CLASS VI PERMIT APPLICATION NARRATIVE
40 CFR 146.82(A)

Project Name: Buckeye III CCS

Facility Information:

Facility Contact: Buckeye III CCS, LLC
14302 FNB Parkway
Omaha, Nebraska 68154
402-691-9500

Well Locations: Coshocton County, Ohio

Well Name	Latitude (WGS 84)	Longitude (WGS 84)
Bellflower 1	40.215516	-81.864158

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Acronym List

amsl	Above Mean Sea Level
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AOI	Area of Interest
AoR	Area of Review
AP	Artificial Penetrations
bgs	Below ground surface
BH	Bottom Hole
BIC	Basal Sandstone Injection Complex
CBS	Cambrian Basal Sandstone
CCS	Carbon Capture and Storage
CO_2	Carbon Dioxide
CI	Casing Inspection
CBL	Cement Bond Log
COCORP	Consortium for Continental Reflection Profiling
DAS	Distributed Acoustic Sensing
DTS	Distributed Temperature Sensing
DH	Downhole
ERRP	Emergency and Remedial Response Plan
ft	Feet
GS	Geologic Sequestration
gm	Gram
H_2S	Hydrogen Sulfide
KY	Kentucky
LCR	Lower Copper Ridge
MIT	Mechanical Integrity Test
MMt	Million Metric Tonnes
MMt/y	Millions of Metric Tonnes per year
Mt/y	Thousand Metric Tonnes per year
NACE	National Association of Corrosion Engineers
NY	New York
OEPA	Ohio Environmental Protection Agency
ODNR	Ohio Department of Natural Resources
OH	Ohio
OSU	Ohio State University
ppmv	Parts Per Million Volume

PA	Pennsylvania
mol%	Percentage of total moles in a mixture made up by one constituent
PISC	Post-Injection Site Care
psi	Pounds Per Square Inch
psia	Pounds Per Square Inch, Absolute
P/T	Pressure-Temperature
PNC	Pulsed Neutron Capture
QASP	Quality Assurance and Surveillance Plan
SAPT	Standard Annulus Pressure Test
SIC	Standard Industrial Classification
SEM	Static Earth Model
SSTVD	Sub-Sea True Vertical Depth
TN	Tennessee
TD	Total Depth
TDS	Total Dissolved Solids
UCR	Upper Copper Ridge
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water
U.S. EPA	U.S. Environmental Protection Agency
VSP	Vertical Seismic Profile
VA	Virginia
WV	West Virginia

1 Project Background and Contact Information

Buckeye III CCS, LLC is proposing the development of Buckeye III CCS, which includes a Class VI Underground Injection Control (UIC) well named Bellflower 1 associated with the Three Rivers Energy biorefinery in Coshocton, Coshocton County, Ohio (the "project"; Figure 1). Lakeview Energy, LLC owns the Three Rivers Energy biorefinery and has requested sequestration services under an agreement with Buckeye III CCS, LLC. This narrative is provided in support of a Class VI UIC Well permit application for the project.

Buckeye III CCS, LLC is an affiliate of Tenaska, Inc. (Tenaska) who has made major, corporate-level commitments toward CCS development in the region. Tenaska is a privately held, independent power company based in Omaha, Nebraska. Established in 1987, Tenaska has a generating fleet of over 7,500 MW, is one of the largest gas marketing companies in North America, and has balance sheet equity of $2.9 billion. Buckeye III CCS, LLC will serve as the project owner and will assume liability for development, finance, and operation of the project.

The key project contacts are:

[redacted]
Buckeye III CCS, LLC
14302 FNB Parkway
Omaha, Nebraska 68154
[redacted]

[redacted]
Projeo Corporation
1700 S Mount Prospect Rd.
Des Plaines, Illinois 60018
[redacted]

The supporting documentation for this application was prepared in accordance with the U.S. Environmental Protection Agency's (U.S. EPA's) UIC Control Program for Carbon Dioxide Geologic Sequestration Wells codified at 40 CFR 146.

With this application, Buckeye III CCS, LLC is requesting a permit to construct the injection well Bellflower 1. After issuance of the permit by the UIC Program Director, Buckeye III CCS, LLC plans to start construction of the well within 2 years but additionally requests two options to extend the permit term by 2 years. The reason for this request is that the project relies on the installation of capture equipment by Lakeview Energy, LLC, which will also likely require modification of permits for the Three Rivers Energy facility, both of which may be delayed for reasons outside the control of Buckeye III CCS, LLC. After submittal of required documentation to the UIC Program Director and receiving authorization to inject, and once Lakeview Energy, LLC is ready to operate their CO_2 capture equipment, Buckeye III CCS, LLC will initiate injection. This application assumes that the 30-year injection period will start in approximately 2027, end in 2057, and be followed by a 50-year post-injection site care period, taking the project to 2107. Start of injections could vary by 1 to 5 years.

The project is not requesting an injection depth waiver or an expansion of aquifer exemptions with this application.

There are no federally recognized Native American tribal lands or territories within the proposed Area of Review (AoR; 40 CFR 146.82(a)(20)).

The SIC codes applicable to the project are identified below (40 CFR 144.31(e)(3)):

- 49530300 Nonhazardous waste disposal sites – primarily engaged in collection and disposal of refuse by processing or destruction or in operation of incinerators/waste treatment plants/landfills/other sites for disposal of such materials; and
- 51690203 Carbon Dioxide – primarily engaged in wholesale distribution of CO_2.

State contacts with jurisdictions within the proposed AoR include the following (40 CFR 146.82(a)(20)):

Ohio Department of Natural Resources (ODNR; Class II UIC wells)
Division of Oil & Gas Resources
2045 Morse Road, Columbus, OH 43229
Kenny Brown: 614-265-6933, michael.brown@dnr.state.ohio.us

Ohio Environmental Protection Agency (OEPA; Class I, IV, and V UIC wells)
Division of Drinking and Ground Waters, Underground Injection Control Program
P.O. Box 1049, Columbus, OH 43216-1049
Lindsay Taliaferro: 614-644-2771, l.taliaferro@epa.ohio.gov

The permits and authorizations that will likely be required for the project, the permit/authorization jurisdictions, and the associated project development activities are provided in Table 1 (40 CFR 144.31(e)(6)).

Table 1. Permits and authorizations that may be necessary for development of the project.

Required Permits and Authorizations for Coshocton County, Ohio		
Permit/Authorization	**Activity**	**Jurisdiction**
UIC Class VI Permit to Construct	Drilling of Injection Wells	U.S. EPA
UIC Class VI Authorization to Inject	Injecting CO_2	U.S. EPA
Greenhouse Gas Rule Subpart RR Monitoring, Reporting, and Verification Plan Approval	Injecting CO_2	U.S. EPA
Section 404 Nationwide Permit	Temporary impacts to federal jurisdictional waters	USACE
Isolated Wetlands Permit	Temporary impacts to waters that do not have federal jurisdiction	OEPA
Construction Stormwater General Permit	Management of stormwater during construction	OEPA
Drilling Permit	Observation well construction	ODNR

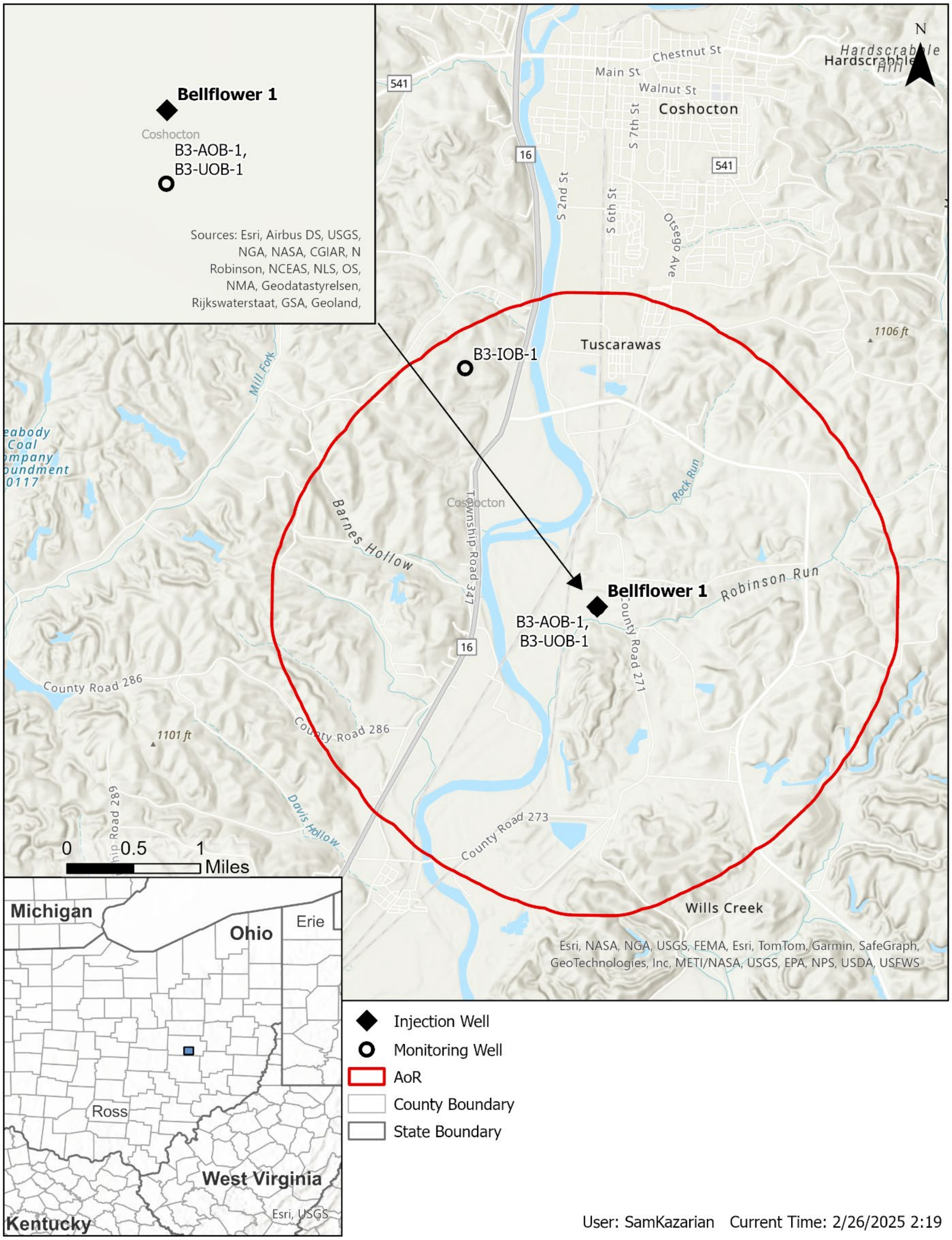

Figure 1: Location of project injection and monitoring wells and AoR boundary in Coshocton County.

The project is currently proposing an AoR that includes a 0.5-mile buffer on the modeled maximum extent of the pressure front to mitigate the current unknowns in subsurface data that will be resolved with data from pre-operational testing. These unknowns are discussed in this Application Narrative and in the Area of Review and Corrective Action Plan. Due to the extent of the AoR, several figures were created to address federal requirements at 40 CFR 146.82(a)(2) for a map of the area, with features shown or absent as noted below:

- Injection wells: There are no records of currently active injection wells in the AoR (Figure 2).
- Oil and gas wells (Figure 3 and Table 2; further discussed in subsection 4.1 of the Area of Review and Corrective Action Plan; source: ODNR):
  - Producing: There are 26 known producing wells (Rose Run Sandstone, Clinton Sand, and Berea Sandstone) with “oil”, “gas”, “oil and gas”, or “gas with oil show” status in the AoR.
  - Unknown: There is 1 well with an “unknown” status but a known location in the AoR.
  - Plugged wells or dry holes: There are 2 wells with “plugged gas” status, 2 wells with “plugged gas with oil show” status, and 9 wells with “plugged oil and gas” status. Additionally, there are 5 wells with “dry hole” status, 1 well with “Dry hole with gas shows” status, and 1 well with “dry hole with oil show” status in the AoR.
- Water wells: There are 374 known water wells in the AoR, as shown in Figure 4 (see subsection 2.7.2 below for discussion).
- Deep stratigraphic boreholes: There are no stratigraphic test well records in the AoR.
- Roads and railroads: State Highways 16 and 83, various county and town roads, two active railways, and two abandoned railways are in the AoR, as shown in Figure 3.
- State or U.S. EPA-approved subsurface cleanup sites: There are two records of subsurface cleanup sites within the AoR (Figure 6):
  - Coshocton Landfill, a U.S. EPA Superfund site. The Coshocton landfill lies northeast of the injection well site and covers 88.5 acres. The site, originally used for coal strip mining, later became a city landfill from 1968 to 1979, accepting industrial and hazardous waste. Contamination from the waste impacted the groundwater, surface water, and soil. The U.S. EPA and Ohio EPA investigated the site in 1980 and identified it as a potential public health threat, leading to its placement on the National Priorities List in 1982. A 1988 study confirmed contamination from around 30 chemicals, prompting a cleanup plan that included capping 40 acres of the landfill, long-term monitoring, and restricted site access. In 1995, a Preliminary Close Out Report confirmed the proper construction of response actions, leading to the site's removal from the National Priorities List in 1998. The U.S. EPA continues five-year reviews to ensure the remedy remains protective of public health and the environment, with the last one conducted in 2023.

  - G.E. Co. Coshocton Plant, a state voluntary cleanup program site, lies inside the northern border of the project's AoR. The 59.2-acre property, formerly G.E. Electromaterials, was developed in 1946 for manufacturing plastic laminates and later became a primary producer of fiberglass laminates for circuit boards until operations ceased in 2004. SABIC IP purchased the site, decommissioned it in 2007, and left it mostly grass-covered, with one remaining building used for groundwater monitoring. OEPA issued a No Further Action letter for the site in 2014 subject to environmental covenant which restricts the site to commercial and industrial use, with a prohibition on groundwater extraction for potable purposes, though it may be used for monitoring or remediation. Currently, the land is vacant of structures and is used for equipment storage.
- Other pertinent surface features:
  - The city of Coshocton and townships of Jackson, Tuscarawas, Virginia, and Franklin are in the AoR, as shown in Figure 4.
- Surface bodies of water: The following named surface bodies of water are in the mapped area, as shown in Figure 5: Muskingum River, Robinson Run, Rock Run, Coopers Run, and BSA-Muskingum Valley Council Lake. There are various unnamed tributaries and ponds in the AoR as well.
- Springs: There are no records of springs in the mapped area.
- Quarries: There is 1 record of an abandoned quarry in the AoR as shown in Figure 7.
- State, tribal, and territory boundaries: There are no tribal or territory boundaries in the AoR.
- Surface and subsurface mines: There are abandoned underground coal mines within and near the AoR. Mining operations in the mapped area are shown in Figure 7 and further discussed in subsection 2.1.10 below.

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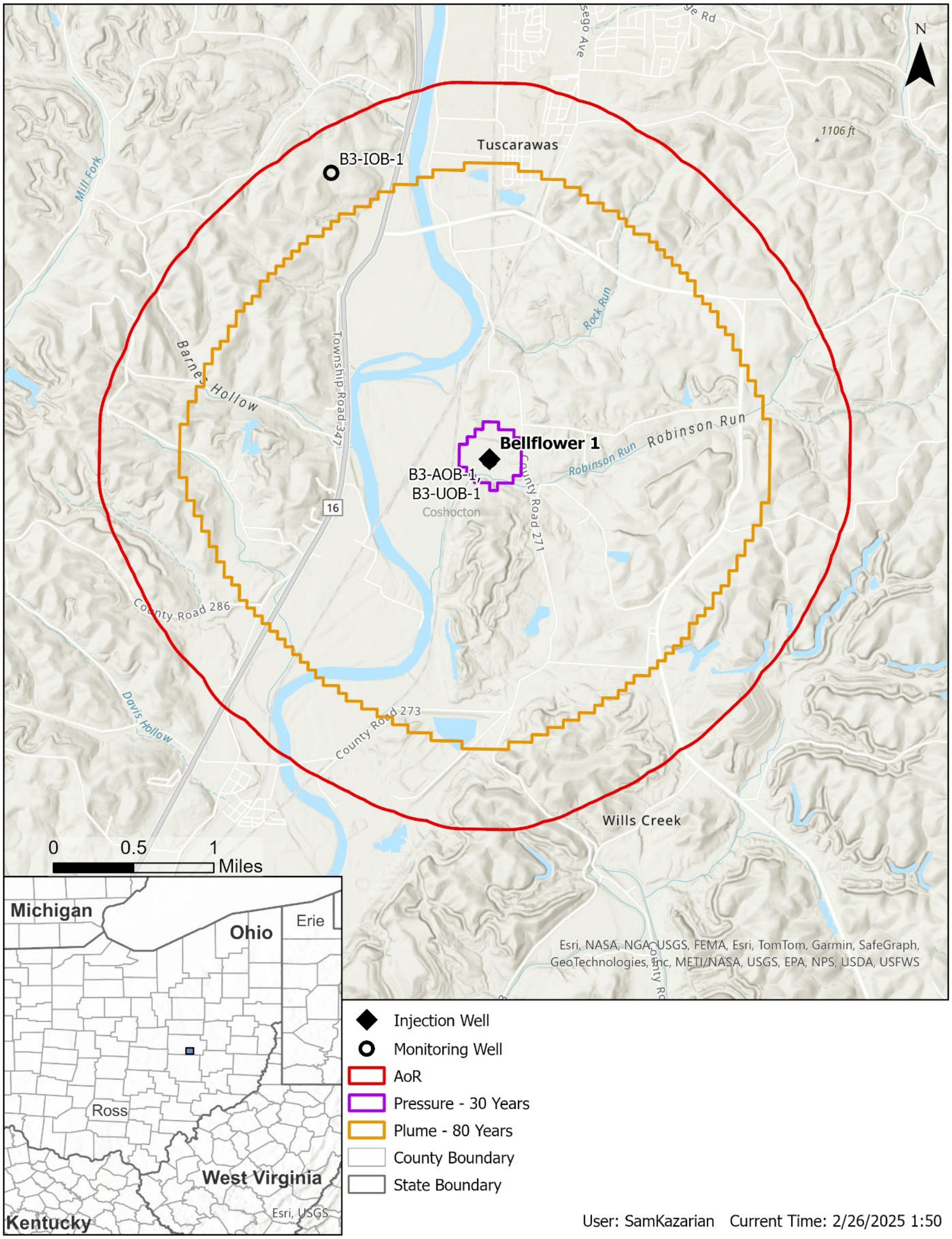

Figure 2: Locations of proposed injection and observation wells, the AoR, and the plume boundary.

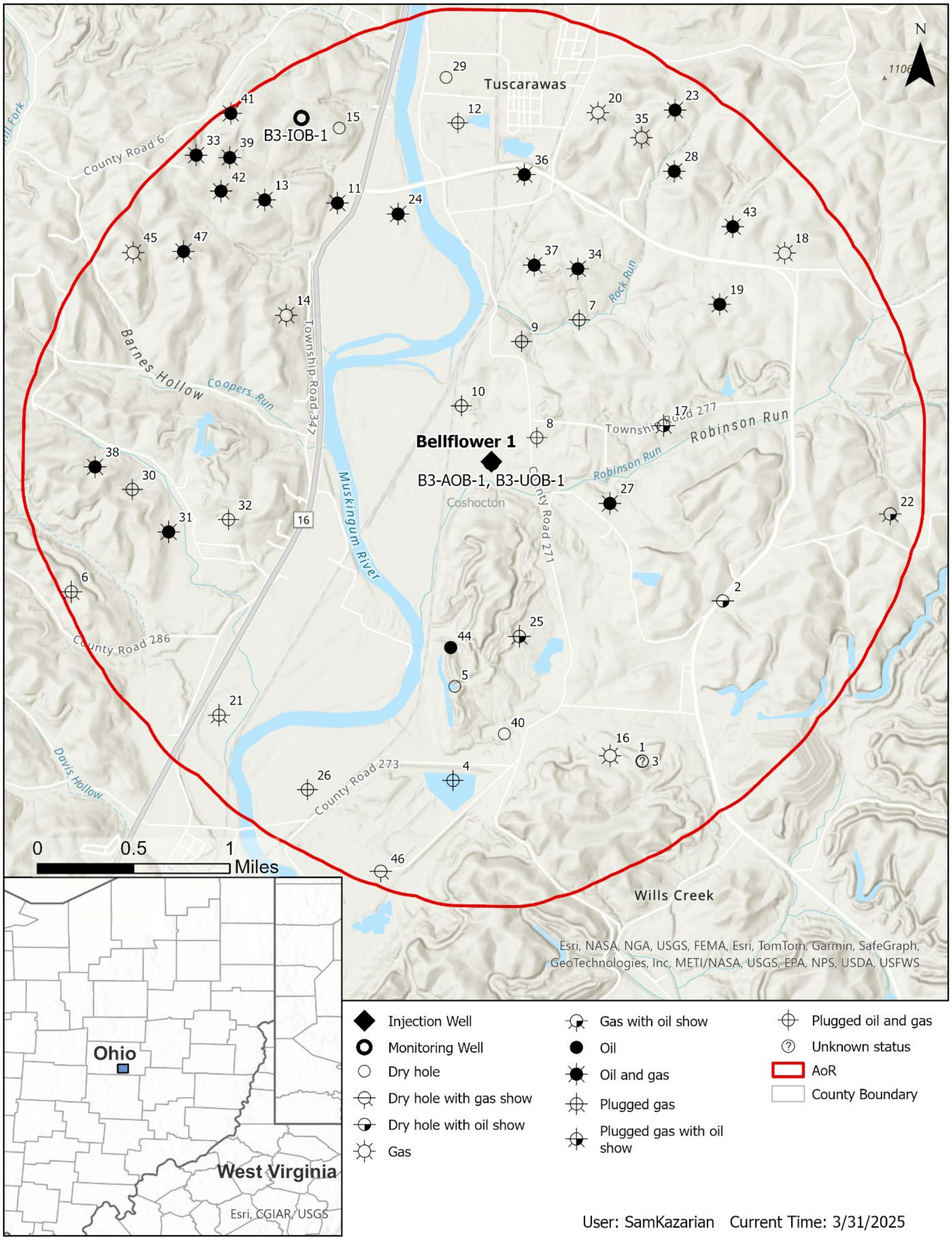

Figure 3: Oil and gas wells in the AoR, keyed to Table 2.

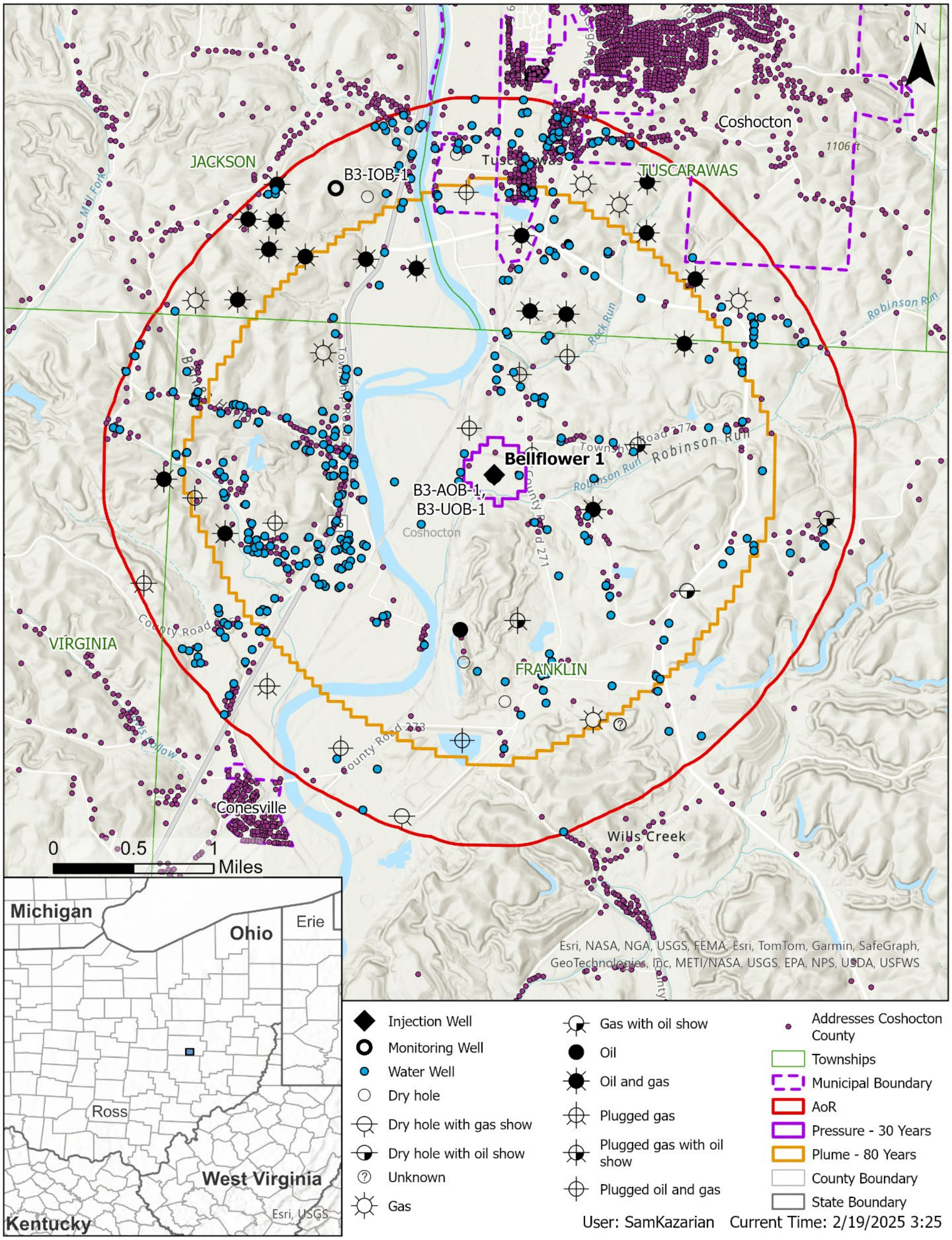

Figure 4: Infrastructure in the AoR.

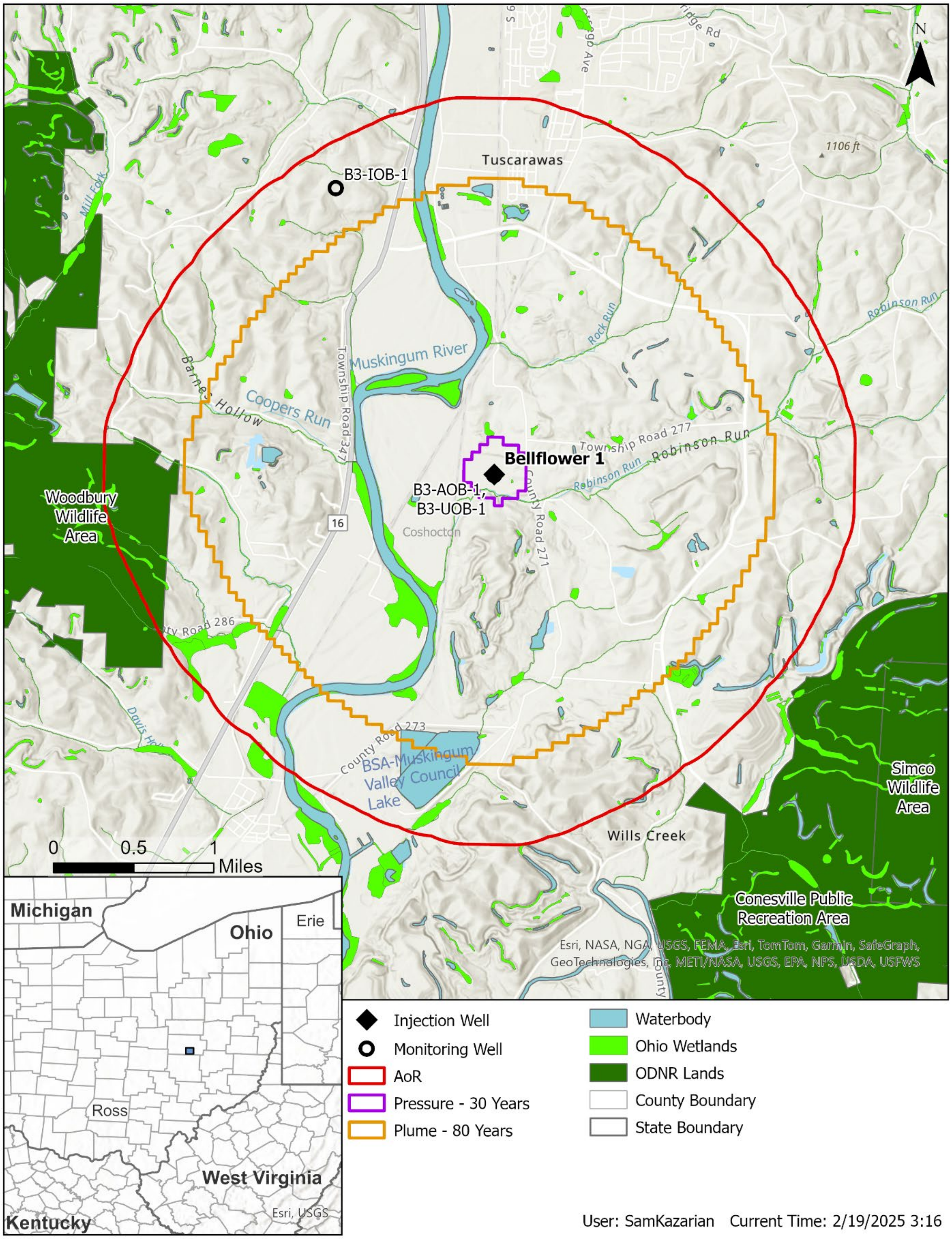

Figure 5: Lakes and water bodies, wetlands, and Ohio Department of Natural Resources (ODNR) lands in the AoR.

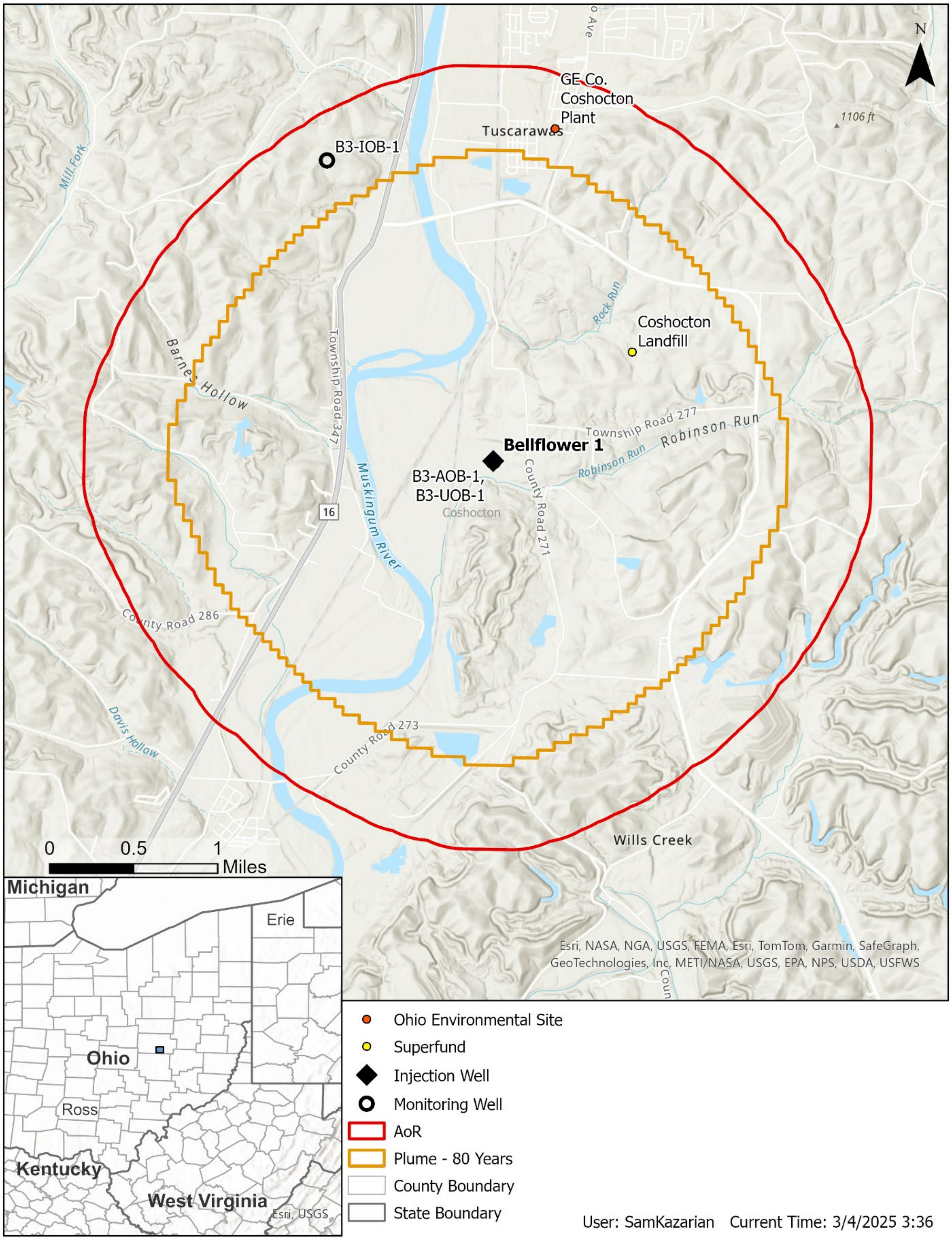

Figure 6. Environmental cleanup sites in the AoR.

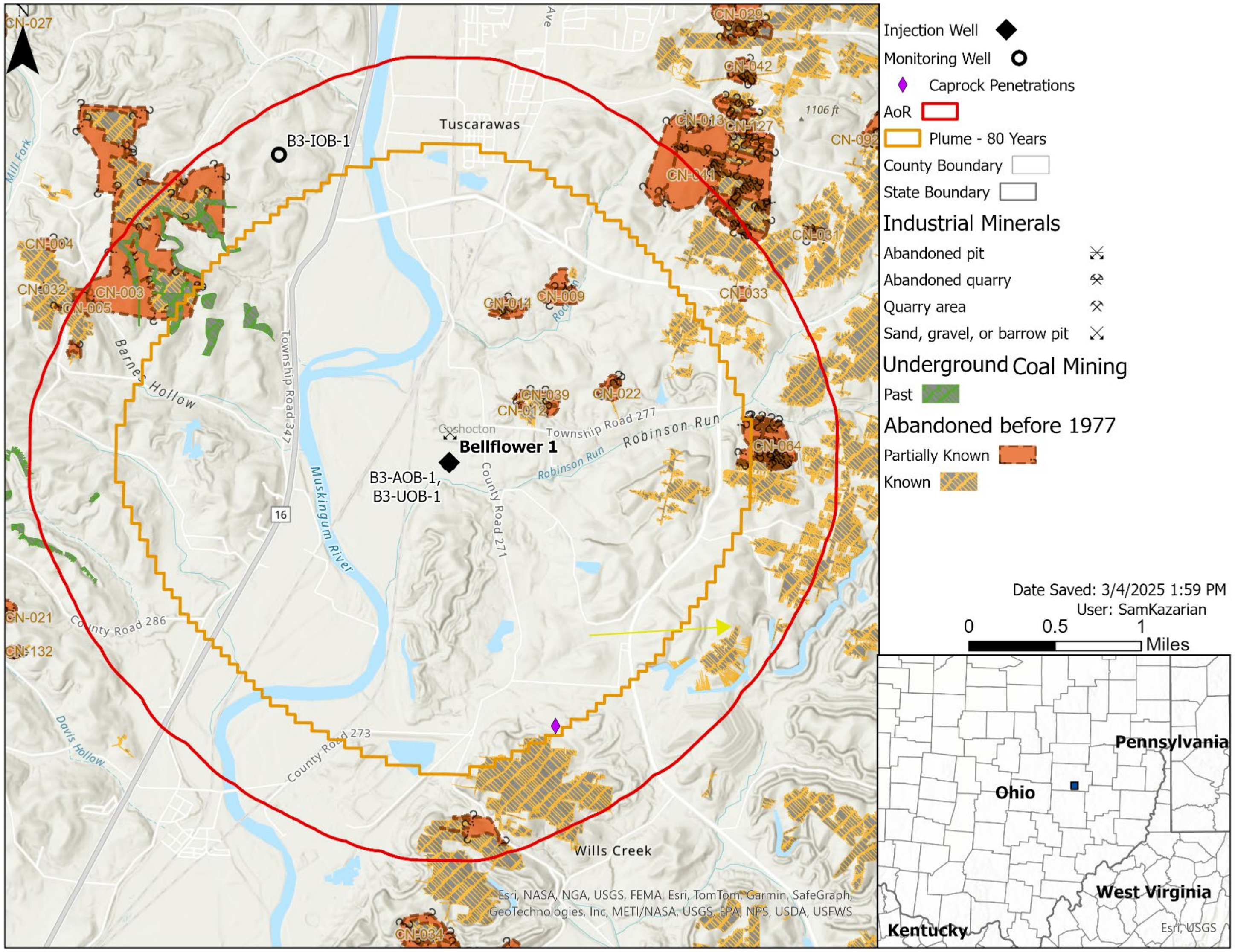

Figure 7: Mining in the AoR.

Table 2: Oil and Gas Wells within the AoR.

Number	API	Well Lease/Name	Well Type	Original Well Status	Date	Plug Date	Surface Lat	Surface Long	MD	TVD	Producing Formation	Enverus Well Status
1	34031111190000	LAPP EMERY R	V	D&A	10/20/1954	n/a	40.19307	-81.849	4220	4220	D&A	P & A
2	34031206390000	PORTEUS LESLIE	V	dry_oilshow		9/7/1954	-81.8413	-81.8413	4133	4133	CLINTON SAND	P & A
3	34031206730000	LAPP EMERY R F	V	dry		n/a	40.19308	-81.849	4220	4220	D&A	P & A
4	34031219720000	TUMBLIN ONETA	V	pl_oil_gas	3/25/1969	6/3/1972	40.19148	-81.8676	3856	3856	CLINTON SAND	P & A
5	34031220200000	MUSKINGUM VALLEY COUNCIL INC BOY SCOUTS	V	dry	6/10/1970	7/28/1970	40.19857	-81.8675	4047	4047	D&A	INACTIVE COMPLETED
6	34031224600000	PEABODY COAL CO	V	pl_gas	7/31/1974	7/21/1978	40.2054	-81.9053	6306	6306	ORISKANY SANDSTONE	INACTIVE COMPLETED
7	34031224610000	COCHRAN	V	pl_oil_gas	10/2/2001	11/20/2001	40.22626	-81.8557	3949	3949	CLINTON GROUP	INACTIVE COMPLETED
8	34031224690000	ROSS EDWARD & DAVID	V	pl_oil_gas	10/2/2015	3/23/2016	40.21736	-81.8597	3974	3974	CLINTON SAND	INACTIVE PRODUCER
9	34031225170000	WISKIMENS RALPH & FRASE CONSTANCE	V	pl_oil_gas	11/16/1974	2/25/1985	40.22458	-81.8613	4014	4014	CLINTON SAND	INACTIVE PRODUCER
10	34031225340000	FRASE CONSTANCE	V	pl_oil_gas	2/1/1985	3/1/1985	40.2197	-81.8672	3916	3916	UNKNOWN	INACTIVE PRODUCER
11	34031225520000	TRI-MAC INC	V	oil_gas	12/31/1974	n/a	40.23487	-81.8796	5966	5966	ROSE RUN / CLINTON	INACTIVE PRODUCER
12	34031225760000	COMMUNITY IMPROVEMENT CORP	V	pl_oil_gas	6/3/1975	7/11/2000	40.241	-81.8678	6138	6138	CLINTON SAND	INACTIVE COMPLETED
13	34031225950000	TRI-MAC INC	V	oil_gas	5/1/1975	n/a	40.23505	-81.8867	6246	6246	ROSE RUN / CLINTON	INACTIVE PRODUCER
14	34031225990000	TRI-MAC INC	V	gas	5/13/1975	n/a	40.22639	-81.8845	6474	6474	ROSE RUN / CLINTON	INACTIVE PRODUCER
15	34031226330000	POPE HE	V	dry	7/10/1975	11/8/1977	40.24052	-81.8794	6248	6248	attempt ROSE RUN	INACTIVE COMPLETED
16	34031234620000	COLUMBUS & SOUTHERN POWER CO	V	gas	8/26/1979		40.19345	-81.8522	7585	7585	CLINTON SAND	INACTIVE PRODUCER
17	34031234640000	COL & SOUTHERN OHIO ELEC CO	V	pl_gas_oilshow	5/18/1979	7/25/1995	40.21836	-81.8473	6619	6622	ROSE RUN SS	INACTIVE PRODUCER
18	34031236150000	NOBLE DANIEL L	V	gas	10/25/1979	n/a	40.23144	-81.8355	6455	6455	CLINTON SAND	INACTIVE PRODUCER
19	34031236160000	NOBLE DANIEL L& WEST F HEIRS UNIT	V	oil_gas	9/24/1979	n/a	40.22752	-81.8419	4203	4203	CLINTON SAND	INACTIVE PRODUCER
20	34031236580000	PORTEUS LESLIE B	V	gas	9/4/1984	n/a	40.24186	-81.854	6167	6167	ROSE RUN SS	INACTIVE PRODUCER
21	34031236860000	UNIVERSAL CYCLOPS CORP	V	pl_gas	6/2/1980	7/13/1982	40.19623	-81.8907	6173	6173	CLINTON SAND	INACTIVE COMPLETED
22	34031237370000	SHEETS RODNEY A & BARBARA J	V	D&A	12/12/1979	n/a	40.21186	-81.8249	1105	1105	BEREA SANDSTONE	INACTIVE PRODUCER

23	34031239210000	WELLS CARL S	V	oil_gas	6/4/1980	n/a	40.24212	-81.8464	4265	4265	CLINTON SAND	INACTIVE PRODUCER
24	34031243090000	POPE-OHIO	V	oil_gas	1/23/1981	n/a	40.2341	-81.8736	5982	5982	ROSE RUN / CLINTON	INACTIVE PRODUCER
25	34031245480000	MUSKINGUM VALLEY COUNCIL BSA	V	pl_gas_oilshow	2/2/1982	1/31/2001	40.20238	-81.8612	6395	6395	ORISKANY SANDSTONE	INACTIVE PRODUCER
26	34031246730000	LAPP	V	pl_oil_gas	1/28/1983	2/15/1983	40.19069	-81.8819	3915	3930	CLINTON SAND	INACTIVE COMPLETED
27	34031247890000	DOTY HELEN	V	oil_gas	4/5/1982	n/a	40.21246	-81.8525	3990	3990	CLINTON SAND	INACTIVE PRODUCER
28	34031247960000	WELLS C	V	oil_gas	4/15/1982	n/a	40.23751	-81.8465	4237	4237	CLINTON GROUP	INACTIVE PRODUCER
29	34031250140000	GUTHRIE-WATERS	V	P&A	1/5/1983	4/11/1983	40.24442	-81.869	3879	3879	CLINTON SAND	INACTIVE COMPLETED
30	34031252230000	DAWSON	V	pl_oil_gas	12/9/1987	1/15/1988	40.21315	-81.8994	3925	3925	CLINTON GROUP	INACTIVE PRODUCER
31	34031252350000	MCDONALD NANCY E	V	oil_gas	12/9/1987	n/a	40.20998	-81.8958	3915	3915	CLINTON GROUP	INACTIVE PRODUCER
32	34031252370000	MCCULLOUGH WILLIAM E	V	pl_oil_gas	11/20/1984	10/20/1986	40.21096	-81.8899	3990	3990	CLINTON GROUP	INACTIVE PRODUCER
33	34031253400000	MESAROS/VICKERS UNIT	V	oil_gas	12/10/1984	n/a	40.23838	-81.8935	4070	4135	CLINTON SAND	INACTIVE PRODUCER
34	34031253530000	MATHIAS CLIFFORD	V	oil_gas	8/15/1986	n/a	40.2301	-81.8558	4135	6507	CLINTON GROUP	INACTIVE PRODUCER
35	34031259790000	PONTEUSL UNIT	V	gas	6/26/1987	n/a	40.24003	-81.8497	6507	6231	CLINTON SAND	INACTIVE PRODUCER
36	34031260070000	PORTEUS UNIT	V	oil_gas	8/24/1990	n/a	40.23715	-81.8612	6230	6231	ROSE RUN SS	INACTIVE PRODUCER
37	34031260900000	COCHRAN	V	oil_gas	1/19/1988	n/a	40.23034	-81.8601	6243	6246	CLINTON SAND	INACTIVE PRODUCER
38	34031260980000	TREAT	V	oil_gas	2/16/1988	n/a	40.23111	-81.8946	4150	4150	CLINTON SAND	INACTIVE PRODUCER
39	34031261750000	DEMOSS NOBLE	V	oil_gas	1/17/1989	n/a	40.21482	-81.9031	3877	3879	CLINTON SAND	INACTIVE PRODUCER
40	34031262040000	ALBERTSON TERRY D& PATRICIA A	V	oil_gas	8/22/1994	n/a	40.23822	-81.8902	3951	3965	CLINTON SAND	INACTIVE PRODUCER
41	34031262830000	MUSKINGUM VALLEY COUNCIL BSOA	V	dry	12/6/1993	3/28/1995	40.19503	-81.8626	4302	4309	D&A	INACTIVE COMPLETED
42	34031262930000	ALBERTSON TERRY & PATRICIA	V	oil_gas	7/31/1990	n/a	40.24154	-81.8901	4070	4070	CLINTON SAND	INACTIVE PRODUCER
43	34031266390000	TREAT	V	oil_gas	5/21/1999	n/a	40.23567	-81.891	4134	4134	CLINTON SAND	INACTIVE PRODUCER
44	34031268560000	NOBLE D	V	oil_gas	1/11/2002	n/a	40.23337	-81.8407	4241	4241	CLINTON SAND	INACTIVE PRODUCER
45	34031269120000	MVSR	V	oil	11/4/2003	n/a	40.20148	-81.868	6297	6297	CLINTON SAND	INACTIVE PRODUCER

46	34031269620000	BORDEN	V	gas	1/31/2005	n/a	40.231	-81.8996	4204	4204	CLINTON SAND	INACTIVE PRODUCER
47	34031602580000	CORRY CORNELIA BA	V	dry_gasshow	6/29/1929	10/14/1929	40.18459	-81.8747	3876	3876	CLINTON SAND	P & A

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2 Site Characterization

2.1 Regional Geology, Hydrogeology, and Local Structural Geology [40 CFR 146.82(a)(3)(vi)]

2.1.1 Geographic Overview

The project is located in Coshocton County, in eastern Ohio. The region lies within the Appalachian Basin, an elongate, retroarc foreland basin that sits within the physiographic province of the Appalachian Plateau (Figure 8). The Appalachian Basin extends approximately 1,270 miles from Canada to Alabama and is flanked by the Cincinnati, Findlay, and Algonquin arches to the west, and the Blue Ridge Mountains and New England Uplands to the east (Colton, 1970). The northern boundary of the basin is demarcated by the Laurentian and Frontenac arches of the Canadian Shield (Ettensohn, 2008), while to the south, the basin transitions into the Black Warrior Basin of northwestern Alabama and northeastern Mississippi (Figure 8).

2.1.2 Tectonic History

The Appalachian Basin developed as a result of flexurally driven subsidence caused by tectonic loading from four nearly continous orogenic events throughout the Paleozoic. Orogenic development related to the Applachian Basin began in the Early-Middle Ordovician (~472 Ma) and continued for almost 200 Ma until the Late Permian (Ettensohn, 2008). The orogenies include the Taconic or Taconian, the Salinic, the Acadian, and the Alleghanian tectophase orogenic cycles (Figure 9). These orogenies can be grouped into two higher-order supercycle phases related to continetal collision and plate convergence with the Taconic and Salinic orogenies included in the Caledonian orogenic phase and the Acadian and Alleghanian orogenies included in the Variscan-Hercynian orogenic phase (Figure 9).

The Caledonian orogenic phase is a result of the Ordovician to Early Devonian closure of the Iapetus Ocean that formed the continent of Laurussia through the collision of the continents of Laurentia, Baltica, and the Avalonian microcontinent (Kearey et al., 2009; Torsvik and Cocks, 2016).

The Variscan-Hercynian orogenic event occurred during the Middle Devonian–Permian, as the Theic Ocean closed, and continental collision between Laurussia and Gondwana formed the supercontinent of Pangaea (Kearey et al., 2009; Ziegler, 2012; Torsvik and Cocks, 2016).

2.1.3 Influence of Precambrian – Cambrian Tectonic Events

The Paleozoic development of the Appalachian Foreland Basin was heavily influenced by Precambrian-Cambrian age tectonic events. The basement rocks that underlie the basin mainly comprise Grenvillian age crust (1.35–0.95 Ga, Figure 10) that were deformed and metamorphosed during the Grenville orogeny as the supercontinent Rodinia was formed (Ettensohn, 2008). Portions of the Grenville crust have been uplifted and deformed through Paleozoic orogenic events and are exposed at the surface in both the Blue Ridge physiographic province and the Adirondack dome (Figure 8).

Late Precambrian-Cambrian rifting and volcanism occurred during the separation of Laurentia from Gondwana and the formation of the Iapetus, Theic, and Rheic Oceans (Kearey et al., 2009; Torsvik and Cocks, 2016). Inboard rifting resulted in the deposition and emplacement of time-equivalent sedimentary and volcanic rocks (Figure 10) along what are currently the physiographic provinces of the Blue Ridge and Valley and Ridge (Figure 8, Ettensohn, 2008).

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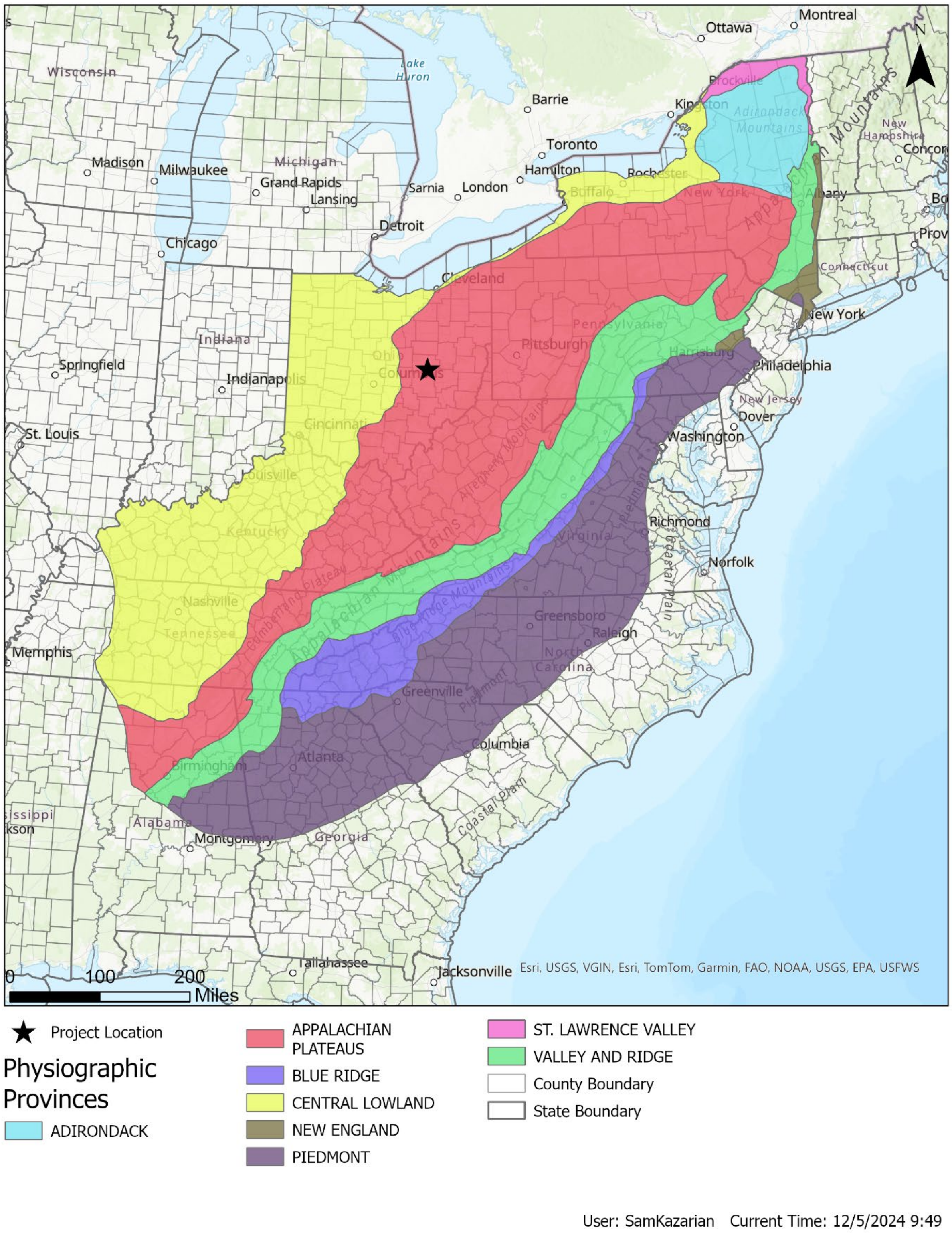

Figure 8: Physiographic provinces of the Appalachian Highlands after Fenneman, 1928. The project location is shown with a black star on the map.

Rifting was followed by a period of stabilization across the margin, relative sea level rise, and thermally driven subsidence of the basin that resulted in the widespread deposition of Precambrian-Early Cambrian synrift siliciclastic sediments (Colton, 1970). During the Late Cambrian, continued submergence of the platform established the "Great American Carbonate Bank", depositing up to 3,000 ft of mixed limestone, dolostone, and minor siliciclastic sediment (Figure 10; Demicco and Mitchell, 1982).

2.1.4 Early Ordovician

The Late Cambrian post-rift passive margin phase continued into the Early Ordovician as sedimentation and carbonate development continued across the passive margin (Figure 9 and Figure 10). The near equatorial paleogeographic setting and aridification of the climate, during the Early Ordovician, resulted in the uninterrupted deposition of carbonates, dolomites, and sedimentary strata of the Knox Group (Figure 10; Read, 1989; Scotese, 2003; Ettensohn, 2008).

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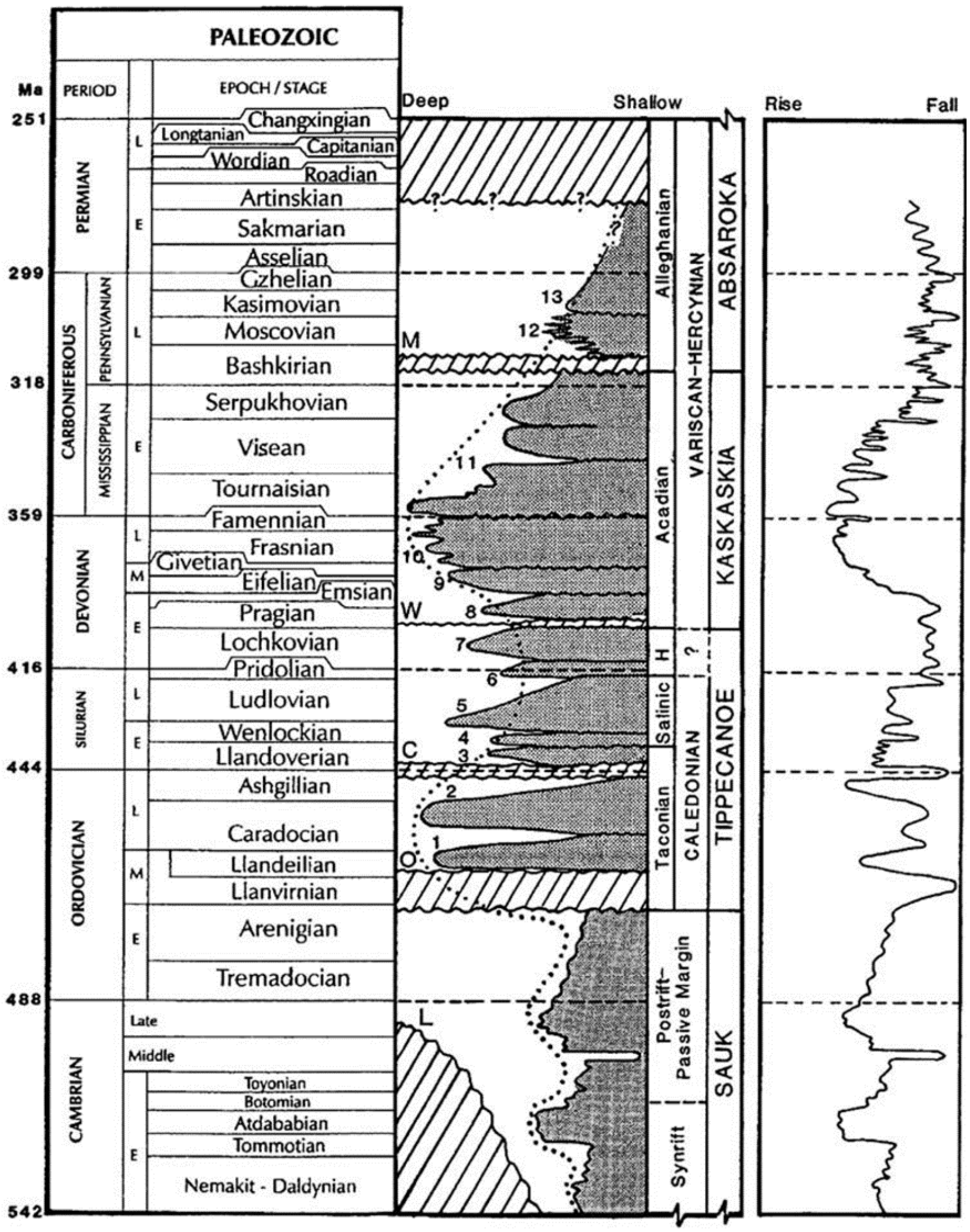

Figure 9: Paleozoic geologic time scale, showing the occurrence and relative duration of synrift, postrift passive margin, and 13 third-order, tectophase cycles (numbered) in the Appalachian Basin as a relative sea-level curve, compared with generalized sea-level curve (modified from Ross and Ross, 1988; Read, 1989; and Dennison, 1989). Unconformities are labeled on the sea-level curve: L, Lipalian; O, Owl Creek (Knox); C, Cherokee; W, Wallbridge; and M, Monday Creek. (Figure from Ettensohn, 2008).

2.1.5 Ordovician-Silurian Caledonian Orogeny

Syn- and post-rift sedimentation is observed from the Late Precambrian through the Ordovician. Precambrian Grenville age basement rocks, the influence of Iapetan rifting, and the development of the Rome Trough is visible at the base of the stratigraphic section, seen in Figure 9 and Figure 10. The transition from the Early to Middle Ordovician period, is stratigraphically delineated by the Knox (Owl Creek) unconformity which is present between the top of the Knox Group and the base of the Black River-Trenton limestone stratigraphic units (Figure 10). The unconformity was formed as a result of tectonic loading and thermally driven subsidence related to the onset of Caledonian (Taconian/Taconic orogenic phase) orogenesis (Figure 9 and Figure 10; Ettensohn, 2008; Ziegler, 1989). This shift to a protracted period of mountain building and subsequent foreland basin development is reflected in the deposition of a thick and diverse assemblage of basinal sediments (Figure 10), with an expansion of sedimentary units across the basin as the foredeep of the basin progressively translates from the present-day southeast to the northwest (Figure 10 from Ettensohn, 2008).

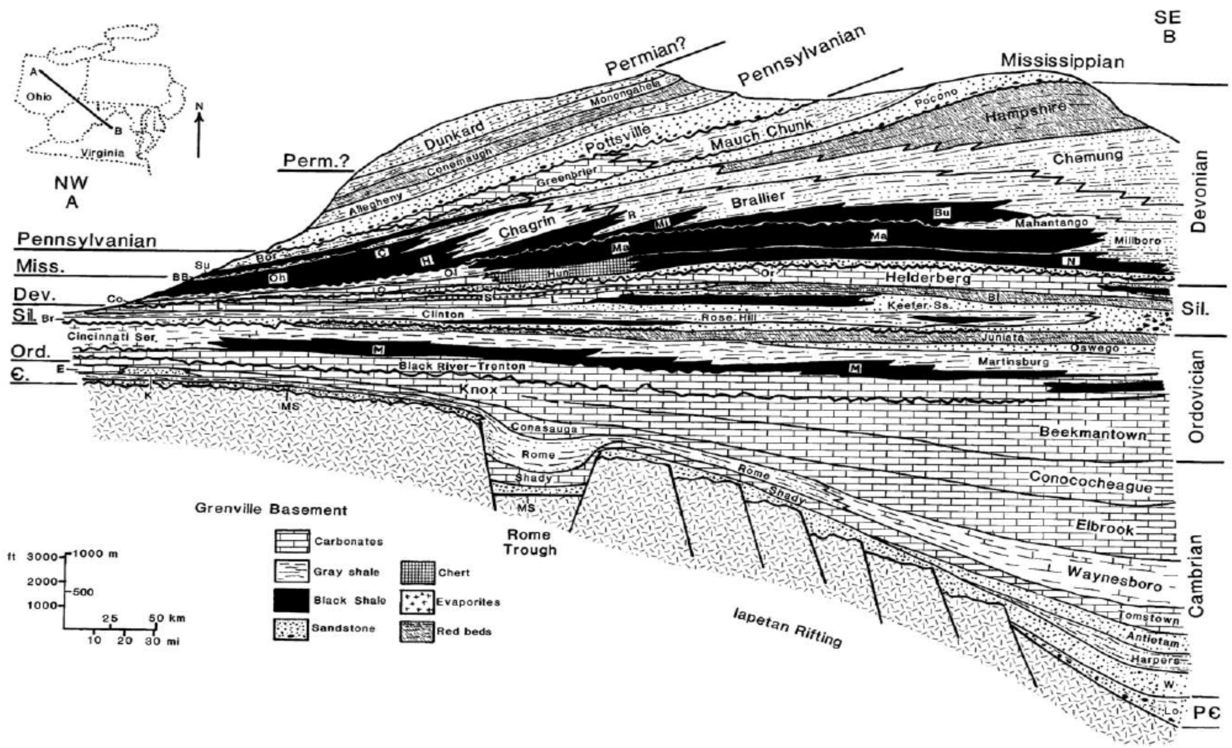

Figure 10: Schematic cross section of the Appalachian Basin from Virginia to Ohio (NW) to Virginia (SE) showing the major relationships of stratigraphic units from the Precambrian to the Permian stratigraphy. The section is flattened on the base of the Silurian. Precambrian Grenville age basement rocks and the influence of Iapetan rifting and the development of the Rome Trough is visible at the base of the section. Syn- and post-rift sedimentation is observed from the Late Precambrian through the Ordovician. The Ordovician transition to foreland basin development as a result of the Caledonian orogeny is represented by the Knox unconformity (dark black squiggly line). between the Knox Group and the Black River-Trenton limestone stratigraphic units. Subsequent flexurally and thermally driven subsidence of the foreland basin is represented by the expansion of sedimentary units across the basin as the foredeep of the basin progressively translates from the present-day southeast to the northwest. (Figure from Ettensohn, 2008).

The Early-Middle Ordovician Taconian Orogeny commenced with the Owl Creek (Knox) unconformity (Figure 9) and followed with a shift from broad deposition of carbonate facies to more structural variability, and with it, variability in sedimentation. Deposition began with the St. Peter Sandstone in the west and progressed with widening of the foreland basin and deposition of a thick (up to 7,500 ft) succession of dark shales: the Martinsburg, Reedsville, and Utica (Figure

10; Ettensohn, 2008). Dark shale deposition was followed by extensive infill of the fluvial-delta, transitional/marginal marine redbeds of the Queenston Delta (Figure 10 and Figure 11; Colton, 1970; Dennison, 1976; Blue, 2011), and development of the Cherokee discontinuity (Figure 9; Dennison and Head, 1975).

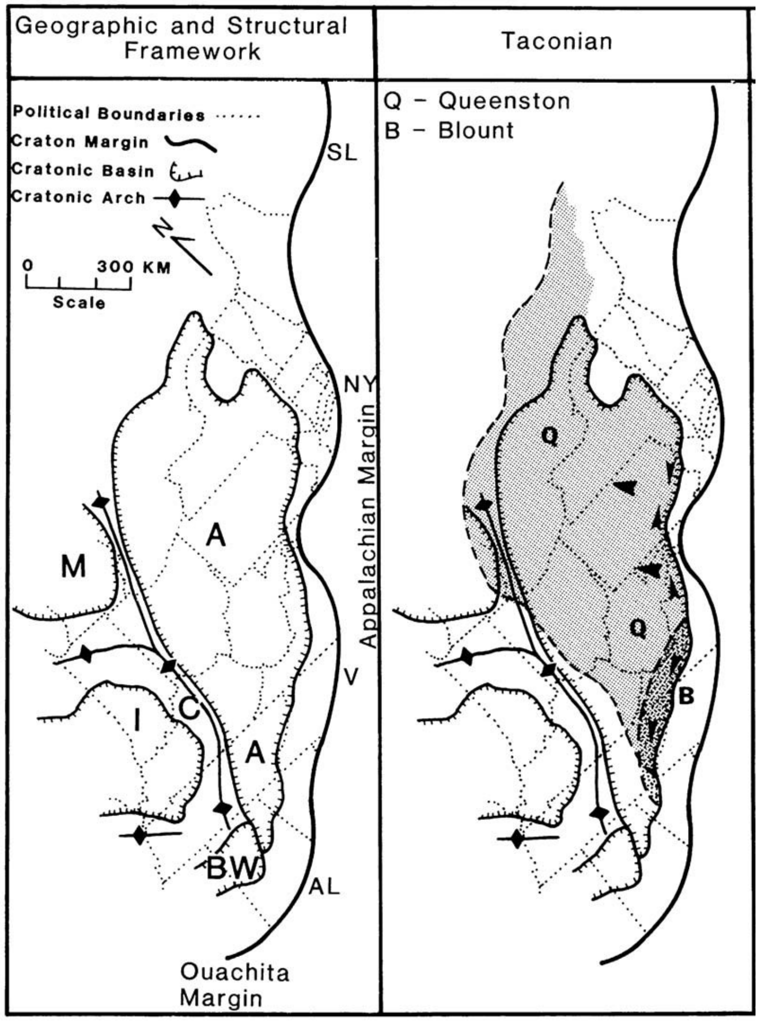

Figure 11: Distribution of Taconian Queenston Delta clastic wedge on southeastern Laurussia. Paleo currents noted by arrows. (Figure from Ettensohn, 2008).

Boucot's (1962) Salinic orogenic event was initially identified as an angular unconformity in the northeastern U.S. but marks the multi-phase north to south migration of tectonism and the accretion of Baltica to form Laurussia. A series of dark shales were deposited in the foreland basin that include the Williamson and time-equivalent Rose Hill formations (Figure 10, Figure 12; Ettensohn and Brett, 1998). In the project area, Early Salinic tectonism saw the deposition of a series of iron-rich siliciclastics, shed from the Taconic highlands (Folk, 1960; Colton, 1970; Cecil et al, 2004; Ettensohn, 2008). These clastic sequences are what make up the Medina Group: Grimsby, Whirlpool, Medina, the "Clinton" sands in Ohio, and the Tuscarora of Pennsylvania (see subsection 2.4 of this Application Narrative for more information on the formation that makes up the project's injection zone; Figure 10 and Figure 12; Folk, 1960; Colton, 1970).

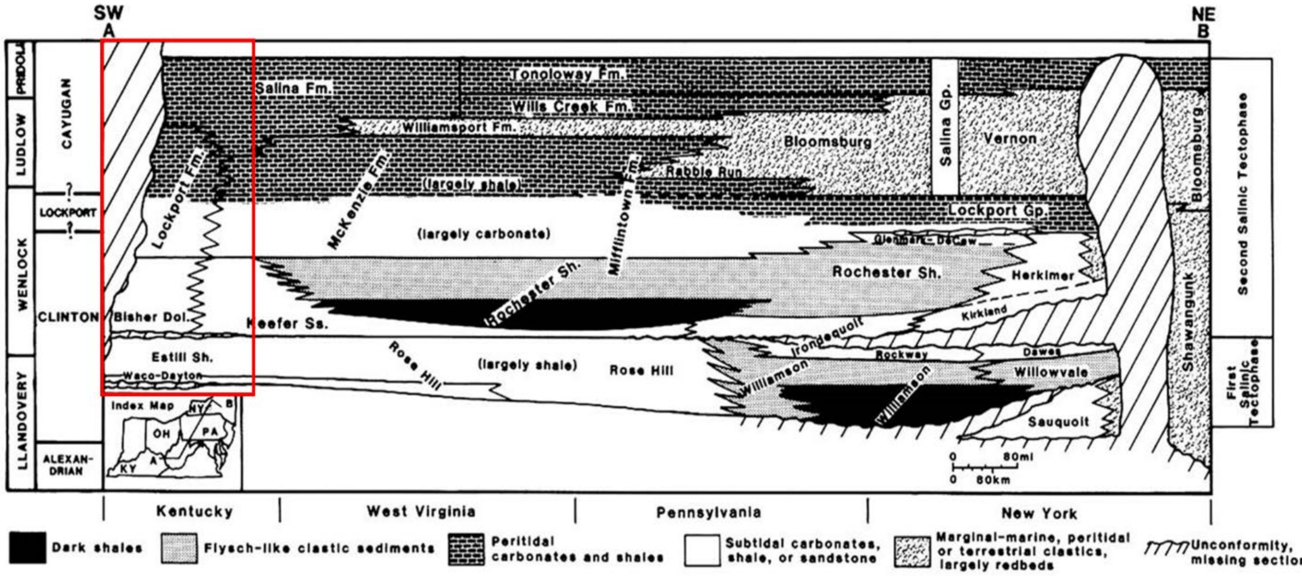

Figure 12: Southwest-northeast section partially parallel to basin strike highlighting the two Salinic phases of tectonism in the Appalachian Basin and the associated formations deposited. The red square is the approximate location of the project area. (Figure from Ettensohn, 2008).

Continued Salinic tectonism is evidenced by the Bloomsburg redbeds deposited in the foreland basin and the Salina evaporites covering the central Appalachians and Michigan Basin in response to restriction of the basin and eustatic sea-level fall (Ultieg, 1964; Ricker, 1969; Ziegler, 1989, Ettensohn, 2008). During the Middle Silurian, carbonate platform deposits formed on uplifted terranes, including the Cincinnati-Kankakee-Algonquin arch system, which isolated specific basin areas and led to widespread evaporite deposition in the Upper Silurian (Figure **13**; Colton, 1970, Ettensohn, 2008; Coyle, 2022). The evaporite beds of the Salina group were followed by a period of tectonic quiescence and development of a thick succession of carbonates (Figure 10 and Figure **13**; Ettensohn, 2008).

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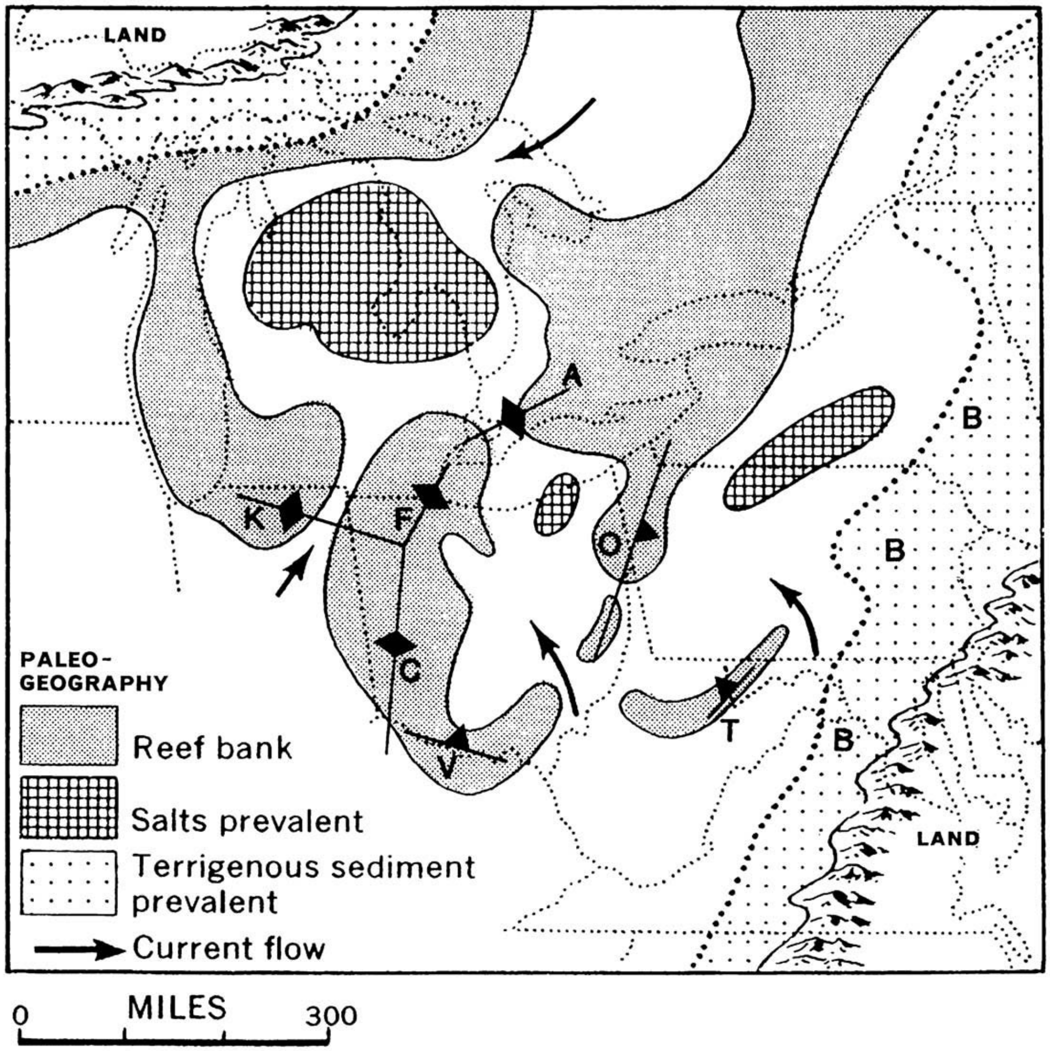

Figure 13**: Schematized Late Silurian paleogeographic map of Salinic depositional systems. Deposition and lithologies were driven by bulge migration that reactivated regional basement structures, as well as by foreland subsidence. Depositional systems are labeled as Algonquin arch (A), Findlay arch (F), Kankakee arch (K), Cincinnati arch (C), Iapetan Ohio-West Virginia hinge zone (O), Tristate block (T), and Grenvillian Vanceburg-Ironton fault zone (V). Arrows point to downthrown or down-dipping sides. Bloomsburg-Vernon redbeds (B). Adapted from Kay and Colbert (1965).**

2.1.6 Devonian-Permian Variscan-Hercynian Orogeny

The Variscan–Hercynian (Acadian phase) orogenic cycle is characterized by the closure of the Rheic Ocean during collision with Gondwana to form Pangaea (Kearey et al., 2009; Torsvik and Cocks, 2016). The Early Devonian Acadian orogenic phase of the Variscan-Herynian orogeny is characterized by dextral transgressional accretion of the Avalon and Laurussian terranes moving from northeast to southwest; this contrasts with the sinistral accretion of the Salinic orogenic cycle (van Staal et al., 1998; Ettensohn, 2008). Onset of the Acadian orogeny is marked by the Wallbridge discontinuity Figure 9 and the deposition of the Lower Devonian Oriskany Sandstone (Figure 10; Colton, 1970; Etensohn, 2008). Continued cyclic orogenesis is characterized by the deposition of the Onondaga Formation and is later characterized by transgressive black shales (Marcellus Shale) alternating with clastic wedge deposits (Mahantango Formation) (Figure 10; Ettensohn, 2008). The transgressive shales were deposited in the proximal foreland basin, while coarser clastics were deposited craton-ward in toward the peripheral bulge of the foreland basin (Figure 10; Colton, 1970; Ettensohn, 2008). Paleogeographically, the amalgamating supercontinent of Pangaea was moving progressively northward during this time and passing from an arid sub-tropical climatic belt to a more humid tropical equatorial region (Scotese, 2003).

The Alleghenian orogeny is the final tectonic phase of the Appalachian Foreland Basin, signifying the ultimate closure of the Rheic Ocean and the gradual amalgamation of Gondwana and Laurussia, sealing the two landmasses together from South to North and forming Pangaea (Kearey et al., 2009; Torsvik and Cocks, 2016). Alleghenian related foreland basin subsidence is recorded in the sediments deposited from the Monday Creek Unconformity in the Pennsylvanian through the Early Permian (Figure 9 and Figure 10; Sloss, 1963). Hatcher (2005) described the Central Appalachian Basin as a broad fold and thrust belt with megathrusts carrying Paleozoic crust 218 mi across the Laurentian Platform and foreland basin. The thickest accumulations of these siliciclastic sediments, reaching up to 9,500 ft in thickness, are concentrated in the foredeep of the foreland basin (Figure 10; Meckel, 1967; Colton, 1970; Patchen et al., 1985a, b). In contrast to the distribution of clastic wedges in the previous orogenic events, a blanket of siliciclastic sediment advanced westward for over 620 mi, indicative of an overfilled foreland basin (Jordan, 1995). Notably, the sedimentary profile of this orogeny deviates from previous tectophase cycles, primarily comprising terrestrial (abundant coal) and marginal-marine, molasse-like sediments (Ettensohn, 2008). Sediments associated with the Alleghenian orogeny were deposited in a humid climate in a tropical equatorial belt with various paralic, estuarine, fluvial, and alluvial-plain environments being prevalent during this time (Scotese, 2003; Cecil et al., 2004; Ettensohn, 2008).

2.1.7 Paleogeographic Influences on Sedimentation

Though the regional tectonism is the primary control on sedimentation in the basin, the cyclic nature of the sedimentary fill in the basin is also influenced by the paleogeography and glacial-interglacial eustatic cycles (Cecil et al., 2004; Ettensohn, 2008). Through early Cambrian time, the Appalachian Basin area of the Laurentian continent shifted latitudinally from 60° to 40°S, and further north to 15°S through the Late Mississippian. By the Late Permian, the Appalachian Basin area was located 5°N of the Equator (Kearey et al., 2009; Torsvik and Cocks, 2016). This shift to the north is recorded in the siliciclastic-carbonate-siliciclastic pattern of basinal sedimentation as the landmass passed through varying climatic zones (Scotese, 2003; Cecil et al., 2004).

2.1.8 Summary

Sediments deposited from the early to middle Cambrian is the intended injection complex for the project. They include from oldest to youngest: the Precambrian Basement (lower confining zone), the Cambrian Basal Sandstone (injection zone), the lower siltstone facies of the Maryville Formation (injection zone), and the upper Maryville Limestone (confining zone). Characterization, lateral continuity, and remaining uncertainties are discussed in subsection 2.4 of this Application Narrative.

2.1.9 Hydrogeology

Aquifers in Coshocton County are in the shallow subsurface and are represented by aquifers from Quaternary Alluvium through the Lower Pennsylvanian (Figure 9; see subsection 2.7 of the Application Narrative). They are the Conemaugh Group, Allegheny Formation, and Pottsville Group, and in the project area, they are less than 1,000 ft below ground surface (bgs). Each of these units has various layers of aquifer and aquitard materials, described further in subsection 2.7 of this Application Narrative. The hydrology of the region is largely influenced by seasonal precipitation, snowmelt, and groundwater recharge.

2.1.10 Mining

Mining in Ohio has played a significant role in the state's economic and industrial development, particularly through the extraction of coal, limestone, clay, and salt. The Appalachian Coal Basin, encompassing southeastern Ohio, has historically been a major coal-producing region, with deposits from the Pennsylvanian-age Allegheny and Monongahela formations being widely mined for use in power generation and industrial production (Lamborn, 1942; Milici, 2014; Wright and Erber, 2018). These coals have also been evaluated for their resource potential in coalbed methane (Milici, 2014). Additionally, Ohio's salt resources, primarily from the Silurian Salina Group near Lake Erie, have been extensively mined for use in road de-icing and chemical industries (Clifford, 1973; Hansen, 1996).

The project area is located mostly within the western, unfolded, portion of the Dunkard Basin, though the westernmost portion of the folded eastern Dunkard basin. (Milici, 2014). Mineable coal resources are found in upwards of 40 counties in eastern Ohio, though not all have been mined (Figure 14; Brant and Delong, 1960; Wright and Erber, 2018). The coals occur in the same stratigraphic intervals that have been identified as underground sources of drinking water as outlined in subsection 2.7 of the Application Narrative.

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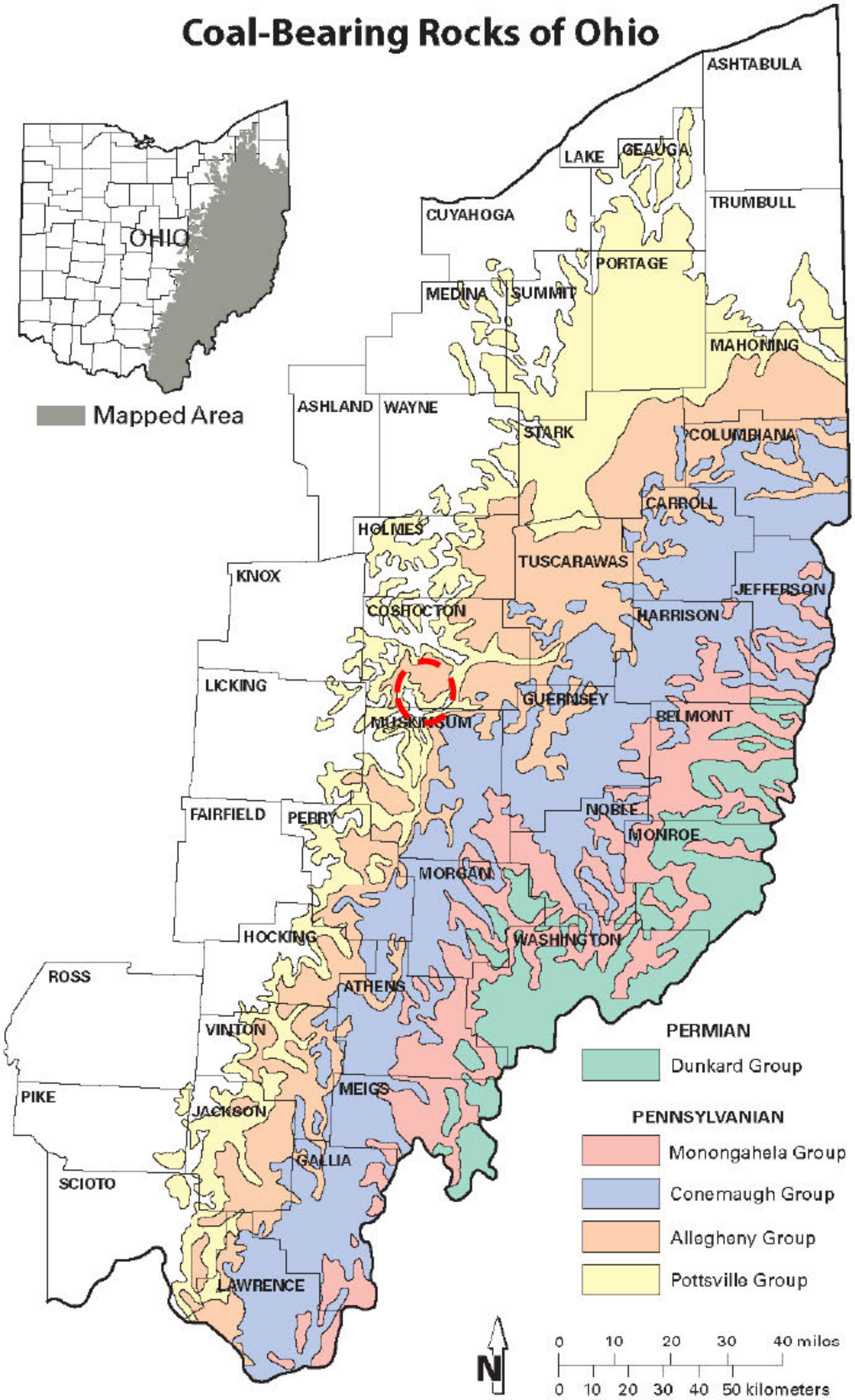

Figure 14: Map of coal bearing rocks in Ohio. Project area is the red dashed oval, and the approximate AoR is the solid red oval. Modified from Wright and Erber, 2018).

Figure 15 shows the stratigraphic column of the major lithologic units and their associated coals in the Pennsylvanian and Permian Systems in Ohio (Wright and Erber, 2018). The coals outlined in the dashed red lines are the potential mineable coals in Coshocton County, Ohio.

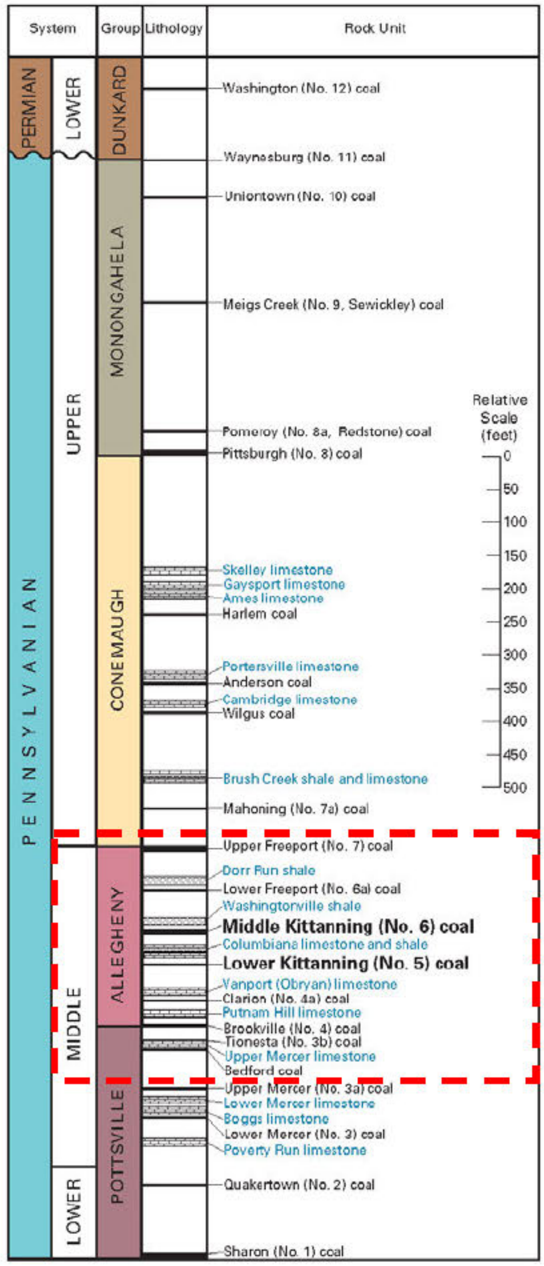

Figure 15: Stratigraphic column of the major lithologic units and their associated coals in the Pennsylvanian and Permian Systems in Ohio (modified from Wright and Erber, 2018).

The coal reserves of Coshocton County are primarily from the Allegheny and Upper Pottsville coal beds. Beginning with the oldest coal bed and working up section, the Bedford coal has a wide distribution in the county but has a highly variable thickness, ranging from a few inches to 9 feet (Brant and DeLong, 1960). However, due to its shaly character and interbedded channel, it has low value. The Quakertown (No. 2) and Upper Mercer (No. 3a) coal seams have been found to be greater than 14 inches in only a few places in the county and are not deemed mineable (Brant and DeLong, 1960). The Brookville coal outcrops in all but the northwestern part of Coshocton County. It is rarely found with a thickness of greater than 14 inches and is not considered mineable in most of the county (Brant and DeLong, 1960). The Lower Kittanning (No. 5) coal has a variable thickness across the county, ranging from less than 14 to 28 inches. It is found in most hillsides, so it is easily able to be strip mined; however, its variable thickness has reduced mining operations (Brant and DeLong, 1960). The Middle Kittanning (No. 6) is the predominant mining target across the county. It occurs well above drainage in most of the county, and its thickness exceeds 28 inches and is found to be over 42 inches in the southern part of the county (Brant and DeLong, 1960).

There are 7 historical and 2 active industrial mineral permits, 521 historic and 1 active surface mine permits, 10 historic and 0 active underground mine permits, and 67 historic mine openings in the AoR. The active surface mine permit in the AoR is permitted as a surface prep plant.

2.1.11 Local Structural Geology

The region includes the following major structural geologic features, which are discussed further below:

- Rome Trough Fault System; and
- Burning Springs – Cambridge Fault Zone.
- Killbuck Dome

Additional discussion of faults in relation to the AoR and a determination that they would not interfere with containment in the injection zone is included in subsection 2.3 of the Application Narrative.

2.1.11.1 Rome Trough Fault System

The Rome Trough Fault System is a major structural feature of the region (Figure 16) and extends from central Kentucky to the northeast, crossing West Virginia, and into western Pennsylvania. The Rome Trough Fault System represents a broad zone of deformation related to failed Eastern Interior rifting during the Early and Middle Cambrian that is associated with the opening of the Iapetus-Theic Ocean (Woodward, 1961; McGuire and Howell, 1963; Shumaker, 1986; Thomas, 1991).

In northern West Virginia, the failed rift graben of the Rome Trough is characterized by a broad, tilted horst block that is bound on its western margin by the Interior Fault and to the east by the East-Margin Fault (Figure 17; Gao et al., 2000). Seismic interpretation across the Rome Trough Fault System (Figure 17) suggests that the East-Margin Fault influenced both the basin geometry and depositional systems during the Early to Middle Cambrian rifting stage; however, during the Late Cambrian to Ordovician passive-margin and Middle to Late Paleozoic foreland basin stages, the structure is interpreted to be inactive (Gao et al., 2000).

The Rome Trough Fault System and related structures are located approximately 70 miles to the southeast of Coshocton County, Ohio.

Figure 16: Regional fault map of the study area. Major structures discussed include the Rome Trough Fault System and Burning Springs Anticline – Cambridge Arch. Fault locations adapted from Baranoski, 2013. COCORP seismic line OH-2 is shown in blue.

2.1.11.2 Burning Springs Anticline – Cambridge Arch

The Burning Springs Anticline – Cambridge Arch, also known as the Cambridge cross-strike structural discontinuity (Baranoski, 2013), trends north-northwest and extends from north-central West Virginia across Ohio toward Lake Erie (Root, 1996; Figure 16). The Burning Springs Anticline is located in West Virginia and transects the Rome Trough Fault System at a high angle.

The Burning Springs Anticline is characterized by a broad zone of deformation that includes both basement-involved high-angle normal faulting and northwestward directed thrust faulting (Root and Onasch, 1999). Basement-involved normal faulting, similar to the timing of other structures in the area, occurred on the Burning Springs Anticline from the Cambrian to the Pennsylvanian-Permian (Root, 1996). Later episodes of detached thrust faulting along the Burning Springs–Cambridge Arch is attributed to the Pennsylvanian-Permian age Alleghenian orogeny (Root and Onasch, 1999). Compressional deformation associated with the Alleghenian orogeny forms several well developed anticlines, which include the Burning Springs Anticline as a result of fault-related thrust faulting.

There is some debate as to the extent of the Cambridge Arch. It begins at the Ohio River and runs north-northwest, terminating in either Coshocton County (Baranoksi 2013, Gray 1982) or as far north as Lake Erie (Root, 1996). COCORP seismic line OH-2 crosses the Cambridge Arch in Coshocton County at shotpoint 200. The Cambridge Arch is characterized, on seismic, as a narrow horst block, approximately 1.5 km wide, bounded by high angle (> 80 degrees) normal faults (Root, 1996). Although several smaller normal faults are identified east of the arch, no other faulting is identified on the seismic line west of the arch.

2.1.11.3 Killbuck Dome

The Killbuck Dome is a domal uplift cut by a series of northeast trending anticlines. Four episodes of tectonic activity are related to this structural feature: Precambrian thrusting, upper Cambrian extensional faulting, upper Cambrian and lower Knox uplift, and upper Ordovician – lower Silurian thrusting. (Wicks 1997). The Dome is located on the northern border of Coshocton County and extends into Holmes County. It is located more than 16 miles from the proposed Bellflower 1 site.

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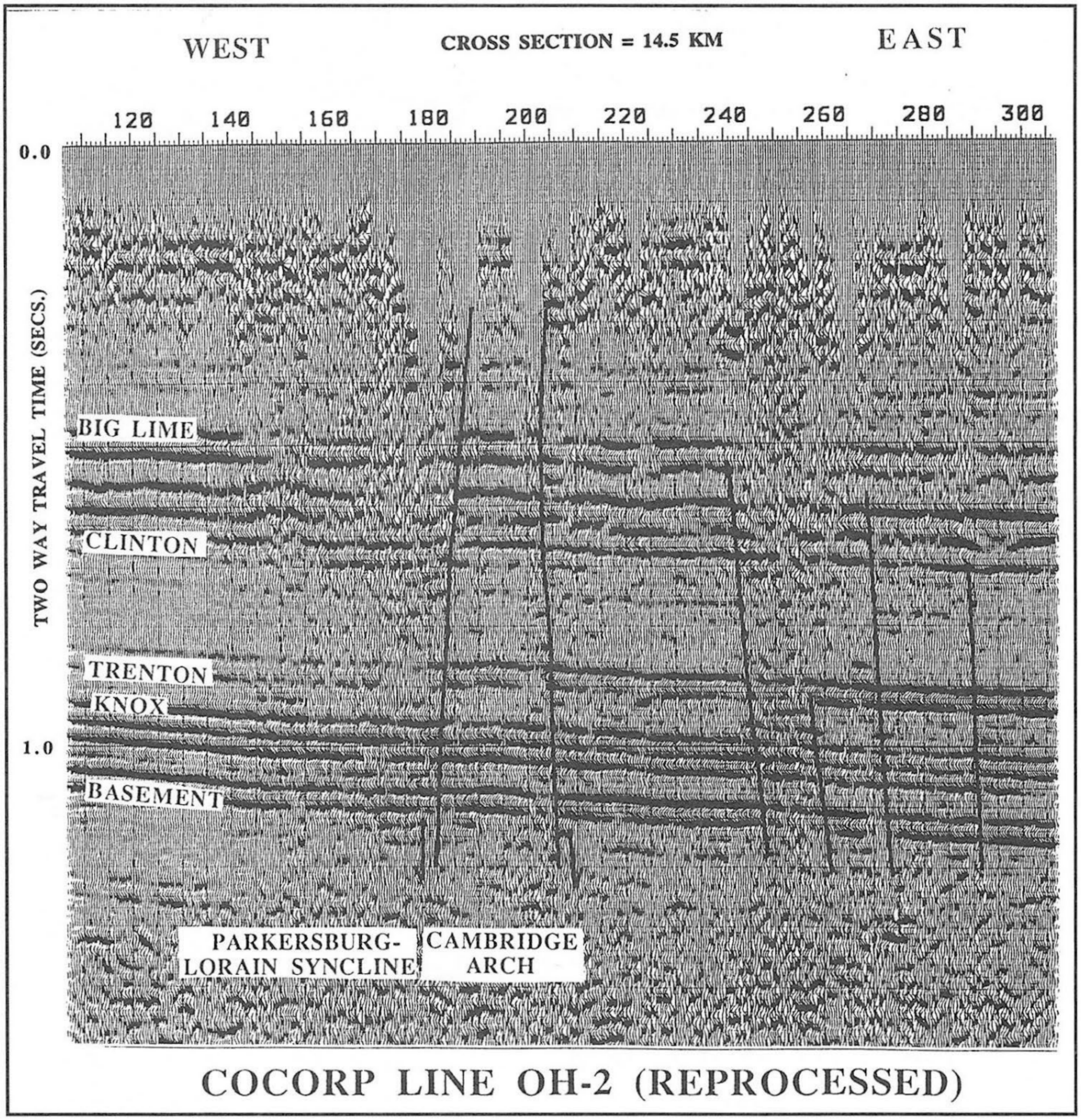

Figure 17: COCORP seismic line OH-2.

2.1.12 Data Used for Geologic Characterization

The data used to develop the geologic model for the project was well information, including location, deviation surveys, well logs, hydrocarbon production, and wastewater injection rates from various third-party vendors, State databases (ODNR), and publicly shared research. The well logs include Measured Depth, Gamma Ray (GR), Neutron Porosity Sandstone, Density Porosity Sandstone, Bulk Density, Spontaneous Potential (SP), Caliper, Shallow, Medium and Deep

Resistivity, and Sonic. In addition, historic core analyses from 10 wells along with literature analyses from other core were used to characterize the injection complex (Table 2).

Digital well logs from 10 wells were loaded into Petrel geologic interpretation software (Petrel is trademarked by and licensed from Schlumberger (SLB) Corporation) and used for picking tops for the reservoirs and confining units. Well log cross sections, shown later in this Application Narrative, were created using a subset of these logs. Subsets of these data sets were used to build the petrophysical model and calculate the porosity and permeabilities for the injection complex (further discussed in subsections 2.4 and 2.5 of this Application Narrative). Locations of wells, cores, and type logs used to evaluate the subsurface and build the geologic model are outlined in Table 2, and their locations are shown in Figure 18.

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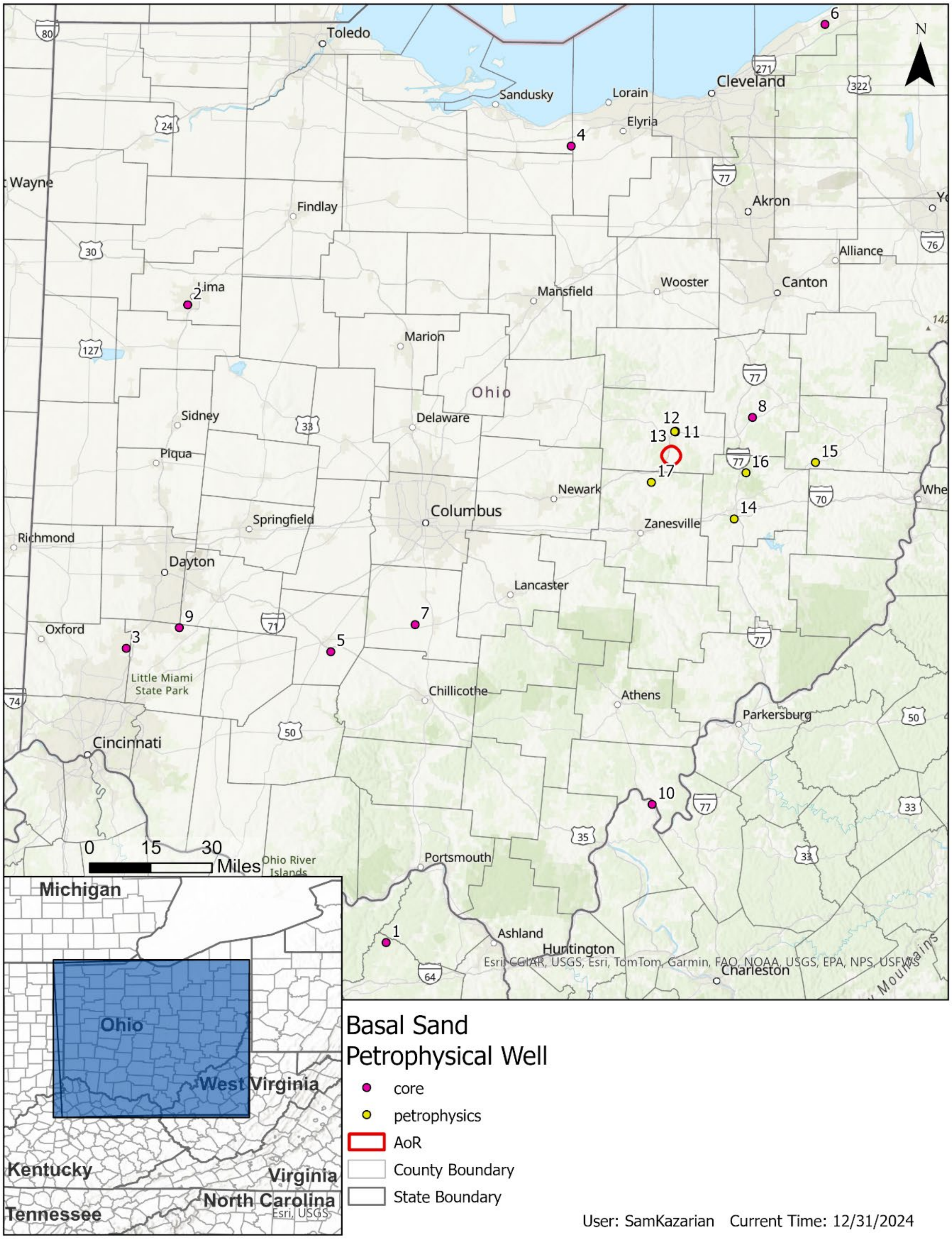

Figure 18: Location of wells used to characterize the Cambrian Basal Sandstone petrophysics and wells used for the core study. See Table 2 to match well numbers with API numbers, latitudes, and longitudes.

Table 3: List of well names, API numbers, latitude and longitudes (WGS 84) for core, type logs, literature core studies, and petrophysical model logs used to build the geologic model.

No.	Well Name and Number	API	Lat	Long
	Wells with Core			
1	KY Hanson Aggregate No 1	16043001050000	38.469552	-83.132596
2	BP Strat No 1	34003636910000	40.712114	-84.130414
3	Armco Steel No 1	34017200040000	39.486162	-84.356106
4	Herman et al No 1	34043200190000	41.311057	-82.351738
5	Hopkins FA-1	34047200010000	39.497819	-83.417332
6	Calhio No 1	34085201420000	41.751028	-81.156722
7	WP No 1	34129202510000	39.601504	-83.034443
8	Ohio Geol Survey CO2 No 1	34157253340000	40.353705	-81.489962
9	Am Agg DS-2	34165600050000	39.565890	-84.115991
10	AEP No 1	47053004230000	38.976103	-81.937975
	Petrophysical Wells			
11	Adams No 1	34031271770000	40.300901	-81.848034
12	Adams No 2	34031271780000	40.302635	-81.846740
13	Adams No 3	34031272410000	40.302150	-81.850905
14	SOS D-1	34059242020000	39.993661	-81.572822
15	Zechman Thomas Unit No 1	34067207370000	40.194891	-81.197836
16	Ellas Unit 1	34089255420000	40.156714	-81.518145
17	Consol Coal Co Cr 400	34119270760000	40.121054	-81.955840

2.2 Maps and Cross Sections of the AoR [40 CFR 146.82(a)(2), 146.82(a)(3)(i)]

The project consists of a primary injection complex, the Basal Sandstone Injection Complex (BIC). The regional cross section in Figure 19 and Figure 20 and the cross sections confined to the injection complex and the model domain in Figure 21, Figure 22 and Figure 23 highlight the regional and local lateral continuity and thickness of the Basal Sandstone Group (BIC injection zone). In addition, the Maryville Group, the uppermost confining zone, also exhibits regional and local lateral continuity and consistent thickness. Additionally, the Wells Creek Formation has been shown to be a proven seal for stratigraphic traps in central Ohio, as discussed in subsection 2.4 of this Application Narrative. The overlying Black River Group, Trenton Limestone, Utica Shale, and Cincinnati Group further separate it from the Underground Sources of Drinking Water (USDWs). The lowest USDW, the Black Hand Sandstones of the Pocono Group, is approximately 6,500 ft above the top of the Maryville Silt (confining zone) and is shown in Figure 20. Further discussion of the regional geology, primary seal thickness and lateral extent, injection zone thickness and lateral extent, and other site-specific geologic characteristics is in subsections 2.1 and 2.4, respectively, of this Application Narrative.

The Gamma Ray and the petrophysical character of the Basal Sandstone Group in the Static Earth Model (SEM) domain is consistent in both the dip and the strike direction. The lowest USDW, the Black Hand sandstone in the Pocono Group, is approximately 6,000 ft above the top of the SEM and is shown in Figure 20. Further discussion of the petrophysics of the BIC is in subsection 2.5

of this Application Narrative, and further discussion of the Black Hand sandstone is in subsection 2.7 of this Application Narrative.

The Cambridge Arch is the only regional fault in the project area and near the AoR. However, it does not pose a threat to containment for this project due to its location >5 miles east of the injection well and outside the AoR.

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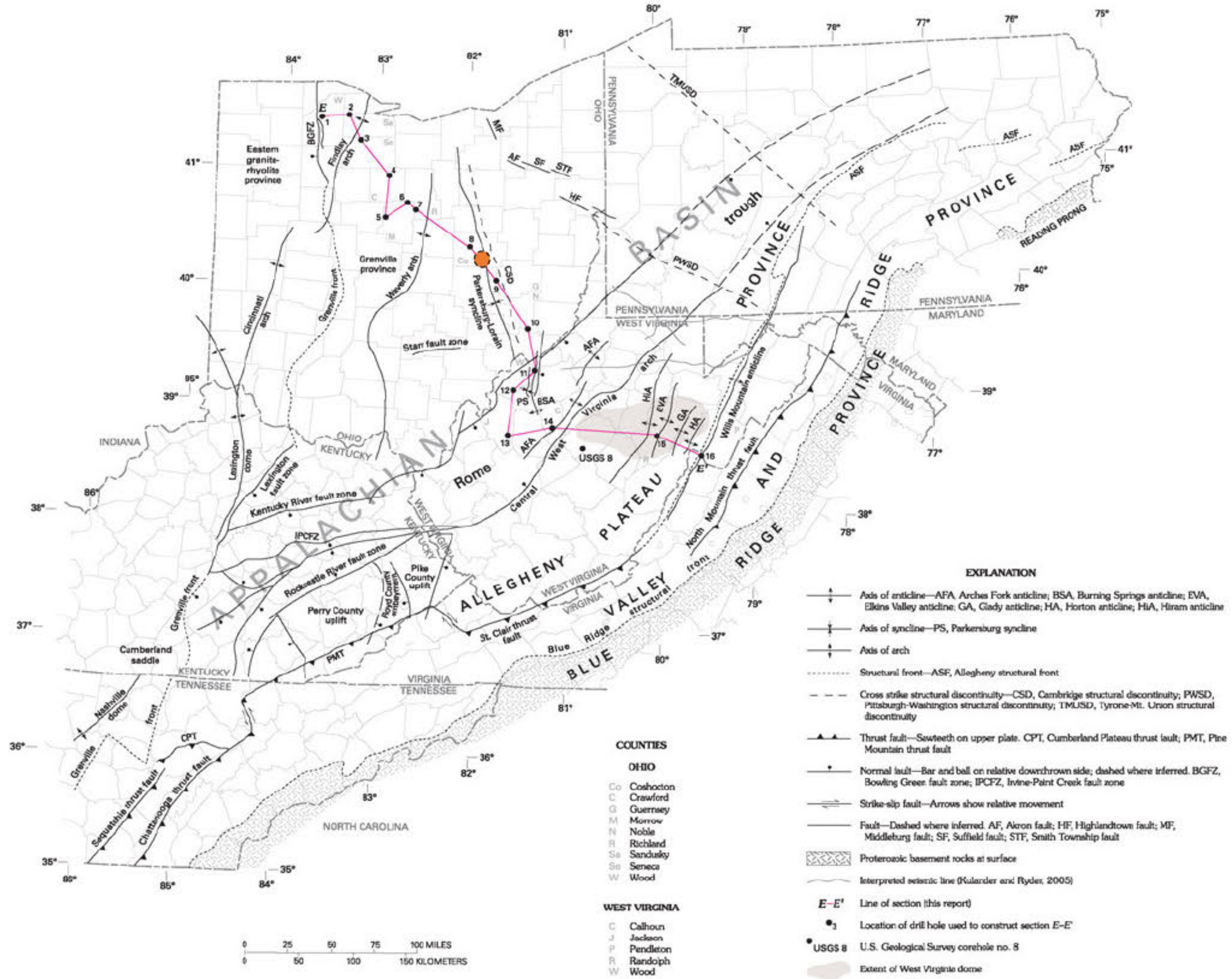

Figure 19: Base Map of the Appalachian Region and structural features with the cross section in Figure 15 shown in red. The approximate AoR is outlined in the dashed orange circle. Modified from Ryder et al., 2012.

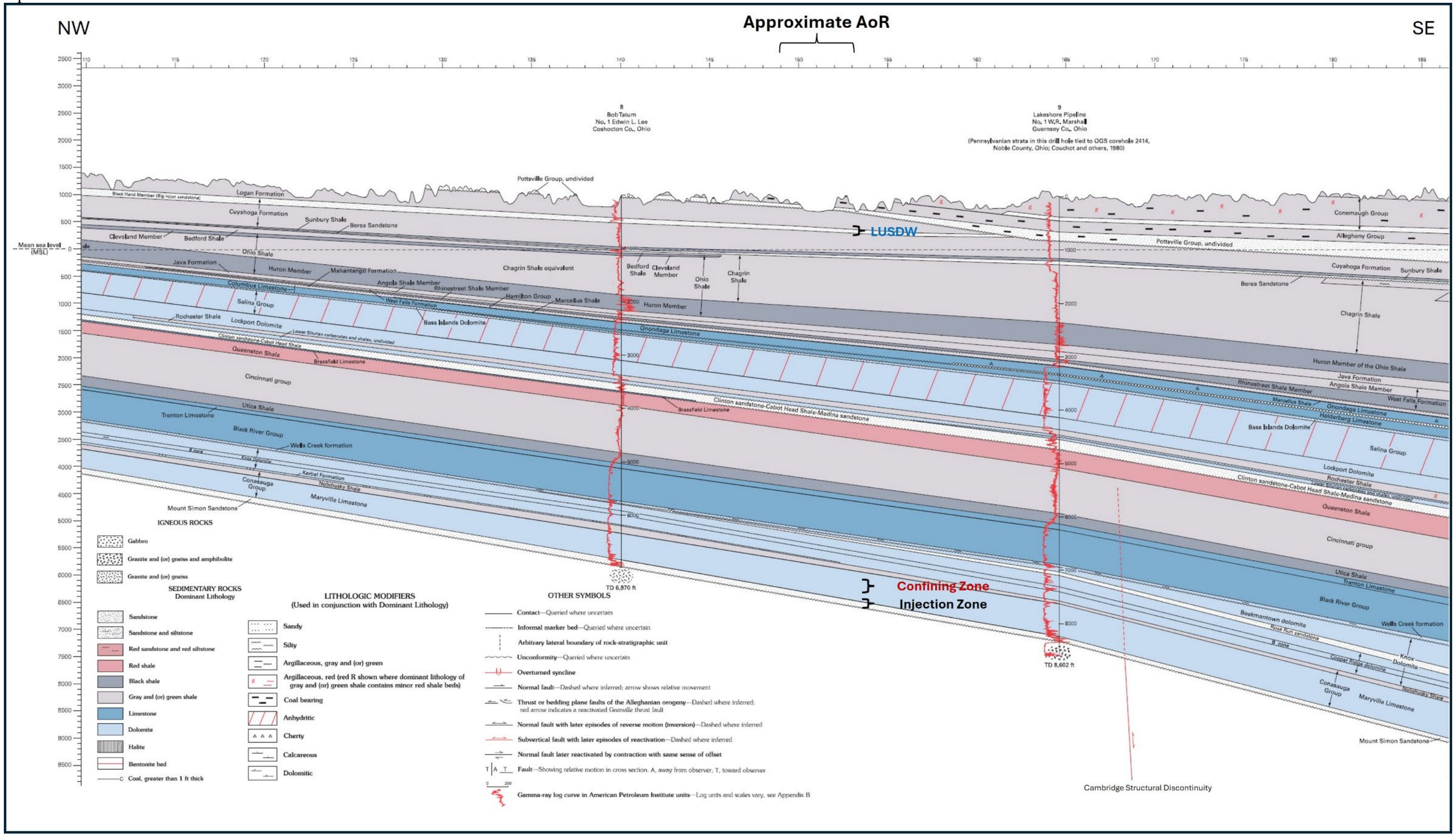

Figure 20: Regional cross section from ground level to the Cambrian Mt. Simon through the AoR (Figure 14 shows position of the cross section with respect to the AoR). Modified from Ryder et al., 2012.

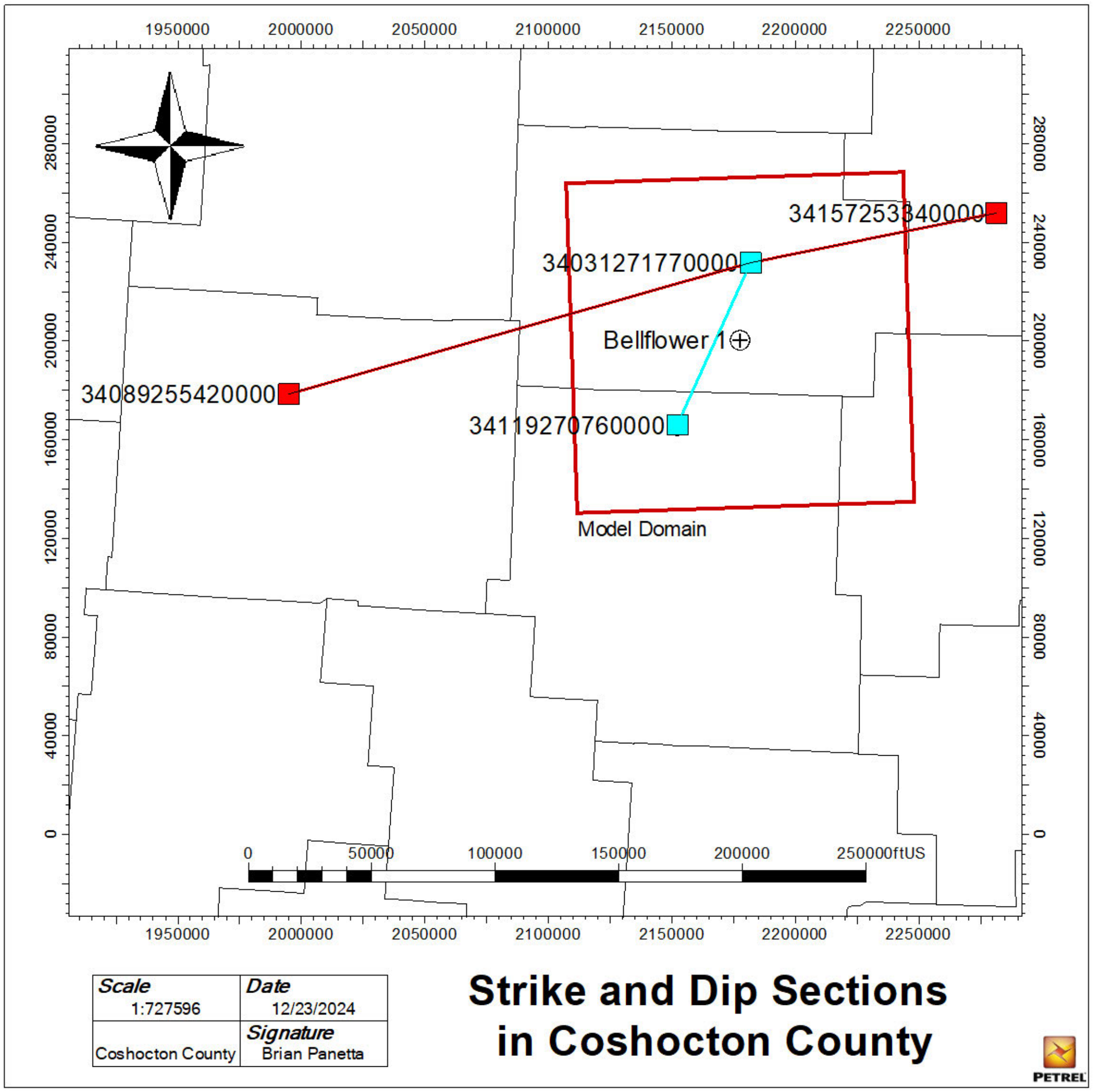

Figure 21: Base Map of the project model domain (red square), the proposed injection well (Bellflower 1) and the SW-NE dip cross section, shown in red (Figure 22), and the S-N strike cross section, shown in blue (Figure 23).

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Marked as PBI
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Figure 22: SW-NE Dip, stratigraphic cross section, hung on the Maryville LS, through the project model domain. Well tracks from left to right include: with the depth track in feet measured depth (far left), the Gamma Ray, and the Bulk Density on the right.

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Figure 23: S-N Strike, stratigraphic cross section, hung on the Maryville LS, through the project model domain. Well tracks from left to right include: with the depth track in feet measured depth (far left), the Gamma Ray, and the Bulk Density on the right.

2.3 Faults and Fractures [40 CFR 146.82(a)(3)(ii)]

2.3.1 Evidence for Faults and Fractures

The mapped structural features near the project area are the Cambridge Arch stretching into southern Coshocton County and the Killbuck Dome in north-central Coshocton, and into Holmes County. Figure 24 displays the mapped structures in the assessment area relative to the project and identifies the youngest formations impacted by these structures. Table 3 provides information for all the mapped faults.

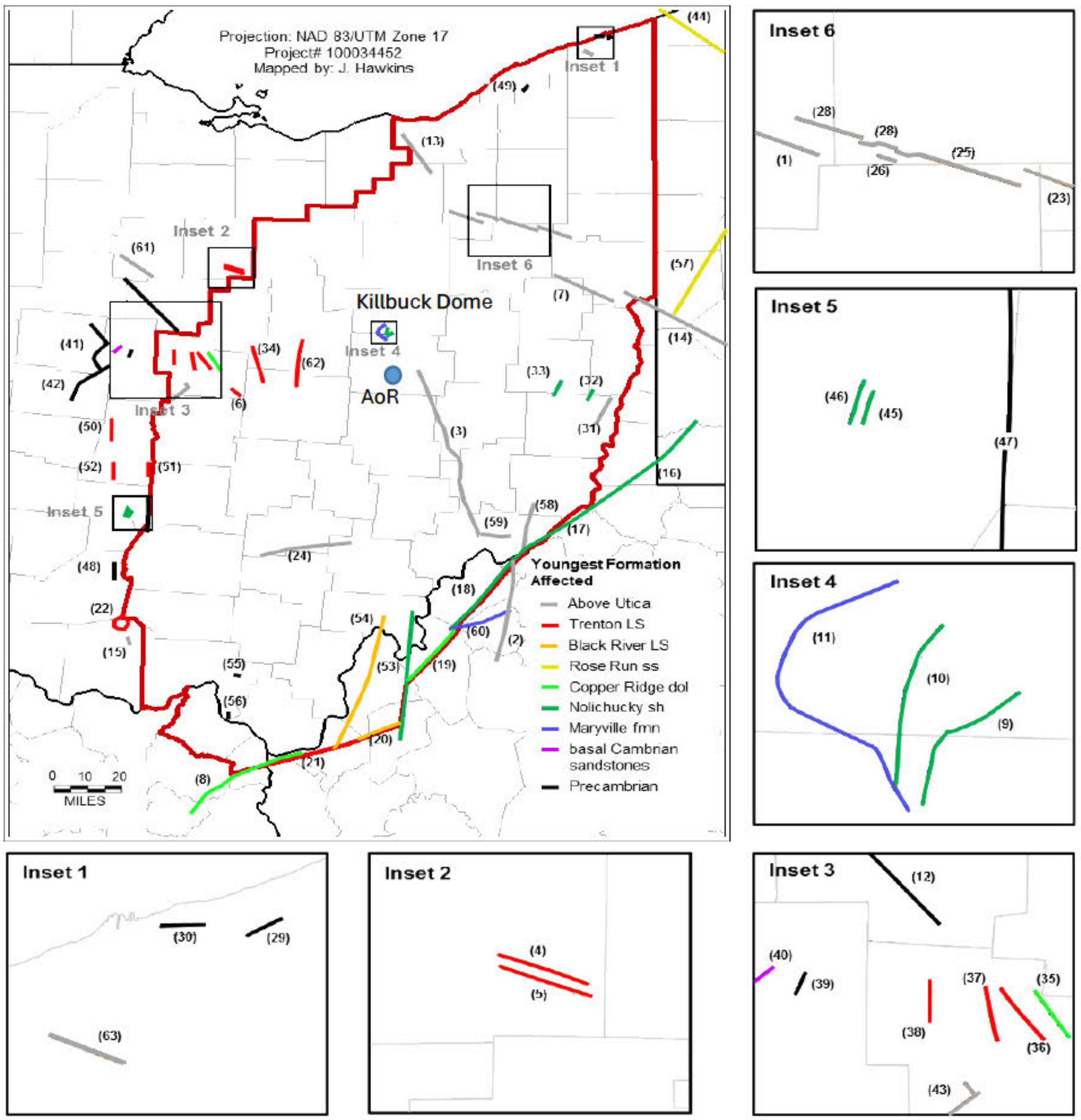

Figure 24: Selected faults throughout the state from Baranoski (2013). Colors indicate the youngest formation affected, and the numbers identify each fault. Fault names and youngest formation affected are in Table 3 below.

The Cambridge Arch (Fault #3 in Figure 24) is a Proterozoic basement-fault generated feature that has influenced Paleozoic stratigraphy and extends to and is recognized at the surface (Solis, 2019). This feature is approximately 6.5 miles east of the proposed injection well location. The Killbuck Dome in north-central Coshocton and Holmes County is on trend with the Cambridge Arch and is ~19 miles northwest of the proposed injector location (Figure 21). The seismically defined "Airport Dome", also recognized in 2-D seismic (Buckeye, 2023), lies ~8.5 miles due north of the proposed location. Aftermarket 2-D seismic lines exist throughout the project area and based on the work of Battelle (2018), no additional faults were recognized in the area. Except for the aforementioned pre-Paleozoic aged structures, the project area and proposed injection well location are structurally benign where tectonic quiescence has prevailed throughout the Paleozoic. No structural faulting or fracturing that may impact disposal is anticipated.

Table 4: Names, fault direction, and youngest impacted formation.

No.	Fault Name	Direction of Throw	Youngest Formation Affected
1	Akron Fault	S	Above Utica
2	Burning Springs Fault System	Wrench	Above Utica
3	Cambridge Cross Strike Discontinuity (CSD)	W	Above Utica
4	Crawford Fault (North)	N	Trenton
5	Crawford Fault (South)	S	Trenton
6	Harlem Fault	SW	Trenton
7	Highlandtown Fault	S	Above Utica
8	Kentucky River Fault System	SE	Copper Ridge
9	Killbuck Dome #1	NE	Nolichucky
10	Killbuck Dome #2	E	Nolichucky
11	Killbuck Dome #3	W	Maryville
12	Marion Fault	NE	Precambrian
13	Middlesburg Fault	W	Above Utica
14	Pittsburgh-Washington CSD	S	Above Utica
15	Plum Run Quarry Fault	W	Above Utica
16	Rome Trough Fault System #1	SE	Nolichucky
17	Rome Trough Fault System #2	SE	Nolichucky
18	Rome Trough Fault System #3	SE	Nolichucky
19	Rome Trough Fault System #4	SE	Copper Ridge
20	Rome Trough Fault System #5	SE	Black River
21	Rome Trough Fault System #6	S- SE	Trenton
22	Serpent Mound Impact Structure	W	Above Utica
23	Smith Township Fault	S	Above Utica
24	Starr Fault System	S	Above Utica
25	Suffield Fault System #1	S	Above Utica
26	Suffield Fault System #2	S	Above Utica
27	Suffield Fault System #3	S	Above Utica
28	Suffield Fault System #4	S	Above Utica
29	Unnamed Ashtabula Co. Fault #1	SE	Precambrian
30	Unnamed Ashtabula Co. Fault #2	S	Precambrian
31	Unnamed Belmont Co. Fault	E	Above Utica
32	Unnamed COCORP Fault #1a	E	Nolichucky

No.	Fault Name	Direction of Throw	Youngest Formation Affected
33	Unnamed COCORP Fault #1b	E	Nolichucky
34	Unnamed COCORP Fault #2	E	Trenton
35	Unnamed COCORP Fault #3	E	Copper Ridge
36	Unnamed COCORP Fault #4a	W	Trenton
37	Unnamed COCORP Fault #4b	E	Trenton
38	Unnamed COCORP Fault #4c	W	Trenton
39	Unnamed COCORP Fault #5a	E	Precambrian
40	Unnamed COCORP Fault #5b	SE	Mt. Simon
41	Bellefontaine Outlier Faults (N)	SW	Precambrian
42	Bellefontaine Outlier Faults (S)	NW	Precambrian
43	Unnamed Delaware Co. Fault	SE	Above Utica
44	Unnamed Erie (PA) Co. Fault	NE	Rose Run
45	Unnamed Fayette Co. Fault #1	E	Nolichucky
46	Unnamed Fayette Co. Fault #2	W	Nolichucky
47	Unnamed Fayette, Pickaway, Ross Cos. Fault	E	Precambrian
48	Unnamed Highland Co. Fault	E	Precambrian[1]
49	Unnamed Lake Co. Fault	SE	Precambrian
50	Unnamed Madison Co. Fault (N)	E	Trenton
51	Unnamed Madison Co. Fault (SE)	E	Trenton
52	Unnamed Madison Co. Fault (SW)	E	Trenton
53	Unnamed Meigs Co. Fault #1	E	Nolichucky
54	Unnamed Meigs Co. Fault #2	E-SE	Black River
55	Unnamed Scioto Co. Fault (N)	S	Precambrian[1]
56	Unnamed Scioto Co. Fault (S)	E	Precambrian[2]
57	Unnamed Washington (PA) Co. Fault	SE	Rose Run
58	Unnamed Washington Co. Fault #1	E	Above Utica
59	Unnamed Washington Co. Fault #2	S	Above Utica
60	Unnamed West Virginia Fault	NW	Maryville
61	Unnamed Wyandot Co. Fault	SW	Above Utica
62	Utica Mountain Fault	E	Trenton
63	York Field Fault	SW	Utica

2.4 Injection and Confining Zone Details [40 CFR 146.82(a)(3)(iii)]

The stratigraphy in the project area is composed of ~7,000 ft of sediments on top of Precambrian basement, ranging in age from Cambrian up to Pennsylvanian (Morrowan - Atokan) at the surface proposed location. Freshwater aquifers occupy porous units within the Pennsylvanian and Upper Mississippian, and historic oil production has been largely from Lower Mississippian sandstones, Clinton (Medina) sandstones, and the Cambro-Ordovician Rose Run sandstone (Figure 25). Recently, in eastern Ohio, unconventional oil and gas production has been established in the Middle Devonian and Upper Ordovician but is not objective in Coshocton County.

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System	Series	Stratigraphic Unit (SU) (Group or Major Formation)	Aquifer, Confining Zone or Reservoir	Depth (TVDSS) / Interval Thickness (ft) Bellflower 1
		Pennsylvanian (undivided)	Freshwater Aquifers	660'
Mississippian	Upper (Chester / Meramecian)	Mauch Chunk Fm.	Freshwater Aquifers	500'
Mississippian	Upper (Chester / Meramecian)	Greenbriar Ls. Fm.	*Seal (Limestone)*	400'
Mississippian	Lower (Osagean / Kinderhookian)	Pocono Grp. – Black Hand Ss. Big Injun Ss.	(base) Lowermost USDW	
Mississippian	Lower (Osagean / Kinderhookian)	Pocono Grp. – Sunberry Sh.	*Seal (Shale)*	
Mississippian	Lower (Osagean / Kinderhookian)	Pocono Grp. – Berea Ss.	Conventional Oil Reservoir	
Devonian	Upper	Ohio Shale Grp.	*Seal (Shale)*	
Devonian	Upper	Olentangy Shale Fm.	*Seal (Shale)*	
Devonian	Middle	Tully Ls.		
Devonian	Middle	Hamilton Grp. – Mahantango Shale Fm.	*Seal (Shale)*	
Devonian	Middle	Hamilton Grp. – Marcellus Shale Fm.	*Seal (Shale)*	
Devonian	Lower	Onondaga Ls. Fm.	*Seal (Limestone)*	
Devonian	Lower	Oriskany Ss. Fm.	Conventional Oil/Gas Reservoir	
Devonian	Lower	Helderberg Grp.	*Seal (Limestone)*	
Silurian	Upper	Bass Islands Dolomite Grp.	*Seal*	
Silurian	Upper	Salina Grp. – Salina "D" - "G"	*Seal (Evaporite/Salt)*	
Silurian	Upper	Salina Grp. – Salina "A" - "C"	*Seal (Evaporite/Salt)*	
Silurian	Upper	Lockport Dolomite Grp.	Conventional Oil/Gas Reservoir	
Silurian	Upper	Clinton Grp. – Rochester Shale Fm.	*Seal (Shale)*	
Silurian	Lower	Clinton Grp. – Dayton / Keefer Fm.	*Seal (Shale)*	
Silurian	Lower	Medina (Tuscarora Ss.) Grp. *(informal - "Clinton" & "Medina" sands)*	Conventional Oil/Gas Reservoir	
Ordovician	Upper	Queenston Shale (Juniata Fm.)	*Seal (Shale)*	
Ordovician	Upper	Utica Shale Fm.	*Seal (Shale)*	
Ordovician	Upper	Trenton Ls. Grp.	*Seal (Limestone)*	
Ordovician	Upper	Black River Ls. Grp.	*Seal (Limestone)*	
Ordovician	M	Wells Creek Fm. (shale)	*Seal (Shale)*	
Ordovician	L	Knox Grp. – Beekmantown Fm.	*thin to absent*	
Cambrian	Upper	Knox Grp. – Rose Run	Conventional Oil/Gas Reservoir	
Cambrian	Upper	Knox Grp. – Copper Ridge – 'Upper'	***Secondary Confining Zone***	
Cambrian	Upper	Knox Grp. – Copper Ridge – 'B-zone'	*shale*	
Cambrian	Upper	Knox Grp. – Copper Ridge – 'Lower' (vuggy)	*Secondary Injection Potential*	
Cambrian	Middle	Conasauga Grp. – Nolichucky Fm.	*Seal (Shale)*	
Cambrian	Middle	Conasauga Grp. – Maryville Fm. – Maryville Ls. (vuggy)	*Secondary Injection Potential*	
Cambrian	Middle	Conasauga Grp. – Maryville Fm. – Maryville Silt	**Primary Confining Zone**	-6122' / 198'
Cambrian	Middle	Conasauga Grp. – Maryville Fm. – Maryville Flow	*Secondary Injection Potential*	-6320' / 123'
Cambrian	Middle	Conasauga Grp. – Cambrian Basal Sandstone	**Primary Injection Zone**	-6443' / 115'
preCamb.		Grenville Complex (crystalline)	**Primary Confining Zone**	-6558' / 115'

Figure 25: Generalized stratigraphic column for the project. Proposed Primary Injection Complex: 1 – Basal Sandstone Injection Complex (*Depth is to the top of the Stratigraphic Unit (SU), except where noted.) Modified from Childs, 1985; Patchen et al., 1985b; Riley et al., 2010; Wickstrom, 2011.

Subsurface analysis in the project area indicates several stacked, porous reservoirs with sufficient confining seals for sequestration that exist beneath the 2,800 ft TVD threshold for storage of supercritical CO_2 (sCO_2). The primary injection complex for this project is the BIC. Throughout this permit, when referring to the entire injection complex, the nomenclature outlined above will be used, and when describing or indicating specific intervals, the Group, Formation, or appropriate formal interval (i.e., "Shale") name will be used.

2.4.1 Basal Sandstone Injection Complex (BIC)

The BIC is composed of, from top to base: the Middle Cambrian Maryville Silt, which forms the upper confining zone, the Maryville Flow, the Cambrian Basal Sandstone (CBS), which is the objective injection zone, and the Precambrian, crystalline, Grenville Complex, which comprises the basal confining zone. The objective injection interval resides more than 1,000 ft below the nearest known producing oil reservoir. Within the BIC, additional porosity zones offer secondary injection potential. The Upper confining zone is further bolstered by the overlying Upper Cambrian, Upper Copper Ridge, which provides an additional 200 ft + of seal / confining capacity (Figure 36). Figure 26 is a type log of the stratigraphy that makes up the BIC and averages ~450 ft in the project area.

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Figure 26: Type Log and stratigraphy of the BIC (log from the Buckeye #1 Adams, API 34031271770000, 6 miles north of the proposed injection well).

2.4.1.1 BIC Primary Confining Zone: Maryville Silt Member of the Maryville Formation

The Maryville Formation of the Conasauga Group is entirely Middle Cambrian in age, and part of the Sauk Megasequence (Sloss, 1963). Historically there has been debate and confusion regarding the stratigraphy and nomenclature of the Middle Cambrian in Ohio. Janssens (1973) originally referred to the Middle Cambrian in Ohio as the Rome Formation, with a thin Conasauga Formation over top; this vernacular and stratigraphy is still often used, incorrectly, in oil field terminology. Subsequent work has since illustrated the Rome Formation is restricted to those units east in the Rome Trough, in West Virginia and Kentucky, and are Middle to Lower Cambrian in age (Childs, 1985). Figure 27 shows numerous cross-sections and correlations constructed by the Rome Trough Consortium (2001) illustrating the Rome Formation being restricted to the Rome Trough. Conversely, the correlations show the Conasauga Group onlapping the pre-Cambrian unconformity, transgressing the Ohio Platform and Waverly Arch into Ohio. The northwestern-most well in this cross-section (Figure 27) ends in Muskingum County, Ohio, just south of the project area (see inset map), and reflects the current formational stratigraphic nomenclature and correlations used herein.

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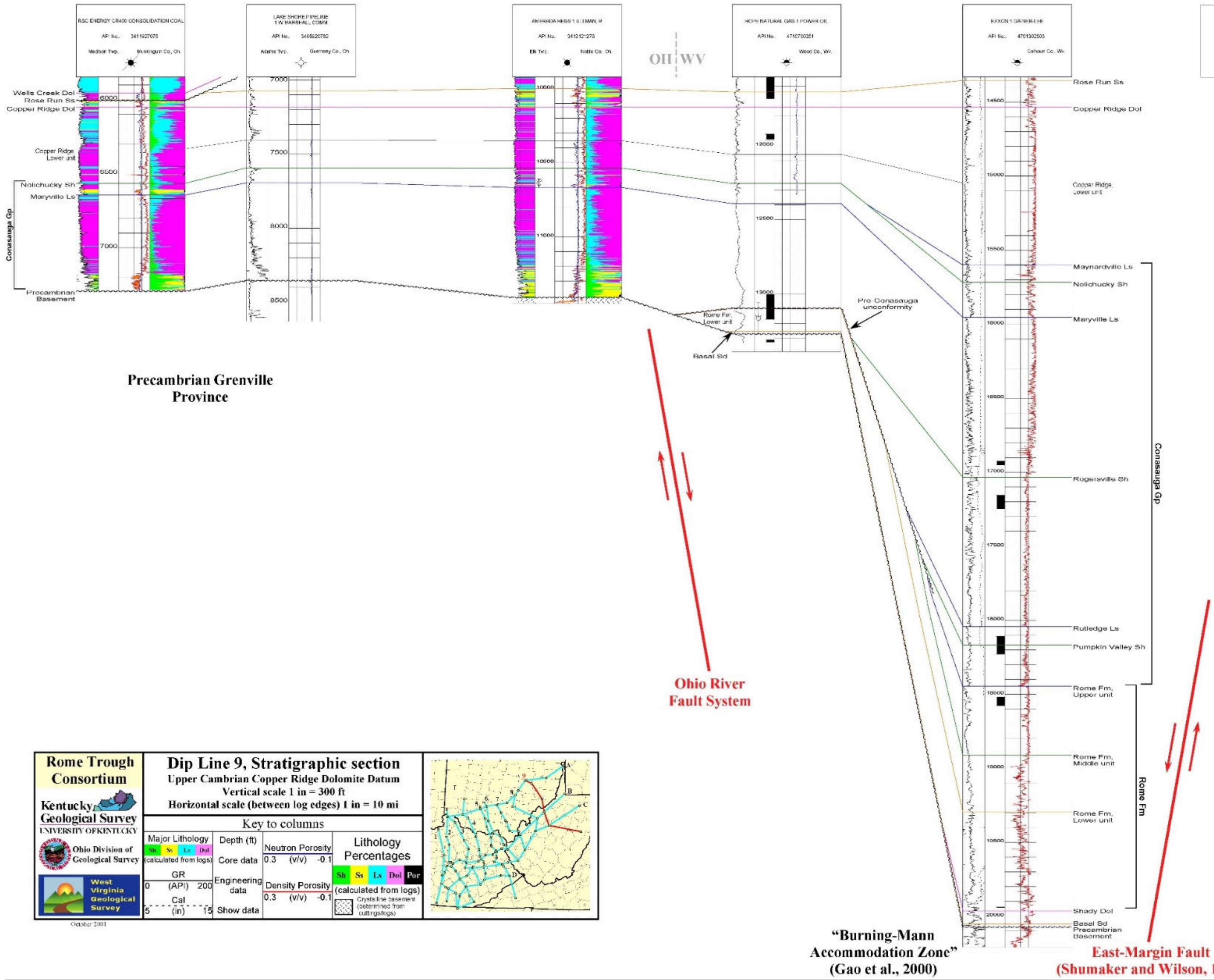

Figure 27: Rome Trough Consortium cross-section Dip Line 9, Stratigraphic Section, illustrating the Cambrian correlations out of the Rome Trough in West Virginia, westward into eastern Ohio (Rome Trough Consortium, 2001).

Within the Maryville Formation, three distinctive units are recognized on log and in subsurface correlations (Figure 26): from bottom to top, informally termed, they are the: Maryville Flow, Maryville Silt, and Maryville Lime; this stratigraphy is similarly acknowledged in other reports (e.g., Wickstrom, 2008 and Battelle, 2018). The primary confining zone and caprock for the proposed CBS injection zone is the Maryville Silt unit.

The Maryville Formation overlies the CBS (Figure 26 & Figure 27), and according to Wickstrom (2011), an unconformity may separate the CBS from the overlying Maryville Formation. Overall, this Formation represents a deepening upwards section in response to the Sauk Megasequence transgression, deposited on a low declivity, shallow marine, carbonate ramp, similar to Glumac and Walker's (2000) model (Figure 28), where depositional strike was northeast to southwest, parallel to the Waverly Arch (Battelle, 2022).

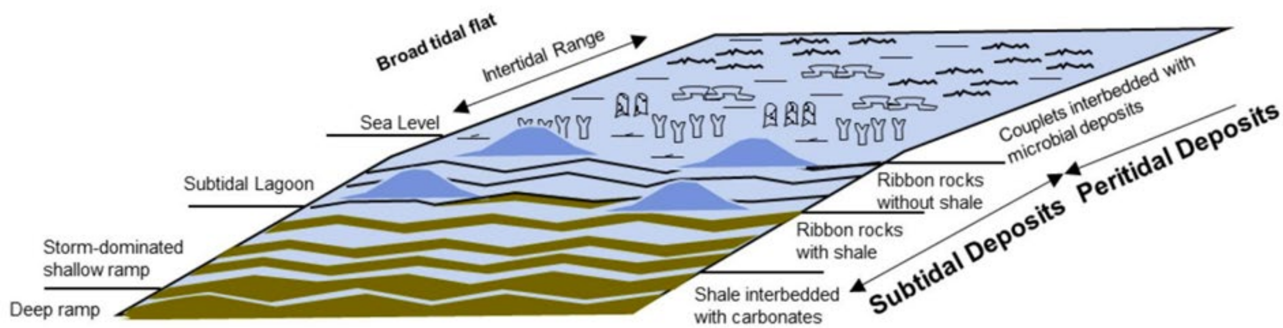

Figure 28: Generalized shallow mixed clastic-carbonate ramp model illustrating rock types and textures (Adapted from Glumac and Walker, 2000).

The basal Maryville Flow member is composed of light to medium gray, feldspathic arenaceous dolomite, with rip-up clasts, scour surfaces and bioturbation indicating deposition in the near-shore to shallow subtidal environment (Wickstrom, 2011). This section rapidly grades upward into the Maryville Silt section, where the facies become a fine to medium grained cryptocrystalline, irregular to massively bedded silty dolomite deposited in a shallow subtidal to open marine environment (Wickstrom, 2011; Battelle, 2022). The uppermost Maryville is composed of fine to medium crystalline dolomitic limestone/calcitic dolomite with vugs, rip-up clasts and scour surfaces (Wickstrom, 2011) suggesting a possible shallowing in the upper Maryville Formation. Petrophysical, mineralogic and other core-based data for these units are not available in the immediate area of the proposed injection well. These data will be collected and evaluated in pre-operational testing through coring and logging.

The Maryville Silt confining unit averages ~200 ft thick in the project area (Figure 26) and depositionally thins to the west and thickens to the east – southeast, towards the Rome Trough (Figure 27; also see subsection 2.2 above; Battelle, 2022). Based on open-hole logs, the Maryville Silt is extremely tight, non-porous, and impermeable. Density values average 2.85 g/cm^3 (Figure 23), and neutron-density cross-plots average 0% throughout the entirety of the Maryville Silt. There are no core data available in Coshocton County for any part of the Maryville Formation; however, ~22 miles to the east-northeast, in Tuscarawas County, the Ohio Geological Survey CO2

No. 1 well (API # 341572533400) was cored through the Maryville Formation (Wickstrom, 2011). Based on similar log signatures, the CO2 No. 1 well is used as lithologic proxy for the project area. Three core data points in the equivalent Maryville Silt in the OGS CO2 No. 1 well substantiate the log data in the Adams #1 type log in Figure 26. Core measured porosity values at net confining stress (NCS) average 0.6% and have an average bulk density of 2.85 g/cm^3; core permeability averages < 0.0001 md (Mullett & Wickstrom, 2008).

Due to the unavailability of special core analysis data and the absence of analogous data in the surrounding area, capillary pressure (Pc) and relative permeability (kr) with respect to brine saturation (Sl) for the confining zone were inferred through a comprehensive literature review. Site-specific data will be obtained from the pre-operational data gathered from the injection and observation wells. The planned data collection is outlined in Table 7 of subsection 2.4.1.7 below. Utilizing Brooks-Corey (1966) models, capillary pressure and relative permeability were calculated. A detailed description of the equations is given in subsection 1.3.1 of the Area of Review and Corrective Action Plan.

According to the SEM, the top of the Maryville Silt at the proposed injection well is -6,122 (SSTVD) (Figure 26). The gross thickness of the Maryville Silt is relatively uniform, averaging 198 ft.

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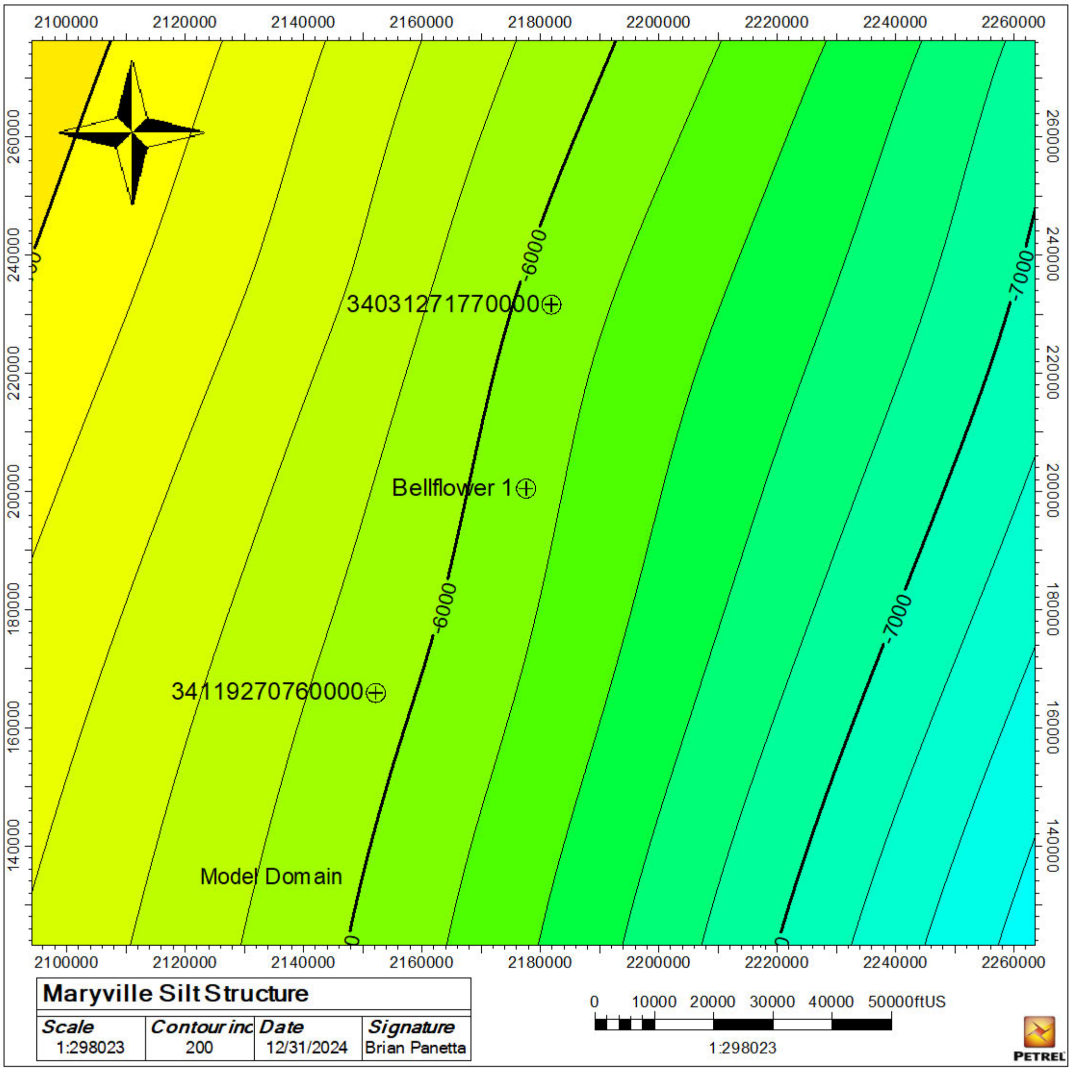

Figure 29: Structure at the top of the Maryville Silt (left) and isochore (right) with proposed injection site shown.

Based on regional lithologic continuity, available petrophysics, and thickness, the Maryville Silt section will serve as an effective barrier to fluid migration and suitable upper confining zone for the BIC.

2.4.1.2 BIC Secondary Confining Zones: Upper Copper Ridge

Secondary confining potential for the CBS injection zone exists in the Upper Cambrian Knox Group, Copper Ridge Formation. The Formation as a whole averages a relatively consistent thickness of ~400 ft in the project area, thins to the west towards the Waverly Arch, and thickens to the east toward the Rome Trough (Figure 24). Further to the west into central and western Ohio, the Copper Ridge Formation is truncated at the Knox Unconformity where hydrocarbons are produced. The Copper Ridge is predominately made up of dolostone deposited on a low energy shallow marine platform with similar depositional strike as the aforementioned Maryville Formation (Battelle, 2022). Regionally, a tripartite stratigraphy is recognized where the Formation is divided into three intervals, the Lower Copper Ridge (LCR), the (Copper Ridge) B-zone, and the Upper Copper Ridge (UCR) (Figure 26). The B-zone separates the Formation based on exposure features and karst development attendant with a sea level base lowering and higher order cyclicity in the Sauk Megasequence (Battelle, 2022). Whereas the LCR has porosity development associated with Upper Cambrian exposure, similar to the B-zone (and will be discussed later in this permit), the UCR, where preserved beneath the Rose Run, remains a tight section of dolomite. Throughout the entirety of the project area, the UCR is preserved and, thus, a suitable secondary confining zone (Figure 30).

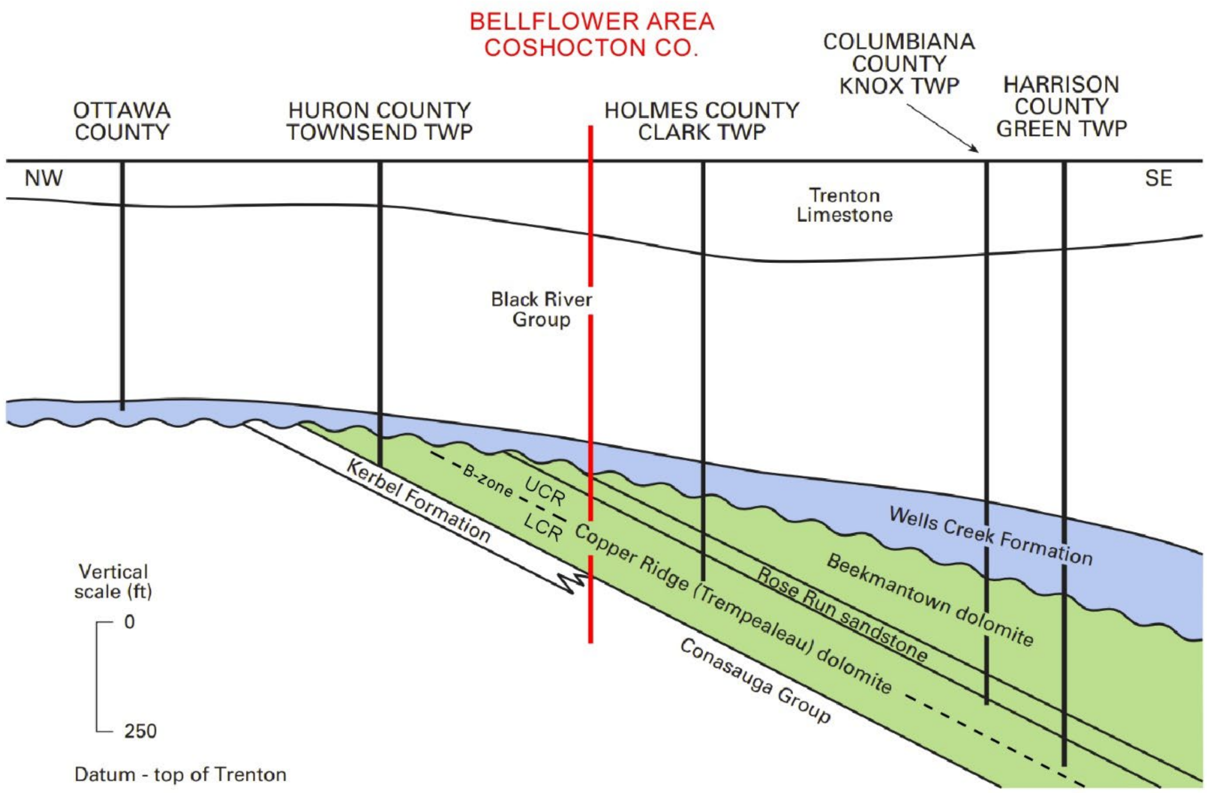

Figure 30: Generalized northwest to southeast cross-section through Ohio illustrating the Knox stratigraphy and truncation at the Knox Unconformity. Project location highlighted in red. Modified from Wickstrom, 2011.

The UCR averages ~150 ft in the project area and based on open-hole logs (Figure 24), the UCR is a tight, relatively non-porous impermeable section of dolomite. Density values average 2.75 g/cm^3 (Figure 23), and neutron-density cross-plots average 3-4% throughout the section of the UCR. As with the Maryville Formation, no core data is available in Coshocton County for any part of the Copper Ridge Formation; however, ~22 miles to the east-northeast, in Tuscarawas County, the Ohio Geological Survey CO2 No. 1 well (API # 341572533400) was cored through in the UCR (Wickstrom, 2011). Based on similar log signatures, the CO2 No. 1 well is used as lithologic proxy for the project area. Two core data points in the equivalent UCR in the OGS CO2 No. 1 well substantiate the log data in the Adams #1 type log in Figure 23. Core measured porosity values at net confining stress (NCS) average 2% and have an average bulk density of 2.83 g/cm^3; core permeability ranges from 0.017 to 0.0005 md (Mullett & Wickstrom, 2008).

Given the lateral continuity and the impermeability of the dolomite, the UCR in the project area should serve as an effective secondary upper confining zone for the BIC.

2.4.1.3 Additional Upper Confining Capacity for the BIC

The entirety of the Upper Ordovician section (Figure 22) offers yet additional sCO_2 confining capacity and protection to USDW sources. The Black River and Trenton Limestone Groups are composed of dense micritic limestones and tight fossiliferous limestones (Buckeye Brine, 2023). This section is laterally continuous throughout the project area, and cumulative thickness averages 700 ft of tight, impermeable rock. Whereas there is a fractured Trenton play in eastern Ohio into West Virginia and New York, there have been no completions in the Trenton in Coshocton County, Ohio.

Superjacent to the Black River and Trenton Limestone is the Utica and overlying Queenston (Juniata) Shales. The Utica (and Point Pleasant) is ~300 ft thick and composed of laminated, dense, and impermeable, organic rich shale. Whereas this is a well-known resource play to the east, in the vicinity of the project area, the Utica is only marginally mature at ~5,000 ft and in the oil window (Hickman et al., 2015; Figure 31).

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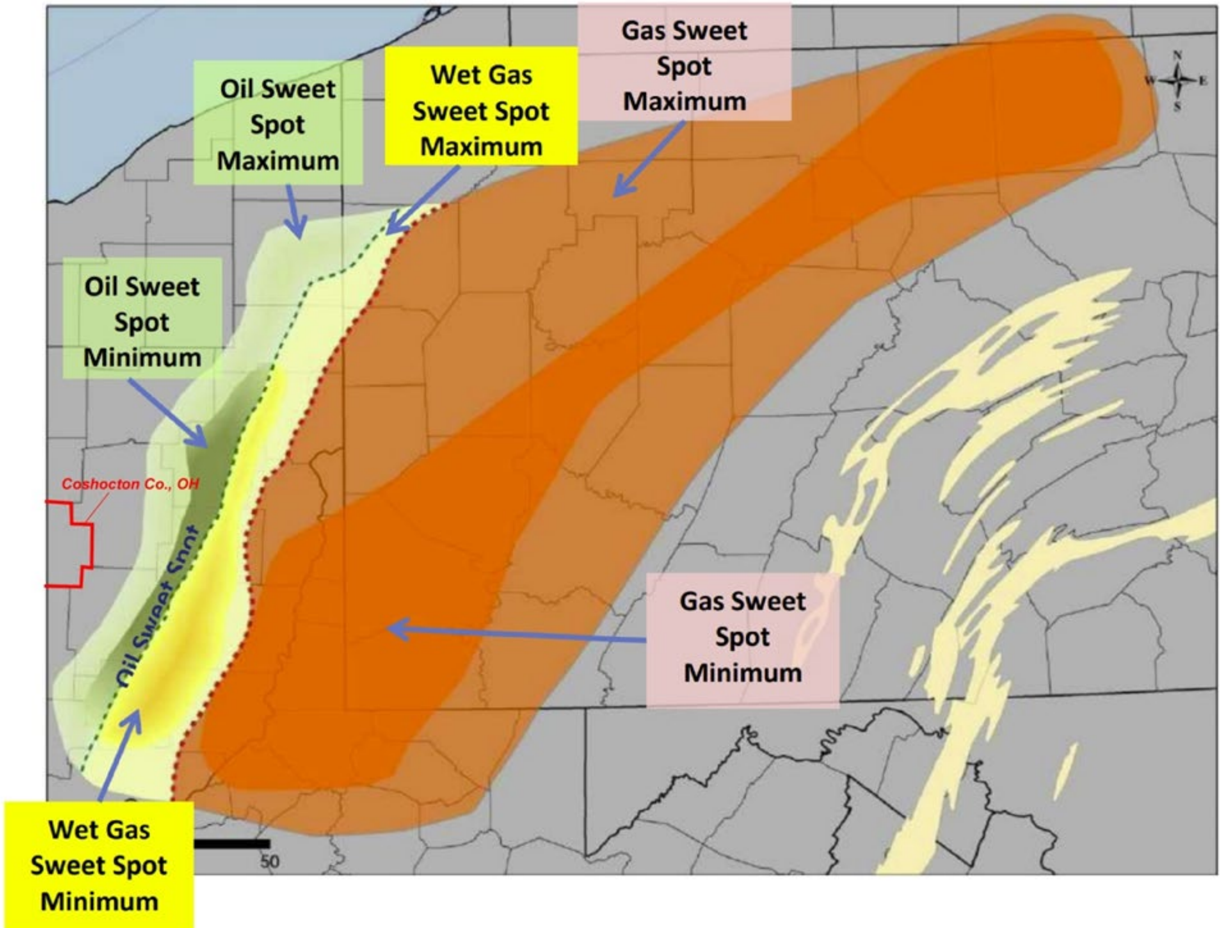

Figure 31: Geographic extent of minimum and maximum sweet spots for resource assessment of the Point Pleasant / Utica Shale (after Hickman et al., 2015). Coshocton County, Ohio, outlined in red.

The overlying ~1,100 ft of Queenston Shale is composed of thinly laminated pro-deltaic, oxic shales that were shed from the east in concert with the westward progradational “Queenston Delta Complex” (Blue, 2011).

In summary, in conjunction with both the Primary and Secondary Confining Zones previously discussed, the Upper Ordovician offers an additional ~2,100 ft+ of impermeable, tight, caprock overlying the proposed CBS Primary Injection Zone.

2.4.1.4 BIC Primary Injection Zone: Cambrian Basal Sandstone (CBS)

The primary objective injection zone for the proposed location is the sandstone immediately overlying the Precambrian basement (Grenville Complex), in the lower portion of the Middle Cambrian Conasauga Group (Figure 26 and Figure 32).

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Ohio and in the project area (log from the Buckeye #1 Adams, API 34031271770000, 6 miles north of the project).

Similar to the aforementioned Cambrian correlation issues, there has been debate as to the name and age of the sandstone bearing units at the base of the Conasauga in eastern Ohio, i.e., the CBS and Maryville "Flow." For many years, this sand interval was referred to as the Mt. Simon sandstone; however, the Mt. Simon Sandstone, at its type location in Eau Claire, Wisconsin, consists of 234 ft of coarse-grained, partly conglomeratic sandstone overlying Precambrian granite and overlain by fine-grained sandstone of the Eau Claire Formation" (Willman et al., 1975). Although far removed from its type section, the term "Mt. Simon Sandstone" is still widely used in Ohio for any sand or sand-bearing interval overlying the Precambrian surface, regardless of age or lithology/texture. This 'Mt. Simon' terminology is still used in both oil field vernacular as well as in literature (e.g., Dinterman et al., 2017), thereby contributing to the continued ambiguity of this interval. In 2013, Babcock and Baranoski utilized trilobite biostratigraphy to successfully delineate the age of the sand / sand bearing intervals immediately above the Precambrian surface in Ohio. They found that the bulk of these sands were not Mt. Simon Sandstone but, rather, basal transgressive sandstones in the lower part of the Maryville Formation of the Conasauga Group (Figure 33). This distinction is important not only for correlation purposes but, moreover, recognition of differing depositional systems and reservoir properties.

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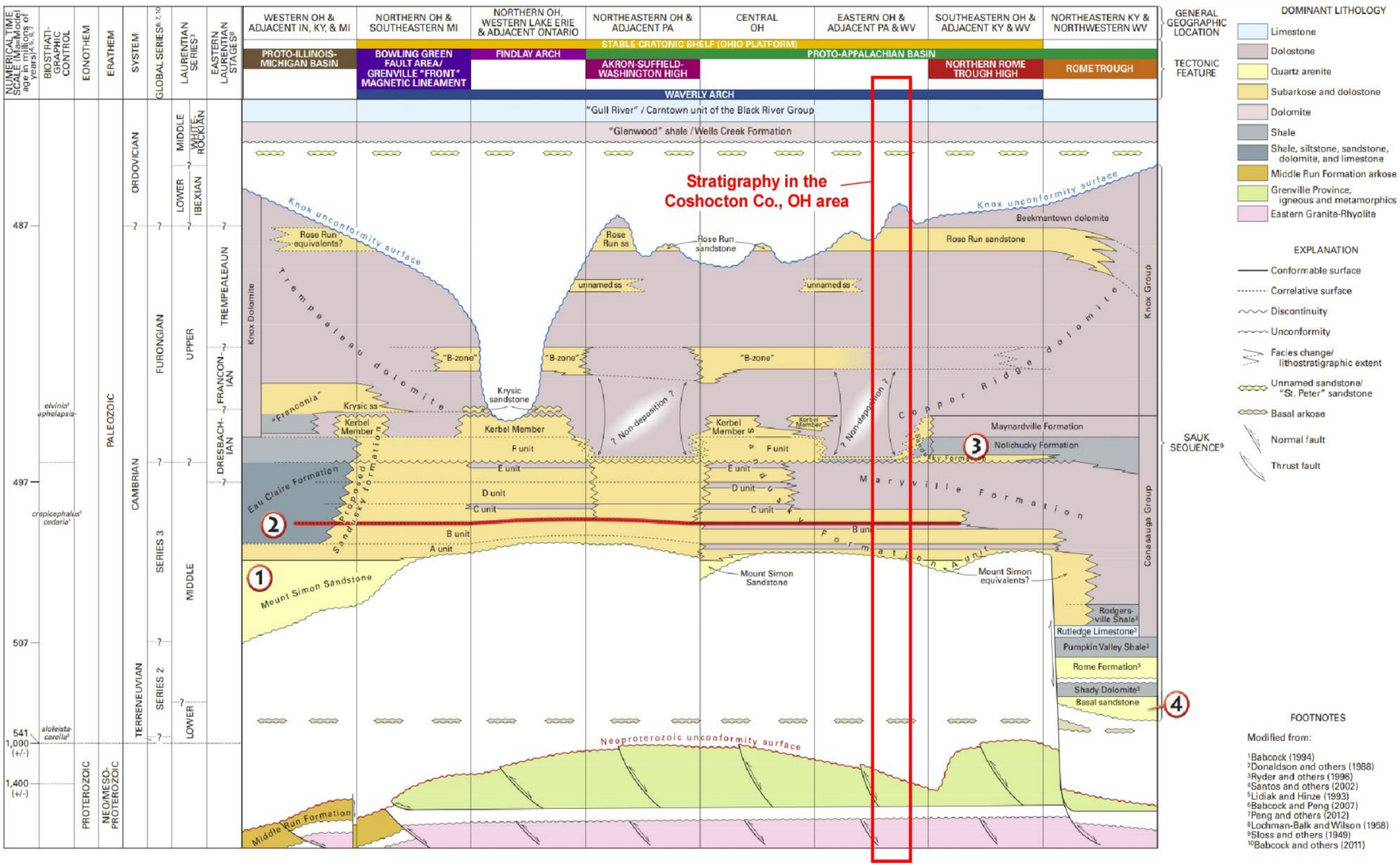

Figure 33: Regional stratigraphy and biostratigraphy for the Cambrian section of the Appalachian Basin region (Babcock & Baranoski, 2013). Generalized stratigraphy of the Coshocton County, Ohio area highlighted in red.

In the project area of Coshocton and surrounding counties, the Maryville correlations in hold true and are repeatable over distance (where data exists), particularly in regard to the Cambrian Basal Sandstone (CBS).

There is a relative paucity of wells in eastern Ohio that penetrate and have logs through the Precambrian; however, data from Adams #1 type log in and , in combination with data from Wickstrom (2011), suggest that the combined CBS interval averages a relatively consistent ~100 ft thick throughout the project area and eastern Ohio. Structurally, the CBS dips and rolls off to the east towards the Rome Trough. According to the SEM, the top of the modeled CBS interval in the project area at the proposed injection well is -6,443 ft (SSTVD; Figure 34).

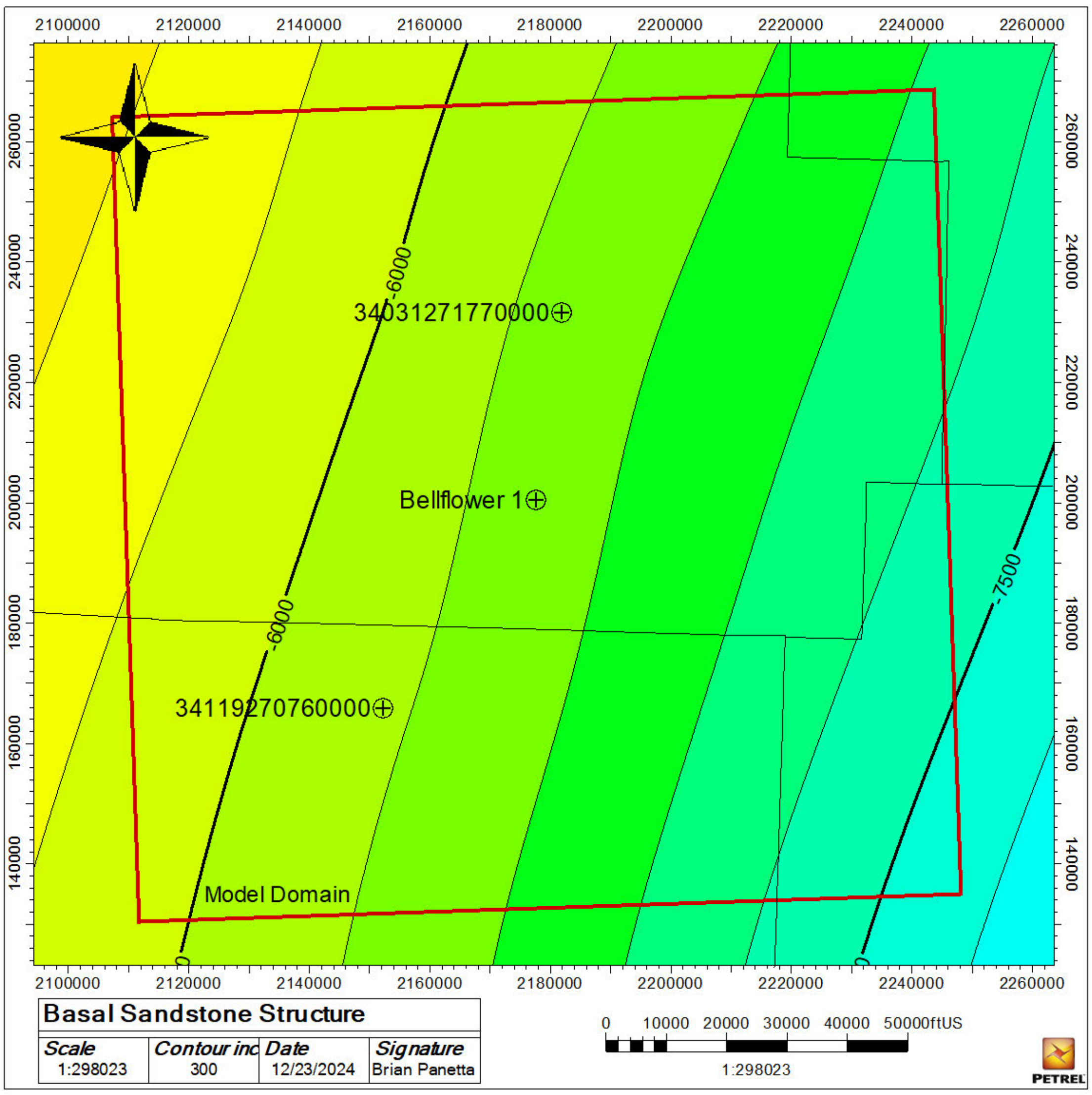

Figure 34: Structure at the top of the Cambrian Basal Sandstone with location of Bellflower 1 shown. The SEM domain is outlined in red.

There are no core data available in Coshocton County for the CBS; however, as discussed in previous sections, core is available to the east, in Tuscarawas County, in the Geological Survey CO2 No. 1 Well (Wickstrom, 2011). Based on similar log signatures, the CO2 No. 1 well is used as the lithologic proxy for the project area (Figure 37).

Full XRD analysis was only available for the CBS from the Ohio Division of Geological Survey CO2 No. 1 well in Tuscarawas County, Ohio. The analysis indicates that the CBS is an arkosic sandstone with minor calcite and trace amounts of other minerals (Table 4, Figure 35 and Figure 36). The framework grain analysis for the CO2 No. 1 well core analysis classifies the CBS as a very fine to medium grain arkosic sandstone (Table 5). The CO2 No. 1 core had an average porosity of 7% and permeabilities ranging from 0.0001 md to 0.8 md.

Table 5: XRD analysis (weight %) for RSWC collected in the Cambrian Basal Sandstone at the Ohio Division of Geological Survey CO2 No. 1 well in Tuscarawas County, Ohio. Modified from Wickstrom et al., 2011.

Measured Depth (ft):	8,538	8,561	8,563
Sample Number:	1-68R	1-72R	1-74R
Chlorite	1	1	1
Kaolinite	Trace	1	Trace
Illite	1	2	2
Mixed Illite/Smectite	Trace	1	Trace
Total Clay	**2**	**5**	**3**
Calcite	Trace	1	Trace
Dol/Ank	11	3	19
Siderite	Trace	Trace	Trace
Total Carbonates	**11**	**4**	**20**
Quartz	72	68	62
K-spar	13	21	13
Plagioclase	1	1	2
Pyrite	1	1	Trace
Hematite	0	0	0
Barite	0	0	0
Total Other Minerals	**87**	**91**	**77**

Table 6: Framework Grain Analysis for the Cambrian Basal Sandstone at the Ohio Division of Geological Survey CO2 No. 1 well in Tuscarawas County, Ohio. Modified from Wickstrom et al., 2011.

Measured Depth (ft):	8,538	8,561	8,563
Sample Number:	1-68R	1-72R	1-74R
Rock Name (Dunham):	Arkose	Arkose	Arkose
Quartz Monocrystalline	37	44	30
Quartz Polycrystalline	6	7	5
Kspar	20	18	21
Plagioclase	2	3	3
Lithic Fragments	1	1	1
Cement / Replacement	25	13	27
Porosity	9	14	10
TOTALS:	**100%**	**100%**	**100%**

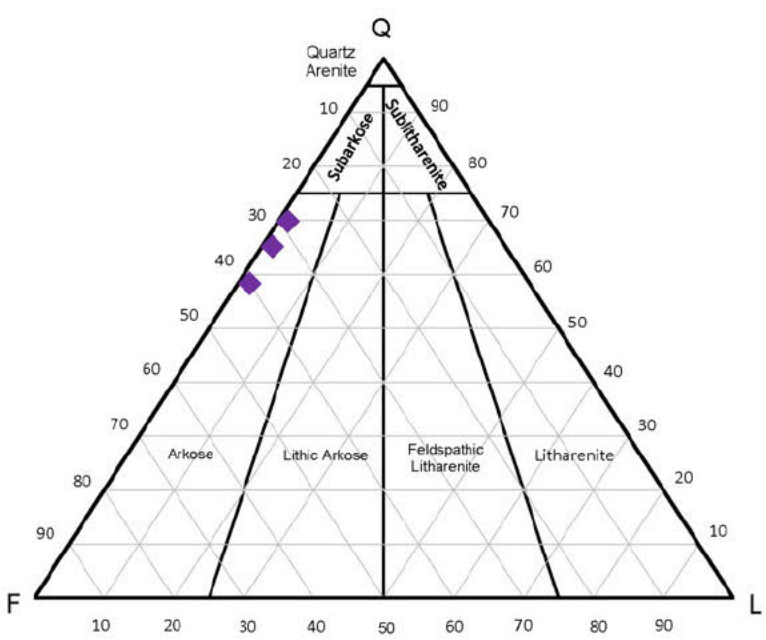

Figure 35: Ternary diagram showing CBS core points from the CO2 No. 1 well using Folk (1968) classification system.

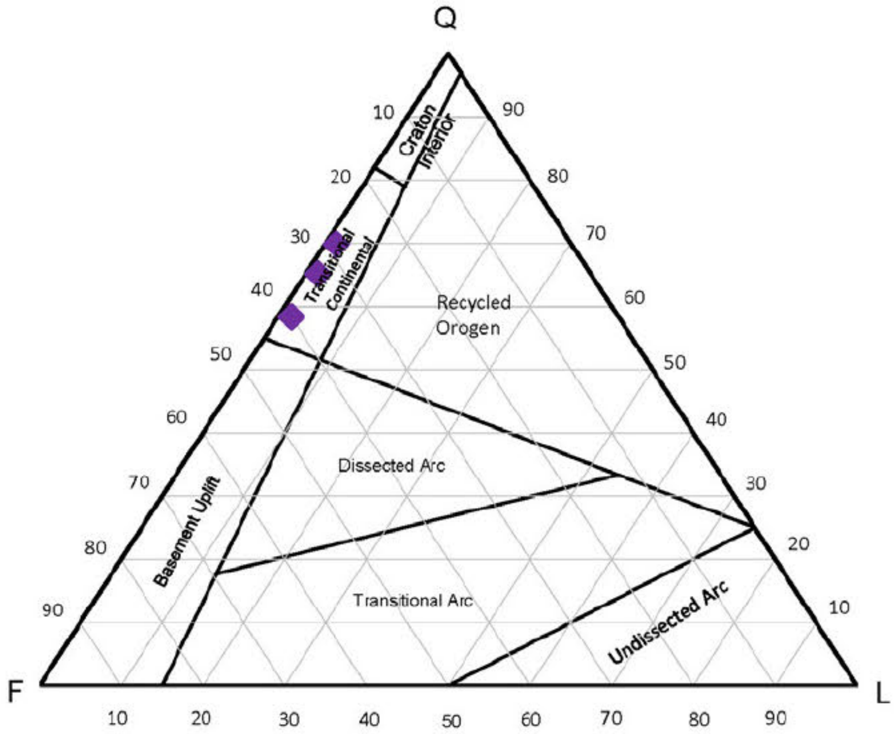

Figure 36: QFL ternary diagram showing CBS core points from the CO2 No. 1 well using classification system from (Dickinson and Suczek, 1979).

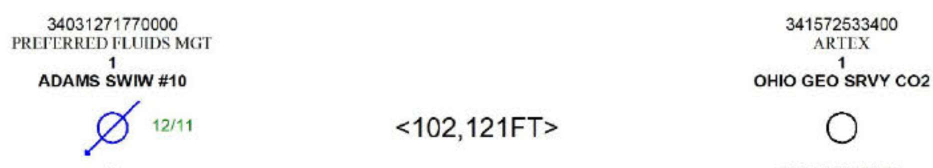

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Figure 37: Correlation of CBS from the Adams #1 type log to the CO2 No. 1 core well for lithologic proxy. Datum is the Conasauga (not shown here). Note, the CO2 No. 1 well is ~1300 ft structurally deeper than the Adams #1 well.

According to whole core data for the CO2 No. 1 well, the CBS is composed of light pink to white, medium-grained, poor to well sorted, rounded feldspathic dolomitic quartz arenite (Wickstrom, 2011). Trough cross-bedding, discontinuity surfaces, and vertical burrows suggest near-shore to shore face deposition (Wickstrom, 2011). This section grades upwards into the Maryville Flow where the lithologies are composed of light to medium gray, feldspathic arenaceous dolomite, with rip-up clasts, scour surfaces, and bioturbation indicating deposition in the shallow subtidal to shallow marine environment (Wickstrom, 2011). Overall, from the Precambrian unconformity up through the top of the Maryville Flow, these sediments represent a deepening upward section coincident with the transgressing Conasauga Group seas. Due to the lack of petrophysical and mineralogical data in the area of the proposed injection, the CBS will be evaluated in pre-operational testing through coring and logging.

In Coshocton County, log measured porosities in the Adams #1 type log average ~12% with peaks up to 16%. It should be noted that the CO2 No. 1 core well is ~20 miles east of the Adams #1 type well where the CBS injection interval is an additional ~1,300 ft deeper. According to Medina et al., 2011, there is a direct correlation in the decrease in permeability and porosity with depth and burial in the 'Mt. Simon' sandstones. Inasmuch as the proposed injection location will be at a similar depth as the Adams #1 type well, the CBS should be ~1,300 ft shallower than the CO2 No. 1 core well, and thus, better petrophysical reservoir properties are anticipated. This does not include lateral facies changes that may yield additional positive reservoir development, such as is documented in other cores from the CBS interval in the greater Ohio area, e.g., in the WP1 well (Battelle, 2017) and the KGS #1 Hanson well (Bowersox, et al., 2019).

Additionally, 221 core sample points from nine wells in eastern Ohio were also evaluated. Porosities ranged from 0.5 to 23%, with an average of 12%. Permeabilities ranged from <.0001 md to over 2,000 md, with an average of 98 md. Approximately 61% of the samples had permeabilities greater than 1 md (Batelle, 2017).

Due to the unavailability of special core analysis data and the absence of analogous data in the surrounding area, capillary pressure (Pc) and relative permeability (kr) with respect to brine saturation (Sl) for the injection zone were inferred through a comprehensive literature review. Site-specific data will be obtained from the pre-operational data gathered from the injection and observation wells. Utilizing Brooks-Corey (1966) models, capillary pressure and relative permeability were calculated. A detailed description of the equations is given in subsection 1.3.1 of the Area of Review and Corrective Action Plan.

In the lack of core data to substantiate the proposed injection zone, real world data exists illustrating the success of, and storage capacity within the CBS. Figure 38 highlights the Class II UIC wells, and their respective zones of disposal. Many of the wells were completed openhole (OH) from the upper Copper Ridge to the CBS, in central Coshocton County as well as in Muskingum, Guernsey, and Tuscarawas counties.

There are two wells in which brine disposal is exclusively being injected into the CBS, the Killbuck well in southern Holmes County and the Moran well in eastern Licking County (both with notes in red in Figure 38). As Figure 39 shows, the two aforementioned wells share similar log characteristics and thickness with the Adams #1 type log. The Killbuck well was completed through pipe in 1985, where the CBS was perforated and given a small fracture treatment; available records from the operator and through the ODNR yield a cumulative disposal to date of ~3.6 million barrels of fluid (MMBF) in ~15 years of available data. The Moran well was likewise completed through pipe, solely in the CBS (Figure 39), and with only an acid stimulation job. Available records from the ODNR yield a cumulative of 5.0+ MMBF disposed in the last 30+ years. These historical data further substantiate and bolster the injectivity and storage capacity of the CBS.

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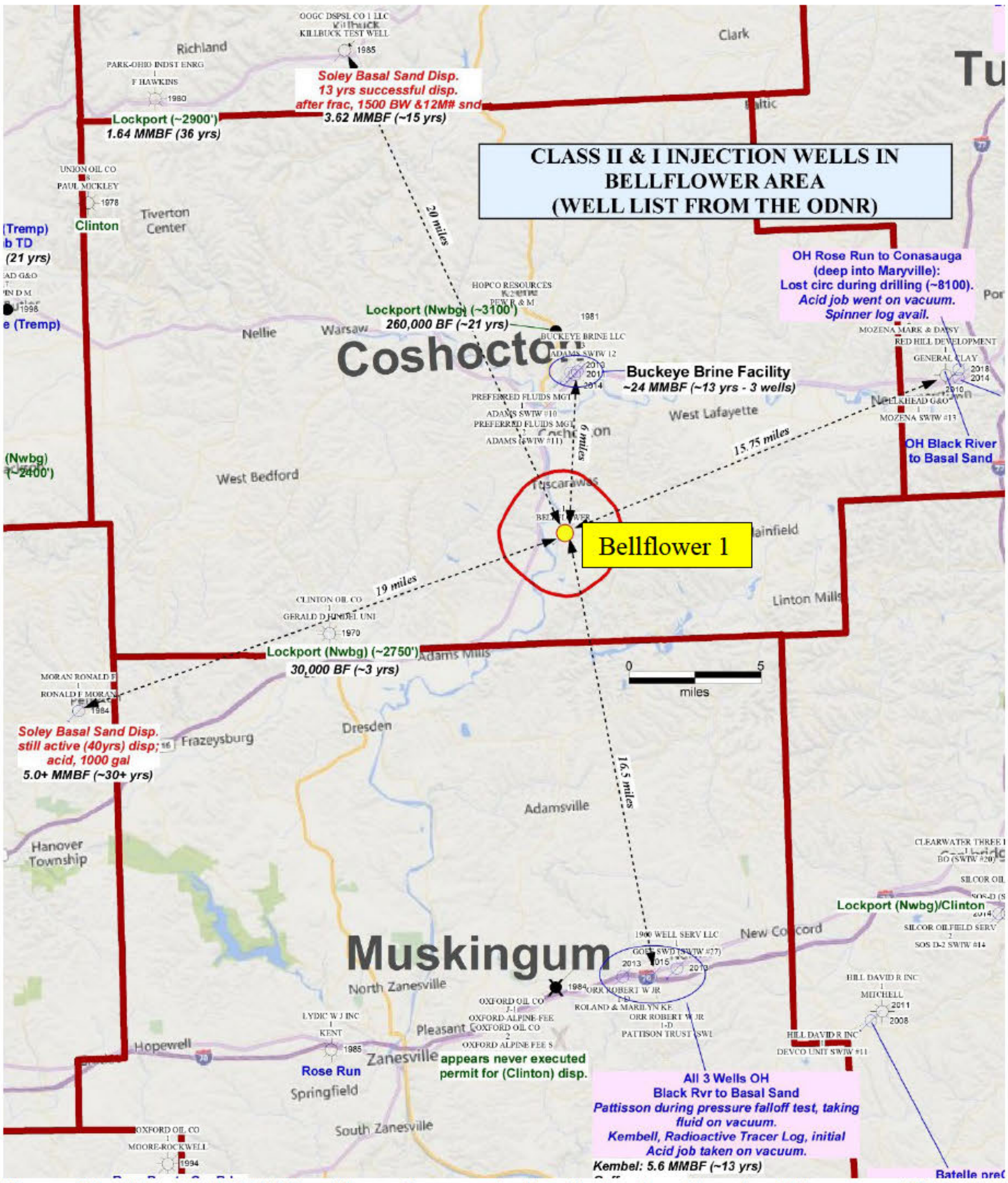

Figure 38: Class II & I UIC wells, and zones, in the Coshocton County, Ohio area. Distance of proposed injection location and nearest disposal in which the CBS is open to disposal shown with arrows; AoR highlighted in red. The Moran and Killbuck wells, the wells solely disposing into the CBS, are highlighted by red text.

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Figure 39: Three well cross-section with the Moran (left) and Killbuck (right) wells in comparison to the Adams #1 well, illustrating perforations and zones of successful disposal, and storage, of oil field brines.

The Buckeye Brine Disposal Facility (Buckeye Brine, LLC) was established in 2012 as a Class II UIC well facility for oil and gas brine/waste, and is located 6 miles north of the proposed injection location. Three wells were drilled between 2011 and 2014, one of which penetrated the entire BCS/ Maryville Flow interval, into the basement:

- Adams #1 (spud 12/2011) with a TD in the top of the pre-Cambrian basement.
- Adams #2 (spud 10/2013) with a TD in the Maryville Silt.
- Adams #3 (spud 08/2014) with a TD 10 ft into the top of the BCS.

In 2019, two of the wells, the Adams #1 and #3 were converted to non-hazardous waste Class I UIC wells, and to date, the whole complex has managed upwards of 1 trillion gallons (~24 MMBF) of waste fluid.

These wells were completed openhole (OH) with casing set above the Rose Run, leaving the rest of the uncased section, down to the respective total depths, open for disposal. Although no cores were taken in any of the three wells, great efforts were taken to evaluate the geology of the area and to identify the intervals in the Ohio sections which were taking the most fluid. This included 2-D seismic surveys, formation micro imaging (FMI) logs, flow and log spinner tests, and multiple radioactive tracer (RAT) tests through time, all of which are reported and summarized in Buckeye Brine (2023). Through this work, it was determined that the bulk of the disposal was occurring in vuggy (karst) porosity zones developed in the lower Copper Ridge and the upper Maryville Lime (Figure 40). These intervals are typical lost circulation zones during drilling in the area.

The Adams #1 well is the only well that historically was open to the CBS. The Adams #3 did reach the CBS, but comparison of the rig measured total depth (RTD) and loggers measured total depth (LTD) shows 25 ft of fill between the time of drilling and logging, covering the CBS, and thus that section was not open to disposal. Flowmeter Spinner Logs run upon initial completion in the Adams #1 in March of 2012 indicated that the Maryville Lime was the only formation that was taking fluid, from 6,756 to 6,780 ft (Figure 41) (Buckeye Brine, 2023). Similar tests were run in the Adams #2 and the Adams #3 yielding additional disposal in the Lower Copper Ridge and Nolichucky (Figure 41). In 2016, during a mechanical integrity test (MIT), a radioactive tracer survey (RTS) was in the OH section, and, over 4 years later, disposal was still solely going into the same Maryville Lime interval (6,730-6,776 ft). Furthermore, at this same time, they recorded a new TD indicating 221 ft of fill up from sloughings in the OH section associated with turbulent flow during injection (Buckeye Brine). Therefore, the CBS was backfilled during this four-year period and was not open to disposal. As was illustrated above in the Moran and Killbuck wells, the CBS is a sufficient zone for injection but may have only received a small amount of disposal fluids prior to backfill at the Buckeye Brine facility. See subsection 2.9 for further discussion on interference with other UIC wells in the region not being anticipated for the project.

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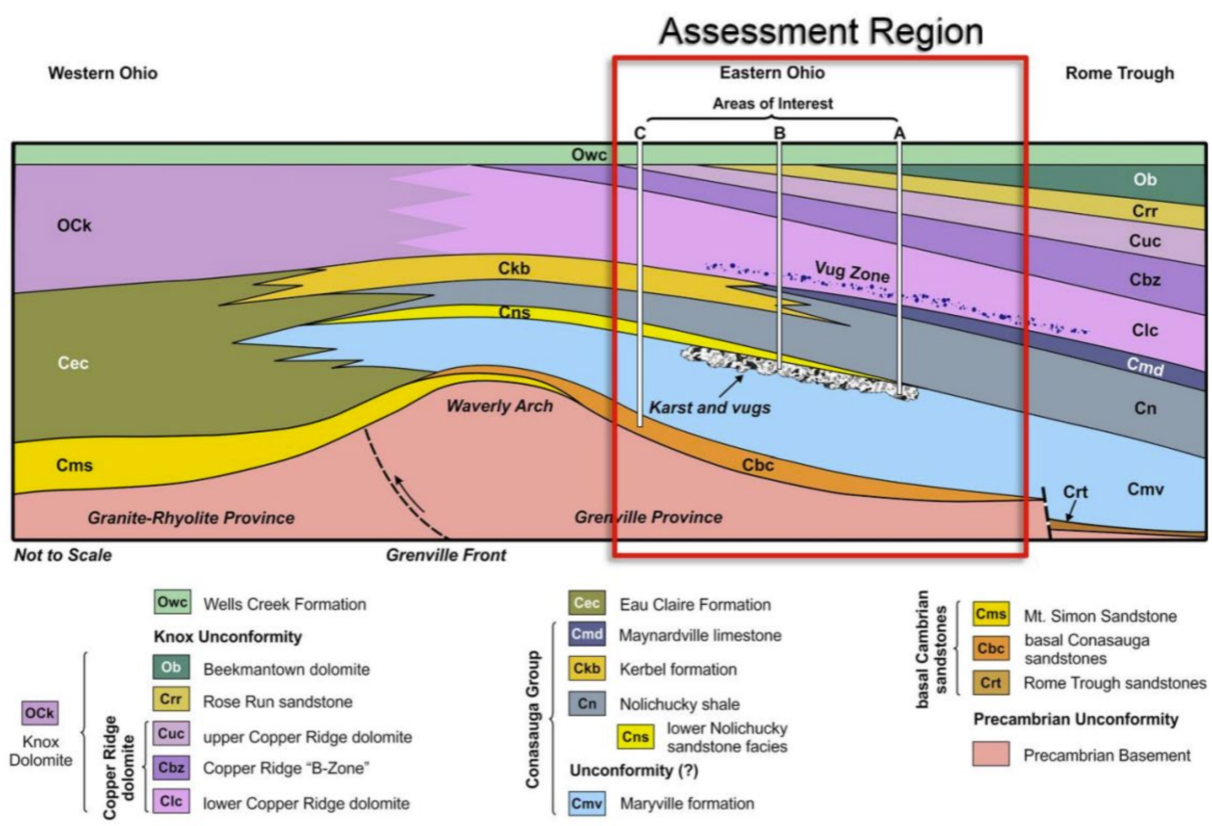

Figure 40: Generalized geology of the project area and the BIC (Wells Creek through Grenville section); location for the proposed injection well near "area of interest" B. Note the vuggy porosity zones in the lower Copper Ridge and the upper Maryville (Battelle, 2018).

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Figure 41: Composite inflow zones based on flowmeter tests from all 3 wells in the Buckeye Brine Facility overlain on the Adams #1 well. The right side of the image shows the historical blended average of flow (disposal), per formation (Buckeye Brine, 2023).

2.4.1.5 BIC Secondary Injection Zones

There is approximately 150 ft of section that separates the CBS and the primary confining zone, and an additional ~1,000 ft that separates the CBS primary injection interval from the 2,100 ft of impermeable Upper Ordovician rocks. Within this interval, there are other porous zones that offer secondary injection potential.

The Maryville Flow, which immediately overlies the CBS, is an arenaceous dolomite. The Maryville Flow may develop sandy layers in the lower portion of the unit towards the south. Due to the vertical heterogeneity of interbeds of moderate and low porosity and permeability layers in the lower part of the section, there could be injection bleed over of CO_2 and pressure into the lower Maryville Flow. In addition, there is a sand that occurs within the Nolichucky Formation (i.e., the Nolichucky “Flow” in Figure 32) at the top of the Conasauga Group that offers storage capacity, particularly to the west of the proposed injection location (see Battelle, 2017). The Nolichucky sand is encased in shale that may act as upper and lower confining zones for this sand. Lastly, the the Rose Run is composed of relatively porous sand; however, this sand is sporadically oil and (mostly) gas productive in the project area and, thus, not objective. Two other zones with injection and storage potential exist in the lower Copper Ridge and the upper Maryville limestone; these intervals are well documented in the Buckeye Brine Disposal Facility described in subsection 2.4.1.4 above (Figure 41).

2.4.1.6 BIC Lower Confining Zone: Crystalline Pre-Cambrian Grenville Complex

The backbone of the Precambrian basement in eastern Ohio is the Grenville Province, an extension of the metamorphic and igneous terrane exposed in southern Canada (Figure 40). The basement here consists of metamorphosed igneous and sedimentary rocks formed during the Grenville orogeny approximately 1-1.2 billion years ago (Culshaw and Dostal, 2002). The Grenville Province is known to contain numerous imbricated westward thrust blocks that have overridden the East Continent Rift system in western Ohio (Wickstrom, 2011). The Grenville section beneath the Paleozoic interval in the project area is composed of tight metamorphic rocks largely devoid of metasediments. Core and log data from the OGS CO2 No. 1 well substantiate these observations where core data from the top 50+ ft of metamorphic rocks have porosity values less than 0.5% and permeabilities all less than 0.0001 md and therefore serve as an excellent bottom seal to the BIC.

2.4.1.7 Uncertainties & Additional Required Information

Given the sparsity of subsurface data in the project area, data collection will be imperative to appropriately characterize the injection and confining zones. Rotary sidewall coring, logging and testing data will be collected as part of the pre-operational testing for the project (see Pre-Operational Testing Program). Successful collection of downhole data and core and the subsequent tests and measurements will provide greater clarity around current uncertainties in lithology and facies, reservoir properties, including capillary pressure, relative permeability, geomechanics, and mineralogy as required per 40 CFR §§ 146.82(a)(3)(iv) and 146.82(a)(3)(iii).

Table 7: Supplemental capillary pressure information within the injection and confining zone [40 CFR 146.82(a)(3)(iii)].

Injection Complex	Zone	Formation/Sample No.	Sample Depth TVD (ft)	Sample Depth MD (ft)	Porosity ϕ (%)	Permeability Air k (mD)	Permeability Brine k (mD)	Water Saturation Sw (%)	Residual Water Saturation	Capillary Entry Pressure	Pore-size distribution (λ)	Cementation exponent (m)	Saturation exponent (n)	Formation Resistivity (Rt)	Water Resistivity (Rw)
Basal Sandstone Injection Complex (BIC)	Upper Confining Zone	Maryville Silt (Sample no. TBD)	tbd	tbd	tbd	tbd									
		Maryville Silt (Sample no. TBD)													
		Maryville Silt (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
	Primary Injection Zone	Cambrian Basal Sandstone (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
		Cambrian Basal Sandstone (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
		Cambrian Basal Sandstone (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
	Lower Confining Zone	Precambrian Basement (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
		Precambrian Basement (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
		Precambrian Basement (Sample no. TBD)	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd

Table 8: Supplemental geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining and injection zones [40 CFR 146.82(a)(3)(iv)].

Injection Complex	Zone	Fm. Name	Sample No.	Sample Depth TVD (ft)	Sample Depth MD (ft)	Sample Orientation	Porosity ϕ (%)	Permeability k (mD)	Water Saturation SW (%)	Temperature at Depth (°C)	In Situ Fluid Pressure (psi)	Fracture Gradient (psi/ft)	P-wave Velocity (ft/s)	S-wave Velocity (ft/s)	Bulk Density (g/cm3)	Youngs Modulus	Poisson's Ratio	Bulk Modulus	Shear Modulus	Unconfined Compressive Strength (UCS)	Internal Friction Angle	Confining Strength	Cohesion
Upper Injection Complex: Basal Sandstone Injection Complex (BIC)	Upper Confining Zone	Maryville Silt	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
	Primary Injection Zone	Cambrian Basal Sandstone	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
	Lower Confining Zone	Precambrian Basement	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd

2.4.1.8 Regional Estimated Injection Zone Storage Capacity

Prospective storage resource estimates for the project were calculated for the Sandstone reservoir using the methodology detailed in Goodman et al. (2011, 2016) for saline formations. This methodology generates storage resource estimates using equations (1) and (2) (from Goodman, 2016):

$$G_{CO2} = A_t h_g \emptyset_{total} \rho_{CO2} E_{Saline} \quad \text{(Eq. 1),}$$

where E_{saline} is the CO_2 storage efficiency factor that reflects a fraction of the total pore volume that is filled by CO_2,

$$E_{Saline} = E_A E_h E_{\emptyset} E_V E_D \quad \text{(Eq. 2),}$$

where A is area, h is thickness, $\emptyset$ is porosity, V is volumetric displacement, and d is microscopic displacement.

Prospective storage resource estimates were calculated using the DOE-NETL CO_2 SCREEN tool. All physical inputs, storage efficiencies, and assumptions are shown in Table 9. The resource estimate suggests that the BIC may be able to store between 5.0 (P10) to nearly 303.28 (P90) MMt of CO_2. Table 10 details the results of the prospective storage resource calculations.

Table 9: Parameters used for Calculating Storage Resource Estimates for BIC.

Resource Estimation Inputs	
Attribute	
Area (km^2)	1,800
Reservoir Thickness (m)	33
Porosity (%)	13
Pressure (Mpa)	26.7
Temperature (ºC)	67

Table 10: Probabilistic scenarios for prospective storage resource estimates for BIC based on the regional values.

Resource Storage Probabilities			
	P10	P50	P90
Total CO2 (MMt)	5	57.29	303.28
Total Efficiency (%)	.09	1.04	5.34

2.5 Geomechanical and Petrophysical Information [40 CFR 146.82(a)(3)(iv)]

2.5.1 Cambrian Basal Sandstone Petrophysical Analysis

Bowersox et al. (2018) was the primary repository for core data used in this model. The dataset includes porosity, permeability, and grain density data from a core taken from a well in Carter County, Kentucky (API number 16043001050000). This dataset includes only 20 porosity and permeability measurements, from the Carter County well in the CBS. Additional core data were obtained and reviewed from Batelle (2017), Medina et al. (2010) and Wickstrom et al. (2010). Core data in Batelle (2017) included core from nine wells across Ohio and West Virginia. Core data in the Medina et al. (2010) study included 2,742 samples taken from the Mt. Simon sandstone in western Ohio, Indiana, Michigan, and western Kentucky. There are lithologic and mineralogic differences between the Mount Simon Sandstone and the CBS; most notably, the Mt. Simon is quartz dominated and lacks dolomite cements, whereas the CBS contains varying amounts of feldspars and dolomite cement as well as interbedded dolostones (Battelle, 2013).

Data from the Tuscarawas County well, more than 25 miles to the east of the project area Wickstrom et al. (2010), were also reviewed. The study included 11 data points in the CBS. The reservoir quality of the CBS, including porosity, permeability, and thickness, all decrease from west to east (Battelle, 2013). Porosity and permeability have also been shown to decrease with depth in the CBS (Medina, 2010).

Porosity was calculated using a standard equation of:

$$(\text{Grain Density} - \text{Bulk Density})/(\text{Grain Density} - \text{Fluid Density}) \quad \text{(Eq. 3)}$$

where bulk density came from the logs of interest, and a fluid density of 1.00 g/cm^3 was used.

Permeability was calculated using the relationship between porosity and permeability from the core data. This methodology was applied to the Adams #1 well, API no. 3403127177, which logged the entire CBS interval.

In situ fluid pressures are available from the Adams #1 well, 6 miles north of the proposed injection well location. Measured static pressures were collected on all three disposal wells at the facility prior to disposal. The initial well drilled for disposal at this complex, the Adams #1, had an initial measured static pressure of 2,730 psig, with a calculated pressure gradient of 0.467 psi/ft, indicating a near normal fluid pressure gradient for saltwater (0.465 psi/ft) (Buckeye Brine, 2023). Updated pore pressures of the injection and confining zones at the injection site will also be evaluated prior to injection. Further information on the in-situ fluid pressure used in the geologic model is in subsection 1.5 of the Area of Review and Corrective Action Plan.

2.5.2 Proposed Geomechanical Studies

As part of the data collection program in the Pre-Operational Testing Program, geomechanical studies are proposed to include in-situ stress analysis and fracture pressure analysis. The in-situ stress analysis aims to determine the stress state of the reservoir and overlying formations, providing insights into the mechanical stability of the confining zones. Fracture pressure analysis will evaluate the maximum pressure that can be applied without fracturing the confining zones, ensuring that the injection process does not compromise the integrity of the storage formations.

A series of geomechanical studies to address key questions regarding the geomechanical properties of the confining zone intervals (Table 8; subsection 2.4.1.7). Cores collected will provide measurements of rock strength and ductility for the confining zone intervals. The following planned geotechnical tests will be performed:

- Triaxial compression – ductility;
- Triaxial compression – failure.

2.5.3 Regional Stress State

Orientation of the maximum horizontal stress state in the region is available from a variety of data sets and compiled in the world stress map and regional studies of the Appalachian Basin (Morris et al., 2017; Heidbach et al., 2018; Brudzinski and Kozlowska, 2019). The orientation of the maximum horizontal stress in central Ohio is generally ENE-WSW and exhibits a mix of tensors from focal mechanism solutions that place it in the strike-slip or thrust faulting regime (Morris et al., 2017). According to Morris et al. (2017), the combination of coexisting thrust-faulting and strike-slip faulting regimes indicates that the intermediate principal stress component (σ_2) is closer in magnitude to the minimum principal stress component (σ_3) than it is to the maximum principal stress component (σ_1), and that the stress difference ratio (φ) is less than 0.5, where

$$\varphi=(\sigma_2 - \sigma_3)/(\sigma_1 - \sigma_3) \quad \text{(Eq. 4)}$$

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

The USGS ANSS (Advanced National Seismic System) Comprehensive Earthquake Catalog network was used to provide the historical seismicity record for the AoR locally and regionally (USGS, 2023). Regional historical seismicity was considered for a 50-mi radius around the approximate center of the AoR for a 50-year time period with a magnitude greater than M2.0 (Figure 43: USGS, 2023).

The project is located within an area of relatively low seismicity. In the AoR, there is no known source of natural seismicity that would compromise the containment of CO_2. The surrounding region has a very low risk of damaging seismic activity, while western Ohio lies on the edge of the New Madrid Seismic Zone and the Anna Seismic Zone, and northeastern Ohio contains the Northeast Ohio Seismic Zone, both of which have increased activity (Dart and Hansen, 2008). However, very few of the earthquakes that have historically occurred are known to be associated with faults (Dart and Hansen, 2008).

The USGS-published National Seismic Hazard Map shows the frequency of damaging earthquake shaking expected in a 10,000-year period (Figure 42). Based on this information, the AoR is considered to have the lowest risk of damaging earthquakes on the scale, with fewer than two expected within a 10,000-year period. The surrounding region also has a comparatively low risk of two to four damaging earthquakes expected within a 10,000-year period. According to the USGS, damaging earthquakes are identified as those that have a Modified Mercalli Intensity (MMI) level VI (6) or higher. They are characterized by "strong" shaking and "felt by nearly everyone, many awakened. Some heavy furniture moved; few instances of fallen plaster. Damage slight" (USGS, 2023).

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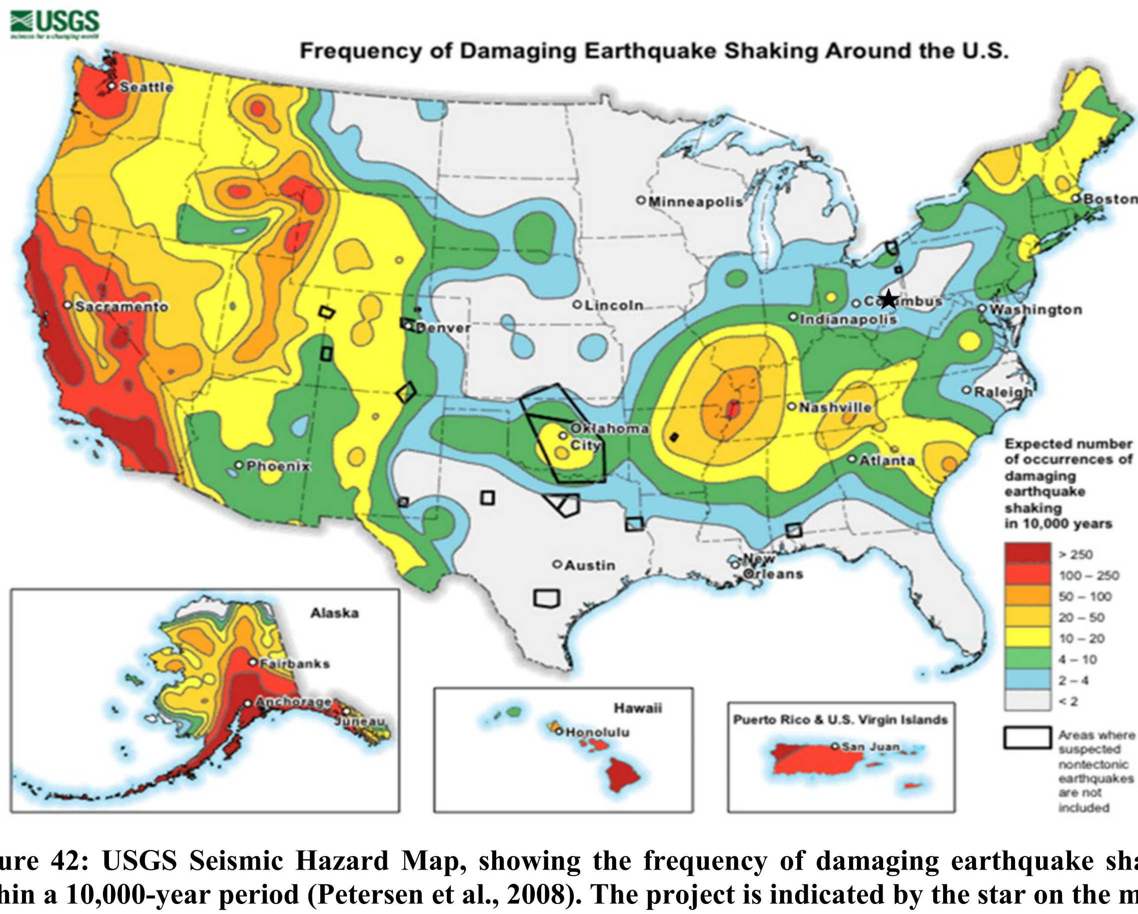

Figure 42: USGS Seismic Hazard Map, showing the frequency of damaging earthquake shaking within a 10,000-year period (Petersen et al., 2008). The project is indicated by the star on the map.

The Appalachian Basin of Eastern Ohio, where the project is located, is a region of low natural seismicity, with any earthquakes that do occur being of low magnitude. Peak ground acceleration (as a percentage of the gravity constant 9.8 m/s^2) with a 2% likelihood of being exceeded within a 50-year period is illustrated for the region in Figure 43. The peak ground acceleration for the project area is estimated to be 4 to 6 percent of gravity, which would correlate to a Modified Mercalli Intensity of IV-V (light to moderate shaking with limited damage to unstable or delicate objects).

Historically, the Northeast Ohio seismic zone, north of the AoR, has recorded few moderate earthquakes per decade, but felt earthquakes have been reported more frequently in recent decades, likely due to induced activity. The largest earthquake in this zone, with a magnitude of 5.0 on the Richter Scale (M5.0), occurred in 1986. This seismic event created Modified Mercalli intensities of VI in the region. Another damaging earthquake with M5.2 occurred in 1998 in northwestern Pennsylvania, just east of the border with Ohio (Dart and Hansen, 2008). Within 50 miles of the proposed injection location, there have been five earthquakes in the last 50 years (Figure 44). The location, magnitude, and distance from the AoR for each of these earthquakes is listed in Table 11.

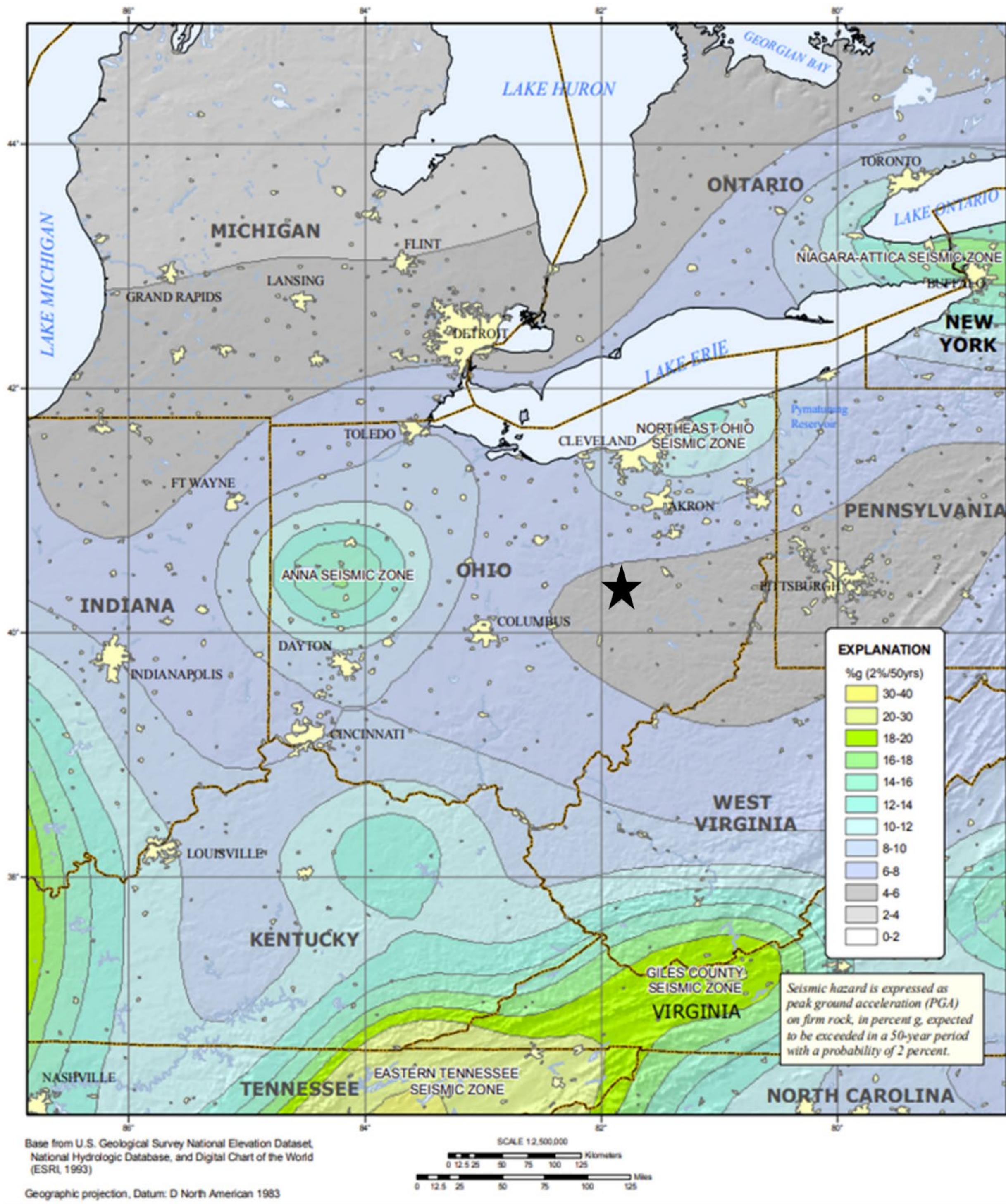

Figure 43: A Seismic Hazard Map of Ohio and nearby states from the USGS National Seismic Hazard Maps, showing the peak ground acceleration that has a 2% chance of being exceeded in 50 years. The project location is marked with a star on the map.

The Emergency and Remedial Response Plan (ERRP) includes information on conducting a formal risk assessment of potential risk scenarios, including microseismic events that could potentially be associated with industrial activities.

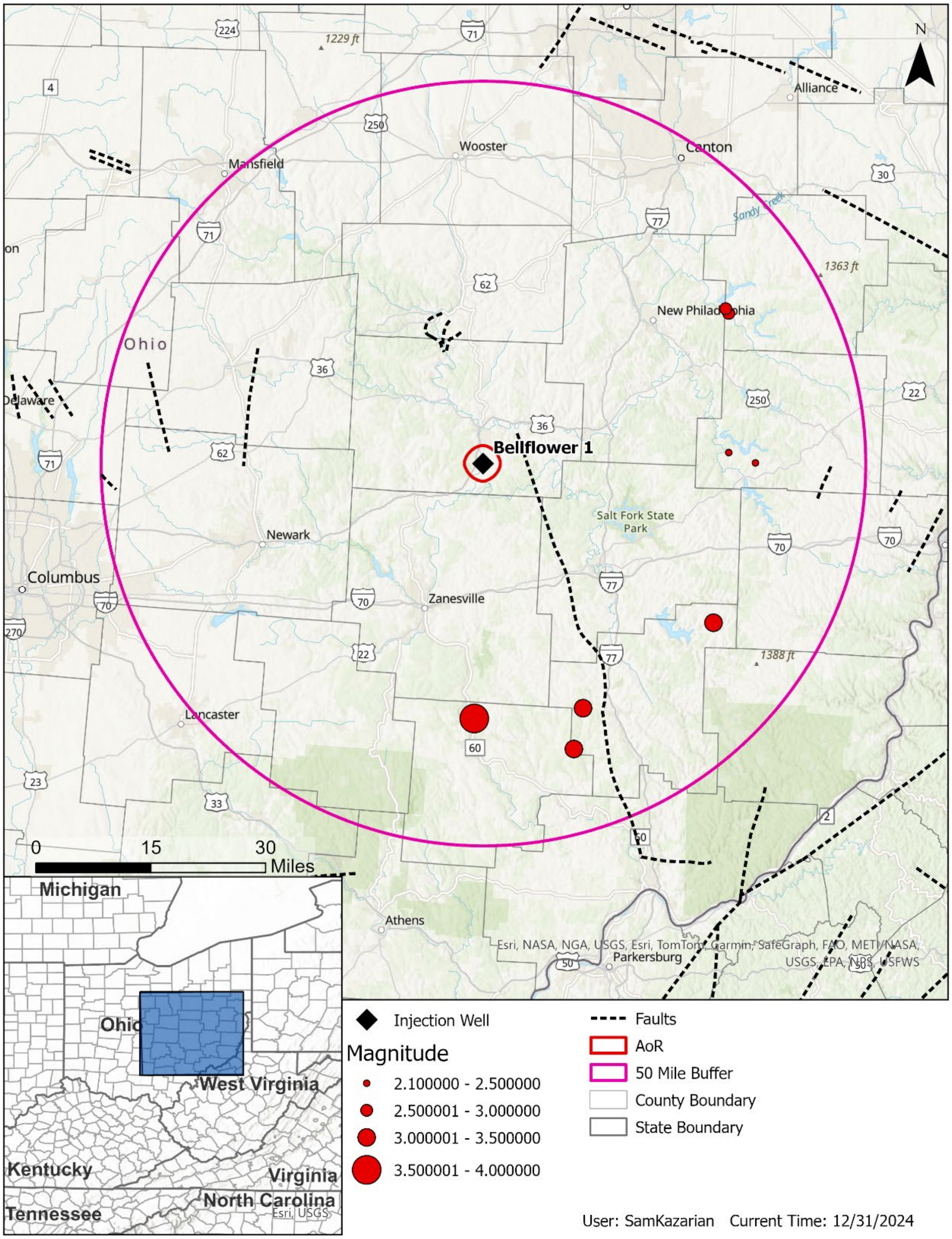

Figure 44: Local seismic events within a 50-mile radius of the AoR.

Table 11: Seismic events within 50 miles of the AoR over a 50-year period with a magnitude greater than M2.0 (USGS, 2024).

Date	Latitude (WGS 84)	Longitude (WGS 84)	Depth (mi)	Magnitude	Distance to AoR (mi)
10/2/13	40.239	-81.257	2	2.1	32
9/30/15	40.22	-81.1903	2.1	2.1	35.5
10/28/21	40.5029	-81.2577	2.5	2.6	34.5
11/19/21	40.5121	-81.265	5	2.6	34.5
6/3/17	39.9166	-81.2934	1.73	3.4	39.5

Since the early 2010s, the Eastern Ohio area of the Appalachian Basin has experienced a significant increase in induced seismic activity, which has been linked with the operations associated with the intensification of unconventional gas extraction conducted in the basin (Skoumal, 2018; Brudzinski and Kozłowska, 2019), more specifically, hydraulic fracturing and the disposal of the wastewater associated with production from the Utica Shale (Skoumal, 2018). Several known occurrences of induced seismicity have occurred in and around Youngstown, OH; this seismicity is concentrated in a corridor from eastern Ohio and into central West Virginia, which may be due to geologic variations in the subsurface or extraction operations.

Several regional studies have documented the importance of proximity to Precambrian basement when considering the possibility of induced microseismicity as related to wastewater disposal wells and hydraulic fracturing. In general, the low permeability of the Precambrian basement rock as compared to the relatively higher permeability of fractured basement rocks and pre-existing faults is interpreted to be a key factor in the potential for fault reactivation (Morris et al., 2017). Additionally, the proximity to critically stressed and optimally oriented faults that are pre-existing in basement lithologies is thought to impact the likelihood of induced recordable seismicity (Skoumal et al., 2018). Considering these factors, Skoumal et al. (2018) suggests that injection within 3,280 ft, or 1,000 m, of basement has the greatest risk of inducing seismicity. The Cambrian Basal Sandstone, however, is within the distance of 3,280 feet of the basement, having been deposited directly on top of Precambrian basement rocks. For this reason, further 2D seismic acquisition may be required to assess that risk of basement faulting. Additionally, microseismic monitoring will be utilized to assess and mitigate the induced seismicity risk through the duration of injection.

To date, there have been no known induced seismic events in Coshocton County, OH, and the historical seismicity record suggests that the proposed storage location is not in a seismically hazardous location. Thus, loss of containment due to seismicity is considered a low risk.

2.7 Hydrologic and Hydrogeologic Information [40 CFR 146.82(a)(3)(vi), 146.82(a)(5)]

The AoR is located within the Appalachian Plateau physiographic province in Coshocton County, Ohio. The county lies within the western part of the Tuscarawas River Watershed (HUC 8 subbasin 05040001), southeastern Mohican River Watershed (HUC 8 05040002), Walhonding River Watershed (HUC 8 05040003), and the northern parts of the Muskingum River (HUC 8 05040004) and Wills River (HUC 8 05040005) watersheds. The Tuscarawas River Watershed encompasses an area of approximately 2,595 square miles, whereas the Mohican River Watershed covers about 1,005 square miles, the Walhonding River Watershed spans around 1,251 square miles, the Muskingum River Watershed covers about 1,566 square miles, and the Wills River Watershed covers approximately 853 square miles.

The dominant surface water features are the Tuscarawas River in the eastern part of the county, the Muskingum River in the south, and the Walhonding, Mohican, and Kokosing rivers in the west and their tributaries. These surface waters directly or indirectly flow into the Muskingum River through the southern part of the county. Overall, the hydrology of the region is largely influenced by seasonal precipitation, snowmelt, and groundwater recharge.

The two types of groundwater sources in the area are the Quaternary Alluvial aquifers and the Upper Pennsylvanian to Lower Mississippian age sedimentary bedrock aquifers of the Appalachian Plateaus. The Quaternary Alluvial aquifers consist of clay, sand, silt, and unconsolidated gravel and are generally unconfined. The bedrock aquifers are generally confined and dip gently to the southeast, comprised of sandstones, conglomerates, siltstones, shales, limestones, clays, and coals (Collins, 1979). A stratigraphic view of the Appalachian Plateau near the AoR is shown in Figure 45**.**

The bedrock aquifers (Figure 45) are grouped into five units: the Conemaugh Group, Allegheny Group, Pottsville Group, the Logan Formation, and the Cuyahoga Formation. Each of these units has distinct water-bearing and confining layers which are described further in the following subsections.

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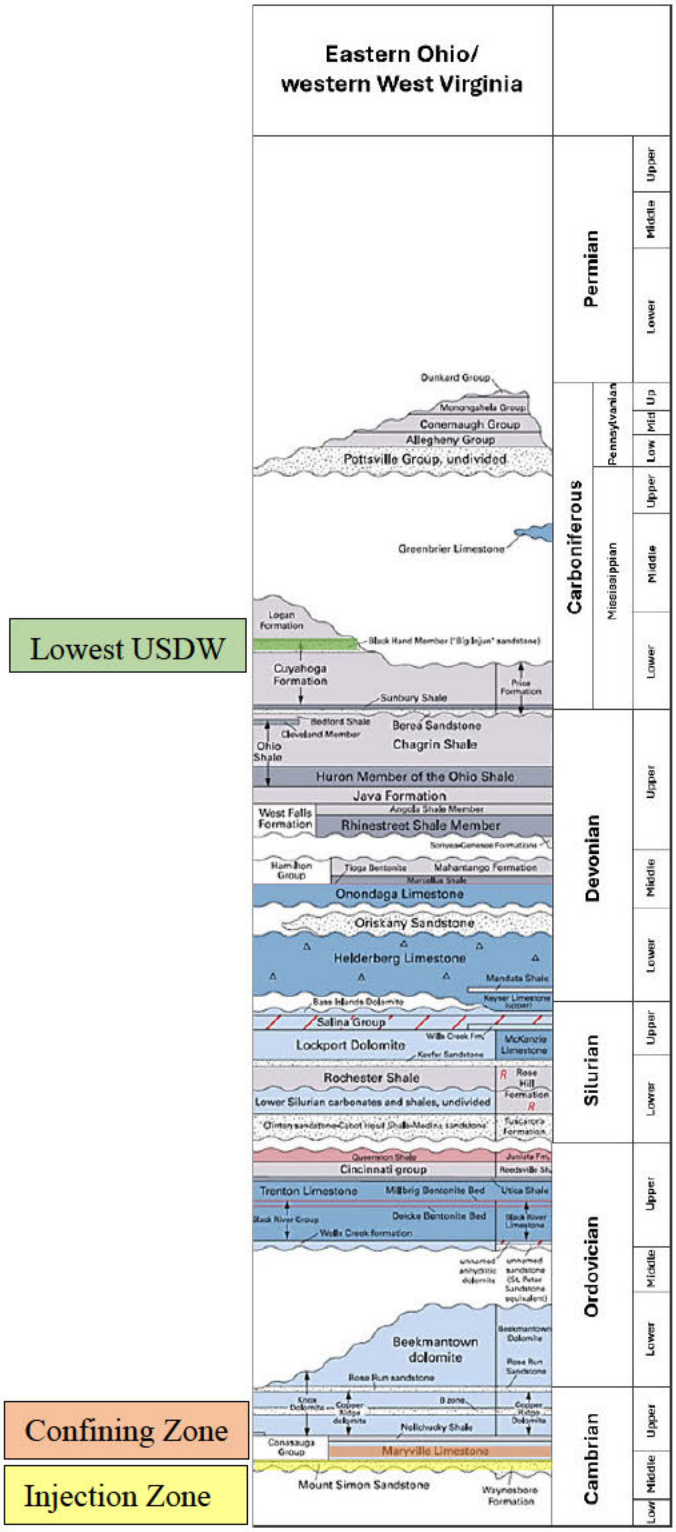

Figure 45: Conceptual stratigraphic column in area near the AoR. Adapted from USGS map (Ryder, 2008).

2.7.1 Hydrogeologic Description

U.S. EPA defines a USDW as having less than 10,000 ppm Total Dissolved Solids (TDS). Water quality samples from bedrock aquifers in the area were reported with concentrations less than 10,000 ppm TDS. The determination of the lowermost USDW for the project was based on freshwater/saltwater interface mapping done by the ODNR in 2012 (Riley, 2012) and lithologic well logs from the ODNR water well database.

Freshwater aquifers in the area, which comprise the USDWs are summarized in Figure 46. The Black Hand Sandstone Member of the Cuyahoga Formation is considered to contain the base of freshwater and is also defined as the lowermost USDW in the AoR.

System	Series	Stratigraphic Unit	Sub-Units	Notes	Lithology
Pennsylvanian	Upper	**Conemaugh Group**		Aquitard	Gray, green, brown and black shale, siltstone, and mudstone with minor limestone and coal
	Middle	**Allegheny Group**		Aquifer	Gray to black shale, siltstone, sandstone, and conglomerate with minor limestone, clay, flint, and coal
	Lower	**Pottsville Group**	Homewood Sandstone	Aquifer	White to tan sandstone, with some shale lenses
			Massillon Sandstone	Aquifer	Gray-white sandstone
			Sharon Sandstone	Aquifer	Gray-white to light red tan sandstone, with interbedded conglomerate zones
Mississippian	Upper				Unconformity
	Middle	**Logan Formation**		Aquifer	Brown to red-brown sandstones interbedded with minor siltstones and shales
	Lower	**Cuyahoga Formation**	Black Hand Sandstone	*Aquifer - Lowermost USDW*	Yellow to brown Big Injun sandstone
				Aquitard	Gray to brown shale with interbedded sandstone and siltstone

Figure 46: Conceptual stratigraphic column from the AoR illustrating the freshwater aquifers and lowermost USDW.

2.7.1.1 Quaternary Alluvium

The uppermost aquifer unit in the AoR is the unconsolidated quaternary alluvial deposits of the surface water features. This aquifer is the most productive unit in the area and has production rates greater than 500 gallons per minute (Sugar, 1988). Alluvium, consisting of stream-deposited or glacially deposited sand, clay, and gravel typically is overlain by fluvial silts and clays. The thickness of the alluvium reaches up to 225 ft in Coshocton County (Spahr, 1995).

2.7.1.2 Conemaugh Group

The Conemaugh Group is Upper Pennsylvanian in age and mainly consists of mudstones, sandstones, and shales with thin coals, clays, and limestones (Collins, 1979). The group is mostly non-marine in origin with some marine units (the Ames or Skelley Limestones) occurring in the lower portion of the group (Stout, 1944). This aquifer has a median transmissivity of 170 ft^2/d

(Kozar, 2001). The Conemaugh Group extends from the base of the Pittsburgh coal to the top of the Upper Freeport coal and reaches a maximum thickness of around 170 ft in the county (Lamborn, 1954).

2.7.1.3 Allegheny Group

The Allegheny Group comprises sequences of sandstone, shale, freshwater and marine limestone, clay, and coal (Branson, 1962). The group is Middle Pennsylvanian in age and is known as a major coal bearing unit, but is predominantly made up of sandstones (Stout, 1944). This aquifer has a median transmissivity of 850 ft^2/d (Kozar, 2001). The Allegheny Group includes the Freeport, Kittanning, and Brookville coals. The group extends from the top of the Upper Freeport coal to the top of the Homewood Sandstone. Within Coshocton County, the thickness of this group ranges from approximately 160 ft to 280 ft and averages around 212 ft (Lamborn, 1954).

2.7.1.4 Pottsville Group

The Pottsville Group averages around 188 ft in thickness in Coshocton County and consists of predominantly sandstones, conglomerates, and shales, and thin layers of limestones, coals, and shales. This group includes the Homewood, Massillon, Sharon, and Harrison formations (Lamborn, 1954). The Pennsylvanian Sharon Sandstone near the base of the Pottsville Group was identified as the lowermost USDW within Carroll County to the northeast. The Sharon Sandstone ranges from 10 to 250 ft in thickness and yields petroleum, natural gas, and brine in southeastern Ohio (Stout, 1944).

2.7.1.5 Logan Formation

The Middle Mississippian Logan Formation contains sandstones and siltstones with interbedded shale (Lamborn, 1954). The formation consists of the Vinton Sandstone, Allensville Conglomerate, Byer Sandstone, and Berne Conglomerate (Majchszak, 1984). The thickness of the Logan Formation reaches approximately 340 ft in Coshocton County (Ryder, 2008).

2.7.1.6 Cuyahoga Formation

The Cuyahoga Formation is Lower Mississippian in age and consists of the Black Hand Sandstone, Portsmouth Shale, Buena Vista Sandstone, and Henley Shale (Majchszak, 1984). The Cuyahoga Formation is up to approximately 450 ft thick in the county (Ryder, 2008).

The upper part of the Cuyahoga Formation contains the Black Hand Sandstone, which is a sandstone unit identified as the lowermost UDSW within the AoR. The Black Hand Sandstone is a conglomeratic sandstone that can contain interbedded shales and siltstones (Majchszak, 1984). The thickness of the member ranges from around 25 ft to 400 ft in the county (Lamborn, 1954). Aquifer transmissivity for the Black Hand Sandstone is relatively low for a sand and gravel aquifer with a value of 135 ft^2/d (Norris, 1982). In comparison, the Pottsville Group has a median transmissivity of 1,300 ft^2/d (Kozar, 2001). The elevation of the base of the Black Hand Sandstone is around 700 ft amsl in the northwest part of Coshocton County, and 400 ft amsl in the southeast of the county (Danielsen, 2020).

2.7.2 Groundwater Flow and Principal Aquifer Zones

Groundwater within the shallow Quaternary Alluvium generally flows from higher elevation to lower elevations ultimately discharging to the Tuscarawas, Muskingum, Walhonding, Mohican, and Kokosing rivers. Groundwater within the bedrock aquifer systems similarly flows from areas of higher elevation to areas of lower elevation, towards the major surface drainageways, but taking a longer and deeper flow path. The groundwater in the bedrock aquifers flows approximately perpendicular to local tributary streams, through an intricate network of stress-relief fractures and interconnected bedding-plane separations, commonly in a stair-step pattern (Wyrick, 1981). The groundwater within the bedrock likely discharges locally to surface water or may recharge to subregional or regional aquifers (Kozar, 2012). However, enhanced permeability of bedrock in valleys, due to stress relief fractures, may result in groundwater flow parallel to and beneath local tributary streams before ultimately discharging to surface-water bodies (Kozar, 2012). The deeper bedrock aquifers usually contain much older water, which is usually brackish and has not been flushed by shallow groundwater circulation.

Potentiometric surface data were not mapped for Coshocton County. Therefore, a map of potentiometric surface was obtained from neighboring Tuscarawas County, Ohio (Sprowls, 2007). This map regionally illustrates the potentiometric surface mirroring the topographic surface, where water flows from higher elevations to lower elevations in both the surficial alluvial aquifers and deeper bedrock formations (Figure 47).

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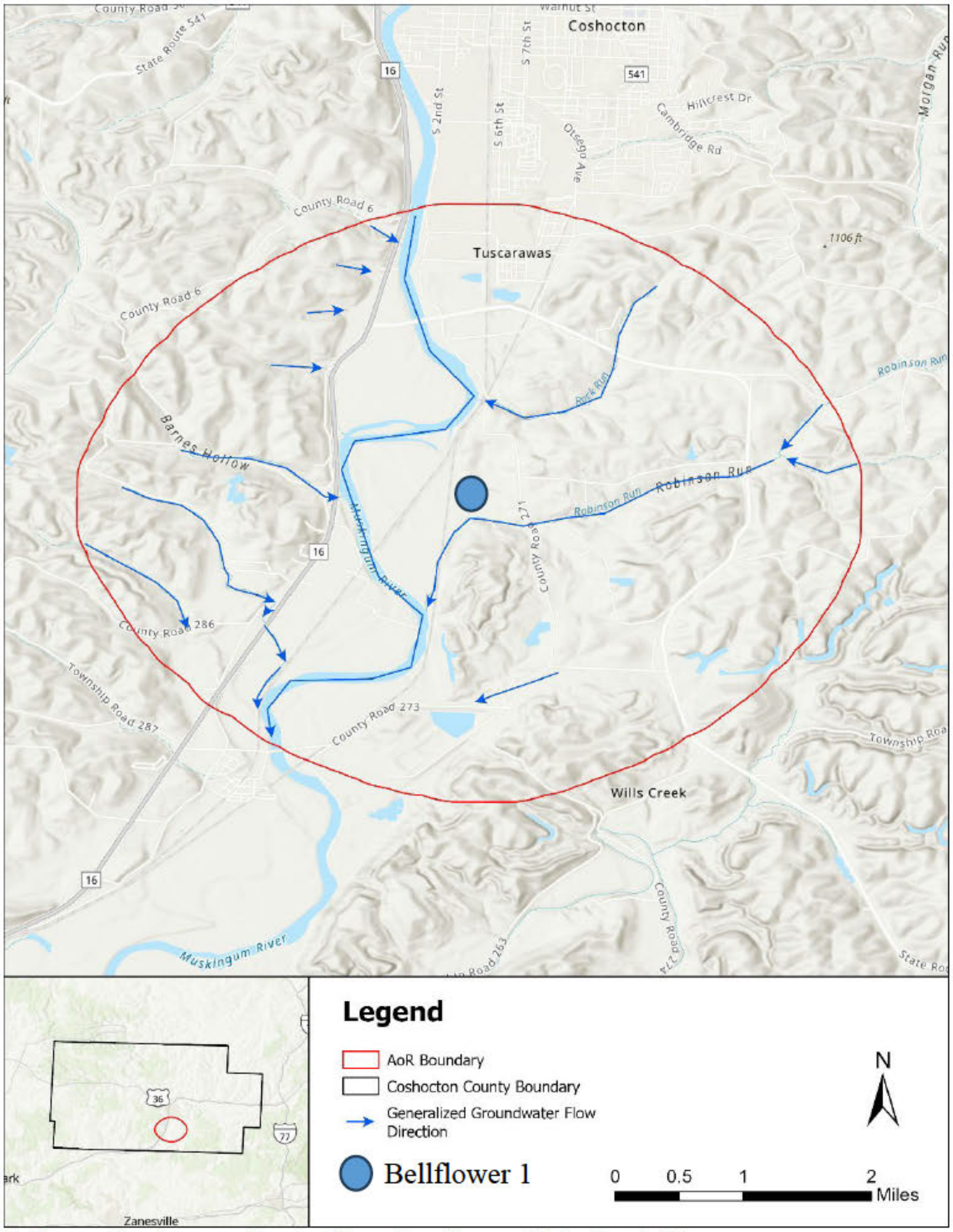

Figure 47: Generalized groundwater flow directions within the AoR.

2.7.3 Drinking Water Wells in the AoR

Water well completion records were obtained from the ODNR Water Well Database for wells within the AoR for a total of 374 records. A map showing the location of these wells is in Figure 48. Note that the completion records may include monitoring wells, abandoned wells, or wells that were never equipped with a pump. Of these, 193 wells are characterized as drinking water wells, with 192 wells categorized as domestic wells and 1 well categorized as a municipal well. Within the AoR, 96 well records do not have a listed well use, and the remaining 278 well records are categorized as agriculture/irrigation, heating/cooling, industrial, monitoring, other, piezometer, or public/semi-public. The 192 domestic well records within the AoR have depths ranging from 30 to 360 ft bgs, which is the deepest of any water well types in the AoR. The median well depth for all water well records in the study area is 75 ft bgs. The deepest water well is approximately 6,083 ft above the top of the CBS, the primary injection zone.

Table 12 summarizes the information contained within these well records, and Appendix A contains detailed information on each well record within the AoR. The deepest water well is approximately 6,083 ft above the top of the CBS, the primary injection zone.

Table 12: Summary of water well records within the AoR

Well Use	Number of Wells	Average Total Depth (ft)	Average Static Water Level (ft)
Agriculture/Irrigation	7	80	24
Domestic	192	95	44
Heating/Cooling	2	129	27
Industrial	5	105	24
Monitor	63	76	74
Municipal	1	80	18
Other	1	66	35
Piezometer	4	52	23
Public/Semi-Public	3	78	27

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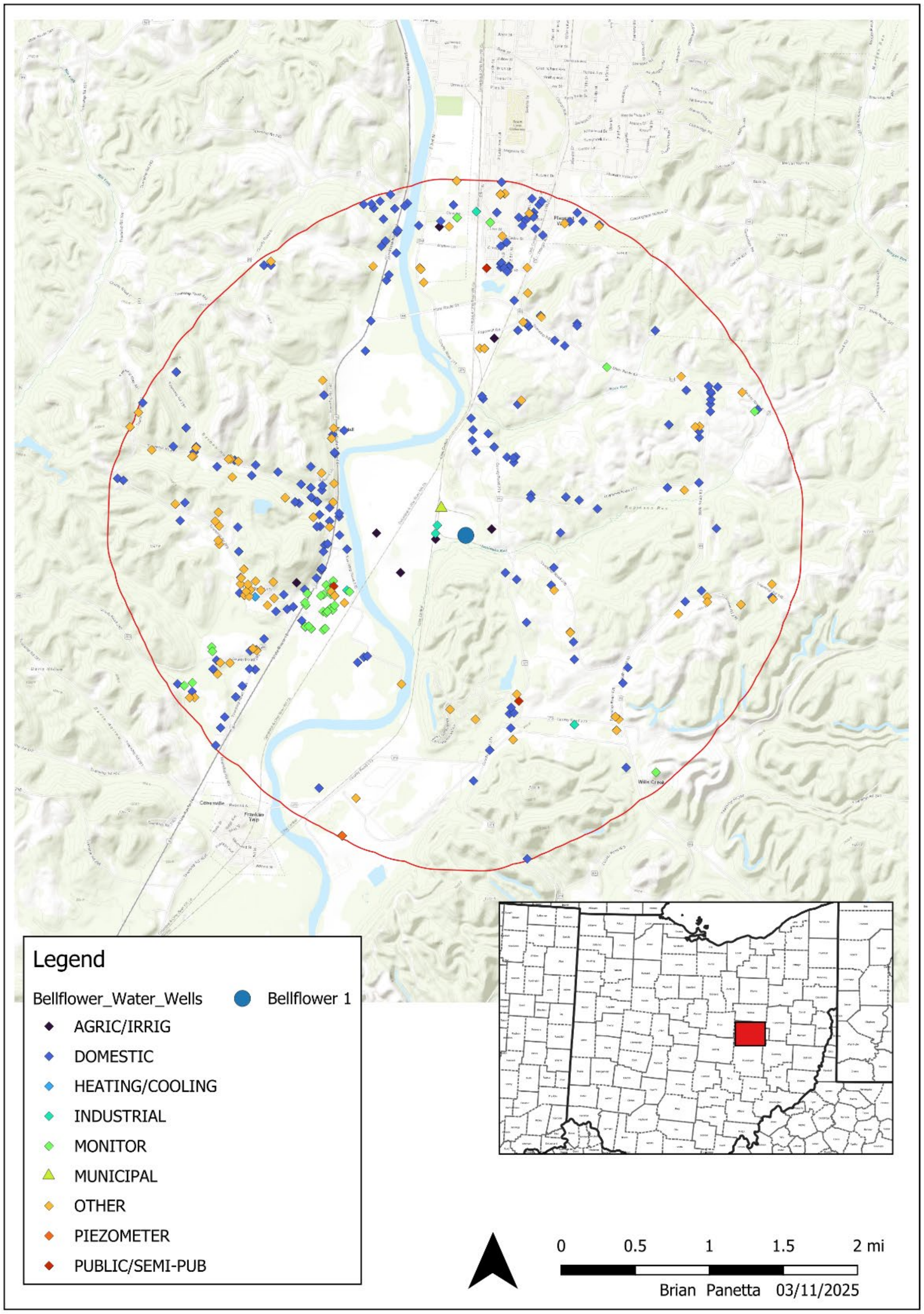

Figure 48: Location of groundwater wells within the AoR.

2.7.4 Water Quality in the AoR

Water quality within the AoR varies with depth and geologic formation. The OEPA divides the state's aquifers into categories to characterize groundwater quality in major aquifers throughout Ohio. Major aquifer types are mapped from ODNR glacial and bedrock aquifer maps (ODNR, 2000). Sand and gravel buried valley aquifers near the surface and sandstone aquifers lie within the AoR. Well water quality data published in 1988 by the ODNR Division of Water consists of analyses from 5 sand and gravel wells and 2 bedrock wells within Coshocton County. Well depths range from 76 ft to 120 ft for the sand and gravel wells and 230 ft to 311 ft for the bedrock wells (Sugar, 1988). The chemical data is summarized in Table 13**.**

Wells are more commonly affected by bacterial contamination than any other type of contamination in Ohio (Swisshelm and Lane, 1987). The primary source of groundwater bacterial contamination is from onsite sewage systems, mostly septic tanks (Palmstrom, 1984). Data collected by the Ohio Department of Health from 1974 through 1985 included 177,366 samples from private wells and 217,185 samples from public wells analyzed for total coliform. Approximately 28 percent of water samples from private wells (OEPA, 1981) and 8 percent of samples from public wells contained coliform bacteria (OEPA, 1980). Additionally, volatile organic compounds (VOCs) and nitrates have been detected in Ambient Ground Water Quality Monitoring Program (AGWQMP) wells (OEPA, 2015).. The detection rate for VOCs in groundwater is low at 506 detections from 172,077 analyses. Average nitrate and nitrite values were measured at 0.77 mg/L for sand and gravel aquifers and 0.48 mg/L for sandstone aquifers (OEPA, 2015).

Data collected in 2015 as part of the AGWQMP consists of approximately 2,600 organic and 6,000 inorganic water quality samples from 282 active wells. Increased groundwater residence time generally results in increased mineralization and salinity of the groundwater, depending on mineral solubility within the aquifer. The median well depth for the AGWQMP wells in the sand and gravel aquifers is approximately 90 ft (n=194), and the median depth in the sandstone aquifers is around 220 ft (n=39) (OEPA, 2015). Groundwater wells located in the sand and gravel buried valley aquifers typically have higher TDS, alkalinity, and pH than wells in the sandstone aquifers. Alkalinity, pH, TDS, sodium (Na), and chloride (Cl) concentrations increase with well depth, while magnesium and calcium decrease. Groundwater in most of Ohio has a dominant calcium bicarbonate composition (Stein, 1974). Southeastern Ohio is characterized by shallow aquifers and coal deposits with calcium magnesium bicarbonate water type (Swisshelm and Lane, 1987).

Formation water quality data were collected by the ODNR Geological Survey from 1974 to 1976. Samples collected at 100 ft depth intervals from a single well in Tuscarawas County include 10 aquifer water samples up to 900 ft bgs, with the top of the Black Hand Sandstone estimated around 372 ft bgs (Majchszak, 1984). The data are summarized in Table 14**.** Water samples from depths of 100 ft to 300 ft slightly increase in chloride concentrations from 10.5 mg/l to 52.5 mg/l. Samples from depths of 400 ft to 500 ft rapidly increase in chloride concentrations from 420 mg/l to 850 mg/l due to the addition of aquifer waters from the Black Hand Sandstone. Generally, TDS concentrations increase with depth with samples ranging from 322 mg/l at the 100 ft water sample depth and 2,500 mg/l at the 900 ft sample depth (Majchszak, 1984). Data collected from wells in

Coshocton County include 3 water samples from depths of 400 ft to 410 ft within the Black Hand Sandstone. Chloride concentrations for these samples range from 13 mg/l to 67 mg/l with an average of 43 mg/l, and TDS values range from 322 mg/l to 632 mg/l with an average of 425 mg/l (Majchszak, 1984).

Data analyzed by the U.S. Geological Survey in 1980 consists of select chemical constituents for 30 water samples from wells drilled into the Black Hand Sandstone in southeastern Ohio. Well depths range from 110 ft to 780 ft with a median depth of 302 ft (Norris, 1982). This chemical data is summarized in Table 14.

Table 13: ODNR Division of Water well water quality data summary in Coshocton County, Ohio (Sugar, 1988).

Parameter (mg/L)	Major Aquifer	Average Value
Chloride	Sand and Gravel	44.4
	Bedrock	22.0
Fluoride	Sand and Gravel	0.16
	Bedrock	0.80
Hardness, Total as CaCO3	Sand and Gravel	295
	Bedrock	110
Iron	Sand and Gravel	0.43
	Bedrock	0.11
Manganese	Sand and Gravel	0.68
	Bedrock	Not Detected
Nitrate	Sand and Gravel	0.87
	Bedrock	0.60
Sulfate	Sand and Gravel	94.2
	Bedrock	28.0
Dissolved Solids	Sand and Gravel	440
	Bedrock	250

Table 14: U.S. Geological Survey water quality data summary for wells drilled into the Black Hand Sandstone (lowermost USDW) in southeastern Ohio (Norris, 1982).

Parameter (mg/L)	Average Value	Median Value	Minimum Value	Maximum Value
Chloride	101	31.0	1.00	550
Fluoride	0.84	0.60	0.10	2.60
Hardness, Total as $CaCO_3$	120	60.0	8.00	1300
Iron	0.27	0.06	0	4.00
Manganese	0.03	0.01	0	0.15
Nitrate	0.36	0.02	0	5.70

Sulfate	64.5	31.5	0.30	990

2.8 Geochemistry [40 CFR 146.82(a)(6)]

2.8.1 Baseline Fluid Chemistry

Average salinity was calculated, and initial fluid chemistry data were collected from the USGS Produced Water Database for the USDWs, the injection zones, and the confining zones and are shown in Table 15 and Table 16 (Blondes et al., 2019). The database was filtered to include regional data from the states of Ohio, Pennsylvania, eastern Kentucky, and West Virginia (Figure 49). Anomalous and outlier data points were investigated to determine validity, and in some cases, these data points were removed from the dataset due to their high uncertainty. Fluid samples will be acquired during the construction of the injection well as part of the Pre-Operational Testing Program to validate or update these data.

The determination of the lowermost USDW for the project relied on freshwater/saltwater interface mapping conducted by the ODNR (Riley, 2012) and lithologic well logs from the ODNR water well database. Water quality samples discussed in subsection 2.7.4 from bedrock aquifers in the AoR are primarily from shallow sampling points (< 200 ft TVD below ground surface) while average TDS calculations in this section are from regional averages with depths > 1,000 ft TVD, which accounts for the increase in average calculated TDS for these shallow intervals.

The USGS sampling data indicate that the CBS, has an average TDS > 232,000 mg/L (Table 15). The brines of the intended injection complexes and USDWs are predominantly Na^+ and Cl^- with secondary Ba^{2+}, HCO_3^-, Ca^{2+}, K^+, Mg^{2+}, and SO_4^{2-}. For reference, initial fluid chemistry data collected from the USGS National Produced Waters Geochemical Database for the USDWs, the injection zones, and the confining zones are shown in Table 16.

Table 15: Regional Total Dissolved Solids (TDS) data for the injection complex. There are no data for the Maryville Silt confining zone.

Total Dissolved Solids			
Formation Type	**Formation**	**TDS (mg/L)**	**n =**
USDW	Allegheny Group	355	2
Lowermost USDW	Black Hand SS	377	4
Formation below Lowermost USDW	Greenbrier Formation	156,678	10
	Rose Run	320,833	13
Confining Zone	Maryville Silt		
Injection Zone	Basal SS	232,387	4

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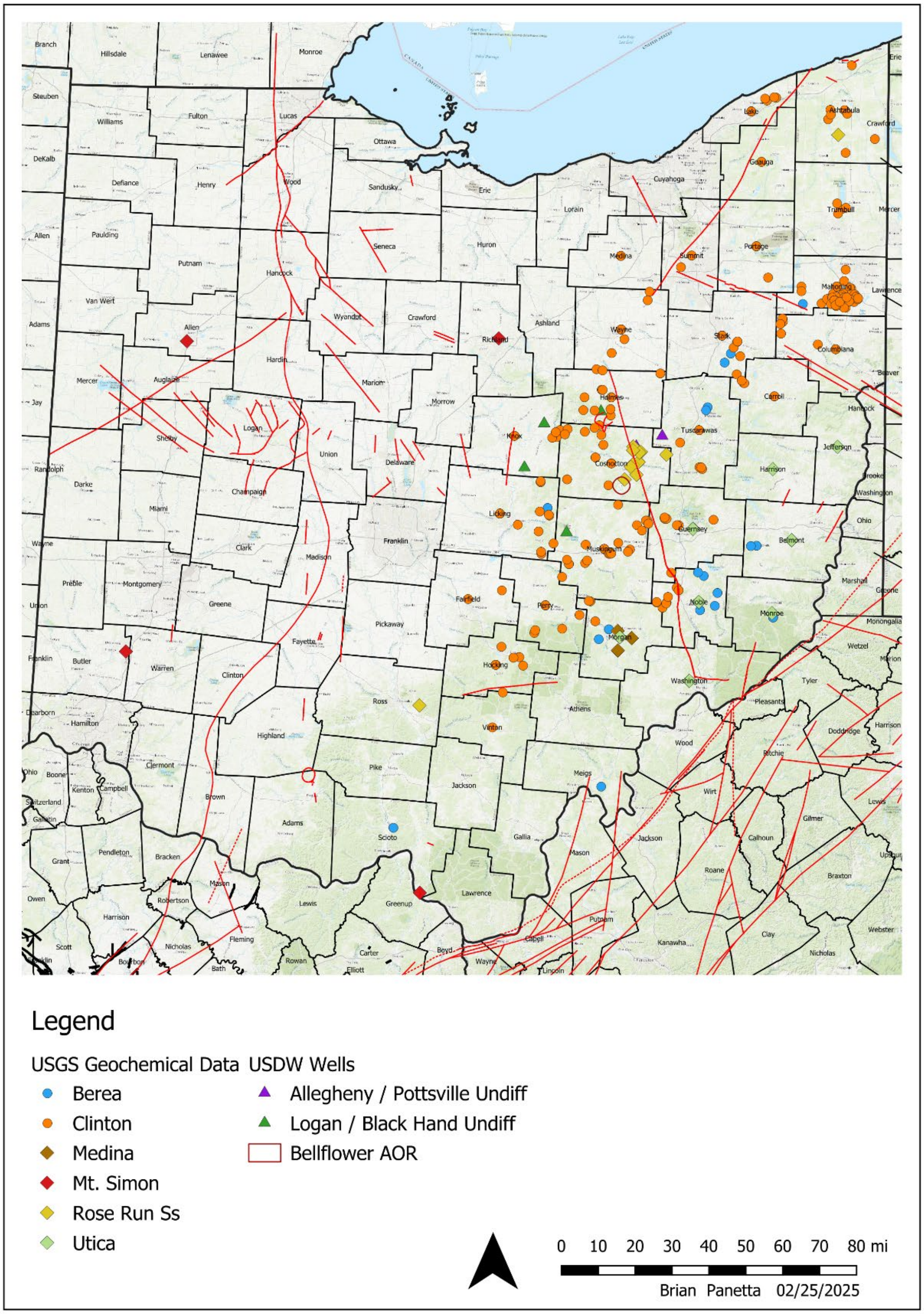

Figure 49: Location map of regional baseline fluid chemistry data from the USGS National Produced Waters Geochemical Database (2023).

Table 16: Regional Baseline Fluid Chemistry data for the injection zone and USDWs from USGS (National Produced Waters Geochemical Database, (2023).

Parameter/ Constituent	Concentration in Injection Zone (CBS) (mg/L)	Concentration in Lowermost USDW (Black Hand Sandstone) (mg/L)	Concentration in USDW (Allegheny Group) (mg/L)
pH	6.07	7.4	6.4
Ba^{2+}	-	66.8	29.2
HCO^{3-}	24	-	
Ca^{2+}	28,925	84.3	35
Cl^{-}	102,500	37	192
K^{+}	-	2	2.8
Mg^{2+}	3,060	18.8	20.8
Na^{+}	54,500	29.1	12.6
SO_4^{2-}	793	102.8	101.2

2.8.2 Fluid-Rock Interactions

A literature review was conducted to evaluate the potential for reactivity between the fluid and solid phases during injection into the BIC. There are no studies on the primary injection interval, so analog studies were reviewed based on the mineralogy of the intended injection complex. Zhang (2015) performed a numerical simulation of porosity evolution of the Mount Simon sandstone under carbon sequestration conditions and found that permeability decreased from 1.60 md to 1.02 md after 180 days of exposure to CO_2 saturated brine. The simulation closely matched a laboratory measured permeability decrease of 1.60 md to 0.8 md. After 30 years of exposure, the model predicted that the permeability would decrease from 1.6 md to 0.003 md. A sensitivity analysis was performed to analyze the most important variables affecting permeability change. The most significant decrease occurred when the initial porosity is between 6 and 10%. The next most important factor is the amount of feldspar present in the sandstone. The higher the amount of feldspar corresponds to a larger decrease in permeability. SiO_2 was the primary mineral responsible for permeability decrease. It is formed from the dissolution of both quartz and feldspar.

In a study by Harbert, et al., (2020), two Mount Simon core samples were exposed to supercritical CO_2 dissolved in brine at in-situ reservoir conditions for a period of one month to study geomechanical alteration of the samples. Changes in porosity, permeability, dynamic moduli, and brittleness were observed. They showed that geomechanical alterations reduced mineral strength along grain boundaries and promoted fracture propagation, which may increase permeability and porosity while reducing brittleness.

2.8.3 Planned Testing and Modeling

The data utilized for evaluating geochemical interactions within the CBS are regional and not specific to the project area. Consequently, following the completion of pre-operational testing, it will be determined if reactive transport modeling should be conducted.

Buckeye III CCS, LLC will acquire core samples, either whole core or sidewall core, from the proposed injection zone to determine the petrophysical and mineralogical properties of the BIC (see Pre-Operational Testing Program). Mineralogical analysis will determine the type percent composition of potentially reactive minerals within the CBS at the proposed injection location.

Buckeye III CCS, LLC also plans to gather fluid samples from the injection zone and shallower zones to establish a baseline geochemical description of reservoir fluids. Collected fluid samples are planned to be used to develop synthetic brine compositions to run core flooding studies to assess possible interactions between injected CO_2, reservoir matrix, and in-situ brine. Fluid samples will allow pre- and post- CO_2 injection analysis to determine the changes in brine chemistry, which can be compared with reservoir samples subjected to geochemical testing to assess changes in the rock matrix. If Buckeye III CCS, LLC determines geochemical changes to reservoir rock or fluids are prominent as concluded from these tests, a reactive transport model will be built and coupled with the current reservoir model to assess long term fate of injected CO_2 as it is related to mineralogical changes in the reservoir.

2.9 Site Suitability [40 CFR 146.83]

Based on all available data and research presented in this Application Narrative, the project area meets the suitability requirement outlined in the regulations for CO_2 injection.

The BIC consists of the Maryville Silt as the primary confining zone, Maryville Flow, CBS as the injection target, and the Precambrian crystalline basement (Grenville Province), which acts as the lower confining unit.

The CBS is laterally continuous, averages 100 ft in thickness, and is composed of basal transgressive sandstones that grade upward into dolomitic sands and arenaceous dolomite. The reservoir quality is linked to both the initial depositional facies and diagenetic alteration, which can either occlude or enlarge pores. Well core in the Coshocton County area are not available; however, log porosities range from 12 to 16%, and permeabilities are between < 0.01 md to 400 md. Oil field brine has been and is currently, and successfully disposed of in the CBS in two adjacent counties; one well is 20 miles away and the other is 30 miles away. Petrophysical and mineralogical data for the CBS, as well as the confining zones, will be collected and evaluated in pre-operational testing through coring and logging.

Static earth modeling and simulation of the project area resulted in a total injection mass of 15 MMt CO_2 in the BIC for the potential injection location over 30 years. Due to the relatively low porosity and permeability in the nearby area, the CO_2 plume does not migrate far from the injection site (~ 1.75-mile radius) in the 50-year PISC period. Using the US-DOE-NETL methods, it was calculated that the BIC has the potential to be able to sequester P10 of 5 MMt to a P90 of 303 MMt over a 30-year injection duration. Data collection from the pre-operational testing for the injection well will narrow the uncertainty range prior to injection.

Interference of oilfield wastewater being disposed in the Adams wells at the Buckeye Brine facility is not anticipated. According to their UIC report (2023), they illustrate: (1) through spinner and RAT test, little to no fluid is being disposed of in the CBS in the Adams #1 well, and (2) shortly after disposal began in the Adams #1 well, the hole was back-filled with well sloughings associated with disposal that covered the CBS. Based on these data, there should be no pressure or plume interference between the Buckeye Brine Disposal Facility and the proposed project.

Literature review and regional well log analysis indicate the project's confining zone will provide long-term containment of CO_2. The primary confining zone, the Maryville Silt, consists of subtidal, massively bedded, impermeable silty dolomite that averages 200 ft thick and is laterally continuous throughout eastern Ohio and into adjoining states. The Maryville Silt's effectiveness as a confining zone is further bolstered by the overlying tight carbonates in the laterally continuous Black River and Trenton as well as the Upper Ordovician shales (Utica and Queenston), adding an additional ~2,200 ft vertical section of impermeable rocks.

No faults were identified though 2D seismic interpretation, or literature search, that offset the Maryville Silt or create leakage pathways to the lowermost USDW. There is, however, at least 1 confirmed legacy oil and gas well that penetrates the caprock within the AoR as seen in Figure 32 of subsection 3.2 of the Area of Review and Corrective Action Plan. This well is addressed in the plan, along with those wells without depth data, to ensure that the legacy wells are not conduits for potential leakage.

There were no direct studies on fluid-rock interactions between CO_2 and the CBS. A literature review of analog studies on the Mt. Simon Sandstone was used. Those studies showed that permeability is reduced over time with exposure to supercritical CO_2. The rate and magnitude of these reactions will be evaluated during pre-operational testing for these systems. Surface and well infrastructure materials are being designed using CO_2 compatible materials and techniques, and the proposed CO_2 stream is dry (at least 95% CO_2); thus, no adverse interactions are anticipated.

3 Summary of Other Plans

3.1 Area of Review and Corrective Action Plan

The information and files submitted in the Area of Review and Corrective Action Plan satisfy the federal requirements of 40 CFR 146.84. This plan addresses how the project AoR is delineated and uses corrective action techniques to address all deficient artificial penetrations and other features that compromise the integrity of the confining zone above the injection zone. The AoR encompasses the entire region surrounding the project's injection well where USDWs may be endangered by injection activity.

The computational model describes modeling of the subsurface injection of CO_2 into the BIC at the project injection wellsite. The STOMPX-CO2 simulator was used to assess the development of the CO_2 plume, the pressure front, and the long-term outcome of the injected CO_2. The AoR is based on the maximum extent of the separate-phase plume and/or pressure-front over the lifetime of the project. The pressure front area is much smaller than the CO_2 plume area. Therefore, the modeled maximum extent of the CO_2 plume defines the AoR. It is important to note that modeling indicates the CO_2 plume extends significantly beyond the critical pressure front (6,196 acres vs. 75 acres), and the pressure buildup from CO_2 injection is not substantial. This indicates that using a different approach for critical pressure calculation would not impact the determined AoR. To be conservative with the AoR, a 0.5-mile buffer was added to the maximum extent of the CO_2 plume, which is at the end of the PISC period (80 years).

This plan details the computational modeling, assumptions that were made, and site characterization data that the model was based on to satisfy the requirements of 40 CFR 146.84(c).

A public record search identified 47 historic oil and gas wells and 374 water wells in the AoR. Data sources for the oil and gas wells include ODNR and Enverus data software accessed online in 2024. Only 1 of the 47 oil and gas wells is known to penetrate the upper confining zone for the project (Maryville Silt). At the time of data collection, there are 2 active oil and gas wells (of the 47), and both have total depths shallower than the Maryville Silt.

Buckeye III CCS, LLC proposes a corrective action and monitoring strategy based on temporal evolution of the CO_2 plume. Buckeye III CCS, LLC will include terms for accessing legacy wells in the AoR, including site access timelines, in pore space agreements with landowners. Likewise, Buckeye III CCS, LLC will follow these terms for notifying affected landowners and well operators prior to conducting corrective action on a well. Landowners will be compensated for any damage to the surface.

Buckeye III CCS, LLC will review the AoR annually during the injection phase and once every five years during the post-injection phase to ensure the initial model predictions are adequate for predicting the extent of the CO_2 plume and pressure front.

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

3.2 Financial Responsibility

Buckeye III CCS, LLC has prepared the Financial Assurance Demonstration to comply with federal requirements at 40 CFR 146.85. The plan estimates costs of a third party conducting project activities and provides information on financial instruments that Buckeye III CCS, LLC will use to demonstrate Financial Assurance for the following activities: (1) Corrective Action; (2) Injection Well Plugging; (3) Post-Injection Site Care; (4) Site Closure; and (5) Emergency and Remedial Response. The estimated costs of each of these activities are presented in Table 17 below.

Table 17: Cost Estimates for Activities to be Covered by Financial Responsibility.

Activity	Total Cost ($)	Timeline of Coverage
Corrective Action	$206,175	2027-2057
Plugging Injection Wells	$184,925	2062
Post-Injection Site Care	$5,175,300	2058-2107
Site Closure	$378,251	2107
Emergency and Remedial Response	$24,614,325	2027-2107
TOTAL	**$30,558,976**	

Buckeye III CCS will execute a combination of financial instruments prior to construction of the injection well. These financial instruments will cover third party costs of one emergency leakage event as discussed in the Emergency and Remedial Response Plan, all of the costs of injection well plugging as discussed in the Injection Well Plugging Plan, all of the costs of corrective action as discussed in the Area of Review and Corrective Action Plan, and all of the costs of 50 years of post-injection site care and site closure as discussed in the Post-Injection Site Care and Site Closure Plan.

Financial Responsibility GSDT Submissions

GSDT Module: Financial Responsibility Demonstration
Tab(s): Cost Estimate tab and all applicable financial instrument tabs

Please use the checkbox(es) to verify the following information was submitted to the GSDT:
☐ Demonstration of financial responsibility ***[40 CFR 146.82(a)(14) and 146.85]***

3.3 Injection Well Construction

The project's injection well, Bellflower 1, will be newly drilled and is designed to accommodate the mass of CO_2 that will be delivered to the project and the subsurface characteristics of the CO_2 injection interval. Injection well construction is further described in the following plans that are part of this application: (1) Stimulation Program and (2) Construction Details.

3.3.1 Proposed Stimulation Program

The Stimulation Program outlines the stimulation measures that the project may use to mitigate drilling-induced damage near the wellbore without interfering with containment, per 40 CFR

146.82(a)(9). It is expected to effectively clear the perforated interval of fines, perforation charge residue, and debris from cement or casing. Additionally, stimulation helps eliminate drilling mud filtrate and dissolved minerals present in the formation. This process is common, as the untreated presence of these elements can lead to elevated downhole injection pressures and reduced injectivity, underscoring the significance of thorough treatment. Specific stimulation fluids, additives, and diverters will be based on injection well site conditions from pre-operational testing results and the type of stimulation needed.

Additionally, treatment may be necessary to mitigate the precipitation of evaporite minerals in and near the well bore due to the high salinity of the injection formation fluids. The precipitation of these minerals reduces well injectivity, impacts pressure buildup by blocking pore space near the wellbore and reduces reservoir porosity and permeability. The current simulation data suggest that salt precipitation is not a problem for the proposed injection interval over the 30-year injection period; however, further modeling will be performed using additional data collected from pre-operational testing. The necessity for mitigation efforts will be re-evaluated at that time, prior to seeking authorization to inject.

At least 30 days in advance of proposed stimulation, Buckeye III CCS, LLC will submit details to the UIC Program Director on the purpose of stimulation, procedures, and stimulation fluids to be used and their anticipated volumes and concentrations.

3.3.2 Construction Procedures

The Construction Details describes the analysis conducted and proposed design for injection well Bellflower 1 that ensures the prevention of the movement of fluids into or between USDWs and compatibility of well materials with the CO_2 stream and anticipated downhole conditions. The design allows the use of testing devices and workover tools, and that allows continuous monitoring of the annulus space between the injection tubing and long string casing, in compliance with 40 CFR 146.86.

The well design for Bellflower 1 includes a 3.5-inch outer diameter (OD) tubing with 22Cr-110 grade duplex stainless steel (22Cr-110), a maximum injection rate of 0.5 MMt/y into the BIC, and maximum downhole pressure limit of 3,821 psig. The design features a 16-inch conductor casing set at 150 ft, a 9.625-inch surface casing at 1,200 ft, and a 7-inch long-string casing reaching 7,204 ft, with sections of L80 grade steel (L80) and 22Cr-110 materials. The BIC injection zone will be isolated with a packer at 7,000 ft. Injection modeling ensured suitability for tubing sizes, selecting 3.5-inch OD for efficiency. All casing strings except conductor, if driven, will be cemented to the surface using CO_2-resistant cement for critical zones. Operational parameters and construction schematics for Bellflower 1, including perforation plans, are in the Construction Details.

Measures are in place to prevent exceeding fracture gradients or mandated injection pressures. Adjustments may be made based on future reservoir characterization. The final nodal analysis recommends a tubing configuration and operational parameters to ensure pressure and rate limitations are met while considering factors such as zonal isolation and well integrity.

3.4 Pre-Operational Testing Plan

The Pre-Operational Testing Program is designed to meet the requirements of 40 CFR 146.87 and 40 CFR 146.86, ensuring accurate baseline datasets, verification of injection and confining zone characteristics, and compliance with injection well construction requirements. This program will characterize the BIC in the project area. The testing program will include a combination of logging, coring, hydrogeologic formation testing, and other activities during the drilling and construction phases of injection and observation wells.

The pre-operational testing will involve whole or sidewall coring and an extensive well logging program, including wireline logging in injection and observation wells. Formation geohydrologic testing, such as pump tests and injectivity tests, will verify the chemical and physical characteristics of the BIC injection and confining zones. Fracture pressure will be determined using formation testing tools and mini-fracture tests, ensuring borehole stability and optimal cement installation.

This program will determine or verify the depth, thickness, mineralogy, lithology, porosity, permeability, and geomechanical properties of the upper confining zone (Maryville Silt), lower confining zone (Grenville Complex), and injection interval (CBS) as well as the Maryville Flow. Formation fluid characteristics will also be obtained from the CBS, Maryville Limestone (above-zone), and Black Hand Sandstone (lowermost USDW) to establish baseline data for future comparisons. The wells, including injection and observation types, will support site characterization efforts.

A report detailing the results of all testing operations, including interpretations, will be submitted to the UIC Program Director within 60 days of completing the injection well. This report will include data on casing and cement integrity, well logs, core analysis, fluid sampling, and hydrogeologic test results. This ensures that all pre-injection conditions are documented and comply with regulatory requirements.

Upon completion of characterization and testing, the borehole will be finalized as an injection well. Mechanical integrity tests (e.g., pressure and wireline tests) will verify well construction and integrity. Cement bond, variable density, and temperature logs will confirm the quality of the cement job after long-string casing installation, ensuring conformance with project and regulatory standards.

Pre-Operational Logging and Testing GSDT Submissions
GSDT Module: Pre-Operational Testing ***Tab(s):*** Welcome tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Proposed pre-operational testing program ***[40 CFR 146.82(a)(8) and 146.87]***

3.5 Well Operation

The Summary of Requirements – Class VI Operating and Reporting Conditions outlines the operational design developed to comply with 40 CFR 146.82(a)(7), 146.82(a)(10), and 146.88 and provides a plan for safe injection into Bellflower 1.

Buckeye III CCS, LLC aims to safely inject CO_2 at a maximum rate of 0.5 MMt/y in the injection well, ensuring well integrity while maintaining pressures below 90% of the fracture pressure in the BIC. The maximum downhole injection pressure was modeled as 4,538 psig, which corresponds to 3,821 psig at 90% of the fracture pressure gradient and a maximum allowable surface pressure of 1,938 psig. Operating conditions are detailed in Table 1 of the Summary of Requirements – Class VI Operating and Reporting Conditions.

The injection well will be continuously monitored to ensure safe operations and compliance with 40 CFR 146.88(e)(2). Operational monitoring includes real-time observation of injection pressures at the wellhead and downhole, continuous fiber optic temperature monitoring along the wellbore, annular space pressure monitoring, and corrosion coupon monitoring to detect potential corrosion. Details of these monitoring systems are provided in Sections 4.0, 5.0, and 6.0 of the Testing and Monitoring Plan. All automatic shutdowns will be thoroughly investigated prior to resuming injection to confirm the absence of mechanical integrity issues. If a shutdown or loss of mechanical integrity occurs, Buckeye III CCS, LLC will immediately investigate the root cause and take necessary remedial actions as outlined in Appendix A of the Emergency and Remedial Response Plan.

In adherence to 40 CFR 146.88(d), Buckeye III CCS, LLC will monitor and maintain the mechanical integrity of Bellflower 1 at all times. Well maintenance and workovers will be part of normal operations to keep Bellflower 1 in a safe operating condition. Procedures for well maintenance will vary depending on the nature of the procedure. All maintenance and workover operations will be monitored to ensure there is not a loss of mechanical integrity. As outlined in subsection 2.5 of the Testing and Monitoring Plan, and in adherence to 40 CFR 146.91(d), Buckeye III CCS, LLC will notify the UIC Program Director of any planned workover or injection well test at least 30 days in advance, and the results of any mechanical integrity test, workover, or injection well test will be provided within 30 days after the test or maintenance is completed (40 CFR 146.91(b)).

The CO_2 will be sourced from the Three Rivers Energy biorefinery with the potential to add other sources such as industrial facilities and power plants located in the vicinity of the project, which would be transported by pipeline. All CO_2 sources will be required to meet a tariff that defines the minimum composition specifications of the CO_2 stream prior to Buckeye III CCS, LLC accepting the CO_2, which will be a condition of the customer service agreement with the source. The CO_2 will be in the liquid phase as it enters the wellhead and will transition to a supercritical phase in the wellbore. The injectate stream composition coming into the storage field will vary throughout the injection phase of the project. To account for this, Buckeye III CCS, LLC plans to continuously monitor the CO_2 stream chemical composition to ensure it meets minimum composition specifications that will be refined when sources are finalized, and capture equipment is operational (see Section 3.0 of the Testing and Monitoring Plan).

To mitigate CO2-induced corrosion risks, Buckeye III CCS, LLC will adhere to monitoring practices outlined in Section 5.0 of the Testing and Monitoring Plan. Buckeye III CCS, LLC will submit semi-annual operating reports to the UIC Program Director, including injection data, monitoring results, and any events impacting mechanical integrity.

3.6 Testing and Monitoring Plan

The Testing and Monitoring Plan describes how Buckeye III CCS, LLC will monitor the project to ensure it does not endanger USDWs, pursuant to 40 CFR 146.90. Monitoring and testing data will track the CO_2 plume and pressure front, validate and refine geological models and simulations, support AoR re-evaluations, and demonstrate non-endangerment. A Quality Assurance and Surveillance Plan, meeting the requirements of 40 CFR 146.90(k), is included as an appendix to this plan.

Buckeye III CCS, LLC plans to drill and monitor three wells for the project, monitoring the in-zone (CBS), above-zone (Maryville Limestone), and lowermost USDW (Black Hand Sandstone), respectively, in addition to an existing shallow groundwater well at the Three Rivers Energy biorefinery.

The Testing and Monitoring Plan incorporates direct and indirect monitoring technologies to observe:

- Injectate composition per Section 3 of the plan (40 CFR 146.90(a));
- Operational parameters per Section 4 of the plan (40 CFR 146.90(b));
- Corrosion of well materials and components per Section 5 of the plan (40 CFR 146.90(c));
- Any migration of CO_2 or brine above the confining zones per Section 6 of the plan (40 CFR 146.90(d));
- USDW groundwater quality per Section 6 of the plan (40 CFR 146.90(d) and 146.95(f)(3)(i));
- Well integrity over the injection phase per Section 7 of the plan (40 CFR 146.89(c) and 146.90(e));
- Near-wellbore environment using pressure fall-off testing per Section 8 of the plan (40 CFR 146.90(f)); and
- Development of the CO_2 plume and pressure front in the storage formations over time per Section 9 of the plan (40 CFR 146.90(g)).

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

3.7 Injection Well Plugging

The Injection Well Plugging Plan describes the process Buckeye III CCS, LLC proposes to plug Bellflower 1 in conformance with federal requirements at 40 CFR 146.92 and 146.93(e). After completing the planned CO_2 injection into the BIC, Buckeye III CCS, LLC may elect to delay plugging the well up to 5 years to allow monitoring in-zone reservoir conditions post-injection.

The plugging process and materials are designed to prevent unwanted fluid movement, resist corrosion caused by CO_2/water mixtures, and safeguard USDWs. Prior to plugging, the final bottom-hole pressure of the injection well will be measured, and an inhibited spacer fluid (brine) will be used to flush and fill the wells to maintain pressure control and inhibit corrosion. The measured bottom-hole pressure and temperature will guide the selection of the appropriate weight of brine to stabilize the well and inform decisions regarding the blend of cement needed to plug the well, addressing considerations such as preventing leak-off or premature setting. Mechanical integrity tests (MITs), including external methods such as temperature logs, oxygen activation logs, noise logs, and pulsed neutron logs, will be conducted before plugging. If mechanical integrity is compromised, repairs will be made before proceeding with plugging operations.

The injection tubing, strings, and gauges will be removed from the well. If the packer cannot be removed after flushing, it will be cut from the tubing and left in the well. The injection zone will be plugged using the retainer method, squeezing CO_2-resistant cement into the perforations. Balanced plugs will be used to isolate the remainder of the well, with CO_2-resistant cement employed in the injection and confining zones and Class A neat cement or equivalent used in shallower plugs.

Buckeye III CCS, LLC will submit updates to the plan, notifications, and reports as detailed in subsection 5.1 of the Injection Well Plugging Plan. This includes delayed plugging notification, 60-day notification prior to plugging, and a well plugging report to ensure regulatory compliance and transparency.

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

3.8 Post-Injection Site Care and Site Closure

The Post-Injection Site Care and Site Closure Plan outlines activities Buckeye III CCS, LLC will undertake to meet the requirements of 40 CFR 146.93. Monitoring will continue for 50 years post-injection, focusing on groundwater quality, CO_2 plume, and pressure front tracking. Monitoring will not cease until a demonstration of non-endangerment of USDWs is approved by the UIC

Program Director under 40 CFR 146.93(b)(3). Upon site closure approval, all monitoring wells will be plugged, the site restored, and a closure report submitted.

Based on the modeling of the pressure front as part of the AoR delineation, pressure at the injection well is expected to decrease to levels below the threshold pressure immediately after injection ceases, as shown in Figure 1 in the Post-Injection Site Care and Site Closure Plan.

Monitoring includes groundwater sampling, pressure and temperature measurements, and direct and indirect plume tracking, as detailed in Tables 1 through 6 of the plan. Results will be reported annually within 60 days of the injection cessation anniversary.

Non-endangerment demonstrations will utilize monitoring data and computational modeling to confirm reservoir stability and USDW protection. Plume behavior, pressure decline, and groundwater quality comparisons to baseline data will validate these findings. All injection and monitoring wells will be plugged and abandoned per the Injection Well Plugging Plan and applicable state regulations.

Site closure activities include equipment decommissioning, well plugging, and site restoration to pre-injection conditions. A final Site Closure Report, including well plugging details and injection records, will be submitted to the UIC Program Director and retained for 10 years. Records from the post-injection period will also be maintained and submitted as required.

PISC and Site Closure GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** PISC and Site Closure tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ PISC and Site Closure Plan ***[40 CFR 146.82(a)(17) and 146.93(a)]***

3.9 Emergency and Remedial Response Plan

The Emergency and Remedial Response Plan (ERRP) describes actions that Buckeye III CCS, LLC will take to address an emergency in the AoR that may cause movement of the injection fluid or formation fluid in a manner that may endanger an USDW during the construction, operation, or post-injection site care periods, pursuant to 40 CFR 146.82(a)(19) and 146.94.

Examples of potential risks include: (1) injection or observation well integrity failure, (2) injection well monitoring and/or surface equipment failure, (3) natural disaster, (4) fluid leakage into a USDW, (5) CO_2 leakage to USDW or land surface, or (6) an induced or natural seismic event. In the case of one of the listed risks, site personnel, project personnel, and local authorities will be relied upon to implement this ERRP. Buckeye III CCS, LLC will communicate to the public any event that requires an emergency response, as described in the ERRP, to ensure that the public understands what happened and whether there are any environmental or safety implications. This will include a detailed description of what happened, any impacts to the environment or other local resources, how the event was investigated, what actions were taken, and the status of the remediation.

If Buckeye III CCS, LLC obtains evidence that the injected CO_2 stream and/or associated pressure front may cause an endangerment to a USDW, Buckeye III CCS, LLC will perform the following actions:

1. Initiate shutdown plan for the injection well.
2. Take all steps reasonably necessary to identify and characterize any release.
3. Notify the 24-hour Emergency Contact (Appendix B of the ERRP) followed by the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
4. Implement applicable portions of the approved ERRP.

The emergency contact list in Appendix B of the ERRP will be updated annually at a minimum, and the ERRP will be reviewed at least once every five years following its approval as well as within one year of an AoR reevaluation and following any significant changes to the injection process or the injection facility or an emergency event. Periodic training will be provided, not less than annually, to construction personnel, well operators, project safety personnel, environmental personnel, the operations manager, and corporate communications. The training plan will record that the necessary personnel have been trained and possess the required skills to perform their relevant emergency response activities described in the ERRP.

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

3.10 Injection Depth Waiver and Aquifer Exemption Expansion

No injection depth waiver or aquifer exemption expansion is required in this application.

3.11 Other Information

No other information is included in the permit application at this time.

However, Buckeye III CCS, LLC will provide any other information requested by the UIC Program Director, or new or updated information that is not specifically requested/required but may be useful for the permit application. This section fulfills the requirement at 40 CFR 146.82(a)(21).

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5 Appendix A: Detailed Water Well Completion Records for the Area of Review in Coshocton County, Ohio

#	Record Number	Township	Total Depth (ft)	Static Water Level (ft)	Completion Date	Aquifer Type	Depth to Bedrock (ft)	Well Use	Latitude (WGS 84)	Longitude (WGS 84)
1	24717	FRANKLIN	155	70	10/06/1947	SAND	0	DOMESTIC	40.208523	-81.887524
2	25987	FRANKLIN	48	21		SANDSTONE	6	DOMESTIC	40.206439	-81.856455
3	39808	FRANKLIN	73	30	01/03/1948	SANDSTONE	4	DOMESTIC	40.218835	-81.883016
4	54565	FRANKLIN	70	50	08/28/1948	SANDSTONE	12	DOMESTIC	40.211239	-81.859324
5	54566	FRANKLIN	62	45	09/03/1948	SHALE	16	DOMESTIC	40.218522	-81.850151
6	54594	FRANKLIN	108	68	04/29/1949	SANDSTONE	4	DOMESTIC	40.217726	-81.847782
7	76565	FRANKLIN	42	19	09/07/1950	SAND & GRAVEL	0	DOMESTIC	40.213130	-81.879610
8	76570	FRANKLIN	70	50	10/13/1950	LIMESTONE	0	DOMESTIC	40.209080	-81.884870
9	76571	FRANKLIN	40	33	10/18/1950	SHALE	24	DOMESTIC	40.218793	-81.851847
10	76575	FRANKLIN	66	47	11/03/1950	SANDSTONE	16	DOMESTIC	40.217493	-81.885880
11	2076178	FRANKLIN	37	12	08/27/2019	CLAY	0	MONITOR	40.199661	-81.898890
12	1001850	FRANKLIN	360	52	12/28/2005	SHALE	3	DOMESTIC	40.215000	-81.893620
13	792282	FRANKLIN	100	55	09/26/1994	SHALE	45	DOMESTIC	40.196406	-81.894641
14	538123	FRANKLIN	157	110	03/29/1974	SILTSTONE	20		40.210796	-81.825265
15	819376	FRANKLIN	255	150	09/09/1995	SHALE	0	DOMESTIC	40.209529	-81.825245
16	1008838	FRANKLIN	265	140	10/22/2007	SANDSTONE	0		40.209380	-81.833480
17	354323	FRANKLIN	92	40	07/29/1967	SHALE	0		40.209350	-81.825080
18	521004	FRANKLIN	150	100	10/03/1977	SHALE	15		40.208895	-81.833441
19	147156	FRANKLIN	75	60	06/26/1954	SANDSTONE	45	DOMESTIC	40.209986	-81.834236
20	39805	FRANKLIN	109	54	10/13/1947	SANDSTONE	16	DOMESTIC	40.224720	-81.880381
21	51358	FRANKLIN	100	15	07/18/1949	SHALE	0	DOMESTIC	40.228130	-81.883070
22	51359	FRANKLIN	42	24	07/20/1949	SAND & GRAVEL	0	DOMESTIC	40.214490	-81.880610
23	51365	FRANKLIN	131	30	08/20/1949	SANDSTONE	0	DOMESTIC	40.216293	-81.880730
24	51366	FRANKLIN	81	36	08/23/1949	SHALE	35	DOMESTIC	40.215286	-81.883116
25	74119	FRANKLIN	110	0	06/18/1949	SANDSTONE	14	DOMESTIC	40.216435	-81.883241
26	76552	FRANKLIN	40	22	06/28/1950	SHALE	22	DOMESTIC	40.224579	-81.900548
27	76578	FRANKLIN	44	20	02/20/1951	SAND & GRAVEL	0	DOMESTIC	40.232554	-81.877934

#	Record Number	Township	Total Depth (ft)	Static Water Level (ft)	Completion Date	Aquifer Type	Depth to Bedrock (ft)	Well Use	Latitude (WGS 84)	Longitude (WGS 84)
28	183554	FRANKLIN	89	49	03/22/1958	SHALE	0	DOMESTIC	40.215260	-81.883520
29	196062	FRANKLIN	40	7	08/10/1957	SHALE	0	DOMESTIC	40.206860	-81.888470
30	196098	FRANKLIN	70	30	04/05/1948	SANDSTONE	20	DOMESTIC	40.216615	-81.880722
31	233181	FRANKLIN	108	27	06/25/1958	SAND/GRAVEL/BOULDERS	0		40.208940	-81.881490
32	273421	FRANKLIN	56	36	09/11/1963	SANDSTONE	6	DOMESTIC	40.224294	-81.881803
33	328733	FRANKLIN	62	36	10/29/1966	SAND & GRAVEL	0	DOMESTIC	40.206041	-81.885138
34	407771	FRANKLIN	110	29	12/15/1971	SAND	0		40.208540	-81.881020
35	450867	FRANKLIN	103	30	11/30/1976	GRAVEL/SAND/CLAY	0		40.207871	-81.879758
36	2039564	FRANKLIN	110	34.4	08/30/2012	SAND & GRAVEL	0	PUBLIC/SEMI-PUB	40.209467	-81.881178
37	2023985	FRANKLIN	75	0	08/11/2009	SAND & GRAVEL	0	MONITOR	40.207558	-81.884674
38	2023986	FRANKLIN	130	0	08/11/2009	SAND & GRAVEL	0	MONITOR	40.207548	-81.884664
39	2023987	FRANKLIN	130	0	08/12/2009	SAND & GRAVEL	0	MONITOR	40.205451	-81.884669
40	2023988	FRANKLIN	40	0	08/10/2009	SAND & GRAVEL	0	MONITOR	40.205458	-81.884674
41	2023989	FRANKLIN	75	0	08/10/2009	SAND & GRAVEL	0	MONITOR	40.205455	-81.884670
42	2024006	FRANKLIN	130	0	08/11/2009	SAND & GRAVEL	0	MONITOR	40.205453	-81.884665
43	2024009	FRANKLIN	75	0	08/06/2009	SAND & GRAVEL	0	MONITOR	40.205452	-81.884672
44	2024010	FRANKLIN	130	0	08/06/2009	SAND & GRAVEL	0	MONITOR	40.205458	-81.884670
45	2024011	FRANKLIN	75	0	08/03/2009	SAND & GRAVEL	0	MONITOR	40.205447	-81.884663
46	2024012	FRANKLIN	125	0	08/04/2009	SAND & GRAVEL	0	MONITOR	40.205453	-81.884663
47	2024014	FRANKLIN	75	0	08/05/2009	SAND & GRAVEL	0	MONITOR	40.205449	-81.884660
48	2024015	FRANKLIN	40	0	08/07/2009	SAND & GRAVEL	0	MONITOR	40.205269	-81.883916
49	2026663	FRANKLIN	40	0	04/14/2010	SAND & GRAVEL	0	MONITOR	40.207807	-81.884797
50	2055100	FRANKLIN	114	31.5	09/25/2015	SAND & GRAVEL	0	INDUSTRIAL	40.209114	-81.879478
51	2082199	FRANKLIN	40	29.8	08/11/2020	SAND & GRAVEL	0	MONITOR	40.206980	-81.882445
52	2082201	FRANKLIN	40	32.3	08/12/2020	SAND & GRAVEL	0	MONITOR	40.206980	-81.882445
53	971430	FRANKLIN	85	60	09/30/2004	SANDSTONE	0	AGRIC/IRRIG	40.209720	-81.885930
54	666511	FRANKLIN	45	25	09/13/1982	SHALE	0	DOMESTIC	40.210233	-81.883417

#	Record Number	Township	Total Depth (ft)	Static Water Level (ft)	Completion Date	Aquifer Type	Depth to Bedrock (ft)	Well Use	Latitude (WGS 84)	Longitude (WGS 84)
55	770092	FRANKLIN	80	36	03/31/1994	SHALE	0	DOMESTIC	40.210233	-81.883417
56	783802	FRANKLIN	75	35	10/12/1993	SHALE	17	DOMESTIC	40.211042	-81.882837
57	2061515	FRANKLIN	75	40	03/01/2017	SHALE & SANDSTONE	30	DOMESTIC	40.211227	-81.882718
58	2061516	FRANKLIN	75	40	03/11/2017	SANDSTONE & LIMEST	30	DOMESTIC	40.211231	-81.882715
59	615481	FRANKLIN	115	35	10/14/1985	SHALE	0		40.223926	-81.881952
60	376553	FRANKLIN	65	25	03/22/1968	SHALE	29		40.199386	-81.857449
61	376552	FRANKLIN	108	34	03/22/1968	SHALE	29		40.196826	-81.862647
62	216685	FRANKLIN	110	55	05/02/1959	SHALE	78	DOMESTIC	40.223053	-81.863473
63	242424	FRANKLIN	83	6	09/14/1960	SAND & GRAVEL	0	DOMESTIC	40.183324	-81.855572
64	273354	FRANKLIN	120	86	12/07/1961	SANDSTONE	19		40.228134	-81.857857
65	324416	FRANKLIN	63	28	06/25/1965	SANDSTONE	4	DOMESTIC	40.210610	-81.857860
66	2048221	FRANKLIN	80	8	07/18/2014	SAND & GRAVEL	0	AGRIC/IRRIG	40.210980	-81.872700
67	2048222	FRANKLIN	80	11	07/18/2014	SAND & GRAVEL	0	AGRIC/IRRIG	40.214780	-81.875900
68	1013316	FRANKLIN	75	35	01/25/2010	SHALE	20	DOMESTIC	40.228180	-81.862730
69	685055	FRANKLIN	60	0	10/17/1988	SANDSTONE	14	DOMESTIC	40.227733	-81.858295
70	823142	FRANKLIN	125	45	03/26/1997	SHALE	0	DOMESTIC	40.227733	-81.858295
71	896729	FRANKLIN	263	150	03/12/2001	SANDSTONE	12	DOMESTIC	40.225128	-81.863924
72	776694	FRANKLIN	105	60	04/25/1994	FIRE CLAY	0	DOMESTIC	40.224078	-81.863988
73	776693	FRANKLIN	95	42	04/25/1994	SHALE	35	DOMESTIC	40.226252	-81.864214
74	776696	FRANKLIN	110	50	04/27/1994	SHALE	30	DOMESTIC	40.224792	-81.861976
75	896719	FRANKLIN	200	90	10/24/2000	SHALE	10	DOMESTIC	40.223500	-81.861170
76	2037707	FRANKLIN	95	40	05/22/2012	SANDSTONE & SHALE	0	DOMESTIC	40.222050	-81.858620
77	529353	FRANKLIN	74	57	04/24/1980	SAND	0	DOMESTIC	40.190807	-81.862686
78	855036	FRANKLIN	75	25	04/01/1999	SHALE	30	DOMESTIC	40.193860	-81.860732
79	856457	FRANKLIN	33	15	08/07/1998	GRAVEL	0	DOMESTIC	40.196065	-81.858109
80	925654	FRANKLIN	50	26	11/26/2002	SANDSTONE & SHALE	21	DOMESTIC	40.197464	-81.858323
81	939010	FRANKLIN	60	30	07/12/2002	SANDSTONE	15	DOMESTIC	40.197560	-81.857764

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82	971424	FRANKLIN	50	15	08/09/2004	SAND	10	DOMESTIC	40.198080	-81.858133
83	961283	FRANKLIN	80	27	06/25/2003	SANDSTONE	31	PUBLIC/SEMI-PUB	40.198725	-81.857173
84	2010695	FRANKLIN	80	17.5	04/16/2007	SAND & GRAVEL	78	MUNICIPAL	40.217400	-81.867720
85	2011141	FRANKLIN	93	17	05/02/2007	SAND & GRAVEL	0	INDUSTRIAL	40.214890	-81.868370
86	2011142	FRANKLIN	90	20	04/23/2007	SAND & GRAVEL	0	INDUSTRIAL	40.215700	-81.868150
87	2060342	FRANKLIN	91	22	11/29/2016	SAND & GRAVEL	0	AGRIC/IRRIG	40.215469	-81.861218
88	143461	FRANKLIN	54	12	10/29/1954	SHALE	15	DOMESTIC	40.189707	-81.882371
89	579884	FRANKLIN	100	16.9	12/11/1992	SAND & CLAY	0		40.188810	-81.877620
90	1002836	FRANKLIN	94	120	08/12/2011		31	MONITOR	40.194940	-81.857770
91	1002838	FRANKLIN	90	0	08/12/2011	SANDSTONE	31		40.194940	-81.857780
92	1002882	FRANKLIN	65	0	02/17/2012	CLAY & SANDSTONE	74	MONITOR	40.185108	-81.879257
93	2036906	FRANKLIN	29.3	8.7	03/30/2009	SAND & GRAVEL	0	PIEZOMETER	40.185108	-81.879257
94	2036909	FRANKLIN	68.2	8.8	04/01/2009	SAND & GRAVEL	0	PIEZOMETER	40.185108	-81.879257
95	2036910	FRANKLIN	66	28.4	04/02/2009	SAND & GRAVEL	0	PIEZOMETER	40.185108	-81.879257
96	2037867	FRANKLIN	78.4	63.7	05/16/2012	COAL	74	MONITOR	40.185108	-81.879257
97	2047846	FRANKLIN	199.2	187.8	05/10/2014	COAL	0	MONITOR	40.185108	-81.879257
98	2049056	FRANKLIN	297.3	237.2	07/22/2014	SANDSTONE	0	MONITOR	40.185108	-81.879257
99	2049057	FRANKLIN	243.5	231.1	08/05/2014	COAL	0	MONITOR	40.185108	-81.879257
100	2049058	FRANKLIN	307.5	283.1	08/11/2014	COAL	0	MONITOR	40.185108	-81.879257
101	2049455	FRANKLIN	45.4	44.2	09/26/2014	SANDSTONE	36	PIEZOMETER	40.185108	-81.879257
102	2049571	FRANKLIN	79.6	15.9	09/26/2014	SANDSTONE	0	MONITOR	40.185108	-81.879257
103	2049572	FRANKLIN	160.5	113.7	09/26/2014	SANDSTONE	0	MONITOR	40.185108	-81.879257
104	2049574	FRANKLIN	65	9.7	09/26/2014	SANDSTONE	0	MONITOR	40.185108	-81.879257
105	2049575	FRANKLIN	35.6	22.1	09/26/2014	SANDSTONE	0	MONITOR	40.185108	-81.879257
106	2055481	FRANKLIN	138	92.3	12/02/2015	SANDSTONE	30	MONITOR	40.185108	-81.879257
107	2055482	FRANKLIN	55.3	32.4	12/02/2015	CLAY & SHALE	30	MONITOR	40.185108	-81.879257
108	2058069	FRANKLIN	34.2	9.8	07/06/2016	SAND & GRAVEL	0	MONITOR	40.185108	-81.879257

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109	2062226	FRANKLIN	90.4	57.1	04/18/2017	SANDSTONE	0	MONITOR	40.185108	-81.879257
110	2062227	FRANKLIN	27.4	10.7	04/18/2017	SHALE	0	MONITOR	40.185108	-81.879257
111	2062228	FRANKLIN	18.4	7.5	04/18/2017	SANDSTONE	0	MONITOR	40.185108	-81.879257
112	2062230	FRANKLIN	16.4	8.5	04/17/2017	FILL MATERIAL	0	MONITOR	40.185108	-81.879257
113	2062232	FRANKLIN	80.4	52.7	04/17/2017	SANDSTONE	0	MONITOR	40.185108	-81.879257
114	450846	FRANKLIN	220	0	07/16/1975	SILTSTONE	23		40.196110	-81.844610
115	779932	FRANKLIN	130	38	11/18/1993	SHALE	43	INDUSTRIAL	40.196558	-81.850003
116	666501	FRANKLIN	132	110	04/08/1988	SHALE	4		40.208723	-81.829155
117	354324	FRANKLIN	168	69	08/05/1967	SHALE	0	DOMESTIC	40.218920	-81.856310
118	459509	FRANKLIN	50	15	08/25/1973	SHALE	25		40.219760	-81.836740
119	658733	FRANKLIN	100	35	06/14/1991	SHALE	60	DOMESTIC	40.218591	-81.856342
120	2066557	FRANKLIN	110	60	01/31/2018	SANDSTONE	20	DOMESTIC	40.215290	-81.852430
121	754777	FRANKLIN	68	25	06/15/1992	SHALE	0	DOMESTIC	40.219969	-81.838926
122	440323	FRANKLIN	159	104	11/17/1972	COAL	3		40.209650	-81.853040
123	867687	FRANKLIN	145	30	02/27/1999	SHALE	24	DOMESTIC	40.202944	-81.850227
124	1010566	FRANKLIN	148	90	04/13/2009	SANDSTONE	0	DOMESTIC	40.204644	-81.850401
125	627432	FRANKLIN	70	40	04/05/1985	STONE	48		40.205611	-81.850848
126	641311	FRANKLIN	120	55	10/16/1983	SHALE	0		40.205554	-81.850836
127	3001607	FRANKLIN	90	53	06/22/2022	SANDSTONE	53	DOMESTIC	40.210140	-81.853420
128	740925	FRANKLIN	70	30	08/04/1993	SANDSTONE	51	DOMESTIC	40.211865	-81.853148
129	618205	FRANKLIN	41	10	12/12/1983	SAND & GRAVEL	0		40.200080	-81.872210
130	649124	FRANKLIN	55	15	04/30/1986	SAND & GRAVEL	0	DOMESTIC	40.202620	-81.877100
131	649129	FRANKLIN	55	20	06/30/1986	SAND & GRAVEL	0	DOMESTIC	40.202722	-81.876652
132	2051466	FRANKLIN	80	25	03/06/2015	SAND & GRAVEL	0	DOMESTIC	40.202083	-81.877867
133	196055	FRANKLIN	100	50	05/11/1957	SANDSTONE	0	DOMESTIC	40.221535	-81.894240
134	196090	FRANKLIN	65	30	01/01/1958	SANDSTONE	34	DOMESTIC	40.220084	-81.892018
135	208834	FRANKLIN	125	16	09/21/1962	SHALE	31	DOMESTIC	40.220860	-81.896470

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136	216681	FRANKLIN	42	28	12/06/1958	SHALE	20	DOMESTIC	40.219361	-81.885687
137	230492	FRANKLIN	55	37	06/24/1961	SANDSTONE	22	DOMESTIC	40.217610	-81.886390
138	244276	FRANKLIN	117	91	11/15/1963	SHALE	40	DOMESTIC	40.221106	-81.884516
139	273389	FRANKLIN	120	52	07/31/1962	SANDSTONE	3		40.221434	-81.893783
140	307081	FRANKLIN	50	25	06/13/1964	SANDSTONE	29		40.219870	-81.894490
141	400323	FRANKLIN	101	67	10/14/1969	LIMESTONE	6		40.220504	-81.883109
142	459522	FRANKLIN	95	30	11/07/1973	SANDSTONE	0	DOMESTIC	40.220492	-81.888681
143	603952	FRANKLIN	42	10	05/01/1981	SANDSTONE	14		40.221636	-81.894750
144	623917	FRANKLIN	113	52	10/25/1984	SHALE	10		40.221618	-81.895029
145	776686	FRANKLIN	240	170	01/10/1994	SHALE	0	DOMESTIC	40.217706	-81.883539
146	923745	FRANKLIN	106	54	08/15/2001	SHALE	0	DOMESTIC	40.219053	-81.884425
147	776711	FRANKLIN	300	185	09/24/1994	SHALE	69	DOMESTIC	40.217728	-81.883606
148	641329	FRANKLIN	102	30	12/07/1984	SANDSTONE	15	DOMESTIC	40.218100	-81.884330
149	641310	FRANKLIN	97	55	09/10/1983	SANDSTONE	30		40.217997	-81.887666
150	718152	FRANKLIN	110	50	10/30/1991	SHALE	15	DOMESTIC	40.221122	-81.891553
151	270362	FRANKLIN	60	32	09/04/1961	SHALE	25		40.202985	-81.890787
152	273362	FRANKLIN	45	19	02/24/1962	SHALE	24		40.210900	-81.892700
153	273384	FRANKLIN	65	38	06/29/1962	SHALE	25		40.213270	-81.895920
154	307092	FRANKLIN	43	17	08/01/1964	LIMESTONE & SHALE	9	DOMESTIC	40.207106	-81.887048
155	321865	FRANKLIN	200	53	12/18/1964	FILL MATERIAL	49		40.209453	-81.893068
156	336405	FRANKLIN	60	22	11/24/1965	SHALE	14		40.215070	-81.896000
157	336443	FRANKLIN	67	32	03/01/1967	LIMESTONE	28		40.213642	-81.896066
158	400332	FRANKLIN	78	18	10/30/1969	SHALE	30		40.208352	-81.892536
159	422108	FRANKLIN	108	50	06/11/1971	SANDSTONE	3		40.216410	-81.896140
160	428060	FRANKLIN	93	44	10/25/1971	SHALE	13		40.207430	-81.889567
161	435704	FRANKLIN	93	35	03/11/1972	SHALE	43		40.208270	-81.891940
162	440322	FRANKLIN	54	34	11/03/1972	SHALE	3		40.215513	-81.896517

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163	459534	FRANKLIN	149	69	02/26/1974	SHALE	45		40.208144	-81.888754
164	1013281	FRANKLIN	80	38	02/16/2010	SANDSTONE & SHALE	8	DOMESTIC	40.219450	-81.909130
165	641349	FRANKLIN	45	25	08/08/1985	LIMESTONE	15		40.217090	-81.901670
166	2059089	FRANKLIN	300	80	09/23/2016	SHALE	5	DOMESTIC	40.217262	-81.900455
167	2055467	FRANKLIN	100	60	12/30/2015	SHALE & SANDSTONE	2	DOMESTIC	40.215490	-81.901000
168	2049360	FRANKLIN	102	56	09/24/2014	SANDSTONE	0	DOMESTIC	40.212620	-81.893420
169	628702	FRANKLIN	60	20	12/22/1986	LIMESTONE	0		40.210035	-81.893014
170	641333	FRANKLIN	61	25	12/11/1984	FLINT	20	DOMESTIC	40.210079	-81.893071
171	798312	FRANKLIN	42	6	01/29/1996	SANDSTONE	26	DOMESTIC	40.208564	-81.893171
172	2062610	FRANKLIN	150	0	05/30/2017	SHALE	40	HEATING/COOLING	40.208235	-81.891164
173	649113	FRANKLIN	95	30	10/20/1984	SHALE	15	DOMESTIC	40.207361	-81.886272
174	815428	FRANKLIN	50	15	08/17/1996	LIMESTONE	24	DOMESTIC	40.219275	-81.908378
175	273382	FRANKLIN	106	38	06/20/1962	SHALE	58		40.201697	-81.895405
176	286766	FRANKLIN	100	50	03/28/1963	SHALE	34		40.198246	-81.898559
177	286773	FRANKLIN	49	35	05/25/1963	LIMESTONE	28	DOMESTIC	40.198815	-81.898877
178	286774	FRANKLIN	130	50	06/04/1963	SANDSTONE	104		40.201700	-81.894160
179	325411	FRANKLIN	127	60	05/28/1966	SHALE	40	DOMESTIC	40.202945	-81.891636
180	354319	FRANKLIN	59	30	05/08/1967	SHALE	47		40.203154	-81.891278
181	435728	FRANKLIN	112	40	06/02/1972	SANDSTONE	36		40.198206	-81.899187
182	435729	FRANKLIN	100	34	06/16/1972	SANDSTONE	73		40.200590	-81.895698
183	490648	FRANKLIN	66	32	09/13/1976	SANDSTONE	37	DOMESTIC	40.201060	-81.896300
184	2076177	FRANKLIN	37.5	12	08/26/2019	CLAY	0	MONITOR	40.199364	-81.899918
185	2076396	FRANKLIN	37.6	26.3	09/24/2019	SILT	0	MONITOR	40.203211	-81.896546
186	2076397	FRANKLIN	36	27.3	09/27/2019	SAND & GRAVEL	0	MONITOR	40.202788	-81.896439
187	3013068	FRANKLIN	140	70	02/05/2024	SANDSTONE	25	DOMESTIC	40.199520	-81.900760
188	716928	FRANKLIN	71	35	09/26/1990	SANDSTONE	0	DOMESTIC	40.201933	-81.895880
189	538805	FRANKLIN	78	48	08/15/1978	LIMESTONE	30	DOMESTIC	40.203154	-81.891278

#	Record Number	Township	Total Depth (ft)	Static Water Level (ft)	Completion Date	Aquifer Type	Depth to Bedrock (ft)	Well Use	Latitude (WGS 84)	Longitude (WGS 84)
190	3008974	FRANKLIN	140	45	06/30/2023	SHALE	40	DOMESTIC	40.203056	-81.890833
191	2004683	FRANKLIN	125	42	08/16/2006	LIMESTONE	21	DOMESTIC	40.204147	-81.889891
192	464043	FRANKLIN	43	10	07/02/1974	LIMESTONE	26		40.221808	-81.899516
193	477191	FRANKLIN	53	20	06/19/1975	LIMESTONE	20		40.221791	-81.899711
194	2042463	FRANKLIN	200	101	04/05/2013	SHALE & LIMESTONE	10	DOMESTIC	40.222730	-81.902120
195	3016782	FRANKLIN	140	80	08/05/2024	SHALE	0	DOMESTIC	40.222222	-81.899444
196	603975	FRANKLIN	35	7	09/08/1982	SANDSTONE	15		40.222647	-81.899235
197	3003198	FRANKLIN	40	25	09/09/2022	LIMESTONE	7	DOMESTIC	40.222751	-81.899182
198	54591	FRANKLIN	75	30	04/23/1949	SHALE	5	DOMESTIC	40.213472	-81.882474
199	78838	FRANKLIN	53	28	06/30/1953	SANDSTONE	29		40.224920	-81.881720
200	105660	FRANKLIN	70	42	06/27/1953	SANDSTONE	42	DOMESTIC	40.222450	-81.881449
201	105663	FRANKLIN	60	33	07/25/1953	SHALE	45	DOMESTIC	40.222550	-81.881540
202	273357	FRANKLIN	90	27	02/05/1962	SHALE	6		40.217691	-81.881537
203	428067	FRANKLIN	124	40	11/12/1971	SHALE	27		40.219514	-81.881477
204	440332	FRANKLIN	80	65	03/28/1973	STONE	65		40.216165	-81.884015
205	538818	FRANKLIN	60	30	06/27/1980	BEDROCK	5	DOMESTIC	40.212831	-81.882611
206	2063543	FRANKLIN	200	80	07/26/2017	SANDSTONE	10	DOMESTIC	40.213600	-81.882090
207	636692	FRANKLIN	149	47	08/21/1987	SHALE	84		40.215245	-81.881903
208	2026778	FRANKLIN	150	34	04/22/2010	SANDSTONE	23	DOMESTIC	40.217150	-81.881970
209	3000384	FRANKLIN	160	80	04/15/2022	SANDSTONE	6	DOMESTIC	40.219290	-81.882960
210	1008840	FRANKLIN	53	35	11/23/2007	SAND & GRAVEL	0	DOMESTIC	40.201127	-81.890913
211	406080	FRANKLIN	65	40	07/30/1972	SANDSTONE	50		40.208903	-81.891776
212	406081	FRANKLIN	61	40	08/03/1972	SANDSTONE	40		40.208744	-81.892327
213	414410	FRANKLIN	75	42	11/02/1970	SANDSTONE	12		40.208892	-81.890446
214	421808	FRANKLIN	60	22	06/08/1971	SHALE	35		40.209424	-81.892128
215	440343	FRANKLIN	65	45	06/12/1973	SHALE	4		40.209766	-81.891171
216	445123	FRANKLIN	115	60	01/25/1973	SHALE	2		40.209724	-81.888914

#	Record Number	Township	Total Depth (ft)	Static Water Level (ft)	Completion Date	Aquifer Type	Depth to Bedrock (ft)	Well Use	Latitude (WGS 84)	Longitude (WGS 84)
217	174036	FRANKLIN	68	38	09/08/1956	SHALE	16	DOMESTIC	40.195349	-81.895141
218	183560	FRANKLIN	82	41	06/27/1958	SHALE	52	DOMESTIC	40.199497	-81.892504
219	2054156	FRANKLIN	146	30	10/05/2015	SANDSTONE	85	DOMESTIC	40.201170	-81.891660
220	2049347	FRANKLIN	100	20	09/25/2014	SHALE & SANDSTONE	10	DOMESTIC	40.198399	-81.893303
221	2022296	FRANKLIN	96	40	05/22/2009	GRAVEL	93	DOMESTIC	40.193610	-81.895700
222	78802	FRANKLIN	127	67	06/19/1951	SANDSTONE	27	DOMESTIC	40.202274	-81.843372
223	78820	FRANKLIN	60	35	07/18/1952	SHALE	55	DOMESTIC	40.192500	-81.843260
224	78827	FRANKLIN	49	42	10/20/1952	SANDSTONE	5	DOMESTIC	40.200749	-81.843953
225	174017	FRANKLIN	160	80	05/19/1956	SHALE	10	DOMESTIC	40.228251	-81.833724
226	174018	FRANKLIN	48	34	05/19/1956	SHALE	0	DOMESTIC	40.224967	-81.835026
227	196071	FRANKLIN	50	35	09/12/1957	SHALE	10	DOMESTIC	40.216104	-81.832533
228	224576	FRANKLIN	91	27	09/15/1959	SHALE	20		40.207640	-81.837090
229	328736	FRANKLIN	65	39	02/04/1967	SANDSTONE	22	DOMESTIC	40.208873	-81.836278
230	606883	FRANKLIN	107	30	12/12/1981	SHALE	20		40.197199	-81.844352
231	618227	FRANKLIN	96	22	01/18/1984	SHALE	3		40.197441	-81.844803
232	538112	FRANKLIN	102	50	01/20/1983	SANDSTONE & COAL	40	DOMESTIC	40.225574	-81.835056
233	3009141	FRANKLIN	87	10	07/25/2023	GRAVEL & SAND	0	AGRIC/IRRIG	40.214338	-81.868334
234	658732	FRANKLIN	180	85	12/02/1991	SHALE	40	DOMESTIC	40.220533	-81.834909
235	538107	FRANKLIN	70	40	03/02/1983	SANDSTONE	20		40.226039	-81.835010
236	625457	FRANKLIN	200	83	01/11/1985	SHALE	15		40.225986	-81.835570
237	529352	FRANKLIN	112	92	04/14/1980	SHALE	28	DOMESTIC	40.227516	-81.833695
238	1010570	FRANKLIN	188	88	05/08/2009	SHALE	0	DOMESTIC	40.226132	-81.838948
239	768088	FRANKLIN	76	0	08/31/1995	SHALE	35	MONITOR	40.231599	-81.847046
240	685058	FRANKLIN	76	20	06/05/1989	SANDSTONE	52	DOMESTIC	40.215826	-81.881918
241	704391	FRANKLIN	64	38	04/30/1990	SAND & GRAVEL	0	DOMESTIC	40.246614	-81.851346
242	233179	FRANKLIN	108	26	05/15/1958	FILL MATERIAL	0		40.208536	-81.881025
243	2047612	FRANKLIN	156.6	107.6	04/10/2014	SANDSTONE	0	MONITOR	40.185108	-81.879257

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244	3008047	FRANKLIN	40	30	05/16/2023	SAND & GRAVEL	0	MONITOR	40.205173	-81.882348
245	3005962	FRANKLIN	189	164	08/03/2022	SANDSTONE & SHALE	12	MONITOR	40.192115	-81.839437
246	376554	FRANKLIN	130	16	03/22/1968	SHALE	89		40.197730	-81.865920
247	459545	JACKSON	71	12	06/17/1974	GRAVEL	0	DOMESTIC	40.247230	-81.876560
248	631511	JACKSON	60	3	12/21/1985	SHALE	3	DOMESTIC	40.246877	-81.878637
249	709738	JACKSON	50	19	11/14/1991	SANDSTONE	31	DOMESTIC	40.246545	-81.877351
250	631528	JACKSON	65	12	06/12/1986	SANDSTONE	17	DOMESTIC	40.246942	-81.877627
251	51400	JACKSON	65	20	06/17/1950	SANDSTONE	16	DOMESTIC	40.246542	-81.874660
252	174906	JACKSON	83	25	11/22/1957	LIMESTONE	24	DOMESTIC	40.242840	-81.876250
253	258669	JACKSON	44	20	08/04/1962	SAND & GRAVEL	0	DOMESTIC	40.247101	-81.873056
254	328739	JACKSON	59	21	04/22/1967	SAND & GRAVEL	0	DOMESTIC	40.246826	-81.873407
255	538141	JACKSON	112	68	01/11/1975	SHALE	15	DOMESTIC	40.245490	-81.876071
256	625452	JACKSON	125	50	12/10/1984	SHALE	54		40.240850	-81.877231
257	754776	JACKSON	50	25	06/08/1992	SAND & GRAVEL	0	DOMESTIC	40.235519	-81.877334
258	718142	JACKSON	36	28	06/28/1991	SAND & GRAVEL	0	DOMESTIC	40.239514	-81.875482
259	923743	JACKSON	43	20	08/05/2001	SAND & GRAVEL	0	DOMESTIC	40.240057	-81.875184
260	882035	JACKSON	202	90	10/05/1998	SHALE	0	DOMESTIC	40.243352	-81.875733
261	947271	JACKSON	100	25	03/13/2008	SANDSTONE & SHALE	28	DOMESTIC	40.244239	-81.874314
262	760060	JACKSON	65	25	02/15/1993	SHALE	31	DOMESTIC	40.244436	-81.874182
263	996687	JACKSON	300	0	08/30/2005	SHALE	220	DOMESTIC	40.222550	-81.859500
264	996688	JACKSON	180	60	08/30/2005	SHALE	15	DOMESTIC	40.222599	-81.858381
265	996752	JACKSON	220	80	07/08/2005		15	DOMESTIC	40.222480	-81.858690
266	224575	JACKSON	42	27	09/11/1959	SHALE	12		40.229570	-81.883290
267	273383	JACKSON	115	90	06/27/1962	LIMESTONE	0		40.241060	-81.890300
268	1009039	JACKSON	180	35	06/24/2008		5	DOMESTIC	40.240667	-81.891167
269	925643	JACKSON	158	85	07/15/2002	CLAY & SHALE	15	DOMESTIC	40.240695	-81.890275
270	717965	JACKSON	100	40	04/15/1991	SHALE	82	DOMESTIC	40.247909	-81.875260

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271	3004139	JACKSON	288	150	08/30/2022	SHALE	6	DOMESTIC	40.230000	-81.902000
272	33008	TUSCARAWAS	90	40	06/03/1948	SANDSTONE	61		40.235788	-81.857896
273	76573	TUSCARAWAS	70	44	10/25/1950	SANDSTONE	14	DOMESTIC	40.246430	-81.861621
274	196051	TUSCARAWAS	67	43	04/06/1957	SAND & GRAVEL	0	DOMESTIC	40.247880	-81.857160
275	201651	TUSCARAWAS	140	0	05/03/1957	SANDSTONE	139		40.248285	-81.860676
276	351641	TUSCARAWAS	112	29.5	11/02/1968	SAND & GRAVEL	0		40.248314	-81.860657
277	450837	TUSCARAWAS	138	51	02/17/1975	SAND & GRAVEL	0		40.248188	-81.861237
278	9916003	TUSCARAWAS	140	58	08/25/1954	SANDSTONE	139		40.248231	-81.861218
279	9916068	TUSCARAWAS	78	38	04/24/1936	SAND & GRAVEL	0		40.240815	-81.871266
280	9916069	TUSCARAWAS	96	28	06/13/1936	SAND & GRAVEL	0		40.239398	-81.870720
281	783803	TUSCARAWAS	58	35	10/16/1993	SAND	0	DOMESTIC	40.247303	-81.856259
282	627417	TUSCARAWAS	70	0	09/11/1976	SAND & GRAVEL	0	DOMESTIC	40.247640	-81.855910
283	649134	TUSCARAWAS	35	0	09/02/1986	SAND & GRAVEL	0	DOMESTIC	40.246545	-81.856897
284	538124	TUSCARAWAS	72	30	03/20/1974	SAND & GRAVEL	0	DOMESTIC	40.244950	-81.856660
285	831789	TUSCARAWAS	108	27.3	04/14/1997	SAND/GRAVEL/BOULDERS	0	HEATING/COOLING	40.209410	-81.881420
286	2015504	TUSCARAWAS	40	0	02/13/2008	SAND & GRAVEL	0	MONITOR	40.207308	-81.881524
287	2015505	TUSCARAWAS	40	0	02/12/2008	SAND & GRAVEL	0	MONITOR	40.207158	-81.881224
288	2015506	TUSCARAWAS	40	0	02/08/2008	SAND & GRAVEL	0	MONITOR	40.207598	-81.881004
289	2015509	TUSCARAWAS	40	0	02/07/2008	SAND & GRAVEL	0	MONITOR	40.206858	-81.882064
290	2015511	TUSCARAWAS	40	0	02/07/2008	SAND & GRAVEL	0	MONITOR	40.206988	-81.881904
291	2015512	TUSCARAWAS	40	0	02/05/2008	SAND & GRAVEL	0	MONITOR	40.208638	-81.882444
292	2015513	TUSCARAWAS	40	0	02/06/2008	SAND & GRAVEL	0	MONITOR	40.208678	-81.881504
293	2015514	TUSCARAWAS	75	0	02/06/2008	SAND & GRAVEL	0	MONITOR	40.208688	-81.884524
294	2015516	TUSCARAWAS	40	0	02/11/2008	SAND & GRAVEL	0	MONITOR	40.205508	-81.884234
295	2015518	TUSCARAWAS	40	0	02/12/2008	SAND & GRAVEL	0	MONITOR	40.205318	-81.882134
296	2016659	TUSCARAWAS	40	0	05/22/2008	SAND & GRAVEL	0	MONITOR	40.209578	-81.882134
297	2016660	TUSCARAWAS	40	0	05/21/2008	SAND & GRAVEL	0	MONITOR	40.209178	-81.881734

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298	2016661	TUSCARAWAS	40	0	05/22/2008	SAND & GRAVEL	0	MONITOR	40.208508	-81.882794
299	2016662	TUSCARAWAS	40	0	05/21/2008	SAND & GRAVEL	0	MONITOR	40.208608	-81.881104
300	2016663	TUSCARAWAS	40	0	05/20/2008	SAND & GRAVEL	0	MONITOR	40.208978	-81.879144
301	2016664	TUSCARAWAS	42	0	05/20/2008	SAND & GRAVEL	0	MONITOR	40.209988	-81.881254
302	877727	TUSCARAWAS	49	20	05/28/1999	SAND & GRAVEL	0	DOMESTIC	40.242204	-81.874315
303	292789	TUSCARAWAS	40	29	11/07/1964	SHALE	0	DOMESTIC	40.235377	-81.857182
304	292790	TUSCARAWAS	45	30	11/07/1964	SANDSTONE	12	DOMESTIC	40.234963	-81.858529
305	295334	TUSCARAWAS	134	25	09/08/1964	SHALE	133		40.233106	-81.862738
306	631506	TUSCARAWAS	59	25	11/02/1985	SAND	0		40.233109	-81.863329
307	360347	TUSCARAWAS	79	33	01/13/1969	SAND & GRAVEL	0		40.233106	-81.862738
308	603980	TUSCARAWAS	38	20	11/28/1982	SAND & GRAVEL	0	DOMESTIC	40.244960	-81.871540
309	716946	TUSCARAWAS	80	48	10/28/1991	SHALE	28	DOMESTIC	40.228444	-81.862905
310	106137	TUSCARAWAS	90	14	04/21/1954	SAND	0		40.240668	-81.871127
311	147182	TUSCARAWAS	125	84	03/12/1955	COAL	10	DOMESTIC	40.228702	-81.833670
312	174048	TUSCARAWAS	55	39	12/29/1956	SHALE	4	DOMESTIC	40.229321	-81.833652
313	328717	TUSCARAWAS	70	45	03/05/1966	SHALE	10	DOMESTIC	40.229455	-81.833731
314	135950	TUSCARAWAS	110	50	12/31/1954	ROCK	101		40.249424	-81.866848
315	150806	TUSCARAWAS	102	50	02/08/1955	SAND & GRAVEL	0		40.249424	-81.866848
316	798324	TUSCARAWAS	44	20	07/29/1994	SAND & GRAVEL	0	PUBLIC/SEMI-PUB	40.240967	-81.862738
317	529351	TUSCARAWAS	80	32	10/23/1979	SANDSTONE	20		40.230868	-81.837539
318	538134	TUSCARAWAS	67	0	08/20/1974		0	DOMESTIC	40.227826	-81.827676
319	783826	TUSCARAWAS	40	20	07/31/1994	SAND & GRAVEL	0	DOMESTIC	40.241082	-81.860924
320	987074	TUSCARAWAS	70	0	11/17/2004		45	MONITOR	40.227638	-81.828037
321	628707	TUSCARAWAS	55	30	05/14/1987	SANDSTONE	10		40.229473	-81.829699
322	3004332	TUSCARAWAS	80	30	10/18/2022	SHALE	2	DOMESTIC	40.230000	-81.834000
323	24740	TUSCARAWAS	81	54	05/07/1948	SHALE	26		40.238634	-81.857390
324	24749	TUSCARAWAS	113	50	06/12/1948	SHALE	0	DOMESTIC	40.229941	-81.832832

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325	51363	TUSCARAWAS	61	44	08/06/1949	SAND & GRAVEL	0	DOMESTIC	40.237880	-81.859100
326	51384	TUSCARAWAS	56	39	12/23/1949	SAND & GRAVEL	0	DOMESTIC	40.249410	-81.861110
327	54571	TUSCARAWAS	36	11	09/17/1948	SAND & GRAVEL	0	DOMESTIC	40.247059	-81.867178
328	54581	TUSCARAWAS	60	34	11/11/1948	SAND & GRAVEL	0		40.241116	-81.857545
329	328731	TUSCARAWAS	60	26	09/03/1966	SAND & GRAVEL	0	DOMESTIC	40.243540	-81.860270
330	760073	TUSCARAWAS	40	25	09/28/1993	SAND & GRAVEL	0	DOMESTIC	40.241214	-81.859915
331	273395	TUSCARAWAS	70	42	09/22/1962	SHALE	2		40.236370	-81.855626
332	369867	TUSCARAWAS	80	12	10/12/1968	CLEANOUT	0	DOMESTIC	40.235788	-81.850994
333	509777	TUSCARAWAS	187	105	01/14/1978	SANDSTONE	5	DOMESTIC	40.236477	-81.855687
334	538403	TUSCARAWAS	200	75	09/30/1978	SHALE	40		40.236310	-81.855580
335	9916002	TUSCARAWAS	42	0	04/03/1953	SAND & GRAVEL	0		40.245357	-81.848513
336	939050	TUSCARAWAS	68	20	04/20/2004	SHALE	10	DOMESTIC	40.229534	-81.836843
337	927043	TUSCARAWAS	120	31	03/08/2001	CLAY & SAND	11	DOMESTIC	40.235292	-81.840995
338	658749	TUSCARAWAS	310	150	06/05/1992	SHALE	33	DOMESTIC	40.235564	-81.850985
339	927044	TUSCARAWAS	202	105	03/08/2001	DRIFT	7	DOMESTIC	40.233577	-81.852508
340	815407	TUSCARAWAS	127	50	10/02/1995	SHALE	0	DOMESTIC	40.235658	-81.857431
341	230477	TUSCARAWAS	65	47	06/11/1960	SAND & GRAVEL	0	DOMESTIC	40.241410	-81.860950
342	538117	TUSCARAWAS	41	15	09/05/1973	SAND & GRAVEL	0	DOMESTIC	40.241524	-81.860849
343	717973	TUSCARAWAS	38	20	09/27/1991	SAND & GRAVEL	0	DOMESTIC	40.241082	-81.859922
344	717976	TUSCARAWAS	38	18	12/16/1991	SAND & GRAVEL	0	DOMESTIC	40.241082	-81.859922
345	704398	TUSCARAWAS	150	30	06/18/1990	SHALE	20	DOMESTIC	40.234069	-81.853792
346	369857	TUSCARAWAS	59	30	07/27/1968	SAND & GRAVEL	0	DOMESTIC	40.246010	-81.858790
347	369858	TUSCARAWAS	60	30	07/27/1968	SAND & GRAVEL	0	DOMESTIC	40.245729	-81.857965
348	796463	TUSCARAWAS	66	35	03/06/1995	SAND & GRAVEL	0	OTHER	40.246427	-81.857470
349	631541	TUSCARAWAS	59	35	08/26/1985	SAND & GRAVEL	0	DOMESTIC	40.246010	-81.857580
350	631542	TUSCARAWAS	65	35	08/29/1985	SAND	0	DOMESTIC	40.245219	-81.858308
351	631517	TUSCARAWAS	52	25	02/13/1986	SAND & GRAVEL	0	DOMESTIC	40.246185	-81.856913

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352	694581	TUSCARAWAS	50	23	08/31/1989	SAND & GRAVEL	0	DOMESTIC	40.246080	-81.856936
353	717977	TUSCARAWAS	38	18	12/16/1991	SAND & GRAVEL	0	DOMESTIC	40.241020	-81.860495
354	867666	TUSCARAWAS	48	30	06/12/1998	SAND & GRAVEL	0	DOMESTIC	40.240680	-81.860090
355	273381	TUSCARAWAS	35	26	06/15/1962	LIMESTONE	32	DOMESTIC	40.245734	-81.852258
356	362912	TUSCARAWAS	40	17	05/24/1967	SHALE	1	DOMESTIC	40.245488	-81.848481
357	230462	TUSCARAWAS	42	39	09/26/1959	SHALE	35	DOMESTIC	40.245805	-81.850582
358	147168	TUSCARAWAS	62	28	10/02/1954	SAND & GRAVEL	0		40.244140	-81.860850
359	174019	TUSCARAWAS	55	22	05/19/1956	SAND & GRAVEL	0	DOMESTIC	40.244335	-81.855668
360	273380	TUSCARAWAS	47	26	06/12/1962	SAND & GRAVEL	0	DOMESTIC	40.243160	-81.861000
361	230469	TUSCARAWAS	30	20	12/19/1959	SAND & GRAVEL	0	DOMESTIC	40.245450	-81.868750
362	273372	TUSCARAWAS	58	22	05/01/1962	SAND & GRAVEL	0		40.244930	-81.867660
363	2002827	TUSCARAWAS	22	0	03/22/2006	SILT & GRAVEL	0	MONITOR	40.245830	-81.866670
364	2002828	TUSCARAWAS	22	0	03/22/2006	SAND & GRAVEL	0	MONITOR	40.245830	-81.866670
365	2002830	TUSCARAWAS	22	0	03/23/2006	SAND & GRAVEL	0	MONITOR	40.245830	-81.866670
366	2025514	TUSCARAWAS	78	23	12/14/2009	GRAVEL	0	AGRIC/IRRIG	40.244890	-81.868900
367	937031	TUSCARAWAS	96	14.6	10/29/2001	SAND & GRAVEL	0	INDUSTRIAL	40.246474	-81.864232
368	273364	TUSCARAWAS	35	23	02/24/1962	FIRE CLAY	25		40.245530	-81.852920
369	2024589	TUSCARAWAS	59	35	10/19/2009	SANDSTONE	33	AGRIC/IRRIG	40.234129	-81.861514
370	2033020	TUSCARAWAS	43	0	05/31/2011	SAND & GRAVEL	0	MONITOR	40.245446	-81.862421
371	625482	VIRGINIA	296	20	03/19/1985	SHALE	0		40.224520	-81.907710
372	677502	VIRGINIA	37	15	08/20/1988	FLINT	15		40.222318	-81.904863
373	603955	VIRGINIA	40	18	08/10/1981	SHALE	0		40.225950	-81.906690
374	2061184	VIRGINIA	330	200	02/06/2017	SANDSTONE	0	DOMESTIC	40.226910	-81.906180