on a topographic map, concluded that there is a 20 to 25 foot per mile updip to the east. In Mr Thomas' opinion, the Cherry Canyon Formation is a channel sand, possibly sand bars, and the line of least resistance in the formation is typically where porosity is

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[34] Tr. 35.

[35] Tr. 143.

[36] Tr. 129-130.

encountered. According to Mr. Thomas, the Yost Trust No. 1 is on strike with the proposed disposal well. The Yost Trust No. 1 is perforated from 5,344 feet to 5,354 feet and, to-date, has produced 36,713 barrels of oil (BO), and 71,903 Mcf of gas. Current daily production is 11 BO and 13 Mcf of gas. Mr. Thomas' concern is that the proposed disposal well is on-strike with the Yost Trust No. 1, and therefore injected fluids could follow the path of least resistance and impact production.

Other wells perforated in the Cherry Canyon Formation within two miles include the Donahoo, H.L. Lease, Well No. 2 (API No. 42-389-31497), located approximately 1.3 miles southwest of the proposed disposal well. This well was perforated in the Cherry Canyon Formation from 5,272 feet to 5,282 feet and produced 7,914 BO. The Reeves 43-1[37] is located approximately 0.9 miles southeast of the proposed disposal well location. This well was perforated from 5,310 feet to 5,357 feet and produced 9,013 BO, and has since been converted into an injection/disposal well. Mr. Thomas concluded that the Cherry Canyon Formation in the area is down-dip tight, and up-dip tight, based on the production and location of these two wells, as the cumulative production of both wells was less than 10,000 BO. In comparison, the Yost Trust No. 1 is on-strike with the proposed disposal well location and has produced over 36,000 BO to-date, and continues to be a producing well.

Injection into the Cherry Canyon Formation

The Protestants are concerned that the top of the proposed disposal interval is at a depth of 5,400 feet. The Yost Trust No. 1 is a producing well with lower perforations from 5,344 feet to 5,354 feet that is located approximately 1.1 miles to the south of the proposed disposal well location. Therefore, only 46 feet of vertical separation exists between the top of the proposed injection interval and the bottom set of perforations in this producing well.

Another concern of the Protestants is a direct result of the well log that the Applicant submitted with the disposal well application. "The area above 5,400 feet in the Hermosa (No.1) well log appears to be a sand that appears to have some porosity and some permeability...that correlates to the productive interval in the Yost (No.1) well." [38] Based on the Hermosa No. 1 well log, "a ten foot carbon stringer...would be relied upon to keep the fluid in zone...it seems like a small amount of isolation...This is a relatively small, relatively thin isolation zone" [39]

The Protestants also questioned the Applicant's four-well cross-section and the correlations that show a dip between the Yost Trust No. 1 well log and the Hermosa No. 1 log. Mr. Davis stated

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[37] The Reeves 43-1 was described in the ***Confining Intervals*** section, (4), p. 5.

[38] Tr. 143

[39] Tr. 144-145.

that more time would be required to personally examine the well logs, but at this time there is a "very real possibility" that the proposed injection interval will be into a productive formation.[40]

During cross-examination, Mr. Davis stated that he does not foresee the proposed completion of the disposal well impacting fresh ground and surface water, provided the Applicant circulates cement to the surface behind both strings of casing. [41] Mr. Davis does have a concern that the proposed disposal well may impact the producing Yost Trust No. 1 well located approximately one mile away. Mr. Davis acknowledged that the Reeves 43-1 commercial disposal well is located closer than a mile to the Yost Trust No. 1 well and there is no apparent adverse impact on Yost Trust No. 1 production as a result of injection into the Reeves 43-1 well. The injection interval in the Reeves 43-1 commercial disposal well (4,339 feet to 5,320 feet) is also above the proposed injection interval in the Applicant's proposed disposal well (5,400 feet to 6,500 feet).

On re-direct, Mr. Davis stated that the Reeves 43-1 disposal well is not on-strike with the Yost Trust No. 1, whereas the Applicant's proposed disposal well location would be on-strike with the Yost Trust No. 1. Based on the testimony of Mr. Thomas, the porosity and permeability in the sand channels of the Cherry Canyon Formation tend to be continuous, on-strike, north-south in this instance, and that you would not have continuous porosity and permeability as you went updip or downdip. The existing disposal wells are updip and downdip from the Yost Trust No. 1. The concern in this case is that the proposed disposal well location is on-strike with the Yost Trust No. 1 and injected fluids would be able to migrate to the Yost Trust No. 1.

No Need for an Additional Commercial Disposal Well Permit

The Protestants do not believe that there is a need for the Applicant's proposed commercial disposal well. There are already numerous active commercial disposal wells in the area, as well as numerous commercial disposal well permits that have not been activated. There are a total of 70 active commercial saltwater disposal wells within a five-county area, which includes Reeves County. [42] There are an additional 57 commercial saltwater disposal permits that have been granted in this five-county area that have not yet been activated. In Mr. Davis' opinion, "it could be that the wells have not been drilled yet, the wells could have been drilled and completed...may be taking injection but the completion paperwork just hasn't cycled through the Commission yet...that is currently taking a few months." [43] In Reeves County alone, there are 26 active commercial saltwater disposal wells and an additional 27 commercial saltwater disposal permits that have not yet been

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[40] Tr. 148.

[41] Tr. 164.

[42] The five county area includes Reeves, Culberson, Loving, Pecos, and Ward Counties, Tr. 156.

[43] Tr. 154.

activated. Within a 15-mile radius of the proposed disposal well, there are currently 22 active permits for commercial salt water disposal wells. [44] Included in this total are two active salt water disposal wells located within two miles of the proposed disposal well location. On cross-examination, Mr. Davis stated that he had not spoken with any operators in the area regarding disposal needs.

Applicant's Rebuttal Evidence

Mr. Johnston does not agree with Mr. Davis's opinion that the confining interval is only ten feet thick above the proposed injection interval from 5,400 feet to 6,500 feet at the proposed disposal well location. Based on the Yost Trust No. 1 log, Mr. Johnston identified the confining interval as the section on the log from 5,370 feet to 5,420 feet. "The Pe curve goes up but it doesn't go up much above about three, so you're dealing with a sandstone. The other thing is...the porosity is low and at the same time the resistivity is high." [45] "The correlation also shows that the lower perforations in the Yost Trust (No. 1) ... the lower set of perforations is producing from above our proposed disposal interval."[46] According to Mr. Johnston,"in these Delaware Canyon sands, before you are going to have much good fluid flow, you're going to need to have porosity above 12 percent, and over that interval you've clearly got density porosity well below 10 percent." [47]

On cross-examination of Mr. Johnston regarding the porosity of the confining interval, Mr. Johnston stated that "the confining layer needs to have porosity substantially less than 10 percent. Which if you look at the density porosity log, the confining interval that I discussed does have a porosity well below 10 percent." [48]

EXAMINERS' OPINION

Pursuant to Texas Administrative Code § 3.9, any person who disposes of saltwater or other oil and gas waste by injection into a porous formation not productive of oil, gas, or geothermal resources shall be responsible for complying with that section, Texas Water Code, Chapter 27, and Title 3 of the Natural Resources Code. Pursuant to Texas Water Code § 27.051(b), the Commission has authority to permit disposal and injection wells if it finds:

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[44] Mr. Carter defined an active permit as a well that has not been plugged, or a permit that has not been cancelled.

[45] Tr. 174.

[46] Tr. 176.

[47] Tr. 177.

[48] Tr. 181.

(1) that the use or installation of the injection well is in the public interest;

(2) that the use or installation of the injection well will not endanger or injure any oil, gas, or other mineral formation;

(3) that, with proper safeguards, both ground and surface fresh water can be adequately protected from pollution; and

(4) that the applicant has made a satisfactory showing of financial responsibility if required by Section 27.073.

In the Examiners' opinion, the Applicant failed to show that the application meets the requirements of Statewide Rule 9, and Chapter 27 of the Texas Water Code. The Applicant failed to show that injection will be into a porous formation not productive of oil or gas, and that the use or installation of the injection well will not endanger or injure any oil or gas formation.

Statewide Rule 9: Injection into a Formation Not Productive of Oil or Gas

The original commercial disposal well application was filed under Statewide Rule 46, *Fluid Injection into Productive Reservoirs,* with a disposal interval from 4,200 feet to 6,200 feet. However, the application was protested and the Applicant determined that they do not have a mineral lease agreement with the mineral owner at the proposed disposal well location. As a result, the upper and lower depths of the disposal interval were lowered and the application was re-filed pursuant to Statewide Rule 9.

Texas Administrative Code § 3.9 (3) (A) applies to "injection into a porous formation not productive of oil, gas, or geothermal resources." [49] The Applicant's engineering witness stated that the amended disposal interval will be in the Cherry Canyon and Brushy Canyon Formations. The Protestants' witness agreed that the disposal interval in the current application includes the Cherry Canyon Formation. One of the Protestants' concerns with the current application is disposal into a productive formation. As evidence to support the Protestants' position, the Yost Trust No.1 is located on-strike with the proposed disposal well location, was completed in the Bell Canyon Formation from 4,353 feet to 4,365 feet, and in the Cherry Canyon Formation from 5,344 feet to 5,354 feet. This well has produced over 36,000 BO and 71 MMcf of gas.

The evidence and testimony provided by the Applicant's witness to support the proposed disposal interval within the Cherry Canyon and Brushy Canyon Formations includes:

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[49] TAC §3.9 Disposal Wells.

(1) the proposed disposal interval is currently being used by other disposal well operators within two miles of the location of the current application;

(2) the top of the proposed disposal interval is 46 feet deeper than the bottom of the perforated interval in the Yost Trust No. 1;

(3) a 40 to 50 foot thick sandstone interval with a density porosity reading less than 10 percent located directly above the top of the proposed disposal interval that will act as a confining interval to prevent injected fluids from migrating from the permitted disposal interval; and

(4) the Yost Trust No. 1 is completed in the Bell Canyon and Cherry Canyon Formations, therefore, the Applicant is not convinced that the Cherry Canyon interval is contributing to the overall production of the well.

In the Examiners' opinion, the Applicant's evidence is not persuasive and fails to justify recommending the application for approval for the following reasons:

(A) Although the proposed disposal interval includes the interval that is currently being used by two other disposal well operators within two miles of the proposed disposal well location, the subject application differs. The two disposal wells within two miles that contain the proposed disposal interval are permitted under Statewide Rule 46 (injection into productive reservoirs) whereas the subject application is filed under Statewide Rule 9 (injection into reservoirs not productive of oil or gas). The Applicant stated that the original application was filed pursuant to Statewide Rule 46, but was later re-filed pursuant to Statewide Rule 9 due to the realization that the Applicant does not have a mineral lease agreement with the mineral owner at the proposed disposal well location.

(B) The requested disposal interval includes the Cherry Canyon Formation, which is listed as a producing interval in the completion report for the Yost Trust No. 1, a well located approximately 1.1 miles away from the proposed disposal well location. Therefore, the Cherry Canyon Formation is considered a productive formation within two miles of the proposed disposal well location, the distance requirement listed on Form W-14 for identifying productive zones on the disposal well application.[50]

(C) The Applicant's witness opined that since the Yost No.1 was completed in both the Bell Canyon and Cherry Canyon Formations, there is no way to know whether the Cherry Canyon Formation is contributing to production in the well. However, the operator's actions support the Protestants' claim that the Cherry Canyon Formation

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[50] Form W-14, line item 35.

is productive in this area. The completion of the Yost No.1 in the Cherry Canyon Formation included ball sealers and an acid break-down to ensure as many perforations would be open as possible in the 5,344 foot to 5,354 foot interval within the Cherry Canyon Formation, and the interval was hydraulically fracture stimulated. Furthermore, there is no evidence in the record to indicate that a plug has been set above this perforated interval in the Cherry Canyon Formation. In the Examiners' opinion, if this interval were not contributing to production, the operator would most likely set a plug above this interval which would indicate that this lower interval is not contributing to production.

In the Examiners' opinion, the subject application does not meet the requirements of Statewide Rule 9. Based on the evidence in the record there is past and current production from the Cherry Canyon Formation within two miles of the proposed disposal well location. In addition, injection wells that include the Cherry Canyon Formation in the injection interval within two miles of the proposed disposal well location are permitted pursuant to Statewide Rule 46.

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

In the Examiner's opinion, the Applicant's evidence fails to show that the use of the proposed injection well will not injure or endanger any oil, or gas formation. The proposed disposal interval includes the Cherry Canyon Formation, which is a productive formation in the Yost Trust No. 1well, located on-strike, 1.1 miles to the south. The only geologic separation between the perforated interval in the Yost Trust No. 1 and the top of the proposed disposal interval is 40 to 50 feet of sandstone. Sandstone is not unequivocally considered an impervious layer as required by Statewide Rule 9 due to its intrinsic properties.[51] However, sandstone could conceivably confine injection fluids if it is established that the permeability is sufficiently low, to the degree that it will prevent fluid migration.

The Applicant's engineering witness opined that in the Delaware Canyon Sands, porosity greater than 12% would be required for good fluid flow, and that a confining layer would require porosity substantially less than 10 % porosity. However, the Applicant did not provide an estimate of the permeability or porosity of the sandstone interval to support its claim that this interval would be a confining interval. The Applicant's engineering witness only refers to the density porosity log reading being well below 10 % for the Yost Trust No.1. However, the density logging tool does not

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[51] *See* F.J. PETTIJOHN ET. AL., SAND AND SANDSTONE 412-413. (2nd ed. 1987) (Variation in permeability is enormous and can range from hundreds of darcys in well-washed, unconsolidated terrace and river sands to virtually zero in a sandstone fully cemented by quartz, the quartz-cemented sandstone having a permeability comparable to that of some silts and clays. The permeability of a sandstone is one of its most variable properties, its variability far exceeding that of porosity. This variability has made permeability difficult to predict.)

actually measure porosity.[52,53] The Applicant's log excerpt did not contain the information required to show whether the density porosity reading was a reasonable estimate of the formation porosity since the baseline matrix and fluid density used to generate the density porosity curve were not included with the log excerpt.

In addition, the density porosity curve shown on the Yost Trust No. 1 log is difficult to read due to the reduction in the scale of the log on the cross section. The 40 to 50 foot sandstone interval that the Applicant identified as the upper confining interval is condensed to a 9/16th inch by 1 inch area. As such, the curves are difficult to differentiate, however the density porosity curve appears to be greater than 10% at a depth of 5,380 feet. Therefore, if one simply assumed the fluid density and matrix density used as density logging tool inputs were correct for this interval, reading the density porosity curve shows that the entire 50 foot gross thickness of this interval would not prevent fluid flow.

The Applicant's evidence of shale streaks in the offset well logs north-northwest and southeast corresponds with the Protestants' summary of the local geology of sand channels containing porosity and permeability running north-south, while the formation is tight to the east and west, or up-dip and down-dip. It is for this reason that operation of the Reeves 43-1 injection well located approximately 0.9 miles to the southeast of the proposed disposal well, and approximately 4,000 feet northeast of the Yost Trust No. 1 is not persuasive evidence to show that the proposed disposal well will not endanger or injure the productive Cherry Canyon Formation.

Ground and Surface Fresh Water Adequately Protected From Pollution

In the Examiners' opinion, the installation and use of the proposed disposal well would adequately protect both ground and surface fresh water from pollution. The GAU identified the BUQW at a depth of 2,150 feet at the proposed disposal well location. The well has not been drilled yet, but the surface casing will be set to a depth of 2,200 feet and cemented in place with cement circulated to surface to protect the BUQW. Long string casing will be set at a depth of 6,500 feet and will be cemented in place with cement circulated to surface.

Injected fluids would be confined below the BUQW as there is an impervious salt anhydrite interval approximately 2,000 feet in thickness with a lower depth at 4,300 feet that will act as a

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[52] *See* MICHAEL J. ECONOMIDES, AND KENNETH G. NOLTE. RESERVOIR STIMULATION 4-3 (3rd ed. 2000) (Density tools measure the electron density of a formation, which is extremely close to its bulk density.)

[53] *See* GEORGE ASQUITH and DANIEL KRYGOWSKI. BASIC WELL LOG ANALYSIS 39-40 (2nd ed. 2004) (Formation bulk density is a function of matrix density, porosity and density of the fluid in the pores. To determine density porosity, either by chart or by calculation, the matrix density and type of fluid in the formation must be known. A computer in the logging unit calculates density porosity from the measured bulk density of the formation...the wellsite gelogist or logging engineer specifies the matrix and fluid density that are to be used.)

confining interval to protect the BUQW. As described in the previous section, no existing wellbores within a one-quarter or one-half mile radius penetrate the proposed disposal interval.

Public Interest

Pursuant to Texas Water Code § 27.051(d), in determining whether the proposed application demonstrates a public interest, several factors may be considered, which include: whether there is a practical, economic, and feasible alternative to an injection well reasonably available; compliance history; as well as other considerations raised by the Commission in consideration of the application.[54] In the Examiners' opinion, if the application were to meet all other requirements of Chapter 27 of the Texas Water Code and Statewide Rule 9, the application would meet the public interest requirement. The evidence shows that there are horizontal well completions in the Bone Spring and Wolfcamp Formations in the area of the proposed disposal well location. These horizontal well completions require multiple hydraulic fracture stimulation stages, which inject large volumes of water into the formations, resulting in large volumes of flowback water. In 2014, within a 30-mile radius of the proposed disposal well location there were 1,456 active producing wells and 160 unspudded drilling permits had been issued over a three month period.

Two oil and gas operators active in the area indicated that the construction of a disposal well on the north side of Pecos would help with disposal issues encountered east and south of Pecos. With the current activity, as well as the potential for increased drilling in the area in the future, additional disposal capacity is needed in this area. The Applicant's witness stated that two operators in the area have cited having the necessary infrastructure in place as one of the factors to be considered before ramping up activity in the area.

The Applicant provided testimony that some oil and gas operators have specific criteria that a disposal facility must meet before the operator will permit its water to be transported to that facility for disposal. Therefore, all active commercial disposal wells may not meet the requirements of all oil and gas operators, and therefore the disposal capacity is not available. The Applicant's witness also stated that an operator considers a wait time greater than one hour to be excessive. If the proposed disposal well were approved, it would decrease the truck volume traveling south of Pecos and subsequently decrease truck travel and wait times.

The Protestants provided evidence that there are currently two active salt water disposal wells within two miles of the Applicant's proposed disposal well and a total of 22 active permits for commercial salt water disposal wells within a 15-mile radius of the proposed disposal well. However, the Protestants' engineering witness stated that he had not spoken with any operators in the area regarding disposal needs, whereas the Applicant's witness testified that two operators had suggested that a disposal well located north of Pecos would be a desirable location. The Applicant's

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[54] The "public interest" finding required by Texas Water Code 27.051(b) is limited to matters related to oil and gas production, and does not include issues such as traffic safety and road conditions.

witness also provided evidence that atleast one operator is encountering wait times in the area that the operator considers to be excessive. In total, there are 26 active commercial saltwater disposal wells and an additional 27 commercial saltwater disposal permits that have not yet been activated in Reeves County. However, no evidence was provided showing the location of the commercial disposal wells that had been permitted but not activated, so there is no evidence that any of these permitted locations would be in the immediate area north of Pecos.

There is also evidence that recycling of 100% of all water produced is not possible at this time due to a lack of surface storage capacity for the recycled water. There is evidence of an operator trying to recycle as much water as possible, yet still requires an average of 14,000 to 15,000 barrels of water per day to be hauled to a disposal facility.

Financial Assurance

The Examiners conclude that the Applicant has made a satisfactory showing of financial responsibility as required by Section 27.073 of the Texas Water Code. The Applicant has a current approved Form P-5 (Organization Report) and a $25,000 letter of credit on file with the Commission for financial assurance. There is no evidence to suggest any current active enforcement matters involving the Applicant.

FINDINGS OF FACT

1. At least 10 days' notice of the hearing was provided to the owner of the surface tract, to all adjacent surface owners within one-half mile of the surface tract, and to the Reeves County Clerk. No operators were determined to be within one-half mile of the proposed disposal well location.

2. Notice of the original application and the revised application was mailed to the county clerk, to the owner of the drill site surface tract, and to all adjacent surface owners of the drill site tract.

3. Notice of the Applicant's original application was published in the *Pecos Enterprise*, a newspaper of general circulation in Reeves County, Texas, on September 10, 2013. Notice of the permit amendment was published in the *Odessa American*, a newspaper of general circulation in Reeves County, on January 20, 2014.

4. The applied-for-permit will inject into a porous formation that is productive of oil, gas, or geothermal resources:

   (A) the original commercial disposal well application was filed under Statewide Rule 46 (injection into a productive reservoir) with a disposal interval from 4,200 feet to

6,200 feet which included the Bell Canyon, Cherry Canyon, and Brushy Canyon Formations;

(B) the Applicant does not have a mineral lease agreement with the mineral owner at the proposed disposal well location;

(C) due to the lack of a mineral lease, Applicant amended the disposal interval to between 5,400 feet and 6,500 feet to remove the Bell Canyon Formation from the requested disposal interval, and the application was re-filed pursuant to Statewide Rule 9;

(i) Applicant's Form W-14, the application to dispose of oil and gas waste by injection into a formation not productive of oil and gas, does not list the Cherry Canyon Formation as a productive zone within two miles; and

(ii) Applicant's Form W-14 does not name the Cherry Canyon Formation as a disposal formation.

(D) the disposal interval in the applied-for-permit will inject fluids in the Cherry Canyon and Brushy Canyon Formations:

(i) two disposal wells within two miles contain the proposed disposal interval but are permitted under Statewide Rule 46 (injection into productive reservoirs);

(ii) the Yost Trust No. 1 was completed in the Bell Canyon Formation from 4,353 feet to 4,365 feet, and in the Cherry Canyon Formation from 5,344 feet to 5,354 feet and has produced over 36,000 BO and 71 MMcf of gas;

(iii) the Yost Trust No.1 is located approximately 1.1 miles away and is on-strike with the proposed disposal well location;

(iv) the Cherry Canyon Formation is productive within two miles of the proposed well site location; and

(v) the Applicant failed to showed that the Cherry Canyon Formation is not productive of oil, gas, or geothermal resources at the proposed well site location.

5. The use or installation of the injection well in the applied-for-permit will endanger or injure oil, gas, or other mineral formations:

   (A) the top of the proposed disposal interval within the Cherry Canyon Formation is only 46 feet deeper than the bottom of the perforated interval in the Cherry Canyon Formation in the Yost Trust No. 1 which was hydraulically fracture stimulated;

   (B) there is a 40 to 50 foot thick sandstone interval located directly above the proposed disposal interval which is below the perforated interval in the Yost Trust No. 1; and

   (C) the evidence is insufficient to show that this 40 to 50 foot thick sand interval will act as a confining interval to prevent the upward migration of injected fluids;

7. The proposed injection well will adequately protect both ground and surface fresh water from pollution:

   (A) The base of usable quality groundwater (BUQW) is at a depth of 2,150 feet, corresponding to the Rustler Formation. The well will be cased and cemented to isolate the BUQW from the injection interval;

   (B) surface casing will be set to a depth of 2,200 feet and will be cemented in place with cement circulated to surface;

   (C) long string casing will be set at a depth of 6,500 feet and will be cemented in place with cement circulated to surface;

   (D) injected fluids will be confined below the base of useable-quality water due to the presence of an impervious salt anhydrite interval approximately 2,000 feet in thickness with a lower depth at 4,300 feet that will act as a confining interval to protect the useable-quality water at this location; and

   (E) the maximum surface injection pressure will be no greater than 0.5 psi per foot to the top of the injection interval.

8. The use or installation of the injection well will be in the public interest:

   (A) in 2014, within a 30-mile radius of the proposed disposal well location there were 1,456 active producing wells and 160 unspudded drilling permits had been issued over a three month period;

   (B) two oil and gas operators active in the area indicated that the construction of a disposal well on the north side of Pecos would help with disposal issues;

(C) with the existing activity, as well as the potential for increased drilling in the area in the future, additional disposal capacity is needed in this area;

(D) some oil and gas operators have specific criteria that a disposal facility must meet before the operator will approve of its water to be transported to that facility for disposal;

(E) an oil and gas operator in the area considers a wait time greater than one hour to be excessive; and

(F) Applicant's disposal well, if permitted, will meet these needs.

9. Probity has made a satisfactory showing of financial responsibility.

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. The subject application will inject into a productive formation in violation of Statewide Rule 9, which limits injection to porous formations not productive of oil, gas, or geothermal resources. 16 TEX. ADMIN. CODE § 3.9.

3. The subject application will endanger oil, gas or geothermal resources in violation of Statewide Rule 9. 16 TEX. ADMIN. CODE § 3.9.

4. Probity SWD, LLC has not met its burden of proof and the subject application does not satisfy 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 that the application of Probity SWD, LLC for commercial disposal authority pursuant to Statewide Rule 9 for the North Pecos 2119 Lease, Well No. 1, Reeves-Block 4 (Del. 4430) Eagleville (Eagle Ford-2) Field, Reeves County, Texas, be denied, as set out in the attached Final Order.

Respectfully submitted,

Karl Caldwell
Technical Examiner

Terry Johnson
Legal Examiner

Attachment A

North Pecos 2119 # 1
(API # 42-389-_____)
Probity SWD, LLC
Reeves County, Texas

Proposed SWD Configuration

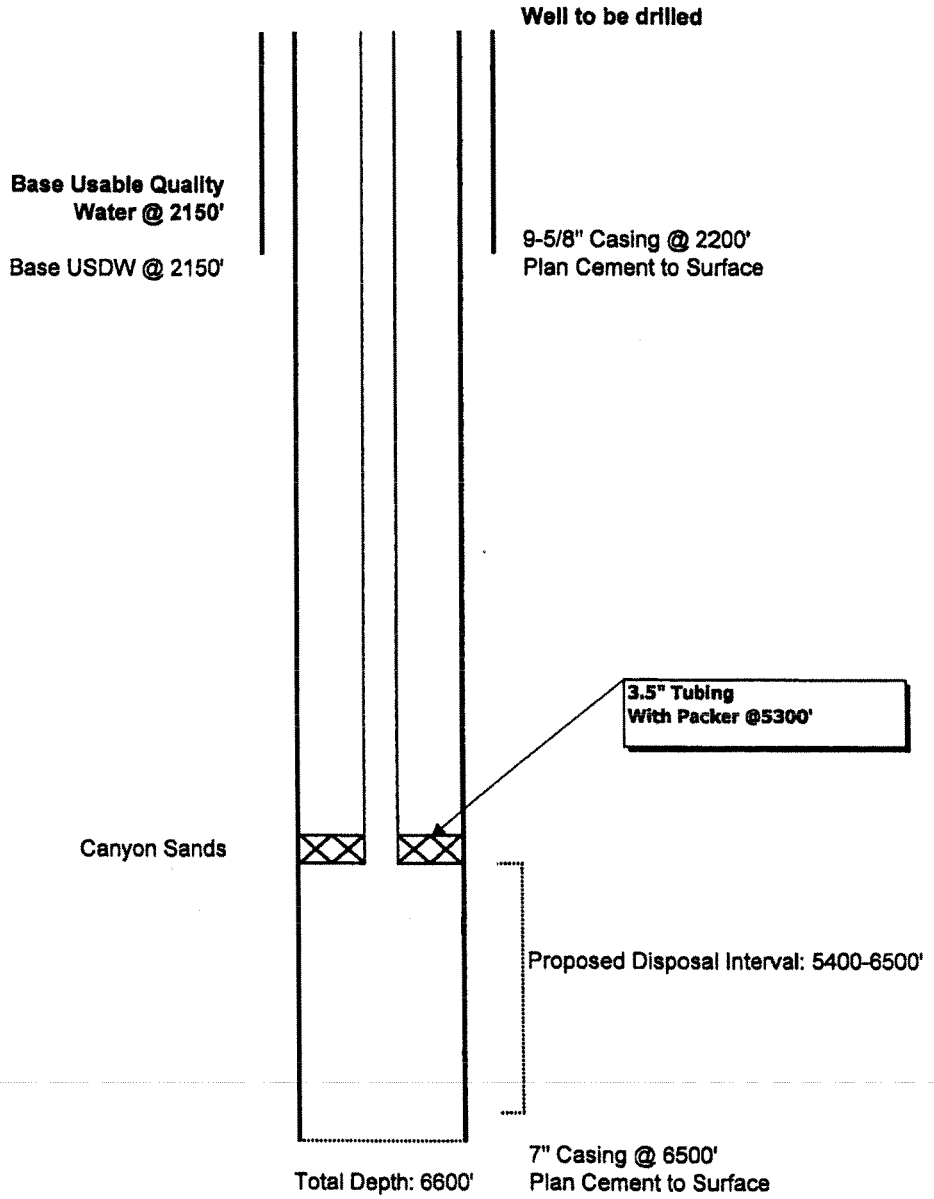

Exhibit No. 2
O&G Docket No. 08-0286963
Date: April 16, 2014
Probity SWD, LLC