Attachment 1: EPA Comments

1) Oxy:

Figure AOR-3 & 4

EPA:

These figures appear to be referenced throughout the text, but the quality is insufficient to read any details including well names or annotations on the figures. The figures should be updated to a higher resolution format.

2) Oxy:

Figure AOR-4 "Large basement faulting starts to the south of the project site, with faults cutting through the Frio but not up into the Lower Miocene."

Figure AOR-7 "No major growth faults are observed to cut through the upper confining zone…. One extensional growth fault within the AoR is interpreted from 2D seismic to cut into, but not through, the Frio storage zone. Seismic interpretation shows the fault to have offset at the base of the Frio that is less than 50 ft

EPA:

The interpreted cross section (AOR-4) is just east of the Oxy project area. The cross section depicts a large growth fault at the same latitude as the project area. It is also said that the growth faults do not penetrate the upper confining zone. Additional data must be provided to ensure that faulting does not lie within the project area and that faulting does not penetrate the upper confining zone. EPA is not provided with sufficient data to confirm the applicant's conclusions that faulting poses no risks to CO2 containment.

The simplified schematic of Figure AOR-7 does not provide a sufficient characterization of the subsurface. While this figure depicts offset of less than 50 feet, figure AOR-4 depicts the growth faults of this region having an offset on the order of hundreds of feet. Additional site-specific data is needed to better constrain fault offsets and ensure that faulting does not jeopardize the containment of CO2.

3) Oxy:

2.3.2

"74 well logs were interpreted to create the interpretation within the Frio formation."

EPA:

The data derived from these logs, along with the log locations were not included in the submitted application materials.

4) Oxy:

Figure AOR-20

"45 control wells within and surrounding the YAMS CO2 Sequestration Project area used for petrophysical interpretation of porosity, permeability, and net sand thickness of the Miocene_Lower, Anahuac, Frio, Frio_Lower, and Vicksburg zones."

EPA:

This figure is not of sufficient resolution to analyze the presented information.

Also, EPA will require documentation on where the referenced wells are located, and any documentation of analysis derived.

5) Oxy:

Figure AOR-21

EPA:

This figure shows the results of the site-specific data interpretation. In order to confirm the applicant's interpretation, the applicant should provide the data used for these specific characterizations in addition to the locations of each data point.

6) Oxy:

2.4.1

Table AOR-3/Figure AOR-21

EPA:

The above section, table and figures provide the names of 15 wells within the model domain which were used to characterize geologic parameters. While the average values are provided in Figure AOR-21, individual well data is required to better understand the applicant's derivation of permeability, porosity, thickness, etc.

Section 2.4.1 also indicates openhole log-based total porosity in comparison to 19 core porosity measurements from a well near the AoR. Please clarify the name and location of these wells.

7) Oxy:

2.4.2

Horizontal permeability is based on available core analysis from a single well near the YAMS CO2 sequestration project… Core permeability distribution suggests a range of 100-10,000 mD…. An average of 1,732 mD is calculated for the Frio_lower injection interval.

EPA:

The use of only one core location to characterize geologic parameters for the entire injection zone implies a high degree of homogeneity across the site. Oxy should specify the name and location of this well. More site-specific data is required for the accurate characterization of the injection/confining zones.

8) Oxy:

2.7 Initial Conditions:

"The water salinity value will be updated the test well MLR4 is drilled, and site-specific data are obtained."

EPA:

This section indicates a plan to drill test well, MLR4, for the collection of more site-specific data. Oxy should clarify what other data types are planned to be gathered through the construction of this well. If constructed to Class VI specifications, this exploratory well could be converted to either a monitoring well or (pending EPA review) an injection well.

9) Oxy:

2.7 Initial Conditions: (pg. 41-42 of 82)

Mineral contents in units of mass percentage were taken from the measured data of the Frio C sands report by Knauss et al. (2005)… Carbonate minerals can reprecipitate upon a decrease in temp <120C/248F. The reservoir temp is 64C/147F so this should be minimal. Kaolinites and smectites can reprecipitate into pore space, reducing pore volume, permeability and increasing pressure….

EPA:

EPA requires that the applicant ascertain and utilize site-specific mineral content and geochemical data to demonstrate containment within the reservoir. Oxy should also provide the locations used for Frio sand characterization by Knauss et al. (2005).

10) Oxy:

Fracture Pressure and Fracture Gradient: (pg. 42-46 of 82)

"Our analysis only includes the risk of failure initiation of the matrix… "there is no evidence of faulting or fracturing at the site..."

EPA:

The applicant should provide more thorough data confirming that faults do no penetrate lower/upper confining zones. Based on such demonstrations an analysis of fault reactivation risk may be required. EPA cannot confirm that there is no faulting or fracturing based on the submitted interpretations such as cross-sections, simplified seismic profiles, etc.

11) Oxy:

Map of legacy well locations, monitoring wells, and CO_2 plume extent with time: (pg. 49-53, 64-67 of 82)

EPA:

The applicant should provide clearer figures. Figures AOR-49-53 are missing north arrows, scales, etc. The legends should be improved as well.

12) Oxy:

Proposed repair schematics: (pg. 75-82 of 82)

EPA:

The applicant should improve the resolution of the repair schematics in Figures AOR-58-61. Parts of these figures appear to be illegible. Clearly label the existing wellbore and the proposed repairs in these figures.