CLASS VI PERMIT APPLICATION NARRATIVE
40 CFR 146.82(a)

Bluebonnet Sequestration Hub

1.0 Project Background and Contact Information

Facility name: Bluebonnet Sequestration Hub
Bluebonnet CCS 1, Bluebonnet CCS 2 and Bluebonnet CCS 3 Wells.

Facility contacts: Claimed as PBI Project Manager
5 Greenway Plaza Houston, TX 77046
Claimed as PBI

Well location: Chambers County, Texas

Well Name	Latitude (NAD27)	Longitude (NAD27)
Bluebonnet CCS 1	Claimed as PBI	[redacted]
Bluebonnet CCS 2	Claimed as PBI	[redacted]
Bluebonnet CCS 3	Claimed as PBI	[redacted]

The advancement of carbon capture and sequestration (CCS) technology is critically important in addressing CO_2 emissions and global climate change concerns. The Bluebonnet Sequestration Hub is designed to demonstrate utility-scale integration of transport and permanent storage of captured CO_2 into a deep geologic formation.

The Bluebonnet Hub will display that the geologic sequestration process can be deployed safely, ensuring retainment of the injected CO_2 within the intended storage reservoir and protection the underground sources of drinking water (USDW). By using safe and proven pipeline technology, the CO_2 will be transported to a storage site located in Chambers County, Texas, where it will be injected into the Claimed as PBI utilizing three new built dedicated CO_2 Injector wells, Bluebonnet CCS 1, bluebonnet CCS 2 and Bluebonnet CCS 3. A total of [redacted] million metric tons (MMT) is estimated to be stored during Claimed as PBI.

The Bluebonnet Hub is strategically located near a concentration of industrial power-generating plants, refineries, and chemical production, natural-gas processing, and natural-gas liquefaction facilities along the Gulf Coast from the Beaumont/Port Arthur area to the east to the Houston area in the west.

The project will get custody of the CO_2 captured by these emitters through offtake agreements and transport the captured CO_2 via a third-party pipeline to the site, where the CO_2 will be stored. Bluebonnet Sequestration Hub, LLC, (through its affiliates) has leased approximately Claimed as PBI across Chambers, Liberty, and Jefferson Counties, as part of the project development. These agreements include rights to sequester CO_2 in the pore space, surface use, and land access necessary to facilitate this proposed carbon sequestration project.

GSDT Submission - Project Background and Contact Information
GSDT Module: Project Information Tracking ***Tab(s):*** General Information tab; Facility Information and Owner/Operator Information tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒Required project and facility details ***[40 CFR 146.82(a)(1)]***

2.0 Site Characterization

The Bluebonnet Sequestration Hub is located approximately [redacted] east of Houston on the Lower Coastal Gulf Plain, where the topographic elevation ranges from 25 – 40 ft above mean sea level and site access can be gained via roads.

The surface geology of the proposed site is characterized by the clay, silt, and sand-rich deposits of the Beaumont Formation. The site contains several freshwater bodies such as lakes/ponds, canals, ditches, and a slow-moving bayou. The site is partially classified as farmed palustrine wetland among minor other wetland types.

No previously recorded National Register of Historic Places (NRHP) districts or properties, sites designated as State Antiquities Landmarks, Recorded Texas Historic Landmarks, or historical markers are within the project AoR. The Texas Archeological Sites Atlas (TASA) revealed no previously recorded archaeological sites within 0.5 mile of the proposed project area (THC 2022).

No schools, hospitals, or nursing homes are known within the AoR. [redacted].

No Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), aka Superfund, or Resource Conservation and Recovery Act (RCRA) sites were identified. No springs, no mines or mineral deposits, and no quarries were identified in the AoR.

Oxy Low Carbon Ventures, LLC, the parent company of Bluebonnet Sequestration Hub, LLC, drilled and completed Encanto 01 as a stratigraphic test well in 2022-2023, and acquired an extensive set of site-based data to complete the site characterization and AoR delineation. The Project also drilled a shallow water well to refine the base of USDW with multiple fluid samples above and below the USDW. The different datasets across multiple disciplines acquired in these two wells have been integrated and are presented in this permit.

Figure NAR-1: Bluebonnet Hub location with respect to potential remediation sites, existing legacy wells, water bodies, spring, mines, quarries, surface infrastructure, and State, Tribal and Territory boundaries as well as roads.

The Bluebonnet Sequestration Hub accommodates a stacked storage complex, located in a structural province called the Houston Embayment, into which the Houston Delta deposited thick Tertiary siliciclastic sediments. In this embayment, the formation dip is relatively flat and steepens with depth at varying rates ranging between Claimed as PBI degrees. The present-day structure is oriented towards the Southeast, i.e., in the direction of the Texas Gulf Coastline. Tertiary sediments were deposited by fluvial-deltaic processes associated with the Houston Delta. This resulted in a series of gulfward-thickening formations, comprised of stacked porous sandstones overlain by confining low-permeability strata.

Within the Bluebonnet Sequestration Hub, areal sand trends of the Claimed as PBI were mapped, providing largescale storage capacity, which are capped by five confining zones. The geologically older and deeper stacked storage complex consisting of the Claimed as PBI will be developed first and is the subject of this Class VI permit application. Furthermore, the site development plan includes a storage complex in the geologically younger and Claimed as PBI.

2.1 Regional Geology, Local Structural Geology, Injection & Confining Zone Summary [40 CFR 146.82(a)(3)(vi)], [40 CFR 146.82(a)(3)(iii)]

The Bluebonnet Sequestration Hub is located onshore Texas Gulf Coast, approximately Claimed as PBI inland, within a structural province called the Houston Embayment, into which the Houston Delta deposited Tertiary siliciclastic sediments. These sediments were transported to the coastal margin by rivers and subsequently deposited in deltas or reworked by marine processes.

Two examples of these fluvial-deltaic siliciclastic sedimentary systems are the Claimed as PBI formations, which are the two proposed injection zones for permanent CO_2 storage. The deposition of these gulfward-prograding depocenters was interrupted repeatedly by transgressions, where the continental platform was submerged over a widespread period. These flooding events reflect increases in sea level and associated shale deposition, one of which is the prominent regional marine shale, the Claimed as PBI, which represents one of the five proposed confining units, capping the proposed Claimed as PBI

At the time of deposition, the Bluebonnet Sequestration Hub was located on the landward updip stable shelf of the Gulf Coast basin, where contemporaneous growth faults developed parallel to the shelf margin and syndepositional movement resulted in sediment thickening on the downthrown side of the faults. Various faulting styles within the Bluebonnet 3D seismic region were evaluated extensively to select the Area of Review (AoR) for the Bluebonnet Sequestration Hub in which any faulting that would impact the integrity of the storage complex is absent.

The proposed storage complex includes, from top to bottom (shown in Figure NAR-2):

Claimed as PBI

The Claimed as PBI is laterally continuous in a north-south dip direction and is better developed in the northern updip part of the proposed AoR and thins toward the south and downdip. The Claimed as PBI is also continuous in an east-west strike direction within and beyond the AoR, where minor thickness changes occur as well. The sandstones within the Claimed as PBI were likely deposited in a proximal delta front and are characterized by high porosity and permeability, both critical parameters for input in the storage capacity and injectivity estimations.

Claimed as PBI are composed of a series of fluvial/deltaic and marginal-marine to nonmarine sands. Based on whole core data, the internal architecture of the Claimed as PBI reservoir sandstone covers a range from a terminal distributary channel to a proximal delta front. These sands exhibit high porosity and permeability as well. The structure of the injection zone is a gently southeast-dipping monocline inside the proposed AoR. The Claimed as PBI is laterally continuous in a north-south dip direction, beyond the limits of the AoR. Claimed as PBI log signatures are correlative and very similar among the offset wells, which indicates preferred connectivity of reservoir properties in a dip direction. The Claimed as PBI is also laterally continuous in an east-west strike direction, beyond the limits of the AoR; however, small scale well-to-well lateral facies changes are expected, affecting the injectivity within the multiple stacked flow units of the Claimed as PBI due to sedimentary distribution patterns, which are oriented perpendicular to the coastline.

The Claimed as PBI are laterally continuous in north-south dip and east-west strike directions, with typical shale thickening towards the south and downdip. These marine transgressive shales reflect flooding events when the Gulf Coast was submerged under water due to rises of sea level and thus are excellent stratigraphic markers. Sequence stratigraphic analysis confirms the continuity of these confining zones. These compact shales are of marine origin and contain varying amounts of silt and bioturbation, depending on water depth. Overall, they are characterized by low permeabilities. Clay speciation is dominantly illite/smectite. Textural and mineralogical clay alignment varies among the multiple confining zones. Depending on the individual rock fabric, mineralogy, porosity, permeability, and capillary pressure measurements, these shales offer good to excellent seal potential to contain the injected CO_2 within the injection zones.

The Claimed as PBI are characterized by a paleosol, silty calcareous mudstones and non-silty lime-mudstones. The depositional environment for the paleosol of the Claimed as PBI is a coastal marsh. The paleosol can be hematitic

where iron was oxidized, resulting in a red color. The common texture in the paleosol is mottled, potentially caused by rooting, burrowed, and contains many small calcareous nodules. Fine-grained interbedded sandstones are present as well representing storm washover deposits. The mineralogical composition consists of clays, which are dominantly illite/smectite, calcite, quartz, and minor plagioclase, K-feldspar, hematite, pyrite and anatase. In the sequence stratigraphic framework, the paleosol is a weathering surface, which is a sequence boundary that caps the [redacted] Based on the fabric and mercury injection capillary pressure (MICP) data, these non-silty lime-mudstones have a competent sealing capacity.

Figure NAR-3 shows a cross-section north south through the AoR.

Figure NAR-2: Proposed storage complex at Bluebonnet Sequestration Hub, identifying formations and elements of the storage complex. This permit requests approval for CO_2 injection into the [redacted], utilizing the [redacted] as the primary confining zone for containment of the injected CO_2, a secondary [redacted] After BEG, 2017.

Figure NAR-3: Regional structural dip cross section through the Area of Interest (AOI), highlighting the proposed storage complex; scale 1:8,000. The proposed CO_2 injection zones are the Claimed as PBI The proposed primary confining zone to contain the sequestered CO_2 within the and Claimed as PBI is the thick marine transgressive Claimed as PBI which is overlain by a secondary Claimed as PBI and above that overlain by Claimed as PBI Major faults are highlighted in black. The base of Underground Sources of Drinking Water (USDW), below which TDS>10,000 mg/L is shown in dashed blue.

2.2 Faults and Fracture Analysis and Structural Styles [40 CFR 146.82(a)(3)(ii)]

The AoR was chosen due to the lack of seismic-scale faulting within the Claimed as PBI (Figure NAR-4). The structural styles interpreted from 3D seismic data include regional growth faulting, salt doming, transtensional faulting, and growth fault reactivation. All of these identified structural styles fit within the larger regional context and are common along the Texas Gulf Coast. Fault interpretation was manually performed with additional context provided by seismic attribute enhancements. Large-scale movement of the regional faults ceased prior to the end of Claimed as deposition and strain resulting from subsequent loading concentrated more discreetly along select zones of weakness.

Figure NAR-4: Example map view of Fault Likelihood extraction on confining zone surfaces with 3D seismic cross section for reference. There is no evidence for faulting within the AoR at the Claimed as PBI [redacted] displays patterns from underlying Claimed as PBI, but no offset is visible.

Fault seal analysis was performed on all faults included in the geological model. Two techniques were performed, Shale Gouge Ratio and CO_2 column height modeling (Figure NAR-5). The results from the independent techniques are complimentary and demonstrate that fault offset is sufficiently large for the modeled faults to seal in all the examined confining and injection zones.

Figure NAR-5: Claimed as PBI that rises nearly to surface within the model, is the most proximal updip fault to the AoR. Within the injection and confining intervals, fault offset is sufficient to create seals within porous lithologies.

2.3 Petrophysical Information [40 CFR 146.82(a)(3)(iii)]

In the geological model the net effective porosity in the main injection zones, Claimed as PBI ranges from Claimed as PBI with a net sand thickness from Claimed as PBI and an average permeability that ranges from Claimed as PBI. The confining zones net effective porosity ranges from Claimed as PBI, the gross thickness from Claimed as PBI and an average permeability from Claimed as PBI The average reservoir properties are calculated with the volume of shale Claimed as PBI

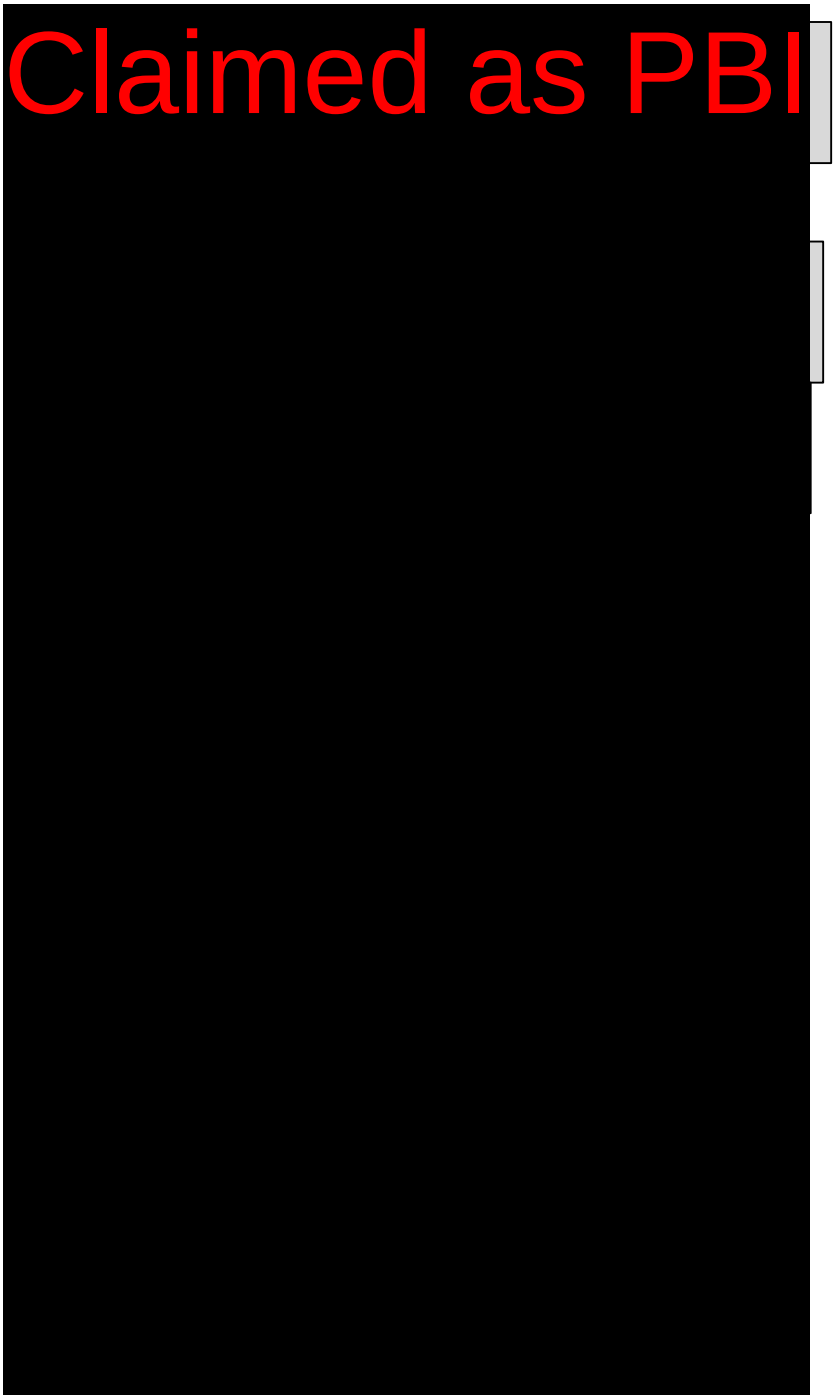


Figure NAR-6: Geologic model with averages porosity, permeability, gross thickness for confining zones and net sand thickness over the injection zones. (Average reservoir properties used Claimed as PBI shale as a cutoff.)

2.4 Seal Capacity Analysis in Confining Zones Summary [40 CFR 146.82(a)(3)(iii)]

Bluebonnet Hub performed the seal capacity analysis for the confining zones utilizing data from MICP. The project is currently performing tests to obtain threshold entry pressure values as well, to be integrated to the data set collected in the Encanto 01 core.

The seal capacity of a particular formation or zone will vary based on the pore system. The Claimed as PBI are composed of layers that are highly effective as confining zones, intercalated with some slightly transmissive layers that, all together, provide the seal capacity of the zone. Table NAR-1 shows the results of the seal capacity analysis for each of the confining zones in terms of displacement pressure and reservoir height. Details of the seal capacity analysis for each confining zone are presented in the Appendix A of the Area or Review and Corrective Action Plan of this application.

Table NAR-1: Displacement pressure and reservoir height.

Claimed as PBI

2.5 Geochemical Modeling [40 CFR 146.82(a)(6)]

The Bluebonnet Hub project team conducted a geochemical equilibrium modeling to identify primary chemical reactions (solid and aqueous phase) to be included into the reactive-transport simulations and provide initial assessment of the CO_2 compatibility with rocks and fluids in the Claimed as PBI The modeling included brines speciation, geochemical baseline prior injection, and CO_2 interaction with reservoir brine and minerals.

Quartz and smectite are the most stable phases initially present in the reservoir. Claimed as PBI simulation results show plagioclase (anorthite) dissolution as larger amounts of CO_2 dissolved in water shifts the equilibria to more acidic environment. In addition, a substitution process occurs by precipitation of calcite and kaolinite. Claimed as PBI shows smaller reactivity as clay content increases and shows the lowest reactivity in comparison to the other formations, corroborating the assumption that CO_2 will not affect the Claimed as PBI.

Reactive-transport simulations were conducted to evaluate geochemical impacts on reservoir storage capacity, possible injectivity modification, and long-term trapping mechanisms. Porosity slightly increased with a maximum of 0.5% for the Claimed as PBI s from the start of injection up to about Claimed as PBI after injection. Porosity remained unchanged for the

Claimed as PBI Since the Claimed as PBI has a very low permeability and small fluid mobility, no significant changes are observed in the current model, confirming its integrity.

The long-term decrease in porosity is due to calcite and kaolinite precipitation. A maximum decrease in porosity was about Claimed as PBI in the region where the CO_2 plume contacted the reservoir. This represents less than Claimed a change in pore volume within the simulation domain. The main trapping mechanisms during the injection period are the super-critical phase as mobile and trapped CO_2. Note that the mineral CO_2 storage is negative during initial period due to calcite dissolution and release of HCO_3^-. Then, CO_2 is mainly trapped in residual phase up to about Claimed as PBI after injection, when the mineralization starts to be the main storage mechanism due to carbonate precipitation. Super-critical mobile CO_2 show a steady decrease over time, reaching close to zero at longer periods.

2.6 Geomechanics Study [40 CFR 146.82(a)(3)(iv)]

In the case of CO_2 injection into the reservoir, pore pressure and horizontal principal stress magnitudes increases while decreasing the magnitude of the effective principal stresses. The stress model was constrained by core measurements and calibrated to pressures and interpretations of minimal principal horizontal stress from wellbore pressure tests. Pore pressure increases required to cause failure on a hypothetical, optimally-oriented fault and matrix are summarized in Table NAR-2. The Mohr Coulomb failure analysis was conducted at a particular depth and is representative of the entire formations.

Table NAR-2: Summary of pore pressure increase (psi) required to cause failure in a hypothetical, optimally-oriented fault and matrix in formations identified as confining and injection zones.

Claimed as PBI

The maximum expected increase in well bottomhole pressure for Claimed as PBI .

2.7 Hydrogeology and Underground Source of Drinking Water [40 CFR 146.82(a)(3)(vi), 146.82(a)(5)]

Groundwater production for drinking and municipal use in Chambers, Liberty, and Jefferson Counties, Texas, is primarily sourced from the Chicot Aquifer, the shallowest of three primary aquifers that make up the overall Gulf Coast Aquifer. The primary recharge mechanism for fresh groundwater is precipitation and infiltration that has not been consumed as runoff or stream flow. Aquifers underlying the Chicot Aquifer in the project area are generally considered too saline for

drinking water and few water supply wells in the area penetrate the deeper Evangeline and Jasper Aquifers.

The underground source of drinking water (USDW) is defined by the US EPA as an aquifer or part of an aquifer that contains fewer than 10,000 ppm total dissolved solids (TDS). Publicly available studies suggest base USDW depth ranges from Claimed as PBI (lower Chicot Aquifer) across Chambers and Jefferson Counties. Within the Bluebonnet Sequestration Project site, USDW depth ranges between Claimed as PBI Multiple fluid samples were acquired in a shallow water well above and below the USDW to reduce the uncertainty in salinity variations with depth and to assess salinity-depth relationships. The salinity-depth relationships were found to be nonlinear and increased rapidly with depth. Fluid samples and well logs were used to support base USDW interpretation.

Figure NAR-8 shows a cross-section for the base of the USDW in Bluebonnet Hub AoR.

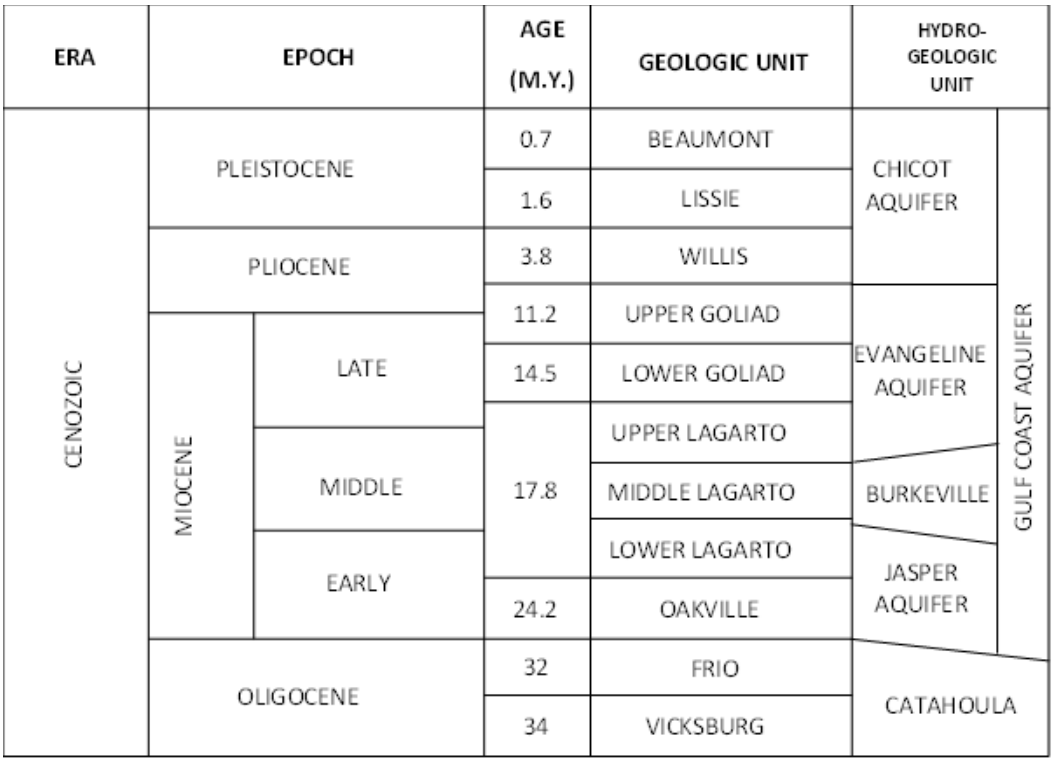


Figure NAR-7: Geologic and hydrogeologic units of the Gulf Coast Aquifer system, modified from Young et al. (2016).

Figure NAR-8: Base of USDW shown in blue following the LDNR-IMD deep resistivity method. Site-specific RDT fluid samples acquired from Bluebonnet USDW 01 (Claimed as PBI) showed TDS values >10,000 mg/L in the sands below Claimed as PBI and are compared to the interpreted base Moderately Saline Zone (10,000 mg/l TDS) after Young et al. (2016).

2.8 Seismic History [40 CFR 146.82(a)(3)(v)]

Regional earthquakes were identified using the USGS online database, cross-checked against the Bureau of Economic Geology's TEXNET database to determine the location of events (Figure NAR-9). No recorded events of any magnitude from 1900 to present were identified within 50 miles of the Bluebonnet site. A single earthquake was identified within a 75-mile radius of the Bluebonnet project: a magnitude 3.8 event occurring 1 km WNW of Sulphur, Louisiana, in 1983 at a depth of 5.9 km. The USGS Long-Term Seismic Hazard Map indicates that this area is at relatively low risk for natural earthquake activity. Plans for Bluebonnet include placement of a dense network of seismometers that will offer reliable location of seismic events with magnitude as small as 0.0 on the Richter scale (also shown in Figure NAR-9).

Figure NAR-9: Seismometer stations (green and white circles) and historic seismic activity (yellow star).

2.9 Geocellular and Dynamic Model Construction

The static geological model was created using Schlumberger Petrel (v2021) and is based on the interpretation of a diverse collection of geological, geophysical, and petrophysical data acquired throughout public data, literature, and in-house 3D seismic data.

The methodology applied to the static geomodel was to model the large-scale features, followed by modeling progressively smaller and more uncertain features. The first step applied to the Bluebonnet geomodel was to establish a conceptual structural and depositional model as well as its characteristic stratigraphic layering. The structural and stratigraphic architecture provided a first-order constraint on the spatial continuity, porosity, permeability, net sand, and other attributes within each layer. Next, petrophysical values were distributed for each zone using a cell-based methodology.

The project used 152 wells with quality logs and reservoir top data, in conjunction with 3D seismic data, to construct reservoir top surfaces. Eighty-nine of these wells also had the appropriate digital

logs to be petrophysically analyzed and used in the building of the petrophysical property models. Sixty-three of these wells have basic logs and have been used to pick the formation tops.

The model includes several major geological zones from top to bottom: Claimed as PBI [redacted] The model covers an area of about 13.58 miles by 13.69 miles. The bottom confining zone is Claimed as PBI [redacted] Grid cell area is consistent throughout the geomodel area at 500 ft x 500 ft. The grid thickness varies somewhat but averages at about 10 ft. The final geologic model is represented by a 143 × 142 × 310 grid in a Cartesian system for a total of 6+ million active grid cells.

The total porosity of the injection zone is based on neutron and density porosity logs from 33 wells within and around the Geologic Model Domain (see Figure NAR-10). An interconnected (effective) porosity for wells with porosity logs was calculated from total porosity corrected for the shale volume. The remaining wells did not have neutron and/or density porosity logs but were required for porosity calculation in the petrophysical interpretation. A linear correlation between volume of shale and effective porosity from wells with porosity logs developed Claimed as PBI [redacted] was used and corroborated with local data. The results of this method compared largely with the 33 well subset, so the linear correlation was applied to the remaining wells.

The horizontal permeability for the injection zones is based on a porosity permeability relationship established Claimed as PBI [redacted]

Figure NAR-10: Map representing 152 control wells within and surrounding the Bluebonnet Hub AoR used for petrophysical interpretation of porosity, permeability, and net reservoir thickness of the Claimed as PBI Claimed as PBI A total of 89 wells are within the geomodel. Pie charts outlined in blue represent 33 wells with neutron and density well-logs. The stratigraphic well Encanto 01 is identified with a black star.

2.10 Site Storage Capacity and CO_2 Retention

The dynamic simulation model provides an advanced method for determining the storage capacity. Details of the construction and physics of the base case dynamic model are described in detail in the Area of Review and Corrective Action Plan. The base case model includes CO_2 dissolved in the aqueous phase or as free or trapped supercritical CO_2 but does not model trapping due to mineralization. Figure NAR-11 and Figure NAR-12 show the change in storage capacity and CO_2 plume area with time from the dynamic simulation, forecasted for Claimed as PBI . The storage capacity will reach a peak at the end of the injection period at Claimed as PBI , then decline to a value of Claimed as PBI at the stop of plume migration in the Claimed as PBI and will decrease from Claimed as PBI . The plume area is based on the area determined by pore volume weighted gas saturation. The storage capacity on a per-area basis from dynamic modeling is ultimately higher near the injector

than at the outer edges of the CO_2 plume due to the heterogeneity of the storage formation and the CO_2 migration updip but is averaged over the entire area.

Figure NAR-11: CO_2 plume area and storage capacity from dynamic simulation, from start of injection to Claimed as PBI post injection in Claimed as PBI.

Figure NAR-12: CO_2 plume area and storage capacity from dynamic simulation, from start of injection to Claimed as PBI post injection in the Claimed as PBI

More detailed geological description and site characterization is included in the AoR and Corrective Action Plan attachment of this application.

3.0 AoR and Corrective Action [40 CFR §146.82(a)(13)]

3.1 Delineation of AoR

The AoR is defined as the larger of the maximum extent of the separate-phase plume and pressure front during the life of the project. Both the CO_2 plume and the critical pressure front are determined using a multiphase CO_2-brine transport computational model, constructed from a geocellular model that accounts for the site-specific hydrogeology and physical and chemical properties of all phases of the injected CO_2 stream and displaced fluids.

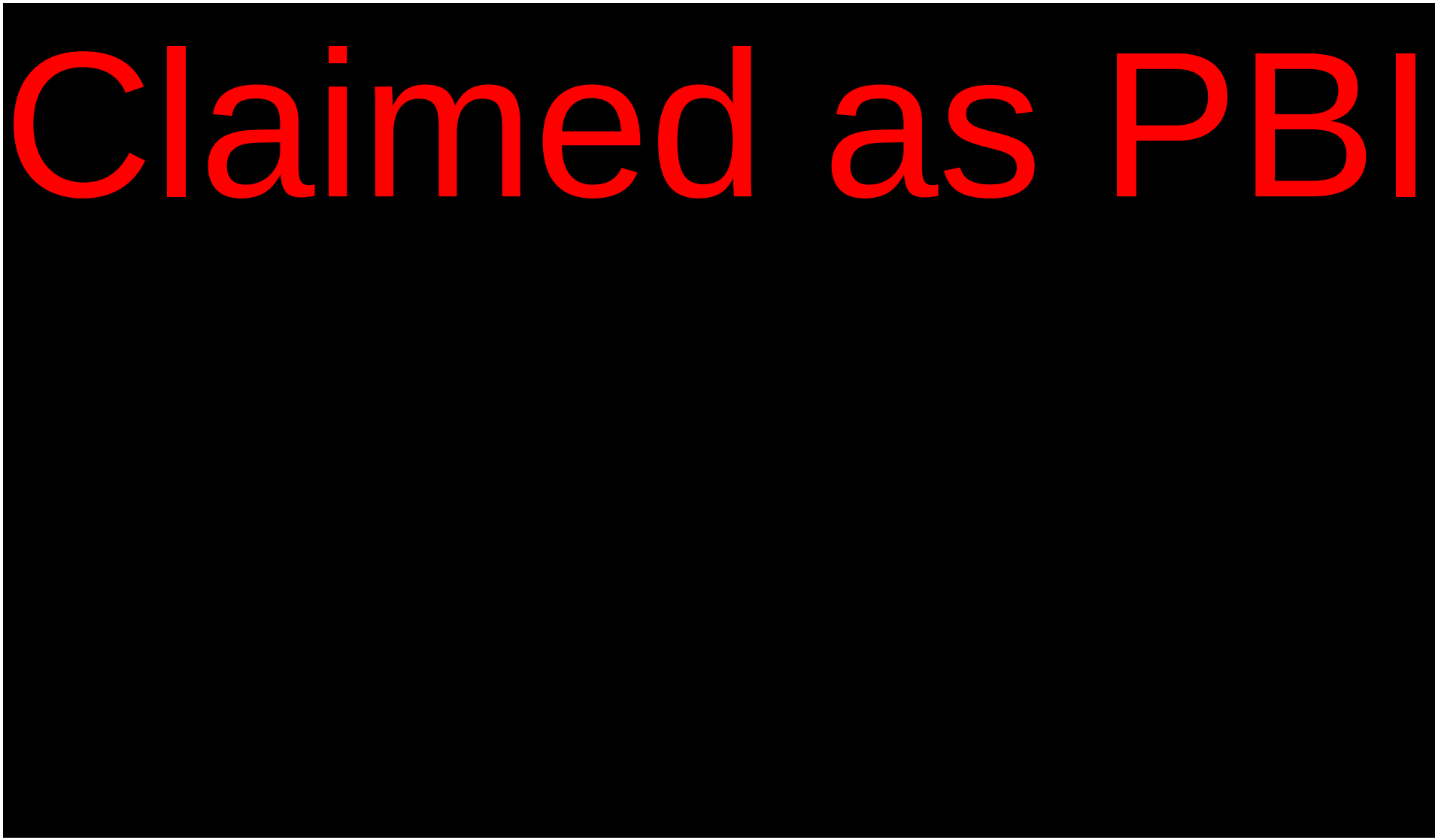
As described in Section 2.9 above, the static geocellular model was constructed using Schlumberger's Petrel (v2021) 3D geostatistical modeling software, which is a comprehensive, integrated subsurface platform containing data interpretation tools for well correlation, mapping, and structural and property modeling.

The dynamic simulation model was created using the GEM (v2023.3YES0) reservoir simulator with the Greenhouse Gas (GHG) module, from Computer Modeling Group Ltd. (CMG). GEM is a commercially available, compositional, and finite-difference simulator that is commonly used to model hydrocarbon production, enhanced oil recovery, and other thermodynamic and fluid flow reservoir processes. The GHG module accounts for the thermodynamic interactions between three phases: an H_2O-rich phase (liquid), CO_2-rich phase (gas), and a solid phase, which may include several minerals. Physical properties (e.g., density, viscosity, and enthalpy) of the H_2O and CO_2 phases and CO_2 solubility in H_2O are calculated from a correlation suitable for a wide range of typical storage reservoir conditions.

The model was initialized with hydrostatic conditions and run without any active wells for four years to ensure equilibrium and no fluid movement. In the fifth year, the Bluebonnet CCS 1, CCS 2, and CCS 3 wells all begin injecting with a primary rate constraint of Claimed as PBI

Claimed as PBI

Table NAR-3: Stage injection, injection, and production rate for all the wells.



The CO_2 plume extent was simulated assuming Claimed as PBI as described in the previous section. The project simulated Claimed as PBI The plume tends to stabilize before the Claimed as PBI however, the project defined the Claimed as PBI to delineate the maximum extend of the CO_2 plume in the AoR as a conservative approach. The project used a cutoff [redacted] CO_2 saturation as supported by the fluid substitution analysis. Figure NAR-13 and Figure NAR-14 show the pore volume weighted CO_2 saturation map distribution for the Claimed as PBI respectively.

Figure NAR-13: Pore volume weighted CO_2 saturation map distribution after Claimed as PBI [redacted].

Figure NAR-14: Pore volume weighted CO_2 saturation map distribution after Claimed as PBI [redacted].

The Bluebonnet Hub project team evaluated different approaches to estimate the critical pressure threshold as describe in the Area of Review and Corrective Action Plan attachment. The calculated critical pressure differential for the Bluebonnet Hub Claimed as PBI [redacted]

Figure NAR-15 and Figure NAR-16 shows the critical pressure delineation for Claimed as PBI [redacted]

Figure NAR-15: View of highest pore-pressure increases after Claimed as PBI [redacted] Values displayed are pore-volume-weighted averages across the injection interval. The orange polygon is the pressure front for the Claimed as PBI

Figure NAR-16: View of highest pore-pressure increases after Claimed as PBI Values displayed are pore-volume-weighted averages across the injection interval. The purple polygon is the pressure front for Claimed as PBI

3.2 Corrective Action Plan

The proposed AoR represents approximately Claimed as PBI square miles of extension (combination of pressure front at Claimed as PBI of injection and CO_2 plume at Claimed as PBI) and includes Claimed legacy oil and gas wells and Claimed water wells, according to the records obtained. The area is dedicated mostly to farming and recreational activities. Oil and gas development is present in areas outside of the AoR; however, exploration activities in the proposed AoR have not proved to be economical, as all the legacy wells were classified as dry holes.

The Claimed water wells inside the AoR targeted the Chicot aquifer. These wells are dedicated to domestic use, stock, rig supply, and groundwater monitoring activities. The measured depths range Claimed as PBI None of these Claimed wells penetrated the confining or injection zone; thus, none require any corrective action.

All oil and gas wells identified in the proposed AoR were drilled through the Claimed as PBI Claimed as PBI . See Table NAR-4.

Table NAR-4: Oil and gas wells and deep penetrations within the AoR.


Claimed as PBI

A detailed analysis was performed to evaluate the risk and timing of the plume and/or pressure front reaching each of the wells inside the AoR, relative to the project schedule, to propose corrective actions and a timeline for these procedures.

From the individual well analysis, Claimed as PBI were identified as requiring remedial actions to isolate the injection zone properly from the confining zone and USDW zones. These wells are listed in Table NAR- 5, along with the main mechanism of failure and proposed schedule. The project plans to complement this evaluation Claimed as PBI, to adjust the corrective action schedule and program.

Table NAR-5: Wells to be remediated in the proposed AoR.

At a fixed frequency specified in the Area of Review and Corrective Action Plan, or more frequently when monitoring and operational conditions warrant, Bluebonnet Sequestration Hub, LLC, will reevaluate the AoR and perform any required corrective action in the manner specified in 40 CFR §146.84.As part of this reevaluation process, Bluebonnet Hub, must also update the Area of Review and Corrective Action Plan or demonstrate to Environmental Protection Agency (EPA) Underground Injection Control (UIC) Program Director that no update is needed.

Following each Area of Review and Corrective Action Plan reevaluation or demonstration showing that no new evaluation is needed, Bluebonnet Hub shall submit the resultant information in an electronic format to the UIC program Director for review and approval of the results. Once approved by the UIC Program Director, the revised Area of Review and Corrective Action Plan will become an enforceable condition of this permit.

AoR and Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Tabulation of all wells within AoR that penetrate confining zone ***[40 CFR 146.82(a)(4)]*** ☒ AoR and Corrective Action Plan ***[40 CFR 146.82(a)(13) and 146.84(b)]*** ☒ Computational modeling details ***[40 CFR 146.84(c)]***

4.0 Financial Responsibility [40 CFR §146.82(a)(14)]

Bluebonnet Sequestration Hub, LLC, shall maintain financial responsibility and resources to meet the requirements of 40 CFR 146.85 and the conditions of this permit. Financial responsibility shall be maintained through all phases of the project. The approved financial assurance mechanisms are found in the Financial Assurance Plan document of this permit. The financial instrument(s) must be sufficient to cover the cost of:

- Corrective action (meeting the requirements of 40 CFR 146.84)
- Injection well plugging (meeting the requirements of 40 CFR 146.92)
- Post-injection site care and site closure (meeting the requirements of 40 CFR 146.93)
- Emergency and remedial response (meeting the requirements of 40 CFR 146.94)

During the active life of the geologic sequestration project, Bluebonnet Sequestration Hub, LLC, must adjust the cost estimate for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument(s) and provide this adjustment to the UIC Program Director in an electronic format. Bluebonnet Sequestration Hub, LLC, must also provide to the Director written updates of adjustments to the cost estimate in an electronic format within 60 days of any amendments to the Project Plans that address the cost items covered in the financial assurance plan.

Bluebonnet Sequestration Hub, LLC, shall provide notification to meet the requirements of 40 CFR §146.85 and the conditions of this permit.

- Whenever the current cost estimate increases to an amount greater than the face amount of a financial instrument currently in use, Bluebonnet Sequestration Hub, LLC, within 60 days after the increase, must either cause the face amount to be increased to an amount at least equal to the current cost estimate and submit evidence of such an increase to the Director, or obtain other financial responsibility instruments to cover the increase. Whenever the current cost estimate decreases, the face amount of the financial assurance instrument may be reduced to the amount of the current cost estimate only after Bluebonnet Sequestration Hub, LLC, has received written approval from the Director.

- Bluebonnet Sequestration Hub, LLC, must notify the Director by certified mail and in an electronic format of adverse financial conditions, such as bankruptcy, that may affect the

ability to carry out injection well plugging, post-injection site care and site closure, and any applicable ongoing actions under the Corrective Action and/or Emergency and Remedial Response.

- If Bluebonnet Sequestration Hub, LLC, or third-party provider of a financial responsibility instrument is going through a bankruptcy, Bluebonnet Sequestration Hub, LLC, must notify the Director by certified mail and in an electronic format of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code, which names Bluebonnet Sequestration Hub, LLC, as the debtor within 10 days after commencement of the proceeding.

- A guarantor of a corporate guarantee must make such a notification, if he or she is named as debtor, as required under the terms of the guarantee.

- A permittee who fulfills the requirements of financial assurance by obtaining a trust fund, surety bond, letter of credit, escrow account, or insurance policy will be deemed to be without the required financial assurance in the event of bankruptcy of the trustee (or issuing institution) or suspension/revocation of the authority of the trustee institution to act as trustee of the institution issuing the trust fund, surety bond, letter of credit, escrow account, or insurance policy.

Bluebonnet Sequestration Hub, LLC, must establish other financial assurance or liability coverage, acceptable to the Director, within 60 days of a change to the Area of Review and Corrective Action Plan.

Financial Responsibility GSDT Submissions
GSDT Module: Financial Responsibility Demonstration ***Tab(s):*** Cost Estimate tab and all applicable financial instrument tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Demonstration of financial responsibility ***[40 CFR 146.82(a)(14) and 146.85]***

5.0 CO_2 Injector Well Design and Construction [40 CFR §146.82(a)(11) and (12)]

The Bluebonnet CCS 1, Bluebonnet CCS 2 and Bluebonnet CC 3 injector wells were designed with the highest standards and best practices for drilling and well construction. The operational parameters and material selection are intended to ensure mechanical integrity in the system and to optimize operations during the life of the project.

5.1 Well Design and Construction: Bluebonnet CCS 1

Claimed as PBI

Figure NAR 17: Bluebonnet CCS 1 well schematic – original completion.

5.1.1 Conductor Bluebonnet CCS 1

5.1.2 Surface Section Bluebonnet CCS 1

5.1.3 Long String Section Bluebonnet CCS 1

Claimed as PBI

5.1.4 Completion Bluebonnet CCS 1

Claimed as PBI

5.2 Well Design and Construction: Bluebonnet CCS 2

Claimed as PBI

Figure NAR-18: Bluebonnet CCS 2 well schematic – original completion.

5.2.1 Conductor Bluebonnet CCS 2

5.2.2 Surface Section Bluebonnet CCS 2

5.2.3 Long String Section Bluebonnet CCS 2

5.2.4 Completion Bluebonnet CCS 2

Claimed as PBI

5.3 Well Design and Construction: Bluebonnet CCS 3

Claimed as PBI

Figure NAR-19: Bluebonnet CCS 3 well schematic – original completion.

5.3.1 Conductor Bluebonnet CCS 3

Claimed as PBI

5.3.2 Surface Section Bluebonnet CCS 3

Claimed as PBI

5.3.3 Long String Section Bluebonnet CCS 3

Claimed as PBI

5.3.4 Completion Bluebonnet CCS 3

Claimed as PBI

6.0 Pre-Operational Logging and Testing [40 CFR §146.82(a)(8)]

Bluebonnet Sequestration Hub, LLC, will construct three new CO_2 injection wells, (Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3), targeting injection in the Claimed as PBI

In addition to the injector wells, the project will construct three new in-zone monitoring wells (Bluebonnet IZM FM1, Bluebonnet IZM FM2, and Bluebonnet IZM M1) and will recomplete the stratigraphic well Encanto 01.

Oxy Low Carbon Ventures, LLC, the parent company of Bluebonnet Sequestration Hub, LLC, drilled the stratigraphic well Encanto 01 in 2022 and acquired advanced geophysical logs as well as Claimed as PBI core and Claimed as PBI cores (SWC). The project also performed step rate tests and falloff tests in the prospect reservoirs and leak off tests on the proposed confining zones. The results and a summary of the data acquisition program for Encanto 01 are shown in Appendix A of the Area of Review and Corrective Action Plan. In May 2024, Encanto 01 was reentered to collect additional water samples from the Claimed as PBI Stratigraphic well Encanto 01 was temporarily abandoned and will be re-completed as an in-zone monitoring well for the project.

The project plans to construct two water producer wells (Bluebonnet PRDW F1 and Bluebonnet PRDW F2) to extract water from the Claimed as PBI as a technique to control the pressure front during the injection phase. These wells will be completed with pressure and temperature sensors downhole and pressure and temperature sensors on the surface and will be used as part of the monitoring network to track the CO_2 plume and pressure front.

The project defines the above-confining zone as the first permeable zone above the Claimed as PBI as characterized by stratigraphic well Encanto 01 and mapped laterally though the storage complex.

In May 2024, the project drilled Bluebonnet USDW 1, targeting the shallow aquifers from the surface Claimed as PBI The main objective of this well was to validate the base of the USDW and determine the water composition of the different flow units as part of the site characterization and baseline for injection operations. The detailed data acquired during Bluebonnet USDW 1 construction is provided in Appendix B of the Area of Review and Corrective Action Plan. Bluebonnet USDW 1 will be used as a monitoring well for the shallow aquifer to monitor changes in water composition during the injection and post-injection phases of the project.

The project plans to construct five additional above-confining-zone/USDW monitoring wells (Bluebonnet USDW 2, Bluebonnet USWD 3, Bluebonnet USDW 4, Bluebonnet USWD 5, and Bluebonnet USDW 6). These wells will be used to track changes in pressure and in water composition of the base of the USDW in the Hub.

The project also plans to drill two water disposal wells (Bluebonnet DSW M1 and Bluebonnet DSW M2), targeting the Claimed as PBI [redacted], as well as fluid generated during the construction and operation of the Bluebonnet site.

The Pre-Operational Formation Testing Plan for Bluebonnet Hub aims to obtain the chemical and physical characteristics of the injection and confining zone(s). This program includes a combination of logging, sidewall coring, formation hydrogeologic testing, and other activities performed during the drilling and construction of the CO_2 injection well, monitoring wells, water production wells, and water disposal wells.

The pre-operational testing program will determine or verify the depth, thickness, mineralogy, lithology, porosity, permeability, and geomechanical information of the injection zone, overlying confining zone, and other relevant geologic formations. In addition, formation fluid characteristics are to be obtained from the injection zone to establish baseline data against which future measurements may be compared after the start of injection operations.

Specific details on the proposed pre-operational logging and testing program are found in Pre-Operational Testing Plan of this permit.

Pre-Operational Logging and Testing GSDT Submissions

GSDT Module: Pre-Operational Testing
Tab(s): Welcome tab

Please use the checkbox(es) to verify the following information was submitted to the GSDT:
☒ Proposed pre-operational testing program ***[40 CFR 146.82(a)(8) and 146.87]***

7.0 Proposed Stimulation Program [40 CFR §146.82(a)(9)]

Bluebonnet Sequestration Hub, LLC, may stimulate the injection zone in the CO_2 injector wells Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3 to enhance or regain injection capabilities.

Stimulation and cleanouts to enhance or regain the injection potential of the Claimed as PBI [redacted] in the CO_2 injector wells may include, but are not limited to, coil tubing cleanouts, stick pipe cleanouts, matrix acid stimulation, and water flushes.

The need for stimulation and cleanouts will be determined once the characterization data from the Bluebonnet Sequestration Hub is completed, and the wells are available and have been evaluated (i.e., results of geophysical logs, core analyses, and hydrogeologic testing, operating conditions).

8.0 Well Operation [40 CFR §146.88]

The CO_2 wells are designed to maximize the rate of injection and to reduce the surface pressure and friction alongside the tubing, while maintaining the bottomhole pressure below 90% of the frac gradient. The selected design provides enough clearance to deploy the pressure and temperature gauges on tubing and to ensure continuous surveillance of external integrity and conformance Claimed as PBI [redacted] The design allows for other logs to be periodically run, (e.g., pulse neutron).

8.1 Operational Procedures [40 CFR 146.82(a)(10)]

The operational procedures detailed below describe how Bluebonnet Sequestration Hub, LLC, will initiate injection and conduct startup-specific monitoring of the Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3.

The multi-stage (step-rate) startup procedure and period only apply to the initial start of injection operations until the well reaches the full injection rate. Monitoring frequencies and methodologies after the initial startup will follow the Testing and Monitoring Plan document of this permit.

During the startup period, the permittee will submit a daily report summarizing and interpreting the operational data. At the request of the EPA, Bluebonnet Sequestration Hub, LLC, may be required to schedule a daily conference call to discuss this information. The injection rates will be successively higher, controlled with variable frequency drive pumps. The elapsed time and pressure values will be read and recorded for each rate and time step. At no point during the procedure will the injection pressure be allowed to exceed the maximum injection pressure of Claimed as PBI [redacted] measured at the wellhead. The injection rate will be measured and recorded using a Claimed as PBI [redacted]

Additional operational parameters are detailed in the Summary of Operating Conditions document of this permit.

Table NAR- 6, Table NAR- 7, and Table NAR- 8 show the operating parameters proposed for the CO_2 injector wells.

Table NAR-6: Bluebonnet CCS 1 operating conditions.

Table NAR-7: Bluebonnet CCS 2 Operating Conditions.

Table NAR-8: Bluebonnet CCS 3 Operating Conditions.

Automatic alarms and automatic shutoff systems will be installed and maintained. Successful function of the alarm system and shutoff system will be demonstrated prior to injection and once annually thereafter.

At all times, pressure will be maintained on the well that will prevent the return of the injection fluid to the surface. The wellbore must be filled with a high specific gravity fluid during workovers to maintain a positive (downward) gradient and/or a plug shall be installed, which can resist the pressure differential. A BOP must be installed and kept in proper operational condition whenever the wellhead is removed for work on the well.

Bluebonnet Sequestration Hub, LLC, shall cease injection should it appear that the well is lacking mechanical integrity or that the injected CO_2 stream and/or associated pressure front may cause an endangerment to a USDW.

8.2 Proposed Carbon Dioxide Stream [40 CFR 146.82(a)(7)(iii) and (iv)]

The proposed carbon dioxide stream composition is as shown below in Table NAR-9. No injectant other than that identified in this permit shall be injected into the well except fluids used for stimulation, rework, and well tests as approved by the UIC Program Director.

Table NAR-9: CO_2 stream composition.

8.3 Reporting and Record Keeping

Electronic reports, submittals, notifications, and records made and maintained by Bluebonnet Sequestration Hub, LLC, under this permit, must be in an electronic format approved by EPA. The permittee shall electronically submit all required reports to the UIC Program Director.

Bluebonnet Sequestration Hub, LLC, shall submit semiannual reports containing:

- Any changes to the physical, chemical, and other relevant characteristics of the CO_2 stream from the proposed operating data.
- Monthly average, maximum, and minimum values for injection pressure, flow rate and daily volume, temperature, and annular pressure.
- A description of any event that exceeds operating parameters for the annulus or injection pressure specified in the permit.
- A description of any event that triggers the required shutoff systems and the responses taken.
- The monthly volume and/or mass of the CO_2 stream injected over the reporting period and volume and/or mass injected cumulatively over the life of the project.
- Monthly annulus fluid volume added or produced.
- Results of the continuous monitoring required including:

- a tabulation of the:
  (1) daily maximum injection pressure,
  (2) daily minimum annulus pressure,
  (3) daily minimum value of the difference between simultaneous measurements of annulus and injection pressure,
  (4) daily volume,
  (5) daily maximum flow rate, and
  (6) average annulus tank fluid level; and
- Graph(s) of the continuous monitoring required or of daily average values of these parameters. The injection pressure, injection volume and flow rate, annulus fluid level, annulus pressure, and temperature shall be submitted on one or more graphs, using contrasting symbols or colors, or in another manner approved by the Director.

- Results of any additional monitoring identified in the Testing and Monitoring Plan.

Any permit noncompliance shall be reported to the Director within 24 hours as described below:

- Bluebonnet Sequestration Hub, LLC, shall report to the Director any permit noncompliance, which may endanger human health or the environment, and/or any events that require implementation of actions in the Emergency and Remedial Response Plan document of this permit. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. Such verbal reports shall include, but not be limited to, the following information:
  - Any evidence that the injected CO_2 stream or associated pressure front may have caused an endangerment to a USDW or any monitoring or other information, which indicates that any contaminant may have caused endangerment to a USDW.
  - Any noncompliance with a permit condition or malfunction of the injection system, which may have caused fluid migration into or between USDWs.
  - Any triggering of the shutoff system.
  - Any failure to maintain mechanical integrity.
  - Pursuant to compliance with the requirement at 40 CFR 146.90 (h) for surface air/soil gas monitoring or other monitoring technologies, if required by the Director, any release of CO_2 to the atmosphere or biosphere.
  - Actions taken to implement appropriate protocols outlined in the Emergency and Remedial Response Plan document of this permit.

- A written submission shall be provided to the Director in electronic format within five days of the time Bluebonnet Sequestration Hub, LLC, becomes aware of the circumstances. The submission shall contain a description of the noncompliance and its cause; the period of noncompliance (including the exact dates and times); and if the noncompliance has not been corrected, then the anticipated time it is expected to continue, as well as actions taken to implement appropriate protocols outlined in the Emergency and Remedial Response Plan document of this permit. This submission should also include the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

Within 30 days, the permittee will report to the Director the results of periodic tests of mechanical integrity; any well workover, including stimulation; any other test of the injection well conducted by the permittee, if required by the Director; and any test of any monitoring well required by this permit.

The following items require advance notification from the permittee to the Director:

- **Well Tests –** Bluebonnet Sequestration Hub, LLC, shall give at least 30 days advance written notice to the Director in an electronic format of any planned workover, stimulation, or other well test.
- **Planned Changes** – Bluebonnet Sequestration Hub, LLC, shall give written notice to the Director in an electronic format, as soon as possible, of any planned physical alterations or additions to the permitted injection facility other than minor repair/replacement or maintenance activities. An analysis of any new injection fluid shall be submitted to the Director for review and written approval at least 30 days prior to injection. This approval may result in a permit modification.
- **Anticipated Noncompliance –** Bluebonnet Sequestration Hub, LLC, shall give at least 14 days advance written notice to the Director in an electronic format of any planned changes in the permitted facility or activity that may result in noncompliance with the permit requirements.

The following include other reporting requirements:

- **Compliance Schedules –** Reports of compliance or noncompliance with or any progress reports on, interim and final requirements contained in any compliance schedule of this permit, shall be submitted in an electronic format by Bluebonnet Sequestration Hub, LLC, no later than 30 days following each scheduled date.
- **Transfer of Permits –** This permit is not transferable to any person except after notice is sent to the Director in an electronic format at least 30 days prior to the transfer and requirements of 40 CFR 144.38 (a) have been met. Pursuant to the requirements at 40 CFR 144.38 (a), the Director will require modification or revocation and reissuance of the permit

to change the name of the permittee and incorporate such other requirements as may be necessary under the SDWA.

- **Other Noncompliance –** Bluebonnet Sequestration Hub, LLC, shall report in an electronic format all other instances of noncompliance not otherwise reported in the next monitoring report. The reports shall contain the information previously listed in Section N (3)(b) of this permit.

- **Other Information –** When Bluebonnet Sequestration Hub, LLC, becomes aware of a failure to submit any relevant facts in the permit application or incorrect information has been submitted in a permit application or in any report to the Director, the permittee shall submit such facts or corrected information in an electronic format, within 10 days in accordance with 40 CFR 144.51 (l)(8).
- **Report on Permit Review –** Within 30 days of receipt of this permit, Bluebonnet Sequestration Hub, LLC, shall certify to the UIC Program Director in an electronic format that he or she has read and is personally familiar with all terms and conditions of this permit.

The following guidelines are provided for recordkeeping:

- Bluebonnet Sequestration Hub, LLC, shall retain records and all monitoring information, including all calibration and maintenance records and original chart recordings for continuous monitoring instrumentation and copies of all reports required by this permit (including records from pre-injection, active injection, and post-injection phases) for a period of at least 10 years from collection.
- Bluebonnet Sequestration Hub, LLC, shall maintain records of all data required to complete the permit application form for this permit and any supplemental information (e.g., modeling inputs for AoR delineations and reevaluations and plan modifications) submitted under 40 CFR 144.27, 144.31, 144.39, and 144.41 for a period of at least 10 years after site closure.
- Bluebonnet Sequestration Hub, LLC, shall retain records concerning the nature and composition of all injected fluids until 10 years after site closure.
- The retention periods may be extended at any time at a request of the Director. Bluebonnet Sequestration Hub, LLC, shall continue to retain records after the specified retention period of this permit or any requested extension thereof expires, unless the permittee delivers the records to the Director or obtains written approval from the Director to discard the records.
- Records of monitoring information shall include:
  - The date, exact place, and time of sampling or measurements;
  - The name(s) of the individual(s) who performed the sampling or measurements;
  - A precise description of both the sampling methodology and handling of samples;
  - The date(s) analyses were performed;

- The name(s) of the individual(s) who performed the analyses;
- The analytical techniques or methods used; and
- The results of such analyses.

9.0 Testing and Monitoring [40 CFR §146.82(a)(15)]

The Testing and Monitoring Plan document of this permit describes how Bluebonnet Sequestration Hub, LLC, will monitor the Bluebonnet Sequestration Hub pursuant to 40 CFR 146.90. In addition to demonstrating that the well is operating as planned, the carbon dioxide plume and pressure front are moving as predicted, and that there is no endangerment to USDWs, the monitoring data will be used to validate and adjust the geological models used to predict the distribution of the CO_2 within the storage zone to support AoR reevaluations and a non-endangerment demonstration.

Bluebonnet Hub Testing and Monitoring Plan was tailored based on a qualitative risk assessment of the site that also was used to inform the Emergency and Remedial Response Plan for the Bluebonnet Hub.

Several components are integrated into the master monitoring plan for the Bluebonnet Hub, which are classified in the following categories:

1. Operational testing and monitoring during injection.
2. Mechanical integrity testing.
3. Groundwater quality and geochemical monitoring.
4. CO_2 plume and pressure-front tracking.
5. Near-surface and surface monitoring.
6. Induced seismicity.

The methodology and frequency of testing and monitoring methods are expected to change throughout the project. Pre-injection monitoring and testing will focus on establishing baselines and ensuring that the site is ready to receive injected CO_2. Injection phase monitoring will be focused on collecting data that will be used to calibrate models and ensure the containment of CO_2. Post-injection phase monitoring and testing is designed to demonstrate CO_2 plume stabilization and ensure containment.

The proposed testing and monitoring plan will collect sufficient geospatial and monitoring data to validate the numerical simulation model, inform operational decisions on the quantity and rate of CO_2 injected, and trigger corrective or preventive maintenance actions, amongst others, to operate the site as designed, efficiently and safely. The monitoring results will allow the project to reevaluate the AoR and show that there is no endangerment to the USDW.

Bluebonnet Sequestration Hub, LLC, plans to drill three CO_2 injector wells: Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3, as part of the field development plan for the Bluebonnet Hub. The monitoring program proposed is designed based on the modeled CO_2 plume extension and propagation of the pressure front for the three wells injecting simultaneously according to the AoR delineation process.

Each CO_2 injector will be equipped with flow rate meters, pressure, and temperature transducers in surface as well as downhole pressure and temperature gauges to monitor in real time variations in operating conditions that could indicate changes in reservoir behaviors or potential loss of mechanical integrity. Claimed as PBI [redacted]

The proposed monitoring plan includes a layout of four in-zone (reservoir) monitoring wells, (Bluebonnet IZM FM1, Bluebonnet IZM FM2, Bluebonnet IZM M1, and Encanto 01). These wells will be equipped with pressure and temperature transducers on the surface as well as pressure and temperature gauges downhole to monitor in real time the variation of pressure and temperature in the reservoir. These wells will allow the use of pulse neutron logs to identify early breakthrough of CO_2 and will be eClaimed as PBI [redacted] except for Encanto 01, Claimed as PBI [redacted].

The Testing and Monitoring Plan includes six above-confining-zone/USWD monitoring wells (Bluebonnet USDW 1, Bluebonnet USDW 2, Bluebonnet USDW 3, Bluebonnet USDW 4, Bluebonnet USDW 5, and Bluebonnet USDW 6) to track geochemical changes in the aquifers as well as pressure variations. Bluebonnet USWD 1 was drilled in 2024 as part of the efforts to characterize the USDW.

The project team plans to drill two water production wells, Bluebonnet PRDW F1 and Bluebonnet PRDW F2, to extract formation water from the Claimed as PBI as a technique to control reservoir pressure. The water production wells will be used as part of the monitoring system, and they will be equipped with pressure and temperature sensors on the surface as well as downhole gauges and sensors according to the artificial lift design.

The project team plans to permit and build two water disposal wells, Bluebonnet DSW M1 and Bluebonnet DSW M2, Claimed as PBI [redacted] This well will be equipped with pressure and temperature gauges downhole allowing the project to monitor variations above the Claimed as PBI [redacted]

In addition to utilizing a well-based network to monitor pressure, temperature, CO_2 plume migration, and geochemistry changes in aquifers, the Bluebonnet Hub will also employ surface and near-surface methods to monitor CO_2 containment. Details for all the monitoring techniques proposed for Bluebonnet Hub are described in the Testing and Monitoring Plan of this application.

9.1 Mechanical Integrity

Bluebonnet Sequestration Hub, LLC, will conduct tests to verify the internal and external mechanical integrity of the CO_2 injector wells before and during the injection period pursuant to 40 CFR §146.89(c), 40 CFR §146.90(e), 40 CFR §146.87(a)(2)(ii) and 40 CFR §146.87 (a)(3)(ii)]. Other than during periods of well workover or maintenance approved by the UIC Program Director, in which the sealed tubing-casing annulus will be disassembled for maintenance or

corrective procedures, the injection wells must have and maintain mechanical integrity consistent with 40 CFR 146.89.

The purpose of internal mechanical integrity testing is to confirm the absence of significant leakage withing the injection tubing, casing, or packer [40 CFR§146.89 (a)(1)]. Continuous monitoring of injection pressure, injection rate, injected volume, and annulus pressure will be used to ensure internal mechanical integrity.

The purpose of external mechanical integrity testing is to confirm the absence of significant leakage outside of the casing [40 CFR §146.89(a)(2)]. Bluebonnet Hub proposes conducting pulse neutron log in the CO_2 injector wells on an annual basis to demonstrate external mechanical integrity. In addition, Claimed as PBI [redacted]

Additional details regarding demonstration of mechanical integrity are described in the Testing and Monitoring Plan, the Well Construction Details Plan, the Pre-Operational Formation Testing Plan and the Plugging Plan.

Bluebonnet Sequestration Hub, LLC, will observe the following reporting guidelines:

- Bluebonnet Sequestration Hub, LLC, shall notify the Director in an electronic format of his or her intent to demonstrate mechanical integrity at least 30 days prior to such demonstration. However, at the discretion of the Director, a shorter time may be allowed.

- Reports of mechanical integrity demonstrations that contain logs must include an interpretation of the results by a knowledgeable log analyst. Bluebonnet Sequestration Hub, LLC, shall report in an electronic format the results of a mechanical integrity demonstration.

- Bluebonnet Sequestration Hub, LLC, shall calibrate all gauges used in mechanical integrity demonstrations and other required monitoring to an accuracy of not less than 0.5 percent of full scale, within one year prior to each required test. The date of the most recent calibration shall be noted on or near the gauge or meter. A copy of the calibration certificate shall be submitted to the UIC Program Director in an electronic format with the report of the test. Pressure gauge resolution shall be no greater than 5 psi. Certain mechanical integrity and other testing may require greater accuracy and shall be identified in the procedure submitted to the UIC Program Director prior to the test.

Bluebonnet Sequestration Hub, LLC, must adhere to the following guidelines regarding failure to maintain mechanical integrity:

- If Bluebonnet Sequestration Hub, LLC, or Director finds that the well fails to demonstrate mechanical integrity during a test; is unable to maintain mechanical integrity during operation; or that a loss of mechanical integrity as defined by 40 CFR 146.89 (a)(1) or (2) is suspected during operation (such as a significant unexpected change in the annulus or injection pressure), the project must:

- Immediately cease injection.
- Take all steps reasonably necessary to determine whether there may have been a release of the injected CO_2 stream or formation fluids into any unauthorized zone. If there is evidence of USDW endangerment, the Permittee shall implement the Emergency and Remedial Response Plan document of this permit.
- Follow the reporting requirements as directed in the Emergency and Remedial Response Plan.
- Restore and demonstrate mechanical integrity to the satisfaction of the Director and receive written approval from the Program Director prior to resuming injection.
- Notify the Program Director in an electronic format when injection is expected to resume.

- If a shutdown (e.g., downhole or at the surface) is triggered, Bluebonnet Sequestration Hub, LLC, must immediately investigate and identify, as expeditiously as possible, the cause of the shutdown. If, upon such investigation, the well appears to be lacking mechanical integrity or if monitoring required indicates that the well may be lacking mechanical integrity, the permittee must take the actions as described in the Emergency and Remedial Response Plan.

- If the well loses mechanical integrity prior to the next scheduled test date, then the well must either be plugged or repaired and retested within 30 days of losing mechanical integrity. Bluebonnet Sequestration Hub, LLC, shall not resume injection until the mechanical integrity is demonstrated and the Program Director gives written approval to recommence injection in cases where the well has lost mechanical integrity.

Bluebonnet Sequestration Hub, LLC, shall demonstrate mechanical integrity at any time upon written notice from the UIC Program Director.

Testing and Monitoring GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Testing and Monitoring tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Testing and Monitoring Plan ***[40 CFR 146.82(a)(15) and 146.90]***

10.0 Injection Well Plugging [40 CFR §146.82(a)(16)]

Upon the end of life, Bluebonnet CCS 1, Bluebonnet CCS 2, and Bluebonnet CCS 3 will be plugged and abandoned (P&A) consistent with the requirements of Environmental Protection Agency (EPA) document 40 CFR Subpart H – Criteria and Standards Applicable to Class VI Wells. The plugging procedure and materials will be designed to prevent any unwanted fluid movement, resist the corrosive aspects of CO_2 with water mixtures, and protect any underground sources of drinking water (USDWs).

Detailed plugging procedures and diagrams are presented in the Plugging Plan that is submitted as part of this application.

Injection Well Plugging GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Injection Well Plugging tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Injection Well Plugging Plan ***[40 CFR 146.82(a)(16) and 146.92(b)]***

11.0 Post-Injection Site Care (PISC) and Site Closure [40 CFR §146.82(a)(17)]

The Post-Injection Site Care and Site Closure (PISC) plan describes the activities that Bluebonnet Sequestration Hub, LLC, will perform to meet the requirements of 40 CFR 146.93. Bluebonnet Sequestration Hub, LLC, will monitor groundwater quality and track the position of the CO_2 plume and pressure front Claimed as PBI Bluebonnet Sequestration Hub, LLC, may not cease post-injection monitoring until a demonstration of non-endangerment of USDWs has been approved by the UIC Program Director pursuant to 40 CFR 146.93(b)(3). Following approval for site closure, Bluebonnet Sequestration Hub, LLC, will plug all remaining monitoring wells, restore the site to its original condition, and submit a site closure report and associated documentation.

PISC and Site Closure GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** PISC and Site Closure tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ PISC and Site Closure Plan ***[40 CFR 146.82(a)(17) and 146.93(a)]***
GSDT Module: Alternative PISC Timeframe Demonstration ***Tab(s):*** All tabs (only if an alternative PISC timeframe is requested) Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Alternative PISC timeframe demonstration ***[40 CFR 146.82(a)(18) and 146.93(c)]***

12.0 Emergency and Remedial Response [40 CFR §146.82(a)(19)]

The Emergency and Remedial Response Plan (ERRP) document of this permit describes actions that Bluebonnet Sequestration Hub, LLC, shall take to address movement of the injection fluid or formation fluid in a manner that may endanger an underground source of drinking water (USDW) during the construction, operation, or post-injection site care periods.

If Bluebonnet Sequestration Hub, LLC, obtains evidence that the injected CO_2 stream and/or associated pressure front may cause an endangerment to a USDW, Bluebonnet Sequestration Hub, LLC, will initiate shutdown plan for the injection well, take all steps reasonably necessary to

identify and characterize any release, notify the permitting agency (UIC Program Director) of the emergency event within 24 hours, and implement applicable portions of the approved ERRP.

Emergency and Remedial Response GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Emergency and Remedial Response tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Emergency and Remedial Response Plan ***[40 CFR 146.82(a)(19) and 146.94(a)]***

13.0 Injection Depth Waiver and Aquifer Exemption Expansion

Injection depth waivers are not requested in this permit application.

Injection Depth Waiver and Aquifer Exemption Expansion GSDT Submissions
GSDT Module: Injection Depth Waivers and Aquifer Exemption Expansions ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Injection Depth Waiver supplemental report ***[40 CFR 146.82(d) and 146.95(a)]*** ☐ Aquifer exemption expansion request and data ***[40 CFR 146.4(d) and 144.7(d)]***

14.0 References

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