



# RAILROAD COMMISSION OF TEXAS

## HEARINGS DIVISION

**OIL & GAS DOCKET NO. 02-0297674, et al.**

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**THE APPLICATIONS OF HILCORP ENERGY COMPANY PURSUANT TO 16 TEX. ADMIN. CODE §3.46 FOR PERMITS TO INJECT FLUID INTO A RESERVOIR PRODUCTIVE OF OIL OR GAS, WEST RANCH -A- LEASE, WELL NUMBERS 1002, 1003, 1005, 1006, 1008, & 1009, WEST RANCH (41-A & 98-A CONS.) FIELD, JACKSON COUNTY, TEXAS**

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### PROPOSAL FOR DECISION

**HEARD BY:** Brian Fancher, P.G. – Technical Examiner  
Laura Miles-Valdez – Legal Examiner

**REVIEWED BY:** Jennifer Cook – Administrative Law Judge

**APPEARANCES:**

**APPLICANT:**

Brian Sullivan  
Bill Hayenga  
Jay King  
Abel Salazar  
Jill Fisk  
Michael Schoetz

**REPRESENTING:**

Hilcorp Energy Company

**PROTESTANTS:**

Andy Trevino  
Todd Lanphere  
  
Phillip Ledbetter  
Andy Trevino  
  
Tony Williams

**REPRESENTING:**

Phere Operating, Inc.  
  
Texana Groundwater Conservation District  
  
Industrial Independent School District

**PROCEDURAL HISTORY**

|                               |  |
|-------------------------------|--|
| Application Published:        | May 13, 2015   |
| Application Filed:            | June 16, 2015  |
| Protest Received:             | May 19, 2015   |
| Request for Hearing:          | July 24, 2015  |
| Notice of Hearing:            | September 4, 2015  |
| Hearing Held:                 | October 6 <sup>th</sup> , 7 <sup>th</sup> , & 9 <sup>th</sup> , 2015 |
| Transcript Received:          | October 20, 2015   |
| Record Closed:                | November 30, 2015  |
| Proposal for Decision Issued: | February 29, 2016  |

**STATEMENT OF THE CASE**

The Technical Examiner and Administrative Law Judge's (collectively "Examiners") Proposal For Decision is made of the following oil and gas docket numbers: 02-0297674; 02-0297675; 02-0297678; 02-0297681; 02-0297682 and 02-0297683. The Examiners chose to consolidate the above-named dockets into Oil & Gas Docket No. 02-0297674 due to the common facts and parties of the cases.

Hilcorp Energy Company ("Hilcorp" or "Applicant") seeks authority to inject produced water and carbon-dioxide ("CO<sub>2</sub>") into its West Ranch -A- Lease (the "Subject Lease"), Well Nos. 1002, 1003, 1005, 1006, 1008 and 1009 ("Subject Wells"), pursuant to Statewide Rule 46 [16 Tex. Admin. Code §3.46].<sup>1</sup> The Subject Lease is composed of roughly 11,582-acres. Collectively, Hilcorp proposes to inject 120,000 barrels of produced water per day (20,000 barrels of water per day per well) and 25,000 MCF of CO<sub>2</sub> per day (25,000,000 cubic feet of CO<sub>2</sub> per day per well) into two sand-members of the Frio Formation from 5,750 to 6,300 feet (collectively, "Subject Application").

The Subject Application was originally protested by Phere Operating, Inc. ("Phere"), Texana Groundwater Conservation District ("Texana"), and Industrial Independent School District ("Industrial ISD"). There were no other submissions expressing an interest in the Subject Application. On September 4, 2015, notice of the hearing in this matter was sent to all persons who expressed an interest, in writing, in the Subject Application; this included Hilcorp, Phere, Texana and Industrial ISD. The hearing was held on October 6, 7 and 9, 2015.

By letter dated October 21, 2015, Phere withdrew its protest from the Subject Application and is no longer a party in this matter.<sup>2</sup> Therefore, Texana and Industrial ISD are the only remaining protestants to the Subject Application.<sup>3</sup>

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<sup>1</sup> The subject applications were filed with the Oil & Gas Division on October 8, 2014. As a result, this case is being considered under the version of Statewide Rule 46 that was in effect from July 2, 2012, through November 16, 2014.

<sup>2</sup> Texana filed a letter dated November 5, 2015, opposing Phere's request to withdraw and suggesting the only relief should be an "acknowledgement that Phere's protests have been withdrawn." Since Phere no longer opposes the Subject Application and has withdrawn its protest, it is no longer a protestant and does not qualify as a party under Commission rules. *See, e.g.*, 16 Tex. Admin. Code §§ 1.61 and 1.62. Phere's request to withdraw its protest and withdraw as a party is GRANTED. At the beginning of the hearing, Hilcorp preliminarily motioned that Phere be denied standing as a party in this case because, Hilcorp argued that Phere does not qualify as an affected person, as defined in Statewide Rule 46. Since Phere withdrew its protest to the Subject Application on October 21, 2015, Hilcorp's motion is DENIED as moot.

The boundaries of Texana are coterminous with Jackson County, Texas. Texana asserts that the Subject Application should not be granted due to the following: (1) Hilcorp's planned CO<sub>2</sub> flood presents a real threat to pollute usable quality groundwater; (2) Hilcorp's voluntary monitoring programs are insufficient to prevent and detect groundwater pollution; and (3) Hilcorp has no plan to deal with such pollution.<sup>4</sup>

Industrial ISD protests the Subject Application due to concerns related to public safety and protection of groundwater. Industrial ISD's concerns are as follows: (1) that there be sufficient due diligence regarding the roughly 700 existing wells in the Subject Field; (2) that sufficient groundwater monitoring of the area be performed by a third-party; and (3) that a mitigation plan be established by Hilcorp, should the existing groundwater be negatively impacted.<sup>5</sup>

By letter dated November 17, 2015, State Representative Phil Stephenson submitted a list of requirements that Texana would like to see incorporated into any permits resulting from the Subject Application. The list includes the following that: (1) Hilcorp develop, maintain, and share inventories of oil wells and water wells located on the field as specified by Texana; (2) Hilcorp monitor and report all groundwater production on the well field; (3) Hilcorp provide access to a water well monitoring network acceptable to Texana (near the perimeter of the well field, completed down to the base of usable quality water); (4) Hilcorp utilize tracer chemicals in all injected fluids as specified by Texana; (5) Hilcorp reimburse Texana for the costs associated with monitoring and assessing the groundwater conditions of the Subject Field; and (6) Hilcorp provide copies of the records associated with (a) well integrity testing and monitoring, (b) formation pressure monitoring, and (c) plugged or abandoned well(s).<sup>6</sup>

### **DISCUSSION OF THE EVIDENCE**

#### **Statewide Rule 46 ("SWR 46")**

Generally, SWR 46 requires that a permit be approved prior to conducting fluid injection operations in a reservoir productive of oil, gas, or geothermal resources. An applicant is required to file its injection application with the Railroad Commission of Texas' ("Commission") Austin office, as well as supply a copy to affected persons who include: (1) the owner of record of the surface tract on which the well is located; (2) each commission-designated operator of any well located within one-half mile of the proposed injection well; (3) the county clerk of the county in which the well is located; and (4) the city clerk or other appropriate city official of any city where the well is located within the corporate city limits of the city.<sup>7</sup> In addition, notice of each

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<sup>3</sup> In the October 21, 2015 letter, Phere also motioned to withdraw its pleadings, testimony, exhibits, evidence, and questions on cross-examination in conjunction with its request to withdraw its protest of the Subject Application. However, at the hearing in this case, all parties stipulated on the record that Phere's evidence would also be considered Texana's testimony. Tr., Vol. I, Pgs. 36-39. Texana is still an active protestant in this matter. Phere's motion is DENIED. See 16 Tex. Admin. Code § 1.123 (recorded stipulations are to be enforced). The exhibits marked as Phere's exhibits are also considered to be Texana's exhibits.

<sup>4</sup> Texana Ground Water Conservation District's Closing Brief ("Texana's Closing") filed November 16, Pg. 6.

<sup>5</sup> Tr., Vol. I., Pgs. 49 – 52.

<sup>6</sup> Hilcorp's request in a letter dated November 30, 2015, to exclude from the record State Representative Phil Stephenson's letter is DENIED.

<sup>7</sup> 16 Tex. Admin. Code §3.46(c) ("Notice and opportunity for hearing").

injection application is required to be published once by the applicant in a newspaper of general circulation for the county where the injection well will be located.

**Applicant's Direct Evidence (Hilcorp)**

**King's Supporting Testimony**

Mr. Jay King, a Staff Geologist employed at Hilcorp, testified as an expert geologic witness on behalf of Hilcorp.<sup>8</sup>

The Subject Field was formed on January 27, 2015, through a consolidation of the West Ranch (41-A) and West Ranch (98-A) Fields ("41-A Field and 98-A Field").<sup>9</sup> Historically, the 41-A and 98-A Fields were two of six major reservoirs that comprised the West Ranch Field, which was discovered in 1938.<sup>10</sup> Hilcorp is in the process of unitizing portions of the Frio Formation for enhanced recovery purposes. Hilcorp's proposed unit includes roughly 4,700-acres. The purpose of Hilcorp's proposed unit is to employ enhanced recovery operations in the Frio Formation to rescue residual hydrocarbons which were not recovered by previous operators in the Subject Field.

Mr. King testified that approval of the Subject Application is integral for Hilcorp to successfully exercise its proposed enhanced recovery operations on the Subject Lease. The Subject Lease will be connected by pipeline to the W.A. Parish Power Plant located in Fort Bend County. That power plant will supply Hilcorp with CO<sub>2</sub> for injection into the Subject Wells.

**Geology**

Hilcorp's proposed injection interval is from 5,750 to 6,300 feet.<sup>11</sup> This application is aimed at injecting into the 41-A Sand and 98-A Sand members of the Frio Formation. Mr. King testified that those sand members are continuous throughout the Subject Lease and stratigraphically occur in the form of a four-way, closed anticline.<sup>12</sup> Based on a type log taken from the Subject Field, he testified that the top of the 41-A Sand occurs at 5,710 feet, and the 98-A Sand occurs at 6,130 feet.<sup>13</sup> He indicated that a 10' thick consistent, pervasive shale break occurs immediately above the top of the proposed injection interval (*i.e.*, the 41-A Sand), which will confine injected fluids to that interval.<sup>14</sup>

**Salazar's Supporting Testimony**

Mr. Abel Salazar, a Staff Reservoir Engineer at Hilcorp, testified as an expert reservoir engineer on behalf of Hilcorp.<sup>15</sup>

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<sup>8</sup> Tr., Vol. I., Pgs 53-78.

<sup>9</sup> See, e.g., Hilcorp Exh. No. A.

<sup>10</sup> See also Hilcorp Exh. Nos. 3 and 5.

<sup>11</sup> See also Hilcorp Energy Company's Closing Argument ("Hilcorp's Closing") filed November 16, 2015.

<sup>12</sup> See also Hilcorp Exh. Nos. 7-11.

<sup>13</sup> Tr., Vol. I., Pg. 68-69; see also Hilcorp Exh. No. 8.

<sup>14</sup> Tr., Vol. I., Pg. 69, L. 19 – 22 and Pg. 75, L. 17; see also Hilcorp Exh. Nos. 8-11.

<sup>15</sup> Tr., Vol. I., Pgs. 79-101.

Development Plan

Hilcorp plans to successively incorporate a total of 114 CO<sub>2</sub> injection patterns, or injection wells, on the Subject Lease through the year 2020.<sup>16</sup> Mr. Salazar testified that Hilcorp plans to begin drilling roughly 48 wells per year through the year 2020. In other words, he testified that by the end of Hilcorp's development plan for the Subject Lease, it will include 158 injection wells and 164 production wells. Each of those wells will be newly drilled.<sup>17</sup>

Hilcorp presented a "pressure profile" of the Subject Field based on downhole pressure measurements taken from a single well, the WRA No. 600.<sup>18</sup> That profile eclipses 30 zones that span from roughly 3,050 to 6,400 feet in that well. Mr. Salazar testified that he used a methodology called repeat formation tester ("RFT") to construct the profile. Based on that exhibit, the reservoir pressures generally increase with depth and that no fluid movement was observed between those 30 zones. Therefore, those 30 zones are not in pressure communication.<sup>19</sup> For example, the zone immediately overlying the proposed injection interval measured 783 pounds per square inch gauge ("psig"). The 41-A Sand (*i.e.*, the top of the proposed injection interval) recorded a reservoir pressure of 2,162 psig. In comparison, those two zones show a pressure differential of roughly 1,379 psig, which indicates that the zone immediately overlying the 41-A Sand is isolated from the proposed injection interval. Thus, the Subject Application's proposed injection interval contains adequate confinement immediately above it.<sup>20</sup>

Fisk's Supporting Testimony

Ms. Jill Fisk, the Asset Team Leader for Hilcorp's Central Texas Assets, testified on behalf of Hilcorp.<sup>21</sup>

For each of the Subject Wells, Ms. Fisk provided the following:

- Proposed completion data and schematics for the Subject Well;
- The injection permit application for the Subject Well;
- Maps showing the quarter-mile radius for the Subject Well showing all wells in that area;
- A summary of the wells within a quarter-mile radius for each Subject Well;
- Commission records concerning the plugging status of each plugged well within the quarter-mile radius of the Subject Well that penetrates the proposed injection interval;
- A letter from the Commission Groundwater Advisory Unit designating the base of usable-quality of water at the proposed location for the Subject Well;
- A half-mile radius plat showing there are no other offset operators within a half-mile of the Subject well;
- A Certificate of Notice that the application for the Subject Well was provided to the Chief Clerk in Jackson County, Texas;

<sup>16</sup> See also Hilcorp Exh. Nos. 12, 13 and 13A.

<sup>17</sup> Tr., Vol. I., Pg. 82, L. 5.

<sup>18</sup> Hilcorp Exh. No. 14.

<sup>19</sup> Tr., Vol. I., Pg. 83, L. 4 – 25.

<sup>20</sup> Tr., Vol. I., Pg. 88, L. 25 – Pg. 89, L. 10; see also Hilcorp Exh. No. 14, Pgs. 1-2.

<sup>21</sup> Tr., Vol. II., Pgs. 9-206.

- A Certificate of Notice that the application for the Subject Well was provided to the surface owner (Hilcorp);
- A Publisher's Affidavit from the newspaper that published notice of permit application and a copy of the notice;
- A United States Geological Survey earthquake survey of the area showing no earthquake activity;
- The Commission permit to drill the Subject Well;
- The letter from the Commission Oil and Gas Division with a determination that the application for the Subject Well is administratively complete but it cannot be approved due to protests received; and
- The Notice of Hearing for the hearing in this case.<sup>22</sup>

#### Notice of Application

Hilcorp is the surface owner of the Subject Lease. Hilcorp provided a copy of the Subject Application to the Jackson County Clerk on June 11, 2015. A copy of the Subject Application was published in *The Jackson County Herald-Tribune*, a newspaper of general circulation in Jackson County, on Wednesday, May 13, 2015.<sup>23</sup>

#### Usable Quality Water

Ms. Fisk testified that the current base of usable quality water ("BUQW") occurs at 1,450 feet below the surface location of the Subject Wells, and that the BUQW was determined by the Commission's Underground Water Advisory Unit.

#### The Wells (Casing, Cementing and Completion)

The Subject Wells are planned to be drilled in the near future. Ms. Fisk testified that each well's design includes 10 ¾" surface casing set at a depth of 2,600 feet and cemented to surface with ~1,400 sacks of cement. Each well will have 7" production casing set at 6,500 feet and cemented to surface with ~1,600 sacks of cement. The proposed injection will be at a maximum injection pressure of 2,875 psig.

#### Areas of Review (AORs)

Hilcorp performed a review of each Commission-regulated well (e.g. production wells) located within the ¼-mile and ½-mile radii of each Subject Well's proposed location. Hilcorp is the only operator of wells inside ½-mile of the Subject Wells' proposed locations.

Ms. Fisk provided well tabulations and containing data for each of the Subject Wells and for each Commission-regulated well located within a ¼-mile radius of the Subject Wells. Compiling the well tabulations provided show the following:

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<sup>22</sup> Hilcorp Exh. Nos. 15-20.

<sup>23</sup> See also Hilcorp Exh. Nos. 15-20.

|                             | <u>Existing Wells</u> <sup>24</sup> | <u>P&amp;A Wells</u> <sup>25</sup> | <u>Penetrates Inj. Int.</u> |
|-----------------------------|-------------------------------------|------------------------------------|-----------------------------|
| Well No. 1002 <sup>26</sup> | 24                                  | 3                                  | 21                          |
| Well No. 1003 <sup>27</sup> | 21                                  | 4                                  | 20                          |
| Well No. 1005 <sup>28</sup> | 23                                  | 3                                  | 21                          |
| Well No. 1006 <sup>29</sup> | 22                                  | 3                                  | 20                          |
| Well No. 1008 <sup>30</sup> | 29                                  | 1                                  | 22                          |
| Well No. 1009 <sup>31</sup> | 22                                  | 2                                  | 19                          |

For example, Well No. 1002 is surrounded by 24 existing wellbores and 3 plugged and abandoned wellbores (“P&A Wells” or “P&A’d Wells”). 21 of those 27 wellbores located within ¼-mile of Well No. 1002 were drilled deep enough to penetrate the Subject Application’s proposed injection interval (*i.e.*, 5,750 to 6,300 feet).

In addition, Ms. Fisk provided a spreadsheet that summarizes several aspects of the P&A wells located inside the Subject Wells’ ¼-mile AOR that penetrate the proposed injection interval.<sup>32</sup> The spreadsheet includes well identification data, spud date, total depth, casing depths, plugging data, and general comments related those P&A wells. The spreadsheet shows that P&A Well Nos. 149, 199, 236, 313, and 348 all have surface casing set above the current BUQW, which is at 1,450 feet. Ms. Fisk, however, testified that she reviewed each of those P&A wells and they were plugged in a manner to isolate fresh groundwater from injection fluids through escape of the Subject Application’s injection interval.<sup>33</sup>

Ms. Fisk testified that Hilcorp plans to address any issues that may arise immediately to prevent the migration of fluids outside of the proposed injection interval.<sup>34</sup> According to Ms. Fisk, no wells located within ¼-mile of the Subject Wells will be a conduit for the migration of injected fluids, and that approval of Hilcorp’s consolidated application is necessary to recover hydrocarbons in the Subject Field that would otherwise go unrecovered.

<sup>24</sup> “Existing Wells” refers to wellbores that have not been plugged and abandoned.

<sup>25</sup> “P&A Wells” refers to plugged and abandoned wellbores.

<sup>26</sup> See Hilcorp Exh. No. 15.

<sup>27</sup> See Hilcorp Exh. No. 16.

<sup>28</sup> See Hilcorp Exh. No. 17.

<sup>29</sup> See Hilcorp Exh. No. 18.

<sup>30</sup> See Hilcorp Exh. No. 19.

<sup>31</sup> See Hilcorp Exh. No. 20.

<sup>32</sup> Hilcorp Exh. No. 21.

<sup>33</sup> Tr., Vol. II., Pg. 55, L. 22 – Pg. 58, L. 11.

<sup>34</sup> See, *e.g.*, Tr., Vol. 2, Pgs. 151, 171-172.

Re-Entry of Existing P&A'd Wells

Ms. Fisk testified regarding an exhibit consisting of a three point summarization entitled, "Risks with Re-entering P&A'd Wells."<sup>35</sup> The three main points of that exhibit include – (1) Re-entering P&A'd Wells could damage the surface casing that is protecting usable quality groundwater; (2) If the previous operator was unable to set deeper plugs during the original P&A operation, then it is very unlikely that subsequent operations would be successful; and, (3) In many of the P&A'd wells at West Ranch (*i.e.*, Subject Lease), the production casing has been cut and salvaged near the bottom of the surface casing, which makes it very difficult to re-enter a well.

In summary, based on that exhibit, Ms. Fisk testified that "to reenter a well that Hilcorp feels is already properly plugged, has numerous pressure barriers in place, will protect the groundwater, will protect fluids from blowing out to the surface; to me, you only – you have a – run a very high risk, in my opinion, of creating a problem where there's not currently a problem."<sup>36</sup>

Wellbore Evaluation & Monitoring Program ("WEMP")

Ms. Fisk testified that she is in charge of the WEMP at the Subject Lease.<sup>37</sup> She testified regarding an exhibit that summarizes the implementation and development of Hilcorp's WEMP at the Subject Lease.<sup>38</sup> With regard to the wellbore evaluation efforts, Hilcorp will review the mechanical integrity of all, roughly 700, existing wells on the Subject Lease and rate them through a priority system created by Hilcorp. After review, those wellbores will either be used as part of the CO<sub>2</sub> flood as production wells, used as a monitoring well, or P&A'd.

With regard to the monitoring program, Hilcorp will install tubing and casing pressure gauges on roughly 400 wells that will be connected to a Supervisory Control and Data Acquisition ("SCADA") system. That SCADA system will provide "real-time" monitoring of those wells and be equipped with alarms set to notify Hilcorp if any significant changes occur.

Groundwater Monitoring Plan ("GMP")

Ms. Fisk testified regarding an exhibit entitled, "Groundwater Monitoring Plan," as well as an aerial map that indicates the locations of groundwater monitoring wells.<sup>39</sup> Those groundwater monitoring wells are completed in either the Chicot or Evangaline Aquifers. She testified that Hilcorp's GMP will be in place before and during the duration of the CO<sub>2</sub> project. The GMP includes monthly baseline sampling for one year, beginning October 2015, prior to CO<sub>2</sub> injection. Subsequently, Hilcorp will sample during the first three years of CO<sub>2</sub> injection and intermittently as needed thereafter. She testified that groundwater sampling will be performed by Timberwolf Environmental, a third-party environmental consulting company.<sup>40</sup>

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<sup>35</sup> Hilcorp Exh. No. 22.

<sup>36</sup> Tr., Vol. II., Pg. 65, L. 9 – 15.

<sup>37</sup> Tr., Vol. II., Pg. 67, L. 19.

<sup>38</sup> Hilcorp Exh. No. 23.

<sup>39</sup> Hilcorp Exh. Nos. 26, 27 and 27A; *see also* Hilcorp Exh. No. 28.

<sup>40</sup> Tr., Vol. II., Pg. 98, L. 5.



Those samples will be analyzed by an environmental laboratory accredited by Texas, and they will be analyzed for dissolved gasses (CO<sub>2</sub>, ethane, and methane), dissolved metals (Arsenic, Barium Cadmium, Chromium, Lead, Mercury, Selenium, and Silver), and additional water quality parameters (*e.g.*, iron, manganese, pH, etc.). The groundwater analytical results will be provided to landowners upon request.

### Protestant's Argument (Texana)

Texana argued the Subject Application is contrary to the policy of the state, the requirements of the Injection Well Act, and the requirements of Statewide Rule 46. Therefore, Texana requests that the application be denied.<sup>41</sup>

Texana reiterated the Subject Field is composed of roughly 700 historical wellbores, and has been drilled and produced since the 1930s. Those 700 wellbores pass through the BUQW. Hilcorp plans to add up to 158 injection wells on the Subject Lease with the intent of implementing a CO<sub>2</sub> flood by injecting up to 1.6 million tons of CO<sub>2</sub> per year on the Subject Lease. Hilcorp provided evidence that the U.S. Department of Energy (“DOE”) opined it is possible that CO<sub>2</sub> may leak from the injection reservoirs (*i.e.*, the proposed injection interval), migrate into shallower fresh water aquifers and harm the groundwater if casing and cement fails in wells completed in the Subject Field.<sup>42</sup>

With regard to wells and operations associated with the Subject Application, Texana outlined that the DOE prescribed that a monitoring program be established and operated in accordance with Commission regulations for certification of CO<sub>2</sub> storage related to enhanced oil recovery (“EOR”) operations.<sup>43</sup> Texana then argued that the Subject Application should conform to 16 Tex. Admin. Code §§ 5.305 and 5.306, even though Hilcorp is not seeking approval of the Subject Application in accordance with requirements of the Commission’s regulations for certification of CO<sub>2</sub> storage related to EOR operations. Texana contended, instead, that the monitoring program Hilcorp claims it will implement is voluntary, and thus subject to Hilcorp’s discretion.

### Trevino's Supporting Testimony

Andy Trevino, Consulting Engineer, testified on behalf of Texana as an expert witness in geology, CO<sub>2</sub>, and petroleum engineering.<sup>44</sup> Mr. Trevino is a former employee of the Commission and is registered as a Professional Engineer with the Texas Board of Professional Engineers. Mr. Trevino referenced a copy of Oil & Gas Final Order 02-0295336, et. al. – Application of Hilcorp Energy Company for Authority Pursuant to Statewide Rule 46 for the West Ranch -A- Lease, Well Nos. 1129, 1144, 1133, 1139, 1089, 1136, 1131, 1104, 1149, 1126, 1115 & 1127, West Ranch (41-A & 98-A Cons.) Field, Jackson County, Texas (these wells are referred to as “Permitted Wells” and these applications are referred to as “Prior Applications”).<sup>45</sup>

<sup>41</sup> See, *e.g.*, Texana’s Closing.

<sup>42</sup> See, *e.g.*, Texana’s Closing, Pgs . 4 – 5.

<sup>43</sup> *Id.*; see also Hilcorp Exh. No. 29 and Protestants Exh. No. 5.

<sup>44</sup> Tr., Vol. III., Pgs. 9-91.

<sup>45</sup> Protestant’s Exh. No. 7. Mr. Trevino represented that he serves both Phere and Texana as his clients in this application. Based on Hilcorp’s stipulation any evidence presented by Phere also represents Texana’s position, the Examiners chose to mark any demonstrative evidence presented by Mr. Trevino as Protestants.

**Proposal for Decision**

The Permitted Wells are also located on the Subject Lease and are authorized to inject up to 20,000 barrels per day (“bpd”) of produced water into subsurface interval from 5,050 to 6,339 feet.

Mr. Trevino referenced an aerial map that shows the surface locations of the Subject Wells, Permitted Wells, and what Mr. Trevino referred to as “problem wells” (hereafter referred to as “Problem Wells”).<sup>46</sup> Mr. Trevino asserts about roughly 85 Problem Wells exist in the West Ranch Field area.<sup>47</sup> He testified that he characterizes a Problem Well as a plugged well that has open perforations within either the proposed injection interval in the Subject Application<sup>48</sup> or the injection interval for the Permitted Wells<sup>49</sup> and does not have a cement plug immediately above the top of the proposed injection interval or the injection interval for the Permitted Wells.<sup>50</sup>

Mr. Trevino testified regarding two spreadsheets composed of Problem Wells located within the ½-mile AORs for the Subject Wells (“List 1”) and outside the ½-mile AORs for the Subject Wells and in the “West Ranch Field Area” (“List 2”).<sup>51</sup> List 1 includes 9 Problem Wells where the deepest plug is placed above the top of the Subject Application’s proposed injection interval (*i.e.*, above 5,750 feet) but according to Mr. Trevino not close enough to the proposed injection interval to be considered slightly above the interval.

For example, List 1 includes Well No. 402. According to List 1, that well’s deepest plug is at 2,626 feet and its total depth is 6,231 feet. Similarly, List 2 indicates the deepest plug for 42 P&A’d wells’ is above the top of the proposed injection interval. He testified that based on his review of Commission records related to those Problem Wells, 80% of the wells were completed with 5 ½-inch production casing and cemented with 528 sacks of cement. Based on a calculation that assumes an 8 5/8-inch wellbore circumference and 30% washout, those Problem Wells’ top of cement behind the production casing is at approximately 4,350 feet. He testified, therefore, a potential conduit for fluids to escape the injection interval exists in those Problem Wells when deeper perforations are not isolated by a cement plug immediately above the proposed injection interval. Mr. Trevino referenced a table entitled, “Zone Characteristics.” For the 41-A Sand and 98-A Sand reservoirs (*i.e.*, the proposed injection interval).<sup>52</sup> Mr. Trevino testified “the purpose of that table is to demonstrate there is sufficient pressure today to push fluids from the producing intervals to nearly the surface and, at least, to the base of usable-quality water.”<sup>53</sup> Based on that exhibit, Mr. Trevino testified that those reservoirs currently contain sufficient pressure to raise fluids to the BUQW.<sup>54</sup>

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<sup>46</sup> Protestants Exh. No. 6.

<sup>47</sup> See also Protestants Exh. Nos. 8 and 9.

<sup>48</sup> The proposed injection interval is the Subject Application is 5,750 – 6,300 feet. See, e.g. Hilcorp’s Closing, Pg. 18.

<sup>49</sup> The injection interval for the Permitted Wells is 5,050 – 6,339 feet. See, e.g., Protestants’ Exh. No. 7, Pg. 2. This injection interval, which is not at issue in this case, is larger and begins above the proposed injection interval in this case. Mr. Trevino considered any well that has open open perforations within either the proposed injection interval or the larger injection interval for the Permitted Wells to be Problem Wells if there was no cement plug

<sup>50</sup> See, e.g., Tr., Vol. III., Pg. 35, L. 25 through Pg. 37, L. 20 and Pg. 43.

<sup>51</sup> Protestants Exh. Nos. 8 and 9, respectively. Protestants Exh. 6 is a map identifying the area Mr. Trevino reviewed and the location of the Problem Wells.

<sup>52</sup> Protestants Exh. No. 12.

<sup>53</sup> Tr., Vol. III., Pg. 55, L. 5.

<sup>54</sup> Tr., Vol. III., Pg. 61, L. 24.

Mr. Trevino referenced excerpts from the Commission's publication entitled, "Well Completion and Plugging Procedures Reference Manual."<sup>55</sup> That publication was circulated roughly 23 years ago.<sup>56</sup> Mr. Trevino testified the purpose of those excerpts is to show what the Commission requires to plug and abandon wellbores. The second excerpt of that publication shows that for wells with production casing not cemented through usable water & productive horizons, a 100' thick plug is placed immediately above the perforations in the production casing. Therefore, based on his review of the Problem Wells, combined with the plugging methods described in that publication, he testified, "I found no indication that a bottom plug was set that would contain the injected fluids within the wellbore, and for that, the perforations were cemented off...so when they abandoned a zone, they should put a plug within 100 feet of the producing zone or injection zone. If there's no plug, then the fluids are free to flow passed the confining interval, whether it's the shale between the Ward [Formation] and the 41 Sand (*i.e.*, the geologic confining unit above the proposed injection interval) or Anahuac Shale [Formation] (*i.e.*, the geologic confining unit above the injection interval for the Permitted Wells). So it creates a conduit for these fluids that rise up to the base of the usable-quality water or even up to the surface should sufficient pressure exist in the reservoir."<sup>57</sup> However, Mr. Trevino did not provide an example of an instance in which this has occurred.

### **Protestant's Evidence (Industrial)**

Industrial ISD offered no exhibits and provided testimony from one witness who basically discussed concerns regarding the Subject Application. Tony Williams, Superintendent at Industrial ISD, testified on behalf of Industrial ISD. At the outset of the hearing, Mr. Williams conveyed his concerns with regard to the Subject Application. Those concerns were - (1) that sufficient due diligence be done for the roughly 700 existing wells in the Subject Field; (2) that sufficient groundwater monitoring of the area be performed by a third-party; and (3) that a mitigation plan be established by Hilcorp to provide freshwater should the existing groundwater be negatively impacted.<sup>58</sup>

He testified that his concerns grew larger as a result of the evidence presented by Hilcorp and Protestants.<sup>59</sup> He stated that he remains concerned about the due diligence on the existing wells in the Subject Field. He indicated that he is still concerned about whether Hilcorp's WEMP is adequate based on the size of Hilcorp's proposed CO<sub>2</sub> flood. He testified that based on the presentations made at the hearing, Hilcorp will not be able to control the entire reservoir. Lastly, Mr. Williams expressed concern with regard to mitigation of potential groundwater pollution.

### **Applicant's Rebuttal Evidence (Hilcorp)**

#### **Salazar's Supporting Testimony**

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<sup>55</sup> Protestants Exh. No. 11.

<sup>56</sup> Tr., Vol. III., Pg. 54.

<sup>57</sup> Tr., Vol. III., Pg. 52, L. 25 – Pg. 53, L. 22.

<sup>58</sup> Tr., Vol. I., Pgs. 49 – 52.

<sup>59</sup> Tr., Vol. III., Pg 93.

In part, Hilcorp's rebuttal case was aimed at offsetting Protestants' concerns regarding the Problem Wells. Hilcorp submitted a table entitled, "Rebuttal P&A Summary for Plugged Wells in Half Mile Radius."<sup>60</sup> Mr. Salazar testified that the table represents a more accurate description of the well list (*i.e. Problem Wells*) Protestants earlier provided.<sup>61</sup> He stated the table is based on well reports submitted to the Commission, as well as data that was only available to Hilcorp.<sup>62</sup> The table indicates that most of those P&A'd wells contain cement plugs or cast-iron bridge plugs at deeper intervals in the wells than previously understood, as seen in Protestants Exh. No. 8 (*i.e., List 1*). In addition, Mr. Salazar testified that the wells on List 1 were previously considered in injection/disposal applications for the Permitted Wells, which were approved by the Commission in Oil & Gas Final Order 02-0295336, et. al.<sup>63</sup>

### Official Notice

After the hearing, Hilcorp requested that official notice be taken of official Commission records. Specifically, Hilcorp requested that official notice be taken for 12 injection well permits that Hilcorp has been issued administratively through the Commission's Oil and Gas Division. These twelve permitted wells are in this same field and as part of the same project for which the Subject Application was submitted. After notice provided to all parties, and there being no response, official notice is hereby taken of the following permits:

The identification numbers for the permits are:

1. O&G Docket No: 02-0298351 Well No. 1014;
2. O&G Docket No: 02-0298352 Well No. 1015;
3. O&G Docket No: 02-0298353 Well No. 1017;
4. O&G Docket No: 02-0298354 Well No. 1018;
5. O&G Docket No: 02-0298415 Well No. 1011;
6. O&G Docket No: 02-0298416 Well No. 1012;
7. O&G Docket No: 02-0298837 Well No. 1019;
8. O&G Docket No: 02-0298838 Well No. 1020;
9. O&G Docket No: 02-0298839 Well No. 1040;
10. O&G Docket No: 02-0298840 Well No. 1016;
11. O&G Docket No: 02-0298841 Well No. 1039; and
12. O&G Docket No: 02-0298842 Well No. 1063.

Six of the permits were issued in December 2015 and six of the permits were issued in February 2016. All of them are injection well permits in the Subject Lease. The permitted fluids are salt water and CO<sub>2</sub>. The injection interval for these twelve permits are approximately the same as proposed in the Subject Application. The top intervals of these twelve wells range between 5,750 – 5,848 feet while the bottom intervals range between 6,300 – 6,398 feet. The twelve permits do not contain the conditions requested by the Protestants in this case.

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<sup>60</sup> Hilcorp Exh. No. 34.

<sup>61</sup> Tr., Vol. III., Pg. 145, L. 5.

<sup>62</sup> Tr., Vol. III., Pg. 145, L. 6 - 11 and Pg.

<sup>63</sup> Tr., Vol. III., Pg. 157, L. 3 - 7.

**EXAMINERS' RECOMMENDATION**

The Subject Application parallels twelve previous Hilcorp cases for injection on the Subject Lease that were approved by the Commission on August 25, 2015 (Oil & Gas Final Order 02-0295336, et. al.). Based on the record evidence, Hilcorp has met its burden of proof for approval of the Subject Application. Accordingly, the Examiners recommend that it be granted.

**Proposed Completion of the Subject Wells**

Hilcorp established that each of the Subject Wells will be completed in manner as follows: (1) 10 ¾" surface casing set at a depth of 2,600 feet and cemented to surface with ~1,400 sacks of cement; and (2) 7" production casing set at 6,500 feet and cemented to surface with ~1,600 sacks of cement. The proposed injection will be at a maximum injection pressure of 2,875 psig. Hilcorp evidenced that its proposed completion program will meet the minimum casing and cement requirements of Statewide Rule 46(f).

**Confinement to the Injection Interval**

Again, the Permitted Wells are authorized to inject up to 20,000 bpd per well of produced water from 5,050 to 6,339 feet. The Subject Wells' proposed injection interval is from 5,750 to 6,300 feet. Hilcorp seeks to inject up to 20,000 bpd of produced water and 20,000 bpd of CO<sub>2</sub> in the Subject Wells. In other words, the Subject Application consists of a smaller injection interval inside the larger injection interval of the Permitted Wells that is already granted for injection of produced water on the Subject Lease. Compared to the Prior Applications, the chief difference in the Subject Application is that it includes CO<sub>2</sub> as a type of injection fluid.

Nonetheless, Hilcorp evidenced that produced water and CO<sub>2</sub> will not escape the Subject Application's proposed injection interval due to the roughly 10' thick shale interval identified by Mr. King immediately above the top of the injection interval. Furthermore, Mr. King evidenced that faulting does not occur beneath the Subject Lease.

Protestants raised its concerns with those Problem Wells identified on List 1 and List 2. Once again, List 1 is made of Problem Wells within ½-mile of the Subject Wells' proposed locations, while List 2 includes Problem Wells beyond ½-mile. Protestants' chief concern with regard to those Problem Wells is that Commission records indicate they may not be P&A'd in a manner that includes a cement plug immediately above the top of the proposed injection interval. Protestants concluded, therefore, that injection fluids placed in the Subject Wells' injection interval will potentially escape that interval. Protestants, however, did not provide an example of such an occurrence. Hilcorp refuted that evidence by presenting additional plugging information for the wells on List 1, which indicated that the majority of those Problem Wells actually contain a cement plug or cast-iron bridge plug near the top of the proposed injection interval. Furthermore, Hilcorp identified that the Problem Wells raised by Protestants were previously considered by the Commission in the Prior Applications, which the Commission previously granted. In other words, Protestants did not provide new information regarding the Problem Wells in the Subject Application which was not previously considered in the Prior

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Applications.<sup>64</sup> Phere formally withdrew its protest to the Subject Application by letter dated October 21, 2015.

Injection of CO<sub>2</sub>

First, Texana argued that the Subject Application should conform to 16 Tex. Admin. Code §§5.305, 5.306, but that Hilcorp is not seeking approval of the Subject Application in accordance with requirements of the Commission's regulations for certification of CO<sub>2</sub> storage related to EOR operations. Second, Texana contended, instead, that the monitoring program Hilcorp claims it will implement is voluntary, and thus subject to Hilcorp's discretion.

Under the title, Applicability, §5.301(a) states:

This subchapter establishes the requirements for certification of the injection, and incidental storage, of anthropogenic CO<sub>2</sub> into productive reservoirs for the purpose of enhanced recovery of oil, gas, or geothermal resources, and for which the operator *requests* certification from the commission that the anthropogenic CO<sub>2</sub> is permanently stored (emphasis added).

§5.301(e) states:

No permit is required for an operator to register with, or obtain a certification from, the commission for geologic storage of anthropogenic CO<sub>2</sub> incidental to enhanced recovery under this subchapter...The wells into which CO<sub>2</sub> is injected for the purpose of enhanced recovery continue to be covered by §3.46.

§5.301(f) states:

Registration under this subchapter is voluntary. An enhanced recovery facility may register under this subchapter to account for geologic sequestration of anthropogenic CO<sub>2</sub>.

The Examiners opine that while Chapter 5 provides operators an avenue to certify an injection program that utilizes anthropogenic CO<sub>2</sub> as a means for enhanced oil recovery, it does not require such a program to be certified by the Commission when the application includes injection of CO<sub>2</sub> under Statewide Rule 46. If an operator elects to certify an injection program under Chapter 5, then the operator is subject to the monitoring provisions of that subchapter.<sup>65</sup> Therefore, the Examiners opine that Hilcorp's Subject Application may be granted pursuant to the requirements of Statewide Rule 46 because the provisions of Chapter 5 are voluntary to the operator. The Examiners also note that 12 similar injection well permits have been issued administratively to Hilcorp to inject both salt water and CO<sub>2</sub> which do not contain the conditions requested by the remaining Protestants.

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<sup>64</sup> Tr., Vol. III., Pg. 161, L. 1.

<sup>65</sup> See 16 Tex. Admin. Code § 5.301(d) – The operator of an enhanced recovery facility registering for certification of geologic storage of anthropogenic CO<sub>2</sub> incidental to enhanced recovery operations is subject to the monitoring provision of this subchapter.

**Proposal for Decision**Discussion of Protection of Water

The current BUQW occurs at 1,450 feet below the surface locations of the Subject Wells. Hilcorp's proposed injection interval is from 5,750 to 6,300 feet in the Subject Wells. Again, that injection interval is a portion of a larger injection interval authorized for use through the Permitted Wells. Immediately above the Subject Application's injection interval lies a roughly 10' thick shale interval that is continuous across the Subject Lease, and will prevent the upward migration of disposal fluids from escaping the proposed injection interval. Additionally, the Subject Wells will be completed in a manner that meets the requirements Statewide Rule 46(f). Thus, the Subject Application will protect fresh water from harm.

Discussion of Protection of Oil and Gas

Because the injected material will be confined to the injection interval, oil and gas production will also be protected. Moreover, Hilcorp is the only operator in the AOR. The Subject Lease is a proposed unit, and the purpose of that unit is to employ enhanced recovery operations in the Frio Formation to rescue residual hydrocarbons which were not recovered by previous operators in the Subject Field. Not only will the Subject Application protect oil and gas, it will prevent waste by recovering hydrocarbons which have thus far been unable to be recovered.

For those reasons, in reviewing the record in this case, and remaining consistent with the Commissions' decision made in the Prior Applications, the Examiners recommend that the Subject Application and that the Commission adopt the following Findings of Fact and Conclusions of Law.

**FINDINGS OF FACT**

1. Hilcorp Energy Company ("Hilcorp" or "Applicant") submitted an application to the Commission seeking authority to inject produced water and carbon-dioxide ("CO<sub>2</sub>") into its West Ranch -A- Lease (the "Subject Lease"), Well Nos. 1002, 1003, 1005, 1006, 1008 and 1009 ("Subject Wells"), pursuant to Statewide Rule 46 [16 Tex. Admin. Code §3.46] ("Subject Application").
2. Notices of the Subject Application were published May 19, 2015, in the *Jackson County Herald Tribune*, a newspaper of general circulation in Jackson County, Texas. The Notice of Hearing was published September 4, 2015.
3. Hilcorp provided a copy of the Subject Application to the Jackson County Clerk on June 11, 2015.
4. Hilcorp is the only active operator in the Subject Field and the owner of the surface tract where the Subject Wells are located.
5. Texana Groundwater Conservation District ("Texana"), Industrial Independent School District ("Independent ISD") and Phere Operating, Inc. ("Phere") submitted protests of

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- the Subject Application. There were no other submissions expressing an interest in the Subject Application.
6. On September 4, 2015, notice of the hearing in this matter was sent to all persons who expressed an interest, in writing, in the Subject Application; this included Hilcorp, Phere, Texana and Industrial ISD. The hearing was held on October 6, 7 and 9, 2015.
  7. Notices of Hilcorp's Subject Application and hearing were issued to all persons entitled to notice. Phere, who initially protested the Subject Application, withdrew its protest to the Subject Application after the hearing on October 21, 2015.
  8. The Subject Wells will be used to inject produced water and CO<sub>2</sub> for the purposes of a waterflood and a miscible displacement injection project.
  9. The proposed Subject Wells will inject a maximum volume of 20,000 barrels of produced water per day ("bpd") and 25,000,000 cubic feet of CO<sub>2</sub> per day, per well, at a maximum surface injection pressure of 2,875 pounds per square inch gauge ("psig") per well.
  10. The Subject Wells will be cased and cemented to confine the injected fluid to the proposed injection zone. Each of the Subject Wells will be completed as follows:
    - a. 10 3/4" surface casing set at a depth of 2,600 feet and cemented to surface with ~1,400 sacks of cement; and
    - b. 7" production casing set at 6,500 feet and cemented to surface with ~1,600 sacks of cement.
  11. The use or installation of the Subject Wells in the applied-for permit will not cause the pollution of ground and surface fresh water as indicated by the following:
    - a. The requested injection interval is between 5,750 feet and 6,300 feet.
    - b. Stratigraphically above the top of the proposed injection interval is a geologic shale break that occurs from 5,700 feet to 5,710 feet. That shale break is roughly 10 feet thick and is an impermeable layer that seals the injection interval to prevent migration of injected fluids outside the injection interval.
    - c. The Base of Usable Quality Water ("BUQW") occurs below the surface location of the Subject Wells from the ground surface to a depth of 1,450 feet. The Goliad Aquifer contains superior-quality water and occurs beneath the Subject Wells from 900 feet to 1,450 feet also at that location.
    - d. The Subject Wells will be cased and cemented to confine the injected fluid to the proposed injection interval.
  12. The use or installation of the Subject Wells will not endanger or injure oil, gas, or other mineral formations as indicated by the following:



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- a. The purpose of the Subject Application is to implement waterflood and miscible displacement operations through the injection of produced water and CO<sub>2</sub> into the injection interval beneath the Subject Lease.
- b. Because the injection is part of a larger enhanced recovery project, the result of the injection into the Subject Wells will increase the ultimate recovery from the Subject Field by recovering hydrocarbons that have thus far not been able to be recovered.
- c. Injection through the Subject Wells will remain confined to the Subject Application's injection interval and protect other mineral resources outside the injection interval.

**CONCLUSIONS OF LAW**

1. Proper notice was issued in accordance with all applicable statutes and regulatory codes. *See* Tex. Water Code § 27.034; 16 Tex. Admin. Code § 3.46(c).
2. All things have occurred and been accomplished to give the Commission jurisdiction in this matter pursuant to Tex. Nat. Res. Code ch. 81 and Tex. Water Code ch. 27. *See, e.g.*, Tex. Nat. Res. Code § 81.051; Tex. Water Code §§ 27.031 and 27.034.
3. Hilcorp's Subject Application pursuant to Statewide Rule 46 ("SWR 46") for permits to inject produced water and CO<sub>2</sub> into the proposed injection interval complies with the applicable provisions of SWR 46.
4. Approval of Hilcorp's Subject Application will not endanger or injure oil, gas, or other mineral formations.
5. Hilcorp's Subject Application will adequately protect ground and surface fresh water from pollution or harm.
6. Hilcorp has met its burden of proof and satisfied the requirements of Statewide Rule 46. 16 Tex. Admin. Code § 3.46.

**EXAMINERS' RECOMMENDATION**

Based on the record evidence, the Examiners recommend that the Commission approve Hilcorp's Subject Application.

Respectfully,



Brian Fancher, P.G.  
Technical Examiner



Jennifer Cook  
Administrative Law Judge