RAILROAD COMMISSION OF TEXAS
HEARINGS DIVISION

OIL & GAS DOCKET NO. 08-0316308

APPLICATION OF NGL WATER SOLUTIONS PERMIAN, LLC (609265) 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 FOR THE HWY 302 SWD (45197) LEASE, WELL NO. 2, WHEAT FIELD, REEVES COUNTY, TEXAS

AMENDED PROPOSAL FOR DECISION

HEARD BY: Austin Gaskamp - Technical Hearings Examiner
Robert Musick, P.G. - Technical Hearings Examiner
Jennifer N. Cook - Administrative Law Judge
Ezra A. Johnson - Administrative Law Judge

WRITTEN AND REVIEWED BY:

Robert Musick, P.G. - Technical Hearings Examiner
Ezra A. Johnson - Administrative Law Judge
Austin Gaskamp - Technical Hearings Examiner

PROCEDURAL HISTORY:

Application Filed:	July 2, 2018
Notice of Pre-Hearing Issued:	December 19, 2018
Pre-Hearing Conference:	January 11, 2019 and April 30, 2019
Pre-Hearing Transcript Received	May 9, 2018
Hearing Date:	May 10, 2019
Hearing Transcript Received:	May 28, 2019
Close of Record:	May 28, 2019
Proposal for Decision Issued:	October 14, 2019
Reopened Hearing:	March 11, 2020
Amended Proposal for Decision Issued:	December 14, 2020

APPEARANCES:

For Applicant:

NGL Water Solutions Permian, LLC:

George C. Neale (Attorney) – Austin, Texas
Christopher S. Hotchkiss (Attorney) – Austin, Texas
Rick Johnston (Professional Engineer)
Tim Jurco (Vice President)
Joe Vargo (Regulatory Manager)
Matthew Hoffman (Supervisor, IPT)
Cole Lane (Vice President)
Neel Duncan (Manager, IPT)

For Protestant:

PA Prospect, LLC

Mr. Wesley McGuffey (Attorney) – Hance Scarborough, L.L.P.
Jim M. Clark P.E (Engineer)
Jimmy Jones
Barton Jehny

Interested Party:

Republic EES, LLC:

Jay Stewart (Attorney) – Hance Scarborough, L.L.P.

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I. Statement of the Case[1]

NGL Water Solutions Permian, LLC (Operator No. 609265) ("NGL" or "Applicant") filed an application ("Application") for a commercial disposal permit pursuant to Statewide Rule 9,[2] to dispose of oil and gas waste by injection into a formation not productive of oil and gas on the Hwy 302 (45197) Lease ("Lease"), Well No. 2 ("proposed disposal well"), in the Wheat Field (Field No. 96742001), in Reeves County, Texas. NGL requested a permit be issued for the proposed disposal well granting authority to dispose of 50,000 barrels per day ("bpd") at a subsurface depth of 4,500 feet to 7,000 feet, within the Bell Canyon, Cherry Canyon and Brushy Canyon formations, also known as the Delaware Mountain Group ("DMG").

After review was deemed administratively complete by the technical staff of the Railroad Commission of Texas ("Commission"), details about NGL's nearby saltwater disposal Well No. 1 on the Hwy 302 Lease ("Well No. 1") began to show signs that it could be causing a conduit for the vertical migration of injected fluids to the base of useable-quality groundwater ("BUQW").

The Application is protested by PA Prospect, LLC ("PA Prospect" or "Protestant"), who operates a permitted brine mining well within one-half mile of the proposed disposal well. In addition, Republic EES, LLC, ("Republic") has been identified as an interested party for the case.[3]

PA Prospect identified several reporting failures relating to the operation of Well No. 1 for an unknown period of time prior to the Application's administrative review. PA Prospect argued that Well No. 1 is a conduit for injected fluids from the proposed disposal well. PA Prospect presented evidence of numerous regulatory compliance and mechanical failures by NGL, as well as evidence of NGL's inaccurate reporting on the status of Well No. 1 to the Commission. NGL does not argue that the well had a back-side channel, from the injection interval to the Bradenhead, but claims it has been remediated by its plugging. PA Prospect disagrees the channel is remediated, and Well No. 1 provides an existing conduit out of the injection interval classifying it as an unfixable "problem well."

On November 19, 2019, the Examiners recommendation to deny the Application was submitted at a conference of the Commission duly noticed for that date. Immediately prior to the November 19, 2019 conference, NGL plugged Well No. 1 and the form W-3 was approved by the district office. Prior to plugging, NGL admitted, on the record, that

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[1] The transcript for the pre-hearing conference held on January 11, 2019 or April 30, 2019, is referred to as "PHC Tr. [pg:ln(s)]." and the transcript for the hearing held on May 10, 2019, is referred to as "Hearing Tr. [pg:ln(s)]". The Transcript for the hearing on remand is referred to as "Hearing Tr. Vol. 2 [pg:ln(s)]". Applicant's exhibits are referred to as "PHC NGL Ex. [exhibit no]." or "Hearing NGL Ex. [exhibit no]." or "Rehearing NGL Ex. [exhibit no]."; Protestant's exhibits are referred to as "PHC PA Prospect Ex. [exhibit no]." or "Hearing PA Prospect Ex. [exhibit no] or; Rehearing PA Prospect Ex. [exhibit no] . Republic's exhibits are referred to as "PHC Republic Ex. [exhibit no]." or "Hearing Republic Ex. [exhibit no]."

[2] Statewide Rule (SWR) 9 refers to 16 Tex. Admin. Code § 3.9.

[3] Republic attended the proceedings but did not present argument or evidence in this matter.

Well No.1 was a conduit for injected fluids. The matter was remanded by the Commissioners to the Hearings Division to reopen the record and take evidence, "for the purpose of determining the extent to which the plugging of this well will prevent the escape of injected fluids from the proposed injection interval."[4]

Based on the evidence presented in the hearing on the merits and at the continuation of that hearing on remand, the Technical Examiner and Administrative Law Judge ("Examiners") recommend denial of NGL's Application. There is substantial evidence in the record showing that extensive and unusual corrosion damage to the casing of Well No. 1, for an extended period, caused damage to the halite and anhydrite confining strata in the near-wellbore area and created a back-channel conduit outside of the casing for fluids to migrate to the BUQW. At least four unsuccessful attempts by NGL to repair Well No. 1 to remedy the back-channel conduit and to alleviate the Bradenhead pressure[5] demonstrate that the plugging of Well No. 1 does not adequately prevent migration of injected fluids between the injection interval and the BUQW within the one quarter-mile area of review, due to the back-channel conduit that formed between the cemented casing and the adjacent formations. While plugging Well No. 1 now prevents the wellbore itself from being a conduit for the migration of injection fluids, Applicant failed to present evidence sufficient to show that the back-channel conduit located outside of the wellbore was fully remediated by the plugging operations.

II. Notice and Jurisdiction

NGL's Application for a commercial disposal well was published on June 21, 2018 in the *Pecos Enterprise*. The publication discussed the proposed disposal well, the well location, legal authority and notice of public hearing.

On December 19, 2018, the Hearings Division of the Commission sent a Notice of Prehearing Conference ("Notice") via first-class mail to Applicant and affected persons setting a pre-hearing conference date of January 11, 2019.[6] The Notice contains (1) a statement of the time, place, and nature of the pre-hearing conference; (2) a statement of the legal authority and jurisdiction under which the hearing is to be held; (3) a reference to the particular sections of the statutes and rules involved; and (4) a short and plain statement of the matters asserted.[7] The pre-hearing conference was held on January 11, 2019. It is noted that a second pre-hearing conference was held on April 30, 2019, to address outstanding motions and matters preliminary to the hearing on the merits. Applicant and the Protestant appeared and participated at both pre-hearing conferences.

At the pre-hearing conference on April 30, 2019, the parties agreed to commence the hearing on the merits on May 10, 2019. The hearing on the merits was held on May 10, 2019. Applicant and Protestant attended and participated in the hearing on the merits.

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[4] NGL Rehearing Ex. 1.

[5] Bradenhead pressure is defined as pressure between production casing and surface casing as measured from the well head.

[6] *See* Notice of Pre-Hearing Conference issued December 19, 2018.

[7] *See* Tex. Gov't Code §§ 2001.051, .052; 16 Tex. Admin. Code §§ 1.41, 1.42, 1.45, 3.9.

Republic appeared as an interested party but did not offer argument or evidence on the record. Consequently, all parties received more than 10 days' notice of the hearing and an opportunity for hearing.

III. Applicable Law

Tex. Water Code § 27.031 states:

> PERMIT FROM RAILROAD COMMISSION. No person may continue using a disposal well or begin drilling a disposal well or converting an existing well into a disposal well to dispose of oil and gas waste without first obtaining a permit from the railroad commission.

Tex. Water Code § 27.051(b) states:

> (b) The railroad commission may grant an application for a permit under Subchapter C[8] in whole or part and may issue the permit if it finds:
>
> (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.[9]

Consistent with the Texas Water Code, Statewide Rule 9 (16 Tex. Admin. Code § 3.9 states the following:

> 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 16 Tex. Admin. Code § 3.9, Texas Water Code, Chapter 27, and Title 3 of the Natural Resources Code. Pursuant to the Texas Water Code § 27.051(b):
>
> The Railroad Commission may grant an application for a permit under Subchapter C in whole or part and may issue the permit if it finds:

[8] Subchapter C of the Texas Water Code authorizes the Commission to issue permits for injection wells used to dispose of oil and gas waste. *See, e.g.,* Tex. Water Code § 27.031.

[9] Section 27.073 of the Texas Water Code authorized the Commission to require financial assurance in order to issue an injection well permit. Statewide Rule 78 does require financial assurance for operators of disposal wells. *See, e.g.,* Tex. Admin. Code § 3.78(a)(6), (d), (g).

(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.

IV. Discussion of the Evidence

A. Applicant's Evidence

1. Application

NGL requested commercial disposal authority pursuant to Statewide Rule 9 to inject oil and gas waste into a porous formation not productive of oil and gas for the proposed disposal well, Wheat Field, Reeves County, Texas. The proposed disposal well has not been drilled at the time of the hearing, but a permit to drill (W-1) the well was received by the Commission on June 8, 2018. The drilling permit states the proposed vertical well is designated as API No. 42-389-37245 and is 7,000 feet deep.

NGL submitted Commission Form W-14, the Application on July 2, 2018, seeking to dispose of oil and gas waste by injection into a formation not productive of oil and gas under Statewide Rule 9. The Application indicates the proposed injection interval is from 4,500 to 7,000 feet, which correlates to the Bell Canyon, Cherry Canyon, and Brushy Canyon formations, also known as the Delaware Mountain Group. On October 2, 2018, the Application was determined to be administratively complete by the Commission's technical staff, but a protest from PA Prospect was received prior to that time, necessitating a hearing.

NGL seeks authority in the Application to inject a maximum daily volume of 50,000 bpd at a maximum surface injection pressure of 2,250 psig.[10] In response to the Commission's request during the review of the Application, NGL performed an injectivity test on NGL's Well No. 1, which has a similar well design and is located about 1,100 feet distance from the proposed disposal well. The injectivity test results indicate a maximum pump-in rate at 55,000 bpd sustained for approximately 30 minutes.[11]

It should be noted that the Application included a seismicity study within a 100 square mile area of the proposed disposal well. The study indicated that no seismic activity had been recorded in the study area as far back as 1970.[12]

[10] Hearing NGL Ex. No. 1.

[11] Hearing Tr. Pg. 27, Lns. 21-25.

[12] Hearing NGL Ex. No. 4.

2. Notice and Protest

Notice of the Application was provided to operators and adjoining surface owners within a one half-mile radius of the proposed disposal well, which included PA Prospect, LLC, the protestant for the case. Notice was not originally sent to Republic due to NGL's lack of knowledge of a transfer of a portion of the rights of PA Prospect in the acreage surrounding the proposed well site, but NGL corrected the error by providing supplemental notice on February 13, 2019.[13]

NGL made a motion to dismiss Republic as a competitor. Republic argued that the hearing was already scheduled due to PA Prospect's protest. Accordingly, Republic argued that they were not seeking affected party status but requested to observe the hearing as an interested person instead.[14]

On April 30, 2019, a pre-hearing conference was held at the Commission's offices in Austin, Texas, to consider, among other things, a motion by Protestant to compel discovery from NGL. Protestant claimed that NGL possessed pressure data on Well No. 1 that was not provided in discovery. Republic was present but did not offer any evidence or argument for the record.

The hearing on the merits was held as noticed on May 10, 2019. At the hearing, Applicant appeared and presented evidence by and through its counsel George Neal. In addition, Rick Johnston and Tim Jurco appeared on behalf of the Applicant to offer sworn expert testimony. Applicant provided 16 exhibits at the hearing and four late-filed exhibits in support of the Application. Protestant appeared and presented evidence by and through its counsel, Wesley P. McGuffey. In addition, James M. Clark appeared on behalf of Protestant to offer sworn expert testimony. Protestant provided 14 exhibits at the hearing. Republic was present but did not offer any evidence or argument for the record.

3. Permitted Injection Well No. 1

NGL's Well No. 1 is within 1,100 feet and within the one-quarter mile review area for the proposed disposal well.[15] At the time of the original hearing date, Well No. 1 was shut-in due to Bradenhead pressure issues. Rick Johnston, consulting engineer for NGL and designated expert in the field of petroleum engineering, testified that NGL shut-in the well and initiated a workover on the well to alleviate the Bradenhead pressure.[16] The workover's objective was to address abnormal pressure on the tubing by casing annulus and Bradenhead. Mr. Johnston further testified that NGL pulled the tubing out, set a bridge plug immediately above the permanent packer, and tried to pressure test the casing. [17] The pressure test failed.[18] Further evaluation was performed by setting packers at various

[13] Hearing Tr. Pg. 37, Lns. 1-25; Hearing NGL Ex. No. 10.

[14] Hearing Tr. Pg. 95, Lns. 1-25.

[15] Hearing Tr. Pg. 21, Lns. 15-25.

[16] Hearing Tr. Pg. 21, Lns. 1-25.

[17] Hearing Tr. Pg. 61, Lns. 1-25.

[18] *Id.*

depths while moving the bridge plug to test segments of the casing.[19] Results of the testing established the existence two sets of holes in the casing.[20] The "upper holes" were found between 1,838 and 2,033 feet. The "lower hole" was found between 4,827 and 4,860 feet.[21]

Mr. Johnston testified that when the Application was filed, it was known that Well No. 1 was experiencing problems and that a workover rig had been sent to the well location in May 2018 to address and attempt to eliminate the Bradenhead pressure.[22] Mr. Johnston also testified that during the workover, they tried to remedy the Bradenhead pressure by bleeding off the pressure, but it had some flow of saltwater:

> They closed the valve in, and the pressure built back up. That's an indication that you probably don't have confinement of the injected fluids. Something is happening on the outside of the production casing to allow flow that will put pressure on the surface casing outside of the production casing.[23]

Mr. Johnston testified that Bradenhead pressure is usually associated with some sort of cement job failure or an adjacent injection well's effect on a well with no cement and the pressure makes it to the surface.[24] "[T]o have pressure and the pressure to build back up, in my mind, we have some connection of the Bradenhead to the injection interval."[25] Mr. Johnston confirmed that the workover efforts revealed the existence and location of holes in the casing.[26] In addition, Well No. 1 failed a mechanical integrity test.[27] Mr. Johnston ascribed these problems with the well casing to corrosion.[28]

Mr. Johnston asserted that the problems with Well No. 1 would not have been an issue with the administrative review of the Application. Issues with the Well No. 1 would be separate issues not related to the proposed disposal well and should not affect the permitting of the proposed disposal well under the Application.[29] NGL recommended a special condition in the proposed disposal well Permit that requires repairing or plugging the Well No. 1 to remove the existing conduit.[30]

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[19] Hearing Tr. Pg. 86, Lns. 9-20.

[20] *Id.*

[21] Hearing Tr. Vol. 2 Pg. 28, Lns. 3-5.

[22] Hearing Tr. Pg. 61, Lns. 1-25.

[23] Hearing Tr. Pg. 59, Lns. 12-25.

[24] Hearing Tr. Pg. 60, Lns. 13-18.

[25] Hearing Tr. Pg. 60, Lns. 21-25.

[26] Hearing Tr. Pg. 86, Lns. 14-25.

[27] Hearing Tr. Pg. 61, Lns. 18-20.

[28] *Id.*

[29] Hearing Tr. Pg. 198, Lns. 1-25.

[30] Hearing Tr. Pg. 64, Lns. 10-25.

4. Geology and Resource Development

In the hearing, Mr. Johnston testified about the geology around Well No. 1 by using a density neutron log to support his conclusions. Using the density neutron log, he identified the log's signature that matched the casing shoe depth and asserted that the top of the halite (sodium chloride, commonly known as rock salt or salt) and anhydrite (calcium sulfate) formation was about 2,270 feet MD (measured depth).[31] Mr. Johnston claims that borehole caliper readings in the anhydrite section of the formation differentiate halite stringers from anhydrite sections. Anhydrite is less soluble than halite, therefore the washouts on the Density Neutron log caliper reading should correlate to halite, not anhydrite.[32]

Mr. Johnston indicated that the Delaware Mountain Group top appears around 4,290 feet.[33] He contended that, entering the Delaware Mountain Group, an increase in density/porosity can be observed on the density neutron log. He noted that shallower, in the halite and the anhydrite formation, you have no porosity and appears solid by the signature:

> If it's salts its solid, crystal and salt, no porosity, no permeability. If it's the anhydrite it's just solid; calcium sulfate, no permeability, no porosity. It's just crystalline and then the top of our proposed disposal interval in the pending application is at 4,500 feet, and then as you page forward you can see the porosity development that's the target of the proposed disposal.[34]

5. Protection of Useable Quality Water Aquifers

A letter dated June 29, 2018, from the Commission's Groundwater Advisory Unit, estimates the BUQW is at 1,450 feet,[35] which correlates to the base of the Rustler formation.[36] Commission Form W-14, lists planned surface casing for the proposed disposal well to be set at 1,700 feet, which is deeper than the BUQW and protective of fresh groundwater.

Mr. Johnston indicated that NGL plans on accomplishing compliance with Statewide Rule 9 by running a 10 3/4-inch surface casing to 1,700 feet and cementing the casing back to the surface.[37] In addition to the surface casing, Mr. Johnston testified that NGL plans on running a 7 5/8-inch production casing in Well No. 1 to 7,000 feet with a DV tool at 4,500 feet and running cement up to 2,000 feet from the DV tool, which will be protective of the halite and anhydrite formation at 2,270 feet.[38]

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[31] Hearing Tr. Pg. 30, Lns. 14-25.

[32] Hearing Tr. Pg. 31, Lns. 1-25.

[33] Hearing Tr. Pg. 32, Lns. 17-25.

[34] Hearing Tr. Pg. 33, Lns. 1-10.

[35] Hearing Tr. Pg. 20, Lns. 21-25.

[36] Hearing NGL Ex. No. 2.

[37] Hearing Tr. Pg. 21, Lns. 1-25; Hearing NGL Ex. No. 1.

[38] *Id.*

6. Permit Special Conditions

At the first hearing, NGL conceded that Well No. 1 was a "problem well" and a conduit.[39] "[W]hen I say 'a problem well,' it can act as a conduit to let our injected fluids in the No. 2 escape the interval."[40] Prior to the remand order, Applicant requested a special permit condition that Well No. 1 either be repaired to mitigate the Bradenhead pressure known to be occurring at the time or that the well be plugged if it could not be repaired. [41] Because Well No. 1 is plugged, this request is now moot.

7. Nearest Production Wells

NGL indicated in the first hearing that WPX Energy Permian, LLC ("WPX") has horizontal laterals that pass underneath the one-half mile area of review but have no penetration of the disposal interval. WPX is not a protestant to the Application. Mr. Johnston testified that the WPX laterals are separated vertically from the disposal interval by approximately 1,000 feet:

> They [WPX] have a handful of horizontal laterals that are up to the northwest. While those laterals run through the half-mile circle these are wells that are horizontal wells that are landed well below the disposal interval. They don't have a vertical penetration of the disposal interval within the half mile. [42]

In addition, PA Prospect has a brine mining well within the one half-mile area of review, but Mr. Johnston suggested that these should not be considered penetrations of the disposal interval:

> PA Prospect operates a brine mining well . . . and then you can see the NGL Highway 302 No. 1 [Well No. 1]. So, the only penetration of the disposal interval within a half a mile is the other NGL Highway 302 No. 1 Well [Well No. 1].[43]

8. Rule Requirements

NGL provided Commission records showing their active P-5 status required by Statewide Rule 80, along with a financial assurance amount of $50,000 required by Statewide Rule 78. [44]

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[39] Hearing Tr. Pg. 199, Lns. 2-7.

[40] Hearing Tr. Pg. 64, Lns. 15-25.

[41] Hearing Tr. Pg. 22, Lns. 1-25.

[42] Hearing Tr. Pg. 23, Lns. 1-25.

[43] *Id.*

[44] Hearing NGL Ex. No. 11.

NGL asserts that the proper safeguards have been put in place and will not endanger oil and gas or mineral formations associated with the injection interval. Mr. Johnston claims that the proposed disposal well complies with Statewide Rule 9. [45]

Mr. Johnston testified as to industry need for the proposed well, noting that such need would increase if Well No. 1 was plugged:

> And certainly, depending on how the workover goes on the No. 1 Well, if things go badly and they have to plug the well, clearly, they are going to need this well to replace it.[46]

Tim Jurco, vice president for NGL and designated expert for NGL on water disposal, also testified as to industry need at the first hearing. He asserted that demand for disposal wells in the area demonstrates a public interest in the installation of the proposed disposal well.[47] Documented evidence of this industry need included a contractual agreement for NGL to provide at least 35,000 barrels of water per day capacity to RKI Exploration and Production, LLC.[48] In addition, Mr. Jurco's testimony was supplemented by an affidavit which indicates a need for the proposed disposal well.[49]

9. Hearing on Remand

Mr. Johnston again testified on behalf of NGL at the reopened hearing on March 11, 2020. Mr. Johnston opined that the plugging work performed on Well No. 1, in August and September 2019, after the issuance of the proposal for decision, was successful in remediating the conduit.[50]

Mr. Johnston testified that he prepared the Commission form W3-A, *Notice of Intention to Plug and Abandon*, for Well No. 1.[51] Mr. Johnston then presented daily activity reports from the workover rig crew spanning sixteen days of rig time.[52] Mr. Johnston stated that the crew had trouble spotting the first cement plug. It took the crew five attempts to spot the plug satisfactorily and to stay at the required depth in the permeable Delaware Sands.[53] NGL assumed that any conduit behind the pipe would be in communication with the top set of perforations and tried to leave them open to pump cement out of and intersect the channel.[54]

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[45] Hearing Tr. Pg. 44, Lns. 1-25.

[46] *Id.*

[47] Hearing NGL Ex. No. 15.

[48] Hearing Tr. Pg. 49-50, Lns. 1-25.

[49] Hearing Tr. Pg. 47, Lns. 1-25.

[50] Hearing Tr. Vol. 2, Pg. 16, Lns. 4-5.

[51] NGL Rehearing Ex. 3.

[52] NGL Rehearing Ex. 4.

[53] Hearing Tr. Vol. 2 Pg. 22, Lns. 12-15.

[54] Hearing Tr. Vol. 2 Pg. 22. Lns. 22-25.

According to Mr. Johnston, on day 12, the crew pumped 1,000 sacks below the retainer at 4,100 feet and spotted 200 feet of cement on top of the retainer (Plug No. 2, referred to as, "the big squeeze").[55] NGL Rehearing Exhibit 5 is the Commission Form W-3, *Plugging Record*, signed and approved on October 8, 2019.[56] Mr. Johnston created a volumetric analysis of the cementing operation to demonstrate that 858.9 sacks (1,168 cubic feet) of cement must have been pumped out of the perforations.[57]

> So we pumped a tremendous amount of cement. Our thinking is that it went out, and if there's any sort of a channel the path of least resistance is going to be to go shallower up the channel, and we believe that channel has been eliminated.[58]

Mr. Johnston opined that the acceptance of the plugging report demonstrates that the Commission recognizes the well as being successfully plugged.[59]

Mr. Johnston next presented pages from the McGraw-Hill Encyclopedia of Geologic Sciences in an effort to show that the back-channel conduit could not cause a cavern by the dissolution of the anhydrites that make up the confining interval above the perforations in the No. 1 well. [60] Mr. Johnston stated as his expert opinion that anhydrites are "only soluble in acids and only slightly soluble in water."[61] Mr. Johnston presented a well log from the No. 1 well showing that, in the range of the casing where the "upper holes" were found, 1,833 to 2,030 feet, the borehole is relatively in gauge, the density curve is very high, and the Neutron curve is reading a very low porosity value indicative of anhydrite.[62] In contrast, from 2,500 feet to 2,535, the hole is over gauge, the density is low, and the neutron curve is reading very high demonstrating "textbook salt."[63] The "lower hole" in the casing (as distinguished from the intentional perforations) is in the Delaware Sands, i.e., in the disposal interval, at 4,850 feet.[64] Mr. Johnston supplemented his formation interpretation with a reference materials providing identification of bulk density responses consistent with the values reported on the well log.[65] It was his expert opinion that the anhydrites provides an upper confining interval that would be unlikely to be dissolved by injected fluids.

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[55] Hearing Tr. Vol. 2 Pg. 23, Lns. 7-13.

[56] NGL Rehearing Ex. 5.

[57] NGL Rehearing Ex. 6.

[58] Hearing Tr. Vol. 2 Pg. 26, 3-8.

[59] Hearing Tr. Vol. 2 Pg. 27, Lns. 2-7.

[60] NGL Rehearing Ex. 9.

[61] Hearing Tr. Vol. 2 Pg. 30, Lns. 23-24.

[62] Hearing Tr. Vol. 2 Pg. 32-33, Lns. 21-25, 1-5.

[63] Hearing Tr. Vol. 2 Pg. 33, Lns. 13-14.

[64] Hearing Tr. Vol. 2 Pg. 36, Lns. 11-14.

[65] NGL Rehearing Ex. 11.

Following Mr. Johnston's testimony, Mr. Matthew Hoffman, appeared and provided testimony on behalf of NGL. Mr. Hoffman was the supervisor from Integrated Petroleum Technologies ("IPT"), during the remediation and plugging efforts.[66] Mr. Hoffman was not on-site during these operations but was the direct report of the well-site supervisor.[67] Mr. Hoffman testified that the well is properly plugged.[68] He further testified that the plugging operation originally proposed to the district office was modified when the rig crew could not pump into perforations at 900 ft, at 2,000 psi with no bleed-off of pressure.[69] After Mr. Hoffman sent an email to that effect to the district office, Kolby Durham verbally dictated to Mr. Hoffman to spot a 30-sack plug from 950 feet to 650 ft, wait on the cement and to tag the top of cement.[70] The procedure was performed, as stated, and the plugging operation resumed.[71]

Mr. Hoffman testified that that during the "big squeeze" the crew attempted to bleed off pressure but the well continued flowing.[72] It was the crew's interpretation that retarder in the cement was causing the cement to dry more slowly and the system begin to "u-tube," indicating it was not set.[73] The crew left it overnight, bled the pressure off again, recovering less than one barrel, and the pressure dissipated indicating the cement had set.[74] Mr. Hoffman stated his belief that the plugging was successful in that it went as planned with Commission guidance.[75] He expanded on this by testifying it is his opinion that the channels would have been eliminated.[76]

Mr. Neel Duncan, Petroleum Engineer, manager, and part of the ownership team of IPT, was the final witness for NGL at the hearing on remand. Mr. Duncan did not dispute that the well was suffering from Bradenhead pressure issues prior to plugging. Mr. Duncan testified that the decision to raise the cement squeeze volume from 700 sacks, commission approved volume to 1000 in contemplation of the existence of the proposed well.[77] It is Mr. Duncan's opinion that the four previously failed squeeze jobs discussed at the hearing were not failures because each reduced the Bradenhead pressure somewhat.[78] On cross-examination, Mr. Duncan did admit that no tests were performed after the big squeeze to verify the job was ultimately successful in remediating the back-channel conduit.[79] Mr. Duncan did not think that such testing was necessary because

[66] Hearing Tr. Vol. 2 Pg. 46, Lns. 9-13.

[67] Hearing Tr. Vol. 2 Pg. 47, Lns. 11-18.

[68] Hearing Tr. Vol. 2 Pg. 49, Lns. 14-21.

[69] NGL Rehearing Ex. 14.

[70] Hearing Tr. Vol. 2 Pg. 51, Lns. 8-16.

[71] Hearing Tr. Vol. 2 Pg. 52, Lns. 4-8.

[72] Hearing Tr. Vol. 2 Pg. 53, Lns. 12-16.

[73] Hearing Tr. Vol. 2 Pg. 53, Lns. 18-24.

[74] Hearing Tr. Vol. 2 Pg. 54, Lns. 3-5.

[75] Hearing Tr. Vol. 2 Pg. 64, Lns. 17-20.

[76] Hearing Tr. Vol. 2 Pg. 65, Lns. 2-5.

[77] Cite to Transcript

[78] Cite to Transcript

[79] Cite to Transcript

going to the "source" of the conduit was always successful in his experience.[80] It was Mr. Duncan's opinion that testing a squeeze of this volume and plugging job for back-channel conduit remediation is not usually done, but relies on the volume of cement to assume a successful remediation:

> If it was a plugging well, no. That is typically not done because you pump so much volume that you expect to solve a channel problem.

B. Protestant's Evidence

The Application to permit the proposed disposal well is protested by PA Prospect, LLC. PA Prospect indicated that they operate a brine mining well within one-half mile of the proposed Well No. 2,[81] and disagree that the Application is sound .[82] Protestant further indicates that the information in the Application is false due to NGL's failure to produce critical documents to the Commission in this case.[83] Protestant also claims that the Application does not meet the permitting requirements of Rule 9 due to the conduit associated with Well No. 1, located within a quarter-mile of the proposed disposal well.[84] Protestant asserts that NGL has not met its burden of proof that the conduit behind casing on Well No. 1 has been remediated.

1. NGL Well No. 1

Jim Clark, a consulting engineer for PA Prospect and designated expert in the field of petroleum engineering, testified that Well No. 1 was drilled in 2014 and is severely damaged by corrosion.[85] The severe corrosion in the annular area would not be expected with a wellbore that is only for four years old. [86] Mr. Clark testified that the well should not be subject to corrosion because not only is it above the packer, it is in an area of the wellbore that should have contained corrosion-inhibiting, treated water.[87]

2. Well Annulus Pressure

Mr. Clark testified that corrosion and holes in the tubing and casing resulted in Bradenhead pressure exceeding 1,000 pounds per square inch, gauge ("psig"). On April 22, 2018, NGL pressure tested Well No. 1, and determined that tubing pressure was 1,150 psig; casinghead pressure was 1,100 psig; and Bradenhead pressure was 1,000

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[80] Cite to Transcript

[81] Hearing Tr. Pg. 180, Lns. 23-25.

[82] Hearing Tr. Pg. 16, Lns. 7-25.

[83] *Id*.

[84] Hearing Tr. Pg. 16, Lns. 17-24; Hearing Tr. Pg. 126, Lns. 14-25.

[85] Hearing Tr. Pg. 127, Lns. 1-25.

[86] *Id.*

[87] Hearing Tr. Pg. 158, Lns. 1-25.

psig. The pressure tests performed by NGL documented that communication developed between the well's production casing and tubing, as well as Bradenhead pressure.[88]

Mr. Clark testified that pressure clearly developed on the Bradenhead on the production casing and tubing annulus at least by April 22, 2018, and probably before.[89] This would mean that NGL violated Statewide Rule 3.17, which requires,

> Whenever pressure develops between any two strings of casing, the district office shall be notified immediately. . . . Any well showing pressure on the Bradenhead . . . the well shall be killed, and pump pressure applied through the tubing head. Should pressure gauge on the Bradenhead reflect the applied pressure the casing shall be condemned, and a new production or oil string shall be run and cemented.[90]

3. Well No. 1 Injection Test

Bradenhead pressure was discovered on Well No. 1 on or before April 22, 2018. On April 26, 2018, an injectivity test was performed which documented a maximum pressure during the test of 2,290 psig.[91] Well No. 1 was shut-in on April 29, 2018, about 3 days after the injectivity test and about 7 days after discovery of the Bradenhead pressure. Mr. Clark argued that Mr. Johnston's testimony indicated that it was not prudent to continue to operate the well and conduct a maximum capacity injectivity test with Bradenhead pressure.

Mr. Clark also testified that Bradenhead pressure indicates that fluid is escaping from the permitted interval.[92] The injectivity test that was performed on Well No. 1 could not prove maximum injectivity capability because some of this injected fluid was going outside of the permitted injection interval through holes in the casing. Therefore, Mr. Clark thought it unlikely that the injectivity test supports a valid 50,000-bpd maximum injection rate.[93]

4. Well No. 1 Workover

In response to the Bradenhead pressure documented on April 22, 2018, by the pressure test of Well No. 1, NGL performed a workover in May 2018.[94] Mr. Clark testified that the workover resulted in NGL detecting a hole in the (4 ½ inch) tubing and two holes in the (7 5/8 inch) casing, with the first hole located between 1,838 and 2,033 feet and the second hole located between 4,827 and 4,860 feet.[95] Another "shallow" hole was

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[88] Hearing Tr. Pg. 80, Lns. 1-8.

[89] Hearing Tr. Pg. 134, Lns. 1-6.

[90] 16 Tex. Admin. Code §3.17; Hearing Tr. Pg. 134, Lns. 18-25.

[91] Hearing Tr. Pg. 134, Lns. 2-5.

[92] Hearing Tr. Pg. 134, Lns. 11-12.

[93] Hearing Tr. Pg. 139, Lns. 1-25.

[94] Hearing PA Prospect Ex. No. 10.

[95] Hearing Tr. Pg. 141, Lns. 1-25; Pg. 166, Lns. 1-25.

found in a tubing collar at about 1,867 feet.[96] Mr. Clark stated his opinion that these holes are the likely source of the premature corrosion of the casing for Well No. 1:

> There was a hole in the tubing probably starting internally, worked its way externally, and then you've got flow in that annular area of your injection fluids and that's causing corrosion of that annular area . . . .You've got your saltwater injection now going basically where it's not supposed to go in this annular area, and that's what's causing the corrosion.[97]

5. Well No. 1 Cement Squeezes

Four cement squeezes were performed during the workovers noted above to try to plug the holes in the casing, prior to NGL decided to plug and abandon Well. No. 1. The first squeeze was to cement the lower hole in the casing between 4,827 and 4,860 feet and the second squeeze was for the upper hole between 1,838 and 2,033 feet in the casing.

During the first cement squeeze, NGL pumped about 250 barrels of mud down the tubing, expecting to circulate the mud from the bridge plug to the surface through the annular space between the tubing and casing. The workover report indicates that circulation to the surface did not occur, which appears to indicate the mud was exiting through one of the holes in the tubulars.[98]

The second cement squeeze used 85 barrels of cement to fill the well's annular space, but the workover report indicates it should have been only 18 barrels, which suggest that a large void was filled or partially filled.[99] Mr. Clark testified that the workover report indicates that the cement was circulated to surface which contradicts another entry in the workover log that indicates it was not circulated to surface.[100] Mr. Clark testified that the workover report indicates the shallow holes in the casing did not hold pressure after the cement squeeze attempts.[101] After it was shown that the "shallow" squeeze did not hold pressure, there was no additional testing of the deeper squeeze.[102]

Further workovers and cement squeezes were performed in May 2019 and June 2019. In May 2019, 400 sacks were squeezed at 3,250 feet.[103] Another workover took place in June of 2019.[104]

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[96] Hearing Tr. Pg. 142, Lns. 8-25; Hearing PA Prospect Ex. No. 10.

[97] Hearing Tr. Pg. 144, Lns. 21-25.

[98] Hearing Tr. Pg. 162, Lns. 1-25.

[99] Hearing Tr. Pg.159, Lns. 1-21, Pg.163, Lns. 4-25

[100] Hearing Tr. Pg.159, Lns. 1-21, Hearing Tr. Pg.166, Lns. 10-18

[101] Hearing Tr. Pg. 141, Lns. 10-12.

[102] Hearing Tr. Pg. 159-160, Lns. 1-25.

[103] PA Prospect Rehearing Ex. 4.

[104] PA Prospect Rehearing Ex. 5.

6. Regulatory Requirements

Mr. Clark further testified that NGL did not comply with Well No. 1's permit standard conditions, specifically Standard Conditions Nos. 2(b), 3, and 6 summarized below: [105]

- Permit Standard Condition 2(b) requires NGL to notify the Commission's District Office no less than 48 hours prior to beginning any workover or remedial operations. The Protestants claim NGL failed to perform the notification required by their Permit;

- Permit Standard Condition Nos. 3, requires the wellhead to have a pressure observation valve on the tubing to monitor the annulus of the well.[106] The Protestants claim NGL failed to have a pressure observation valve on the tubing required by their Permit;

- Permit Standard Condition No. 6, requires NGL to file the appropriate forms within 30 days after completion, conversion to disposal or any workover that changes the well completion. Mr. Clark claim that NGL failed to provide the Commission with updated forms as required by their Permit after the workover in May 2018. Mr. Clark testified that a Form W-2 was not filed timely to show the completion status of the Well and therefore the Commission did not have the information for the Application filed on July 2, 2018 to perform an adequate application review within the one-quarter mile review area. In addition, an updated Form W-2 was eventually updated on April 27, 2019. Mr. Clark testified that the updated Form W-2 omitted information about the acid fracture, cement squeeze, and cast-iron bridge plug. In addition, Mr. Clark claims that NGL also omitted information in their Form W-15 (Cement Report) which was signed on April 26, 2019 and attached to the W-2. He contends there is a discrepancy with the cement squeezes in the Form W-15, which indicates that cement was circulated to surface on May 18, 2018, which Mr. Clark asserts did not occur based on the workover report.[107]

PA Prospect claimed that NGL's failure to comply with the permit standard conditions for Well No. 1 affected the Application because the updated Commission Form W-2 dated April 27, 2019, for Well No. 1 was not available for part of the Commission's administrative application review.[108] PA Prospect argued further that the failure to provide this information to the Commission led to a failure to consider the existence of a conduit documented by the workover report within the Application's area of review.[109] "[I]f the Administrative Staff had been aware of the problems with Well No. 1, I don't think [the Application] would have made it up to the Hearings Division," according to Mr. Clark. [110]

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[105] Hearing Tr. Pg. 127-128, Lns. 1-25.

[106] Hearing Tr. Pg. 127, Lns. 12-25.

[107] Hearing Tr. Pg. 165-166, Lns. 1-25. PA Prospect Ex. Nos. 11 and 12.

[108] Hearing Tr. Pg. 129, Lns. 8-25.

[109] *Id.*

[110] Hearing Tr. Pg. 178, Lns. 1-25.

In addition to the compliance failures discussed above, Mr. Clark claimed that the H-10 report for Well No. 1 also shows errors. He testified that the H-10 report shows the maximum injection pressure to be 1,300 psig for April 2018, but NGL ran an injectivity test in April 2018 with a documented maximum pressure during that test of 2, 290 psig.[111] Also, in April 2018, they reported zero (0) psig for the annulus pressure between tubing and casing on the H-10 report, but information from the pressure test conducted on April 22, 2018, shows a psig of 1,050 on the surface casing annulus during testing.[112]

Protestant contended that the relevance of NGL's compliance failures with the permit's standard conditions affect PA Prospect as an operator of the adjoining brine mining well that produces saturated brine for use in oil and gas drilling operations.[113] Mr. Clark testified that PA Prospect is reliant on the permit's standard conditions to protect its well's brine zone.[114]

7. Existing Conduit

Mr. Clark testified that Well No. 1 intersects a halite and anhydrite formation from 1,870 feet to the base at 4,214 feet deep, the same interval PA Prospect is mining.[115] As noted above, injection fluid exited the well through a hole in the (7 5/8 inch) casing into the halite and anhydrite formation somewhere between 1,838 and 2,033 feet.[116] The halite, and to a lesser extent, anhydrite dissolve into solution, which causes unintentional solution mining in the same interval that PA Prospect is mining with its brine mining operation.[117]

Mr. Clark maintained in this testimony that fluids exiting the casing likely leached some salt and anhydrite of an undetermined volume around the wellbore. Mr. Clark stated his opinion that the dissolution cavern possibly created by the casing failure of Well No. 1 is too large to properly repair.[118] Given the previous failed attempts to repair or mitigate the problems with Well No. 1, Mr. Clark stated his belief that plugging the well will not eliminate the conduit.[119] He also noted that NGL essentially conceded that Well No. 1 is a likely conduit within one-quarter mile of the proposed well if the admitted problems with the casing cannot be repaired or rendered safe.[120]

Moreover, Mr. Clark pointed to the fact that, prior to plugging, there was still Bradenhead pressure on Well No. 1 and therefore some degree of communication exists

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[111] Hearing Tr. Pg. 136, Lns. 1-6.

[112] Hearing Tr. Pg. 136, Lns. 15-20.

[113] Hearing Tr. Pg. 180, Lns. 1-5.

[114] Hearing Tr. Pg. 129, Lns. 1-7.

[115] Hearing Tr. Pg. 149, Lns. 8-17.

[116] Hearing Tr. Pg. 150, Lns. 1-25.

[117] Hearing Tr. Pg. 151, Lns. 1-25.

[118] Hearing Tr. Pg. 152, Lns. 1-25.

[119] *Id.*

[120] Hearing Tr. Pg. 178, Lns. 1-7.

between the surface and the injection interval.[121] Additionally, there is no confirmation that the dissolution of the halite and anhydrite formation have been fixed by the workover cement squeezes, etc.[122]

8. Proposed disposal well Concerns

Mr. Clark testified that NGL's proposed disposal well will utilize the same well design as NGL utilized for Well No. 1, with no significant changes to well specifications.[123] The primary change to the proposed well design is a 5.5-inch tubing for the new well compared to the 4.5-inch tubing for Well No. 1. Mr. Clark explained the increase in the tubing diameter will result in a higher injection rate for the proposed disposal well.[124]

Mr. Clark maintained that Protestant has the same concerns for the Subject Well as they do for Well No. 1, which is the potential communication between the two injection wells through the injection interval. Mr. Clark argues that Well No. 1 remains a conduit for injection fluids to migrate outside of their injection interval. He notes that holes in the casing of Well No. 1 may have potentially acted as perforations outside of the permitted injection interval, similar to an unplugged dry hole.[125]

Lastly, Mr. Clark testified that the injection test performed on Well No. 1, which is a similar well design, does not support a 50,000-bpd maximum injection rate. Since the injectivity test was performed while Well No. 1 had Bradenhead pressure, Mr. Clark argued that the documented corrosion holes adjacent to the halite and anhydrite formation essentially resulted in brine dissolution and the expansion of the injection interval beyond the permitted interval, thus not proving anything about injectivity capability.[126]

Hearing on Remand

Mr. Clark appeared at the reopened hearing and testified again on behalf of Protestant. Mr. Clark presented a chemical analysis of a water sample taken from the Bradenhead.[127] This sample shows to be a saturated brine.[128] Mr. Clark contended that NGL is not injecting saturated brine, but that the brine was saturating from the formation on the back side of the well, by dissolution, on the back side of the well.[129] Mr. Clark performed a study of the fracture gradients at the depth of the "upper holes." He found that the formation was exposed to fracture gradients 53% - 130% higher than what the

[121] Hearing Tr. Pg. 175, Lns. 1-25.

[122] Hearing Tr. Pg. 164, Lns. 1-25.

[123] Hearing Tr. Pg. 184, Lns. 11-21.

[124] *Id.*

[125] Hearing Tr. Pg. 184-187, Lns. 1-25.

[126] Hearing Tr. Pg. 139, Lns. 1-25.

[127] PA Prospect Rehearing Ex. 1.

[128] Hearing Tr. Vol. 2 Pg. 122, Lns. 7-11.

[129] Hearing Tr. Vol. 2 Pg. 122, Lns. 12-15.

formation could withstand[130] and that hydraulic fracturing to usable groundwater has likely occurred. [131]

> Since the surface casing shoe was exposed to these very large pressure gradients, I believe that the injection of this well fracked into usable quality groundwater and that is the outlet path for the solution mining. I mean, I shouldn't call it mining, but the dissolution of the evaporite section that occurred.[132]

Mr. Clark further stated that:

> [t]here's no evidence that the plugging of this well repaired the documented communication between the saltwater disposal interval and the Bradenhead interval that existed on May 30th of 2019. There's cement in the Bradenhead, basically the 10-3/4 by 7-5/8" annulus between the surface and 1,050 feet, but the wellbore remains a potential conduit between the surface casing shoe --between the surface casing shoe and the Delaware Mountain sands for future injection wells in the area. I don't see any evidence that the channel was repaired. They pumped a lot of cement. I don't dispute that. They had already pumped cement in the injection interval and still had the communication.[133]

Mr. Clark provided several ways NGL could have tested whether the back-channel conduit had been remediated.

> Well, if you look at that step on August 30th of 2019 where they have pumped the thousand sacks of cement below the cement retainer, which I think was at 4100 feet or it says 4,086 here, I would have then drilled the plug. After the cement hardened, I would have drilled the plug out, reperforated, established injection again and see if we had any pressure on the Bradenhead again. And if there was no pressure on the Bradenhead then, you know, as you're injecting under pressure, because we've got documented history of this well where there's no Bradenhead pressure at times whether it's sitting idle, but then when you inject into it -- start injecting you get Bradenhead pressure. [134]
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> . . .
> I'm saying they could have and should have tested it, but I think it would have failed. I think it would have still reflected Bradenhead pressure.[135]

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[130] PA Prospect Ex. 3.

[131] Hearing Tr. Vol. 2 Pg. 126, Lns. 17-21.

[132] *Id.*

[133] Hearing Tr. Vol. 2 Pg. 131, Lns. 1-14.

[134] Hearing Tr. Vol. 2 Pg. 145, Lns. 1-15.

[135] Hearing Tr. Vol. 2 Pg. 147, Lns. 14-17.

Mr. Clark further offered a secondary testing method to keep Well No. 1 partially plugged and use it as a monitor well to monitor the Bradenhead pressure.[136]

Regarding the Commission's approval of the well plugging, Mr. Clark took issue with Applicant's assumptions about its effect on the back-channel conduit. "I don't dispute that the well has been plugged in accordance with Railroad Commission standards, but I do dispute that the channel still exists. I mean, I believe the channel still exists. So it's a two-part issue to me."[137] Furthering the differentiation between plugging and proper remediation Mr. Clark states, "The well passed an integrity test and Bradenhead pressure returned. The Commission approved the H-5 but the well was still leaking. Similarly, if the Commission approves a W-3 it doesn't mean the conduit is closed."[138] "This R11 is the daily reports associated with that squeeze, and then R10 shows that there was still Bradenhead, but they did try an injectivity test, passed an H-5 test following that squeeze, reestablished injection in the well and they got the Bradenhead pressure back again."[139] "In fact, I'm aware of three different times this well passed an H-5 test and subsequently showed Bradenhead pressure."[140]

V. Examiners' Analysis of the Evidence

NGL did not meet its burden to show that the proposed disposal well's Application meets the requirements of Chapter 27 of the Texas Water Code and Statewide Rule 46. The Examiners conclude the Commission may deny NGL's Application because the requirements of the Texas Water Code § 27(b)(1)-(3) have not been met. The Examiners recommend the Commission deny the Application for the proposed disposal well.

A. Analysis of Evidence presented on Remand

At the remanded hearing, the existence of the channel behind pipe extending from the injection interval to the Bradenhead was not disputed by the parties. After four previous cement squeeze jobs failed to eliminate Bradenhead pressure, NGL decided to plug the well in favor of the approval of the proposed well's Application.

The Examiners must differentiate well plugging from a successful remediation of an acknowledged back-channel conduit. Both parties and the Examiners have no doubt that the wellbore, that which exists inside the casing, is plugged properly. There are cement plugs, and the surface casing annulus is cemented. However, a problem remains *outside* of the casing.

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[136] Hearing Tr. Vol. 2 Pg. 148, Lns. 4-9.

[137] Hearing Tr. Vol. 2 Pg. 156, Lns. 18-22.

[138] Hearing Tr. Vol. 2 Pg. 159-160, Lns. 12-25, 1.

[139] Hearing Tr. Vol. 2 Pg. 155, Lns. 20-25.

[140] Hearing Tr. Vol. 2 Pg. 159, Lns. 15-17.

NGL was granted the opportunity on rehearing to present additional evidence that the plugging operations performed on Well No. 1 adequately repaired the admitted conduit, channel, or cavern likely exacerbated by NGL's operations that continued long after it was known that Bradenhead pressure was present and that subsequent repair efforts were not successful. NGL is reliant on an approved plugging report as evidence that the conduit has been successfully remediated. The Examiners do not find the approved plugging report to be evidence that the back-side channel is repaired. No tests were conducted to demonstrate this,[141] and the well was plugged in a manner that makes it impossible to do so.[142]

The channel extended from the injection zone to the Bradenhead, intersecting numerous salt and anhydrite formations, likely in communication with the holes found in the casing. The hydraulic connection spanning from the injection interval to the Bradenhead shows that some amount of anhydrite had to be dissolved, or it would have acted as a confinement in the near wellbore area. The parties agree that the salt likely would have been dissolved, as noted on the caliper log after drilling and the salt saturations of the water sample produced from the Bradenhead. No volumetric calculation of the dissolved salt was made.[143] Even with only slight solubility, the volumes of water potentially exposed to this conduit and available to reach saturation may have been substantial. Based on the well logs presented by NGL, if halite and anhydrite were known to be washed out from a relatively brief period during drilling, high volumes of injection known to have been in communication with the Bradenhead likely washed out more of these confining strata over much longer period of time. It also appears that NGL injected fluid after the discovery of Bradenhead pressure and afterward when it was known the cement squeezes failed to eliminate the Bradenhead pressure. Moreover, NGL far exceeded their permitted daily authority for the ten days available to inject when most of May 2019 was taken up by workovers. In June of 2019, 630,498 bbls were injected after documented Bradenhead issues in May. [144] It is not proper to label this continued commercial injection as "testing the health of the well."[145] This high-rate injection would have likely exacerbated a known and documented channel prior to the final plugging operations. NGL relies on the chemical solubility of anhydrite, or lack thereof, as the main driver of dissolution, but mechanical erosional forces due to high pressures and rates can also be acting to reduce the integrity of the near wellbore formations. The fluid injected after Bradenhead pressure was known is important to this case. If a conduit were known to exist, potentially pushing more fluid at high pressure through it would increase the dissolution and thus increase the void space and reduce the formation's ability to confine the injected water. Also, if the injection pressures fractured the surface casing shoe, as Protestant showed, groundwater pollution could have occurred during the operation of the well. The water sample produced from the Bradenhead showed to be brine saturated

[141] Hearing Tr. Vol. 2 Pg. 108, Lns. 16-19.

[142] Hearing Tr. Vol. 2 Pg. 105, Lns. 11-18.

[143] Hearing Tr. Vol. 2 Pg. 90, Lns. 19-20.

[144] Hearing Tr. Vol. 2 Pg. 177, Lns 2-7.

[145] Hearing Tr. Vol. 2 Pg. 175, Ln 14.

and slightly acidic. This is evidence that dissolution of the confining layer was likely happening, and the acids present may indicate a slight proclivity to dissolve anhydrite.

Several occurrences during the remediation and plugging efforts further suggest that the back-channel conduit has not been remediated. The plug set in the injection interval leaked out of position four times before IPT was satisfied with the fifth and proceeded with plug No. 2, the "big squeeze," out of the top set of perforations. This indicates an increased likelihood that a significant amount of the cement, meant to block the channel, could have leaked off into the porous DMG. Whether purposefully or inadvertently, retarder was added to the cement by the cement contractor making it harden more slowly. Evidence seems to suggest that the retarder addition was inadvertent as it changed the usual plugging process. The crew onsite noticed that an effect was seen in the form of u-tubing fluids after the cement was pumped, indicating the cement was still back flowing and not yet set, different than the normal expectation. The crew waited for an extended period and were satisfied that the effect had stopped. This extended period of uncured cement would also allow more time for the cement slurry to leak off into the DMG. Mr. Hoffman acknowledged that there is a chance that significant amounts of cement leaked off in the DMG.

NGL pumped the final "big squeeze" through the upper perforations with the Bradenhead open, no fluids were produced from the Bradenhead to know if displacement in the channel had occurred. Mr. Duncan maintains that the channel is a "hydraulic signal," not a flow path during injection. Mr. Duncan contends it would only become a flow path with the Bradenhead open, as it was during the squeeze. No fluids were produced at surface that would indicate a displacement of fluids in the channel. [146] This could indicate that the channel is very large, or no fluid was displaced during the squeeze.[147]

Mr. Hoffman was the supervisor on previous squeeze attempts. Although Mr. Hoffman said he had never had an unsuccessful plugging during testimony, this was the first time he had tried to remediate an injection well with a known conduit migrating out of the injection interval.[148] Additionally, Mr. Hoffman admitted that the previous squeeze attempts were not successful in eliminating the Bradenhead pressure, although during operations they thought they were successful.[149]

When the Commission approved NGL's plugging report, how much knowledge they had of the back-side channel or that this well was being remediated to protect from a near-by injection well is unknown. Mr. Hoffman considered the plugging successful because the Commission's directives were followed, not that he had observed any definite responses from the well. By his own admission, Mr. Johnston had rushed the

[146] Hearing Tr. Vol. 2 Pg. 232-233, Lns. 21-25, 7-12.

[147] Hearing Tr. Vol. 2 Pg. 117, Lns 16-18.

[148] Hearing Tr. Vol. 2 Pg. 103, Lns. 14-19.

[149] Hearing Tr. Vol. 2 Pg. 101, Lns. 7-11.

W-3 application and the plugging to finish before the hearing had concluded.[150] According to Mr. Johnston's testimony, there is no place on the W-3 to report a back-channel communication.[151] Although numerous cement squeeze attempts prior to the final squeeze did not eliminate the Bradenhead pressure, Mr. Johnston's opinion is that this attempt was successful because cement was actually squeezed into the source of the pressure that is the source of the energy for the communication.[152] This is contrary to a past attempt of squeezing 150 sacks of cement in the "lower hole," within the injection interval, that was not successful.[153] Mr. Clark does not share the opinion that "going to the source" is always successful[154] and evidence shows that all prior squeeze attempts into the injection interval failed to close the channel.

Mr. Duncan does not dispute that Well No. 1 was suffering from Bradenhead pressure issues prior to plugging.[155] Mr. Duncan believes, however, that going to the source of the conduit, i.e., injection interval, is always successful. Rather than actual testing, therefore, Applicant argues that it should be allowed to rely on the volume of cement pumped in the "big squeeze" to assume a successful remediation of the back-channel conduit. His affidavit labels the previous squeeze jobs as "unsuccessful."[156]

Applicant further relies on the confining abilities and fracture resistance *of the formation the surface casing is set in* to protect groundwater from the back-channel conduit.

> [W]hen you get the pressure on the Bradenhead that means you're at your last barrier. That surface casing is a barrier to protect groundwater, but once you get Bradenhead pressure that's a signal that you're on your last barrier and you better fix it.[157]

The upper confining interval of anhydrite and halite is undisputedly damaged because all parties acknowledge the existence of a back-channel conduit. Mr. Duncan admits that Bradenhead pressure indicates the well is "on its last barrier." Relying on the competency of the formation the surface casing is set in is insufficient, especially in the face of evidence that the formation would have likely broken down due to exceeding its fracture pressure at the surface casing shoe by a wide margin. It is possible that injected fluids have already leaked into protected groundwater for some time and the injection interval is in communication with groundwater, not just the surface casing shoe.

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[150] Hearing Tr. Vol. 2 Pg. 67, Lns. 5-12.

[151] Hearing Tr. Vol. 2 Pg. 69, Lns. 15-21.

[152] Hearing Tr. Vol. 2 Pg. 72, Lns. 4-13.

[153] Hearing Tr. Vol. 2 Pg. 128-129, Lns. 11-25, 1-4.

[154] Hearing Tr. Vol. 2 Pg. 162-163, Lns. 20-25, 1-3.

[155] Hearing Tr. Vol. 2 Pg. 208, Lns. 13-14.

[156] PA Prospect Rehearing Ex. 5.

[157] Hearing Tr. Vol. 2 Pg. 232, Lns. 1-5.

Given all the foregoing, the Examiners find that Applicant failed to provide evidence sufficient to show that the cement volumes pumped during the plugging operations on Well No. 1 successfully remediated the back-channel conduit. Given the numerous mechanical integrity issues with Well No. 1, failed previous attempts and the acknowledged existence of the backside channel conduit, the cement squeeze should have been tested or the well used as a monitoring well. Instead, no testing was done to minimize delays in Applicant's effort to obtain a permit for Well No. 2. In addition, the Examiners find that the continuation of injection operations into Well No. 1 following the unsuccessful attempts to stop pressure on the Bradenhead likely caused further erosion around the previous cement squeezes. This is also likely to continue to occur with the presence of nearby injection volumes from the proposed well.

B. Public Interest

Evidence presented by Protestant demonstrates that Well No. 1 is a conduit within the one-quarter mile area of review that will allow injection fluids to migrate outside of their injection interval. In addition, unsuccessful attempts by NGL to repair the casing and alleviate Bradenhead pressure in Well No. 1 show a substantial likelihood that plugging the well cannot adequately prevent such migration. Given the considerable risk of groundwater contamination resulting from the use or installation of the proposed disposal well, approval of the Application would not be in the public interest.[158]

C. Protection of Mineral Formations

PA Prospect demonstrated that their brine mining operation could be directly harmed by injected fluids escaping the proposed interval by way of the back-channel conduit outside the production casing of the Well No. 1, which exists within one-quarter mile of the proposed disposal well.

NGL did not meet its burden to prove that its proposed disposal well will not endanger or injure any oil, gas, or other mineral formation. Failure of the casing for Well No. 1 likely caused the dissolution of the salt formation external to the casing and created a channel behind the casing, thus resulting in a breach of the salt and anhydrite confining layer above the injection interval. Subsequent plugging of the well did not remediate this back-channel conduit.

The Delaware Mountain Group formations, that is, the disposal formations indicated by the Application are regularly utilized for the disposal of produced fluids and oil and gas waste in the area. The Formations have demonstrated the capability to receive disposed fluids at the volume and surface pressures requested by NGL, but the record in this docket indicates that the testing was faulty. NGL performed its pump-in injectivity test on the nearby Well No. 1 at the proposed rate and pressure to document their injection capability for their proposed disposal well. A workover conducted on Well No. 1 documented at least one hole in the tubing and two holes in the production casing, which allowed fluids to exit the casing and impact adjacent strata during the injectivity test.

[158] Texas Water Code § 27.051 (b)(1).

Therefore, the injectivity test was performed with fluids exiting the production casing through corrosion holes in areas outside the proposed injection interval. The Examiners conclude the injectivity test was not evidence of as to whether the proposed injection interval has the capability of accepting the requested volume of 50,000 bbls per day.

NGL failed to prove that the plugging and remediation of Well No. 1 will prevent the upward migration or injected fluids into the mined formations of PA Prospect and out of the injection interval via the back-channel conduit. Accordingly, NGL further failed to prove that the proposed disposal operation will not endanger or injure any, oil, gas or other mineral formation pursuant to Texas Water Code § 27.051 (b)(2).

D. Protection of Ground and Surface Fresh Water

NGL did not meet its burden to prove that oil and gas waste would be confined to the injection interval and not pollute ground or surface water.

The wellbore of Well No. 1 penetrates the disposal interval and is located within one-quarter mile radius of the proposed disposal well. Well No. 1 was drilled in 2014 and has numerous mechanical integrity issues. The plugging of this will not prevent the back-channel conduit that formed due to the failure of the casing being or becoming a conduit for migrating fluids to the BUQW.

NGL's evidence does not demonstrate that both ground and surface are adequately protected from pollution pursuant to Texas Water Code § 27.051 (b)(3).

VI. Findings of Fact and Conclusions of Law

The Examiners recommend that the Commission adopt the following Findings of Fact and Conclusions of Law:

FINDINGS OF FACT

1. The following findings concern the procedural history for the Docket:

    a. NGL Water Solutions Permian, LLC (Operator No. 609265) ("NGL" or "Applicant") filed an application ("Application") for a commercial disposal permit pursuant to Statewide Rule 9, to dispose of oil and gas waste by injection into a formation not productive of oil and gas pursuant to 16 Tex. Admin. Code § 3.9, in Reeves County, Texas.
    b. NGL's Application for a commercial disposal well was published on June 21, 2018, in the Pecos Enterprise. The publication discussed the proposed disposal well, well location, legal authority, notice of public hearing, etc.
    c. A letter dated June 29, 2018, from the Commission's Groundwater Advisory Unit, estimates the BUQW is at 1,450 feet, which correlates to the base of the Rustler formation.
    d. On July 2, 2018, the Application (Commission Form W-14) for the proposed disposal well was submitted to the Commission for review and consideration.

e. On October 2, 2018, the Application was determined to be administratively complete by the Commission's technical staff.
f. A protest was received on the Application from PA Prospect. The Commission's technical staff sent a memo dated November 5, 2018 to Docket Services of the Hearings Division. The memo indicates NGL requested a hearing for the Application.
g. On December 19, 2018, the Hearings Division of the Commission sent a Notice of Pre-hearing Conference ("Notice") via first-class mail to Applicant and affected persons setting a pre-hearing conference date of January 11, 2019. The Notice contained (1) a statement of the time, place, and nature of the pre-hearing conference; (2) a statement of the legal authority and jurisdiction under which the hearing is to be held; (3) a reference to the particular sections of the statutes and rules involved; and (4) a short and plain statement of the matters asserted.
h. NGL identified a new potentially affected party, Republic EES, LLC ("Republic") within one-half mile of the proposed disposal well and notice was not originally sent to Republic. Notice was provided to Republic on February 13, 2019.
i. The pre-hearing conference was held on January 11, 2019, and a second pre-hearing conference was held on April 30, 2019. The second conference was scheduled to address matters preliminary to the hearing on the merits.
j. At the April 30, 2019 pre-hearing conference, Republic indicated that they are not seeking affected party status. The parties agreed to commence the hearing on the merits on May 10, 2019.
k. The hearing on the merits was held on May 10, 2019.
l. The reopened hearing was held on March 11, 2020.

2. The Application is protested by PA Prospect who operates a permitted brine mining well within the one-half mile of the proposed disposal well.

3. NGL seeks to drill and complete the proposed disposal well in the Wheat Field (Field No. 96742001). The HWY 302 Lease is located 17.3 miles Northwest of Pecos, Texas. The permit to drill (W-1) the well was received by the Commission on June 8, 2018.

4. The proposed disposal well has the following proposed design:

   a. The drilling permit states the proposed vertical well is designated as API No. 42-389-37245 and is 7,000 feet deep.
   b. The proposed injection interval is from 4,500 to 7,000 feet, which correlates to the Bell Canyon, Cherry Canyon, and Brushy Canyon formations, also known as the Delaware Mountain Group.
   c. The planned surface casing is planned to be 1,700 feet deep, which is deeper than the BUQW and protective of fresh groundwater.
   d. NGL plans on running a 7-5/8-inch production casing to 7,000 feet deep with a DV tool at 4,500 feet. Cement will run from the 4,500 feet deep at the DV tool up to 2,000 feet, which will address issues with the halite and anhydrite section at 2,270 feet.

5. NGL seeks authority in the Application to inject a maximum daily volume of 50,000 bpd at a maximum surface injection pressure of 2,250 psig.

6. The Applicant failed to disclose in the Application the Bradenhead pressure concerns for Well No. 1 and existing conduit that is located within 1,100 feet of the proposed disposal well.

    a. NGL conducted a pressure tested on April 22, 2018 for Well No. 1 and determined that tubing pressure was 1,150 psig, casinghead pressure was 1,100 psig, and Bradenhead pressure was 1,000 psig.
    b. NGL failed to notify the District Office about the Bradenhead pressure on Well No. 1 in accordance with Statewide Rule 3.17 and the Permit Standard Condition 2(b).
    c. NGL conducted a workover in May 2018 on Well No. 1 and detected a hole in the tubing (4 ½ inch) and two holes in the casing (7 5/8 inch). The workover's objective was to address pressure on the tubing within the casing annulus and Bradenhead.
    d. NGL conducted cement squeezes during the workover to try to plug the holes in tubing and casing. An upper squeeze was shown not to hold pressure and a bottom squeeze was never tested to determine if it would hold pressure.
    e. Bradenhead pressure continued after the workover cement squeezes.

7. The results of the injectivity test included in the Application are invalid for the purpose of establishing the maximum volume that can be injected into the injection interval for the propose SWD Well.

8. WPX Energy Permian, LLC ("WPX") has horizontal wells with the horizontal drainhole passing underneath the proposed disposal well within the one-half mile area of review. WPX did not protest the Application. The well's drainhole laterals do not penetrate the disposal interval and are separated vertically from the disposal interval by approximately 1,000 feet and are not impacting the proposed disposal well.

9. The failure of the mechanical integrity of Well No. 1 caused the dissolution of the salt formation external to the well casing, i.e., a channel behind the casing, resulting in a breach of the salt and anhydrite confining layer above the injection interval.

10. Applicant failed to provide evidence sufficient to show that the plugging of Well No. 1 successfully remediated the acknowledged back-channel conduit.

    a. The upper confining interval of anhydrite and halite was undisputedly damaged because all parties acknowledge the existence of a back-channel conduit
    b. The acknowledged back-channel conduit extended from the injection zone to the Bradenhead, intersecting numerous salt and anhydrite formations, likely in communication with the holes found in the casing.
    c. NGL continued to operate the well after it became aware of the probable existence of the back-channel conduit, causing further damage to the upper confining interval. During the effort to plug the well, the plug set in the injection interval leaked out of position four times before Applicant's plugging contractor

was satisfied with the fifth and proceeded with the next plug, i.e., the "big squeeze," out of the top set of perforations. This indicates an increased likelihood that a significant amount of the cement, meant to block the channel, simply leaked off into the porous DMG.

d. NGL pumped the "big squeeze" through the upper perforations with the Bradenhead open. No fluids were produced at surface that would indicate a displacement of fluids in the channel.
e. Applicant failed to conduct tests sufficient to show that the known back-channel conduit was remediated. It relies instead on the general assertion that such operations are "always successful."

11. Accordingly, there is a substantial likelihood that oil and gas waste injected into the proposed disposal well will not be confined to the injection interval due to the existence of a conduit within one-quarter mile of the proposed disposal well.

    a. Location of the proposed disposal well within one-quarter mile of a conduit for the migration of injected fluids is not in the public interest.
    b. Location of the proposed disposal well within one-quarter mile of a conduit for the migration of injected fluids is substantially likely to endanger or injure oil, gas, or other mineral formations. Protestant's brine mining operation is subject to direct harm by injected fluids escaping the proposed interval by way of a conduit outside the production casing of the Well No. 1.
    c. There is a substantial likelihood that ground and surface water would not be adequately protected from pollution pursuant to Texas Water Code § 27.051 (b)(3) if the proposed disposal well is drilled within one-quarter mile of a conduit for the migration of injected fluids.

12. NGL has an active Commission Organization Report (Form P-5, Operator No. 609265), on file with $ 50,000 as financial assurance required by Statewide Rule 78.

CONCLUSIONS OF LAW

1. Resolution of the Application is a matter committed to the jurisdiction of the Commission. Tex. Nat. Res. Code § 81.051.

2. All notice requirements have been satisfied. 16 Tex. Admin. Code § 3.46.

3. NGL has made a satisfactory showing of financial responsibility. Texas Water Code § 27.051(b)(4).

4. The Application does not satisfy the remaining requirements of Chapter 27 of the Texas Water Code and Statewide Rule 46.

    a. The use or installation of the proposed disposal well is not in the public interest. Texas Water Code § 27.051 (b)(1).

b. The use or installation of the injection well will endanger or injure oil, gas and other mineral formations. Texas Water Code § 27.051 (b)(2); *see also* 16 Tex. Admin. Code § 3.46(d)(1)(E).
c. Ground and surface fresh water cannot be adequately protected from pollution through use of proper safeguards. Texas Water Code § 27.051 (b)(3); *see also* 16 Tex. Admin. Code § 3.46(d)(1)(B).

VII. Examiners' Recommendation

Based on the evidence in the record, Examiners recommend denial of the Application of NGL Water Solutions Permian, LLC for a commercial permit to dispose of oil and gas waste by injection into the Cherry Canyon, Brushy Canyon and Bell Canyon Formations, porous formations not productive of oil and gas for the HWY 302 Lease, proposed disposal well, in the Wheat Field, Reeves County, Texas.

Respectfully,

DocuSigned by:
Austin Gaskamp
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Austin Gaskamp
Technical Examiner

DocuSigned by:
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Ezra A. Johnson
Administrative Law Judge