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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF ATMOSPHERIC PROTECTION
WASHINGTON, D.C. 20460

July 15, 2025

Mrs. Lauren Read
BKV dCarbon Ventures, LLC
1200 17th Street
Suite 2100
Denver, Colorado 80202

Re: Monitoring, Reporting and Verification (MRV) Plan for Lima Tango CCS 1

Dear Mrs. Read:

The United States Environmental Protection Agency (EPA) has reviewed the Monitoring, Reporting and Verification (MRV) Plan submitted for Lima Tango CCS 1, as required by 40 CFR Part 98, Subpart RR of the Greenhouse Gas Reporting Program. The EPA is approving the MRV Plan submitted by Lima Tango CCS 1 on May 20, 2025, as the final MRV plan. The MRV Plan Approval Number is 1015343-1. This decision is effective five days after the signature date below and is appealable to the EPA's Environmental Appeals Board under 40 CFR Part 78. In conjunction with this MRV plan approval, we recommend reviewing the Subpart PP regulations to determine whether your facility is required to report data as a supplier of carbon dioxide. Furthermore, this decision is applicable only to the MRV plan and does not constitute an EPA endorsement of the project, technologies, or parties involved.

If you have any questions regarding this determination, please contact me or the Greenhouse Gas Reporting Program Helpdesk at ghgreporting@epa.gov.

Sincerely,

SHARYN LIE Digitally signed by SHARYN LIE
Date: 2025.07.15 13:37:33 -04'00'

Sharyn Lie
Director, Climate Change Division

Technical Review of Subpart RR MRV Plan for Lima Tango CCS 1

July 2025

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<u>Appendices</u>

This document summarizes the U.S. Environmental Protection Agency's (EPA's) technical evaluation of the Greenhouse Gas Reporting Program (GHGRP) subpart RR Monitoring, Reporting, and Verification (MRV) plan submitted by BKV dCarbon Ventures, LLC (dCarbon) for the Lima Tango CCS 1 injection well, located in McMullen County, Texas. Note that this evaluation pertains only to the subpart RR MRV plan, and does not in any way replace, remove, or affect Underground Injection Control (UIC) permitting obligations. Furthermore, this decision is applicable only to the MRV plan and does not constitute an EPA endorsement of the project, technologies, or parties involved.

1 Overview of Project

The MRV plan states that BKV dCarbon Ventures, LLC (dCarbon), a subsidiary of BKV Corporation (BKV) is developing the Lima Tango CCS 1 injection well (Lima Tango) project in McMullen County, Texas. The plan explains the project would receive a CO_2 stream produced by the nearby Las Tiendas Natural Gas Processing Plant (NGP), operated by Energy Transfer LP (ET), which is a separate, pre-existing facility; and inject up to 177,000 metric tons of CO_2 annually over a 12-year period via an underground injection control (UIC) Class II well in secure geologic formations for safe and permanent storage. The plan states that the Lima Tango CCS 1 injection well/facility and the ET Las Tiendas NGP Plant are not under common ownership or common control, and the ET Las Tiendas NGP Plant has a function separate and distinct from the injection well source category, making them separate and distinct facilities under 40 CFR 98.6.

The MRV plan states that dCarbon has an approved W-14 injection permit and W-1 drilling permit, with the Texas Railroad Commission (TRRC) permit number 17575. dCarbon intends to dispose of CO_2 produced by the nearby NGP into the Lima Tango CCS 1 injection well via a UIC Class II well (UIC number 000126980, API number 42-311-37581) and is authorized by the TRRC to inject up to 177,000 metric tons per year (MT/yr) of CO_2 into the Lima Tango. The permit issued by the TRRC allows injection into the Queen City Formation at a depth of 3,508 feet to 4,870 feet true vertical depth (TVD) with a maximum allowable surface pressure of 1,700 pounds per square inch gauge (psig). dCarbon plans to inject continuously for approximately 12 years. The plan states that although dCarbon intends to initiate injection with lower volumes, all calculations in the MRV plan conservatively assume close to the maximum injection amount allowed by the TRRC permit (177,000 MT/yr). dCarbon anticipates drilling and completing the Lima Tango in Q3 of 2025 and beginning injection operations in early 2026. The well will inject a CO_2 stream that contains approximately 87.46% CO_2 (water saturated at 120 degrees Fahrenheit and 3 pounds per square inch gas), although the composition of the gas may vary slightly over time.

Lima Tango is located within the Gulf of Mexico Basin, approximately 15.44 miles northeast of Freer, Texas. The Gulf of Mexico Basin formed during Jurassic rifting and was filled during the Cretaceous and Paleogene by sediments from the Rio Grande River system. The Queen City Formation injection interval dates to the Middle Eocene, during a time of regional sedimentation and shale deposition. Section 3 of the MRV plan provides a detailed stratigraphic overview of the basin, identifying the Queen City Formations as the primary injection target for the project.

The Queen City Formation at the Lima Tango site, located between 3,508 and 4,870 feet TVD, serves as the CO_2 injection interval and maintains a uniform thickness of about 1,400 feet across the area. It contains three sand-rich injection zones (IZ-1 to IZ-3), each with low clay content (<15%) and high sand content (>60%), making them highly suitable for CO_2 storage. The formation is bounded by thick, laterally continuous shale units: the Weches Shale (110 feet) as the Upper Confining Zone (UCZ) and the Reklaw Shale and basal Queen City shales (965 feet) as the Lower Confining Zone (LCZ). These shales exhibit properties typical of effective seals—high clay content, low porosity, low resistivity, and strong gamma ray responses. Minimal faulting, a gentle structural dip, and petrophysical data from the Nueces Minerals No. 1 well further support the site's suitability for long-term geologic sequestration.

The description of the project provides the necessary information for 40 CFR 98.448(a)(6).

2 Evaluation of the Delineation of the Maximum Monitoring Area (MMA) and Active Monitoring Area (AMA)

As part of the MRV plan, the reporter must identify and delineate both the maximum monitoring area (MMA) and the active monitoring area (AMA), pursuant to 40 CFR 98.448(a)(1). Subpart RR defines maximum monitoring area as “the area that must be monitored under this regulation and is defined as equal to or greater than the area expected to contain the free phase CO_2 plume until the CO_2 plume has stabilized plus an all-around buffer zone of at least one-half mile.” Subpart RR defines active monitoring area as “the area that will be monitored over a specific time interval from the first year of the period (n) to the last year in the period (t). The boundary of the active monitoring area is established by superimposing two areas: (1) the area projected to contain the free phase CO_2 plume at the end of year t, plus an all-around buffer zone of one-half mile or greater if known leakage pathways extend laterally more than one-half mile; (2) the area projected to contain the free phase CO_2 plume at the end of year t + 5.” See 40 CFR 98.449.

The MRV plan indicates that Schlumberger’s Petrel software, a static earth model, and Rock Flow Dynamic’s tNavigator, dynamic plume model, will be utilized for the project. The modeling utilizes structural and petrophysical interpretations made from available well and 3D seismic data as primary inputs. The resulting static earth model (SEM) was then used for fluid flow simulations. Petrophysical calculations, including a porosity-permeability model data, were derived from well logs at the Nueces Minerals No. 1 well (approximately two miles away from the Lima Tango). The MRV plan states the model will be further updated and calibrated when the injection well is drilled and additional data, including whole or rotary sidewall cores, is collected over the injection and confining intervals.

A fit-for-purpose reservoir simulation model was created from the SEM to assess average injectivity based on empirical and analytical methods and to simulate CO_2 injection scenarios to aid in project design. Inputs for the reservoir model are shown below:

Parameter	Value
Pore Pressure Gradient (psi/foot):	0.48
Frac Pressure Gradient (psi/foot):	0.6

Temperature Gradient (degrees Fahrenheit (F) /foot):	0.015
Surface Temp (degrees F):	70
Fluid Salinity (ppm TDS)	30,000
Connate Water Saturation (decimal percent (%)):	0.47
Porosity (decimal %):	0.256
Relative permeability (mD):	133.85
Net-to-gross (ratio):	1
Rate constraints (MT/yr)	177,000
Pressure constraints (% of fracture pressure)	90

The MRV plan identified three injection zones in the model construction (IZ-1, IZ-2, and IZ-3) but the final model run selected for the Lima Tango only injects CO_2 into IZ-2 and IZ-3. The model used a yearly injection rate of 177,000 MT/yr for a cumulative injection of 2,124,000 MT after 12 years. The MRV plan provided a table that estimated yearly rates and cumulative injection amounts for both the IZ2 and IZ-3 zones. The MRV plan in figure 23 illustrates a northwest to southeast cross-sectional view of the CO_2 plume in IZ-2 and IZ-3. The CO_2 plume profiles for both zones are funnel-shaped, indicative of the higher porosity and permeability at the top of these zones as well as the buoyancy of the CO_2 relative to the formation water.

The MRV plan states the numerical simulation using tNavigator was used to estimate the size and migration of the CO_2 plume. dCarbon modeled injection of CO_2 into IZ-2 and IZ-3 for 12 years followed by 190 years of post-injection modeling. Results indicated that the plume had ceased to migrate by 98 years post injection. A five percent cutoff of gas saturation was used to determine the boundary of the CO_2 plume. Shown in figure 24 of the MRV plan, the MMA was determined to be 0.88 square miles with the greatest extent reaching 0.72 miles from the injector.

Section 4 of the MRV plan states that dCarbon determined the AMA using the regulatory method in subpart RR. For the variables (n) and (t), dCarbon used Year 1 of injection as the specific time interval from the first year of the period (n) and Year 12 (end of injection) as the last year in the period (t). In Figure 25 of the MRV plan, both the AMA and MMA were plotted together and found the AMA to be fully contained within the MMA. dCarbon proposes to use the slightly larger MMA as both the AMA and MMA and will refer to this common area of monitoring.

The MMA, as it is defined in the MRV plan, is consistent with subpart RR requirements because the defined MMA accounts for the expected free phase CO_2 plume, based on modeling results, and incorporates the additional 0.5-mile or greater buffer area. The rationale used to delineate the MMA, as described in dCarbon's MRV plan, accounts for the existing operational and subsurface conditions at the site, along with any potential changes in future operations

The delineations of the MMA and AMA are acceptable per the requirements in 40 CFR 98.448(a)(1). The MMA and AMA described in the MRV plan are clearly delineated in the plan and are consistent with the definitions in 40 CFR 98.449.

3 Identification of Potential Surface Leakage Pathways

As part of the MRV plan, the reporter must identify potential surface leakage pathways for CO_2 in the MMA and the likelihood, magnitude, and timing of surface leakage of CO_2 through these pathways pursuant to 40 CFR 98.448(a)(2). In Section 5 of their MRV plan, dCarbon identified the following potential leakage pathways that required consideration:

- Leakage from Surface Equipment
- Leakage from Approved, Not Yet Drilled Wells
- Leakage from Existing Wells
- Leakage from Fractures and Faults
- Leakage through Confining Layers
- Leakage from Natural or Induced Seismicity
- Leakage from Lateral Migration

A summary of the risk assessment for the potential leakage pathways is provided in Table 7 of the MRV plan and is recreated below.

Leakage Pathway	Likelihood	Timing	Magnitude
Potential Leakage from Surface Equipment	**Possible**	Anytime during project operations, but most likely during start-up / transition or maintenance periods	**<100 MT per event** (100 MT represents approximately 5 hours of full flow facility release)
Leakage from Approved, Not Yet Drilled Wells	**Improbable**, as there are no approved not yet drilled wells	After new wells are permitted and drilled	**<1 MT per event**
Leakage from Existing wells	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and the total depth of the nearby existing wells	When the CO_2 plume expands to the lateral locations of existing wells	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach an existing well combined with thickness and low porosity / permeability of the UCZ
Potential Leakage from Fractures and Faults	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year end	Anytime during operation	**<100 MT per event**, due to natural dispersion of CO2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage

	of injection (EOI) plume outline (**Figure 27**)		
Leakage Through Confining Layers	**Improbable**, as the UCZ is 110 feet thick and very low porosity and permeability	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation and thickness/properties of the UCZ
Leakage from Natural or Induced Seismicity	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage from Lateral Migration	**Improbable**, as the Queen City Formation is a very thick and laterally continuous formation with the closest well penetration over a mile downdip	More likely late in life as plume expands	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation and continuity / thickness of the UCZ

3.1 Leakage Through Surface Equipment

Section 5.1 of the MRV plan states that the Lima Tango facility is located near the ET Las Tiendas NGP Plant and is designed for injecting the CO_2 stream. The facility is designed to minimize leakage points such as valves and flanges by following industry standards and best practices. A shut-in valve is located at the wellhead in case of emergency. The compressor will also have emergency shut down switches that can be activated automatically in case of unexpected operating conditions. The MRV plan states the compressor facility, pipeline, and injection well location are subject to Auditory, Visual and Olfactory (AVO) inspections dCarbon safety and operations standards. These recurring monthly inspections, which are standard for detecting leaks and malfunctioning equipment in the gas production industry, will help detect any potential leaks that may occur. With these inspections, operations personnel can usually repair leaks immediately by tightening valves, flanges, or similar equipment.

Thus, the MRV plan provides an acceptable characterization of CO_2 leakage that could be expected from Class II Injection Well.

3.2 Leakage Through Wells within MMA

Leakage through Existing Wellbores

In Section 5.3 of the MRV plan, dCarbon states that historical oil and gas operations occurring within the MMA has mostly been in shallower formations and the targeted Queen City injection interval is approximately 2,000 feet deeper. All 36 wells present in the MMA were drilled to target shallower oil reservoirs or were unsuccessful dry holes targeting shallower zones.

Leakage through Wells Not Yet Drilled

Section 5.2 of the MRV plan states a review of the Texas Railroad Commission's GIS viewer on December 9, 2024, within a 6,500-foot radius of the proposed injection site found one cancelled/abandoned well from 2012 and three outdated permits lacking API or permit numbers, sourced from a hardcopy map. These findings indicate no approved, undrilled wells within the AMA/MMA, suggesting that the risk of leakage from such wells is improbable.

Groundwater Wells

Section 3.6 of the MRV plan states the Jackson-Yegua aquifer lies 2,300 feet above the Queen City injection interval and is separated by low-permeability formations, notably the Weches Shale, which serves as the Upper Confining Zone (UCZ). Below the injection interval, the Carrizo-Wilcox aquifer is isolated by the Reklaw Shale, designated as the Lower Confining Zone (LCZ). Both shales are recognized aquitards by the Texas Water Development Board. Although the Carrizo-Wilcox aquifer shows increasing salinity downdip and is considered a potential USDW by the TRRC, dCarbon demonstrated adequate geologic isolation for its proposed injection zone, and the TRRC Groundwater Advisory Unit concurred. Additionally, no water wells exist within two miles of the Lima Tango CCS 1 injection site.

3.3 Leakage Through Faults or Fractures

Section 5.4 of the MRV plan states three faults intersect the Queen City Formation in the area covered by licensed 3D seismic data. Fault 1 shows significant vertical offset (100–250 feet) and deep rooting but lies 3,200 feet northwest of the AMA/MMA, posing no risk of CO_2 plume interaction. Faults 2 and 3 are smaller, with limited vertical displacement and located over 1,000 feet and 1.5 miles, respectively, from the CO_2 plume. Neither fault extends significantly above the Queen City Formation, reducing their potential as leakage pathways. Overall, the likelihood of CO_2 leakage through these faults is considered improbable.

Thus, the MRV plan provides an acceptable characterization of CO_2 leakage that could be expected from surface components.

3.4 Leakage Through Confining Layers

According to Section 5.5 of the MRV plan, the Queen City Formation injection interval is securely confined by thick, low-permeability shale layers above (Weches Shale, UCZ) and below (lower Queen City and Reklaw Shales, LCZ). These zones, totaling over 1,000 feet of impermeable material, isolate the injection zone from the Yegua and Carrizo-Wilcox USDWs. No wellbores penetrate these confining layers within the modeled plume area, and the few that do in the broader project area are over a mile from the injection site. Given the limited CO_2 plume migration and robust geologic barriers, leakage risk through the confining layers is considered improbable.

Thus, the MRV plan provides an acceptable characterization of the likelihood of CO_2 leakage that could be expected through confining layers.

3.5 Leakage From Natural or Induced Seismicity

Section 5.6 of the MRV plan states that the Lima Tango site has no recorded seismic activity within 19 miles, and mapped faults do not extend to the crystalline basement, with significant vertical separation from it. Injection modeling shows negligible pore pressure changes at faults, insufficient to induce slip, and no faults intersect the CO_2 plume area after 12 years of injection. As a result, the risk of leakage from natural or induced seismicity is considered improbable. If unexpected pressure increases occur, dCarbon will conduct Fault Slip Potential analysis and, if necessary, shut in the well and investigate.

Thus, the MRV plan provides an acceptable characterization of the likelihood of CO_2 leakage that could be expected from natural or induced seismicity.

3.6 Leakage From Lateral Migration

Section 5.7 of the MRV plan states that the project area has a gentle regional dip of about two degrees, resulting in slow and controlled lateral CO_2 migration. While five wells penetrate the Queen City Formation, all are located outside the AMA/MMA, with the nearest well (Duwell 1) 6,800 feet down dip. The formation is laterally continuous and uniformly thick, indicating that the risk of leakage from lateral migration is improbable.

Thus, the MRV plan provides an acceptable characterization of the likelihood of CO_2 leakage that could be expected from lateral migration.

4 Strategy for Detection and Quantifying Surface Leakage of CO2 and for Establishing Expected Baselines for Monitoring

40 CFR 98.448(a)(3) requires that an MRV plan contain a strategy for detecting and quantifying any surface leakage of CO_2, and 40 CFR 98.448(a)(4) requires that an MRV plan include a strategy for establishing the expected baselines for monitoring potential CO_2 leakage. Section 6 of the MRV plan discusses the strategies dCarbon will employ for monitoring and quantifying surface leakage of CO_2 through the pathways identified in the previous section to meet the requirements of 40 CFR §98.448(a)(4). Section 7 of the MRV plan discusses the strategies that dCarbon will use for establishing expected baselines for CO_2 leakage. Monitoring will occur 1 year prior to injection, and during the 12-year injection phase of the project.

4.1 Detecting and Quantifying Leakage from Surface Equipment

Section 6.1 of the MRV plan states that the monitoring for surface leakage at the facility will be detected through a combination of continuous automated monitoring systems, low-oxygen alarms in high-risk areas, and personal gas monitors worn by field personnel. These systems are designed to identify abnormal conditions such as reduced oxygen levels or the presence of H_2S. In addition, daily inspections and monthly AVO (audio, visual, olfactory) checks will be conducted to detect signs of leaks. If leakage occurs, the volume of CO_2 released will be quantified based on operating conditions at the time of the event, following the procedures outlined in 40 CFR § 98.448(a)(5) under the Greenhouse Gas Reporting Program.

Additionally, the MRV plan states that dCarbon will rely on precise metering and gas analysis. After compression to a supercritical state, CO_2 will pass through a Coriolis meter for flow measurement and a gas chromatograph at the well site to verify composition. The meter will be calibrated to industry standards, and gas samples will be taken at least quarterly to ensure accuracy and recalibrate if needed. Any CO_2 leakage between the meter and the injection wellhead will be quantified following Subpart W of the GHGRP and reported under 40 CFR § 98.448(a)(5), using the CO_{2FI} term in Equation RR-12. Leakage volumes will be reported but not subtracted from injection volumes.

The MRV plan provides adequate characterization of the Lima Tango approach to detect potential leakage from surface equipment as required by 40 CFR 98.448(a)(3).

4.2 Detecting and Quantifying Leakage from Existing and Future Wells

Section 6.2 of the MRV plan states that there are no wells within the MMA (current, existing, or pending) that penetrate as deep as the Queen City injection interval. However, dCarbon will reverify the status and public information for all proposed and approved drilling permits within the MMA on a quarterly basis, and dCarbon will investigate any future proposed wells within the area of the MMA to determine if any additional risks are introduced through the new well proposal.

The MRV plan states the injection well design has pressure and temperature gauges monitoring the injection stream at the wellhead in addition to pressure sensors for each annulus of the well, and dCarbon will monitor and collect injection volumes, pressures, temperatures, and gas composition data for the injection well, which will be reviewed and adjusted when data is outside the acceptable performance limits. A change of pressure on the annulus would indicate the presence of a possible leak requiring remediation. Additionally, dCarbon will conduct annual bottomhole pressure and temperature measurements to calibrate the surface readings to bottom hole, and mechanical integrity tests (MITs) will be performed annually to detect for the presence of a leak. Upon a negative MIT, the well would immediately be isolated, and the leak mitigated.

The MRV plan states that upon a detected leak into existing or future wells in the monitoring area, dCarbon will endeavor to work with the operator(s) of those wells to take gas samples quarterly to quantify variations or increases of CO_2 compared with historical or baseline CO_2 concentrations. Any measurable increases in CO_2 that can be confidently attributed to injection volumes from the Lima Tango injection well would then be calculated using standard engineering procedures for estimating potential well leakage. These volumes would be documented and reflected in the annual monitoring report, and dCarbon would evaluate and execute any additional downhole remediations that could address leakage from the injection well to the existing and future wells in the monitoring area.

The MRV plan provides adequate characterization of the Lima Tango facility's approach to detect potential leakage through existing and future wells as required by 40 CFR 98.448(a)(3).

4.3 Detecting and Quantifying Leakage from Existing Faults and Fractures and Natural or Induced Seismicity

Section 6.3 of the MRV states that no existing faults or fractures have been identified that would allow CO_2 to migrate vertically to intervals with USDWs or to the surface.

Section 6.5 of the MRV plan states although the risk of natural or induced seismicity is very low, dCarbon will use the TexNet monitoring system to track seismic activity near the Lima Tango. If a magnitude 3.0 or greater event occurs, dCarbon will evaluate injection volumes and pressures to assess any potential for leakage, specifically looking for signs that faults intersecting the confining zones may have been activated. In the unlikely event of leakage, dCarbon will apply standard engineering methods to estimate the release and include both the estimates and methodologies in the annual monitoring report. In the event that CO_2 leakage occurs due to natural or induced seismicity and/or faults and fractures, dCarbon will determine which standard engineering techniques for estimating potential leakage is appropriate for the situation and report such leakage estimates and methodology in the annual monitoring report.

The MRV plan provides adequate characterization of dCarbon's approach to detect potential leakage from existing faults and fractures and natural or induced seismicity as required by 40 CFR 98.448(a)(3).

4.4 Detecting and Quantifying of Leakage through Confining Layers or Lateral Migration

Section 6.4 of the MRV plan states that leakage through confining layers at the Lima Tango is considered improbable due to the multiple thick, low-permeability formations separating the injection interval from potential potable groundwater. No groundwater wells are present nearby, and resistivity logs from offset wells show no indication of freshwater. When the injection well is drilled, dCarbon will log the shallow zone to check for porosity and freshwater; if found, a monitoring well will be installed and the MRV plan updated. In the unlikely event of leakage, dCarbon will use appropriate engineering methods to estimate and report the release in the annual monitoring report.

Section 6.6 of the MRV plan also explains that the nearest wells penetrating the Queen City injection interval are 2,200 feet and 4,300 feet from the AMA/MMA boundary, and 6,800 feet and 9,600 feet from the injection site. Due to their distance and inactive status, the risk of CO_2 leakage via lateral migration is considered unlikely. If leakage does occur, dCarbon will apply appropriate engineering methods to estimate the release and report findings in the annual monitoring report.

The MRV plan provides adequate characterization of the Lima Tango facility's approach to detect potential leakage through the confining layers or lateral migration as required by 40 CFR 98.448(a)(3).

4.5 Determination of Baselines

Section 7 of the MRV plan identifies the strategies that dCarbon will undertake to establish the expected baselines for CO_2 surface leakage per 40 CFR §98.448(a)(4). Prior to the start of continuous injection, the MRV plan identified the following data to compare with future data to detect surface leakage:

Groundwater Monitoring

The MRV plan states if a potential freshwater aquifer is identified during drilling, dCarbon will install a groundwater monitoring well near the injection site. A third-party lab will analyze samples to establish baseline groundwater quality. Initially, samples will be collected quarterly, with the possibility of reducing to annual sampling after the first year.

Operational Performance

The MRV plan states that once injection starts, dCarbon will use continuous data—such as injection pressure, temperature, rate, and annulus pressure—to establish operational performance baselines. Any deviations from these trends will be investigated as potential leak indicators. Periodic non-continuous data, including daily to weekly AVO inspections and field personnel gas monitoring for low O_2 or high H_2S levels, will support leak detection. Additionally, annual Mechanical Integrity Testing (MIT) will be conducted to assess well integrity and identify possible leaks.

Baseline Seismicity

The MRV plan states that prior to injection, dCarbon will establish a baseline for seismicity near the Lima Tango using historical data from the USGS and the TexNet seismic array, which has operated in South Texas since 2017 and expanded in 2018. The seismicity baseline will be based on TexNet data starting from 2019.

Thus, the MRV plan provides an acceptable approach for detecting and quantifying leakage and for establishing expected baselines in accordance with 40 CFR 98.448(a)(3) and 40 CFR 98.448(a)(4).

5 Considerations Used to Calculate Site-Specific Variables for the Mass Balance Equation

Section 8 of the MRV plan provides the equations that dCarbon will use to calculate the mass of CO_2 sequestered annually.

5.1 Calculation of Mass of CO_2 Sequestered

According to Section 8.1 of the MRV plan, the CO_2 received for this injection well will be wholly injected and not mixed with any other supplies of CO_2, thus the annual mass of CO_2 injected will equal the quantity of CO_2 received. Any future streams will be metered separately before being combined into the calculated stream. Therefore, in accordance with 40 CFR 98.444(a)(4), dCarbon has elected to use the mass of CO_2 injected as the mass of CO_2 received instead of using Equation RR-1 or RR-2.

dCarbon's approach to calculating the mass of CO_2 received is acceptable for the subpart RR requirements.

5.2 Calculation of Mass of CO_2 Injected

Section 8.2 of the MRV plan states that dCarbon will use a volumetric flow metering to measure the flow of the injected CO_2 stream and annually calculate the total mass of CO_2 (in metric tons) in the CO_2 stream injected each year in metric tons by multiplying the volumetric flow at standard conditions by the CO_2 concentration in the flow and the density of CO_2 at standard conditions, according to Equation RR-5:

$$CO_{2,u} = \sum_{p=1}^{4} Q_{p,u} * D * C_{CO_{2,p,u}}$$

Where:

$CO_{2,u}$ = Annual CO_2 mass injected (metric tons) as measured by flow meter u.

$Q_{p,u}$ = Quarterly volumetric flowrate measurement for flowmeter u in quarter p at standard conditions (standard cubic meters per quarter)

D= Density of CO_2 at standard conditions (metric tons per standard cubic meter): 0.0018682

$C_{CO2,p,u}$ = Quarterly CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO2, expressed as a decimal fraction).

p = Quarter of the year

u = Flow meter.

dCarbon provides an acceptable approach to calculation the mass of CO_2 injected in accordance with subpart RR requirements.

5.3 Calculation of Mass of CO_2 Produced/Recycled

Section 8.3 of the MRV plan states the Lima Tango will inject CO_2 from the nearby ET Las Tiendas NGP Plant solely for geologic sequestration into a deep saline, non-productive aquifer, with no CO_2 production or enhanced oil recovery involved. The CO_2 originates from natural gas processed from Eagle Ford Formation wells, which are stratigraphically deeper than the Queen City injection zone and located about eight miles northwest of the injection site, well outside the MMA/AMA.

5.4 Calculation of Mass of CO_2 Emitted by Surface Leakage

Section 8.4 of the MRV plan states that due to the presence of hazardous hydrogen sulfide (H_2S) in the injection stream, direct measurement of CO_2 leakage from surface equipment will not be performed. Instead, any leak would be treated as a major upset event, with detection through gas detectors and continuous monitoring systems triggering alarms. The mass of CO_2 released would be estimated based on operating conditions—such as pressure, flow rate, leak size, and duration—following the calculation methods specified in 40 CFR § 98.448(a)(5).

In the unlikely event that CO_2 is released because of surface leakage, the MRV plan states that the mass emitted would be calculated for each surface pathway according to methods outlined in the plan and totaled using Equation RR-10 as follows:

$$CO_{2E} = \sum_{x=1}^{X} CO_{2,x}$$

Where:

CO_{2E} = Total annual CO_2 mass emitted by surface leakage (metric tons) in the reporting year

$CO_{2,x}$ = Annual CO_2 mass emitted (metric tons) at leakage pathway x in the reporting year

X = Leakage pathway

dCarbon provides an acceptable approach for calculating the mass of CO_2 emitted by surface leakage under the subpart RR requirements.

5.5 Calculation of Mass of CO_2 Sequestered in Subsurface Geologic Formations

Since the Lima Tango facility does not actively produce oil, natural gas, or any other fluid, Section 8.5 of the MRV plan states that Equation RR-12 will be used to calculate the total annual CO_2 mass sequestered in subsurface geologic formations.

$$CO_2 = CO_{2I} - CO_{2E} - CO_{2FI} \qquad \text{(Eq. RR-12)}$$

where:

CO_2 = Total annual CO_2 mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.

CO_{2I} = Total annual CO_2 mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.

CO_{2E} = Total annual CO_2 mass emitted (metric tons) by surface leakage in the reporting year.

CO_{2FI} = Total annual CO_2 mass emitted (metric tons) from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the mass flow meter used to measure injection quantity and the injection wellhead, for which a calculation procedure is provided in subpart W of 40 CFR 98.

dCarbon provides an acceptable approach for calculating the mass of CO_2 sequestered in subsurface geologic formations under subpart RR.

6 Summary of Findings

The subpart RR MRV plan for the Lima Tango facility meets the requirements of 40 CFR 98.448. The regulatory provisions of 40 CFR 98.448(a), which specifies the requirements for MRV plans, are summarized below along with a summary of relevant provisions in the Lima Tango MRV plan.

Subpart RR MRV Plan Requirement	**Lima Tango MRV Plan**
40 CFR 98.448(a)(1): Delineation of the maximum monitoring area (MMA) and the active monitoring area (AMA).	Section 4 of the MRV plan delineates and describes the MMA and AMA. dCarbon used geologic and numerical simulations for calculation of the projected CO_2 plume and key project boundaries. The MRV plan defines the active monitoring area as the same area as the MMA.
40 CFR 98.448(a)(2): Identification of potential surface leakage pathways for CO_2 in the MMA and the likelihood, magnitude, and timing, of surface leakage of CO_2 through these pathways.	Section 5 of the MRV plan identifies and evaluates potential surface leakage pathways. The MRV plan identifies the following potential pathways: surface equipment, existing wells, wells not yet drilled, existing faults and fractures, natural or induced seismicity, confining layers, and lateral migration. The MRV plan analyzes the likelihood, magnitude, and timing of surface leakage through these pathways.
40 CFR 98.448(a)(3): A strategy for detecting and quantifying any surface leakage of CO_2.	Section 6 of the MRV plan describes dCarbon's strategy for detecting and quantifying potential CO_2 leakage to the surface should it occur.
40 CFR 98.448(a)(4): A strategy for establishing the expected baselines for monitoring CO_2 surface leakage.	Section 7 of the MRV plan describes dCarbon's strategy for establishing baselines against which monitoring results will be compared to assess potential surface leakage. dCarbon will conduct CO_2 groundwater sampling, gas composition sampling, and seismic monitoring to establish baselines for CO_2 surface leakage.
40 CFR 98.448(a)(5): A summary of the considerations you intend to use to calculate site-specific variables for the mass balance equation.	Section 8 of the MRV plan describes dCarbon's approach for determining the total amount of CO_2 sequestered using the Subpart RR mass balance equations, including calculation of the total annual mass of CO_2 emitted from equipment leakage.
40 CFR 98.448(a)(6): For each injection well, report the well identification number used for the UIC permit (or the permit application) and the UIC permit class.	Section 2 of the MRV plan identify the well identification number used for the UIC permit and the UIC class for the Lima Tango CCS 1 injection well. The well is permitted as Class II and regulated by Texas Railroad Commission.

40 CFR 98.448(a)(7): Proposed date to begin collecting data for calculating total amount sequestered according to equation RR-11 or RR-12 of this subpart.	Section 9 of the MRV plan states that dCarbon will be ready to begin CO_2 injection in 2026 and will begin to collect data for the total volume of CO_2 sequestered. Baseline monitoring data will be collected prior to injection, and the MRV plan will be implemented upon receiving EPA MRV plan approval.

Appendix A: Final MRV Plan

Subpart RR Monitoring, Reporting, and Verification (MRV) Plan

Lima Tango CCS 1

McMullen County, Texas

Prepared by

BKV dCarbon Ventures, LLC

May 16, 2025

Table of Contents

1 – INTRODUCTION

BKV dCarbon Ventures, LLC (dCarbon), a subsidiary of BKV Corporation (BKV), is authorized by the Texas Railroad Commission (TRRC) to inject up to 9.5 million standard cubic feet per day (MMscfd), equivalent to approximately 177,000 metric tons per year (MT/yr), of carbon dioxide (CO_2) into the proposed Lima Tango CCS 1 injection well in McMullen County, Texas. The permit issued by the TRRC allows injection into the Queen City formation at a depth of 3,508 feet to 4,870 feet with a maximum allowable surface pressure of 1,700 pounds per square inch gauge (psig).

dCarbon intends to dispose of CO_2 into the Lima Tango CCS 1 well produced from the nearby Las Tiendas Natural Gas Processing (NGP) Plant, operated by Energy Transfer LP (ET), which is a separate pre-existing facility. The Lima Tango CCS 1 injection well/facility and the ET Las Tiendas NGP Plant are not under common ownership or common control, and the ET Las Tiendas NGP Plant has a function separate and distinct from the injection well source category, making them separate and distinct facilities under 40 CFR 98.6.

The project site is 15.44 mi NW of Freer, Texas, as shown in **Figure 1**.

dCarbon anticipates drilling and completing the Lima Tango CCS 1 well in the third quarter of 2025 and beginning injection operations in early 2026. The Lima Tango CCS 1 well has approved Form W-14 injection and Form W-1 drilling permits with the TRRC permit number 17575, Underground Injection Control (UIC) number 000126980, and American Petroleum Institute (API) number 42-311-37581. Copies of the approved Form W-1 and W-14 permits are included in the **Appendix, Section 13.3.**

Although dCarbon intends to initiate injection with lower volumes, all calculations in this document have been performed assuming the maximum injection amount allowed by the TRCC permit (177,000 MT/yr). dCarbon plans to inject for 12 years.

dCarbon submits this Monitoring, Reporting, and Verification (MRV) plan for approval by the Environmental Protection Agency (EPA) in accordance with 40 CFR § 98.440-449, Subpart RR, of the Greenhouse Gas Reporting Program (GHGRP).

dCarbon’s TRRC operator number is 100589.

dCarbon’s Environmental Protection Agency Identification (EPA ID) number is 110071343305.

The Lima Tango CCS 1 well’s Greenhouse Gas Reporting Program Identification (GHGRP ID) number is 590006. All aspects of this MRV plan refer to this well and this GHGRP ID number.

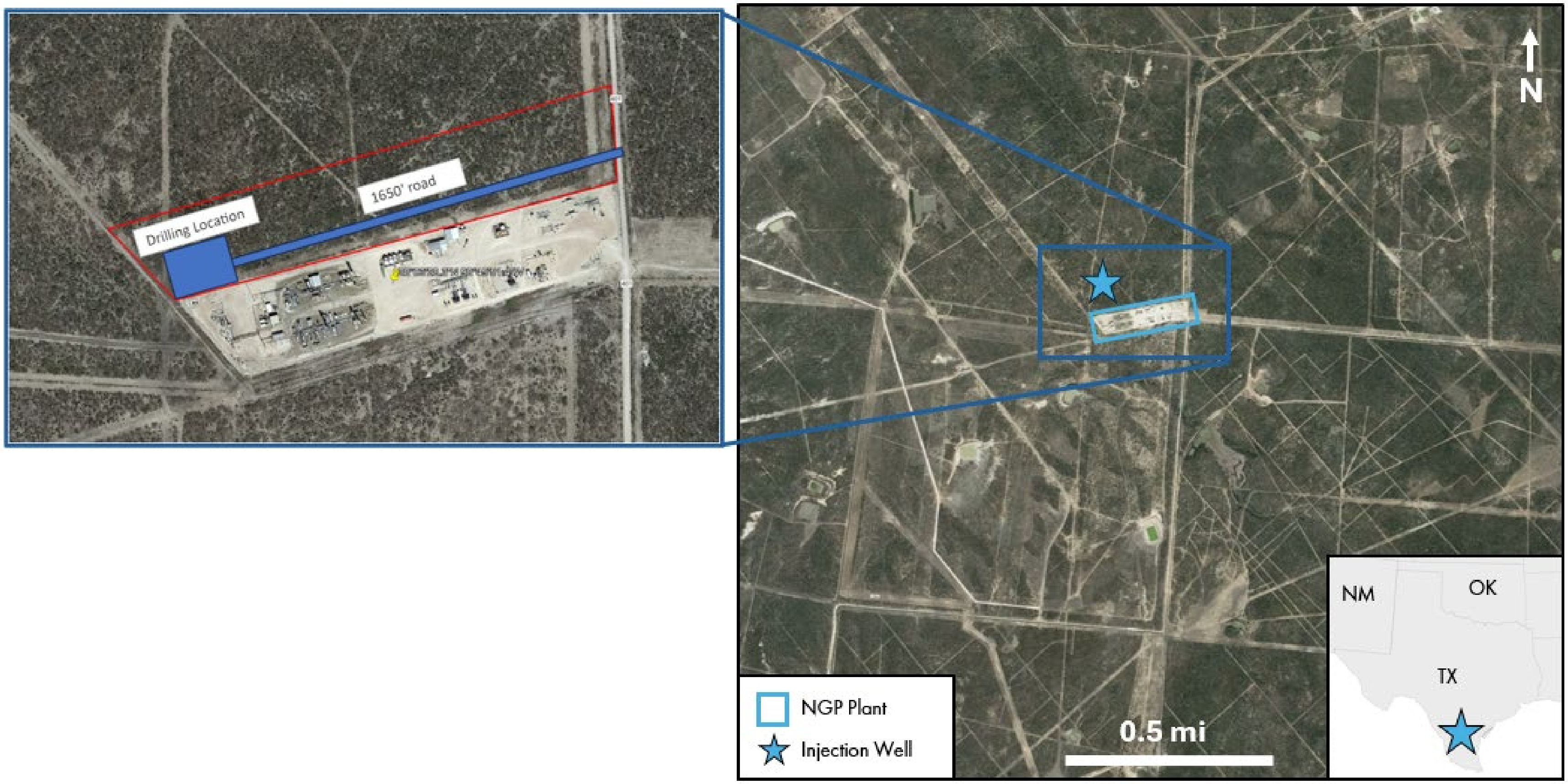

Figure 1. Location map of the Las Tiendas NGP Plant and the proposed Lima Tango CCS 1 injection well drilling location adjoining the plant in McMullen County, Texas.

2 – FACILITY INFORMATION

Gas Plant Facility Name:

Las Tiendas Plant
348 County Road 401
Freer, Texas 78357

Latitude: 27° 57.63' N
Longitude: 98° 35.64' W

Operator: Energy Transfer LP

GHGRP ID number: 1010735

Facility Registry Service Identifier (FRS ID): 110071159879

North American Industry Classification System (NAICS) Code: 486210

Reporting structure: Onshore Natural Gas Processing

Underground Injection Control (UIC) Permit Class:

The Oil and Gas Division of the Texas Railroad Commission (TRRC) regulates oil and gas activity in Texas and has primacy to implement the Underground Injection Control (UIC) Class II program for injection wells. The TRRC has permitted the Lima Tango CCS 1 well as an UIC Class II well. The Class II permit was issued to dCarbon in accordance with Statewide Rule 9.

Injection Well:

Operator: BKV dCarbon Ventures, LLC

Lima Tango CCS 1, API number 42-311-37581

UIC number: 000126980

Lima Tango CCS 1, GHGRP ID: 590006

3 – PROJECT DESCRIPTION

This section discusses the geologic setting, the lithology and reservoir characteristics of the planned injection and confining intervals, the formation fluid geochemistry, the potential for induced seismicity, the groundwater hydrology in the project area, the CO_2 project facilities, and the reservoir modeling performed for the proposed Lima Tango CCS 1 injection well. dCarbon has prepared this MRV plan to support the storage of CO_2 in McMullen County, Texas. The term interval is used for the composite layers and the term zone is used for the specific layers of rocks for the storage and confinement of CO_2.

3.1 Overview of Geology

Paleogene deposition began with the mud-rich Paleocene Midway Shale (**Figure 2**), which is widely present across the northern and western Gulf of Mexico margins. Sediment supply and sand content increased markedly thereafter, with deposition of the coarse siliciclastics of the Paleocene Lower and Middle Wilcox Formations and the Eocene Upper Wilcox Formation, followed by the Eocene Queen City and Sparta Formations. These deposits rapidly filled foreland troughs and prograded across the former Upper Cretaceous shelf margins. Sediment starved mud-rich intervals are present between the Upper Wilcox and Queen City Formations (as the Eocene Reklaw Shale) and between the Queen City and Sparta Formations (as the Eocene Weches Shale) as shown in **Figure 2**. The storage interval for this project is the Queen City Formation and the Reklaw and Weches Shales are lower and upper confining zones, respectively.

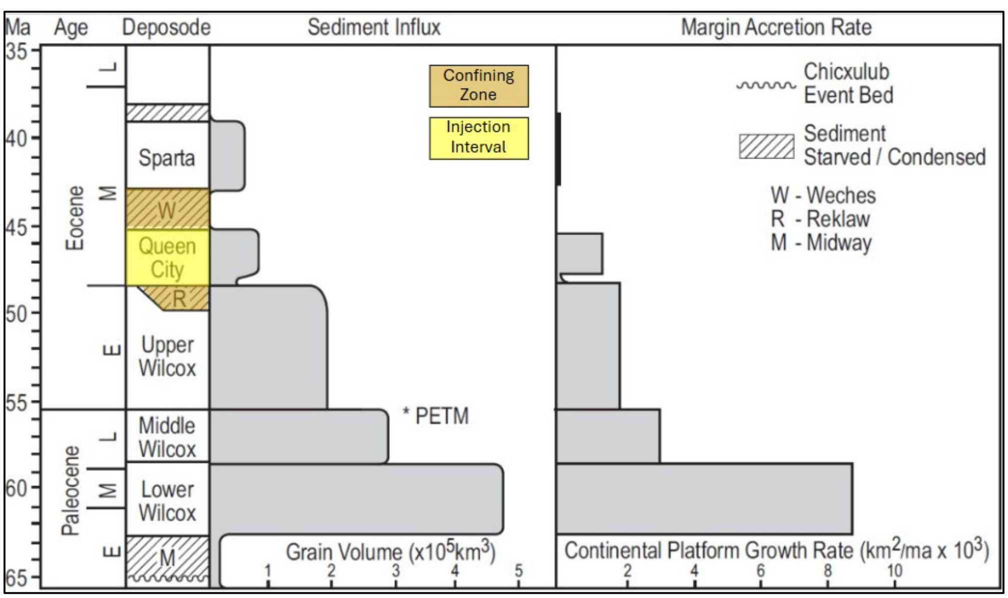

Figure 2. Regional stratigraphy at Lima Tango CCS 1 site in McMullen County, Texas, (modified from Snedden and Galloway, 2019). The Eocene sediment starved/condensed sections are in hachured fill and labeled R (Reklaw Shale) and W (Weches Shale). These are the lower and upper confining zones, respectively, for the Queen City Formation injection interval.

In this area, the Middle Eocene strata are tens of miles up dip from the shelf edge and the growth fault rafting that characterizes the time-equivalent section in the Gulf of Mexico. A published seismic section near the proposed injection site (**Figure 3**) illustrates the gentle dip and lack of growth faulting at the position of the proposed Lima Tango CCS 1 (red star). The strata in this setting are uniform in thickness, gently dipping towards the coast with less than two degrees of dip, and unimpacted by growth-fault related accommodation. We expect that the injected CO_2 will gradually migrate up dip to the west and northwest, owing to its buoyancy relative to the saline reservoir water. There are three faults mapped at the Queen City stratigraphic level in the Lima Tango CCS 1 model area. The most significant one is in northwestern part of the licensed 3D seismic area and is 1.2 miles from the modeled 98-year post-injection plume extent and 1.5 miles from the modeled 50-pounds per square inch (psi) change in pressure due to the injection. **Section 5.4** describes this fault further and addresses the lack of leakage risk that it presents given the fault's distance away from the modeled plume and pressure front.

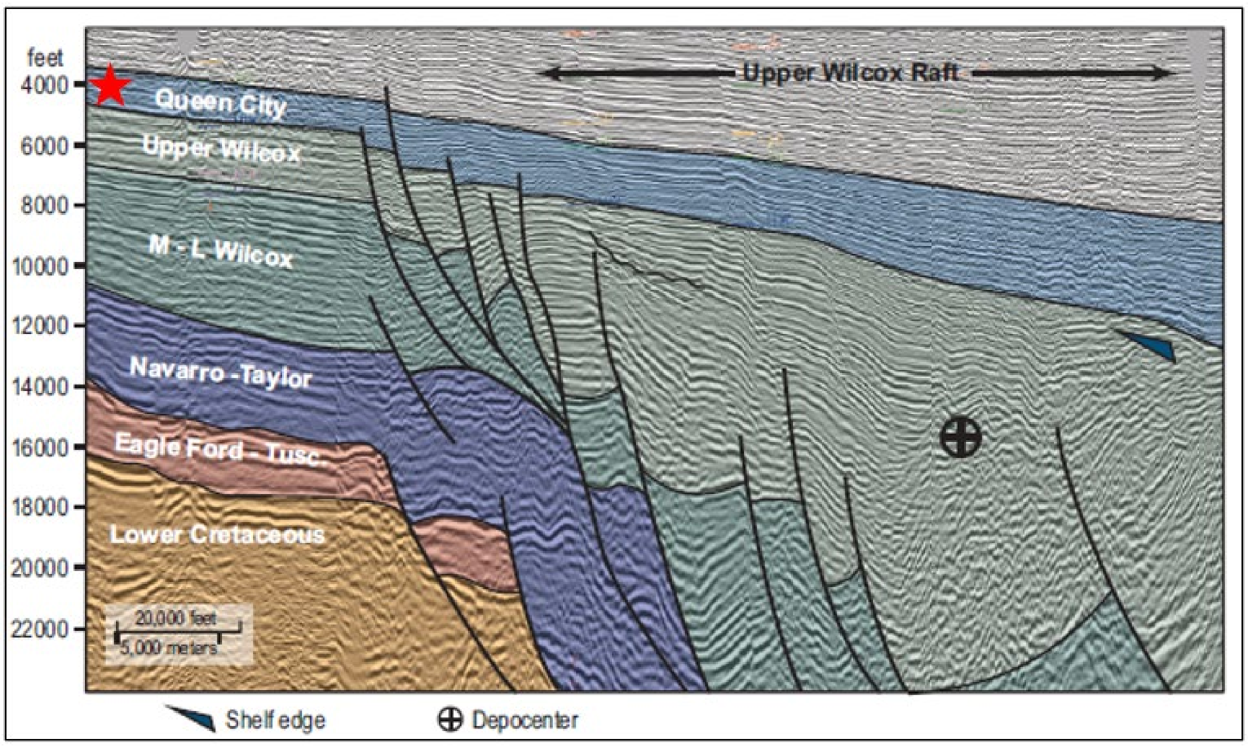

Figure 3. Representative northwest to southeast seismic cross section from Snedden and Galloway (2019) with the Queen City Formation and the Lima Tango project annotated with a red star. Figure 4 shows the line of section location.

3.2 Bedrock Geology

3.2.1 Basin Description

The proposed injection site lies in in McMullen County, Texas, just north of the border between McMullen and Duval Counties. The project takes place in the Gulf of Mexico basin, originally

formed by rifting during the Jurassic (Snedden and Galloway, 2019). The basin began rapid filling thereafter in the Cretaceous and Paleogene with large volumes of continentally derived sediments transported to the coastal plain by the Rio Grande River system, with the shales representing times of sediment starvation or condensed section. **Figure 4** presents a regional paleogeographic construction representative of the time of deposition of the Queen City Formation injection interval (Middle Eocene) by Galloway and Snedden (2019).

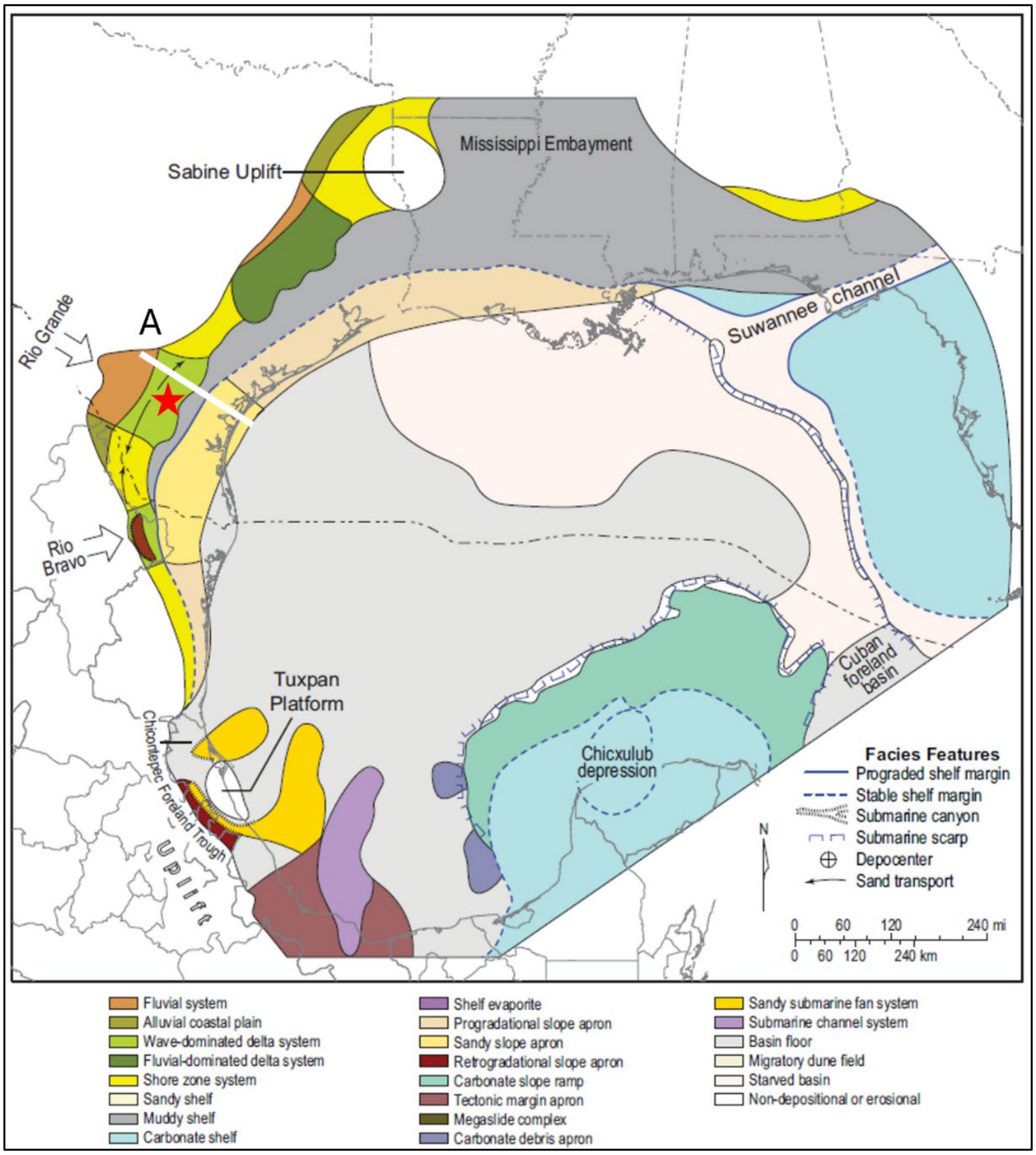

Figure 4. Middle Eocene paleogeographic reconstruction by Snedden and Galloway (2019). The Queen City Formation was deposited during this time, with the red star denoting the proposed injection site in the wave-dominated deltaic depositional environment. The location of the seismic line in Figure 3 is the white line marked by the letter "A".

3.2.2 Stratigraphy

Deposition of the Middle to Upper Eocene strata occurred in a wave-dominated deltaic setting along the margin of the early Gulf of Mexico basin (**Figure 4)**. The Queen City Formation is estimated to occur at depth ranging from 3,508-4,870 ft true vertical depth (TVD) with a reference datum of ground level at the Lima Tango CCS 1 proposed well site and has approximately 1,400 feet of uniform gross thickness across the modeled area. The Queen City Formation is the injection interval and is comprised of three potential injection zones (IZs). The Middle Eocene Weches Shale, with 110 feet of gross thickness, is the Upper Confining Zone (UCZ), and the lower Queen City shale and Early Eocene Reklaw Shale, with 965 feet of gross thickness, including over 50 feet of continuous impermeable shale, is the Lower Confining Zone (LCZ). **Figure 2** shows the stratigraphic relationship of the two confining zones and the injection interval.

Attractive attributes for CCS storage in the project area includes high storage capacity, minimal faulting, tight widespread confining shales, and gentle dip down to the coast. The injection interval is a package of thick, sheet-like, laterally continuous, porous, and permeable sandstone bodies characterized by low spontaneous potential (SP) and high deep resistivity (DRES) readings relative to the shales on wireline logs as shown in the type log (**Figure 5**) and cross section (**Figure 6)**. Individual sand bodies are separated by internal confining shales with higher SP and lower DRES wireline log signatures. The entire injection interval is bracketed by thick upper and lower confining shales, also with higher SP and lower DRES wireline log signatures. Both the injection interval and confining zones are laterally continuous and maintain constant thickness across the project area with a gentle up to the northwest dip (**Figure 6**). The upper confining shale (Weches Shale) is widespread and serves as the regional seal for the Queen City storage assessment unit (SAU) (Roberts-Ashby *et al*., 2014).

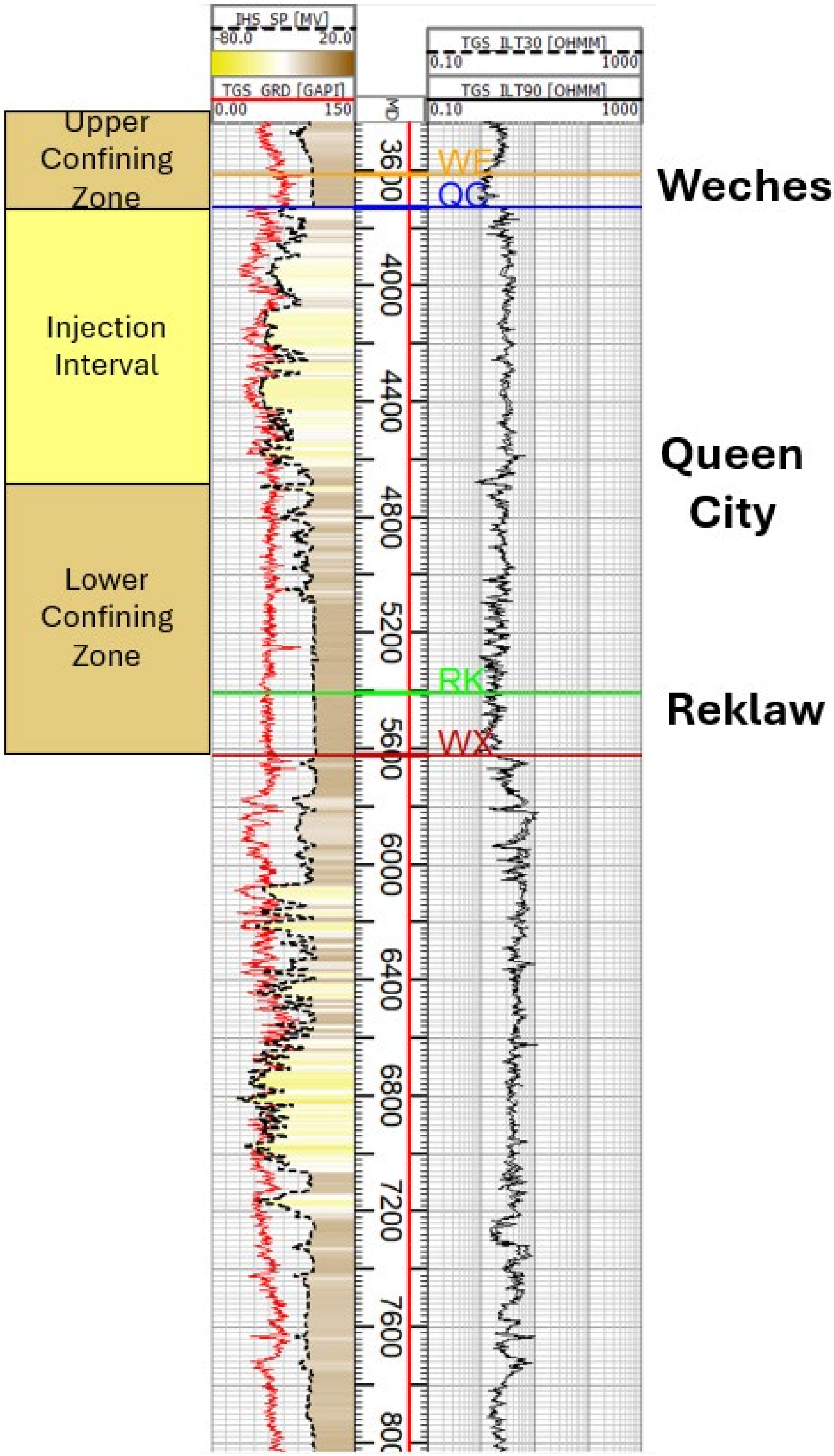

Figure 5. Nueces Mineral No. 1 (API 42-311-3181300) type log depicting the confining zones, injection interval, and associated formation names in the project area. The left column contains gamma ray (GR) (red) and SP (color-filled) curves, and the right column contains a DRES curve (black) on a logarithmic scale. Depth scale is in the middle column is in feet measured depth (MD).

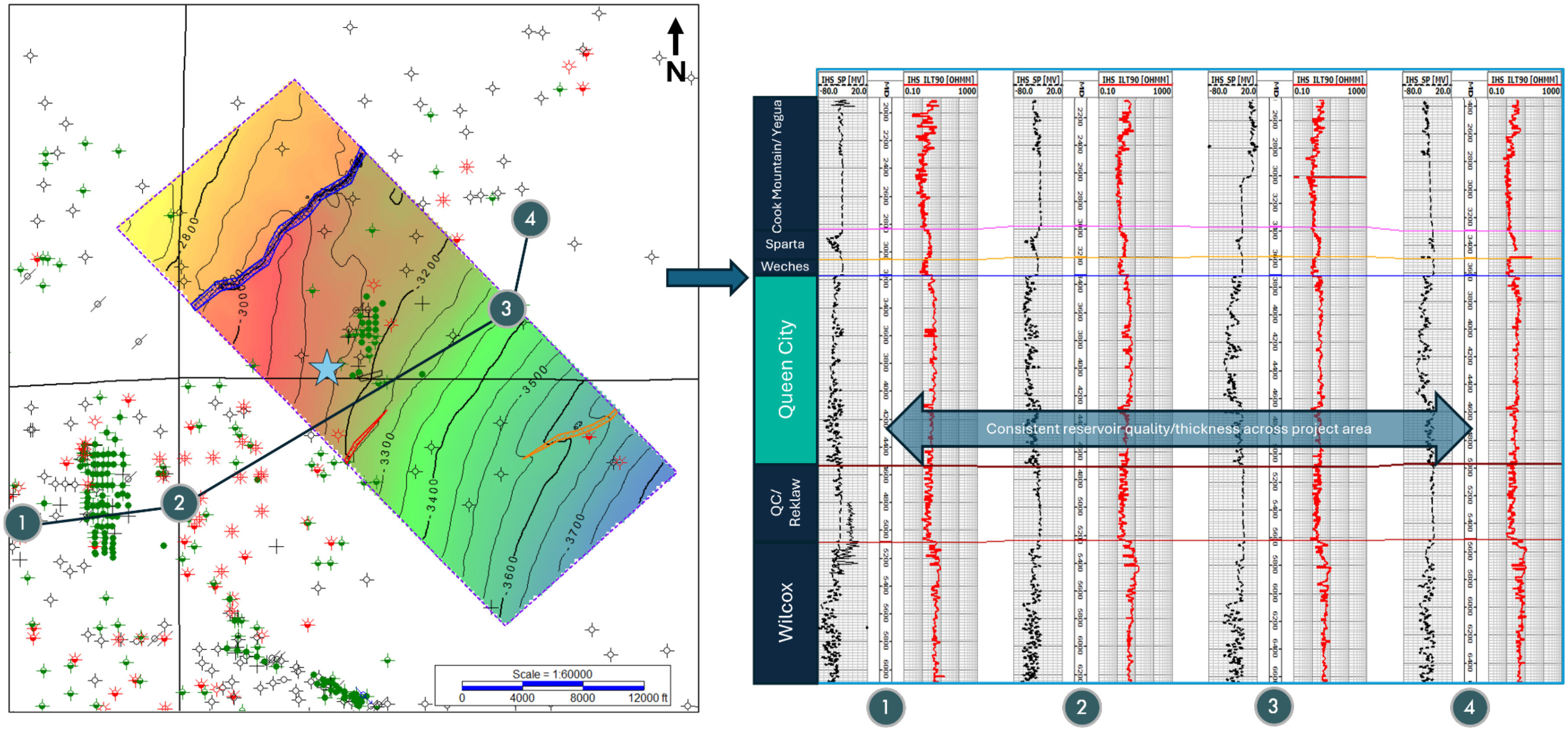

Figure 6. Map of the Lima Tango CCS 1 project area with proposed injection well (light blue star), existing wells, faults, seismic data, cross section wells, and numbered stratigraphic cross section flattened on the Queen City Formation top. The cross section is a four-well section from southwest to northeast across the project area with wells numbered on both the map and cross section. The licensed three dimensional (3D) seismic data is represented by the rectangular area of color filled structural contours on the top of the Queen City Formation in feet true vertical depth subsea (TVDSS) with a contour interval of 50 feet. The Weches Shale is the UCZ for the Queen City storage interval; the lowermost Queen City (QC) and Reklaw Shale are the LCZ for the Queen City and serves as an impermeable barrier between the Queen City and the Upper Wilcox aquifer.

3.2.3 Faulting

The Lima Tango CCS 1 well site is characterized by gentle dip (less than two degrees) and little faulting (**Figure 7**). Paleogene faulting along the western margin of the Gulf of Mexico was initiated by slump over Mesozoic shelf margins during very rapid sediment deposition. The Lima Tango CCS 1 site is located landward of these shelf margins (**Figure 3**) and much of the sediment bypassed this area to the offshore. As such, the deposition was more uniform in this area and the mechanisms for growth faulting were not in place.

There are three faults intersecting the Queen City Formation that have been mapped on the 3D seismic data licensed for this project (**Figure 7**). A late, down-to-the-coast fault with 100-250 feet of offset is on the northwestern portion of the seismic data (**Figure 7**, blue fault labeled 1). This fault is rooted in the Mesozoic section and continues nearly to the surface with consistent offset throughout the section indicating that it moved late.

An antithetic to this fault (**Figure 7**, orange fault labeled 3) is mapped on the southeastern portion of the seismic data, dipping to the northwest. This fault cuts down to the Upper Cretaceous and has offset up to 60 feet within the Queen City Formation.

A smaller fault (**Figure 7**, red fault labeled 2) was mapped in the middle portion of the seismic data. It also dips to the southeast, cutting down from the Eocene to Upper Paleocene section, with minimal offset.

Additional deep, normal faults with minor offset were mapped on the licensed three dimensional (3D) seismic and intersect neither the Queen City Formation nor the lower confining zone.

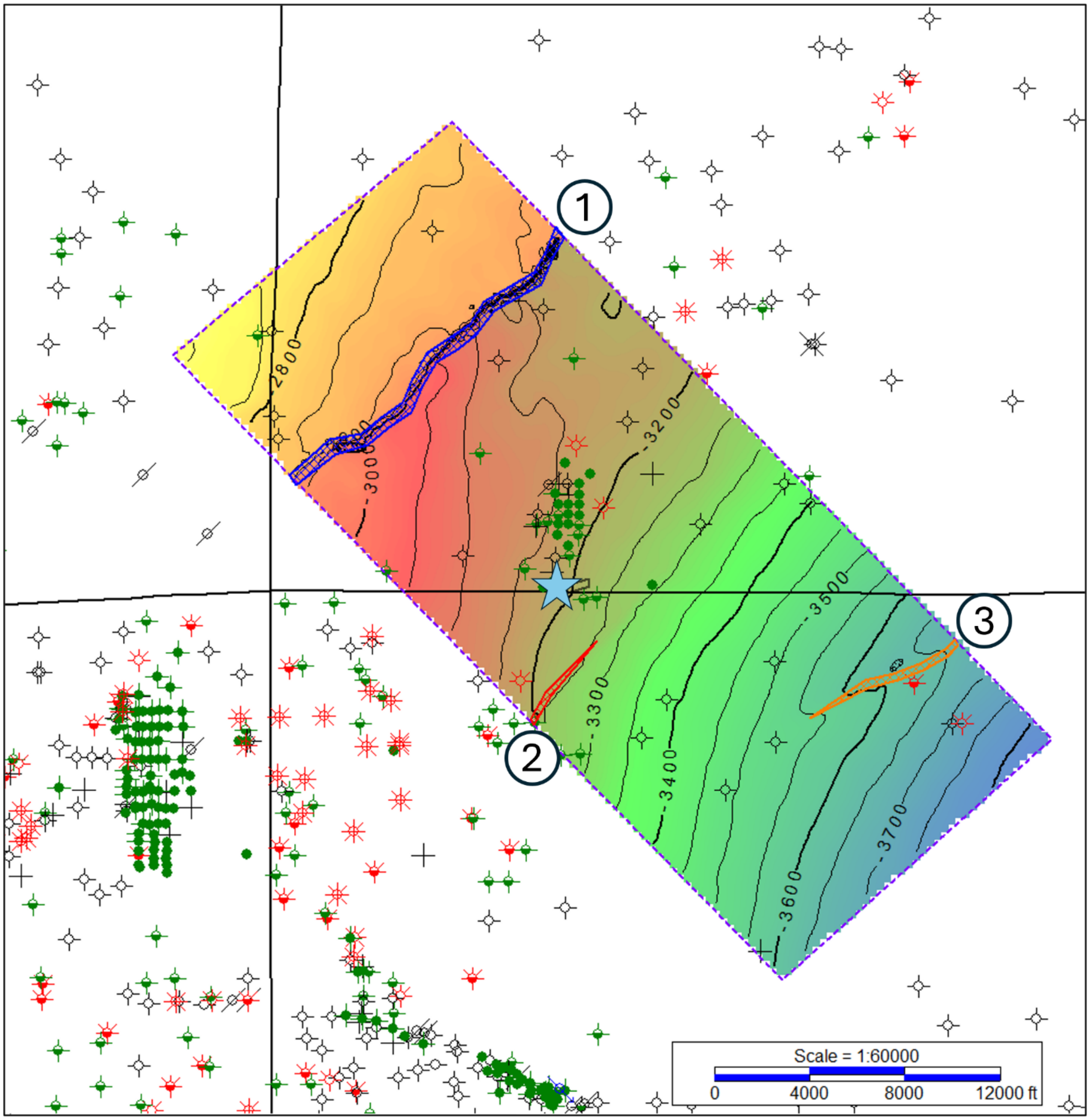

Figure 7. Top Queen City Formation structure in feet TVDSS with a contour interval of 50 feet. The injection well is highlighted with the blue star and all existing oil and gas wells are shown. Faults are indicated by the colored polygons and numbers. North is up.

3.3 Lithological and Reservoir Characterizations

A set of 69 digital well logs and 81 raster well logs that were deep enough to reach the Queen City Formation were used to map the subsurface. Formation tops were interpreted on well logs and tied to 20 square miles of licensed 3D seismic data. Digital logs from the Nueces Minerals No. 1 type log were used to construct a petrophysical model that included a porosity-permeability transform, water saturation calculation, geomechanical properties, and facies. **Figure 8** depicts the datasets utilized for interpretations described in this project.

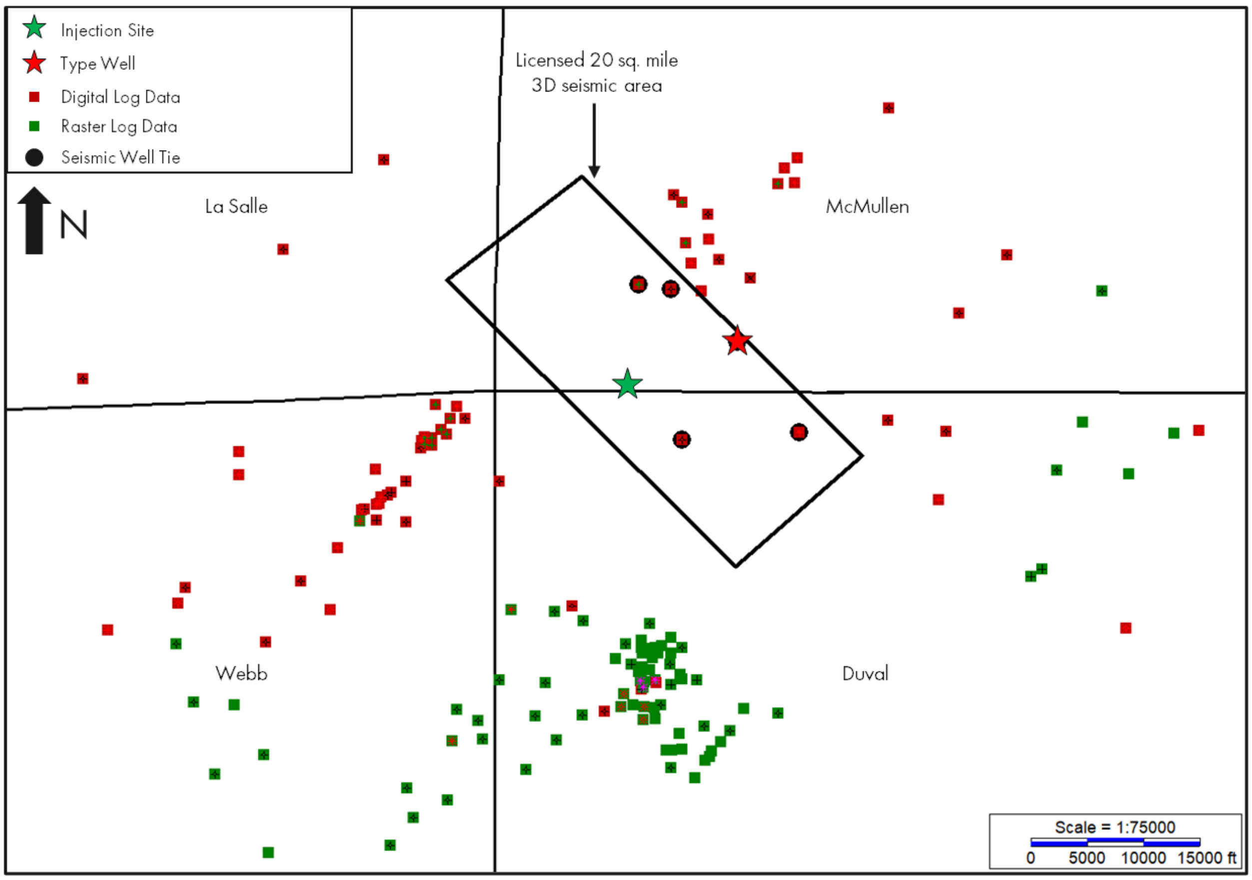

Figure 8. Data availability map depicting the 150 wells with digital wireline logs (red squares) and raster logs (green squares) in the mapped area. The Nueces Mineral No. 1 type log used for petrophysical interpretations (red star) and the 20 square miles of licensed and reprocessed 3D seismic data relative to the proposed Lima Tango CCS 1 injection well (green star) are also shown. Note that not all drilled wells are shown on this map.

3.3.1 Injection Interval

The Queen City Formation is the injection interval. It is comprised of three sand-rich injection zones (IZs) designated IZ-1 to IZ-3 (**Figure 9**). They have low volume clay (vClay) (less than 15 percent (%)) and a dominance of sand (greater than 60 %) in our petrophysical and facies models, respectively.

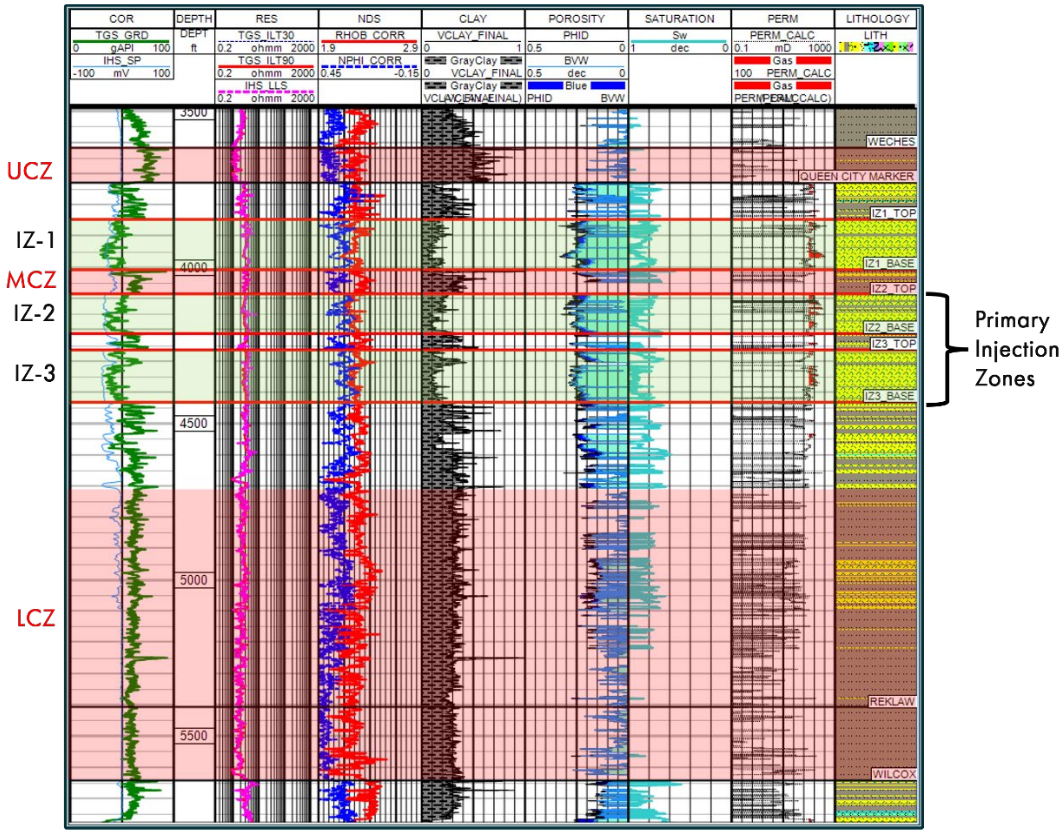

Figure 9. Petrophysical log of the Nueces Minerals No. 1 well with the Queen City Formation primary injection interval annotated on the right and the individual injection and confining zones annotated on the left. The injection interval is comprised of Injection Zone 2 (IZ-2) and Injection Zone 3 (IZ-3). Injection Zone 1 (IZ-1) was mapped but not included as part of the CO_2 plume model.

3.3.2 Confining Zones

The Weches Shale, which overlies the Queen City Formation, and the Reklaw Shale, which underlies the Queen City Formation, were identified as the UCZ and LCZ, respectively. These shales are comprised of starved, condensed, shale-dominated intervals with high gamma ray, low resistivity, and low porosity log signatures, as well as high vClay and a dominance of shale (greater than 30%) in our petrophysical and facies models.

3.3.3 Injection and Confining Zones and Properties

A petrophysical interpretation of wireline logs available at the Nueces Minerals No. 1 well is presented in **Figure 9**. The individual injection and confining zones are highlighted in green and red, respectively and labeled at the left. The modeled primary IZ is annotated at the right. The UCZ is compromised of the Weches Shale, Injection Zone 1 (IZ-1) is comprised of uppermost Queen City sand, the Middle Confining Zone (MCZ) is comprised of a shale within the Queen City, Injection Zone 2 (IZ-2) is comprised of the next major sand down in the Queen City, and Injection Zone 3 (IZ-3) is comprised of a well-developed sand in the middle of the Queen City. The LCZ was additionally identified as the Reklaw Shale but there are also shales with very thinly interbedded sands in the basal Queen City that have low porosity and permeability. This interval

is highlighted as also contributing to the LCZ in **Figure 9**. The dominant lithology, thickness, porosity, and permeability of each zone is presented in **Table 1**.

Table 1. Properties of the Queen City Formation injection zones and the Weches Shale, Queen City, and Reklaw Shale confining zones assessed at the Lima Tango project area. Porosity is given in percent (%) and permeability is given in millidarcies (mD).

Subunit	Dominant Lithology	Thickness (feet)	Average Reservoir Porosity (%)	Average Reservoir Permeability (mD)	Description
Upper Confining Zone (UCZ)	Shale	110	1	0.002	Weches Shale
Injection Zone 1 (IZ-1)	Sand	160	16	75	Queen City sand (identified but not modeled)
Middle Confining Zone (MCZ)	Shale	90	3	0.2	Queen City intraformational shale
Injection Zone 2 (IZ-2)	Sand	125	20	120	Queen City sand
Injection Zone 3 (IZ-3)	Sand	168	19	100	Queen City sand
Lower Confining Zone (LCZ)	Shale	965	1.5	0.05	Lowermost Queen City interbedded sands and shales and the Reklaw Shale

3.4 Formation Fluid Chemistry

The available formation fluid chemistry analyses available from the United States Geological Survey (USGS) National Produced Waters Geochemical Database v2.3 for the targeted Queen City Formation injection interval are shown in in **Figure 10**. All values are located southeast or east of the Lima Tango CCS 1 site and have Total Dissolved Solids (TDS) values greater than 20,000 parts per million (ppm). The average, low, and high TDS values are presented in **Table 2** as are the corresponding values for potential of hydrogen (pH), sodium (Na), calcium (Ca), and chlorides (Cl).

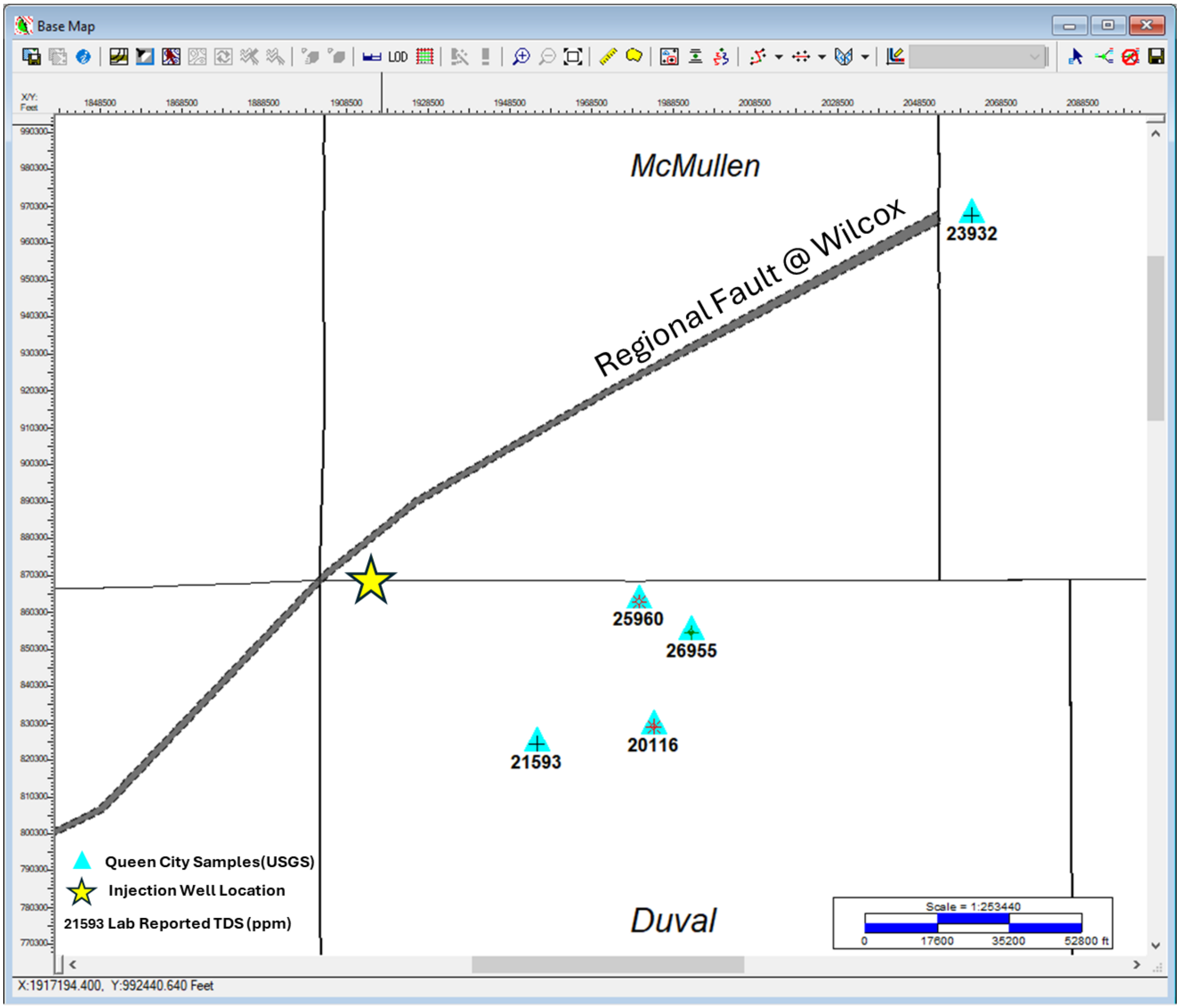

Figure 10. Map showing the location and values of TDS (ppm) in wells with of available USGS water samples values from the Queen City Formation. These were used in the formation fluid chemistry analysis. Regional fault location is from Kosters, *et al.*, 1989. North is up.

Table 2. Queen City Formation fluid chemistry.

	TDS (ppm)	pH	Na (ppm)	Ca (ppm)	Cl (ppm)
AVG	23,711	7.8	8,900	92	12,815
LOW	20,116	7.4	7,561	54	10,950
HIGH	26,955	8	10,100	152	14,700

3.5 Potential of Induced Seismicity

There has been no earthquake activity near the Las Tiendas NGP plant or within 25 kilometers (km) since 2017 according to the TexNet earthquake monitoring network. The earthquake activity present north of the site as shown in **Figure 11** is believed to result from oil and gas well completions activity in the Eagle Ford trend. The Queen City Formation proposed injection interval at the Lima Tango CCS 1 site is thousands of feet above the crystalline basement rock. As such, seismicity risk related to this project's injection of CO_2 is expected to be nominal.

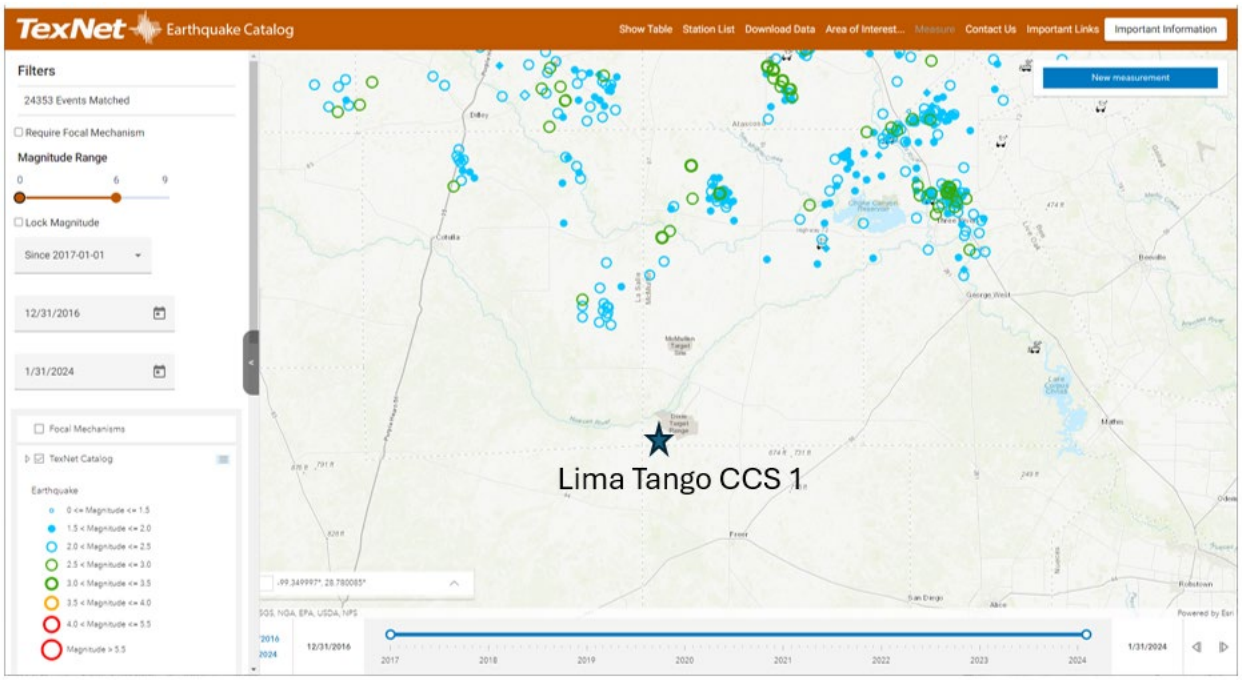

Figure 11. Map of historical seismic activity within 25 km of the proposed Lima Tango CCS 1 site from the Texas Seismological Network (TexNet) Seismic Monitoring Network. North is up.

3.6 Groundwater Hydrology

The proposed Lima Tango CCS 1 injection site lies on the southeastern edge of both the mapped limits of the Carrizo-Wilcox and the Jackson-Yegua aquifers (**Figures 12 and 13).** The proposed disposal interval (Queen City) is estimated to be 3,508 - 4,870 feet true vertical depth (TVD) at the injection site and is isolated from the shallow Underground Source of Drinking Water (USDW) (Jackson-Yegua) and the deep potential USDW (Carrizo-Wilcox). **Figure 14** depicts the injection interval and confining zones relative to both USDWs and the Base of Useable Quality Water strata (BUQW). Note that the Nueces Minerals No. 1 type log shown in this figure is approximately 170 feet downdip from the injection well and picks have been adjusted accordingly.

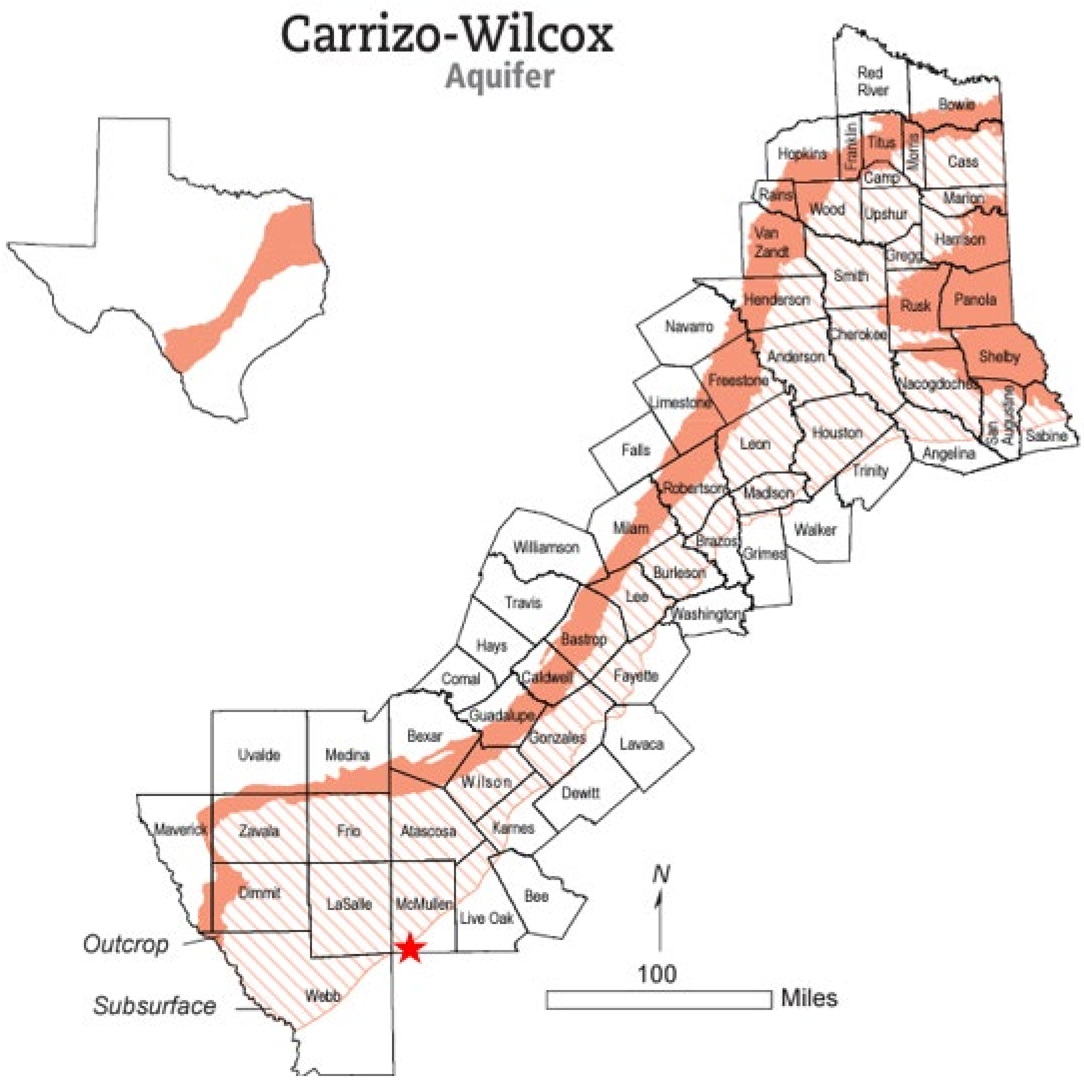

Figure 12. Carrizo-Wilcox aquifer map and recharge area, with outcrop shown in solid fill and subsurface in hachured fill, relative to proposed injection well (red star). Modified from George *et al.*, 2011.

Figure 13. Yegua-Jackson aquifer map and recharge area relative to proposed injection well (red star). Modified from George *et al*., 2011.

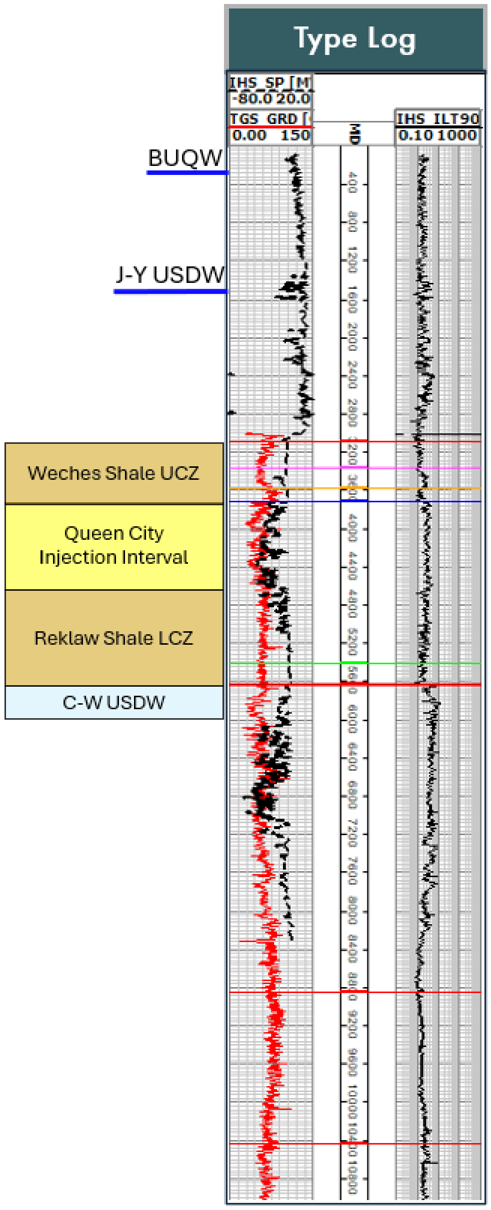

Figure 14. The Nueces Minerals No. 1 type log annotated with the BUQW, the Jackson-Yegua (J-Y) USDW, the Weches Shale UCZ, the Queen City injection interval, the Reklaw Shale LCZ, and the Carrizo-Wilcox (C-W) USDW.

The Jackson-Yegua aquifer is 2,300 feet above the Queen City injection interval and separated from the injection interval by multiple low-porosity and low-permeability formations, most notably, the Weches Shale which is identified as the UCZ (**Figure 14)**. The Carrizo-Wilcox aquifer is 965 feet below the Queen City injection interval and isolated from it by the Reklaw Shale LCZ. Both the Weches and Reklaw Shales have been mapped as aquitards in numerous Texas Water Development Board (TWDB) publications, (Galloway *et al.*, 1991; Sharp *et al.*, 1991). Water samples from the Carrizo-Wilcox aquifer illustrate the increasing salinity of the aquifer downdip to the southeast (**Figure 15**). Owing to the transitional nature and the uncertainty of the

water quality at the Lima Tango CCS 1 injection site, the TRRC Groundwater Advisory Unit (GAU) considers the Carrizo-Wilcox aquifer a potential USDW. Therefore, dCarbon demonstrated geologic isolation between the proposed injection zone and the Carrizo-Wilcox potential USDW and the TRRC GAU agreed that sufficient isolation existed to support dCarbon's W-14 injection permit. There are no water wells within the two-mile radius of the Lima Tango CCS 1 injection site as shown in **Figure 16**.

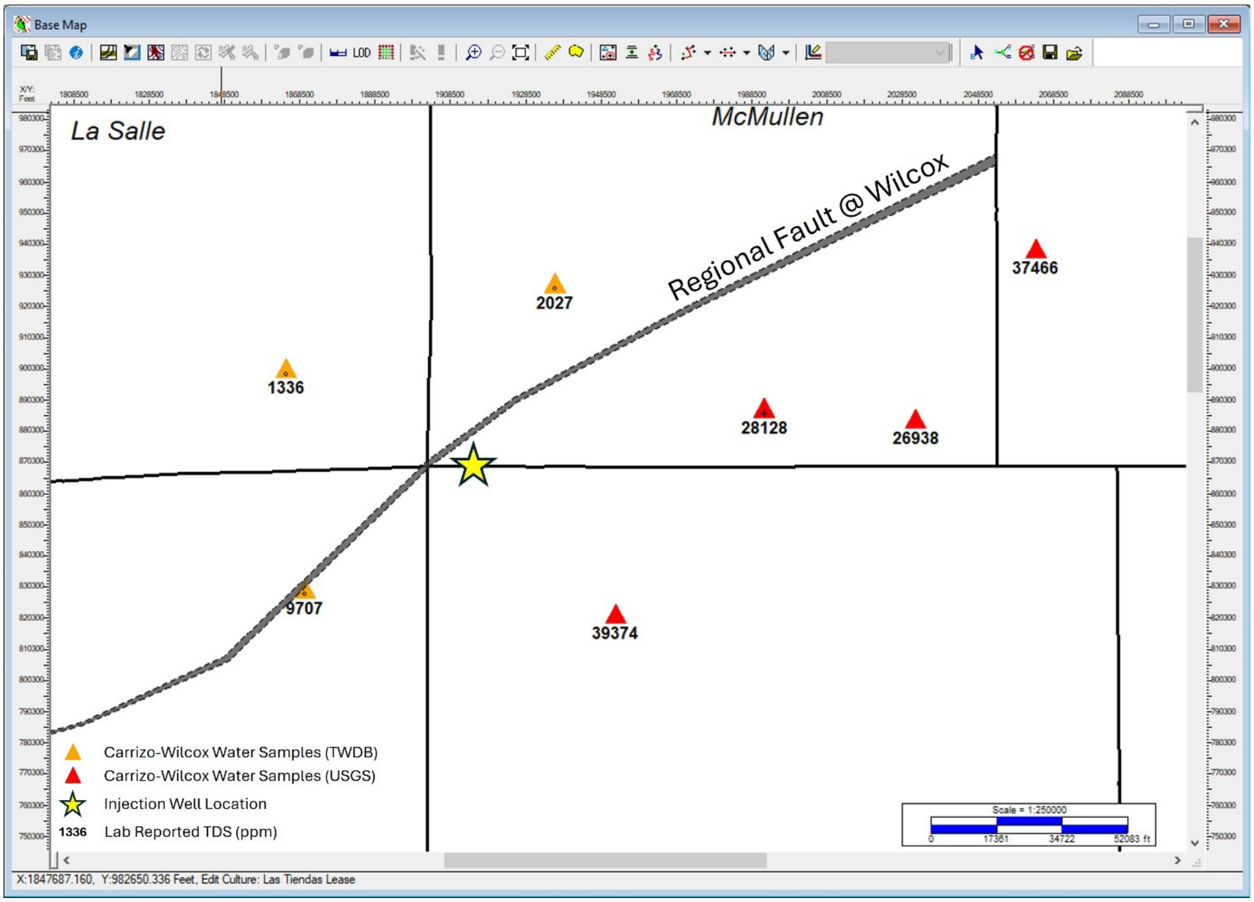

Figure 15. Carrizo-Wilcox water sample data from the USGS and TWDB. Posted values are in ppm TDS and the source denote by the color of the triangle in the legend in the lower left corner. North is up.

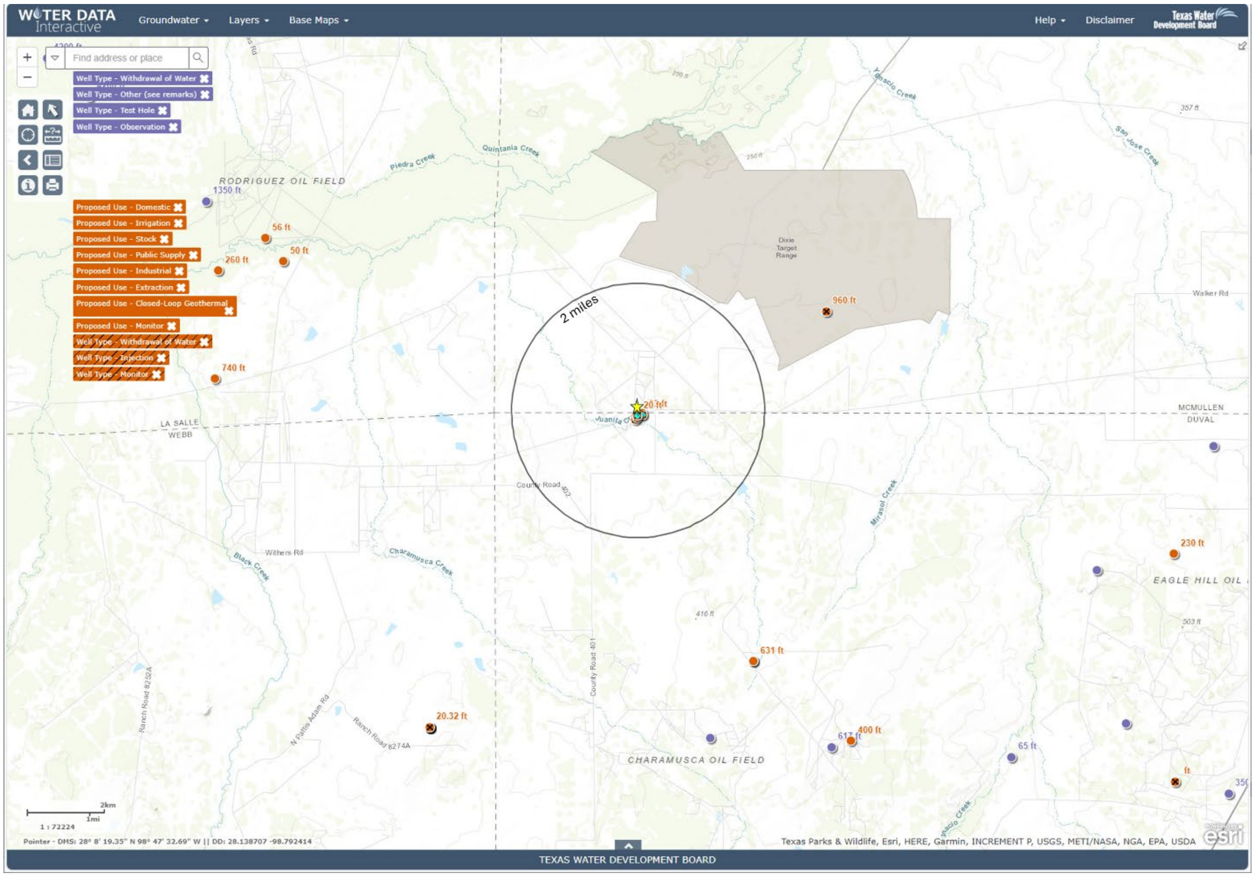

Figure 16. Water wells within the greater Lima Tango CCS 1 area from the TWDB interactive viewer. The yellow star denotes the injection site, and the black circles depict a two-mile radius circle around the proposed injection site. No water withdrawal wells fall within these areas. Monitoring wells at the ET Las Tiendas NGP Plant site have been plugged. North is up.

3.7 Description of CO_2 Project Facilities

dCarbon will accept CO_2 from the ET Las Tiendas NGP Plant (**Figure 17**). The temperature, pressure, composition, and quantity of CO_2 will be measured and metered according to industry standards, with an orifice meter, Coriolis meter, or similar device. dCarbon will compress the CO_2 to a supercritical physical state at the Lima Tango CCS 1 injection site. The CO_2 stream will be metered to verify quantity. The CO_2 will then be injected into the Queen City Formation, which is not known to be productive of oil and gas in the area. A gas analysis of the CO_2 stream is shown in **Table 3**. Although industry-standard sampling of the CO_2 stream is expected to be representative of the composition of the gas, it is possible that the composition will vary slightly over time.

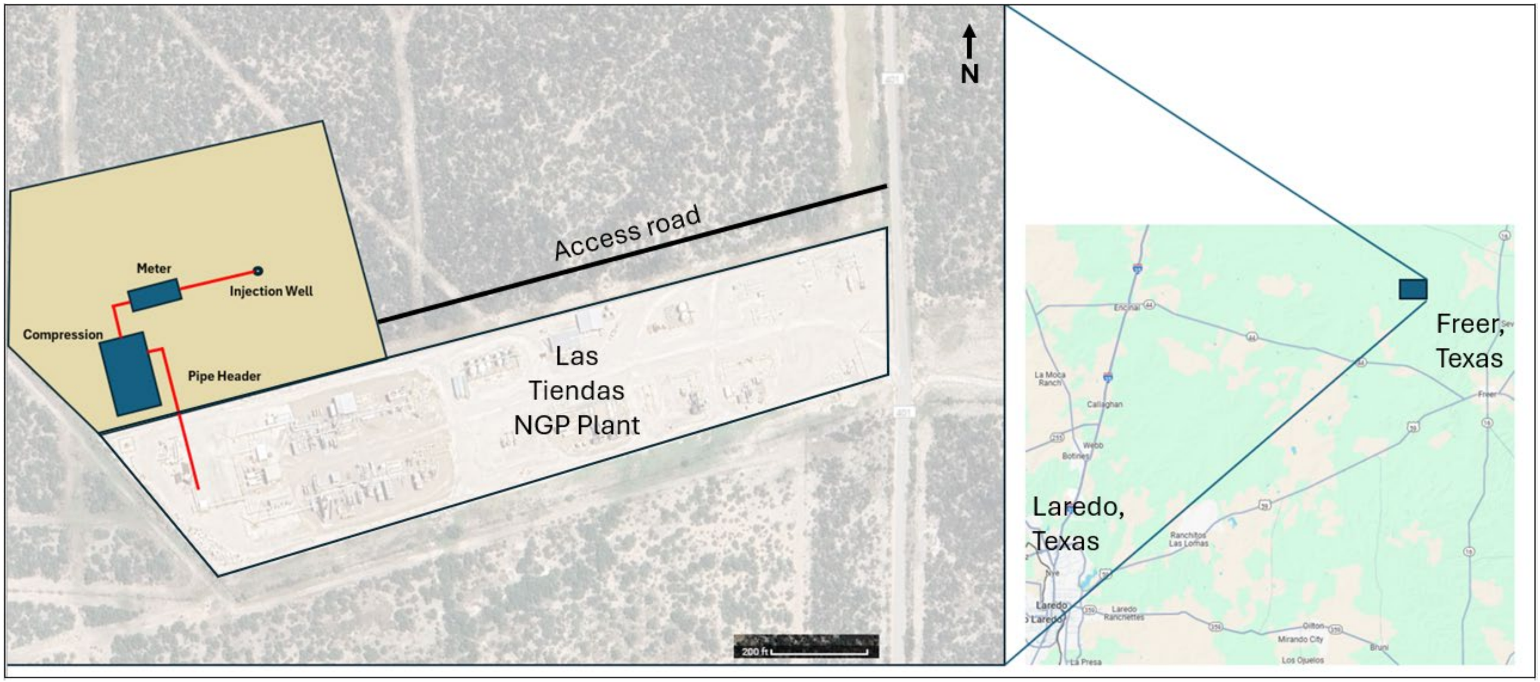

Figure 17. Lima Tango CCS 1 injection well proposed plot plan and location map relative to cities in south Texas.

Table 3. Inlet CO_2 stream analysis for the Lima Tango CCS 1 site in mol percent.

	DESIGN	DESIGN
Water	9.62	Dry Basis
Hydrogen Sulfide	0.01	55 ppmv / 0.006
Nitrogen	0.01	0.010
Carbon Dioxide	87.46	96.774
Methane	2.51	2.776
Ethane	0.34	0.381
Propane	0.01	0.013
i-Butane	0.01	0.009
n-Butane	0.00	0.003
i-Pentane	0.02	0.017
n-Pentane	0.01	0.011
n-Hexane	0.00	0.000
TOTAL	100.00	100.000

Note – *Gas is water saturated at inlet conditions (120 degrees Fahrenheit (F) and 3 pounds per square inch gas (psig) using Bryan Research and Engineering's Promax chemical process simulation software and the GERG 2008 Equation of State (EOS)). Ppmv is pounds per million by volume.

3.8 Reservoir Characterization Modeling

To develop an MRV plan for monitoring, reporting, and verification of geologic sequestration at the Lima Tango CCS 1 facility as required under §98.448(a)(1)-(2) of Subpart RR, dCarbon first constructed a Static Earth Model (SEM) and then a dynamic reservoir simulation model to determine the active and maximum monitoring areas (AMA and MMA, respectively) as defined in §98.449. The primary objectives of the simulation model were to:

1. Estimate the maximum areal extent of the injectate plume and its migration post injection

2. Determine the ability of the Queen City injection interval to handle the required injection rate

3. Characterize potential interaction between the injected CO_2 and any nearby potential leakage pathways

dCarbon employed Schlumberger's Petrel software and Rock Flow Dynamic's tNavigator software to construct the static earth and dynamic plume models, respectively. The initial modeling was the area of licensed 3D seismic data (20 square miles) as shown in **Figure 18**. The model utilizes structural and petrophysical interpretations made from available well and 3D seismic data described in **Section 3.3** as primary inputs.

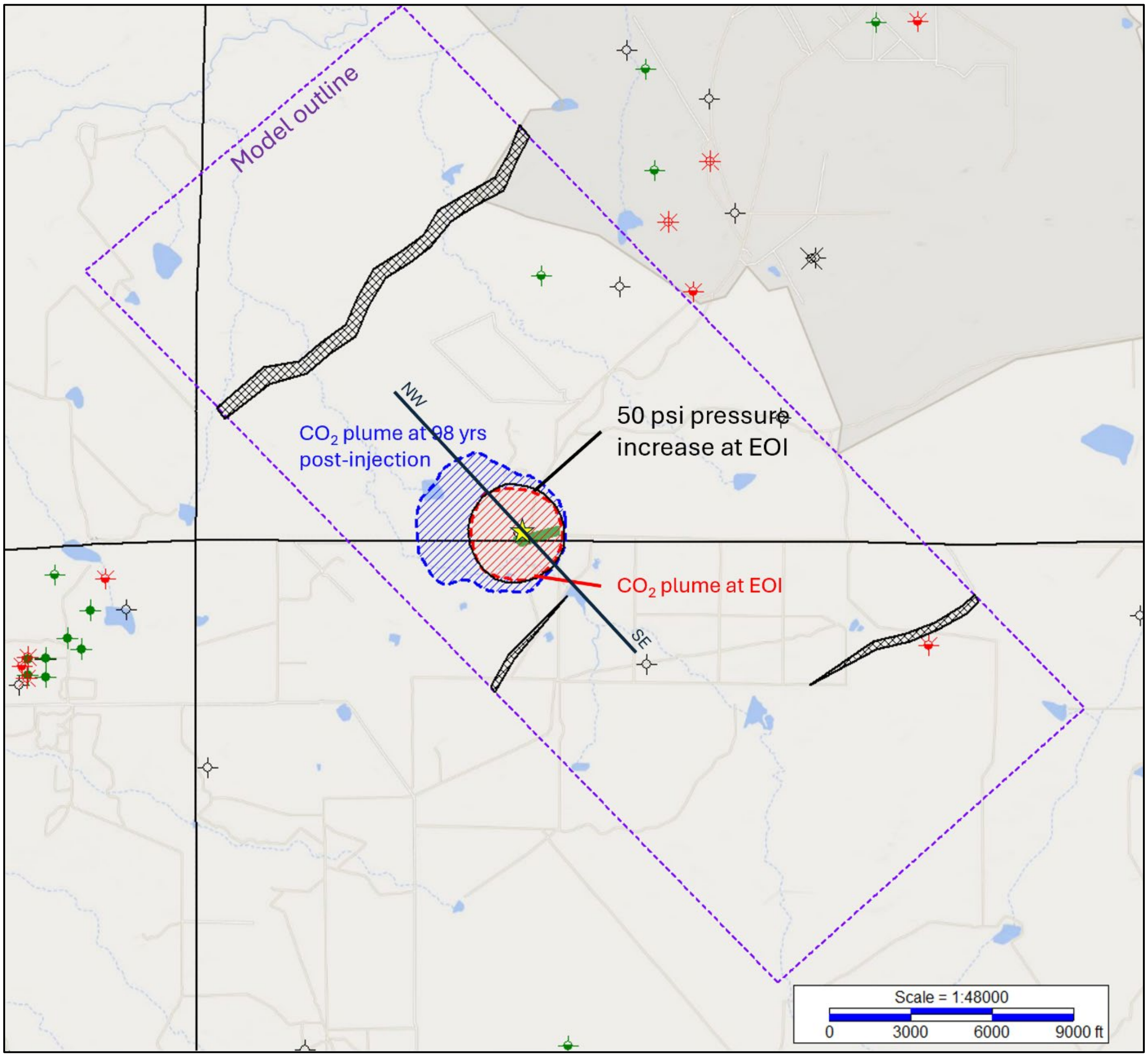

Figure 18. Simulation results showing CO_2 plumes at the end of injection (EOI) for 12 years in red, after 98 years post- injection in blue, and the model extent in violet, which is also the area of licensed 3D seismic. The 50-psi pressure plume at the end of injection is in black. Only wells deep enough to penetrate the top of the Queen City Formation are shown. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults from the 3D seismic data at the Queen City stratigraphic level. North is up.

Petrophysical calculations, including a porosity-permeability model, were derived from well logs at the Nueces Minerals No. 1 well, which is two miles away from the proposed injection site. Local core data was not available to calibrate the petrophysical model so an analog from a sandstone reservoir with comparable porosity and permeability was used (the Bandera Brown B from the Department of Energy (DOE) CO_2 Brine Relative Permeability Database (CO2BRA) (Araujo de Itriago *et al.*, 2024)). The mapping of uniform thickness and consistent correlations of wireline log characteristics with other available logs in the area supports the conclusion that the

Nueces Minerals No. 1 well is representative of the proposed injection site and the modeled area. The model will be further updated and calibrated when the injection well is drilled and additional data, including whole or rotary sidewall cores, is collected over the injection and confining intervals.

Utilizing the previously described inputs, grid layers and cells were created in Schlumberger's Petrel software at the increments listed in **Table 4**, resulting in an SEM model depicted in **Figure 19**. Reservoir properties were distributed in a layer cake manner throughout the modeling area based on petrophysics calculated from wireline logs at the Nueces Mineral No. 1 well. A dip and strike swath of cells through the injection site were gridded at a finer increment of 150 feet by 150 feet to allow for better resolution of plume behavior around the proposed injection well as shown in the central portion of **Figure 19**.

Table 4. SEM parameters by the i, j, and k directions (dir).

	i-dir	j-dir	k-dir
Average Increment (feet)	511	331	12
Layer count	71	45	93
Total length (feet)	36,298	14,904	1,110
Total cell count	297,135		

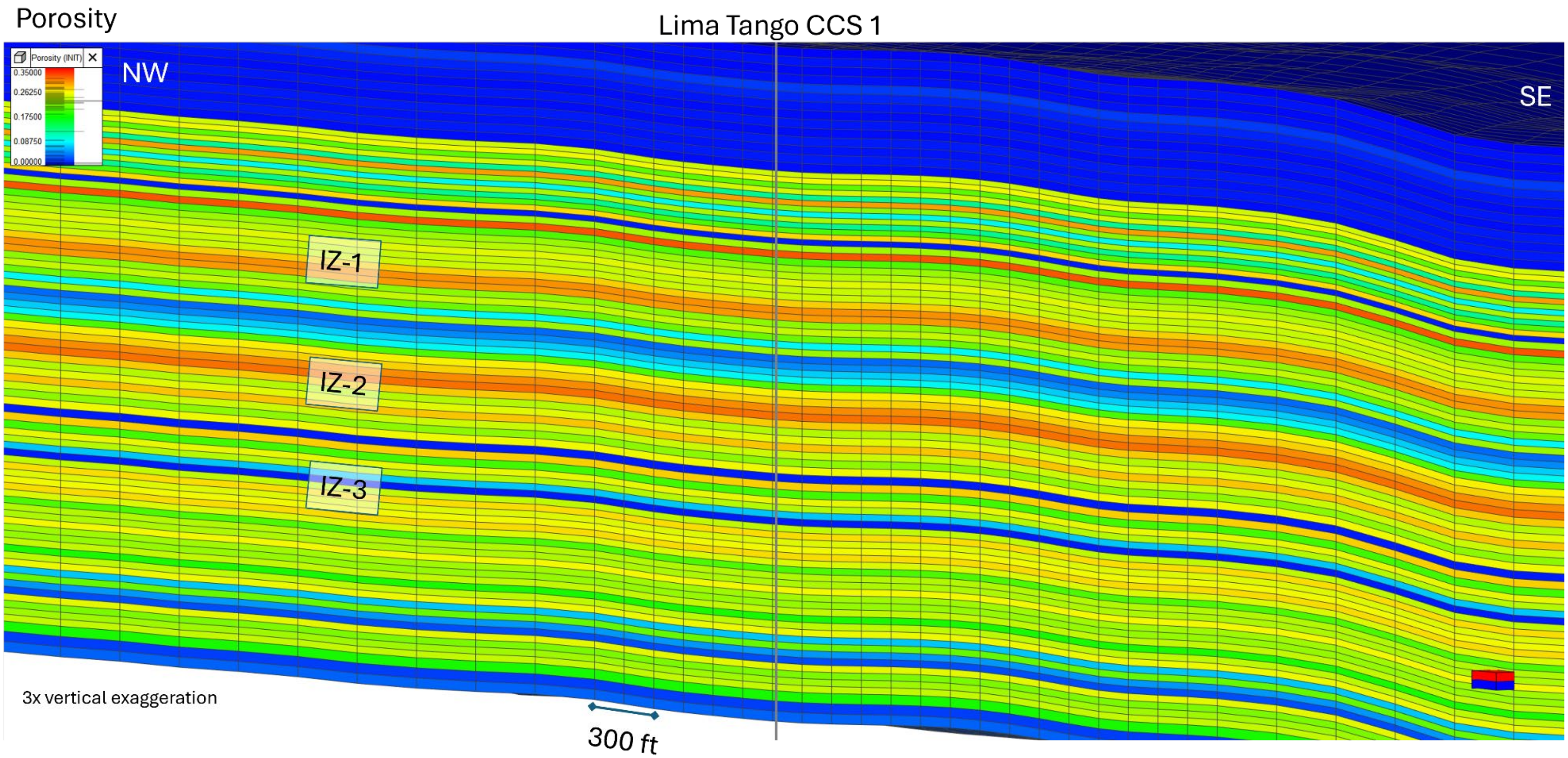

Figure 19. Porosity of the Queen City interval of the SEM. Porosity was calculated from the nearby Nueces Minerals No. 1 wireline well logs. Cross section location is shown on Figure 18.

A fit-for-purpose reservoir simulation model was created from the SEM to assess average injectivity based on empirical and analytical methods and to simulate CO_2 injection scenarios to aid in project design.

Pore and frac gradients, temperature, salinity, water saturation, porosity, and relative permeability model inputs are given in **Table 5**. The pore pressure gradient was assumed to be 0.48 psi/foot based on regional trends in South Texas. The fracture pressure gradient was estimated as 0.7 psi/foot from regional data and then an additional safety factor of 90% was applied, resulting in 0.6 psi/foot of the bottomhole constraint. The surface temperature is the mean annual temperature at the Lima Tango CCS 1 site. Fluid salinity is an average of the regional values described in **Section 3.4**. The relative permeability-porosity data are from a similar sandstone reservoir, the Bandera Brown B, in the DOE's CO2BRA database as cited by Araujo de Itriago *et al.*, 2024 and plotted in **Figure 20**. There are no active injectors in the simulation area from which to source these data.

Table 5. Input reservoir modeling parameters.

Parameter	Value
Pore Pressure Gradient (psi/foot):	0.48
Frac Pressure Gradient (psi/foot):	0.6
Temperature Gradient (degrees Fahrenheit (F) /foot):	0.015
Surface Temp (degrees F):	70
Fluid Salinity (ppm TDS)	30,000
Connate Water Saturation (decimal percent (%)):	0.47
Porosity (decimal %):	0.256
Relative permeability (mD):	133.85
Net-to-gross (ratio):	1
Rate constraints (MT/yr)	177,000
Pressure constraints (% of fracture pressure)	90

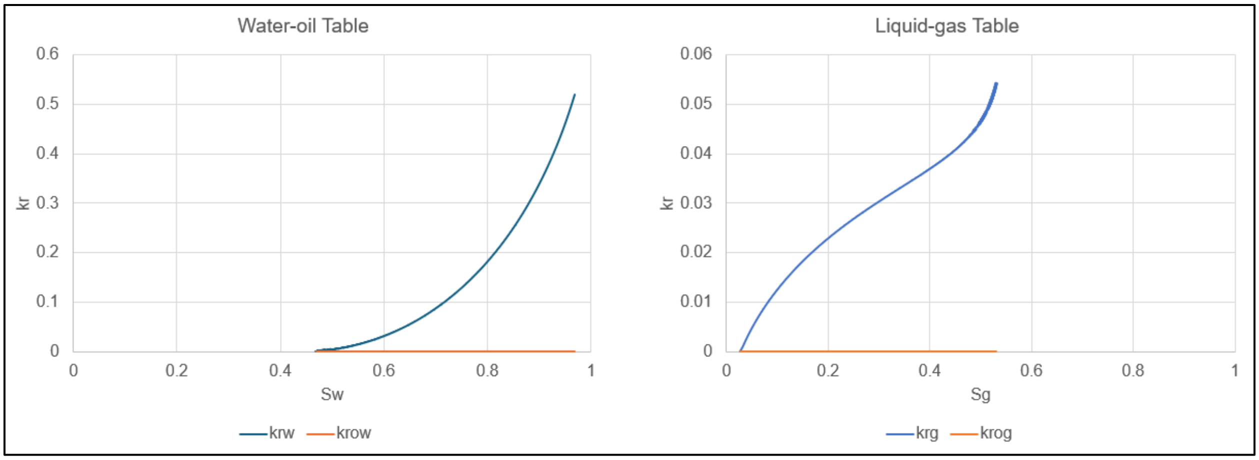

Figure 20. Relative permeability tables for water-oil (left) and liquid-gas (right). Relative permeability-porosity data are from a similar sandstone reservoir, the Bandera Brown B, in the DOE's CO2BRA database as cited by Araujo de Itriago et al., 2024.

dCarbon identified three injection zones in the model construction (IZ-1, IZ-2, and IZ-3) but the final model run selected for the Lima Tango CCS 1 project only injects CO_2 into IZ-2 and IZ-3. This case had a yearly injection rate of 177,000 MT/yr for a cumulative injection of 2,124,000 MT after 12 years as shown in **Table 6**. This injection over time is presented graphically in **Figure 21**. The size of the maximum plume extent and 50-psi pressure plume extent at the end of 12 years of injection are also given in **Table 6**, presented graphically in **Figure 22**, and depicted in map view in **Figure 18**. This figure also shows the plume outline at the end of injection compared to the outline at the end of the 98-year post-injection period. The plume stays within the area of the injection well.

Table 6. Injection parameters by zone and total plume extents.

Injection zone	Yearly rate (MT/yr)	Cumulative injection (MT)	Maximum CO_2 plume extent 98 years after end of injection	50-psi pressure plume extent at end of injection
IZ-2	**75,684**	**908,206**		
IZ-3	**101,316**	**1,215,794**		
Total IZ-2/IZ-3	**177,000**	**2,124,000**	**0.78 square miles**	**0.36 square miles**

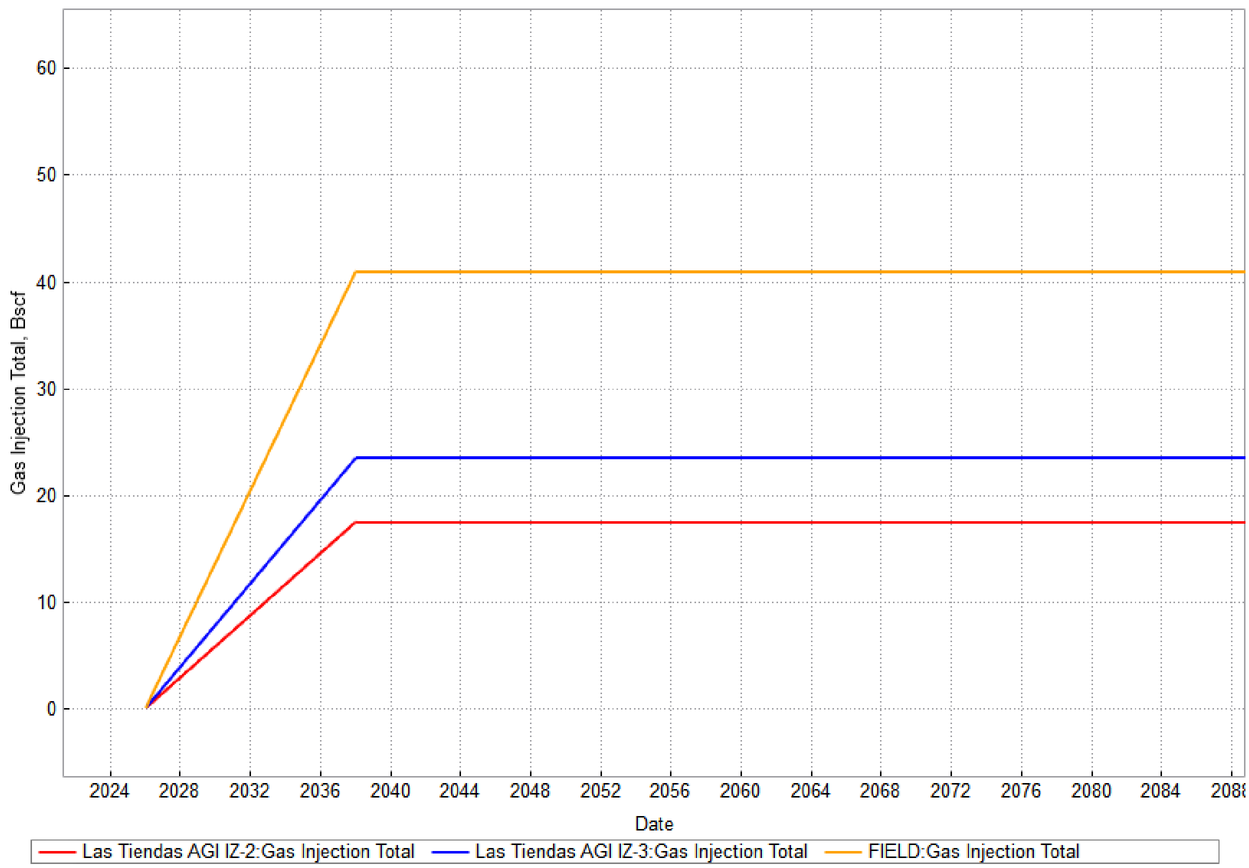

Figure 21. Plot of injection versus time at the Lima Tango CCS 1 injection well.

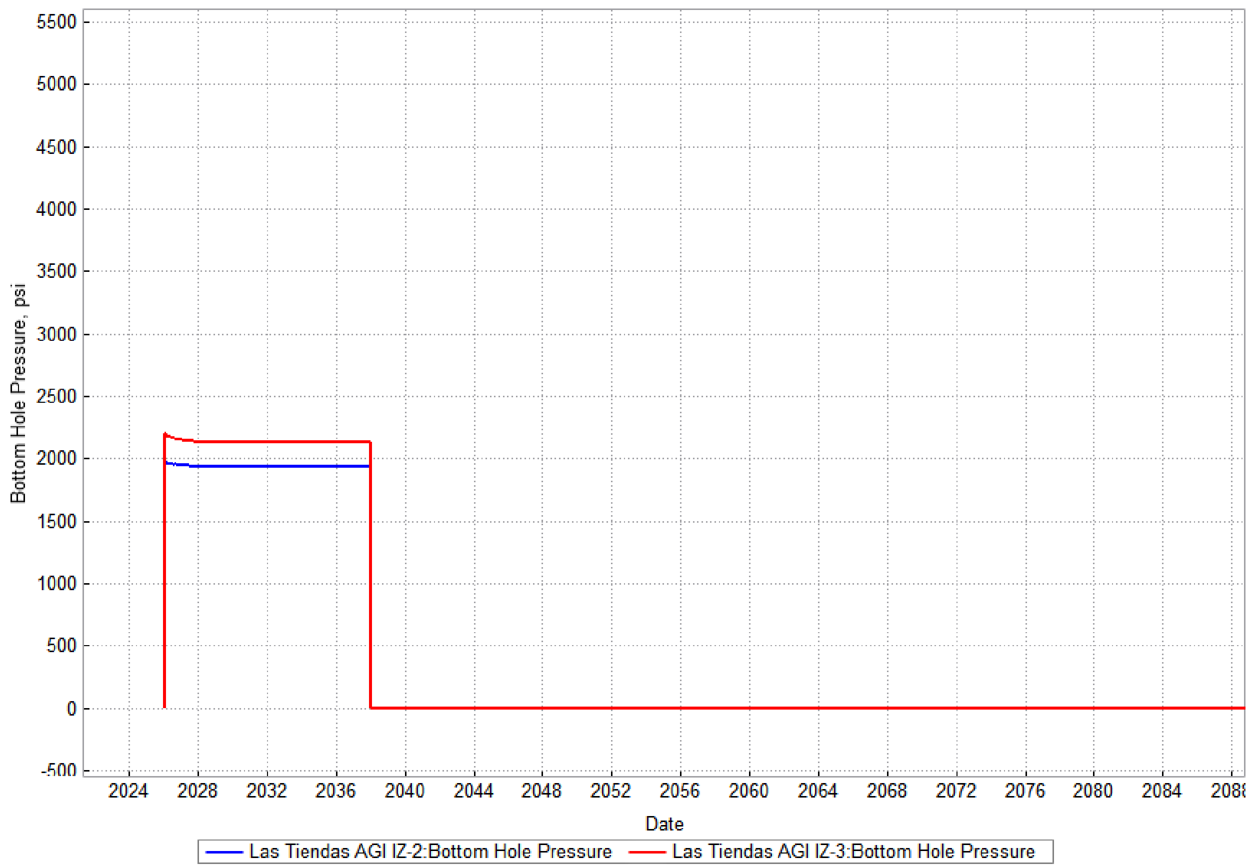

Figure 22. Pressure versus time at the Lima Tango CCS 1 injection well. The pressure constraint is 2412.8 psi for IZ-2 and 2524.3 psi for IZ-3.

A northwest to southeast cross-sectional view of the CO_2 plume in IZ-2 and IZ-3 is presented in **Figure 23**. The CO_2 plume profiles for both zones are funnel-shaped, indicative of the higher porosity and permeability at the top of these zones as well as the buoyancy of the CO_2 relative to the formation water.

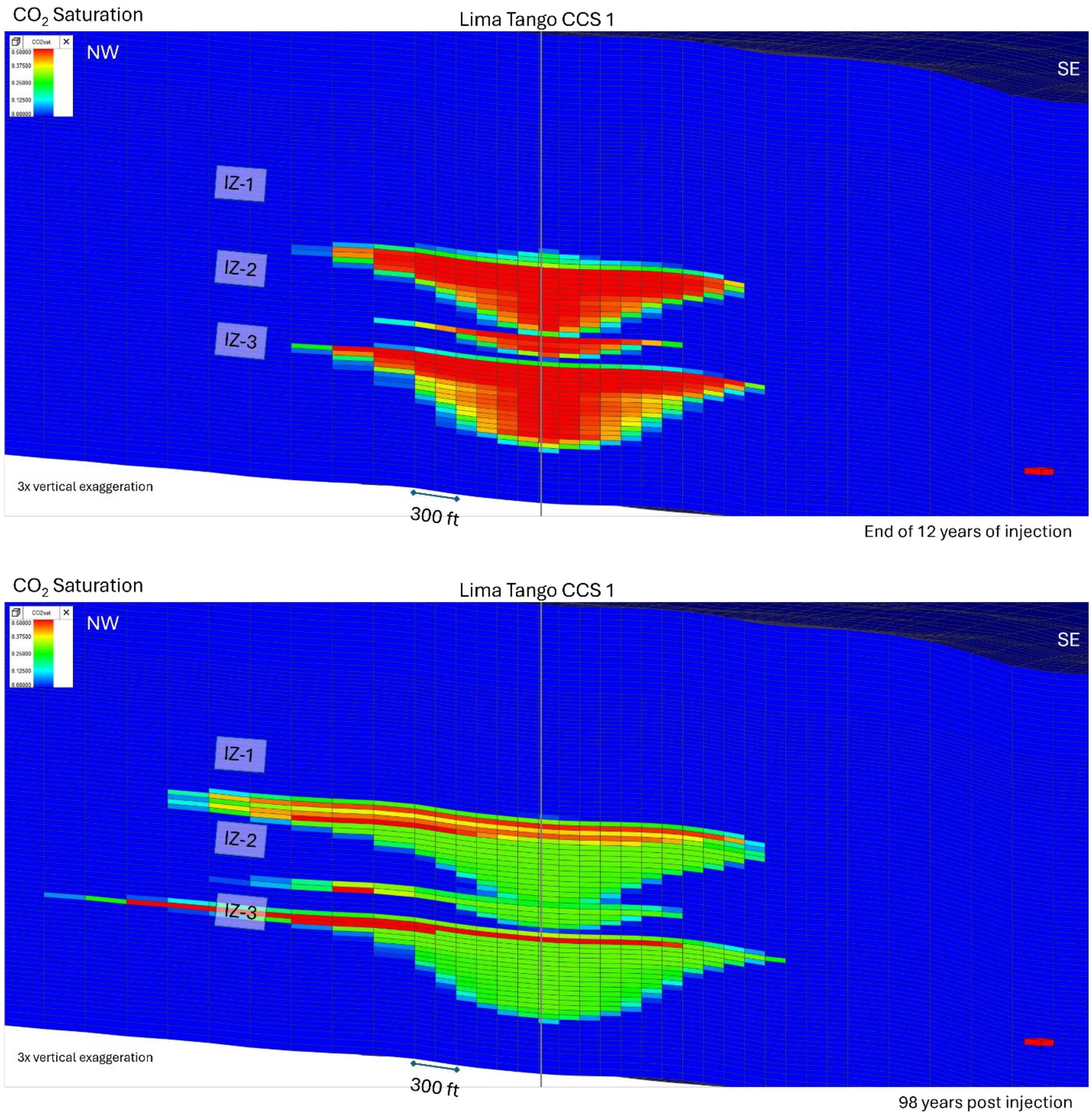

Figure 23. Northwest to southeast cross section depicting the CO_2 saturation profile of the model for the injection from Lima Tango CCS 1 after 12 years of injection (upper) and after 98 years after injection stops (lower). Color scale at the upper left indicates CO_2 gas saturation. Queen City injection zones are annotated. Injection was only modeled for IZ-2 and IZ-3. Cross section location is shown on Figure 18.

4 – DELINEATION OF MONITORING AREAS

This section describes the Maximum and Active Monitoring Areas.

4.1 Maximum Monitoring Area (MMA)

The MMA is defined as equal to or greater than the area expected to contain the free-phase CO_2 plume until the CO_2 plume has stabilized plus an all-around buffer of at least one-half mile. The numerical simulation using tNavigator was used to estimate the size and migration of the CO_2 plume. We modeled injection of CO_2 into IZ-2 and IZ-3 for 12 years followed by 190 years of post-injection modeling. Results indicated that the plume had ceased to migrate by 98 years post injection. A five percent cutoff of gas saturation was used to determine the boundary of the CO_2 plume. The area of the MMA was determined to be 0.88 square miles with the greatest extent reaching 0.72 miles from the injector (**Figure 24**).

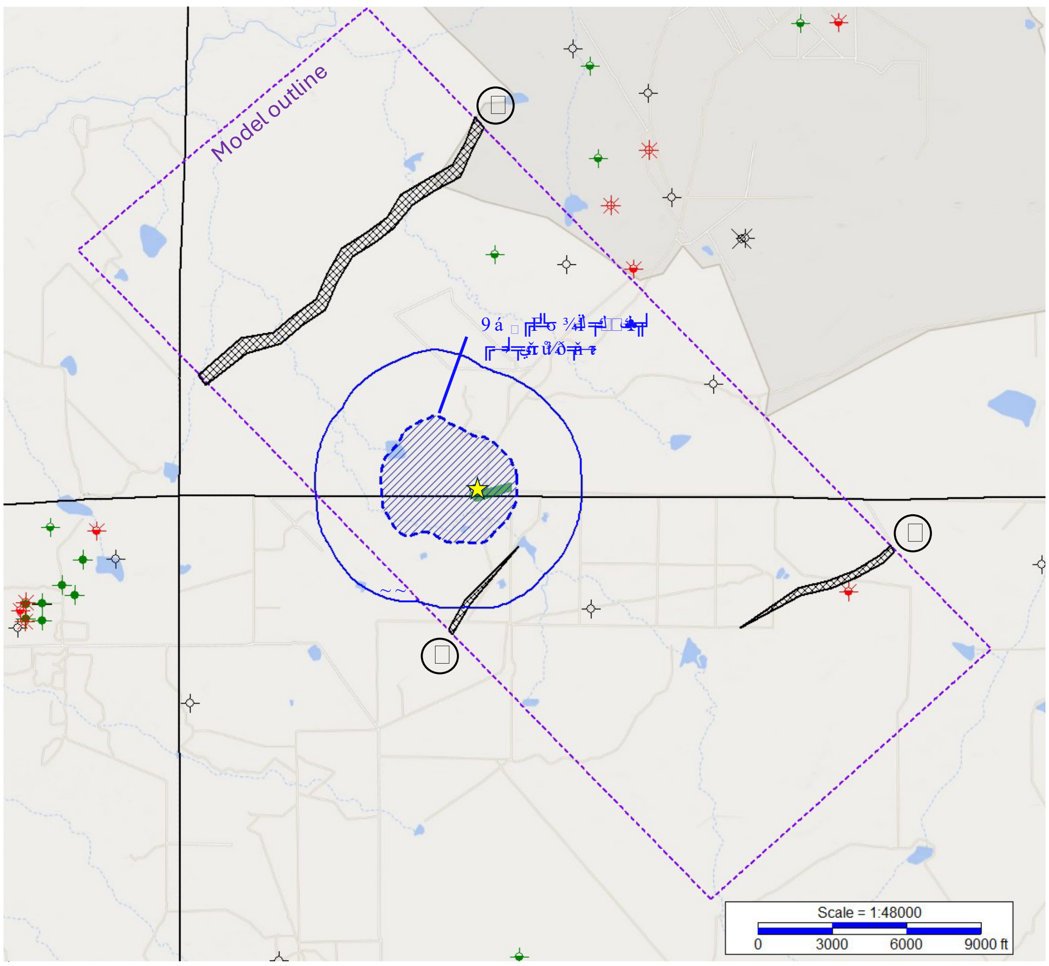

Figure 24. The proposed MMA (blue) and the stabilized CO2 plume (at 98 years post-injection as modeled). Only wells penetrating the Queen City Formation are shown. The red lines represent down-to-the-coast normal faulting mapped on the 3D seismic and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. North is up.

4.2 Active Monitoring Area (AMA)

dCarbon adhered to the definition of Active Monitoring Area (AMA) provided in 40 CFR 98.449 to delineate the AMA for this project (40 CFR Part 98 Subpart RR (Dec. 13, 2024)):

"*Active monitoring area* is the area that will be monitored over a specific time interval from the first year of the period (n) to the last year in the period (t). The boundary of the active monitoring area is established by superimposing two areas:

> (1) The area projected to contain the free phase CO_2 plume at the end of year t, plus an all-around buffer zone of one-half mile or greater if known leakage pathways extend laterally more than one-half mile.
>
> (2) The area projected to contain the free phase CO_2 plume at the end of year t + 5."

dCarbon proposes to monitor the injection site from year one through year 12, which is projected to be the EOI, thereby defining t as 12 years. dCarbon determined AMAs using methods (1) and (2) above and determined (1) to be larger. dCarbon then compared the larger AMA (red solid, **Figure 25**) with the MMA from **Figure 24** and found the AMA to be fully contained within the MMA. We propose to use the slightly larger MMA as both the AMA and MMA and will refer to this common area of monitoring as the AMA/MMA or just as the MMA in subsequent sections. As described in **Section 4.1**, the MMA is a one-half mile buffer after of the CO_2 plume stabilizes post-injection, which exceeds the definition of AMA set forth in 40 CFR § 98.449. By using the MMA as the AMA, dCarbon is employing an active monitoring program that exceeds the regulations of Subpart RR.

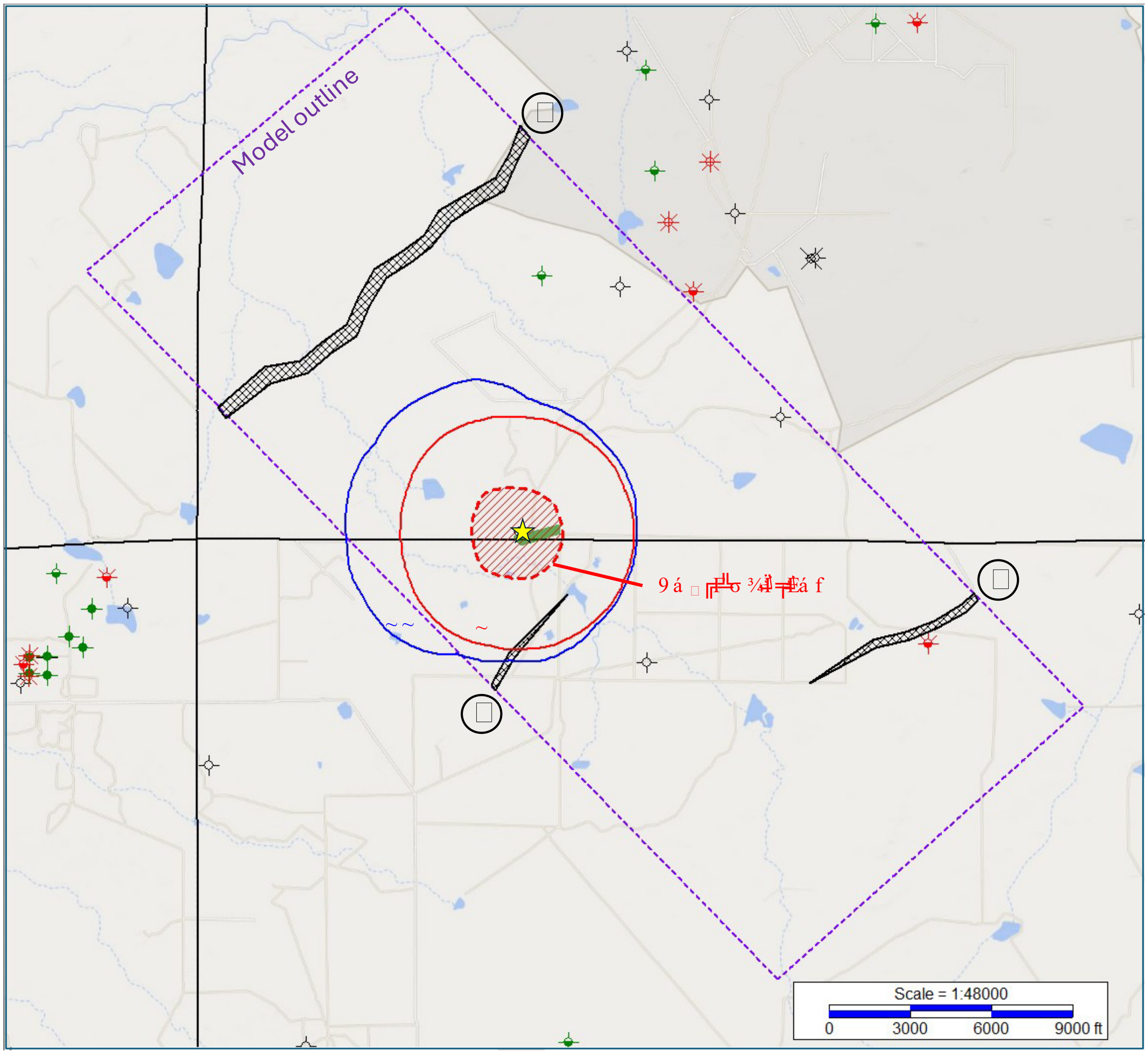

Figure 25. The AMA (red solid) outline and the EOI CO_2 plume (red dashed) outline as modeled. We propose to use the larger MMA (blue solid line) as both the AMA and MMA and will refer to it as the AMA/MMA or just the MMA. Wells penetrating the Queen City are posted with the well symbol at the bottomhole location. The black hachured polygons represent faulting at the Queen City mapped on the 3D seismic data and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. The Lima Tango CCS 1 well is represented by the yellow star and the gas plant is shown with a green polygon. Faults are numbered for discussion in the text. North is up.

5 – IDENTIFICATION AND EVALUATION OF POTENTIAL LEAKAGE PATHWAYS TO SURFACE

This section describes each of the required potential leakage pathways and assesses the likelihood, potential timing, and magnitude based upon the California Air and Resources Board's CCS Protocol Section C.2.2(d). **Table 7** describes the basis for event likelihood and **Table 8** provides the details of the leakage likelihood, timing of occurrence, and estimated magnitude of leakage for each type of leak risk.

Table 7. Risk likelihood matrix (developed based on comparable projects).

Risk Factor for Probability		Description
1	Improbable	<1% chance of occurring*
2	Unlikely	1-5% chance of occurring*
3	Possible	> 5% chance of occurring*
*During the life of the project or 100 years after project closure, whichever is shorter		

Table 8. Description of leakage likelihood, timing, and magnitude.

Leakage Pathway	Likelihood	Timing	Magnitude
Potential Leakage from Surface Equipment	**Possible**	Anytime during project operations, but most likely during start-up / transition or maintenance periods	**<100 MT per event** (100 MT represents approximately 5 hours of full flow facility release)
Leakage from Approved, Not Yet Drilled Wells	**Improbable**, as there are no approved not yet drilled wells	After new wells are permitted and drilled	**<1 MT per event**
Leakage from Existing wells	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and the total depth of the nearby existing wells	When the CO_2 plume expands to the lateral locations of existing wells	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach an existing well combined with thickness and low porosity / permeability of the UCZ
Potential Leakage from Fractures and Faults	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operation	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage Through Confining Layers	**Improbable**, as the UCZ is 110 feet thick and very low porosity and permeability	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation and thickness/properties of the UCZ
Leakage from Natural or Induced Seismicity	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage from Lateral Migration	**Improbable**, as the Queen City Formation is a very thick and laterally continuous formation with the closest well penetration over a mile downdip	More likely late in life as plume expands	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation and continuity / thickness of the UCZ

5.1 Potential Leakage from Surface Equipment

dCarbon's surface facilities at the injection site located near the ET Las Tiendas NGP Plant are specifically designed for injecting the CO_2 stream described in **Table 3**. The facilities minimize

leakage points such as valves and flanges by following industry standards and best practices. A shut-in valve is located at the wellhead in case of emergency. The compressor will also have emergency shut down switches that can be activated automatically in case of unexpected operating conditions.

Additionally, the compressor facility, pipeline, and injection well location will all be subjected to Auditory, Visual, and Olfactory (AVO) leak detection per dCarbon safety and operations standards. These monthly inspections, which are standard for detecting leaks and malfunctioning equipment in the gas production industry, will aid in the rapid detection of any potential leaks that may occur. As a part of these inspections, operations personnel are frequently able to repair leaks immediately by tightening valves, flanges, or similar equipment. Leakage from surface equipment is assessed as possible, however, any leaks that are detected will be analyzed to determine the amount of CO_2 that may have leaked and these leakage quantities, if any exist, will be included in recurring reporting.

5.2 Leakage from Approved, Not Yet Drilled Wells

A search of the TRRC's online GIS viewer (accessed December 9, 2024) in a 6,500 foot radius (which is roughly the size of the AMA/MMA) around the proposed injection site indicated one cancelled/abandoned location from 2012 and three permits that were so old that they had no API number or permit number, and the location source was cited as a hardcopy map (**Appendix, Table 9**). These search results indicate that there are no approved, not yet drilled, wells in the AMA/MMA and leakage from such wells is assessed as improbable.

5.3 Leakage from Existing Wells

There are 36 wells within the MMA listed in **Tables 9 and 10** in the **Appendix Section 13.2**, including at least one cancelled permit**.** These wells are shown in map view depiction of all wells relative to the proposed injection well in **Figure 26.** All wells targeted shallow oil reservoirs or were unsuccessful dry holes targeting shallow formations with no well exceeding a depth of 2,500 feet MD. There is over 2,000 feet of separation (including the UCZ of the Weches Shale) between these penetrations and the Queen City target injection interval. The likelihood of leakage from existing wells is assessed as improbable.

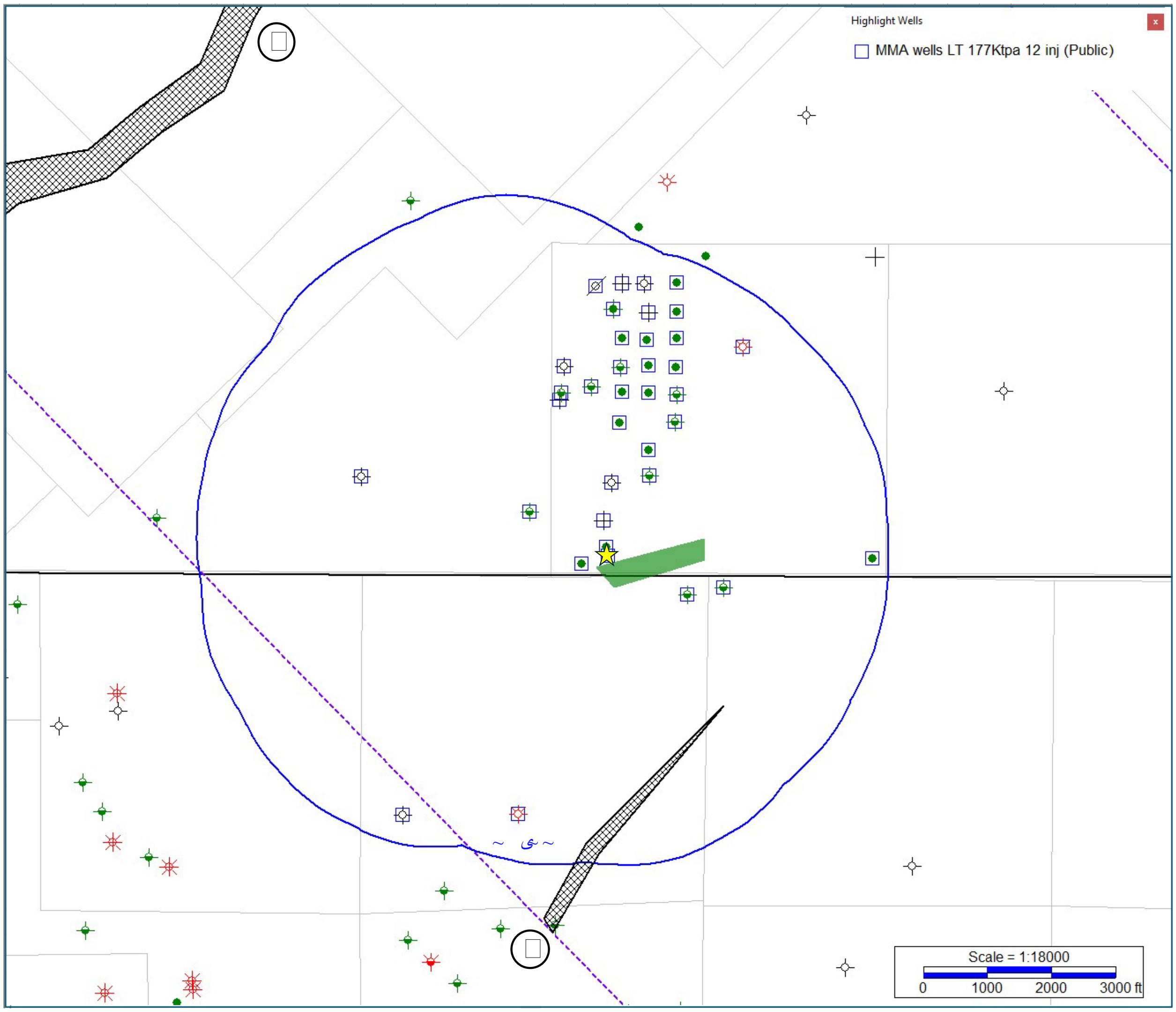

Figure 26. Wells in the AMA/MMA of Lima Tango CCS 1 highlighted with blue squares. The Lima Tango CCS 1 location is shown with a yellow star. The Las Tiendas NGP Plant is shown with a green polygon. Faults are numbered for discussion in the text. North is up.

5.4 Potential Leakage from Fractures and Faults

There are three faults intersecting the Queen City Formation in the modeled area, which is also the area of licensed 3D seismic data. Fault 1 vertically offsets the Queen City Formation by 100-250 feet and is deeply rooted below 10,000 feet (**Figure 27**). The fault cut continues nearly to the surface with consistent minor offset throughout the section indicating that it has had late movement. This fault is well outside of the AMA/MMA (3,200 feet away to the northwest) and, as such, no fault-CO_2 plume interactions are expected.

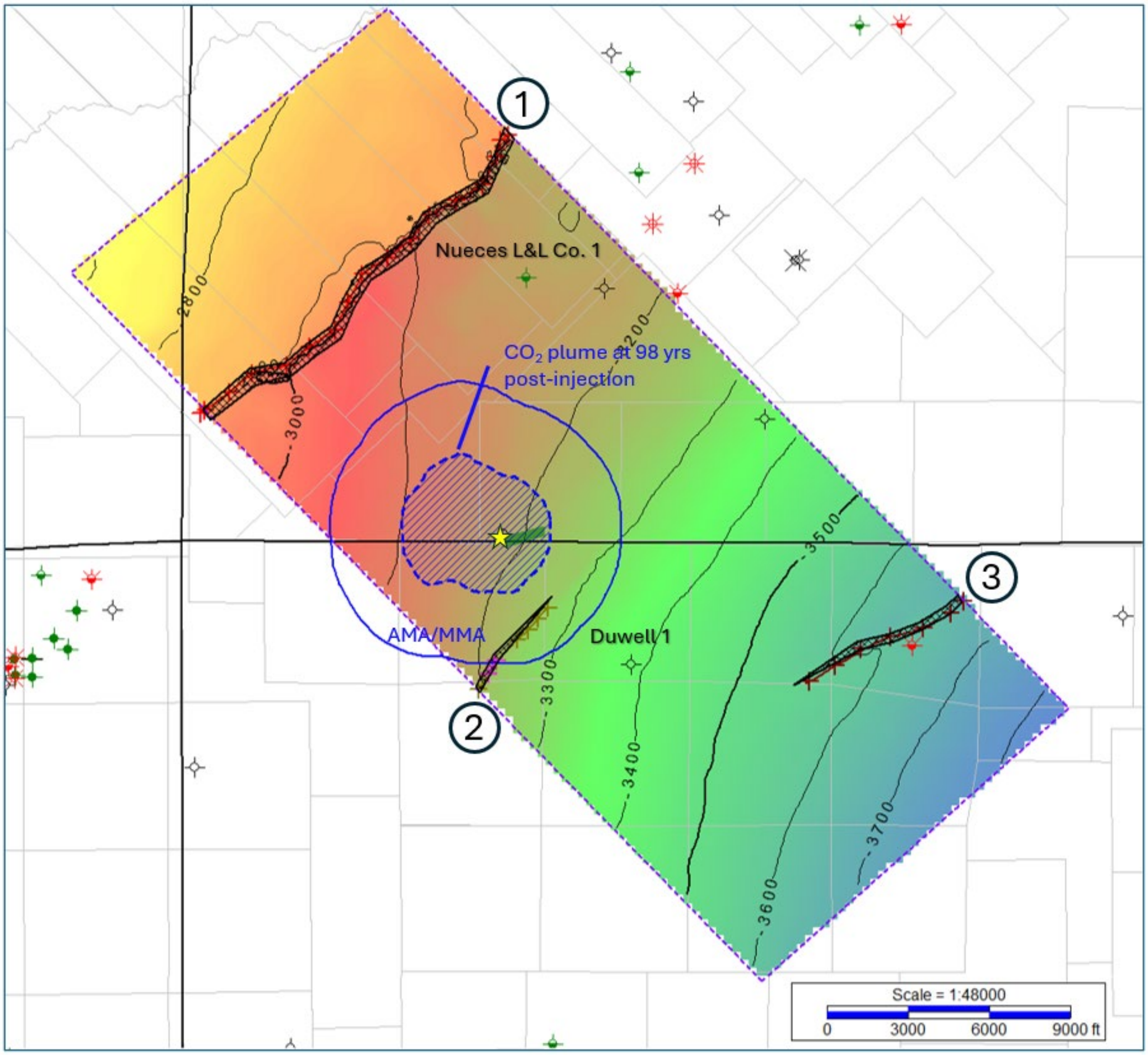

Figure 27. The top Queen City Formation structural contours (feet TVDSS), mapped Queen City Formation faults, AMA/MMA (blue solid line) and 98 years post-injection modeling (blue dashed line). Only wells penetrating the Queen City are shown, with the two closest wells to the injection site labeled. The Lima Tango CCS 1 location is highlighted with a yellow star. Faults are numbered for discussion in the text. North is up.

Fault 2 is much smaller and has a minor vertical offset of 40 to 60 feet within the Queen City Formation (**Figure 27**). In map view, the shortest distance between Fault 2 and the CO_2 plume outline at 98-years post-injection is approximately 1000 feet. The corresponding shortest distance between Fault 2 and the end of injection plume outline is 1200 feet. Fault 3 is located 1.5 miles downdip and southeast from the AMA/MMA; it is not expected to have any fault-CO_2 plume intersections. Both Fault 2 and Fault 3 do not show any displacement beyond a couple hundred feet above the top of the Queen City, thereby limiting their ability to serve as a leak pathway to the shallow USDW and the surface. The likelihood of leakage from fractures and faults is assessed as improbable.

5.5 Leakage Through Confining Layers

The Queen City Formation injection interval is confined by the overlying Weches Shale (the UCZ) and the underlying lower Queen City shales and Reklaw Shale (the LCZ) as described in **Section 3.3.2** and shown in **Figure 10**. The UCZ is comprised of 110 feet of impermeable shale (1% average porosity and 0.002 mD average permeability) as documented in **Table 1**. The LCZ is comprised of 965 feet of impermeable shale (1.5% average porosity and 0.05 mD average permeability) as documented in **Table 1**. These confining zones are supplemented by multiple low-porosity and low-permeability formations separating the Queen City injection interval from the base of the overlying Yegua USDW by a total of 2,300 feet and from the underlying Carrizo-Wilcox USDW by a total of 1,355 feet as described in **Section 3.6**. There are no existing wellbores that penetrate the confining layers in the modeled plume area. There are five wells that penetrate the confining layers in the 20 square mile project area that could serve as potential leakage pathways, but they are all greater than one mile away from the proposed injection well and outside of the AMA/MMA (**Figure 27**). Based on the limited CO_2 plume migration and thick shales above and below the injection interval, the risk of leakage through the confining layers is assessed as improbable.

5.6 Leakage from Natural or Induced Seismicity

The Lima Tango CCS 1 site has no historical seismicity within 19 miles of the proposed well. Mapped faults do not cut down to crystalline basement and have thousands of feet of separation between their deepest offset and the basement. Additionally, injection modeling indicates such minimal pore pressure change at any fault that it is insufficient to cause fault slip. No faults are mapped within the area of the CO_2 plume after 12 years of injection. Based on these factors, the leakage risk due to natural or induced seismicity is assessed as improbable.

Should any unexpected increases in formation pressure be detected, dCarbon can perform Fault Slip Potential (FSP) analysis (Walsh *et al.*, 2017) to evaluate the risk of induced seismicity on the closest mapped faults. dCarbon plans to build this model based on geologic data collected during drilling the Lima Tango CCS 1 well. If there is a concern related to abnormal pressures or seismicity related to operations at the well, dCarbon will shut-in the well and investigate further.

5.7 Leakage from Lateral Migration

The regional dip in the Lima Tango CCS 1 project area is gentle, at approximately two degrees, and therefore lateral migration is expected to be slow and well-behaved. There are five wells in the project area that penetrate the Queen City Formation, but these are all located outside of the AMA/MMA. The wells are depicted in **Figure 27**. The closest well (Duwell 1) is located 6,800 feet down dip and then next closest well (Nueces L&L Co. 1) is located 9,500 feet on strike to the Lima Tango CCS 1 injection well. The Queen City Formation is laterally continuous and of uniform thickness in the project area, making the risk from lateral migration improbable.

6 – PLAN OF ACTION FOR DETECTING AND QUANTIFYING SURFACE LEAKAGE OF CO_2

This section discusses the strategy that dCarbon will employ for detecting and quantifying surface leakage of CO_2 through the pathways identified in previous sections to meet the requirements of 40 CFR § 98.448(a)(3). Monitoring will occur during the planned 12-year injection period, or until the cessation of operations, plus a proposed two-year post-injection period.

6.1 LEAKAGE FROM SURFACE EQUIPMENT

As the CO_2 compressor station, pipeline, and injection well are all designed to handle the expected concentrations, temperatures, and pressures of H_2S and CO_2, any leakage from surface equipment will be quickly detected and addressed. The concentrations of H_2S and CO_2 are 0.01 and 87.46 mol % as stated in **Table 3**. The facility is designed to minimize potential leakage points by following the American Society of Mechanical Engineers (ASME) standards, API standards, and other industry standards, including standards pertaining to material selection and construction. Additionally, connections are designed to minimize corrosion and leakage points. The facility and well will be monitored for a lack of oxygen in high-risk areas. This monitoring equipment will be set with a low alarm setpoint for O_2 that automatically alerts field personnel of abnormalities. Additionally, all field personnel are required to wear gas monitors, which will trigger the alarm at low levels of oxygen (O_2) (typically 19.5%) and industry standard low and high alarm levels for H_2S. The injection facility will be continuously monitored through automated systems that are designed to identify abnormalities in operational conditions. In addition, field personnel will conduct daily inspections and monthly AVO field inspections of gauges, monitors, and leak indicators. The effectiveness of the internal and external corrosion control program is monitored through the periodic inspection of the system and analysis of liquids collected from the line. These inspections, in addition to the automated systems, will allow dCarbon to quickly identify and respond to any leakage situation. Monitoring will occur for the duration of injection and the post-injection period. Should leakage be detected during active injection operations, the volume of CO_2 released will be calculated based on operating conditions at the time of the event, per 40 CFR § 98.448(a)(5).

The CO_2 for injection will be metered in one location. Once the CO_2 is compressed to a supercritical state, it will pass through a Coriolis meter for measurement and then be transported approximately 150 feet via surface pipeline (see **Figure 17**) to the injection well. The injection stream will also be analyzed with a CO_2 gas chromatograph at the well site to determine the final concentration. The meter will be calibrated to industry standards. Any CO_2 leakage from equipment between the flow meter used to measure injection and the injection wellhead will be quantified using the procedures specified in subpart W of the GHGRP, reported as specified in 40 CFR § 98.448(a)(5) & reflected in term CO_{2FI} of equation RR-12. Leakage will not be separately subtracted from the injection volumes. Gas samples will be taken and analyzed per manufacturer's recommendations to confirm stream composition and calibrate or re-calibrate meter, if necessary. At a minimum, these samples will be taken quarterly. Minimal variation of concentration and composition are expected but will be included in regulatory filings as appropriate.

6.2 Leakage from Existing and Future Wells within the Monitoring Area

There are no wells in the AMA/MMA currently existing, approved, or pending that penetrate as deep as the Queen City injection interval. However, dCarbon will reverify the status and public information for all proposed and approved drilling permits within the MMA quarterly. If any wells are proposed, permitted, or drilled within the MMA, dCarbon will investigate the proposal and determine if any additional risks are introduced through the new well proposal. Additionally, dCarbon will continuously monitor and collect injection volumes, pressures, temperatures, and gas composition data for the injection well. This data will be reviewed by qualified personnel and will follow response and reporting procedures when data is outside acceptable performance limits. Finally, dCarbon will update the MRV plan if any new wells are drilled within the MMA, or if any other material changes to the project occurs.

The injection well design has pressure and temperature gauges monitoring the injection stream at the wellhead as well as bottomhole pressure and temperature gauges near the bottom of the tubing. The downhole gauges will monitor the inside of the tubing (injection stream) as well as the annulus. A change of pressure on the annulus would indicate the presence of a possible leak requiring remediation. Mechanical Integrity Tests (MITs) performed annually would also indicate the presence of a leak. Upon a negative MIT, the well would immediately be isolated, and the leak mitigated.

In the unlikely event that any CO_2 leaks occur into existing or future wells in the monitoring area, dCarbon will endeavor to work with the operator(s) of those wells and/or midstream providers to take wellhead gas samples to quantify variations or increases of CO_2 compared with historical or baseline CO_2 concentrations. Any measurable increases in CO_2 which may be confidently attributed to injection volumes from the Lima Tango CCS 1 well will be calculated using standard engineering procedures for estimating potential well leakage determined to be appropriate for the situation. These volumes will be documented and reported in the annual monitoring report and subtracted from reported injection volumes. Additionally, dCarbon will evaluate and execute any additional downhole remediations (*e.g.*, well workovers, which may include adding plugs or remedial cement jobs) that could address leakage from the injection well to the existing and future wells in the area if necessary and practical.

6.3 Leakage from Faults and Fractures

No faults or fractures have been identified that would allow CO_2 to migrate vertically to zones with USDWs or to the surface. The closest fault to the Lima Tango CCS 1 well has minor offset and does not extend into the shallow formations (Fault 2 in **Figure 27**). It is also outside of the modeled plume after 12 years of injection and plume stabilization. Larger faults in the study area are outside the modeled AMA/MMA.

In the unlikely event that such leakage from faults or fractures occurs, dCarbon will determine which standard engineering techniques for estimating potential leakage from the faults and fractures are appropriate for the situation to estimate any leakage from faults and fractures and report such leakage estimates and the methodology employed in the annual monitoring report.

6.4 Leakage through Confining Layers

Leakage through confining layers is improbable, given the number and thickness of layers between the injection interval and any possible potable groundwater. There are not any groundwater wells near the Lima Tango CCS 1 site as shown in **Figure 16**. dCarbon has reviewed offsetting logs through the possible groundwater interval above the shallow base of USDW and not observed a freshwater response on the resistivity logs. When dCarbon drills the Lima Tango CCS 1 well, logs will be obtained over the potential shallow water zone and evaluated for the presence of porosity and a freshwater response. Should a freshwater response be observed, dCarbon proposes to drill a monitoring well over the groundwater interval and would amend this MRV plan to reflect this change.

Should any CO_2 leakage occur, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation to estimate any leakage and report such leakage estimates and the methodology employed in the annual monitoring report.

6.5 Leakage through Natural or Induced Seismicity

While the likelihood of a natural or induced seismicity event is extremely low, dCarbon plans to monitor for seismic activity using the existing TexNet monitoring system. If a seismic event of 3.0 magnitude or greater is detected, dCarbon will review the injection volumes and pressures at the Lima Tango CCS 1 well to determine if any significant changes occurred that would indicate potential leakage. To suspect leakage due to natural or induced seismicity, the evidence would need to suggest that the earthquakes are activating faults that intersect the confining zones.

In the unlikely event CO_2 leakage occurs due to natural or induced seismicity, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.6 Leakage through Lateral Migration

The distances to the closest penetration of the Queen City injection interval are 2,200 feet from the AMA/MMA boundary and 6,800 feet away from the Lima Tango CCS 1 injection site in a down dip direction (the Duwell 1 well). The next closest penetration is 4,300 feet from the AMA/MMA boundary and 9,600 feet from the injection site on strike (Nueces L&L Co. 1 well). The map in **Figure 27** shows the location of these two wells, which are both plugged dry holes. Given the distance and status of these wells, leakage through lateral migration is not expected.

In the unlikely event CO_2 leakage occurs due lateral migration, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.7 Quantification of Leakage

In the unlikely event that CO_2 moves vertically past the primary and secondary confining layers as described earlier in **Section 6**, there are not existing groundwater wells present in this region to use to monitor for leaks.

The well most suited to use a monitor for leaks into the shallow USDW is the Lima Tango CCS 1 injection well itself. Open hole logs will be collected over each casing interval to screen for evidence of freshwater. Should an aquifer be identified during the drilling and logging of the injection well, a separate groundwater monitoring well will be drilled and used to monitor water quality and sampled annually. If dCarbon notices an increase in groundwater CO_2 concentration compared to baseline measurements, the increase in concentration will be analyzed volumetrically to provide a preliminary estimate of CO_2 leakage.

Any leakage that did extend to the surface could be characterized and quantified through surface surveillance in the project area paired with direct pressure, volume, and temperature (PVT) measurements. Currently available (and continuously improving) atmospheric sensing technology could be used to establish a baseline of ambient CO_2 concentration in the project area and identify any fluctuations. Deviations from baseline concentration along with understanding of the distance from potential leak sources can then be coupled with temporally matched meteorological data to semi-quantitatively determine leak attribution and rate. Based on the size of leak, these qualified or quantified leak rates can be compared with spatiotemporally monitored PVT data to co-index or further refine leaked volumes from likely point sources.

Any diffuse leak or leak without an obvious single point source may require additional identification and quantification methods. dCarbon is working with a leading environmental services and data company that specializes in monitoring and quantifying gas leaks in various industrial settings. One such quantification method involves utilizing fixed monitoring systems to detect CO_2. Additional system capabilities also include the deployment of an unmanned aerial vehicle (UAV), which is outfitted with an industry leading high fidelity CO_2 sensor capable of measuring concentrations as little as parts per billion (ppb). The UAV mobile surveillance platform possesses the ability to be flown on a programmable and highly replicable pattern across the MMA in both X and Y axis (longitude + latitude) as well as Z axis (height). Depending on the system's ability to obtain a reliable baseline across the MMA, areal deviation in CO_2 concentration could be measured, and diffuse leak sources could potentially be identified, provided the emissions reach a sufficient threshold. dCarbon will also consider similar technologies with less spatial resolution or fidelity such as fixed wing flyovers and/or improving satellite data with UAV technology to screen for and support diffuse emissions identification and investigation.

Depending on the applicability and monitoring needs, dCarbon will also consider other monitoring quantification methods such as the Eddy Covariance Method (ECM) (Korre *et al.*, 2011). This method utilizes gas fluxes and ambient meteorological conditions to detect and quantify leaks, although the ability to detect smaller leaks may be limited. Additionally, long open path tunable diode lasers could be used to measure distance averaged concentrations of CO_2 in the air, which could help quantify a leak of CO_2. This system could be paired with an array of short, closed path detectors (*e.g.*, gas chromatographs) that are typically placed around a suspected leak or leak area to monitor point-source CO_2 concentration increases and to quantify leakage. dCarbon may also evaluate other emerging technologies for quantifying CO_2 leakage such as Non-Dispersive Infra-Red (NDIR) CO_2 sensors and soil flux detectors. dCarbon may also utilize three-dimensional reservoir models that factor in faults and surface topography to predict CO_2 leakage locations, quantity, and timing. The applicability of such models in predicting and quantifying gas leaks has been tested and documented at the Leroy natural gas storage site in Wyoming, USA. (Chen, 2013)

As the technology and equipment to quantify CO_2 leakage is rapidly evolving and expected to improve over time, dCarbon will continue to update its leak detection and quantification plans as appropriate. If dCarbon detects a leak associated with CO_2 injection at the Lima Tango CCS 1 well, all methods discussed in this section will be considered in addition to emerging technologies to determine the most applicable and effective method of quantification.

7 – BASELINE DETERMINATIONS

This section identifies the strategies that dCarbon will undertake to establish the expected baselines for monitoring CO_2 surface leakage per § 98.448(a)(4).

Prior to the beginning of injection operations, baseline groundwater quality and properties will be determined and monitored through the installation of a groundwater well near the injection well site if the potential for a freshwater aquifer is observed when drilling the injection well. Samples will be taken and analyzed by a third-party laboratory to establish the baseline properties of the groundwater in the area. dCarbon will sample the groundwater monitoring well quarterly initially to establish the baseline water quality. dCarbon may adjust to annual sampling after one year.

Prior to the beginning of injection operations, baseline seismicity in the area near the Lima Tango CCS 1 will be determined through the historical data from USGS and the TexNet seismic array data hosted by the Texas Bureau of Economic Geology. The TexNet seismic array has been in operations in south Texas since 2017 and was expanded in late 2018. Using the historical data from the TexNet array, dCarbon will establish the seismicity baseline beginning in 2019 for the Lima Tango CCS 1 project.

Once injection operations begin in early 2026, the operational performance data recorded by the continuous data collection systems will be used to establish operational performance baselines and any deviations from those trends will be investigated. Examples of continuous data that will be used in establishing operational baselines are injection pressure and temperature, injection rate, and well annulus pressure and temperature. Any deviations from the established baselines will be investigated as a possible leak indicator.

Non-continuous data will also be collected periodically throughout the life of the project and will aid in leak detection. Daily to weekly AVO inspections will monitor for signs of leakage from surface equipment as outlined in in **Sections 5.1 and 6.1**. Field personnel will carry gas monitors that will monitor for low O_2 levels or high H_2S levels, both a sign of a potential CO_2 leak. Annual MIT testing, as outlined in **Section 6.2**, will test for potential leaks related to the well.

8 – SITE SPECIFIC CONSIDERATIONS FOR DETERMINING THE MASS OF CO_2 SEQUESTERED

This section identifies how dCarbon will calculate the mass of CO_2 injected, emitted, and sequestered. This also includes site-specific variables for calculating the CO_2 emissions from equipment leaks and vented emissions of CO_2 between the injection flow meter and the injection well, per 40 CFR § 98.448(a)(5).

8.1 Mass of CO_2 Received

Per 40 CFR § 98.443, the mass of CO_2 received must be calculated using the specified CO_2 received equations "unless you follow the procedures in 40 CFR §98.444(a)(4)." 40 CFR § 98.444(a)(4) states that "if the CO_2 you receive is wholly injected and is not mixed with any other supply of CO_2, you may report the annual mass of CO_2 injected that you determined following the requirements under paragraph (b) of this section as the total annual mass of CO_2 received instead of using Equation RR-1 or RR-2 of this subpart to calculate CO_2 received."

The CO_2 received by dCarbon for injection into the Lima Tango CCS 1 injection well is wholly injected and not mixed with any other supply and the annual mass of CO_2 injected will equal the amount received. Any future streams will be metered separately before being combined into the calculated stream.

8.2 Mass of CO_2 Injected

Per 40 CFR § 98.444(b), since the flow rate of CO_2 injected will be measured with a volumetric flow meter, the total annual mass of CO_2, in metric tons, will be calculated by multiplying the volumetric flow at standard conditions by the CO_2 concentration in the flow and the density of CO_2 at standard conditions, according to Subpart RR Equation 5:

$$CO_{2,u} = \sum_{p=1}^{4} Q_{p,u} * D * C_{CO_{2,p,u}}$$

Where:

$CO_{2,u}$	=	Annual CO_2 mass injected (metric tons) as measured by flow meter u.
$Q_{p,u}$	=	Quarterly volumetric flow rate measurement for flow meter u in quarter p at standard conditions (standard cubic meters per quarter).
D	=	Density of CO_2 at standard conditions (metric tons per standard cubic meter): 0.0018682.
$C_{CO2,p,u}$	=	CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO_2, expressed as a decimal fraction).
p	=	Quarter of the year.
u	=	Flow meter.

8.3 Mass of CO_2 Produced

The Lima Tango CCS 1 well will receive CO_2 produced from the nearby ET Las Tiendas NGP Plant and the CO_2 will be injected for geologic sequestration only. No CO_2 will be produced from the injection well. The injection will occur into a saline, non-productive aquifer and is not part of an enhanced oil recovery project. Natural gas processed at the ET Las Tiendas NGP Plant primarily comes from gas wells producing from the Eagle Ford Formation which is stratigraphically deeper than the Queen City injection intervals and well outside the MMA/AMA. The closest Eagle Ford wells are roughly eight miles northwest of the injection location.

8.4 Mass of CO_2 Emitted by Surface Leakage

Mass of CO_2 emitted by surface leakage and equipment leaks will not be measured directly as the injection stream for this well contains hydrogen sulfide (H_2S), which may be hazardous for field personnel to perform a direct leak survey. Any leakage would be detected and managed as a major upset event. Gas detectors and continuous monitoring systems would trigger an alarm upon a release. The mass of the CO_2 released would be calculated for the operating conditions at the time, including pressure, flow rate, size of the leak point opening, and duration of the leak. This method is consistent with 40 CFR § 98.448(a)(5), allowing the operator to calculate site-specific variables used in the mass balance equation.

In the unlikely event that CO_2 was released because of surface leakage, the mass emitted would be calculated for each surface pathway according to methods outlined in the plan and totaled using 40 CFR Part 98-Subpart RR Equation 10 as follows:

$$CO_{2,E} = \sum_{x=1}^{X} CO_{2,x}$$

Where:

$CO_{2,E}$	=	Total annual mass emitted by surface leakage (metric tons) in the reporting year
$CO_{2,x}$	=	Annual CO_2 mass emitted (metric tons) at leakage pathway x in the reporting year
X	=	Leakage pathway

Annual mass of CO_2 emitted (in metric tons) from any equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flowmeter used to measure injection quantity and injection wellhead will comply with the calculation and quality assurance/quality control requirement proposed in Part 98, Subpart W and will be reconciled with the annual data collected through the monitoring plan.

8.5 Mass of CO_2 Sequestered

The mass of CO_2 sequestered in the subsurface geologic formations will be calculated using 40 CFR Part 98, Subpart RR Equation 12, as this well will not actively produce any oil or natural gas or any other fluids, as follows:

$$CO_2 = CO_{2I} - CO_{2E} - CO_{2FI}$$

Where:

CO_2	=	Total annual CO_2 mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
$CO_{2,I}$	=	Total annual CO_2 mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
$CO_{2,E}$	=	Total annual CO_2 mass emitted (metric tons) by surface leakage in the reporting year.

CO_{2FI}	=	Total annual CO_2 mass emitted (metric tons) from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead, for which a calculation procedure is provided in Subpart W of Part 98.

9 – ESTIMATED SCHEDULE FOR IMPLEMENTATION OF MRV PLAN

The injection well is expected to begin operation at a to-be-determined date in early 2026. Baseline data will be collected before injection begins and the MRV plan will be implemented upon receiving Environmental Protection Agency (EPA) MRV plan approval. Collection of data for calculating the total amount of CO_2 sequestered will begin at the same to-be-determined date in early 2026 that the injection well is operational, and CO_2 is being injected.

10 – QUALITY ASSURANCE

10.1 CO_2 INJECTED

- The flow rate of the CO_2 being injected will be measured with a volume flow meter, consistent with industry best practices. These flow rates will be compiled quarterly.
- The composition of the CO_2 stream will be measured upstream of the volume flow meter with a gas composition analyzer or representative sampling consistent with industry best practices.
- The gas composition measurements of the injected stream will be averaged quarterly.
- The CO_2 measurement equipment will be calibrated according to manufacturer specifications.

10.2 CO_2 EMISSIONS FROM LEAKS AND VENTED EMISSIONS

- Gas detectors will be operated continuously, except for maintenance and calibration.
- Gas detectors will be calibrated according to manufacturer recommendations and API standards.
- Calculation methods from Subpart W will be used to calculate CO_2 emissions from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

10.3 MEASUREMENT DEVICES

- Flow meters will be continuously operated except for maintenance and calibration.
- Flow meters will be calibrated according to the requirements in 40 CFR § 98.3(i).
- Flow meters will be operated per an appropriate standard method as published by a consensus-based standards organization.
- Flow meter calibrations will be traceable to the National Institute of Standards and Technology (NIST).

All measured volumes of CO_2 will be converted to standard cubic feet at a temperature of 60 degrees Fahrenheit and an absolute pressure of 1.0 atmosphere.

10.4 MISSING DATA

In accordance with 40 CFR § 98.445, dCarbon will use the following procedures to estimate missing data if unable to collect the data needed for the mass balance calculations:

- If a quarterly quantity of CO_2 injected is missing, the amount will be estimated using a representative quantity of CO_2 injected from the nearest previous period at a similar injection pressure.
- Fugitive CO_2 emissions from equipment leaks from facility surface equipment will be estimated and reported per the procedures specified in Subpart W of 40 CFR § 98.

11 – RECORDS RETENTION

dCarbon will retain records as required by 40 CFR § 98.3(g). These records will be retained for at least three years and include:

- Quarterly records of the CO_2 injected.
- Volumetric flow at standard conditions.
- Volumetric flow at operating conditions.
- Operating temperature and pressure.
- Concentration of the CO_2 stream.
- Annual records of the information used to calculate the CO_2 emitted by surface leakage from leakage pathways.
- Annual records of information used to calculate CO_2 emitted from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

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13 - APPENDIX

13.1 Expired Permits from the TRRC

Table 9 – Expired permits from TRRC database*.

API	Well No.	Symbol_Description	Location_Source	Latitude	Longitude
311	2B	Permitted Location	Commission`s hardcopy map	28.0660035	-98.7681379
311	8	Permitted Location	Commission`s hardcopy map	28.0695958	-98.7640217
311	4	Permitted Location	Commission`s hardcopy map	28.0636247	-98.7627483

* These permitted wells may exist as dry holes in the S&P Global database well list below

13.2 Wells in MMA

Table 10 – Wells in the MMA (sourced from S&P Global database).

API	Well Name	Well Num	Latitude	Longitude	Status	Total Depth	Operator
421310007000	SOC FOR PROPAGATI	1	28.0565397	-98.7603987	Dry Hole with Oil Show	1350	PETROLEUM PRODUCERS INC
421310007100	NUECES LD & LVESTCK	1	28.0562470	-98.7621096	Dry Hole with Oil Show	1227	BASOM G W TRUSTEE
421313171800	NUECES LD&LVSTCK	1	28.0467414	-98.7758977	Dry Hole	2154	GULF OIL CORP
421313316400	NUECES MINERALS CO	1	28.0467787	-98.7703195	Dry Hole with Gas Show	2500	VICTORIA MINERALS
423110147400	NUECES LD LSTK	1	28.0613037	-98.7779357	Dry Hole	2225	PARKER PETROLEUM CO
423110147500	NUECES LAND & LIVESTOCK CO	1	28.0597908	-98.7697815	Dry Hole with Oil Show	1193	SMITH & COSNER
423110147900	NUECES LAND & LIVESTOCK	1	28.0683736	-98.7640390	Unknown	1215	SECONDARY OIL CORP INC
423110148000	NUECES LAND & LIVESTOCK	2	28.0684014	-98.7626783	Oil Well	1220	OHIO FUEL SUPPLY CO
423110148100	NUECES LAND & LIVESTOCK	3	28.0696469	-98.7626704	Oil Well	1215	OHIO FUEL SUPPLY CO
423110148200	NUECES LAND & LIVESTOCK	4	28.0578346	-98.7531587	Oil Well	1212	SECONDARY OIL CORP INC
423110148400	NUECES LAND & LIVESTOCK	6	28.0696207	-98.7653094	Unknown	1208	SECONDARY OIL CORP INC
423110148500	NUECES L & 6 CO	9	28.0649230	-98.7640330	Oil Well	1220	GRAHAM TOM
423110148600	NUECES L&L CO	10	28.0660888	-98.7640133	Oil Well	1215	GRAHAM BROTHERS
423110148700	NUECES L&L CO	11	28.0671777	-98.7641023	Oil Well	1221	GRAHAM TOM
423110148800	NUECES L&L CO	12	28.0672632	-98.7626518	Oil Well	1227	GRAHAM BROTHERS
423110148900	NUECES L&L CO	13	28.0660097	-98.7627152	Oil Well	1224	GRAHAM BROTHERS

423110149000	NUECES L & L CO	14	28.0648630	-98.7626668	Dry Hole with Oil Show	1223	GRAHAM BROTHERS
423110149200	NUECES LND & LVSTCK	2-A	28.0624432	-98.7640137	Oil Well	1213	BISHOP OIL CO
423110149300	NUECES LD & LIVESTOCK	3-A	28.0613433	-98.7639772	Dry Hole with Oil Show	1216	BISHOP OIL CO
423110149400	NUECES LAND & LIVESTOCK	4A	28.0636782	-98.7627331	Dry Hole with Oil Show	1251	BISHOP OIL CO
423110149500	NUECES LAND & LIVESTOCK	1B	28.0649387	-98.7653312	Oil Well	1206	SECONDARY OIL CORP INC
423110149600	NUECES L&L CO	2B	28.0660141	-98.7653893	Dry Hole with Oil Show	1348	BISHOP OIL CO
423110149700	NUECES LAND & LIVESTOCK	3B	28.0651833	-98.7668115	Dry Hole with Oil Show	1199	BISHOP OIL CO
423110149800	NUECES L & L CO	4B	28.0672593	-98.7653290	Oil Well	1208	SECONDARY OIL CORP INC
423110149900	NUECES LD & LVSTK	1B	28.0646304	-98.7683287	Unknown	1213	KRASNER SAM
423110150000	NUECES LD & LVSTK	2B	28.0660570	-98.7681225	Dry Hole	1222	KRASNER SAM
423110150100	NUECES LD LSTK	2D	28.0583058	-98.7660810	Oil Well	1200	KRASNER SAM
423110150200	NUECES LD LSTK	3D	28.0575764	-98.7672696	Oil Well	1195	KRASNER SAM
423110150300	NUECES LD & LIVE ST	1	28.0649237	-98.7682537	Dry Hole with Oil Show	1505	DUNCAN N V
423110150400	NUECES LAND & LIVESTOCK	1	28.0668838	-98.7594553	Dry Hole with Gas Show	1268	TAYLOR REFINING CO
423110150500	NUECES LAND & LIVESTOCK	1-A	28.0636250	-98.7654534	Oil Well	1213	SECONDARY OIL CORP INC
423110150600	NUECES LAND & LIVESTOCK CO	8	28.0696167	-98.7642548	Dry Hole	1222	NUGENT GEORGE V & L V OIL ACCT
423110236100	NUECES LD LIVESTOCK	1-D	28.0594141	-98.7661765	Unknown	1196	KRASNER SAM & WOODMAN L L
423113141700	NUECES MINERALS	1	28.0610659	-98.7658244	Dry Hole	1358	DKD JOINT VENTURE
423113143500	NUECES MINERALS	2	28.0685222	-98.7657277	Abandoned Oil Well	1280	DKD JOINT VENTURE
423113508200	SCOPE-MUNSON	1	28.0695062	-98.7665958	Abandoned Location		SCOPE PRODUCTION CO LLC

13.3 Approved W-14, W-1, and Drilling Permits

Appendix B: Submissions and Responses to Requests for Additional Information

Subpart RR Monitoring, Reporting, and Verification (MRV) Plan

Lima Tango CCS 1

McMullen County, Texas

Prepared by

BKV dCarbon Ventures, LLC

May 16, 2025

Table of Contents

1 – INTRODUCTION

BKV dCarbon Ventures, LLC (dCarbon), a subsidiary of BKV Corporation (BKV), is authorized by the Texas Railroad Commission (TRRC) to inject up to 9.5 million standard cubic feet per day (MMscfd), equivalent to approximately 177,000 metric tons per year (MT/yr), of carbon dioxide (CO_2) into the proposed Lima Tango CCS 1 injection well in McMullen County, Texas. The permit issued by the TRRC allows injection into the Queen City formation at a depth of 3,508 feet to 4,870 feet with a maximum allowable surface pressure of 1,700 pounds per square inch gauge (psig).

dCarbon intends to dispose of CO_2 into the Lima Tango CCS 1 well produced from the nearby Las Tiendas Natural Gas Processing (NGP) Plant, operated by Energy Transfer LP (ET), which is a separate pre-existing facility. The Lima Tango CCS 1 injection well/facility and the ET Las Tiendas NGP Plant are not under common ownership or common control, and the ET Las Tiendas NGP Plant has a function separate and distinct from the injection well source category, making them separate and distinct facilities under 40 CFR 98.6.

The project site is 15.44 mi NW of Freer, Texas, as shown in **Figure 1**.

dCarbon anticipates drilling and completing the Lima Tango CCS 1 well in the third quarter of 2025 and beginning injection operations in early 2026. The Lima Tango CCS 1 well has approved Form W-14 injection and Form W-1 drilling permits with the TRRC permit number 17575, Underground Injection Control (UIC) number 000126980, and American Petroleum Institute (API) number 42-311-37581. Copies of the approved Form W-1 and W-14 permits are included in the **Appendix, Section 13.3.**

Although dCarbon intends to initiate injection with lower volumes, all calculations in this document have been performed assuming the maximum injection amount allowed by the TRCC permit (177,000 MT/yr). dCarbon plans to inject for 12 years.

dCarbon submits this Monitoring, Reporting, and Verification (MRV) plan for approval by the Environmental Protection Agency (EPA) in accordance with 40 CFR § 98.440-449, Subpart RR, of the Greenhouse Gas Reporting Program (GHGRP).

dCarbon's TRRC operator number is 100589.

dCarbon's Environmental Protection Agency Identification (EPA ID) number is 110071343305.

The Lima Tango CCS 1 well's Greenhouse Gas Reporting Program Identification (GHGRP ID) number is 590006. All aspects of this MRV plan refer to this well and this GHGRP ID number.

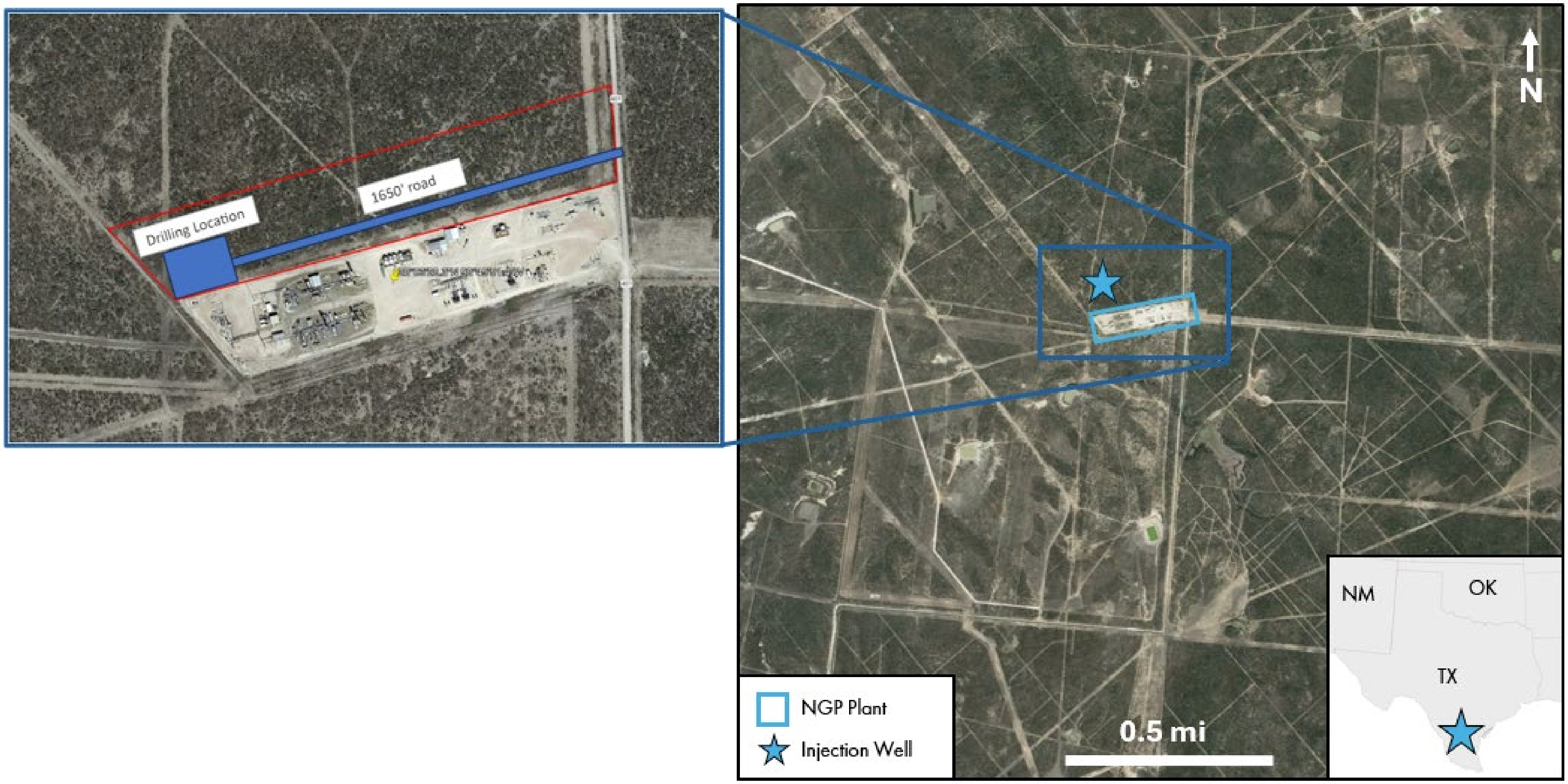

Figure 1. Location map of the Las Tiendas NGP Plant and the proposed Lima Tango CCS 1 injection well drilling location adjoining the plant in McMullen County, Texas.

2 – FACILITY INFORMATION

<u>Gas Plant Facility Name</u>:

Las Tiendas Plant
348 County Road 401
Freer, Texas 78357

Latitude: 27° 57.63' N
Longitude: 98° 35.64' W

Operator: Energy Transfer LP

GHGRP ID number: 1010735

Facility Registry Service Identifier (FRS ID): 110071159879

North American Industry Classification System (NAICS) Code: 486210

Reporting structure: Onshore Natural Gas Processing

<u>Underground Injection Control (UIC) Permit Class</u>:

The Oil and Gas Division of the Texas Railroad Commission (TRRC) regulates oil and gas activity in Texas and has primacy to implement the Underground Injection Control (UIC) Class II program for injection wells. The TRRC has permitted the Lima Tango CCS 1 well as an UIC Class II well. The Class II permit was issued to dCarbon in accordance with Statewide Rule 9.

<u>Injection Well</u>:

Operator: BKV dCarbon Ventures, LLC

Lima Tango CCS 1, API number 42-311-37581

UIC number: 000126980

Lima Tango CCS 1, GHGRP ID: 590006

3 – PROJECT DESCRIPTION

This section discusses the geologic setting, the lithology and reservoir characteristics of the planned injection and confining intervals, the formation fluid geochemistry, the potential for induced seismicity, the groundwater hydrology in the project area, the CO_2 project facilities, and the reservoir modeling performed for the proposed Lima Tango CCS 1 injection well. dCarbon has prepared this MRV plan to support the storage of CO_2 in McMullen County, Texas. The term interval is used for the composite layers and the term zone is used for the specific layers of rocks for the storage and confinement of CO_2.

3.1 Overview of Geology

Paleogene deposition began with the mud-rich Paleocene Midway Shale (**Figure 2**), which is widely present across the northern and western Gulf of Mexico margins. Sediment supply and sand content increased markedly thereafter, with deposition of the coarse siliciclastics of the Paleocene Lower and Middle Wilcox Formations and the Eocene Upper Wilcox Formation, followed by the Eocene Queen City and Sparta Formations. These deposits rapidly filled foreland troughs and prograded across the former Upper Cretaceous shelf margins. Sediment starved mud-rich intervals are present between the Upper Wilcox and Queen City Formations (as the Eocene Reklaw Shale) and between the Queen City and Sparta Formations (as the Eocene Weches Shale) as shown in **Figure 2**. The storage interval for this project is the Queen City Formation and the Reklaw and Weches Shales are lower and upper confining zones, respectively.

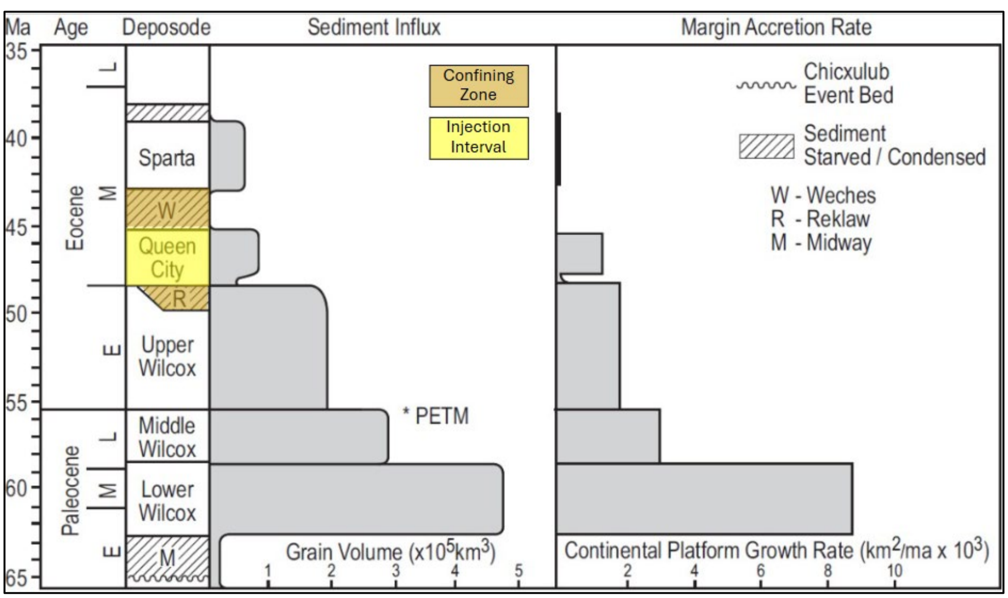

Figure 2. Regional stratigraphy at Lima Tango CCS 1 site in McMullen County, Texas, (modified from Snedden and Galloway, 2019). The Eocene sediment starved/condensed sections are in hachured fill and labeled R (Reklaw Shale) and W (Weches Shale). These are the lower and upper confining zones, respectively, for the Queen City Formation injection interval.

In this area, the Middle Eocene strata are tens of miles up dip from the shelf edge and the growth fault rafting that characterizes the time-equivalent section in the Gulf of Mexico. A published seismic section near the proposed injection site (**Figure 3**) illustrates the gentle dip and lack of growth faulting at the position of the proposed Lima Tango CCS 1 (red star). The strata in this setting are uniform in thickness, gently dipping towards the coast with less than two degrees of dip, and unimpacted by growth-fault related accommodation. We expect that the injected CO_2 will gradually migrate up dip to the west and northwest, owing to its buoyancy relative to the saline reservoir water. There are three faults mapped at the Queen City stratigraphic level in the Lima Tango CCS 1 model area. The most significant one is in northwestern part of the licensed 3D seismic area and is 1.2 miles from the modeled 98-year post-injection plume extent and 1.5 miles from the modeled 50-pounds per square inch (psi) change in pressure due to the injection. **Section 5.4** describes this fault further and addresses the lack of leakage risk that it presents given the fault's distance away from the modeled plume and pressure front.

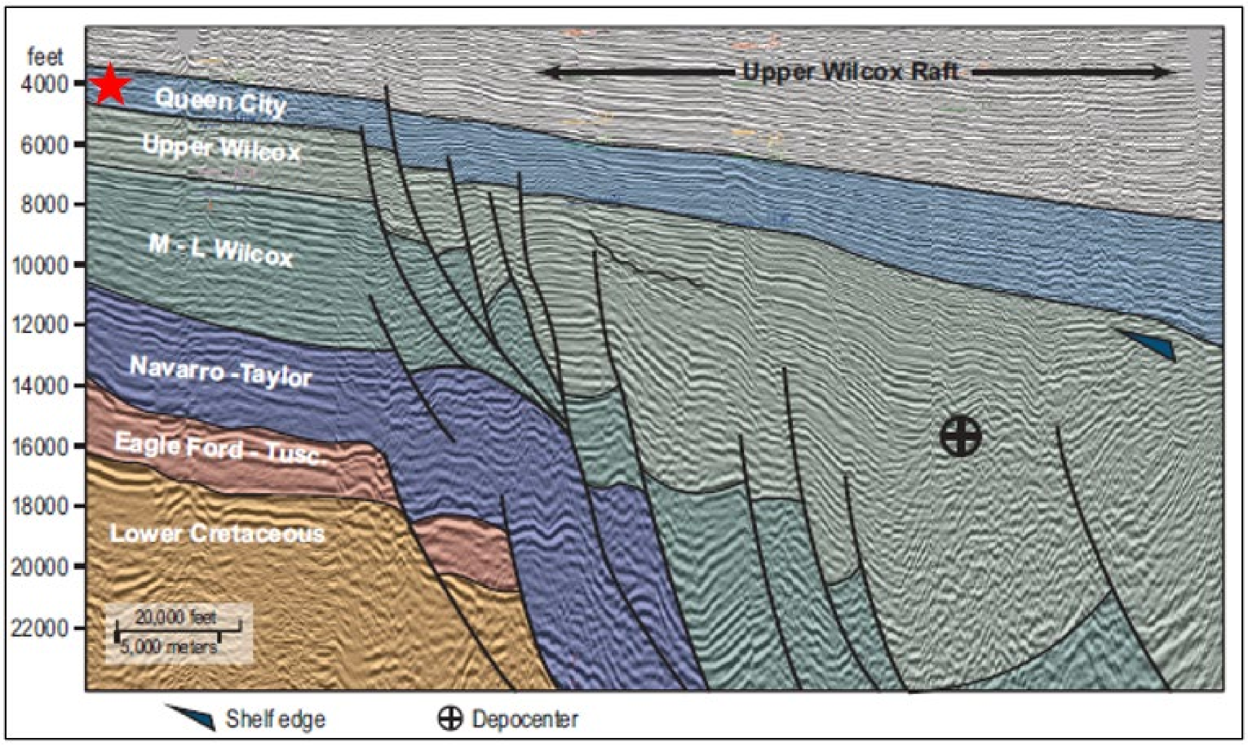

Figure 3. Representative northwest to southeast seismic cross section from Snedden and Galloway (2019) with the Queen City Formation and the Lima Tango project annotated with a red star. Figure 4 shows the line of section location.

3.2 Bedrock Geology

3.2.1 Basin Description

The proposed injection site lies in in McMullen County, Texas, just north of the border between McMullen and Duval Counties. The project takes place in the Gulf of Mexico basin, originally

formed by rifting during the Jurassic (Snedden and Galloway, 2019). The basin began rapid filling thereafter in the Cretaceous and Paleogene with large volumes of continentally derived sediments transported to the coastal plain by the Rio Grande River system, with the shales representing times of sediment starvation or condensed section. **Figure 4** presents a regional paleogeographic construction representative of the time of deposition of the Queen City Formation injection interval (Middle Eocene) by Galloway and Snedden (2019).

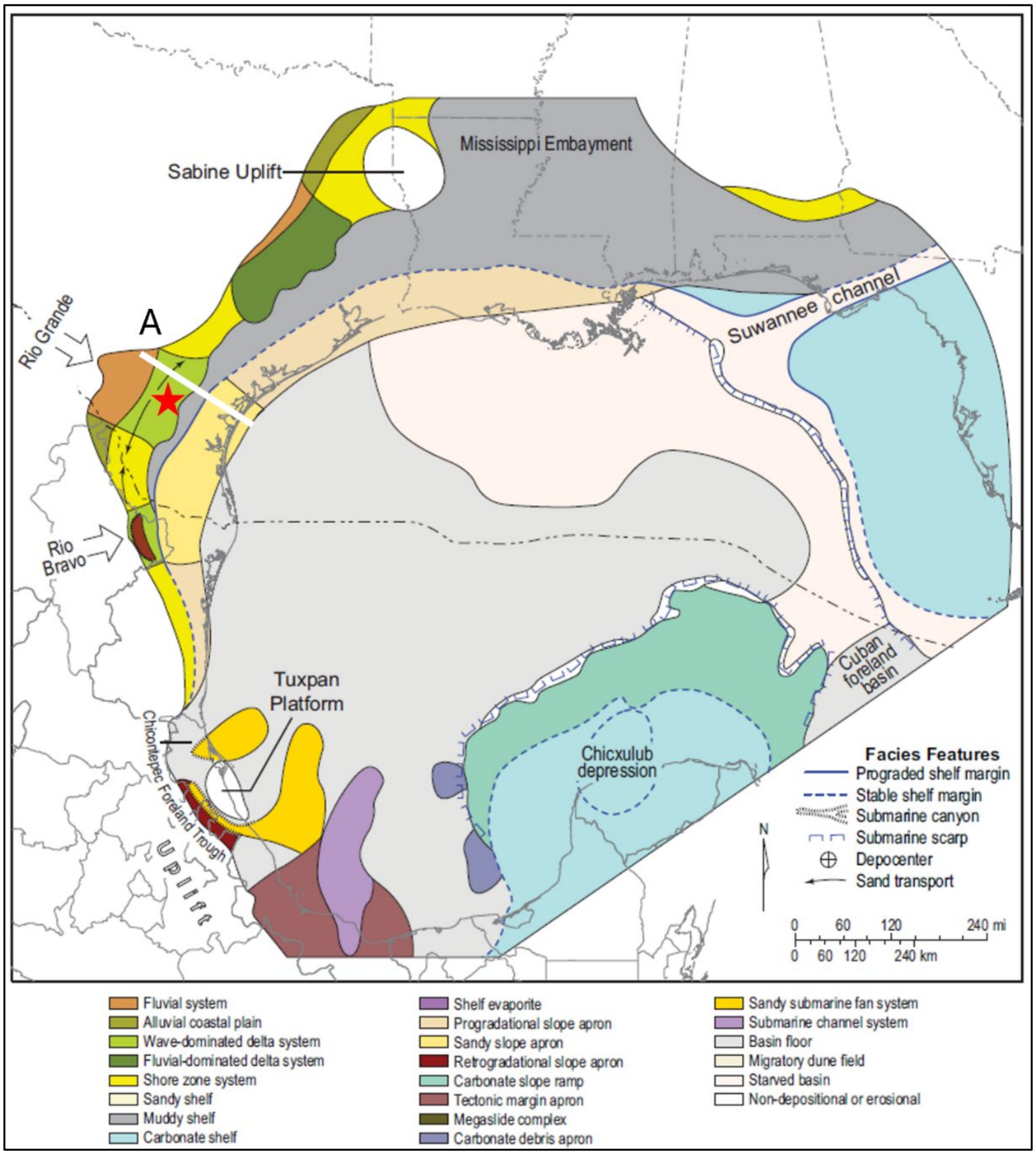

Figure 4. Middle Eocene paleogeographic reconstruction by Snedden and Galloway (2019). The Queen City Formation was deposited during this time, with the red star denoting the proposed injection site in the wave-dominated deltaic depositional environment. The location of the seismic line in Figure 3 is the white line marked by the letter "A".

3.2.2 Stratigraphy

Deposition of the Middle to Upper Eocene strata occurred in a wave-dominated deltaic setting along the margin of the early Gulf of Mexico basin (**Figure 4)**. The Queen City Formation is estimated to occur at depth ranging from 3,508-4,870 ft true vertical depth (TVD) with a reference datum of ground level at the Lima Tango CCS 1 proposed well site and has approximately 1,400 feet of uniform gross thickness across the modeled area. The Queen City Formation is the injection interval and is comprised of three potential injection zones (IZs). The Middle Eocene Weches Shale, with 110 feet of gross thickness, is the Upper Confining Zone (UCZ), and the lower Queen City shale and Early Eocene Reklaw Shale, with 965 feet of gross thickness, including over 50 feet of continuous impermeable shale, is the Lower Confining Zone (LCZ). **Figure 2** shows the stratigraphic relationship of the two confining zones and the injection interval.

Attractive attributes for CCS storage in the project area includes high storage capacity, minimal faulting, tight widespread confining shales, and gentle dip down to the coast. The injection interval is a package of thick, sheet-like, laterally continuous, porous, and permeable sandstone bodies characterized by low spontaneous potential (SP) and high deep resistivity (DRES) readings relative to the shales on wireline logs as shown in the type log (**Figure 5**) and cross section (**Figure 6)**. Individual sand bodies are separated by internal confining shales with higher SP and lower DRES wireline log signatures. The entire injection interval is bracketed by thick upper and lower confining shales, also with higher SP and lower DRES wireline log signatures. Both the injection interval and confining zones are laterally continuous and maintain constant thickness across the project area with a gentle up to the northwest dip (**Figure 6**). The upper confining shale (Weches Shale) is widespread and serves as the regional seal for the Queen City storage assessment unit (SAU) (Roberts-Ashby *et al*., 2014).

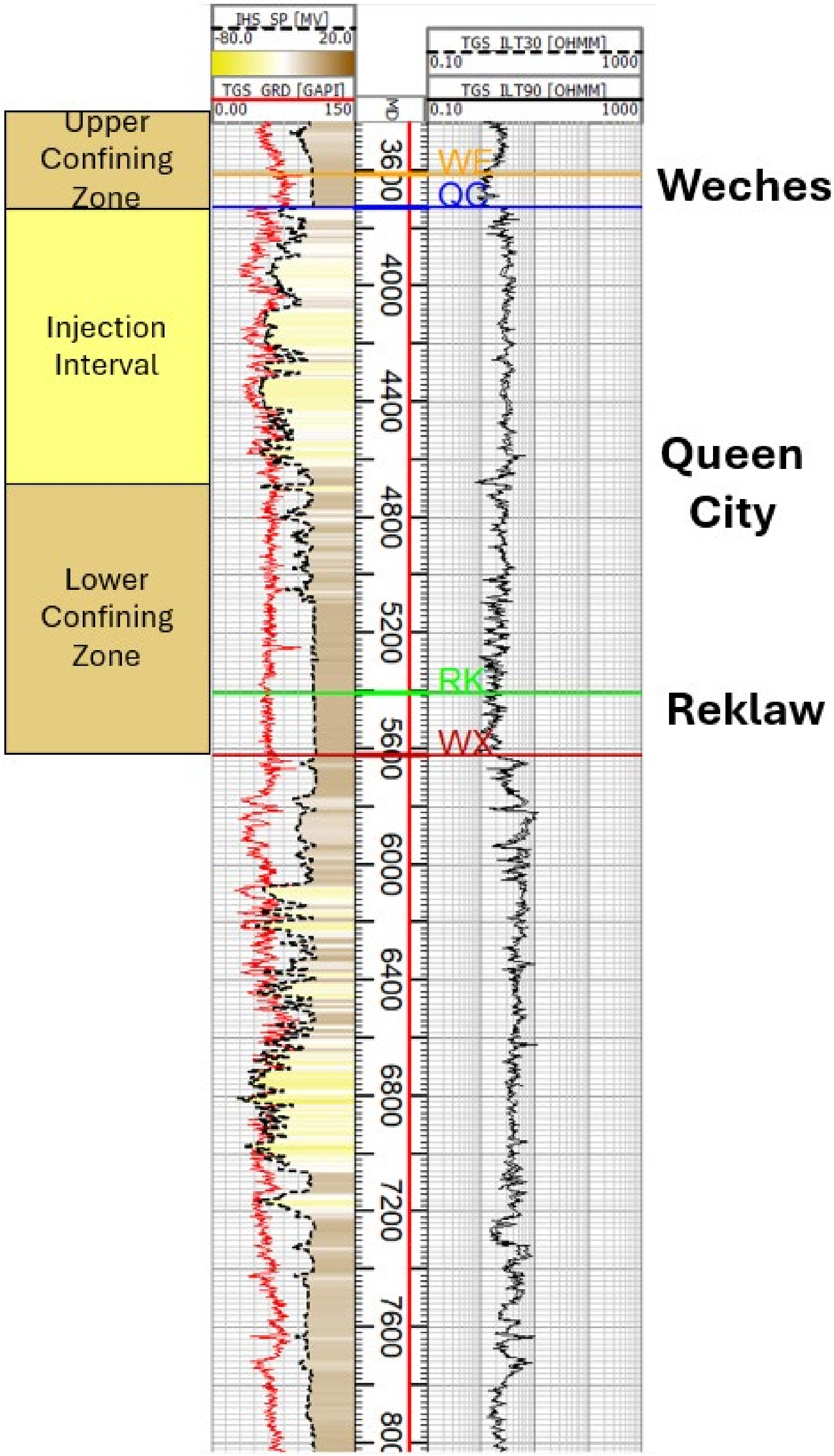

Figure 5. Nueces Mineral No. 1 (API 42-311-3181300) type log depicting the confining zones, injection interval, and associated formation names in the project area. The left column contains gamma ray (GR) (red) and SP (color-filled) curves, and the right column contains a DRES curve (black) on a logarithmic scale. Depth scale is in the middle column is in feet measured depth (MD).

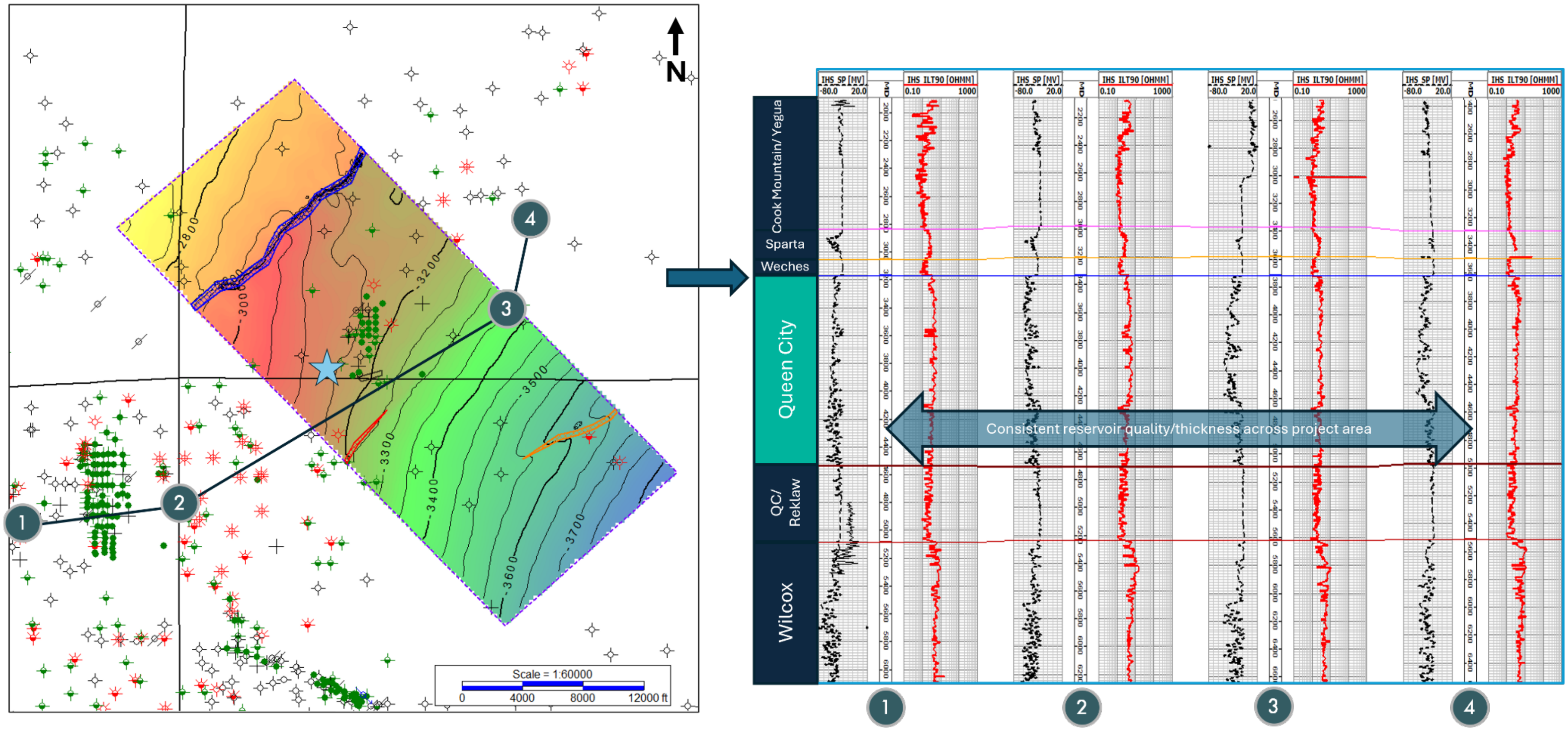

Figure 6. Map of the Lima Tango CCS 1 project area with proposed injection well (light blue star), existing wells, faults, seismic data, cross section wells, and numbered stratigraphic cross section flattened on the Queen City Formation top. The cross section is a four-well section from southwest to northeast across the project area with wells numbered on both the map and cross section. The licensed three dimensional (3D) seismic data is represented by the rectangular area of color filled structural contours on the top of the Queen City Formation in feet true vertical depth subsea (TVDSS) with a contour interval of 50 feet. The Weches Shale is the UCZ for the Queen City storage interval; the lowermost Queen City (QC) and Reklaw Shale are the LCZ for the Queen City and serves as an impermeable barrier between the Queen City and the Upper Wilcox aquifer.

3.2.3 Faulting

The Lima Tango CCS 1 well site is characterized by gentle dip (less than two degrees) and little faulting (**Figure 7**). Paleogene faulting along the western margin of the Gulf of Mexico was initiated by slump over Mesozoic shelf margins during very rapid sediment deposition. The Lima Tango CCS 1 site is located landward of these shelf margins (**Figure 3**) and much of the sediment bypassed this area to the offshore. As such, the deposition was more uniform in this area and the mechanisms for growth faulting were not in place.

There are three faults intersecting the Queen City Formation that have been mapped on the 3D seismic data licensed for this project (**Figure 7**). A late, down-to-the-coast fault with 100-250 feet of offset is on the northwestern portion of the seismic data (**Figure 7**, blue fault labeled 1). This fault is rooted in the Mesozoic section and continues nearly to the surface with consistent offset throughout the section indicating that it moved late.

An antithetic to this fault (**Figure 7**, orange fault labeled 3) is mapped on the southeastern portion of the seismic data, dipping to the northwest. This fault cuts down to the Upper Cretaceous and has offset up to 60 feet within the Queen City Formation.

A smaller fault (**Figure 7**, red fault labeled 2) was mapped in the middle portion of the seismic data. It also dips to the southeast, cutting down from the Eocene to Upper Paleocene section, with minimal offset.

Additional deep, normal faults with minor offset were mapped on the licensed three dimensional (3D) seismic and intersect neither the Queen City Formation nor the lower confining zone.

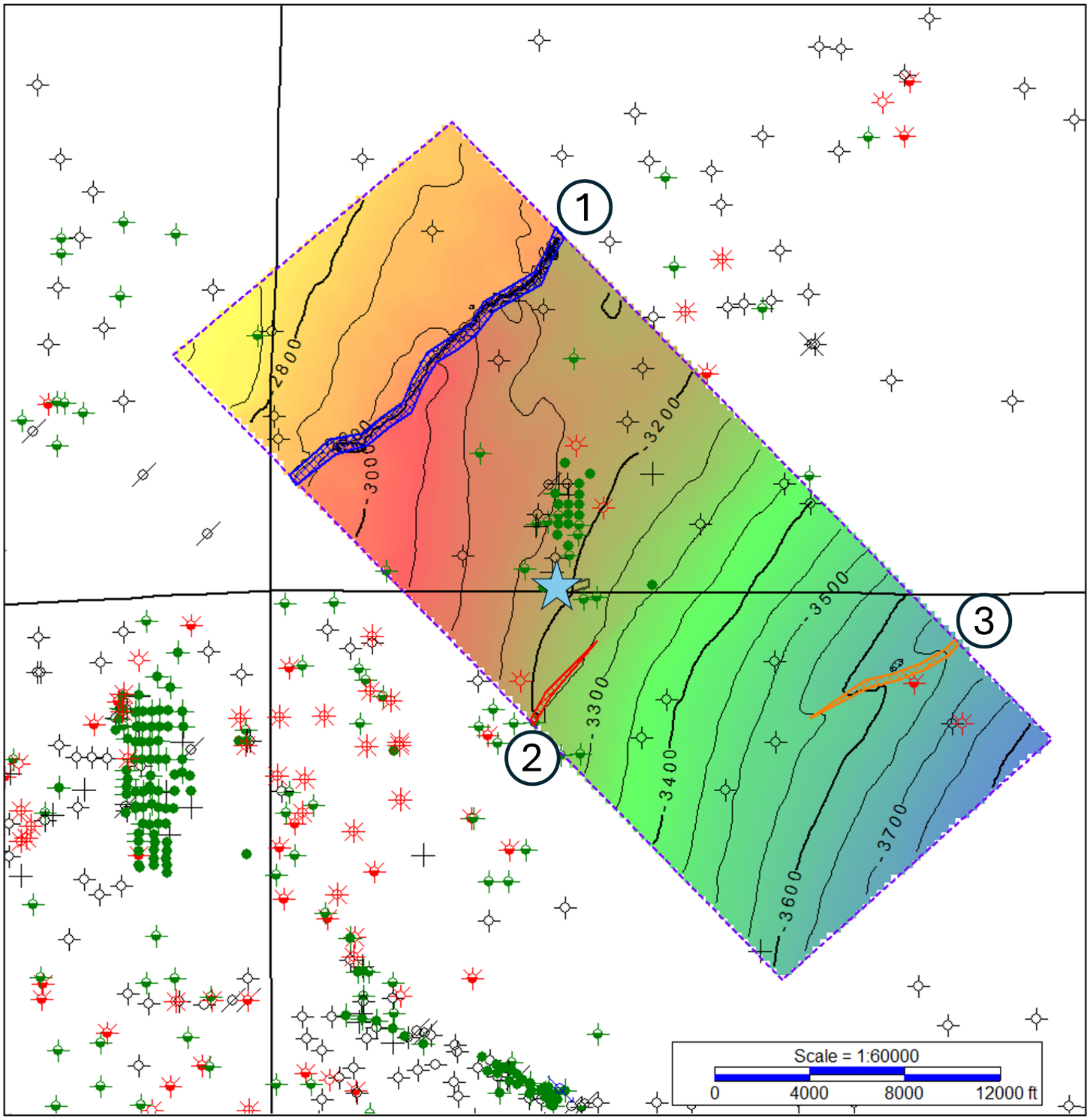

Figure 7. Top Queen City Formation structure in feet TVDSS with a contour interval of 50 feet. The injection well is highlighted with the blue star and all existing oil and gas wells are shown. Faults are indicated by the colored polygons and numbers. North is up.

3.3 Lithological and Reservoir Characterizations

A set of 69 digital well logs and 81 raster well logs that were deep enough to reach the Queen City Formation were used to map the subsurface. Formation tops were interpreted on well logs and tied to 20 square miles of licensed 3D seismic data. Digital logs from the Nueces Minerals No. 1 type log were used to construct a petrophysical model that included a porosity-permeability transform, water saturation calculation, geomechanical properties, and facies. **Figure 8** depicts the datasets utilized for interpretations described in this project.

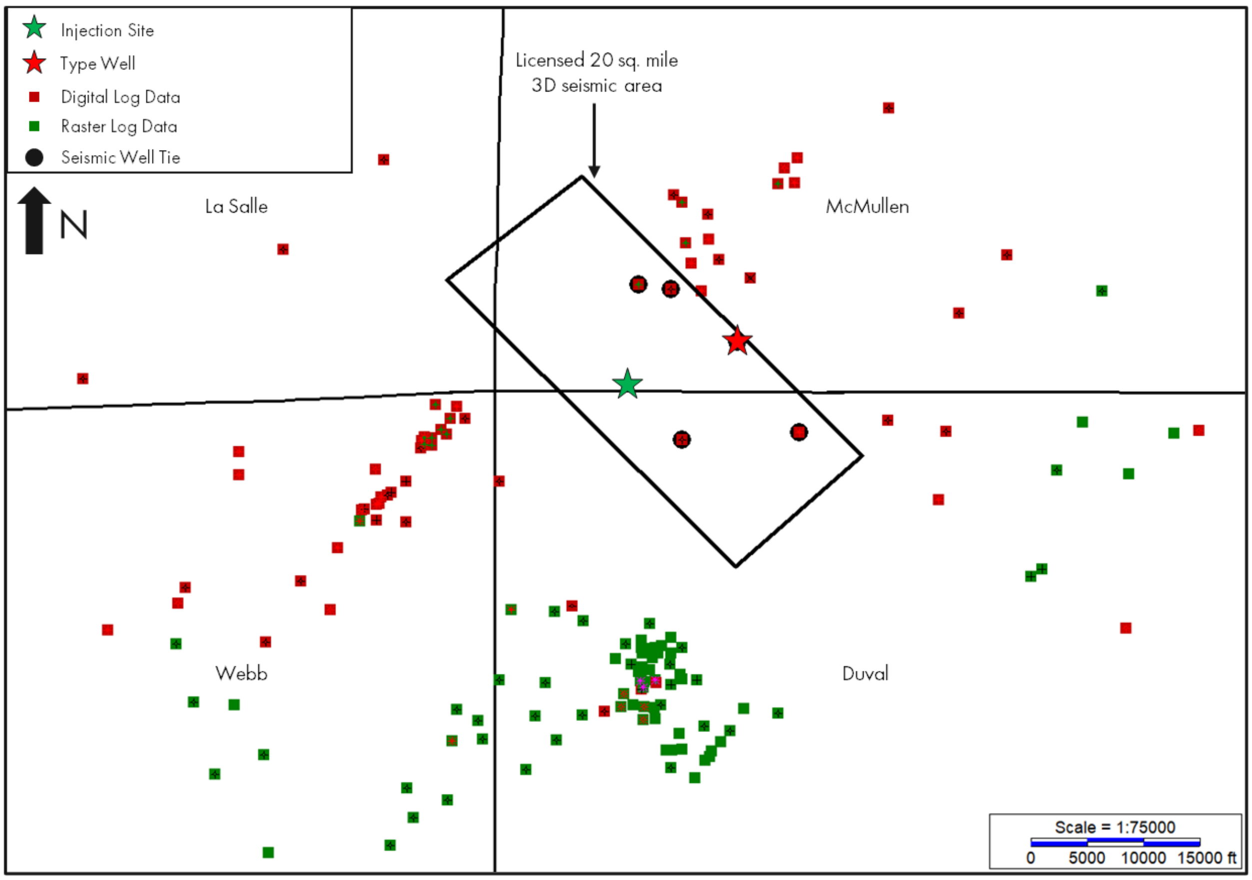

Figure 8. Data availability map depicting the 150 wells with digital wireline logs (red squares) and raster logs (green squares) in the mapped area. The Nueces Mineral No. 1 type log used for petrophysical interpretations (red star) and the 20 square miles of licensed and reprocessed 3D seismic data relative to the proposed Lima Tango CCS 1 injection well (green star) are also shown. Note that not all drilled wells are shown on this map.

3.3.1 Injection Interval

The Queen City Formation is the injection interval. It is comprised of three sand-rich injection zones (IZs) designated IZ-1 to IZ-3 (**Figure 9**). They have low volume clay (vClay) (less than 15 percent (%)) and a dominance of sand (greater than 60 %) in our petrophysical and facies models, respectively.

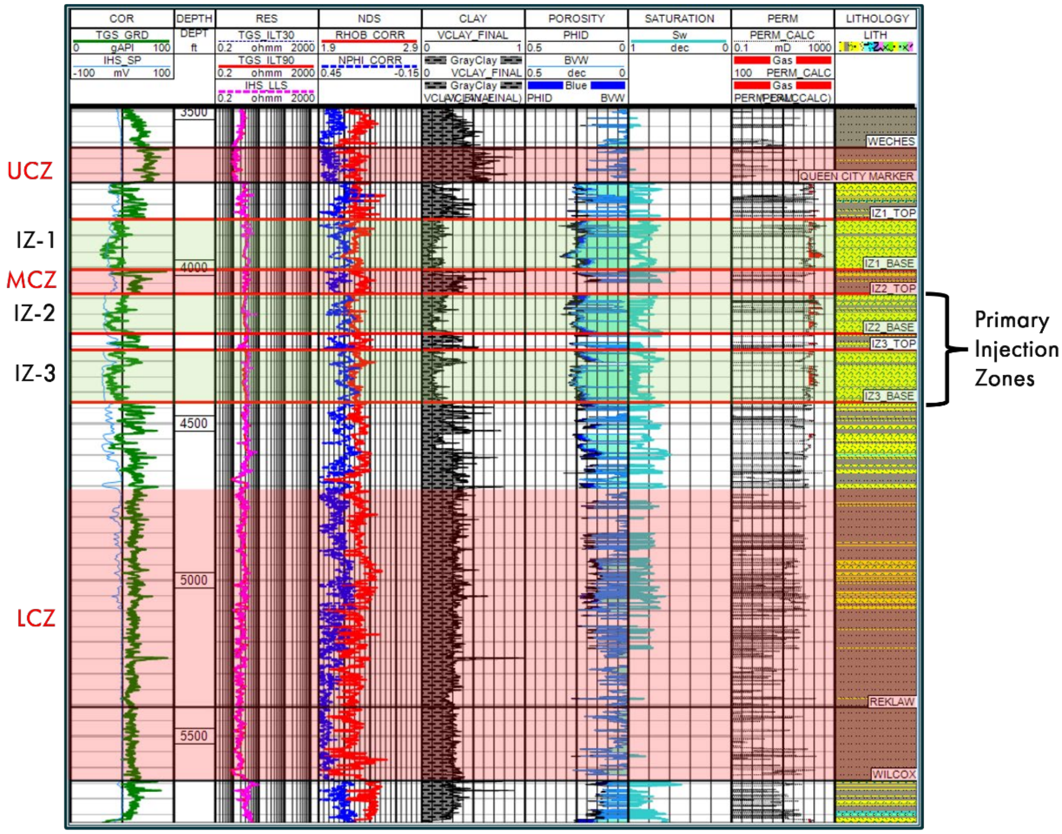

Figure 9. Petrophysical log of the Nueces Minerals No. 1 well with the Queen City Formation primary injection interval annotated on the right and the individual injection and confining zones annotated on the left. The injection interval is comprised of Injection Zone 2 (IZ-2) and Injection Zone 3 (IZ-3). Injection Zone 1 (IZ-1) was mapped but not included as part of the CO_2 plume model.

3.3.2 Confining Zones

The Weches Shale, which overlies the Queen City Formation, and the Reklaw Shale, which underlies the Queen City Formation, were identified as the UCZ and LCZ, respectively. These shales are comprised of starved, condensed, shale-dominated intervals with high gamma ray, low resistivity, and low porosity log signatures, as well as high vClay and a dominance of shale (greater than 30%) in our petrophysical and facies models.

3.3.3 Injection and Confining Zones and Properties

A petrophysical interpretation of wireline logs available at the Nueces Minerals No. 1 well is presented in **Figure 9**. The individual injection and confining zones are highlighted in green and red, respectively and labeled at the left. The modeled primary IZ is annotated at the right. The UCZ is compromised of the Weches Shale, Injection Zone 1 (IZ-1) is comprised of uppermost Queen City sand, the Middle Confining Zone (MCZ) is comprised of a shale within the Queen City, Injection Zone 2 (IZ-2) is comprised of the next major sand down in the Queen City, and Injection Zone 3 (IZ-3) is comprised of a well-developed sand in the middle of the Queen City. The LCZ was additionally identified as the Reklaw Shale but there are also shales with very thinly interbedded sands in the basal Queen City that have low porosity and permeability. This interval

is highlighted as also contributing to the LCZ in **Figure 9**. The dominant lithology, thickness, porosity, and permeability of each zone is presented in **Table 1**.

Table 1. Properties of the Queen City Formation injection zones and the Weches Shale, Queen City, and Reklaw Shale confining zones assessed at the Lima Tango project area. Porosity is given in percent (%) and permeability is given in millidarcies (mD).

Subunit	Dominant Lithology	Thickness (feet)	Average Reservoir Porosity (%)	Average Reservoir Permeability (mD)	Description
Upper Confining Zone (UCZ)	Shale	110	1	0.002	Weches Shale
Injection Zone 1 (IZ-1)	Sand	160	16	75	Queen City sand (identified but not modeled)
Middle Confining Zone (MCZ)	Shale	90	3	0.2	Queen City intraformational shale
Injection Zone 2 (IZ-2)	Sand	125	20	120	Queen City sand
Injection Zone 3 (IZ-3)	Sand	168	19	100	Queen City sand
Lower Confining Zone (LCZ)	Shale	965	1.5	0.05	Lowermost Queen City interbedded sands and shales and the Reklaw Shale

3.4 Formation Fluid Chemistry

The available formation fluid chemistry analyses available from the United States Geological Survey (USGS) National Produced Waters Geochemical Database v2.3 for the targeted Queen City Formation injection interval are shown in in **Figure 10**. All values are located southeast or east of the Lima Tango CCS 1 site and have Total Dissolved Solids (TDS) values greater than 20,000 parts per million (ppm). The average, low, and high TDS values are presented in **Table 2** as are the corresponding values for potential of hydrogen (pH), sodium (Na), calcium (Ca), and chlorides (Cl).

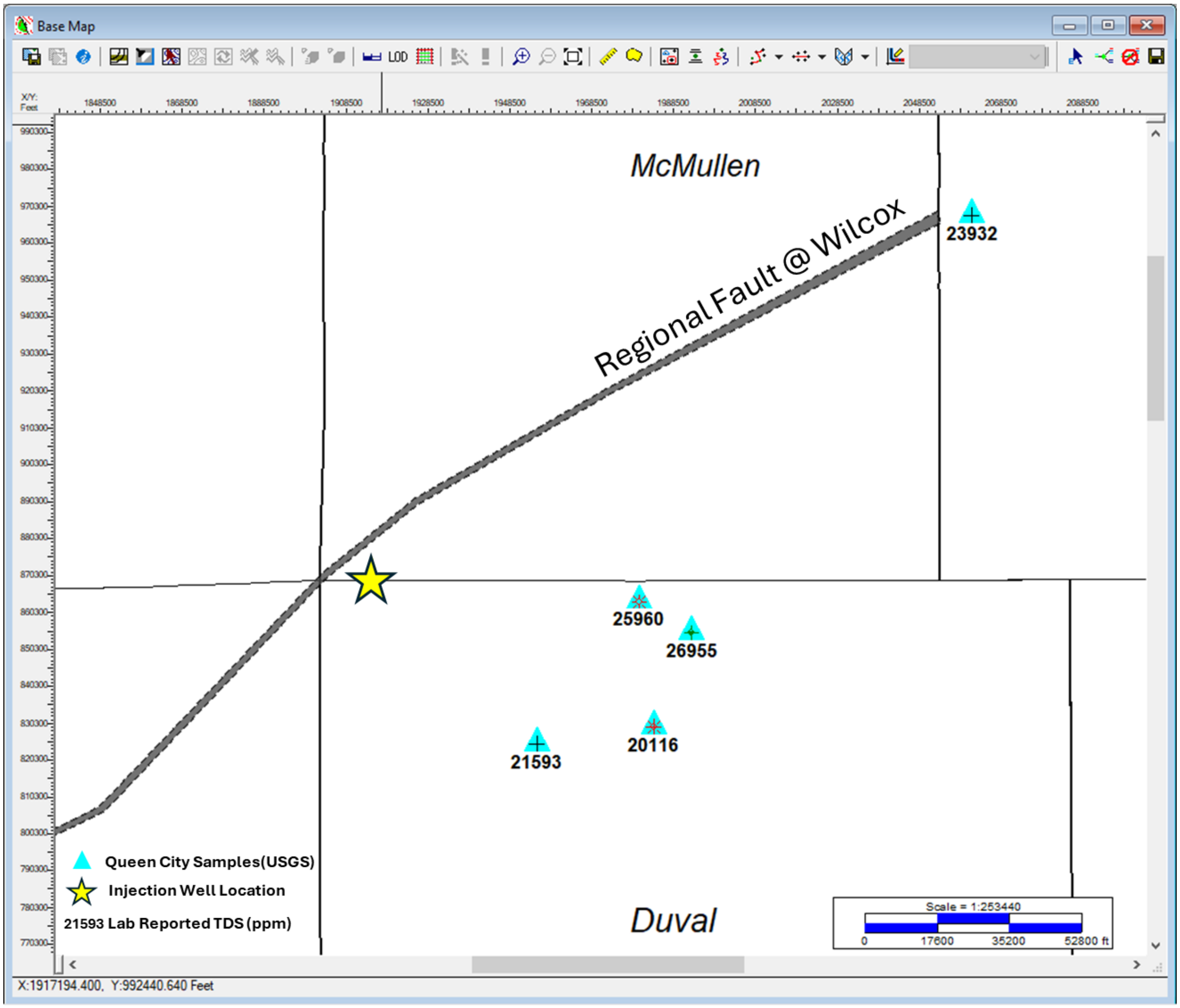

Figure 10. Map showing the location and values of TDS (ppm) in wells with of available USGS water samples values from the Queen City Formation. These were used in the formation fluid chemistry analysis. Regional fault location is from Kosters, *et al.*, 1989. North is up.

Table 2. Queen City Formation fluid chemistry.

	TDS (ppm)	pH	Na (ppm)	Ca (ppm)	Cl (ppm)
AVG	23,711	7.8	8,900	92	12,815
LOW	20,116	7.4	7,561	54	10,950
HIGH	26,955	8	10,100	152	14,700

3.5 Potential of Induced Seismicity

There has been no earthquake activity near the Las Tiendas NGP plant or within 25 kilometers (km) since 2017 according to the TexNet earthquake monitoring network. The earthquake activity present north of the site as shown in **Figure 11** is believed to result from oil and gas well completions activity in the Eagle Ford trend. The Queen City Formation proposed injection interval at the Lima Tango CCS 1 site is thousands of feet above the crystalline basement rock. As such, seismicity risk related to this project's injection of CO_2 is expected to be nominal.

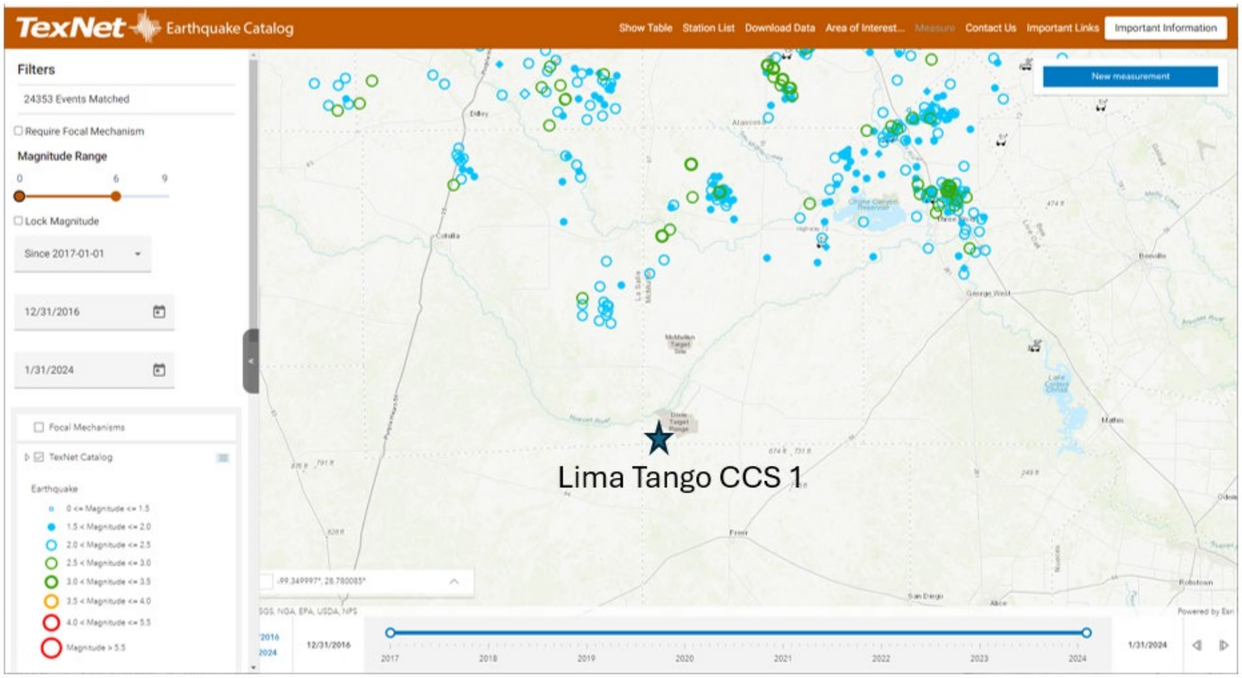

Figure 11. Map of historical seismic activity within 25 km of the proposed Lima Tango CCS 1 site from the Texas Seismological Network (TexNet) Seismic Monitoring Network. North is up.

3.6 Groundwater Hydrology

The proposed Lima Tango CCS 1 injection site lies on the southeastern edge of both the mapped limits of the Carrizo-Wilcox and the Jackson-Yegua aquifers (**Figures 12 and 13).** The proposed disposal interval (Queen City) is estimated to be 3,508 - 4,870 feet true vertical depth (TVD) at the injection site and is isolated from the shallow Underground Source of Drinking Water (USDW) (Jackson-Yegua) and the deep potential USDW (Carrizo-Wilcox). **Figure 14** depicts the injection interval and confining zones relative to both USDWs and the Base of Useable Quality Water strata (BUQW). Note that the Nueces Minerals No. 1 type log shown in this figure is approximately 170 feet downdip from the injection well and picks have been adjusted accordingly.

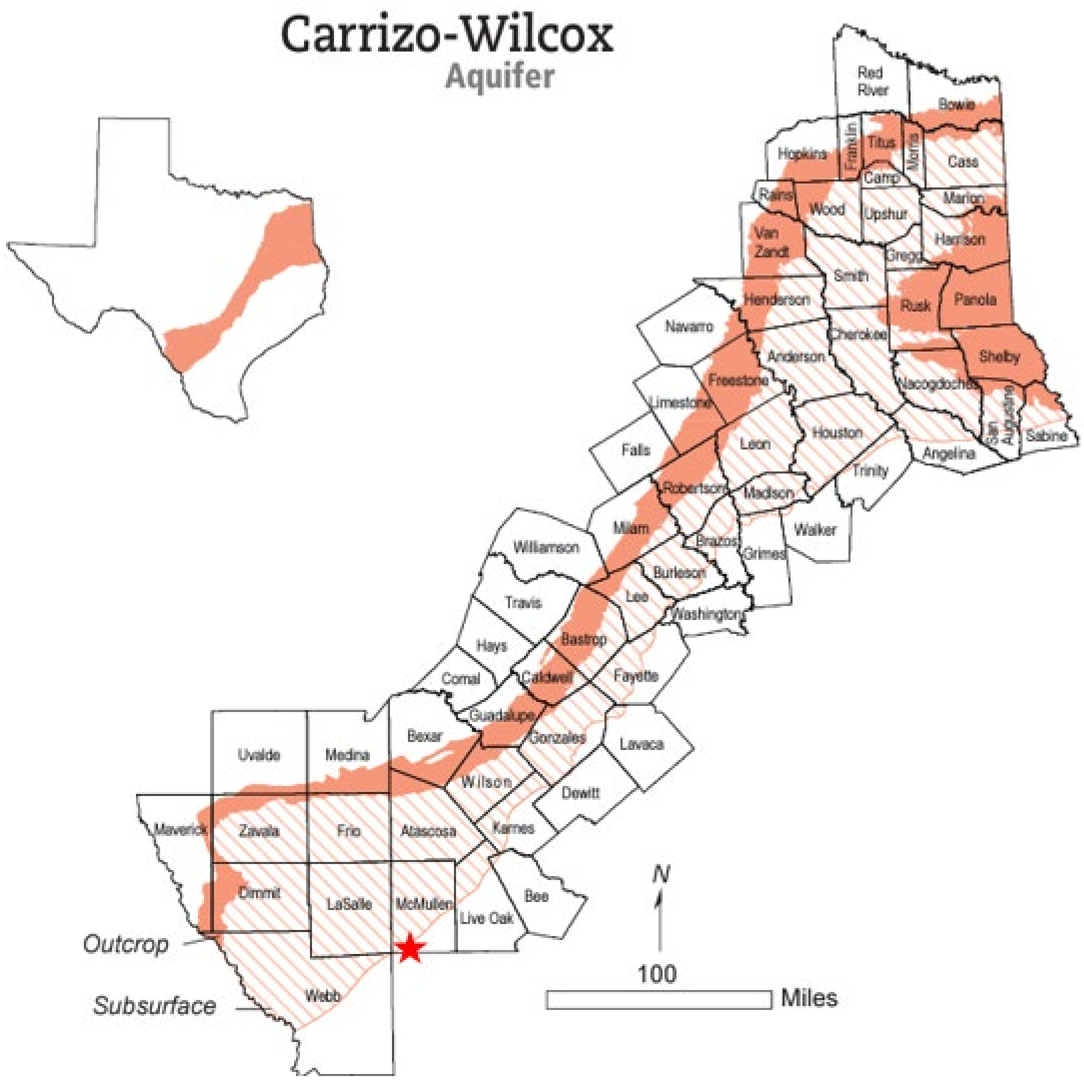

Figure 12. Carrizo-Wilcox aquifer map and recharge area, with outcrop shown in solid fill and subsurface in hachured fill, relative to proposed injection well (red star). Modified from George *et al.*, 2011.

Figure 13. Yegua-Jackson aquifer map and recharge area relative to proposed injection well (red star). Modified from George *et al*., 2011.

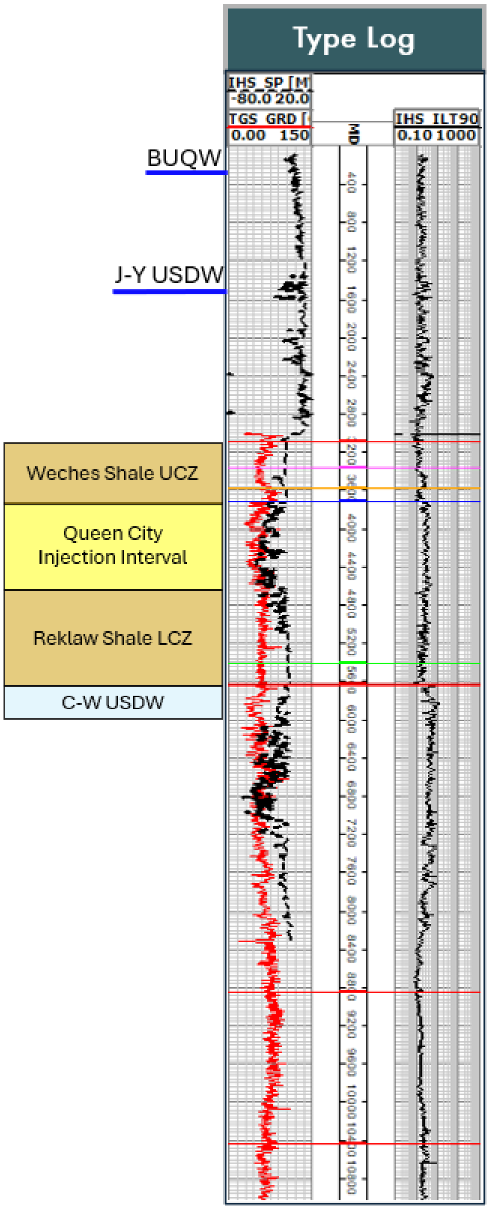

Figure 14. The Nueces Minerals No. 1 type log annotated with the BUQW, the Jackson-Yegua (J-Y) USDW, the Weches Shale UCZ, the Queen City injection interval, the Reklaw Shale LCZ, and the Carrizo-Wilcox (C-W) USDW.

The Jackson-Yegua aquifer is 2,300 feet above the Queen City injection interval and separated from the injection interval by multiple low-porosity and low-permeability formations, most notably, the Weches Shale which is identified as the UCZ (**Figure 14)**. The Carrizo-Wilcox aquifer is 965 feet below the Queen City injection interval and isolated from it by the Reklaw Shale LCZ. Both the Weches and Reklaw Shales have been mapped as aquitards in numerous Texas Water Development Board (TWDB) publications, (Galloway *et al.*, 1991; Sharp *et al.*, 1991). Water samples from the Carrizo-Wilcox aquifer illustrate the increasing salinity of the aquifer downdip to the southeast (**Figure 15**). Owing to the transitional nature and the uncertainty of the

water quality at the Lima Tango CCS 1 injection site, the TRRC Groundwater Advisory Unit (GAU) considers the Carrizo-Wilcox aquifer a potential USDW. Therefore, dCarbon demonstrated geologic isolation between the proposed injection zone and the Carrizo-Wilcox potential USDW and the TRRC GAU agreed that sufficient isolation existed to support dCarbon's W-14 injection permit. There are no water wells within the two-mile radius of the Lima Tango CCS 1 injection site as shown in **Figure 16**.

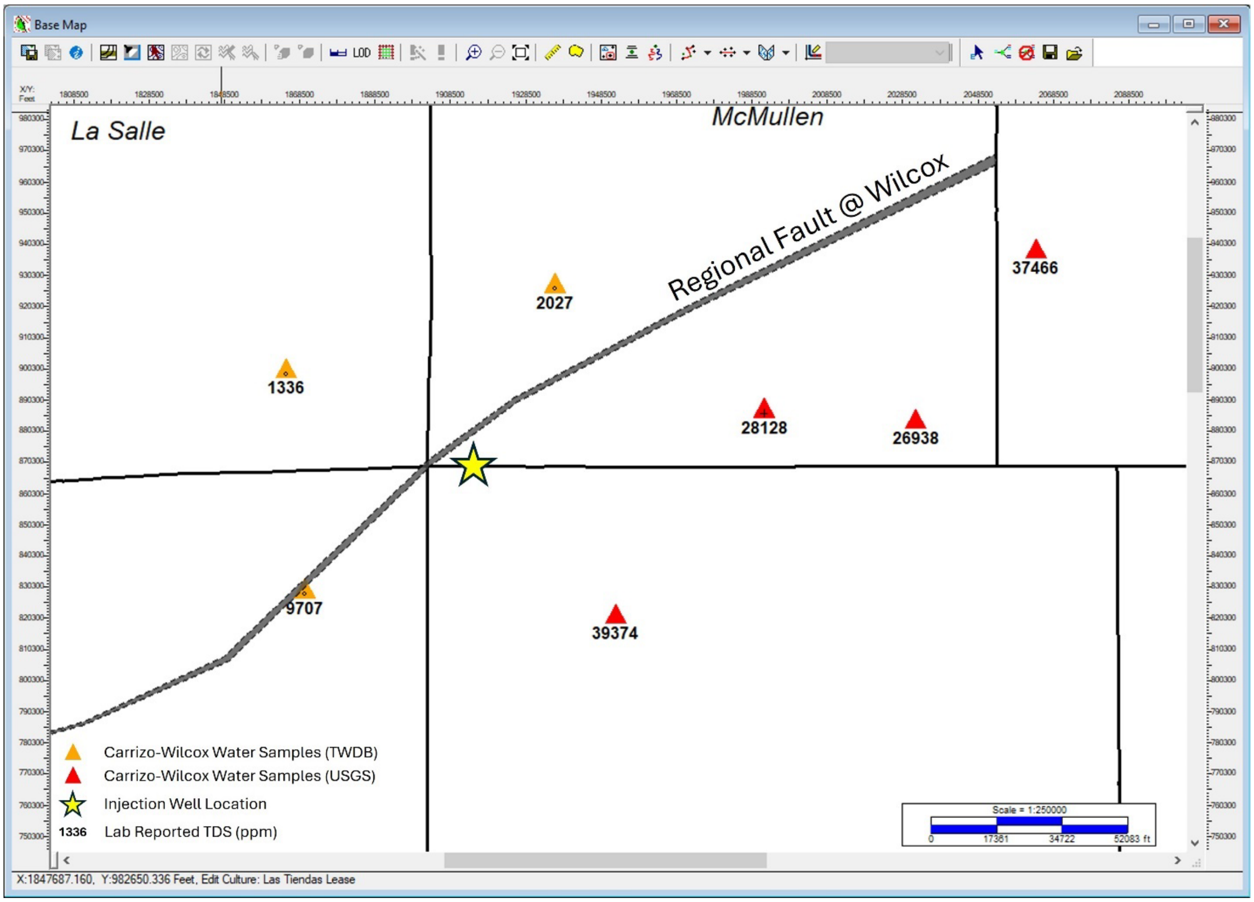

Figure 15. Carrizo-Wilcox water sample data from the USGS and TWDB. Posted values are in ppm TDS and the source denote by the color of the triangle in the legend in the lower left corner. North is up.

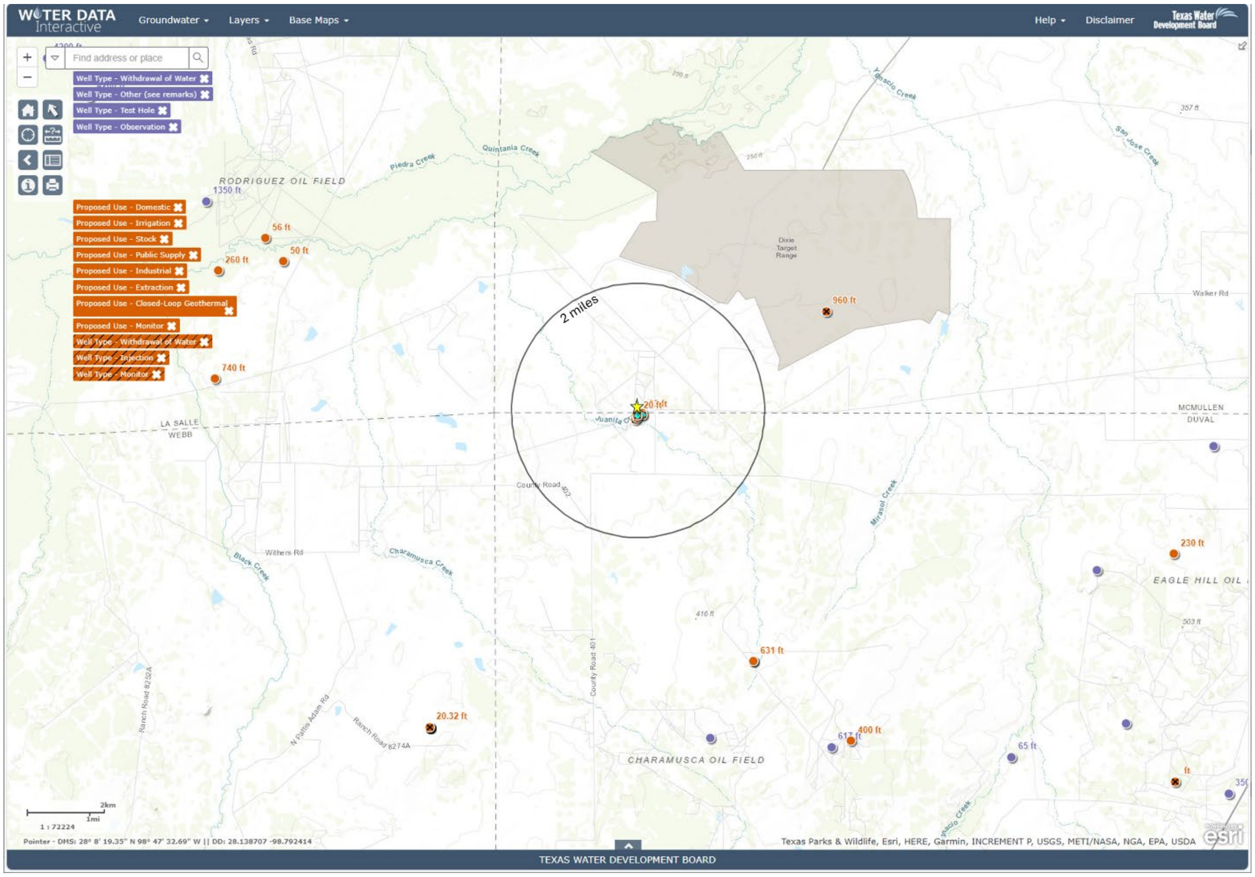

Figure 16. Water wells within the greater Lima Tango CCS 1 area from the TWDB interactive viewer. The yellow star denotes the injection site, and the black circles depict a two-mile radius circle around the proposed injection site. No water withdrawal wells fall within these areas. Monitoring wells at the ET Las Tiendas NGP Plant site have been plugged. North is up.

3.7 Description of CO_2 Project Facilities

dCarbon will accept CO_2 from the ET Las Tiendas NGP Plant (**Figure 17**). The temperature, pressure, composition, and quantity of CO_2 will be measured and metered according to industry standards, with an orifice meter, Coriolis meter, or similar device. dCarbon will compress the CO_2 to a supercritical physical state at the Lima Tango CCS 1 injection site. The CO_2 stream will be metered to verify quantity. The CO_2 will then be injected into the Queen City Formation, which is not known to be productive of oil and gas in the area. A gas analysis of the CO_2 stream is shown in **Table 3**. Although industry-standard sampling of the CO_2 stream is expected to be representative of the composition of the gas, it is possible that the composition will vary slightly over time.

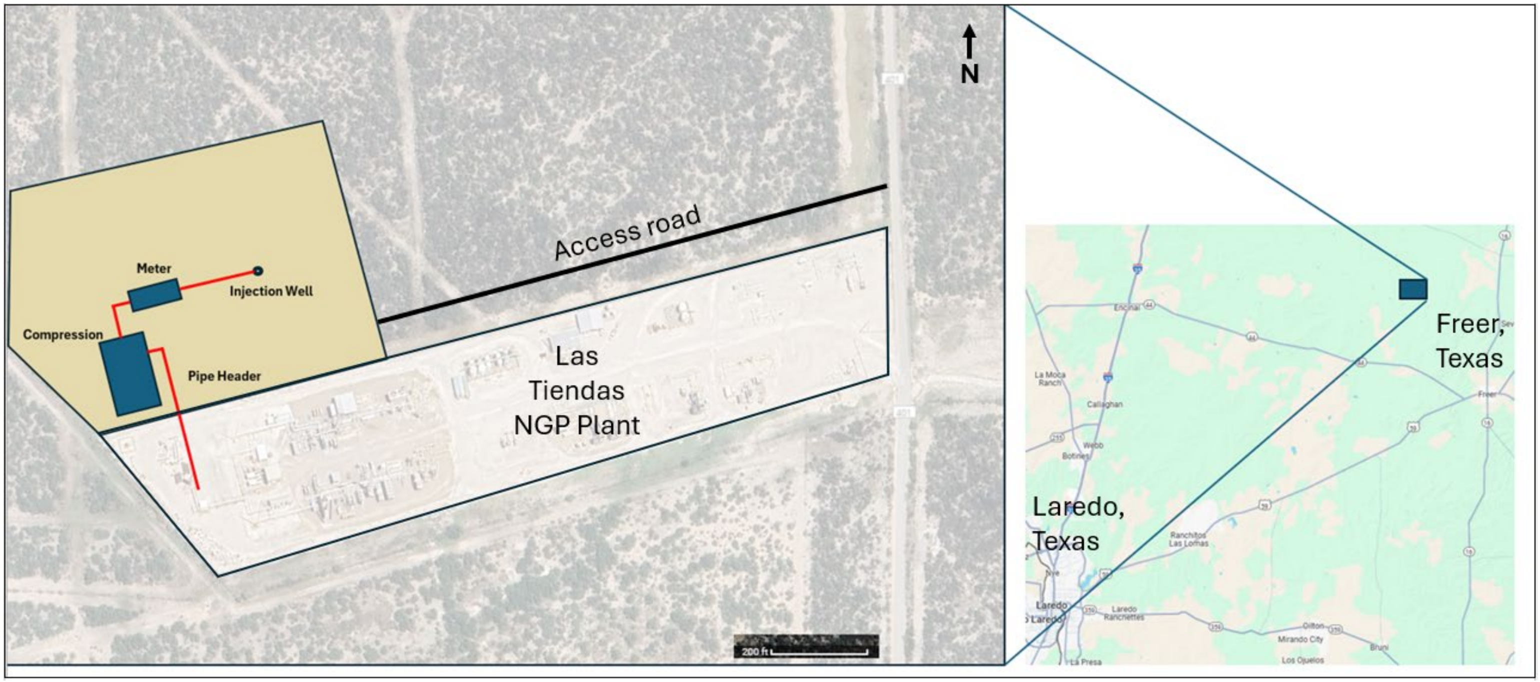

Figure 17. Lima Tango CCS 1 injection well proposed plot plan and location map relative to cities in south Texas.

Table 3. Inlet CO_2 stream analysis for the Lima Tango CCS 1 site in mol percent.

	DESIGN	DESIGN
Water	9.62	Dry Basis
Hydrogen Sulfide	0.01	55 ppmv / 0.006
Nitrogen	0.01	0.010
Carbon Dioxide	87.46	96.774
Methane	2.51	2.776
Ethane	0.34	0.381
Propane	0.01	0.013
i-Butane	0.01	0.009
n-Butane	0.00	0.003
i-Pentane	0.02	0.017
n-Pentane	0.01	0.011
n-Hexane	0.00	0.000
TOTAL	100.00	100.000

Note – *Gas is water saturated at inlet conditions (120 degrees Fahrenheit (F) and 3 pounds per square inch gas (psig) using Bryan Research and Engineering's Promax chemical process simulation software and the GERG 2008 Equation of State (EOS)). Ppmv is pounds per million by volume.

3.8 Reservoir Characterization Modeling

To develop an MRV plan for monitoring, reporting, and verification of geologic sequestration at the Lima Tango CCS 1 facility as required under §98.448(a)(1)-(2) of Subpart RR, dCarbon first constructed a Static Earth Model (SEM) and then a dynamic reservoir simulation model to determine the active and maximum monitoring areas (AMA and MMA, respectively) as defined in §98.449. The primary objectives of the simulation model were to:

1. Estimate the maximum areal extent of the injectate plume and its migration post injection

2. Determine the ability of the Queen City injection interval to handle the required injection rate

3. Characterize potential interaction between the injected CO_2 and any nearby potential leakage pathways

dCarbon employed Schlumberger's Petrel software and Rock Flow Dynamic's tNavigator software to construct the static earth and dynamic plume models, respectively. The initial modeling was the area of licensed 3D seismic data (20 square miles) as shown in **Figure 18**. The model utilizes structural and petrophysical interpretations made from available well and 3D seismic data described in **Section 3.3** as primary inputs.

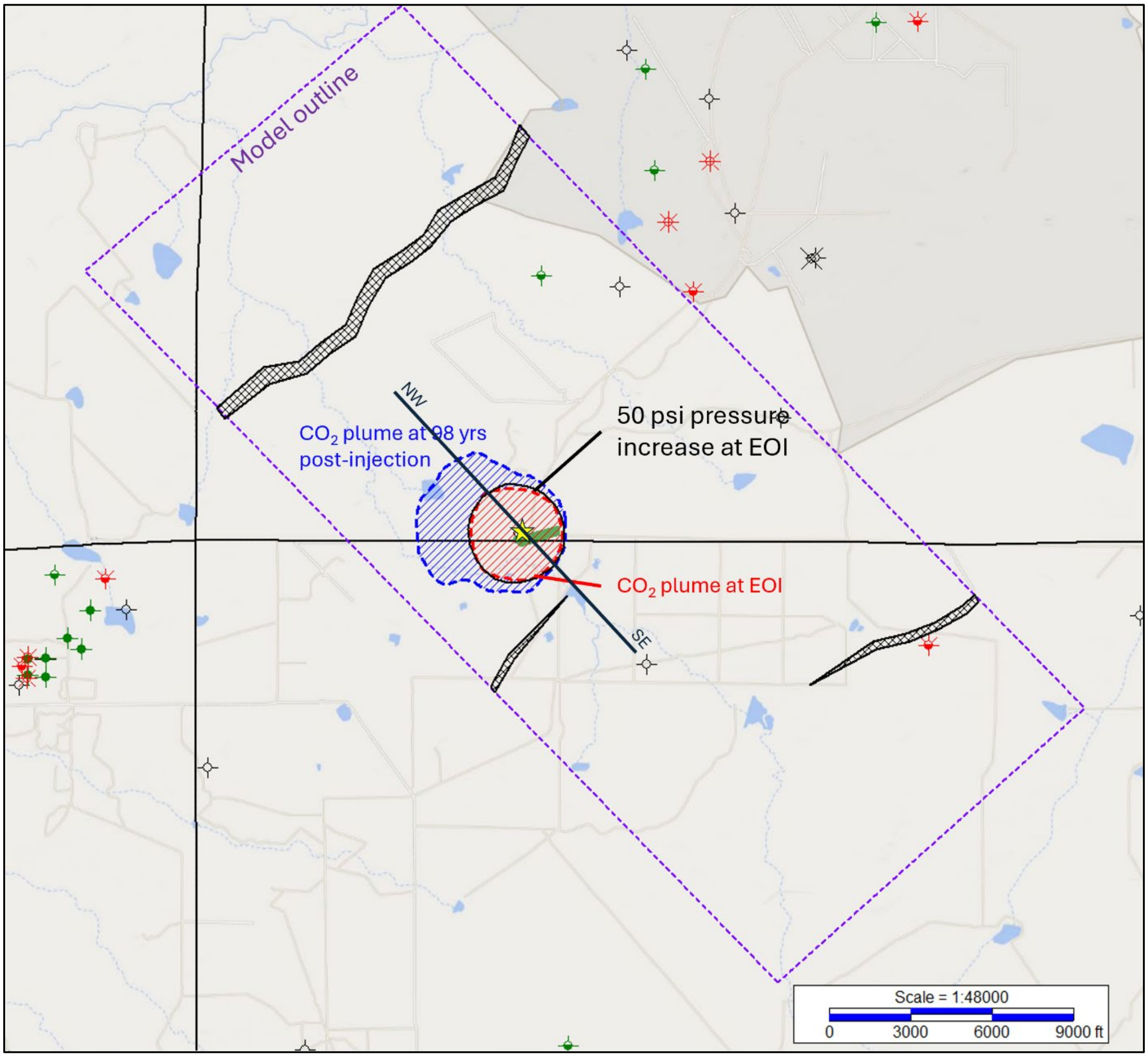

Figure 18. Simulation results showing CO_2 plumes at the end of injection (EOI) for 12 years in red, after 98 years post- injection in blue, and the model extent in violet, which is also the area of licensed 3D seismic. The 50-psi pressure plume at the end of injection is in black. Only wells deep enough to penetrate the top of the Queen City Formation are shown. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults from the 3D seismic data at the Queen City stratigraphic level. North is up.

Petrophysical calculations, including a porosity-permeability model, were derived from well logs at the Nueces Minerals No. 1 well, which is two miles away from the proposed injection site. Local core data was not available to calibrate the petrophysical model so an analog from a sandstone reservoir with comparable porosity and permeability was used (the Bandera Brown B from the Department of Energy (DOE) CO_2 Brine Relative Permeability Database (CO2BRA) (Araujo de Itriago *et al.*, 2024)). The mapping of uniform thickness and consistent correlations of wireline log characteristics with other available logs in the area supports the conclusion that the

Nueces Minerals No. 1 well is representative of the proposed injection site and the modeled area. The model will be further updated and calibrated when the injection well is drilled and additional data, including whole or rotary sidewall cores, is collected over the injection and confining intervals.

Utilizing the previously described inputs, grid layers and cells were created in Schlumberger's Petrel software at the increments listed in **Table 4**, resulting in an SEM model depicted in **Figure 19**. Reservoir properties were distributed in a layer cake manner throughout the modeling area based on petrophysics calculated from wireline logs at the Nueces Mineral No. 1 well. A dip and strike swath of cells through the injection site were gridded at a finer increment of 150 feet by 150 feet to allow for better resolution of plume behavior around the proposed injection well as shown in the central portion of **Figure 19**.

Table 4. SEM parameters by the i, j, and k directions (dir).

	i-dir	j-dir	k-dir
Average Increment (feet)	511	331	12
Layer count	71	45	93
Total length (feet)	36,298	14,904	1,110
Total cell count	297,135		

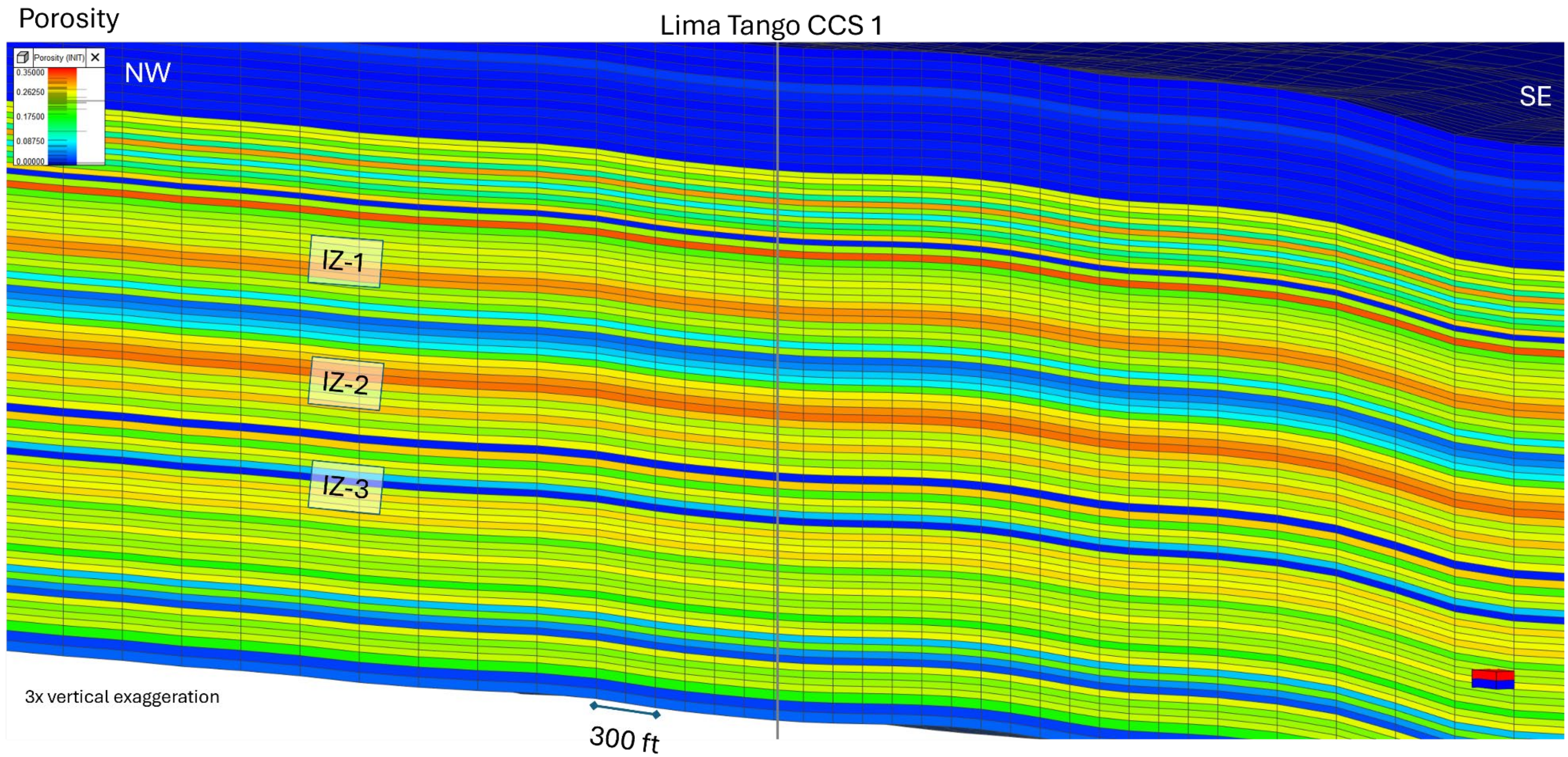

Figure 19. Porosity of the Queen City interval of the SEM. Porosity was calculated from the nearby Nueces Minerals No. 1 wireline well logs. Cross section location is shown on Figure 18.

A fit-for-purpose reservoir simulation model was created from the SEM to assess average injectivity based on empirical and analytical methods and to simulate CO_2 injection scenarios to aid in project design.

Pore and frac gradients, temperature, salinity, water saturation, porosity, and relative permeability model inputs are given in **Table 5**. The pore pressure gradient was assumed to be 0.48 psi/foot based on regional trends in South Texas. The fracture pressure gradient was estimated as 0.7 psi/foot from regional data and then an additional safety factor of 90% was applied, resulting in 0.6 psi/foot of the bottomhole constraint. The surface temperature is the mean annual temperature at the Lima Tango CCS 1 site. Fluid salinity is an average of the regional values described in **Section 3.4**. The relative permeability-porosity data are from a similar sandstone reservoir, the Bandera Brown B, in the DOE's CO2BRA database as cited by Araujo de Itriago *et al.*, 2024 and plotted in **Figure 20**. There are no active injectors in the simulation area from which to source these data.

Table 5. Input reservoir modeling parameters.

Parameter	Value
Pore Pressure Gradient (psi/foot):	0.48
Frac Pressure Gradient (psi/foot):	0.6
Temperature Gradient (degrees Fahrenheit (F) /foot):	0.015
Surface Temp (degrees F):	70
Fluid Salinity (ppm TDS)	30,000
Connate Water Saturation (decimal percent (%)):	0.47
Porosity (decimal %):	0.256
Relative permeability (mD):	133.85
Net-to-gross (ratio):	1
Rate constraints (MT/yr)	177,000
Pressure constraints (% of fracture pressure)	90

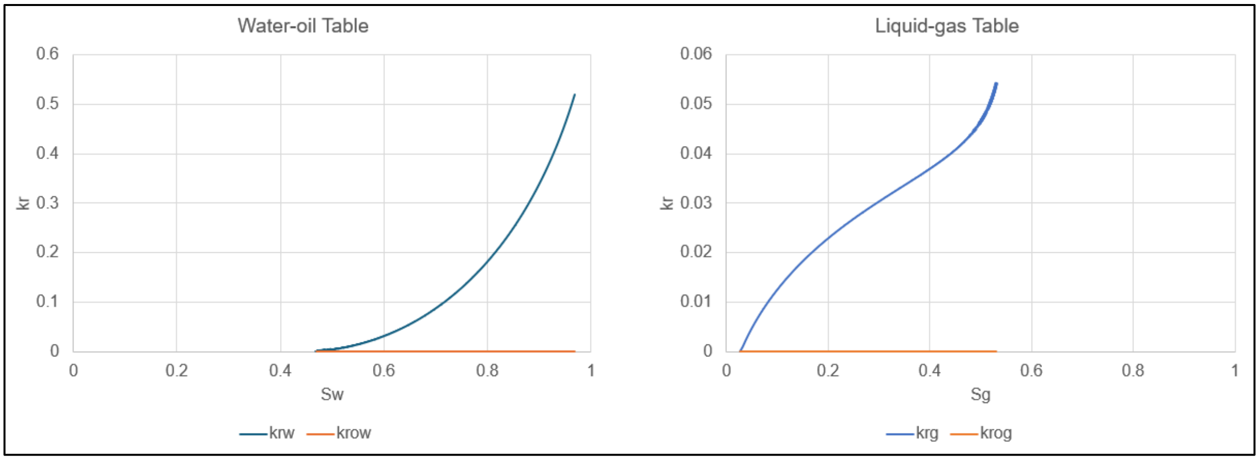

Figure 20. Relative permeability tables for water-oil (left) and liquid-gas (right). Relative permeability-porosity data are from a similar sandstone reservoir, the Bandera Brown B, in the DOE's CO2BRA database as cited by Araujo de Itriago et al., 2024.

dCarbon identified three injection zones in the model construction (IZ-1, IZ-2, and IZ-3) but the final model run selected for the Lima Tango CCS 1 project only injects CO_2 into IZ-2 and IZ-3. This case had a yearly injection rate of 177,000 MT/yr for a cumulative injection of 2,124,000 MT after 12 years as shown in **Table 6**. This injection over time is presented graphically in **Figure 21**. The size of the maximum plume extent and 50-psi pressure plume extent at the end of 12 years of injection are also given in **Table 6**, presented graphically in **Figure 22**, and depicted in map view in **Figure 18**. This figure also shows the plume outline at the end of injection compared to the outline at the end of the 98-year post-injection period. The plume stays within the area of the injection well.

Table 6. Injection parameters by zone and total plume extents.

Injection zone	Yearly rate (MT/yr)	Cumulative injection (MT)	Maximum CO_2 plume extent 98 years after end of injection	50-psi pressure plume extent at end of injection
IZ-2	75,684	908,206		
IZ-3	101,316	1,215,794		
Total IZ-2/IZ-3	177,000	2,124,000	0.78 square miles	0.36 square miles

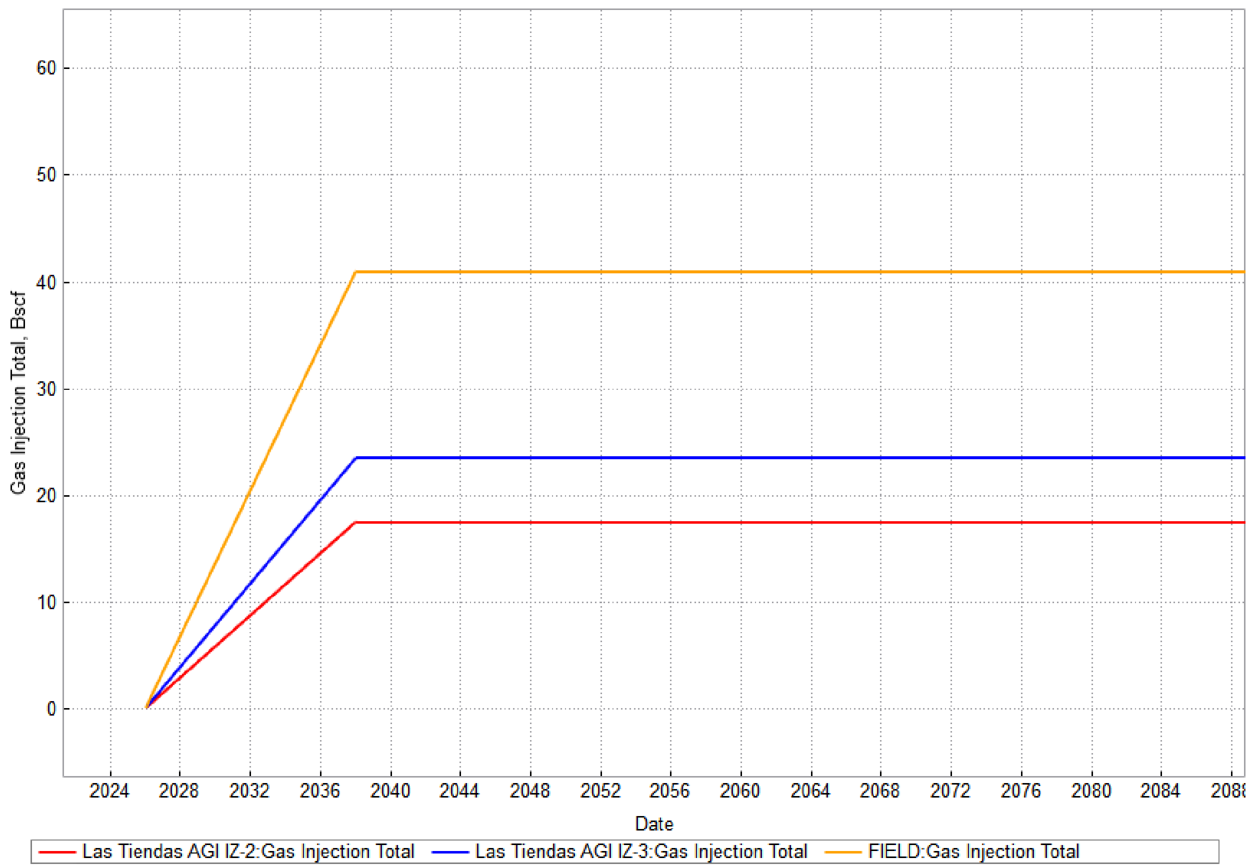

Figure 21. Plot of injection versus time at the Lima Tango CCS 1 injection well.

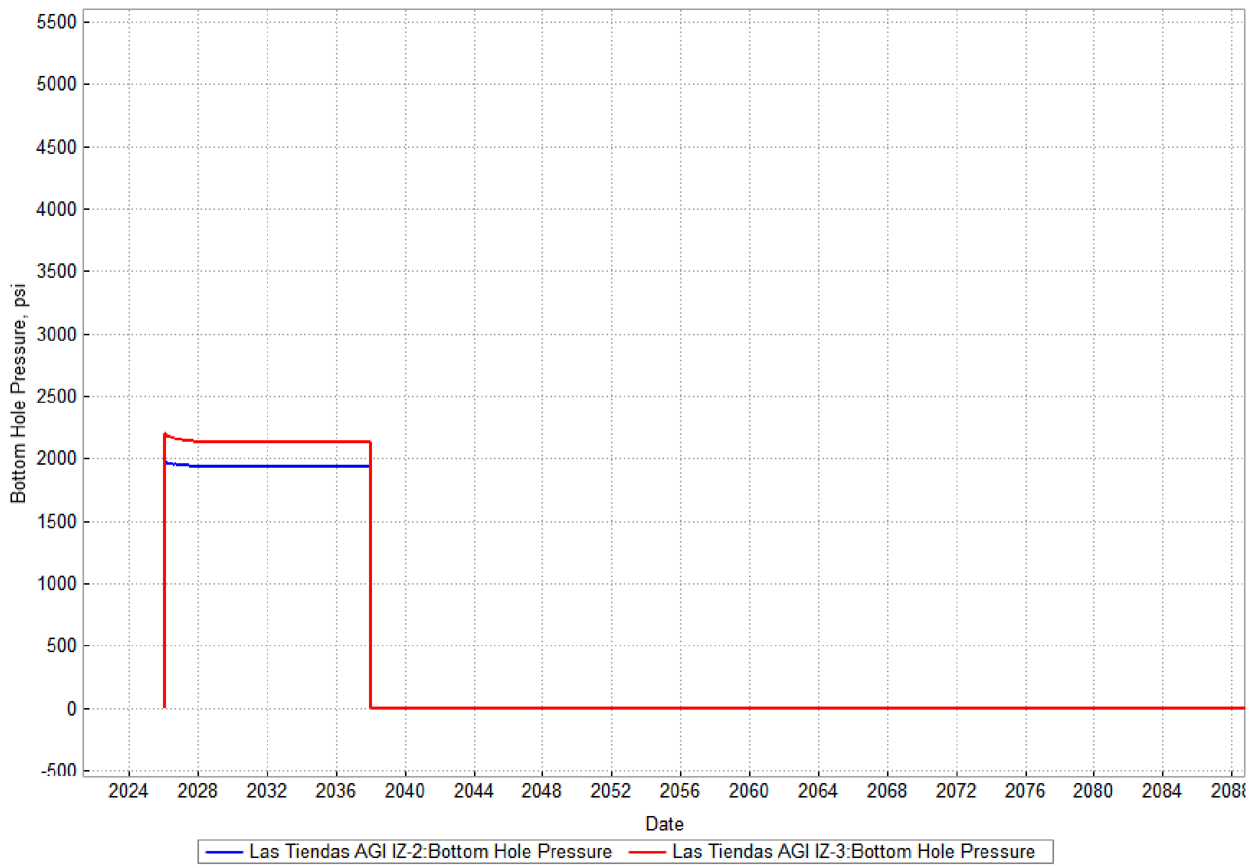

Figure 22. Pressure versus time at the Lima Tango CCS 1 injection well. The pressure constraint is 2412.8 psi for IZ-2 and 2524.3 psi for IZ-3.

A northwest to southeast cross-sectional view of the CO_2 plume in IZ-2 and IZ-3 is presented in **Figure 23**. The CO_2 plume profiles for both zones are funnel-shaped, indicative of the higher porosity and permeability at the top of these zones as well as the buoyancy of the CO_2 relative to the formation water.

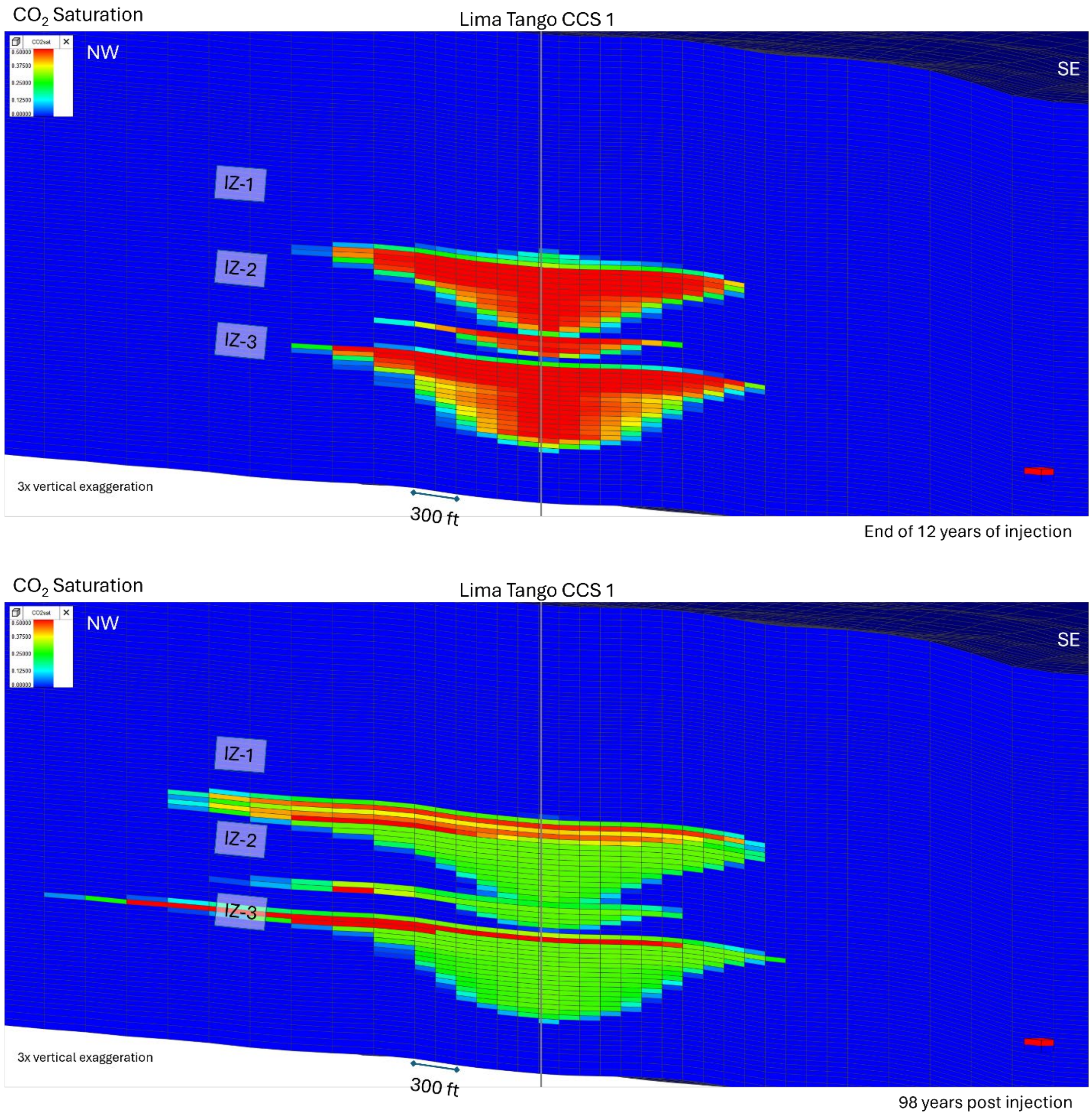

Figure 23. Northwest to southeast cross section depicting the CO_2 saturation profile of the model for the injection from Lima Tango CCS 1 after 12 years of injection (upper) and after 98 years after injection stops (lower). Color scale at the upper left indicates CO_2 gas saturation. Queen City injection zones are annotated. Injection was only modeled for IZ-2 and IZ-3. Cross section location is shown on Figure 18.

4 – DELINEATION OF MONITORING AREAS

This section describes the Maximum and Active Monitoring Areas.

4.1 Maximum Monitoring Area (MMA)

The MMA is defined as equal to or greater than the area expected to contain the free-phase CO_2 plume until the CO_2 plume has stabilized plus an all-around buffer of at least one-half mile. The numerical simulation using tNavigator was used to estimate the size and migration of the CO_2 plume. We modeled injection of CO_2 into IZ-2 and IZ-3 for 12 years followed by 190 years of post-injection modeling. Results indicated that the plume had ceased to migrate by 98 years post injection. A five percent cutoff of gas saturation was used to determine the boundary of the CO_2 plume. The area of the MMA was determined to be 0.88 square miles with the greatest extent reaching 0.72 miles from the injector (**Figure 24**).

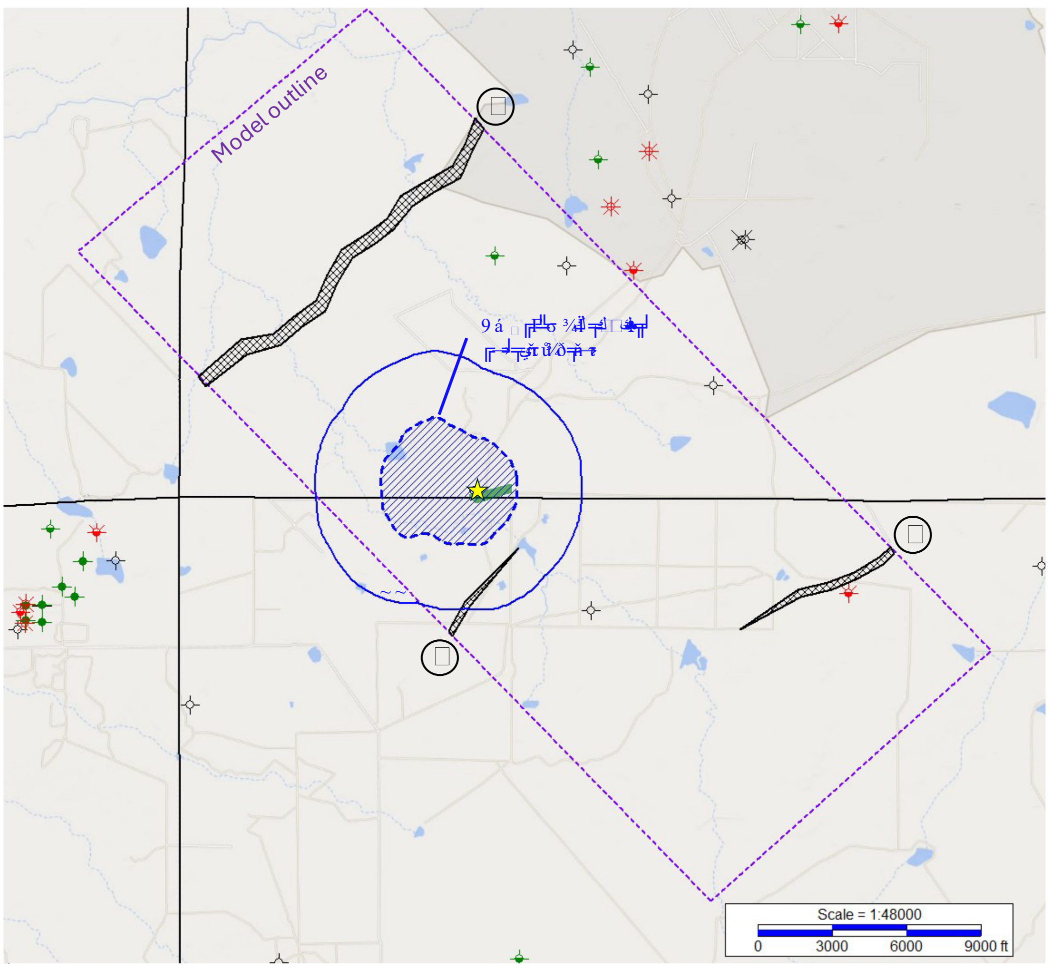

Figure 24. The proposed MMA (blue) and the stabilized CO2 plume (at 98 years post-injection as modeled). Only wells penetrating the Queen City Formation are shown. The red lines represent down-to-the-coast normal faulting mapped on the 3D seismic and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. North is up.

4.2 Active Monitoring Area (AMA)

dCarbon adhered to the definition of Active Monitoring Area (AMA) provided in 40 CFR 98.449 to delineate the AMA for this project (40 CFR Part 98 Subpart RR (Dec. 13, 2024)):

"*Active monitoring area* is the area that will be monitored over a specific time interval from the first year of the period (n) to the last year in the period (t). The boundary of the active monitoring area is established by superimposing two areas:

> (1) The area projected to contain the free phase CO_2 plume at the end of year t, plus an all-around buffer zone of one-half mile or greater if known leakage pathways extend laterally more than one-half mile.
>
> (2) The area projected to contain the free phase CO_2 plume at the end of year t + 5."

dCarbon proposes to monitor the injection site from year one through year 12, which is projected to be the EOI, thereby defining t as 12 years. dCarbon determined AMAs using methods (1) and (2) above and determined (1) to be larger. dCarbon then compared the larger AMA (red solid, **Figure 25**) with the MMA from **Figure 24** and found the AMA to be fully contained within the MMA. We propose to use the slightly larger MMA as both the AMA and MMA and will refer to this common area of monitoring as the AMA/MMA or just as the MMA in subsequent sections. As described in **Section 4.1**, the MMA is a one-half mile buffer after of the CO_2 plume stabilizes post-injection, which exceeds the definition of AMA set forth in 40 CFR § 98.449. By using the MMA as the AMA, dCarbon is employing an active monitoring program that exceeds the regulations of Subpart RR.

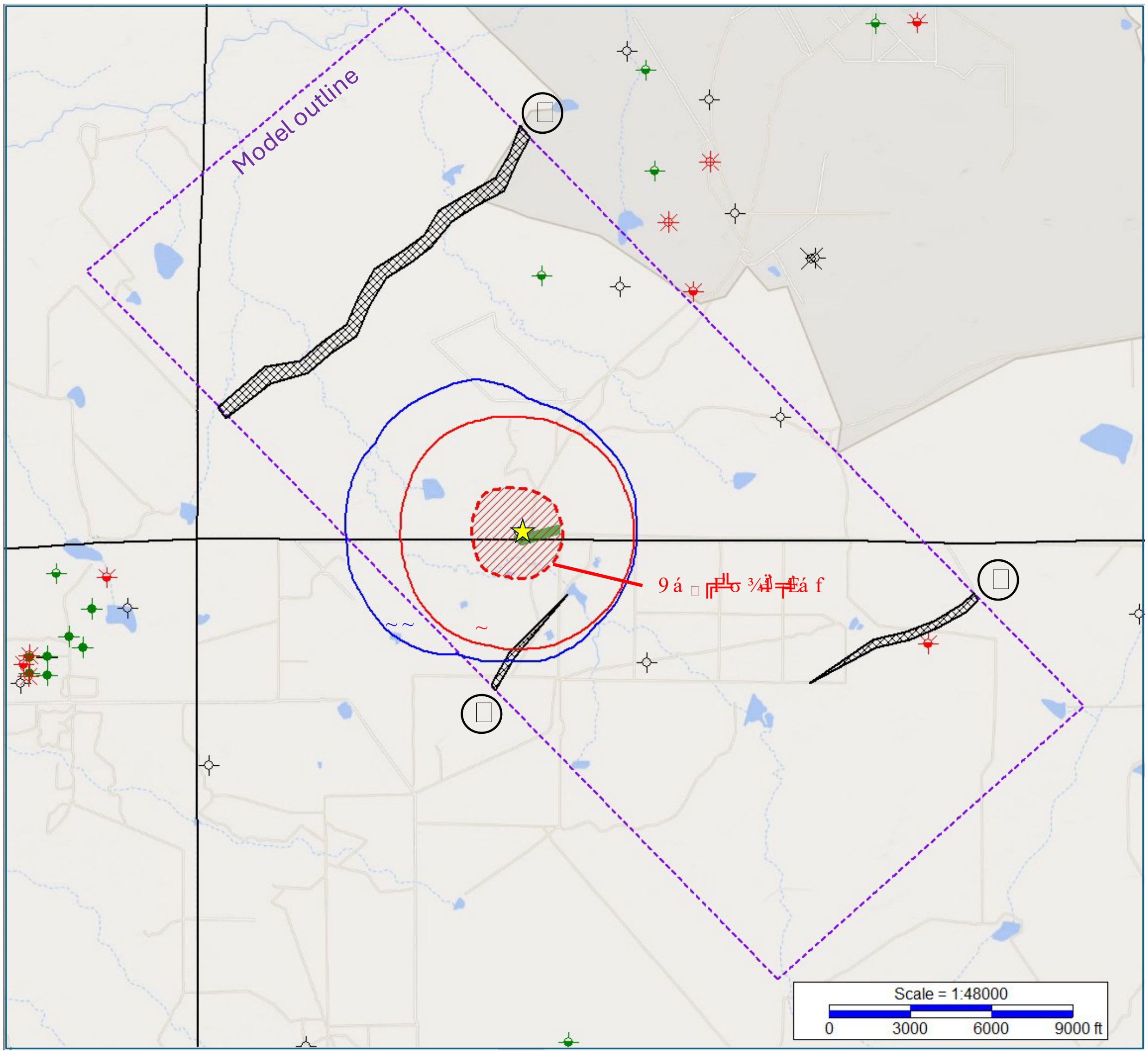

Figure 25. The AMA (red solid) outline and the EOI CO_2 plume (red dashed) outline as modeled. We propose to use the larger MMA (blue solid line) as both the AMA and MMA and will refer to it as the AMA/MMA or just the MMA. Wells penetrating the Queen City are posted with the well symbol at the bottomhole location. The black hachured polygons represent faulting at the Queen City mapped on the 3D seismic data and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. The Lima Tango CCS 1 well is represented by the yellow star and the gas plant is shown with a green polygon. Faults are numbered for discussion in the text. North is up.

5 – IDENTIFICATION AND EVALUATION OF POTENTIAL LEAKAGE PATHWAYS TO SURFACE

This section describes each of the required potential leakage pathways and assesses the likelihood, potential timing, and magnitude based upon the California Air and Resources Board's CCS Protocol Section C.2.2(d). **Table 7** describes the basis for event likelihood and **Table 8** provides the details of the leakage likelihood, timing of occurrence, and estimated magnitude of leakage for each type of leak risk.

Table 7. Risk likelihood matrix (developed based on comparable projects).

Risk Factor for Probability		Description
1	Improbable	<1% chance of occurring*
2	Unlikely	1-5% chance of occurring*
3	Possible	> 5% chance of occurring*
*During the life of the project or 100 years after project closure, whichever is shorter		

Table 8. **Description of leakage likelihood, timing, and magnitude.**

Leakage Pathway	Likelihood	Timing	Magnitude
Potential Leakage from Surface Equipment	**Possible**	Anytime during project operations, but most likely during start-up / transition or maintenance periods	**<100 MT per event** (100 MT represents approximately 5 hours of full flow facility release)
Leakage from Approved, Not Yet Drilled Wells	**Improbable**, as there are no approved not yet drilled wells	After new wells are permitted and drilled	**<1 MT per event**
Leakage from Existing wells	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and the total depth of the nearby existing wells	When the CO_2 plume expands to the lateral locations of existing wells	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach an existing well combined with thickness and low porosity / permeability of the UCZ
Potential Leakage from Fractures and Faults	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operation	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage Through Confining Layers	**Improbable**, as the UCZ is 110 feet thick and very low porosity and permeability	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation and thickness/properties of the UCZ
Leakage from Natural or Induced Seismicity	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage from Lateral Migration	**Improbable**, as the Queen City Formation is a very thick and laterally continuous formation with the closest well penetration over a mile downdip	More likely late in life as plume expands	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation and continuity / thickness of the UCZ

5.1 Potential Leakage from Surface Equipment

dCarbon's surface facilities at the injection site located near the ET Las Tiendas NGP Plant are specifically designed for injecting the CO_2 stream described in **Table 3**. The facilities minimize

leakage points such as valves and flanges by following industry standards and best practices. A shut-in valve is located at the wellhead in case of emergency. The compressor will also have emergency shut down switches that can be activated automatically in case of unexpected operating conditions.

Additionally, the compressor facility, pipeline, and injection well location will all be subjected to Auditory, Visual, and Olfactory (AVO) leak detection per dCarbon safety and operations standards. These monthly inspections, which are standard for detecting leaks and malfunctioning equipment in the gas production industry, will aid in the rapid detection of any potential leaks that may occur. As a part of these inspections, operations personnel are frequently able to repair leaks immediately by tightening valves, flanges, or similar equipment. Leakage from surface equipment is assessed as possible, however, any leaks that are detected will be analyzed to determine the amount of CO_2 that may have leaked and these leakage quantities, if any exist, will be included in recurring reporting.

5.2 Leakage from Approved, Not Yet Drilled Wells

A search of the TRRC's online GIS viewer (accessed December 9, 2024) in a 6,500 foot radius (which is roughly the size of the AMA/MMA) around the proposed injection site indicated one cancelled/abandoned location from 2012 and three permits that were so old that they had no API number or permit number, and the location source was cited as a hardcopy map (**Appendix, Table 9**). These search results indicate that there are no approved, not yet drilled, wells in the AMA/MMA and leakage from such wells is assessed as improbable.

5.3 Leakage from Existing Wells

There are 36 wells within the MMA listed in **Tables 9 and 10** in the **Appendix Section 13.2**, including at least one cancelled permit**.** These wells are shown in map view depiction of all wells relative to the proposed injection well in **Figure 26.** All wells targeted shallow oil reservoirs or were unsuccessful dry holes targeting shallow formations with no well exceeding a depth of 2,500 feet MD. There is over 2,000 feet of separation (including the UCZ of the Weches Shale) between these penetrations and the Queen City target injection interval. The likelihood of leakage from existing wells is assessed as improbable.

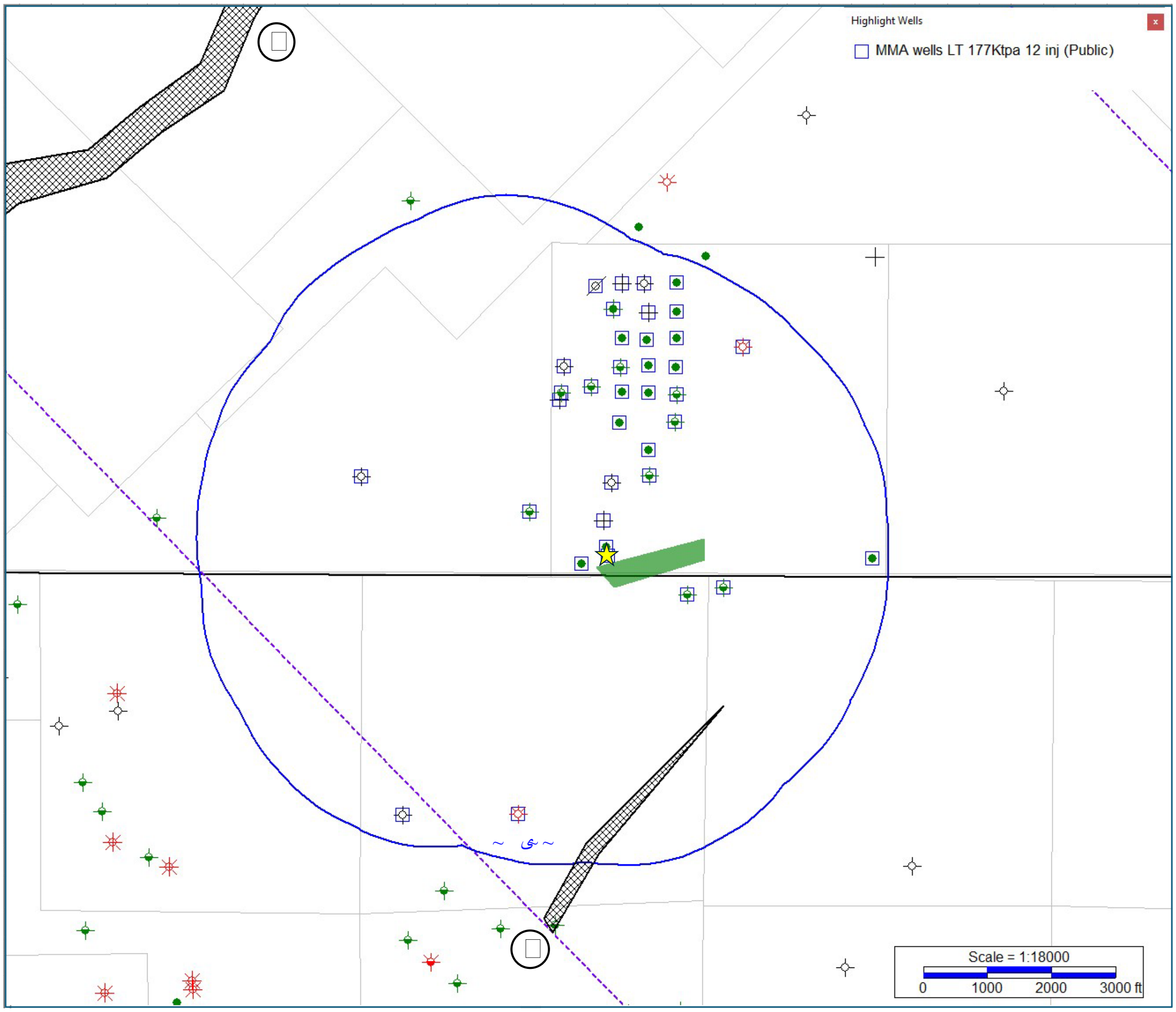

Figure 26. Wells in the AMA/MMA of Lima Tango CCS 1 highlighted with blue squares. The Lima Tango CCS 1 location is shown with a yellow star. The Las Tiendas NGP Plant is shown with a green polygon. Faults are numbered for discussion in the text. North is up.

5.4 Potential Leakage from Fractures and Faults

There are three faults intersecting the Queen City Formation in the modeled area, which is also the area of licensed 3D seismic data. Fault 1 vertically offsets the Queen City Formation by 100-250 feet and is deeply rooted below 10,000 feet (**Figure 27**). The fault cut continues nearly to the surface with consistent minor offset throughout the section indicating that it has had late movement. This fault is well outside of the AMA/MMA (3,200 feet away to the northwest) and, as such, no fault-CO_2 plume interactions are expected.

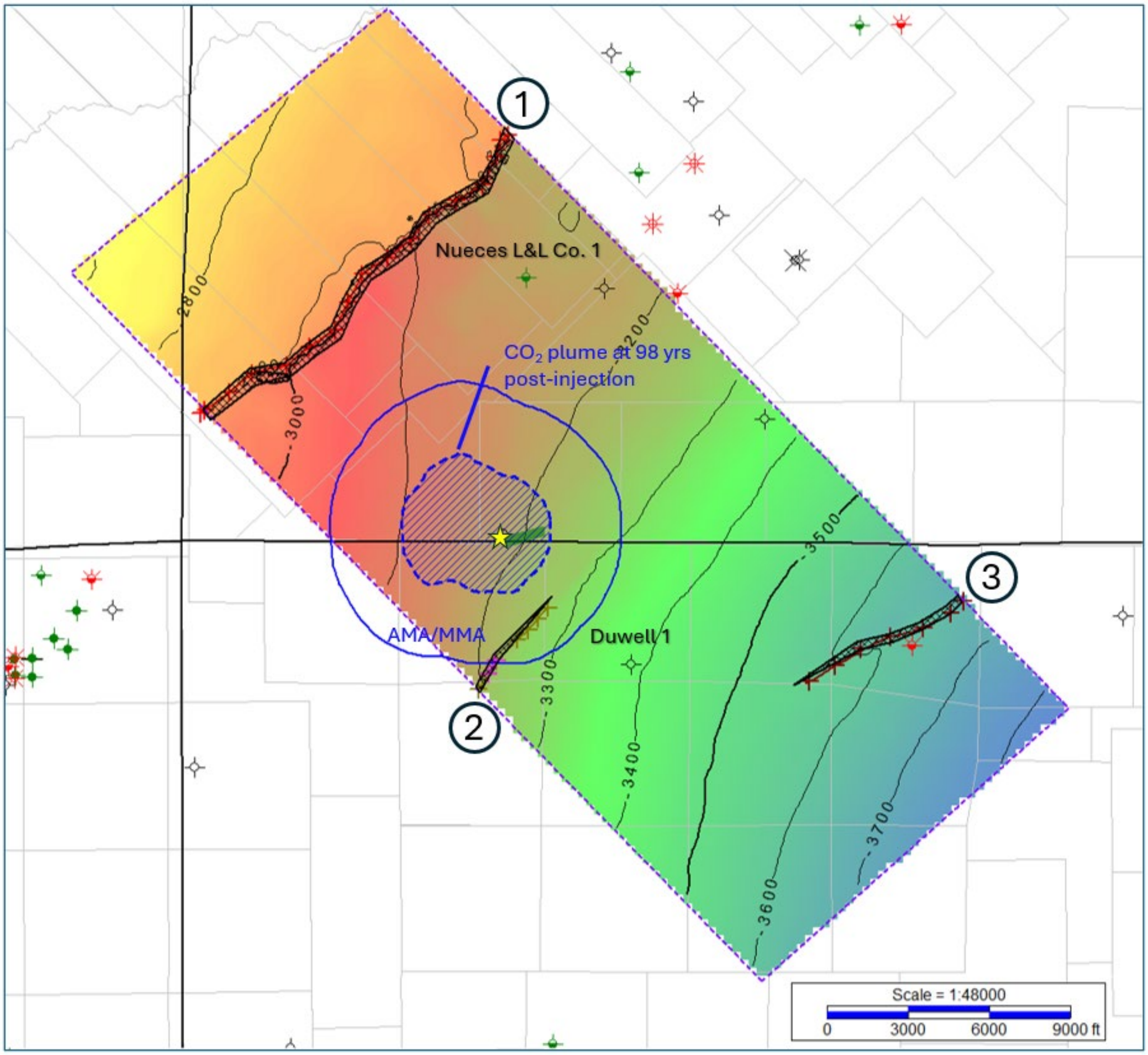

Figure 27. The top Queen City Formation structural contours (feet TVDSS), mapped Queen City Formation faults, AMA/MMA (blue solid line) and 98 years post-injection modeling (blue dashed line). Only wells penetrating the Queen City are shown, with the two closest wells to the injection site labeled. The Lima Tango CCS 1 location is highlighted with a yellow star. Faults are numbered for discussion in the text. North is up.

Fault 2 is much smaller and has a minor vertical offset of 40 to 60 feet within the Queen City Formation (**Figure 27**). In map view, the shortest distance between Fault 2 and the CO_2 plume outline at 98-years post-injection is approximately 1000 feet. The corresponding shortest distance between Fault 2 and the end of injection plume outline is 1200 feet. Fault 3 is located 1.5 miles downdip and southeast from the AMA/MMA; it is not expected to have any fault-CO_2 plume intersections. Both Fault 2 and Fault 3 do not show any displacement beyond a couple hundred feet above the top of the Queen City, thereby limiting their ability to serve as a leak pathway to the shallow USDW and the surface. The likelihood of leakage from fractures and faults is assessed as improbable.

5.5 Leakage Through Confining Layers

The Queen City Formation injection interval is confined by the overlying Weches Shale (the UCZ) and the underlying lower Queen City shales and Reklaw Shale (the LCZ) as described in **Section 3.3.2** and shown in **Figure 10**. The UCZ is comprised of 110 feet of impermeable shale (1% average porosity and 0.002 mD average permeability) as documented in **Table 1**. The LCZ is comprised of 965 feet of impermeable shale (1.5% average porosity and 0.05 mD average permeability) as documented in **Table 1**. These confining zones are supplemented by multiple low-porosity and low-permeability formations separating the Queen City injection interval from the base of the overlying Yegua USDW by a total of 2,300 feet and from the underlying Carrizo-Wilcox USDW by a total of 1,355 feet as described in **Section 3.6**. There are no existing wellbores that penetrate the confining layers in the modeled plume area. There are five wells that penetrate the confining layers in the 20 square mile project area that could serve as potential leakage pathways, but they are all greater than one mile away from the proposed injection well and outside of the AMA/MMA (**Figure 27**). Based on the limited CO_2 plume migration and thick shales above and below the injection interval, the risk of leakage through the confining layers is assessed as improbable.

5.6 Leakage from Natural or Induced Seismicity

The Lima Tango CCS 1 site has no historical seismicity within 19 miles of the proposed well. Mapped faults do not cut down to crystalline basement and have thousands of feet of separation between their deepest offset and the basement. Additionally, injection modeling indicates such minimal pore pressure change at any fault that it is insufficient to cause fault slip. No faults are mapped within the area of the CO_2 plume after 12 years of injection. Based on these factors, the leakage risk due to natural or induced seismicity is assessed as improbable.

Should any unexpected increases in formation pressure be detected, dCarbon can perform Fault Slip Potential (FSP) analysis (Walsh *et al.*, 2017) to evaluate the risk of induced seismicity on the closest mapped faults. dCarbon plans to build this model based on geologic data collected during drilling the Lima Tango CCS 1 well. If there is a concern related to abnormal pressures or seismicity related to operations at the well, dCarbon will shut-in the well and investigate further.

5.7 Leakage from Lateral Migration

The regional dip in the Lima Tango CCS 1 project area is gentle, at approximately two degrees, and therefore lateral migration is expected to be slow and well-behaved. There are five wells in the project area that penetrate the Queen City Formation, but these are all located outside of the AMA/MMA. The wells are depicted in **Figure 27**. The closest well (Duwell 1) is located 6,800 feet down dip and then next closest well (Nueces L&L Co. 1) is located 9,500 feet on strike to the Lima Tango CCS 1 injection well. The Queen City Formation is laterally continuous and of uniform thickness in the project area, making the risk from lateral migration improbable.

6 – PLAN OF ACTION FOR DETECTING AND QUANTIFYING SURFACE LEAKAGE OF CO_2

This section discusses the strategy that dCarbon will employ for detecting and quantifying surface leakage of CO_2 through the pathways identified in previous sections to meet the requirements of 40 CFR § 98.448(a)(3). Monitoring will occur during the planned 12-year injection period, or until the cessation of operations, plus a proposed two-year post-injection period.

6.1 Leakage from Surface Equipment

As the CO_2 compressor station, pipeline, and injection well are all designed to handle the expected concentrations, temperatures, and pressures of H_2S and CO_2, any leakage from surface equipment will be quickly detected and addressed. The concentrations of H_2S and CO_2 are 0.01 and 87.46 mol % as stated in **Table 3**. The facility is designed to minimize potential leakage points by following the American Society of Mechanical Engineers (ASME) standards, API standards, and other industry standards, including standards pertaining to material selection and construction. Additionally, connections are designed to minimize corrosion and leakage points. The facility and well will be monitored for a lack of oxygen in high-risk areas. This monitoring equipment will be set with a low alarm setpoint for O_2 that automatically alerts field personnel of abnormalities. Additionally, all field personnel are required to wear gas monitors, which will trigger the alarm at low levels of oxygen (O_2) (typically 19.5%) and industry standard low and high alarm levels for H_2S. The injection facility will be continuously monitored through automated systems that are designed to identify abnormalities in operational conditions. In addition, field personnel will conduct daily inspections and monthly AVO field inspections of gauges, monitors, and leak indicators. The effectiveness of the internal and external corrosion control program is monitored through the periodic inspection of the system and analysis of liquids collected from the line. These inspections, in addition to the automated systems, will allow dCarbon to quickly identify and respond to any leakage situation. Monitoring will occur for the duration of injection and the post-injection period. Should leakage be detected during active injection operations, the volume of CO_2 released will be calculated based on operating conditions at the time of the event, per 40 CFR § 98.448(a)(5).

The CO_2 for injection will be metered in one location. Once the CO_2 is compressed to a supercritical state, it will pass through a Coriolis meter for measurement and then be transported approximately 150 feet via surface pipeline (see **Figure 17**) to the injection well. The injection stream will also be analyzed with a CO_2 gas chromatograph at the well site to determine the final concentration. The meter will be calibrated to industry standards. Any CO_2 leakage from equipment between the flow meter used to measure injection and the injection wellhead will be quantified using the procedures specified in subpart W of the GHGRP, reported as specified in 40 CFR § 98.448(a)(5) & reflected in term CO_{2FI} of equation RR-12. Leakage will not be separately subtracted from the injection volumes. Gas samples will be taken and analyzed per manufacturer's recommendations to confirm stream composition and calibrate or re-calibrate meter, if necessary. At a minimum, these samples will be taken quarterly. Minimal variation of concentration and composition are expected but will be included in regulatory filings as appropriate.

6.2 Leakage from Existing and Future Wells within the Monitoring Area

There are no wells in the AMA/MMA currently existing, approved, or pending that penetrate as deep as the Queen City injection interval. However, dCarbon will reverify the status and public information for all proposed and approved drilling permits within the MMA quarterly. If any wells are proposed, permitted, or drilled within the MMA, dCarbon will investigate the proposal and determine if any additional risks are introduced through the new well proposal. Additionally, dCarbon will continuously monitor and collect injection volumes, pressures, temperatures, and gas composition data for the injection well. This data will be reviewed by qualified personnel and will follow response and reporting procedures when data is outside acceptable performance limits. Finally, dCarbon will update the MRV plan if any new wells are drilled within the MMA, or if any other material changes to the project occurs.

The injection well design has pressure and temperature gauges monitoring the injection stream at the wellhead as well as bottomhole pressure and temperature gauges near the bottom of the tubing. The downhole gauges will monitor the inside of the tubing (injection stream) as well as the annulus. A change of pressure on the annulus would indicate the presence of a possible leak requiring remediation. Mechanical Integrity Tests (MITs) performed annually would also indicate the presence of a leak. Upon a negative MIT, the well would immediately be isolated, and the leak mitigated.

In the unlikely event that any CO_2 leaks occur into existing or future wells in the monitoring area, dCarbon will endeavor to work with the operator(s) of those wells and/or midstream providers to take wellhead gas samples to quantify variations or increases of CO_2 compared with historical or baseline CO_2 concentrations. Any measurable increases in CO_2 which may be confidently attributed to injection volumes from the Lima Tango CCS 1 well will be calculated using standard engineering procedures for estimating potential well leakage determined to be appropriate for the situation. These volumes will be documented and reported in the annual monitoring report and subtracted from reported injection volumes. Additionally, dCarbon will evaluate and execute any additional downhole remediations (*e.g.*, well workovers, which may include adding plugs or remedial cement jobs) that could address leakage from the injection well to the existing and future wells in the area if necessary and practical.

6.3 Leakage from Faults and Fractures

No faults or fractures have been identified that would allow CO_2 to migrate vertically to zones with USDWs or to the surface. The closest fault to the Lima Tango CCS 1 well has minor offset and does not extend into the shallow formations (Fault 2 in **Figure 27**). It is also outside of the modeled plume after 12 years of injection and plume stabilization. Larger faults in the study area are outside the modeled AMA/MMA.

In the unlikely event that such leakage from faults or fractures occurs, dCarbon will determine which standard engineering techniques for estimating potential leakage from the faults and fractures are appropriate for the situation to estimate any leakage from faults and fractures and report such leakage estimates and the methodology employed in the annual monitoring report.

6.4 Leakage through Confining Layers

Leakage through confining layers is improbable, given the number and thickness of layers between the injection interval and any possible potable groundwater. There are not any groundwater wells near the Lima Tango CCS 1 site as shown in **Figure 16**. dCarbon has reviewed offsetting logs through the possible groundwater interval above the shallow base of USDW and not observed a freshwater response on the resistivity logs. When dCarbon drills the Lima Tango CCS 1 well, logs will be obtained over the potential shallow water zone and evaluated for the presence of porosity and a freshwater response. Should a freshwater response be observed, dCarbon proposes to drill a monitoring well over the groundwater interval and would amend this MRV plan to reflect this change.

Should any CO_2 leakage occur, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation to estimate any leakage and report such leakage estimates and the methodology employed in the annual monitoring report.

6.5 Leakage through Natural or Induced Seismicity

While the likelihood of a natural or induced seismicity event is extremely low, dCarbon plans to monitor for seismic activity using the existing TexNet monitoring system. If a seismic event of 3.0 magnitude or greater is detected, dCarbon will review the injection volumes and pressures at the Lima Tango CCS 1 well to determine if any significant changes occurred that would indicate potential leakage. To suspect leakage due to natural or induced seismicity, the evidence would need to suggest that the earthquakes are activating faults that intersect the confining zones.

In the unlikely event CO_2 leakage occurs due to natural or induced seismicity, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.6 Leakage through Lateral Migration

The distances to the closest penetration of the Queen City injection interval are 2,200 feet from the AMA/MMA boundary and 6,800 feet away from the Lima Tango CCS 1 injection site in a down dip direction (the Duwell 1 well). The next closest penetration is 4,300 feet from the AMA/MMA boundary and 9,600 feet from the injection site on strike (Nueces L&L Co. 1 well). The map in **Figure 27** shows the location of these two wells, which are both plugged dry holes. Given the distance and status of these wells, leakage through lateral migration is not expected.

In the unlikely event CO_2 leakage occurs due lateral migration, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.7 Quantification of Leakage

In the unlikely event that CO_2 moves vertically past the primary and secondary confining layers as described earlier in **Section 6**, there are not existing groundwater wells present in this region to use to monitor for leaks.

The well most suited to use a monitor for leaks into the shallow USDW is the Lima Tango CCS 1 injection well itself. Open hole logs will be collected over each casing interval to screen for evidence of freshwater. Should an aquifer be identified during the drilling and logging of the injection well, a separate groundwater monitoring well will be drilled and used to monitor water quality and sampled annually. If dCarbon notices an increase in groundwater CO_2 concentration compared to baseline measurements, the increase in concentration will be analyzed volumetrically to provide a preliminary estimate of CO_2 leakage.

Any leakage that did extend to the surface could be characterized and quantified through surface surveillance in the project area paired with direct pressure, volume, and temperature (PVT) measurements. Currently available (and continuously improving) atmospheric sensing technology could be used to establish a baseline of ambient CO_2 concentration in the project area and identify any fluctuations. Deviations from baseline concentration along with understanding of the distance from potential leak sources can then be coupled with temporally matched meteorological data to semi-quantitatively determine leak attribution and rate. Based on the size of leak, these qualified or quantified leak rates can be compared with spatiotemporally monitored PVT data to co-index or further refine leaked volumes from likely point sources.

Any diffuse leak or leak without an obvious single point source may require additional identification and quantification methods. dCarbon is working with a leading environmental services and data company that specializes in monitoring and quantifying gas leaks in various industrial settings. One such quantification method involves utilizing fixed monitoring systems to detect CO_2. Additional system capabilities also include the deployment of an unmanned aerial vehicle (UAV), which is outfitted with an industry leading high fidelity CO_2 sensor capable of measuring concentrations as little as parts per billion (ppb). The UAV mobile surveillance platform possesses the ability to be flown on a programmable and highly replicable pattern across the MMA in both X and Y axis (longitude + latitude) as well as Z axis (height). Depending on the system's ability to obtain a reliable baseline across the MMA, areal deviation in CO_2 concentration could be measured, and diffuse leak sources could potentially be identified, provided the emissions reach a sufficient threshold. dCarbon will also consider similar technologies with less spatial resolution or fidelity such as fixed wing flyovers and/or improving satellite data with UAV technology to screen for and support diffuse emissions identification and investigation.

Depending on the applicability and monitoring needs, dCarbon will also consider other monitoring quantification methods such as the Eddy Covariance Method (ECM) (Korre *et al.*, 2011). This method utilizes gas fluxes and ambient meteorological conditions to detect and quantify leaks, although the ability to detect smaller leaks may be limited. Additionally, long open path tunable diode lasers could be used to measure distance averaged concentrations of CO_2 in the air, which could help quantify a leak of CO_2. This system could be paired with an array of short, closed path detectors (*e.g.*, gas chromatographs) that are typically placed around a suspected leak or leak area to monitor point-source CO_2 concentration increases and to quantify leakage. dCarbon may also evaluate other emerging technologies for quantifying CO_2 leakage such as Non-Dispersive Infra-Red (NDIR) CO_2 sensors and soil flux detectors. dCarbon may also utilize three-dimensional reservoir models that factor in faults and surface topography to predict CO_2 leakage locations, quantity, and timing. The applicability of such models in predicting and quantifying gas leaks has been tested and documented at the Leroy natural gas storage site in Wyoming, USA. (Chen, 2013)

As the technology and equipment to quantify CO_2 leakage is rapidly evolving and expected to improve over time, dCarbon will continue to update its leak detection and quantification plans as appropriate. If dCarbon detects a leak associated with CO_2 injection at the Lima Tango CCS 1 well, all methods discussed in this section will be considered in addition to emerging technologies to determine the most applicable and effective method of quantification.

7 – BASELINE DETERMINATIONS

This section identifies the strategies that dCarbon will undertake to establish the expected baselines for monitoring CO_2 surface leakage per § 98.448(a)(4).

Prior to the beginning of injection operations, baseline groundwater quality and properties will be determined and monitored through the installation of a groundwater well near the injection well site if the potential for a freshwater aquifer is observed when drilling the injection well. Samples will be taken and analyzed by a third-party laboratory to establish the baseline properties of the groundwater in the area. dCarbon will sample the groundwater monitoring well quarterly initially to establish the baseline water quality. dCarbon may adjust to annual sampling after one year.

Prior to the beginning of injection operations, baseline seismicity in the area near the Lima Tango CCS 1 will be determined through the historical data from USGS and the TexNet seismic array data hosted by the Texas Bureau of Economic Geology. The TexNet seismic array has been in operations in south Texas since 2017 and was expanded in late 2018. Using the historical data from the TexNet array, dCarbon will establish the seismicity baseline beginning in 2019 for the Lima Tango CCS 1 project.

Once injection operations begin in early 2026, the operational performance data recorded by the continuous data collection systems will be used to establish operational performance baselines and any deviations from those trends will be investigated. Examples of continuous data that will be used in establishing operational baselines are injection pressure and temperature, injection rate, and well annulus pressure and temperature. Any deviations from the established baselines will be investigated as a possible leak indicator.

Non-continuous data will also be collected periodically throughout the life of the project and will aid in leak detection. Daily to weekly AVO inspections will monitor for signs of leakage from surface equipment as outlined in in **Sections 5.1 and 6.1**. Field personnel will carry gas monitors that will monitor for low O_2 levels or high H_2S levels, both a sign of a potential CO_2 leak. Annual MIT testing, as outlined in **Section 6.2**, will test for potential leaks related to the well.

8 – SITE SPECIFIC CONSIDERATIONS FOR DETERMINING THE MASS OF CO_2 SEQUESTERED

This section identifies how dCarbon will calculate the mass of CO_2 injected, emitted, and sequestered. This also includes site-specific variables for calculating the CO_2 emissions from equipment leaks and vented emissions of CO_2 between the injection flow meter and the injection well, per 40 CFR § 98.448(a)(5).

8.1 Mass of CO_2 Received

Per 40 CFR § 98.443, the mass of CO_2 received must be calculated using the specified CO_2 received equations "unless you follow the procedures in 40 CFR §98.444(a)(4)." 40 CFR § 98.444(a)(4) states that "if the CO_2 you receive is wholly injected and is not mixed with any other supply of CO_2, you may report the annual mass of CO_2 injected that you determined following the requirements under paragraph (b) of this section as the total annual mass of CO_2 received instead of using Equation RR-1 or RR-2 of this subpart to calculate CO_2 received."

The CO_2 received by dCarbon for injection into the Lima Tango CCS 1 injection well is wholly injected and not mixed with any other supply and the annual mass of CO_2 injected will equal the amount received. Any future streams will be metered separately before being combined into the calculated stream.

8.2 Mass of CO_2 Injected

Per 40 CFR § 98.444(b), since the flow rate of CO_2 injected will be measured with a volumetric flow meter, the total annual mass of CO_2, in metric tons, will be calculated by multiplying the volumetric flow at standard conditions by the CO_2 concentration in the flow and the density of CO_2 at standard conditions, according to Subpart RR Equation 5:

$$CO_{2,u} = \sum_{p=1}^{4} Q_{p,u} * D * C_{CO_{2,p,u}}$$

Where:

$CO_{2,u}$	=	Annual CO_2 mass injected (metric tons) as measured by flow meter u.
$Q_{p,u}$	=	Quarterly volumetric flow rate measurement for flow meter u in quarter p at standard conditions (standard cubic meters per quarter).
D	=	Density of CO_2 at standard conditions (metric tons per standard cubic meter): 0.0018682.
$C_{CO2,p,u}$	=	CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO_2, expressed as a decimal fraction).
p	=	Quarter of the year.
u	=	Flow meter.

8.3 Mass of CO_2 Produced

The Lima Tango CCS 1 well will receive CO_2 produced from the nearby ET Las Tiendas NGP Plant and the CO_2 will be injected for geologic sequestration only. No CO_2 will be produced from the injection well. The injection will occur into a saline, non-productive aquifer and is not part of an enhanced oil recovery project. Natural gas processed at the ET Las Tiendas NGP Plant primarily comes from gas wells producing from the Eagle Ford Formation which is stratigraphically deeper than the Queen City injection intervals and well outside the MMA/AMA. The closest Eagle Ford wells are roughly eight miles northwest of the injection location.

8.4 Mass of CO_2 Emitted by Surface Leakage

Mass of CO_2 emitted by surface leakage and equipment leaks will not be measured directly as the injection stream for this well contains hydrogen sulfide (H_2S), which may be hazardous for field personnel to perform a direct leak survey. Any leakage would be detected and managed as a major upset event. Gas detectors and continuous monitoring systems would trigger an alarm upon a release. The mass of the CO_2 released would be calculated for the operating conditions at the time, including pressure, flow rate, size of the leak point opening, and duration of the leak. This method is consistent with 40 CFR § 98.448(a)(5), allowing the operator to calculate site-specific variables used in the mass balance equation.

In the unlikely event that CO_2 was released because of surface leakage, the mass emitted would be calculated for each surface pathway according to methods outlined in the plan and totaled using 40 CFR Part 98-Subpart RR Equation 10 as follows:

$$CO_{2,E} = \sum_{x=1}^{X} CO_{2,x}$$

Where:

$CO_{2,E}$	=	Total annual mass emitted by surface leakage (metric tons) in the reporting year
$CO_{2,x}$	=	Annual CO_2 mass emitted (metric tons) at leakage pathway x in the reporting year
X	=	Leakage pathway

Annual mass of CO_2 emitted (in metric tons) from any equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flowmeter used to measure injection quantity and injection wellhead will comply with the calculation and quality assurance/quality control requirement proposed in Part 98, Subpart W and will be reconciled with the annual data collected through the monitoring plan.

8.5 Mass of CO_2 Sequestered

The mass of CO_2 sequestered in the subsurface geologic formations will be calculated using 40 CFR Part 98, Subpart RR Equation 12, as this well will not actively produce any oil or natural gas or any other fluids, as follows:

$$CO_2 = CO_{2I} - CO_{2E} - CO_{2FI}$$

Where:

CO_2	=	Total annual CO_2 mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
$CO_{2,I}$	=	Total annual CO_2 mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
$CO_{2,E}$	=	Total annual CO_2 mass emitted (metric tons) by surface leakage in the reporting year.

CO_{2FI}	=	Total annual CO_2 mass emitted (metric tons) from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead, for which a calculation procedure is provided in Subpart W of Part 98.

9 – ESTIMATED SCHEDULE FOR IMPLEMENTATION OF MRV PLAN

The injection well is expected to begin operation at a to-be-determined date in early 2026. Baseline data will be collected before injection begins and the MRV plan will be implemented upon receiving Environmental Protection Agency (EPA) MRV plan approval. Collection of data for calculating the total amount of CO_2 sequestered will begin at the same to-be-determined date in early 2026 that the injection well is operational, and CO_2 is being injected.

10 – QUALITY ASSURANCE

10.1 CO_2 INJECTED

- The flow rate of the CO_2 being injected will be measured with a volume flow meter, consistent with industry best practices. These flow rates will be compiled quarterly.
- The composition of the CO_2 stream will be measured upstream of the volume flow meter with a gas composition analyzer or representative sampling consistent with industry best practices.
- The gas composition measurements of the injected stream will be averaged quarterly.
- The CO_2 measurement equipment will be calibrated according to manufacturer specifications.

10.2 CO_2 EMISSIONS FROM LEAKS AND VENTED EMISSIONS

- Gas detectors will be operated continuously, except for maintenance and calibration.
- Gas detectors will be calibrated according to manufacturer recommendations and API standards.
- Calculation methods from Subpart W will be used to calculate CO_2 emissions from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

10.3 MEASUREMENT DEVICES

- Flow meters will be continuously operated except for maintenance and calibration.
- Flow meters will be calibrated according to the requirements in 40 CFR § 98.3(i).
- Flow meters will be operated per an appropriate standard method as published by a consensus-based standards organization.
- Flow meter calibrations will be traceable to the National Institute of Standards and Technology (NIST).

All measured volumes of CO_2 will be converted to standard cubic feet at a temperature of 60 degrees Fahrenheit and an absolute pressure of 1.0 atmosphere.

10.4 MISSING DATA

In accordance with 40 CFR § 98.445, dCarbon will use the following procedures to estimate missing data if unable to collect the data needed for the mass balance calculations:

- If a quarterly quantity of CO_2 injected is missing, the amount will be estimated using a representative quantity of CO_2 injected from the nearest previous period at a similar injection pressure.
- Fugitive CO_2 emissions from equipment leaks from facility surface equipment will be estimated and reported per the procedures specified in Subpart W of 40 CFR § 98.

11 – RECORDS RETENTION

dCarbon will retain records as required by 40 CFR § 98.3(g). These records will be retained for at least three years and include:

- Quarterly records of the CO_2 injected.
- Volumetric flow at standard conditions.
- Volumetric flow at operating conditions.
- Operating temperature and pressure.
- Concentration of the CO_2 stream.
- Annual records of the information used to calculate the CO_2 emitted by surface leakage from leakage pathways.
- Annual records of information used to calculate CO_2 emitted from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

12 – REFERENCES

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13 - APPENDIX

13.1 EXPIRED PERMITS FROM THE TRRC

Table 9 – Expired permits from TRRC database*.

API	Well No.	Symbol_Description	Location_Source	Latitude	Longitude
311	2B	Permitted Location	Commission`s hardcopy map	28.0660035	-98.7681379
311	8	Permitted Location	Commission`s hardcopy map	28.0695958	-98.7640217
311	4	Permitted Location	Commission`s hardcopy map	28.0636247	-98.7627483

* These permitted wells may exist as dry holes in the S&P Global database well list below

13.2 WELLS IN MMA

Table 10 – Wells in the MMA (sourced from S&P Global database).

API	Well Name	Well Num	Latitude	Longitude	Status	Total Depth	Operator
421310007000	SOC FOR PROPAGATI	1	28.0565397	-98.7603987	Dry Hole with Oil Show	1350	PETROLEUM PRODUCERS INC
421310007100	NUECES LD & LVESTCK	1	28.0562470	-98.7621096	Dry Hole with Oil Show	1227	BASOM G W TRUSTEE
421313171800	NUECES LD&LVSTCK	1	28.0467414	-98.7758977	Dry Hole	2154	GULF OIL CORP
421313316400	NUECES MINERALS CO	1	28.0467787	-98.7703195	Dry Hole with Gas Show	2500	VICTORIA MINERALS
423110147400	NUECES LD LSTK	1	28.0613037	-98.7779357	Dry Hole	2225	PARKER PETROLEUM CO
423110147500	NUECES LAND & LIVESTOCK CO	1	28.0597908	-98.7697815	Dry Hole with Oil Show	1193	SMITH & COSNER
423110147900	NUECES LAND & LIVESTOCK	1	28.0683736	-98.7640390	Unknown	1215	SECONDARY OIL CORP INC
423110148000	NUECES LAND & LIVESTOCK	2	28.0684014	-98.7626783	Oil Well	1220	OHIO FUEL SUPPLY CO
423110148100	NUECES LAND & LIVESTOCK	3	28.0696469	-98.7626704	Oil Well	1215	OHIO FUEL SUPPLY CO
423110148200	NUECES LAND & LIVESTOCK	4	28.0578346	-98.7531587	Oil Well	1212	SECONDARY OIL CORP INC
423110148400	NUECES LAND & LIVESTOCK	6	28.0696207	-98.7653094	Unknown	1208	SECONDARY OIL CORP INC
423110148500	NUECES L & 6 CO	9	28.0649230	-98.7640330	Oil Well	1220	GRAHAM TOM
423110148600	NUECES L&L CO	10	28.0660888	-98.7640133	Oil Well	1215	GRAHAM BROTHERS
423110148700	NUECES L&L CO	11	28.0671777	-98.7641023	Oil Well	1221	GRAHAM TOM
423110148800	NUECES L&L CO	12	28.0672632	-98.7626518	Oil Well	1227	GRAHAM BROTHERS
423110148900	NUECES L&L CO	13	28.0660097	-98.7627152	Oil Well	1224	GRAHAM BROTHERS

423110149000	NUECES L & L CO	14	28.0648630	-98.7626668	Dry Hole with Oil Show	1223	GRAHAM BROTHERS
423110149200	NUECES LND & LVSTCK	2-A	28.0624432	-98.7640137	Oil Well	1213	BISHOP OIL CO
423110149300	NUECES LD & LIVESTOCK	3-A	28.0613433	-98.7639772	Dry Hole with Oil Show	1216	BISHOP OIL CO
423110149400	NUECES LAND & LIVESTOCK	4A	28.0636782	-98.7627331	Dry Hole with Oil Show	1251	BISHOP OIL CO
423110149500	NUECES LAND & LIVESTOCK	1B	28.0649387	-98.7653312	Oil Well	1206	SECONDARY OIL CORP INC
423110149600	NUECES L&L CO	2B	28.0660141	-98.7653893	Dry Hole with Oil Show	1348	BISHOP OIL CO
423110149700	NUECES LAND & LIVESTOCK	3B	28.0651833	-98.7668115	Dry Hole with Oil Show	1199	BISHOP OIL CO
423110149800	NUECES L & L CO	4B	28.0672593	-98.7653290	Oil Well	1208	SECONDARY OIL CORP INC
423110149900	NUECES LD & LVSTK	1B	28.0646304	-98.7683287	Unknown	1213	KRASNER SAM
423110150000	NUECES LD & LVSTK	2B	28.0660570	-98.7681225	Dry Hole	1222	KRASNER SAM
423110150100	NUECES LD LSTK	2D	28.0583058	-98.7660810	Oil Well	1200	KRASNER SAM
423110150200	NUECES LD LSTK	3D	28.0575764	-98.7672696	Oil Well	1195	KRASNER SAM
423110150300	NUECES LD & LIVE ST	1	28.0649237	-98.7682537	Dry Hole with Oil Show	1505	DUNCAN N V
423110150400	NUECES LAND & LIVESTOCK	1	28.0668838	-98.7594553	Dry Hole with Gas Show	1268	TAYLOR REFINING CO
423110150500	NUECES LAND & LIVESTOCK	1-A	28.0636250	-98.7654534	Oil Well	1213	SECONDARY OIL CORP INC
423110150600	NUECES LAND & LIVESTOCK CO	8	28.0696167	-98.7642548	Dry Hole	1222	NUGENT GEORGE V & L V OIL ACCT
423110236100	NUECES LD LIVESTOCK	1-D	28.0594141	-98.7661765	Unknown	1196	KRASNER SAM & WOODMAN L L
423113141700	NUECES MINERALS	1	28.0610659	-98.7658244	Dry Hole	1358	DKD JOINT VENTURE
423113143500	NUECES MINERALS	2	28.0685222	-98.7657277	Abandoned Oil Well	1280	DKD JOINT VENTURE
423113508200	SCOPE-MUNSON	1	28.0695062	-98.7665958	Abandoned Location		SCOPE PRODUCTION CO LLC

13.3 Approved W-14, W-1, and Drilling Permits

Request for Additional Information: Lima Tango CCS 1
May 13, 2025

Instructions: Please enter responses into this table and make corresponding revisions to the MRV Plan as necessary. Any long responses, references, or supplemental information may be attached to the end of the table as an appendix. This table may be uploaded to the Electronic Greenhouse Gas Reporting Tool (e-GGRT) in addition to any MRV Plan resubmissions.

No.	**MRV Plan**		**EPA Questions**	**Responses**
	Section	**Page**		
1.	6.1	44	"Any CO2 that is determined to have leaked or not been received at the injection wellhead will be quantified using the procedures specified in subpart W of the GHGRP, reported as specified in 40 CFR § 98.448(a)(5), and subtracted from reported injection volumes." Please note that any CO2 leakage from equipment between the flow meter used to measure injection and the injection wellhead should be reflected in term CO_{2FI} of equations RR-11 or RR-12. Therefore, these volumes should not be separately subtracted from the injection volumes. We recommend reviewing these equations and updating this section if necessary.	Section modified to read: "Any CO_2 leakage from equipment between the flow meter used to measure injection and the injection wellhead will be quantified using the procedures specified in subpart W of the GHGRP, reported as specified in 40 CFR § 98.448(a)(5) & reflected in term CO_{2FI} of equation RR-12. Leakage will not be separately subtracted from the injection volumes."
2.	6.4	46	"Leakage through confining layers is improbable, given the number and thickness of layers between the injection interval and any possible potable groundwater. There are not any groundwater wells near the Lima Tango CCS 1 site as shown in **Figure 19**." This statement appears to make an incorrect reference to Figure 19. Please review and revise if necessary.	This statement is in reference to Figure 16. MRV Plan updated with correct reference.

Subpart RR Monitoring, Reporting, and Verification (MRV) Plan

Lima Tango CCS 1

McMullen County, Texas

Prepared by

BKV dCarbon Ventures, LLC

April 1, 2025

TABLE OF CONTENTS

1 – INTRODUCTION

BKV dCarbon Ventures, LLC (dCarbon), a subsidiary of BKV Corporation (BKV), is authorized by the Texas Railroad Commission (TRRC) to inject up to 9.5 million standard cubic feet per day (MMscfd), equivalent to approximately 177,000 metric tons per year (MT/yr), of carbon dioxide (CO_2) into the proposed Lima Tango CCS 1 injection well in McMullen County, Texas. The permit issued by the TRRC allows injection into the Queen City formation at a depth of 3,508 feet to 4,870 feet with a maximum allowable surface pressure of 1,700 pounds per square inch gauge (psig).

dCarbon intends to dispose of CO_2 into the Lima Tango CCS 1 well produced from the nearby Las Tiendas Natural Gas Processing (NGP) Plant, operated by Energy Transfer LP (ET), which is a separate pre-existing facility. The Lima Tango CCS 1 injection well/facility and the ET Las Tiendas NGP Plant are not under common ownership or common control, and the ET Las Tiendas NGP Plant has a function separate and distinct from the injection well source category, making them separate and distinct facilities under 40 CFR 98.6.

The project site is 15.44 mi NW of Freer, Texas, as shown in **Figure 1**.

dCarbon anticipates drilling and completing the Lima Tango CCS 1 well in the third quarter of 2025 and beginning injection operations in early 2026. The Lima Tango CCS 1 well has approved Form W-14 injection and Form W-1 drilling permits with the TRRC permit number 17575, Underground Injection Control (UIC) number 000126980, and American Petroleum Institute (API) number 42-311-37581. Copies of the approved Form W-1 and W-14 permits are included in the **Appendix, Section 13.3.**

Although dCarbon intends to initiate injection with lower volumes, all calculations in this document have been performed assuming the maximum injection amount allowed by the TRCC permit (177,000 MT/yr). dCarbon plans to inject for 12 years.

dCarbon submits this Monitoring, Reporting, and Verification (MRV) plan for approval by the Environmental Protection Agency (EPA) in accordance with 40 CFR § 98.440-449, Subpart RR, of the Greenhouse Gas Reporting Program (GHGRP).

dCarbon's TRRC operator number is 100589.

dCarbon's Environmental Protection Agency Identification (EPA ID) number is 110071343305.

The Lima Tango CCS 1 well's Greenhouse Gas Reporting Program Identification (GHGRP ID) number is 590006. All aspects of this MRV plan refer to this well and this GHGRP ID number.

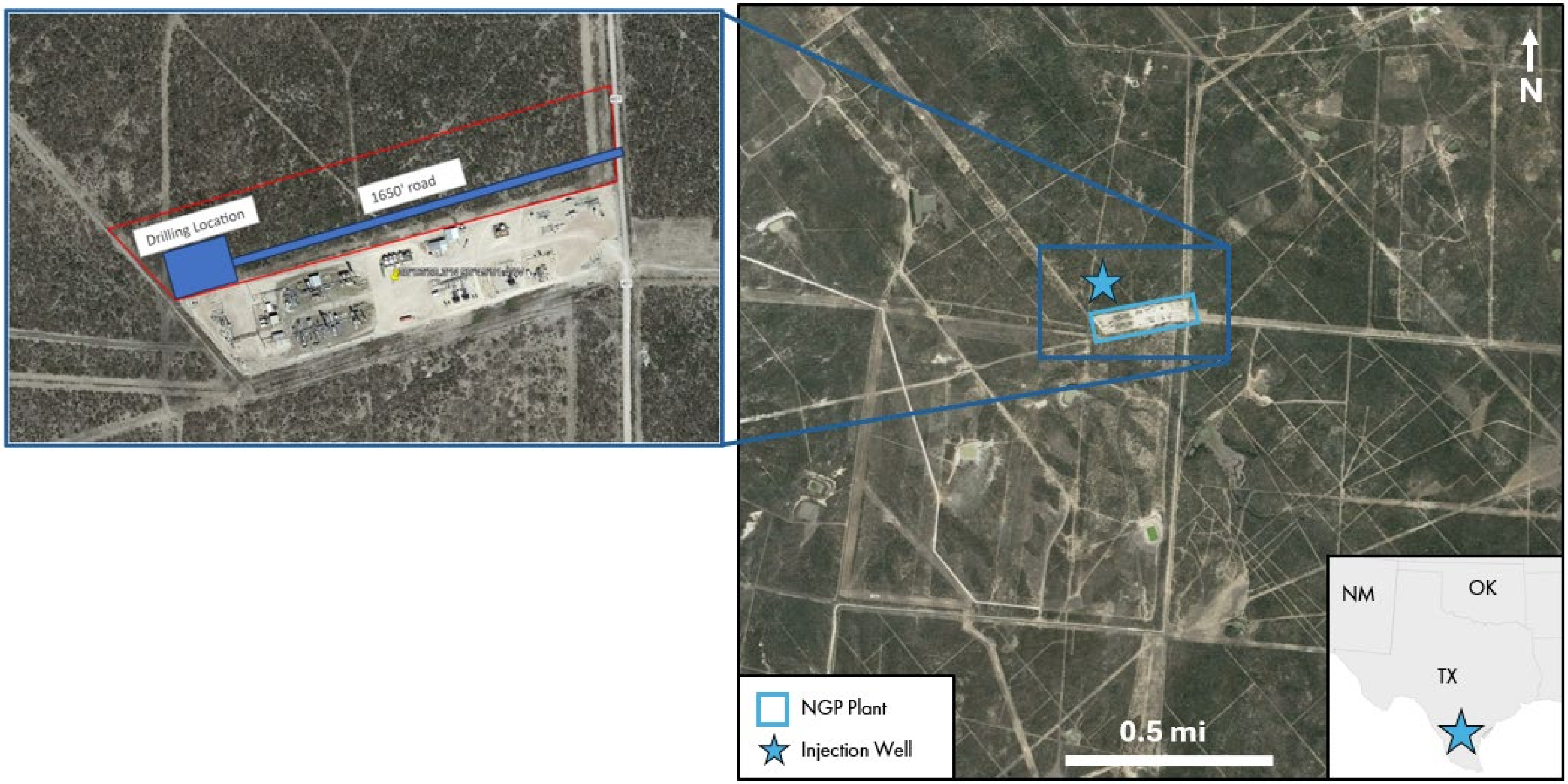

Figure 1. Location map of the Las Tiendas NGP Plant and the proposed Lima Tango CCS 1 injection well drilling location adjoining the plant in McMullen County, Texas.

2 – FACILITY INFORMATION

Gas Plant Facility Name:

Las Tiendas Plant
348 County Road 401
Freer, Texas 78357

Latitude: 27° 57.63' N
Longitude: 98° 35.64' W

Operator: Energy Transfer LP

GHGRP ID number: 1010735

Facility Registry Service Identifier (FRS ID): 110071159879

North American Industry Classification System (NAICS) Code: 486210

Reporting structure: Onshore Natural Gas Processing

Underground Injection Control (UIC) Permit Class:

The Oil and Gas Division of the Texas Railroad Commission (TRRC) regulates oil and gas activity in Texas and has primacy to implement the Underground Injection Control (UIC) Class II program for injection wells. The TRRC has permitted the Lima Tango CCS 1 well as an UIC Class II well. The Class II permit was issued to dCarbon in accordance with Statewide Rule 9.

Injection Well:

Operator: BKV dCarbon Ventures, LLC

Lima Tango CCS 1, API number 42-311-37581

UIC number: 000126980

Lima Tango CCS 1, GHGRP ID: 590006

3 – PROJECT DESCRIPTION

This section discusses the geologic setting, the lithology and reservoir characteristics of the planned injection and confining intervals, the formation fluid geochemistry, the potential for induced seismicity, the groundwater hydrology in the project area, the CO_2 project facilities, and the reservoir modeling performed for the proposed Lima Tango CCS 1 injection well. dCarbon has prepared this MRV plan to support the storage of CO_2 in McMullen County, Texas. The term interval is used for the composite layers and the term zone is used for the specific layers of rocks for the storage and confinement of CO_2.

3.1 Overview of Geology

Paleogene deposition began with the mud-rich Paleocene Midway Shale (**Figure 2**), which is widely present across the northern and western Gulf of Mexico margins. Sediment supply and sand content increased markedly thereafter, with deposition of the coarse siliciclastics of the Paleocene Lower and Middle Wilcox Formations and the Eocene Upper Wilcox Formation, followed by the Eocene Queen City and Sparta Formations. These deposits rapidly filled foreland troughs and prograded across the former Upper Cretaceous shelf margins. Sediment starved mud-rich intervals are present between the Upper Wilcox and Queen City Formations (as the Eocene Reklaw Shale) and between the Queen City and Sparta Formations (as the Eocene Weches Shale) as shown in **Figure 2**. The storage interval for this project is the Queen City Formation and the Reklaw and Weches Shales are lower and upper confining zones, respectively.

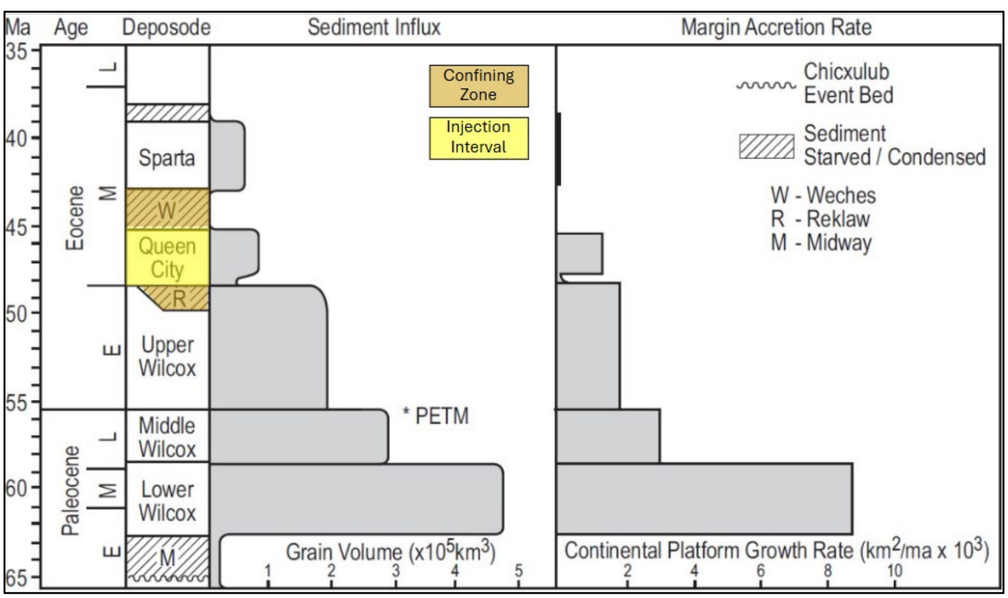

Figure 2. Regional stratigraphy at Lima Tango CCS 1 site in McMullen County, Texas, (modified from Snedden and Galloway, 2019). The Eocene sediment starved/condensed sections are in hachured fill and labeled R (Reklaw Shale) and W (Weches Shale). These are the lower and upper confining zones, respectively, for the Queen City Formation injection interval.

In this area, the Middle Eocene strata are tens of miles up dip from the shelf edge and the growth fault rafting that characterizes the time-equivalent section in the Gulf of Mexico. A published seismic section near the proposed injection site (**Figure 3**) illustrates the gentle dip and lack of growth faulting at the position of the proposed Lima Tango CCS 1 (red star). The strata in this setting are uniform in thickness, gently dipping towards the coast with less than two degrees of dip, and unimpacted by growth-fault related accommodation. We expect that the injected CO_2 will gradually migrate up dip to the west and northwest, owing to its buoyancy relative to the saline reservoir water. There are three faults mapped at the Queen City stratigraphic level in the Lima Tango CCS 1 model area. The most significant one is in northwestern part of the licensed 3D seismic area and is 1.2 miles from the modeled 98-year post-injection plume extent and 1.5 miles from the modeled 50-pounds per square inch (psi) change in pressure due to the injection. **Section 5.4** describes this fault further and addresses the lack of leakage risk that it presents given the fault's distance away from the modeled plume and pressure front.

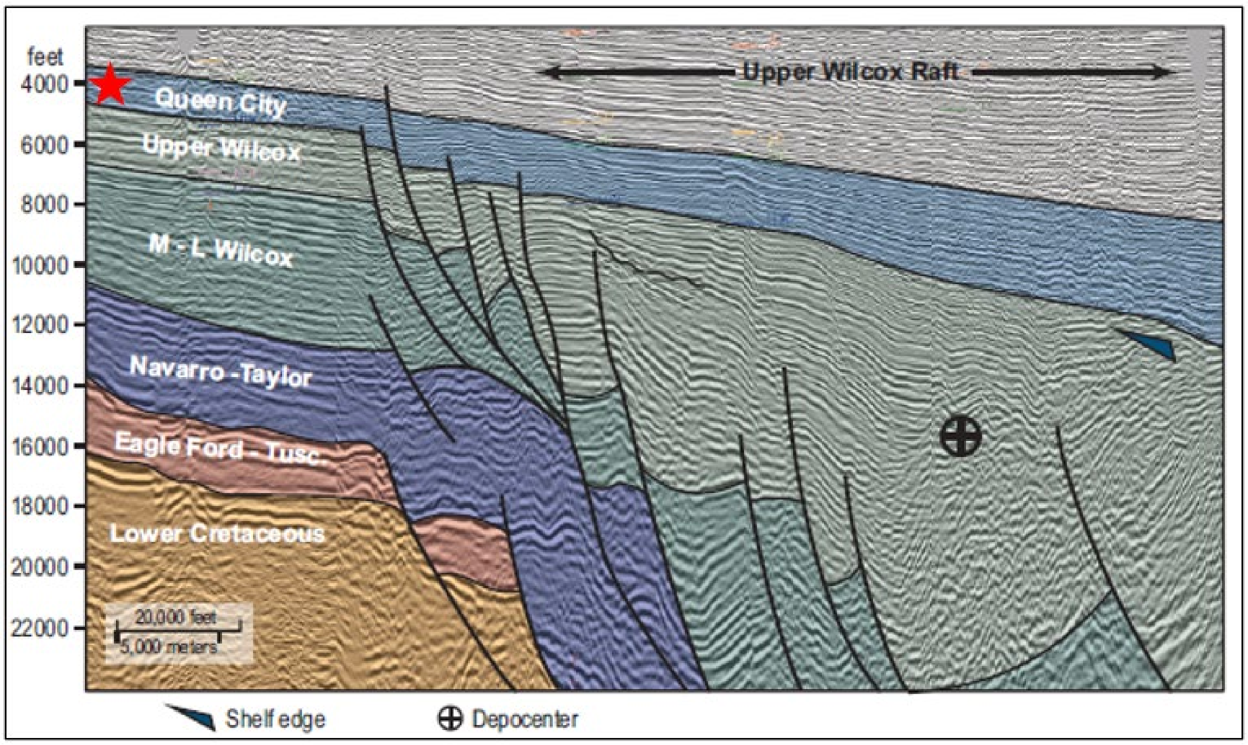

Figure 3. Representative northwest to southeast seismic cross section from Snedden and Galloway (2019) with the Queen City Formation and the Lima Tango project annotated with a red star. Figure 4 shows the line of section location.

3.2 Bedrock Geology

3.2.1 Basin Description

The proposed injection site lies in in McMullen County, Texas, just north of the border between McMullen and Duval Counties. The project takes place in the Gulf of Mexico basin, originally

formed by rifting during the Jurassic (Snedden and Galloway, 2019). The basin began rapid filling thereafter in the Cretaceous and Paleogene with large volumes of continentally derived sediments transported to the coastal plain by the Rio Grande River system, with the shales representing times of sediment starvation or condensed section. **Figure 4** presents a regional paleogeographic construction representative of the time of deposition of the Queen City Formation injection interval (Middle Eocene) by Galloway and Snedden (2019).

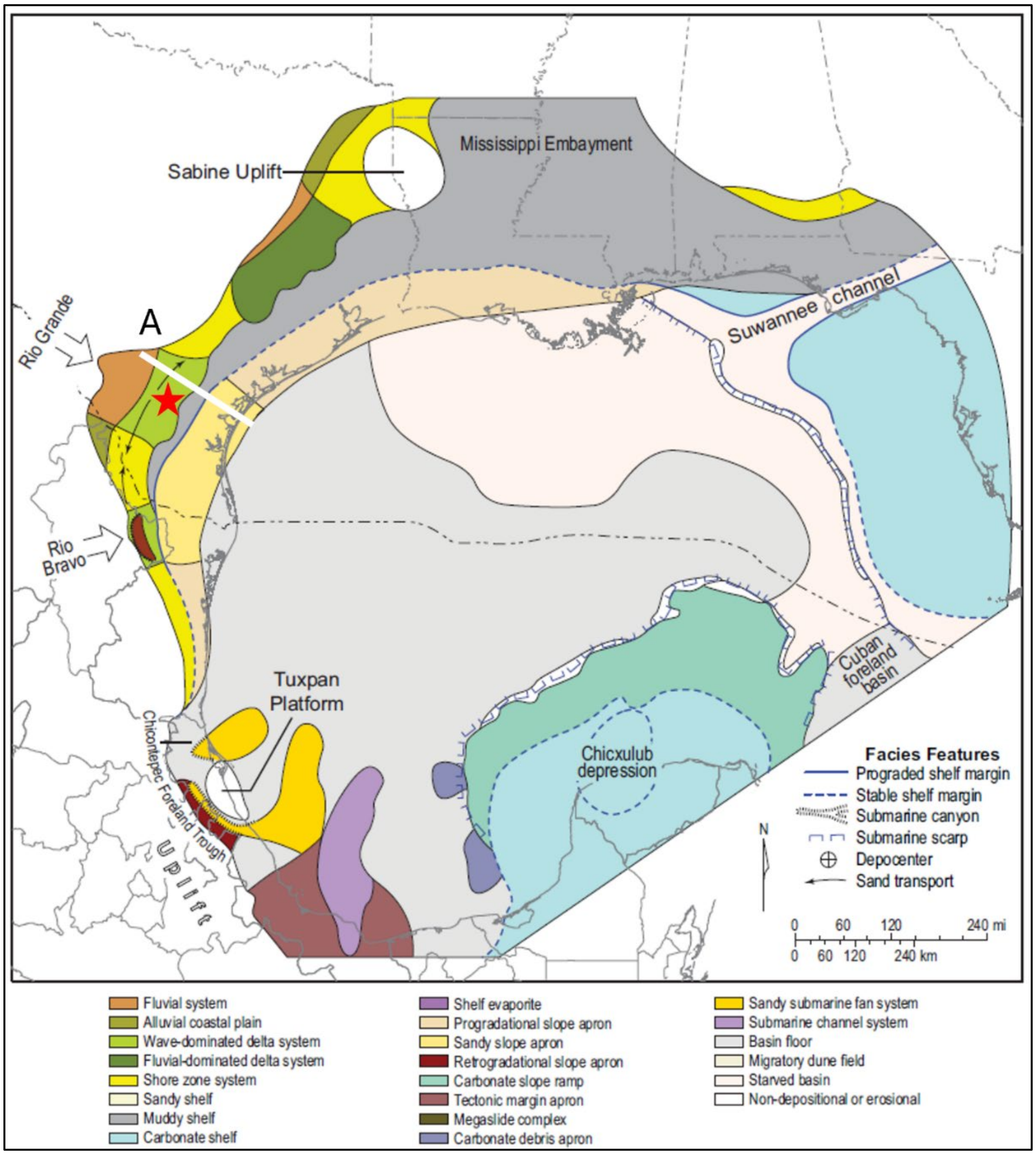

Figure 4. Middle Eocene paleogeographic reconstruction by Snedden and Galloway (2019). The Queen City Formation was deposited during this time, with the red star denoting the proposed injection site in the wave-dominated deltaic depositional environment. The location of the seismic line in Figure 3 is the white line marked by the letter "A".

3.2.2 Stratigraphy

Deposition of the Middle to Upper Eocene strata occurred in a wave-dominated deltaic setting along the margin of the early Gulf of Mexico basin (**Figure 4)**. The Queen City Formation is estimated to occur at depth ranging from 3,508-4,870 ft true vertical depth (TVD) with a reference datum of ground level at the Lima Tango CCS 1 proposed well site and has approximately 1,400 feet of uniform gross thickness across the modeled area. The Queen City Formation is the injection interval and is comprised of three potential injection zones (IZs). The Middle Eocene Weches Shale, with 110 feet of gross thickness, is the Upper Confining Zone (UCZ), and the lower Queen City shale and Early Eocene Reklaw Shale, with 965 feet of gross thickness, including over 50 feet of continuous impermeable shale, is the Lower Confining Zone (LCZ). **Figure 2** shows the stratigraphic relationship of the two confining zones and the injection interval.

Attractive attributes for CCS storage in the project area includes high storage capacity, minimal faulting, tight widespread confining shales, and gentle dip down to the coast. The injection interval is a package of thick, sheet-like, laterally continuous, porous, and permeable sandstone bodies characterized by low spontaneous potential (SP) and high deep resistivity (DRES) readings relative to the shales on wireline logs as shown in the type log (**Figure 5**) and cross section (**Figure 6)**. Individual sand bodies are separated by internal confining shales with higher SP and lower DRES wireline log signatures. The entire injection interval is bracketed by thick upper and lower confining shales, also with higher SP and lower DRES wireline log signatures. Both the injection interval and confining zones are laterally continuous and maintain constant thickness across the project area with a gentle up to the northwest dip (**Figure 6**). The upper confining shale (Weches Shale) is widespread and serves as the regional seal for the Queen City storage assessment unit (SAU) (Roberts-Ashby *et al*., 2014).

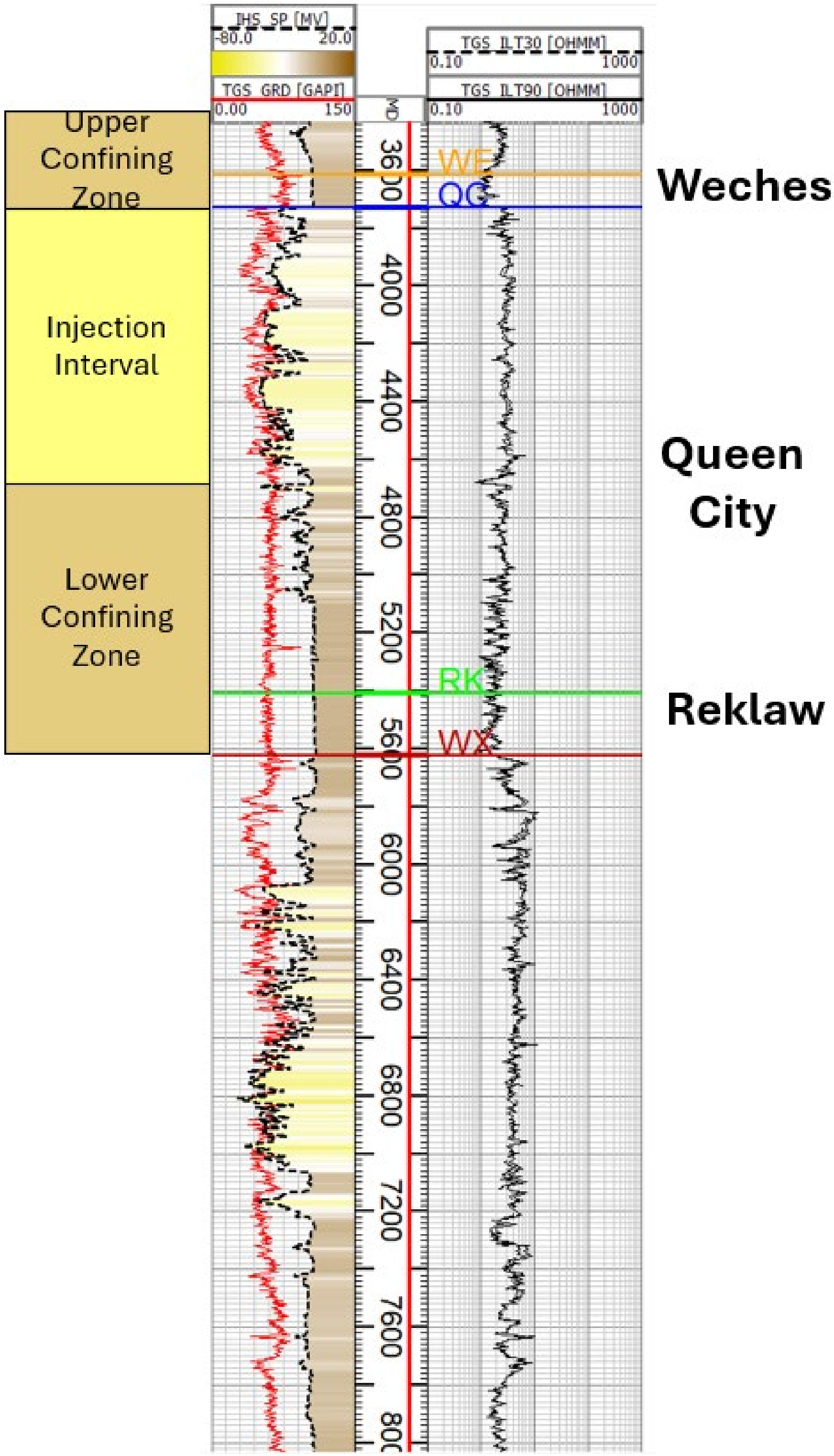

Figure 5. Nueces Mineral No. 1 (API 42-311-3181300) type log depicting the confining zones, injection interval, and associated formation names in the project area. The left column contains gamma ray (GR) (red) and SP (color-filled) curves, and the right column contains a DRES curve (black) on a logarithmic scale. Depth scale is in the middle column is in feet measured depth (MD).

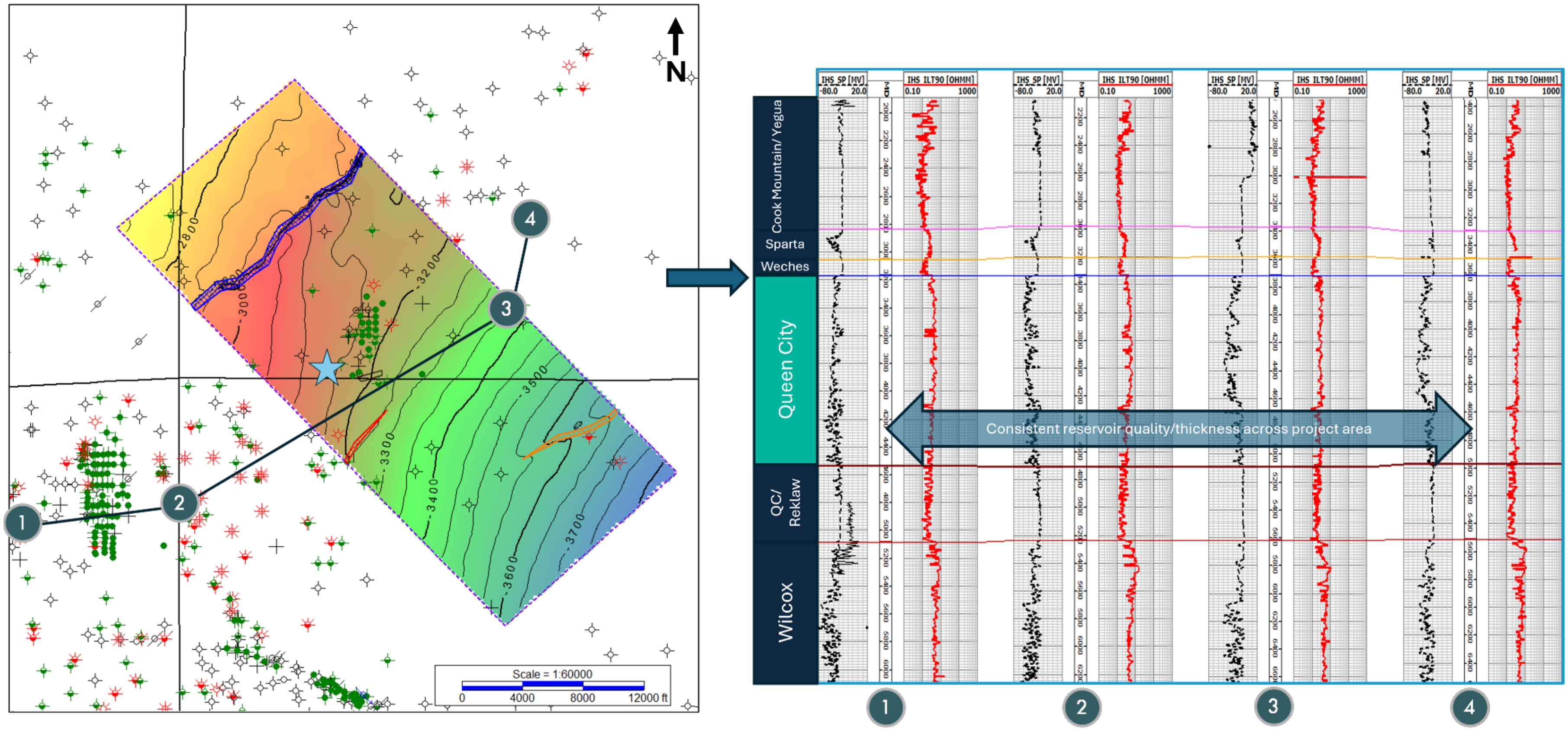

Figure 6. Map of the Lima Tango CCS 1 project area with proposed injection well (light blue star), existing wells, faults, seismic data, cross section wells, and numbered stratigraphic cross section flattened on the Queen City Formation top. The cross section is a four-well section from southwest to northeast across the project area with wells numbered on both the map and cross section. The licensed three dimensional (3D) seismic data is represented by the rectangular area of color filled structural contours on the top of the Queen City Formation in feet true vertical depth subsea (TVDSS) with a contour interval of 50 feet. The Weches Shale is the UCZ for the Queen City storage interval; the lowermost Queen City (QC) and Reklaw Shale are the LCZ for the Queen City and serves as an impermeable barrier between the Queen City and the Upper Wilcox aquifer.

3.2.3 Faulting

The Lima Tango CCS 1 well site is characterized by gentle dip (less than two degrees) and little faulting (**Figure 7**). Paleogene faulting along the western margin of the Gulf of Mexico was initiated by slump over Mesozoic shelf margins during very rapid sediment deposition. The Lima Tango CCS 1 site is located landward of these shelf margins (**Figure 3**) and much of the sediment bypassed this area to the offshore. As such, the deposition was more uniform in this area and the mechanisms for growth faulting were not in place.

There are three faults intersecting the Queen City Formation that have been mapped on the 3D seismic data licensed for this project (**Figure 7**). A late, down-to-the-coast fault with 100-250 feet of offset is on the northwestern portion of the seismic data (**Figure 7**, blue fault labeled 1). This fault is rooted in the Mesozoic section and continues nearly to the surface with consistent offset throughout the section indicating that it moved late.

An antithetic to this fault (**Figure 7**, orange fault labeled 3) is mapped on the southeastern portion of the seismic data, dipping to the northwest. This fault cuts down to the Upper Cretaceous and has offset up to 60 feet within the Queen City Formation.

A smaller fault (**Figure 7**, red fault labeled 2) was mapped in the middle portion of the seismic data. It also dips to the southeast, cutting down from the Eocene to Upper Paleocene section, with minimal offset.

Additional deep, normal faults with minor offset were mapped on the licensed three dimensional (3D) seismic and intersect neither the Queen City Formation nor the lower confining zone.

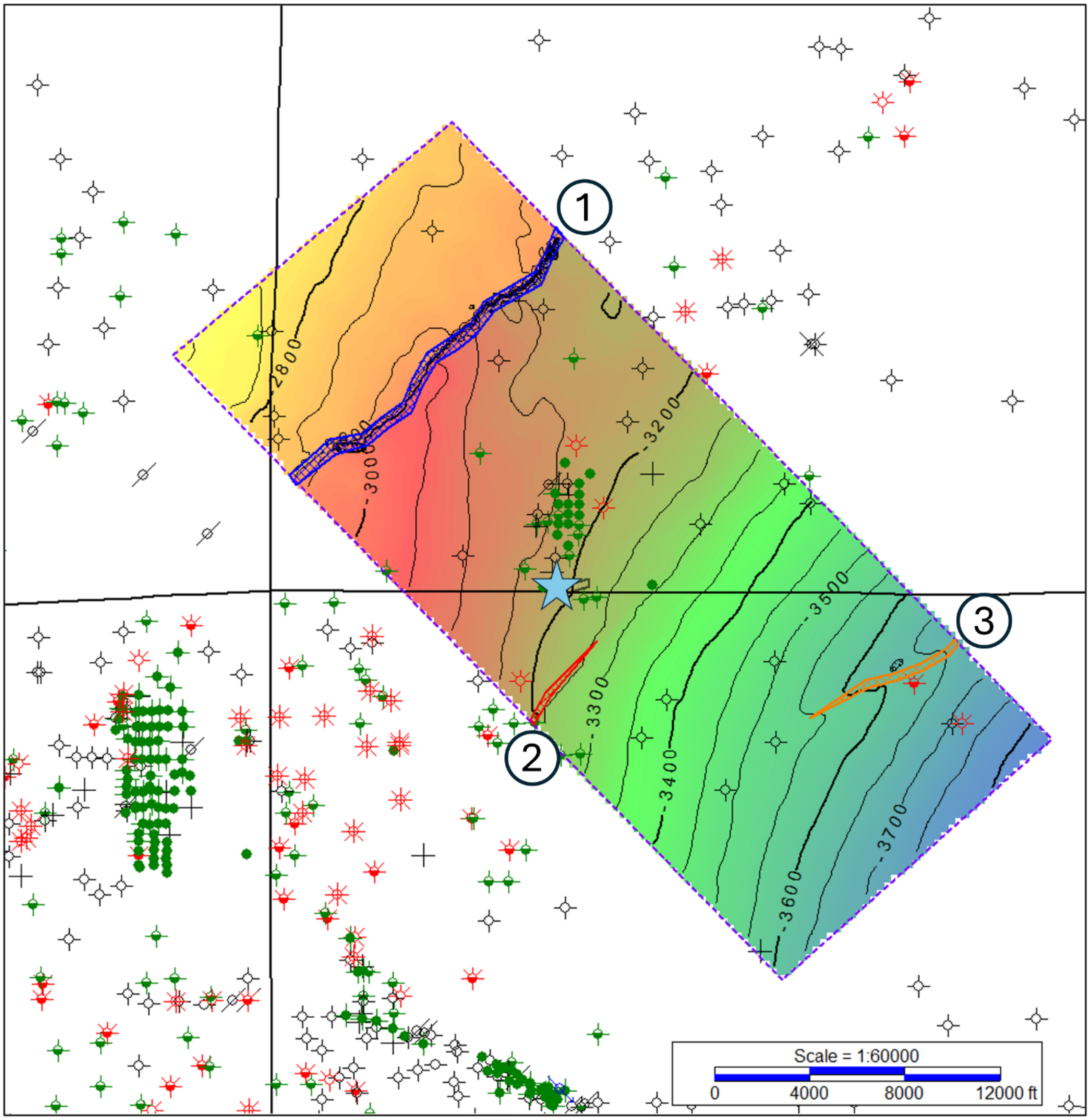

Figure 7. Top Queen City Formation structure in feet TVDSS with a contour interval of 50 feet. The injection well is highlighted with the blue star and all existing oil and gas wells are shown. Faults are indicated by the colored polygons and numbers. North is up.

3.3 Lithological and Reservoir Characterizations

A set of 69 digital well logs and 81 raster well logs that were deep enough to reach the Queen City Formation were used to map the subsurface. Formation tops were interpreted on well logs and tied to 20 square miles of licensed 3D seismic data. Digital logs from the Nueces Minerals No. 1 type log were used to construct a petrophysical model that included a porosity-permeability transform, water saturation calculation, geomechanical properties, and facies. **Figure 8** depicts the datasets utilized for interpretations described in this project.

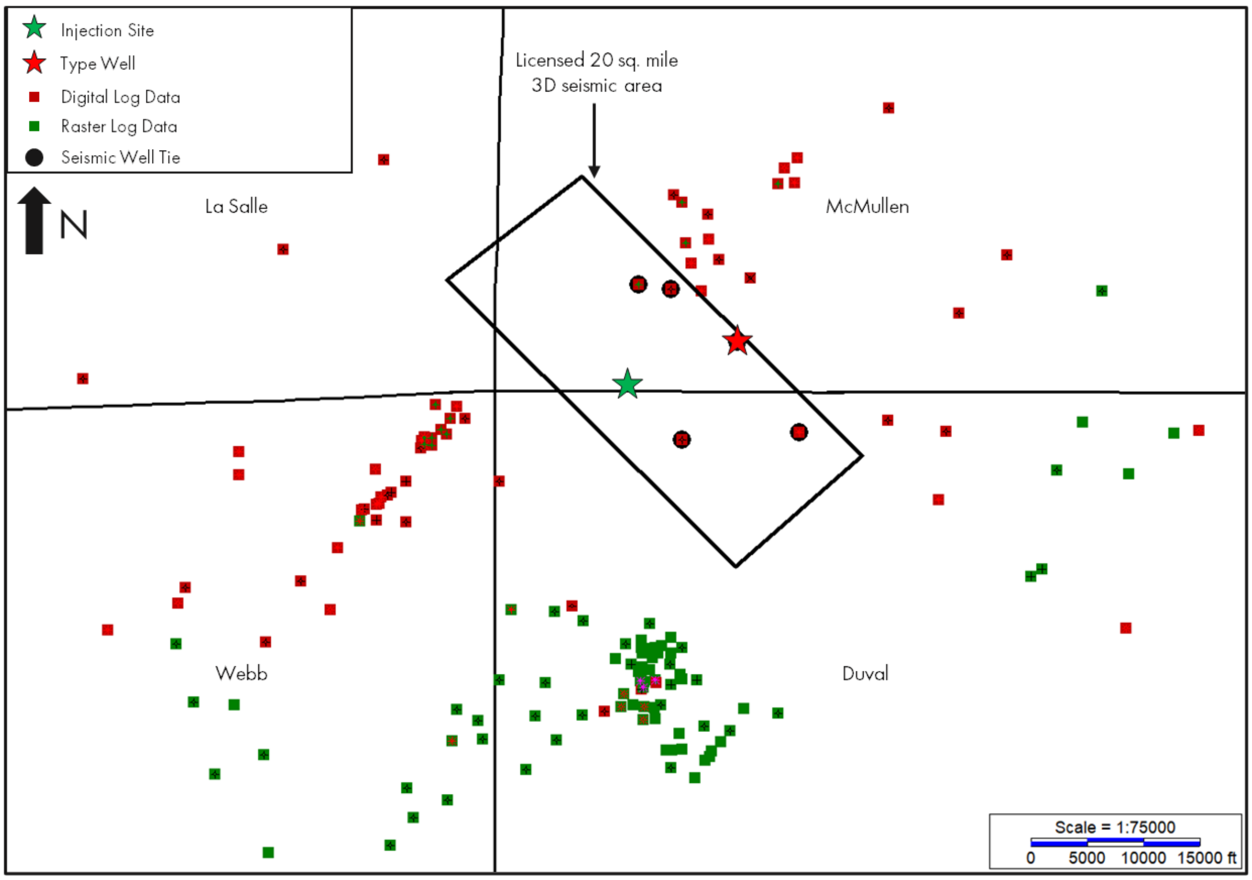

Figure 8. Data availability map depicting the 150 wells with digital wireline logs (red squares) and raster logs (green squares) in the mapped area. The Nueces Mineral No. 1 type log used for petrophysical interpretations (red star) and the 20 square miles of licensed and reprocessed 3D seismic data relative to the proposed Lima Tango CCS 1 injection well (green star) are also shown. Note that not all drilled wells are shown on this map.

3.3.1 Injection Interval

The Queen City Formation is the injection interval. It is comprised of three sand-rich injection zones (IZs) designated IZ-1 to IZ-3 (**Figure 9**). They have low volume clay (vClay) (less than 15 percent (%)) and a dominance of sand (greater than 60 %) in our petrophysical and facies models, respectively.

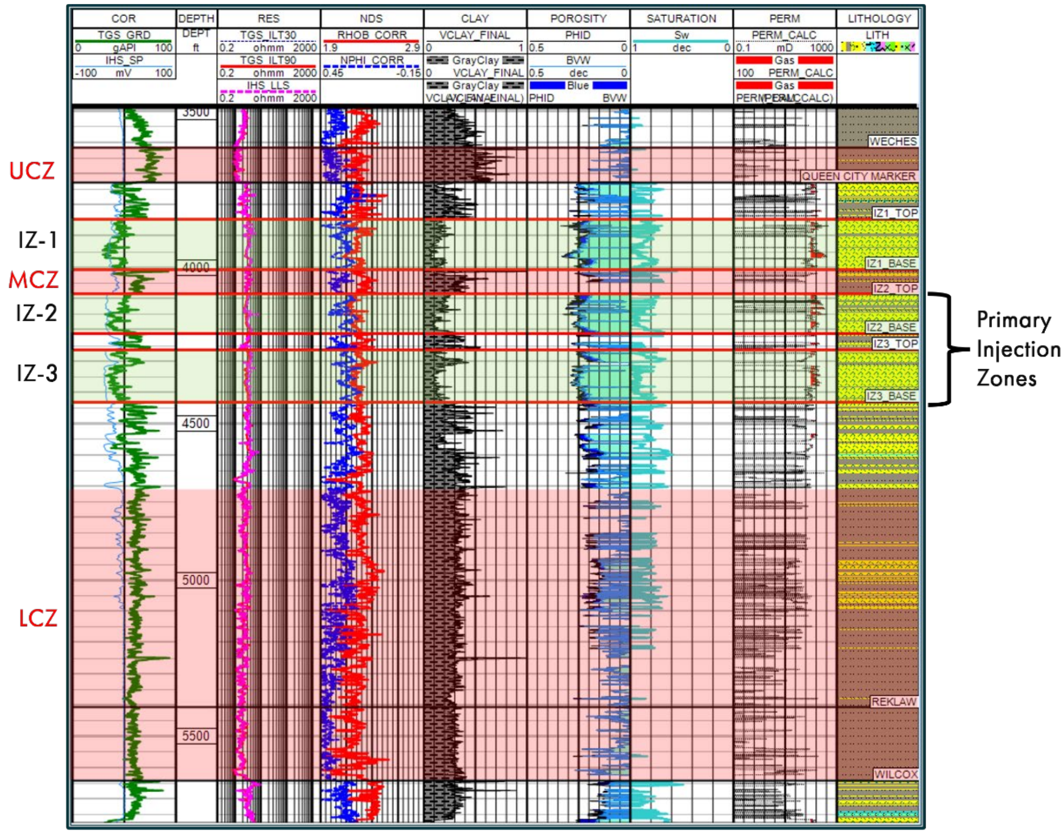

Figure 9. Petrophysical log of the Nueces Minerals No. 1 well with the Queen City Formation primary injection interval annotated on the right and the individual injection and confining zones annotated on the left. The injection interval is comprised of Injection Zone 2 (IZ-2) and Injection Zone 3 (IZ-3). Injection Zone 1 (IZ-1) was mapped but not included as part of the CO_2 plume model.

3.3.2 Confining Zones

The Weches Shale, which overlies the Queen City Formation, and the Reklaw Shale, which underlies the Queen City Formation, were identified as the UCZ and LCZ, respectively. These shales are comprised of starved, condensed, shale-dominated intervals with high gamma ray, low resistivity, and low porosity log signatures, as well as high vClay and a dominance of shale (greater than 30%) in our petrophysical and facies models.

3.3.3 Injection and Confining Zones and Properties

A petrophysical interpretation of wireline logs available at the Nueces Minerals No. 1 well is presented in **Figure 9**. The individual injection and confining zones are highlighted in green and red, respectively and labeled at the left. The modeled primary IZ is annotated at the right. The UCZ is compromised of the Weches Shale, Injection Zone 1 (IZ-1) is comprised of uppermost Queen City sand, the Middle Confining Zone (MCZ) is comprised of a shale within the Queen City, Injection Zone 2 (IZ-2) is comprised of the next major sand down in the Queen City, and Injection Zone 3 (IZ-3) is comprised of a well-developed sand in the middle of the Queen City. The LCZ was additionally identified as the Reklaw Shale but there are also shales with very thinly interbedded sands in the basal Queen City that have low porosity and permeability. This interval

is highlighted as also contributing to the LCZ in **Figure 9**. The dominant lithology, thickness, porosity, and permeability of each zone is presented in **Table 1**.

Table 1. Properties of the Queen City Formation injection zones and the Weches Shale, Queen City, and Reklaw Shale confining zones assessed at the Lima Tango project area. Porosity is given in percent (%) and permeability is given in millidarcies (mD).

Subunit	Dominant Lithology	Thickness (feet)	Average Reservoir Porosity (%)	Average Reservoir Permeability (mD)	Description
Upper Confining Zone (UCZ)	Shale	110	1	0.002	Weches Shale
Injection Zone 1 (IZ-1)	Sand	160	16	75	Queen City sand (identified but not modeled)
Middle Confining Zone (MCZ)	Shale	90	3	0.2	Queen City intraformational shale
Injection Zone 2 (IZ-2)	Sand	125	20	120	Queen City sand
Injection Zone 3 (IZ-3)	Sand	168	19	100	Queen City sand
Lower Confining Zone (LCZ)	Shale	965	1.5	0.05	Lowermost Queen City interbedded sands and shales and the Reklaw Shale

3.4 FORMATION FLUID CHEMISTRY

The available formation fluid chemistry analyses available from the United States Geological Survey (USGS) National Produced Waters Geochemical Database v2.3 for the targeted Queen City Formation injection interval are shown in in **Figure 10**. All values are located southeast or east of the Lima Tango CCS 1 site and have Total Dissolved Solids (TDS) values greater than 20,000 parts per million (ppm). The average, low, and high TDS values are presented in **Table 2** as are the corresponding values for potential of hydrogen (pH), sodium (Na), calcium (Ca), and chlorides (Cl).

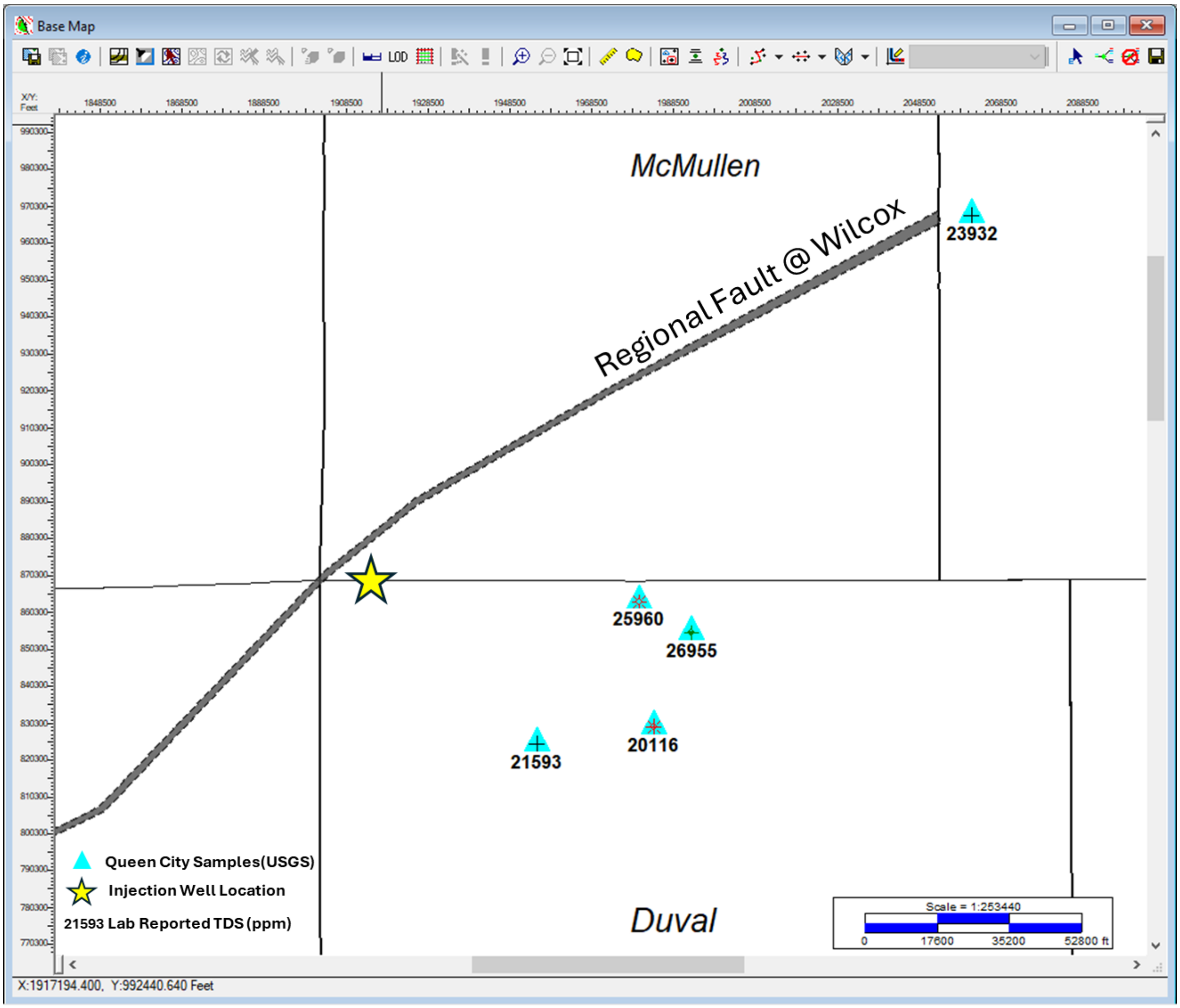

Figure 10. Map showing the location and values of TDS (ppm) in wells with of available USGS water samples values from the Queen City Formation. These were used in the formation fluid chemistry analysis. Regional fault location is from Kosters, *et al.*, 1989. North is up.

Table 2. Queen City Formation fluid chemistry.

	TDS (ppm)	pH	Na (ppm)	Ca (ppm)	Cl (ppm)
AVG	23,711	7.8	8,900	92	12,815
LOW	20,116	7.4	7,561	54	10,950
HIGH	26,955	8	10,100	152	14,700

3.5 POTENTIAL OF INDUCED SEISMICITY

There has been no earthquake activity near the Las Tiendas NGP plant or within 25 kilometers (km) since 2017 according to the TexNet earthquake monitoring network. The earthquake activity present north of the site as shown in **Figure 11** is believed to result from oil and gas well completions activity in the Eagle Ford trend. The Queen City Formation proposed injection interval at the Lima Tango CCS 1 site is thousands of feet above the crystalline basement rock. As such, seismicity risk related to this project's injection of CO_2 is expected to be nominal.

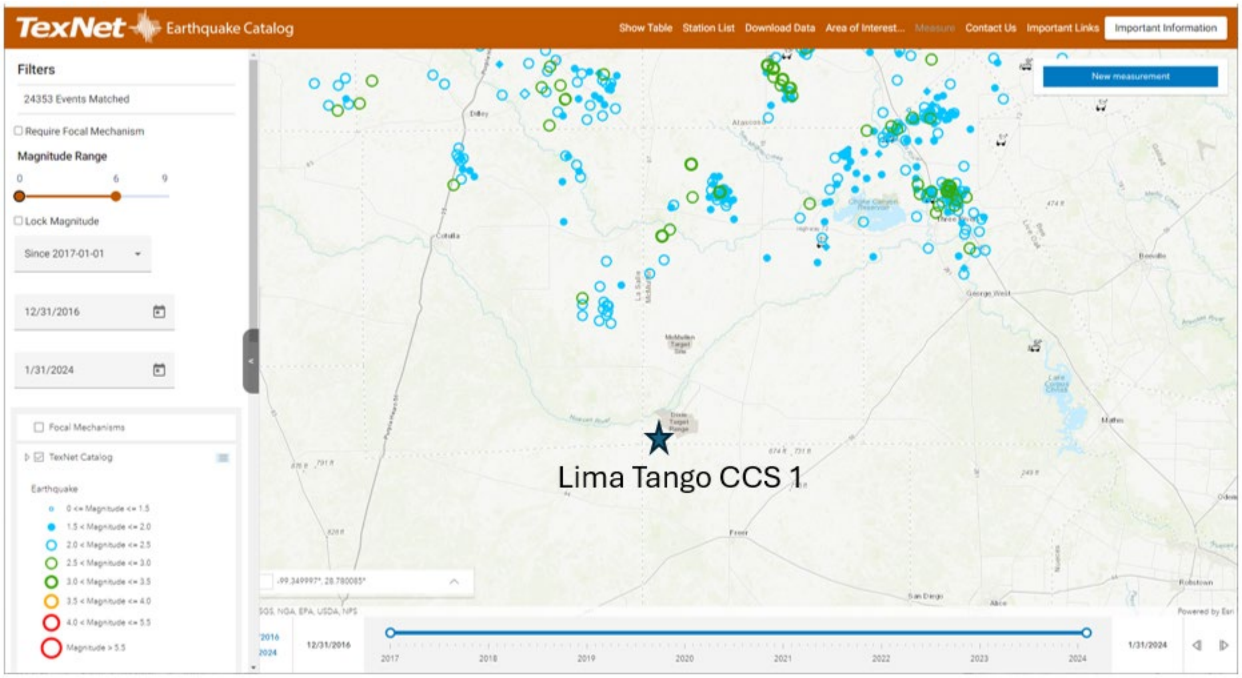

Figure 11. Map of historical seismic activity within 25 km of the proposed Lima Tango CCS 1 site from the Texas Seismological Network (TexNet) Seismic Monitoring Network. North is up.

3.6 GROUNDWATER HYDROLOGY

The proposed Lima Tango CCS 1 injection site lies on the southeastern edge of both the mapped limits of the Carrizo-Wilcox and the Jackson-Yegua aquifers (**Figures 12 and 13).** The proposed disposal interval (Queen City) is estimated to be 3,508 - 4,870 feet true vertical depth (TVD) at the injection site and is isolated from the shallow Underground Source of Drinking Water (USDW) (Jackson-Yegua) and the deep potential USDW (Carrizo-Wilcox). **Figure 14** depicts the injection interval and confining zones relative to both USDWs and the Base of Useable Quality Water strata (BUQW). Note that the Nueces Minerals No. 1 type log shown in this figure is approximately 170 feet downdip from the injection well and picks have been adjusted accordingly.

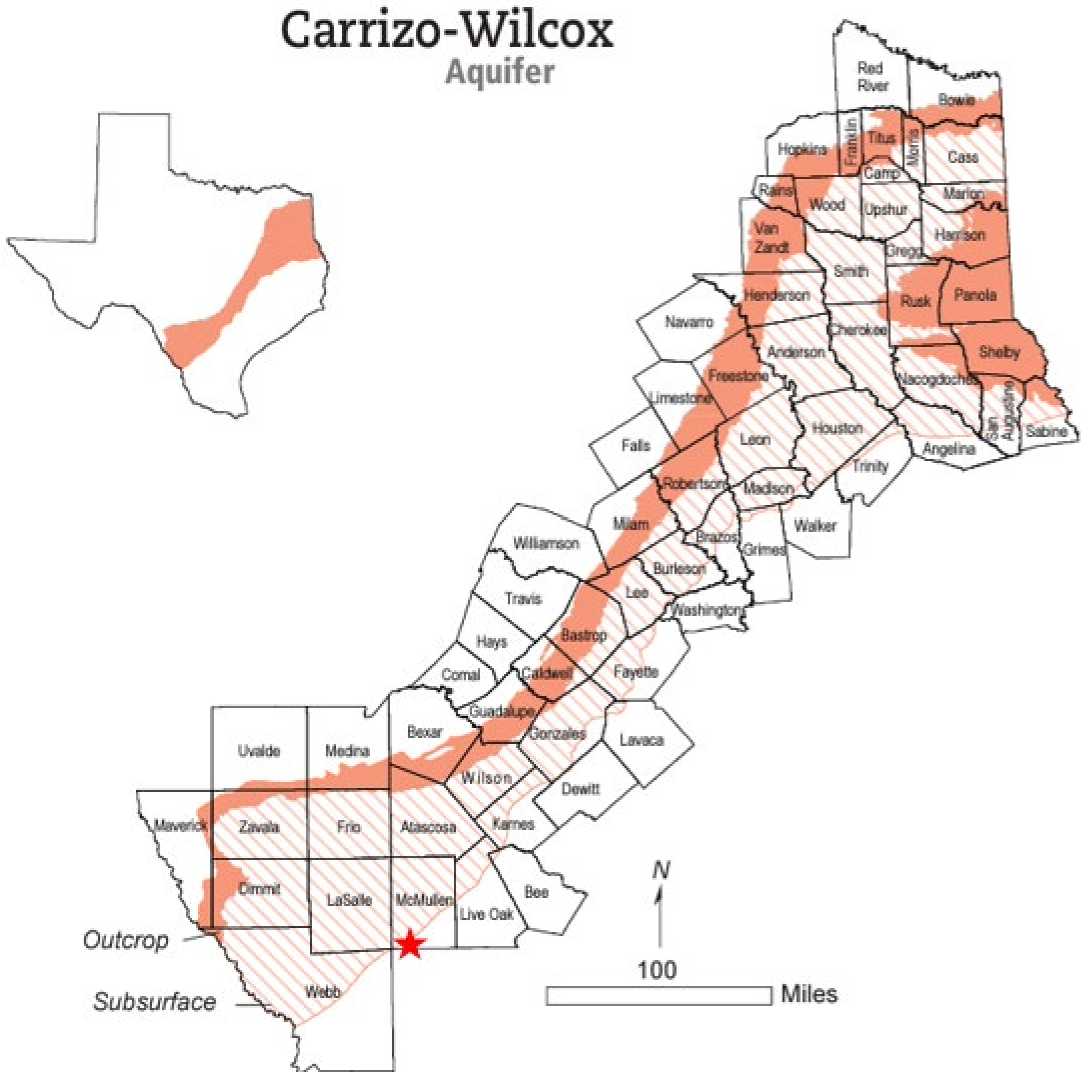

Figure 12. Carrizo-Wilcox aquifer map and recharge area, with outcrop shown in solid fill and subsurface in hachured fill, relative to proposed injection well (red star). Modified from George *et al.*, 2011.

Figure 13. Yegua-Jackson aquifer map and recharge area relative to proposed injection well (red star). Modified from George *et al*., 2011.

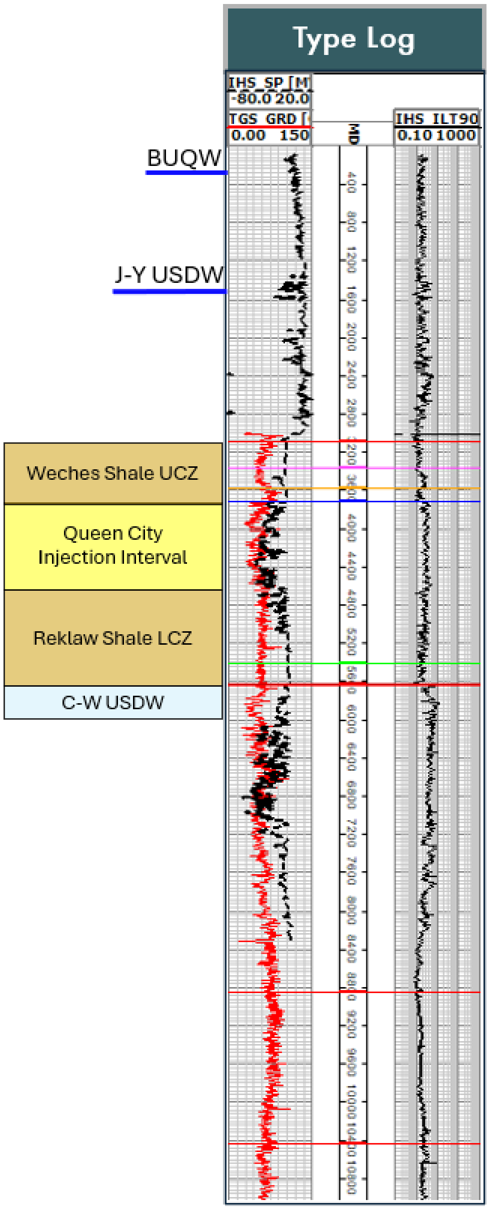

Figure 14. The Nueces Minerals No. 1 type log annotated with the BUQW, the Jackson-Yegua (J-Y) USDW, the Weches Shale UCZ, the Queen City injection interval, the Reklaw Shale LCZ, and the Carrizo-Wilcox (C-W) USDW.

The Jackson-Yegua aquifer is 2,300 feet above the Queen City injection interval and separated from the injection interval by multiple low-porosity and low-permeability formations, most notably, the Weches Shale which is identified as the UCZ (**Figure 14)**. The Carrizo-Wilcox aquifer is 965 feet below the Queen City injection interval and isolated from it by the Reklaw Shale LCZ. Both the Weches and Reklaw Shales have been mapped as aquitards in numerous Texas Water Development Board (TWDB) publications, (Galloway *et al.*, 1991; Sharp *et al.*, 1991). Water samples from the Carrizo-Wilcox aquifer illustrate the increasing salinity of the aquifer downdip to the southeast (**Figure 15**). Owing to the transitional nature and the uncertainty of the

water quality at the Lima Tango CCS 1 injection site, the TRRC Groundwater Advisory Unit (GAU) considers the Carrizo-Wilcox aquifer a potential USDW. Therefore, dCarbon demonstrated geologic isolation between the proposed injection zone and the Carrizo-Wilcox potential USDW and the TRRC GAU agreed that sufficient isolation existed to support dCarbon's W-14 injection permit. There are no water wells within the two-mile radius of the Lima Tango CCS 1 injection site as shown in **Figure 16**.

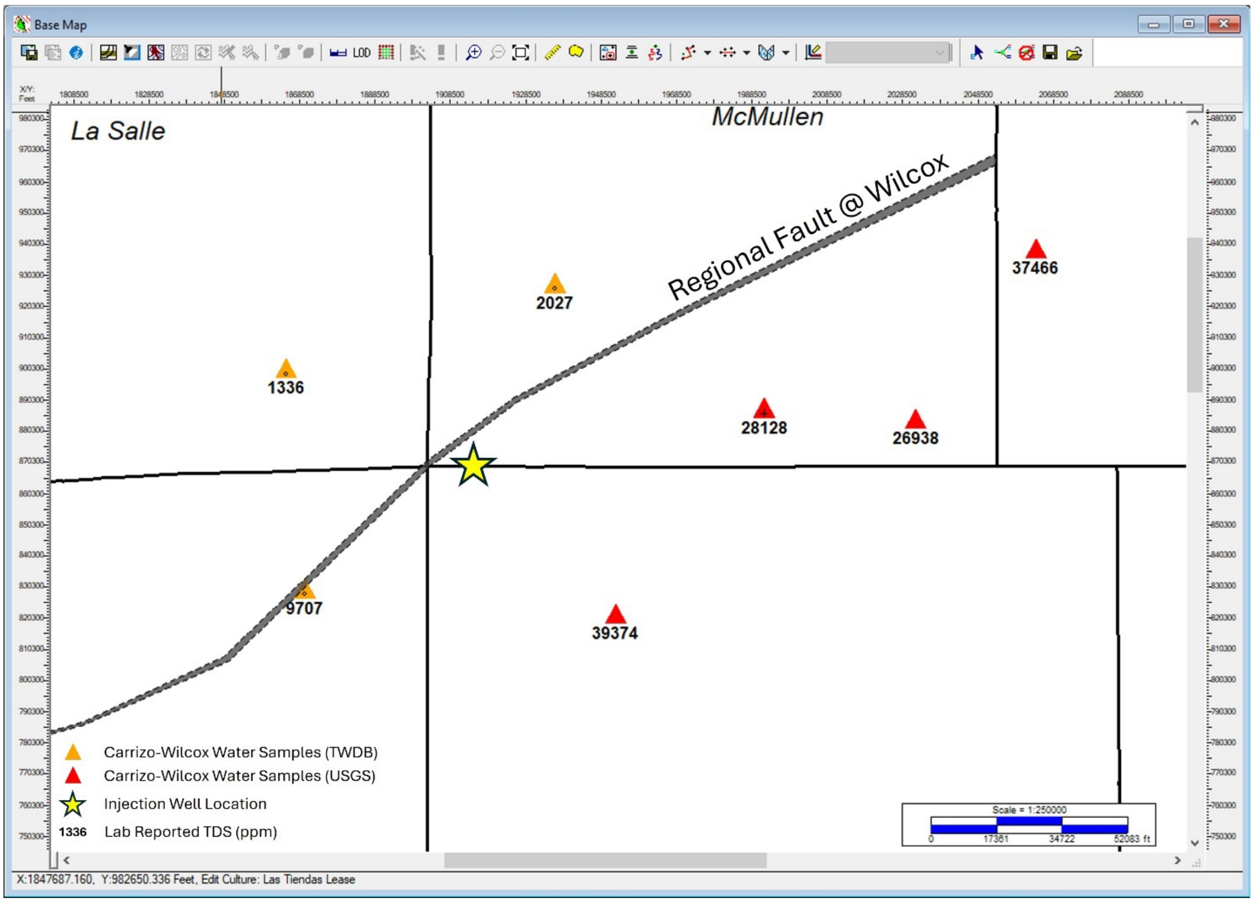

Figure 15. Carrizo-Wilcox water sample data from the USGS and TWDB. Posted values are in ppm TDS and the source denote by the color of the triangle in the legend in the lower left corner. North is up.

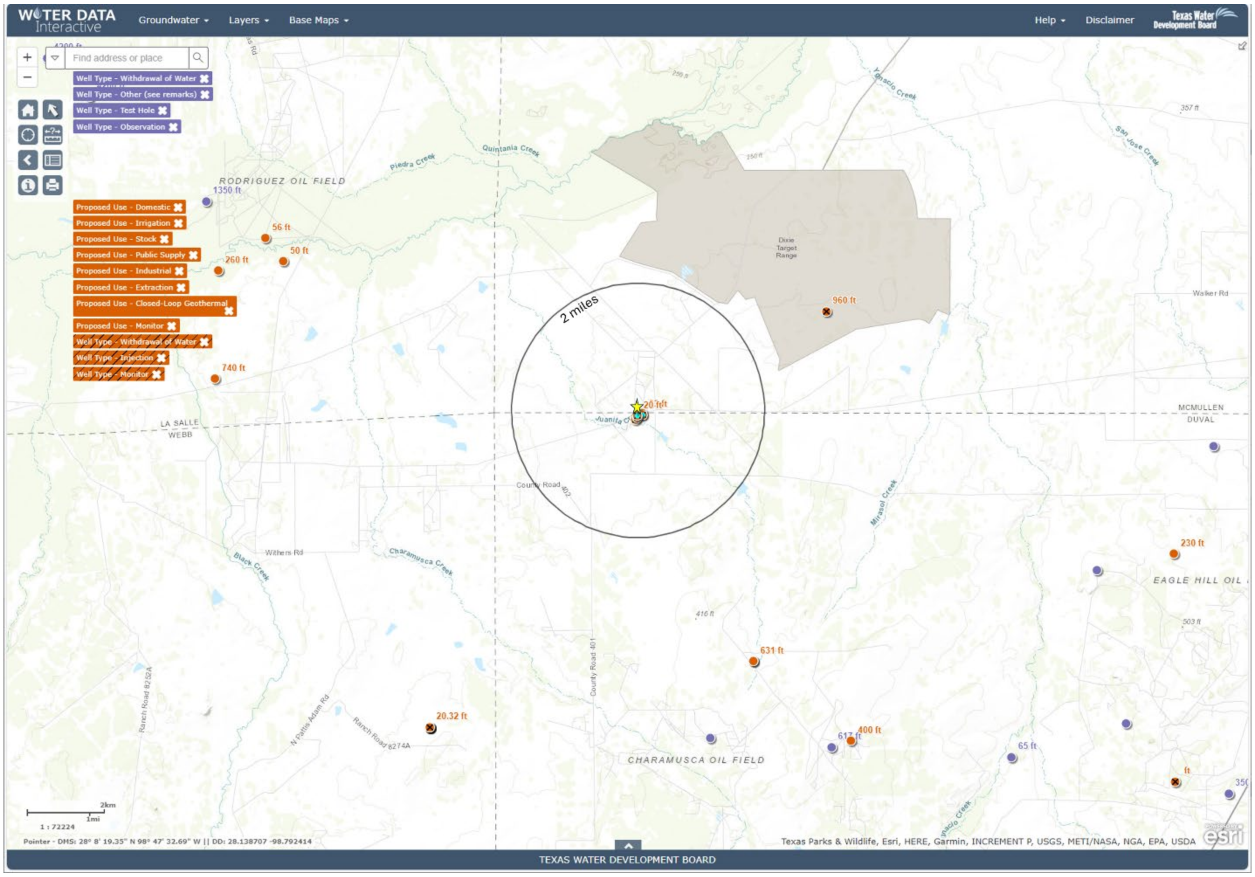

Figure 16. Water wells within the greater Lima Tango CCS 1 area from the TWDB interactive viewer. The yellow star denotes the injection site, and the black circles depict a two-mile radius circle around the proposed injection site. No water withdrawal wells fall within these areas. Monitoring wells at the ET Las Tiendas NGP Plant site have been plugged. North is up.

3.7 Description of CO_2 Project Facilities

dCarbon will accept CO_2 from the ET Las Tiendas NGP Plant (**Figure 17**). The temperature, pressure, composition, and quantity of CO_2 will be measured and metered according to industry standards, with an orifice meter, Coriolis meter, or similar device. dCarbon will compress the CO_2 to a supercritical physical state at the Lima Tango CCS 1 injection site. The CO_2 stream will be metered to verify quantity. The CO_2 will then be injected into the Queen City Formation, which is not known to be productive of oil and gas in the area. A gas analysis of the CO_2 stream is shown in **Table 3**. Although industry-standard sampling of the CO_2 stream is expected to be representative of the composition of the gas, it is possible that the composition will vary slightly over time.

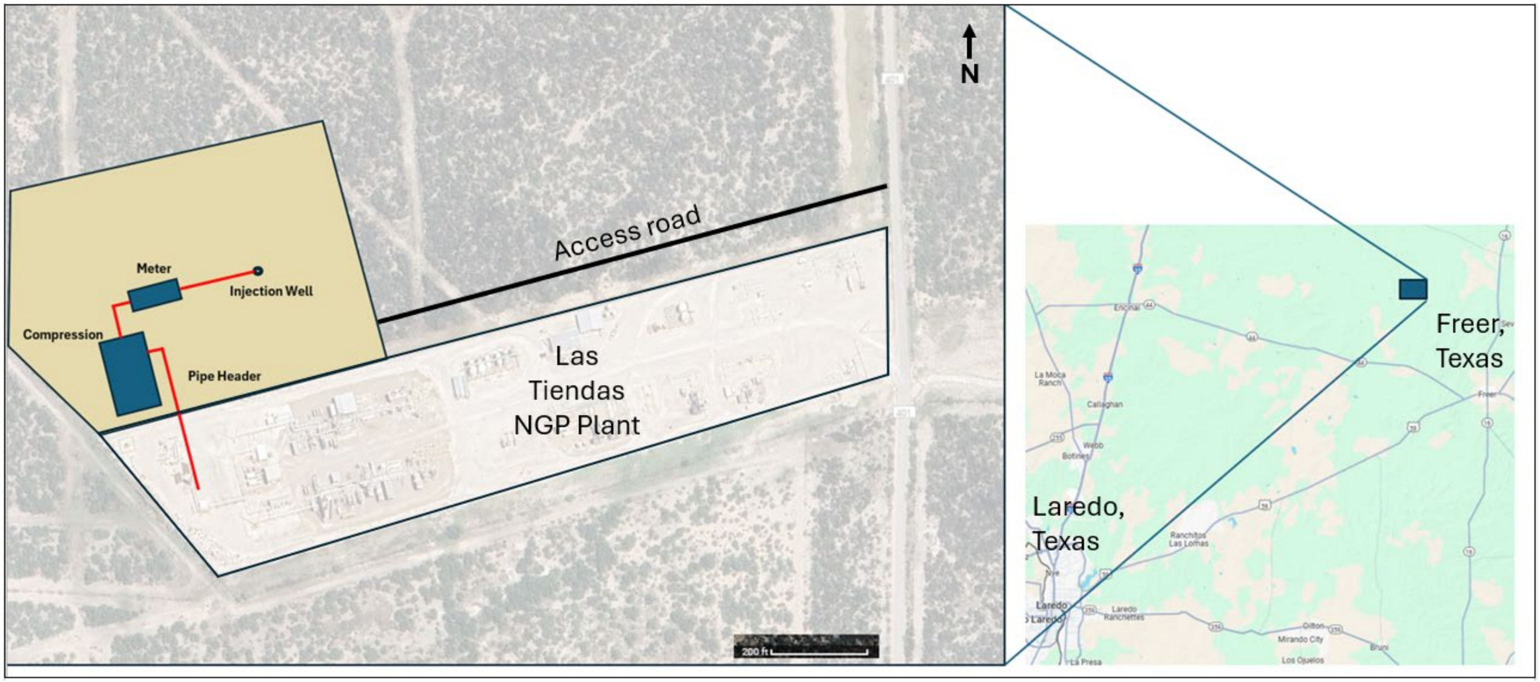

Figure 17. Lima Tango CCS 1 injection well proposed plot plan and location map relative to cities in south Texas.

Table 3. Inlet CO_2 stream analysis for the Lima Tango CCS 1 site in mol percent.

	DESIGN	DESIGN
Water	9.62	Dry Basis
Hydrogen Sulfide	0.01	55 ppmv / 0.006
Nitrogen	0.01	0.010
Carbon Dioxide	87.46	96.774
Methane	2.51	2.776
Ethane	0.34	0.381
Propane	0.01	0.013
i-Butane	0.01	0.009
n-Butane	0.00	0.003
i-Pentane	0.02	0.017
n-Pentane	0.01	0.011
n-Hexane	0.00	0.000
TOTAL	100.00	100.000

Note – *Gas is water saturated at inlet conditions (120 degrees Fahrenheit (F) and 3 pounds per square inch gas (psig) using Bryan Research and Engineering's Promax chemical process simulation software and the GERG 2008 Equation of State (EOS)). Ppmv is pounds per million by volume.

3.8 Reservoir Characterization Modeling

To develop an MRV plan for monitoring, reporting, and verification of geologic sequestration at the Lima Tango CCS 1 facility as required under §98.448(a)(1)-(2) of Subpart RR, dCarbon first constructed a Static Earth Model (SEM) and then a dynamic reservoir simulation model to determine the active and maximum monitoring areas (AMA and MMA, respectively) as defined in §98.449. The primary objectives of the simulation model were to:

1. Estimate the maximum areal extent of the injectate plume and its migration post injection

2. Determine the ability of the Queen City injection interval to handle the required injection rate

3. Characterize potential interaction between the injected CO_2 and any nearby potential leakage pathways

dCarbon employed Schlumberger's Petrel software and Rock Flow Dynamic's tNavigator software to construct the static earth and dynamic plume models, respectively. The initial modeling was the area of licensed 3D seismic data (20 square miles) as shown in **Figure 18**. The model utilizes structural and petrophysical interpretations made from available well and 3D seismic data described in **Section 3.3** as primary inputs.

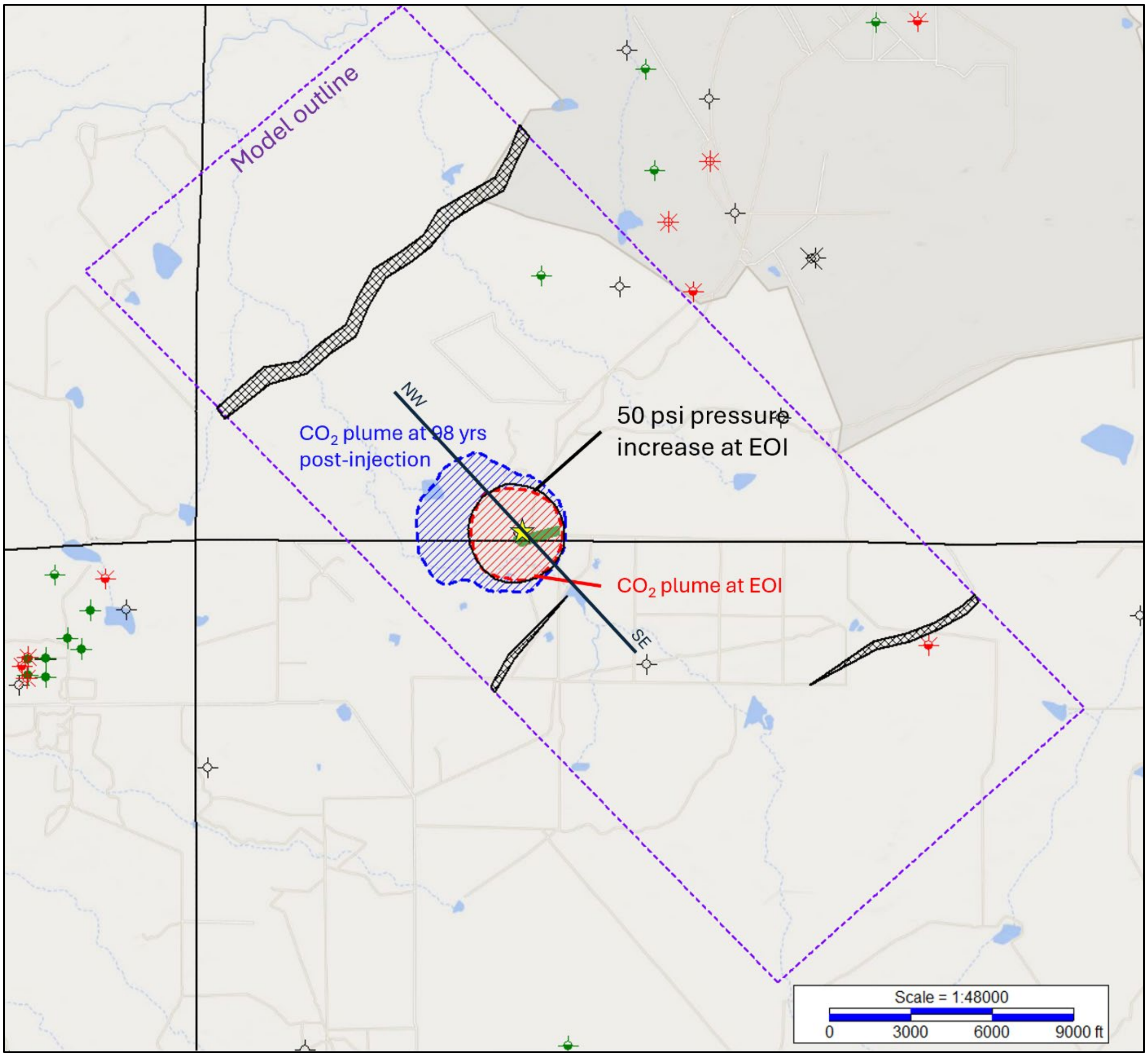

Figure 18. Simulation results showing CO_2 plumes at the end of injection (EOI) for 12 years in red, after 98 years post- injection in blue, and the model extent in violet, which is also the area of licensed 3D seismic. The 50-psi pressure plume at the end of injection is in black. Only wells deep enough to penetrate the top of the Queen City Formation are shown. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults from the 3D seismic data at the Queen City stratigraphic level. North is up.

Petrophysical calculations, including a porosity-permeability model, were derived from well logs at the Nueces Minerals No. 1 well, which is two miles away from the proposed injection site. Local core data was not available to calibrate the petrophysical model so an analog from a sandstone reservoir with comparable porosity and permeability was used (the Bandera Brown B from the Department of Energy (DOE) CO_2 Brine Relative Permeability Database (CO2BRA) (Araujo de Itriago *et al.*, 2024)). The mapping of uniform thickness and consistent correlations of wireline log characteristics with other available logs in the area supports the conclusion that the

Nueces Minerals No. 1 well is representative of the proposed injection site and the modeled area. The model will be further updated and calibrated when the injection well is drilled and additional data, including whole or rotary sidewall cores, is collected over the injection and confining intervals.

Utilizing the previously described inputs, grid layers and cells were created in Schlumberger's Petrel software at the increments listed in **Table 4**, resulting in an SEM model depicted in **Figure 19**. Reservoir properties were distributed in a layer cake manner throughout the modeling area based on petrophysics calculated from wireline logs at the Nueces Mineral No. 1 well. A dip and strike swath of cells through the injection site were gridded at a finer increment of 150 feet by 150 feet to allow for better resolution of plume behavior around the proposed injection well as shown in the central portion of **Figure 19**.

Table 4. SEM parameters by the i, j, and k directions (dir).

	i-dir	j-dir	k-dir
Average Increment (feet)	511	331	12
Layer count	71	45	93
Total length (feet)	36,298	14,904	1,110
Total cell count	297,135		

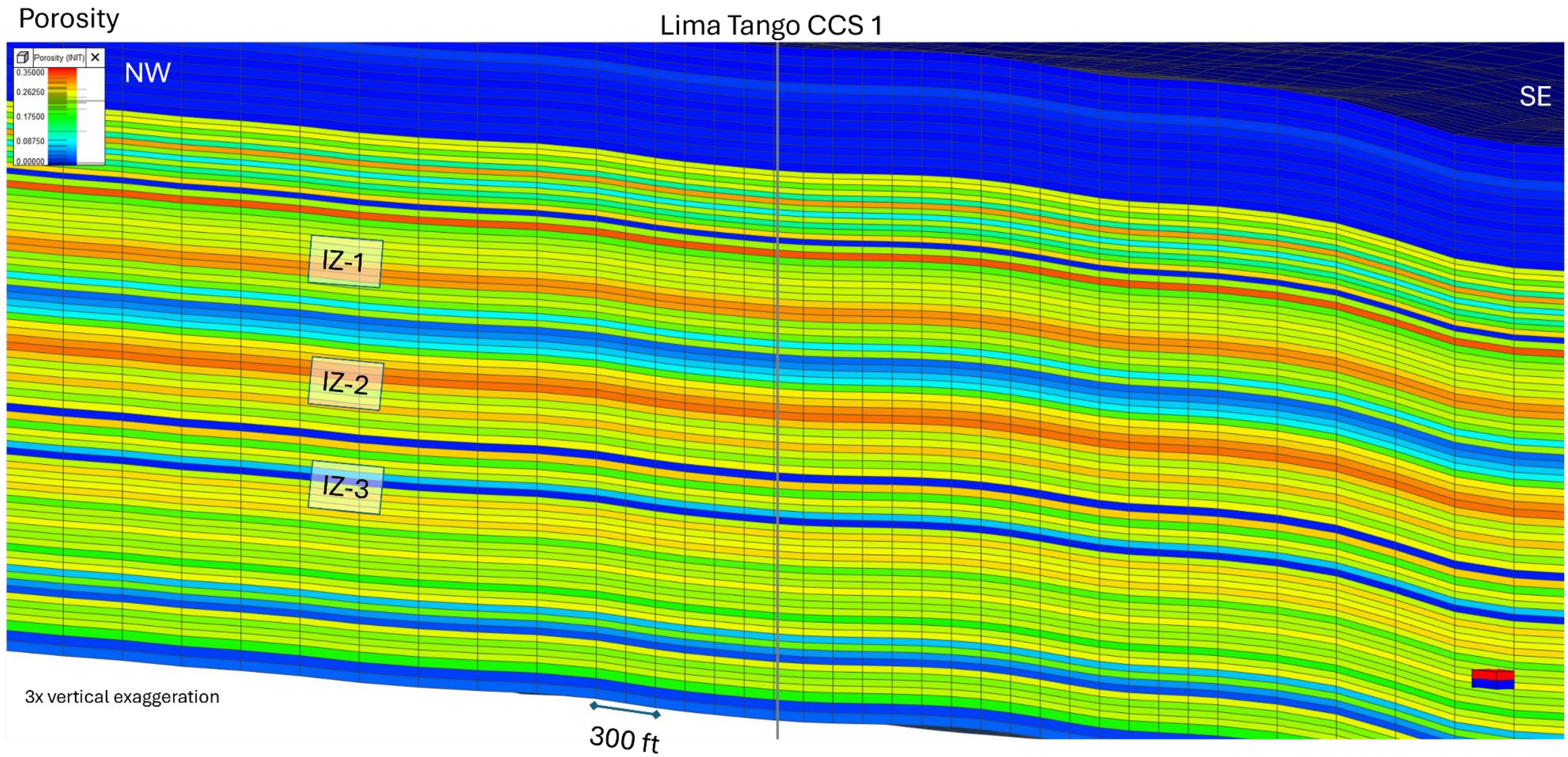

Figure 19. Porosity of the Queen City interval of the SEM. Porosity was calculated from the nearby Nueces Minerals No. 1 wireline well logs. Cross section location is shown on Figure 18.

A fit-for-purpose reservoir simulation model was created from the SEM to assess average injectivity based on empirical and analytical methods and to simulate CO_2 injection scenarios to aid in project design.

Pore and frac gradients, temperature, salinity, water saturation, porosity, and relative permeability model inputs are given in **Table 5**. The pore pressure gradient was assumed to be 0.48 psi/foot based on regional trends in South Texas. The fracture pressure gradient was estimated as 0.7 psi/foot from regional data and then an additional safety factor of 90% was applied, resulting in 0.6 psi/foot of the bottomhole constraint. The surface temperature is the mean annual temperature at the Lima Tango CCS 1 site. Fluid salinity is an average of the regional values described in **Section 3.4**. The relative permeability-porosity data are from a similar sandstone reservoir, the Bandera Brown B, in the DOE's CO2BRA database as cited by Araujo de Itriago *et al.*, 2024 and plotted in **Figure 20**. There are no active injectors in the simulation area from which to source these data.

Table 5. Input reservoir modeling parameters.

Parameter	Value
Pore Pressure Gradient (psi/foot):	0.48
Frac Pressure Gradient (psi/foot):	0.6
Temperature Gradient (degrees Fahrenheit (F) /foot):	0.015
Surface Temp (degrees F):	70
Fluid Salinity (ppm TDS)	30,000
Connate Water Saturation (decimal percent (%)):	0.47
Porosity (decimal %):	0.256
Relative permeability (mD):	133.85
Net-to-gross (ratio):	1
Rate constraints (MT/yr)	177,000
Pressure constraints (% of fracture pressure)	90

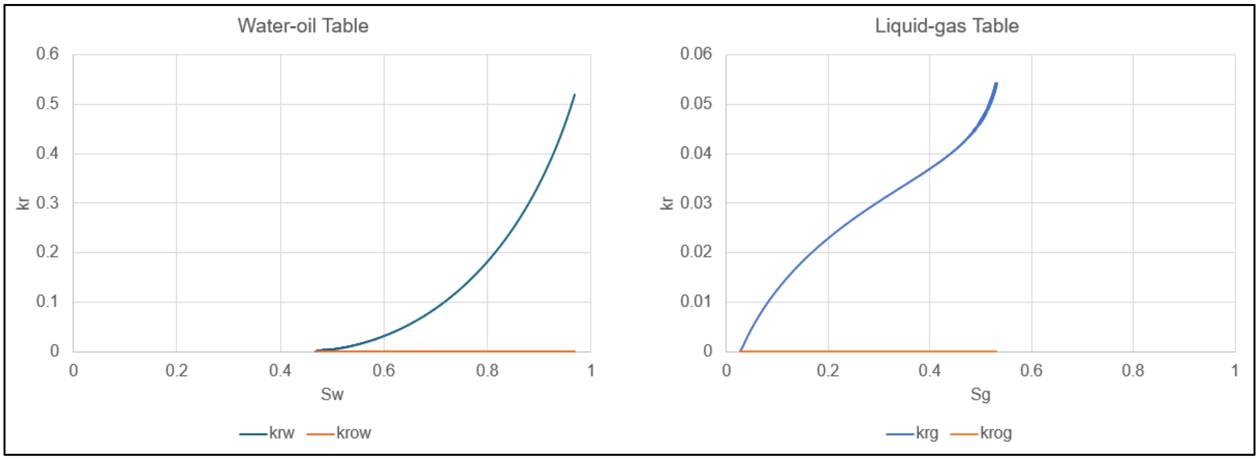

Figure 20. Relative permeability tables for water-oil (left) and liquid-gas (right). Relative permeability-porosity data are from a similar sandstone reservoir, the Bandera Brown B, in the DOE's CO2BRA database as cited by Araujo de Itriago et al., 2024.

dCarbon identified three injection zones in the model construction (IZ-1, IZ-2, and IZ-3) but the final model run selected for the Lima Tango CCS 1 project only injects CO_2 into IZ-2 and IZ-3. This case had a yearly injection rate of 177,000 MT/yr for a cumulative injection of 2,124,000 MT after 12 years as shown in **Table 6**. This injection over time is presented graphically in **Figure 21**. The size of the maximum plume extent and 50-psi pressure plume extent at the end of 12 years of injection are also given in **Table 6**, presented graphically in **Figure 22**, and depicted in map view in **Figure 18**. This figure also shows the plume outline at the end of injection compared to the outline at the end of the 98-year post-injection period. The plume stays within the area of the injection well.

Table 6. Injection parameters by zone and total plume extents.

Injection zone	Yearly rate (MT/yr)	Cumulative injection (MT)	Maximum CO_2 plume extent 98 years after end of injection	50-psi pressure plume extent at end of injection
IZ-2	75,684	908,206		
IZ-3	101,316	1,215,794		
Total IZ-2/IZ-3	177,000	2,124,000	0.78 square miles	0.36 square miles

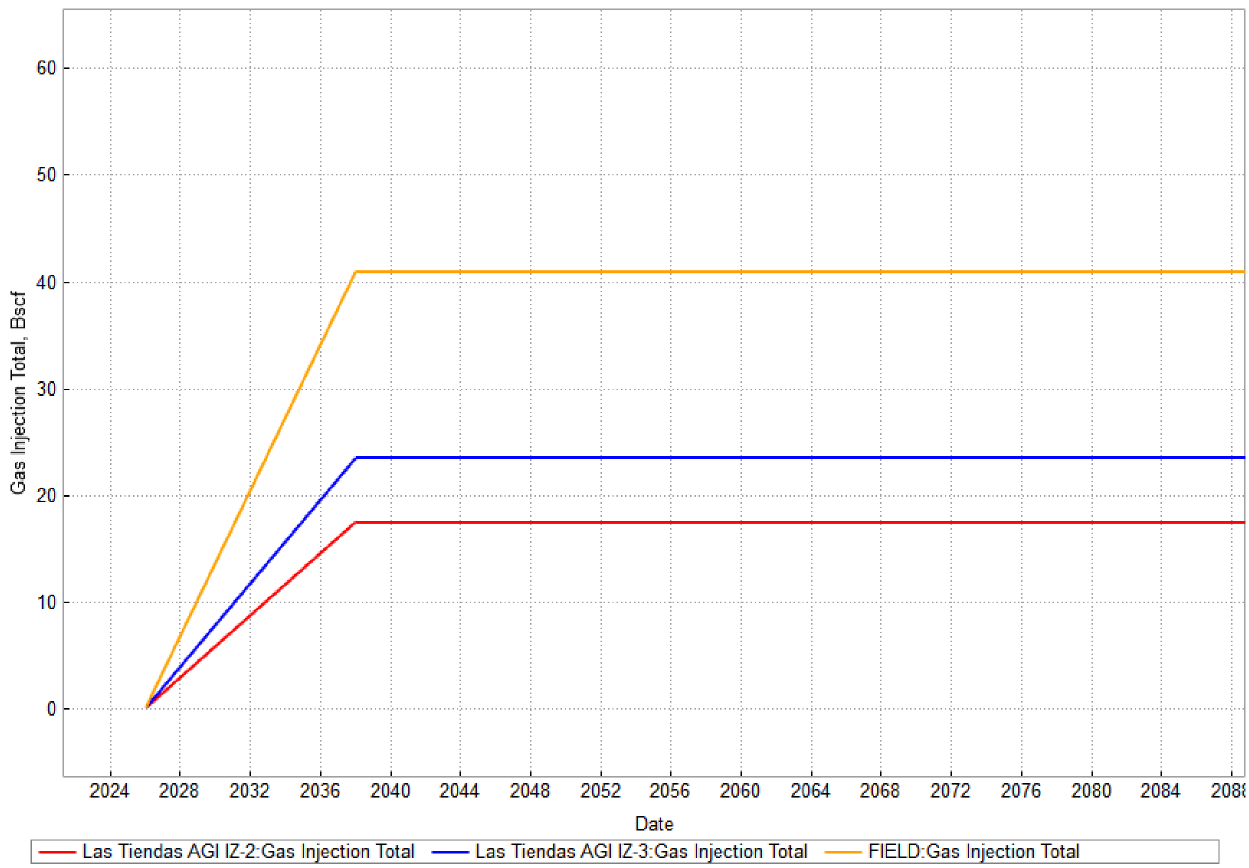

Figure 21. Plot of injection versus time at the Lima Tango CCS 1 injection well.

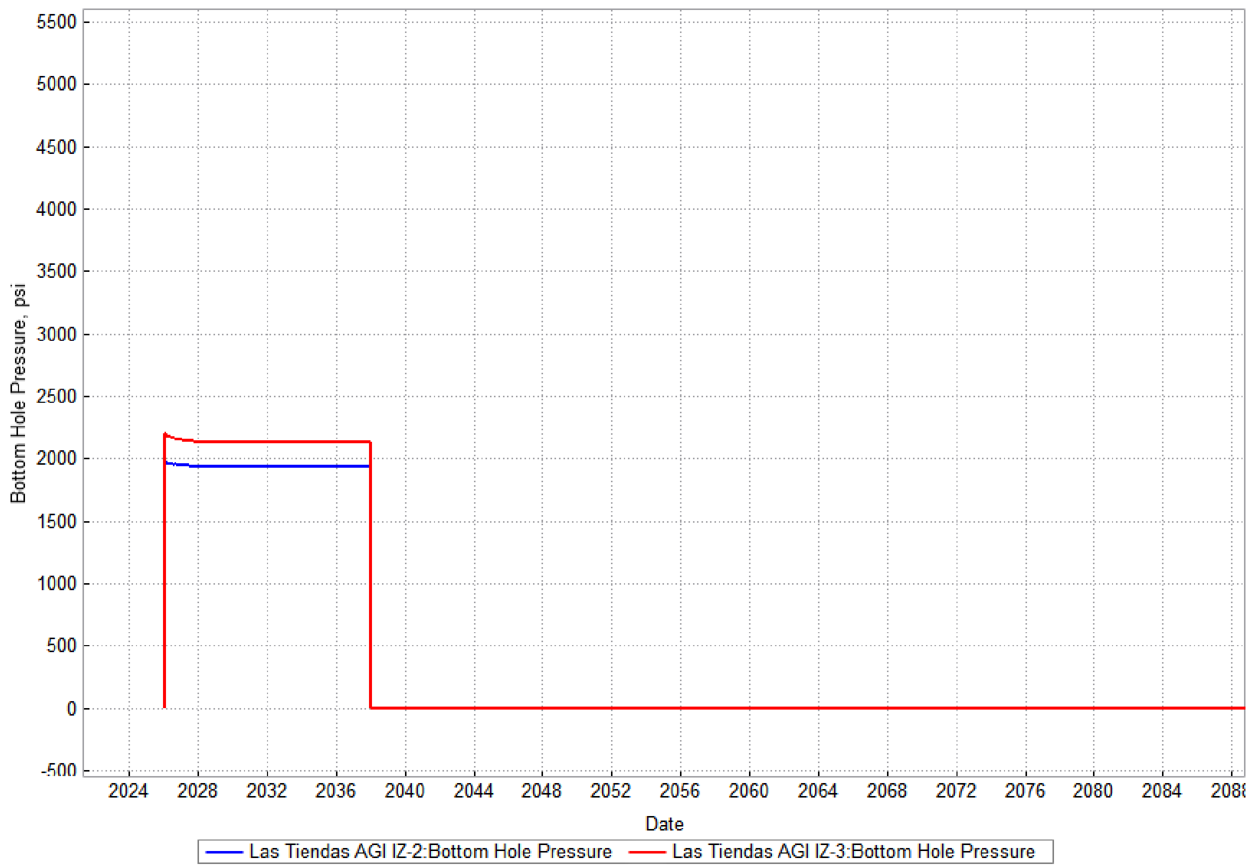

Figure 22. Pressure versus time at the Lima Tango CCS 1 injection well. The pressure constraint is 2412.8 psi for IZ-2 and 2524.3 psi for IZ-3.

A northwest to southeast cross-sectional view of the CO_2 plume in IZ-2 and IZ-3 is presented in **Figure 23**. The CO_2 plume profiles for both zones are funnel-shaped, indicative of the higher porosity and permeability at the top of these zones as well as the buoyancy of the CO_2 relative to the formation water.

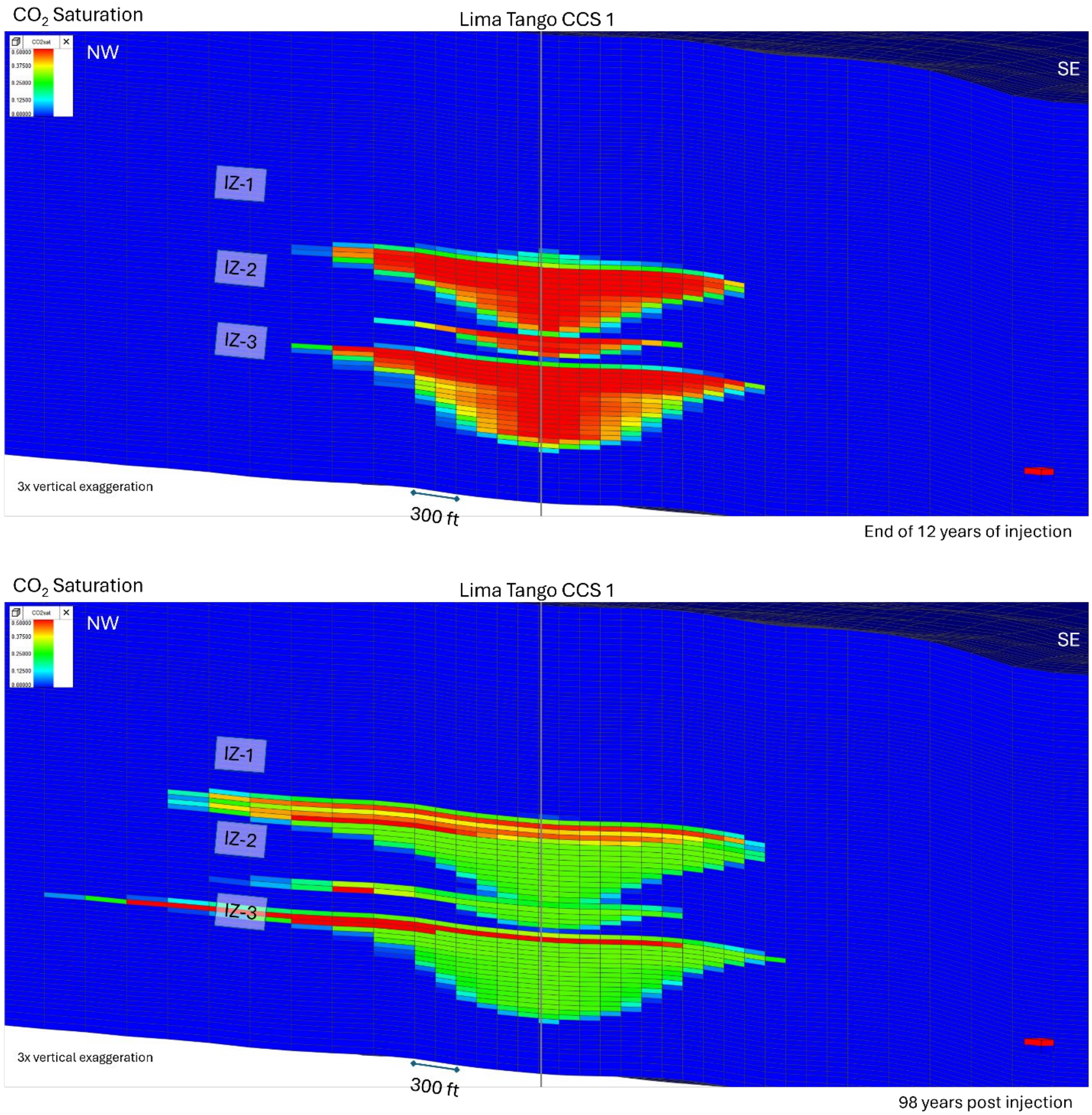

Figure 23. Northwest to southeast cross section depicting the CO_2 saturation profile of the model for the injection from Lima Tango CCS 1 after 12 years of injection (upper) and after 98 years after injection stops (lower). Color scale at the upper left indicates CO_2 gas saturation. Queen City injection zones are annotated. Injection was only modeled for IZ-2 and IZ-3. Cross section location is shown on Figure 18.

4 – DELINEATION OF MONITORING AREAS

This section describes the Maximum and Active Monitoring Areas.

4.1 MAXIMUM MONITORING AREA (MMA)

The MMA is defined as equal to or greater than the area expected to contain the free-phase CO_2 plume until the CO_2 plume has stabilized plus an all-around buffer of at least one-half mile. The numerical simulation using tNavigator was used to estimate the size and migration of the CO_2 plume. We modeled injection of CO_2 into IZ-2 and IZ-3 for 12 years followed by 190 years of post-injection modeling. Results indicated that the plume had ceased to migrate by 98 years post injection. A five percent cutoff of gas saturation was used to determine the boundary of the CO_2 plume. The area of the MMA was determined to be 0.88 square miles with the greatest extent reaching 0.72 miles from the injector (**Figure 24**).

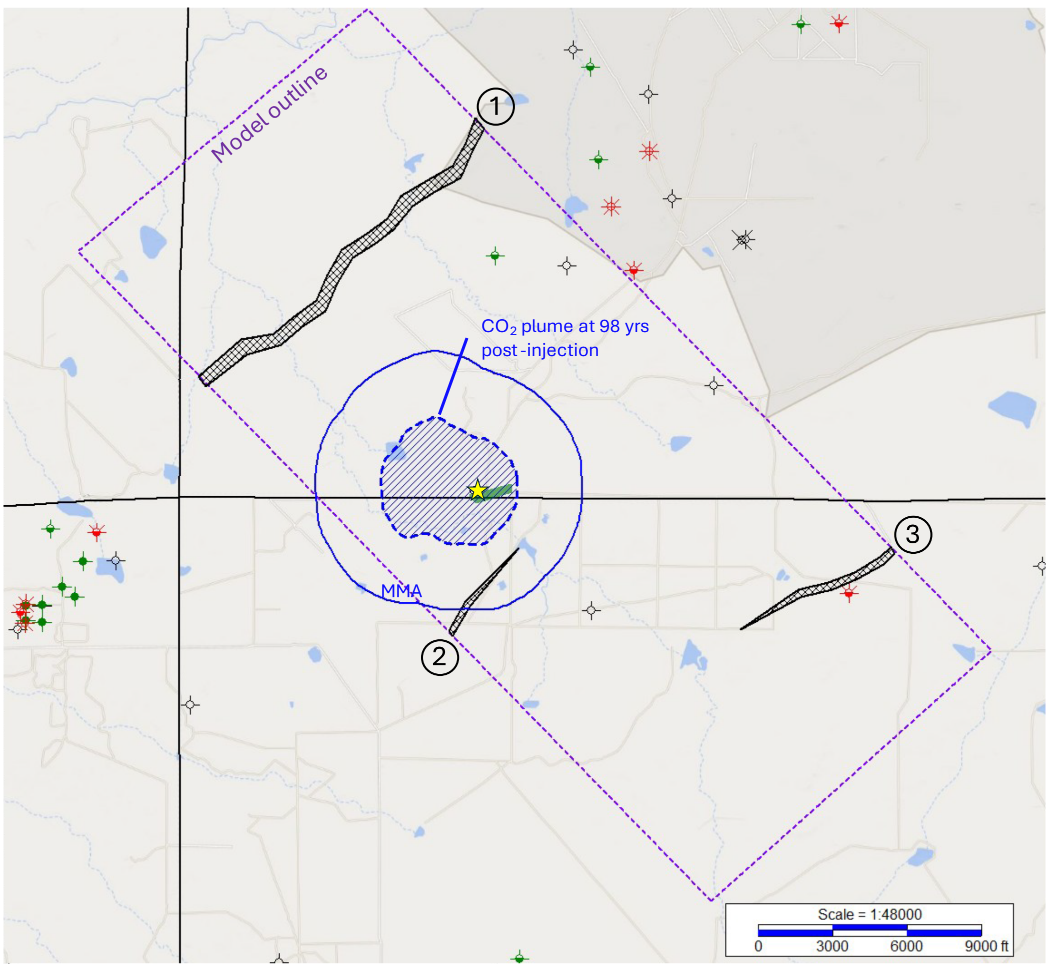

Figure 24. The proposed MMA (blue) and the stabilized CO2 plume (at 98 years post-injection as modeled). Only wells penetrating the Queen City Formation are shown. The red lines represent down-to-the-coast normal faulting mapped on the 3D seismic and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. North is up.

4.2 Active Monitoring Area (AMA)

dCarbon adhered to the definition of Active Monitoring Area (AMA) provided in 40 CFR 98.449 to delineate the AMA for this project (40 CFR Part 98 Subpart RR (Dec. 13, 2024)):

"*Active monitoring area* is the area that will be monitored over a specific time interval from the first year of the period (n) to the last year in the period (t). The boundary of the active monitoring area is established by superimposing two areas:

> (1) The area projected to contain the free phase CO_2 plume at the end of year t, plus an all-around buffer zone of one-half mile or greater if known leakage pathways extend laterally more than one-half mile.
>
> (2) The area projected to contain the free phase CO_2 plume at the end of year t + 5."

dCarbon proposes to monitor the injection site from year one through year 12, which is projected to be the EOI, thereby defining t as 12 years. dCarbon determined AMAs using methods (1) and (2) above and determined (1) to be larger. dCarbon then compared the larger AMA (red solid, **Figure 25**) with the MMA from **Figure 24** and found the AMA to be fully contained within the MMA. We propose to use the slightly larger MMA as both the AMA and MMA and will refer to this common area of monitoring as the AMA/MMA or just as the MMA in subsequent sections. As described in **Section 4.1**, the MMA is a one-half mile buffer after of the CO_2 plume stabilizes post-injection, which exceeds the definition of AMA set forth in 40 CFR § 98.449. By using the MMA as the AMA, dCarbon is employing an active monitoring program that exceeds the regulations of Subpart RR.

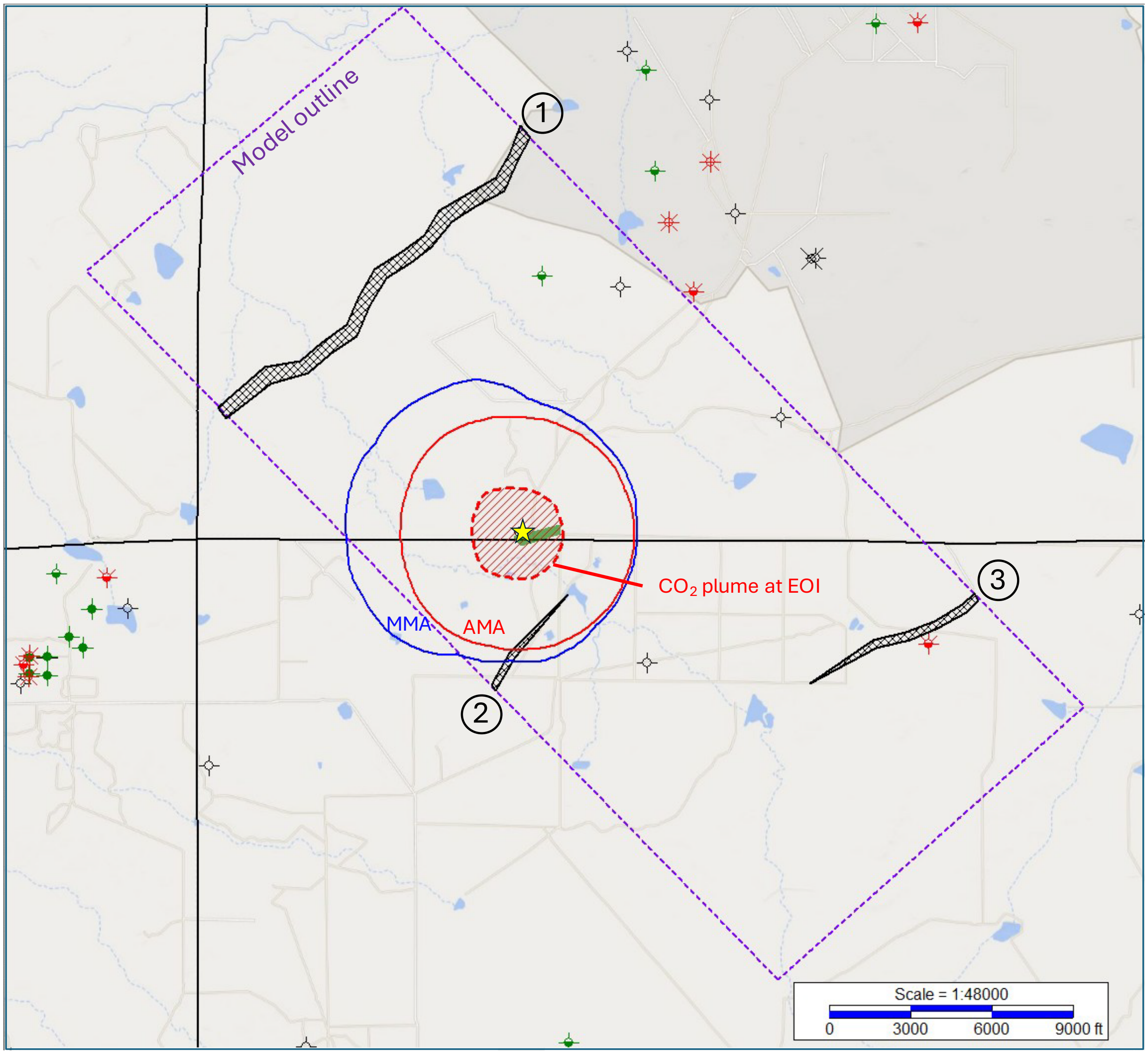

Figure 25. The AMA (red solid) outline and the EOI CO_2 plume (red dashed) outline as modeled. We propose to use the larger MMA (blue solid line) as both the AMA and MMA and will refer to it as the AMA/MMA or just the MMA. Wells penetrating the Queen City are posted with the well symbol at the bottomhole location. The black hachured polygons represent faulting at the Queen City mapped on the 3D seismic data and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. The Lima Tango CCS 1 well is represented by the yellow star and the gas plant is shown with a green polygon. Faults are numbered for discussion in the text. North is up.

5 – IDENTIFICATION AND EVALUATION OF POTENTIAL LEAKAGE PATHWAYS TO SURFACE

This section describes each of the required potential leakage pathways and assesses the likelihood, potential timing, and magnitude based upon the California Air and Resources Board's CCS Protocol Section C.2.2(d). **Table 7** describes the basis for event likelihood and **Table 8** provides the details of the leakage likelihood, timing of occurrence, and estimated magnitude of leakage for each type of leak risk.

Table 7. Risk likelihood matrix (developed based on comparable projects).

Risk Factor for Probability		Description
1	Improbable	<1% chance of occurring*
2	Unlikely	1-5% chance of occurring*
3	Possible	> 5% chance of occurring*
*During the life of the project or 100 years after project closure, whichever is shorter		

Table 8. Description of leakage likelihood, timing, and magnitude.

Leakage Pathway	Likelihood	Timing	Magnitude
Potential Leakage from Surface Equipment	**Possible**	Anytime during project operations, but most likely during start-up / transition or maintenance periods	**<100 MT per event** (100 MT represents approximately 5 hours of full flow facility release)
Leakage from Approved, Not Yet Drilled Wells	**Improbable**, as there are no approved not yet drilled wells	After new wells are permitted and drilled	**<1 MT per event**
Leakage from Existing wells	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and the total depth of the nearby existing wells	When the CO_2 plume expands to the lateral locations of existing wells	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach an existing well combined with thickness and low porosity / permeability of the UCZ
Potential Leakage from Fractures and Faults	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operation	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage Through Confining Layers	**Improbable**, as the UCZ is 110 feet thick and very low porosity and permeability	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation and thickness/properties of the UCZ
Leakage from Natural or Induced Seismicity	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage from Lateral Migration	**Improbable**, as the Queen City Formation is a very thick and laterally continuous formation with the closest well penetration over a mile downdip	More likely late in life as plume expands	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation and continuity / thickness of the UCZ

5.1 Potential Leakage from Surface Equipment

dCarbon's surface facilities at the injection site located near the ET Las Tiendas NGP Plant are specifically designed for injecting the CO_2 stream described in **Table 3**. The facilities minimize

leakage points such as valves and flanges by following industry standards and best practices. A shut-in valve is located at the wellhead in case of emergency. The compressor will also have emergency shut down switches that can be activated automatically in case of unexpected operating conditions.

Additionally, the compressor facility, pipeline, and injection well location will all be subjected to Auditory, Visual, and Olfactory (AVO) leak detection per dCarbon safety and operations standards. These monthly inspections, which are standard for detecting leaks and malfunctioning equipment in the gas production industry, will aid in the rapid detection of any potential leaks that may occur. As a part of these inspections, operations personnel are frequently able to repair leaks immediately by tightening valves, flanges, or similar equipment. Leakage from surface equipment is assessed as possible, however, any leaks that are detected will be analyzed to determine the amount of CO_2 that may have leaked and these leakage quantities, if any exist, will be included in recurring reporting.

5.2 Leakage from Approved, Not Yet Drilled Wells

A search of the TRRC's online GIS viewer (accessed December 9, 2024) in a 6,500 foot radius (which is roughly the size of the AMA/MMA) around the proposed injection site indicated one cancelled/abandoned location from 2012 and three permits that were so old that they had no API number or permit number, and the location source was cited as a hardcopy map (**Appendix, Table 9**). These search results indicate that there are no approved, not yet drilled, wells in the AMA/MMA and leakage from such wells is assessed as improbable.

5.3 Leakage from Existing Wells

There are 36 wells within the MMA listed in **Tables 9 and 10** in the **Appendix Section 13.2**, including at least one cancelled permit**.** These wells are shown in map view depiction of all wells relative to the proposed injection well in **Figure 26.** All wells targeted shallow oil reservoirs or were unsuccessful dry holes targeting shallow formations with no well exceeding a depth of 2,500 feet MD. There is over 2,000 feet of separation (including the UCZ of the Weches Shale) between these penetrations and the Queen City target injection interval. The likelihood of leakage from existing wells is assessed as improbable.

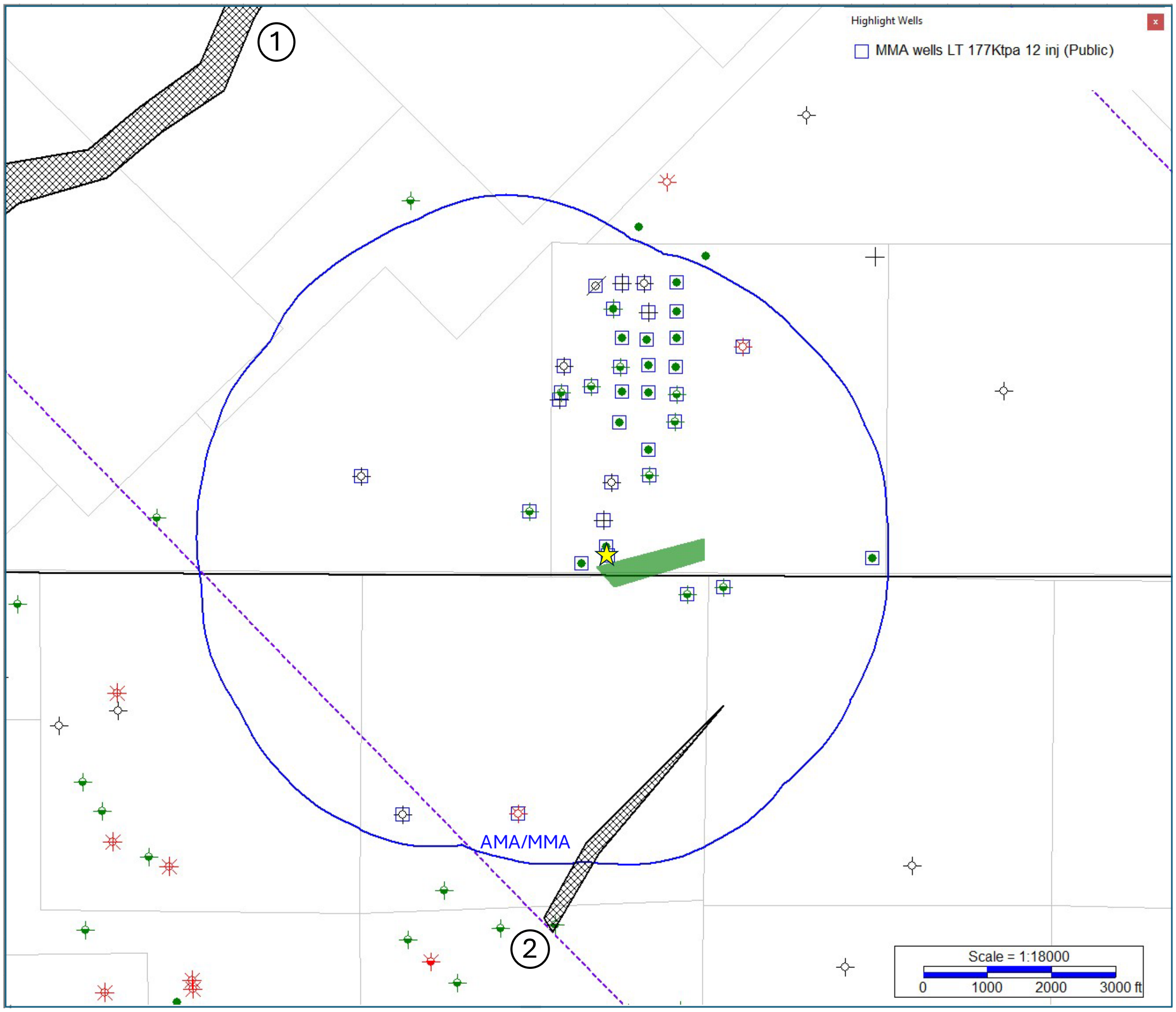

Figure 26. Wells in the AMA/MMA of Lima Tango CCS 1 highlighted with blue squares. The Lima Tango CCS 1 location is shown with a yellow star. The Las Tiendas NGP Plant is shown with a green polygon. Faults are numbered for discussion in the text. North is up.

5.4 Potential Leakage from Fractures and Faults

There are three faults intersecting the Queen City Formation in the modeled area, which is also the area of licensed 3D seismic data. Fault 1 vertically offsets the Queen City Formation by 100-250 feet and is deeply rooted below 10,000 feet (**Figure 27**). The fault cut continues nearly to the surface with consistent minor offset throughout the section indicating that it has had late movement. This fault is well outside of the AMA/MMA (3,200 feet away to the northwest) and, as such, no fault-CO_2 plume interactions are expected.

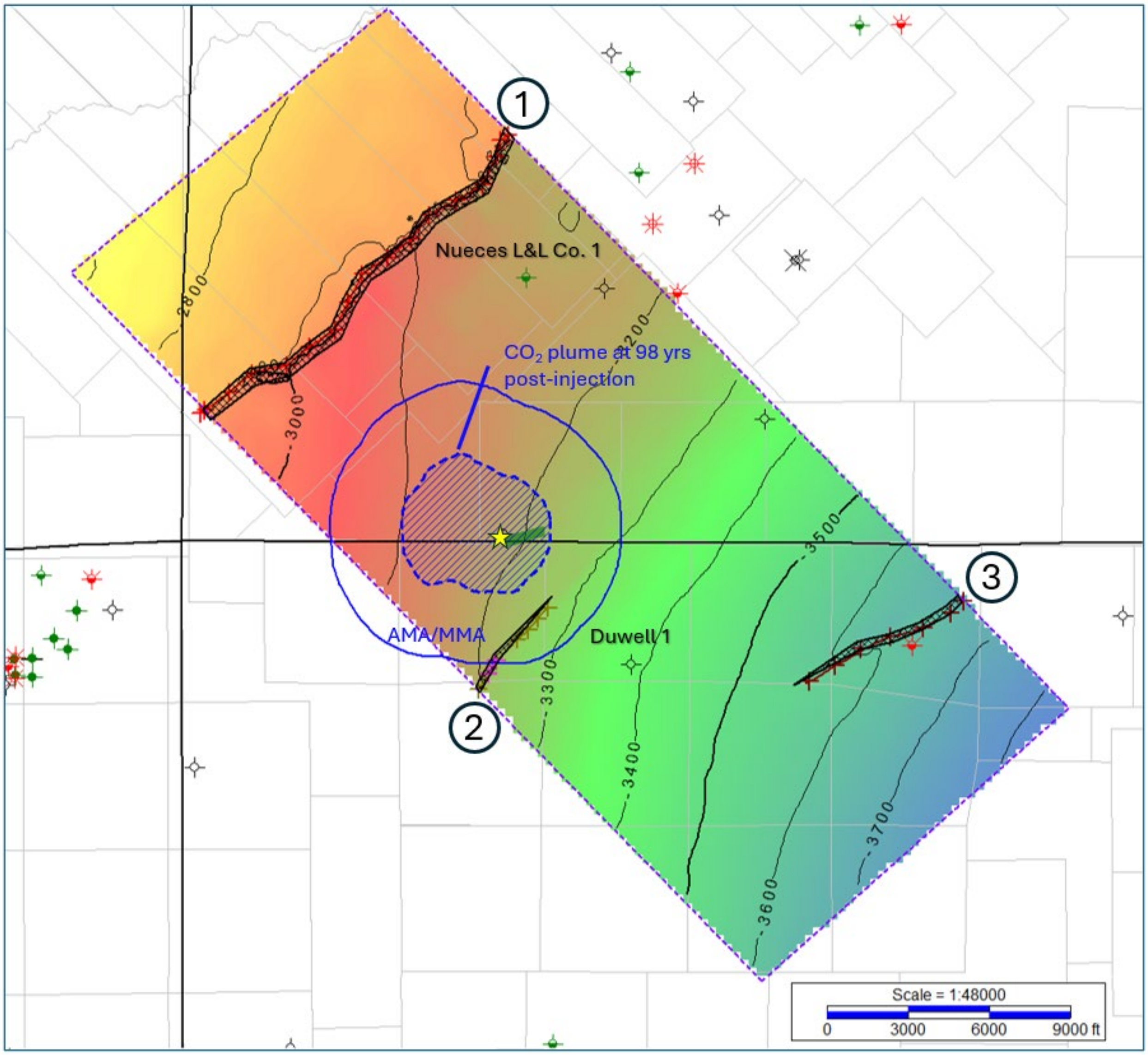

Figure 27. The top Queen City Formation structural contours (feet TVDSS), mapped Queen City Formation faults, AMA/MMA (blue solid line) and 98 years post-injection modeling (blue dashed line). Only wells penetrating the Queen City are shown, with the two closest wells to the injection site labeled. The Lima Tango CCS 1 location is highlighted with a yellow star. Faults are numbered for discussion in the text. North is up.

Fault 2 is much smaller and has a minor vertical offset of 40 to 60 feet within the Queen City Formation (**Figure 27**). In map view, the shortest distance between Fault 2 and the CO_2 plume outline at 98-years post-injection is approximately 1000 feet. The corresponding shortest distance between Fault 2 and the end of injection plume outline is 1200 feet. Fault 3 is located 1.5 miles downdip and southeast from the AMA/MMA; it is not expected to have any fault-CO_2 plume intersections. Both Fault 2 and Fault 3 do not show any displacement beyond a couple hundred feet above the top of the Queen City, thereby limiting their ability to serve as a leak pathway to the shallow USDW and the surface. The likelihood of leakage from fractures and faults is assessed as improbable.

5.5 Leakage Through Confining Layers

The Queen City Formation injection interval is confined by the overlying Weches Shale (the UCZ) and the underlying lower Queen City shales and Reklaw Shale (the LCZ) as described in **Section 3.3.2** and shown in **Figure 10**. The UCZ is comprised of 110 feet of impermeable shale (1% average porosity and 0.002 mD average permeability) as documented in **Table 1**. The LCZ is comprised of 965 feet of impermeable shale (1.5% average porosity and 0.05 mD average permeability) as documented in **Table 1**. These confining zones are supplemented by multiple low-porosity and low-permeability formations separating the Queen City injection interval from the base of the overlying Yegua USDW by a total of 2,300 feet and from the underlying Carrizo-Wilcox USDW by a total of 1,355 feet as described in **Section 3.6**. There are no existing wellbores that penetrate the confining layers in the modeled plume area. There are five wells that penetrate the confining layers in the 20 square mile project area that could serve as potential leakage pathways, but they are all greater than one mile away from the proposed injection well and outside of the AMA/MMA (**Figure 27**). Based on the limited CO_2 plume migration and thick shales above and below the injection interval, the risk of leakage through the confining layers is assessed as improbable.

5.6 Leakage from Natural or Induced Seismicity

The Lima Tango CCS 1 site has no historical seismicity within 19 miles of the proposed well. Mapped faults do not cut down to crystalline basement and have thousands of feet of separation between their deepest offset and the basement. Additionally, injection modeling indicates such minimal pore pressure change at any fault that it is insufficient to cause fault slip. No faults are mapped within the area of the CO_2 plume after 12 years of injection. Based on these factors, the leakage risk due to natural or induced seismicity is assessed as improbable.

Should any unexpected increases in formation pressure be detected, dCarbon can perform Fault Slip Potential (FSP) analysis (Walsh *et al.*, 2017) to evaluate the risk of induced seismicity on the closest mapped faults. dCarbon plans to build this model based on geologic data collected during drilling the Lima Tango CCS 1 well. If there is a concern related to abnormal pressures or seismicity related to operations at the well, dCarbon will shut-in the well and investigate further.

5.7 Leakage from Lateral Migration

The regional dip in the Lima Tango CCS 1 project area is gentle, at approximately two degrees, and therefore lateral migration is expected to be slow and well-behaved. There are five wells in the project area that penetrate the Queen City Formation, but these are all located outside of the AMA/MMA. The wells are depicted in **Figure 27**. The closest well (Duwell 1) is located 6,800 feet down dip and then next closest well (Nueces L&L Co. 1) is located 9,500 feet on strike to the Lima Tango CCS 1 injection well. The Queen City Formation is laterally continuous and of uniform thickness in the project area, making the risk from lateral migration improbable.

6 – PLAN OF ACTION FOR DETECTING AND QUANTIFYING SURFACE LEAKAGE OF CO_2

This section discusses the strategy that dCarbon will employ for detecting and quantifying surface leakage of CO_2 through the pathways identified in previous sections to meet the requirements of 40 CFR § 98.448(a)(3). Monitoring will occur during the planned 12-year injection period, or until the cessation of operations, plus a proposed two-year post-injection period.

6.1 Leakage from Surface Equipment

As the CO_2 compressor station, pipeline, and injection well are all designed to handle the expected concentrations, temperatures, and pressures of H_2S and CO_2, any leakage from surface equipment will be quickly detected and addressed. The concentrations of H_2S and CO_2 are 0.01 and 87.46 mol % as stated in **Table 3**. The facility is designed to minimize potential leakage points by following the American Society of Mechanical Engineers (ASME) standards, API standards, and other industry standards, including standards pertaining to material selection and construction. Additionally, connections are designed to minimize corrosion and leakage points. The facility and well will be monitored for a lack of oxygen in high-risk areas. This monitoring equipment will be set with a low alarm setpoint for O_2 that automatically alerts field personnel of abnormalities. Additionally, all field personnel are required to wear gas monitors, which will trigger the alarm at low levels of oxygen (O_2) (typically 19.5%) and industry standard low and high alarm levels for H_2S. The injection facility will be continuously monitored through automated systems that are designed to identify abnormalities in operational conditions. In addition, field personnel will conduct daily inspections and monthly AVO field inspections of gauges, monitors, and leak indicators. The effectiveness of the internal and external corrosion control program is monitored through the periodic inspection of the system and analysis of liquids collected from the line. These inspections, in addition to the automated systems, will allow dCarbon to quickly identify and respond to any leakage situation. Monitoring will occur for the duration of injection and the post-injection period. Should leakage be detected during active injection operations, the volume of CO_2 released will be calculated based on operating conditions at the time of the event, per 40 CFR § 98.448(a)(5).

The CO_2 for injection will be metered in one location. Once the CO_2 is compressed to a supercritical state, it will pass through a Coriolis meter for measurement and then be transported approximately 150 feet via surface pipeline (see **Figure 17**) to the injection well. The injection stream will also be analyzed with a CO_2 gas chromatograph at the well site to determine the final concentration. The meters will each be calibrated to industry standards. Any CO_2 that is determined to have leaked or not been received at the injection wellhead will be quantified using the procedures specified in subpart W of the GHGRP, reported as specified in 40 CFR § 98.448(a)(5), and subtracted from reported injection volumes. Gas samples will be taken and analyzed per manufacturer's recommendations to confirm stream composition and calibrate or re-calibrate meters, if necessary. At a minimum, these samples will be taken quarterly. Minimal variation of concentration and composition are expected but will be included in regulatory filings as appropriate.

6.2 Leakage from Existing and Future Wells within the Monitoring Area

There are no wells in the AMA/MMA currently existing, approved, or pending that penetrate as deep as the Queen City injection interval. However, dCarbon will reverify the status and public information for all proposed and approved drilling permits within the MMA quarterly. If any wells are proposed, permitted, or drilled within the MMA, dCarbon will investigate the proposal and determine if any additional risks are introduced through the new well proposal. Additionally, dCarbon will continuously monitor and collect injection volumes, pressures, temperatures, and gas composition data for the injection well. This data will be reviewed by qualified personnel and will follow response and reporting procedures when data is outside acceptable performance limits. Finally, dCarbon will update the MRV plan if any new wells are drilled within the MMA, or if any other material changes to the project occurs.

The injection well design has pressure and temperature gauges monitoring the injection stream at the wellhead as well as bottomhole pressure and temperature gauges near the bottom of the tubing. The downhole gauges will monitor the inside of the tubing (injection stream) as well as the annulus. A change of pressure on the annulus would indicate the presence of a possible leak requiring remediation. Mechanical Integrity Tests (MITs) performed annually would also indicate the presence of a leak. Upon a negative MIT, the well would immediately be isolated, and the leak mitigated.

In the unlikely event that any CO_2 leaks occur into existing or future wells in the monitoring area, dCarbon will endeavor to work with the operator(s) of those wells and/or midstream providers to take wellhead gas samples to quantify variations or increases of CO_2 compared with historical or baseline CO_2 concentrations. Any measurable increases in CO_2 which may be confidently attributed to injection volumes from the Lima Tango CCS 1 well will be calculated using standard engineering procedures for estimating potential well leakage determined to be appropriate for the situation. These volumes will be documented and reported in the annual monitoring report and subtracted from reported injection volumes. Additionally, dCarbon will evaluate and execute any additional downhole remediations (*e.g.*, well workovers, which may include adding plugs or remedial cement jobs) that could address leakage from the injection well to the existing and future wells in the area if necessary and practical.

6.3 Leakage from Faults and Fractures

No faults or fractures have been identified that would allow CO_2 to migrate vertically to zones with USDWs or to the surface. The closest fault to the Lima Tango CCS 1 well has minor offset and does not extend into the shallow formations (Fault 2 in **Figure 27**). It is also outside of the modeled plume after 12 years of injection and plume stabilization. Larger faults in the study area are outside the modeled AMA/MMA.

In the unlikely event that such leakage from faults or fractures occurs, dCarbon will determine which standard engineering techniques for estimating potential leakage from the faults and fractures are appropriate for the situation to estimate any leakage from faults and fractures and report such leakage estimates and the methodology employed in the annual monitoring report.

6.4 Leakage through Confining Layers

Leakage through confining layers is improbable, given the number and thickness of layers between the injection interval and any possible potable groundwater. There are not any groundwater wells near the Lima Tango CCS 1 site as shown in **Figure 19**. dCarbon has reviewed offsetting logs through the possible groundwater interval above the shallow base of USDW and not observed a freshwater response on the resistivity logs. When dCarbon drills the Lima Tango CCS 1 well, logs will be obtained over the potential shallow water zone and evaluated for the presence of porosity and a freshwater response. Should a freshwater response be observed, dCarbon proposes to drill a monitoring well over the groundwater interval and would amend this MRV plan to reflect this change.

Should any CO_2 leakage occur, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation to estimate any leakage and report such leakage estimates and the methodology employed in the annual monitoring report.

6.5 Leakage through Natural or Induced Seismicity

While the likelihood of a natural or induced seismicity event is extremely low, dCarbon plans to monitor for seismic activity using the existing TexNet monitoring system. If a seismic event of 3.0 magnitude or greater is detected, dCarbon will review the injection volumes and pressures at the Lima Tango CCS 1 well to determine if any significant changes occurred that would indicate potential leakage. To suspect leakage due to natural or induced seismicity, the evidence would need to suggest that the earthquakes are activating faults that intersect the confining zones.

In the unlikely event CO_2 leakage occurs due to natural or induced seismicity, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.6 Leakage through Lateral Migration

The distances to the closest penetration of the Queen City injection interval are 2,200 feet from the AMA/MMA boundary and 6,800 feet away from the Lima Tango CCS 1 injection site in a down dip direction (the Duwell 1 well). The next closest penetration is 4,300 feet from the AMA/MMA boundary and 9,600 feet from the injection site on strike (Nueces L&L Co. 1 well). The map in **Figure 27** shows the location of these two wells, which are both plugged dry holes. Given the distance and status of these wells, leakage through lateral migration is not expected.

In the unlikely event CO_2 leakage occurs due lateral migration, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.7 Quantification of Leakage

In the unlikely event that CO_2 moves vertically past the primary and secondary confining layers as described earlier in **Section 6**, there are not existing groundwater wells present in this region to use to monitor for leaks.

The well most suited to use a monitor for leaks into the shallow USDW is the Lima Tango CCS 1 injection well itself. Open hole logs will be collected over each casing interval to screen for evidence of freshwater. Should an aquifer be identified during the drilling and logging of the injection well, a separate groundwater monitoring well will be drilled and used to monitor water quality and sampled annually. If dCarbon notices an increase in groundwater CO_2 concentration compared to baseline measurements, the increase in concentration will be analyzed volumetrically to provide a preliminary estimate of CO_2 leakage.

Any leakage that did extend to the surface could be characterized and quantified through surface surveillance in the project area paired with direct pressure, volume, and temperature (PVT) measurements. Currently available (and continuously improving) atmospheric sensing technology could be used to establish a baseline of ambient CO_2 concentration in the project area and identify any fluctuations. Deviations from baseline concentration along with understanding of the distance from potential leak sources can then be coupled with temporally matched meteorological data to semi-quantitatively determine leak attribution and rate. Based on the size of leak, these qualified or quantified leak rates can be compared with spatiotemporally monitored PVT data to co-index or further refine leaked volumes from likely point sources.

Any diffuse leak or leak without an obvious single point source may require additional identification and quantification methods. dCarbon is working with a leading environmental services and data company that specializes in monitoring and quantifying gas leaks in various industrial settings. One such quantification method involves utilizing fixed monitoring systems to detect CO_2. Additional system capabilities also include the deployment of an unmanned aerial vehicle (UAV), which is outfitted with an industry leading high fidelity CO_2 sensor capable of measuring concentrations as little as parts per billion (ppb). The UAV mobile surveillance platform possesses the ability to be flown on a programmable and highly replicable pattern across the MMA in both X and Y axis (longitude + latitude) as well as Z axis (height). Depending on the system's ability to obtain a reliable baseline across the MMA, areal deviation in CO_2 concentration could be measured, and diffuse leak sources could potentially be identified, provided the emissions reach a sufficient threshold. dCarbon will also consider similar technologies with less spatial resolution or fidelity such as fixed wing flyovers and/or improving satellite data with UAV technology to screen for and support diffuse emissions identification and investigation.

Depending on the applicability and monitoring needs, dCarbon will also consider other monitoring quantification methods such as the Eddy Covariance Method (ECM) (Korre *et al.*, 2011). This method utilizes gas fluxes and ambient meteorological conditions to detect and quantify leaks, although the ability to detect smaller leaks may be limited. Additionally, long open path tunable diode lasers could be used to measure distance averaged concentrations of CO_2 in the air, which could help quantify a leak of CO_2. This system could be paired with an array of short, closed path detectors (*e.g.*, gas chromatographs) that are typically placed around a suspected leak or leak area to monitor point-source CO_2 concentration increases and to quantify leakage. dCarbon may also evaluate other emerging technologies for quantifying CO_2 leakage such as Non-Dispersive Infra-Red (NDIR) CO_2 sensors and soil flux detectors. dCarbon may also utilize three-dimensional reservoir models that factor in faults and surface topography to predict CO_2 leakage locations, quantity, and timing. The applicability of such models in predicting and quantifying gas leaks has been tested and documented at the Leroy natural gas storage site in Wyoming, USA. (Chen, 2013)

As the technology and equipment to quantify CO_2 leakage is rapidly evolving and expected to improve over time, dCarbon will continue to update its leak detection and quantification plans as appropriate. If dCarbon detects a leak associated with CO_2 injection at the Lima Tango CCS 1 well, all methods discussed in this section will be considered in addition to emerging technologies to determine the most applicable and effective method of quantification.

7 – BASELINE DETERMINATIONS

This section identifies the strategies that dCarbon will undertake to establish the expected baselines for monitoring CO_2 surface leakage per § 98.448(a)(4).

Prior to the beginning of injection operations, baseline groundwater quality and properties will be determined and monitored through the installation of a groundwater well near the injection well site if the potential for a freshwater aquifer is observed when drilling the injection well. Samples will be taken and analyzed by a third-party laboratory to establish the baseline properties of the groundwater in the area. dCarbon will sample the groundwater monitoring well quarterly initially to establish the baseline water quality. dCarbon may adjust to annual sampling after one year.

Prior to the beginning of injection operations, baseline seismicity in the area near the Lima Tango CCS 1 will be determined through the historical data from USGS and the TexNet seismic array data hosted by the Texas Bureau of Economic Geology. The TexNet seismic array has been in operations in south Texas since 2017 and was expanded in late 2018. Using the historical data from the TexNet array, dCarbon will establish the seismicity baseline beginning in 2019 for the Lima Tango CCS 1 project.

Once injection operations begin in early 2026, the operational performance data recorded by the continuous data collection systems will be used to establish operational performance baselines and any deviations from those trends will be investigated. Examples of continuous data that will be used in establishing operational baselines are injection pressure and temperature, injection rate, and well annulus pressure and temperature. Any deviations from the established baselines will be investigated as a possible leak indicator.

Non-continuous data will also be collected periodically throughout the life of the project and will aid in leak detection. Daily to weekly AVO inspections will monitor for signs of leakage from surface equipment as outlined in in **Sections 5.1 and 6.1**. Field personnel will carry gas monitors that will monitor for low O_2 levels or high H_2S levels, both a sign of a potential CO_2 leak. Annual MIT testing, as outlined in **Section 6.2**, will test for potential leaks related to the well.

8 – SITE SPECIFIC CONSIDERATIONS FOR DETERMINING THE MASS OF CO_2 SEQUESTERED

This section identifies how dCarbon will calculate the mass of CO_2 injected, emitted, and sequestered. This also includes site-specific variables for calculating the CO_2 emissions from equipment leaks and vented emissions of CO_2 between the injection flow meter and the injection well, per 40 CFR § 98.448(a)(5).

8.1 Mass of CO_2 Received

Per 40 CFR § 98.443, the mass of CO_2 received must be calculated using the specified CO_2 received equations "unless you follow the procedures in 40 CFR §98.444(a)(4)." 40 CFR § 98.444(a)(4) states that "if the CO_2 you receive is wholly injected and is not mixed with any other supply of CO_2, you may report the annual mass of CO_2 injected that you determined following the requirements under paragraph (b) of this section as the total annual mass of CO_2 received instead of using Equation RR-1 or RR-2 of this subpart to calculate CO_2 received."

The CO_2 received by dCarbon for injection into the Lima Tango CCS 1 injection well is wholly injected and not mixed with any other supply and the annual mass of CO_2 injected will equal the amount received. Any future streams will be metered separately before being combined into the calculated stream.

8.2 Mass of CO_2 Injected

Per 40 CFR § 98.444(b), since the flow rate of CO_2 injected will be measured with a volumetric flow meter, the total annual mass of CO_2, in metric tons, will be calculated by multiplying the volumetric flow at standard conditions by the CO_2 concentration in the flow and the density of CO_2 at standard conditions, according to Subpart RR Equation 5:

$$CO_{2,u} = \sum_{p=1}^{4} Q_{p,u} * D * C_{CO_{2,p,u}}$$

Where:

$CO_{2,u}$	=	Annual CO_2 mass injected (metric tons) as measured by flow meter u.
$Q_{p,u}$	=	Quarterly volumetric flow rate measurement for flow meter u in quarter p at standard conditions (standard cubic meters per quarter).
D	=	Density of CO_2 at standard conditions (metric tons per standard cubic meter): 0.0018682.
$C_{CO2,p,u}$	=	CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO_2, expressed as a decimal fraction).
p	=	Quarter of the year.
u	=	Flow meter.

8.3 Mass of CO_2 Produced

The Lima Tango CCS 1 well will receive CO_2 produced from the nearby ET Las Tiendas NGP Plant and the CO_2 will be injected for geologic sequestration only. No CO_2 will be produced from the injection well. The injection will occur into a saline, non-productive aquifer and is not part of an enhanced oil recovery project. Natural gas processed at the ET Las Tiendas NGP Plant primarily comes from gas wells producing from the Eagle Ford Formation which is stratigraphically deeper than the Queen City injection intervals and well outside the MMA/AMA. The closest Eagle Ford wells are roughly eight miles northwest of the injection location.

8.4 Mass of CO_2 Emitted by Surface Leakage

Mass of CO_2 emitted by surface leakage and equipment leaks will not be measured directly as the injection stream for this well contains hydrogen sulfide (H_2S), which may be hazardous for field personnel to perform a direct leak survey. Any leakage would be detected and managed as a major upset event. Gas detectors and continuous monitoring systems would trigger an alarm upon a release. The mass of the CO_2 released would be calculated for the operating conditions at the time, including pressure, flow rate, size of the leak point opening, and duration of the leak. This method is consistent with 40 CFR § 98.448(a)(5), allowing the operator to calculate site-specific variables used in the mass balance equation.

In the unlikely event that CO_2 was released because of surface leakage, the mass emitted would be calculated for each surface pathway according to methods outlined in the plan and totaled using 40 CFR Part 98-Subpart RR Equation 10 as follows:

$$CO_{2,E} = \sum_{x=1}^{X} CO_{2,x}$$

Where:

$CO_{2,E}$	=	Total annual mass emitted by surface leakage (metric tons) in the reporting year
$CO_{2,x}$	=	Annual CO_2 mass emitted (metric tons) at leakage pathway x in the reporting year
X	=	Leakage pathway

Annual mass of CO_2 emitted (in metric tons) from any equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flowmeter used to measure injection quantity and injection wellhead will comply with the calculation and quality assurance/quality control requirement proposed in Part 98, Subpart W and will be reconciled with the annual data collected through the monitoring plan.

8.5 Mass of CO_2 Sequestered

The mass of CO_2 sequestered in the subsurface geologic formations will be calculated using 40 CFR Part 98, Subpart RR Equation 12, as this well will not actively produce any oil or natural gas or any other fluids, as follows:

$$CO_2 = CO_{2I} - CO_{2E} - CO_{2FI}$$

Where:

CO_2	=	Total annual CO_2 mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.
$CO_{2,I}$	=	Total annual CO_2 mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
$CO_{2,E}$	=	Total annual CO_2 mass emitted (metric tons) by surface leakage in the reporting year.

CO_{2FI}	=	Total annual CO_2 mass emitted (metric tons) from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead, for which a calculation procedure is provided in Subpart W of Part 98.

9 – ESTIMATED SCHEDULE FOR IMPLEMENTATION OF MRV PLAN

The injection well is expected to begin operation at a to-be-determined date in early 2026. Baseline data will be collected before injection begins and the MRV plan will be implemented upon receiving Environmental Protection Agency (EPA) MRV plan approval. Collection of data for calculating the total amount of CO_2 sequestered will begin at the same to-be-determined date in early 2026 that the injection well is operational, and CO_2 is being injected.

10 – QUALITY ASSURANCE

10.1 CO_2 INJECTED

- The flow rate of the CO_2 being injected will be measured with a volume flow meter, consistent with industry best practices. These flow rates will be compiled quarterly.
- The composition of the CO_2 stream will be measured upstream of the volume flow meter with a gas composition analyzer or representative sampling consistent with industry best practices.
- The gas composition measurements of the injected stream will be averaged quarterly.
- The CO_2 measurement equipment will be calibrated according to manufacturer specifications.

10.2 CO_2 EMISSIONS FROM LEAKS AND VENTED EMISSIONS

- Gas detectors will be operated continuously, except for maintenance and calibration.
- Gas detectors will be calibrated according to manufacturer recommendations and API standards.
- Calculation methods from Subpart W will be used to calculate CO_2 emissions from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

10.3 MEASUREMENT DEVICES

- Flow meters will be continuously operated except for maintenance and calibration.
- Flow meters will be calibrated according to the requirements in 40 CFR § 98.3(i).
- Flow meters will be operated per an appropriate standard method as published by a consensus-based standards organization.
- Flow meter calibrations will be traceable to the National Institute of Standards and Technology (NIST).

All measured volumes of CO_2 will be converted to standard cubic feet at a temperature of 60 degrees Fahrenheit and an absolute pressure of 1.0 atmosphere.

10.4 MISSING DATA

In accordance with 40 CFR § 98.445, dCarbon will use the following procedures to estimate missing data if unable to collect the data needed for the mass balance calculations:

- If a quarterly quantity of CO_2 injected is missing, the amount will be estimated using a representative quantity of CO_2 injected from the nearest previous period at a similar injection pressure.
- Fugitive CO_2 emissions from equipment leaks from facility surface equipment will be estimated and reported per the procedures specified in Subpart W of 40 CFR § 98.

11 – RECORDS RETENTION

dCarbon will retain records as required by 40 CFR § 98.3(g). These records will be retained for at least three years and include:

- Quarterly records of the CO_2 injected.
- Volumetric flow at standard conditions.
- Volumetric flow at operating conditions.
- Operating temperature and pressure.
- Concentration of the CO_2 stream.
- Annual records of the information used to calculate the CO_2 emitted by surface leakage from leakage pathways.
- Annual records of information used to calculate CO_2 emitted from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

12 – REFERENCES

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Texas Water Development Board Interactive Viewer, 2024, https://www3.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer

U. S. Geological Survey National Produced Waters Geochemical Database (ver. 2.0, December 2023) Viewer, https: //www. https://www.usgs.gov/tools/us-geological-survey-national-produced-waters-geochemical-database-viewer

Walsh, F.R.I., *et al.*, 2017, FSP 1.0: A Program for Probabilistic Estimation of Fault Slip Potential Resulting from Fluid Injection, available at: https://scits.stanford.edu/software

13 - APPENDIX

13.1 EXPIRED PERMITS FROM THE TRRC

Table 9 – Expired permits from TRRC database*.

API	Well No.	Symbol_Description	Location_Source	Latitude	Longitude
311	2B	Permitted Location	Commission`s hardcopy map	28.0660035	-98.7681379
311	8	Permitted Location	Commission`s hardcopy map	28.0695958	-98.7640217
311	4	Permitted Location	Commission`s hardcopy map	28.0636247	-98.7627483

* These permitted wells may exist as dry holes in the S&P Global database well list below

13.2 WELLS IN MMA

Table 10 – Wells in the MMA (sourced from S&P Global database).

API	Well Name	Well Num	Latitude	Longitude	Status	Total Depth	Operator
421310007000	SOC FOR PROPAGATI	1	28.0565397	-98.7603987	Dry Hole with Oil Show	1350	PETROLEUM PRODUCERS INC
421310007100	NUECES LD & LVESTCK	1	28.0562470	-98.7621096	Dry Hole with Oil Show	1227	BASOM G W TRUSTEE
421313171800	NUECES LD&LVSTCK	1	28.0467414	-98.7758977	Dry Hole	2154	GULF OIL CORP
421313316400	NUECES MINERALS CO	1	28.0467787	-98.7703195	Dry Hole with Gas Show	2500	VICTORIA MINERALS
423110147400	NUECES LD LSTK	1	28.0613037	-98.7779357	Dry Hole	2225	PARKER PETROLEUM CO
423110147500	NUECES LAND & LIVESTOCK CO	1	28.0597908	-98.7697815	Dry Hole with Oil Show	1193	SMITH & COSNER
423110147900	NUECES LAND & LIVESTOCK	1	28.0683736	-98.7640390	Unknown	1215	SECONDARY OIL CORP INC
423110148000	NUECES LAND & LIVESTOCK	2	28.0684014	-98.7626783	Oil Well	1220	OHIO FUEL SUPPLY CO
423110148100	NUECES LAND & LIVESTOCK	3	28.0696469	-98.7626704	Oil Well	1215	OHIO FUEL SUPPLY CO
423110148200	NUECES LAND & LIVESTOCK	4	28.0578346	-98.7531587	Oil Well	1212	SECONDARY OIL CORP INC
423110148400	NUECES LAND & LIVESTOCK	6	28.0696207	-98.7653094	Unknown	1208	SECONDARY OIL CORP INC
423110148500	NUECES L & 6 CO	9	28.0649230	-98.7640330	Oil Well	1220	GRAHAM TOM
423110148600	NUECES L&L CO	10	28.0660888	-98.7640133	Oil Well	1215	GRAHAM BROTHERS
423110148700	NUECES L&L CO	11	28.0671777	-98.7641023	Oil Well	1221	GRAHAM TOM
423110148800	NUECES L&L CO	12	28.0672632	-98.7626518	Oil Well	1227	GRAHAM BROTHERS
423110148900	NUECES L&L CO	13	28.0660097	-98.7627152	Oil Well	1224	GRAHAM BROTHERS

423110149000	NUECES L & L CO	14	28.0648630	-98.7626668	Dry Hole with Oil Show	1223	GRAHAM BROTHERS
423110149200	NUECES LND & LVSTCK	2-A	28.0624432	-98.7640137	Oil Well	1213	BISHOP OIL CO
423110149300	NUECES LD & LIVESTOCK	3-A	28.0613433	-98.7639772	Dry Hole with Oil Show	1216	BISHOP OIL CO
423110149400	NUECES LAND & LIVESTOCK	4A	28.0636782	-98.7627331	Dry Hole with Oil Show	1251	BISHOP OIL CO
423110149500	NUECES LAND & LIVESTOCK	1B	28.0649387	-98.7653312	Oil Well	1206	SECONDARY OIL CORP INC
423110149600	NUECES L&L CO	2B	28.0660141	-98.7653893	Dry Hole with Oil Show	1348	BISHOP OIL CO
423110149700	NUECES LAND & LIVESTOCK	3B	28.0651833	-98.7668115	Dry Hole with Oil Show	1199	BISHOP OIL CO
423110149800	NUECES L & L CO	4B	28.0672593	-98.7653290	Oil Well	1208	SECONDARY OIL CORP INC
423110149900	NUECES LD & LVSTK	1B	28.0646304	-98.7683287	Unknown	1213	KRASNER SAM
423110150000	NUECES LD & LVSTK	2B	28.0660570	-98.7681225	Dry Hole	1222	KRASNER SAM
423110150100	NUECES LD LSTK	2D	28.0583058	-98.7660810	Oil Well	1200	KRASNER SAM
423110150200	NUECES LD LSTK	3D	28.0575764	-98.7672696	Oil Well	1195	KRASNER SAM
423110150300	NUECES LD & LIVE ST	1	28.0649237	-98.7682537	Dry Hole with Oil Show	1505	DUNCAN N V
423110150400	NUECES LAND & LIVESTOCK	1	28.0668838	-98.7594553	Dry Hole with Gas Show	1268	TAYLOR REFINING CO
423110150500	NUECES LAND & LIVESTOCK	1-A	28.0636250	-98.7654534	Oil Well	1213	SECONDARY OIL CORP INC
423110150600	NUECES LAND & LIVESTOCK CO	8	28.0696167	-98.7642548	Dry Hole	1222	NUGENT GEORGE V & L V OIL ACCT
423110236100	NUECES LD LIVESTOCK	1-D	28.0594141	-98.7661765	Unknown	1196	KRASNER SAM & WOODMAN L L
423113141700	NUECES MINERALS	1	28.0610659	-98.7658244	Dry Hole	1358	DKD JOINT VENTURE
423113143500	NUECES MINERALS	2	28.0685222	-98.7657277	Abandoned Oil Well	1280	DKD JOINT VENTURE
423113508200	SCOPE-MUNSON	1	28.0695062	-98.7665958	Abandoned Location		SCOPE PRODUCTION CO LLC

13.3 Approved W-14, W-1, and Drilling Permits

CHRISTI CRADDICK, CHAIRMAN
WAYNE CHRISTIAN, COMMISSIONER
JIM WRIGHT, COMMISSIONER

DANNY SORRELLS
DEPUTY EXECUTIVE DIRECTOR
DIRECTOR, OIL AND GAS DIVISION
PAUL DUBOIS, P.E.
ASSISTANT DIRECTOR, TECHNICAL PERMITTING

RAILROAD COMMISSION OF TEXAS

OIL AND GAS DIVISION

PERMIT TO DISPOSE OF NON-HAZARDOUS OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL AND GAS

PERMIT NO. 17575

BKV DCARBON VENTURES, LLC
4800 BLUE MOUND ROAD
FORT WORTH TX 76106

Authority is granted to inject Non-Hazardous Oil and Gas waste into the well identified herein in accordance with Statewide Rule 9 of the Railroad Commission of Texas and based on information contained in the application (Form W-14) dated December 05, 2024, for the permitted interval(s) of the QUEEN CITY formation(s) and subject to the following terms and special conditions:

LIMA TANGO CCS (00000) LEASE
MUNSON FIELD
MCMULLEN COUNTY
DISTRICT 01

WELL IDENTIFICATION AND PERMIT PARAMETERS:

Well No.	API No.	UIC No.	Permitted Fluids	Top Interval (feet)	Bottom Interval (feet)	Maximum Gas Daily Injection Volume (MCF/day)	Maximum Surface Injection Pressure for Gas (PSIG)
1	31100000	000126980	Carbon Dioxide (CO2)	3508	4870	9500	1700

SPECIAL CONDITIONS:

Well No.	API No.	Special Conditions
1	31100000	**1. Cement Bond Log (CBL):** **(A) A CBL must be run on the injection string casing. If the CBL does not verify adequate confinement of the injection/disposal interval, the operator must perform a remedial cement squeeze on the casing in order to achieve adequate confinement immediately above this interval. Adequate confinement is considered to be: annular height of 600 feet of cement based on cement volume calculations; or 250 feet of cement verified by a temperature survey conducted at the time of cementing; or 100 feet of cement verified by a cement bond log that shows the cement is well bonded to the pipe and formation (80% bond or higher) with no indication of channeling.** **(B) Any CBL run on the well must be submitted within the completion report (W-2/G-1) or submitted within the RRC Digital Well Log submission system. If the Digital Well Log submission system is used, the operator must indicate so on the completion report via the remarks or attaching confirmation.** **(C) If a remedial cement squeeze is needed to achieve adequate confinement, the operator must notify and receive approval from the RRC district office prior to performing any remedial cementing work. All cementing work must be appropriately reported on a completion report (W-2/G-1) pursuant to Statewide Rule 16(b). A copy of any Forms W-15 must also be included with the next completion report.** **2. (A) The operator shall notify the Commission within 24 hours of a discovery of any monitoring or other information which indicates that any contaminant may cause an endangerment to a USDW; or any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between USDWs. Within 20 days of such a discovery, the operator shall file a report with the Commission documenting the event, findings, and response actions taken.** **(B) The permittee shall report the source(s) and the properties of injected acid gas as they are added. In no case may the volume of acid gas exceed the limit indicated in permit.** **(C) The well's construction and materials used must be resistant to corrosion per the proposed wellbore schematic that was submitted in the application.** **3. This is not an Underground Injection Control (UIC) Class VI permit for geologic sequestration of CO2. Geologic sequestration of CO2 that occurs incidental to oil and gas operations is authorized under a Class II UIC permit under certain circumstances, including but not limited to there being a legitimate/material oil and gas exploration/production purpose for the injection that does not cause or contribute to an**

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		increased risk to USDW. **4. For wells with long string casing set more than 100 feet below the permitted injection interval, the plug back depth shall be within 100 feet of the bottom of the permitted injection interval. For wells with open hole completions, the plug back depth shall be no deeper than the bottom of the permitted injection interval.**

STANDARD CONDITIONS:

1. Injection must be through tubing set on a packer. The packer must be set no higher than 100 feet above the top of the permitted interval.

2. The District Office must be notified 48 hours prior to:
   a. running tubing and setting packer;
   b. beginning any work over or remedial operation;
   c. conducting any required pressure tests or surveys.

3. The wellhead must be equipped with a pressure observation valve on the tubing and for each annulus.

4. Prior to beginning injection and subsequently after any work over, an annulus pressure test must be performed. The test pressure must equal the maximum authorized injection pressure or 500 psig, whichever is less, but must be at least 200 psig. The test must be performed and the results submitted in accordance with the instructions of Form H-5.

5. The injection pressure and injection volume must be monitored at least monthly and reported annually on Form H-10 to the Commission's Austin office.

6. Within 30 days after completion, conversion to disposal, or any work over which results in a change in well completion, a new Form W-2 or G-1 must be filed to show the current completion status of the well. The date of the disposal well permit and the permit number must be included on the new Form W-2 or G-1.

7. Written notice of intent to transfer the permit to another operator by filing Form P-4 must be submitted to the Commission at least 15 days prior to the date of the transfer.

8. This permit will expire when the Form W-3, Plugging Record, is filed with the Commission. Furthermore, permits issued for wells to be drilled will expire three (3) years from the date of the permit unless drilling operations have commenced.

Provided further that, should it be determined that such injection fluid is not confined to the approved interval, then the permission given herein is suspended and the disposal operation must be stopped until

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the fluid migration from such interval is eliminated. Failure to comply with all of the conditions of this permit may result in the operator being referred to enforcement to consider assessment of administrative penalties and/or the cancellation of the permit.

APPROVED AND ISSUED ON January 30, 2025.

Scott Rosenquist

(for) ______________________________

Ricardo Rosso, Interim Manager
Injection-Storage Permits Unit

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API No. 42-311-37581

Drilling Permit # 905619

SWR Exception

RAILROAD COMMISSION OF TEXAS
OIL & GAS DIVISION

APPLICATION FOR PERMIT TO DRILL, RECOMPLETE, OR RE-ENTER

This facsimile W-1 was generated electronically from data submitted to the RRC.
A certification of the automated data is available in the RRC's Austin office.

FORM W-1 07/2004

Permit Status: Approved

1. RRC Operator No. 100589
2. Operator's Name (as shown on form P-5, Organization Report) BKV DCARBON VENTURES, LLC
3. Operator Address (include street, city, state, zip): 4800 BLUE MOUND ROAD FORT WORTH, TX 76106-0000
4. Lease Name LIMA TANGO CCS
5. Well No. 1

6. Purpose of filing (mark ALL appropriate boxes): [X] New Drill [ ] Recompletion [ ] Reclass [ ] Field Transfer [ ] Re-Enter [X] Amended [ ] Amended as Drilled (BHL) (Also File Form W-1D)

7. Wellbore Profile (mark ALL appropriate boxes): [X] Vertical [ ] Horizontal (Also File Form W-1H) [ ] Directional (Also File Form W-1D) [ ] Sidetrack

8. Total Depth 5000

9. Do you have the right to develop the minerals under any right-of-way ? [X] Yes [ ] No

10. Is this well subject to Statewide Rule 36 (hydrogen sulfide area)? [ ] Yes [X] No

11. RRC District No. 01

12. County MCMULLEN

13. Surface Location [X] Land [ ] Bay/Estuary [ ] Inland Waterway [ ] Offshore

14. This well is to be located 15.44 miles in a NW direction from Freer which is the nearest town in the county of the well site.

15. Section 119
16. Block
17. Survey BS&F
18. Abstract No. A-118
19. Distance to nearest lease line: ft.
20. Number of contiguous acres in lease, pooled unit, or unitized tract: 16.5

21. Lease Perpendiculars: 252 ft from the NW line and 468 ft from the SW line.

22. Survey Perpendiculars: 1009 ft from the W line and 4834 ft from the N line.

23. Is this a pooled unit? [ ] Yes [X] No

24. Unitization Docket No:

25. Are you applying for Substandard Acreage Field? [ ] Yes (attach Form W-1A) [X] No

26. RRC District No.	27. Field No.	28. Field Name (exactly as shown in RRC records)	29. Well Type	30. Completion Depth	31. Distance to Nearest Well in this Reservoir	32. Number of Wells on this lease in this Reservoir
01	63845001	MUNSON	Injection Well	5000	0.00	1

Remarks

[FILER Mar 10, 2025 8:14 AM]: location moved 100'; [RRC STAFF Mar 10, 2025 4:27 PM]: There have been problems identified with this permit (see problem letter attachment). Notification sent.; [RRC STAFF Mar 11, 2025 11:10 AM]: Problems identified with this permit are resolved.

Certificate:

I certify that information stated in this application is true and complete, to the best of my knowledge.

Bill Spencer, Consultant — Name of filer

Mar 10, 2025 — Date submitted

(512)9181062, x2 — Phone

bill@spencerconsulting.org — E-mail Address (OPTIONAL)

RRC Use Only Data Validation Time Stamp: Mar 12, 2025 3:54 PM(Current Version)

Railroad Commission of Texas

PERMIT TO DRILL, RE-COMPLETE, OR RE-ENTER ON REGULAR OR ADMINISTRATIVE EXCEPTION LOCATION

CONDITIONS AND INSTRUCTIONS

Permit Invalidation. It is the operator's responsibility to make sure that the permitted location complies with Commission density and spacing rules in effect on the spud date. The permit becomes invalid automatically if, because of a field rule change or the drilling of another well, the stated location is not in compliance with Commission field rules on the spud date. If this occurs, application for an exception to Statewide Rules 37 and 38 must be made and a special permit granted prior to spudding. Failure to do so may result in an allowable not being assigned and/or enforcement procedures being initiated.

Notice Requirements. Per H.B 630, signed May 8, 2007, the operator is required to provide notice to the surface owner no later than the 15th business day after the Commission issues a permit to drill. Please refer to subchapter Q Sec. 91.751-91.755 of the Texas Natural Resources Code for applicability.

Permit expiration. This permit expires two (2) years from the date of issuance shown on the original permit. The permit period will not be extended.

Drilling Permit Number. The drilling permit number shown on the permit MUST be given as a reference with any notification to the district (see below), correspondence, or application concerning this permit.

Rule 37 Exception Permits. This Statewide Rule 37 exception permit is granted under either provision Rule 37 (h)(2)(A) or 37(h)(2)(B). Be advised that a permit granted under Rule 37(h)(2)(A), notice of application, is subject to the General Rules of Practice and Procedures and if a protest is received under Section 1.3, “Filing of Documents,” and/or Section 1.4, “Computation of Time,” the permit may be deemed invalid.

Before Drilling

Fresh Water Sand Protection. The operator must set and cement sufficient surface casing to protect all usable-quality water, as defined by the Railroad Commission of Texas (RRC) Groundwater Advisory Unit (GWAU). Before drilling a well, the operator must obtain a letter from the Railroad Commission of Texas stating the depth to which water needs protection, Write: Railroad Commission of Texas, Groundwater Advisory Unit (GWAU), P.O. Box 12967, Austin, TX 78711-3087. File a copy of the letter with the appropriate district office.

Accessing the Well Site. If an OPERATOR, well equipment TRANSPORTER or WELL service provider must access the well site from a roadway on the state highway system (Interstate, U.S. Highway, State Highway, Farm-to-Market Road, Ranch-to-Market Road, etc.), an access permit is required from TxDOT. Permit applications are submitted to the respective TxDOT Area Office serving the county where the well is located.

Water Transport to Well Site. If an operator intends to transport water to the well site through a temporary pipeline laid above ground on the state’s right-of-way, an additional TxDOT permit is required. Permit applications are submitted to the respective TxDOT Area Office serving the county where the well is located.

*NOTIFICATION

The operator is **REQUIRED** to notify the district office when setting surface casing, intermediate casing, and production casing, or when plugging a dry hole. The district office **MUST** also be notified if the operator intends to re-enter a plugged well or re-complete a well into a different regulatory field. Time requirements are given below. The drilling permit number **MUST** be given with such notifications.

During Drilling

Permit at Drilling Site. A copy of the Form W-1 Drilling Permit Application, the location plat, a copy of Statewide Rule 13 alternate surface casing setting depth approval from the district office, if applicable, and this drilling permit must be kept at the permitted well site throughout drilling operations.

***Notification of Setting Casing.** The operator MUST call in notification to the appropriate district office (phone number shown the on permit) a minimum of eight (8) hours prior to the setting of surface casing, intermediate casing, AND production casing. The individual giving notification MUST be able to advise the district office of the drilling permit number.

***Notification of Re-completion/Re-entry.** The operator MUST call in notification to the appropriate district office (phone number shown on permit) a minimum of eight (8) hours prior to the initiation of drilling or re-completion operations. The individual giving notification MUST be able to advise the district office of the drilling permit number.

Completion and Plugging Reports

Hydraulic Fracture Stimulation using Diesel Fuel: Most operators in Texas do not use diesel fuel in hydraulic fracturing fluids. Section 322 of the Energy Policy Act of 2005 amended the Underground Injection Control (UIC) portion of the federal Safe Drinking Water Act (42 USC 300h(d)) to define "underground Injection" to *EXCLUDE* " ...the underground injection of fluids or propping agents (*<u>other than diesel fuels</u>*) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities." (italic and underlining added.) Therefore, hydraulic fracturing may be subject to regulation under the federal UIC regulations if diesel fuel is injected or used as a propping agent. EPA defined "diesel fuel" using the following five (5) Chemical Abstract Service numbers: 68334-30-5 Primary Name: Fuels, diesel; 68476-34-6 Primary Name: Fuels, diesel, No. 2; 68476-30-2 Primary Name: Fuel oil No. 2; 68476-31-3 Primary Name: Fuel oil, No. 4; and 8008-20-6 Primary Name: Kerosene. As a result, an injection well permit would be required before performing hydraulic fracture stimulation using diesel fuel as defined by EPA on any well in Texas. Hydraulic fracture stimulation using diesel fuel as defined by EPA on a well in Texas without an injection well permit could result in enforcement action.

Producing Well. Statewide Rule 16 states that the operator of a well shall file with the Commission the appropriate completion report within ninety (90) days after completion of the well or within one hundred and fifty (150) days after the date on which the drilling operation is completed, whichever is earlier. Completion of the well in a field authorized by this permit voids the permit for all other fields included in the permit unless the operator indicates on the initial completion report that the well is to be a dual or multiple completion and promptly submits an application for multiple completion. All zones are required to be completed before the expiration date on the existing permit. Statewide Rule 40(d) requires that upon successful completion of a well in the same reservoir as any other well previously assigned the same acreage, proration plats and P-15s or P-16s (if required) or a lease plat and P-16 must be submitted with no double assignment of acreage unless authorized by rule.

Dry or Noncommercial Hole. Statewide Rule 14(b)(2) prohibits suspension of operations on each dry or non-commercial well without plugging unless the hole is cased and the casing is cemented in compliance with Commission rules. If properly cased, Statewide Rule 14(b)(2) requires that plugging operations must begin within a period of one (1) year after drilling or operations have ceased. Plugging operations must proceed with due diligence until completed. An extension to the one-year plugging requirement may be granted under the provisions stated in Statewide Rule 14(b)(2).

Intention to Plug. The operator must file a Form W-3A (Notice of Intention to Plug and Abandon) with the district office at least five (5) days prior to beginning plugging operations. If, however, a drilling rig is already at work on location and ready to begin plugging operations, the district director or the director's delegate may waive this requirement upon request, and verbally approve the proposed plugging procedures.

***Notification of Plugging a Dry Hole.** The operator MUST call in notification to the appropriate district office (phone number shown on permit) a minimum of four (4) hours prior to beginning plugging operations. The individual giving the notification MUST be able to advise the district office of the drilling permit number and all water protection depths for that location as stated in the Groundwater Advisory Unit letter.

DIRECT INQUIRIES TO: DRILLING PERMIT SECTION, OIL AND GAS DIVISION

PHONE
(512) 463-6751

MAIL:
PO Box 12967
Austin, Texas, 78711-2967

RAILROAD COMMISSION OF TEXAS
OIL & GAS DIVISION

PERMIT TO DRILL, DEEPEN, PLUG BACK, OR RE-ENTER ON A REGULAR OR ADMINISTRATIVE EXCEPTION LOCATION

PERMIT NUMBER	DATE PERMIT ISSUED OR AMENDED	DISTRICT
905619	(AMENDED) Mar 12, 2025	* 01
API NUMBER 42-311-37581	FORM W-1 RECEIVED Mar 10, 2025	COUNTY MCMULLEN
TYPE OF OPERATION NEW DRILL	WELLBORE PROFILE(S) Vertical	ACRES 16.5

OPERATOR 100589	NOTICE
BKV DCARBON VENTURES, LLC 4800 BLUE MOUND ROAD FORT WORTH, TX 76106-0000	This permit and any allowable assigned may be revoked if payment for fee(s) submitted to the Commission is not honored. **District Office Telephone No:** (210) 227-1313
LEASE NAME LIMA TANGO CCS	WELL NUMBER 1
LOCATION 15.44 miles NW direction from FREER	TOTAL DEPTH 5000

Section, Block and/or Survey
SECTION 119 BLOCK ABSTRACT 118
SURVEY BS&F

DISTANCE TO SURVEY LINES	DISTANCE TO NEAREST LEASE LINE
1009 ft. W 4834 ft. N	ft.
DISTANCE TO LEASE LINES 252 ft. NW 468 ft. SW	DISTANCE TO NEAREST WELL ON LEASE See FIELD(s) Below

FIELD(s) and LIMITATIONS:

* SEE FIELD DISTRICT FOR REPORTING PURPOSES *

FIELD NAME LEASE NAME	ACRES NEAREST LEASE	DEPTH	WELL # NEAREST WE	DIST
MUNSON LIMA TANGO CCS	16.50	5,000	1 0	01

RESTRICTIONS: Do not use this well for injection/disposal/hydrocarbon storage purposes without approval by the Environmental Services section of the Railroad Commission, Austin, Texas office.

THE FOLLOWING RESTRICTIONS APPLY TO ALL FIELDS

This well shall be completed and produced in compliance with applicable special field or statewide spacing and density rules. If this well is to be used for brine mining, underground storage of liquid hydrocarbons in salt formations, or underground storage of gas in salt formations, a permit for that specific purpose must be obtained from Environmental Services prior to construction, including drilling, of the well in accordance with Statewide Rules 81, 95, and 97.

This well must comply to the new SWR 3.13 requirements concerning the isolation of any potential flow zones and zones with corrosive formation fluids. See approved permit for those formations that have been identified for the county in which you are drilling the well in.

RAILROAD COMMISSION OF TEXAS
OIL & GAS DIVISION
SWR #13 Formation Data

MCMULLEN (311) County

Formation	Remarks	Geological Order	Effective Date
CATAHOULA	disposal	1	12/17/2013
FRIO	disposal	2	12/17/2013
YEGUA	disposal	3	12/17/2013
WILCOX	disposal	4	12/17/2013
NAVARRO		5	12/17/2013
ESCONDIDO		6	12/17/2013
OLMOS		7	12/17/2013
ANACACHO		8	12/17/2013
AUSTIN CHALK		9	12/17/2013
EAGLE FORD	H2S	10	12/17/2013
BUDA	H2S	11	12/17/2013
GEORGETOWN		12	12/17/2013
EDWARDS	H2S	13	12/17/2013
PEARSALL		14	12/17/2013
SLIGO	H2S	15	12/17/2013

The above list may not be all inclusive, and may also include formations that do not intersect all wellbores. The listing order of the Formation information reflects the general stratigraphic order and relative geologic age. This is a dynamic list subject to updates and revisions. It is the operator's responsibility to make sure that at the time of spudding the well the most current list is being referenced. Refer to the RRC website at the following address for the most recent information.
http://www.rrc.texas.gov/oil-gas/compliance-enforcement/rule-13-geologic-formation-info

Request for Additional Information: Lima Tango CCS Well
March 26, 2025

Instructions: Please enter responses into this table and make corresponding revisions to the MRV Plan as necessary. Any long responses, references, or supplemental information may be attached to the end of the table as an appendix. This table may be uploaded to the Electronic Greenhouse Gas Reporting Tool (e-GGRT) in addition to any MRV Plan resubmissions.

No.	MRV Plan		EPA Questions	Responses
	Section	Page		
1.	N/A	N/A	Please ensure that all acronyms are defined during the first use within the MRV plan. For example, the terms "TDS" and "USDW" are not defined within the text.	The MRV plan was searched for acronyms and revised to define all acronyms during the first use within the plan.
2.	N/A	N/A	The MRV plan refers to both "dCarbon" and "BKV" throughout the text, notably with interchanging use of the names in section 6.2. We recommend referring to one of these consistently throughout the MRV plan, unless these are distinct entities.	The MRV plan was searched for interchanging use of names. BKV dCarbon Ventures, LLC is now consistently referred to as "dCarbon" per the definition in the introduction.
3.	2	6	The MRV plan includes the Las Tiendas Plant GHGRP ID number and other information. Additionally, under section 3.7, the MRV plan states "dCarbon will compress the CO2 to a supercritical physical state at the Las Tiendas CCS 1 injection site." In the MRV plan, please clarify whether the Las Tiendas CCS 1 injection site is the same as or separate from the Lima Tango CCS 1 injection site. Please also clarify the owner/operator structures of these two facilities. E.g., do both the injection well and the gas plant have the same owner/operator?	The MRV plan was updated to consistently reflect the official well name (Lima Tango CCS 1) and injection site name (Lima Tango CCS 1 site), which is operated by dCarbon. A description of the separate nature of the entity ownership and structure was added to Section 1 to help clarify that the gas plant is owned and operated by Energy Transfer LP (ET) whereas the injection site and injection well are owned and operated by BKV dCarbon Ventures, LLC (dCarbon).

No.	MRV Plan		EPA Questions	Responses
	Section	Page		
4.	3.1	7	Section 3.1 in the MRV plan states: "The storage interval for this project is the Queen City Formation and the Reklaw and Weches Shales are the upper and lower confining zones, respectively." However, other instances of this MRV plan, including the description for Figure 2 indicate that the Reklaw Shale is the lower confining zone and the Weches Shale is the upper confining zone. Please revise for consistency.	The sentence in Section 3.1 had the terms upper and lower in the incorrect order. It has been revised to: "The storage interval for this project is the Queen City Formation and the Reklaw and Weches Shales are the lower and upper confining zones, respectively." This is now consistent with the rest of the MRV plan.
5.	3.7	31-34	Table 6, as well as Figures 21 and 22, provide projected injection parameters for only Injection Zone 2 and Injection Zone 3. In previous sections of the MRV plan, the Queen City injection interval is comprised of three injection zones, please clarify whether information the additional injection zone should be included.	(Section 3.8, pp. 31-34) dCarbon identified three possible injection zones (IZ-1, IZ-2, and IZ-3), but modeled injecting into two zones (IZ-2 and IZ-3) for the MRV plan. Text added to the beginning of the paragraph on page 31 to clarify that the selected two-zone case is the one shown in Table 6 and used for the final model results.
6.	5.4	41	"Fault 2 is much smaller and offsets the Queen City Formation by 40 to 60 feet. The modeled plume does not reach this fault after 12 years of injection or the following CO2 plume stabilizing." Figures 24, 25, and 26 show a fault that penetrates the MMA/AMA, but does not show a fault appearing between 40-60 feet offset of the stabilized 98-year plume. The proximity of this fault to the stabilized plume may warrant further discussion and the inclusion of the fault on the above-mentioned figures. Please review and revise if necessary.	The text as written did not clearly state that the 40 to 60 feet referred to vertical offset or throw of the fault, not the distance between the fault and plume outlines in map view. The text has been revised for improved clarity and map view distances between Fault 2 and the two CO_2 plume outlines have been given. Fault labels have been added to Figures 24, 25, and 26.
7.	6.1	45	The MRV plan refers to the presence of H_2S in the injected fluids. In the MRV plan, please clarify what the anticipated concentrations of CO2 and H2S are. Please also specify whether H_2S monitors are used at the facility to detect potential leakage.	The inlet stream analysis is given in Table 3, including 0.01 mol % H_2S and 87.46 mol % CO_2 in the water saturated case. The text on page 45 has been revised to state these percentages and refer to Table 3. Language has been added stating that operators will wear personal H_2S monitors.

No.	MRV Plan		EPA Questions	Responses
	Section	Page		
8.	7	50	The baseline determination section discusses only two strategies for monitoring CO_2 surface leakage: groundwater sampling and seismicity. Notably, the groundwater sampling appears dependent on whether aquifers are observed, which may not occur. Please include additional strategies for establishing expected baselines. Other recommended baselines for monitoring may include, if applicable to this facility, H_2S and/or O_2 concentrations, injections pressures or other operational metrics, and visual inspections.	The additional strategies for establishing expected baselines have been added to this section, focused on continuous operational performance data and non-continuous monitoring.
9.	8.2	51	"$C_{CO2,p,u}$ = Quarterly CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO_2, expressed as a decimal fraction" In Equation RR-5, this variable is defined as "$C_{CO2,p,u}$ = CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO_2, expressed as a decimal fraction)." Equations and variables cannot be modified from the regulations. Please revise this section and ensure that all equations listed are consistent with the text in 40 CFR 98.443.	Checked equation against the text in 40 CFR 98.443 and revised to remove the word "Quarterly" from the fourth line of the equation.

No.	MRV Plan		EPA Questions	Responses
	Section	Page		
10.	8.3	52	"The injection well is not part of an enhanced oil recovery project, and therefore, no CO2 will be produced." The requirement to calculate CO2 produced is based on whether a facility might produce injected CO2, regardless of whether a facility conducts enhanced oil recovery. See 40 CFR 98.443(d). In this section and/or others, please provide additional explanation of why the facility is making the determination that there is no production associated with this facility and why it is proposing to use RR-12 instead of RR-11. For example, please explain the relationship between the capture and injection facilities (are they one facility or separate per the definition at 40 CFR 98.6 "Facility"). Please also include either a figure or explanatory text that details the location of the producing wells, to what formations they are drilled, and explain whether the injected CO2 plume could be projected to reach or interact with producing equipment.	Text revised to clarify that no CO_2 will be produced from the injection well or injection facility. There are not any producing wells penetrating the injection formation within the AMA/MMA as described in Sections 5.3 and 6.2.
11.	9	54	"The injection well is expected to begin operation in 2026. Baseline data will be collected before injection begins and the MRV plan will be implemented upon receiving EPA MRV plan approval." 40 CFR 98.448(a)(7) requires a "Proposed date to begin collecting data for calculating total amount sequestered according to equation RR–11 or RR–12 of this subpart. This date must be after expected baselines as required by paragraph (a)(4) of this section are established and the leakage detection and quantification strategy as required by paragraph (a)(3) of this section is implemented in the initial AMA." Please clarify whether such a date is included in the MRV plan.	Text revised to state that the date for calculation the total amount sequestered would begin when the injection well becomes operational, and CO_2 injection commences.

Subpart RR Monitoring, Reporting, and Verification (MRV) Plan

Lima Tango CCS 1

McMullen County, Texas

Prepared by

BKV dCarbon Ventures, LLC

February 4, 2025

TABLE OF CONTENTS

1 – INTRODUCTION

BKV dCarbon Ventures, LLC (dCarbon), a subsidiary of BKV Corporation (BKV), is authorized by the Texas Railroad Commission (TRRC) to inject up to 9.5 million standard cubic feet per day (MMscfd), equivalent to approximately 177,000 metric tons per year (MT/yr), of carbon dioxide (CO_2) into the proposed Lima Tango CCS 1 injection well in McMullen County, Texas. The permit issued by the TRRC allows injection into the Queen City formation at a depth of 3,508 feet to 4,870 feet with a maximum allowable surface pressure of 1,700 pounds per square inch gauge (psig).

dCarbon intends to dispose of CO_2 from the nearby Energy Transfer (ET) Las Tiendas Natural Gas Processing (NGP) Plant into the Lima Tango CCS 1 well. The project site is 15.44 mi NW of Freer, Texas, as shown in **Figure 1**.

dCarbon anticipates drilling and completing the Lima Tango CCS 1 well in the third quarter of 2025 and beginning injection operations in early 2026. The Lima Tango CCS 1 has approved W-14 injection and W-1 drilling permits with the TRRC permit number 17575, UIC number 000126980, and API number 42-311-37581). Copies of the approved W-1 and W-14 are included in the **Appendix, Section 13.3.**

Although dCarbon intends to initiate injection with lower volumes, all calculations in this document have been performed assuming the maximum injection amount allowed by the TRCC permit (177,000 MT/yr). dCarbon plans to inject for 12 years.

dCarbon submits this Monitoring, Reporting, and Verification (MRV) plan for approval by the Environmental Protection Agency (EPA) in accordance with 40 CFR § 98.440-449, Subpart RR, of the Greenhouse Gas Reporting Program (GHGRP).

dCarbon's TRRC operator number is 100589.

dCarbon's Environmental Protection Agency Identification (EPA ID) number is 110071343305.

The Lima Tango CCS 1 well's Greenhouse Gas Reporting Program Identification (GHGRP ID) number is 590006. All aspects of this MRV plan refer to this well and this GHGRP ID number.

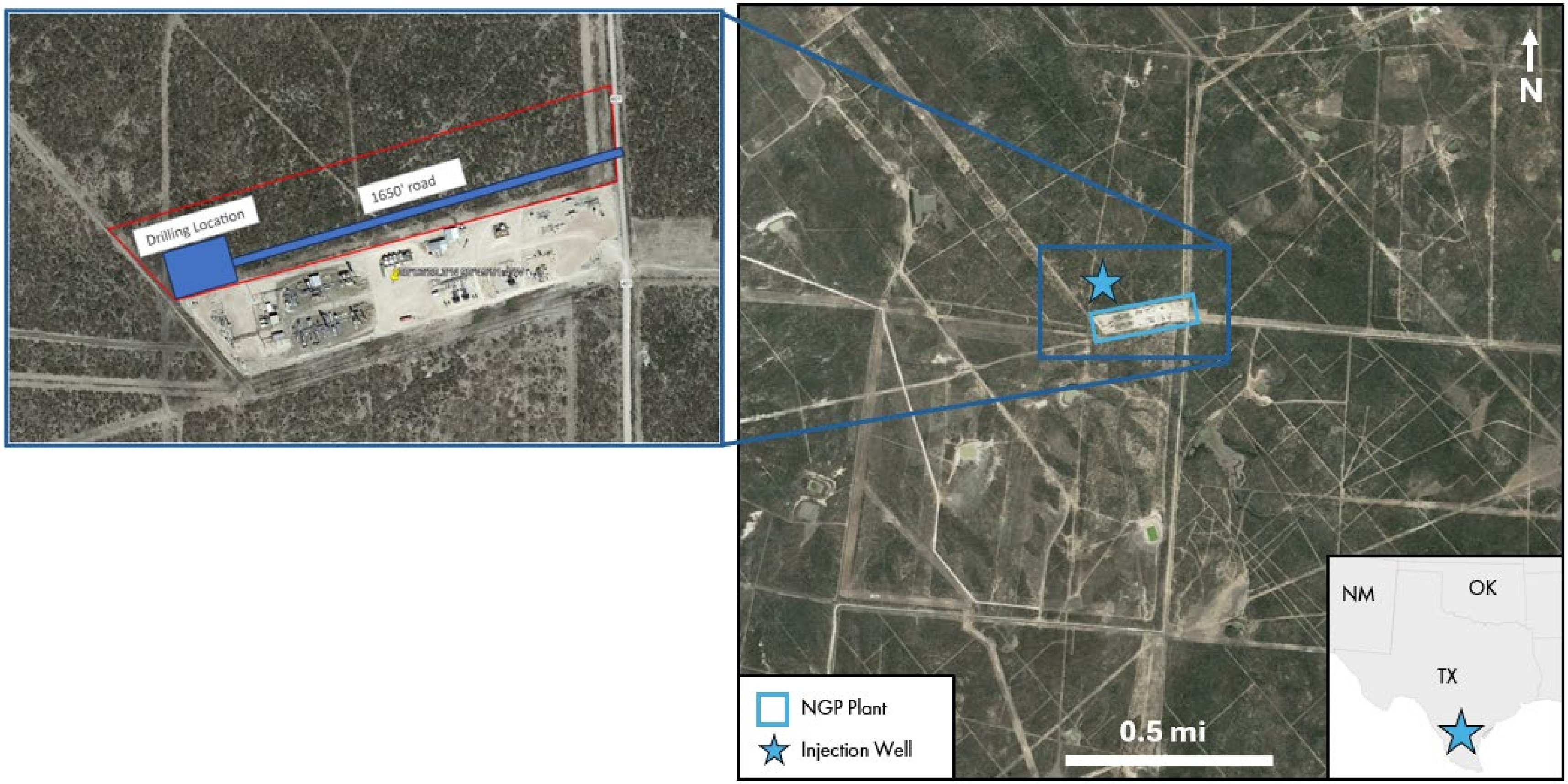

Figure 1. Location map of the Las Tiendas NGP Plant and the proposed Lima Tango CCS 1 injection well drilling location adjoining the plant in McMullen County, Texas.

2 – FACILITY INFORMATION

<u>Gas Plant Facility Name</u>:

Las Tiendas Plant
348 County Road 401
Freer, Texas 78357

Latitude: 27° 57.63' N
Longitude: 98° 35.64' W

GHGRP ID number: 1010735

FRS ID: 110071159879

NAICS Code: 486210

Reporting structure: Onshore Natural Gas Processing

<u>Underground Injection Control (UIC) Permit Class</u>:

The Oil and Gas Division of the Texas Railroad Commission (TRRC) regulates oil and gas activity in Texas and has primacy to implement the Underground Injection Control (UIC) Class II program for injection wells. The TRRC has permitted the Lima Tango CCS 1 well as an UIC Class II well. The Class II permit was issued to dCarbon in accordance with Statewide Rule 9.

<u>Injection Well</u>:

Lima Tango CCS 1, API number 42-311-37581

UIC# 000126980

Lima Tango CCS 1, GHGRP ID: 590006

3 – PROJECT DESCRIPTION

This section discusses the geologic setting, the lithology and reservoir characteristics of the planned injection and confining intervals, the formation fluid geochemistry, the potential for induced seismicity, the groundwater hydrology in the project area, the CO_2 project facilities, and the reservoir modeling performed for the proposed Lima Tango CCS 1 injection well. dCarbon has prepared this MRV plan to support the storage of CO_2 in McMullen County, Texas. The term interval is used for the composite layers and the term zone is used for the specific layers of rocks for the storage and confinement of CO_2.

3.1 Overview of Geology

Paleogene deposition began with the mud-rich Paleocene Midway Shale (**Figure 2**), which is widely present across the northern and western Gulf of Mexico margins. Sediment supply and sand content increased markedly thereafter, with deposition of the coarse siliciclastics of the Paleocene Lower and Middle Wilcox Formations and the Eocene Upper Wilcox Formation, followed by the Eocene Queen City and Sparta Formations. These deposits rapidly filled foreland troughs and prograded across the former Upper Cretaceous shelf margins. Sediment starved mud-rich intervals are present between the Upper Wilcox and Queen City Formations (as the Eocene Reklaw Shale) and between the Queen City and Sparta Formations (as the Eocene Weches Shale) as shown in **Figure 2**. The storage interval for this project is the Queen City Formation and the Reklaw and Weches Shales are the upper and lower confining zones, respectively.

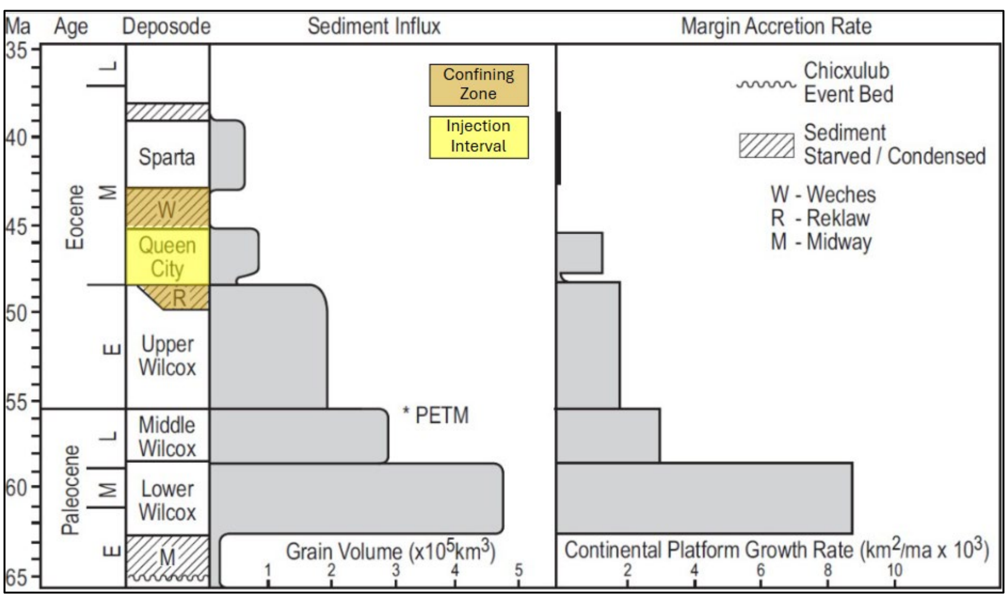

Figure 2. Regional stratigraphy at Lima Tango CCS 1 site in McMullen County, Texas, (modified from Sneddon and Galloway, 2019). The Eocene sediment starved/condensed sections are in hachured fill and labeled W (Weches Shale) and R (Reklaw Shale). These are the upper and lower confining zones, respectively, for the Queen City Formation injection interval.

In this area, the Middle Eocene strata are tens of miles up dip from the shelf edge and the growth fault rafting that characterizes the time-equivalent section in the Gulf of Mexico. A published seismic section near the proposed injection site (**Figure 3**) illustrates the gentle dip and lack of growth faulting at the position of the proposed Lima Tango CCS 1 (red star). The strata in this setting are uniform in thickness, gently dipping towards the coast with less than two degrees of dip, and unimpacted by growth-fault related accommodation. We expect that the injected CO_2 will gradually migrate up dip to the west and northwest, owing to its buoyancy relative to the saline reservoir water. There are three faults mapped at the Queen City stratigraphic level in the Lima Tango CCS 1 model area. The most significant one is in northwestern part of the licensed 3D seismic area and is 1.2 miles from the modeled 98-year post-injection plume extent and 1.5 miles from the modeled 50-pounds per square inch (psi) change in pressure due to the injection. **Section 5.4** describes this fault further and addresses the lack of leakage risk that it presents given the fault's distance away from the modeled plume and pressure front.

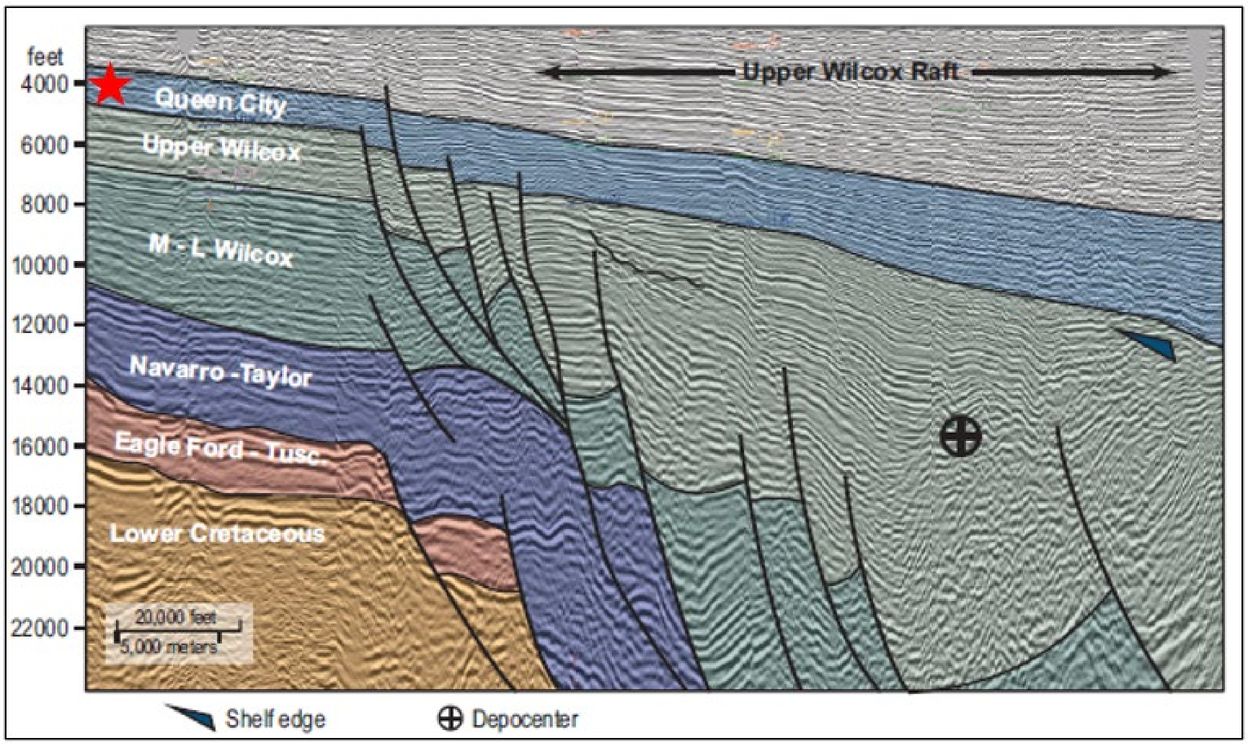

Figure 3. Representative northwest to southeast seismic cross section from Snedden and Galloway (2019) with the Queen City Formation and the Lima Tango project annotated with a red star. Figure 4 shows the line of section location.

3.2 Bedrock Geology

3.2.1 Basin Description

The proposed injection site lies in in McMullen County, Texas, just north of the border between McMullen and Duval Counties. The project takes place in the Gulf of Mexico basin, originally

formed by rifting during the Jurassic (Sneddon and Galloway, 2019). The basin began rapid filling thereafter in the Cretaceous and Paleogene with large volumes of continentally derived sediments transported to the coastal plain by the Rio Grande River system, with the shales representing times of sediment starvation or condensed section. **Figure 4** presents a regional paleogeographic construction representative of the time of deposition of the Queen City Formation injection interval (Middle Eocene) by Galloway and Sneddon (2019).

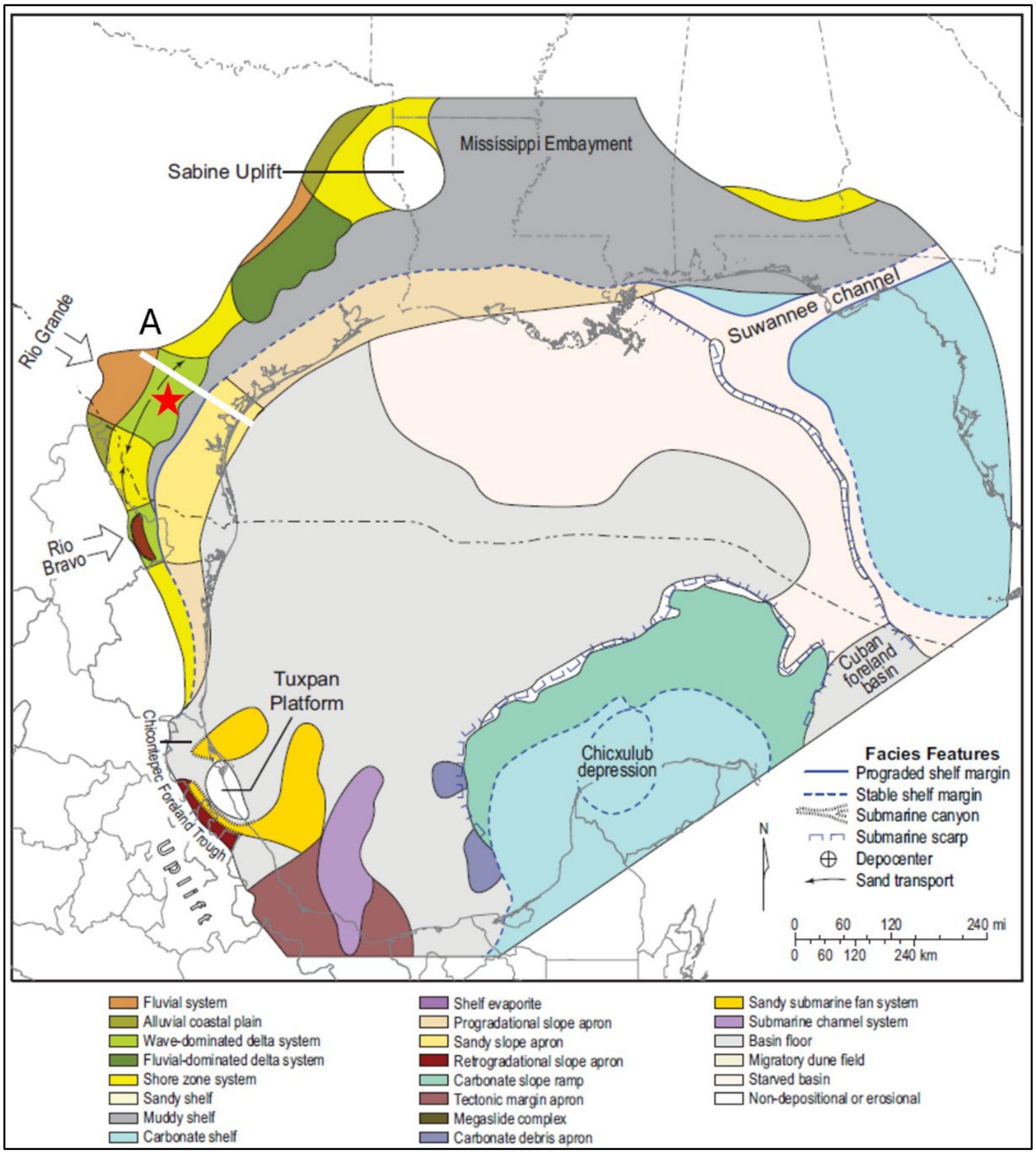

Figure 4. Middle Eocene paleogeographic reconstruction by Snedden and Galloway (2019). The Queen City Formation was deposited during this time, with the red star denoting the proposed injection site in the wave-dominated deltaic depositional environment. The location of the seismic line in Figure 3 is the white line marked by the letter "A".

3.2.2 Stratigraphy

Deposition of the Middle to Upper Eocene strata occurred in a wave-dominated deltaic setting along the margin of the early Gulf of Mexico basin (**Figure 4)**. The Queen City Formation is estimated to occur at depth ranging from 3,508-4,870 ft true vertical depth (TVD) with a reference datum of ground level at the Lima Tango CCS 1 proposed well site and has approximately 1,400 feet of uniform gross thickness across the modeled area. The Queen City Formation is the injection interval and is comprised of three potential injection zones (IZs). The Middle Eocene Weches Shale, with 110 feet of gross thickness, is the Upper Confining Zone (UCZ), and the lower Queen City shale and Early Eocene Reklaw Shale, with 965 feet of gross thickness, including over 50 feet of continuous impermeable shale, is the Lower Confining Zone (LCZ). **Figure 2** shows the stratigraphic relationship of the two confining zones and the injection interval.

Attractive attributes for CCS storage in the project area includes high storage capacity, minimal faulting, tight widespread confining shales, and gentle dip down to the coast. The injection interval is a package of thick, sheet-like, laterally continuous, porous, and permeable sandstone bodies characterized by low spontaneous potential (SP) and high deep resistivity (DRES) readings relative to the shales on wireline logs as shown in the type log (**Figure 5**) and cross section (**Figure 6)**. Individual sand bodies are separated by internal confining shales with higher SP and lower DRES wireline log signatures. The entire injection interval is bracketed by thick upper and lower confining shales, also with higher SP and lower DRES wireline log signatures. Both the injection interval and confining zones are laterally continuous and maintain constant thickness across the project area with a gentle up to the northwest dip (**Figure 6**). The upper confining shale (Weches Shale) is widespread and serves as the regional seal for the Queen City storage assessment unit (SAU) (Roberts-Ashby *et al*., 2014).

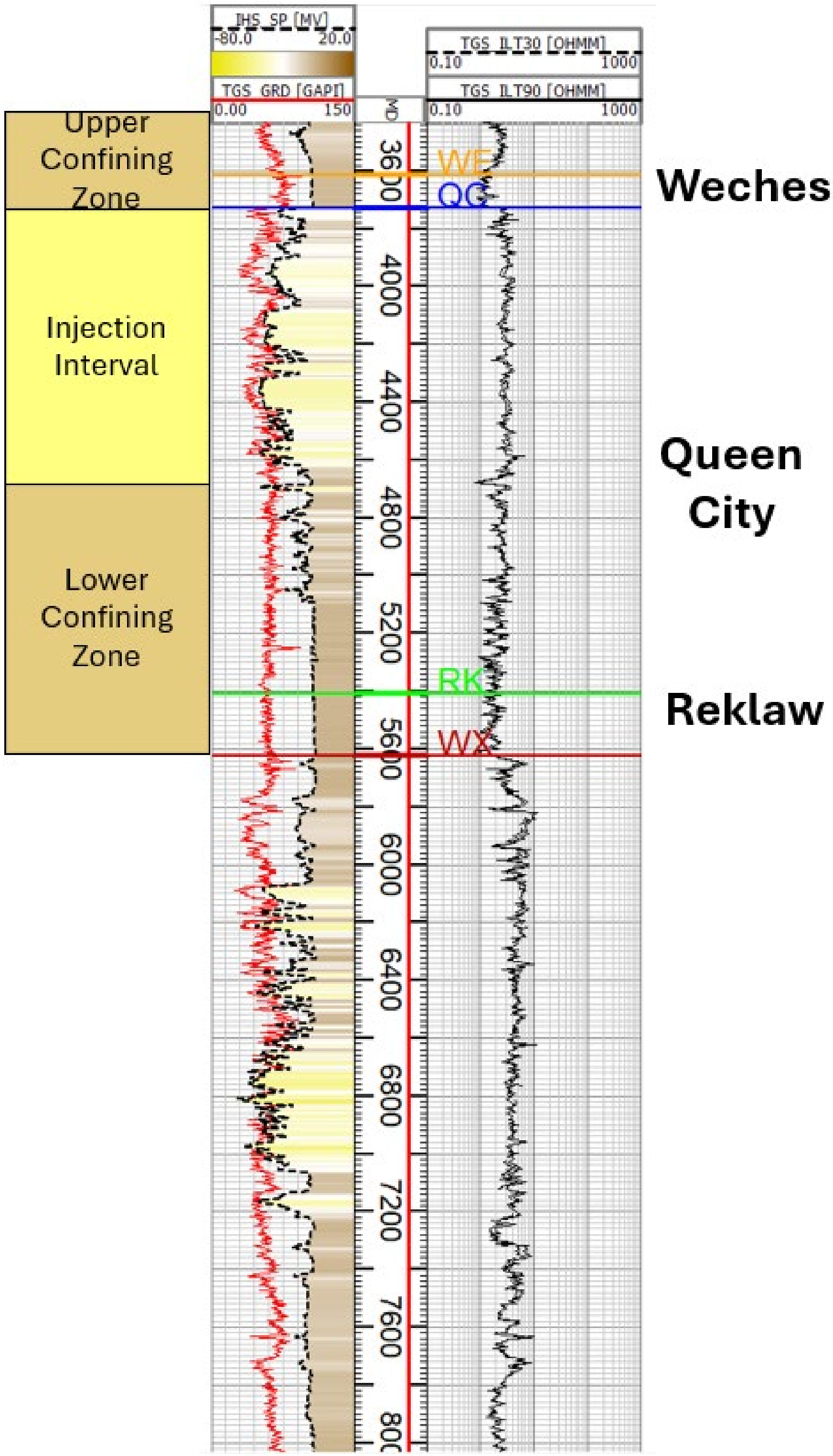

Figure 5. Nueces Mineral No. 1 (API 42-311-3181300) type log depicting the confining zones, injection interval, and associated formation names in the project area. The left column contains GR (red) and SP (color-filled) curves, and the right column contains a DRES curve (black) on a logarithmic scale. Depth scale is in the middle column is in feet MD.

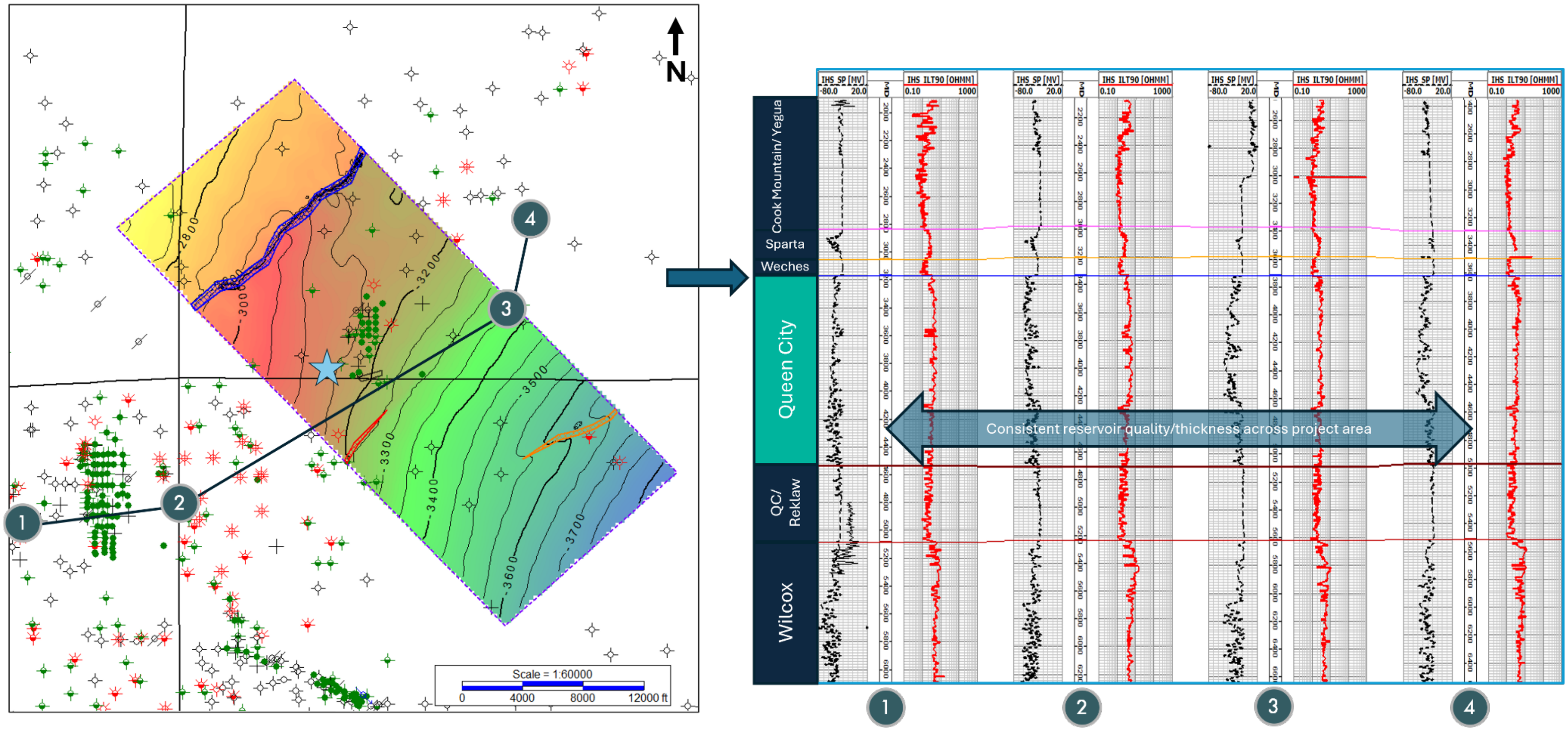

Figure 6. Map of the Lima Tango CCS 1 project area with proposed injection well (light blue star), existing wells, faults, seismic data, cross section wells, and numbered stratigraphic cross section flattened on the Queen City Formation top. The cross section is a four-well section from southwest to northeast across the project area with wells numbered on both the map and cross section. The licensed 3D seismic data is represented by the rectangular area of color filled structural contours on the top of the Queen City Formation in feet true vertical depth subsea (TVDSS) with a contour interval of 50 feet. The Weches Shale is the UCZ for the Queen City storage interval; the lowermost Queen City (QC) and Reklaw Shale are the LCZ for the Queen City and serves as an impermeable barrier between the Queen City and the Upper Wilcox aquifer.

3.2.3 Faulting

The Lima Tango CCS 1 well site is characterized by gentle dip (less than two degrees) and little faulting (**Figure 7**). Paleogene faulting along the western margin of the Gulf of Mexico was initiated by slump over Mesozoic shelf margins during very rapid sediment deposition. The Lima Tango CCS 1 site is located landward of these shelf margins (**Figure 3**) and much of the sediment bypassed this area to the offshore. As such, the deposition was more uniform in this area and the mechanisms for growth faulting were not in place.

There are three faults intersecting the Queen City Formation that have been mapped on the 3D seismic data licensed for this project (**Figure 7**). A late, down-to-the-coast fault with 100-250 feet of offset is on the northwestern portion of the seismic data (**Figure 7**, blue fault labeled 1). This fault is rooted in the Mesozoic section and continues nearly to the surface with consistent offset throughout the section indicating that it moved late.

An antithetic to this fault (**Figure 7**, orange fault labeled 3) is mapped on the southeastern portion of the seismic data, dipping to the northwest. This fault cuts down to the Upper Cretaceous and has offset up to 60 feet within the Queen City Formation.

A smaller fault (**Figure 7**, red fault labeled 2) was mapped in the middle portion of the seismic data. It also dips to the southeast, cutting down from the Eocene to Upper Paleocene section, with minimal offset.

Additional deep, normal faults with minor offset were mapped on the licensed 3D and intersect neither the Queen City Formation nor the lower confining zone.

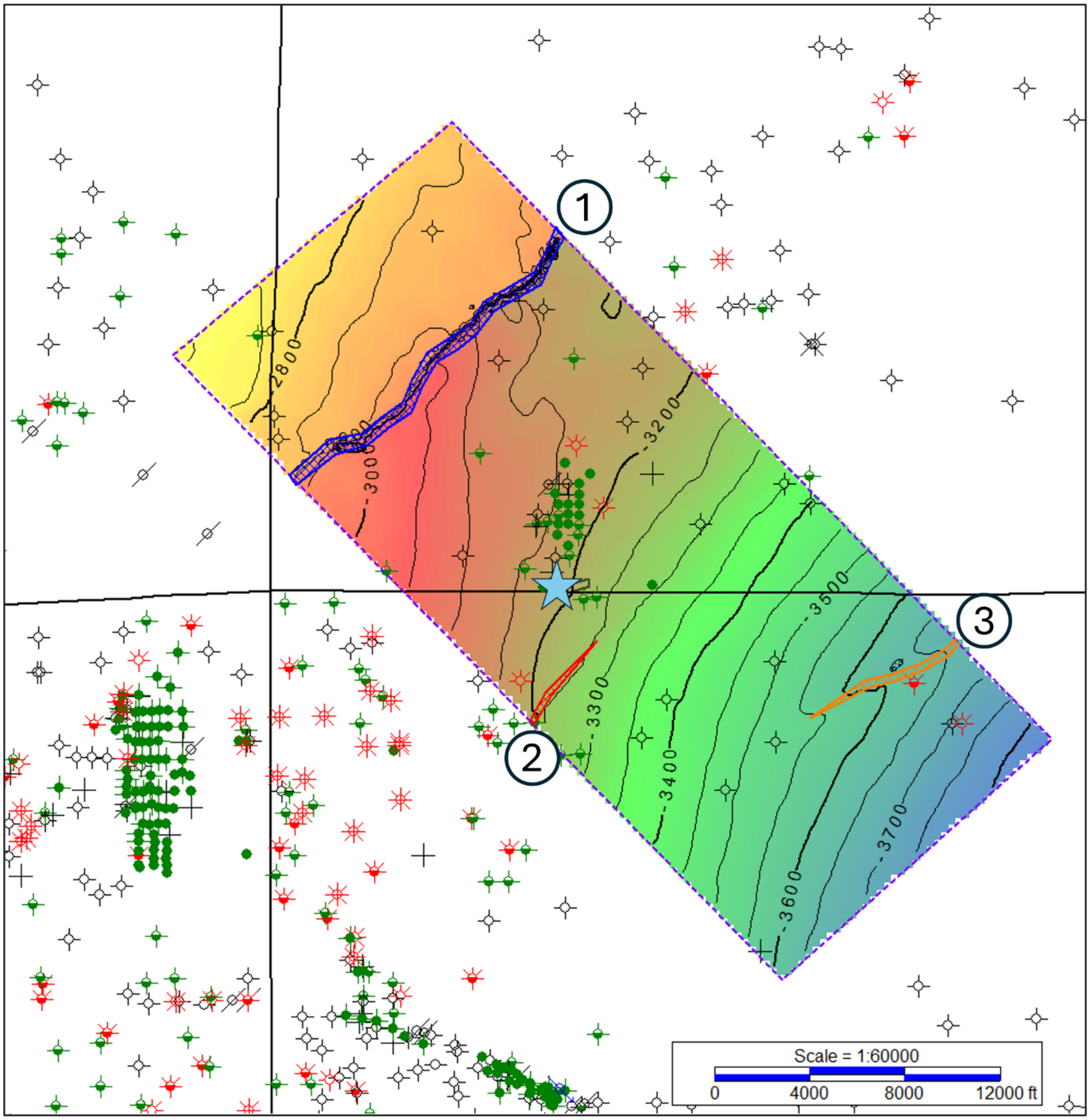

Figure 7. Top Queen City Formation structure in feet TVDSS with a contour interval of 50 feet. The injection well is highlighted with the blue star and all existing oil and gas wells are shown. Faults are indicated by the colored polygons and numbers.

3.3 Lithological and Reservoir Characterizations

A set of 69 digital well logs and 81 raster well logs that were deep enough to reach the Queen City Formation were used to map the subsurface. Formation tops were interpreted on well logs and tied to 20 square miles of licensed 3D seismic data. Digital logs from the Nueces Minerals No. 1 type log were used to construct a petrophysical model that included a porosity-permeability transform, water saturation calculation, geomechanical properties, and facies. **Figure 8** depicts the datasets utilized for interpretations described in this project.

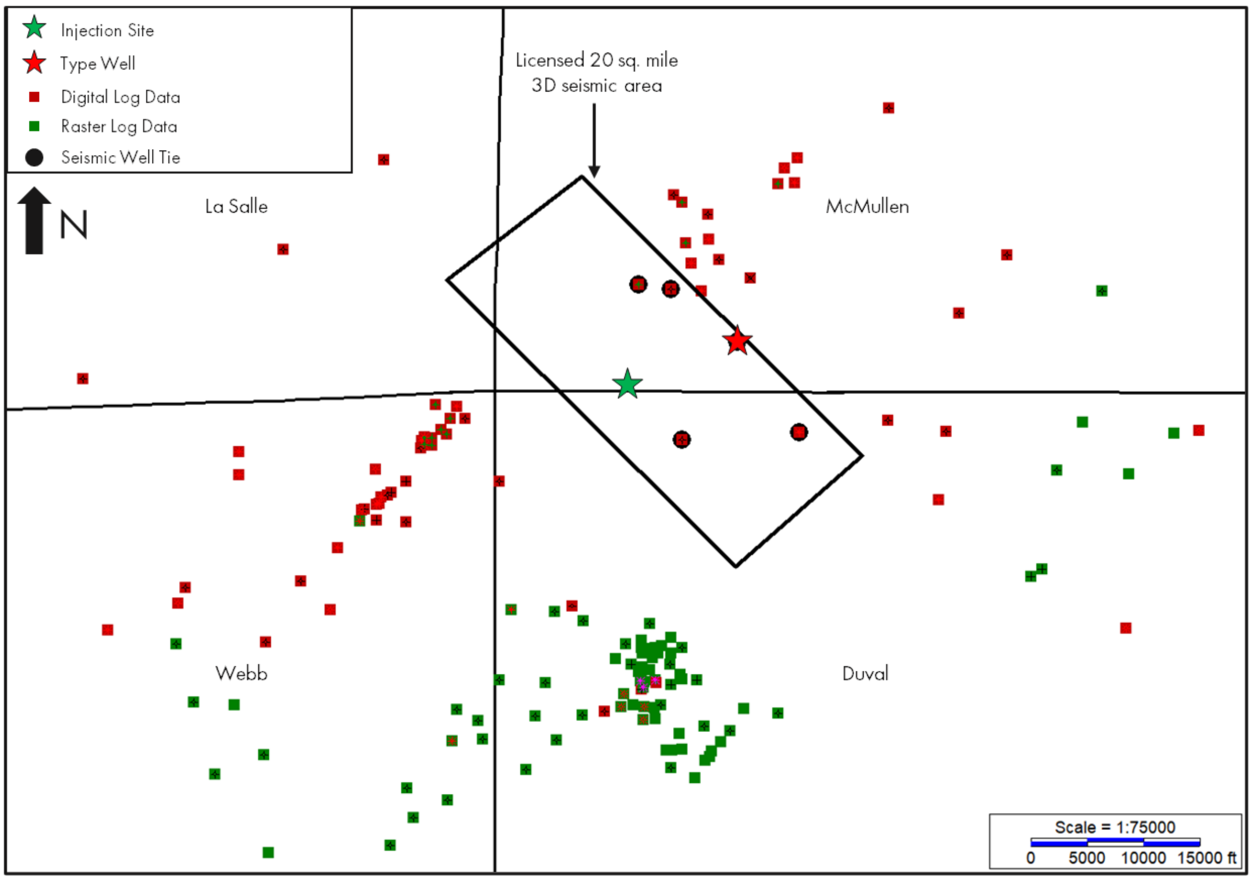

Figure 8. Data availability map depicting the 150 wells with digital wireline logs (red squares) and raster logs (green squares) in the mapped area. The Nueces Mineral No. 1 type log used for petrophysical interpretations (red star) and the 20 square miles of licensed and reprocessed 3D seismic data relative to the proposed Lima Tango CCS 1 injection well (green star) are also shown. Note that not all drilled wells are shown on this map.

3.3.1 Injection Interval

The Queen City Formation is the injection interval. It is comprised of three sand-rich injection zones (IZs) designated IZ-1 to IZ-3 (**Figure 9**). They have low volume clay (vClay) (less than 15%) and a dominance of sand (>60%) in our petrophysical and facies models, respectively.

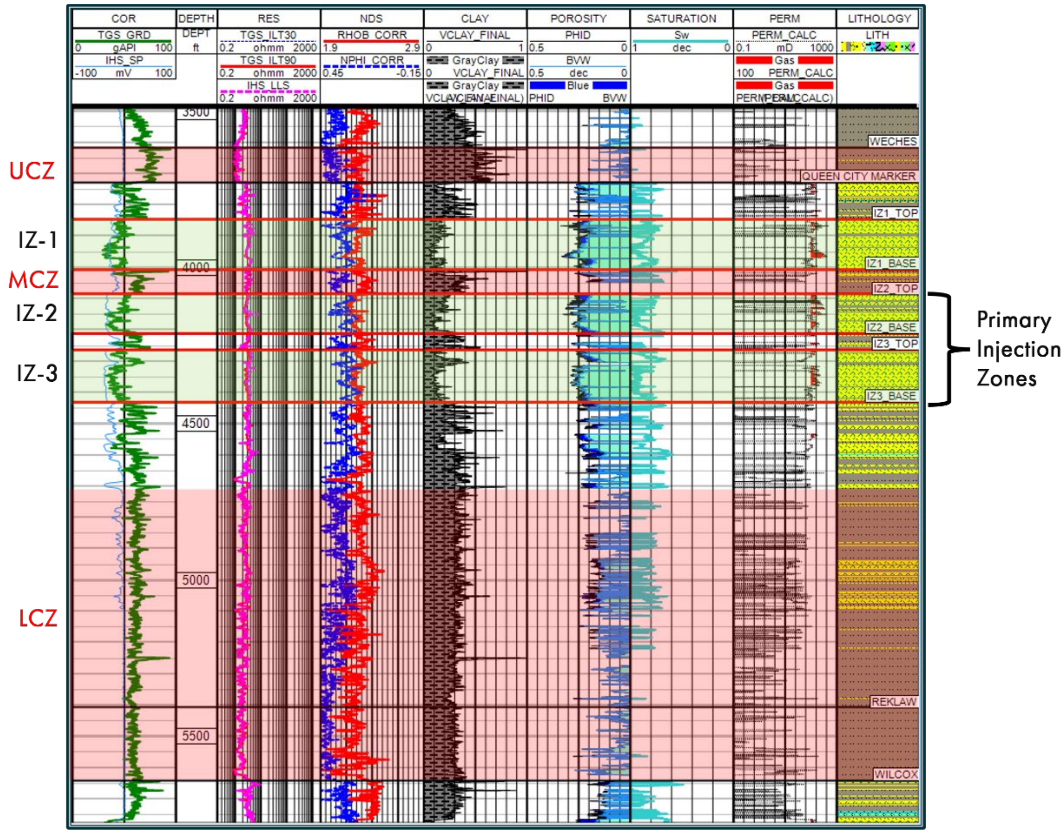

Figure 9. Petrophysical log of the Nueces Minerals No. 1 well with the Queen City Formation primary injection interval annotated on the right and the individual injection and confining zones annotated on the left. The injection interval is comprised of Injection Zone 2 (IZ-2) and Injection Zone 3 (IZ-3). Injection Zone 1 (IZ-1) was mapped but not included as part of the CO_2 plume model.

3.3.2 Confining Zones

The Weches Shale, which overlies the Queen City Formation, and the Reklaw Shale, which underlies the Queen City Formation, were identified as the UCZ and LCZ, respectively. These shales are comprised of starved, condensed, shale-dominated intervals with high gamma ray, low resistivity, and low porosity log signatures, as well as high vClay and a dominance of shale (>30%) in our petrophysical and facies models.

3.3.3 Injection and Confining Zones and Properties

A petrophysical interpretation of wireline logs available at the Nueces Minerals No. 1 well is presented in **Figure 9**. The individual injection and confining zones are highlighted in green and red, respectively and labeled at the left. The modeled primary IZ is annotated at the right. The UCZ is compromised of the Weches Shale, Injection Zone 1 (IZ-1) is comprised of uppermost Queen City sand, the Middle Confining Zone (MCZ) is comprised of a shale within the Queen City, Injection Zone 2 (IZ-2) is comprised of the next major sand down in the Queen City, Injection Zone 3 (IZ-3) is comprised of a well-developed sand in the middle of the Queen City, and the LCZ is comprised of thinly interbedded sands and shales of the basal Queen City and the Reklaw Shale. The dominant lithology, thickness, porosity, and permeability of each zone is presented in **Table 1**.

Table 1. Properties of the Queen City Formation injection zones and the Weches Shale, Queen City, and Reklaw Shale confining zones assessed at the Lima Tango project area.

Subunit	Dominant Lithology	Thickness (feet)	Average Reservoir Porosity (%)	Average Reservoir Permeability (mD)	Description
Upper Confining Zone (UCZ)	Shale	110	1	0.002	Weches Shale
Injection Zone 1 (IZ-1)	Sand	160	16	75	Queen City sand (identified but not modeled)
Middle Confining Zone (MCZ)	Shale	90	3	0.2	Queen City intraformational shale
Injection Zone 2 (IZ-2)	Sand	125	20	120	Queen City sand
Injection Zone 3 (IZ-3)	Sand	168	19	100	Queen City sand
Lower Confining Zone (LCZ)	Shale	965	1.5	0.05	Lowermost Queen City interbedded sands and shales and the Reklaw Shale

3.4 Formation Fluid Chemistry

The available formation fluid chemistry analyses available from the U.S. Geological Survey National Produced Waters Geochemical Database v2.3 for the targeted Queen City Formation injection interval are shown in in **Figure 10**. All values are located southeast or east of the Lima Tango CCS 1 site and have TDS values greater than 20,000 ppm. The average, low, and high TDS values are presented in **Table 2** as are the corresponding values for pH, Na, Ca, and Cl.

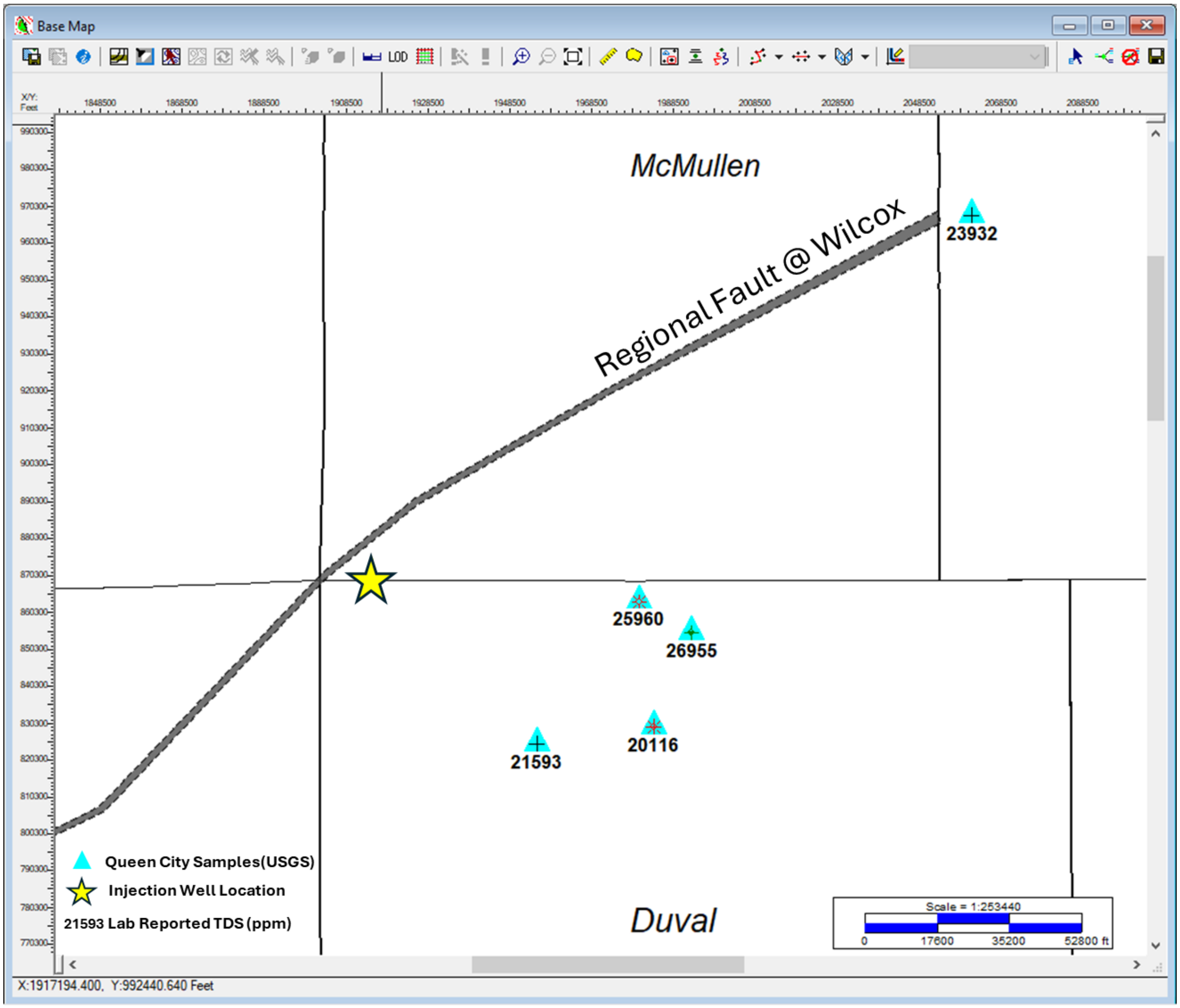

Figure 10. Map showing the location and values of TDS (ppm) in wells with of available USGS water samples values from the Queen City Formation. These were used in the formation fluid chemistry analysis. Regional fault location is from Kosters, *et al.*, 1989. North is up.

Table 2. Queen City Formation fluid chemistry.

	TDS (mg/L)	pH	Na (ppm)	Ca (ppm)	Cl (ppm)
AVG	23,711	7.8	8,900	92	12,815
LOW	20,116	7.4	7,561	54	10,950
HIGH	26,955	8	10,100	152	14,700

3.5 Potential of Induced Seismicity

There has been no earthquake activity near the Las Tiendas NGP plant or within 25 km since 2017 according to the TexNet earthquake monitoring network. The earthquake activity present north of the site as shown in **Figure 11** is believed to result from oil and gas well completions activity in the Eagle Ford trend. The Queen City Formation proposed injection interval at the Lima Tango site is thousands of feet above the crystalline basement rock. As such, seismicity risk related to this project's injection of CO_2 is expected to be nominal.

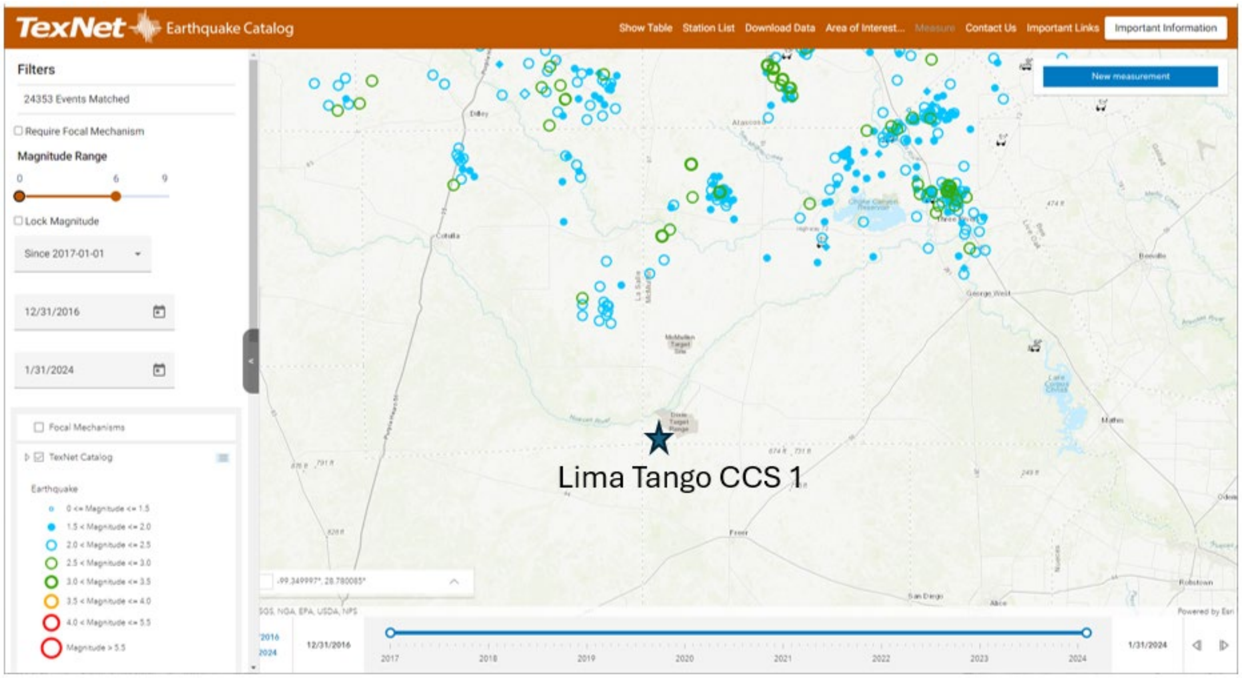

Figure 11. Map of historical seismic activity within 25 km of the proposed Lima Tango CCS 1 site from the TexNet Seismic Monitoring Network. North is up.

3.6 Groundwater Hydrology

The proposed Lima Tango CCS 1 injection site lies on the southeastern edge of both the mapped limits of the Carrizo-Wilcox and the Jackson-Yegua aquifers (**Figures 12 and 13).** The proposed disposal interval (Queen City) is estimated to be 3,508 - 4,870 feet TVD at the injection site and is isolated from the shallow USDW (Jackson-Yegua) and the deep potential USDW (Carrizo-Wilcox). **Figure 14** depicts the injection interval and confining zones relative to both USDWs and the Base of Useable Quality Water strata (BUQW). Note that the Nueces Minerals No. 1 type log shown in this figure is approximately 170 ft downdip from the injection well and picks have been adjusted accordingly.

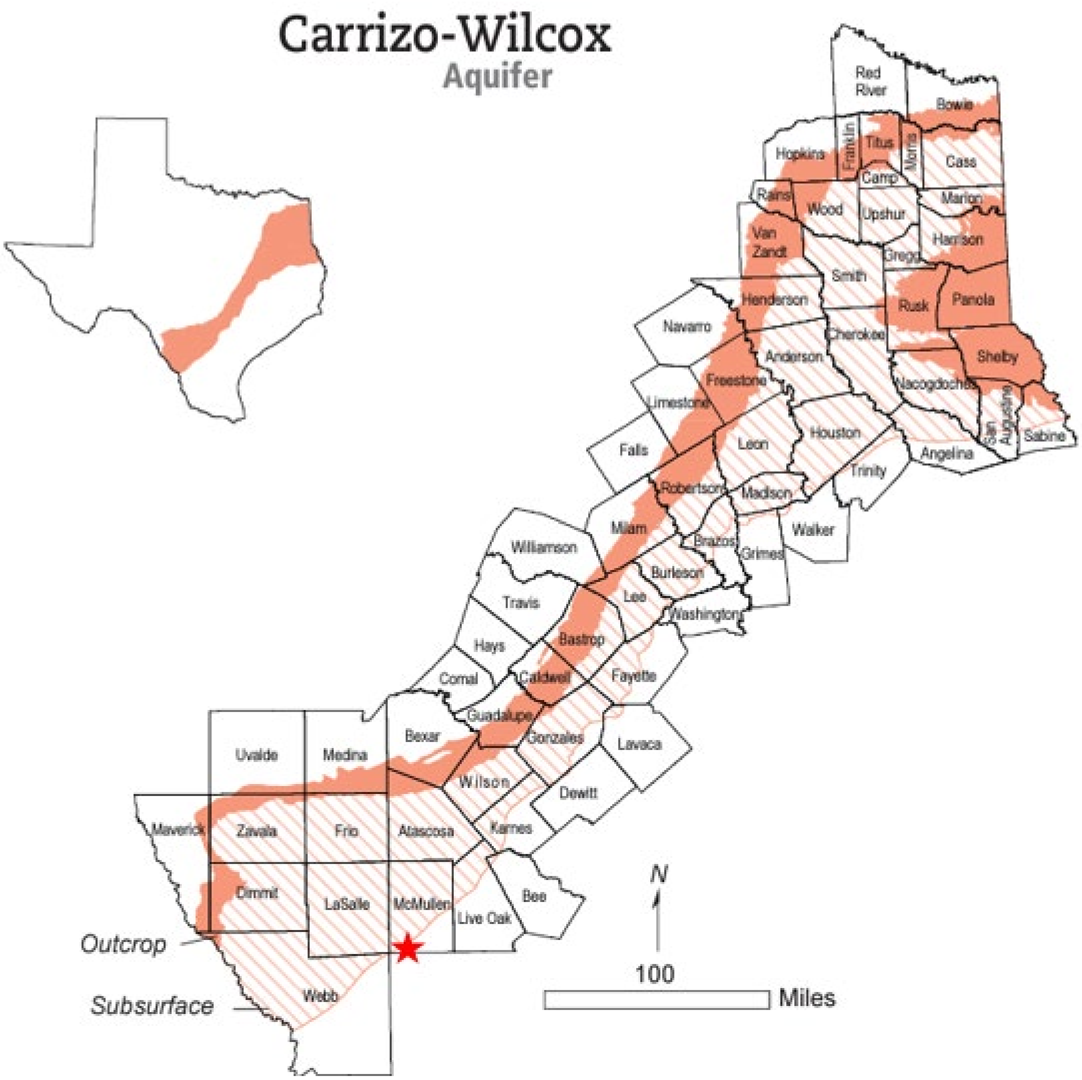

Figure 12. Carrizo-Wilcox aquifer map and recharge area, with outcrop shown in solid fill and subsurface in hachured fill, relative to proposed injection well (red star). Modified from George *et al.*, 2011.

Figure 13. Yegua-Jackson aquifer map and recharge area relative to proposed injection well (red star). Modified from George *et al*., 2011.

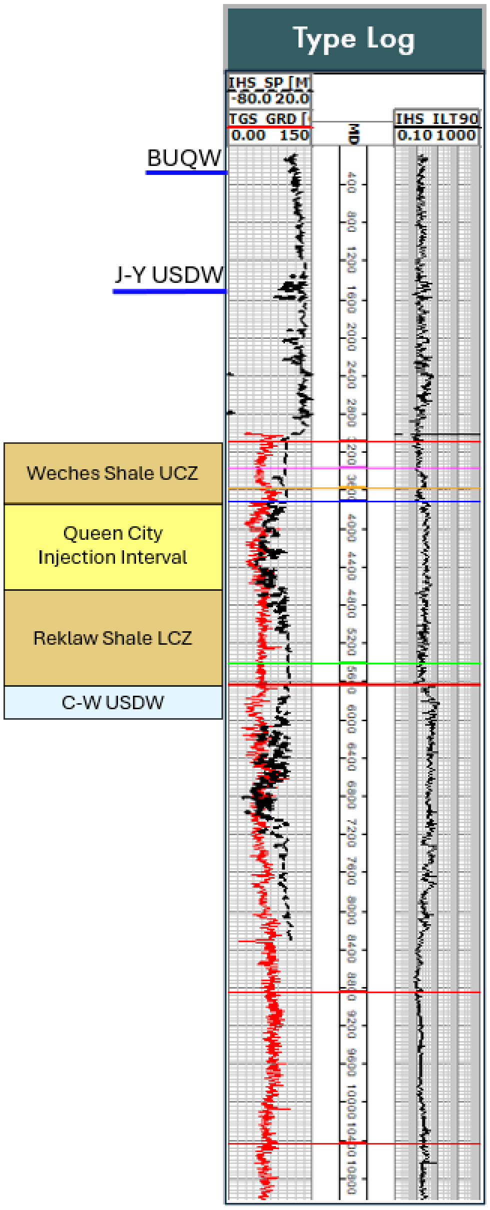

Figure 14. The Nueces Minerals No. 1 type log annotated with the BUQW, the Jackson-Yegua (J-Y) USDW, the Weches Shale UCZ, the Queen City injection interval, the Reklaw Shale LCZ, and the Carrizo-Wilcox (C-W) USDW.

The Jackson-Yegua aquifer is 2,300 feet above the Queen City injection interval and separated from the injection interval by multiple low-porosity and low-permeability formations, most notably, the Weches Shale which is identified as the UCZ (**Figure 14)**. The Carrizo-Wilcox aquifer is 965 feet below the Queen City injection interval and isolated from it by the Reklaw Shale LCZ. Both the Weches and Reklaw Shales have been mapped as aquitards in numerous TWDB publications, (Galloway *et al.*, 1991; Sharp *et al.*, 1991). Water samples from the Carrizo-Wilcox aquifer illustrate the increasing salinity of the aquifer downdip to the southeast (**Figure 15**). Owing to the transitional nature and the uncertainty of the water quality at the Lima Tango CCS 1 injection site, the TRRC Groundwater Advisory Unit (GAU) considers the Carrizo-Wilcox aquifer a potential USDW. Therefore, dCarbon demonstrated geologic isolation between the proposed injection zone and the Carrizo-Wilcox potential USDW and the TRRC GAU agreed that sufficient isolation existed to support dCarbon's W-14 injection permit. There are no water wells within the two-mile radius of the Lima Tango CCS 1 injection site as shown in **Figure 16**.

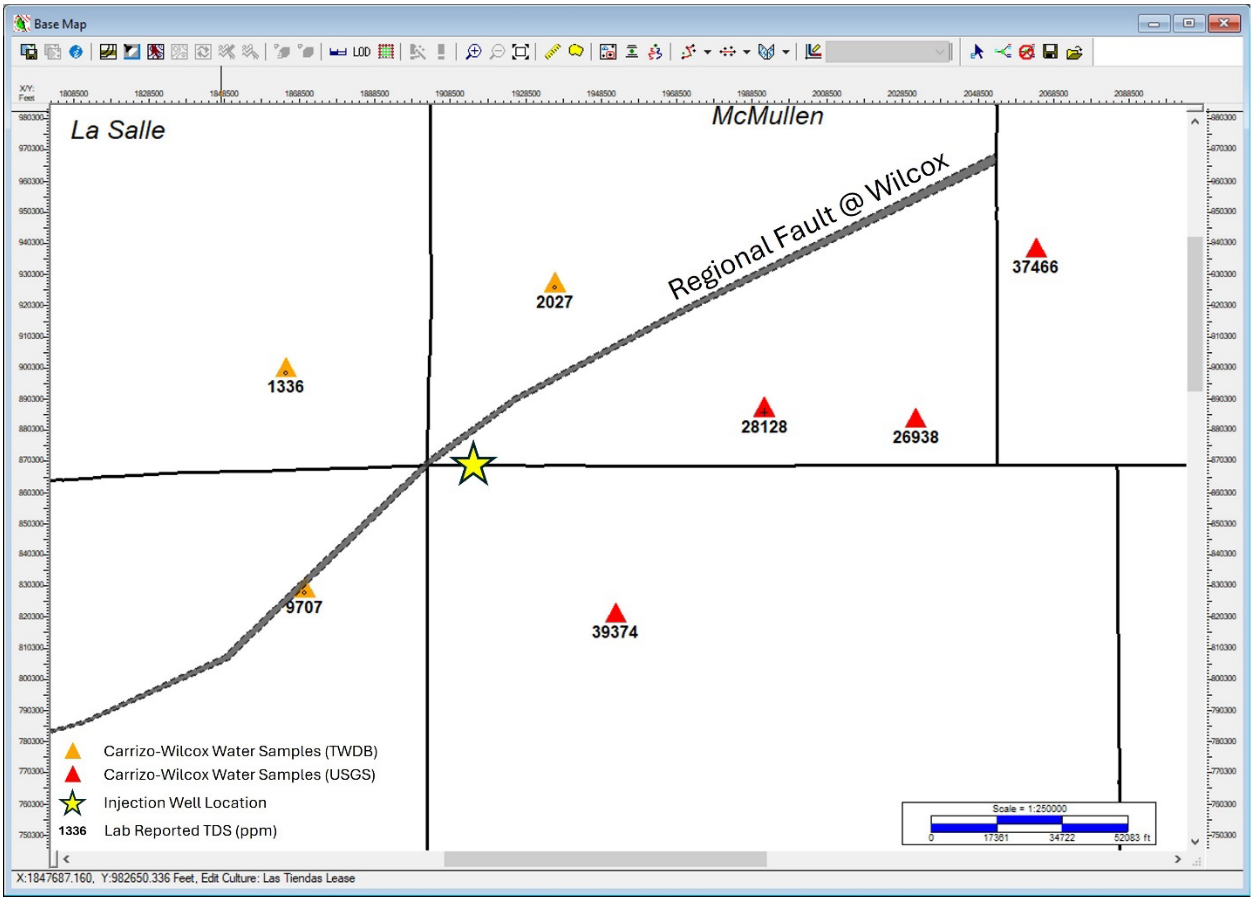

Figure 15. Carrizo-Wilcox water sample data from the USGS and TWDB. Posted values are in ppm TDS and the source denote by the color of the triangle in the legend in the lower left corner. North is up.

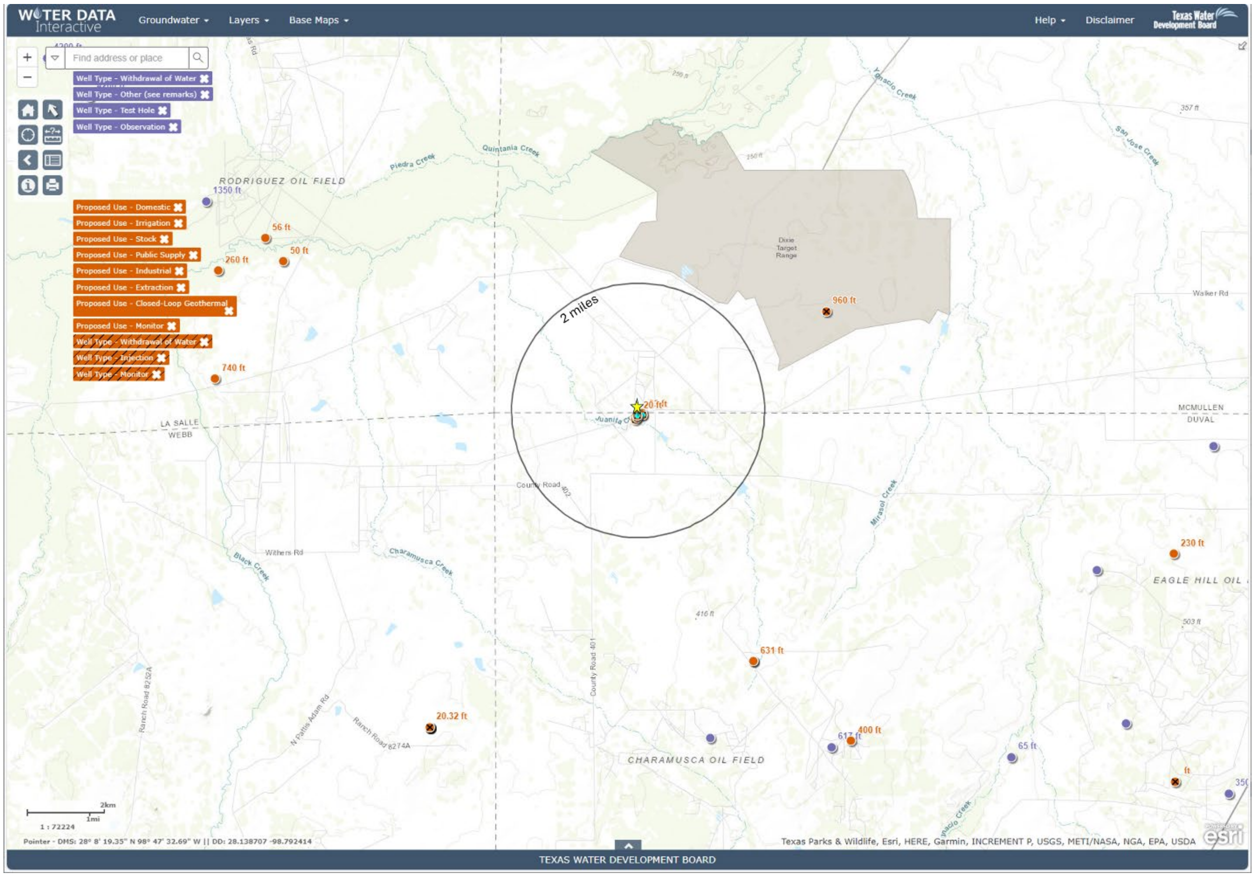

Figure 16. Water wells within the greater Lima Tango CCS 1 area from the TWDB interactive viewer. The yellow star denotes the injection site and the black circles depict a two-mile radius circle around the proposed injection site. No water withdrawal wells fall within these areas. Monitoring wells at the ET Las Tiendas NGP plant site have been plugged. North is up.

3.7 Description of CO_2 Project Facilities

dCarbon will accept CO_2 from the ET Las Tiendas NGP Plant (**Figure 17**). The temperature, pressure, composition, and quantity of CO_2 will be measured and metered according to industry standards, with an orifice meter, Coriolis meter, or similar device. dCarbon will compress the CO_2 to a supercritical physical state at the Las Tiendas CCS 1 injection site. The CO_2 stream will be metered to verify quantity. The CO_2 will then be injected into the Queen City Formation, which is not known to be productive of oil and gas in the area. A gas analysis of the CO_2 stream is shown in **Table 3**. Although industry-standard sampling of the CO_2 stream is expected to be representative of the composition of the gas, it is possible that the composition will vary slightly over time.

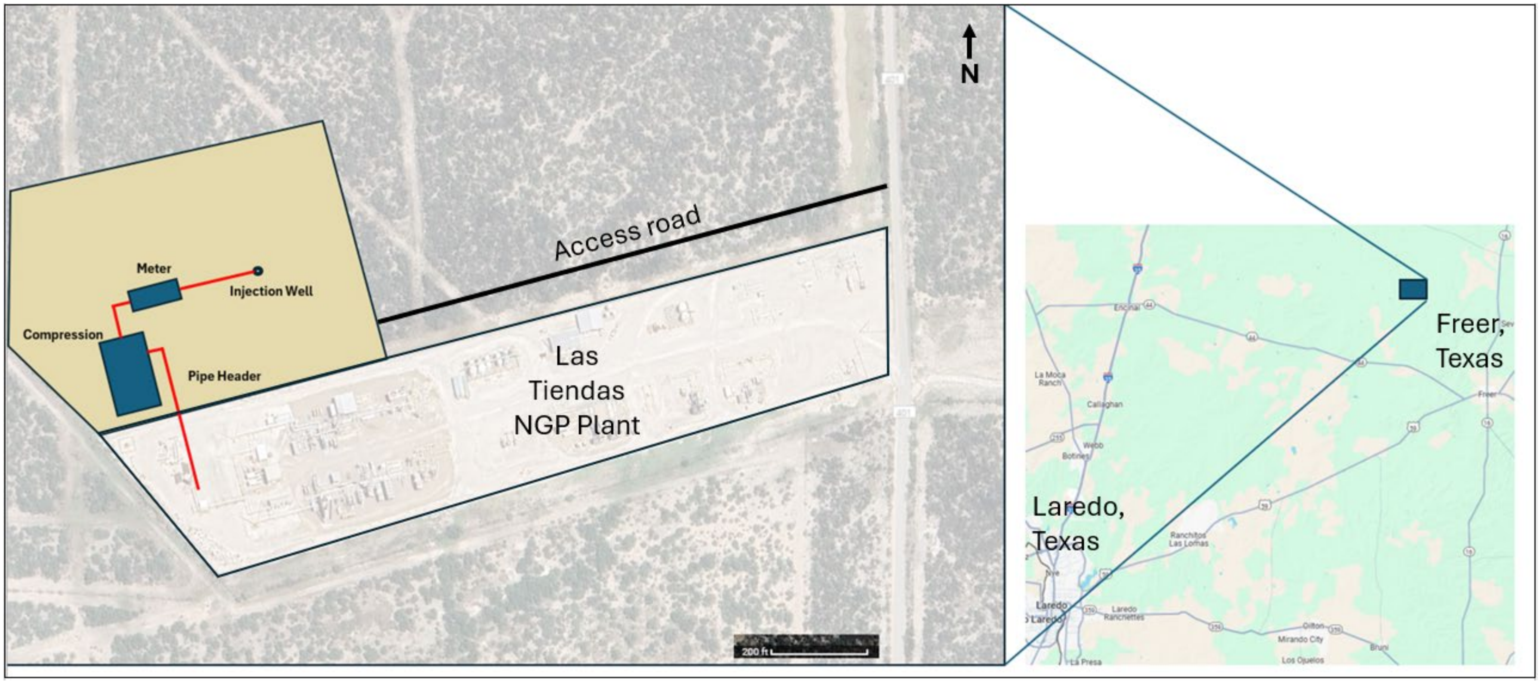

Figure 17. Lima Tango CCS 1 injection well proposed plot plan and location map relative to cities in south Texas.

Table 3. Inlet CO_2 stream analysis for the Lima Tango CCS 1 site in mol percent.

	DESIGN	DESIGN
Water	9.62	Dry Basis
Hydrogen Sulfide	0.01	55 ppmv / 0.006
Nitrogen	0.01	0.010
Carbon Dioxide	87.46	96.774
Methane	2.51	2.776
Ethane	0.34	0.381
Propane	0.01	0.013
i-Butane	0.01	0.009
n-Butane	0.00	0.003
i-Pentane	0.02	0.017
n-Pentane	0.01	0.011
n-Hexane	0.00	0.000
TOTAL	100.00	100.000

Note – *Gas is water saturated at inlet conditions (120 degrees Fahrenheit (F) and 3 pounds per square inch gas (psig) using Promax with GERG 2008 EOS. Ppmv is pounds per million by volume.

3.8 Reservoir Characterization Modeling

To develop an MRV plan for monitoring, reporting, and verification of geologic sequestration at the Lima Tango CCS 1 facility as required under §98.448(a)(1)-(2) of Subpart RR, dCarbon first constructed a Static Earth Model (SEM) and then a dynamic reservoir simulation model to determine the active and maximum monitoring areas (AMA and MMA, respectively) as defined in §98.449. The primary objectives of the simulation model were to:

1. Estimate the maximum areal extent of the injectate plume and its migration post injection

2. Determine the ability of the Queen City injection interval to handle the required injection rate

3. Characterize potential interaction between the injected CO_2 and any nearby potential leakage pathways

dCarbon employed Schlumberger's Petrel software and Rock Flow Dynamic's tNavigator software to construct the static earth and dynamic plume models, respectively. The initial modeling was the area of licensed 3D seismic data (20 square miles) as shown in **Figure 18**. The model utilizes structural and petrophysical interpretations made from available well and 3D seismic data described in **Section 3.3** as primary inputs.

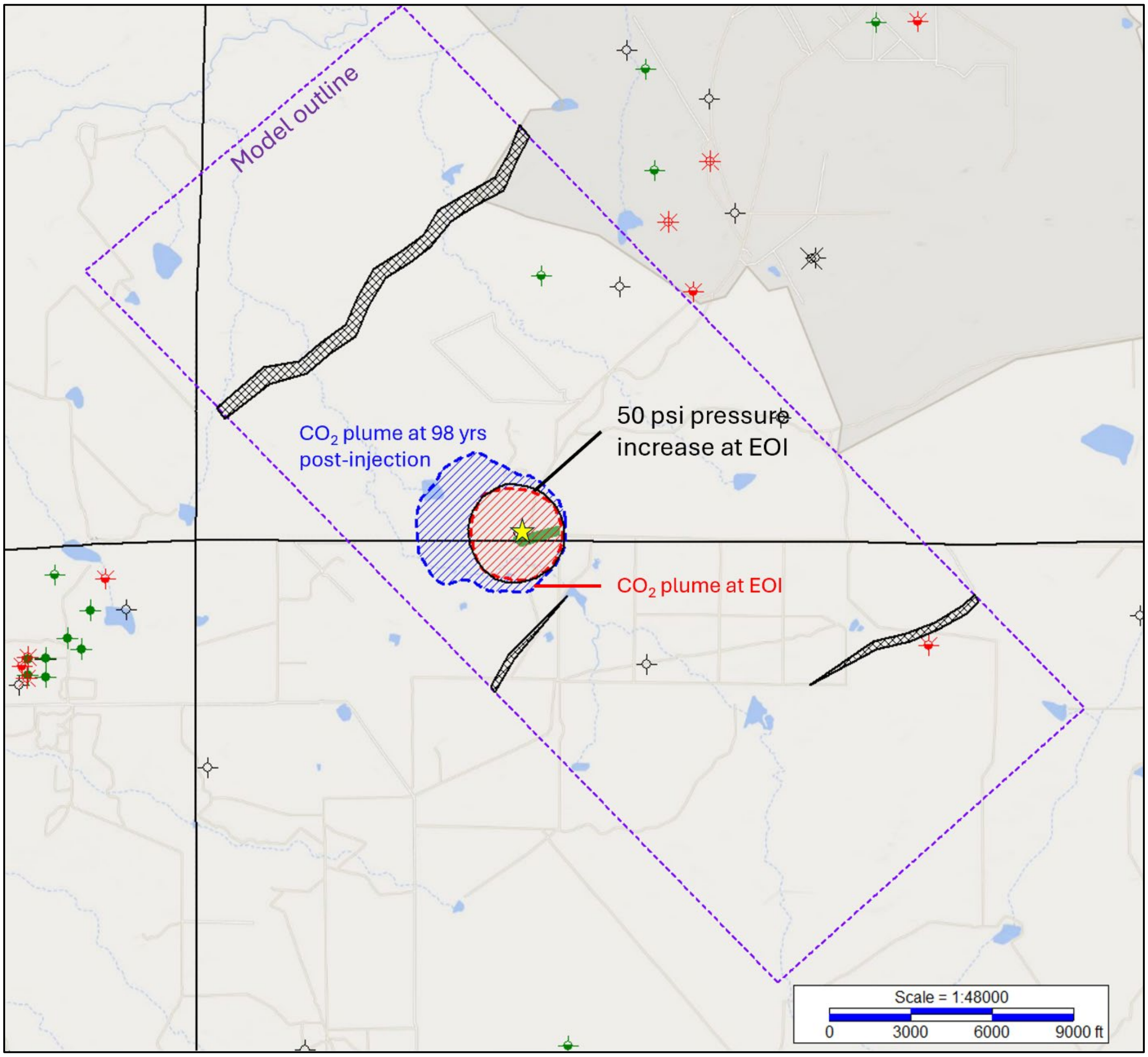

Figure 18. Simulation results showing CO_2 plumes at the end of injection (EOI) for 12 years in red, after 98 years post- injection in blue, and the model extent in violet, which is also the area of licensed 3D seismic. The 50-psi pressure plume at the end of injection is in black. Only wells deep enough to penetrate the top of the Queen City Formation are shown. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults from the 3D seismic data at the Queen City stratigraphic level.

Petrophysical calculations, including a porosity-permeability model, were derived from well logs at the Nueces Minerals No. 1 well, which is two miles away from the proposed injection site. Local core data was not available to calibrate the petrophysical model so an analog from a sandstone reservoir with comparable porosity and permeability was used (the Bandera Brown B from the DOE's CO2BRA database (Araujo de Itriago *et al.*, 2024)). The mapping of uniform thickness and consistent correlations of wireline log characteristics with other available logs in the area supports the conclusion that the Nueces Minerals No. 1 well is representative of the proposed injection site and the modeled area. The model will be further updated and calibrated when the injection well is drilled and additional data, including whole or rotary sidewall cores, is collected over the injection and confining intervals.

Utilizing the previously described inputs, grid layers and cells were created in Schlumberger's Petrel software at the increments listed in **Table 4**, resulting in an SEM model depicted in **Figure 19**. Reservoir properties were distributed in a layer cake manner throughout the modeling area based on petrophysics calculated from wireline logs at the Nueces Mineral No. 1 well. A dip and strike swath of cells through the injection site were gridded at a finer increment of 150 feet by 150 feet to allow for better resolution of plume behavior around the proposed injection well as shown in the central portion of **Figure 19**.

Table 4. SEM parameters.

	i-dir	j-dir	k-dir
Average Increment (feet)	511	331	12
Layer count	71	45	93
Total length (feet)	36,298	14,904	1,110
Total cell count	297,135		

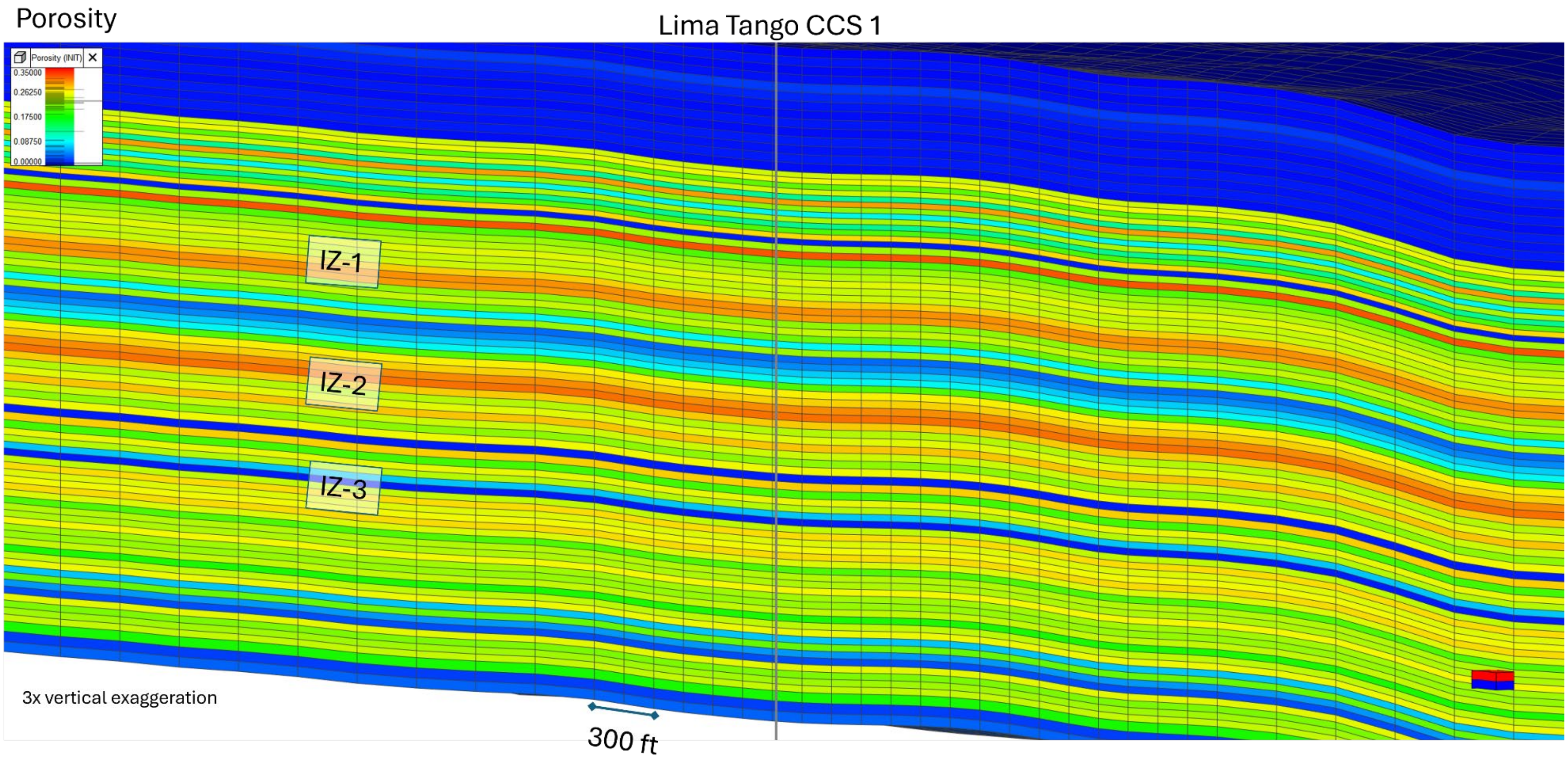

Figure 19. Porosity of the Queen City interval of the SEM. Porosity was calculated from the nearby Nueces Minerals No. 1 wireline well logs.

A fit-for-purpose reservoir simulation model was created from the SEM to assess average injectivity based on empirical and analytical methods and to simulate CO_2 injection scenarios to aid in project design.

Pore and frac gradients, temperature, salinity, water saturation, porosity, and relative permeability model inputs are given in **Table 5**. The pore pressure gradient was assumed to be 0.48 psi/foot based on regional trends in South Texas. The fracture pressure gradient was estimated as 0.7 psi/foot from regional data and then an additional safety factor of 90% was applied, resulting in 0.6 psi/foot of the bottomhole constraint. The surface temperature is the mean annual temperature at the Lima Tango CCS 1 site. Fluid salinity is an average of the regional values described in **Section 3.4**. The relative permeability-porosity data from the DOE's CO2BRA database from a similar sandstone reservoir, the Bandera Brown B as cited by Araujo de Itriago *et al.*, 2024 and plotted in **Figure 20**. There are no active injectors in the simulation area from which to source these data.

Table 5. Input reservoir modeling parameters.

Parameter	Value
Pore Pressure Gradient (psi/foot):	0.48
Frac Pressure Gradient (psi/foot):	0.6
Temperature Gradient (degrees F /foot):	0.015
Surface Temp (degrees F):	70
Fluid Salinity (ppm TDS)	30,000
Connate Water Saturation (decimal percent (%)):	0.47
Porosity (decimal %):	0.256
Relative permeability (mD):	133.85
Net-to-gross (ratio):	1
Rate constraints (MT/yr)	177,000
Pressure constraints (% of fracture pressure)	90

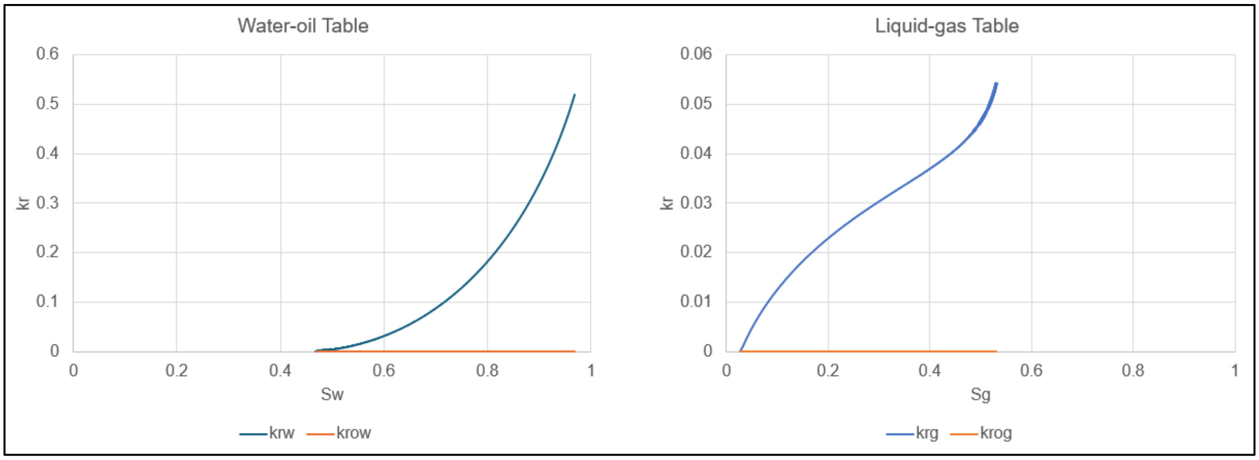

Figure 20. Relative permeability tables for water-oil (left) and liquid-gas (right). Relative permeability-porosity data from the CO2BRA database from a similar sandstone reservoir, the Bandera Brown B (Araujo de Itriago *et al.*, 2024).

The modeled case injects CO_2 into IZ-2 and IZ-3 and had a yearly injection rate of 177,000 MT/yr for a cumulative injection of 2,124,000 MT after 12 years as shown in **Table 6**. This injection over time is presented graphically in **Figure 21**. The maximum plume extent and 50-psi pressure plume extent at the end of 12 years of injection are also given in **Table 6**, presented graphically in **Figure 22**, and depicted in map view in **Figure 18**. This figure also shows the plume outline at the end of injection compared to the outline at the end of the 98-year post-injection period. The plume stays well within the area of the injection well.

Table 6. Injection parameters by zone and total plume extents.

Injection zone	Yearly rate (MT/yr)	Cumulative injection (MT)	Maximum CO_2 plume extent 98 years after end of injection	50-psi pressure plume extent at end of injection
IZ-2	**75,684**	**908,206**		
IZ-3	**101,316**	**1,215,794**		
Total IZ-2/IZ-3	**177,000**	**2,124,000**	**0.78 square miles**	**0.36 square miles**

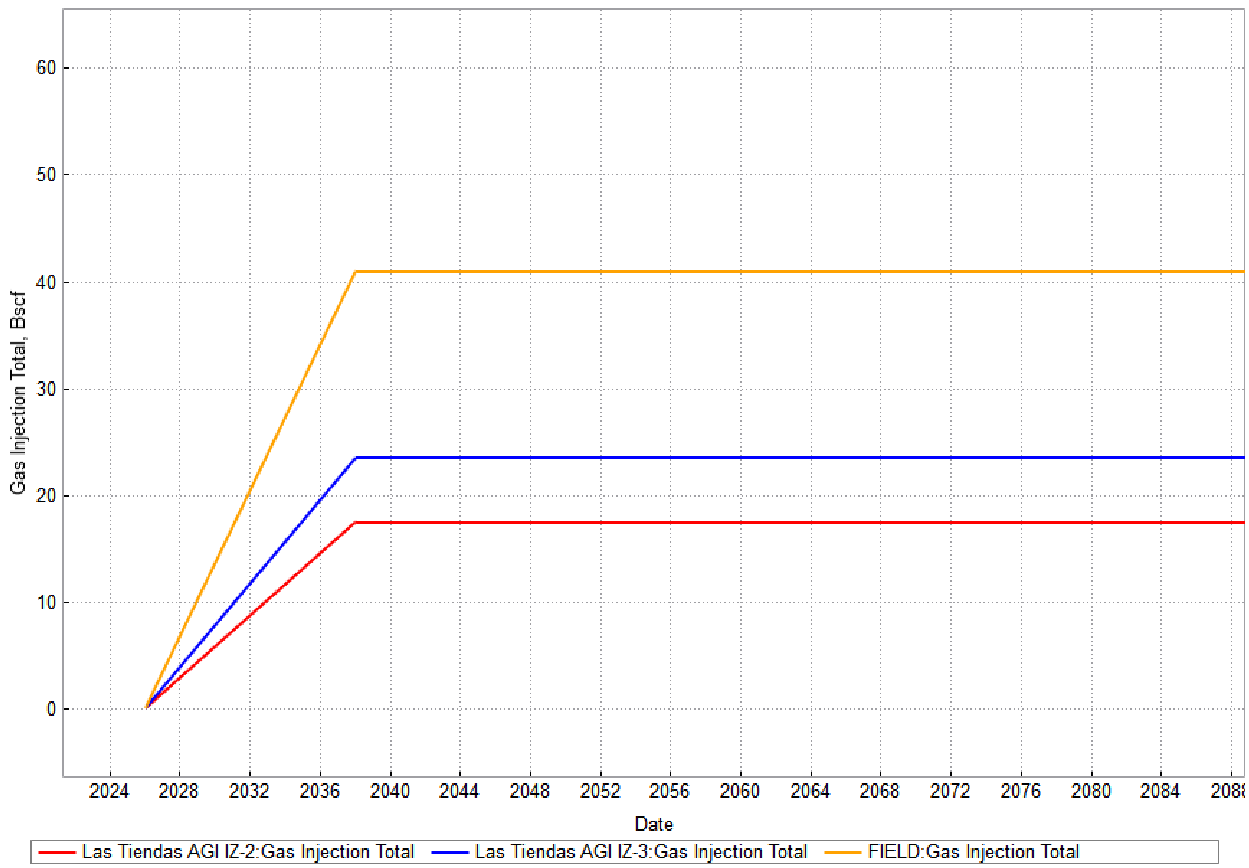

Figure 21. Plot of injection versus time at the Lima Tango CCS 1 injection well.

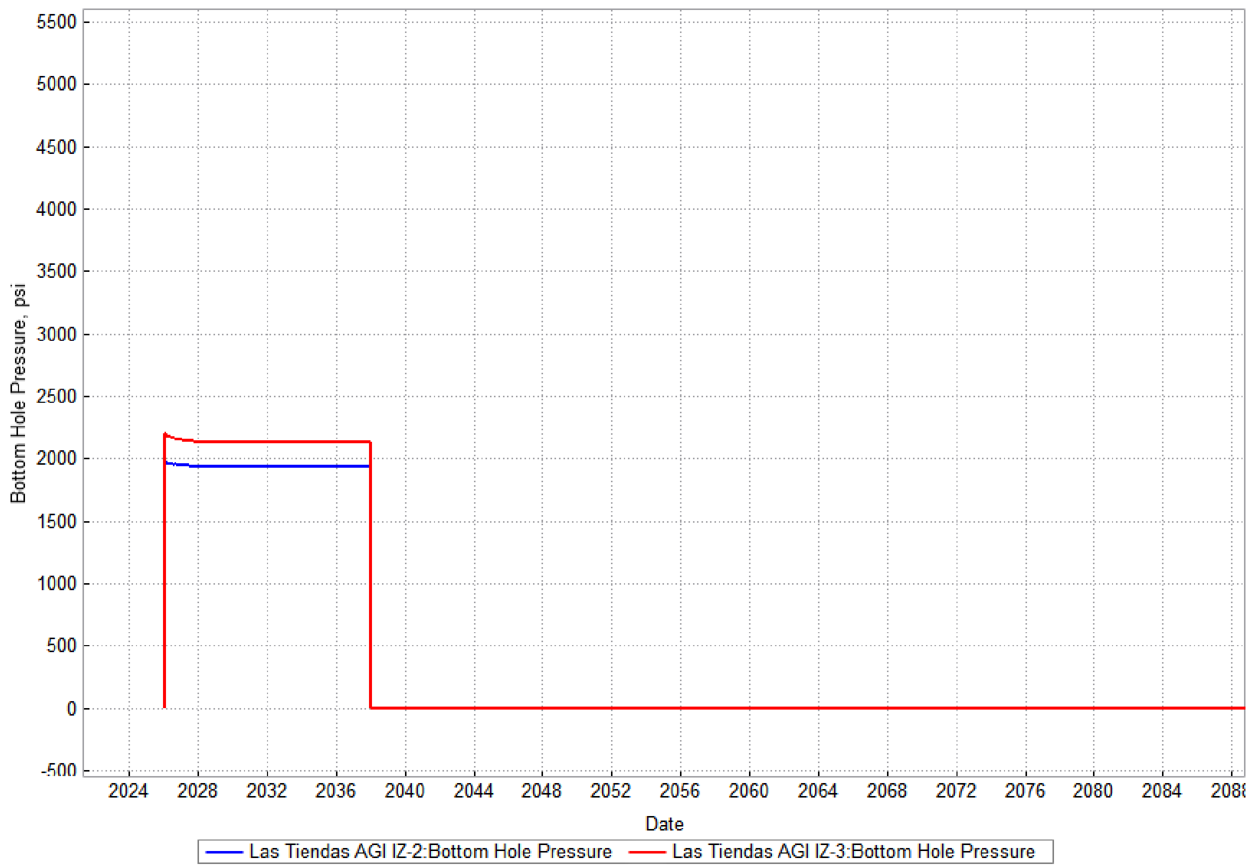

Figure 22. Pressure versus time at the Lima Tango CCS 1 injection well. The pressure constraint is 2412.8 psi for IZ-2 and 2524.3 psi for IZ-3.

A northwest to southeast cross-sectional view of the CO_2 plume in IZ-2 and IZ-3 is presented in **Figure 23**. The CO_2 plume profiles for both zones are funnel-shaped, indicative of the higher porosity and permeability at the top of these zones as well as the buoyancy of the CO_2 relative to the formation water.

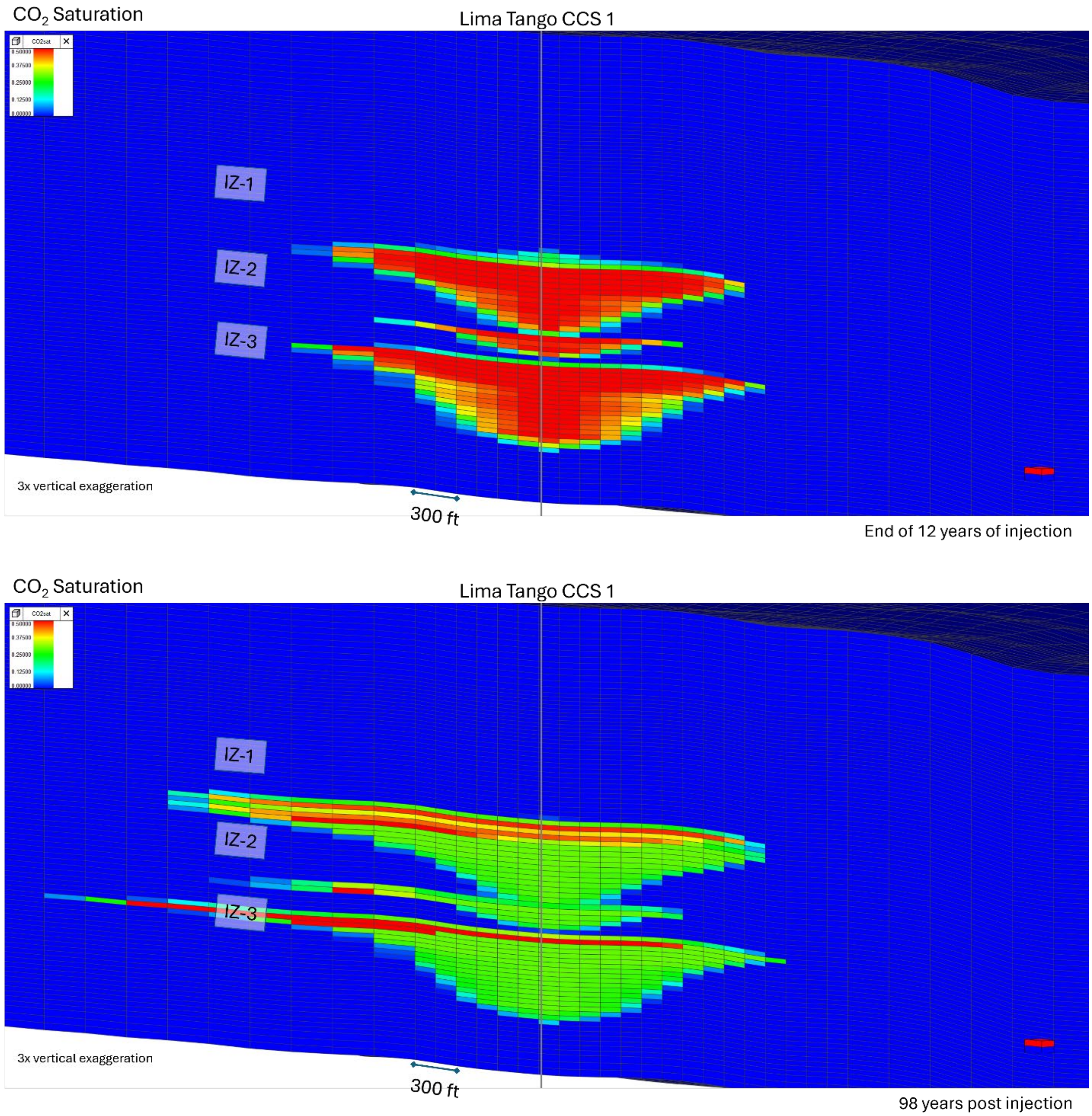

Figure 23. Northwest to southeast cross section depicting the CO_2 saturation profile of the model for the injection from Lima Tango CCS 1 after 12 years of injection (upper) and after 98 years after injection stops (lower). Color scale at the upper left indicates CO_2 gas saturation. Queen City injection zones are annotated. Injection was only modeled for IZ-2 and IZ-3.

4 – DELINEATION OF MONITORING AREAS

This section describes the Maximum and Active Monitoring Areas.

4.1 Maximum Monitoring Area (MMA)

The MMA is defined as equal to or greater than the area expected to contain the free-phase CO_2 plume until the CO_2 plume has stabilized plus an all-around buffer of at least one-half mile. The numerical simulation using tNavigator was used to estimate the size and migration of the CO_2 plume. We modeled injection of CO_2 into IZ-2 and IZ-3 for 12 years followed by 190 years of post-injection modeling. Results indicated that the plume had ceased to migrate by 98 years post injection. A five percent cutoff of gas saturation was used to determine the boundary of the CO_2 plume. The area of the MMA was determined to be 0.88 square miles with the greatest extent reaching 0.72 miles from the injector (**Figure 24**).

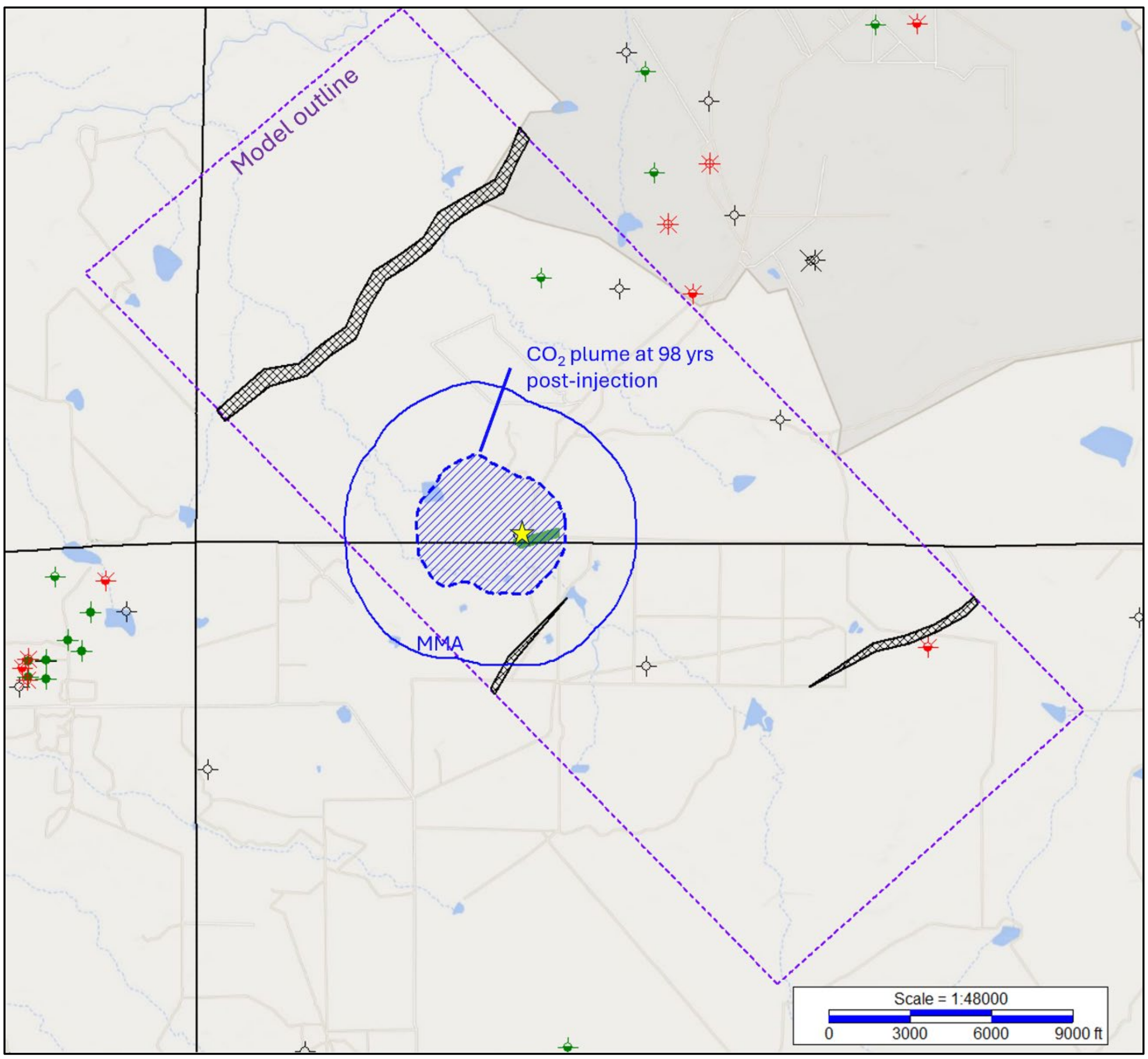

Figure 24. The proposed MMA (blue) and the stabilized CO2 plume (at 98 years post-injection as modeled). Only wells penetrating the Queen City Formation are shown. The red lines represent down-to-the-coast normal faulting mapped on the 3D seismic and described in Section 3.2.3. The yellow star indicates the Lima Tango

CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level.

4.2 Active Monitoring Area (AMA)

dCarbon adhered to the definition of Active Monitoring Area (AMA) provided in 40 CFR 98.449 to delineate the AMA for this project (40 CFR Part 98 Subpart RR (Dec. 13, 2024)):

"*Active monitoring area* is the area that will be monitored over a specific time interval from the first year of the period (n) to the last year in the period (t). The boundary of the active monitoring area is established by superimposing two areas:

> (1) The area projected to contain the free phase CO_2 plume at the end of year t, plus an all-around buffer zone of one-half mile or greater if known leakage pathways extend laterally more than one-half mile.
>
> (2) The area projected to contain the free phase CO_2 plume at the end of year t + 5."

dCarbon proposes to monitor the injection site from year one through year 12, which is projected to be the EOI, thereby defining t as 12 years. dCarbon determined AMAs using methods (1) and (2) above and determined (1) to be larger. dCarbon then compared the larger AMA (red solid, **Figure 25**) with the MMA from **Figure 24** and found the AMA to be fully contained within the MMA. We propose to use the slightly larger MMA as both the AMA and MMA and will refer to this common area of monitoring as the AMA/MMA or just as the MMA in subsequent sections. As described in **Section 4.1**, the MMA is a one-half mile buffer after of the CO_2 plume stabilizes post-injection, which exceeds the definition of AMA set forth in 40 CFR § 98.449. By using the MMA as the AMA, dCarbon is employing an active monitoring program that exceeds the regulations of Subpart RR.

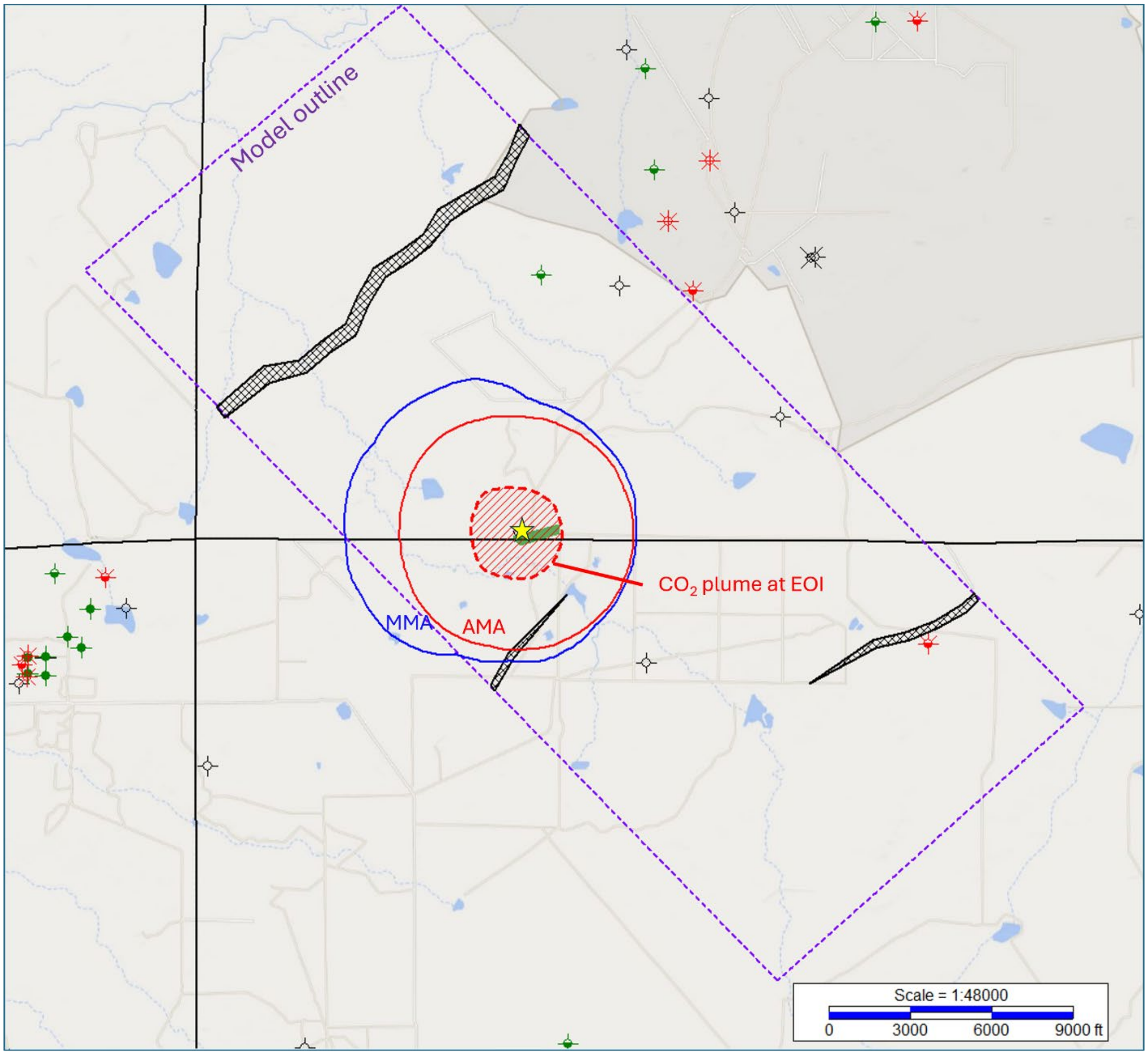

Figure 25. The AMA (red solid) outline and the EOI CO_2 plume (red dashed) outline as modeled. We propose to use the larger MMA (blue solid line) as both the AMA and MMA and will refer to it as the AMA/MMA or just the MMA. Wells penetrating the Queen City are posted with the well symbol at the bottomhole location. The black hachured polygons represent faulting at the Queen City mapped on the 3D seismic data and described in Section 3.2.3. The yellow star indicates the Lima Tango CCS 1 well location and the green polygon is the gas plant location. The black hachured polygons are the locations of the seismically mapped faults at the Queen City stratigraphic level. The Lima Tango CCS 1 well is represented by the yellow star and the gas plant is shown with a green polygon.

5 – IDENTIFICATION AND EVALUATION OF POTENTIAL LEAKAGE PATHWAYS TO SURFACE

This section describes each of the required potential leakage pathways and assesses the likelihood, potential timing, and magnitude based upon the California Air and Resources Board's CCS Protocol Section C.2.2(d). **Table 7** describes the basis for event likelihood and **Table 8** provides the details of the leakage likelihood, timing of occurrence, and estimated magnitude of leakage for each type of leak risk.

Table 7. Risk likelihood matrix (developed based on comparable projects).

Risk Factor for Probability		Description
1	Improbable	<1% chance of occurring*
2	Unlikely	1-5% chance of occurring*
3	Possible	> 5% chance of occurring*
*During the life of the project or 100 years after project closure, whichever is shorter		

Table 8. Description of leakage likelihood, timing, and magnitude.

Leakage Pathway	Likelihood	Timing	Magnitude
Potential Leakage from Surface Equipment	**Possible**	Anytime during project operations, but most likely during start-up / transition or maintenance periods	**<100 MT per event** (100 MT represents approximately 5 hours of full flow facility release)
Leakage from Approved, Not Yet Drilled Wells	**Improbable**, as there are no approved not yet drilled wells	After new wells are permitted and drilled	**<1 MT per event**
Leakage from Existing wells	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and the total depth of the nearby existing wells	When the CO_2 plume expands to the lateral locations of existing wells	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach an existing well combined with thickness and low porosity / permeability of the UCZ
Potential Leakage from Fractures and Faults	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operation	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage Through Confining Layers	**Improbable**, as the UCZ is 110 feet thick and very low porosity and permeability	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation and thickness/properties of the UCZ
Leakage from Natural or Induced Seismicity	**Improbable**, as there are several thousand feet of impermeable rock between the injection interval and surface or USDW that would need to be compromised and there are no mapped faults within the 98-year EOI plume outline (**Figure 27**)	Anytime during operations	**<100 MT per event**, due to natural dispersion of CO_2 within the Queen City Formation before it would laterally reach a fault or fracture significant enough to cause leakage
Leakage from Lateral Migration	**Improbable**, as the Queen City Formation is a very thick and laterally continuous formation with the closest well penetration over a mile downdip	More likely late in life as plume expands	**<1 MT per event** due to natural dispersion of CO_2 within the Queen City Formation and continuity / thickness of the UCZ

5.1 Potential Leakage from Surface Equipment

dCarbon's surface facilities at the injection site located near the ET Las Tiendas NGP Plant are specifically designed for injecting the CO_2 stream described in **Table 3**. The facilities minimize

leakage points such as valves and flanges by following industry standards and best practices. A shut-in valve is located at the wellhead in case of emergency. The compressor will also have emergency shut down switches that can be activated automatically in case of unexpected operating conditions.

Additionally, the compressor facility, pipeline, and injection well location will all be subjected to Auditory, Visual, and Olfactory (AVO) leak detection per BKV and dCarbon safety and operations standards. These monthly inspections, which are standard for detecting leaks and malfunctioning equipment in the gas production industry, will aid in the rapid detection of any potential leaks that may occur. As a part of these inspections, operations personnel are frequently able to repair leaks immediately by tightening valves, flanges, or similar equipment. Leakage from surface equipment is assessed as possible, however, any leaks that are detected will be analyzed to determine the amount of CO_2 that may have leaked and these leakage quantities, if any exist, will be included in recurring reporting.

5.2 Leakage from Approved, Not Yet Drilled Wells

A search of the TRRC's online GIS viewer (accessed December 9, 2024) in a 6,500 ft radius (which is roughly the size of the AMA/MMA) around the proposed injection site indicated one cancelled/abandoned location from 2012 and three permits that were so old that they had no API number or permit number, and the location source was cited as a hardcopy map (**Appendix, Table 9**). These search results indicate that there are no approved, not yet drilled, wells in the AMA/MMA and leakage from such wells is assessed as improbable.

5.3 Leakage from Existing Wells

There are 36 wells within the MMA listed in **Tables 9 and 10** in the **Appendix Section 13.2**, including at least one cancelled permit**.** These wells are shown in map view depiction of all wells relative to the proposed injection well in **Figure 26.** All wells targeted shallow oil reservoirs or were unsuccessful dry holes targeting shallow formations with no well exceeding a depth of 2,500 feet MD. There is over 2,000 feet of separation (including the UCZ of the Weches Shale) between these penetrations and the Queen City target injection interval. The likelihood of leakage from existing wells is assessed as improbable.

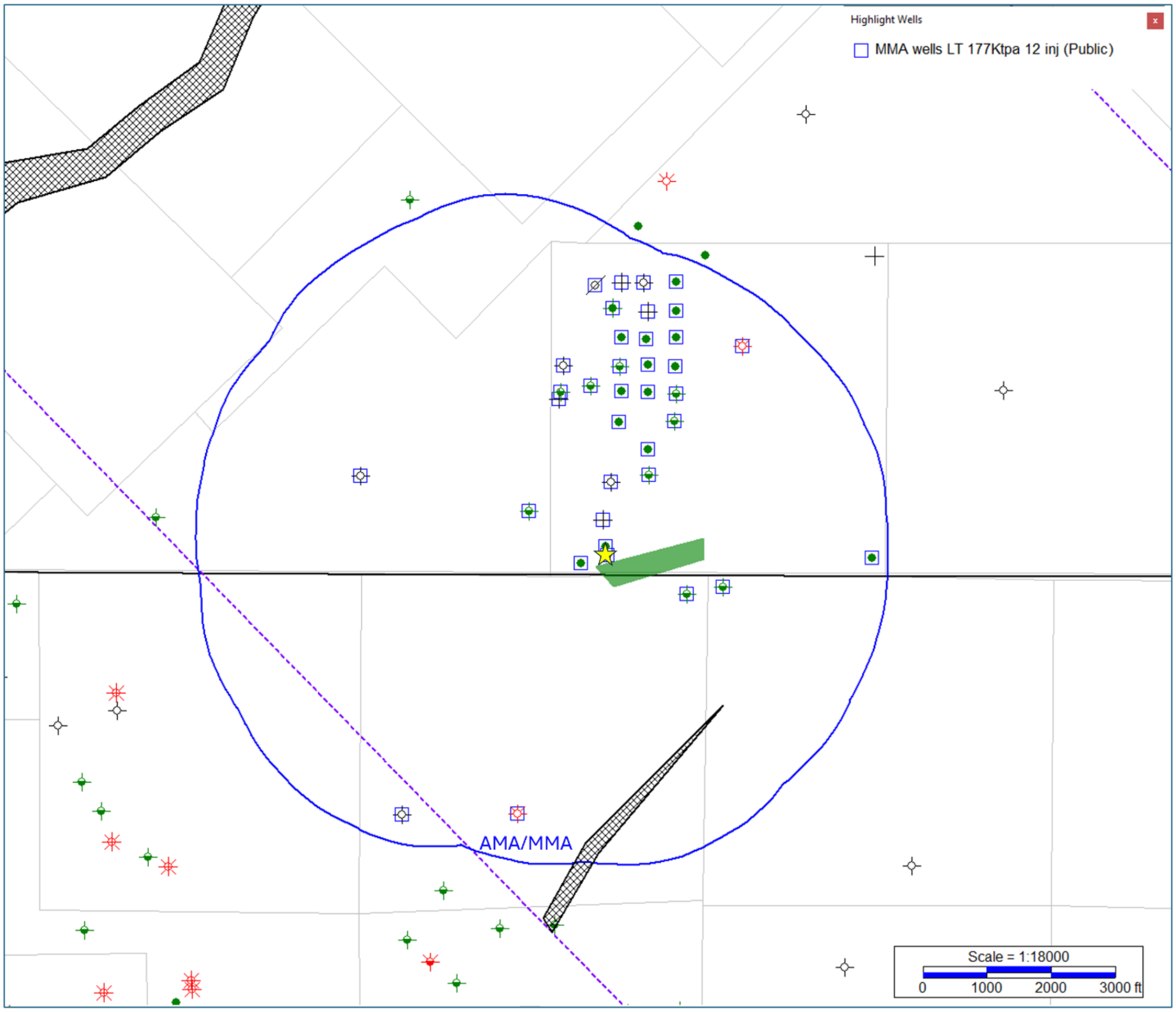

Figure 26. Wells in the AMA/MMA of Lima Tango CCS 1 highlighted with blue squares. The Lima Tango CCS 1 location is shown with a yellow star. The Las Tiendas NGP Plant is shown with a green polygon.

5.4 Potential Leakage from Fractures and Faults

There are three faults intersecting the Queen City Formation in the modeled area, which is also the area of licensed 3D seismic data. Fault 1 offsets the Queen City Formation by 100-250 feet and is deeply rooted below 10,000 feet (**Figure 27**). The fault cut continues nearly to the surface with consistent minor offset throughout the section indicating that it has had late movement. This fault is well outside of the AMA/MMA (3,200 feet away to the northwest) and, as such, no fault-CO_2 plume interactions are expected.

Fault 2 is much smaller and offsets the Queen City Formation by 40 to 60 feet. The modeled plume does not reach this fault after 12 years of injection or the following CO_2 plume stabilizing. Fault 3 is located 1.5 miles downdip and southeast from the AMA/MMA; it is not expected to have any fault-CO_2 plume intersections. Both Fault 2 and Fault 3 do not show even minor displacement more than a couple hundred feet above the top of the Queen City, thereby limiting their ability to serve as a leak pathway to the shallow USDW and the surface. The likelihood of leakage from fractures and faults is assessed as improbable.

5.5 Leakage Through Confining Layers

The Queen City Formation injection interval is confined by the overlying Weches Shale (the UCZ) and the underlying lower Queen City shales and Reklaw Shale (the LCZ) as described in **Section 3.3.2** and shown in **Figure 10**. The UCZ is comprised of 110 feet of impermeable shale (1% average porosity and 0.002 mD average permeability) as documented in **Table 1**. The LCZ is comprised of 965 feet of impermeable shale (1.5% average porosity and 0.05 mD average permeability) as documented in **Table 1**. These confining zones are supplemented by additional section separating the Queen City injection interval from the base of the overlying Yegua USDW by a total of 2,300 feet and from the underlying Carrizo-Wilcox USDW by a total of 1,355 feet as described in **Section 3.6**. There are no existing wellbores that penetrate the confining layers in the modeled plume area. There are five wells that penetrate the confining layers in the 20 square mile project area that could serve as potential leakage pathways, but they are all greater than one mile away from the proposed injection well and outside of the AMA/MMA (**Figure 27**). Based on the limited CO_2 plume migration and thick shales above and below the injection interval, the risk of leakage through the confining layers is assessed as improbable.

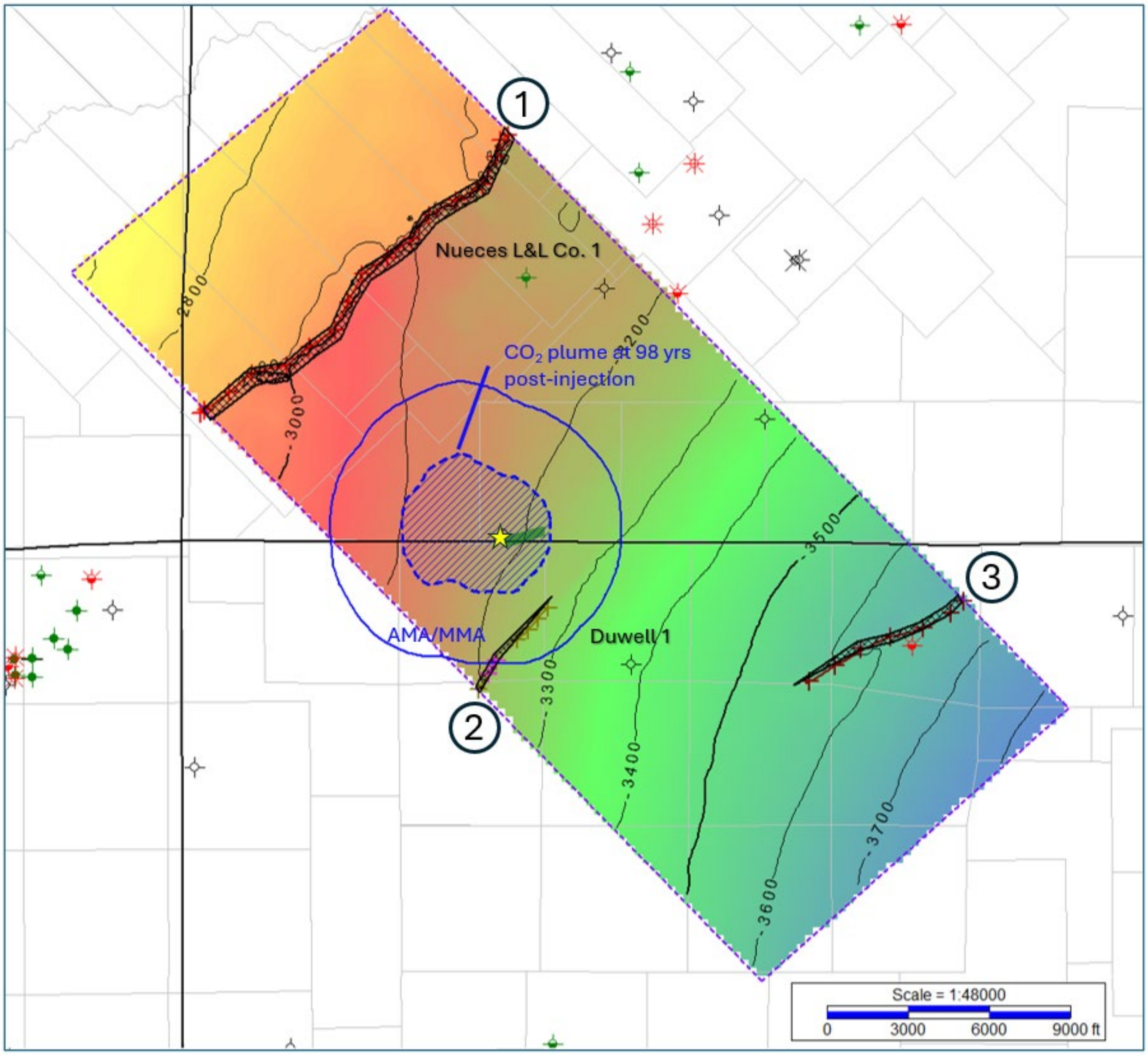

Figure 27. The top Queen City Formation structural contours (feet TVDSS), mapped Queen City Formation faults, AMA/MMA (blue solid line) and CO_2 plume size at the end of 12 years injection and 98 years post-injection modeling (blue dashed line). Only wells penetrating the Queen City are shown, with the two closest wells to the injection site labeled. The Lima Tango CCS 1 location is highlighted with a yellow star. Faults are numbered for discussion in the text.

5.6 Leakage from Natural or Induced Seismicity

The Lima Tango CCS 1 site has no historical seismicity within 19 miles of the proposed well. Mapped faults do not cut down to crystalline basement and have thousands of feet of separation between their deepest offset and the basement. Additionally, injection modeling indicates such minimal pore pressure change at any fault that it is insufficient to cause fault slip. No faults are mapped within the area of the CO_2 plume after 12 years of injection. Based on these factors, the leakage risk due to natural or induced seismicity is assessed as improbable.

Should any unexpected increases in formation pressure be detected, dCarbon can perform Fault Slip Potential (FSP) analysis (Walsh *et al.*, 2017) to evaluate the risk of induced seismicity on the closest mapped faults. dCarbon plans to build this model based on geologic data collected during drilling the Lima Tango CCS 1 well. If there is a concern related to abnormal pressures or seismicity related to operations at the well, dCarbon will shut-in the well and investigate further.

5.7 Leakage from Lateral Migration

The regional dip in the Lima Tango CCS 1 project area is gentle, at approximately two degrees, and therefore lateral migration is expected to be slow and well-behaved. There are five wells in the project area that penetrate the Queen City Formation, but these are all located outside of the AMA/MMA. The wells are depicted in **Figure 27**. The closest well (Duwell 1) is located 6,800 feet down dip and then next closest well (Nueces L&L Co. 1) is located 9,500 feet on strike to the Lima Tango CCS 1 injection well. The Queen City Formation is laterally continuous and of uniform thickness in the project area, making the risk from lateral migration improbable.

6 – PLAN OF ACTION FOR DETECTING AND QUANTIFYING SURFACE LEAKAGE OF CO_2

This section discusses the strategy that dCarbon will employ for detecting and quantifying surface leakage of CO_2 through the pathways identified in previous sections to meet the requirements of 40 CFR § 98.448(a)(3). Monitoring will occur during the planned 12-year injection period, or until the cessation of operations, plus a proposed two-year post-injection period.

6.1 LEAKAGE FROM SURFACE EQUIPMENT

As the CO_2 compressor station, pipeline, and injection well are all designed to handle the expected concentrations, temperatures, and pressures of H_2S and CO_2, any leakage from surface equipment will be quickly detected and addressed. The facility is designed to minimize potential leakage points by following the American Society of Mechanical Engineers (ASME) standards, American Petroleum Institute (API) standards, and other industry standards, including standards pertaining to material selection and construction. Additionally, connections are designed to minimize corrosion and leakage points. The facility and well will be monitored for a lack of oxygen in high-risk areas. This monitoring equipment will be set with a low alarm setpoint for O_2 that automatically alerts field personnel of abnormalities. Additionally, all field personnel are required to wear gas monitors, which will trigger the alarm at low levels of O_2 (typically 19.5%). The injection facility will be continuously monitored through automated systems that are designed to identify abnormalities in operational conditions. In addition, field personnel will conduct daily inspections and monthly AVO field inspections of gauges, monitors, and leak indicators. The effectiveness of the internal and external corrosion control program is monitored through the periodic inspection of the system and analysis of liquids collected from the line. These inspections, in addition to the automated systems, will allow dCarbon to quickly identify and respond to any leakage situation. Monitoring will occur for the duration of injection and the post-injection period. Should leakage be detected during active injection operations, the volume of CO_2 released will be calculated based on operating conditions at the time of the event, per 40 CFR § 98.448(a)(5).

The CO_2 for injection will be metered in one location. Once the CO_2 is compressed to a supercritical state, it will pass through a Coriolis meter for measurement and then be transported approximately 150 feet via surface pipeline (see **Figure 17**) to the injection well. The injection stream will also be analyzed with a CO_2 gas chromatograph at the well site to determine the final concentration. The meters will each be calibrated to industry standards. Any CO_2 that is determined to have leaked or not been received at the injection wellhead will be quantified using the procedures specified in subpart W of the GHGRP, reported as specified in 40 CFR § 98.448(a)(5), and subtracted from reported injection volumes. Gas samples will be taken and analyzed per manufacturer's recommendations to confirm stream composition and calibrate or re-calibrate meters, if necessary. At a minimum, these samples will be taken quarterly. Minimal variation of concentration and composition are expected but will be included in regulatory filings as appropriate.

6.2 Leakage from Existing and Future Wells within the Monitoring Area

There are no wells in the AMA/MMA currently existing, approved, or pending that penetrate as deep as the Queen City injection interval. However, dCarbon will reverify the status and public information for all proposed and approved drilling permits within the MMA quarterly. If any wells are proposed, permitted, or drilled within the MMA, BKV will investigate the proposal and determine if any additional risks are introduced through the new well proposal. Additionally, dCarbon will continuously monitor and collect injection volumes, pressures, temperatures, and gas composition data for the injection well. This data will be reviewed by qualified personnel and will follow response and reporting procedures when data is outside acceptable performance limits. Finally, dCarbon will update the MRV plan if any new wells are drilled within the MMA, or if any other material changes to the project occurs.

The injection well design has pressure and temperature gauges monitoring the injection stream at the wellhead as well as bottomhole pressure and temperature gauges near the bottom of the tubing. The downhole gauges will monitor the inside of the tubing (injection stream) as well as the annulus. A change of pressure on the annulus would indicate the presence of a possible leak requiring remediation. Mechanical Integrity Tests (MITs) performed annually would also indicate the presence of a leak. Upon a negative MIT, the well would immediately be isolated, and the leak mitigated.

In the unlikely event that any CO_2 leaks occur into existing or future wells in the monitoring area, dCarbon will endeavor to work with the operator(s) of those wells and/or midstream providers to take wellhead gas samples to quantify variations or increases of CO_2 compared with historical or baseline CO_2 concentrations. Any measurable increases in CO_2 which may be confidently attributed to injection volumes from the Lima Tango CCS 1 well will be calculated using standard engineering procedures for estimating potential well leakage determined to be appropriate for the situation. These volumes will be documented and reported in the annual monitoring report and subtracted from reported injection volumes. Additionally, dCarbon will evaluate and execute any additional downhole remediations (*e.g.*, well workovers, which may include adding plugs or remedial cement jobs) that could address leakage from the injection well to the existing and future wells in the area if necessary and practical.

6.3 Leakage from Faults and Fractures

No faults or fractures have been identified that would allow CO_2 to migrate vertically to zones with USDWs or to the surface. The closest fault to the Lima Tango CCS 1 well has minor offset and does not extend into the shallow formations (fault 2 in **Figure 27**). It is also outside of the modeled plume after 12 years of injection and plume stabilization. Larger faults in the study area are outside the modeled AMA/MMA.

In the unlikely event that such leakage from faults or fractures occurs, dCarbon will determine which standard engineering techniques for estimating potential leakage from the faults and fractures are appropriate for the situation to estimate any leakage from faults and fractures and report such leakage estimates and the methodology employed in the annual monitoring report.

6.4 Leakage through Confining Layers

Leakage through confining layers is improbable, given the number and thickness of layers between the injection interval and any possible potable groundwater. There are not any groundwater wells near the Lima Tango CCS 1 site as shown in **Figure 19**. dCarbon has reviewed offsetting logs through the possible groundwater interval above the shallow base of USDW and not observed a freshwater response on the resistivity logs. When dCarbon drills the Lima Tango CCS 1 well, logs will be obtained over the potential shallow water zone and evaluated for the presence of porosity and a freshwater response. Should a freshwater response be observed, dCarbon proposes to drill a monitoring well over the groundwater interval and would amend this MRV plan to reflect this change.

Should any CO_2 leakage occur, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation to estimate any leakage and report such leakage estimates and the methodology employed in the annual monitoring report.

6.5 Leakage through Natural or Induced Seismicity

While the likelihood of a natural or induced seismicity event is extremely low, dCarbon plans to monitor for seismic activity using the existing TexNet monitoring system. If a seismic event of 3.0 magnitude or greater is detected, dCarbon will review the injection volumes and pressures at the Lima Tango CCS 1 well to determine if any significant changes occurred that would indicate potential leakage. To suspect leakage due to natural or induced seismicity, the evidence would need to suggest that the earthquakes are activating faults that intersect the confining zones.

In the unlikely event CO_2 leakage occurs due to natural or induced seismicity, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.6 Leakage through Lateral Migration

The distances to the closest penetration of the Queen City injection interval are 2,200 feet from the AMA/MMA boundary and 6,800 feet away from the Lima Tango CCS 1 injection site in a down dip direction (the Duwell 1 well). The next closest penetration is 4,300 feet from the AMA/MMA boundary and 9,600 feet from the injection site on strike (Nueces L&L Co. 1 well). The map in **Figure 27** shows the location of these two wells, which are both plugged dry holes. Given the distance and status of these wells, leakage through lateral migration is not expected.

In the unlikely event CO_2 leakage occurs due lateral migration, dCarbon will determine which standard engineering techniques for estimating potential leakage are appropriate for the situation and report such leakage estimates and the methodology employed in the annual monitoring report.

6.7 Quantification of Leakage

In the unlikely event that CO_2 moves vertically past the primary and secondary confining layers as described earlier in Section 6, there are not existing groundwater wells present in this region to use to monitor for leaks.

The well most suited to use a monitor for leaks into the shallow USDW is the Lima Tango CCS 1 injection well itself. Open hole logs will be collected over each casing interval to screen for evidence of freshwater. Should an aquifer be identified during the drilling and logging of the injection well, a separate groundwater monitoring well will be drilled and used to monitor water quality and sampled annually. If dCarbon notices an increase in groundwater CO_2 concentration compared to baseline measurements, the increase in concentration will be analyzed volumetrically to provide a preliminary estimate of CO_2 leakage.

Any leakage that did extend to the surface could be characterized and quantified through surface surveillance in the project area paired with direct pressure, volume, and temperature (PVT) measurements. Currently available (and continuously improving) atmospheric sensing technology could be used to establish a baseline of ambient CO_2 concentration in the project area and identify any fluctuations. Deviations from baseline concentration along with understanding of the distance from potential leak sources can then be coupled with temporally matched meteorological data to semi-quantitatively determine leak attribution and rate. Based on the size of leak, these qualified or quantified leak rates can be compared with spatiotemporally monitored PVT data to co-index or further refine leaked volumes from likely point sources.

Any diffuse leak or leak without an obvious single point source may require additional identification and quantification methods. dCarbon is working with a leading environmental services and data company that specializes in monitoring and quantifying gas leaks in various industrial settings. One such quantification method involves utilizing fixed monitoring systems to detect CO_2. Additional system capabilities also include the deployment of an unmanned aerial vehicle (UAV), which is outfitted with an industry leading high fidelity CO_2 sensor capable of measuring concentrations as little as parts per billion (ppb). The UAV mobile surveillance platform possesses the ability to be flown on a programmable and highly replicable pattern across the MMA in both X and Y axis (longitude + latitude) as well as Z axis (height). Depending on the system's ability to obtain a reliable baseline across the MMA, areal deviation in CO_2 concentration could be measured, and diffuse leak sources could potentially be identified, provided the emissions reach a sufficient threshold. dCarbon will also consider similar technologies with less spatial resolution or fidelity such as fixed wing flyovers and/or improving satellite data with UAV technology to screen for and support diffuse emissions identification and investigation.

Depending on the applicability and monitoring needs, dCarbon will also consider other monitoring quantification methods such as the Eddy Covariance Method (ECM) (Korre *et al.*, 2011). This method utilizes gas fluxes and ambient meteorological conditions to detect and quantify leaks, although the ability to detect smaller leaks may be limited. Additionally, long open path tunable diode lasers could be used to measure distance averaged concentrations of CO_2 in the air, which could help quantify a leak of CO_2. This system could be paired with an array of short, closed path detectors (*e.g.*, gas chromatographs) that are typically placed around a suspected leak or leak area to monitor point-source CO_2 concentration increases and to quantify leakage. dCarbon may also evaluate other emerging technologies for quantifying CO_2 leakage such as Non-Dispersive Infra-Red (NDIR) CO_2 sensors and soil flux detectors. dCarbon may also utilize three-dimensional reservoir models that factor in faults and surface topography to predict CO_2 leakage locations, quantity, and timing. The applicability of such models in predicting and quantifying gas leaks has been tested and documented at the Leroy natural gas storage site in Wyoming, USA. (Chen, 2013)

As the technology and equipment to quantify CO_2 leakage is rapidly evolving and expected to improve over time, dCarbon will continue to update its leak detection and quantification plans as appropriate. If dCarbon detects a leak associated with CO_2 injection at the Lima Tango CCS 1 well, all methods discussed in this section will be considered in addition to emerging technologies to determine the most applicable and effective method of quantification.

7 – BASELINE DETERMINATIONS

This section identifies the strategies that dCarbon will undertake to establish the expected baselines for monitoring CO_2 surface leakage per § 98.448(a)(4).

Baseline groundwater quality and properties will be determined and monitored through the installation of a groundwater well near the injection well site if the potential for a freshwater aquifer is observed when drilling the injection well. Samples will be taken and analyzed by a third-party laboratory to establish the baseline properties of the groundwater in the area. dCarbon will sample the groundwater monitoring well quarterly initially to establish the baseline. dCarbon may adjust to annual sampling after one year.

Baseline seismicity in the area near the Lima Tango CCS 1 will be determined through the historical data from USGS and the TexNet seismic array data hosted by the Texas Bureau of Economic Geology.

8 – SITE SPECIFIC CONSIDERATIONS FOR DETERMINING THE MASS OF CO_2 SEQUESTERED

This section identifies how dCarbon will calculate the mass of CO_2 injected, emitted, and sequestered. This also includes site-specific variables for calculating the CO_2 emissions from equipment leaks and vented emissions of CO_2 between the injection flow meter and the injection well, per 40 CFR § 98.448(a)(5).

8.1 Mass of CO_2 Received

Per 40 CFR § 98.443, the mass of CO_2 received must be calculated using the specified CO_2 received equations "unless you follow the procedures in 40 CFR §98.444(a)(4)." 40 CFR § 98.444(a)(4) states that "if the CO_2 you receive is wholly injected and is not mixed with any other supply of CO_2, you may report the annual mass of CO_2 injected that you determined following the requirements under paragraph (b) of this section as the total annual mass of CO_2 received instead of using Equation RR-1 or RR-2 of this subpart to calculate CO_2 received."

The CO_2 received by dCarbon for injection into the Lima Tango CCS 1 injection well is wholly injected and not mixed with any other supply and the annual mass of CO_2 injected will equal the amount received. Any future streams will be metered separately before being combined into the calculated stream.

8.2 Mass of CO_2 Injected

Per 40 CFR § 98.444(b), since the flow rate of CO_2 injected will be measured with a volumetric flow meter, the total annual mass of CO_2, in metric tons, will be calculated by multiplying the volumetric flow at standard conditions by the CO_2 concentration in the flow and the density of CO_2 at standard conditions, according to Subpart RR Equation 5:

$$CO_{2,u} = \sum_{p=1}^{4} Q_{p,u} * D * C_{CO_{2,p,u}}$$

Where:

$CO_{2,u}$	=	Annual CO_2 mass injected (metric tons) as measured by flow meter u
$Q_{p,u}$	=	Quarterly volumetric flow rate measurement for flow meter u in quarter p at standard conditions (standard cubic meters per quarter)
D	=	Density of CO_2 at standard conditions (metric tons per standard cubic meter): 0.0018682
$C_{CO2,p,u}$	=	Quarterly CO_2 concentration measurement in flow for flow meter u in quarter p (vol. percent CO_2, expressed as a decimal fraction)
p	=	Quarter of the year
u	=	Flow meter

8.3 MASS OF CO_2 PRODUCED

The injection well is not part of an enhanced oil recovery project, and therefore, no CO_2 will be produced.

8.4 MASS OF CO_2 EMITTED BY SURFACE LEAKAGE

Mass of CO_2 emitted by surface leakage and equipment leaks will not be measured directly as the injection stream for this well contains H_2S, which may be hazardous for field personnel to perform a direct leak survey. Any leakage would be detected and managed as a major upset event. Gas detectors and continuous monitoring systems would trigger an alarm upon a release. The mass of the CO_2 released would be calculated for the operating conditions at the time, including pressure, flow rate, size of the leak point opening, and duration of the leak. This method is consistent with 40 CFR § 98.448(a)(5), allowing the operator to calculate site-specific variables used in the mass balance equation.

In the unlikely event that CO_2 was released because of surface leakage, the mass emitted would be calculated for each surface pathway according to methods outlined in the plan and totaled using 40 CFR Part 98-Subpart RR Equation 10 as follows:

$$CO_{2,E} = \sum_{x=1}^{X} CO_{2,x}$$

Where:

$CO_{2,E}$	=	Total annual mass emitted by surface leakage (metric tons) in the reporting year
$CO_{2,x}$	=	Annual CO_2 mass emitted (metric tons) at leakage pathway x in the reporting year
X	=	Leakage pathway

Annual mass of CO_2 emitted (in metric tons) from any equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flowmeter used to measure injection quantity and injection wellhead will comply with the calculation and quality assurance/quality control requirement proposed in Part 98, Subpart W and will be reconciled with the annual data collected through the monitoring plan.

8.5 MASS OF CO_2 SEQUESTERED

The mass of CO_2 sequestered in the subsurface geologic formations will be calculated based off from 40 CFR Part 98, Subpart RR Equation 12, as this well will not actively produce any oil or natural gas or any other fluids, as follows:

$$CO_2 = CO_{2I} - CO_{2E} - CO_{2FI}$$

Where:

CO_2	=	Total annual CO_2 mass sequestered in subsurface geologic formations (metric tons) at the facility in the reporting year.

$CO_{2,I}$	=	Total annual CO_2 mass injected (metric tons) in the well or group of wells covered by this source category in the reporting year.
$CO_{2,E}$	=	Total annual CO_2 mass emitted (metric tons) by surface leakage in the reporting year.
CO_{2FI}	=	Total annual CO_2 mass emitted (metric tons) from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead, for which a calculation procedure is provided in Subpart W of Part 98.

9 – ESTIMATED SCHEDULE FOR IMPLEMENTATION OF MRV PLAN

The injection well is expected to begin operation in 2026. Baseline data will be collected before injection begins and the MRV plan will be implemented upon receiving EPA MRV plan approval.

10 – QUALITY ASSURANCE

10.1 CO_2 INJECTED

- The flow rate of the CO_2 being injected will be measured with a volume flow meter, consistent with industry best practices. These flow rates will be compiled quarterly.
- The composition of the CO_2 stream will be measured upstream of the volume flow meter with a gas composition analyzer or representative sampling consistent with industry best practices.
- The gas composition measurements of the injected stream will be averaged quarterly.
- The CO_2 measurement equipment will be calibrated according to manufacturer specifications.

10.2 CO_2 EMISSIONS FROM LEAKS AND VENTED EMISSIONS

- Gas detectors will be operated continuously, except for maintenance and calibration.
- Gas detectors will be calibrated according to manufacturer recommendations and API standards.
- Calculation methods from Subpart W will be used to calculate CO_2 emissions from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

10.3 MEASUREMENT DEVICES

- Flow meters will be continuously operated except for maintenance and calibration.
- Flow meters will be calibrated according to the requirements in 40 CFR § 98.3(i).
- Flow meters will be operated per an appropriate standard method as published by a consensus-based standards organization.
- Flow meter calibrations will be traceable to the National Institute of Standards and Technology (NIST).

All measured volumes of CO_2 will be converted to standard cubic feet at a temperature of 60 degrees Fahrenheit and an absolute pressure of 1.0 atmosphere.

10.4 MISSING DATA

In accordance with 40 CFR § 98.445, dCarbon will use the following procedures to estimate missing data if unable to collect the data needed for the mass balance calculations:

- If a quarterly quantity of CO_2 injected is missing, the amount will be estimated using a representative quantity of CO_2 injected from the nearest previous period at a similar injection pressure.
- Fugitive CO_2 emissions from equipment leaks from facility surface equipment will be estimated and reported per the procedures specified in Subpart W of 40 CFR § 98.

11 – RECORDS RETENTION

dCarbon will retain records as required by 40 CFR § 98.3(g). These records will be retained for at least three years and include:

- Quarterly records of the CO_2 injected.
- Volumetric flow at standard conditions.
- Volumetric flow at operating conditions.
- Operating temperature and pressure.
- Concentration of the CO_2 stream.
- Annual records of the information used to calculate the CO_2 emitted by surface leakage from leakage pathways.
- Annual records of information used to calculate CO_2 emitted from equipment leaks and vented emissions of CO_2 from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead.

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13 - APPENDIX

13.1 EXPIRED PERMITS FROM THE TRRC

Table 9 – Expired permits from TRRC database*.

API	Well No.	Symbol_Description	Location_Source	Latitude	Longitude
311	2B	Permitted Location	Commission`s hardcopy map	28.0660035	-98.7681379
311	8	Permitted Location	Commission`s hardcopy map	28.0695958	-98.7640217
311	4	Permitted Location	Commission`s hardcopy map	28.0636247	-98.7627483

* These permitted wells may exist as dry holes in the S&P Global database well list below

13.2 WELLS IN MMA

Table 10 – Wells in the MMA (sourced from S&P Global database).

API	Well Name	Well Num	Latitude	Longitude	Status	Total Depth	Operator
421310007000	SOC FOR PROPAGATI	1	28.0565397	-98.7603987	Dry Hole with Oil Show	1350	PETROLEUM PRODUCERS INC
421310007100	NUECES LD & LVESTCK	1	28.0562470	-98.7621096	Dry Hole with Oil Show	1227	BASOM G W TRUSTEE
421313171800	NUECES LD&LVSTCK	1	28.0467414	-98.7758977	Dry Hole	2154	GULF OIL CORP
421313316400	NUECES MINERALS CO	1	28.0467787	-98.7703195	Dry Hole with Gas Show	2500	VICTORIA MINERALS
423110147400	NUECES LD LSTK	1	28.0613037	-98.7779357	Dry Hole	2225	PARKER PETROLEUM CO
423110147500	NUECES LAND & LIVESTOCK CO	1	28.0597908	-98.7697815	Dry Hole with Oil Show	1193	SMITH & COSNER
423110147900	NUECES LAND & LIVESTOCK	1	28.0683736	-98.7640390	Unknown	1215	SECONDARY OIL CORP INC
423110148000	NUECES LAND & LIVESTOCK	2	28.0684014	-98.7626783	Oil Well	1220	OHIO FUEL SUPPLY CO
423110148100	NUECES LAND & LIVESTOCK	3	28.0696469	-98.7626704	Oil Well	1215	OHIO FUEL SUPPLY CO
423110148200	NUECES LAND & LIVESTOCK	4	28.0578346	-98.7531587	Oil Well	1212	SECONDARY OIL CORP INC
423110148400	NUECES LAND & LIVESTOCK	6	28.0696207	-98.7653094	Unknown	1208	SECONDARY OIL CORP INC
423110148500	NUECES L & 6 CO	9	28.0649230	-98.7640330	Oil Well	1220	GRAHAM TOM
423110148600	NUECES L&L CO	10	28.0660888	-98.7640133	Oil Well	1215	GRAHAM BROTHERS
423110148700	NUECES L&L CO	11	28.0671777	-98.7641023	Oil Well	1221	GRAHAM TOM
423110148800	NUECES L&L CO	12	28.0672632	-98.7626518	Oil Well	1227	GRAHAM BROTHERS
423110148900	NUECES L&L CO	13	28.0660097	-98.7627152	Oil Well	1224	GRAHAM BROTHERS
423110149000	NUECES L & L CO	14	28.0648630	-98.7626668	Dry Hole with Oil Show	1223	GRAHAM BROTHERS

423110149200	NUECES LND & LVSTCK	2-A	28.0624432	-98.7640137	Oil Well	1213	BISHOP OIL CO
423110149300	NUECES LD & LIVESTOCK	3-A	28.0613433	-98.7639772	Dry Hole with Oil Show	1216	BISHOP OIL CO
423110149400	NUECES LAND & LIVESTOCK	4A	28.0636782	-98.7627331	Dry Hole with Oil Show	1251	BISHOP OIL CO
423110149500	NUECES LAND & LIVESTOCK	1B	28.0649387	-98.7653312	Oil Well	1206	SECONDARY OIL CORP INC
423110149600	NUECES L&L CO	2B	28.0660141	-98.7653893	Dry Hole with Oil Show	1348	BISHOP OIL CO
423110149700	NUECES LAND & LIVESTOCK	3B	28.0651833	-98.7668115	Dry Hole with Oil Show	1199	BISHOP OIL CO
423110149800	NUECES L & L CO	4B	28.0672593	-98.7653290	Oil Well	1208	SECONDARY OIL CORP INC
423110149900	NUECES LD & LVSTK	1B	28.0646304	-98.7683287	Unknown	1213	KRASNER SAM
423110150000	NUECES LD & LVSTK	2B	28.0660570	-98.7681225	Dry Hole	1222	KRASNER SAM
423110150100	NUECES LD LSTK	2D	28.0583058	-98.7660810	Oil Well	1200	KRASNER SAM
423110150200	NUECES LD LSTK	3D	28.0575764	-98.7672696	Oil Well	1195	KRASNER SAM
423110150300	NUECES LD & LIVE ST	1	28.0649237	-98.7682537	Dry Hole with Oil Show	1505	DUNCAN N V
423110150400	NUECES LAND & LIVESTOCK	1	28.0668838	-98.7594553	Dry Hole with Gas Show	1268	TAYLOR REFINING CO
423110150500	NUECES LAND & LIVESTOCK	1-A	28.0636250	-98.7654534	Oil Well	1213	SECONDARY OIL CORP INC
423110150600	NUECES LAND & LIVESTOCK CO	8	28.0696167	-98.7642548	Dry Hole	1222	NUGENT GEORGE V & L V OIL ACCT
423110236100	NUECES LD LIVESTOCK	1-D	28.0594141	-98.7661765	Unknown	1196	KRASNER SAM & WOODMAN L L
423113141700	NUECES MINERALS	1	28.0610659	-98.7658244	Dry Hole	1358	DKD JOINT VENTURE
423113143500	NUECES MINERALS	2	28.0685222	-98.7657277	Abandoned Oil Well	1280	DKD JOINT VENTURE
423113508200	SCOPE-MUNSON	1	28.0695062	-98.7665958	Abandoned Location		SCOPE PRODUCTION CO LLC

13.3 APPROVED W-14, W-1, AND DRILLING PERMITS

RAILROAD COMMISSION OF TEXAS

OIL AND GAS DIVISION

PERMIT TO DISPOSE OF NON-HAZARDOUS OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL AND GAS

PERMIT NO. 17575

BKV DCARBON VENTURES, LLC
4800 BLUE MOUND ROAD
FORT WORTH TX 76106

Authority is granted to inject Non-Hazardous Oil and Gas waste into the well identified herein in accordance with Statewide Rule 9 of the Railroad Commission of Texas and based on information contained in the application (Form W-14) dated December 05, 2024, for the permitted interval(s) of the QUEEN CITY formation(s) and subject to the following terms and special conditions:

LIMA TANGO CCS (00000) LEASE
MUNSON FIELD
MCMULLEN COUNTY
DISTRICT 01

WELL IDENTIFICATION AND PERMIT PARAMETERS:

Well No.	API No.	UIC No.	Permitted Fluids	Top Interval (feet)	Bottom Interval (feet)	Maximum Gas Daily Injection Volume (MCF/day)	Maximum Surface Injection Pressure for Gas (PSIG)
1	31100000	000126980	Carbon Dioxide (CO2)	3508	4870	9500	1700

SPECIAL CONDITIONS:

Well No.	API No.	Special Conditions
1	31100000	**1. Cement Bond Log (CBL):** **(A) A CBL must be run on the injection string casing. If the CBL does not verify adequate confinement of the injection/disposal interval, the operator must perform a remedial cement squeeze on the casing in order to achieve adequate confinement immediately above this interval. Adequate confinement is considered to be: annular height of 600 feet of cement based on cement volume calculations; or 250 feet of cement verified by a temperature survey conducted at the time of cementing; or 100 feet of cement verified by a cement bond log that shows the cement is well bonded to the pipe and formation (80% bond or higher) with no indication of channeling.** **(B) Any CBL run on the well must be submitted within the completion report (W-2/G-1) or submitted within the RRC Digital Well Log submission system. If the Digital Well Log submission system is used, the operator must indicate so on the completion report via the remarks or attaching confirmation.** **(C) If a remedial cement squeeze is needed to achieve adequate confinement, the operator must notify and receive approval from the RRC district office prior to performing any remedial cementing work. All cementing work must be appropriately reported on a completion report (W-2/G-1) pursuant to Statewide Rule 16(b). A copy of any Forms W-15 must also be included with the next completion report.** **2. (A) The operator shall notify the Commission within 24 hours of a discovery of any monitoring or other information which indicates that any contaminant may cause an endangerment to a USDW; or any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between USDWs. Within 20 days of such a discovery, the operator shall file a report with the Commission documenting the event, findings, and response actions taken.** **(B) The permittee shall report the source(s) and the properties of injected acid gas as they are added. In no case may the volume of acid gas exceed the limit indicated in permit.** **(C) The well's construction and materials used must be resistant to corrosion per the proposed wellbore schematic that was submitted in the application.** **3. This is not an Underground Injection Control (UIC) Class VI permit for geologic sequestration of CO2. Geologic sequestration of CO2 that occurs incidental to oil and gas operations is authorized under a Class II UIC permit under certain circumstances, including but not limited to there being a legitimate/material oil and gas exploration/production purpose for the injection that does not cause or contribute to an**

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		increased risk to USDW. **4. For wells with long string casing set more than 100 feet below the permitted injection interval, the plug back depth shall be within 100 feet of the bottom of the permitted injection interval. For wells with open hole completions, the plug back depth shall be no deeper than the bottom of the permitted injection interval.**

STANDARD CONDITIONS:

1. Injection must be through tubing set on a packer. The packer must be set no higher than 100 feet above the top of the permitted interval.

2. The District Office must be notified 48 hours prior to:
   a. running tubing and setting packer;
   b. beginning any work over or remedial operation;
   c. conducting any required pressure tests or surveys.

3. The wellhead must be equipped with a pressure observation valve on the tubing and for each annulus.

4. Prior to beginning injection and subsequently after any work over, an annulus pressure test must be performed. The test pressure must equal the maximum authorized injection pressure or 500 psig, whichever is less, but must be at least 200 psig. The test must be performed and the results submitted in accordance with the instructions of Form H-5.

5. The injection pressure and injection volume must be monitored at least monthly and reported annually on Form H-10 to the Commission's Austin office.

6. Within 30 days after completion, conversion to disposal, or any work over which results in a change in well completion, a new Form W-2 or G-1 must be filed to show the current completion status of the well. The date of the disposal well permit and the permit number must be included on the new Form W-2 or G-1.

7. Written notice of intent to transfer the permit to another operator by filing Form P-4 must be submitted to the Commission at least 15 days prior to the date of the transfer.

8. This permit will expire when the Form W-3, Plugging Record, is filed with the Commission. Furthermore, permits issued for wells to be drilled will expire three (3) years from the date of the permit unless drilling operations have commenced.

Provided further that, should it be determined that such injection fluid is not confined to the approved interval, then the permission given herein is suspended and the disposal operation must be stopped until

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the fluid migration from such interval is eliminated. Failure to comply with all of the conditions of this permit may result in the operator being referred to enforcement to consider assessment of administrative penalties and/or the cancellation of the permit.

APPROVED AND ISSUED ON January 30, 2025.

Scott Rosenquist

(for) ______________________________

Ricardo Rosso, Interim Manager
Injection-Storage Permits Unit

Note: This document will only be distributed electronically.

API No. 42-311-37581

Drilling Permit # 905619

SWR Exception

RAILROAD COMMISSION OF TEXAS
OIL & GAS DIVISION

APPLICATION FOR PERMIT TO DRILL, RECOMPLETE, OR RE-ENTER

This facsimile W-1 was generated electronically from data submitted to the RRC.
A certification of the automated data is available in the RRC's Austin office.

FORM W-1 07/2004

Permit Status: Approved

1. RRC Operator No. 100589

2. Operator's Name (as shown on form P-5, Organization Report) BKV DCARBON VENTURES, LLC

3. Operator Address (include street, city, state, zip): 4800 BLUE MOUND ROAD FORT WORTH, TX 76106-0000

4. Lease Name LIMA TANGO CCS

5. Well No. 1

6. Purpose of filing (mark ALL appropriate boxes): [X] New Drill [ ] Recompletion [ ] Reclass [ ] Field Transfer [ ] Re-Enter [ ] Amended [ ] Amended as Drilled (BHL) (Also File Form W-1D)

7. Wellbore Profile (mark ALL appropriate boxes): [X] Vertical [ ] Horizontal (Also File Form W-1H) [ ] Directional (Also File Form W-1D) [ ] Sidetrack

8. Total Depth 5000

9. Do you have the right to develop the minerals under any right-of-way ? [X] Yes [ ] No

10. Is this well subject to Statewide Rule 36 (hydrogen sulfide area)? [ ] Yes [X] No

11. RRC District No. 01

12. County MCMULLEN

13. Surface Location [X] Land [ ] Bay/Estuary [ ] Inland Waterway [ ] Offshore

14. This well is to be located 15.44 miles in a NW direction from Freer which is the nearest town in the county of the well site.

15. Section 119

16. Block

17. Survey BS&F

18. Abstract No. A-118

19. Distance to nearest lease line: ft.

20. Number of contiguous acres in lease, pooled unit, or unitized tract: 16.5

21. Lease Perpendiculars: 226 ft from the NW line and 368 ft from the SW line.

22. Survey Perpendiculars: 909 ft from the W line and 4834 ft from the N line.

23. Is this a pooled unit? [ ] Yes [X] No

24. Unitization Docket No:

25. Are you applying for Substandard Acreage Field? [ ] Yes (attach Form W-1A) [X] No

26. RRC District No.	27. Field No.	28. Field Name (exactly as shown in RRC records)	29. Well Type	30. Completion Depth	31. Distance to Nearest Well in this Reservoir	32. Number of Wells on this lease in this Reservoir
01	63845001	MUNSON	Injection Well	5000	0.00	1

Remarks

Certificate:

I certify that information stated in this application is true and complete, to the best of my knowledge.

Bill Spencer, Consultant
Name of filer

Jan 31, 2025
Date submitted

(512)9181062, x2
Phone

bill@spencerconsulting.org
E-mail Address (OPTIONAL)

RRC Use Only Data Validation Time Stamp: Feb 4, 2025 1:41 PM(Current Version)

Railroad Commission of Texas

PERMIT TO DRILL, RE-COMPLETE, OR RE-ENTER ON REGULAR OR ADMINISTRATIVE EXCEPTION LOCATION

CONDITIONS AND INSTRUCTIONS

Permit Invalidation. It is the operator's responsibility to make sure that the permitted location complies with Commission density and spacing rules in effect on the spud date. The permit becomes invalid automatically if, because of a field rule change or the drilling of another well, the stated location is not in compliance with Commission field rules on the spud date. If this occurs, application for an exception to Statewide Rules 37 and 38 must be made and a special permit granted prior to spudding. Failure to do so may result in an allowable not being assigned and/or enforcement procedures being initiated.

Notice Requirements. Per H.B 630, signed May 8, 2007, the operator is required to provide notice to the surface owner no later than the 15th business day after the Commission issues a permit to drill. Please refer to subchapter Q Sec. 91.751-91.755 of the Texas Natural Resources Code for applicability.

Permit expiration. This permit expires two (2) years from the date of issuance shown on the original permit. The permit period will not be extended.

Drilling Permit Number. The drilling permit number shown on the permit MUST be given as a reference with any notification to the district (see below), correspondence, or application concerning this permit.

Rule 37 Exception Permits. This Statewide Rule 37 exception permit is granted under either provision Rule 37 (h)(2)(A) or 37(h)(2)(B). Be advised that a permit granted under Rule 37(h)(2)(A), notice of application, is subject to the General Rules of Practice and Procedures and if a protest is received under Section 1.3, “Filing of Documents,” and/or Section 1.4, “Computation of Time,” the permit may be deemed invalid.

Before Drilling

Fresh Water Sand Protection. The operator must set and cement sufficient surface casing to protect all usable-quality water, as defined by the Railroad Commission of Texas (RRC) Groundwater Advisory Unit (GWAU). Before drilling a well, the operator must obtain a letter from the Railroad Commission of Texas stating the depth to which water needs protection, Write: Railroad Commission of Texas, Groundwater Advisory Unit (GWAU), P.O. Box 12967, Austin, TX 78711-3087. File a copy of the letter with the appropriate district office.

Accessing the Well Site. If an OPERATOR, well equipment TRANSPORTER or WELL service provider must access the well site from a roadway on the state highway system (Interstate, U.S. Highway, State Highway, Farm-to-Market Road, Ranch-to-Market Road, etc.), an access permit is required from TxDOT. Permit applications are submitted to the respective TxDOT Area Office serving the county where the well is located.

Water Transport to Well Site. If an operator intends to transport water to the well site through a temporary pipeline laid above ground on the state’s right-of-way, an additional TxDOT permit is required. Permit applications are submitted to the respective TxDOT Area Office serving the county where the well is located.

*NOTIFICATION

The operator is **REQUIRED** to notify the district office when setting surface casing, intermediate casing, and production casing, or when plugging a dry hole. The district office **MUST** also be notified if the operator intends to re-enter a plugged well or re-complete a well into a different regulatory field. Time requirements are given below. The drilling permit number **MUST** be given with such notifications.

During Drilling

Permit at Drilling Site. A copy of the Form W-1 Drilling Permit Application, the location plat, a copy of Statewide Rule 13 alternate surface casing setting depth approval from the district office, if applicable, and this drilling permit must be kept at the permitted well site throughout drilling operations.

***Notification of Setting Casing.** The operator MUST call in notification to the appropriate district office (phone number shown the on permit) a minimum of eight (8) hours prior to the setting of surface casing, intermediate casing, AND production casing. The individual giving notification MUST be able to advise the district office of the drilling permit number.

***Notification of Re-completion/Re-entry.** The operator MUST call in notification to the appropriate district office (phone number shown on permit) a minimum of eight (8) hours prior to the initiation of drilling or re-completion operations. The individual giving notification MUST be able to advise the district office of the drilling permit number.

Completion and Plugging Reports

Hydraulic Fracture Stimulation using Diesel Fuel: Most operators in Texas do not use diesel fuel in hydraulic fracturing fluids. Section 322 of the Energy Policy Act of 2005 amended the Underground Injection Control (UIC) portion of the federal Safe Drinking Water Act (42 USC 300h(d)) to define "underground Injection" to *EXCLUDE* " ...the underground injection of fluids or propping agents (*<u>other than diesel fuels</u>*) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities." (italic and underlining added.) Therefore, hydraulic fracturing may be subject to regulation under the federal UIC regulations if diesel fuel is injected or used as a propping agent. EPA defined "diesel fuel" using the following five (5) Chemical Abstract Service numbers: 68334-30-5 Primary Name: Fuels, diesel; 68476-34-6 Primary Name: Fuels, diesel, No. 2; 68476-30-2 Primary Name: Fuel oil No. 2; 68476-31-3 Primary Name: Fuel oil, No. 4; and 8008-20-6 Primary Name: Kerosene. As a result, an injection well permit would be required before performing hydraulic fracture stimulation using diesel fuel as defined by EPA on any well in Texas. Hydraulic fracture stimulation using diesel fuel as defined by EPA on a well in Texas without an injection well permit could result in enforcement action.

Producing Well. Statewide Rule 16 states that the operator of a well shall file with the Commission the appropriate completion report within ninety (90) days after completion of the well or within one hundred and fifty (150) days after the date on which the drilling operation is completed, whichever is earlier. Completion of the well in a field authorized by this permit voids the permit for all other fields included in the permit unless the operator indicates on the initial completion report that the well is to be a dual or multiple completion and promptly submits an application for multiple completion. All zones are required to be completed before the expiration date on the existing permit. Statewide Rule 40(d) requires that upon successful completion of a well in the same reservoir as any other well previously assigned the same acreage, proration plats and P-15s or P-16s (if required) or a lease plat and P-16 must be submitted with no double assignment of acreage unless authorized by rule.

Dry or Noncommercial Hole. Statewide Rule 14(b)(2) prohibits suspension of operations on each dry or non-commercial well without plugging unless the hole is cased and the casing is cemented in compliance with Commission rules. If properly cased, Statewide Rule 14(b)(2) requires that plugging operations must begin within a period of one (1) year after drilling or operations have ceased. Plugging operations must proceed with due diligence until completed. An extension to the one-year plugging requirement may be granted under the provisions stated in Statewide Rule 14(b)(2).

Intention to Plug. The operator must file a Form W-3A (Notice of Intention to Plug and Abandon) with the district office at least five (5) days prior to beginning plugging operations. If, however, a drilling rig is already at work on location and ready to begin plugging operations, the district director or the director's delegate may waive this requirement upon request, and verbally approve the proposed plugging procedures.

***Notification of Plugging a Dry Hole.** The operator MUST call in notification to the appropriate district office (phone number shown on permit) a minimum of four (4) hours prior to beginning plugging operations. The individual giving the notification MUST be able to advise the district office of the drilling permit number and all water protection depths for that location as stated in the Groundwater Advisory Unit letter.

DIRECT INQUIRIES TO: DRILLING PERMIT SECTION, OIL AND GAS DIVISION

PHONE
(512) 463-6751

MAIL:
PO Box 12967
Austin, Texas, 78711-2967

RAILROAD COMMISSION OF TEXAS
OIL & GAS DIVISION

PERMIT TO DRILL, DEEPEN, PLUG BACK, OR RE-ENTER ON A REGULAR OR ADMINISTRATIVE EXCEPTION LOCATION

PERMIT NUMBER 905619	DATE PERMIT ISSUED OR AMENDED Feb 04, 2025	DISTRICT * 01
API NUMBER 42-311-37581	FORM W-1 RECEIVED Jan 31, 2025	COUNTY MCMULLEN
TYPE OF OPERATION NEW DRILL	WELLBORE PROFILE(S) Vertical	ACRES 16.5
OPERATOR 100589 BKV DCARBON VENTURES, LLC 4800 BLUE MOUND ROAD FORT WORTH, TX 76106-0000		NOTICE This permit and any allowable assigned may be revoked if payment for fee(s) submitted to the Commission is not honored. **District Office Telephone No:** (210) 227-1313
LEASE NAME LIMA TANGO CCS		WELL NUMBER 1
LOCATION 15.44 miles NW direction from FREER		TOTAL DEPTH 5000

Section, Block and/or Survey
SECTION 119 BLOCK ABSTRACT 118
SURVEY BS&F

DISTANCE TO SURVEY LINES 909 ft. W 4834 ft. N	DISTANCE TO NEAREST LEASE LINE ft.
DISTANCE TO LEASE LINES 226 ft. NW 368 ft. SW	DISTANCE TO NEAREST WELL ON LEASE See FIELD(s) Below

FIELD(s) and LIMITATIONS:

* SEE FIELD DISTRICT FOR REPORTING PURPOSES *

FIELD NAME / LEASE NAME	ACRES / NEAREST LEASE	DEPTH	WELL # / NEAREST WE	DIST
MUNSON LIMA TANGO CCS	16.50	5,000	1 0	01

RESTRICTIONS: Do not use this well for injection/disposal/hydrocarbon storage purposes without approval by the Environmental Services section of the Railroad Commission, Austin, Texas office.

THE FOLLOWING RESTRICTIONS APPLY TO ALL FIELDS

This well shall be completed and produced in compliance with applicable special field or statewide spacing and density rules. If this well is to be used for brine mining, underground storage of liquid hydrocarbons in salt formations, or underground storage of gas in salt formations, a permit for that specific purpose must be obtained from Environmental Services prior to construction, including drilling, of the well in accordance with Statewide Rules 81, 95, and 97.

This well must comply to the new SWR 3.13 requirements concerning the isolation of any potential flow zones and zones with corrosive formation fluids. See approved permit for those formations that have been identified for the county in which you are drilling the well in.

RAILROAD COMMISSION OF TEXAS
OIL & GAS DIVISION
SWR #13 Formation Data

MCMULLEN (311) County

Formation	Remarks	Geological Order	Effective Date
CATAHOULA	disposal	1	12/17/2013
FRIO	disposal	2	12/17/2013
YEGUA	disposal	3	12/17/2013
WILCOX	disposal	4	12/17/2013
NAVARRO		5	12/17/2013
ESCONDIDO		6	12/17/2013
OLMOS		7	12/17/2013
ANACACHO		8	12/17/2013
AUSTIN CHALK		9	12/17/2013
EAGLE FORD	H2S	10	12/17/2013
BUDA	H2S	11	12/17/2013
GEORGETOWN		12	12/17/2013
EDWARDS	H2S	13	12/17/2013
PEARSALL		14	12/17/2013
SLIGO	H2S	15	12/17/2013

The above list may not be all inclusive, and may also include formations that do not intersect all wellbores. The listing order of the Formation information reflects the general stratigraphic order and relative geologic age. This is a dynamic list subject to updates and revisions. It is the operator's responsibility to make sure that at the time of spudding the well the most current list is being referenced. Refer to the RRC website at the following address for the most recent information.
http://www.rrc.texas.gov/oil-gas/compliance-enforcement/rule-13-geologic-formation-info