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Illinois Storage Corridor
CarbonSAFE Phase III

Pre-drilling Site Assessment: One Earth Energy

Technical Report

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EXECUTIVE SUMMARY

The Illinois Storage Corridor project will drill a test well in Ford County, IL, near the One Earth Energy facility in Gibson City, IL. Lithologic, geomechanical, and geophysical data collected from samples testing and an extensive geophysical logging suite will be used to determine the feasibility of the geologic sequestration of 50 million tonnes or more of injected carbon dioxide at this location. The primary target reservoir and caprock to be investigated for the Illinois Storage Corridor project are the Mt. Simon Sandstone and Eau Claire Formation, respectively, which together constitute a storage complex that has already been successfully used for natural gas storage in east-central Illinois and for geologic sequestration of carbon dioxide in south-central Illinois. The Lower Mt. Simon, which includes a high- porosity and -permeability arkosic layer, is being targeted as the primary storage zone. Regional maps of this unit indicate that the Lower Mt. Simon is expected to have excellent reservoir characteristics and high net thickness at the drill site.

The project team has assessed the planned drilling site using subsurface geologic data and regional analyses. These data were used to generate geologic structure and isopach thickness maps for target reservoir and caprock layers which were incorporated into a detailed discussion of the nature of the Illinois Basin's Cambro-Ordovician carbon dioxide storage complex at the drilling site. Formation tops were prognosed for 11 lithologic units to aid drilling and coring procedures.

Additional GIS analysis indicates that no protected and sensitive areas, groundwater resources, or existing resource development will be negatively affected by project drilling activities. The Osman Monocline and Colfax Syncline, deep subsurface structural features associated with the La Salle Anticlinorium, are potentially near the area of the storage site. A short 2D seismic survey indicates there is no structural influence on the integrity of the storage complex in the proposed region of the well. Additional seismic surveys to better evaluate reservoir and seal continuity and presence of structures are planned.

The precise coordinates of the well site have not yet been determined. The well is expected to be drilled to a total depth of approximately 6,800 feet. A lost circulation zone in the Potosi Dolomite, which has been demonstrated to have intermittent cavernous porosity from karstification, has the potential to impact drilling progress.

This document also details the coring and sampling program, proposed logging suite, and well testing program, all of which will be dynamically reviewed as drilling progresses.

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INTRODUCTION

The Illinois Storage Corridor project intends to drill a stratigraphic test well west of the One Earth Energy (OEE) facility in Gibson City, Illinois, to determine the feasibility of the geologic sequestration of 50 million metric tons or more of injected CO_2 at this location. This report includes project and site location descriptions, geologic setting, storage complex assessment, well siting and protection of resources, drilling concerns and preliminary formation top prognosis, and planned logging and sampling programs, to characterize the regional and local context for the proposed Gibson #1 stratigraphic test well.

The OEE ethanol facility is located on the western edge of Gibson City (population ~3,500) in southwestern Ford County, Illinois (Figure 1). The well will be drilled in a rural setting about three miles west of the plant around PLSS location T23N R7E, Section 7 (NAD83 datum near 40.46865, - 88.455128), slightly east of the Ford County-McLean County border. There are no restrictions regarding access to the site. The project activities are largely in rural settings (injection) and within the property of existing industrial facilities. Rail accessibility is present at the OEE facility. There are no apparent physiographic barriers to conducting monitoring operations.

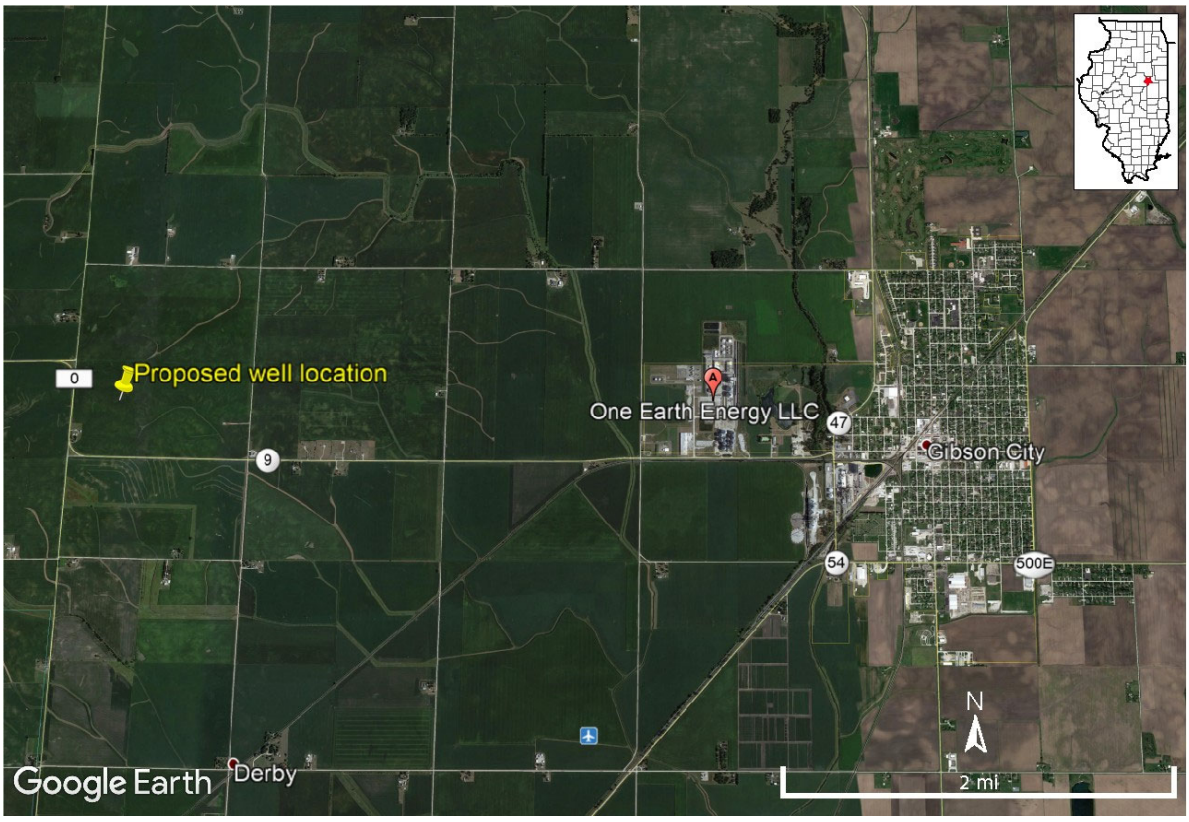

Figure 1. Satellite image of proposed Gibson #1 stratigraphic test well location (yellow marker) in Ford County, Illinois. Inset map shows position of site within Illinois. The One Earth Energy facility east of the proposed well site and west of Gibson City is shown.

GEOLOGIC SETTING

Structural Features

The Mt. Simon Sandstone and Eau Claire Formation are the primary target reservoir and caprock, respectively, that will be investigated with data collected from the project well associated with the One Earth Energy ethanol facility.

Deep subsurface structural features are not well-defined in this portion of the Illinois Basin. The LaSalle Anticlinorium (Nelson, 1995) is a geological feature that trends N-S to NE-SW and is about 200 mi (320 km) long by 80 mi (130 km) wide. The anticlinorium is a large upward fold belt comprised of smaller domes, anticlines (individual upward folds), monoclines (step-like folds), and intervening synclines (downward folds). The Manlove Field to the south utilizes one of these anticlines (the Mahomet Dome) for natural gas storage. Two features associated with this belt, the Osman Monocline and Colfax Syncline, are potentially near the area of the storage site (Figure 2). OEE and ISGS conducted a short 2D seismic survey to examine reservoir and seal continuity near the proposed site and for the presence of structures. Initial examination indicates there is no structural influence on the integrity of the storage complex. Additional 2D seismic surveys in the project are being conducted in the area to better constrain structures and reservoir.

The proposed drill site is within the area of north-central to southern Illinois that is suitable for carbon storage in the Mt. Simon Sandstone (Figure 3), as constrained by both structural considerations and salinity of formation waters. Reservoirs having formation fluids having less than 10,000 mg/L total dissolved solids (TDS) are designated as Underground Sources of Drinking Water (USDW) and considered unsuitable for carbon storage. Regional mapping of salinity data indicates that TDS levels in the Mt. Simon Sandstone are well above 10,000 mg/L in Ford County (Figure 3). A depth of 2,500-3,000 ft (760-910 m) below ground surface is necessary for CO_2 to be stored as supercritical fluid, and the proposed drill site is well south of the 3,000 ft (910 m) measured depth (MD) contour line on the upper surface of the Mt. Simon Sandstone (depth increases to the south); projected MD to the top Mt. Simon based on regional mapping is about 4,222 ft (1,287 m). Depth to top of the formation is a conservative benchmark for estimating reservoir suitability, since the targeted reservoir zone is in the lower part of the approximately 2,000 ft-thick formation.

History of Seismicity

There is low risk of natural seismic activity impacting well integrity, the injection formation, or the seal at the proposed site. This part of Illinois is in a low-risk area for seismicity, with approximately 2-10 expected occurrences of damaging earthquake shaking in 10,000 years (USGS, 2018). Historical earthquake records (Heigold and Larsen, 1990) show no events in Ford County. Two earthquakes were recorded in adjoining McLean County in the 1880s; one in nearby Piatt County in 1952; and one in southern Vermilion County, Illinois, in 1903. All four of these earthquakes were ranked III on the Modified Mercalli Intensity Scale, i.e., “felt noticeably indoors”.

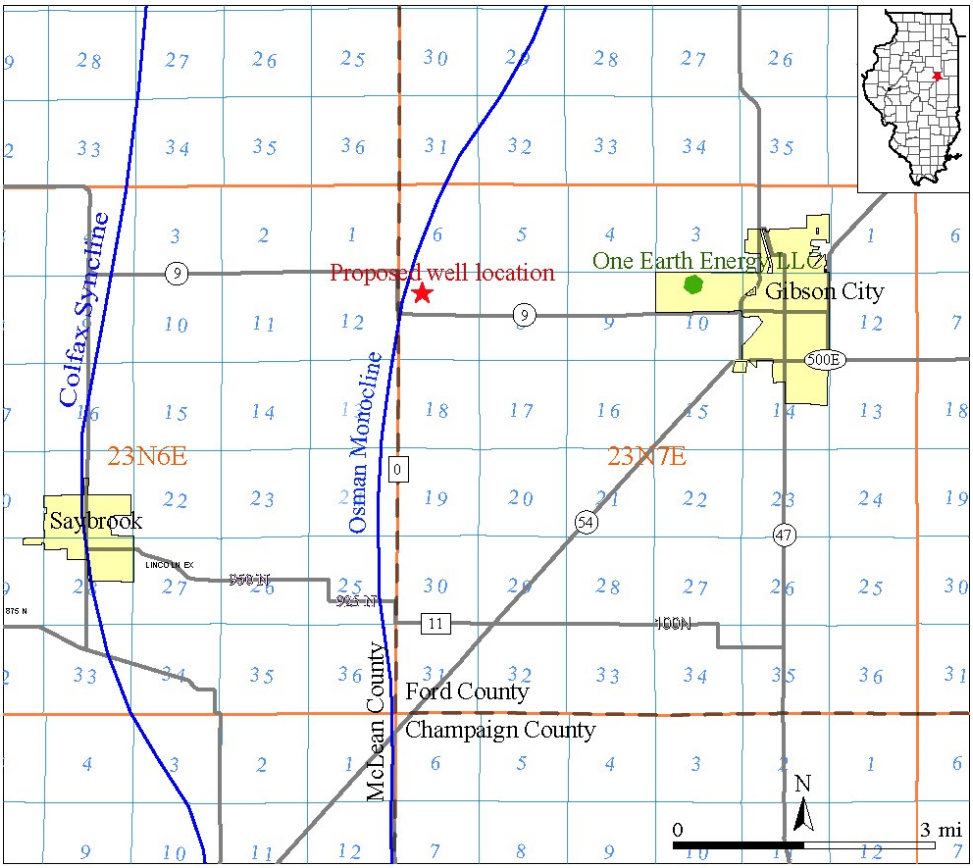

Figure 2. Map showing projected locations of geological structural features to the west of Gibson City, in the vicinity of proposed well location (Nelson 1995). The features shown (Colfax Syncline and Osman Monocline) are part of the La Salle Anticlinorium.

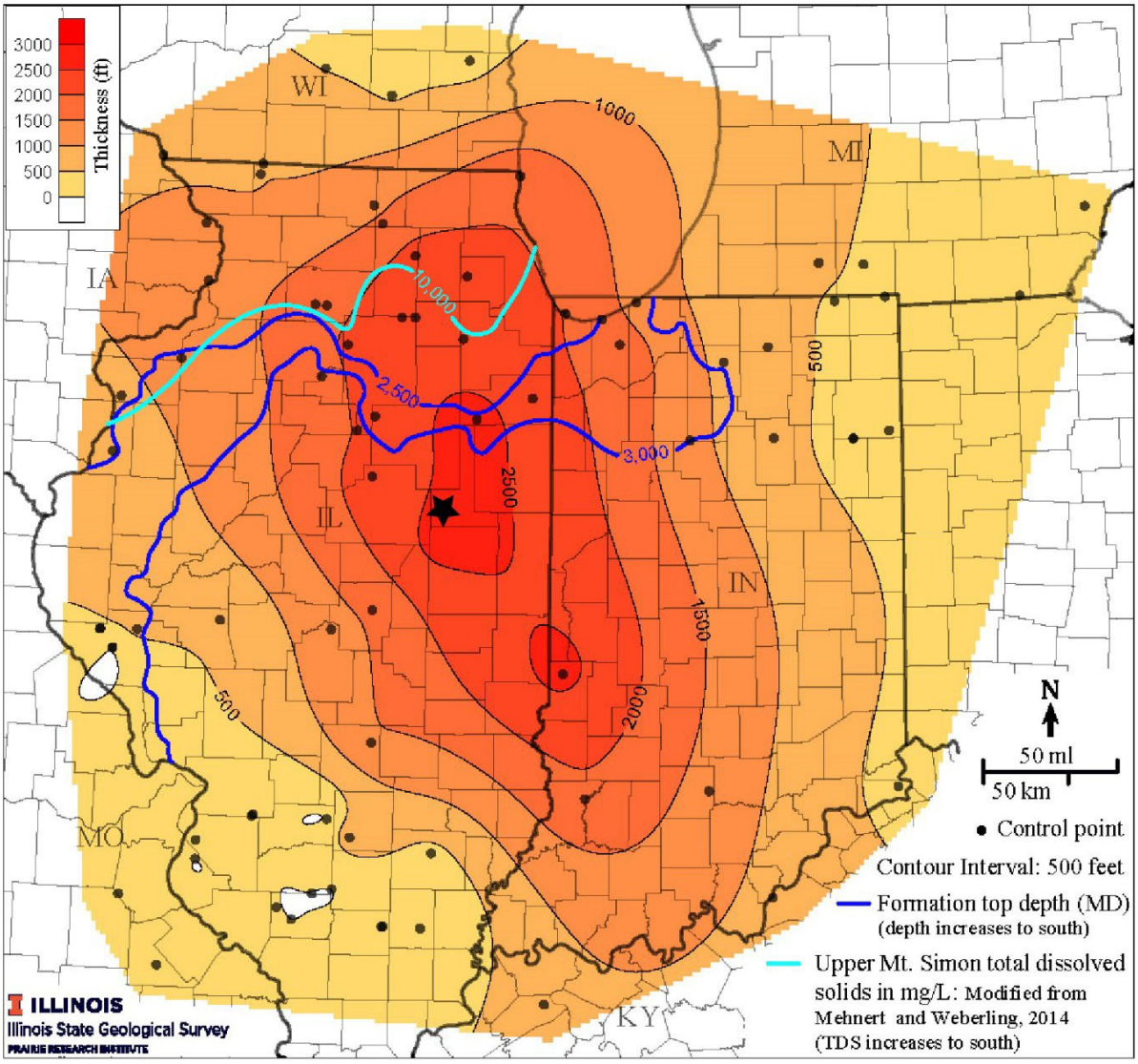

Figure 3. Structural and isopach map showing the location of the proposed drill site (black star) relative to the approximate northern limit of suitable reservoir conditions for carbon storage in the Mt. Simon Sandstone. Light blue line indicates the 10,000 total dissolved solids cutoff line for formation brine north of which formation waters are potentially potable. Dark blue lines indicate the 2,500 and 3,000 ft MD (measured depth) structural contours of the top of the Mt. Simon Sandstone. Isopach map (closed contours) shows combined thickness of Mt. Simon Sandstone and Argenta sandstone.

STORAGE COMPLEX ASSESSMENT

The Cambro-Ordovician storage complex (Figure 4) consists of multiple potential target reservoirs (Mt. Simon Sandstone, St. Peter Sandstone, Potosi Dolomite) overlain by multiple confining layer seals (Eau Claire Formation and Maquoketa Shale Group) and the widespread Devonian New Albany Shale Group. This section describes key characteristics of those potential reservoirs and seals.

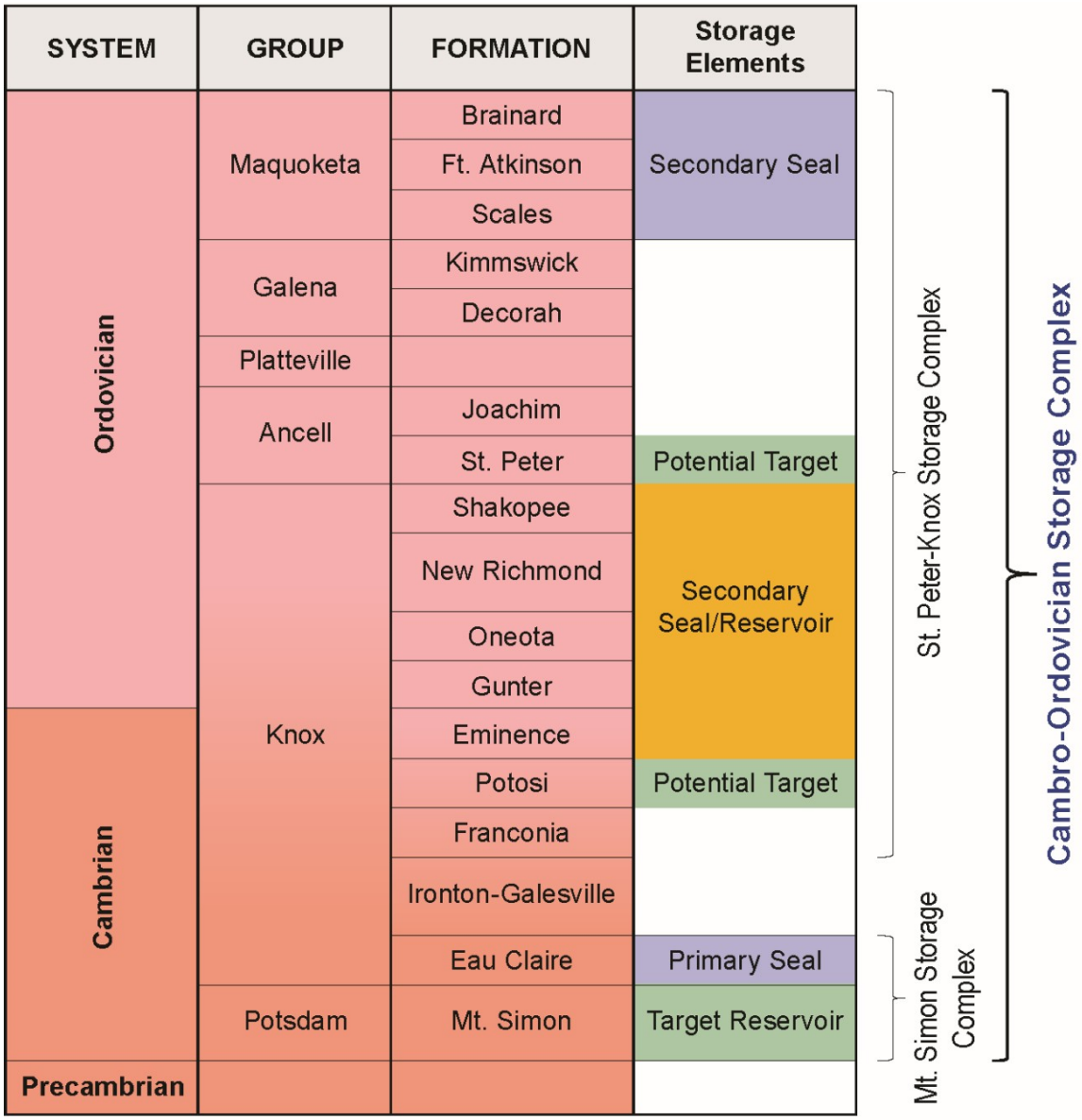

Figure 4. Stratigraphic relationships of the primary reservoirs and seals in the Cambro-Ordovician storage complex in the Illinois Basin.

Reservoir

Mt. Simon Sandstone

The Mt. Simon Sandstone is the targeted injection zone at the potential storage site in Ford County, IL. At this location the Mt. Simon is expected to be at approximately 4,222 ft (1,287 m) depth and have a thickness of 2,000 ft (610 m). The combined thickness of the Mt. Simon and the underlying Argenta sandstone (which directly overlies crystalline basement rock) is projected to be about 2550 ft (777 m) (Figure 3). The ISGS subdivides the Mt. Simon into Lower, Middle and Upper units. Regionally, the Lower and Upper units generally have good to excellent reservoir characteristics, and the Middle has poor reservoir quality. For accurate determination of reservoir quality at this site, the Illinois Storage Corridor project will drill a well to collect core samples, acquire geophysical logs and conduct in situ tests that will be used to constrain reservoir parameters. The nearest data-rich deep well, Hinton #7 (14 mi [23 km] south), exhibits very good reservoir quality in the Lower and Upper Mt. Simon. The depositional environment of the Mt. Simon Sandstone suggests that rock characteristics should be broadly similar laterally so that generally similar reservoir characteristics are expected new well location. Figure 5 shows a cross section of wells (including Hinton #7) depicting the lateral relation of formations across the central part of the Illinois Basin. Note that CO_2 injection associated with the IL-ICCS project in Macon County is within the Lower Mt. Simon.

In the Lower Mt. Simon, a zone of enhanced porosity and permeability informally termed the "arkosic zone" is found in locations within the study region. The zone has developed from diagenetic (post- depositional) alteration of the rocks through dissolution of feldspar grains originally deposited as part of the sediment. The arkosic zone is present at Hinton #7 (blue highlight in Figure 5) and is expected to be present in the Gibson City area. The regional net thickness map (Figure 6), showing aggregate thickness of Lower Mt. Simon strata with 10% porosity or greater (including, but not limited to, the arkosic zone) projects approximately 500 ft (150 m) of net thickness in the LMS in the vicinity of the well site. A pore- volume (porosity fraction times thickness) map (Figure 7) also indicates good prospects (~75 ft) in the western Ford County area.

The Hinton #7 well has 215 ft (66 m) of excellent quality reservoir in the arkose zone with porosity and permeability values up to 25% and 600 mD, respectively. At the IBDP and IL-ICCS injection sites in Macon County, IL, the Lower Mt. Simon Sandstone has core porosity and permeability values as high as 27% and 400 mD, and a mean (log) porosity of 16.6%. Lateral continuity of the high-quality reservoir in the Lower Mt. Simon is uncertain because of limited well control, but most wells within the southern half of the Mt. Simon depocenter that penetrate the Lower Mt. Simon show the occurrence of a porous zone.

The Upper Mt. Simon also can have good reservoir quality, especially within flat channel sands that are used for natural gas storage and waste disposal in the Illinois Basin (Morse and Leetaru, 2005).

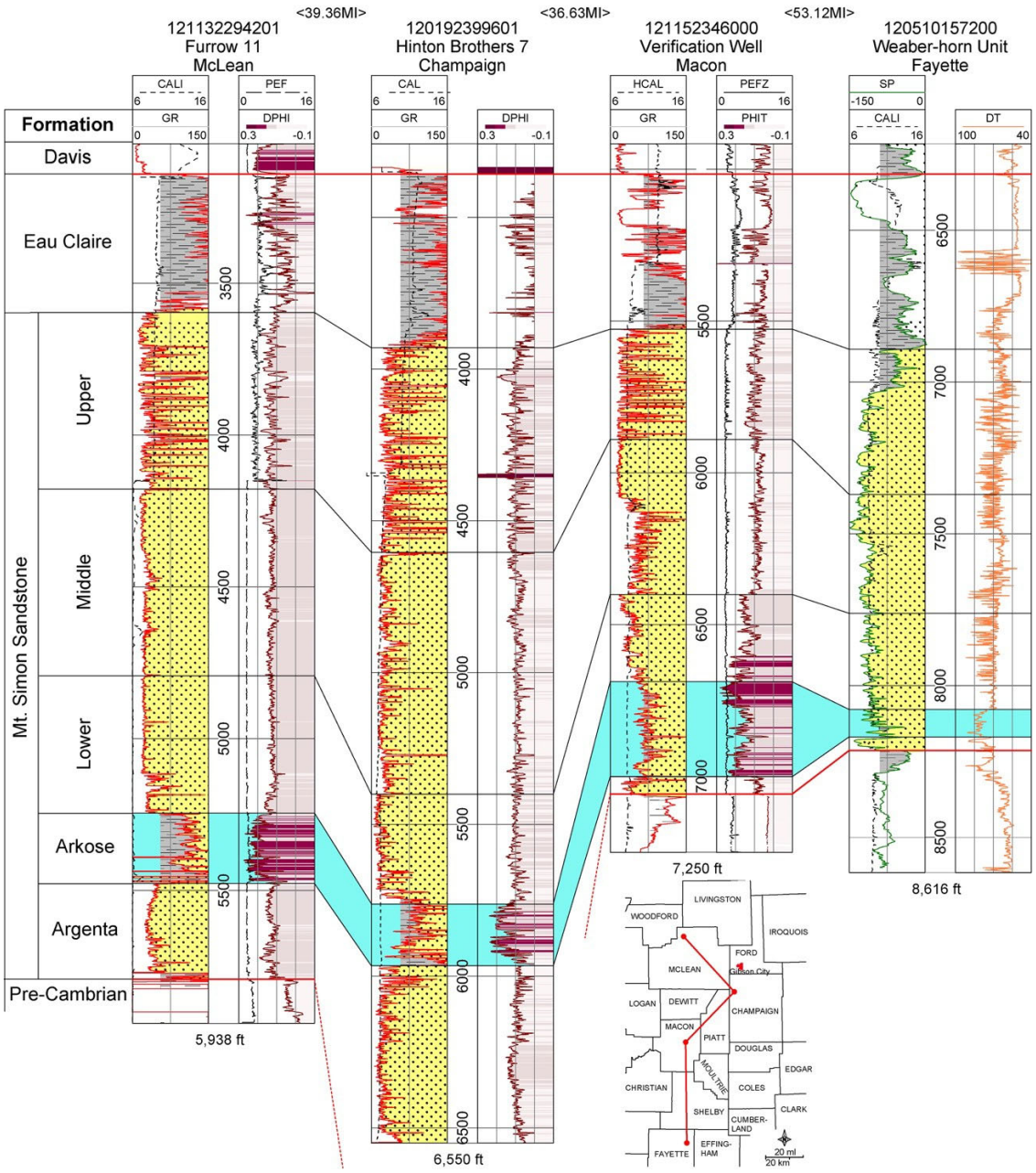

Figure 5. North to south stratigraphic cross-section, displaying the Hinton Brothers #7 well, illustrating the position and variability of the potential reservoir and overlying sealing strata. The blue highlighted section is the "arkosic" zone, a sequence of high porosity, high permeability strata, and a targeted injection interval.

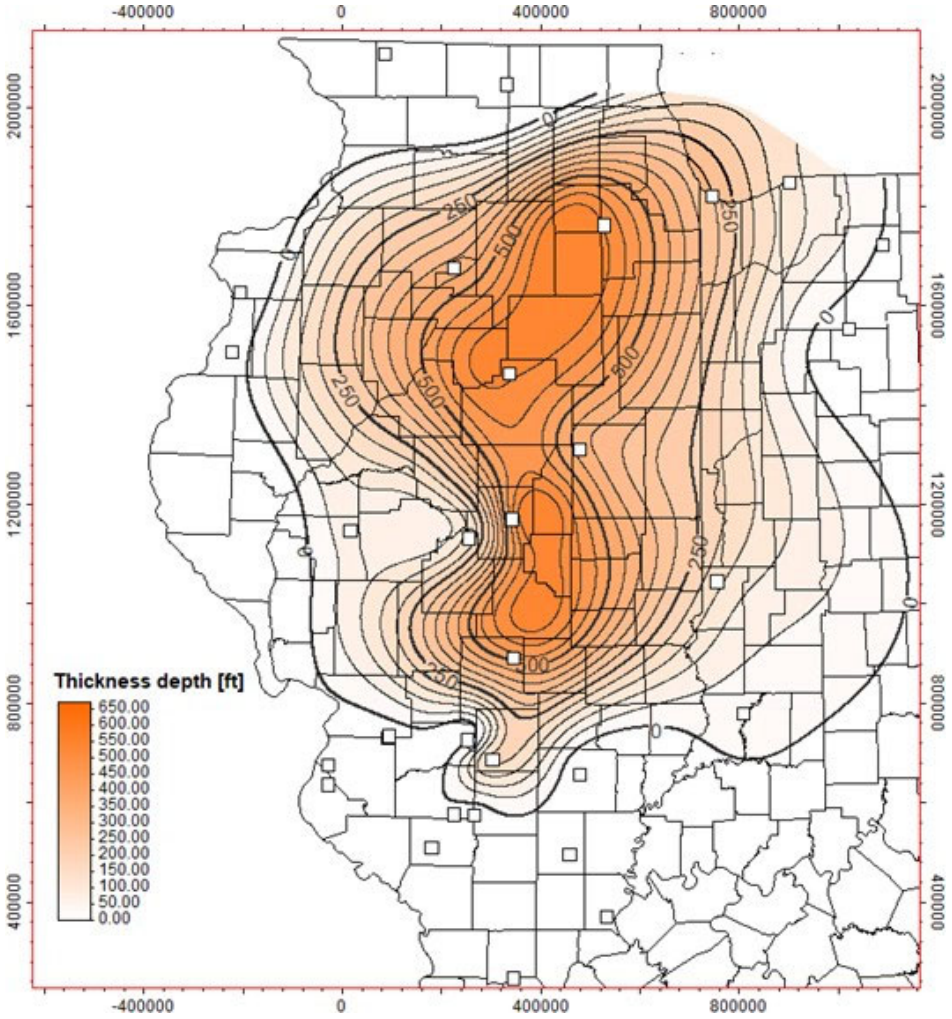

Figure 6. Lower Mt. Simon net thickness map, using 10% cutoff--i.e., aggregate thickness of Lower Mt. Simon strata with porosity of 10% or greater.

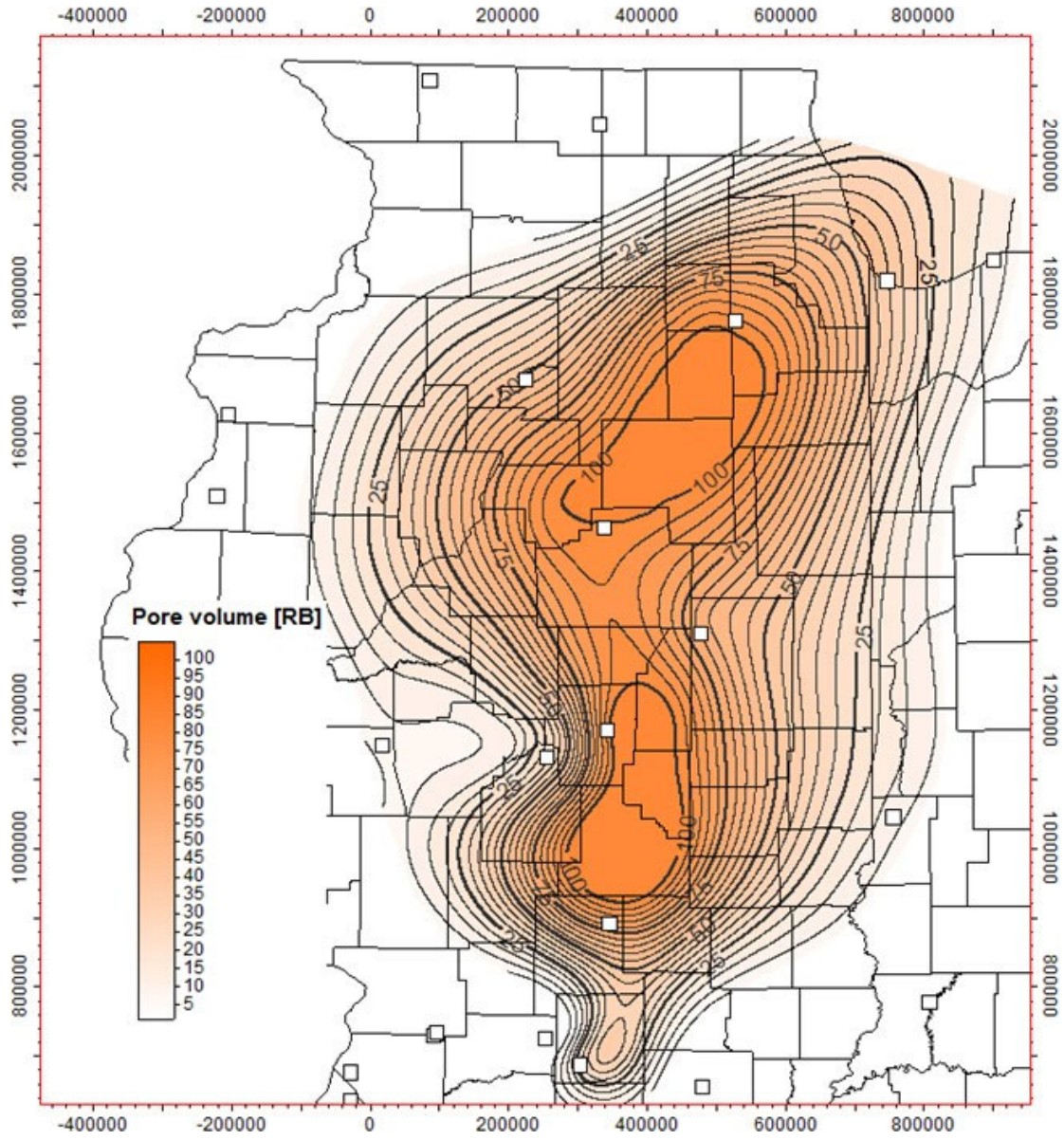

Figure 7. Pore volume (porosity fraction multiplied by thickness) map for the Lower Mt. Simon.

Confining Units

New Albany Shale

The Devonian-Mississippian New Albany Shale Group is a thick, impermeable, and laterally continuous shale formation which acts as a potential tertiary seal in the Illinois Basin storage complex. The proposed drilling location is near the northern erosional limit of the New Albany Group. Based on regional mapping the top of the New Albany, if present, is projected to be at 672 ft (205 m) measured depth (MD) and the unit is estimated to be about 80-120 ft (24-37 m) thick.

Maquoketa Shale

The Ordovician Maquoketa Shale Group (Figure 8) is a laterally continuous impermeable confining layer which functions as a secondary seal in the Cambro-Ordovician storage complex in the Illinois Basin.

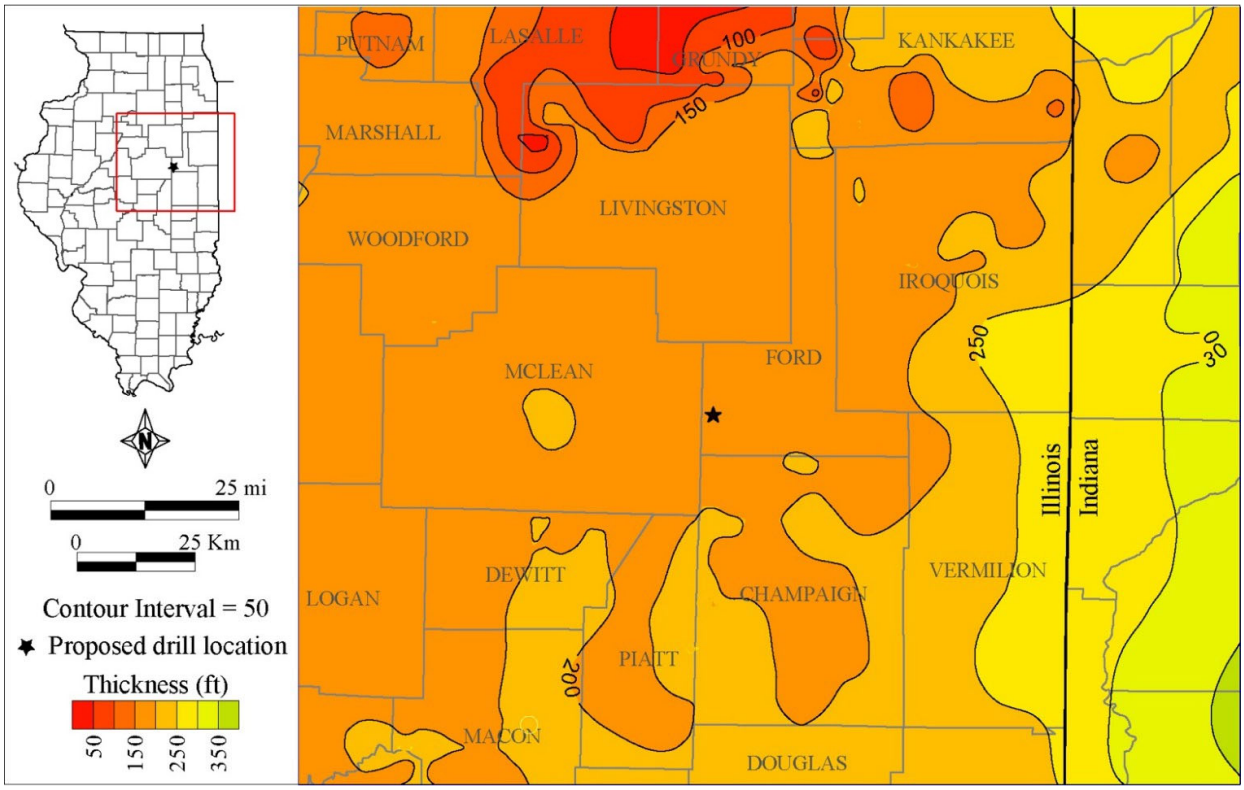

Figure 8. Regional thickness of Maquoketa Shale Group.

Medina et al. (2019) evaluated the regional seal capacity of the Maquoketa using a lithofacies model to define three main units (upper, middle, and lower) and quantify five distinct lithologies. The Upper unit of the Maquoketa is dominated by dolomitic and calcitic shale and silty shale, the Middle unit is dominated by limestone and muddy limestone, and the Lower unit is dominated by dolomitic and calcitic shale and occasionally contains minor amounts of muddy limestone and silty shale. The top of the Maquoketa is expected to be about 1,337 ft (408 m) deep, and the formation is estimated to be approximately 195 ft (59 m) thick at the proposed drill site.

Eau Claire Formation

The Eau Claire Formation is the primary confining unit of the Mt. Simon Storage Complex. The

top of the Eau Claire is projected to be about 3,691 ft (1,125 m) deep (MD) at the proposed injection site, and the formation is projected to be about 531 ft (162 m) thick (Figure 9).

The Eau Claire is a highly laminated, fissile shale to silty shale with abundant siltstone beds in the bottom half, and limestone to clayey limestone in the upper half. The shaliest section directly overlies the Mt. Simon Sandstone. Advective flow from the Mt. Simon Sandstone into the Eau Claire is insignificant (Roy et al 2014). Modeling of ionic diffusion into the Eau Claire has shown this also to be insignificant (Roy et al 2014).

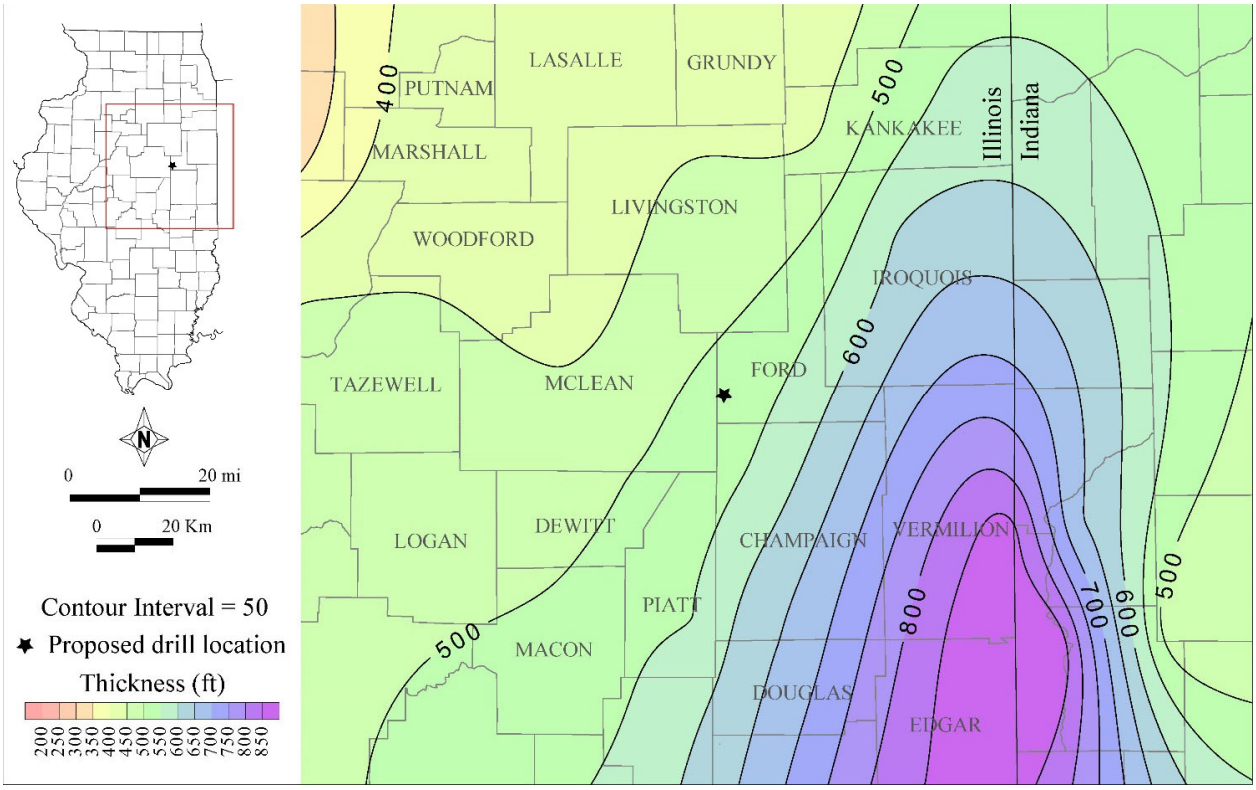

Figure 9. Regional thickness of the Eau Claire Formation.

WELL SITING AND PROTECTION OF RESOURCES

Protected and Sensitive Areas

The area of investigation and surrounding environs approximately 5 mi (8 km) west of Gibson City are in predominantly cultivated lands. An assessment of environmental geospatial data (ISGS, INAI, INPC) and agency web maps for the site location indicate no conflicts with State or Federal lands, threatened or endangered species, historical places, wetlands and floodplains, or high-probability archaeological areas.

The proposed drilling location is near the mapped boundary of the Sangamon River near Fisher Upstream Area watershed area that is a subset of the Mahomet Sole Source Aquifer (SSA) Project Review Area. The Sangamon River near Fisher Upstream Area watershed, Sugar Creek watershed, and Tributary to the Middle Fork Vermilion River watershed are adjacent to the Mahomet SSA. The Project Review Area (Figure 10) for the Mahomet SSA consists of the designated SSA area plus these three adjacent watersheds that provide recharge to the Mahomet Aquifer System.

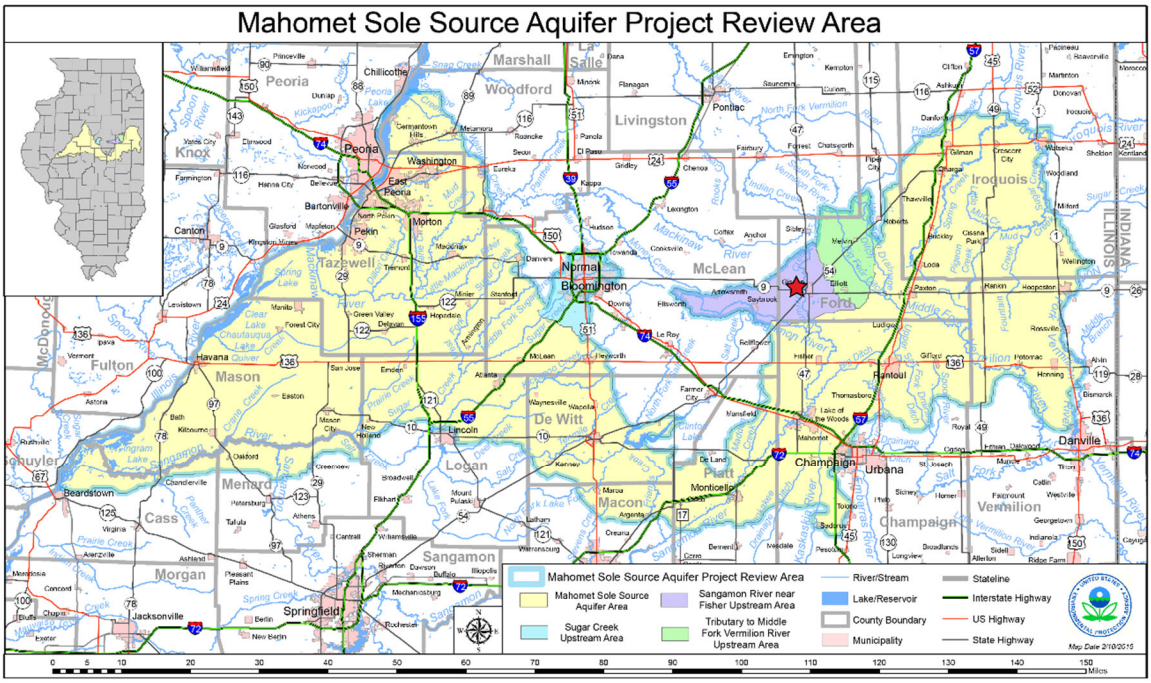

Figure 10. Location of One Earth Energy (red star) in relation to the Mahomet Sole source aquifer in yellow (source US EPA).

Drummer Creek, a tributary included in the Sangamon River state preserved area, flows southward along the west side of Gibson City before entering the Sangamon River. The West Branch of Drummer Creek passes approximately 1 to 1.25 mi (1.6-2.0 km) north-northwest of the proposed drilling area. No floodplains are indicated in the immediate vicinity of the West Branch, but older FEMA maps designate areas along the main Drummer Creek branch as being within the 100-year flood zone (FEMA). The potential for archaeological sites exists along both the main and West branches of Drummer Creek, generally within 1,000 ft (305 m) of the waterway (HARGIS). No

permanent wetlands exist in the near vicinity of the proposed drilling area, but ephemeral or intermittent hydrologic features, characterized by short periods of standing or flowing water during the growing season, are present (NWI) as a network of small, intermittently flowing streambed channels. A small PEM1Af wetland – a category of wetland that is present on farmed land and typically has surface water only briefly (generally two weeks or less) during the growing season – is present approximately 0.5 mi (0.8 km) north of the projected drilling area.

Groundwater

Water supply wells within the region are predominantly set in the shallow water-bearing sand and gravel deposits within the unconsolidated materials, which can vary in thickness from 100 feet to over 300 feet (30-90 m) due in large part to the influence of the Wisconsin Episode of glaciation. Typically, water supply wells are from about 90-170 ft (27-52 m) in depth and draw on a sand-and-gravel unit at about 100-150 ft (30-46 m) depth, beneath a veneer of topsoil and several clay layers. The nearest Community Water Supply wells are within the west boundary of Gibson City drawing from the shallow (<100 feet deep [30 m]) water-bearing deposits.

Existing Resource Development

The proposed site is within or near the erosional limit of several major coal seams, including the Danville, Herrin, Springfield, and Colchester Coals (Illinois State Geological Survey Ford County Coal Data | ISGS). There are no records of coal mining in Ford County and therefore no known active or abandoned slopes or shafts in the immediate vicinity of the proposed well site. However, coal mining has taken place in McLean County, which adjoins Ford County immediately to the west of the site.

Three inactive mines are located in Ford County within a 12-mile (19-km) radius of the proposed drilling site. The Colfax Coal Company mine (index 279) was located 24N 5E, section 3 in McLean County. It mined the Danville Coal at a depth of 387-400 ft (118-122 m) from 1888-1910. Just to the east, the Oleander Mining Company (index 2892) mined the Danville Coal at a depth of 400 ft (122 m) from 1894-1925. The Stewart Coal Company (index 6374) mined the Herrin Coal at a depth of 310 ft (94 m) in 24N 6E, section 5, from 1894-1895. All three mines are shown on Figure 11.

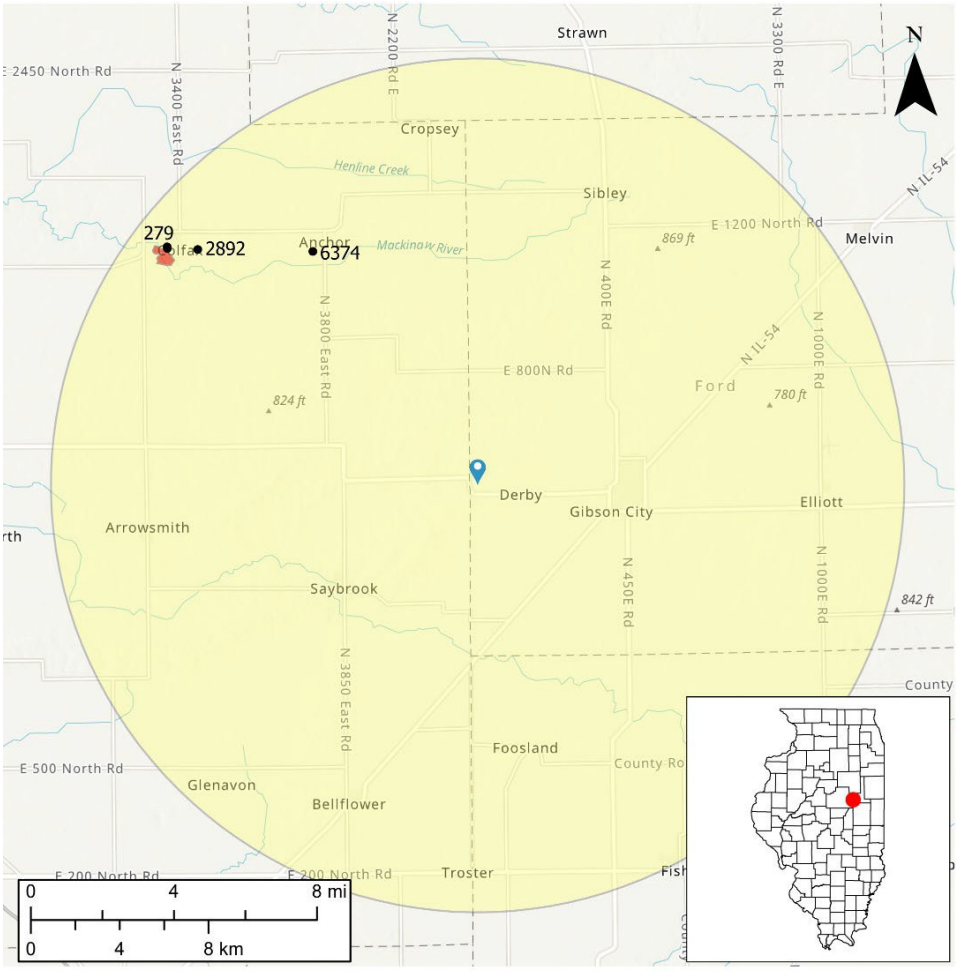

Figure 11. Map showing coal mines within 12-mile (19-km) diameter of the proposed site. Numbers shown are the index numbers used by the ISGS Coal Section to identify the mines.

Small clusters of currently or formerly producing oil and gas wells exist in the areas around the proposed site. These all produce or were completed in much shallower strata than the proposed Storage Complex. The Manlove Natural Gas Storage Field, about 12 miles (19 km) south of the One Earth Energy facility, injects methane into the Upper Mt. Simon. The Lexington Gas Storage Field approximately 25 miles (40 km) northwest of the OEE facility injects natural gas into the Upper Mt. Simon.

Deep Well Penetrations

The nearest wells to the proposed site that penetrate selected deep formations are listed in Table 1. The closest well that penetrates the Mt. Simon Storage Complex is the Erp #1 well approximately 3 mi (5 km) to the north. Regionally, there is only one well that penetrates the Lower Mt. Simon Sandstone (Hinton #7), about 15 mi (24 mi) south of the proposed One Earth storage location in the Manlove Natural Gas Storage Field. There are 178 Upper Mt. Simon penetrations currently on record (observation, gas injection, and saltwater disposal) associated with Manlove activities. All wells that penetrate the Eau Claire caprock within 20 mi (32 km) of the site are listed in Appendix A.

Table 1. Nearest wells to the proposed site which penetrate selected formations at total depth (TD).

API	Well Name	Latitude (DD)	Longitude (DD)	Distance (miles)	Total Depth (feet)	State	County	Penetration at TD
120530000100	Erp	40.5194000	-88.4501900	3	4250	IL	Ford	Eau Claire
120530009100	Peoples	40.4789300	-88.388230	3	883	IL	Ford	Maquoketa
120530000200	Stroh	40.5271200	-88.4529200	4	2225	IL	Ford	St. Peter
120190014600	Schuler	40.3767200	-88.4226500	6	1970	IL	Champaign	Knox
120190013000	Hinton, R S	40.340208	-88.422691	10	4203	IL	Champaign	Mt. Simon
120192399601	Hinton, B7	40.263803	-88.412651	15	6550	IL	Champaign	Argenta
121130097400	Elbert, V.	40.55915	-88.745134	17	3990	IL	McLean	Mt. Simon
120530008700	Fecht, W. J.	40.676484	-88.190479	20	2237	IL	Ford	Knox
120390039100	Lamb, J	40.223473	-88.701534	21	4933	IL	De Witt	Mt. Simon
121130074200	Pyne	40.626106	-88.836867	22	4002	IL	McLean	Mt. Simon
121050074200	Dodson	40.830636	-88.546868	25	3454	IL	Livingston	Mt. Simon
121130065600	Grimes	40.57	-88.94	27	4234	IL	McLean	Mt. Simon
121132294201	Furrow	40.6831500	-88.388230	29	5938	IL	McLean	Precambrian

DRILLING PROGNOSIS

The project well is expected to be drilled to a depth of ~6,800 ft (2,070 m). A generalized stratigraphic column is shown in Figure 12, while the measured depths and subsea elevations of prognosed formation tops expected to be encountered at the drill site are listed in Table 2, as based on regional structural correlation and/or nearest well data. (See also Figure 5 for a regional structural cross section from available deep well data, showing the deep stratigraphic trends in the Eau Claire and Mt. Simon.) A discussion of potential lost circulation zones that may be encountered during drilling is presented before a summary of the primary target reservoir and caprock.

Table 2. Formation tops for proposed drilling site, prognosed from structural correlation and nearby well data. Measured depth (MD) and subsea elevation (SS) are in feet. (See also the Lost Circulation Zone section of the report, below).

Formation	Measured Depth (feet)	Subsea elevation (feet)
Ground Level	0	842
Top of Bedrock (Pennsylvanian)	250	592
New Albany Shale	672	170
Maquoketa Shale	1,337	-495
Trenton Limestone	1,532	-690
St. Peter Sandstone	1,967	-1,125
Shakopee Dolomite (Knox)	2,232	-1,390
Potosi Dolomite	3,067	-2,225
Ironton-Galesville	3,482	-2,640
Eau Claire Formation	3,691	-2,849
Mount Simon Sandstone	4,222	-3,380
Precambrian	6,772	-5,945

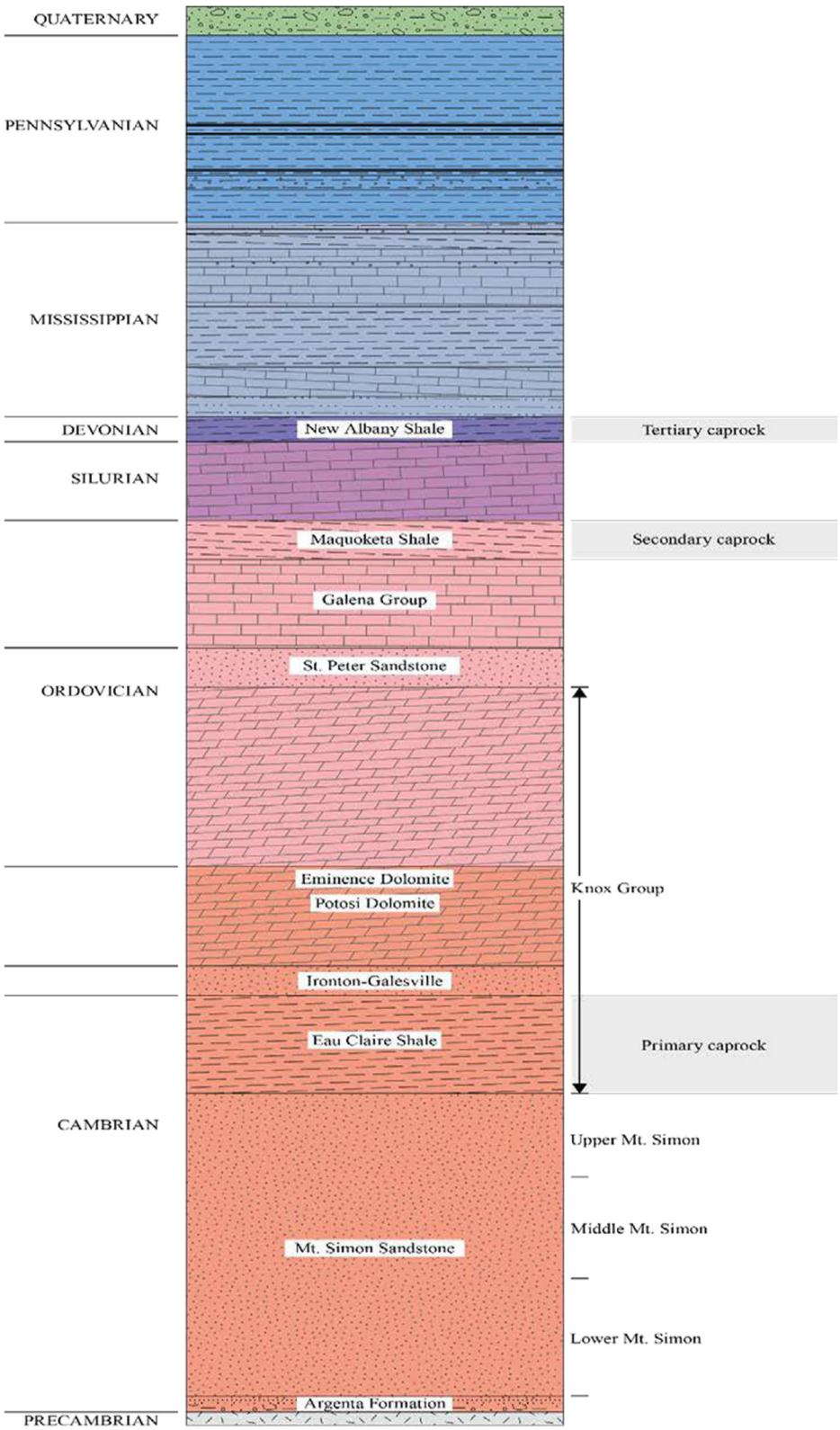

Figure 12. Generalized regional stratigraphic column.

Lost Circulation Zone

A zone of lost circulation might be encountered in the Potosi Dolomite, a formation within the larger Knox Megagroup. The Potosi is characterized by up to 7-ft (2.1-m) thick vuggy intervals, brecciated zones, and cavernous porosity that suggest a paleokarst environment (Freiburg and Leetaru, 2012), and may be a viable storage target as reservoir modeling in zones of cavernous porosity suggests that it could contain approximately 99 tons (90 million tonnes) of CO_2 from a single injection well (Will et al., 2014). Deep wells drilled throughout the Illinois Basin have demonstrated the Potosi's lost circulation zone and excellent reservoir properties:

- The cavernous porosity of the Potosi was encountered during drilling of both the Illinois Basin – Decatur Project (IBDP) and Illinois Industrial Carbon Capture and Storage (IL-ICCS) project wells in Macon County, IL: the considerable volume of lost drilling fluid forced well engineers to plug the zone with cement and drill through the plug.
- A deep waste disposal well (API 125110) was drilled at Newport Chemical Plant in Vermillion County, IN, in 1960, 900 ft (274 m) into the Mt. Simon. The lost circulation in the Knox and Potosi was predicted and encountered during drilling from 2,800 feet to 4,000 ft (853 to 1219 m). The zone was not considered for waste storage. Unlike at the Macon County IBDP and IL-ICCS wells, after several such zones were encountered, lost circulation was satisfactorily controlled by the addition of circulation materials directly to the drilling mud, albeit at added cost.
- A chemical waste disposal project at Tuscola, Douglas County, IL, has injected over 55 million tons (50 million tonnes) of CO_2 equivalent of liquid chemical waste into the Potosi through the Cabot-Tuscola #2 well (Leetaru, 2014).

Primary Target Reservoir and Caprock

The primary characterization target for this project is the Mt. Simon Sandstone (Figure 4), estimated to be from approximately 4,222 to 6,222 ft (1,287 to 1,896 m) deep (Table 2); we intend to drill completely through the Mt. Simon and Argenta and into the underlying Precambrian basement rocks in order to fully evaluate the reservoir quality of the Mt. Simon and to understand the controls of the basement on this quality. The Eau Claire Formation directly overlies the Mt. Simon and is the thickest primary sealing unit for the reservoir with an estimated depth of approximately 3,691 to 4,222 ft (1,125 to 1,287 m). Based on previous drilling experiences in the Illinois Basin, a significant zone of lost circulation is expected to be encountered in the Potosi Dolomite, of the Knox Megagroup, between 3,067 and 3,312 ft (935 to 1,009 m) in depth (Table 2), with potential minor lost circulation encountered throughout the Knox Megagroup dolomites. A detailed discussion of the regional geological setting of the drilling site location is provided in the Geologic Setting section.

DATA COLLECTION

The Project well will provide data to evaluate reservoir potential for long-term storage of CO_2 focusing mainly on the Cambrian Mt. Simon Sandstone and its primary and secondary sealing units. In addition, we will evaluate the well for the presence of hydrocarbons and drill into the Precambrian basement for general scientific knowledge about the deep Illinois Basin. Extensive data collection and testing will be performed using the well. Details of these investigations are provided below.

Coring and Sampling Program

Core will be taken from the Maquoketa Group (secondary seal, 60 ft.), the Eau Claire Formation (primary seal, +/-60 ft.) and contact with the Upper Mt. Simon Sandstone (potential reservoir, +/-60 ft.), and the Lower Mt. Simon Sandstone (potential reservoir target, up to 120 ft.). The coring intervals are preliminary projections subject to change. Rotary sidewall core will also be collected and determined based on full-core recovery and evaluation of geophysical logs. Well cuttings will also be available.

Proposed Logging Suite

An extensive suite of geophysical logs will be collected from the well bore immediately after drilling. They will be used to evaluate CO_2 storage potential, hydrocarbon potential, and general lithological and petrophysical characteristics of the sedimentary column (Table 3).

Intermediate Open Hole Logging Run: Surface Casing to TD

Table 3. Proposed logging suite for the Illinois Storage Corridor well in Ford County, IL

Logging Run	Logging Tools	Interval
Triple Combo	GR, Caliper, SP, Resistivity, Density, Neutron	Correlation, Porosity, Saturations, Hole Size, Resistive Anisotropy
Dipole Sonic	Sonic compressional and shear	Porosity, Mechanical Properties,
Formation Images	Formation Micro-Imager borehole images	Structure, Env. Deposition, Fractures
Magnetic Resonance	Magnetic Resonance	Porosity, free and bound fluids, Permeability
Elemental Spectroscopy	Elemental Capture Spectroscopy	Lithology
Natural Gamma Ray Spectroscopy	Spectral GR	Clay Minerals
Sidewall Cores	Sidewall Coring Tool	Porosity, Permeability
Temperature	Temperature Log	Geothermal Gradient

Well Testing Program

Following drilling the project team will analyze the drilling, coring and logging results to identify specific zones for well testing. If the Mt. Simon Sandstone, or other formations, do not indicate sufficient reservoir quality for CO_2 storage, testing may not be conducted.

The pre-drilling well testing plan is as follows:

- Reservoir Limit Test – Mt. Simon Sandstone. This test includes pumping from one or more intervals within the Mt. Simon Sandstone to establish broad reservoir characteristics and determine whether vertical and horizontal limits can be detected.
- Step rate tests – Step rate tests involve injection of water into the formation to determine parting pressures of strata and establish fracture gradients needed for guidelines for injection pressures during CO_2 storage and for geomechanical measurements. The tests will be performed in the Eau Claire and Mt. Simon formations.
- Vertical Interference Testing. The team will evaluate the potential for conducting vertical interference testing during the step rate tests in the Mt. Simon and Eau Claire formations. The performance and success of these tests depends on the vertical spacing of the intervals being tested, intervening lithologies, and wellbore integrity.

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APPENDICES

Appendix A

Locations and well information for wells within twenty miles of the proposed stratigraphic test well drill site which penetrate the Eau Claire or Mt. Simon formations.

Well API	Distance (mi)	Lease	Well No.	TD	Formation at TD	Well Category	Well Type	Status	Completed
1205300001	3.51	Erp	1	4250	Eau Claire	X			01/01/1940
1201900130	9.03	Hinton, R S	1	4203	Mt. Simon	GSTF	OBS		11/01/1959
1201900654	9.48	Ritchie, R S	1	4230	Mt. Simon	GSTF	OBS		09/21/1966
1201921626	10.93	Delaney, N	1	4272	Mt. Simon	GSTF	INJ		01/06/1975
1201900120	11.02	Lange, CC	1	4175	Mt. Simon	GSTF	INJ		12/16/1959
1201900119	11.24	Leischner, W	1	4200	Mt. Simon	GSTF	OBS		02/01/1960
1201922568	11.44	Sizer Trust	2	4252	Mt. Simon	GSTF	DA	PLG	10/28/1982
1201921972	11.48	Sloan, V	1	4218	Mt. Simon	GSTF	INJ		03/06/1978
1201921578	11.51	Nelson, C	3	4200	Mt. Simon	GSTF	INJ		11/12/1973
1201921703	11.64	Provine, W	1	4395	Mt. Simon	GSTF	INJ		08/29/1975
1201922398	11.67	Trippiedi, M	1	4272	Mt. Simon	GSTF	INJ		08/24/1979
1201922397	11.69	Sizer Trust	1	4250	Mt. Simon	GSTF	INJ		
1201921657	11.69	Leischner, W	5	4250	Mt. Simon	GSTF	INJ		07/09/1974
1201921997	11.69	Crooks, D	1	4235	Mt. Simon	GSTF	INJ		04/14/1978
1201922389	11.72	Sloan, V	2	4248	Mt. Simon	GSTF	INJD		07/01/1979
1201901447	11.83	Nelson, C	1	4182	Mt. Simon	GSTF	INJD		
1201900121	11.96	Buchan, M E	1	4232	Mt. Simon	GSTF	INJ		01/04/1960
1201921680	11.96	Wilkins, V	2	4215	Mt. Simon	GSTF	INJ		06/20/1975
1201901553	11.97	Nelson, C	2	4188	Mt. Simon	GSTF	INJ		06/27/1973
1201901280	11.99	Suttle, L	1	4300	Mt. Simon	GSTF	OBS		
1201900123	12.02	Weihmier, C G	1	4208	Mt. Simon	GSTF	INJ		01/26/1960
1201921612	12.10	Weihmier, C G	3	4286	Mt. Simon	GSTF	INJ		08/08/1974
1201922133	12.14	Rohling	1	4262	Mt. Simon	GSTF	INJ		09/05/1978
1201922067	12.16	Williams, C	9	4247	Mt. Simon	GSTF	INJ		08/07/1978
1201921901	12.19	Wilkins, V	4	4215	Mt. Simon	GSTF	INJ		10/28/1977
1201921964	12.22	Wilner, H	1	4200	Mt. Simon	GSTF	INJ		10/29/1977
1201901339	12.23	Hinton, A C etal	2	4182	Mt. Simon	GSTF	GSTG		09/07/1971
1201900264	12.23	Leischner	M1	4081	Mt. Simon	GSTF	OBS		01/06/1963
1201901395	12.33	Beasley, C	1	4180	Mt. Simon	GSTF	GSTG		
1201921701	12.41	Hanks, W	1	4325	Mt. Simon	GSTF	GSTG		08/01/1975
1201901456	12.44	Kroner, L J	4	4203	Mt. Simon	GSTF	GSTG		
1201901486	12.46	Wilkins, V	1	4180	Mt. Simon	GSTF	INJ		06/09/1973
1201901481	12.47	Stappenbeck, L	1	4170	Mt. Simon	GSTF	GSTG		05/27/1973
1201901448	12.49	Ponder, V	1	4190	Mt. Simon	GSTF	GSTG		
1201900214	12.60	Fee or Peoples Gas Light and Coke	4	4178	Mt. Simon	GSTF	GSTG		08/14/1972

Well API	Distance (mi)	Lease	Well No.	TD	Formation at TD	Well Category	Well Type	Status	Completed
1201922132	12.65	Kroner, L	6	4247	Mt. Simon	GSTF	INJ		10/07/1978
1201901337	12.67	Leischner, W	3	4160	Mt. Simon	GSTF	GSTG		
1201921900	12.67	Wilkins, V	3	4210	Mt. Simon	GSTF	INJ		08/20/1977
1201921851	12.68	Williams, C	8	4239	Mt. Simon	GSTF	INJ		08/30/1976
1201924140	12.81	Sommer, C	1	4366	Mt. Simon	GSTF	OBS		09/01/1994
1201901444	12.85	Beasley, C	2	4200	Mt. Simon	GSTF	GSTG		06/01/1972
1201921969	12.87	Bateman, L	1	4200	Mt. Simon	GSTF	INJ		11/28/1977
1201901377	12.90	Kroner, L J	5	4175	Mt. Simon	GSTF	GSTG		
1201900597	12.91	Buchan, J	2	4300	Mt. Simon	GSTF	OBS		
1201921998	12.92	Stappenbeck, L	2	4220	Mt. Simon	GSTF	INJ		05/19/1978
1201921733	12.92	Peoples Gas Light And Coke	5	4238	Mt. Simon	GSTF	INJ		11/19/1975
1201900265	12.95	Fee or Peoples Gas Light and Coke	3	3341	Eau Claire	GSTF	OBS		03/14/1963
1201900267	12.96	Fee or Peoples Gas Light and Coke	1	4093	Mt. Simon	GSTF	INJ		11/29/1962
1201901446	12.96	Webster, G	5	4166	Mt. Simon	GSTF	GSTG		
1201921855	12.98	Hinton, E	1	4248	Mt. Simon	GSTF	INJ		09/28/1976
1201900128	12.99	Webster, George	1	4100	Mt. Simon	GSTF	STRU		10/01/1959
1201900615	13.02	Williams, C	2	4500	Mt. Simon	GSTF	GSTG		
1201900284	13.11	Hunt, A G	4	4477	Mt. Simon	GSTF	GSTG		
1201921937	13.12	Mccord, L	1	4213	Mt. Simon	GSTF	INJ		11/20/1977
1201900623	13.13	Hinton, M E	2	4500	Mt. Simon	GSTF	GSTG		
1201901278	13.16	Liestman, A L	3	4348	Mt. Simon	GSTF	GSTG		
1201901338	13.20	Liestman, A L	1	4538	Mt. Simon	GSTF	GSTG		
1201900762	13.22	Williams, C	4	4504	Mt. Simon	GSTF	GSTG		
1201901375	13.24	Williams, C	5	4210	Mt. Simon	GSTF	GSTG		
1201901384	13.27	Foster, L Etal	2	4166	Mt. Simon	GSTF	GSTG		
1201900622	13.29	Stedem, F M	1	4490	Mt. Simon	GSTF	GSTG		
1201901544	13.33	Stedem, F M	3	4495	Mt. Simon	GSTF	GSTG		12/14/1972
1201900647	13.37	Hunt, A G	6	4500	Mt. Simon	GSTF	GSTG		
1201901340	13.39	Liestman, A L	2	4540	Mt. Simon	GSTF	GSTG		
1201901387	13.39	Jacobs, L F	2	4250	Mt. Simon	GSTF	GSTG		
1201922354	13.43	Mccord, L	3	4239	Mt. Simon	GSTF	INJ		06/01/1979
1201900689	13.45	Webster, G	4	4512	Mt. Simon	GSTF	GSTG		05/20/1967
1201901454	13.45	Hawkins, Z K	1	4174	Mt. Simon	GSTF	GSTG		
1201901555	13.46	Beard, H	2	4205	Mt. Simon	GSTF	INJ		10/06/1973
1201900766	13.47	Foster, L Etal	1	4507	Mt. Simon	GSTF	GSTG		10/11/1968
1201900283	13.48	Webster, G	3	4497	Mt. Simon	GSTF	GSTG		
1201901457	13.49	Williams, C	7	4170	Mt. Simon	GSTF	GSTG		
1201901341	13.52	Stedem, F M	2	4300	Mt. Simon	GSTF	Unk	PLG	
1201900285	13.58	Hunt, A G	5	4483	Mt. Simon	GSTF	GSTG		

Well API	Distance (mi)	Lease	Well No.	TD	Formation at TD	Well Category	Well Type	Status	Completed
1201921970	13.64	Mccord, L	2	4222	Mt. Simon	GSTF	INJ		
1201901545	13.65	Williams, J A	3	4155	Mt. Simon	GSTF	GSTG		12/02/1972
1201924142	13.65	Collins, A	4	4294	Mt. Simon	GSTF	GSTG		07/30/1994
1201924141	13.65	Collins, A	3	4338	Mt. Simon	GSTF	GSTG		07/08/1994
1201900286	13.66	Hinton, O	2	4520	Mt. Simon	GSTF	GSTG		
1201901277	13.67	Beard, H	1	4370	Mt. Simon	GSTF	GSTG		
1201900754	13.67	Collins, A W	1	4560	Mt. Simon	GSTF	GSTG		
1201901445	13.71	Collins, W L	2	4205	Mt. Simon	GSTF	GSTG		
1201900753	13.74	Williams, C	3	4522	Mt. Simon	GSTF	GSTG		
1201901321	13.77	Williams, C	6	4168	Mt. Simon	GSTF	GSTG		
1201921714	13.78	Bidner, O	2	4265	Mt. Simon	GSTF	INJ		10/19/1975
1201900621	13.80	Williams, C	1	4502	Mt. Simon	GSTF	GSTG		
1201901442	13.82	Williams, A C	3	4165	Mt. Simon	GSTF	GSTG		
1201900634	13.88	Williams, J A	1	4500	Mt. Simon	GSTF	GSTG		
1201924016	13.89	Williams, J	5	4509	Mt. Simon	GSTF	GSTG		10/01/1993
1201901378	13.89	Jacobs, L F	1	4235	Mt. Simon	GSTF	GSTG		
1201924018	13.90	Beard, H	4	4244	Mt. Simon	GSTF	GSTG		10/01/1993
1201924017	13.90	Beard, H	3	4430	Mt. Simon	GSTF	GSTG		10/01/1993
1201901376	13.90	Williams, A	1	4540	Mt. Simon	GSTF	GSTG		
1201901208	13.90	Bidner, O D	1	4550	Mt. Simon	GSTF	GSTG		
1201924070	13.91	Williams, A	7	4362	Mt. Simon	GSTF	GSTG		06/11/1994
1201924065	13.91	Williams, A	6	4375	Mt. Simon	GSTF	GSTG		05/17/1994
1201901292	13.92	Williams, A	2	4533	Mt. Simon	GSTF	GSTG		
1214720925	13.93	Bidner, O and L	1	4655	Mt. Simon	GSTF	OBS		10/30/1993
1201923910	13.93	Williams, A	5	4304	Mt. Simon	GSTF	GSTG		06/08/1993
1201923909	13.93	Williams, A	4	4381	Mt. Simon	GSTF	GSTG		06/08/1993
1201900658	13.94	Flessner, R	1	4530	Mt. Simon	GSTF	INJ		04/05/1967
1201923897	13.95	Collins, W	3	4435	Mt. Simon	GSTF	GSTG		12/15/1992
1201923898	13.95	Collins, W	4	4390	Mt. Simon	GSTF	GSTG		08/19/1992
1201901443	13.96	Collins, W L	1	4200	Mt. Simon	GSTF	GSTG		
1201923899	13.98	Williams, C	10	4484	Mt. Simon	GSTF	GSTG		06/09/1992
1201923900	13.98	Williams, C	11	4481	Mt. Simon	GSTF	GSTG		05/09/1992
1201923995	14.04	Hinton, P	2	4350	Mt. Simon	GSTF	GSTG		10/15/1993
1201923994	14.04	Hinton, P	1	4386	Mt. Simon	GSTF	GSTG		10/15/1993
1201900616	14.05	Hinton Brothers	3	4310	Mt. Simon	GSTF	GSTG		
1201901205	14.06	Hinton Brothers	6	4196	Mt. Simon	GSTF	GSTG		
1201921715	14.07	Binder, O	3	4260	Mt. Simon	GSTF	INJ		09/18/1975
1201924072	14.08	Hinton, P	4	4346	Mt. Simon	GSTF	GSTG		04/23/1994
1201924071	14.08	Hinton, P	3	4345	Mt. Simon	GSTF	GSTG		03/27/1994
1201923896	14.09	Williams, J	4	4357	Mt. Simon	GSTF	GSTG		07/14/1992
1201900281	14.09	Hinton Brothers	2	4514	Mt. Simon	GSTF	GSTG		
1201901449	14.11	Williams, J A	2	4159	Mt. Simon	GSTF	GSTG		
1201901290	14.13	Ruckman, G C	1	4376	Mt. Simon	GSTF	GSTG		
1201923895	14.13	Hawkins, Z	2	4396	Mt. Simon	GSTF	GSTG		10/20/1992

Well API	Distance (mi)	Lease	Well No.	TD	Formation at TD	Well Category	Well Type	Status	Completed
1201921978	14.14	Ruckman, G	2	4334	Mt. Simon	GSTF	INJ		11/06/1978
1201900604	14.15	Hinton, O	3	4310	Mt. Simon	GSTF	GSTG		12/07/1965
1201901458	14.16	Liestman, I E	1	4210	Mt. Simon	GSTF	INJ		
1201901441	14.17	Wisegarver, G E	3	4178	Mt. Simon	GSTF	GSTG		
1201901453	14.23	Hazen, F	3	4215	Mt. Simon	GSTF	GSTG		
1201900750	14.24	Mitchell, R P Etal	1	4528	Mt. Simon	GSTF	GSTG		
1201901207	14.28	Rapp, C	2	4212	Mt. Simon	GSTF	GSTG		
1201900751	14.28	Hinton Brothers	4	4520	Mt. Simon	GSTF	GSTG		
1201923996	14.32	Hinton Brothers	7	6550	Mt. Simon	GSTF	GSTG		
1201901181	14.36	Hinton Brothers	5	4525	Mt. Simon	GSTF	GSTG		
1201921717	14.40	Canny, K	1	4344	Mt. Simon	GSTF	INJ		12/23/1975
1201901279	14.44	James, R W	2	4560	Mt. Simon	GSTF	GSTG		
1201901459	14.46	Primmer, R	6	4217	Mt. Simon	GSTF	GSTG		
1201900686	14.47	Primmer, R	1	4556	Mt. Simon	GSTF	GSTG		
1201901293	14.47	Hazen, F	2	4359	Mt. Simon	GSTF	GSTG		
1201901342	14.53	Wisegarver, G E	2	4335	Mt. Simon	GSTF	GSTG		
1201900648	14.53	Buckles Brothers	1	4531	Mt. Simon	GSTF	GSTG		
1201901479	14.55	Buckles Brothers	3	4211	Mt. Simon	GSTF	GSTG		
1201921813	14.58	Kuhns, L	1	4312	Mt. Simon	GSTF	INJ		06/05/1976
1201900688	14.61	Howe, Stanley A	1	4530	Mt. Simon	GSTF	GSTG		
1201900763	14.67	Rapp, C	1	4520	Mt. Simon	GSTF	GSTG		
1201901264	14.68	Primmer, R	4	4300	Mt. Simon	GSTF	GSTG		
1201901502	14.69	James, W L	1	4195	Mt. Simon	GSTF	INJ		07/28/1973
1201921790	14.75	Wisegarver, G	4	4285	Mt. Simon	GSTF	INJ		05/09/1976
1201900752	14.76	Hazen, F	1	4560	Mt. Simon	GSTF	GSTG		
1201901312	14.80	Primmer, R	5	4235	Mt. Simon	GSTF	GSTG		
1201901185	14.80	Buckles Brothers	2	4550	Mt. Simon	GSTF	GSTG		
1201901206	14.88	Lester, B	1	4550	Mt. Simon	GSTF	GSTG		
1201900603	14.89	Estes, W	1	4250	Mt. Simon	GSTF			12/10/1965
1201900653	14.90	James, R W	1	4325	Mt. Simon	GSTF			10/28/1966
1201901501	14.95	Lester, B	2	4185	Mt. Simon	GSTF	INJ		07/27/1973
1201900764	14.96	Primmer, R	3	4570	Mt. Simon	GSTF	GSTG		
1201900765	14.99	Primmer, R	2	4560	Mt. Simon	GSTF	GSTG		
1201921888	15.07	Kamerer, F	1	4260	Mt. Simon	GSTF	INJ		07/21/1977
1201901298	15.10	Kroner, F L	1	4200	Mt. Simon	GSTF	GSTG		
1201901556	15.14	Lester, B	3	4253	Mt. Simon	GSTF	INJ		09/06/1973
1201921853	15.17	Lyons, B	1	4360	Mt. Simon	GSTF	INJ		09/12/1976
1201901543	15.19	Plunk, M	1	4257	Mt. Simon	GSTF	INJ		09/03/1973
1201921789	15.24	Springer, A D	1	4306	Mt. Simon	GSTF	INJ		06/08/1976
1201901415	15.25	Shride, H	1	4212	Mt. Simon	GSTF	GSTG		

Well API	Distance (mi)	Lease	Well No.	TD	Formation at TD	Well Category	Well Type	Status	Completed
1201901414	15.31	Kroner, J	1	4220	Mt. Simon	GSTF	GSTG		
1201922547	15.33	Kamerer, F	3	4254	Mt. Simon	GSTF	INJ		05/27/1981
1201924068	15.39	Lukens, L	1	4585	Mt. Simon	GSTF	OBS		10/05/1993
1201921720	15.42	Plunk, M	2	4351	Mt. Simon	GSTF	INJ		07/16/1976
1201901554	15.43	Schnelby, E	1	4240	Mt. Simon	GSTF	INJ		10/08/1973
1201922401	15.44	Bloom, M	1	4250	Mt. Simon	GSTF	INJ		
1201921814	15.47	Hazen, F	5	4202	Mt. Simon	GSTF	INJ		07/15/1976
1201921719	15.47	Clapper, K	1	4318	Mt. Simon	GSTF	INJ		02/06/1976
1201921620	15.52	Turner, D	1	4306	Mt. Simon	GSTF	INJ		11/12/1974
1201921615	15.56	Kroner, J	2	4280	Mt. Simon	GSTF	INJ		09/09/1974
1201922066	15.57	Kamerer, F	2	4268	Mt. Simon	GSTF	INJ		07/02/1978
1201921617	15.65	Hazen, F	4	4302	Mt. Simon	GSTF	INJ		10/14/1974
1201921889	15.73	Hazen, F	6	4306	Mt. Simon	GSTF	INJ		
1201922411	15.75	Kroner, L J	7	4276	Mt. Simon	GSTF	GSTG		10/15/1979
1201921718	15.78	Turner	2	4324	Mt. Simon	GSTF	INJ		11/28/1975
1201922548	15.80	Kamerer, F	4	4286	Mt. Simon	GSTF	INJ		06/29/1981
1201921852	15.86	Kroner, J	3	4300	Mt. Simon	GSTF	INJ		08/13/1976
1201922134	15.97	Young, L	1	4285	Mt. Simon	GSTF	INJ		
1201923689	16.05	Warner, F	1	4386	Mt. Simon	GSTF	OBS		11/13/1990
1201900590	16.13	Kroner, L J	3	4225	Mt. Simon	GSTF	INJ		10/07/1965
1201900687	16.69	Abbott, S P	1	4360	Mt. Simon	GSTF	OBS		
1201921716	17.24	Weinard, R	1	4406	Mt. Simon	GSTF	INJ		10/04/1975
1211300747	19.43	Smith, J D	1	4125	Mt. Simon	GSTF	OBS		11/13/1969