EPA's Request for Additional Information #1 and OLCV's Responses

Request for Additional Information

[Oxy Brown Pelican (R06-TX-0005)] - [Request #1]

Instructions: Populate the "Response" column with answers/responses to each comment/question below, then upload the completed responses to Field #3 in the "Information Requests" reporting module of the GSDT. If necessary, upload attachments or references in Field #4 of the module and/or update information within other GSDT modules. ***To allow reviewers to quickly locate and review changes/updates, clearly identify the location within the application where edits for each response were made (e.g., Site Characterization, Section 2.7.4, p. 53, updated paragraph 2).***

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
General				
1	N/A	**Background:** Higher-resolution figures were submitted as separate files for the AOR/Corrective Action, Project Narrative, and PISC/Site Closure sections for both CCS1 (AOR_BRP_CCS1_Figures_cbi.pptx, Narrative_BRP_CCS1_Figures_cbi.pptx, PISC_BRP_CCS1_Figures_cbi.pptx) and CCS2 (AOR_BRP_CCS2_Figures_cbi.pdf, Narrative_BRP_CCS2_Figures_cbi.pdf, PISC_BRP_CCS2_Figures_cbi.pdf). However, lower-resolution figures remain within respective narratives, and no reference to the separate files of higher resolution figures is included in the narratives. Additionally, files should be submitted as .pdf or image files (e.g., .jpg, .bmp) rather than as PowerPoint files due to the ease with which PowerPoint files may be altered. **Comment:** Please update all narrative sections to replace lower-resolution images with the high-resolution images previously submitted separately. Alternatively, update narrative sections with text directing readers to the separate files of high-resolution images. If the alternative option is chosen, please also resubmit files for CCS1 as .pdf files rather than as PowerPoint files.	The geologic and simulation models have been updated with information obtained from the recently drilled Shoe Bar 1 and Shoe Bar 1AZ stratigraphic test wells. The figures accompanying the text are updated following technical updates. High Resolution images can be found at the end of the narratives.	
2	40 CFR 146.82(a)(21)	**Comment:** Please upload digital (pdf) copies of all references cited within the application to the GSDT and OneDrive (if applicable). One folder/zip file containing references for all application sections/modules is acceptable. For books or similar hardcopy references, a scanned copy of the data or referenced section (e.g., a specific table, a single chapter) along with a copy of the cover and title page is sufficient. Upload copies of references without copyright issues to the GSDT as supplemental information along with a table listing all references, including copyrighted	OLCV has located copies of references and uploaded the documents to the GSDT. Note that OLCV provided a spreadsheet indicating which references are copyrighted and/or otherwise restricted from sharing.	

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		references or references with other issues (e.g., licensing) that prohibit the public release of a given reference. In the table, indicate which references are copyrighted and are being provided via a separate submission process to EPA Region 6 (the OneDrive folder) due to copyright/licensing concerns. Then in the CBI OneDrive folder, upload copies of all references regardless of copyright/licensing status (these references are for internal EPA use only and will not be released publicly). In the rare instance that a reference cannot be submitted, provide a detailed explanation in the accompanying table describing why it cannot be provided.		
3	40 CFR 146.82(a)(9); 40 CFR 144.39; 40 CFR 144.41	**Background:** Sections were supplied regarding injection well stimulation plans (5.STIM_BRP_CCS1_cbi.pdf and STIM_BRP_CCS2_cbi.pdf). Both sections indicate that stimulation is not anticipated, and separate plans for stimulation will be developed and submitted for review/approval if needed. However, 40 CFR 144.41 defines types of permit modifications that fall under a minor modification. All other modifications qualify as major modifications, which require an additional public comment period (40 CFR 144.39). Adding a well stimulation plan following the initial permit to construct would result in a major modification requiring another public comment period. **Comment:** While not required, EPA strongly recommends that applicants provide a draft stimulation plan to act as a placeholder for future modifications, even if such a plan is not currently anticipated. This plan should be project- and well-specific and should include the stimulation fluids (including additives) or diverting agents to be used and a step-by-step procedure that would be employed during stimulation.	OLCV has written a Stimulation Plan for the BRP Project. It was uploaded to the GSDT in September 2023.	
4	40 CFR 146.82(a)(2)	**Background:** Despite plans for two injection wells (CCS1 and CCS2), Figure 59 in the AOR narrative for CCS2 (AOR_BRP_CCS2_cbi2.pdf) appears to be the only map or figure in any module of either application that depicts both injection wells. All other maps identified throughout appear to have only one symbol generically labeled as either a “proposed injector” or as “CO2_INJ.” **Comment:** Please update all maps throughout the application to show both CO_2 injection wells.	The geologic and simulation models were updated with information obtained from the recently drilled Shoe Bar 1 and Shoe Bar 1AZ stratigraphic test wells. To honor the data from these wells, the models were updated and now include three CO_2 injectors: BRP CCS1, BRP CCS2, and BRP CCS3. These wells are shown on figures and maps.	

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5	N/A	**Background:** Several issues were noted regarding submissions between the GSDT and the CBI OneDrive folder. 1) Numerous files were uploaded to the CBI OneDrive folder that were not located in the GSDT, including several files in the "Attachments" folders for both CCS1 and CCS2. 2) While the narratives for CCS1 and CCS2 are essentially the same, various files appeared in the Attachments folder for CCS1 but not CCS2 and vice versa. 3) Several of the Attachments were not found to be referenced in any of the narratives (i.e., they appear to be files added solely to this folder but not referenced anywhere to point readers to them). 4) Some files in the Attachments folder appear to be uploaded there as well as included within narratives, but no reference directing readers to them in the Attachments folder is included (or why they appear in both places). 5) Various narrative files were noted to be uploaded to the GSDT as "summary" files in lieu of uploading full files that were then redacted. Some examples include but are not limited to: AOR Summary_BRP_CCS1_r.pdf and AOR Summary_BRP_CCS2_r.pdf; FA Summary_BRP_CCS1_r_v2.pdf and FA Summary_BRP_CCS2_r.pdf; Narrative Summary_BRP_CCS1_r.pdf and Narrative Summary_BRP_CCS2_r.pdf. **Comment:** Please verify that all files uploaded to the CBI OneDrive folder are also uploaded to the GSDT for both CCS1 and CCS2 since each well was submitted as a separate application. Ensure that all files submitted separately (e.g., as attachments) are referenced in narratives to direct readers to them, otherwise incorporate them (e.g., figures, maps, other attachments) in the narrative only. Verify that all filenames of files added to the OneDrive match names of files uploaded to the GSDT and that "placeholder" documents containing all necessary information are used if needed. Lastly, verify that all narratives submitted to the GSDT contain the same information as narratives submitted to the OneDrive save for redactions (i.e., submit full narratives in both locations rather than a summary narrative to the GSDT and full narrative to the OneDrive). For more information, see the Region 6-specific guidance document "GSDT_OneDrive Issues.pdf."	The geologic and simulation models were updated with information obtained from the recently drilled Shoe Bar 1 and Shoe Bar 1AZ stratigraphic test wells. The application documents are updated accordingly and re-submitted with redactions as requested in GSDT.	

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AOR/Corrective Action				
6	40 CFR 146.84(c)(1)	**Background:** Regarding activities to be performed during the AOR re-evaluation, the AOR narrative for CCS2 (AOR_BRP_CCS2_cbi2.pdf, p. 80/103) states such activities will include, "Review and analyze available monitoring and operational data and compare them to the dynamic simulation forecast to assess whether the predicted CO2 plume migration is consistent with the actual data. This includes data from the Brown Pelican CO2 Sequestration Project CCS1 injection well…" **Comment:** This should be corrected to state "CCS2" rather than "CCS1" since this document is for CCS2. Also, since both injectors were modeled together, it would be advisable for both AOR narratives to indicate that data from CCS1 and CCS2 together will be included in any AOR re-evaluations.	Typos were corrected in the revised submission of the documents following updates to the geologic and simulation models.	
7	40 CFR 146.82(a)(4), 40 CFR 146.84(c)(2), 40 CFR 146.82(a)(21), 40 CFR 146.84(d)	**Background:** Regarding well records and information, the AOR narrative (CCS1 p. 74/104, CCS2 p. 73/103) indicates that one water well and one legacy well were identified in the AOR "…according to the records obtained from the Texas Railroad Commission, IHS, and the Texas Water Development Board (TWDB)." However, a detailed explanation of AP identification procedures and AP records searches is not provided, and there appears to be no indication that an exhaustive AP records search was conducted, including searches of various other state databases as well as reviews of commercial maps, historical aerial photographs, scout tickets, etc. Texas Railroad Commission officials have confirmed to EPA that, in addition to reviewing TRRC's GIS viewer and locating records through it and the various databases in the resource center, applicants should also send a request to TRRC's Central Records department for any non-digital data. Searches of records at other agencies should also be conducted, including TCEQ, TWDB, the Texas Department of Licensing and Regulation (TDLR), and the Bureau of Economic Geology (BEG) (see the Region 6-specific guidance document "Well Records Search Information-draft_2023_06_07.pdf" for additional information). Based on this information, searches of all sources listed above (at a minimum) must be conducted for well records searches to satisfy 40 CFR 146.84(c)(2) and 40 CFR 146.84(d). EPA's Underground Injection Control (UIC) Program Class VI	The geologic and simulation models were updated with information obtained from the recently drilled Shoe Bar 1 and Shoe Bar 1AZ stratigraphic test wells. The AoR and list of Artificial Penetrations within the AoR are updated based on the revised modeling work, and the application documents are updated accordingly. Detailed information on searches for APs is presented in an appendix to the AoR and Corrective Action Plan document, Appendix B: Artificial Penetrations.	

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		Well Area of Review Evaluation and Corrective Action Guidance document (EPA 816-R-13-005, May 2013), which supports 40 CFR 146.84, discusses two critical narratives that detail the technical efforts for: (1) identifying all APs in the area of review, and (2) the AP records data collection process associated with the AOR APs to assess their conditions concerning the impact of the proposed Class VI action. The procedures and protocols for this are discussed in Chapter 4 of the guidance document found at https://www.epa.gov/sites/default/files/201507/documents/epa816r13005.pdf. **Comment:** Please update narratives to provide information for parts (1) and (2) above detailing how the AOR AP locations were found and how each AP's records were compiled. The updated information should include detailed steps taken to ensure the identification of all APs within the AOR, and it should include a detailed description of steps taken to conduct an exhaustive records search, including searches beyond TRRC and TWDB databases.		
8	40 CFR 146.84(d)	**Background:** Section 5.1.2 of the AOR narrative for CCS1 (p. 74/104) and CCS2 (p. 73/104) states that, "Corrective action is needed and will be completed before CO_2 injection starts." However, Table 9 (p. 77/104 for CCS1, p. 76/103 for CCS2), the AOR narrative (p. 79/104 for CCS1, p. 78/103 for CCS2), and Appendix A (p. 92/104 for CCS1, p. 91/103 for CCS2) all indicate that corrective action will be completed starting in Year 10 of injection operations. **Comment:** Please clarify in the respective section(s) when corrective action will be completed on the legacy well in the AOR. Also, if the pressure front will reach the legacy well in Year 10, then corrective action should be completed on the well prior to Year 10.	The geologic and simulation models were updated with information obtained from the recently drilled Shoe Bar 1 and Shoe Bar 1AZ stratigraphic test wells. The AoR and timing of Corrective Actions was updated based on the revised modeling work, and a revised schedule for corrective action is now provided in the AoR document.	
9	40 CFR 146.84(b)(4); 40 CFR 146.84(d); 40 CFR 146.82(c)(6)	**Background:** The AOR narrative (CCS1 p. 75-76/104; CCS2 p. 74-75/103) and AOR narrative Appendix A (CCS1 p. 92-94/104; CCS2 p. 91-93/103) provide wellbore diagrams depicting the well in the AOR for which corrective action is planned, including both current specifications of the well and planned specifications after remediation. However, no step-by-	AoR and Corrective Action Plan Section 5.2.4: now includes a step-by-step procedure. Cement and Cement additives discussion is located in the construction document.	

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		step narrative of planned activities is included, nor is information on materials, cements, cement additives, or other details. **Comment:** Please provide a step-by-step narrative of the process by which the legacy well will be remediated, and include details of all materials to be used, planned cement(s) and additives, and any other essential elements.		
10	40 CFR 146.82(a)(2)	**Background:** Figure 59 of the AOR narrative (CCS1 p. 73/104; CCS2 p. 72/103) appears to be the most complete map of the project area, including the AOR, artificial penetrations (including both water and oil/gas wells), and planned monitoring and water withdrawal wells. However, the map appears to be missing several items required by the referenced regulation, including: the locations of both injection wells; the location(s) of any state- or EPA-approved subsurface cleanup sites (e.g., Superfund/CERCLA, hazardous waste/RCRA, brownfields, leaking underground storage tanks); locations of any springs, mines, or quarries; locations and labels of any surface water bodies; and labeled roads, boundaries, and any other structures present. Additionally, no narrative discussion is included indicating that searches for springs, mines, quarries, and subsurface cleanup sites have been conducted and no sites located. **Comment:** Please update the map to include all required elements detailed in 40 CFR 146.82(a)(2). Also, please update the narrative to include details of searches for subsurface cleanup sites, mines, springs, and quarries, including any resources consulted and the results of those searches. If no such sites were identified, please indicate this as part of the narrative.	Figure 1 in the AoR document is updated and the text is updated to reflect the sources consulted. There are no superfund sites, brownfields, underground storage tanks, springs, mines, or quarries in the AoR. AoR Section 2.2.1. includes details of the search including resources consulted.	
11	40 CFR 146.84(b)(2)(iv); 40 CFR 146.90	**Background:** The Computational Modeling Approach tables in the AOR crosswalks (2. R6 AoR Corrective Action Plan Crosswalk - BRP CCS 1cbi.docx and 2. R6 AoR Corrective Action Plan Crosswalk - BRP CCS 2cbi.pdf) Oxy completed and submitted indicate that information regarding site access is contained in Section 5.2 of the AOR narrative. However, no such information was located in either narrative for CCS1 or CCS2.	Inserted language in AoR and Corrective Action Plan Section 5.3: As part of OLCV's agreement with the Shoe Bar Ranch, the operator acquired the exclusive rights to sequester and store liquids, gases, and other substances in the property. With that, OLCV has the right to maintain and operate any and all equipment necessary or useful to our sequestration operations. The term of the agreement is in effect until 100	

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		Comment: Please provide information regarding how Oxy has secured site access and can guarantee such access for the duration of the project in the event future corrective action is needed. Guaranteed site access is also required for testing and monitoring for the life of the project. Site access details should also be updated in that section if necessary.	years after the cessation of sequestration operations, unless the operator elects to abandon earlier.	
Testing/Monitoring & QASP				
12	40 CFR 146.90(d)(1)	**Background:** ***6.2 Analytical parameters-*** *"*Water samples will be collected in selected shallow water and surface water bodies before and during the first year of injection. These samples will create a baseline for the system." **5.0 Water Sampling**-5.1 Sampling Flowing Surface Waters "The following methodology will be used to collect flowing surface waters from rivers, streams, drainage ditches, bayous, etc." **Comment:** Provide specific locations of all sampling of shallow and surface waters in both an inventory format and a topographic map of the AOR.	Further evaluation of the site, including high resolution drone imagery and high-resolution satellite imagery, was conducted. There is no surface water in the AoR. Statements about surface waters were removed from the document.	
13	40 CFR 146.89(c)	**Background:** Per Table TM-10 - Temperature or noise log for external mechanical integrity- "If required to complement the other proposed methods" **Comment:** Federal regulations require that at least once per year, the owner or operator must use either an approved tracer survey, such as an oxygen-activation log, or a temperature or noise log.	OLCV has updated the section on mechanical integrity to include annual temperature logging. In addition, OLCV proposes to install DTS Fiber in the injection wells which will provide continuous temperature monitoring, exceeding the requirement for annual temperature or noise log. In the future, OLCV may propose that temperature data from the DTS fiber be substituted for annual temperature logging.	
14	40 CFR 146.90(g)(1)	**Background:** 9.1 SLR Wells **Comment:** Per regulations and guidance, direct monitoring needs to be placed inside the plume during the injection period. Network is "used to detect deviations from the predicted project performance."	The Shoe Bar 1 will be converted to an Injection Zone monitor well (SLR1) and two additional Injection Zone monitor wells are planned: SLR2 and SLR3. All three of these well are planned to be within the maximum extent of the AoR.	
15	40 CFR 146.90(d)	**Background:** 9.1 Plume and pressure front monitoring location and frequency **Comment:** Table 13 lacks information for each well, including geographical locations and depths. Figures 5 and 6 are generic in nature, we need specifics for each monitoring well.	Table 2 in the Testing and Monitoring Plan lists the locations and intended purpose of each monitor well. Table 3 in the Testing and Monitoring Plan lists the monitoring objectives, methods, and frequency by well type.	

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16	40 CFR 146.86(b)(vi)	**Background:** 9.3 Injector Well - DTS technology was described in Section 7.0 of this document. The technique is also used to evaluate vertical conformance during injection, as a continuous temperature profile will be available to understand vertical migration of the CO2 and flow distribution in the perforations. **Comment:** What contingencies would be in place if the DTS technology were to fail?	In addition to DTS, OLCV proposes to install permanent downhole gauges and surface gauges to monitor pressure and temperature.	
17		**Background:** 10.0 Induced Seismicity **Comment:** Why 5.6 miles from the injection well? Not identified in the narrative.	In January 2022, the Texas Railroad Commission published a Response Plan to Seismic Events in Texas (https://www.rrc.texas.gov/media/buhgzt0o/2022-01-31_seismic_response_sog_final.pdf) that documents notification requirements and operator actions based on distance from source of seismicity. OLCV is incorporating this guidance into our seismicity monitoring plans. OLCV anticipates submitting revisions by December 2023. The 5.6-mile radius is used because this is the metric used for disposal well applications to the Railroad Commission. "Pursuant to 16 Texas Administrative Code §3.9(3)(B) and §3.46(b)(1)(C), SWD well permit applications must include a review of USGS earthquake records for a circular area of 100 square miles around the proposed SWD well location (a circular area with a radius of 9.08 kilometers, or 5.64 miles)."	
18	40 CFR 146.90(k)	**Background:** 4.1 CO2 Sampling - "If the CO2 composition shows abnormal values during the testing period, a validation of the sampling process will be performed with a new sample collected by the laboratory technician and sent to the testing facilities for verification." **Comment:** Shut-in time? The CO2 stream analyzed X (days, weeks) after ops resume? Alternative CO2 stream sampling schedule based on the injected amount, not time, triggered if permit modified or if injection activities deviate? Define thresholds for deviations (e.g., if injection volume is less than X over X period). Define what threshold of change in chemical or physical characteristics of the CO2 stream will trigger	Shut in time: The facility capturing CO_2 is expected to be continuously operating with short annual planned downtime. The facility will not send injectate into the pipeline until it meets the pipeline specification. Time of analysis after Ops resume: The facility will not resume delivering to the sequestration site until the CO_2 injectate stream meets the specification approved in the permit. The duration of the sampling after downtime will be variable and determined by the DAC facility. In addition to the sampling at the DAC facility the BRP facility is equipped	

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		additional sampling at a frequency of X to collect sufficient data to characterize the CO2 stream. These questions are also applicable to other testing and monitoring activities in the application.	with automatic shut-off controls so that off-spec streams will not be delivered wells. Thresholds for deviations: the injectate stream must meet the specifications for CO_2, O_2 and H_2O. Short disruptions (a few minutes) will not trigger a shut down or additional sampling. Longer disruptions, or uncertain cause of the disruption, will trigger a shutdown of the pipeline delivering injectate to the wellheads until the stream can be restored to the specification.	
Post-Injection Site Care & Site Closure				
19		**Background:** "8.0 Quality Assurance and Surveillance Plan (QASP) The Quality Assurance and Surveillance Plan is presented as a separate document." **Comment:** Where is this document specifically?	The QASP document is now submitted as a separate document (previously incorporated into the Testing and Monitoring Plan).	
20	40 CFR 146.93(2)	**Background:** Table 1- Pressure Differential to Pre-Injection Conditions at the Top of the Lower San Andres Formation at Monitoring Well Locations **Comment:** The top of Lower SA and Pressure Differential for both CCS 1 and CCS 2 are exactly the same, seems suspect, and requires validation.	Table 1 has updated with well specific depths expected to be encountered in the wells.	
21	40 CFR 146.93(2)	**Background:** Figure 2- Aqueous pressure differentials from the baseline condition at the top of the injection zone at 12 years (end of injection). **Comment:** Figures are the exact same for CCS 1 and CCS 2 PISC narrative. No injector is referenced within the pressure distribution.	Table 2 has updated with well-specific pressure estimates expected to be encountered in the wells.	
22	40 CFR 146.93(2)	**Background:** Figure 3- Aqueous pressure differentials from the baseline condition at the top of the injection zone at 62 years after start of injection (50 years post-injection). **Comment:** Figures are the exact same for CCS 1 and CCS 2 PISC narrative. No injector is referenced within the pressure distribution.	Figure 2 and 3 have been updated well-specific pressure estimates expected to be encountered in the wells.	

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23	40 CFR 146.93(2)	**Background:** Figure 4- Areal extent of the CO2 plume at site closure in Year 62 (9/1/2086), defined by the vertical integration of saturation of CO2 injected. **Comment:** Figures are the exact same for CCS 1 and CCS 2 PISC narrative. No injector is referenced within the pressure distribution.	Figure 5 has updated well-specific pressure estimates.	
24	40 CFR 146.93(2)	**Background:** Figure 7- Areal extent of the CO2 plume at site closure in Year 62 (9/1/2086), defined by the vertical integration of saturation of CO2 injected. **Comment:** Figures are the exact same for CCS 1 and CCS 2 PISC narrative. No specific injector is referenced within the plume distribution.	Figure 5 has updated well-specific pressure estimates.	

EPA's Request for Additional Information #2 and OLCV's Responses

Request for Additional Information

[Oxy Brown Pelican (R06-TX-0005)] - [Request #2]

Instructions: Populate the "Response" column with answers/responses to each comment/question below, then upload the completed responses to Field #3 in the "Information Requests" reporting module of the GSDT. If necessary, upload attachments or references in Field #4 of the module and/or update information within other GSDT modules. ***To allow reviewers to quickly locate and review changes/updates, clearly identify the location within the application where edits for each response were made (e.g., Site Characterization, Section 2.7.4, p. 53, updated paragraph 2).***

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Project Information/Site Characterization				
1	40 CFR 146.82(a)(3)(iii)	**Background:** The AOR narrative (p. 13) states that, "Well log measurements and core data from the offset Penwell (San Andres) oilfield (Figure 8) were used for the characterization of the storage complex elements. Core analyses from the proposed stratigraphic well will provide additional data on porosity, permeability, and capillary entry pressure of the upper and lower confining zones in the AoR." **Comment:** Please explain how regional data from approximately 5-6 miles away (the Penwell field) outside of the AOR, well data from one stratigraphic test well approximately one mile away from the injectors, and logging/coring/testing associated with the drilling of the two injectors is sufficient to adequately characterize the AOR.	The two recently drilled stratigraphic test wells (Shoe Bar 1AZ and Shoe Bar 1) are located in the center and eastern edge of the modeled AoR and significantly augmented the previous suite of local and sub-regional data with an extensive well log suite, whole core, rotary sidewall core, and dynamic formation test data. Rock and fluid properties observed in Shoe Bar 1 and Shoe Bar 1AZ wells were calibrated to seismic facies from the newly acquired BRP 3D seismic dataset as a proxy to predict rock and fluid properties beyond well control in the study area. The data collected in the Shoe Bar 1 and Shoe Bar 1AZ is presented in Appendix A to the AoR and Corrective Action Plan.	
2	N/A	**Background:** Section 2.2.5 of the AOR narrative (p. 20) states, "A text document (located alongside this document in the same folder) is supplied indicating the networks, station names, locations, and start and end times for the stations used by USGS and TexNet to locate seismic events." However, reviewers were unable to locate such a document. **Comment:** Please provide the document in question, either separately or as an appendix to this narrative.	The document is provided as an attachment to the AoR and called "Attachment_A_Seismic_stations_All-texasarea.pdf"	
3	40 CFR 146.82(a)(3)(iii)	**Background:** In the AOR narratives, Oxy refers to the Upper San Andres as a "potential upper confining zone" in Figure 7 (stratigraphic column, p. 13) and on p. 15. However, the narrative on p. 17 refers to the Upper San Andres as the "primary confining layer" which "will be confirmed with the log and core data of the Stratigraphic well." Additionally, Figure 7, the	Clarified in Figure 8 (formerly 7) and text that the Upper San Andres and Grayburg together comprise the primary Upper Confining Zone. This interpretation is confirmed by core data from the Shoe Bar 1 and Shoe Bar 1AZ.	

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		narrative on p. 13, and the narrative elsewhere all indicate that the Grayburg Formation is the primary confining layer. It appears that the Grayburg has suitable porosity/permeability to be characterized as the primary confining layer while the Upper San Andres is in hydraulic communication with the injection zone and may provide pressure dissipation. **Comment:** Please confirm which formation is considered the primary, secondary, etc. confining layer. It may be appropriate to characterize the Grayburg and Upper San Andres together as the confining zone for the project, assuming any above-confining zone monitoring wells target formations above the Grayburg.		
4	40 CFR 146.82(a)(3)(iii)	**Background:** AOR Figure 26 (p. 34) and the narrative on p. 43 provide porosity and permeability values for the injection and confining zones. **Comment:** What is the source of the porosity and permeability values for the Grayburg formation? If the source is not wells located at the SBR site, on what basis is the data considered representative of the AOR?	The Shoe Bar 1 and Shoe Bar 1AZ are the source of porosity and permeability values for the Grayburg formation. Sample locations and data types are described in Appendix A to the AoR and Corrective Action Plan.	
5	40 CFR 146.82(a)(3)(iii)	**Background:** As previously stated, the AOR narrative describes the Upper San Andres as either a potential upper confining zone or as the primary confining zone. The narrative (p. 15) also indicates that the Upper and Lower San Andres are "believed to be in hydraulic communication." **Comment:** Please clarify how, if the Upper San Andres is in hydraulic communication with the Lower San Andres (injection zone), it will provide confinement and what the nature of the confinement will be. For example, will pressure dissipation occur within the San Andres with CO_2 ultimately being confined by the Grayburg? Additionally, please clarify how the Grayburg Formation will be sufficient as the primary confining layer if the Upper San Andres is found to be insufficient as a confining layer based on stratigraphic test well results and/or during pre-operational testing.	Data from the Shoe Bar 1 and Shoe Bar 1AZ demonstrate that the Upper and Lower San Andres are not in hydraulic communication within the AoR. Core-based average permeability in the Upper San Andres formation from Shoe Bar 1 and Shoe Bar 1AZ was < 0.1 mD, confirming it as a seal for the storage complex in the AoR. The statement about the Upper and Lower San Andres being in hydraulic communication was removed from the text.	
6	40 CFR 146.82(a)(3)(iii)	**Background:** AOR narrative p. 45 states that, "…Oxy performed a field-level calibration exercise of the Penwell wells that lie within the simulation model's boundaries (Figure 38)."	The data from Penwell field is based on TRRC records from 1970.	

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		Comment: Please provide additional information about this field-level calibration exercise that is the source of the formation pressure value for the model initial conditions; specifically, when was this data collected, and based on oil field operational information, what evidence is there that the data, e.g., formation pressure, remains accurate?	The purpose of this evaluation was to demonstrate that the Penwell field was not in pressure communication with the BRP Project site. This conclusion is still valid, as a downhole pressure gauge in the Shoe Bar 1 well has measured consistent [redacted] pressure gradient in the Lower San Andres since approximately March – November 2023. The BRP Project model was initialized using data from the Shoe Bar 1 and Shoe Bar 1AZ, because those data are now available. The Penwell field calibration is no longer used as the basis for the initial pressure at the BRP site.	
7	40 CFR 146.82(a)(3)(iv)	**Background:** Section 2.2.4 of the AOR narrative (p. 17) states that there is an east-west-running basement fault present within the area of the project site, and p. 18 states that Devonian and older strata are faulted but do not extend into the sequestration zone or the top or base seals. **Comment:** Is there any available evidence to demonstrate pressure isolation between the injection zone and the underlying faulted units?	Seismic data interpretation indicates that there is ~1800 feet of separation between the deep faulted zones and the Lower San Andres Injection Zone. In addition, the Glorieta and Clearfork (above faulted zone, but below Injection Zone) are separated from the Lower San Andres Injection Zone by a Lower Confining Zone. Based on data from Shoe Bar 1 and Shoe Bar 1AZ, the Glorieta and Clearfork have [redacted] gradient respectively, whereas the Lower San Andres has a [redacted] gradient.	
8	40 CFR 146.82(a)(6)	**Background:** The AOR narrative (p. 26) indicates that TWDB GAU letters and BRACS Well 1258 were used to correlate and map the base of the Dockum minor aquifer in the subsurface across the area of interest. Additionally, there are five water withdrawal wells within the boundaries of the Shoe Bar Ranch (p. 25-26), of which one was mentioned to have water quality data available (45-11-701, from 1948). **Comment:** Is TDS data available for the BRACS 1258 well or any of the other water withdrawal wells besides 45-11-701?	Water analyses are not available for BRACS 1258. Water analyses are available for 45-11-701, 45-11-902, 45-11-903, 45-19-301, 45-19-302. These data were uploaded to the GSDT.	
9	40 CFR 144.3	**Background:** The AOR narrative (p. 26) states that, "TWDB GAU letters specify the Dockum minor aquifer of the Santa Rosa Formation (depth range: 600 ft to 1,150 ft below ground level) as the base of protected aquifers in the AoI." However, it is unclear if this determination is based	The sentence was updated to: "TWDB GAU letters specify the Dockum minor aquifer of the Santa Rosa Formation (depth range: 600 ft to 1,150 ft below ground level) as the base of protected aquifers in the AoI, which is consistent	

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		on a TDS concentration < 10,000 mg/L, or if it is based on a determination previously made by TWDB that may or may not conform to the UIC regulatory definition of a USDW (which Oxy cites on p. 23-24). **Comment:** Please clarify whether the designation by TWDB of the Dockum minor aquifer as the base of protected aquifers refers to the deepest layer that has waters with a TDS content less than 10,000 mg/L, consistent with the definition of a USDW in the federal UIC regulations.	with EPA Class VI regulation (40 CFR 144.3) as deepest layer that has waters with a TDS concentration of less than 10,000 mg/L."	
Financial Responsibility				
10	40 CFR 146.85(a)(2)	**Background:** Estimated Cost for activities covered does not correlate between CCS1 and CCS2. **Comment:** Estimates in the CCS 1 narrative do not match with referenced FA_BRP_COST_EST_041522 pdf or with estimates in CCS2.	Costs associated with CCS1, CCS2 and CCS3 are now incorporated into the FA Plan.	
11	40 CFR 146.85(a)	**Background:** "For the corrective action, plugging of injection and monitoring wells, post-injection site care (PISC) and site closure, Oxy Low Carbon Ventures, LLC, intends to eventually use a dedicated Trust." **Comment:** Demonstrate that the third-party administrator has a proven track record of effective management and is financially stable and that the agreements include a description of the acceptable ways in which the trustee can invest the fund. Verify that the conditions under which payments can be authorized are identified.	OLCV intends to utilize a letter of credit to demonstrate financial responsibility for corrective action, plugging of injection and monitoring wells, post-injection site care and site closure. OLCV has updated the application accordingly. The letter of credit will be issued by a U.S. commercial bank or a U.S. branch office of a foreign bank that has (a) assets of at least Ten Billion Dollars ($10,000,000,000) and (b) has a Long-Term Credit Rating of at least "A-" by S&P and at least "A3" by Moody's. OLCV will establish a standby trust fund in accordance with EPA's guidance to receive any funding necessary to address the cost of covered activities. OLCV intends to secure the letter of credit and establish the standby trust right before the permit to construct is issued in an effort to minimize the associated costs of the instruments incurred by OLCV while the application is under review by the EPA.	
12	40 CFR 146.85(a)	**Background:** "Due to the uncertainty regarding the cost estimates and the timing of funding, Oxy Low Carbon Ventures, LLC, proposes to provide a	OLCV intends to utilize a letter of credit to demonstrate financial responsibility and has updated the application accordingly. The letter of credit will be issued by a U.S.	

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		Letter of Credit (LOC) to provide the required assurance to the Program Director." **Comment:** Demonstrate that the letter is issued by a bank or other regulated, financially stable institution and that the applicant has established a standby trust to receive any funding necessary to address the cost of covered activities.	commercial bank or a U.S. branch office of a foreign bank that has (a) assets of at least Ten Billion Dollars ($10,000,000,000) and (b) has a Long-Term Credit Rating of at least "A-" by S&P and at least "A3" by Moody's. OLCV will establish a standby trust fund in accordance with EPA's guidance to receive any funding necessary to address the cost of covered activities. OLCV intends to secure the letter of credit and establish the standby trust right before the permit to construct is issued in an effort to minimize the associated costs of the instruments incurred by OLCV while the application is under review by the EPA.	
13	40 CFR 146.85(a)(6)(ii)	**Background:** For the Emergency and Remedial Response Plan (ERRP) and protection to USDW assurance, Oxy Low Carbon Ventures, LLC, intends to use independent third-party insurance underwritten by qualified insurers. **Comment:** No information regarding the third-party instrument.	OLCV intends to utilize a letter of credit to demonstrate financial responsibility for the Emergency and Remedial Response Plan. OLCV has updated the application accordingly. The letter of credit will be issued by a U.S. commercial bank or a U.S. branch office of a foreign bank that has (a) assets of at least Ten Billion Dollars ($10,000,000,000) and (b) has a Long-Term Credit Rating of at least "A-" by S&P and at least "A3" by Moody's. OLCV will establish a standby trust fund in accordance with EPA's guidance to receive any funding necessary to address the cost of covered activities. OLCV intends to secure the letter of credit and establish the standby trust right before the permit to construct is issued in an effort to minimize the associated costs of the instruments incurred by OLCV while the application is under review by the EPA.	
Pre-Operational Testing				
14	N/A	All comments related to pre-operational testing were derived from information found in other sections. Since the comments reference pre-operational testing specifically, they are included in this subsection of this RAI table rather than elsewhere.	Pre-Operational Testing is now included as a separate document.	

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15	40 CFR 146.82(a)(8); 40 CFR 146.87	**Background:** Oxy did not provide a separate module covering the Pre-Operational Testing. Instead, various pieces are included in the Well Construction (primarily), Testing & Monitoring, and QASP narratives. However, the Pre-Operational Testing Module is one of the five required modules in the GSDT that must be submitted for an application to be considered complete. EPA Headquarters has indicated that all applications must have a dedicated Pre-Operational Testing module submitted rather than having information spread between multiple sections. **Comment:** Please compose a distinct Pre-Operational Testing narrative, including all required supporting information (figures, tables, etc.), to be uploaded directly to the Pre-Operational Testing module of the GSDT.	Pre-Operational Testing is now included as a separate document.	
16	40 CFR 146.82(a)(21)	**Background:** Reviewers were unable to locate any information regarding logging, coring, mechanical integrity testing, or other planned testing for monitoring wells. **Comment:** Please provide details regarding any pre-operational testing planned for monitoring wells associated with the project.	Logging, coring and pre-operation testing is described in the Pre-Operational Testing Plan.	
17	40 CFR 146.87(a)(2) & (3); 40 CFR 146.82(a)(3)(iii); 40 CFR 146.82(c)(7)	**Background:** The Well Construction narrative on p. 8 indicates that the logs/tests in Table 10 are "proposed" but does not indicate which ones Oxy actually intends to conduct. Many of the tests/logs listed are required by regulations, but others are optional. Additionally, spontaneous potential is a required test that appears to be missing from the narrative and tables. **Comment:** Please clarify in the narrative, along with any associated tables or other sources (as needed), which tests Oxy actually intends to conduct. Ensure that, at a minimum, all tests required by regulations are included and will be conducted at the appropriate times (e.g., pre- versus post-casing installation, pre- versus post-cementing, etc.).	The logging and testing plans for monitor wells is located in Pre-Operational Testing Plan, Section 4 (SLR and ACZ wells); Pre-Operational Testing Plan, Section 5 (USDW well); Pre-Operational Testing Plan, Section 6 (water withdrawal wells);	
18	40 CFR 146.82(a)(3)(iii); 40 CFR 146.87(a)	**Background:** Well Construction Table 10 mentions that a Litho Scanner™ will be used to determine mineralogy. **Comment:** What specifically does this tool measure (i.e., what parameters) and how? Are results qualitative or quantitative?	Litho Scanner is described in Section 1.0. Elemental Capture Spectroscopy (ECS) such as Litho Scanner is a tool that is used to quantify elemental dry weight concentrations of key elements such as Calcium, Magnesium, Silicon, Sulfur, Iron,	

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			and others. This data can then be used to determine detailed mineralogy	
19	40 CFR 146.82(a)(6); 40 CFR 146.87(d)(3)	**Background:** Well Construction Table 10 indicates that swab samples of the injection zone only will be taken for geochemistry. However, no indication is provided regarding the specific parameters to be tested, testing methods, etc., similar to the way water quality parameters are provided in Table 9 (p. 11) of the Testing and Monitoring narrative and testing methods are provided in Table 11 (p. 20-21) of the QASP narrative. Additionally, regulations require that baseline geochemical data be obtained on subsurface formations including all USDWs (40 CFR 146.82(a)(6); USDW sampling/monitoring is described in the Testing & Monitoring narrative), and that other physical and chemical characteristics be determined for the injection and confining zone (40 CFR 146.87(d)(2)) and formation fluids of the injection zone (40 CFR 146.87(d)(3)). **Comment:** Please update the narrative to indicate exactly which geochemical parameters will be tested and the planned laboratory testing methods for each, similar to information provided for water quality testing in Tables 9 and 11 of the Testing & Monitoring and QASP narratives, respectively. Also ensure that appropriate geochemical testing is planned and described for both the injection and confining zones.	Table 5 in the QASP plan shows the analytes that will be tested and laboratory testing methods for fluids collected in the Injection Zone, the first permeable zone above the confining zone and in the USDW.	
20	40 CFR 146.82(c)(8); 40 CFR 146.82(a)(21); 40 CFR 146.87(a)(4); 40 CFR 146.89	**Background:** For external and internal mechanical integrity, Region 6 is requiring that applicants conduct all the following tests: (1) a casing inspection log prior to tubing installation; (2) an annulus pressure test after tubing installation; (3) an oxygen activation log (OAL). This is in addition to the required CBL, VDL, and temperature logs required post-cementing under 40 CFR 146.87(a)(3)(ii). **Comment:** Please update the narrative, tables, and any other items as needed to include the above mechanical integrity tests if not already included. Tests should also be described and step-by-step instructions provided as discussed in the next comment.	The narrative and tables have been updated to include mechanical integrity tests if not already included. Tests have been described and documents include step-by-step instructions	
21	40 CFR 146.82(c)(8);	**Background:** Mechanical integrity and other tests (e.g., pressure fall-off, pump or injectivity, step-rate, leak-off, etc.) are listed in Well Construction Tables 10 and 11. However, other than a description of pressure fall-off	For CO_2 injector wells, the following information is found in the Pre-Operations Testing Plan document: MIT (3.3),	

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	40 CFR 146.87(a)(4); 40 CFR 146.89	testing in the QASP narrative (Section 7.0 p. 22-25), no description, procedures, or pass/fail criteria (when necessary) are provided for any of the tests. Any tests Oxy intends to perform should not only be described in a fair amount of detail but should also include step-by-step instructions for how the testing will be performed and what constitutes a pass or fail. **Comment:** Please update the narrative to provide a description of all planned tests, both required and optional, along with procedures for how each test will be performed. Procedures for each test do not need to be highly detailed, but they should contain enough details such that reviewers may adequately evaluate the plans and ensure testing will conform to best practices. Examples of descriptions and procedures that would be considered adequate at this stage may be found in various Class I hazardous no-migration petitions that have been submitted to EPA Region 6 (available via FOIA if desired).	fracture pressure (3.5), pressure fall off (3.7) and injectivity testing (3.6).	
22	40 CFR 146.87(b); 40 CFR 146.82(a)(3)(iii) & (iv); 40 CFR 146.82(c)(7)	**Background:** In Well Construction Table 10, Oxy indicates that 35 sidewall core samples will be taken at depths to be determined during drilling. No whole core sampling appears to be planned for either injection well. **Comment:** Please provide more specific details about planned coring intervals, i.e., how many cores are planned for each interval (injection zone, confining zone, other zones), at what approximate depths (subject to change with drilling), etc. Also, please justify why no whole core is planned for/needed from either injection well.	Appendix A to the Pre-Operations Testing Plan is a justification for why the Project does not intend to acquire additional core in the BRP CCS1 or BRP CCS2 wells. The project does intend to acquire additional core in the BRP CCS3, and a description of the coring plan is provided in Section 3.2 of the Pre-Operations Testing plan.	
23	40 CFR 146.87(b); 40 CFR 146.82(a)(3)(iii) & (iv); 40 CFR 146.82(a)(8); 40 CFR 146.82(a)(21); 40 CFR 146.82(c)(7)	**Background:** No details were located in the well construction, testing & monitoring, QASP, or other narratives regarding the tests Oxy plans to conduct on either whole or sidewall cores taken from injection wells. **Comment:** Please update the narrative to provide details of planned testing to be conducted on core samples, including descriptions and/or specific details of any coring tests to be conducted. Examples: 1) in lieu of "porosity," indicate specifically "total porosity," "diffuse porosity," etc.; 2) for lithology, indicate what tests/methods will be used (e.g., XRF, XRD, SEM, etc.) and what information will be provided; 3) for physical	OLCV does not plan to collect core in the BRP CCS1 or BRP CCS2 injector wells, because these wells will be located within 2,000' of the Shoe Bar 1AZ well. Over 700 feet of core was collected in the Shoe Bar 1AZ, and seismic data shows good stratigraphic and structural conformance between the Shoe Bar 1AZ and the BRP CCS1 and BRP CCS2 locations. OLCV will collect sidewall core in the BRP CCS3. The tests planned to be conducted on these cores are shown in Table 8 of the Pre-Operational Testing Plan.	

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		properties such as rock strength, ductility, and elastic properties, indicate what tests/methods will be used.		
24	40 CFR 146.87(d)(1)	**Background:** Well construction Table 10 indicates that step-rate testing for the fracture gradient will be conducted in the injection zone only. Table 11 indicates that a leak-off test for fracture gradient/MASP will be conducted, but no indication is given showing the zones for which testing will be conducted. **Comment:** Please update the narrative/tables to indicate that all required fracture pressure testing will be conducted at a minimum in both the injection zone and any confining zone(s).	Section 5.0 of the Injection Well Construction Plan and Section 3.5 of the Pre-Operation Plan have been updated to show that minifracs will be conducted in the Injection Zone and in the Upper and Lower Confining Zones.	
25	40 CFR 146.87(d); 40 CFR 146.82(a)(3(iv) 40 CFR 146.82(a)(6); 146.82(c)(7)	**Background:** Other than fracture pressure testing, no other information was located in the narratives, tables, or other locations to indicate that any of the tests/sampling required under the referenced regulations would be conducted, including reservoir fluid temperature, pH, conductivity, reservoir pressure, and static fluid level of the injection zone and any other physical/chemical parameters of the formations and formation fluids in the injection or confining zones. **Comment:** Please update the narrative to include plans for conducting all required testing under the referenced regulations, including testing of the injection and confining zones and any required formation fluids.	Section 5.0 of the Injection Well Construction Plan and Section 3.9 of the Pre-Operation Plan has been updated to show that fluids samples will be obtained from the Injection wells.	
26	40 CFR 146.87(e)	**Background:** Well construction Tables 10 and 11 and Testing & Monitoring Table 1 all indicate that a pressure fall-off test will be conducted in the injection wells as part of the pre-operational hydrogeological testing. However, in addition to pressure fall-off testing, the regulations also require that either a pump test or injectivity test be conducted. **Comment:** Please update the table and narrative to include the use of a pump test or injectivity test in addition to the pressure fall-off test for verification of hydrogeologic characteristics of the injection zone.	Section 5.0 of the Injection Well Construction Plan and Section 3.6 of the Pre-Operation Plan has been updated to show the Injection well testing that is planned.	

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Injection Well Construction				
27	40 CFR 146.82(a)(11)	**Background:** 40 CFR 146.82(a)(11) states that the applicant must provide "Schematics or other appropriate drawings of the surface and subsurface construction details of the well." The same well schematic including well name and location was provided for both wells. **Comment:** Please submit separate updated well schematics that include specific data for each of the two proposed injection wells.	Wellbore schematics have been updated (Figure 3 and Figure 5)	
28	40 CFR 146.86(c)	**Background:** 40 CFR 146.86(c) requires that the applicant provide details regarding tubing and packer materials to ensure compatibility with the CO_2 stream and downhole mechanical integrity. **Comment:** Table 7 provides specifications regarding the tubing used from 0-4350'. The tubing specifications are not included for the lower 30 feet of the well. Please update this section to include the specifications of tubing materials used from 4350-4380'.	Former Table 7 (now 7 and 13) have been updated. Details about material selection are located in Appendix A	
29	40 CFR 146.86(b)(5)	**Background:** 40 CFR 146.86(b)(5) requires that the applicant provide details regarding the compatibility of casing and cement with the CO_2 stream. This includes a confirmation that all additives will be compatible with the CO_2 stream. **Comment:** The applicant should provide details regarding the additives used (Table 8) and demonstrate that those additives will be compatible with the proposed CO_2 stream. The applicant should provide the same demonstration regarding the cement itself. A clear explanation of compatibility of well materials with the CO_2 stream will greatly aid in ensuring the public that CO_2 corrosivity does not present risks to entrapment.	Section 4.5 of the Injection Well Construction Plan and Appendices A and B provide details on casing and cement program and compatibility with the injectate stream.	
30	40 CFR 146.86(b) & (c)	**Background:** 40 CFR 146.86(b) & (c) indicate that the applicant must provide detailed characterization of the formation fluids to ensure compatibility with well materials. **Comment:** The applicant will be required to provide this information once the adequate data is collected during well construction.	Table 22 in the Injection Well Construction Plan lists the geochemical analysis for a fluid sample obtained in the Shoe Bar 1 well at 4,837 ft MD. This sample is interpreted to be highly representative of the Injection Zone. Additional fluid samples will be collected in the Injection wells during construction.	

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31	40 CFR 146.86(b)(1)	**Background:** 40 CFR 146.86(b) requires that the applicant provide a detailed characterization of the CO_2 stream. This includes a discussion of corrosivity of the CO_2 stream along with the quantity, chemical composition, and temperature of the CO_2 stream. **Comment:** The applicant should provide a discussion of the CO_2 that characterizes the chemical content, corrosiveness, temperature, and density of the CO_2 stream. The applicant is also required to provide the methodology behind CO_2 chemical characterization.	The specification of the CO2 injectate stream is presented in Section 3 of the Testing and Monitoring Plan and in Table 21 of the Injection Well Construction Plan.	
32	40 CFR 146.82(a)(11)	**Background:** 146.82(a)(11) specifies that the applicant must provide detailed schematics of the proposed injection well(s). Additionally, all provided details regarding well construction must be consistent throughout the application. Throughout the narrative and schematics, the total depth is 5645'. Table 8 includes cementing details to a depth of 7,300'. **Comment:** Please update the application to include the correct total depth and(or) explain why a depth of 7,300' is included in Table 8.	Schematics have been updated	
33	40 CFR 146.82(a)(11)	**Background:** Construction narrative (pg 5/14) states, " An 8 ¾-in. hole for the long string will be drilled vertically from 1,800 ft to the kickoff point (KOP), and then directionally drilled to TD at 5,645 ft measured depth (MD) while taking deviation surveys every 100 ft." **Comment:** The well schematic (pg 3/13) does not show the kickoff point, end of build, end of hold, and end of drop. The schematic needs to be updated to include those factors. If it is a slight deviation, an exaggerated deviation could be added to provide some idea of the particular location for such deviation. If the bottom hole location is expected to be significantly off from the surface location, a map or projection should be included to show how far away and in which direction the bottom hole location will be from the injector's surface location.	Figure 1, 2 and 4 in the Injection Well Construction plan have been updated to show the orientation of the Injector wells.	
34	40 CFR 146.82(a)(11); 40 CFR 146.86(b)(iv)	**Background:** The narrative, schematic, and casing specifications do not take into account a conductor casing.	Conductor pipe has been added to the schematics and plan.	

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		Comment: For completeness purposes for a permit to construct, conductor pipe needs to be detailed in the construction schematic and drilling plan (depth, borehole or drive hole size, cementing). Please include a conductor casing on the well construction schematic and table casing specifications or explain why one is not being utilized.		
35	40 CFR 146.86(b)(iv)	**Background:** Table 4 Casing Specifications (pg 6/13) shows the long string casing from 4,000 to 5,545 as having a 7-in outer diameter and an 8.681 inner diameter. **Comment:** The inner diameter cannot be larger than the outer diameter. Please correct the discrepancy.	Data has been corrected and plan is updated	
36	40 CFR 146.82(a)(11); 40 CFR 146.86(b)(iv)	**Background:** The surface casing depth unit is not provided in the schematic, similar to other casings depth value units. **Comment:** The well schematic figures reference depths as either MD, TVD, or both; for clarity, please use consistent units throughout (and match Tables 4 through 7).	Document has been updated for consistent depth	
Injection Well Plugging				
37	40 CFR 146.92(b)	**Background:** Section 5.2 Plugging Procedures (pg 7/7) states, "Plug #3: Set a balanced plug with 14.8 ppg CO_2 resistant slurry to cover the Yates Formation (2,700 to 2,800 ft)." **Comment:** Step 13 of the plugging procedures refers to the Yates Formation; however, this layer is not on the plugging schematic or described elsewhere in the application materials. Please clarify why it was not mentioned beforehand or included in the schematic.	Procedures have been updated to reflect learning from 2023 Strat wells.	
38	40 CFR 146.82(a)(11)	**Background:** Section 4.0 Information on Plugs (pg 3/7) states, "The proposed plugging schematic is shown in Figure 1 for Brown Pelican CCS1. The same plugging plan is intended for Brown Pelican CCS2." **Comment:** Figure 1 Brown Pelican CCS1 Injection plugging schematic is provided for both plugging plans (PLG_BRP_CCS1_cbi.pdf and PLG_BRP_CCS2_cbi.pdf). All plugging plans should have a schematic	Wellbore schematics have been updated. Each well has its own wellbore schematics.	

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		corresponding to the appropriate injection well. Please provide a separate schematic for each well, including the correct title and lat/long location.		
39	40 CFR 146.92(b)(4)	**Background:** The injector well schematic and plugging procedures set Plug #3 at 2,700 to 2,800 ft. Therefore, plug #3 will be 1550 ft below the USDW which is at 1150 ft according to the schematic. **Comment:** EPA recommends Plug 3 to be set closer to the base of the USDW. Please refer to the Underground Injection Control (UIC) Program Class VI Well Plugging, Post-Injection Site Care, and Site Closure Guidance, where it is recommended for plugs to extend at a minimum, from the base of the surface casing (required to be set at some distance below the base of lowermost USDW) up through the base of the lowermost USDW.	The proposed procedure has been updated. Plug #7 is to be set at the base of the USDW between 1100 to 1200 ft with base of USDW estimated at 1150 ft.	
40	40 CFR 146.92(b)(4)	**Background:** Section 5.2 Plugging procedure (pg 7/7), Step 12, states "Plug #2: Set a balanced plug with 14.8 ppg CO_2-resistant slurry from the cement retainer (~4,400 ft) to 100 ft above the San Andres Formation." **Comment:** According to the schematic, the top of the San Andres (assuming this is Upper and Lower Combined) is at a depth of 4,007 ft MD, which makes Step 12 inconsistent with Table 2 (which describes a 100 ft plug). Please correct the discrepancy.	Procedure and wellbore schematics have been updated. The discrepancy has been corrected.	
41	40 CFR 146.92(b)	**Background:** This project will involve the use of monitoring wells. **Comment:** Include plugging procedures and plug information for the monitoring wells, including the total depth of the well, depth to the top of the perforations, depth to the base of the confining zone/top of the injection zone, and any other well-specific factors.	The plugging plans for Monitor and Water Withdrawal wells are provided as Appendix A to the Injection Well Plugging plan.	
42	40 CFR 146.92(b)(6)	**Background:** Pg 7/7 Plugging procedures steps 11-14, describe how Plugs #1-4 are going to be set in the injection well. **Comment:** Please clarify the curing time for the cement plugs to set. As a reference, the Well Plugging Guidance (pg 31/73) states an adequate time for setting can vary ranging from 24 to 48 hours.	The curing time for the CO_2 resistant plugs will be determined at time of operation via laboratory testing in compliance with API 10B2 (Testing of Oilwell Cements). OLCV utilizes industry recognized thresholds of 50 psi compressive strength to pressure test and 500 psi compressive strength for physically tagging.	

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			500 psi (or greater) compressive strength will be achieved for abandonment slurries and will be reached in < 48 hours after placement. Information on cement curing is found in section 2.3 of the Injection Well Plugging Plan.	
43	40 CFR 146.92(b)	**Background:** The footnote to Table 2 states that the plugging procedure will be updated as required by EPA and Louisiana regulators. **Comment:** Correct this to refer to Texas regulators.	The footnote has been updated to refer to Texas regulators.	
44	40 CFR 146.92(a)	**Background:** 40 CFR 146.92(a) requires that, prior to plugging, Class VI injection wells be flushed with a buffer fluid, and the EPA Headquarters well plugging guidance document (found at https://www.epa.gov/sites/default/files/2016-12/documents/uic_program_class_vi_well_plugging_post-injection_site_care_and_site_closure_guidance.pdf) states that this buffer or workover fluid "must be compatible with carbon dioxide and carbon dioxide-rich brines and must, therefore, be buffered against low pH conditions that might be encountered downhole." Section 2.0 Planned Tests or Measures to Determine Bottomhole Reservoir Pressure mentions the use of a kill fluid but does not specify its composition. **Comment:** Please provide details of all components planned for inclusion in the kill fluid along with information verifying that the fluid will be compatible with low pH conditions.	All kill fluids that will be pumped will be 10 ppg NaCl brine. [redacted] This information can be found in Section 2.3 of the Injection Well Plugging Plan.	
45	40 CFR 146.89(f)	**Background:** Section 3.0 Planned External Mechanical Integrity Test(s) lists three possible methods for verifying external mechanical well integrity. **Comment:** Include a description of the tests and the methods that will be used to perform them. As part of this, include what conditions constitute passing and failing for each test.	Table 1 of the Injection Well Plugging Plan shows mechanical integrity test methods, and the text now describes the test criteria.	

EPA's Request for Additional Information #3 and OLCV's Responses

Request for Additional Information

[Oxy Brown Pelican (R06-TX-0005)] - [Request #3]

Instructions: Populate the "Response" column with answers/responses to each comment/question below, then upload the completed responses to Field #3 in the "Information Requests" reporting module of the GSDT. If necessary, upload attachments or references in Field #4 of the module and/or update information within other GSDT modules. ***To allow reviewers to quickly locate and review changes/updates, clearly identify the location within the application where edits for each response were made (e.g., Site Characterization, Section 2.7.4, p. 53, updated paragraph 2).***

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
General				
1	N/A	**Background:** There are numerous instances throughout the application where text states "Oxy Low Carbon Ventures, LLC" followed in parentheses by "OLCV." However, several cases were identified where the abbreviation appears to be incorrectly listed as "OCLV," including the Operations narratives (bottom of p. 2, bottom of p. 3) and the Emergency and Remedial Response narratives (at least 15 instances), though there may also be instances that occur elsewhere. **Comment:** Please update narratives to the correct abbreviation throughout the application.	OLCV is the correct acronym. This typo has been corrected.	
2	N/A	**Background:** One recurring issue noted throughout the application (see e.g., RAI #2 pre-op testing comments) is that information often appears to be scattered in multiple sections. This was again noted in reviewing the Operations narrative, where required information was found not only in the Operations narratives but also in narratives for project overview (1.Narrative_BRP_CCS1_CBI.pdf and Narrative_BRP_CCS2_cbi.pdf) and Construction (1.CON_BRP_CCS1_cbi.pdf and CON_BRP_CCS2_cbi.pdf). **Comment:** While there is not necessarily a requirement that all information on a given topic be included in a single narrative section, doing so will significantly speed up EPA's ability to review the application. The more "standalone" a document is, the easier and quicker it is to review.	OLCV has attempted to make the documents "standalone" without dramatically increasing the size of each document.	

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3	N/A	**Background:** Numerous references were noted to be listed in references lists (e.g., overview narrative, AOR narrative) but not actually cited anywhere in the narratives themselves. **Comment:** Please ensure all references listed in the References section of each narrative are cited within the narrative and that all references cited within the narrative are included in the References list.	Reference lists have been QCd and updated.	
4	N/A	**Background:** Some latitude and longitude values in the application are listed as degrees-minutes-seconds (e.g., Facility Information sections at the beginning of various narratives), while latitudes/longitudes in other places are given as decimal degrees (e.g., the well schematic (Fig. 1) of the Construction narrative, Table 5 of the AOR narrative, etc.). **Comment:** It is recommended that values be updated to be consistent throughout the application.	Coordinates have been updated to show decimal degrees.	
Project Narrative				
5	N/A	**Background:** The application narrative for CCS2 (Narrative_BRP_CCS2_cbi.pdf) is missing p. 7 (i.e., it is completely blank). **Comment:** Please update the narrative for CCS2 to include p. 7.	The narrative has been updated and now includes information on three injector wells: BRP CCS1, BRP CCS2, and BRP CCS3.	
6	40 CFR 146.82(a)(11)	**Background:** As previously mentioned in RAI #2 for items related to well construction, the well schematic on p. 11 of both narratives is for CCS1, with a note that CCS2 will be exactly the same. Additionally, wells are planned to be drilled deviated, but those details are also not shown on the schematics. **Comment:** In addition to the well construction narratives, please update the project narratives and any other relevant sections to provide separate schematics that are specific to each injection well as well as schematics that clearly illustrate the plans for drilling both injectors as deviated wells.	Text, figures, and schematics are provided for BRP CCS1, BRP CCS2 and BRP CCS3.	
7	N/A	**Comment:** Please see RAI #1 Item #1 regarding replacing lower resolution in-text figures and/or referencing any higher resolution figures provided separately (applicable to all narratives).	Higher resolution figures are provided where applicable.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
8	40 CFR 146.88(f)(1)	**Background:** In the discussion of mechanical integrity (Section 8.1, p. 20), the project narrative indicates that, in the event a well fails to demonstrate mechanical integrity, OLCV must cease injection. Per the listed regulation, in the event of loss of mechanical integrity, "...the owner or operator must: (1) Immediately cease injection..." **Comment:** Please update the text here and in any other sections as necessary to indicate that injection operations will cease ***immediately*** if mechanical integrity is lost.	The phrase was restated as "Immediately cease injection;"	
9	40 CFR 146.83(a)(1)	**Background:** Table 1 (p. 6) of both project narratives lists the depth used to estimate storage capacity. The depth header indicates the depth is "TVDMD." Is this meant to be TVD (total vertical depth) or MD (total measured depth)? Other figures (e.g., the well construction schematic on p. 11) list both depths separately since the wells are deviated. **Comment:** Please clarify if the depth listed is TVD or MD.	The depth to the top of the Injection Zone is now shown in TVD. This CO_2 Screen tool provides a simple estimate of pore space, and considers the area encountered by all three proposed injection wells. A more robust evaluation of pore space is determined in the dynamic simulation model. The simulation model results are described in the AoR and Corrective Action Plan.	
10	40 CFR 146.83(a)(1)	**Background:** Equation 1 (p. 6) was used as an initial estimate of the storage capacity at the site, but no values were listed for CO_2 density (ρ_{CO2}) or E_{saline}. **Comment:** Please clarify what values were used for the two missing parameters.	Below Table 1, the following notes were added: CO_2 density = 50.40 lb/ft3 E_{saline} = (0.09, 0.13, 0.18)	
11	N/A	**Background:** Narrative Figure 3 (p. 7) shows, among other things, the "CO_2 injected (MMT)," with values stabilizing at approximately 6.5 MMT by 12 years (end of injection). However, 6.5 MMT does not appear to agree with plans to inject up to 0.77 MMT/year (both wells) over the project life, which would be a total injected volume of over 9 MMT. **Comment:** Please clarify if the CO_2 Injected value is meant to be a cumulative volume injected over the project life or something else as well as how the values depicting quantity of CO_2 injected were derived.	For the figure referred, the CO_2 injected is the cumulative injected based on simulation modeling results. An annual volume of 0.385 MMT/year CO_2 will be injected between 2025-2027. Between 2027 to 2037 the Project will inject 0.77 MMT/year. This yields a total of 8.47 MMT CO_2 injected (total cumulative).	
12	N/A	**Background:** For Narrative Section 8.1 of both narratives, paragraph 1 states, "Other than during periods of well workover...maintain mechanical	The repeated text has been removed.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		integrity consistent with 40 CFR 146.89." This same text is then repeated in the very next paragraph (paragraph 2) with additional text added. **Comment:** Please remove one of the duplicated sets of wording.		
Operations				
13	40 CFR 146.82(a)(7)(i)	**Background:** Table 1 of the operations narratives (4.OP_BRP_CCS1_cbi.pdf and OP_BRP_CCS2_cbi.pdf) lists the maximum and average yearly injection rates (metric tons per year), but it does not list the maximum and average daily injection rates and volumes and/or masses as required by 40 CFR 146.82(a)(7)(i). It is unclear if these rates/volumes may simply be divided by 365 to get daily rates/volumes or if any kind of variation is planned/anticipated for injection rates/volumes. **Comment:** Please update Table 1 (and any other application components as needed, e.g., Table 5 of the AOR narratives) to specify the average and maximum daily injection rates/volumes.	Table 1 was updated to maximum and average daily injection rates and volumes as required by 40 CFR 146.82(a)(7)(i).	
14	40 CFR 146.82(a)(7)(ii)	**Background:** The average injection pressure is also not included in Table 1 (p. 1) of the operations narrative for either application as required by 40 CFR 146.82(a)(7)(ii). **Comment:** Please also update Table 1 (and any other application components as needed, e.g., Table 5 of the AOR narratives) to include the average injection pressure for each injector.	Table 1 was updated to include the average injection pressure.	
15	40 CFR 146.82(a)(7)(i)	**Background:** Table 1 of each Ops narrative lists a maximum injection rate (760,660 metric tons/year) that appears to be for each injector. However, in Section 2.9 of the AOR narrative, the narrative (p. 53) indicates that, "…dual slant injectors…are injecting at a total maximum group rate of 40 MMscfd (0.77 MM TPA)," and Table 5 (p. 54) states that the group injection rate for BRP CCS1 and CCS2 will be 2,110 tons/day (which calculates to approximately 0.77 MMTPA). **Comment:** Please update the appropriate section(s), e.g., Ops Table 1, AOR Table 5, etc. of any narrative(s) to clarify if the maximum proposed	Table 1 was updated to clarify the maximum injection rate.	

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		injection rates are per well or a combined total for both wells. If combined totals, please indicate if the amounts per well are split equally (i.e., 50:50).		
16	40 CFR 146.82(a)(7)(i)	**Background:** Table 3 (p. 4) lists the planned injection rates during startup of well operations. The final rate is listed as 1,318 tons/day, which is stated to be 100% of the permit maximum injection rate. However, Table 1 states that the maximum injection rate is 760,660 metric tons/yr (presumably for both wells based on information in the AOR narrative – see previous comment), and Table 5 in the AOR narrative lists the group injection rate as 2110 tons/day (or 1,055 tons/day per well assuming a 50:50 split). **Comment:** Please verify the proposed startup injection rate and/or clarify the difference between that rate and the proposed maximum rate which, based on information elsewhere, appears to be lower.	Table 1 and Table 3 have been updated to reflect the changes.	
Site Characterization/AOR				
17	40 CFR 146.82(a)(3)(iii)	**Background:** On Figure 8 of the AOR narrative (p. 14), the depth of the injection zone formation top is provided in meters, but the confidence interval is listed as 50 ft, and the distance scale bar is also in feet. **Comment:** Please update the figure to show consistent distance/depth units and to correct the units for the confidence interval.	This figure has been updated and also shows depth in feet. Note that "MD" means Measured Depth.	
18	40 CFR 146.82(a)(3)(iv)	**Background:** On p. 18, the AOR narrative indicates that, "Oxy has licensed a number of 2D seismic lines…" **Comment:** Are these data available for review, or is Figure 12 (p. 19) all that is available?	Licensed seismic data is restricted by the data owner in how it can be shared. [redacted]	
19	40 CFR 146.82(a)(3)(v)	**Background:** The low-resolution Figure 14 embedded in the AOR narrative (p. 14) shows seismic activity within 50 miles of the AOR and includes a legend and scale bar. However, the high-resolution image provided separately is missing both the legend and scale bar. **Comment:** Please update the high-resolution version of Figure 14 to add a scale bar and legend similar to the low-resolution embedded image.	This image with a legend is now included in the "High resolution images" Section at the end of the AoR and Corrective Action Plan.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
20	40 CFR 146.82(a)(3)(v)	**Background:** The AOR narrative (p. 20) indicates that Figure 15 (p. 22) shows seismic activity from January 2017 to February 2022 and includes any seismic evens of magnitude 2 or greater. However, Figure 15 shows a date range of 12/31/2016 to 12/21/2021, a magnitude range of 5-9, and a legend with earthquakes of magnitude 1.5 and higher. Additionally, the map itself shows TexNet seismic monitoring stations, not seismic events. Instead, Figure 14 appears to be the map that shows the actual seismic events. **Comment:** Please update Figure 15 to either show earthquake information for the correct dates as indicated by the legend or to show TexNet monitoring stations.	The figure showing existing TexNet monitoring stations is renamed Figure 19. The narrative has been revised to describe that this Figure shows seismic monitoring stations. The date has also been revised.	
21	40 CFR 146.82(a)(5)	**Background:** The referenced regulation requires that maps and stratigraphic cross-sections be provided that indicate "…the general vertical and lateral limits of all USDWs, water wells and springs within the area of review, their positions relative to the injection zone(s), and the direction of water movement, where known." Figures 17 and 18 are maps of the major and minor aquifers in the region, and Figure 19 is a map showing the locations of water wells with respect to the AOR. These three figures show the lateral limits of the USDWs and wells within the AOR but not the vertical limits. There are two well log sections (W_E Well Log Section_cbi.pdf and N_S Well Log Section_cbi.pdf) in the Attachments folder for CCS1 that appear to show the vertical extent of the aquifers but not any water wells. Additionally, these logs do not appear to be referenced anywhere in the narrative to point readers to them. **Comment:** Are the referenced well log sections meant to serve as cross-sections illustrating the extent of the major and minor aquifer (and other layers)? If so, please reference the sections within the narrative(s) or incorporate the sections into the narrative itself. Also, please include locations and depths of water wells (and any other wells) on the cross-sections. If the sections are not meant to serve this purpose, then new cross-sections are needed to illustrate the required information.	OLCV added the water wells to the W-E and N-S well log sections, which are in a separate attachment and also added language in the documentation referring to the respective attachments.	
22	N/A	**Background:** There is a file in the Attachments folder for CCS1 called "All Wells Topo Map_cbi.pdf" that appears to display all wells within the	This file can be deleted.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		outline of the area of interest. However, the resolution is not high enough and API numbers were used to identify wells, such that it is not possible to identify individual wells and their unique identifiers. The file also does not appear to be referenced in any of the narratives. **Comment:** This map is technically not necessary since it shows wells that are located well beyond the project's area of review and other maps show wells within the AOR. If Oxy desires to keep the map as part of the application, please update it to make it legible and allow for individual wells to be distinguished. Also, please reference the map within the appropriate narrative(s) (see Item #1 on RAI #1).		
23	40 CFR 146.82(a)(3)	**Background:** The narrative on p. 33 states, "A total of 158 wells had well log data of sufficient quality to derive petrophysical properties accurately. After comprehensive petrophysical evaluation, porosity logs were generated for these 158 wells, of which 72 are located within the AoI." **Comment:** Is there a map showing where these wells are located (either all 158 or the 72 within the AOI)? Are any of the logs available for viewing?	The well count has been revised and a map is now included: "A total of 164 neutron-density calibrated porosity curves (XPOR) that were QCd by qualified OLCV and Oxy petrophysicsts were used for the porosity model of the BRP geomodel (Figure 31)."	
24	N/A	**Background:** At the end of Section 5.1 (p. 74), the narrative states, "The location of the shallow water well and the legacy oil well labeled as ES-1 are shown in Figure 58." However, Figure 58 (p. 72) is a 3D view of the CO2 plume saturation 50 years post-injection. It appears the correct figure reference should be Figure 59 (p. 73). Additionally, Figure 59 is not labeled with "ES-1" for the legacy well, but instead is labeled with the well's API #. **Comment:** Please update the figure reference to the correct figure number, and please update the figure or narrative to correctly indicate how the legacy well is identified on the figure.	Figure references have been updated.	
Modeling				
25	40 CFR 146.82(a)(13); 40 CFR 146.84	***Comments are provided as a separate attachment along with this RAI table.***		

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
25-1	NA	Reviewers suggest that the applicant consider the possibility that hydrocarbon saturation in the Lower San Andres is possible and discuss qualitatively the potential implications of that on AoR and/or produced fluids management. Please provide a justification for the assumption that the hydrocarbon saturation is negligible, or very low, a discussion of the likelihood of oil liberation under miscible or near-miscible conditions (e.g., by comparing reservoir conditions against established CO2-EOR screening criteria – e.g., Taber et al. (1997)), and a brief discussion on how possible liberation of otherwise non-mobile hydrocarbon phase could affect operations under the operational scenario of Class VI injection with brine production away from the injection well (though it seems very unlikely that any mobilized hydrocarbon would break through to the production well in the designed operational timeframe). Taber, J. J., Martin, F.D., and Seright, R.S. (1997). EOR Screening Criteria Revisited – Part 2: Applications and Impact of Oil Prices. SPE Reservoir Engineering, Vol. 12 (Issue 3), 199-206.	See Section 3.2 of Appendix A to the AOR and Corrective Action Plan. OLCV conducted reservoir pyrolysis measurements on core plugs. The pyrolysis data revealed the absence of any moveable or thermovaporizable hydrocarbons in these samples. [redacted]	
25-2	NA	No-flow boundary conditions were applied to the upper and lower boundaries of the model based on an assessment of effective confining units above and below (Grayburg and Glorieta, respectively). This assumption seems reasonable, but the reviewers suggest that it could be better justified in the narrative by linking the very detailed description of site geology to the statement about assumed no flow top and bottom barriers.	The statement was updated as follows: "No-flow boundary conditions were applied to the upper and lower boundaries of the model, with the assumption that the Injection Zone and Confining Zones are continuous throughout the region. This hypothesis is attributed to the large entry pressure observed in the capillary pressure data (i.e., Figure 43) retrieved from MICP experiments (Section 3.4 in Appendix A, Results of Stratigraphic Test Wells). Further discussion regarding geology site specific to justify the no-flow boundary can be found in Section 2.2.3.3 (Upper Confining Zone) and Section 2.2.3.5 (Lower Confining Zone)."	
25-3	NA	The applicants use a credible and robust approach to estimate the state of stress and maximum acceptable injection pressure. We understand that this analysis is based on estimates from offset wells in adjacent commercial hydrocarbon production operations, so we accept that the estimates are credible, but note that a comparison with a noted	The application was updated to reflect the site-specific data obtained in the Shoe Bar 1 and Shoe Bar 1AZ to estimate maximum acceptable injection pressure and state of stress.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		(estimated) fracture gradient from literature for a different site in the same countysuggests a lower maximum operating pressure than the 2,900 psi determined by theapplicants.		
25-4	NA	Some reviewers raised some concerns about the shape of the modeled domain, which aligned with the shape of the property boundary (extending a set buffer distancebeyond the property boundary on all sides). These reviewers noted that the reservoir (and fluid flow through the reservoir) is not limited by property or jurisdictionalboundaries but is rather constrained only by the specific attributes of the geologicsetting. Based on the assertion mentioned above and the explanation that thesensitivity analysis of boundary conditions was shown to not have a significant effect on the plume and pressure response, the reviewers accept that the boundary extent can be reasonably understood to not have a significant impact on the simulation results. Accepting that the appropriate physics is honored in the numerical simulation, these reviewers still note that computational efficiencies that may be afforded by trimming the modeled domain should be weighed against any perception that numericalmodeling choices are artificially constrained in a way that could cast doubt on forecasts of critical reservoir behavior (pressure, CO2 plume, etc.) and delineated AoR. A model extent that aligns to prevailing geologic features (or is geometrically symmetrical, incases where the reservoir and confining units are laterally extensive) may give somereviewers a greater degree of comfort.	Added language in the documentation to clarify: "The areal extent of the geocellular model (12×10.8 miles) covers the Shoe Bar Ranch lease plus a 1-mile buffer zone around the lease that allowed for the evaluation of pore space under the entire acreage, while also including the northernmost extent of the nearby Penwell San Andres oilfield and the southernmost extent of the TXL oilfield (Figure 25). Well log data from Penwell Field and TXL Field served as crucial control points for the initial geomodel to inform reservoir statistics of all potential injection and confining zones, prior to the acquisition of our two stratigraphic test wells. These offset logs provided important high-density areal log coverage in the north and southeast, surrounding the sparse data coverage in the western part of the lease. In addition, historical production data from the Penwell field permitted model evaluation via simulation-based history matching."	
25-5	NA	The model runs (generating forecasts for CO2 plume and pressure response) for the planned injection period (12 years) and continues for another 50 years post-injection to simulate CO2 migration after PISC. Simulation results show that the pressure stabilizes around 2400 psi and indicate that most buoyant flow of supercritical CO2 will have approached equilibrium. Reviewers note that the method of showing plume and pressure affected area extent at different times through the project operational life cycle, with visual inspection to understand ceasing of plume movement and pressure stabilization is a valid approach. It may also be useful to consider using numerical approaches to understand these important trends, such as spatial moment analysis methods for plume trend analysis (Harp et al., 2020) and related computational tools	Thank you for the additional references. The CMG modeling software allows for inspection of simulation case outputs throughout the Injection and Post-Injection periods. Numerical methods are incorporated into the CMG method. We will continue to consider additional approaches.	

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		(Vasylkivska et al., 2021) to calculate metrics such as time-dependent plume area, location of plume centroid over time, rate of migration of plume centroid, and dynamic evolution of plume spreading in direction of primary and secondary plume axes. Harp, D., T. Onishi, S. Chu, B. Chen, and R. Pawar (2019). Development of quantitative metrics of plume migration at geologic CO2 storage sites. Greenhouse Gasses: Science & Technology 9: 687-702. https://www.osti.gov/pages/servlets/purl/1571599 Vasylkivska, V., G. Lackey, Y. Zhang, D. Bacon, B. Chen, K. Mansoor, Y. Yang, S. King, R. Dilmore, and D. Harp (2021). NRAP-Open-IAM: A Flexible Open-Source Integrated Assessment Model for Geologic Carbon Storage Risk Assessment and Management. Environmental Modelling & Software 143, 105114.		
25-6	NA	A minor issue noted by several reviewers is that the maps provided in the application show only a single point of CO2 injection (single injection well), but the narrative discusses two injection wells (CCS1 and CCS2). Reviewers suggest that this should be addressed prior to final approval of the Class VI permit application. Modification of the model is recommended when site-specific data become available to include improved characterization of fracture pressure/maximum injection pressure, to updaterepresentations of porosity and permeability, and to verify that the capillary entrypressure of the confining zone is greater than the pressure anticipated to occur in the carbon dioxide plume, based on improved simulation.	The locations of the Injector wells have been updated. The new locations are reflected in the geocellular and dynamic modeling results. The text has been updated accordingly.	
25-B1	NA	The reviewers note that the application includes a mixture of English units (including “oil patch” units like bbl) and SI units (metric tons of CO2), which can lead to some confusion (is t/day short or metric tons per day?). Consider choosing one primary unit type (itseems English units is the applicant’s preference) and including a parenthetical note with corresponding SI units.	Units have been standardized to SI, except where OLCV determined it was helpful to show English units.	
25-B2	NA	P. 25 – List the depth of the Dockum or the vertical distance from the Dockum to the injection interval.	AoR and Corrective Action Plan document section 2.2.8 identifies the base of the Santa Rosa formation / Dockum aquifer at a depth range of 600’ to 1,150’ below ground	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
			level and notes at the end of the chapter that "over 2,500' of Rustler through Queen Formation evaporites and regional seal separate the base USDW from the Lower San Andres Injection Zone."	
25-B3	NA	P. 53 – There will be no long-term pressure disturbance with cumulative water withdrawal volume similar to injected CO2 volume, but locally around the injector and producer wells there will be changes in pressure. This should be noted in 2.9.	The rates and descriptions of water withdrawal wells has been updated. These wells are listed in Section 2.9 of the AoR and Corrective Action Plan.	
25-B4	NA	P. 55 – might want to provide references throughout for standard equations.	Key equations, e.g., Peng-Robinson, have references.	
25-B5	NA	P. 59 bottom – Is the [redacted] excess pore pressure?	Prior to the results of the Shoe Bar 1 and Shoe Bar 1AZ wells, the pore pressure required to move the effective stress state to tensile failure was listed as [redacted].	
25-B6	NA	Figures 47 and 48 appear to have no green line in the PDF.	Figures (now 51,52,53) have been updated and no longer reference a green line.	
25-B7	NA	Top of P. 62 seems repeated.	Text has been updated.	
25-B8	NA	Section 3.2.1 add references.	References have been updated.	
25-B9	NA	P. 68 – Using the USDW density (lower than storage formation brine) seems conservative for the Pc calculation. It seems more appropriate that the base assumption be that the reservoir brine density should be used to calculate the critical pressure,since the brine must be lifted to the USDW to flow into/endanger the USDW. Since this is a conservative approach (estimates a larger AoR, and so is therefore more protective), it does not need to be changed.	Noted.	
25-B10	NA	Figure 60 – SNDR is not defined. Generally, it would be useful to include a table of acronyms.	SNDR (meaning San Andres) has been removed; and acronyms have been spelled out at first usage throughout the text.	
25-B11	NA	P. 79 – The reviewers are of the opinion that remediating the Edison-Scharbauer-1 well before 10 years after the start of injection operations	The corrective action schedule has been updated and is shown in Table 17 of the AoR and Corrective Action Plan.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		would be prudent and should be considered by the applicants since that sits within the AoR for the injection well.		
25-B12	NA	On page 55, under equation 4, "So" should be written as (So).	The text now shows, "where So is cohesion and is a function of friction and unconfined compressive strength (UCS)."	
25-B13	NA	On page 62, in the first paragraph, (FPP) is not defined.	FPP refers to Fracture Parting Pressure. OLCV changed the text to "fracture pressure," which is defined in section 6.2	
25-B14	NA	No reference provided for Kerans and Tinker (1997).	This reference is now included in the "References" section and attached in the GSDT.	
25-B15	NA	Explain what "accurately tuned" refers too. Is this referring to performance matching? Provide details on what model inputs were part of the tuning and modification.	Changed the word from "accurately tuned" to "calibrated."	
25-B16	NA	Explain how the transition interval affects the density of both gas and liquid phases. Explain what is known from literature or research on how rapidly the density changes occur, and how that information compares to the simulator's transition rate.	At reservoir pressure and temperature, CO_2 will be supercritical. The effect on density and simulation results due to the transition from liquid to gas is complex. However, the injectate stream for BRP Project does not go through a phase transition, so the density change is not pertinent to the simulation results for this Project. The CMG manual provides further details on phase stability analysis and density calculations.	
25-B17	NA	What model layer is shown by Figure 1?	Previous Figure 1 (now Figure 2) shows the maximum combined extend of the CO_2 and pressure plumes.	

EPA's Request for Additional Information #4 and OLCV's Responses

Request for Additional Information

Oxy Brown Pelican (R06-TX-0005) - Request #4

Instructions: Populate the "Response" column with answers/responses to each comment/question below, then upload the completed responses to Field #3 in the "Information Requests" reporting module of the GSDT. If necessary, upload attachments or references in Field #4 of the module and/or update information within other GSDT modules. ***To allow reviewers to quickly locate and review changes/updates, clearly identify the location within the application where edits for each response were made (e.g., Site Characterization, Section 2.7.4, p. 53, updated paragraph 2).***

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
General				
1	N/A	**Background:** Numerous discrepancies are still being noted between tables and narratives both within a given section and between different sections (e.g., testing & monitoring, well construction, project narrative, etc.). **Comment:** Please thoroughly review/proofread all narratives, tables, etc. and ensure that all numbers, statements, and any other elements are consistent across the entire application.	OLCV has QCd the narratives and tables to ensure consistency.	
2	N/A	**Background:** Beyond the files mentioned in Item #13 below, there are several other files originally submitted to the "Attachments" folder for CCS1 with the initial application submission to the CBI OneDrive that were never uploaded to the GSDT (see last page of this table for a listing). **Comment:** Please confirm whether files in the Attachments folder are still considered part of the most recent application. If so, please ensure the files are uploaded to the GSDT and referenced in the application.	The relevant files have been selected and uploaded to GSDT.	
Project Narrative				
3	40 CFR 146.82(a)(11)	**Background:** Project narrative p. 9 indicates that CCS1 and CCS3 are completed in the G1 subzone and CCS2 is completed in the Holt subzone of the Lower San Andres. However, well schematics in both the Project Narrative and the Construction Narrative appear to indicate that all three wells are perforated essentially throughout the entire Lower San Andres (all three subzones). Measured depths on the schematics and in "Perforations" tables for each well (p. 15, p. 26, and p. 38) in the Construction narrative appear to support this for at least CCS1 and CCS3.	The BRP CCS1 and BRP CCS3 are anticipated to be completed in the G1 subzone. The BRP CCS2 is anticipated to be completed in the Holt. The WBDs in the Narrative and in the Construction document have been corrected to match this completion interval. The Perforation tables in the Construction document have been updated corrected to match this completion interval.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		Comment: Please clarify in the narrative and/or schematics exactly which subzone(s) each injector is completed in and precisely where perforated intervals are planned for each. Please provide clarification in the well construction and any other narratives/figures as needed.		
4	Various	**Other Corrections/Clarifications/Inconsistencies:** ➢ Project Narrative Section 2.5 (p. 8) states that "…the Grayburg with mean average thickness of 23 ft…" – This should read "237 ft" according to AOR narrative Figure 30 (p. 43) and in agreement with stratigraphic columns in the project and AOR narratives. ➢ Paragraph 3 on p. 9 states that BRP CCS1 and BRP CCS2 are slanted injectors – This should read BRP CCS1 and BRP CCS3. ➢ There are multiple discrepancies between the narratives for each injection well and the included schematics, both here and in the Construction narrative (PBI_CON_BRP_v1.pdf): ○ For all 3 injectors, the conductor hole is listed as 24" in Project Narrative "Surface Section" for each (p. 14, 17, and 19) as well as Construction narrative (p. 8, p. 20, p. 32), but listed as 26" on schematics both here and in the Construction narrative. ○ KOP for CCS1 in Project Narrative (p. 15), Construction Narrative (p. 9), and Construction Table 6 (p. 8) listed as 3500 ft MD, but schematics show it as 3600 ft MD/TVD. ○ KOP for CCS2 in Project Narrative (p. 17) and Construction narrative (p. 22) is 3805 ft MD, but 3885 ft MD in Construction Table 12 (p. 19) and 3900 ft MD/TVD on schematics. ○ For CCS2, landing point (5835 ft MD) and TVD (5082 ft) listed in Project Narrative (p. 17) and Construction narrative (p. 22) are off by 1 foot compared to schematics (5834 ft MD/5083 ft TVD). ○ For CCS2, Project Narrative (p. 17) states that tubing and packer will be run to approximately 4100 ft (last line on p. 17), whereas schematics and Construction Table 13 (p. 20) indicate tubing to 4500 ft TVD and packer set at 4500 ft MD. ➢ Section 8.1 (p. 23) indicates that the maximum wellhead start-up injection pressure will not exceed the maximum injection pressure of 1,100 psig (no injector specified). However, the Ops narratives (Table 1, p. 2, and item 3 of Section 4.0, p. 4) and Table 2 (p. 24) of the	➢ "23 ft" has been corrected to "237 ft" ➢ Paragraph 3 on p. 9 has been corrected to read BRP CCS1 and BRP CCS3. ➢ 26" OH is correct and was updated in the Narrative and Construction documents ➢ The KOP for BRP CCS1 is anticipated to be 3500ft. The WBD has been updated to reflect this correction. ➢ The KOP for BRP CCS2 is anticipated to be 3885ft. The WBD has been updated to reflect this correction. ➢ The landing point for the BRP CCS2 is anticipated to be 5835ft MD/5117 ft TVD. The WBD has been updated to reflect this correction. ➢ For BRP CCS2 the tubing/packer depth is recommended to be set at +/-4500'MD. The Narrative has been updated to be consistent with Construction document. ➢ The maximum wellhead start-up injection pressure for BRP CCS1 and BRP CCS3 has is 1,100 psig and the maximum wellhead start-up injection pressure for BRP	

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		project narrative (save for CCS3, which is missing) indicate that the maximum surface injection pressure for CCS1 and CCS3 will be 1000 psig with CCS2 at 1800 psig. ➢ Table 2 (p. 24) contains injection rates and pressures for CCS1 and CCS2, but entries for CCS3 are missing. ➢ Table 2. CO_2 Stream Composition (Narrative p. 25) should be Table 3 (Table 2 is on the previous page as Operating Conditions for CO_2 Injector Wells)	CCS3 is 1,800 psig. These values have been updated for consistency in the Narrative and Operations documents. ➢ BRP CCS3 values have been added to Table 2. ➢ The numbering of Table 2 and Table 3 are updated.	
Operations				
5	40 CFR 146.82(a)(7)(ii)	**Background:** Item 14 in RAI #3 requested that the average injection pressure be included in e.g., Table 1 of the Operations narratives for each injector. The response comment indicates that the application was updated to include this information. However, reviewers were still unable to locate these values. These values are also noted to be missing from Project Narrative Table 2 (p. 24) and AOR Narrative Table 6 (p. 65). **Comment:** Please update all applicable narratives/tables to include average wellhead and/or bottomhole injection pressures in addition to the maximum wellhead and bottomhole injection pressures already included.	Maximum surface wellhead pressure, maximum bottomhole injection pressure and average bottomhole injection pressure have been added to the Operations narratives.	
6	40 CFR 146.82(a)(7)(i); 40 CFR 146.90(b)	**Background:** The referenced regulation requires average and maximum daily volume and/or mass as well as the total anticipated volume and/or mass to be reported for each injection well in addition to average and maximum daily rates. These quantities are missing from Table 1 of all 3 Ops narratives as well as Narrative Table 2 (PBI_Narrative_BRP_v1.pdf, p. 24) and AOR Table 6 (PBI_AOR_BRP_v1.pdf, p. 65). **Comment:** Please update all applicable tables/narratives to include average and maximum daily volumes and/or masses as well as total injection volumes and/or masses for each injection well.	Maximum daily injection mass., average daily injection mass and total injection mass has been added to Table 1 of the Operations documents.	
7	N/A	**Other Corrections/Clarifications/Inconsistencies:** ➢ Equation 1 (p. 2) of the Operations narrative for CCS2 (PBI_OP_BRP_CCS2_v1.pdf) incorrectly states that 90% of the maximum downhole injection pressure is 2,406.5 psia – This pressure should be 3,406.5 psia.	➢ Equation 1 pressure was corrected to 3,406.5 psia.	

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		➢ Table 3 (p. 4) of the CCS2 Operations narrative lists the final startup rate as 1319 tons/day, which is higher than the average daily injection rate of 1112 tons/d listed in Table 1 as well as in Table 2 of the Project Narrative. Both CCS1 and CCS3 have a maximum startup rate of 455 tons/d each, which is essentially the same as the planned average daily rate (450 metric tons/d) listed in Table 1 of the respective Ops plans, whereas CCS2 is approximately 20% higher. – Confirm that 1319 tons/d is correct. ➢ Table 1 (p. 2) of the CCS3 Ops plan (PBI_OP_BRP_CCS3_v1.pdf) has "BRP CCS2" listed in the entries for maximum injection rate and average injection rate instead of "BRP CCS3." ➢ Section 4.0, list item (3), of the CCS3 Ops plan lists the maximum surface wellhead injection pressure as 1,800 psig. However, Table 1 of the same narrative, as well as other tables/narratives, indicates that the maximum pressure is only 1,000 psig.	➢ The maximum and average injection rates have been updated. ➢ Typos referring to BRP CCS2 in Table 1 of the CCS3 Operations plan have been corrected. ➢ The maximum surface well head pressure has been corrected to be 1,100 pisg in Section 4.0, list item 3.	
Site Characterization/AOR/Corrective Action				
8	40 CFR 146.82(a)(2)	**Background:** Item #10 in RAI #1 requested a map that includes all features required under 40 CFR 146.82(a)(2). In response, the AOR narrative (PBI_AOR_BRP_v1.pdf) was updated and Figure 1 (p. 7) added, satisfying all aspects of this requirement except for legacy wells (oil/gas and water) being shown but not labeled on the map. **Comment:** Please update AOR Narrative Figure 1 to identify the names (or other identifier, e.g., API or serial number) of each legacy well (3 oil/gas, 1 water). It is also advisable to update this information on Figure 1 (p. 4) of the ERR narrative (PBI_ERR_BRP_v1.pdf). Alternatively, Testing & Monitoring narrative Figure 7 (PBI_TM_BRP_v1.pdf, p. 37) shows all required information, including soil gas monitoring and GPS stations, save for the legacy water well (not shown/labeled) and could be used and included here instead with the addition of the water well.	Figure 1 is updated with the API/identifier numbers of heritage AP's. If API numbers for BRP Project wells have been created, they are also shown.	

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9	40 CFR 146.82(a)(3)(ii)-(v)	**Background:** Regarding Item #18 of RAI #3, Oxy indicated it had acquired proprietary 2D/3D seismic lines covering the AOR, and that viewing these data could be discussed with EPA Region 6. A discussion of this seismic data was provided in Sections 2.2.3 and 2.2.4 of the AOR narrative (PBI_AOR_BRP_v1.pdf) along with seismic images (Figures 9 (p. 17), 15 (p. 26), and 16 (p. 27)) and an image of amplitude extractions (Figure 10, p. 18). A presentation with further discussion points and additional seismic images was provided to Region 6 staff in a virtual meeting on 4/15/2024. **Comment:** Based on the presentation and discussion from 4/15/2024, please update the application to include the additional seismic and other images presented. Ensure that any additional information related to other discussion points (e.g., faulting in deeper layers, seismic changes and the interpretation of the depositional environment, etc.) and project plans (e.g., planned seismic monitoring, sufficiency of sidewall core data only in CCS3, etc.) is included.	These data and interpretations are included as "Attachment D" to the AOR chapter of this application.	
10	40 CFR 146.82(a)(3)(iii)	**Background:** AOR Appendix A (p. 4-6) indicates whole core was taken from the Lower San Andres only, with rotary sidewall cores taken from the upper and lower confining zones. At the Shoe Bar 1 test well, 681 horizontal plugs were taken from the whole core of the injection zone, and 78 sidewall cores were taken in the confining zones. For the Shoe Bar 1AZ test well, 50 horizontal plugs were taken in the injection zone, and 51 sidewall cores were taken in the confining zones. **Comment:** Please explain why no whole core was taken of the confining zones. Also, please explain the significantly higher number of cores taken at Shoe Bar 1 compared to Shoe Bar 1AZ. Note also that Region 6 is requesting for Oxy to update the Pre-Op Testing plan to include acquisition of whole core in both the injection and confining zones since whole core was not obtained in the confining zones for either stratigraphic test well (See also Item #27 below.)	In Section 3.1.1 of Appendix A to the AoR the plugging plan was clarified. In summary, fewer horizontal plugs were cut from whole core in the Shoe Bar 1AZ than in the Shoe Bar 1 because a greater number of plugs were not needed to confidently constrain the rock properties of the Injection Zone. From the upper confining zone, 50 feet of whole core was collected in the Shoe Bar 1 and 12 feet of whole core were collected in the Shoe Bar 1AZ. OLCV added Section 4 of Appendix A to the AoR to specifically describe details and results of data collected in the upper confining zone. In addition, see Section 5 of Appendix D to the AoR for detailed results and conclusions on integrity of the upper confining zone and upper confining system.	

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			OLCV acknowledges the request of Region 6 for additional whole core data in the confining zone. However, OLCV demonstrates in Section 5 of Appendix D that no further core data is required to meet the requirements of 40 CFR 146.82(a)(3)(iii) and that the confining zone and upper confining system will prevent migration of CO_2 to the USDW.	
11	40 CFR 146.82(a)(3)(iii)	**Background:** According to AOR Appendix A, Oxy conducted numerous tests on whole and sidewall core plugs obtained from the injection and confining zones in both stratigraphic test wells, including 731 porosity and permeability measurements (p. 6) (including both horizontal and vertical permeability per Table 3 p. 5), 217 XRD measurements, 172 thin sections, and 10 SEM images (p. 28). However, only average porosities and permeabilities (presumed to be horizontal) and very general lithological descriptions were reported for the injection and confining zones (p. 28) along with graphs of whole rock mineralogy at various depths for the injection zones only. **Comment:** Please provide additional core characterization data, including data for both the injection and confining zones. Potential data to provide may include, but is not limited to, raw porosity/permeability/grain density values in addition to averages; images or other information for representative XRD, SEM, and thin sections; and additional whole rock mineralogy data. Also, please expand AOR Appendix A Figure 14 (perhaps to a full page), as it is difficult to read the mineralogical compositions at the various depths since they are so close together (nearly double the total depth is shown compared to Figure 15, which is much easier to read).	Data was loaded into GSDT as part of the information request.	
12	40 CFR 146.82(a)(3)(iii)	**Background:** Figure 39 (p. 52) of the AOR narrative, which is the same as Figure 5 (p. 10) of AOR Appendix A (PBI_AOR_BRP_Appendices_V1.pdf) is difficult to read (resolution issues), including the footnotes denoted on Track 8. Also, porosities, permeabilities, and grain densities are plotted for core plugs and full-diameter cores for samples from the injection zone, but no values are plotted for any of the sidewall cores in the upper or lower confining zones. Lastly, are the logs shown the only logs available? Other	Higher resolution plots were created of the Shoe Bar 1AZ log, Figures 29 and 39. Porosities, permeabilities and grain densities are plotted for Injection Zone, Upper and Lower Confining Zones. key logs acquired are shown on the plot. All log files were uploaded to the GSDT.	

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		logs were indicated to have been run (see e.g., AOR Appendix A Tables 1 & 2, p. 2-4), but nothing other than those in Figure 39 was included. **Comment:** Please provide a higher resolution image of Figure 39/Figure 5 in each narrative. Also, can the core values for porosity, permeability, and grain density also be plotted on the figure similar to those for the injection zone? Lastly, please provide any other logs available for review.		
13	40 CFR 146.82(a)(5) & (6)	**Comment:** The following files are referenced in the AOR Narrative and were originally submitted in the "Attachments" folder in the CBI OneDrive for CCS1 as part of the original application submission, but they were never uploaded to the GSDT. If Oxy wishes for these files to be considered as part of the official application submittal, please ensure they are uploaded to the GSDT. (See also Item #2 above.) ➢ Well logs and cross-sections requested to be updated and included as part of RAI #3 Item 21 (see also p. 35-36): N_S Well Log Section_cbi.pdf, W_E Well Log Section_cbi.pdf, W_E Regional Cross Section_cbi.pdf ➢ Water analyses contained in "SBR Water Wells Map_cbi.pdf" subfolder (p. 35; also requested in RAI #2 Item 8 as part of request for analysis from BRACS 1258, if available, or other area water wells) ➢ TWDB GAU letters (Attachments subfolder "GAU Letters") (p. 35) ➢ Gamma ray well log responses for BRACS 1258 (Attachments subfolder "BRACS Wells") (p. 35) ➢ Stratigraphic N-S and W-E cross-sections with correlated Pecos Valley and Dockum aquifers (W_E Well Log Section_cbi.pdf, N_S Well Log Section_cbi.pdf) (p. 36) ➢ Structural maps for the Pecos Valley and Dockum Aquifers (Base Dockum Aquifer_cbi.pdf, Base Pecos Valley Aquifer_cbi.pdf, Top Dockum Aquifer_cbi.pdf) (p. 36)	Files have been selected and uploaded to GSDT. PBI_BRP_AOR_Additional_Supporting_Information_June_2024.zip	
14	40 CFR 146.82(a)(3)(iii)	**Background:** AOR narrative p. 64 states that BRP CCS1 is completed in the G1 subzone of the Lower San Andres, which has approximately 350 ft gross thickness. The next paragraph states that BRP CCS3 is also completed in the G1 subzone, which has a thickness of approximately 450 ft. However, isopach maps and cross-sections indicate a thickness of approximately 100 ft across CCS1 to CCS3.	The G1 is approximately 350 feet thick and the G4 is approximately 450 thick. Maps and cross sections are consistent with these thicknesses. The Holt sub-zone is approximately 200 feet thick, and BRP Project is targeting approximately 100 feet within that zone.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		Comment: Please confirm if the values listed for thicknesses at CCS1 and CCS3 are correct at 350 ft and 450 ft, respectively.		
15	40 CFR 146.84(d)	**Background:** With the updated application, there are now three legacy oil/gas wells within the AOR. Based on the AOR narrative and Figures 78 and 79 (p. 101-102), all three legacy wells are intercepted by the pressure front within 5 years. The narrative indicates that the Eidson E-1 well will be remediated prior to the commencement of injection operations, but the other two wells will not be remediated until two years after injection begins. However, Region 6 believes that all remediation should be completed before injection operations begin for any wells intercepted by the plume and/or pressure front within the first five years of operations. **Comment:** Please update the narrative and plans to indicate that remediation of all three legacy wells will be completed prior the start of injection operations. (Note also that the Project Narrative (p. 11-12) and AOR Appendix B (p. 53) also discuss this same remediation schedule as above and should be updated in addition to the AOR narrative.)	Text in 5.2.2 of the AoR document is updated with the following: "OLCV will conduct corrective action on three heritage APs: Eidson- E-1(API 4213531130), Scharbauer Eidson-1 (API 4213510667) and Eidson Scharbauer-1 (API 4213506139) prior to commencement of CO_2 injection operations." In AOR Appendix B, 2.1.3, text is updated to the following: "OLCV will conduct corrective action prior commencement of injection." In the Narrative section 3.0, text is updated to the following: "To conservatively protect the USDW, OLCV will perform corrective action on these three wells prior to commencement of CO2 injection operations."	
16	40 CFR 146.84(b)(2)(iv); 40 CFR 146.84(d)	**Background:** In the Corrective Action section of the AOR Narrative (Section 5.2.4, p. 107 et seq), remedial plugging procedures seem to indicate that CO_2-resistant cement plugs will only be used in plugs below the 2700-2800 ft plug in each of the three remediated wells. However, plugging schematics all appear to indicate the use of CO_2-resistant cement in all plugs regardless of depth. **Comment:** Please clarify if CO_2-resistant cement will be used in all plugs or only certain ones. Region 6's expectation is that CO_2-resistant cement will be used for all plugs in remedial cementing jobs of legacy wells.	The plugging procedures and diagrams have been updated to show CO_2 resistant plugs in plugging procedures performed for this Project.	
17	40 CFR 146.84(b)(2)(iv); 40 CFR 146.84(c)(2)-(3)	**Background:** There are numerous conflicts and/or missing values between the corrective action schematics (Section 5.2.4, Figs. 83 through 88) in the AOR Narrative, AOR Appendix B Table 5a (p. 7-8; pdf p. 53-54/217), and the well/plugging records provided for each of the wells being remediated. Additionally, values are listed that do not appear to be supported by information contained in the well records (e.g., hole sizes, sx of cement).	AOR Appendix B, Table 5 is QCd and/or corrected to match well records. In the AOR, wellbore diagrams (Fig 83-88) were corrected to match AOR Appendix B, Table 5.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		Comment: Please review the well records, schematics, and tables to ensure all values in all locations match and are supported by evidence from well records. If information was derived from other sources, please indicate as such and provide those sources.		
18	40 CFR 146.84(b)(2)(iv); 40 CFR 146.84(c)(2)-(3)	**Background:** Per Table 2 of AOR Appendix B (p. 4; pdf p. 50/217), the only records available for all three wells were plugging records. Additionally, well records provided for Eidson E-1 appear to contain contradictory information, with the first page of the pdf records packet listing one set of plugging depths (depicted on Fig. 83 of the AOR narrative and in Table 5a of AOR Appendix B), while p. 8 and 9 appear to list different plug depths/lengths (though they are generally illegible). **Comment:** The availability of completion records in addition to plugging records would be ideal. Despite this, and regardless of discrepancies that may exist in the records provided, note that EPA Region 6 expects that all plug depths and thicknesses will be confirmed as part of remedial operations in all three legacy wells.	Plugging records for this well were located at the Texas Railroad Commission library. The records were stored in microfilm format. No original, printed copy of the records was located and/or preserved. OLCV will confirm wellbore and take corrective action on the Eidson E-1.	
19	40 CFR 146.82(a)(5); 40 CFR 146.84(b)(2)(iv); 40 CFR 146.84(c)(2)-(3); 40 CFR 146.84(d)	**Background:** On corrective action schematics (AOR Narrative Figs. 83-88), no base of the USDW is listed for the Eidson E-1 or the Scharbauer Eidson 1. For the Eidson-Scharbauer-1, a USDW base is listed at ~1015 ft at the base of the Santa Rosa. Plugs proposed as part of remediation plans appear to cover what would seem to be the base of the USDW (50 ft below, 50 ft above) in each well (850-950' in Eidson E-1; 1115-1215' in Scharbauer Eidson 1; and 965-1065' in Eidson-Shcarbauer-1) based on the USDW occurring between 600-1150 ft below ground level (AOR Narrative p. 35), but it is not clear how this base was determined/identified for individual wells. **Comment:** Please clarify how the base of the USDW was determined at each well planned for remediation, as this has implications for placement of plugs during remedial operations. If values were estimated from structure maps (base USDW, e.g., AOR Fig. 69, p. 92) or cross-sections, please provide those maps/cross-sections with these wells and all other	Please refer to Section 2.4 of Appendix B to the AOR for a description and tabulation of USDW depths in artificial penetrations.	

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		current/proposed wells in the AOR, including project wells, plotted so that reviewers can also verify these depths with location.		
20	40 CFR 146.84(c)(2)	**Background:** For the Eidson-Scharbauer-1, plugging records were provided with the updated GSDT submission (November 2023). However, plugging records for the later re-entry and re-plugging of this well were not provided in the latest GSDT submission despite being provided originally in the CBI OneDrive with the original application submittal. **Comment:** Please provide the re-entry records for this well in addition to the original records, particularly since plugs shown on AOR Figs. 87 and 88 (and AOR Appendix B Table 5a) are based on those records.	Records were resubmitted in GSDT: PBI_BRP_Eidson-Scharbauer-1_AP_records.zip	
21	40 CFR 146.82(a)(3)(iii)	**Background:** AOR Appendix A (p. 23) indicates MICP testing on samples from Shoe Bar 1AZ are ongoing (as of November 2023 submittal). The same is also indicated in Section 3.8 (p. 33) for the geomechanical testing of Shoe Bar 1AZ whole and rotary sidewall cores. **Comment:** Have these results been received yet? If so, please update the application to include them.	The results of MICP analysis the Shoe Bar 1AZ have been recently received. Injection Zone results are now included in the text of AOR Appendix A. Interpretation is ongoing for the results for the Upper and Lower Confining zones and can be included in the future.	
22	40 CFR 146.84(c)(2)	**Comment:** Since the stratigraphic test wells have been constructed and are now APs within the AOR, please submit the as-built plans and schematics for those wells. Also, please submit plans/schematics for any other wells that have been drilled thus far (e.g., USDW, water withdrawal, etc. – see Pre-Op Testing Narrative Table 1, p. 4).	The as-built plans and plugging diagrams are included in Appendix A to the Plugging plan.	
23	40 CFR 146.84(e)	**Background:** AOR Narrative Section 6.1 (p. 119) indicates that, after an AOR re-evaluation, the report will be submitted to the EPA within 1 year. **Comment:** Please update the narrative to change the time for submitting the report from one year to 90 days. Reports should generally be submitted as soon as possible, particularly in instances where corrective action and/or a major modification to the AOR or other plans may be warranted/required.	Changed text to “90 days”	
24	Various	**Other Corrections/Clarifications/Inconsistencies:**		

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		➢ Item 17 of RAI #3 indicated that Figure 8 (p. 14) of the original AOR narrative, now Figure 11 (Structure map of the Top Lower San Andres Formation; p. 20 & p. 137) of the updated narrative (PBI_AOR_BRP_v1.pdf), lists the confidence interval as "50 ft" while the elevation listed in the color scale is in meters. The comment response indicated the figure was updated and now shows depth in feet, with MD referring to measured depth. However, this update appears to be for a different figure, as Figure 11 still shows "CI = 50 ft" but depth in meters.	Depth structure maps have been updated to show a color bar and scale in feet.	
		➢ P. 28-29 of the AOR narrative states, "Recent seismicity 25 miles of the Project site…," but the statement appears to be missing the direction (believed to be NE based on Figure 18 (p. 30) and its caption.	Updated text to indicate a North – Northeast direction.	
		➢ Paragraph 1 on p. 28 of the AOR narrative indicates that the list of seismic networks, monitoring stations, etc. are provided in Attachment A rather than "Appendix C" as in Paragraph 2 on p. 28.	Updated text to indicate "Appendix C" instead of "Attachment A."	
		➢ Paragraph 1 (p. 28) of the AOR narrative was also revised in response to RAI #3 Item #20. However, the revised wording seems to indicate that Figure 18 depicts USGS seismic events through Dec. 2016, while Figure 19 depicts TexNet seismic events from Jan. 2017-Feb 2022. However, Figure 19 depicts TexNet seismic monitoring stations, not seismic events. Also, the narrative states Figure 19 is through Feb 2022, while Figure 19 itself and its caption both state November 2023.	Updated text to indicate that TexNet data in Figure 19 includes the period from January 2017 – November 2023. The colors and sizes of the circles in Figures 18 and 19 correspond to the magnitude of the events. In addition to seismic monitoring stations, Figure 19 now shows seismic events.	
		➢ AOR Narrative Figure 29 (p. 42) – is there a higher resolution image available of this figure?	A higher resolution well log has been created for Figure 29.	
		➢ Numerous max bottomhole pressures and reference depths do not match between the AOR Narrative (p. 64), AOR Narrative Table 6 (p. 65) and the Ops narratives for CCS1, CCS2, and CCS3 (p. 2 of each). Pressure values do not appear to be simply a difference between some values listed as psig and some as psia. – Verify that all depths, pressures, etc. agree between all sections of the application. Also recommend sticking with either psia or psig across all sections.	Updates have been made to Table 6 in the AoR document, AoR narrative and the Operations documents for consistency.	
		➢ AOR Narrative Table 6 (p. 65) lists the "Z bottom" for BRP CCS2 as 5,087 ft, which is shallower than Z top (= 5,115 ft).	Depths for BRP CCS2 have been updated.	
		➢ AOR Narrative Table 8 (p. 70) – last row lists the G1 subzone as part of the Upper San Andres, not the Lower San Andres.	The G1 is part of the Lower San Andres. This has been updated.	

Item #	Associated Regulation(s)	Comment/Question	Applicant Response to Comments	EPA Responses to Applicant Comments
		➢ AOR Narrative Table 10 (p. 79) – based on Table 8 of AOR Appendix A (p. 15), the values listed are for Shoe Bar 1AZ, not Shoe Bar 1. ➢ AOR narrative p. 38 states that, "The areal extent of the geocellular model and the simulation model are shown in." Is there meant to be a figure referenced in this statement? ➢ AOR narrative p. 51 contains the same paragraph twice ("The final log-derived permeability for the Injection Zone was computed using the Lucia RFN transform and delivered as in input to the static geological model. The log plot (Figure 39) from Shoe Bar 1AZ shows the match between core measured data (porosity and permeability) and log-derived porosity and log-derived Lucia RFN based permeability.") ➢ AOR narrative p. 71 states, "__ is an example from 4,700 ft TVD, but the same exercise was conducted throughout the depth interval of the San Andres Formation with little change in the final interpretation." – (underline/space added). No figure number is given. ➢ AOR Appendices – Document header indicates "Attachment A - Seismic Stations" despite document containing 3 separate appendices. ➢ AOR Appendix A Table 2 (p. 3-4; pdf p. 3-4/217) – wireline resistivity and caliper log entries are duplicated. ➢ AOR Appendix A Table 6 – Pressure (psia) and Temp (deg F) headers need aligned with the correct columns. ➢ AOR Appendix A narrative p. 14 indicates formation names and depths listed in Appendix A Tables 5 and 6, but formation names are missing. ➢ AOR Appendix A p. 28 (paragraph 3) describes lithology and average porosity/permeability for the G1 subzone as "…stacked mud-dominated packstones (MDPs) and GDPs…(average porosity = 11.2%, average permeability = 12.0 mD)" but then again as "…wispy wackestones…(average porosity = 9.7%, average permeability 1.9 mD)." One of these descriptions should likely be for the G4 instead. ➢ AOR Appendix A Figure 18 (p. 35) – Is a higher resolution image available? ➢ AOR Appendix B Figures 6a, 6b, and 6c (p. 18-19/26; pdf p. 64-65/217) – based on Appendix B Figure 4 (p. 15) (and others), the northernmost well shown on these 3 figures should be the Eidson-Scharbauer-1, not the Scharbauer Eidson.	Table 10 has been updated to refer to Shoe Bar 1AZ. Text corrected: The areal extent of the geocellular and simulation model is shown in the yellow outline in Figure 25. Deleted duplicate text. Updated missing text to refer to Figure 53. Updated Deleted duplicate text. Corrected table headers. Formation names were added to Tables 5 and 6 in Appendix A to the AoR document. Text was corrected to refer to G1 and G4. A higher resolution image of Figures 18, 20, 22 and 24 are uploaded. Figures were updated to show correct well names and API numbers.	

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Financial Responsibility				
25	40 CFR 146.85	***This module will be subject to final review upon the completion of all other technical modules. Please ensure this module is updated to reflect the most current version of your application while making revisions in response to RAIs.***	This module will be updated by 7/10	
Pre-Operational Testing				
26	40 CFR 146.87(a)(2) & (3); 40 CFR 146.82(a)(3)(iii); 40 CFR 146.82(c)(7)	**Comment:** The following tests still appear to be missing from updated tables and/or the information appears to conflict between different sections: ➢ Pre-op Testing Table 8 (p. 14-15) and Well Construction Table 27 (p. 42-43) – resistivity, SP, and caliper logs are listed for intermediate and production casing but are missing for surface casing. ➢ Well Construction Table 27 – missing temperature log for cased holes (correctly included in Pre-Op Testing Table 8). ➢ Deviation surveys – Pre-Op Testing Table 8 shows these being conducted every 100 ft, but Well Construction Table 27 indicates they will be done every 200 ft – please clarify which is correct.	Table 10 I the Pre-Op plan (formerly Table 8) and Table 27 of the Construction document have been updated to show surface logging of SP, Resistivity and Caliper. In the Construction document, Table 27 was updated to show temperature logs. Deviation surveys were changed to every 100 ft.	
27	40 CFR 146.82(a)(3)(iii); 40 CFR 146.82(a)(21); 40 CFR 146.87(b)	**Background:** Based on Pre-Op Testing narrative Section 2.3 (p. 11) and AOR Appendix A Section 2.2 (p. 4), it appears that whole core was taken only in the injection zone, with rotary sidewall cores taken in both the confining and injection zones. Region 6 believes that whole core acquisition in the confining zones, particularly the upper confining zone, would have been more beneficial and preferred to sidewall cores only. (See also Item #10 above.) **Comment:** Since no whole core was acquired in the confining zones, please update the pre-op testing narrative and tables to include the collection and characterization of whole core in both the confining and injection zones during drilling of at least one of the three injection wells.	Section 4 of Appendix A to the AoR for detailed results on integrity of the Upper Confining Zone and Upper Confining System. OLCV acknowledges the request of Region 6 for additional whole core data in the confining zone. However, OLCV demonstrates in Section 5 of Appendix D that no further core data is required to meet the requirements of 40 CFR 146.82(a)(3)(iii) and that the Upper Confining Zone and Upper Confining System will prevent migration of CO_2 to the USDW.	
28	40 CFR 146.82(a)(6); 40 CFR 146.87(d)(3)	**Background:** In response to RAI #2 Item #19, Oxy indicated that QASP Table 5 shows the analytes that will be tested and the laboratory testing methods that will be used for fluids collected in the injection zone, the first permeable zone above the confining zone, and the USDW. However,	QASP Table 6 has been updated with different procedures because a OLCV selected a different laboratory to perform the analyses. After further discussion with geochemical experts, noble gas analyses has been removed from the list	

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		there is no mention in the pre-op testing and well construction narratives directing readers to this table in the QASP plan. **Comment:** Please either update the narrative to direct readers of the pre-op testing and construction plans to QASP Table 5, or duplicate QASP Table 5 within the appropriate narrative sections for pre-op testing (e.g., Section 3.9) and well construction (e.g., Section 5.0). Please ensure that all tests listed will be conducted and that tests match those described in the narratives (Section 3.9 and Section 5.0), since Table 5 also includes other tests such as isotopic analyses, dissolved gas sampling, etc.	of planned tests because it is expected to yield inconclusive results. QASP Table 6 lists the analytes that will be tested and laboratory methods. This table was copied into the Pre-Operational testing plan and is listed as Table 14 (Injection Zone Injectors), Table 16 (Injection Zone Monitors) and Table 18 (lowermost USDW). In the Construction document, the text was updated to direct the reader to either Table 14 in the Pre-Operational Testing Plan or Table 6 in the Quality Assurance and Surveillance Plan. In Section 3.9 of the Pre-Operations document, the test is updated: "OLCV will collect fluid and dissolved gas samples in each of these zones." Section 5.0 of the Construction plan is updated: "The fluid and dissolved gas samples."	
29	40 CFR 146.82(c)(8); 40 CFR 146.82(a)(21); 40 CFR 146.87(a)(4); 40 CFR 146.89	**Background:** Various tables in the pre-op testing narrative were updated to include the use of an oxygen activation log (activated pulsed neutron log) in response to RAI #2 Item #20. However, no narrative description and step-by-step instructions were included for the OAL or for a standard temperature log. **Comment:** Please update the pre-op testing narrative to describe both an OAL and temperature log and provide step-by-step instructions for how each will be conducted.	Section 3.11 has been added to the Pre-Operational Testing plan to describe oxygen activation logging.	
30	40 CFR 146.87(d); 40 CFR 146.82(a)(3(iv) 40 CFR 146.82(a)(6); 146.82(c)(7)	**Background:** In response to RAI #2 Item #25, Section 5.0 of the Well Construction plan and Section 3.9 of the Pre-Op Testing plan were updated to show that fluid sampling will be conducted in injection wells. Both narratives indicate that samples will be tested for "pH, conductivity, alkalinity, major cations, major anions, trace metals, dissolved gases, density, and TDS among others." However, neither narrative specifies which cations, anions, trace metals, or dissolved gases will be tested,	Table 14 in Section 3.9 of the Pre-Op plan has been updated with details on the fluid and dissolved gas testing plan. Section 5.0 of the Construction plan has been updated to refer back to Table 14 in the Pre-Op plan. Section 3.12 of the Pre-Op plan was added. This section describes fluid level testing in the injection wells. Section 5.0	

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		similar to what is shown in Table 7 (p. 13) and Table 13 (p. 27) of the Pre-Op Testing narrative or Table 13 (p. 30-31) of the Testing & Monitoring narrative. Additionally, static fluid level measurements are required but are also missing in both the Pre-Op testing and Well Construction plans. **Comment:** Please update the pre-op testing narrative to specifically indicate all analytes to be tested in injection zone formation fluids of the injection wells along with the proposed analytical methods for each analyte. Alternatively, reference one of the above-mentioned tables, assuming all analytes listed in the given table will be tested in the formation fluids and using the listed analytical methods. If referencing Pre-op Testing Tables 7 or 13, please clarify exactly which methods will be used for ICP, IC, titration/IC, and methylene blue testing (similar to T&M Table 13 for USDW sampling). Please update the plans to indicate that static fluid level measurements are planned for each injector as required.	of the Construction plan has been updated to refer back to 3.12 of the Pre-Op plan.	
31	40 CFR 146.82(a)(21)	**Background:** Pre-Op Testing narrative Table 12 (p. 26) and Table 18 (p. 31) list testing/logging to be conducted in the SLR and ACZ monitoring wells (Table 12) and the water withdrawal wells (Table 18). However, Sections 4.5 (p. 29) and 6.3 (p. 32) only discuss the APT, baseline temperature logs, and the USIT. **Comment:** Please confirm if all the tests/logs in Table 12 and Table 18 will be run on SLR/ACZ wells and water withdrawal wells, respectively, or if only those tests discussed within the narrative will be conducted.	Table 15 (previously Table 12) lists the logs that will be conducted in the SLR wells. Below the table, the text was updated to state "The logs listed in table 13 will be conducted on the SLR wells." Table 19 (previously Table 18) lists the logs that will be conducted in the water withdrawal wells. Below the table the text was updated to state, "The logs listed in Table 19 were conducted in the water withdrawal wells."	
32	40 CFR 146.82(a)(6); 40 CFR 146.90(d)	**Background:** Pre-Op Testing Table 17 (p. 30) lists the pre-op geochemical analysis plan for the USDW well but doesn't list specific analytes or analytical methods for most parameters. Also, the narrative indicates that baseline USDW sampling will be done quarterly beginning approximately 1 year before the start of injection. **Comment:** Please confirm if the general list of analytes listed in Table 17 is the same as the more specific listing in Testing & Monitoring Table 13 (p. 30-31), including analytical methods. If so, either duplicate that table here or reference the reader to it. With injection operations ideally beginning	Table 18 (previously 17) was replaced with a duplicate table from the Testing and Monitoring Plan. Text updated to state: "Baseline data collection will commence in June 2024."	

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		within a year or less, please also confirm if baseline USDW sampling has begun or when it will commence.		
33	Various	**Other Corrections/Clarifications/Inconsistencies:** ➢ Pre-Op Testing Table 4 (p. 10) – wireline resistivity and wireline caliper log entries are listed twice. ➢ Pre-Op Testing Table 8 (p. 14) and Well Construction Table 27 (p. 42-43) – wireline resistivity entry listed twice. ➢ Pre-Op Testing Section 4 (p. 25) states that the AOR will be monitored by two in-zone monitoring wells (SLR) and one above confining zone well (ACZ), but maps, etc. elsewhere indicate that there are 3 SLR wells – the converted Shoe Bar 1 stratigraphic test well plus two additional, one in the north and one in the south of the AOR – along with the USDW and ACZ monitoring wells.	Deleted duplicate text. Deleted duplicate text. Based on new information obtained in the water withdrawal wells, there is an absence of any permeable zone above the upper confining zone and below the lowermost USDW. Therefore, the future utilization of the Shoe Bar 1 and Shoe Bar 1AZ is revised: the Shoe Bar 1 and the Shoe Bar 1AZ will be plugged above the Injection Zone and will be used to monitor the Upper Confining Zone. The Project will drill the SLR2 and SLR3 wells to directly monitor the Injection Zone and will utilize data obtained from the water withdrawal wells to monitor the Injection Zone. The Project plans to monitor the lower most USDW (which is also the first permeable zone above the confining zone) using the USDW1 well.	
Injection Well Construction				
34	40 CFR 146.86(b)(5)	**Background:** Under 40 CFR § 146.86(b)(5), "Cement and cement additives must be compatible with the carbon dioxide stream and formation fluids and of sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project." EPA cannot approve an application unless it is able to adequately evaluate the type or grade of cement and cement additives, requiring submission of that information to the UIC Program Director. Any information claimed as confidential or proprietary in that submission will be treated as confidential business information according to the requirements of 40 CFR § 2, Subpart B. **Comment:** Well schematics and Tables 21-23 (p. 40-41/64) reference additives of pozzolan, fly ash, silica sand/flour. Are these the only additives used? Please provide a list or table incorporating a list of additives or	See Appendix A to the Construction plan for additional details on cement composition. PBI_BRP_CONFIDENTIAL_Cement.zip added to GSDT	

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		potential additives that will be used along with some indicator of the quantities of each additive (e.g., ratios, percentages, or exact amounts).		
35	40 CFR 146.86(b)	**Background:** Parameters such as hole size, depths, perforation location, and KOP are inconsistent between narratives, tables and well schematics. **Comment:** Please review the narrative and all tables/well schematics and ensure that information is consistent throughout. Please include open hole and conductor casing intervals in tables and schematics.	Parameters have been corrected to match. OH for Conductor added to Table 3, Table 9, and Table 15. Wellbore schematics have been updated in both Narrative and Construction documents. Casing documents are shown in Table 4, Table 11, and Table 16.	
36	Various	**Other Corrections/Clarifications/Inconsistencies:** ➢ Figure 5 (p. 18) – please correct "Horinzontal." ➢ Table 27 (p. 42) indicates deviation surveys will be done every 200 ft, whereas the Pre-Op Testing narrative Table 8 (p. 14) indicates every 100 ft. Please clarify. ➢ Table 27 (p. 43) – Wireline Resistivity is listed twice. ➢ Table 27 (p. 43) – 40 CFR 146.87(a)(2)(i) also requires SP, resistivity, and caliper logging before and upon installation of surface casing, but these are missing from the table. ➢ Table 27 (p. 43) – Wireline temperature log is missing as required by 40 CFR 146.87(a)(2)(ii)	Spelling of "Horizontal" was corrected. Corrected to show deviation surveys every 100 ft Removed duplicate line on Resistivity. SP, Resistivity and Caliper logs were added to the surface logging. Wireline temperature log was added.	
Injection Well Plugging				
37	40 CFR 146.82(a)(3); 40 CFR 146.92	**Background:** Section 2.1.1 Monitor SLR1 (p. 2/25) refers to the Yates formation as the first permeable zone above the upper confining zone. In Section 2.1.1.2 Plugging in 2026, conversion to Yates (Above Confining Zone) monitor (p. 5/25), item 36 of the procedure is to perforate the well from 2,538'-2,808' to monitor the Yates. In Section 2.1.3.1 Conversion from Shoe Bar 1AZ to ACZ1, Yates (Above Confining Zone) monitor (p. 12/25), item 22 of the procedure is to perforate the well from 2,612'-2,904' to monitor the Yates. The Yates is not present on any well schematics. **Comment:** Please identify the Yates formation on well schematics and the depths associated with it. Additionally, please discuss the Yates formation	Based on MDT pre-test data collected in the WW1, WW2, WW3 and WW4 wells, no permeable zones are present above the Upper Confining Zone and below the lowermost USDW (Dockum group). Although the Yates appeared to have moderate porosity based on log data, MDT pre-tests indicate the rock is tight and it was not possible to obtain fluid samples. The Dockum group is both the lowermost USDW and the first permeable zone above the Upper Confining Zone. References to the Yates as the first permeable zone above the confining zone have been removed.	

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		in the site characterization (AOR Narrative) of this application as well (the Yates is shown on AOR Narrative Figure 1 (p. 15) but not described).		
38	Various	**Comment:** There are several discrepancies between the values in procedures, tables, and schematics: ➢ 2.1.2 Injection Zone monitor wells SLR2 and SLR3 plugging procedures (p. 9/25) are similar to BRP CCS2 procedures (p. 14/17). Therefore, the SLR2 and SLR3 procedures setting depths do not correlate with the schematics plug depths on p. 10-11/25. ➢ 2.1.2 Injection Zone monitor wells SLR2 and SLR3 plugging procedures (p. 9/25) are similar to BRP CCS2 procedures (p. 14/17). Therefore, the SLR2 and SLR3 procedures setting depths do not correlate with the schematics plug depths on p. 10-11/25. ➢ Balanced plugs #3 in Figures 4 & 5 (p. 11/25), SBR SLR Monitoring Wells Schematics is placed from 3,700-44,400', which is too deep. Please correct plug depth. ➢ 2.1.2 Injection Zone monitoring wells SLR2 and SLR3 plugging procedures (p. 9/25) appear to match those of BRP CCS2 procedures (p. 14/17). Please update procedures to match provided schematics. ➢ 3.3 Plugging Procedures for BRP CCS2 step 21 (p. 15/17) states, "Spot 15 sack Class G balanced plug from 3,850' to 3,750 MD." Table 3 (p. 7/17) has Plug No. 4 at 3,750 to 3,950, a 100' difference.	SLR2 and SLR3 plugging procedures and WBDs have been updated. Figures 4 and 5 of Appendix A to the Plugging Plan have been updated. The depths in listed in the procedures for SLR2 and SLR3 now match the diagram. Balanced plug #3 is corrected to 3,700 – 4,300 ft. Table 3 was corrected to match Step 21, plug from 3850-3750 ft.	
Post-Injection Site Care & Site Closure				
39	40 CFR 146.93(a)(2)(ii)	**Background:** "Figure 3 and Figure 4 show the simulated pressure differentials from the critical pressure values…" and "The colored area in Figure 5 shows the CO_2 plume extent in Year 62, as defined by the global mole fraction of CO_2. Figure 6 to 8 show a N-S cross section with the CO_2 global mole fraction at the end of the injection period at Year 12 and the Year 62 for wells BRP CCS1, CCS2, and CCS3, respectively." **Comment:** Please provide figures with a more zoomed-in view. Resolution and scope deteriorate when zoomed into the gradient plume. Also, please label injectors and any other relevant information.	Figures 3-8 in the PISC document has been updated to show a more zoomed-in view. Surface locations of wells are marked with symbols and labels.	

For Comment #2 (above): List of files included in the "Attachments" folder originally submitted to the CBI OneDrive for CCS1 as part of the original application submission.

0101_Proposed_Testing_BRP_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	251 KB
0301_Domain_Coordinates_File_BRPcbi	5/4/2022 2:35 PM	Adobe Acrobat D...	9 KB
All Wells Topo Map_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	521 KB
Base Dockum Aquifer_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	323 KB
Base Pecos Valley Aquifer_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	164 KB
BRACS Wells_cbi	5/4/2022 2:35 PM	Compressed (zipp...	16,713 KB
BRP AOR Shapefile_cbi	5/4/2022 2:34 PM	Compressed (zipp...	2 KB
BRP AOR Well Locations_cbi	5/12/2022 11:12 AM	Microsoft Excel W...	3,027 KB
FA_BRP_COST_EST_041522_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	946 KB
GAU Letters_cbi	5/4/2022 2:34 PM	Compressed (zipp...	5,152 KB
gm201610en	5/4/2022 2:35 PM	Adobe Acrobat D...	11,392 KB
Lower San Andres Average Permeability_cbi	5/4/2022 2:34 PM	Adobe Acrobat D...	530 KB
Lower San Andres Average Porosity_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	366 KB
N_S Well Log Section_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	880 KB
NTG_keyword_file_cbi	5/4/2022 2:35 PM	Compressed (zipp...	3,639 KB
OutputFiles-cbi	5/4/2022 2:35 PM	Compressed (zipp...	62 KB
Perm_keyword_file_cbi	5/4/2022 2:35 PM	Text Document	11,209 KB
Permeability Fence Diagram_cbi	5/4/2022 2:34 PM	Adobe Acrobat D...	229 KB
Porosity Fence Diagram_cbi	5/4/2022 2:34 PM	Adobe Acrobat D...	175 KB
Porosity_keyword_file_cbi	5/4/2022 2:34 PM	Text Document	9,350 KB
Pressure_cbi	5/4/2022 2:34 PM	Text Document	9,568 KB
PVT.INC	5/4/2022 2:34 PM	INC File	2 KB
Relperm_Tables_cbi	5/4/2022 2:34 PM	Text Document	2 KB
SBR Water Wells Map_cbi	5/4/2022 2:35 PM	Compressed (zipp...	1,340 KB
Snapshots-cbi	5/4/2022 2:34 PM	Compressed (zipp...	14,677 KB
Structural Model_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	101 KB
Thickness between L_SNDR and GLRT_cbi	5/4/2022 2:34 PM	Adobe Acrobat D...	490 KB
Top Dockum Aquifer_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	298 KB
Top Lower San Andres Structure Map_cbi	5/4/2022 2:34 PM	Adobe Acrobat D...	211 KB
W_E Regional Cross Section_cbi	5/4/2022 2:34 PM	Adobe Acrobat D...	367 KB
W_E Well Log Section_cbi	5/4/2022 2:35 PM	Adobe Acrobat D...	886 KB
WellTrajectory_BRP_CCS1_cbi	5/4/2022 2:34 PM	Text Document	15 KB
WellTrajectory_BRP_CCS2_cbi	5/4/2022 2:35 PM	Text Document	15 KB

EPA's Follow Up Clarifications to Request for Additional Information #4 and OLCV's Responses

Comment	Location and summary of edit
Project Narrative Section 2.5 (p. 9) now states CCS1 and CCS3 will be injecting into both the G1 and G4 subunits as opposed to just the G1. This is also stated in Section 5.1 (CCS1; p. 14) and Section 5.3 (CCS3; p. 19). Perforation depths on well schematics within the Project Narrative (p. 16 and p. 21) and on schematics and tables in the Well Construction narrative (p. 15 and p. 38) appear to agree with injection into the G1 and G4 both. However, AOR narrative Section 2.9 (p. 64) still says only the G1, and TVD values listed in AOR Table 6 (p. 65) also appear to correspond with the G1 only. Confirm if the G4 subzone has been added as part of the injection zone for CCS1 and CCS3. If so, discrepancies need to be corrected in the AOR section and any other sections that may still indicate only the G1 is being used for CCS1 and CCS3.	**AOR Section 2.9:** Updated with the following, "BRP CCS1 slant injector is completed in the upper porosity packages (sub-zone G1 and G4) of the Lower San Andres Formation," and "BRP CCS3 slant injector is completed in the upper porosity packages of the Lower San Andres Formation (sub-zone G1 that is approximately 390 ft thick and G4 that is approximately 130 ft thick" **AOR Table 6:** Updated perf depths and clarified that depths are MD.
Operations: From RAI #4 Item 6, various tables (Ops Narrative Table 1 for all 3 injectors, Project Narrative Table 2 (p. 24), and AOR Narrative Table 6 (p. 65)) were updated to show max and average daily mass or volume for each injector as required by the regs, but these entries replaced the required entries for average and max injection rates, which are also required (i.e., ALL of these are required, so now average and max rates are missing – see 40 CFR 146.82(a)(7)(i)). Update the tables to include all required information under the referenced regulation.	**Operations Plan, CCS1, Table 1:** Added back to the table "Group maximum injection rate, Group average injection rate, maximum injection rate BRP CCS1 and Average injection rate BRP CCS1" **Operations Plan, CCS2, Table 1:** Added back to the table "Group maximum injection rate, Group average injection rate, maximum injection rate BRP CCS2 and Average injection rate BRP CCS2" **Operations Plan, CCS3, Table 1:** Added back to the table "Group maximum injection rate, Group average injection rate, maximum injection rate BRP CCS3 and Average injection rate BRP CCS3"
AOR: Related to Project Narrative Item #1 above, time series maps in the AOR narrative (Figs. 78-82, p. 102-106) only show the pressure fronts for the G1 and Holt, but nothing for the G4. Please update the maps (and narratives, if needed) to show the pressure front for the G4 as well or that it is coincident with the pressure fronts of the G1.	**AOR Section 5.2:** The combined pressure front in the G1 and G4 was modeled. The legends for Figures 78-82 have been updated to state "G1 & G4 pressure plume." **PISC Section 3:** Updated Figure 3A and 4A to note that G1 and G4 pressure plumes are combined.
AOR: RAI 4 Item 14 asked for clarification of the thicknesses of the 3 subzones as discussed in the AOR Narrative. The RAI response and updated narrative indicate G4 is ~450 ft thick, G1 is ~350 ft thick, and Holt is	**AOR Section 2.9:** Typo is corrected. Text is updated as follows: "BRP CCS1 slant injector is completed in the upper porosity packages (sub-zone G1 and G4) of the Lower San Andres Formation (approximately [redacted] gross thickness in the G1 and [redacted] gross thickness in the G4), and the BRP CCS2 horizontal well is completed at the Holt sub-zone of the Lower San Andres (approximately [redacted]

~200 ft thick and that maps and cross-sections are consistent with these values; based on this, the overall thickness of the Lower San Andres is ~1000 ft. However, AOR Fig. 8 (p. 15), Fig. 26 (p. 39), Fig. 29 (p.42) and Fig. 39 (p. 52), Fig. 30 (p. 43), and the supplemental log cross-sections (N_S_Log_Section.pdf and W_E_Log_Section.pdf) submitted in the AOR module all appear to suggest the G4 is only ~120-130 ft thick, with a total overall thickness of the Lower San Andres of ~680-700 ft, not ~1000 ft.	gross thickness)." And the following, "BRP CCS3 slant injector is completed in the upper porosity packages of the Lower San Andres Formation (sub-zone G1 that is approximately [redacted] thick and G4 that is approximately [redacted] thick)."
AOR: Based on the explanation provided in the meeting with Region 6 on 7/18/24, please update the application to clarify how the base of the USDW was determined since the use of a "clean" gamma ray signal is not a typical method. Additionally, the fluid analysis of the USDW well (noted to not have reached the base of the USDW) had a TDS of around 1600 mg/L, which is well below the 10,000 mg/L TDS cutoff for a USDW and suggests the USDW is deeper than the suggested 655-850 ft (AOR Appendix A, p. 58). □ Also, there are conflicting maps within the application and supplemental files that should be rectified. E.g., Base Dockum Aquifer_cbi.pdf (submitted as supplemental information to the AOR module), AOR Narrative Fig. 69-A (p. 92), and Fig. 15 (Base USDW/Top Dewey Lake Formation) of AOR Appendix B (p. 30) all show the base of the USDW, but all look different. Top Dockum Aquifer_cbi.pdf (submitted as supplemental info to the AOR module) and AOR Appendix B Fig. 16 (p. 31) both show the top of the Dockum aquifer but also do not agree with each other.	**AOR Appendix B Section 4:** the methodology for picking the base of the USDW has been updated to include using Archie's (1942) method. The base of the UWDW using this method is coincident with the base of the Dockum group / top of the Dewey Lake formation. The transition from Dockum to Dewey Lake can be clearly and consistently picked on GR logs. Because resistivity data is not available in all wells, GR logs are used to pick the base Dockum. **For USDW maps:** • For the base USDW: AOR Figure 69A and Figure 16 in AOR Appendix B were updated to be consistent with Figure 15 in AOR Appendix B. • For the top USDW: Figure 17 in AOR Appendix B was updated to be consistent with Figure 15 in AOR Appendix B. • New high-resolution maps were uploaded to GSDT: Base_Dockum_Aquifer_cbi and Top_Dockum_Aquifer_cbi
AOR: Please clarify how the tops of the injection zone were chosen for the wells to be remediated. Both the Eidson E-1 and Scharbauer-Eidson 1 schematics indicate the top of the IZ is at 4300 ft, with the top at the Eidson-Scharbauer-1 at 4423 ft. However, based on the top of the Lower San Andres contour map (AOR Narrative Fig. 11, p. 20) and surface elevations from log headers (AOR Appendix B. Fig. 14, p. 29), reviewers estimate (since well locations are not shown on the contour map) that the top of the IZ is at approximately	**AOR Appendix B Section 5:** Added Table 9 that lists top and base depths for the Dockum in the Eidson E-1, Eidson Scharbauer-1, and Scharbauer Eidson-1. Also, added Figure 18 that shows the top and base of the Lower San Andres. **AOR Figure 11: updated to be consistent with top and base Lower San Andres maps in AOR Appendix B Section 5.**

4490 ft TVD at Eidson E-1, ~4430 ft at Scharbauer-Eidson 1, and at ~4400 ft for Eidson-Scharbauer-1. From this, plugs in the Eidson E-1 and Scharbauer-Eidson 1 may be too high and need to be placed lower in the well. (Note that the IZ formation top closer to 4500 ft also seems to better agree with the Shoe Bar 1AZ well logs (e.g., AOR Narrative Figs. 29 (p. 42) and 39 (p. 52); AOR Appendix A Figs. 13 (p. 29) and 35 (p. 49)). The Shoe Bar 1 log has the top of the IZ at ~4375 ft, but it is further east away from the wells being remediated compared to the Shoe Bar 1AZ.)	
Construction: No construction cementing information is provided in Construction Appendix C for Shoe Bar 1 (Fig. C1, p. 23) or Shoe Bar 1AZ (Fig. C2, p. 24); info also not provided in Plugging Appendix A for either well (SBR 1 – Figs. 1 (p. 4) & 2 (p. 6); SBR 1 AZ – Figs. 6 (p. 11) & 7 (p. 13)).	**Construction Appendix C:** Construction cementing information was added to the wellbore schematics in Figures C1 for Shoe Bar 1 and in Figures C2 for Shoe Bar 1AZ. **Plugging Appendix A:** Construction cementing information was added to the wellbore schematics in Figures 1 and 2 for Shoe Bar 1 and in Figures 6 and 7 for Shoe Bar 1AZ.
Construction: Metallurgy and [redacted]	[redacted]
Construction: What kind of corrosion monitoring is planned for injectors, monitoring wells, and water withdrawal wells? Will corrosion coupons be used in all wells to monitor all types of metallurgy used in each well? □ Water withdrawal wells – see T&M section below.	**Testing and Monitoring Plan, Section 5.1**: "Corrosion monitoring of the CO_2 injection wells and water withdrawal wells will be conducted in a surface monitoring spool located near the wellhead that contains multiple access points. To measure corrosion, coupons or probes composed of well materials (such as casing 25Cr, L80 or packer material… specific of the well construction) will be inserted at the access points in the spool, and those coupons or probes will be exposed to fluids being injected or produced from the wellbores. For Injection Zone and Confining Zone monitoring wells, a monitoring spool will be placed at the wellhead that is open to the tubing to monitor corrosion of the fluids/gas in the tubing. Coupons/probes will be collected and sent to a third-party company for analysis in accordance with NACE Standard SP-0775-2018-SG on a quarterly basis during the Injection Period and until wells are plugged in the post-injection period. Note that CO_2 is not expected to be encountered in the water withdrawal wells or in Confining Zone monitor wells.
Plugging: Plugging – all plugs in injection, monitoring, and water withdrawal wells, regardless of depth, must use CO2-resistant cement.	**Plugging Plan:** cement plug compositions changed to denote CO2 resistant cement.

Plugging: Generally, cement volumes listed in the plugging procedure (starting pg. 13/25) do not match the values in the tables and figures.	**Plugging Plan:** cement volumes and plug depths were checked and updated to be consistent between tables, text and schematics.
Pre-Op: 1. Section 3.10 (Temperature Logging) and 3.11 (Oxygen activation logging) (p. 29-30) were added w/descriptions of the tests, but step-by-step instructions are still not provided as requested (RAI #4 Item 29).	**Pre-Operational Testing Plan Section 3.11.** We anticipate collecting temperature logging coincident with oxygen activation logging. Step-by-step plan for both logging tools is now included.
Testing & Monitoring: Based on the discussion between Oxy and Region 6 on 7/18/24, please update the testing and monitoring plans to include corrosion coupon monitoring for each type of metal used in casing, tubing, etc. expected to be in contact with the CO2 plume and/or formation fluids (if not already done; see T&M Narrative Table 7, p. 23). Additionally, please also add L80 coupon monitoring within the withdrawal stream for each water withdrawal well.	**Testing and Monitoring Plan, Section 5.1**: "Corrosion monitoring of the CO_2 injection wells and water withdrawal wells will be conducted in a surface monitoring spool located near the wellhead that contains multiple access points. To measure corrosion, coupons or probes composed of well materials (such as casing, tubing and packer materials… specific of the well construction) will be inserted at the access points in the spool, and those coupons or probes will be exposed to fluids being injected or produced from the wellbores. For Injection Zone and Confining Zone monitoring wells, a monitoring spool will be placed at the wellhead that is open to the tubing to monitor corrosion of the fluids/gas in the tubing. Coupons/probes will be collected and sent to a third-party company for analysis in accordance with NACE Standard SP-0775-2018-SG on a quarterly basis during the Injection Period and until wells are plugged in the post-injection period. Note that CO_2 is not expected to be encountered in the water withdrawal wells or in Confining Zone monitor wells.
Testing & Monitoring: More clarity on event-driven monitoring	**Testing and Monitoring Plan, Table 1—Summary of Testing and Monitoring Frequency:** "[1]Event-driven sampling of CO2 injectate stream will be triggered if there are changes in the DAC process that may arise from facility upgrades or after facility shut-in periods." "*OLCV will monitor pressure and temperature data obtained from downhole gauges and/or DTS fiber daily, and also routinely evaluate long-term data trends to detect deviations from the reference temperature or pressure gradient. If persistent deviations in temperature or pressure are detected, OLCV will obtain reservoir fluid samples and analyze fluid and dissolved gas chemistry to determine the presence or absence of increased CO2. In addition, fluid and dissolved gas chemistry data from the lowermost USDW and soil gas chemistry from shallow soils will be monitored for trends to detect deviations from reference chemistry. If persistent and/or abrupt anomalies in chemistry are detected additional fluid or soil gas samples will be obtained to confirm the presence or absence of increased CO2" **Testing and Monitoring Plan, Table 3—Summary of monitoring by well type and project stage:** "OLCV will monitor pressure and temperature data obtained from downhole gauges and/or DTS fiber daily, and also routinely evaluate long-term data trends to detect deviations from the reference temperature or pressure gradient. If persistent deviations in temperature or pressure are detected, OLCV will obtain reservoir fluid samples and analyze fluid and dissolved gas chemistry to determine the presence or absence of increased CO2. In addition, fluid and dissolved gas chemistry data from the

	lowermost USDW and soil gas chemistry from shallow soils will be monitored for trends to detect deviations from reference chemistry. If persistent and/or abrupt anomalies in chemistry are detected additional fluid or soil gas samples will be obtained to confirm the presence or absence of increased CO2" **Testing and Monitoring Plan, Table 5—CO2 injectate stream monitoring method and frequency:** Added comment below table, "Event-driven = changes in the DAC process that may arise from facility upgrades or after facility shut-in periods." **Testing and Monitoring Plan, Table 10 on Monitoring in the Injection Zone:** "OLCV will monitor pressure and temperature data obtained from downhole gauges and/or DTS fiber daily, and also routinely evaluate long-term data trends to detect deviations from the reference temperature or pressure gradient. If persistent deviations in temperature or pressure are detected, OLCV will obtain reservoir fluid samples and analyze fluid and dissolved gas chemistry to determine the presence or absence of increased CO2. Saturation logging may also be conducted to further support or refute the presence of increased CO2." **Testing and Monitoring Plan, Table 11 on Monitoring Above the Injection Zone:** "OLCV will monitor pressure and temperature data obtained from downhole gauges and/or DTS fiber daily, and also routinely evaluate long-term data trends to detect deviations from the reference temperature or pressure gradient. If persistent deviations in temperature or pressure are detected, OLCV will obtain reservoir fluid samples and analyze fluid and dissolved gas chemistry to determine the presence or absence of increased CO2. Saturation logging may also be conducted to further support or refute the presence of increased CO2." **Testing and Monitoring Plan, Table 12 on Monitoring the Near Surface:** "OLCV will monitor pressure and temperature data obtained from downhole gauges and/or DTS fiber daily, and also routinely evaluate long-term data trends to detect deviations from the reference temperature or pressure gradient. If persistent deviations in temperature or pressure are detected, OLCV will obtain reservoir fluid samples and analyze fluid and dissolved gas chemistry to determine the presence or absence of increased CO2. In addition, fluid and dissolved gas chemistry data from the lowermost USDW and soil gas chemistry from shallow soils will be monitored for trends to detect deviations from reference chemistry. If persistent and/or abrupt anomalies in chemistry are detected additional fluid or soil gas samples will be obtained to confirm the presence or absence of increased CO2." **Testing and Monitoring Plan, Table 18—Direct and indirect methods of tracking the CO2 plume and pressure front:** "OLCV will monitor pressure and temperature data obtained from downhole gauges and/or DTS fiber daily, and also routinely evaluate long-term data trends to detect deviations from the reference temperature or pressure gradient. If persistent deviations in temperature or pressure

	are detected, OLCV will obtain reservoir fluid samples and analyze fluid and dissolved gas chemistry to determine the presence or absence of increased CO2. Saturation logging may also be conducted to further support or refute the presence of increased CO2."
Testing & Monitoring: Explain why a U-tube system for SLR2 and SLR3 is only being considered and provide the rationale behind the decision.	**Testing and Monitoring Plan, 2.1.1 Injection Zone Monitoring wells:** A U-tube system may allow for cost-effective sampling of fluids and dissolved gasses from the Injection Zone. [redacted]
Testing and Monitoring: Several instances where the application states "… for the first 10 years…" should be updated to include something like the following verbiage: "pending an approved amended testing and monitoring plan/PISC." If an alternative PISC is not proposed/planned, please clarify why the specified monitoring is only being done for the first 10 years. (See also PISC/Site Closure Item 1 below.)	**Testing and Monitoring:** The frequency of data collection is expected to decrease during the post-injection period as the CO2 plume / pressure front stabilizes. The PISC plan submitted pre-injection anticipates these changes in data collection frequency. Tables and text indicating "for the first 10 years" have been updated to state "for the first 10 years pending an approved PISC plan. **Further clarification is provided in PISC Section 5:** "If pressure and temperature data are consistent with lack of continued CO2 migration, pressure and temperature monitoring in the Injection Zone will be continued annually after 10 years until plugging." Additionally, "If geochemistry data of fluids and dissolved gasses in the lowermost USDW are consistent with the absence of introduced Injection Zone brine or CO2 injectate into the USDW, this monitoring method will be discontinued after 10 years.
Testing & Monitoring: There are discrepancies on the time frame to construct SLR3. Pg. 10/64 states it will be constructed within 5 years, and no CO2 is anticipated to reach SLR3 before year 7, and Section 6.1 (pg. 25/64) states the well will be drilled between five and nine years after injection commences. The construction time frame should be verified and updated on all relatable sections. Additionally, fluid samples cannot be taken from SLR3 prior to injection as stated in Table 1 since it will not be constructed before injection.	**Testing and Monitoring:** Updated the construction timing of SLR3 in Section 6.1 to be consistent with the timing in Section 2.1.1; "The SLR3 well will be drilled within five years after CO2 injection commences." The text of Table 1 has been updated to remove SLR3 from the pre-injection testing, "P/T measurement, fluid sampling prior to injection in the SLR2 and WW wells."
ERRP: There are discrepancies between the seismic event thresholds in the ERR	Testing and Monitoring Plan Section 12.1: The Testing and Monitoring Plan was updated to be consistent with the ERRP, which

plan (Section 5.5 Natural Disaster(??) (p. 18) and Section 5.6 Induced Seismicity (p. 19-20)) and the Testing and Monitoring plan (Section 12.1, p. 59-60). ERR uses ML = 2.0-3.5, ML = 3.5-4.5, and ML > 4.5 as threshold values for various response actions, whereas T&M uses ML = 2.0 to < 4, ML = 4 to <4.5, and ML > 4.5. Please clarify which is correct and update the other narrative to match.	contained the appropriate values. The text in 12.1 was updated to say, "For events above ML 2.0 but below ML 3.5 within 5.6 miles of the injection wells, OLCV will closely monitor seismic activity," and, "For events with ML 3.5 to ML 4.5 within 5.6 miles of the injection well."
PISC: Several instances where the application states "… for the first 10 years…" should be updated to include something like the following verbiage: "pending an approved amended testing and monitoring plan/PISC." If an alternative PISC is not proposed/planned, please clarify why the specified monitoring is only being done for the first 10 years. (See also Testing & Monitoring Item 4 above.)	**PISC:** The frequency of data collection is expected to decrease during the post-injection period as the CO2 plume / pressure front stabilizes. The PISC plan submitted pre-injection anticipates these changes in data collection frequency. **PISC Section 5:** Additional clarification on the change in frequency is provided. "If pressure and temperature data are consistent with lack of continued CO2 migration, pressure and temperature monitoring in the Injection Zone will be continued annually after 10 years until plugging." Additionally, "If geochemistry data of fluids and dissolved gasses in the lowermost USDW are consistent with the absence of introduced Injection Zone brine or CO2 injectate into the USDW, this monitoring method will be discontinued after 10 years.
PISC: Monitoring Post Injection will be subject to the same reporting requirements as the injection phase until site closure is approved. Reevaluations of the AoR and reviews of the AoR and Corrective Action Plan will continue throughout the post-injection phase, all of which provides a more robust permit record to support decision-making, i.e., non-endangerment demo, addition/reduction in monitoring, amended PISC timeframe, etc. □ Described as either "event-driven" or "…for first 10 years…"	**PISC Section 5.3:** Changed to, "OLCV will re-evaluate the AoR every five years during the post-injection phases. In addition, monitoring and operational data will be reviewed periodically by OLCV during the injection and post-injection phases. Monitoring reports will be prepared and submitted to the EPA Region 6 UIC Branch office twice per year. These reports will summarize methods and results of groundwater quality monitoring, CO2 Injection Zone pressure tracking, and indirect geophysical monitoring for CO2 plume tracking."
Financial Assurance: no plans provided	Revised plan was submitted
EJ/Community: plans provided	Revised plan submitted to EPA Region 6 on 25 July 2024
Narrative: From RAI 4 Item 4, wording in the Project Narrative (p. 17) for CCS2 was updated to correct that tubing and packer will be run to approximately 4500 ft in agreement with schematics. However, wording in the Construction narrative Section 4.2.3 (p. 24) still says 4100 ft.	**Construction Plan, 4.2.3 Proposed Completion Procedure for BRP CCS2:** Changed depth from 4,100 to 4,500 ft, "The 2 7/8-in. tubing and packer completion will be run to approximately 4,500 ft,"
Narrative: CCS3 injection rates and pressures were added to Table 2. However, CCS2 has "Average injection pressure BRP CCS2" rather than the average bottomhole injection pressure, similar to CCS1 and CCS3.	**Project Narrative, Table 2.** Edited text to say, "Average bottomhole injection pressure BRP CCS2."

Narrative: From RAI 4 Item 4, Table 3 of the Project Narrative (p. 25) is still incorrectly labeled as Table 2 (correct Table 2 is on the previous page, i.e., there are two tables labeled "Table 2").	**Narrative:** Table 2 is labeled "Operating conditions for CO2 Injector wells" and Table 3 labeled is "CO2 Stream Composition."
AOR: □ From RAI 4 Item 17, hole sizes are still listed on remedial well schematics, but no hole sizes were ever located in any of the well records provided. These hole sizes need justified or removed from schematics. Also, depth of 4.5" production casing (Fig. 84, p. 111) for Eidson E-1 after corrective action is incorrectly listed as 8490' instead of 8408' (corrected on the before corrective action schematic, Fig. 83).	The "size of drill bit" is listed on the cementing report for Eidson E-1. A 12 ¼ inch size of drill bit is interpreted to be the size of the hole, because it is a common size of hole for the surface section. A 7 7/8 size of drill bit is interpreted to be a 7 7/8 size of hole, because it is a common size of hole for the production section. The well schematics have been updated to state, "12-1/4" (size of drill bit, interpreted to be hole size)" and, "7-7/8" (size of drill bit, interpreted to be hole size)" [redacted] For Scharbauer Eidson 1 (API # 42-135-10667) the available records do not list hole size. Casing size of 8 5/8 is listed for the surface section. Although a 12 ¼ inch hole size is common for 8 5/8 inch casing, the hole size has been removed from the schematic. No casing size or hole size is listed for the production section. Hole size has been removed from the schematic. For Eidson Scharbauer (API # 42-135-06139), the available records do not list hole size. Casing size of 8 5/8 is listed for the surface section. Although a 12 ¼ inch hole size is common for 8 5/8 inch casing, the hole size has been removed from the schematic. The casing in the production section is listed as 4 ½ inch; no hole size is provided. **AOR:** Figures 83 – 88 have been updated with the revised wellbore schematics.
AOR: AOR Appendix A Fig. 12 (p. 27) references "…the samples listed in Tables 9 and 10..." but this should be Tables 10 and 11.	**AOR Appendix A Figure 12 caption:** Changed to: "Figure 12--Relative permeability and capillary pressure of the five samples selected for Injection Zone (A) and Upper and Lower Confining Zones (B) for the samples listed in Tables 10 and 11."

Construction: Schematics for Shoe Bar 1 show ground level at "29850 ft" instead of 2985 ft – Construction Appendix C Fig. C1 (p. 23), Plugging Appendix A Figs. 1 (p. 4) and 2 (p. 6), others?	**Construction Appendix C:** Corrected ground depth for the Shoe Bar 1 in Figure C1 and replaced with 2968.9 which is the as-drilled ground elevation **Plugging Appendix A:** Corrected ground depth for the Shoe Bar 1 in Figures 1 and 2 and replaced with 2968.9 which is the as-drilled ground elevation
Construction: In Construction Appendix C, Fig. C7 (p. 29) for WW2 is missing all info re: hole sizes, casing, tubing, etc. for all 3 casing sections (similar to what is shown for the other 3 WW wells).	**Construction Appendix C:** Replaced Figure 7 for WW2.
Construction: Well Construction – The deviation surveys being done every 100 ft was corrected on Table 27. However, the proposed drilling procedures of all injection wells still state deviation surveys are being done every 200 ft.	**Construction Plan:** updated text to show deviation surveys 100 ft instead of 200 ft.
Plugging: In Plugging Appendix A, procedure plug depths (pg. 24/25) do not match WW4 schematic plugs; Figure 13 (pg. 25/25) is from previous plugging plan.	**Plugging Appendix A:** WW4 plug depths have been checked and corrected to be consistent between the text and schematic. Figure 13 (re-numbered to Figure 12) now shows the current plugging plan for WW4.
Plugging: For BRP CCS2, in Table 5 Plug #4 is set from 3750 to 3950 ft. In Figure 2, Plug #4 is set from 3750 - 3850 ft.	**Plugging Plan:** Table 3 (re-numbered) was checked and corrected to be consistent with the well schematic. Both the schematic and table show plug #4 from 3750- 3950 ft.
Other updates	
	Testing and Monitoring Table 18: updated pre-injection monitoring for SLR2 to reflect anticipated drill timing of spring 2025 and anticipated injection in summer 2025
	Construction Appendix C and Plugging Appendix A: corrected the KB, hole and casing sizes of the water withdrawal wells to be consistent with as-drilled design

EPA's Additional Follow Up Clarifications to Request for Additional Information #4 and OLCV's Responses

Oxy Brown Pelican – Questions on RAI #4 Clarification Responses

Uploaded documents:

- AOR Appendix A v3
- Narrative v4
- Construction
- Separate WBD for CCS1, CCS2, CCS3 in PDF format
- Pre-Op Plan
- Plugging
- FA

Oxy responses in BLUE below

General

- **[MAJOR]** NHPA and ESA assessment requirements

Project Narrative

- **[MAJOR]** In Table 2 (p. 24) the values for "Daily maximum injection rate" and "Daily average injection rate" are switched for CCS1 and CCS2 – CCS1 lists 25.0 and 21.9 mmscf/d as the max and average rates, respectively, and CCS2 lists 8.24 and 7.88 mmscf/d as the max and average rates, respectively, which is opposite what is listed in the Operations narratives for CCS1 and CCS2.
  - **The values for CCS1 and CCS2 have been corrected in Table 2**
- **[MINOR]** RAI 4 Item 4 and a follow up clarification item to RAI 4 both indicated that Table 3 (p. 25) is incorrectly labeled as Table 2. Comments indicate this has been corrected, but Table 3 is still incorrectly labeled as Table 2. CO2 Stream Composition (i.e., there are two Table 2's listed).
  - **Table 3 is correctly labeled in the Microsoft Word version dated 30 July. Unclear where the error is resulting. .**
  - From word version

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

The CO_2 stream composition is shown below in Table 3. No injectant other than those identified in this permit shall be injected into the well except fluids used for stimulation, rework, and well tests as approved by the Program Director.

Table 3. CO_2 Stream Composition

Component	Specification
CO_2 content	>95 mol% (>96.5 mass%)
Water	<30 lbm/MMscf
Nitrogen	<4 mol%
Sulphur	<35 ppm by weight
Oxygen	<5 mol%
Glycol	<0.3 gal/MMscf
Carbon Monoxide	<4,250 ppm by weight
NOx	<6 ppm by weight
SOx	<1 ppm by weight

Oxy Brown Pelican – Questions on RAI #4 Clarification Responses

AOR/Corrective Action

- **[MINOR]** AOR Appendix A Fig. 12 (p. 27) – response indicates caption has been corrected to say "…the samples listed in Tables 10 and 11…" not Tables 9 and 10, but this correction has not been made.
  - **Figure 12 is correctly labeled in the Microsoft Word version dated 30 July. Unclear where the error is resulting. PDF and Word doc will be checked to match.**
  - From Word version
-

> **Figure 12--Relative permeability and capillary pressure of the five samples selected for Injection Zone (A) and Upper and Lower Confining Zones (B) for the samples listed in Tables 10 and 11. Curves in black show the most representative sample for each zone. krw and krnw represent the relative permeability for the wetting (water) and non-wetting (gas) phases, respectively.**

Construction

- **[MAJOR]** Well construction schematics in the Project Narrative have been updated with the new USDW depths, as have schematics in the Plugging Plan, but the schematics in the Construction narrative still show the old USDW depths – Fig. 3 (p. 6), Fig. 5 (p. 18), and Fig. 7 (p. 30).
  - Also missing from the separate BRP_CCS1/2/3_WBD pdfs submitted with the Construction section
  - **WBD in the Construction narrative are updated**
  - **WBD have been uploaded to GSDT as separate PDFs**
- **[MAJOR]** The SM25CRW-125 material is CO2 resistant and will be used 1000+ feet above the upper perforations, to TD on all wells. The concern is that on CCS3, the tubing and packer is set above the CO2 resistant material, so a portion of the long string L-80 material will be exposed to CO2.
  - **The packer depth on BRP CCS3 has been adjusted and is now planned to be set at 3,680 ft so that SM25CRW-125 casing will be contact with the Injection Zone.**

Financial Assurance

- **[N/A – Comment Only – no correction needed]** Cost Estimates provided by the applicant are aligned with the output generated from EPA cost estimate tool. – The ERR section is the source of the only current discrepancy. This is the most unpredictable module within the cost estimate due to the uncertainty of an event and the long duration covered by this module. 146.85(a) does not require well construction to be covered in this section so any changes to their materials, etc., will not affect this module.
- **[MINOR]** The applicant plans to conduct corrective action on 3 deficient wells. For a total cost of 1.57* million USD. – Why is there an asterisk next to the cost in the estimate figure? Please add the asterisk purpose into the figure or text.
  - **Asterisk on Table 2 is removed**

Oxy Brown Pelican – Questions on RAI #4 Clarification Responses

- **[MINOR]** "In accordance with 16 TAC 5.205(c)(2)(C)(i), the cost estimates are performed for each phase separately and are based on the costs to the Texas Railroad Commission of hiring a third party to perform required activities." - Section 4.0, Cost Estimate for Activities Covered by Financial Responsibility. ***This should be updated*** *to cite the correct federal regulation and EPA.*
  - **Text has been updated: "In accordance with 40 CFR 146.85 et seq. and 16 TAC 5.205 (c)(2)(C)(i), the cost estimates must be performed for each phase separately and must be based on the costs to the regulatory agency of hiring a third party to perform the required activities."**
- **[MINOR]** "The letter of credit will be issued by a US commercial bank or U.S. branch office of a foreign bank..." -Section 3.0, Instruments to Meet Financial Responsibility. – The draft LOC indicates that ***ISSUING INSTITUTION REDACTED*** will be the issuing institution. If this is finalized, the above statement should be updated and (under 40 CFR 146.85(a)(6)(ii)) the owner or operator should submit proof of the third-party's financial strength.
  - **Banking information was added and redacted.**