Class VI UIC Area of Review and Corrective Action

This submission is for:

Project ID: R06-LA-0004

Project Name: YAMS CO2 Sequestration Project

Current Project Phase: Pre-Injection Prior to Construction

Overview

Simulator Used for AoR delineation modeling: GEM

Version Used: 2020.10

Simulator Description/Documentation: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0201_Simulator_Description_Documentation_YAMS.pdf

Total Simulation Time From Start of Injection: 44194 days

Additional AoR Delineation Information: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0202_Add_AOR_Delineation_Info_YAMS.pdf

Description of Information Submitted: This does not apply as no state has primacy in the project area as of submittal.

Model Domain

Coordinate System: State Plane

Horizontal Datum: NAD83

Coordinate System Units: ft

Vertical Datum: Mean Sea Level

Describe Vertical Datum: All grid and well depths in TVDSS

Zone: Louisiana South

FIPSZONE: 1702 ADSZONE: 4501

Mesh Type: Other

Describe Mesh Type: corner-point grid

Domain Size in Global Units Specified Above

Domain Coordinates File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0301_Domain_Coordinates_File_YAMS.pdf

Grid Size

Number of Nodes in x: 110 y: 173 z: 236

Grid Spacing: Constant

Grid Spacing in x: 500 y: 500 z: 10

Grid File Format: Eclipse Keyword File

Grid File Description: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0302_Grid_File_Description_YAMS.pdf

Eclipse Keyword File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0303_Eclipse_Keyword_File_YAMS.pdf

Faults Modeled: No

Caprock Modeled: No

Image File(s) for Model Domain Grid: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0304_Image_File_YAMS.pdf

Processes Modeled by Simulator

Reservoir Conditions:

Supercritical CO2 Conditions

Phases Modeled:

Aqueous Supercritical CO2

Aqueous Phase:

Phase Compressibility: Compressible

Compressibility Value: 0.000003 1/psi

Phase Composition: Non-Compositional

Supercritical CO2 Phase:

Phase Compressibility: Compressible

Phase Composition: Compositional

Supercritical CO2 Phase Components:

CO2 Methane

Equation of State Description Including Reference: Peng-Robinson EOS

File with EOS Reference or Documentation: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0401_File_with_EOS_YAMS.pdf

Multifluid Flow Processes:

Advection Buoyancy

Non-wetting Fluid Trapping Pore Compressibility

Thermal Conditions: Isothermal

Heat Transport Processes:

Geochemistry Modeled: Yes

File Describing Geochemistry Modeling: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0402_File_Describing_Geochemistry_Modeling_YAMS.pdf

Geomechanical/Structural Deformations Modeled: No

Rock Properties and Constitutive Relationships

Porosity/Permeability Model

Single Porosity

Porosity Distribution: Heterogeneous

Porosity included in Eclipse Keyword File: Yes

Porosity Variable Name in Eclipse Keyword File: POR

File Describing how Porosity was Determined and Assigned to Numerical Model: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0501_Porosity_Determined_Assigned_YAMS.pdf

Image Files for Porosity Distributions: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0502_Image_Files_Porosity_Distribution_YAMS.pdf

Permeability Distribution: Heterogeneous

Permeability included in Eclipse Keyword File: Yes

Permeability Variable Name in Eclipse Keyword File: PERMI

File Describing how Permeability was Determined and Assigned to Numerical Model: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0503_Permeability_Determined_Assigned_YAMS.pdf

Image Files for Permeability Distributions: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0504_Image_Files_Permeability_Distribution_YAMS.pdf

Number of Rock Types Modeled: 1

Description of Rock Type Selection and Assignment: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0505_Description_Rock_Type_YAMS.pdf

Rock Type Distribution Data File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0506_Rock_Type_Distribution_YAMS.pdf

Image Files for Rock Type Distribution: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0507_Image_Files_Rock_Type_YAMS.pdf

Rock Type #1

Rock Compressibility: Pore

Rock Compressibility Distribution: Single Value

Compressibility Value: 0.000005 1/Pa

Compressibility included in Eclipse Keyword File: Yes

Compressibility Variable Name in Eclipse Keyword File: CPOR

Constitutive Relationships

Aqueous Saturation vs. Capillary Pressure: Table

Tabular Format File for Aqueous Saturation vs Capillary Pressure: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0508_Aqueous_Sat_Cap_Press_YAMS.pdf

Aqueous Trapped Gas Modeled: Yes

Hysteresis other than non-wetting fluid trapping: No

Aqueous Relative Permeability: Table

Tabular Format File for Aqueous Relative Permeability: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0509_Aqueous_Relative_Perm_YAMS.pdf

Hysteresis other than non-wetting fluid trapping: No

Gas Relative Permeability: Table

Tabular Format File for Gas Relative Permeability: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0510_Gas_Relative_Perm_YAMS.pdf

Hysteresis other than non-wetting fluid trapping: No

Porosity and Permeability Reduction Due to Salt Precipitation

Boundary Conditions

Attach Boundary Conditions Description File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0601_Boundary_Conditions_Description_YAMS.pdf

Initial Conditions

Initial Phases in Domain: Aqueous

Initial Aqueous Pressure: Varying with Depth, Temperature, and Salinity

Initial Aqueous Pressure: -999 MPa at Reference Elevation: -999 m

Initial Temperature: Varying with Depth

Initial Temperature: -999 C at Reference Elevation: -999 m Gradient: -999 deg C/m

Initial Salinity: Spatially Constant

Initial Salinity: -999 mg/L

Initial Condition Comments: The initial conditions can be found in the AoR and Corrective Action Plan in the confidential business information.

Operational Information

Number of Injection Wells: -999

Number of Production/Withdrawal Wells: -999

Model Output/Results

Provide file name and corresponding spatial location for each file: See Confidential Business Information file for Time Series information.

Time-Series File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0901_Time_Series_File_YAMS.pdf

Provide file name and corresponding variable and time stamp for each file: See Confidential Business Information file for snapshot data information.

Snapshot File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0902_Snapshot_File_YAMS.pdf

Provide file name and corresponding description of surface for each file: This is not applicable.

Surface Flux File: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0903_Surface_Flux_File_YAMS.pdf

Sensitivity Analysis Description/Results: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/0904_Sensitivity_Analysis_YAMS.pdf

AoR Pressure Front Delineation

Lowermost USDW:

Name of Lowermost USDW: -999

Water Density: -999 kg/m^3 at Elevation: -999 m

Location of Measurement for Density: -999

Temperature: -999 C at Elevation: -999 m

Location of Measurement: -999

Pressure: -999 MPa at Elevation: -999 m

Location of Measurement: -999

Salinity: -999 mg/L at Elevation: -999 m

Location of Measurement: -999

Elevation of bottom of USDW: -999 m

Injection Zone:

Name of Injection Zone: -999

Water Density: -999 kg/m^3 at Elevation: -999 m

Location of Measurement: -999

Temperature: -999 C at Elevation: -999 m

Location of Measurement: -999

Pressure: -999 MPa at Elevation: -999 m

Location of Measurement: -999

Salinity: -999 mg/L at Elevation: -999 m

Location of Measurement: -999

Elevation of top of Injection Zone: -999 m

Method of Estimating Critical Pressure: Static Mass Balance

Assumptions: linear density gradient

File Describing Critical Pressure Estimation: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/1001_Critical_Pressure_Estimation_YAMS.pdf

Estimated Critical Pressure: 32 MPa

Delineated AoR:

Shapefile or KML File Showing Delineated AoR: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/1002_Shape_Delineated_AOR_YAMS.pdf

Corrective Action

File with Location of All Penetrations within AoR: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/1101_Location_Penetrations_AOR_YAMS.pdf

File with Location of Wells Requiring Corrective Action: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/1102_Location_Corrective_Action_YAMS.pdf

Supporting Documentation: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/1103_Supporting_Documentation_YAMS.pdf

Area of Review and Corrective Action Plan [40 CFR 146.82(a)(13) and 146.84(b) or applicable state requirements]

Are you making an Area of Review and Corrective Action Plan submission at this time?: Yes

Reason for Project Plan Submission: Permit application submission

Project Plan Upload

Attach the Area of Review and Corrective Action Plan: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/AOR_CA_YAMS_CCS_1g.pdf

Appendices and Supporting Materials Upload

Attach Any Supporting Documentation for the AoR and Corrective Action Plan: https://epa.velo.pnnl.gov/alfresco/service/velo/getFile/no_wiki/shared/Submissions/R06-LA-0004/Phase1-PreConstruction/AoRModeling-07-20-2021-1055/1202_Appendices_Supporting_Materials_YAMS.pdf

Area of Review Reevaluation [40 CFR 146.84(e) or applicable state requirements]

Minimum fixed frequency of AoR reevaluation: 5 Years

Are you making an Area of Review reevaluation submission at this time?: No

Reevaluation Background

Reevaluation Materials

Please upload your amended AoR and Corrective Action Plan on the previous tab.

Complete Submission

Authorized submission made by: Kelly Watson

For confirmation a read-only copy of your submission will be emailed to: Kelly_Watson@oxy.com