State Office of Administrative Hearings

Kristofer S. Monson
Chief Administrative Law Judge

April 10, 2024

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RE: Docket Number 582-23-15496.TCEQ; Texas Commission on Environmental Quality No. 2022-1553-WDW; Application by Uranium Energy Corp. for Permits WDW423 and WDW424

Dear Parties:

Please find attached a Proposal for Decision (PFD) in this case.

Any party may, within 20 days after the date of issuance of the PFD, file exceptions or briefs. Any replies to exceptions, briefs, or proposed findings of fact shall be filed within 30 days after the date of issuance on the PFD. 30 Tex. Admin. Code § 80.257.

All exceptions, briefs, and replies along with certification of service to the above parties and the ALJs shall be filed with the Chief Clerk of the TCEQ electronically at http://www14.tceq.texas.gov/epic/eFiling/ or by filing an original and seven copies with the Chief Clerk of the TCEQ. Failure to provide copies may be grounds for withholding consideration of the pleadings.

CC: Service List

SOAH Docket No. 582-23-15496 **Suffix: TCEQ**

BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

IN RE: 2022-1553-WDW

APPLICATION BY URANIUM ENERGY CORP. FOR PERMITS WDW423 AND WDW424

TABLE OF CONTENTS

I. Jurisdiction, Notice, and Procedural History 2

II. Proposed Site and Draft Permit Conditions 3

III. Burden of Proof and Prima Facie Case 5

IV. Applicable Law 7

V. Summary of the Evidence 8

VI. Analysis 9

A. Whether the Application Adequately Characterizes the Geology and Identifies and Assesses Faults in the Vicinity of the UEC Wells. 10

1. UEC's Application and Position 13

2. The ED's Position 28
3. Protestants' Position 32
a) Identification and Assessment of Faults 33
b) Class III Pump Test 37
c) Local Geology 40
d) USDWs Below 5,600 Feet 48
4. OPIC's Position 49
5. UEC's Reply 51
a) Post Permit Issuance 51
b) Identification and Assessment of Faults 52
c) Local Geology 55
d) Cone of Influence 57
e) USDWs Below 5,600 Feet 57
f) Class III Pump Test 58
6. ED's Reply 59
a) Permit Issuance Process 59
b) Revised Application 60
c) Class III Pump Test 60
7. Protestants' Reply 61
8. The ALJs' Analysis 62
a) Characterization of Geology 63
b) Identification and Assessment of Faults 72

B. Whether the Draft Permits Provide for Adequate Monitoring of Migration of Injected Fluids in the Vicinity of the UEC Wells 79

1. The ED's Position 79

2. UEC's Position 81

3. Protestants' Position 81

4. OPIC's Position 83

5. The ALJs' Analysis 83

C. Whether the Location and Design of the UEC Wells and Pre-Injection Facilities are Adequate. 85

1. Consideration of Other Wells Near the UEC Wells 85

2. The Gleinser No. 2 Well 86

a) Protestants' and OPIC's Positions 86

b) UEC's Position 89

c) The ED's Position 90

d) The ALJs' Analysis 91

3. Hausman No. 2 Well 93

a) Protestants' and OPIC's Positions 93

b) UEC's Position 95

c) The ALJs' Analysis 96

VII. Transcript Costs 97

VIII. Recommendation 99

SOAH Docket No. 582-23-15496 **Suffix: TCEQ**

BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

IN RE: 2022-1553-WDW

APPLICATION BY URANIUM ENERGY CORP. FOR PERMITS WDW423 AND WDW424

PROPOSAL FOR DECISION

Uranium Energy Corporation (UEC) filed an Application with the Texas Commission on Environmental Quality (Commission or TCEQ) for renewal and amendment of two Class I injection well permits authorizing the injection of nonhazardous wastewater associated with in-situ uranium mining. The proposed wells (collectively, UEC wells) will be located in Goliad County, Texas.

TCEQ referred consideration of the proposed permits to the State Office of Administrative Hearings (SOAH) for a hearing on three issues:

A. Whether the Application adequately characterizes the geology and identifies and assesses faults in the vicinity of the UEC wells;

B. Whether the draft permits provide for adequate monitoring of migration of injected fluids in the vicinity of the UEC wells; and

C. Whether the location and design of the UEC wells and pre-injection facilities is adequate.

The Goliad County Groundwater Conservation District (District) and several nearby residents (Landowners) (collectively, Protestants) and the Office of Public Interest Counsel (OPIC) opposed the Application and requested that conditions be placed on any permit. The Commission's Executive Director (ED) supported the Application and urged that the draft permits be granted without modification.

Based on the evidence and the applicable law, the Administrative Law Judges (ALJs) find that UEC failed to meet its burden of proof and remand this matter to the ED for further examination.

I. JURISDICTION, NOTICE, AND PROCEDURAL HISTORY

No party contested jurisdiction or notice. The ALJs will address jurisdiction and notice in the findings of fact and conclusions of law.

Permits WDW423 and WDW424 were previously issued for Class I injection wells in May 2010, for a term of ten years. Before their expiration, TCEQ received the current Application in January 2020 and, in April 2020, determined it was administratively complete. TCEQ then completed a technical review and prepared draft permits. In December 2022, TCEQ referred the matter to SOAH for a contested case hearing.

On July 17, 2023, a preliminary hearing was held before SOAH ALJ Katerina DeAngelo. The administrative record and jurisdictional documents were admitted into evidence.[1] UEC, the ED, OPIC, the District, and the Landowners were named as parties. On October 27, 2023, the ALJs granted UEC's partial motion for summary disposition finding that the design of the UEC wells and pre-injection facilities was adequate. On December 8, 2023, a second preliminary hearing was held at which the ALJs ruled on objections. Then the hearing on the merits was held.

Hearing Date:	December 12-13, 2023
Administrative Law Judges:	Katerina DeAngelo & Andrew Lutostanski
For UEC:	David J. Tuckfield & Bill Cobb
For the ED:	Don Redmon, Diane Goss, & Michael Martinez
For the District:	Adam Friedman & Jessica Mendoza
For Landowners:	John H. H. Bennett
For OPIC:	Jennifer Jamison
Record Close Date:	February 12, 2024

II. PROPOSED SITE AND DRAFT PERMIT CONDITIONS

The UEC site will be located at 14869 North United States Highway 183, Yorktown, Goliad County, Texas and consists of a 17-acre tract of land, which will include the two proposed injection wells and associated pre-injection units.[2]

[1] UEC Ex. 1 (including Tabs A-E).

[2] UEC Ex. 1 at 1798, 1801.

The Application would authorize the construction and operation of two Class I injection wells for injection of industrial nonhazardous wastes associated with in-situ uranium mining. Injected wastes would include recovered rainwater from bermed areas, process wastewater from reverse osmosis reject, restoration groundwater, wash down from maintenance and housekeeping, accidental upsets, dissolved salts and low concentrations of uranium and radium, other associated wastes such as groundwater and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams, and injection zone and well materials.[3]

The permitted injection zone for the UEC wells is within the Frio and Vicksburg Formations from 2,800 to 3,590 feet below ground level (BGL). The authorized injection interval is within the Vicksburg Formation from 3,200 to 3,590 feet BGL. The Jasper Aquifer is the lowermost underground source of drinking water in the vicinity of the well locations. Its base occurs at depths of approximately 1,750 feet BGL in the area.[4]

There are various provisions in the draft permits addressing requirements to ensure that the injection of fluids is protective of freshwater:

[3] ED Ex. 8 at Bates ED–08-000053.

[4] ED Ex. 8 at Bates ED–08-000053.

- Under Provision V, the drilling and completion of each well must comply with the construction standards in Rule 331.62;[5]

- Under Provisions VI and VII, only certain wastes may be disposed in the UEC wells;

- Under Provision IX, the wells must be tested and monitored in accordance with the requirements of Rules 305.125 and 331.64;

- Under Provision XII, the base of the wellhead must be enclosed by a diked, impermeable pad or sump to protect the ground surface from spill, and any collected fluids must be disposed in an appropriate manner.[6]

The UEC wells have not yet been drilled and constructed. Once wells are constructed, a permittee will be required to conduct various tests and submit a completion report.[7] A permittee must obtain approval from the ED before beginning any injection operations.[8]

III. BURDEN OF PROOF AND PRIMA FACIE CASE

UEC bears the burden of proof by a preponderance of the evidence.[9] The Application was filed after September 1, 2015, and the Commission referred it to SOAH under Texas Water Code section 5.556, which governs referral of

[5] The Commission's rules regulating the permitting, construction, and operation of Class I injection wells are found in 30 Texas Administrative Code (TAC) chapters 37, 39, 50, 281, 305, 331, and 335. For ease of reference, they are referred to in this Proposal for Decision (PFD) as Rule ____.

[6] ED Ex. 8 at Bates ED–08-000053-57.

[7] *See* Rules 305.154, 331.65.

[8] *See* Rules 305.154, 331.45, .65.

[9] 30 TAC § 80.17(a); 1 TAC § 155.427.

environmental permitting cases to SOAH.[10] Therefore, this case is subject to Texas Government Code section 2003.047(i-1)-(i-3), as enacted in 2015, which provides:

> (i-1) In a contested case regarding a permit application referred under Section 5.556 [of the] Water Code, the filing with [SOAH] of the application, the draft permit prepared by the executive director of the commission, the preliminary decision issued by the executive director, and other sufficient supporting documentation in the administrative record of the permit application establishes a prima facie demonstration that:
>
> (1) the draft permit meets all state and federal legal and technical requirements; and
>
> (2) a permit, if issued consistent with the draft permit, would protect human health and safety, the environment, and physical property.
>
> (i-2) A party may rebut a demonstration under Subsection (i-1) by presenting evidence that:
>
> (1) relates to . . . an issue included in a list submitted under Subsection (e) in connection with a matter referred under Section 5.556, Water Code; and
>
> (2) demonstrates that one or more provisions in the draft permit violate a specifically applicable state or federal requirement.
>
> (i-3) If in accordance with Subsection (i-2) a party rebuts a presumption established under Subsection (i-1), the applicant

[10] Tex. Water Code §§ 5.551(a), .556.

> and the executive director may present additional evidence to support the draft permit.[11]

Although this law creates a presumption, sets up a method for rebutting that presumption, and shifts the burden of production on that rebuttal, it does not change the underlying burden of proof. The burden of proof remains with UEC to establish by a preponderance of the evidence that the Application would not violate applicable requirements and that the permits, if issued consistent with the draft permits, would protect human health and safety, the environment, and physical property.[12]

In this case, the Application, the draft permits, and the other materials listed in Texas Government Code section 2003.047(i-1), which are collectively referred to as the prima facie demonstration, were offered and admitted into the record at the preliminary hearing.

IV. APPLICABLE LAW

It is the policy this state to maintain the quality of freshwater in Texas to the extent consistent with the public health and welfare and the operation of existing industries, taking into consideration the economic development of the state, to prevent underground injection that may pollute freshwater, and to require the use of all reasonable methods to implement this policy.[13]

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[11] *Accord* 30 TAC § 80.17(c).

[12] 30 TAC § 80.17(a), (c).

[13] Tex. Water Code § 27.003.

A permit is needed to inject fluid into an injection well.[14] An applicant for a permit must provide necessary information.[15] In particular, before issuing a Class I injection well permit, TCEQ shall consider an analysis of the local geology and hydrogeology of the well site, including, at a minimum, detailed information regarding stratigraphy, structure, and rock properties, aquifer hydrodynamic, and mineral resources.[16]

TCEQ may grant an application in whole or part and may issue the permit if it finds that, with proper safeguards, both ground and surface freshwater can be adequately protected from pollution.[17]

V. SUMMARY OF THE EVIDENCE

The administrative record established a prima facie demonstration that: (1) the Application adequately characterizes the geology and identified and assessed faults in the vicinity of the UEC wells; (2) the draft permits provide for adequate monitoring of migration of injected fluids in the vicinity of the UEC wells; and (3) the location and design of the UEC wells and pre-injection facilities are adequate.[18]

[14] Tex. Water Code § 27.011.

[15] Tex. Water Code § 27.013.

[16] Rule 331.121(c)(2).

[17] Tex. Water Code § 27.051(a)(3).

[18] Tex. Gov't Code § 2003.047(i-1).

At the hearing on the merits, Protestants offered evidence for the purpose of rebutting UEC's prima facie demonstration. The District had 28 exhibits admitted, which included the prefiled testimony of Terrell Graham, Art Dohmann, Kim Gordon, and James Beach.[19] Landowners had 16 exhibits admitted, which included the prefiled testimony of Heike Jenkins, David Michaelsen, Misty Ortega, Kenneth Klanika, and Jim Bluntzer.[20]

The ED and UEC presented additional evidence in response to evidence offered by Protestants. At the hearing, UEC had 11 exhibits admitted, which included the prefiled testimony of Stephanie Williams, R. Craig Wall, and Phillip Grant.[21] The ED had ten exhibits admitted, which included the prefiled testimony of Dan Hannah.[22] OPIC offered no testimony or exhibits.

VI. ANALYSIS

The Commission referred this matter to SOAH for hearing on the three issues described above. With respect to each of the referred issues, and for the reasons set forth below, the ALJs find that UEC has not met its burden to prove by a preponderance of the evidence that the draft permits comply with applicable statutory and regulatory requirements.

[19] The District's admitted exhibits consist of Exhibits 100, 101, 200-202, 300-315, 400-404, 501, and 505.

[20] Landowners' admitted exhibits consist of Exhibits 1, 1A, 1B, 2, 2A, 2B, 3, 3A, 3B, 4, 4A, 4B, 4C, 5, 5A, and 5B.

[21] UEC's admitted exhibits consist of Exhibits 1, 2, 2-01, 2-01, 2-02, 2-03, 2-04, 3, 3-01, 3-02, 4, 4-01, and 4-02.

[22] The ED's admitted exhibits consist of Exhibits 1-10.

A. Whether the Application Adequately Characterizes the Geology and Identifies and Assesses Faults in the Vicinity of the UEC Wells

The Commission must consider the following, among other things, *before* issuing a Class I injection well permit: maps and cross-sections indicating the general vertical and lateral limits of underground sources of drinking water (USDWs) and freshwater aquifers, their positions relative to the injection formation and the direction of water movement; and maps, cross sections, and description of the geologic structure of the local area and regional geologic setting.[23]

In addition, the Commission must consider whether the Class I injection well is sited such that the well injects into a formation that is beneath the lowermost formation containing a USDW or freshwater aquifer; and that the siting of the Class I injection well is limited to areas that are geologically suitable.[24] The geologic suitability is determined based on: an analysis of the structural and stratigraphic geology, the hydrogeology, and the seismicity of the region; an analysis of the local geology and hydrogeology of the well site, including detailed information regarding stratigraphy, structure and rock properties, aquifer hydrodynamics and mineral resources; and a determination that the geology of the area can be described confidently and that limits of waste fate and transport can be accurately predicted through the use of analytical and numerical models.[25]

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[23] Rule 331.121(a)(2)(D)-(F) (emphasis added).

[24] Rule 331.121(c)(1), (2).

[25] Rule 331.121(c)(2).

A Class I injection well must be sited such that: the injection zone has sufficient permeability, porosity, thickness and areal extent to prevent migration of fluids into USDWs or freshwater aquifers; the confining zone is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to prevent the movement of fluids into a USDW or freshwater aquifer, and contains at least one formation of sufficient thickness and with lithologic and stress characteristics of preventing or propagating fractures.[26]

The owner or operator of the Class I injection well must demonstrate that the confining zone is separated from the base of the lowermost USDW or freshwater aquifer by at least one sequence of permeable and less permeable strata that will be an added layer of protection for the USDW or freshwater aquifer in the event of fluid movement in an unlocated borehole or transmissive fault; or that the piezometric surface of the fluid in the injection zone is less that the piezometric surface of the lowermost USDW.[27]

Also, *before* issuing a Class I injection well permit, the Commission must consider the technical report in the application that includes delineation of all faults

[26] Rule 331.121(c)(3). Porosity is a measure of the void space within a rock. This is the volume of a formation that will hold the injected fluids. Generally, as the porosity increases, the volume of fluid the formation can hold also increases. Permeability measures the ability of a rock to allow fluids to flow through a formation. Generally, the higher the permeability, the higher the possible rate of injection using lower pressures. The reservoir thickness is the cross-sectional (vertical) height within the reservoir that has sufficient porosity and permeability to transmit the injected fluid into the formation. District Ex. 300 (Gordon Dir.) at 7-8.

[27] Rule 331.121(c)(4).

within the area of review (AOR),[28] together with a demonstration, unless previously demonstrated to the Commission or the United States Environmental Protection Agency, that the fault is not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone.[29] A permit for a Class I injection well shall not be issued if a fault exists within 2.5 miles from the proposed or existing wellbore of the Class I injection well or the area within the cone of influence (COI) (whichever is greater), unless the applicant demonstrates to the satisfaction of the Commission that the fault is not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone.[30]

Section V of TCEQ's Instructions for a Permit Application to Dispose of Waste in a Class I Injection Well (Instructions) set forth the criteria for describing the geology in the vicinity of the proposed wells.[31] The Instructions describe what is necessary to satisfy Rule 331.121(c)(2)(A), (B), and (C).The applicant is required to include a description of the regional and local (within the AOR) stratigraphic and structural geology, lithology, and hydrogeology pertinent to the proposed injection

[28] AOR is the area surrounding an injection well described according to the criteria set forth in Rule 331.42 or, in the case of an area permit, the project area plus a circumscribing area the width of which is either 1/4 mile or a number calculated according to the criteria set forth in Rule 331.42. Rule § 331.2(13).

[29] Rule 331.121(a)(2)(P) (emphasis added). The injection zone is defined as a formation, a group of formations, or part of a formation that receives fluid through a well. Rule 331.2(60).

[30] Rule 335.205(a)(5). COI is the potentiometric surface area around the injection well within which increased injection zone pressures caused by injection of wastes would be sufficient to drive fluids into an underground source of drinking water or freshwater aquifer. Rule 331.2(32).

[31] *See* UEC Ex. 2-02.

program.[32] Regional geology should be rendered on a scale capable of accurately depicting the geology of the region (approximately a 20 to 50-mile radius).[33] For local geology, an application is required to include maps covering the AOR, which has a 2.5-mile radius from the injection well, or the area of the COI, whichever is greater. Sufficient well data must be used to accurately depict the local geology.[34]

1. UEC's Application and Position

UEC argues that the Application adequately characterizes the regional and local geology and adequately identifies and assesses faults in the vicinity of the UEC wells and that the faults in the vicinity of the wells are self-sealing and do not present a threat of transmissivity.[35] The Application contains a Geology Report that describes the regional and local geology and hydrogeology in the vicinity of UEC wells.[36] Both UEC's experts Stephanie Williams and R. Craig Grant testified that the report complies with the requirements in the Instructions.[37]

The regional geology and hydrogeology portion of the Application's technical report contains information describing: the geologic suitability of the region; the regional stratigraphy, including a stratigraphic column; the regional hydrostratigraphy, including major aquifers and the lowest USDW; the

[32] UEC Ex. 2-02 at Bates APP004910-11.

[33] UEC Ex. 2-02 at Bates APP004910.

[34] UEC Ex. 2-02 at Bates APP004911.

[35] *See* UEC Initial Brief (Br.) at 4-21.

[36] UEC Ex. 1 at 1893-1933.

[37] UEC Ex. 2 (Wiliams Direct (Dir.)) at 8-10, 12-14, 20; UEC Ex. 4 (Grant Dir.) at 13, 18.

confining zone and injection zone, including structure and isopach maps of the zones; cross sections that describe the region from the surface through the confining strata below the injection zone; the regional structural geology as it relates to the injection well site including fault characteristics and trends; regional seismic activity; and regional groundwater flow in the injection zone.[38]

The local geology and hydrogeology portion of the technical report contains information describing: the geologic suitability of the area; the stratigraphic units at the UEC wells locations in detail, including a stratigraphic column; hydrostratigraphy and the major aquifers and the USDW; approximate depths to the permitted horizons as estimated for the UEC wells using log depths from nearby Nugget Oil Corp. Gleinser No. 2 (Gleinser No. 2) well; two cross sections; structural geology; injection interval; confining strata beneath injection zone; local structural cross sections; structural geology; faulting transmissivity; confining zone lateral continuity; confining zone lithologic and stress characteristics; seismic history; delineation of all faults within the AOR; and the surface geology.[39]

The Application provides that the UEC site is located approximately 13.5 miles north of Goliad in Goliad County within the South Texas Gulf Coast Region. The regional geologic study area is circular with an approximate radius of 15 miles.[40] The site will be located along the trend of the San Marcos Arch, a

[38] *See* UEC Ex. 1 at 1896-1905. Mr. Grant explained that the structure and isopach maps provide an overhead view of subsurface geology, while the cross sections provide a side-on view through a vertical plane. UEC Ex. 4 (Grant Dir.) at 10.

[39] *See* UEC Ex. 1 at 1905-24.

[40] UEC Ex. 1 at 82 (Figure V-1), 1896.

structural feature which lies within the upper inland portion of the Gulf Coast Basin. Specifically, the site will be situated within the Wilcox fault zone, an approximately 20-mile-wide band of growth faults oriented roughly from southwest to northeast. The permitted injection zone for the UEC wells is within the Frio and Vicksburg Formations from 2,800 to 3,590 feet BGL. The authorized injection interval is within the Vicksburg Formation from 3,200 to 3,590 feet BGL and consists of a stratigraphically isolated sand package within a relatively thick sequence of clay and/or shale above and below that comprise the injection zone.[41]

According to the Application, the confining zone is laterally continuous throughout the AOR. The confining zone consists of strata within the upper Frio Formation, which is regionally correlative and has a higher clay-to-sand ratio than the underlying upper Vicksburg Group. The higher clay ratio is significant as the dense, clay-rich shale layers have a lower permeability than sand layers and prevent vertical fluid movement. The overall thickness of the upper confining cone within the AOR ranges from 350-450 feet. The upper confining zone consists of a thick clay/shale sequence with discontinuous interbedded sands located mainly within the lower and upper part of the unit. The middle part of the unit is comprised of a continuous clay/shale approximately 250 feet thick. The upper confining zone is overlain by the Anahuac Formation, which consists of dense marine clay/shale that ranges from approximately 100 to 250 feet thick and provides an additional layer of containment above the upper confining zone. Considering the apparent

[41] UEC Ex. 1 at 130, 1902-03, 1906, 1915-16, 1937. Injection interval is the part of the injection zone in which the well is authorized to be screened, perforated, or in which the waste is otherwise authorized to be directly emplaced. Rule 331.2(57).

displacement along the faults and the thick upper confining zone, it is extremely unlikely that the injection reservoir unit will be juxtaposed against sand or other potentially porous or permeable strata that will conduct injected fluid out of the reservoir.[42]

The Application states that the confining zone contains at least one formation of sufficient thickness with lithologic and stress characteristics capable of preventing initiation and/or propagation of fractures, namely the upper Frio Formation. The Frio Formation consists of sand and shale sequences with a high density of dense, clay-rich shale. The shales are described as plastic and ductile and possess lithologic and stress characteristics capable of preventing the initiation and propagation of fractures. The Application states that the plastic nature of the region's shales, which seal fractures, prevents vertical movement of fluids up the fracture plane.[43]

The Application represents that the base of the lowermost USDW is separated from the confining zone by at least one sequence of permeable strata (which would allow "bleed off" for further dissipation of any increasing pressure or fluids) and less permeable strata (which prevent upward migration of fluids).[44] According to UEC's expert Williams, the Application identifies the 597 feet of alternating permeable (sand) and less permeable (shale) strata within the Anahuac

[42] UEC Ex. 1 at 1902, 1916-19. Confining zone is a part of a formation, a formation, or group of formations between the injection zone and the lowermost USDW or freshwater aquifer that acts as a barrier to the movement of fluids out of the injection zone. Rule § 331.2(33). A structure map of the top of the confining zone is included as Figure V-24. A total thickness map of the confining zone is shown on Figure V-25. UEC Ex. 1 at 2022-23.

[43] UEC Ex. 1 at 1920-21.

[44] UEC Ex. 1 at 1921-22.

and Catahoula Tuff Formations between the base of the lowermost USDW and top of the confining zone and demonstrates that the potentiometric surface (the level to which water will rise in a well) of the injection zone is less than the potentiometric surface of the lowermost USDW.[45]

The Application assesses the potential for injection into the well to result in a seismic (earthquake) event. The Application details seismic history in the AOR and states the local study area has little potential for earthquake damage in part due to the relatively low level of tectonic activity. The Application states that there is sufficient thickness of sediments below the lower confining zone to act as a barrier against a potential migration of injected fluids between the injection zone and lower basement rocks.[46]

The Application includes a description of the surface geology, indicating the location of the UEC wells, site, and known or suspected faults.[47] The Application shows mapped faults in the study area that are represented in cross sections which run perpendicular to the projected strike (direction or orientation) of the faults.[48] Structure maps were included in the Application showing faults in the AOR.[49] The top of the injection interval, the top of the injection zone, and the top of confining

[45] UEC Ex. 2 (Wiliams Dir.) at 19.

[46] UEC Ex. 2 (Wiliams Dir.) at 19-20.

[47] UEC Ex. 1 at 1924.

[48] UEC Ex. 1 at 1931 (Figure V-18).

[49] UEC Ex. 4 (Grant Dir.) at 14.

zone, are shown with the mapped faults in the Application.[50] There are 11 faults (five down to the coast and six antithetic) within the AOR based on log correlation and stratigraphic relationships.[51]

According to UEC, the faults are not transmissive because: (1) the shales at the site are plastic and unconsolidated at the depths of interest, and it is unlikely that coherent, transmissive fractures or fault planes exist; (2) when two bodies of unconsolidated shale, or shale and sand, slide past each other along a fault, it is likely that the fault plane will become filled and sealed with plastic shale; (3) due to the very plastic nature of the Gulf Coast Region shales and clays, faults tend to seal themselves, allowing no vertical fluid movement up the fault plane; and (4) the large thickness of shale strata above the injection interval, which provides extensive shale to shale contact along the fault plane, combined with possible shale smearing along the fault plane, provides adequate sealing to prevent any vertical migration of formation and/or injected fluids along the fault plane.[52] Mr. Grant testified that the placement of the UEC wells will not result in upward movement of injected fluids via vertical fault conduits and would not contaminate an aquifer containing usable quality water.[53] He added that the presence of shale to shale contact across the confining zone strata, plus shale smearing within the fault plane precludes vertical transmission of fluids up the fault planes.[54]

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[50] UEC Ex. 1 at 1933 (Figure V-20), 1861 (Figure V-22), 1862 (Figure V-24).

[51] UEC Ex. 1 at 1914-15, 1933 (Figure V-20).

[52] UEC Ex. 4 (Grant Dir.) at 25.

[53] UEC Ex. 4 (Grant Dir.) at 17.

[54] UEC Ex. 4 (Grant Dir.) at 17.

UEC contends that the faults in the vicinity of the UEC wells are self-sealing because the injection interval for the wells consists of a stratigraphically isolated sand package within a relatively thick sequence of clay and/or shale above and below. The injection zone contains a buffer—or upper containment interval—approximately 390 feet thick consisting of low permeability strata overlying the injection interval. Additionally, the overall thickness of the upper confining zone within the AOR ranges from approximately 800 to 1,000 feet thick. The upper confining zone consists of a thick clay/shale sequence with discontinuous interbedded sands located mainly within the lower and upper parts of the unit. The middle part of the unit is comprised of continuous clay/shale ranging from approximately 250 to 400 feet thick. In addition, the upper confining zone is overlain by the Anahuac Formation, which consists of a dense marine clay/shale that ranges from approximately 100 to 250 feet thick and provides an additional layer of containment above the upper confining zone. The lower confining zone contains clays and shales associated with the lower Vicksburg Group and Jackson Group, which are generally over 1,200 feet thick. Therefore, considering the apparent displacement along the faults, the upper injection zone buffer and the thick upper and lower confining zones, it is unlikely that the injection reservoir unit will be juxtaposed against sand or other potentially porous or permeable strata that will conduct injected fluid out of the reservoir.[55]

According to the Application, in areas consisting of hard and brittle materials or highly porous and permeable sands, the actual fault itself could possibly be a potential conduit for fluid movement; however, the subsurface sediments

[55] UEC Ex. 1 at 1916-19; UEC Ex. 4 (Grant Dir.) at 17.

encountered in the Texas Gulf Coast Region contain a large percentage of fine-grained material both interbedded and intermixed with porous materials. Also, the sediments are relatively young (in geological terms); were deposited in wet depositional environments (fluvial, deltaic and marine); and were buried rapidly, thus incorporating a significant volume of water. These factors usually generate "soft" sedimentary deposits and sequences, and hardly become indurated (or hard/brittle) until very deep depths of burial are achieved. Based on these factors, the faults typically occurring in Gulf Coast sediments are mainly sealing faults.[56]

In the absence of macroscopic fractures (not expected in the "soft" sediments of the shallow Gulf Coast basin), deformed sands and shales in the fault plane would be expected to have a lower permeability than surrounding undeformed shale or sand. In addition, in a sand-shale sequence, smearing of ductile shale horizons along fault planes generally strongly reduces cross-fault permeability.[57]

According to the Application, mapped faults transect the confining zone, with a maximum vertical displacement of approximately 180 feet, which is less than the total thickness of the confining zone. This indicates that more porous and/or permeable formations/units, either above or below the confining zone, would not come in contact with one another due to fault offset. The Application demonstrates that it is unlikely that the injection reservoir unit will be juxtaposed against sand or

[56] UEC Ex. 1 at 131.

[57] UEC Ex. 1 at 1918.

other potentially porous or permeable strata that will conduct injected fluid out of the reservoir.[58]

The Application provides that the presence of hydrocarbon reservoirs or fields along faults also provides an indication of the sealing ability of the faults based on their ability to trap hydrocarbons.[59] In the Gulf Coast Region, a large number of hydrocarbon fields are associated with fault traps. The trapping mechanisms include the juxtaposition of low permeability strata (shale or clay) against reservoir strata (sand), clay smear or clay injection within the fault zone, and the development of a shear zone (cataclasis) in the reservoir strata associated with movement.[60]

The Jasper Aquifer is the lowermost USDW in the vicinity of the UEC wells.[61] Its base occurs at depths of approximately 1,750 feet BGL in this area.[62] The UEC wells will inject into a formation that is well beneath the lowermost formation containing a USDW or freshwater aquifer.[63] The alternating sand and shale layers in the geologic formations above the confining zone are well below the base of the lowermost USDW and provide an added layer of protection for the lowermost USDW in the event of fluid movement in an unlocated borehole or transmissive

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[58] UEC Ex. 1 at 131, 1917-19.

[59] UEC Ex. 1 at 1918-19.

[60] UEC Ex. 1 at 1918.

[61] While no detailed groundwater studies on the Jasper Aquifer were found, both the potentiometric data and the groundwater flow map from the Carrizo Aquifer study suggest that the regional groundwater flow in the UEC injection zone is southeast and toward the Gulf Coast. UEC Ex. 1 at 1905.

[62] UEC Ex. 1 at 27.

[63] UEC Ex. 1 at 1902.

fault. No USDW is present within the confining zone or injection zone.[64] Detailed mapping of the local subsurface geology was conducted based on a review of electric logs from over 160 wells drilled in the area. There are 169 wells shown in the AOR, 146 of which penetrate the confining and/or injection zones within the AOR.[65]

Ms. Williams testified that, to analyze the local geology, she used regional resources, including the Loucks Paper, and she reviewed wells within the local study and made projections and estimations of the parameters within the injection interval, injection zone, and confining zone, including porosity and permeability.[66] She did not review the numerical values from the well logs to assess the porosity or to identify an exact value of porosity but assessed them for more porous and less porous intervals within a formation.[67] She stated that the Loucks Paper did not make an estimation for porosity and permeability in the Vicksburg Formation and Goliad County or for the proposed disposal intervals and that porosity and permeability values were not quantified from local data for the Application.[68]

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[64] UEC Ex. 1 at 1921-22.

[65] UEC Ex. 1 at 240, 1905. Water wells within the AOR are shown on Figure VIII-1 and Attachment C-1, and information for these wells is tabulated on Table VIII-1. Total depths of water wells in the area are generally less than 659 feet. UEC Ex. 1 at 217, 281.

[66] Hearing Transcript (Tr.) Volume (Vol.) 1 at 184-85, 189, 191; District Ex. 302, R.G. Loucks et al., *Sandstone Consolidation Analysis to Delineate Areas of High-Quality Reservoirs Suitable for Production of Geopressured Geothermal Energy Along the Texas Gulf Coast* (1979) (Loucks Paper). The Loucks Paper focused on deeper depths, specifically for geothermal energy inquiry. Ms. Williams testified that the values for the shallower UEC wells should be on the higher spectrum of the regional values. UEC Ex. 2 (Wiliams Dir.) at 25. Ms. Williams stated that she interprets the local study to predominantly mean the AOR. Tr. Vol. 1 at 196.

[67] Tr. Vol. 1 at 187-88.

[68] Tr. Vol. 1 at 189-90, 192, 196.

Ms. Williams stated, "I would say that we do not have site-specific data [within the AOR]. We have an extrapolation of the geology at the local study area . . ."[69]

Ms. Williams testified that, in the absence of direct measurements at the location of the proposed wells, regional data is used to estimate the porosity and permeability of the injection interval.[70] According to Ms. Williams, in heterogenous formations, as in this case,[71] she needs to address the "acceptable range." Therefore, she uses regional data to make a geologic interpretation of what the geology will be at each specific well location. She opined that she could get a range from values seen within the formation and determine the value expected to fall within that range.[72] She felt "confident that the artificial penetrations are described [in the Application] accurately."[73]

Ms. Williams said that in the Class I injection well permit applications, an applicant makes "extrapolations" of what they expect to find in the formations. Once a well is drilled, there are numerous requirements about data that must be submitted to TCEQ through a completion report. If the projected values in the application differ from the actual data, a permit amendment or modification may be

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[69] Tr. Vol. 1 at 212.

[70] UEC Ex. 2 (Wiliams Dir.) at 24.

[71] District expert Gordon also stated that the Vicksburg Formation is known to be heterogenous. This means that the characteristics of the formation can vary widely from location to location, both laterally and vertically. District Ex. 300 (Gordon Dir.) at 5.

[72] Tr. Vol. 1 at 191, 194. Ms. Williams admitted that that the porosity and the permeability could vary with depth and throughout the injection interval. Tr. Vol. 1 at 205.

[73] Tr. Vol. 1 at 207.

required. According to Ms. Williams, the data collected once the well is drilled provide the key information to confidently describe porosity, permeability, and other reservoir or geologic characteristics at the site-specific location.[74]

Mr. Grant provided the following summary of the Application's identification and assessment of 11 faults in the vicinity of the UEC wells:[75]

- Fault 1 is the northernmost fault and extends across approximately 75% of the width of the AOR in a southwest–northeast trending direction. The fault extends through an area with a low density of drilled wells and available well logs. This fault cuts the injection interval and upper confining zone. The thickness of the upper confining zone averages approximately 400 feet along the trend of the fault. The maximum vertical displacement of the confining zone is approximately 80 feet and juxtaposes shale against shale. The fault appears to dip to the southeast and extends into the deeper section.[76]

- Fault 2 is located approximately 3,800 feet northwest of the well in Permit WDW424 and displaces approximately 50 to 80 feet of the upper confining zone, juxtaposing shale against shale, and also intersects the top of the injection interval. The upper confining zone averages approximately 400 feet in thickness along the trend of this fault.[77]

- Fault 3 is located approximately 1,200 feet southeast of the well in Permit WDW423 and appears to displace the top of the upper confining zone. Approximately 150 feet of displacement exist at this level, juxtaposing shales of the upper Frio Formation against shales of the Frio Formation. The upper confining zone averages approximately 400 feet in thickness along the trend

[74] Tr. Vol. 1 at 180, 198-201.

[75] UEC Ex. 1 at 1931 (Figure V-18).

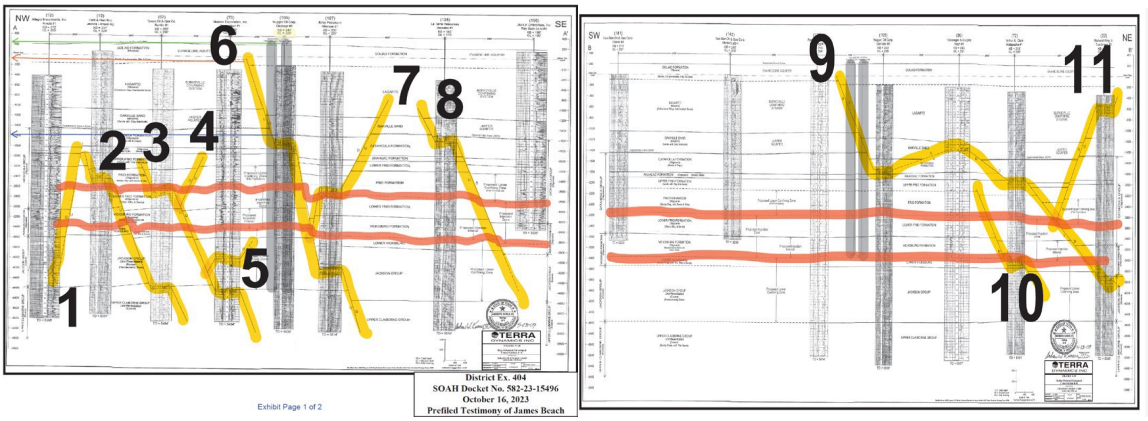
[76] UEC Ex. 4 (Grant Dir.) at 14. According to the ED, because of the lack of data points, the fault cannot be mapped completely across the injection area. ED Ex. 9 at Bates ED–09.000073.

[77] UEC Ex. 4 (Grant Dir.) at 15.

of this fault. The fault dips to the southeast and extends into the deeper section. This fault also appears to split along strike to the northeast.[78]

- Fault 4 is present in the southernmost AOR and appears to displace strata within the upper portion of the section, including the top of the upper confining zone, with approximately 50 feet of displacement. The upper confining zone averages approximately 475 feet in thickness along the trend of this fault. This fault juxtaposes the upper confining zone against clays of the overlying Anahuac Formation. However, it does not appear that the fault extends deeper.[79]

- Faults 5-11 provide shale to shale contact across these faults and limit vertical transmissivity.[80] Fault 6 starts below the injection interval and continues to go through the injection zone and all the way up into the Evangeline Aquifer.[81] Faults 1, 2, 3, 4, 6, 7, and 8 transect the injection interval and continue without break at least above the injection zone.[82]



[78] UEC Ex. 4 (Grant Dir.) at 15. Mr. Beach noted that the Application predicts that wastewater will reach this fault within ten years. District Ex. 400 (Beach Dir.) at 18. Mr. Grant responded that actual operation of the well(s) will not be at a continuous maximum injection rate as conservatively modeled, so it is unlikely the wastewater will reach the fault within ten years. Also, reaching the fault within ten years is not equivalent to initiating vertical movement up the fault. UEC Ex. 1 (Grant Dir.) at 34.

[79] UEC Ex. 4 (Grant Dir.) at 15-16.

[80] UEC Ex. 4 (Grant Dir.) at 16.

[81] Tr. Vol. 2 at 51; *see* District Ex. 404.

[82] Tr. Vol. 2 at 51-52.

Mr. Grant testified that these 11 faults juxtapose low permeability shale against low permeability shale and do not present a risk of injectate migrating out of the injection zone. This juxtaposition of shale to shale across the faults provides a vertical seal to injectate movement, limiting transmissivity.[83] Mr. Grant opined that, *typically*, the presence of shale-to-shale contact across the confining zone strata, plus shale smearing within the fault plane precludes vertical transmission of fluids up the fault planes.[84] He stated that, 98% of the time, shale-to-shale juxtaposition is always sealing. To definitively determine the existence of shale smearing in a fault, a core should be taken when drilling the well that actually cuts through the fault in the bore hole. He confirmed that this has not been done in the AOR.[85] Mr. Grant agreed that a pump test could be a useful tool to determine if the faults are transmissive.[86] Mr. Grant stated that one of the reasons that pump tests are important is because the makeup of the fault and whether it is transmissive depends on the geologic makeup of that fault.[87]

According to Mr. Grant, the Application demonstrates, to the satisfaction of the ED, that the faults are not sufficiently transmissive or vertically extensive to allow migration of injected fluids out of the injection zone.[88] Mr. Grant testified that

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[83] UEC Ex. 4 (Grant Dir.) at 14-16.

[84] UEC Ex. 4 (Grant Dir.) at 17; Tr. Vol. 2 at 99 (emphasis added).

[85] Tr. Vol. 2 at 98-99.

[86] Tr. Vol. 2 at 58-59.

[87] Tr. Vol. 2 at 71.

[88] UEC Ex. 4 (Grant Dir.) at 13. Mr. Grant confirmed that TCEQ cannot issue the amended permits until UEC proves all faults that vertically extend from the injection interval up into the USDW are not transmissive. Tr. Vol. 2 at 52-53.

he determined that the faults are not transmissive based on (1) the Jones Paper, which provides a general proposition that faults in the Gulf Coast Region tend to seal themselves due to the very plastic nature of the Gulf Coast Region shales, and (2) the presence of hydrocarbons at the site.[89] He explained that consideration of faults is necessary to assure that injected waste will remain in the injection zone and to assess the expected pressure buildup within the injection zone. According to Mr. Grant, the geological assessment of the faulting present in the AOR indicates that they are vertically sealing, preventing injected fluids from exiting the injection zone. The calculated pressure increases shown in the Application are not sufficient to move injected fluids up the fault planes to above the top of the injection zone.[90]

UEC modeled the COI using the PRESS2 pressure model, which calculated the maximum pressure increases which could occur in the injection reservoir during the lifetime operation of the wells.[91] According to Ms. Williams, the PRESS2 pressure model requires the input of one permeability and one porosity value. Therefore, she provided a representative value for the injection interval—she selected an average permeability and porosity value.[92] She admitted that, during the drilling of the wells, there could be less net sand than predicted and that, if the sand

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[89] Tr. Vol. 2 at 60, 62, 69; District Ex. 505, Thomas A. Jones, Jill S. Haimson, *Demonstration of Confinement: an Assessment of Class I Wells in the Great Lakes and Gulf Coast Regions* (1986) (Jones Paper).

[90] UEC Ex. 4 (Grant Dir.) at 13.

[91] Tr. Vol. 1 at 201. The COI calculations are provided in that the Application's Reservoir Mechanics Report. UEC Ex. 1 at 2037-39. The PRESS2 pressure model was run to show pressure buildup in the injection interval ten and 30 years into the future. To account for the mapped offset faults located northwest and southeast of the UEC wells within the AOR, mirror image injection wells were designed equidistant in the model on the other side of the fault trace. This resulted in a conservatively large no-flow boundary reflecting the possibly sealing nature of the fault to lateral pressure transmittal due to fault plane offset and clay smearing along the fault face. UEC Ex. 1 at 1996.

[92] Tr. Vol. 1 at 206.

thickness within the injection interval is thinner than modeled, that could increase the pressure.[93] Mr. Grant testified that the PRESS2 pressure model provides evidence of the sealing nature of the fault to lateral pressure transmittal due to fault plane offset and clay smearing along the fault face.[94]

2. The ED's Position

The ED argues that the Application adequately characterizes the geology and adequately identifies and assesses faults in the vicinity of the UEC wells.[95] According to ED's technical summary and preliminary decision, evaluation of the structural and stratigraphic geology indicates that the site is located in a geologically suitable location for injection well operations. The ED determined that the Application sufficiently considers nearby faults including faults representing impermeable boundaries to injected fluids and as pathways for migration of injected fluids.[96] The ED found that UEC has demonstrated that the injection zone is of sufficient permeability, porosity, thickness, and areal extent to receive the injected waste streams. The confining zone was shown to be laterally continuous and free of

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[93] Tr. Vol. 1 at 203-04, 212.

[94] UEC Ex. 4 (Grant Dir.) at 17-18. Ms. Gordon testified that reservoir pressure is the pressure of fluids within a reservoir. Pressure generally increases with depth. Reservoir pressure may increase if fluids are injected. Reservoir pressure influences the ability to inject fluids into formations and it influences how far up injected fluids or native fluids will migrate vertically. District Ex. 300 (Gordon Dir.) at 8.

[95] *See* ED Initial Br. at 3-6.

[96] ED Ex. 9 at Bates ED-09.000072. Section V of the current Class I injection well renewal and amendment Application contains geologic and technical data regarding faulting within the AOR. The mapped faults in the study area are best represented in cross section A-A', which runs perpendicular to the projected strike of the faults. UEC Ex. 1 at 1931 (Figure V-18).

transecting, transmissive faults, or fractures to prevent the migration of fluids into USDW.[97]

The ED's expert Dan Hannah testified that applications for Class I injection wells require sufficient well data be used to accurately depict the local geology including data collected from logs, cores, and tests performed during drilling, completion, and operation of existing wells.[98] He confirmed that TCEQ must consider both regional and local data before issuing a Class I injection well permit.[99] He said that local data points are needed to compare the regional studies to confirm or more accurately characterize the geology to be able to say that there are shared reservoir characteristics.[100]

Mr. Hannah testified that the Application adequately characterized the geology in the vicinity of the UEC wells as required by TCEQ rules.[101] He stated that the methods used by UEC to characterize the geology were appropriate and similar to the methods used to characterize geology in other permit applications that he reviewed. According to Mr. Hannah, the predominant methods were citing and reproduction of published information/studies on Texas Gulf Coast regional geology and interpretation of geophysical (wireline) logs from oil and gas wells in the vicinity

[97] ED Ex. 6 at Bates ED-06.000045; UEC Ex. 1 at 26.

[98] Tr. Vol. 2 at 146.

[99] Tr. Vol. 2 at 148, 155.

[100] Tr. Vol. 2 at 153.

[101] Mr. Hannah stated that he based this determination on the review of the Application and did not conduct an independent analysis of geology in this area of Goliad County. Tr. Vol. 2 at 146-47.

of the UEC wells. The information from regional studies and interpretation of geophysical logs from nearby wells was used to formulate a conceptional model that characterizes the local geology.[102]

Mr. Hannah testified that the wireline log data was not used in determining porosity, permeability, or bottom-hole of the disposal interval for UEC wells; instead, the Loucks Paper, a regional study, was used.[103] He confirmed that no local data was used to determine porosity, permeability, or bottom-hole.[104] Mr. Hannah said it was possible to be "reasonably confident" about the geology in the area of the proposed wells without information on local geology based on regional studies.[105] He testified that it would not be feasible to measure permeability in an injection zone prior to drilling the wells.[106] According to Mr. Hannah, the permeability of the injection zone is measured directly from core samples obtained during drilling of the well or is determined indirectly from pressure fall-off testing conducted after the well has been drilled and constructed.[107] Mr. Hannah stated that there is no permit required to drill a stratigraphic test well, other test wells, or water wells if there is no injection involved.[108] He said it would be possible to measure porosity, permeability, bottom-hole temperature, and other characteristics of the injection zone by logging

[102] ED Ex. 1 (Hannah Dir.) at 8.

[103] Tr. Vol. 2 at 154-55.

[104] Tr. Vol. 2 at 154-155.

[105] Tr. Vol. 2 at 156.

[106] Tr. Vol. 2 at 161; ED Ex. 1 (Hannah Dir.) at 11.

[107] ED Ex. 1 (Hannah Dir.) at 11.

[108] Tr. Vol. 2 at 161-62.

and coring a stratigraphic test well or a water well or by performing a pump test by drilling water wells.[109]

Mr. Hannah further testified that the Application identified and assessed faults in the vicinity of the UEC wells as required by TCEQ rules. He stated that he considered the Application's identification of faults in the vicinity of the UEC wells to be adequate under the applicable rules.[110] According to Mr. Hannah, concern about vertical transmissivity of faults in the AOR is alleviated by the properties of the proposed injection zone and confining zone—thick, continuous, low-permeability shales and clay above the injection interval in both zones present a barrier to vertical migration of injected fluids.[111]

The ED explained that, once the UEC wells are drilled, constructed, and completed according to the provisions of the permits and TCEQ rules, UEC will be required to conduct various tests on the well construction and perform injectivity tests to determine well capacity and reservoir characteristics under Rule 331.62(a)(8). Pressure fall-off testing will be conducted to assess the characteristics of the injection zone and provide indications about the transmissivity or sealing properties of nearby faults by measuring the pressure response within the formation. UEC will be required to provide a completion report providing the

[109] Tr. Vol. 2 at 162.

[110] ED Ex. 1 (Hannah Dir.) at 9.

[111] ED Ex. 1 (Hannah Dir.) at 9, 11-12. Mr. Hannah admitted that he paraphrased the Application language. Tr. Vol. 2 at 176.

information and test results required under Rule 331.65(b)(1) and must obtain approval from the ED prior to beginning any injection operations.[112]

Mr. Hannah stated that there is no public notice issued when a completion report is submitted to the ED by an applicant and that the public cannot submit comments regarding the report or request a hearing regarding the ED's determination to approve or disapprove the report. After the completion report is submitted, a TCEQ project manager assigned to review the application would "subjectively" determine whether the difference between what was submitted in the Application and what is in the report is significant enough to require an amendment or modification.[113]

3. Protestants' Position[114]

Protestants argue that UEC failed to adequately characterize the geology and faults to prove that the USDWs will be protected.[115] Protestants state that Texas law and numerous TCEQ rules make clear that TCEQ cannot issue Class I disposal well permits until after the applicant proves all USDWs are protected from migration of fluids from the proposed injection interval.[116] Protestants state that relying on technical information submitted to TCEQ after permits are issued undermines

[112] ED Ex. 6 at Bates ED–09.000074.

[113] Tr. Vol. 2 at 160-61.

[114] Landowners incorporated the District's written closing and reply in their closing.

[115] District Initial Br. at 4.

[116] District Initial Br. at 10.

public interest and violates their right to due process—as testified by Mr. Hannah, there will be no opportunity for public participation after the permits are issued and any further decisions of whether groundwater is protected would be within the ED's sole discretion.[117]

a) Identification and Assessment of Faults

It is essential to characterize and assess all faults within the AOR prior to permit issuance, including the number, location, vertical extent, and transmissivity of each fault. If faults are not adequately delineated and assessed, a permitted injection well could unlawfully pollute freshwater when fluids migrate out of the disposal interval and into the USDWs.[118]

Protestants argue that UEC failed to adequately identify and assess the location and vertical extent of all faults by not disclosing known faults within the AOR. The initially submitted Application for the UEC wells represented that only four faults existed within the AOR and that none of those faults intersected the injection interval or extended vertically up into a USDW.[119] According to Protestants, UEC knew the representation was false because UEC was aware of 11 faults back in 2009.[120] Even after supplementing the Application with the revised cross sections identifying 11 faults, Protestants note, UEC never supplemented the

[117] District Initial Br. at 13; Tr. Vol. 2 at 160-61.

[118] District Initial Br. at 14-15.

[119] District Initial Br. at 15. During the ED's technical review process, UEC revised its initially submitted Application and included 11 faults within the AOR. UEC Ex. 1 at 99-100, 129-33.

[120] UEC Ex. 1 at 1874; Tr. Vol. 2 at 37-38.

corresponding narrative portion of the Application—there is no description of the location, vertical extent, and potential impacts to groundwater of the additional seven faults.[121]

Protestants argue that it is important not to rely on well logs alone in an area of complex faulting. According to the District's expert James Beach, simply reviewing electric logs to characterize faulting and fluid migration is insufficient—these logs are thousands of feet apart from each other and a few are more than half of a mile from each other. Mr. Beach noted inconsistencies in UEC's maps, both in the original and renewal applications. For example, in relation to Fault 6, UEC changed its interpretation of the fault when it switched a single well log in the cross section for a log from a different nearby well. As a result of this change, UEC changed its conclusion that Fault 6 stopped below the USDW to the fault extending all the way into the Evangeline Aquifer. Moreover, Fault 3 from the original cross section A-A' is not depicted on the revised cross section A-A', or it has completely changed direction if it is now Fault 7.[122]

Furthermore, Protestants argue that UEC failed to adequately demonstrate that the faults within the AOR are not transmissive.[123] According to the Jones Paper,

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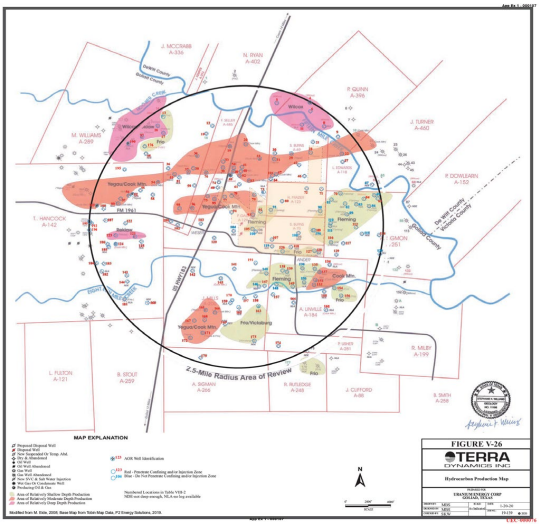
[121] District Initial Br. at 16; Tr. Vol. 2 at 61. Mr. Grant confirmed that the revised Application, which listed 11 faults, did not include the narrative in the geology section about the added faults. Tr. Vol. 2 at 61. He testified that the same characteristics of the four initially identified faults apply to the additionally identified faults. These additional faults are primarily splinter (bifurcating) or antithetic (updip to the coast) faults with smaller throw, less offset, and smaller vertical reach. UEC Ex. 4 (Grant Dir.) at 32.

[122] District Initial Br. at 17; District Ex. 400 (Beach Dir.) at 10-11, 17; Tr. Vol. 2 at 38-40. The Evangeline Aquifer is the primary source of groundwater for Goliad County. District Ex. 100 (Graham Dir.) at 3.

[123] District Initial Br. at 18.

the same paper UEC heavily relies upon to claim faults within the AOR tend to be sealing, an applicant for a Class I disposal well must conduct an investigation into subsurface faulting and complex geologic structures because this can breach confinement, creating a hydraulic connection between the injection zone and a USDW or aquifer. The Jones Paper further states that the Gulf Coast Region has numerous subsurface faults which must be investigated on a site-by-site basis.[124] In response to the assertion that the faults are self-sealing based on the presence of hydrocarbons, Protestants state that the Application and Mr. Grant's testimony confirm that the site does not have deeper hydrocarbons.[125] Figure V-26 in the Application does not support the presence of trapped hydrocarbons near the faults:[126]



[124] District Ex. 505 at 15. Mr. Grant confirmed that the Jones Paper states that faulting and complex geologic structures pose a similar risk to a confinement system as a problem artificial penetration and explained that this means that, even when you may have a confining layer, a fault, a geologic structure, or an artificial penetration, can circumvent that layer. He testified that he did not include the paper's direction about the site-by-site investigation for further review. Tr. Vol. 2 at 66-68.

[125] District Initial Br. at 22.

[126] UEC Ex. 1 at 107 (Figure V-26).

Protestants note that the legend for Figure V-26 indicates relatively deep and moderately deep hydrocarbon production with pink and orange colors, respectively. The site, especially the center portion where UEC interpreted the faults to be located, has no presence of deep hydrocarbons that have been "trapped" by the sealing faults. Moreover, Figure V-26 shows at least ten dry holes peppering a large swath of the site.[127] Mr. Grant agreed that the location of the faults lacked deep hydrocarbons and was covered with numerous dry holes.[128]

Moreover, Mr. Beach testified that Faults 3 and 4 are a potential pathway far into the USDW—these faults combine to create a potential pathway for fluids to migrate from the injection interval vertically up to around 100 feet below the approximate base of the USDW, and the dashed line for Fault 4 continues upward another 800 feet well into the USDW. He explained that fluids that migrate vertically up Fault 3 can migrate horizontally towards Fault 4 then vertically up into the USDW. Faults can work together to create hydraulic connections between formations. This can also include fluids migrating up a fault, then migrating horizontally to a nearby "inadequately" plugged wellbore that can be a pathway for fluids, or vice versa.[129] This is why extreme caution must be used and an extensive

[127] Mr. Grant testified that a dry hole means that an oil and gas operator drilled the hole to produce hydrocarbons but did not find any. Tr. Vol. 2 at 86.

[128] Tr. Vol. 2 at 84.

[129] Mr. Grant testified that Faults 3 and 4 are offset from each other and do not combine to form a continuous vertical pathway for vertical migration. In addition, these faults are vertically sealing, as demonstrated by the local hydrocarbon traps formed by the lateral and vertical sealing nature of these faults. UEC Ex. 1 (Grant Dir.) at 32. Protestants emphasize that Mr. Grant did not review the well logs in the cross sections to verify UEC's interpretations of the faults, did not review any well logs that were not part of the original application, and did not review any seismic data that UEC had in its possession. District Initial Br. at 17-18; Tr. Vol. 2 at 14-16, 44.

investigation must be conducted before operating wastewater disposal wells into a formation with complex faulting system.[130]

Protestants argue that UEC never investigated transmissivity of the faults at the proposed disposal site and propose that UEC should conduct a pump test to adequately assess transmissivity.[131] Mr. Beach noted that, based on his expertise, pump tests are useful and common tools when studying movement of groundwater. He explained that a pump test at the site at deeper depths could provide important information about whether these faults are transmissive.[132]

b) Class III Pump Test

According to Protestants, the only site-specific evidence regarding transmissivity of the faults presented at the hearing was a pump test performed by UEC when applying for its Class III injection wells for uranium mining.[133] Mr. Beach testified that the pump test results show a hydraulic connection across the fault, which undermines UEC's general statement that all faults in the region tend to be sealing.[134] This type of site-specific evidence is precisely what the Jones Paper

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[130] District Ex. 400 (Beach Dir.) at 15.

[131] District Initial Br. at 21, 23.

[132] Tr. Vol. 1 at 145. Mr. Grant agreed that a deeper depth pump test would be a useful tool for gauging vertical transmissivity of the faults and confirmed that UEC is familiar with the process of creating exploratory bore holes and has drilled them in the past. Tr. Vol. 2 at 58, 132. Ms. Gordon also mentioned that to collect additional data, UEC could drill a stratigraphic test well at the site. Tr. Vol. 1 at 104.

[133] District Ex. 400 (Beach Dir.) at 20. A pump test is when one water well is pumped on one side of a fault and another water well on the other side of the fault is observed for reactions to the water level. District Initial Br. at 19.

[134] District Ex. 400 (Beach Dir.) at 20-21.

directed applicants to obtain when seeking to dispose wastewater into an area with complex faulting.[135]

In a prior SOAH proceeding for UEC's Class III injection well permit in Goliad County, an ALJ concluded that there were unresolved issues, including possible Northwest Fault transmissibility based on a "24-hour pump test" performed by UEC.[136] The ALJ found that he "must treat the 24-hour pump test as some evidence of transmissivity across the fault" and "some evidence that the underground injection may pollute the freshwater." The ALJ's recommendation was based, in part, on the ED's expert witness testifying that the pump test "shows communication, hydraulic connectivity, across the fault." The ALJ pointed out that the witness never changed his opinion even though the pump test results were "messy." The ALJ ultimately recommended that TCEQ remand the application to conduct further pump tests or, alternatively, deny the permit.[137]

In its exceptions to the PFD, the ED stated that the pump test was described as "preliminary," and this testing was not submitted as part of the application, did not have required certification or a professional engineer or geoscientist seal, and did not undergo a technical review by the ED. Ultimately, the Commission found that concerns about the transmissivity of the Northwest Fault are appropriately

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[135] District Initial Br. at 19.

[136] District Ex. 201 at 10, *Application of Uranium Energy Corporation for Class III Injection Well Permit No. UR03075, for Aquifer Exemption, and for Production Area Authorization No. 1 in Goliad County, Texas*, SOAH Docket No. 582-09-3064, TCEQ Docket No. 2008-1888-UIC (Sept. 28, 2010).

[137] District Ex. 201 at 64-65, 138, 147.

addressed through any future production area authorizations that implicate, or are closer to, the fault, and granted the permit.[138]

Protestants emphasize that Mr. Wall, UEC's Vice President for Environmental, Health and Safety, agreed that information about the geology at the site remains the same for current and Class III injection well permit applications. Mr. Wall agreed that the ALJ and the ED's expert witness found that, regardless of an engineer or geoscientist seal, the pump test was evidence that freshwater resources might be polluted.[139] Finally, Mr. Wall testified that the ALJ's conclusions in the Class III injection well permit hearing are irrelevant because TCEQ did not adopt the ALJ's findings; at hearing, however, Mr. Wall agreed that the ALJ's findings were not irrelevant.[140] Protestants note that TCEQ in its Final Order never disagreed with the ALJ's findings that the hydraulic connection across the fault was evidence that the underground injection might pollute the freshwater.[141]

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[138] UEC Ex. 3-01 at Bates APP004825, APP004871. *See* Rule 331.21, requiring that all geoscientific information submitted to TCEQ shall be prepared by, or under the supervision of, a licensed professional geoscientist or a licensed professional engineer and shall be signed, sealed, and dated by the licensed professional geoscientist or licensed professional engineer.

[139] Tr. Vol. 2 at 127.

[140] Tr. Vol. 2 at 129; District Initial Br. at 20. UEC argues that a review of Mr. Wall's testimony shows he was responding to a generic and theoretical question about whether a finding made in this case by an ALJ could be relevant even if that finding is not adopted by the Commission. UEC Reply Br. at 19-20.

[141] Tr. Vol. 2 at 130; District Initial Br. at 21.

c) Local Geology

Protestants argue that, despite the known complexity of the Vicksburg Formation, UEC failed to adequately characterize the local geology.[142] Consequently, UEC failed to: adequately model and otherwise characterize reservoir conditions of the injection interval; accurately calculate COI; and demonstrate geologic suitability of the proposed disposal site. Therefore, UEC failed to demonstrate that its proposed disposal operations will not cause harmful fluids to migrate out of the permitted injection interval, either due to geologic unsuitability of the formation or through artificial penetrations within the COI.[143]

The District's expert Kim Gordon testified that the porosity, permeability, and other geological and geophysical characteristics of the Vicksburg Formation in Goliad County are not well characterized in available literature, and the properties of the reservoir can vary significantly laterally and vertically. Therefore, detailed subsurface studies, including well data, core samples, and geophysical surveys are necessary to accurately assess properties of the Vicksburg Formation at the project site. This is particularly important when the formation is made up of a complex geologic structure with extensive faulting or where existing wellbores are potential pathways for vertical migration of fluids.[144]

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[142] District Initial Br. at 23-24; Tr. Vol. 1 at 96.

[143] District Initial Br. at 24; 30 TAC § 331.121(c)(2). Mr. Grant testified that the information submitted in Section V [Geology Report] for porosity, permeability, reservoir thickness is used in Section VII [Reservoir Mechanics Report] to model reservoir mechanics. Tr. Vol. 2 at 144. The COI can affect AOR if the COI is greater than the default AOR of 2.5 miles around the injection. If the COI is greater than the 2.5-mile radius, the AOR will be the COI. *See* Rule 331.42(a).

[144] District Ex. 300 (Gordon Dir.) at 7.

Protestants state that the information on local geology included in the Application must be sufficient to demonstrate "that the geology of the area can be described confidently . . ." before TCEQ may issue a Class I injection well permit.[145] Applicants can obtain local geologic data from logs, cores, and tests from existing wells in the AOR. If local geologic data cannot be obtained from wells within the AOR, an applicant can expand the search outside the 2.5-mile AOR to obtain data sufficient to confidently describe local geology.[146] Protestants note that UEC made minimal to no effort to acquire any data on local geology when preparing the Application—UEC did not search core libraries, publicly available or otherwise, or wells within the AOR for applicable, local geologic data.[147]

Protestants state that geologic data is used to determine geologic suitability of the proposed injection interval. Geologic suitability is, among other things, a demonstration that the injection zone has sufficient permeability, porosity, thickness, and areal extent to accept waste without causing migration of fluids into USDWs or freshwater aquifers.[148] It is fundamental to establish the maximum operating pressure to ensure injection operations do not initiate new fractures in the

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[145] Rule 331.121(c)(2)(B), (C).

[146] District Initial Br. at 25. Based on Mr. Hannah's testimony, local geologic data (if none is available within the AOR) would be data closer than 20 miles of the proposed disposal site. Tr. Vol. 2 at 151; UEC Ex. 2-02 at Bates APP004910, Sect. V. A. ("Regional geology should be rendered on a scale capable of accurately depicting the geology of the region (approximately a 20 to 50-mile radius)).''

[147] District Initial Br. at 27; Tr. Vol. 1 at 171, 201. Ms. Williams admitted that she "would not have searched for logs for every artificial penetration that penetrates the injection zone, injection interval . . . or confining zone." Tr. Vol. 1 at 175.

[148] Rule 331.44(c)(3)(A).

injection zone, propagate existing fractures in the injection zone, or otherwise cause movement of fluid out of the injection zone.[149]

Ms. Gordon noted that UEC determined porosity and permeability for the injection interval based primarily on the Loucks Paper, which does not address or analyze porosity or permeability for the Vicksburg Formation in Goliad County (or any neighboring counties) at any depth.[150] UEC used a porosity value of 25% to analyze and model reservoir conditions based on the Loucks Paper.[151] The Loucks Paper shows measured porosity values at the depth of the proposed injection interval (3,000 feet) from less than 10% to greater than 35%. According to Ms. Gordon, given this range of potential porosity values at the proposed injection interval, UEC's decision to use a porosity value of 25% is certainly not the most conservative value supported by the data.[152]

Further, UEC used a permeability value of 285 millidarcies ("mD") to analyze and model reservoir conditions, which was also selected based on the Loucks Paper.[153] Ms. Gordon stated that the Loucks Paper supports a range of permeability values at each depth for multiple Gulf Coast formations, and not a single permeability value for the Vicksburg Formation. The Loucks Paper shows several data points for permeability at or below 1 mD at 3,000 feet, so UEC's

[149] District Initial Br. at 26; Rule 331.63(c).

[150] District Ex. 300 (Gordon Dir.) at 12-13.

[151] UEC Ex. 1 at 2031.

[152] District Ex. 300 (Gordon Dir.) at 12-13.

[153] UEC Ex. 1 at 2030.

decision to use a permeability value of 285 mD is certainly not a conservative value supported by the data.[154] If UEC could not obtain site-specific data to support a permeability value of 285 mD, it should have used a range of inputs for permeability values between 1 mD and 285 mD to more accurately model potential reservoir conditions.[155]

Moreover, Ms. Gordon opined that UEC did not properly characterize thickness of the injection interval. UEC determined thickness based on the well log for the Gleinser No. 2 well. UEC determined the net sand content within the injection interval to be 235 feet (the net sand content being the portion of the injection interval with sufficient porosity and permeability to receive injected wastewater). However, UEC provided no other detail regarding their log analysis and/or how they determined the net sand content. Ms. Gordon disagreed with the selected thickness because UEC presumed a constant value for thickness throughout the injection interval when its own data shows that the thickness varies across the zone.[156] She testified that it was not clear whether there is sufficient resolution across the injection interval to determine the net sand content within the injection interval, so UEC's determination of net sand content is unsubstantiated. UEC should have used a range of inputs for all thickness values supported by the available logs to more accurately model potential reservoir conditions.[157]

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[154] District Ex. 302 at 27.

[155] District Ex. 300 (Gordon Dir.) at 14.

[156] UEC Ex. 1 at 99-100, 2046.

[157] District Ex. 300 (Gordon Dir.) at 14-15.

Ms. Gorden also addressed the static reservoir pressure for the injection interval. UEC concluded that the injection interval was "normally pressured" based on the Loucks Paper and estimated static reservoir pressure to be 1,404 pounds-per-square-inch absolute.[158] Ms. Gordon stated that UEC cannot presume that the injection interval is normally pressured without gathering additional data. Without actual measurements of pressures in the injection interval, this uncertainty cannot be resolved.[159]

Protestants explain that applicants typically calculate COI by inputting information about the injection interval—data like porosity, permeability, reservoir thickness, and static reservoir pressure—into a mathematical model. Detailed information on local geology sufficient to confidently describe the subsurface is necessary to accurately calculate COI and identify wells within the AOR which may allow movement of fluids once disposal operations commence.[160]

Protestants state that UEC's failure to submit the required information on local geology undermines UEC's COI calculations. As Ms. Williams testified, "The cone of influence [varies] based on the input parameters."[161] Ms. Gordon testified that, even assuming regional data is an acceptable substitute for local data, UEC did not select representative parameter values to accurately characterize the injection

[158] UEC Ex. 1 at 205-06.

[159] District Ex. 300 (Gordon Dir.) at 15-16.

[160] District Initial Br. at 25; *see* District Ex. 300 (Gordon Dir.) at 8; *see, e.g.*, Rule 331.44(b)(1); UEC Ex. 2-02 at Bates APP004922 (Section VII.A. of TCEQ-0623, UIC Class I Injection Well Application).

[161] Tr. Vol. 1 at 207.

interval.[162] She explained that the source of UEC's regional data, the Loucks Paper, did not analyze reservoir characteristics of the Vicksburg Formation in Goliad County, or at depths similar to UEC's proposed disposal interval.[163] Moreover, Ms. Williams acknowledged that the Loucks Paper itself warns that the values presented in the paper are "often an order of magnitude too high" because the cores are being analyzed under atmospheric pressures and temperatures rather than native pressures and temperatures.[164]

As described by Ms. Gordon, if local geology is not accurately assessed and/or utilized in COI calculations,

> operators may vastly underestimate (or overestimate) the lateral and/or vertical extent of increased pressure caused by fluid injection . . . If operators underestimate the lateral and/or vertical extent of increased pressure, they may not identify all potential pathways for fluid migration…in the areas surrounding an injection well or they may determine that potential pathways are not problematic when those pathways are, in fact, problematic when correctly modeled with inputs representative of the receiving formation.[165]

Protestants argue that, without accurate information, the model cannot confidently predict the magnitude and extent of anticipated pressure increases in the proposed injection interval, and the effect those pressure increases may have on

[162] District Ex. 300 (Gordon Dir.) at 8-9.

[163] District Ex. 300 (Gordon Dir.) at 10.

[164] Tr. Vol. 1 at 241.

[165] District Ex. 300 (Gordon Dir.) at 8.

artificial penetrations and faults within the AOR.[166] Ms. Gordon testified, "Mischaracterizing any one of these geologic and hydrogeologic parameters means that UEC's modeled COI could be wrong. The problem is intensified and compounded if more than one of these parameters are mischaracterized."[167]

To illustrate the possible differences in COI when different input parameters are used, Ms. Gordon calculated COI for the UEC wells using porosity and permeability values found in the Loucks Paper.[168] However, Ms. Gordon selected slightly more conservative input parameters for her calculations than those selected by UEC.[169] When detailed information on local geology is truly unavailable (unlike here, where local data is available, but omitted from the Application), the most "conservative parameters must be used to model subsurface conditions or the applicant risks underestimating . . . the lateral and/or vertical extent of increased pressure caused by fluid injection."[170]

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[166] District Initial Br. at 28; Rule 331.121(a)(2)(N); UEC Ex. 2-02 at Bates APP004922 (Section VII.A. of TCEQ-0623, UIC Class I Injection Well Application).

[167] District Ex. 300 (Gordon Dir.) at 16; Tr. Vol. 1 at 68-69.

[168] *See, e.g.*, District Exs. 311, 315. Ms. Gordon used a modified version of the Theis equation to model COI. The Theis equation is the mathematical model detailed in TCEQ rules to calculate COI. Rule 331.42(b).

[169] *See, e.g.*, District Ex. 300 (Gordon Dir.) at 23-27. For porosity, Ms. Gordon used 15% instead of UEC's 25%, and for permeability, she used 28.5 mD instead of UEC's 285 mD. Ms. Gordon also calculated COI assuming a reservoir thickness of 235 feet (the same input used by UEC) and 200 feet (a more conservative value). She selected more conservative values because the geology in the vicinity of the UEC wells cannot be confidently described due to the omission of local data, and because the Loucks Paper supports a "wide range of values that could be used as input parameters." Tr. Vol. 1 at 83.

[170] District Ex. 300 (Gordon Dir.) at 9.

Ms. Gordon's COI calculations showed that UEC's calculations drastically underestimate the potential pressure increase in the area around the UEC wells. For example, UEC calculates a maximum pressure increase of 115 pounds per square inch ("psi") within the injection interval 30 years after the initiation of injection operations.[171] Ms. Gordon's COI calculations predict a maximum pressure increase of at least 349 psi (utilizing UEC's reservoir thickness of 235 feet) after 30 years, and an increase of 410 psi (utilizing the more conservative thickness of 200 feet).[172] Protestants argue that the difference between Ms. Gordon and UEC's COI calculations after moderate adjustment in just two input parameters is stark and indicative of the potential degree of inadequacy of UEC's COI calculations. Given the differences, it is likely that UEC's COI underestimated the areal extent of pressure increase caused by its disposal operations thereby omitting wells and other artificial penetrations from the AOR.[173]

Mr. Beach stated that the faults are located less than two miles from the UEC wells, which means the increased formation pressure from the wastewater injection may push fluids up the faults if the faults are transmissive. The increased formation pressure from the large volumes of injected wastewater could push native groundwater towards and up the faults and significantly degrade the USDW and the Evangeline Aquifer.[174] Protestants argue that the Application fails to demonstrate

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[171] UEC Ex. 1 at 2037.

[172] District Ex. 311.

[173] District Initial Br. at 30.

[174] District Ex. 400 (Beach Dir.) at 19. According to Mr. Beach, the Application claims native groundwater in the injection interval is 40,000 total dissolved solids, which is four times the legal limit of a USDW and more than 40 times the number of dissolved solids in Evangeline Aquifer.

that the UEC wells will not pollute USDWs or other freshwater resources in Goliad County, either due to geologic unsuitability of the injection interval or through wells misidentified or omitted from the COI.[175]

d) USDWs Below 5,600 Feet

Protestants argue that UEC never investigated potential USDWs below 5,600 feet. UEC determined that the base of the lowermost USDW within ¼ mile of the proposed wells is 1,753 feet BGL.[176] This determination was based solely on reviewing the resistivity log for the Gleinser No. 2 well with total depth of 5,600 feet BGL.[177] Protestants state that this means UEC never checked deeper than 5,600 feet to see whether there were any USDWs. The Texas Water Development Board (TWDB)'s records of water quality samples in Goliad County show USDWs at 4,332 feet BGL and at 7,571 feet BGL.[178] Therefore, Protestants argue that UEC failed to adequately characterize the hydrogeology at the project site by never considering whether the UEC wells will contaminate two potential USDWs deeper than the USDW identified by the Application.[179]

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[175] District Initial Br. at 30.

[176] App. Ex. 1 at 126.

[177] App. Ex. 1 at 125-26; Tr. Vol. 2 at 92-93; District Ex. 404.

[178] District Ex. 501 at 137; Tr. Vol. 2 at 90.

[179] District Initial Br. at 30-31.

4. OPIC's Position

OPIC agrees with Protestants that UEC failed to adequately characterize relevant geology and faults within the vicinity of the proposed wells. OPIC focuses its position on evidence relevant to three issues: (1) inconsistencies in fault characterization, (2) overreliance on regional data, and (3) opportunity for public involvement.[180]

First, OPIC argues that accurate identification and characterization of the faults within the vicinity of the UEC wells is crucial because the faults can be hydraulic conduits for fluids to migrate outside of the formation that will receive the wastewater, especially in this case, as groundwater is the sole source of drinking water in Goliad County.[181] OPIC relies on Mr. Beach's testimony that, even if there is confining geology overlying the injection zone, a fault can circumvent the confining layer by allowing fluids to travel along the fault where the subsurface geology has shifted, potentially into a USDW.[182] Moreover, OPIC refers to testimonies of Ms. Gordon and Mr. Beach relating to the complexity of faulting in the heterogenous Vicksburg Formation—the characteristics of the formation can vary widely from location to location, both laterally and vertically and inadequacy of only relying reviewing electric logs of wells located thousands of feet apart for offset formations.[183]

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[180] OPIC Initial Br. at 6-7.

[181] OPIC Initial Br. at 7-8.

[182] District Ex. 400 (Beach Dir.) at 9.

[183] District Ex. 300 (Gordon Dir.) at 5; District Ex. 400 (Beach Dir.) at 7, 10.

OPIC also agrees with Protestants that the difficulty of characterizing the faults in the complex Vicksburg Formation is confirmed by the inconsistencies in UEC's maps, both in the original and renewal applications.[184] OPIC adds that the ED conducted no independent verification of local geology or fault characteristics and the ED's analysis of geology in this area of Goliad County was based entirely on information provided by UEC in the Application. OPIC argues that there is too much uncertainty about the geology and complex faulting to approve the requested permits for uranium wastewater disposal, especially given the fact that the residents of Goliad County are wholly dependent on groundwater.[185]

Second, OPIC agrees with Protestants that predominant reliance on regional studies is insufficient to properly characterize the local geology. Because regional data obtained from the Loucks Paper was the sole basis for UEC's selected modeling inputs, OPIC finds that UEC has not met its burden to comply with TCEQ rules, which delineate the suitability of siting for Class I injection wells, and to present the information required by an applicant prior to permit issuance.[186] OPIC notes the testimony of Mr. Hannah that no permit would be required for UEC to drill a stratigraphic test well to measure porosity, permeability, bottom-hole temperature, and other characteristics of the injection zone.[187]

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[184] With respect to Fault 3, Mr. Beach stated the Original Cross Section A-A' is not depicted on Revised Cross Section A-A', or it has completely changed direction if it is now intended to be Fault 7. District Ex. 400 (Beach Dir.) at 17.

[185] OPIC Initial Br. at 9-10.

[186] OPIC Initial Br. at 11-12; Rule 331.121(c)(2).

[187] OPIC Initial Br. at 13; Tr. Vol. 2 at 161-62.

Finally, OPIC is concerned by UEC's contention that required geologic data can only be gathered after issuance of the permit because there is no public notice indicating submission of the completion report, no opportunity for public comment, and the public may not request a hearing to contest the findings of the report despite relevant statutes specifying that pertinent data be submitted to TCEQ prior to permit approval.[188]

5. UEC's Reply

UEC responds that it provided all the geologic information that is required by statute, rules, and the Instructions, including the Reservoir Mechanics Report containing calculations for COI.[189]

a) Post Permit Issuance

UEC refers to Ms. Williams's testimony that the issuance of the permits is not the end of the analysis—the Application, the permits, and the regulations specifically contemplate imposing more requirements based on the site-specific data that is generated when the UEC wells are drilled and completed, which will be submitted to TCEQ in a completion report. In order to collect site-specific geologic data, ample geologic data will be collected from the UEC wells during the drilling and completion of the proposed wells.[190] The cores collected during the drilling of the wells will be

[188] OPIC Initial Br. at 14; *e.g.*, Rules 331.121, 335.205.

[189] UEC Reply Br. at 2-3.

[190] The Application states that a full-hole core will be collected from the injection interval during the drilling of the wells. If full hole coring is not possible or feasible during the drilling, sufficient sidewall cores will be collected. UEC Ex. 1 at 170.

used to measure the porosity of the confining zone, injection zone, and injection interval. Additionally, pressure fall-off testing will be conducted at the conclusion of the completion activities on each well to determine the reservoir characteristics of the injection interval, including the reservoir fluid pressure, transmissibility, permeability, and faulting.[191]

UEC further explains that, if a completion report shows different data than that which is submitted with the Application, TCEQ may require a major amendment to the permit, opening it up again for public comment before the well can be authorized for injection.[192]

b) Identification and Assessment of Faults

UEC states that it is undisputed that there are 11 faults at issue within the AOR.[193] According to UEC, the identification of four faults in the initially submitted Application was an error and was not intentional. After technical review by TCEQ, it was discovered that the Application did not include all the faults that were identified in the original application and the technical report was subsequently revised and resubmitted.[194] In response to Protestants' argument that UEC did not include information about the location, vertical extent, and potential impacts to groundwater of the additional seven faults, UEC states that it is not clear precisely

[191] UEC Ex. 2 (Williams Dir.) at 22-23.

[192] UEC Reply Br. at 8-9.

[193] UEC Reply Br. at 10.

[194] UEC Reply Br. at 11-12.

which regulatory requirement Protestants assert was not satisfied and that the Application provides the location and vertical extent of the faults.[195]

In response to Protestants' argument that Fault 3 on the original cross section A-A' is not depicted on the revised cross section A-A', or it has completely changed direction if it is now intended to be Fault 7, UEC refers to Mr. Grant's testimony that the "original 2009 application cross-sections were revised to incorporate additional geophysical data provided to a UEC geologist at that time, but those revisions were not initially available during the 2020 permit renewal submission. Once provided, those cross-sections revisions were incorporated into the 2020 technical report as part of the [Notice of Deficiency] process. The revisions to the cross-section A-A' validates the desire to reflect the subsurface structural geology more accurately."[196]

UEC argues that Protestants and OPIC did not provide any evidence showing that the faults are transmissive.[197] The Application demonstrated, to the satisfaction of the ED, that the faults are not sufficiently transmissive or vertically transmissive to allow migration of injected fluids out of the injection zone.[198] Protestants' argument about Fault 6 does not change the conclusion about transmissivity.[199] Neither Protestants nor OPIC have identified any required information that is

[195] UEC Reply Br. at 14; UEC Ex. 1 at 1861-61, 1931-33 (Figures V-18, V-19, V-20, V-22, and V-24).

[196] UEC Reply Br. at 14; UEC Ex. 4 (Grant Dir.) at 33.

[197] UEC Reply Br. at 10.

[198] UEC Ex. 4 (Grant Dir.) at 13.

[199] UEC Reply Br. at 15.

missing from sections addressing the transmissive fault issue. UEC also argues that Protestants and OPIC did not complain about Mr. Grant's conclusion that "juxtaposition of shale to shale across the fault [that] provides a vertical seal to injectate movement, limiting transmissivity" but just asserted that further investigation is warranted. UEC adds that the Jones Paper, even though it dictates such further investigation, is not a federal or state requirement.[200] UEC has investigated the faults, and there is no indication the faults are vertically transmissive. Instead, UEC confined the reservoir mechanics pressure modeling by restricting the pressure front against the faults.[201]

In response to Protestants' argument that the only way to determine if the faults are sealing is to conduct a pump test, UEC argues that there is no federal or state requirement for a pump test to adequately assess the faults to issue a permit. A lack of a pump test does not provide a rebuttal to UEC's prima facie demonstration.[202] UEC states that there was no fault pump test conducted for the Class I application because neither the statutes, rules, nor the Instructions require such a test.[203]

UEC states that it utilized geophysical logs and seismic data (all local data) to construct two cross sections through the AOR. The geophysical logs provided fault

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[200] UEC Reply Br. at 20-21.

[201] UEC Reply Br. at 22; UEC Ex. 1 at 2036.

[202] UEC Reply Br. at 17-18. UEC notes that the Jones Paper is silent on pump tests.

[203] UEC Reply Br. at 11. UEC argues that there are no requirements for UEC experts to personally review well logs or seismic data prepared and signed by a licensed professional geoscientist or for UEC to obtain new seismic data. UEC Reply Br. at 15-16.

cut information using adjacent well correlations for the generation of the cross sections, structure maps, and isopach maps. The seismic line interpretation was used by UEC to generate the cross sections in 2009 and aided in defining fault geometry and location.[204] According to UEC, "nothing more was required."[205]

In response to Protestants' assertion that, because there were no deep hydrocarbons at the location of the faults, local hydrocarbon traps could not support the proposition that the faults were sealing, UEC argues that prominent deep hydrocarbon traps are not required to demonstrate that faults are self-sealing.[206]

c) Local Geology

According to UEC, the fact that the Vicksburg Formation is geologically complex does not alter UEC's burden to characterize the local geology—Mr. Grant testified that the majority of the Class I injection wells throughout the Texas Gulf Coast geologic environment are identified as having complex faulting within their AORs, and no detailed feasibility studies are required.[207]

UEC argues that Protestants mischaracterize what constitutes local data. UEC states that local geology can be described by using data that is not necessarily specific to the site—while the Instructions require information regarding "Local

[204] UEC Ex. 4 (Grant Dir.) at 11.

[205] UEC Reply Br. at 16.

[206] UEC Reply Br. at 22.

[207] UEC Reply Br. at 24; UEC Ex. 4 (Grant Dir.) at 31.

Geology and Hydrogeology (within the AOR)," they do not say that such information can only be derived from data obtained within the AOR or that such information must be site-specific. Mr. Hannah testified that it is possible to be "reasonably confident" about the geology in the area of the proposed disposal wells based on regional studies and without information on local geology.[208]

UEC states that it analyzed the existing and available local data—geophysical logs and seismic data.[209] Ms. Williams reviewed the artificial penetrations within the AOR and the logs available for those wells.[210] UEC explained that it analyzed permeability, porosity, and thickness based on known information—published values in the Loucks Paper for permeability and porosity were used to estimate the reservoir characteristics prior to the collection of site-specific data, which will be obtained during drilling.[211] UEC argues that nothing in the statute, rules, or the Instructions suggests or implies that UEC's approach is inadequate.[212] According to UEC, it provided information sufficient to confidently determine whether the injection interval has sufficient permeability, porosity, thickness, and areal extent to receive the injected wastewater in a manner that will not allow migration of fluids into USDWs/freshwater aquifers.[213]

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[208] UEC Reply Br. at 29; Tr. Vol. 2 at 156.

[209] UEC Reply Br. at 29-30, 36.

[210] UEC Reply Br. at 29-30; Tr. Vol. 1 at 170-72.

[211] UEC Reply Br. at 31-33; UEC Ex. 2 (Williams Dir.) at 21-24.

[212] UEC Reply Br. at 33.

[213] UEC Reply Br. at 34, 37.

d) Cone of Influence

UEC argues that, while Protestants might prefer a different methodology, they do not identify a specific statute, rule, or regulation that requires an applicant to follow a "typical" method to calculate COI, nor do they explain how UEC allegedly did not calculate the COI correctly. According to UEC, the Instructions require that the COI be calculated in the Reservoir Mechanics Report, and such report is in the Application and was not challenged.[214]

e) USDWs Below 5,600 Feet

UEC states that it used site-specific data from the nearest well, the Gleinser No. 2 well, to confirm the depth of the lowermost USDW within the AOR, and that the TWDB's records used calculated data, which may not be reliable.[215] UEC argues that Protestants ignore the site-specific data in favor of published data for salinity values at unidentified locations within Goliad County to make a determination of the lowermost USDW. UEC states that Protestants identified three total dissolved solids values for unknown locations that were calculated (without providing the methodology), measured (and subject to contamination), or calculated from log analysis (without specifying conversion factors). These three values differ significantly from other data provided within those depth ranges and should be

[214] UEC Reply Br. at 30-31, 35. UEC states that Ms. Gordon selected different model inputs which showed how different a COI calculation can be—she chose extreme inputs that were even more conservative than the inputs modeled by UEC.

[215] UEC Reply Br. at 37-38; Tr. Vol. 2 at 91. In doing so, UEC relies on Volume 1 of the TWDB's report, which is not in evidence. The TWDB data that was introduced contains information from Volume 2 of a larger report. Volume 1 of that report government issued publication, is available online at https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R157/report157.asp.

classified as point measurements which must be reviewed to determine appropriate averaged values. UEC argues that the data supports that there is no freshwater present deeper than 1,753 feet at the project site.[216]

f) Class III Pump Test

UEC argues that the Class III Pump Test is not admissible or reliable geoscientific information because: it was not admitted into evidence in this proceeding; it was not prepared, signed, sealed, or dated by a licensed professional geoscientist or engineer;[217] and it was raised in a Class III well application that has different standard from Class I well application.[218] UEC points out that the ALJ in the prior proceeding acknowledged that the 24-hour pump test was only briefly looked at by the two witnesses: one concluding that the data was "meaningless," and the other describing the data as "messy."[219] Likewise, "the pump test data reviewed at the Class III hearing was preliminary," and consisted of "unverified data for which there is no final report."[220] Finally, the pump test was not submitted as part of UEC's Application and, thus, was not technically reviewed by the ED.[221] According

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[216] UEC Reply Br. at 41-42.

[217] Protestants respond that UEC's suggestion that the pump test is unreliable because it was not sealed by a geoscientist is peculiar given that it was conducted at UEC's direction. District Initial Br. at 20.

[218] UEC Initial Br. at 18; UEC Reply Br. at 20. Class I wells are used to inject hazardous and non-hazardous wastes into deep, isolated rock formations. Class III wells are used to inject fluids into shallow formations to dissolve and extract minerals. Mr. Grant testified that the presence or lack of lateral transmissivity of a purported fault in the near surface has no relevance to the Class I application deep faulting. The near-surface geology is of geologic formations of different characteristics and age, and affected by near surface aquifer recharge, and weathering—all of which can affect the transmissivity of a near-surface fault. UEC Ex. 4 (Grant Dir.) at 31.

[219] UEC Initial Br. at 19; UEC Ex. 3 (Wall Dir.) at 5, citing District Ex. 201.

[220] UEC Initial Br. at 19; UEC Ex. 3 (Wall Dir.) at 5.

[221] UEC Initial Br. at 19.

to Mr. Grant, "without access to the actual test, second-hand interpretations demonstrate nothing, nor can such interpretations be validated or tested."[222]

6. ED's Reply

a) Permit Issuance Process

According to the ED, the applicable laws for a Class I injection well permit application contemplate that additional information is provided to TCEQ after the permit is issued but prior to operation of the injection well. The applicable laws have an established process for submission and review of the completion report. The ED's review and approval of a completion report is an important component of the regulation of injection wells. The report provides information that is not available and cannot be available until the actual and specific well is drilled, constructed, and completed. The ED states that the post-permitting review and approval of the well construction should not be disregarded. The applicable laws do not require public notice, a public comment period, or opportunity for a contested case hearing on a permittee's submission of a completion report.[223]

Before issuing a Class I injection well permit, the Commission must consider a proposed formation testing program to obtain information on the injection zone and confining zone and construction procedures including cementing and casing program, well material specifications, logging procedures, deviation checks, and a

[222] UEC Ex. 4 (Grant Dir.) at 31.

[223] ED Reply Br. at 3.

drilling, testing, and coring program. The Class I injection well permit applicant is not required to drill, construct, core, test, and log the injection well before the injection well permit is issued, and it is not reasonable to interpret the applicable rules to require it of an applicant.[224]

b) Revised Application

The ED argues that Protestants attempt to confuse the record regarding the identification of faults through testimony and evidence that address prior versions of the Application. The final drafts of the permits are based on the technically complete application. Prior versions of the application that were revised by subsequent submissions are not considered as part of the application.[225] The ED argues that evidence or testimony regarding UEC's delineation of faults in a version of the Application that was later revised should not be given weight.[226]

c) Class III Pump Test

The ED argues that the testimony regarding the Class III injection well permit application should not be given weight. The evidence of the pump testing in the previous hearing addressed horizontal transmissivity across a fault in the shallow Goliad sand formation in which mining solutions would be injected and does not address the migration of fluids or constituents out of the proposed injection zone.[227]

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[224] ED Reply Br. at 3.

[225] *See* ED Ex. 1 (Hannah Dir.) at 45.

[226] ED Initial Br. at 4.

[227] ED Initial Br. at 5-6.

Further, there is no technical report of the pump testing submitted under Rule 305.45(a)(8) to describe how, where, or when the pump testing was conducted. There is no technical report of the pump testing that has been reviewed and sealed by a licensed professional geoscientist. Finally, the pump testing did not go through the ED's technical review.[228]

7. Protestants' Reply

Protestants reiterate that UEC's identification of faults in the Application is "incredibly" unreliable. UEC first knowingly submitted incorrect cross sections of faults. But after revising the Application, the cross sections identified numerous, additional "dangerous" faults in the AOR.[229]

Protestants argue that no formations between the injection interval and the Evangeline Aquifer are solely low permeability shale.[230] Protestants point to Mr. Grant's prefiled testimony stating that Faults 5-11 are not a risk to groundwater pollution because the faults "provide shale to shale contact across these faults and limit vertical transmissivity."[231] However, Mr. Grant testified that all of the following formations between the injection interval and Evangeline Aquifer contain sand: the Vicksburg (injection interval), Lower and Upper Frio, Catahoula Tuff, Jasper Aquifer, Burkeville Confining System, Evangeline Aquifer, and

[228] ED Initial Br. at 6.

[229] District Reply Br. at 3.

[230] District Reply Br. at 4.

[231] UEC Ex. 4 (Grant Dir.) at 16.

Chicot Aquifer; and that the dense clay/shale Anahuac Formation does not exist at the project site.[232] Even if the Anahuac Formation exists near the UEC wells, the cross section clearly shows that the Anahuac Formation where Fault 6 exists is juxtaposed with the "pretty sandy" Catahoula Formation.[233]

Protestants argue that when the faults near the proposed disposal wells were created, they became a sandy-shale mixture. Such faults are more permeable than the Application represents and cannot be confidently described as "self-sealing" shale. The sandy mixture in the faults is corroborated by the only site-specific evidence in the record—a pump test that established hydraulic connection across the fault. According to Protestants, the substantial evidence presented proves that the faults are likely transmissive.[234]

8. The ALJs' Analysis

The ALJs find that the preponderance of the credible evidence proves that the Application adequately identified faults in the vicinity of the UEC wells, but the evidence does not prove that the Application adequately characterized the geology and assessed faults. Protestants rebutted the prima facie determination, and UEC failed to meet its burden.

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[232] Tr. Vol. 2 at 71-74; 78.

[233] Tr. Vol. 2 at 80.

[234] District Reply Br. at 4-5.

The definition of "adequate" is not specified by a statute or regulation. The parties agreed that "adequate" in this context means "legally sufficient" or "sufficient for a specific need or requirement."[235] After considering the parties' briefs and applicable law, the ALJs find that "adequate" in this context means sufficient to conclude that the applicable laws and regulations have been satisfied and the USDWs are protected from pollution.

a) Characterization of Geology

The technical report in the Application contains a description of regional and local geology and hydrogeology.[236] No party disputed the adequacy of the characterization of regional geology; however, both Protestants and OPIC argue that UEC failed to adequately characterize local geology to prove suitability of the injection interval to receive waste and to address all potential problematic artificial penetrations.

To analyze the local geology, UEC mainly used a regional source—the Loucks Paper. The only local sources UEC used to analyze local geology were geophysical logs from oil and gas wells in the vicinity of the UEC wells and seismic data. The geophysical logs provided fault cut information using adjacent well correlations for the generation of the cross sections, structure maps, and isopach

[235] UEC Initial Br. at 2; ED Initial Br. at 2; District Initial Br. at 6; UEC Reply Br. at 6.

[236] *See* UEC Ex. 1 at 1896-1924.

maps. The seismic line interpretation was used by UEC to generate the cross sections and aided in defining fault geometry and location.[237]

It is undisputed that there was no local data used for rock properties, porosity, permeability, and bottom-hole pressure within the AOR. UEC predominantly used the Loucks Paper, a regional study addressing possible sources of geothermal energy at depths deeper than the injection interval, to characterize local geology.[238] The wireline log data was not used in determining porosity, permeability, or bottom-hole of the disposal interval for UEC wells; instead the Loucks Paper was used.[239] Using those sources, UEC made projections and estimations of the parameters within the injection interval, injection zone, and confining zone.[240] Ms. Williams confirmed that she made "extrapolations" of the geology at the local study area, which will be compared to the site-specific data after the permits are issued and when the UEC wells are drilled.[241]

Applicable laws and TCEQ rules clearly state that the Commission cannot issue Class I injection well permits until *after* the applicant proves that all USDWs are protected from migration of fluids from the proposed injection interval.[242] ED witness Hannah confirmed that TCEQ must consider both regional and local

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[237] UEC Ex. 4 (Grant Dir.) at 11.

[238] Tr. Vol. 1 at 212; Tr. Vol. 2 at 154-55.

[239] Tr. Vol. 2 at 154-55.

[240] Tr. Vol. 1 at 184-85, 189, 191.

[241] Tr. Vol. 1 at 180, 198-201.

[242] Tex. Water Code § 27.051(a); Rules 335.205(a)(5)(A), 331.121(a)(2), (c)(2), (c)(3) (emphasis added).

data *before* issuing a Class I disposal permit.[243] UEC and the ED provided extensive testimony about post permit issuance process—once the wells are drilled, site-specific data will be collected to confirm the adequacy of characterization of local geology and to ensure that no USDWs are polluted prior to beginning any injection operations.[244] The ALJs recognize that the site-specific data will be collected after the wells are drilled, but do not agree with UEC's contention that, at this point, TCEQ should issue the permits based on its estimations and predictions of local geology.

Protestants argue that UEC made minimal to no effort to acquire any data on local geology when preparing the Application. The ALJs agree. The Vicksburg Formation is known to be heterogenous, which means that the characteristics of the formation can vary widely from location to location, both laterally and vertically.[245] Ms. Williams used regional data to make a geologic interpretation of what the geology will be at the project site.[246] She testified that, in the absence of direct measurements at the location of the proposed wells, regional data is used to estimate the porosity and permeability of the injection interval.[247] However, UEC did not cite to any laws, rules, requirements, or any Instructions that allow an applicant to do so.

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[243] Tr. Vol. 2 at 148, 155 (emphasis added).

[244] Tr. Vol. 1 at 180, 198-201; ED Ex. 6 at Bates ED–09.000074; UEC Ex. 2 (Williams Dir.) at 22-23.; ED Ex. 1 (Hannah Dir.) at 9, 12-13.

[245] Tr. Vol. 1 at 191; District Ex. 300 (Gordon Dir.) at 5.

[246] Tr. Vol. 1 at 191.

[247] UEC Ex. 2 (Wiliams Dir.) at 24.

TCEQ rules and the Instructions require a geology report to contain two separate sections on geology: regional and local (within AOR). TCEQ rules specify the minimum criteria for siting before issuing a Class I injection well permit: an applicant is required to describe and analyze local stratigraphic and structural geology and include, at a minimum, *detailed* information regarding stratigraphy, structure, and rock properties.[248] TCEQ rules and the Instructions do not state that an applicant is allowed to make "extrapolations" or geologic interpretations of local geology; instead, the Instructions require that sufficient well data must be used to accurately depict the local geology.[249]

Ms. Williams admitted that the Application does not include detailed, local data on rock properties and other local geologic characteristics; that she did not search core libraries, publicly available or otherwise; and that she did not search for logs for every artificial penetration of the injection zone, injection interval, or confining zone.[250] However, she testified that core samples and logs are the key to confidently describe porosity, permeability, and other reservoir or geologic characterizations. These will be obtained, again, *after* the permits are issued and wells are drilled.[251]

As Ms. Gordon testified, the porosity, permeability, and other geological and geophysical characteristics of the Vicksburg Formation in Goliad County are not

[248] Rule 331.121(c)(2) (emphasis added).

[249] UEC Ex. 2-02 at Bates APP004911.

[250] Tr. Vol. 1 at 171, 196.

[251] Tr. Vol. 1 at 175, 180, 198-201 (emphasis added).

well characterized in available literature, and the properties of the reservoir can vary significantly laterally and vertically.[252] Detailed subsurface studies, including well data, core samples, and geophysical surveys, are necessary to accurately assess properties of the Vicksburg Formation at the project site.[253] There is no evidence that UEC did that. According to the Instructions, if local geologic data cannot be obtained from wells within the AOR, an applicant can expand the search outside the 2.5-mile AOR to obtain data sufficient to confidently describe local geology.[254] Again, there is no evidence that UEC did that.

Moreover, according to Mr. Hannah, it would be possible to measure porosity, permeability, bottom-hole temperature, and other characteristics of the injection zone by logging and coring a stratigraphic test well or a water well or by performing a pump test by drilling water wells.[255] No such efforts were made by UEC. The ALJs are not in the position to identify or propose specific methods necessary to adequately characterize local geology and understand that the Class I injection well permit applicant is not required to drill, construct, core, test, and log a well before the injection well permit is issued, but it is concerning that UEC mainly relied on a regional study to make "extrapolations" when other methods could be implemented to acquire local data.

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[252] District Ex. 300 (Gordon Dir.) at 7.

[253] District Ex. 300 (Gordon Dir.) at 7.

[254] *See* UEC Ex. 2-02 at Bates APP004911. Mr. Hannah testified that local geologic data (if none is available within the AOR) would be data closer than 20 miles of the proposed disposal site. Tr. Vol. 2 at 151.

[255] Tr. Vol. 2 at 161-62. Mr. Hannah testified that UEC would not need a permit to drill a stratigraphic test well, other test wells, or water wells as long as no injection is involved.

Protestants presented uncontroverted evidence that the Loucks Paper did not make an estimation for porosity and permeability in the Vicksburg Formation and Goliad County (or any neighboring counties).[256] The Loucks Paper supports a range of average porosity values from approximately 18% to 35% at the depth of the injection interval for multiple Gulf Coast formations, and not a single average porosity value for the Vicksburg Formation.[257] UEC presented no credible evidence to support the decision to use a porosity value of 25% from the Loucks Paper for the project site.

Similarly, the Loucks Paper supports a range of permeability values for multiple Gulf Coast formations, and not a single permeability value for the Vicksburg Formation. The Loucks Paper shows several data points for permeability at or below 1 mD at 3,000 feet.[258] UEC's decision to use a permeability value of 285 mD is not supported by credible evidence. Ms. Williams explained that when describing the local geology in heterogenous formations, she addresses the "acceptable range" that would be found at the site.[259] As described above, the ALJs find that the applicable rules require more than that.

The ALJs conclude that UEC's predominant reliance on regional data is not sufficient to adequately characterize local geology.

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[256] Tr. Vol. 1 at 189-90, 192; District Ex. 300 (Gordon Dir.) at 12-13.

[257] District Ex. 300 (Gordon Dir.) at 12-13.

[258] District Ex. 302 at 27.

[259] Tr. Vol. 1 at 191.

(i) Cone of Influence

The ALJs further conclude that UEC's failure to adequate characterize local geology undermines UEC's COI calculations.

UEC used the Loucks Paper to conclude that the injection interval was "normally pressured" and to estimate the static reservoir pressure to be 1,404 pounds-per-square-inch absolute.[260] UEC modeled the COI by inputting an average permeability and porosity value, selected by Ms. Williams, that was used in the reservoir pressure model.[261] Ms. Williams stated that site-specific data will be collected from the injection interval during the drilling of the wells, which will be used to measure the reservoir characteristics, including pressure.[262]

According to Ms. Gordon, the Loucks Paper did not analyze reservoir characteristics of the Vicksburg Formation in Goliad County, or at depths similar to the proposed disposal interval.[263] Moreover, the Loucks Paper itself warns that the values presented in the paper are often an order of magnitude too high because the cores are being analyzed under atmospheric pressures and temperatures rather than native pressures and temperatures.[264]

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[260] UEC Ex. 1 at 205-06.

[261] Tr. Vol. 1 at 206.

[262] UEC Ex. 2 (Williams Dir.) at 22-23.

[263] District Ex. 300 (Gordon Dir.) at 10.

[264] Tr. Vol. 1 at 241.

Accurately calculating and utilizing COI is crucial—without accurate information, the model cannot confidently predict the magnitude and extent of anticipated pressure increases in the proposed injection interval, and the effect those pressure increases may have on artificial penetrations and faults within the AOR.[265] Moreover, it is fundamental to establish the maximum operating pressure to ensure injection operations do not initiate new fractures in the injection zone, propagate existing fractures in the injection zone, or otherwise cause movement of fluid out of the injection zone.[266]

Protestants presented credible evidence that, by using different input parameters for porosity and permeability values found in the Loucks Paper, a different result for COI could be estimated.[267] Ms. Gordon used 15% for porosity instead of UEC's 25%, and 28.5 mD for permeability instead of UEC's 285 mD. Ms. Gordon assumed a reservoir thickness of 235 feet (the same input used by UEC) and 200 feet (a more conservative value). She selected more conservative values because the geology in the vicinity of the UEC wells cannot be confidently described due to the omission of local data, and because the Loucks Paper supports a "wide range of values that could be used as input parameters."[268] Ms. Gordon's calculations showed that UEC's COI calculations underestimate the potential

[265] *See* District Ex. 300 (Gordon Dir.) at 8, 16; Tr. Vol. 1 at 68-69.

[266] District Initial Br. at 26; 30 TAC § 331.63(c).

[267] *See, e.g.,* District Exs. 300 (Gordon Dir.) at 23-27; 311, 315; Tr. Vol. 1 at 83.

[268] Tr. Vol. 1 at 83. According to Ms. Gordon, when detailed information on local geology is truly unavailable, the most "conservative parameters must be used to model subsurface conditions or the applicant risks underestimating . . . the lateral and/or vertical extent of increased pressure caused by fluid injection." District Ex. 300 (Gordon Dir.) at 9.

pressure increase in the area around the UEC wells—Ms. Gordon's calculations predict a maximum pressure increase of at least 349 psi (utilizing UEC's reservoir thickness of 235 feet), and an increase of 410 psi (utilizing the more conservative thickness of 200 feet) when UEC calculated a maximum pressure increase of 115 psi.[269] Even though Protestants and OPIC do not specifically challenge UEC's COI calculations or the model used for calculation, Protestants showed a possibility of a different result by using different input parameters from the Loucks Paper, which undermines UEC's COI calculations.

(ii) USDWs Below 5,600 Feet

Protestants argue that UEC never investigated potential USDWs below 5,600 feet and cite to the TWDB's records of water quality samples in Goliad County that detected USDWs at 4,332 feet and 7,571 feet BGL.[270] They argue that UEC failed to adequately characterize the hydrogeology at the site by never considering whether the UEC wells will contaminate two potential USDWs deeper than the USDW identified by the Application. The ALJs disagree. The ALJs find Protestants' argument conclusory and not supported by any credible evidence. The ALJs cannot give the TWDB's records significant weight because UEC relied on site-specific data from the nearest well to confirm the depth of the lowermost USWD within the AOR, at 1,753 feet BLG, and there is no evidence presented to show how the data in TWDB's report was gathered and interpreted or to show that the water quality samples were gathered or calculated within the AOR.

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[269] UEC Ex. 1 at 2037; District Ex. 311.

[270] District Ex. 501 at 137.

b) Identification and Assessment of Faults

Protestants argue that: (1) UEC failed to disclose known faults within the AOR; (2) UEC failed to characterize the number, location, and vertical extent of the faults within the AOR; (3) UEC failed to include a "critical" pump test demonstrating that some faults within the AOR are transmissive; (4) UEC only offered a general, qualified opinion that faults across the entire Gulf Coast Region tend to seal; and (5) UEC's claim that faults at the disposal site are likely sealing because of trapped hydrocarbons is unsubstantiated because the Application shows there are no trapped hydrocarbons.[271] Moreover, Protestants argue that no formations between the injection interval and the Evangeline Aquifer are solely low permeability shale.[272] Similarly, OPIC argues that UEC failed to: (1) delineate all faults within the AOR; and (2) demonstrate that the faults are not sufficiently transmissive or vertically extensive to allow migration out of the injection zone.[273]

(i) Identification of Faults

It is undisputed that there are 11 faults within the AOR; at least one fault starts below the injection interval and continues to go through the injection zone and all the way up into the Evangeline Aquifer; and at least five faults transect the injection interval and continue without break at least above the injection zone.[274] UEC presented evidence that it utilized geophysical logs and seismic data to construct two

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[271] District Initial Br. at 15.

[272] District Reply Br. at 4.

[273] OPIC Initial Br. at 6.

[274] UEC Ex. 4 (Grant Dir.) at 15-16; Tr. Vol. 2 at 51-52.

cross sections through the AOR—the geophysical logs provided fault cut information using adjacent well correlations for the generation of the cross sections, structure maps, and isopach maps, and the seismic data was used to generate the cross sections and aided in defining fault geometry and location.[275]

Protestants argue that UEC failed to adequately identify and assess the location and vertical extent of all faults by not disclosing all known faults within the AOR. They highlighted inconsistencies in initial and revised Application—the initially submitted Application listed four faults and stated that none of those faults intersected the injection interval and extended vertically up into a USDW while the revised Application identified eleven faults but did not describe the location, vertical extent, and potential impacts to groundwater of the additional seven faults.[276] Moreover, when UEC switched a single well log in the cross section for a log from a different nearby well, UEC changed its conclusion that Fault 6 stopped below the USDW to a conclusion that the fault extended all the way into the Evangeline Aquifer. Further, Fault 3 from the original cross section A-A' was not depicted on the revised cross section A-A', or it has completely changed direction if it is now Fault 7.[277]

The ALJs find that UEC credibly addressed these inconsistencies and arguments. The ED's expert Hannah explained that the final draft of the permits is based on the technically complete Application and that prior versions of the

[275] UEC Ex. 4 (Grant Dir.) at 11.

[276] UEC Ex. 1 at 99-100, 129-33; Tr. Vol. 2 at 37-38, 61.

[277] District Ex. 400 (Beach Dir.) at 10-11, 17; Tr. Vol. 2 at 38-40.

Application that were revised by subsequent submissions are not considered as part of the Application.[278] Moreover, Mr. Grant testified that the number of faults and cross section A-A' were updated during the TCEQ technical review of the Application and that the same characteristics of the four initially identified faults apply to the additionally identified faults.[279] The ALJs conclude that the preponderance of the credible evidence proves UEC adequately characterized the number, location, and vertical extent of the faults within the AOR.

(ii) Assessment of the Faults and Class III Pump Test

UEC's expert Grant determined that the faults are not transmissive based on the Jones Paper and the presence of hydrocarbons at the project site.[280] The Jones Paper provides a general proposition that faults in the Gulf Coast Region tend to seal themselves due to the very plastic nature of the region shales.[281] The paper states that faulting and complex geologic structures pose a similar risk to a confinement system as a problem artificial penetration—even when there is a confining layer, a fault, a geologic structure, or an artificial penetration can circumvent that layer.[282] Most importantly, the Jones Paper provides that the Gulf Coast Region has numerous subsurface faults which *must be investigated on a*

[278] *See* ED Ex. 1 (Hannah Dir.) at 45.

[279] UEC Ex. 4 (Grant Dir.) at 32.

[280] Tr. Vol. 2 at 60, 62, 69.

[281] Tr. Vol. 2 at 60; District Ex. 505 at 15.

[282] Tr. Vol. 2 at 66; District Ex. 505 at 15.

site-by-site basis.[283] Mr. Grant admitted that he did not include that direction for further investigation when preparing the Application.[284]

The Application states that the presence of hydrocarbon reservoirs or fields along faults provides an indication of the sealing ability of the fault based on its ability to trap hydrocarbons.[285] Protestants provided uncontroverted evidence that the project site does not have trapped hydrocarbons near 11 faults. First, Figure V-26 in the Application shows no presence of deep hydrocarbons that have been trapped by the sealing faults. Figure V-26 shows at least ten dry holes peppering a large swath of the project site, which means no hydrocarbons were found where the holes were drilled.[286] Second, Mr. Grant confirmed that the location of the faults lacked deep hydrocarbons and was covered with numerous dry holes.[287] UEC responded that prominent deep hydrocarbon traps are not required to demonstrate that faults are self-sealing.[288] Because the presence of hydrocarbons at the project site was used by UEC to determine that the faults are not transmissive, the ALJs do not find the response persuasive.

As with the local geology, both UEC and the ED provided testimony that site-specific data of the faults and their transmissibility will be gathered after the

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[283] Tr. Vol. 2 at 67 (emphasis added).

[284] Tr. Vol. 2 at 67-68.

[285] UEC Ex. 1 at 1918-19.

[286] UEC Ex. 1 at 107; Tr. Vol. 2 at 86.

[287] Tr. Vol. 2 at 84.

[288] UEC Reply Br. at 22.

permit is issued. Again, this is not what TCEQ rules require—an applicant must demonstrate that the fault is not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone before a Class I permit is issued.[289]

As discussed above, the ALJs agree with Protestants that UEC made minimal to no effort to investigate the project site for transmissivity of the faults before submitting its Application. Similarly to the identification of local geology, UEC relied solely on a regional study to assert that the faults in the area tend to seal themselves. That very same study directs for a site-specific investigation of subsurface faults in the Gulf Coast Region. None was attempted here. Both Mr. Grant and Mr. Beach testified that a pump test could be a useful tool to determine if the faults are transmissive.[290] However, UEC argues that there is no federal or state requirement for such test, and it did not conduct any for the Application.[291]

According to Protestants, the only site-specific information regarding transmissivity of the faults is a pump test conducted by UEC when applying for its Class III injection wells to conduct uranium mining. However, absent the actual pump test and credible evidence about how the test was conducted, interpreted, and reviewed, the ALJs cannot give the evidence about the Class III pump test any

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[289] *See* Rules 331.121(a)(2)(P); 335.205(a)(5).

[290] Tr. Vol. 1 at 145; Tr. Vol. 2 at 58-59.

[291] UEC Reply Br. at 17.

weight. The ALJs find that Protestants' assertion that the Class III pump shows that the faults in the AOR are transmissive is conclusory and not based on verifiable data.

Protestants also presented evidence of a potential pathway from Fault 3 to Fault 4 and then into the USDW. Mr. Beach explained that faults can work together to create hydraulic connections between formations. This can also include fluids migrating up a fault, then migrating horizontally to a nearby "inadequately" plugged wellbore that can be a pathway for fluids, or vice versa.[292] Mr. Grant's response was that these two faults are offset from each other and do not combine to form a continuous vertical pathway for vertical migration and that these faults are vertically sealing, as demonstrated by the local hydrocarbon traps formed by the lateral and vertical sealing nature of these faults.[293] The ALJs do not find Mr. Grant's response persuasive. In addition to disputed evidence regarding the hydrocarbons and self-sealing nature of the faults, Mr. Grant did not review: the well logs in the cross sections to verify interpretations of the faults; any well logs that were not part of the original application; or any seismic data that UEC had in its possession.[294]

Even though the Jones Paper is not a federal or state requirement, as noted by UEC, it is the very source its expert used to determine that the faults are not transmissive. This issue is significant, especially because groundwater is the sole source of drinking water for the people of Goliad County. Because no investigation was done of subsurface faults, evidence about hydrocarbons at the project site was

[292] District Ex. 400 (Beach Dir.) at 15.

[293] UEC Ex. 1 (Grant Dir.) at 32.

[294] Tr. Vol. 2 at 14-16, 44.

disputed; and because UEC's COI calculations were undermined, when calculating reservoir pressure is so crucial, the ALJs find that UEC did not demonstrate that the faults are not sufficiently transmissive to allow migration of hazardous constituents out of the injection zone.[295]

Finally, Protestants provided credible evidence to dispute UEC's assertion that the injection zone has sufficient permeability and that the faults juxtapose low permeability shale against low permeability shale and do not present a risk of injectate migrating out of the injection zone. Mr. Grant admitted that all of the following formations between the injection interval and Evangeline Aquifer contain sand: the Vicksburg (injection interval), Lower and Upper Frio, Catahoula Tuff, Jasper Aquifer, Burkeville Confining System, Evangeline Aquifer, and Chicot Aquifer; and that the dense clay/shale Anahuac Formation does not exist at the project site.[296] He added that the cross section clearly shows that the Anahuac Formation where Fault 6 exists is juxtaposed with the "pretty sandy" Catahoula Formation.[297] UEC did not rebut this evidence. Fault 6 starts below the injection interval and continues to go through the injection zone and all the way up into the Evangeline Aquifer, which is the primary source of groundwater for Goliad County.[298]

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[295] Rules 331.121(a)(2)(P); 335.205(a)(5).

[296] Tr. Vol. 2 at 71-74; 78.

[297] Tr. Vol. 2 at p. 80.

[298] Tr. Vol. 2 at 51; District Ex. 100 (Graham Dir.) at 3; *see* District Ex. 404.

For the reasons discussed above, the ALJs conclude that Application did not adequately characterize the geology and assess faults in the vicinity of the proposed injection wells and find that UEC has not met its burden regarding Issue A. Accordingly, the ALJs recommended that this matter be remanded to the ED for further consideration of this issue.

B. Whether the Draft Permits Provide for Adequate Monitoring of Migration of Injected Fluids in the Vicinity of the UEC Wells

The ED and UEC argue that the draft permits provide for adequate monitoring, that monitoring wells are inappropriate, and that the consideration of additional monitoring should be deferred until after the draft permits are issued. Protestants argue that the draft permits lack adequate monitoring, and that ambient monitoring must be required under Rule 331.64(h)(1). OPIC argues that ambient monitoring is appropriate here.

1. The ED's Position

The ED's witness Hannah explained that Provision IX of the draft permits requires the wells to be tested and monitored in accordance with Rules 305.125, 305.154, and 331.64.[299] He noted various requirements in these rules: annual mechanical integrity testing of the casing, injection tubing, annular seal, and bottom-hole cement for leaks; annual pressure build-up analysis; evaluation of fluid movement every five years using an approved geophysical method; and evaluation

[299] ED Ex. 1 (Hannah Dir.) at 10.

of the casing each time the well is subjected to workover procedures.[300] There will also be continuous corrosion monitoring and annual monitoring of the pressure buildup in the injection zone through a fall-off test done under Rule 331.64(h)(2).[301]

Mr. Hannah stated that the draft permits do not require the design, construction, or operation of any separately installed monitoring wells and that TCEC rules do not require the installation and operation of monitoring wells for a Class I injection well. However, the ED may require other monitoring and testing which the ED determines to be necessary in accordance with Rule 331.64(i).[302]

The ED suggests that the decision on whether to include additional monitoring conditions should be deferred until after the permit is issued, because additional information about the well will be forthcoming in the completion report provided under Rule 331.65(b)(1).[303] The ED notes that post permitting review and approval of well construction is an integral part of the permitting process, and that requiring additional information now, rather than later, is contrary to how permitting is done.[304]

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[300] ED Ex. 1 (Hannah Dir.) at 10.

[301] ED Ex. 1 (Hannah Dir.) at 10. A pressure fall-off test may provide an estimate of the permeability of the geologic formation or unit receiving injected fluids and may also be used to determine the presence of a flow boundary, such as a significant change in lithology or a sealing fault.

[302] ED Ex. 1 (Hannah Dir.) at 9.

[303] ED Reply Br. at 2-3.

[304] ED Reply Br. at 3.

2. UEC's Position

UEC argues that no monitoring is required for these permits because the draft permits already provide adequate monitoring of injected fluids near the proposed injection wells.[305] Although acknowledging that ambient monitoring can be required under Rule 331.64, UEC asserts that there is no need for it here. UEC's expert Williams opined that, based on her review of the geology and proposed locations of the UEC wells, ambient monitoring is not warranted.[306]

Finally, UEC argues that monitoring should not be considered until after the draft permits are issued and further data is provided in the completion report. Then, "if, during the site-specific assessment of the potential for fluid movement from the well or injection zone—which will be undertaken when the completion report is submitted—the ED determines the potential value of monitoring wells to detect fluid movement, then the ED will require the owner to develop a monitoring plan as specified in Rule 331.64(h)(1)."[307] In other words, this is not the time to consider ambient monitoring.

3. Protestants' Position

Protestants argue that a monitoring plan is required here under Rule 331.64(h)(1) because there is potential for fluid movement and potential value

[305] UEC Initial Br. at 21.

[306] UEC Initial Br. at 21-22; UEC Ex. 2 (Williams Dir.) at 44.

[307] UEC Initial Br. at 22.

of monitoring wells to detect fluid movement.[308] Protestants base their argument on three reasons. First, UEC has not shown that the faults are not transmissive.[309] Second, there are uncertainties in UEC's COI calculations, so it is no possible to anticipate where injected fluids may migrate.[310] Third, there is uncertainty about whether the Gleinser No. 2 well is properly plugged to prevent the migration of fluids.[311]

The District also argues there is significant value in monitoring wells. The District's expert Beach testified that there is too much uncertainty with how fluids will act within the complex faulting system with potentially transmissive faults adjacent to the disposal wells that extend vertically up in to an underground source of drinking water.[312] He noted that monitoring wells would provide a means to conduct quarterly sampling of groundwater in the Jasper Aquifer overlying the injection zone at about 1,700 feet and in the lowermost USDW.[313]

The District asserts that, at a minimum, if the draft permits are issued, there should be monitoring provisions requiring UEC to install and maintain monitor wells in the aquifer overlaying the injection interval and the lowermost USDW.

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[308] District Initial Br. at 32. Rule 331.64(h)(1) provides that, based on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect fluid movement, the ED shall require the owner or operator to develop a monitoring program.

[309] Tr. Vol. 1 at 157.

[310] District Ex. 300 (Kimberly Gordon Dir.) at 5.

[311] *See* District Ex. 300 (Gordon Dir.) at 21.

[312] District Ex. 400 (Beach Dir.) at 22.

[313] District Ex. 400 (Beach Dir.) at 22.

4. OPIC's Position

OPIC argues that ambient monitoring is needed because of the potential fluid movement through the nearby Gleinser No. 2 well and the Mamie Hausman No. 2 (Hausman No. 2) well. OPIC asserts that because it is not clear the Gleinser No. 2 well is properly plugged, there is potential fluid movement and a threat to a USDW.[314] Moreover, the Hausman No. 2 well is also a potential conduit for fluid migration.[315]

OPIC notes that, under Rule 331.64(h)(1), the ED can require ambient monitoring based on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect fluid movement. OPIC concludes that "without the requisite monitoring or a site-specific showing of plugged wells, OPIC cannot find that [UEC] has demonstrated that the permit provides adequate monitoring of migration of injected fluids in the vicinity of the proposed injection wells."[316]

5. The ALJs' Analysis

The ALJs have already concluded that consideration of the permits should be remanded to the ED for closer inspection of the local geology, more precise calculations of the COI, and a better assessment of the faults. The ALJs add to that, as will be discussed in more detail in the next section concerning the nearby

[314] OPIC Initial Br. at 16.

[315] OPIC Initial Br. at 18.

[316] OPIC Initial Br. at 18.

Gleinser No. 2 and Hausman No. 2 wells, that the site-specific evidence here shows the potential for fluid movement from the injection zone. While the evidence is less abundant on the potential value of monitoring wells, the evidence still shows the value in detecting fluid movement through monitoring wells and other appropriate means.

The ALJs are not persuaded by the ED's suggestion that monitor wells are never appropriate for Class I injection wells. That is contrary to the text of Rule 331.64(h), which specifically contemplates that the ED will consider the value of monitoring wells and provides that in some circumstances monitor wells will be installed.

Nor are the ALJs convinced that the "site-specific assessment" referenced in Rule 331.64(h)(1) requires awaiting a completion report and a separate, post-hearing process. Rather, the plain language of the rule requires a "site-specific assessment." The evidence provided in this hearing fits that description: it was a site-specific assessment of the potential for fluid movement and the potential value of monitoring wells to detect fluid movement. Further, contrary to the argument that the extent of monitoring should be determined later, TCEQ specifically referred for consideration in this hearing whether the draft permits provide for adequate monitoring of migration of injected fluids. The ED's and UEC's suggested interpretation is contrary to the rule's text and to TCEQ's action in this proceeding.

Based on Issue A, the ALJs have already recommended that this matter be remanded to the ED for further consideration. Based on Issue B, the ALJs add that

additional consideration should also be given to the site-specific conditions and the development of a monitoring program. The ALJs agree with OPIC that, in the absence of a monitoring program, UEC has not met its burden of proof on Issue B to show that the draft permits provide for adequate monitoring of migration of injected fluids in the vicinity of the UEC wells.

C. Whether the Location and Design of the UEC Wells and Pre-Injection Facilities are Adequate

It is undisputed that the design of the injection well and pre-injection facilities are adequate. However, Protestants and OPIC dispute that the location of the UEC well is adequate. They argue that the location is inadequate because two nearby wells are inadequately plugged to prevent the migration of fluids into a USDW. UEC argues that the two nearby wells do not present a problem. The ED argues that the condition of two wells is not a referred issue and, even if the wells present a problem, the remedy is not to deny the Application for but to take corrective action to fix the wells.

1. Consideration of Other Wells Near the UEC Wells

The ED argues that the condition of the Gleinser No. 2 and Hausman No. 2 wells is not a referred issue and should not be considered.[317] The ALJs disagree. One of the referred issues was whether the location of the UEC wells is adequate. Considering the location of the wells includes considering what is nearby them and

[317] ED Reply Br. at 1.

whether what is nearby make the proposed location inadequate. Here, the evidence shows the Gleinser No. 2 and Hausman No. 2 wells are nearby, and their condition is material to determining whether the proposed location is adequate. The issues are also supported by evidence, and the ED failed to timely object to the evidence about these wells before or during the hearing—only raising the matter far too late in its reply brief. Because the condition of the two nearby wells falls within the referred issue, is material to determining the referred issue, and because it is supported by evidence, the ALJs proceed to consider the parties' arguments.

2. The Gleinser No. 2 Well

a) Protestants' and OPIC's Positions

Protestants argue that the proposed injection well location is inadequate because the Gleinser No. 2 well is inadequately plugged to prevent the migration of fluids into the lowermost USDW at about 1,753 feet BGL.[318] The Gleinser No. 2 well lies east of the UEC wells, about 1,000 feet from the well in permit WDW423 and 1,500 feet from the well in permit WDW424. The Gleinser No. 2 well is within the COI.[319]

The District's expert Gordon testified about a discrepancy in the Gleinser No. 2 well records. The cementing report shows a plug was cemented on August 31, 1982, and the top of the plug was placed at 1,811 feet BGL. However,

[318] District Initial Br. at 33.

[319] District Ex. 300 (Gordon Dir.) at 18.

according to the same report, the next day the production casing was cemented at 1,908 feet—about 100 feet deeper than the plug.[320]

Ms. Gordon stated the production casing could not have run to its reported depth because, if the plug existed at its reported depth of 1,811 feet BGL, it would have physically prevented the setting of the production casing in the borehole. She therefore concluded that, if the later action of placing the production casing at its reported depth is correct, the plug does not exist, is insufficient, or does not exist at its reported depth. She testified that it is more likely that the plug does not exist because the production casing was placed nearly 100 feet below the reported top of the plug. As a result, "it appears that there is no cement plug between the top of the Injection Zone and the base of the lowermost USDW, or at least no plug at the depth indicated in the Cementing Report."[321]

According to Ms. Gordon, if the plug does not exist at 1,811 feet, then there is no effective barrier preventing injected fluids from entering the wellbore and migrating up to a USDW at approximately 1,753 feet BGL. The injection interval is 3,200 to 3,590 feet, and between 2,019 and 5,600 feet the wellbore is an "open hole," meaning there is nothing in the wellbore other than 9.8 pounds per gallon of mud. So the well is open across the injection interval: nothing would prevent injected fluid from entering the wellbore there. Then, moving upward, the Gleinser No. 2 well is perforated in three places (between 1,756 and 1,764 feet, 1,024 and 1,029 feet, and

[320] District Ex. 300 (Gordon Dir.) at 20.

[321] District Ex. 300 (Gordon Dir.) at 20-21.

557 feet and 560 feet); these perforations allow fluid movement. Thus, Ms. Gordon testified, as a whole, "once injected fluids have entered the wellbore at the Injection Interval, they can migrate vertically up the wellbore then through the wellbore perforations and into USDW."[322]

Ms. Gordon opined that pressure will be sufficient to drive fluids upward and cause pollution. According to her calculations, the 9.8 pounds per gallon of mud will not prevent injected fluids from entering the wellbore at the injection interval because a pressure increase from UEC's disposal operations will be more than enough to move fluid into the wellbore and potentially contaminate a USDW. The pressure increase will "likely be sufficient to drive fluids into and up the wellbore and also sufficient to cause pollution of the lowermost USDW." She therefore testified that injected fluids and poor-quality native groundwater—both of which "would be potentially very damaging"—could contaminate a USDW.[323]

Ms. Gordon also provided an alternative explanation for the Gleinser No. 2 well's gas production. The well had produced about 19,000 cubic feet of gas, the equivalent of about 3,000 barrels of oil. Ms. Gordon stated that the well could have produced that much gas without a plug between the lowermost USDW and the injection interval because the gas could have flowed under its own natural gradient. She also noted that another plug was placed in the well at 620 feet—below where the well was perforated—and had produced gas from 557 to 560 feet.[324] Ms. Gordon

[322] District Ex. 300 (Gordon Dir.) at 21-22; District Exs. 307, 310.

[323] District Ex. 300 (Gordon Dir.) at 22, 24.

[324] Tr. Vol. 1 at 86-87, 103-04.

concluded that the only way to make sure that groundwater is protected is to tag the top of the plug to make sure it is in place.[325]

b) UEC's Position

UEC argues that the Gleinser No. 2 well presents no problem. UEC's expert Williams opined that the Gleinser No. 2 well is plugged. She agreed that there is a discrepancy in the cementing report about the depth of the plug, and she acknowledged that the plug cannot be at its listed depth of 1,811 feet. However, she opined that the plug was set deeper than the 1,811 feet previously noted.[326]

Ms. Williams explained that, after the production casing was run to 1,908 feet, a calculated annular volume of 605 cubic feet of cement was pumped to cement the production casing with an annular height of 2,656 feet (which is deeper than the production casing at 1,908 feet). The production casing was then cemented with enough calculated cement to have a cement sheath in the annular space from 1,908 feet to ground surface. After the plug was cemented at a deeper depth than 1,811 feet and the production casing was run and cemented to surface, the well was perforated and produced gas from 557 to 560 feet. The well was then plugged and abandoned in 1983.[327]

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[325] Tr. Vol. 1 at 88.

[326] Tr. Vol. 1 at 228.

[327] UEC Ex. 2 (Williams Dir.) at 40.

Ms. Williams stated that the ability of the well to produce gas through the perforations from 557 to 560 feet is evidence that the plug is present in the well deeper than the production casing.[328] Her reasoning was that, under Railroad Commission rules in effect at the time of the work on the well, the operator was required to cement off the deeper horizon to target the shallower one. The operator "would have had to have plugged off the deeper interval." That is, "they would need to pump a cement plug, and they reported a cement plug deeper in the well."[329]

Although emphasizing that there is no evidence that the Railroad Commission has identified this well as improperly plugged, Ms. Williams conceded that operators may not comply with Railroad Commission regulations. She also acknowledged that she has no authority for the cement plug's presence and competence as a barrier to water flow other than documentation showing a cement plug was pumped. Finally, she agreed that tagging the top of cement to verify the existence of a plug can be requested as corrective action.[330]

c) The ED's Position

The ED argues that the Gleinser No. 2 well does not present a problem. The ED's expert Hannah testified that he has not seen any wells within the AOR that

[328] UEC Ex. 2 (Williams Dir.) at 40.

[329] Tr. Vol. 1 at 225-26.

[330] Tr. Vol. 1 at 226-28, 230.

require a corrective action plan.[331] He acknowledged, however, that he did not do his own calculations to determine if the pressure increase would be sufficient to move fluid through the wellbore.[332]

The ED alternatively argues that, if there is a problem with a well, corrective action—not denial of the Application—is the appropriate remedy.[333] The ED points out Rule 305.152(1), which provides that corrective action may be taken to prevent pollution:

> For wells within the area of review which are inadequately constructed, completed, or abandoned, and which as a result of the injection activities may cause the pollution of fresh water, the commission shall prescribe or incorporate into the permit conditions requiring corrective action adequate to prevent such pollution. Corrective action will be required unless the owner or operator demonstrates to the executive director that, despite the owner or operator's best efforts, he is unable to obtain the necessary permission to undertake such action.

d) The ALJs' Analysis

Because the Gleinser No. 2 well's records are conflicting, the ALJs do not know where the plug is or if there is one. UEC and its expert argue that, although the plug cannot be in the place noted in the records, the records do indicate that a plug was pumped in the well at some lower depth. The ALJs do not find that argument persuasive because it relies on the same unreliable records, which put not only where the plug was placed in doubt but also whether the plug exists at all. Further, the

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[331] ED Ex. 1 (Hannah Dir.) at 13.

[332] Tr. Vol. 2 at 170-71.

[333] ED Reply Br. at 1-2.

District's expert opined that it is more likely that the plug does not exist because the production casing was placed nearly 100 feet below the reported top of the plug.

UEC also argues that the well's prior gas production is evidence that the plug is in the well deeper than the production casing. But during cross-examination that was revealed as no evidence at all—only an assumption that the well operator complied with an unidentified Railroad Commission regulation, purportedly requiring that deeper horizons be cemented off when targeting shallower ones. That is not enough. The regulation was never identified. There was no evidence of the operator's compliance history. Ultimately, a general assumption must yield to the specific circumstances here: conflicting records obscure where the plug is or if it exists at all. As OPIC states, there is "too much uncertainty with respect to Gleisner No. 2 and whether it is properly plugged."[334] The evidence fails to show where the plug is or if there is one.

The ALJs agree with OPIC's assertion and the ED's suggestion that corrective action under Rule 305.152(1) is appropriate.[335] The Gleisner No. 2 well is in the AOR. The unknown placement and existence of its lowermost plug make the well inadequately constructed, completed, or abandoned for the purpose of considering this Application. Ms. Gordon's testimony establishes that the increased pressure from future operations will be enough to drive fluid upward and cause pollution of a USDW. Thus, the evidence establishes that corrective action is

[334] OPIC Initial Br. at 17.

[335] OPIC Initial Br. at 17 ("OPIC cannot find that the draft permit complies with [Rule] 305.152"); ED Reply Br. at 2 ("The remedy for a suspect well or an improperly plugged well in the area of review is corrective action").

appropriate and that the Commission should prescribe or incorporate into the permits conditions requiring corrective action adequate to prevent pollution.[336]

3. Hausman No. 2 Well

a) Protestants' and OPIC's Positions

The Hausman No. 2 well lies about 5,000 feet northeast of the UEC wells. The District's expert Gordon provided a schematic of the Hausman No. 2 well. She opined that the well may serve as a conduit for wastewater to move to a USDW and explained why. Ms. Gordon asserted that a cement plug at the surface prevents movement of fluid from the surface down, but it does not prevent fluid from the injection interval moving up to a USDW. Ms. Gordon's depiction of the well shows that fluid can enter from the injection interval above Plug 1 and migrate up to the base of the USDW at about 1,753 feet before reaching Plug 2 at about 1,570 to 1,675 feet.[337]

According to Ms. Gordon, the mud in the well will not be a sufficient barrier to fluid migration based on increased pressure. She explained that that the annulus (the area between the casing and the formation) is not cemented: the only thing between the production casing and the formation is 9.5 pounds per gallon of mud. This well was plugged about 30 years ago. Over time, mud can separate into its liquid

[336] Rule 305.152(1); *see also* Rule 331.44(b)(1) (providing that for wells for which plugging information is unavailable, the applicant shall submit a plan consisting of the steps or modifications as are necessary to prevent the movement of fluids into USDWs, and when the plan is adequate, TCEQ shall incorporate it into the permit as a condition).

[337] District Ex. 300 (Gordon Dir.) at 25; 314.

and solid components and may not provide the hydrostatic pressure assumed for uniform mud—thereby providing a potential pathway for fluid.[338] She testified that if fluid can move through the annulus of the well and up through the annulus, it can potentially enter the formation.[339]

Ms. Gordon stated that the Hausman No. 2 well is in the 30-year COI based on the Application, and the pressure influence from the injection well will reach it. According to her calculations, pressure will continue to increase and "will likely be sufficient to drive fluids into and up the wellbore and also sufficient to cause pollution of the lowermost [USDW]."[340] In short, Ms. Gordon states, there is no cement plug below the USDW to prevent fluids from migrating through the mud outside of the casing and into the USDW.[341]

In response, OPIC argues that ambient monitoring should be required under Rule 331.64(h)(1), which provides that, based on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect fluid movement, the ED shall require the owner or operator to develop a monitoring program.[342]

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[338] District Ex. 300 (Gordon Dir.) at 28.

[339] Tr. Vol. 1 at 91.

[340] District Ex. 300 (Gordon Dir.) at 27; Tr. Vol. 1 at 89-90.

[341] District Ex. 300 (Gordon Dir.) at 28.

[342] OPIC Initial Br. at 18.

b) UEC's Position

UEC argues that the Hausman No. 2 well is not a concern because the mud in the annulus is a sufficient barrier to fluid flow. Contrary to Ms. Gordon's assertion that the mud may separate over time, Ms. Williams asserts that clay water-based drilling fluids have been shown to remain fluid and relatively unchanged for an extended period of time, and gel strength increases over time and keeps solid materials in the drilling mud suspended over extended periods of time.[343]

Ms. Williams also relies on a paper by Mark Pearce asserting that clay water-based drilling fluids provide adequate protection against vertical fluid migration:

> [T]he long-term mud properties are expected to be more resistant to vertical migration of fluid than the original mud. Since the original mud density typically overbalances formation pore pressure by 100 psi or more, it is realistic to expect that mud filled wellbores will not provide a conduit for the fluid flow from the injection zone to a USDW under the vast majority of operating conditions.[344]

Ms. Williams conceded, however, that she was not aware of the specific construction of the well used in the Pearce Paper,[345] and—rather than relying on the

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[343] UEC Ex. 2 (Williams Dir.) at 41.

[344] UEC Ex. 2-04, Mark S. Pearce, PhD, *Long Term Properties of Clay, Water Based Drilling Fluids* (1989) (Pearce Paper); UEC Ex. 2 (Williams Dir.) at 41-42.

[345] Tr. Vol. 1 at 233.

paper to show that the mud in the annulus will prevent fluid flow here—she used the paper to show that "mud does not separate during periods of quiescence."[346]

Ms. Williams initially asserted that the Hausman No. 2 well is outside the COI and outside the area in which increased pressures are sufficient to drive reservoir fluids into a wellbore.[347] However, under cross-examination, she revised that and agreed that the well was within the 30-year COI. She also acknowledged that none of the monitoring included in the draft permits will detect fluid escaping from the injection interval via an improperly plugged well.[348]

c) The ALJs' Analysis

The evidence shows that the Hausman No. 2 well is in the COI and that increased pressure will likely be sufficient to drive fluids into and up the wellbore and also sufficient to cause pollution of the lowermost USDW. Ms. Gordon's calculations show that the increase in pressure will likely be enough to move water through the mud in the annulus. Ms. Williams disavowed the Pearce Paper mentioned in her direct testimony as support for the fact that the mud-filled wellbore will not be a conduit here. Indeed, that paper was general, stating only that mud-filled wellbores are sufficient under "the vast majority of operating conditions"—not the conditions here.

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[346] Tr. Vol. 1 at 232-34.

[347] UEC Ex. 2 (Williams Dir.) at 42.

[348] Tr. Vol. 1 at 235.

To address the potential fluid movement from the Hausman No. 2 well, the ALJs conclude that ambient monitoring under Rule 331.64(h)(1) is appropriate.[349] Rule 331.64(h)(1) provides: "[b]ased on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect fluid movement, the [ED] shall require the owner or operator to develop a monitoring program." Here, the site-specific evidence shows there is potential for fluid movement from the well or injection zone. The evidence shows there is potential value to monitoring the Hausman No. 2 well to detect fluid movement, because the total dissolved solids in the injection interval is almost four times that in a USDW and can degrade the quality of a USDW.[350] Thus, the evidence suggests that a monitoring program to address the potential migration of fluids from the Hausman No. 2 well is appropriate.

In sum, the ALJs remand this matter to the ED for further consideration. Corrective action is needed to address the well plug in the Gleinser No. 2 well, and a monitoring program is needed to address the potential fluid migration through the Hausman No. 2 well.

VII. TRANSCRIPT COSTS

30 Texas Administrative Code section 80.23(d) provides for the allocation of transcript costs among the parties, excluding the ED and OPIC.[351] In allocating those

[349] OPIC Initial Br. at 18.

[350] Tr. Vol. 1 at 149-50.

[351] 30 TAC § 80.23(d).

costs, the Commission is to consider the following applicable factors in allocating reporting and transcription costs among the other parties:

- the party who requested the transcript;
- the financial ability of the party to pay the costs;
- the extent to which the party participated in the hearing;
- the relative benefits to the various parties of having a transcript;
- the budgetary constraints of a state or federal administrative agency participating in the proceeding; and
- any other factor which is relevant to a just and reasonable assessment of costs.

The ALJs ordered UEC to arrange for and pay the costs of having a court reporter attend the hearing and prepare a transcript, subject to an allocation of costs afterward. UEC's invoices show a transcript cost of $6,221.80. No party disputed that amount.

UEC argues that it should pay one-third of the transcript costs along with the District and the Landowners because all parties participated in the hearing and have an ability to pay. The District argues that it is a governmental entity with limited funding, whereas UEC is a large publicly traded company that should bear the transcript costs for the benefit it seeks—permit amendments. The Landowners did not make an argument.

UEC and the District were the primary participants at the hearing. All parties benefited from the transcript. UEC and the District have the financial ability to pay the transcript costs, but UEC has a greater ability to pay than the District, which is

not a company but a small governmental entity. This matter is also at issue because UEC is the party seeking a benefit—a permit amendment for its wells.

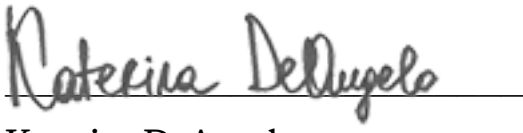
After considering the relevant factors, the ALJs determine that UEC should bear two-thirds of the transcript costs. The District should reimburse UEC for one-third of the costs—$2,073.93.

VIII. RECOMMENDATION

The Draft Permit does not comply with applicable statutory and regulatory requirements. This matter should be remanded to the ED for further consideration.

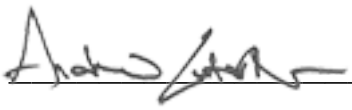
Signed April 10, 2024.

ALJ Signature:



Katerina DeAngelo

Presiding Administrative Law Judge



Andrew Lutostanski

Co-Presiding Administrative Law Judge

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

AN ORDER
REMANDING THE APPLICATION BY
URANIUM ENERGY CORPORATION
FOR PERMIT NOS. WDW423 & 424
IN GOLIAD COUNTY, TEXAS;
SOAH DOCKET NO. 582-23-15496;
TCEQ DOCKET NO. 2022-1553-WDW

On _____, the Texas Commission on Environmental Quality (TCEQ or Commission) considered the application of Uranium Energy Corporation (UEC) for renewal and amendment of two Class I injection well permits authorizing the injection of nonhazardous wastewater generated from the processing of ion exchange resin from in-situ uranium mining operations. The proposed wells are in Goliad County, Texas. A Proposal for Decision (PFD) was presented by Katerina DeAngelo and Andrew Lutostanski, Administrative Law Judges (ALJs) with the State Office of Administrative Hearings (SOAH), who conducted an evidentiary hearing concerning the application on December 12-13, 2023, in Austin, Texas. After considering the PFD, the Commission makes the following findings of fact and conclusions of law.

I. FINDINGS OF FACT

Application

1. Permits WDW423 and WDW424 were previously issued for Class I injection wells in May 2010, for a term of ten years.

2. Before their expiration, UEC filed its Application for Class I Injection Well Permits No. WDW423 and WDW424 (Application) for a renewal and amendment of Class I injection well permits on January 23, 2020.

3. The proposed site is located at 14869 North United States Highway 183, Yorktown, in Goliad County, Texas. It consists of a 17.0-acre tract of land, which will include two proposed injection wells (collectively, UEC wells) and associated pre-injection units.

4. The Executive Director (ED) determined the Application was administratively complete in April 2020.

5. The ED completed a technical review, prepared draft permits (Draft Permits), and made the permits available for public comment.

The Draft Permits

6. The Draft Permits propose to authorize disposal of industrial nonhazardous wastes associated with in situ uranium mining in Goliad County, Texas.

7. The permitted injection zone for proposed wells is the Frio and Vicksburg Formations from 2,800 to 3,590 feet below ground surface.

8. The proposed injection interval is the Vicksburg Formation from 3,200 to 3,590 feet below ground surface.

9. No injection operations were conducted under the previous permits, and the injection wells have not been drilled, constructed, or completed.

Notice and Jurisdiction

10. The Notice of Receipt of the Application and Intent to Obtain a Nonhazardous Waste Underground Injection Control Permit Renewal was

published in English on May 28, 2020, in the *Goliad Advance-Guard* in Goliad County, Texas.

11. The Notice of Application and Preliminary Decision was published in English on April 28, 2022, in the *Victoria Advocate* and on May 5, 2022, in the *Goliad Advance-Guard*, *Karnes Countywide*, *Bee-Picayune*, and *Refugio County Press*.

12. The comment period for the Application closed on June 6, 2022.

13. The ED filed his Response to Comments on September 6, 2022.

14. On December 14, 2022, the Commission considered Goliad County Groundwater Conservation District's (District) hearing request at its open meeting convened on December 20, 2022. After consideration, the Commission issued an Interim Order directing the following three issues be referred to SOAH, denying all issues not referred, and setting the maximum duration of the hearing at 180 days from the date of the preliminary hearing until the date the PFD is issued by SOAH:

    A. Whether the permit application adequately characterizes the geology and identifies and assesses faults in the vicinity of the proposed injection wells;

    B. Whether the draft permit provides for adequate monitoring of migration of injected fluids in the vicinity of the proposed injection wells; and

    C. Whether the location and design of the injection wells and pre-injection facilities is adequate.

15. The notice of the preliminary hearing was published in English in the *Victoria Advocate* on April 23, 2023, in the *Cuero Record* on April 26, 2023, and in the *Goliad Advance-Guard*, *Bee-Picayune*, *Karnes Countywide*, and the *Refugio County Press* on April 27, 2023. The notice included the time, date, and place of the hearing, as well as the matters asserted, in accordance with the applicable statutes and rules.

SOAH Proceedings

16. On July 17, 2023, a preliminary hearing was held with SOAH ALJ Katerina DeAngelo. Don Redmond and Diane Goss appeared representing the ED. David Tuckfield, Bill Cobb, and Andy Barrett appeared on behalf of UEC. Adam Friedman appeared on behalf of the District. Jennifer Jamison appeared for the Office of Public Interest Counsel (OPIC). The following persons appeared and were admitted as parties to the proceeding: Michael Abrameit, Kenneth Klanika; David Michaelsen; Linda Pinsker; Jesse and Misty Ortega; Jim Bluntzer; Gregory Chapman; Heike Jenkins; Aldon Bade; and Dennis Zengerle (collectively, Landowners).

17. The ALJ took notice of the administrative record and accepted jurisdiction of this case.

18. On October 27, 2023, the ALJs granted UEC's motion for partial summary disposition on the design component only of Issue C as a matter of law.

19. On December 8, 2023, a second preliminary hearing was held at which the ALJs ruled on objections.

20. On December 12-13, 2023, ALJs DeAngelo and Andrew Lutostanski convened the hearing on the merits in person and via videoconference. All parties appeared through their respective representatives. The record closed on February 12, 2024, after the parties filed post-hearing briefing.

Issue A: Characterization of geology and identification and assessment of faults in the vicinity of the UEC wells

21. Regional geologic data is data within 20-50 miles of the project site.

22. Local data is data within an area closer than 20 miles of the project site.

23. The Application describes the geology of the Gulf Coast region, from Louisiana to Brownsville, Texas.

24. The Application contains a Geology Report that describes the regional and local geology and hydrogeology of the project site.

25. The Application adequately characterizes the regional geology and hydrogeology of the project site.

26. The Application does not include adequate data on the local geology and hydrogeology of the project site.

27. UEC failed to confidently describe the local geology within the 2.5-mile Area of Review (AOR) at the project site.

28. The Cone of Influence (COI) included in the Application was based on parameters not proven to be representative of the Vicksburg Formation at the project site, potentially underestimating the COI.

29. Geologic faults are potential pathways for fluids to vertically migrate out of an injection interval or injection zone and circumvent an alleged confining layer.

30. According to the Application, the base of the lowermost underground source of drinking water (USDW) is 1,753 feet below ground level.

31. The Evangeline Aquifer is a USDW above the proposed injection interval.

32. Faulting is present within the 2.5-mile AOR.

33. There are 11 faults in the AOR.

34. When initially submitted, the Application represented four faults within the AOR and that none of the identified faults extended vertically into a USDW.

35. In response to a Notice of Deficiency, UEC revised the Application to reflect eleven faults within the AOR.

36. At least five faults within the AOR intersect the injection interval and extend vertically into a USDW.

37. At least one fault within the AOR intersects the injection interval and extends vertically into the Evangeline Aquifer.

38. UEC did not conduct a site-specific investigation to determine whether the faults within the AOR are transmissive.

39. The Application adequately identifies and assesses the location of faults within the AOR.

40. The Application adequately identifies and assesses the vertical extent of the faults within the AOR.

41. The Application fails to adequately identify and assess the transmissivity of the faults within the AOR.

42. The Application fails to adequately describe the porosity and permeability of the disposal formation.

43. The Application fails to adequately show that the faults in the vicinity of the UEC wells are self-sealing.

Issue B: Monitoring of migration injected fluids in the vicinity of the UEC wells

44. The Draft Permits include Monitoring and Testing Requirements, but do not require UEC to conduct ambient monitoring to detect fluid movement out of the injection zone.

45. Based on the site-specific evidence there is potential movement of fluid from the well or injection zone.

46. Based on the site-specific evidence there is potential value of monitoring wells to detect fluid movement.

47. The monitoring and testing requirements in the Draft Permits are inadequate to detect fluid movement outside of the injection zone.

Issue C: Whether the location and the design of the UEC wells are adequate

48. Unplugged wells penetrating the injection interval are potential pathways for vertical migration of fluids from the injection zone.

49. Nugget Oil Corp. Gleinser No. 2 (Gleinser No. 2) well is an existing wellbore within UEC's 10 and 30-year COI approximately 1,500 feet from the UEC wells.

50. The Gleisner No. 2 well penetrates the injection zone and is open hole across the injection interval.

51. Documentation from the Railroad Commission of Texas establishes that the Gleisner No. 2 well may not be properly plugged to prevent migration of fluids from the injection interval into a USDW.

52. The Gleisner No. 2 well is presumed to have been plugged with 9.8 pounds-per-gallon mud.

53. Calculations using appropriate injection interval parameters showed increased formation pressure at the Gleisner No. 2 well caused by UEC's proposed disposal operations sufficient to cause upward movement of fluid in the wellbore and into USDW within the first six months of UEC's operations.

54. Documentation from the Railroad Commission of Texas establishes that the Mamie Hausman No. 2 (Hausman No. 2) well may not be plugged to prevent migration of fluids from the injection interval into a USDW.

55. Calculations using appropriate injection interval parameters showed increased formation pressure at the Hausman No. 2 well caused by UEC's proposed disposal operations sufficient to cause upward movement of fluid in the wellbore and into USDW within three years of UEC's operations.

56. The design of the UEC wells and pre-injection facilities is adequate.

57. The location of the UEC wells is not adequate.

Transcript Costs

58. As the applicant, UEC bore the burden of proof. It also participated in the hearing and has the financial resources to bear the costs.

59. This matter is at issue because UEC is the party seeking a benefit—permit amendments for its wells.

60. UEC and the District were the primary participants at the hearing.

61. All parties benefited from the transcript.

62. UEC, Landowners, and the District all have the financial ability to pay the transcript costs, but UEC has a greater ability to pay than the District, which is not a company but a small governmental entity.

63. The total cost for recording and transcribing the hearing on the merits was $6,221.80.

64. UEC should bear two-thirds of the transcript costs. The District should reimburse UEC for one-third of the costs—$2,073.93.

II. CONCLUSIONS OF LAW

1. TCEQ has jurisdiction over this matter. Tex. Water Code §§ 27.011, .051.

2. SOAH has jurisdiction to conduct a hearing and to prepare a proposal for decision in contested cases referred by the Commission under Texas Government Code section 2003.047.

3. Notice was provided in accordance with Texas Water Code section 27.018; Texas Government Code sections 2001.051 and 2001.052; and 30 Texas Administrative Code sections 39.405 and 39.651.

4. The Application is subject to the requirements in Senate Bill 709, effective September 1, 2015. Tex. Gov't Code § 2003.047(i-1)-(i-3).

5. UEC's filing of the Administrative Record established a prima facie case that: (1) the Draft Permits meet all state and federal legal and technical requirements; and (2) the permits, if issued consistent with the Draft Permits, would protect human health and safety, the environment, and physical property. Tex. Gov't Code § 2003.047(i-1); 30 Tex. Admin. Code § 80.17(c)(1).

6. UEC retains the burden of proof on the issues regarding the sufficiency of the Application and compliance with the necessary statutory and regulatory requirements. 30 Tex. Admin. Code § 80.17(a).

7. The District and Landowners presented evidence rebutting UEC's prima facie case. 30 Tex. Admin. Code § 80.117(c)(2).

8. UEC failed to meet its burden to prove that the Application and Draft Permits meet all applicable state and federal requirements on all issues referred by TCEQ. 30 Tex. Admin. Code § 80.17(a).

9. Class I injection wells include industrial waste disposal wells disposing fluids by injection beneath the lowermost USDW within ¼ mile of the well. 30 Tex. Admin. Code § 331.11(a)(1).

10. TCEQ is prohibited from issuing a permit for a Class I injection well if a fault exists within 2.5 miles from the proposed Class I injection well unless the applicant demonstrates to the satisfaction of the Commission that the fault is not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone. 30 Tex. Admin. Code § 335.205(a)(5)(A).

11. TCEQ may issue a Class I injection well permit if it finds, with proper safeguards, both ground and surface freshwater can be adequately protected from pollution. Tex. Water Code § 27.051(a)(3).

12. UEC failed to prove that the faults within 2.5 miles of its proposed disposal wells are not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone. Consequently, UEC failed to prove that fresh groundwater can be adequately protected from pollution. Tex. Water Code § 27.051(a)(3); 30 Tex. Admin. Code §§ 335.205(a)(5)(A), 331.5(a), 331.63.

13. Before issuing a Class I injection well permit, TCEQ shall consider an analysis of the local geology and hydrogeology of the well site, including, at a minimum, detailed information regarding stratigraphy, structure, and rock properties, aquifer hydrodynamic, and mineral resources. 30 Tex. Admin. Code § 331.121(c)(2).

14. Before issuing a Class I injection well permit, TCEQ shall consider a determination that the geology of the area can be described confidently. 30 Tex. Admin. Code § 331.121(c)(2).

15. UEC's Application failed to include an analysis of local geology and hydrogeology and failed to include detailed information regarding stratigraphy, structure, and rock properties, aquifer hydrodynamic, and

mineral resources. Consequently, UEC failed to confidently describe the local geology at the project site. 30 Tex. Admin. Code § 331.121(c)(2).

16. Before issuing a Class I injection well permit, TCEQ shall consider the delineation of all faults within the AOR, together with a demonstration that the fault is not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone. 30 Tex. Admin. Code § 331.121(a)(2)(P).

17. UEC failed to prove that the faults in the AOR are not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents out of the injection zone. 30 Tex. Admin. Code § 331.121(a)(2)(P).

18. Before issuing a Class I injection well permit, TCEQ shall consider the corrective action proposed to be taken for wells within the AOR which penetrate the injection zone but are not adequately constructed, completed, or plugged. 30 Tex. Admin. Code § 331.121(a)(2)(N).

19. UEC failed to prove necessary corrective action will be taken on the Gleisner No. 2 and Hausman No. 2, wells that are not adequately plugged to prevent migration of fluids out of the injection interval. 30 Tex. Admin. Code § 331.121(a)(2)(N).

20. No injection well permit shall be allowed where an injection well causes or allows the movement of fluid that would result in the pollution of a USDW. 30 Tex. Admin. Code § 331.5(a).

21. All Class I wells shall be operated to prevent the movement of fluids that could result in the pollution of a USDW. 30 Tex. Admin. Code § 331.63(b).

22. UEC failed to demonstrate the proposed disposal wells will prevent movement of fluids that would result in pollution of a USDW. 30 Tex. Admin. Code § 331.63(b).

23. No transcript costs may be assessed against the ED or OPIC because TCEQ rules prohibit the assessment of any cost to a statutory party who is precluded by law from appealing any ruling, decision, or other act of the Commission. 30 Tex. Admin. Code § 80.23(d)(2).

24. Factors to be considered in assessing transcript costs include: the party who requested the transcript; the financial ability of the party to pay the costs; the extent to which the party participated in the hearing; the relative benefits to the various parties of having a transcript; the budgetary constraints of a state or federal administrative agency participating in the proceeding; and any other factor which is relevant to a just and reasonable assessment of the costs. 30 Tex. Admin. Code § 80.23(d)(1).

25. Considering the factors in 30 Texas Administrative Code section 80.23(d)(1), a reasonable assessment of hearing transcript costs against parties to the contested case proceeding is: two-thirds to UEC and one-third to the District.

26. The Application for renewal and amendment of Permits WDW423 and WDW424 provides insufficient information, fails to satisfy TCEQ rules and requirements, and should be remanded so UEC can develop additional information, or in the alternative, the Application should be denied.

NOW, THEREFORE, BE IT ORDERED BY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, IN ACCORDANCE WITH THESE FINDINGS OF FACT AND CONCLUSIONS OF LAW, THAT:

1. UEC's Application for renewal and amendment of Permits WDW423 and WDW424 is remanded so UEC can develop additional information.

2. UEC should bear two third of the transcript costs; the District must reimburse UEC for one third of the transcription costs.

3. The Commission adopts the ED's Response to Public Comment in accordance with 30 Texas Administrative Code section 50.117.

4. All other motions, requests for entry of specific Findings of Fact or Conclusions of Law, and any other requests for general or specific relief, if not expressly granted herein, are hereby denied.

5. The effective date of this Order is the date the Order is final, as provided by Texas Government Code section 2001.144 and 30 Texas Administrative Code section 80.273.

6. TCEQ's Chief Clerk shall forward a copy of this Order to all parties.

7. If any provision, sentence, clause, or phrase of this Order is for any reason held to be invalid, the invalidity of any provision shall not affect the validity of the remaining portions of this Order.

ISSUED:

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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Jon Niermann, Chairman, for the Commission