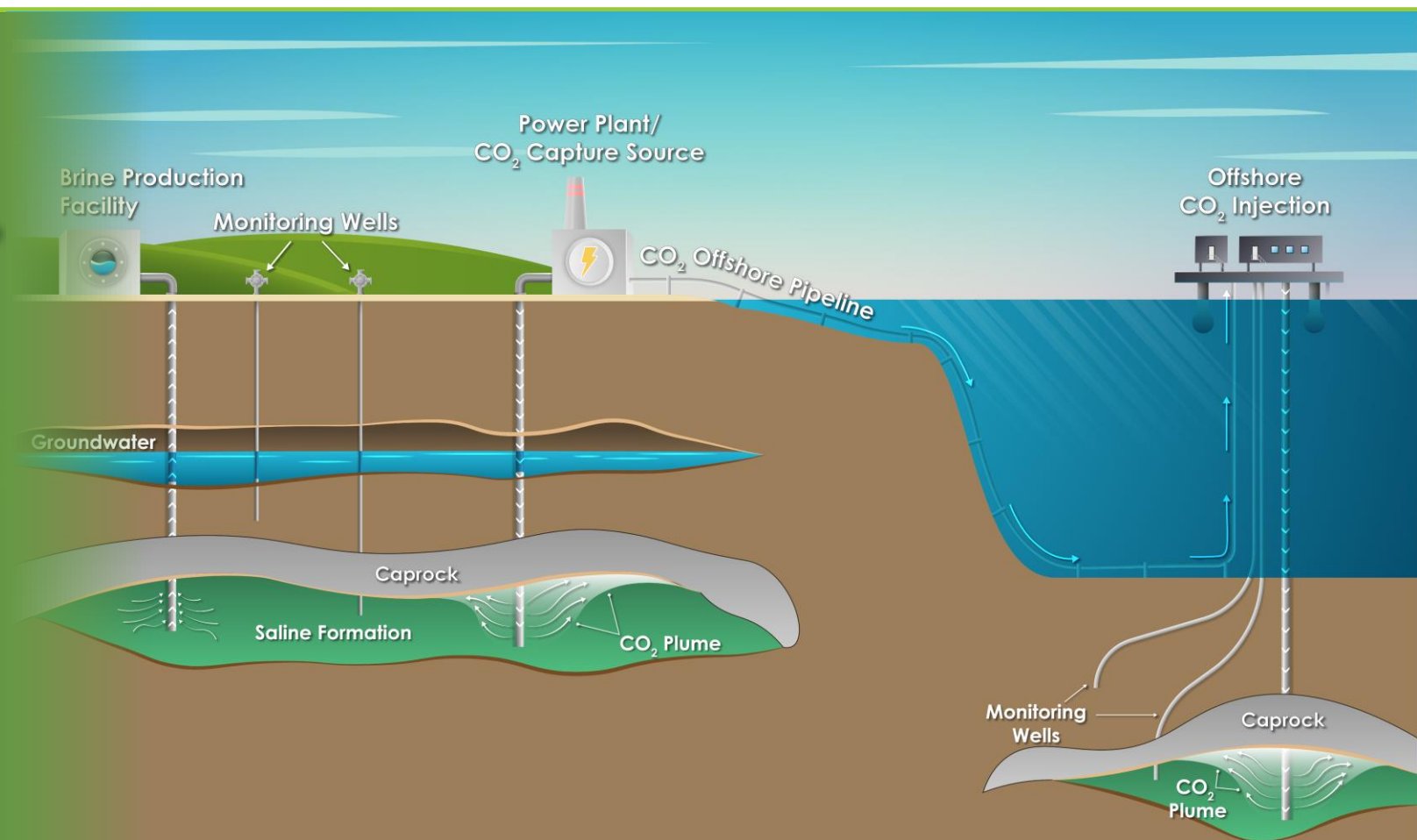
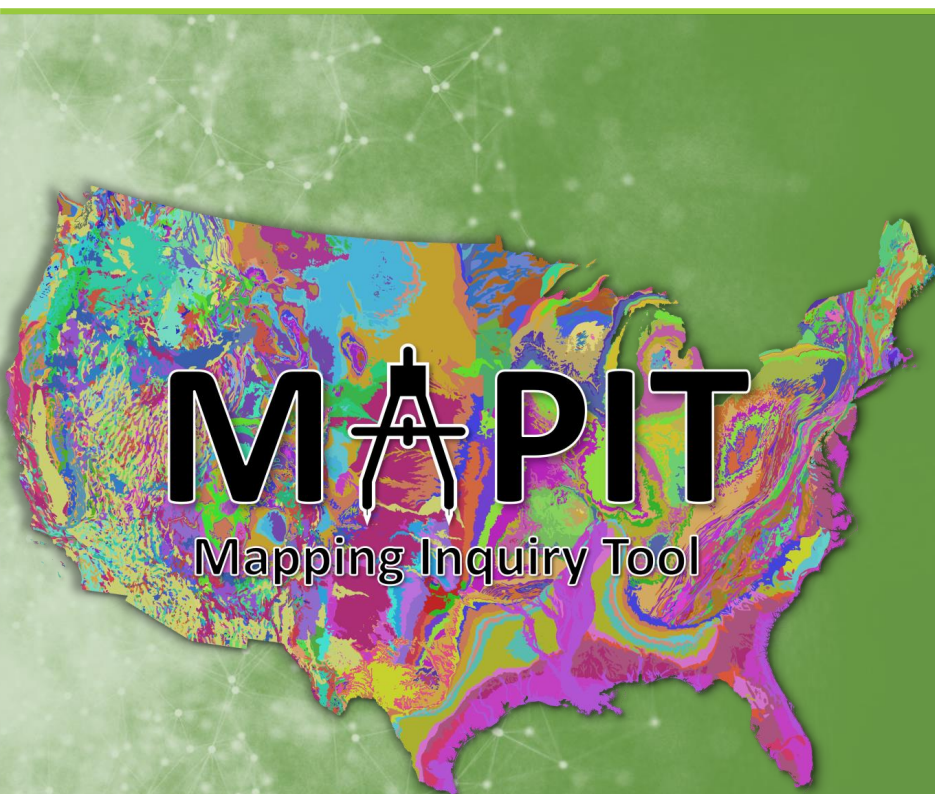


Carbon Storage Site Mapping Inquiry Tool (MapIT)



Cat Schooley

Geospatial Research Scientist



NETL/FECM Carbon Management Review Meeting

Aug. 5, 2024

Disclaimer



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*Catherine Schooley^{1,2}; Scott Pantaleone^{1,2}; Jacob Shay^{1,2}; Brian Strazisar³; Jennifer Bauer¹;
Paige Morkner¹*

¹National Energy Technology Laboratory, 1450 Queen Avenue SW, Albany, OR 97321

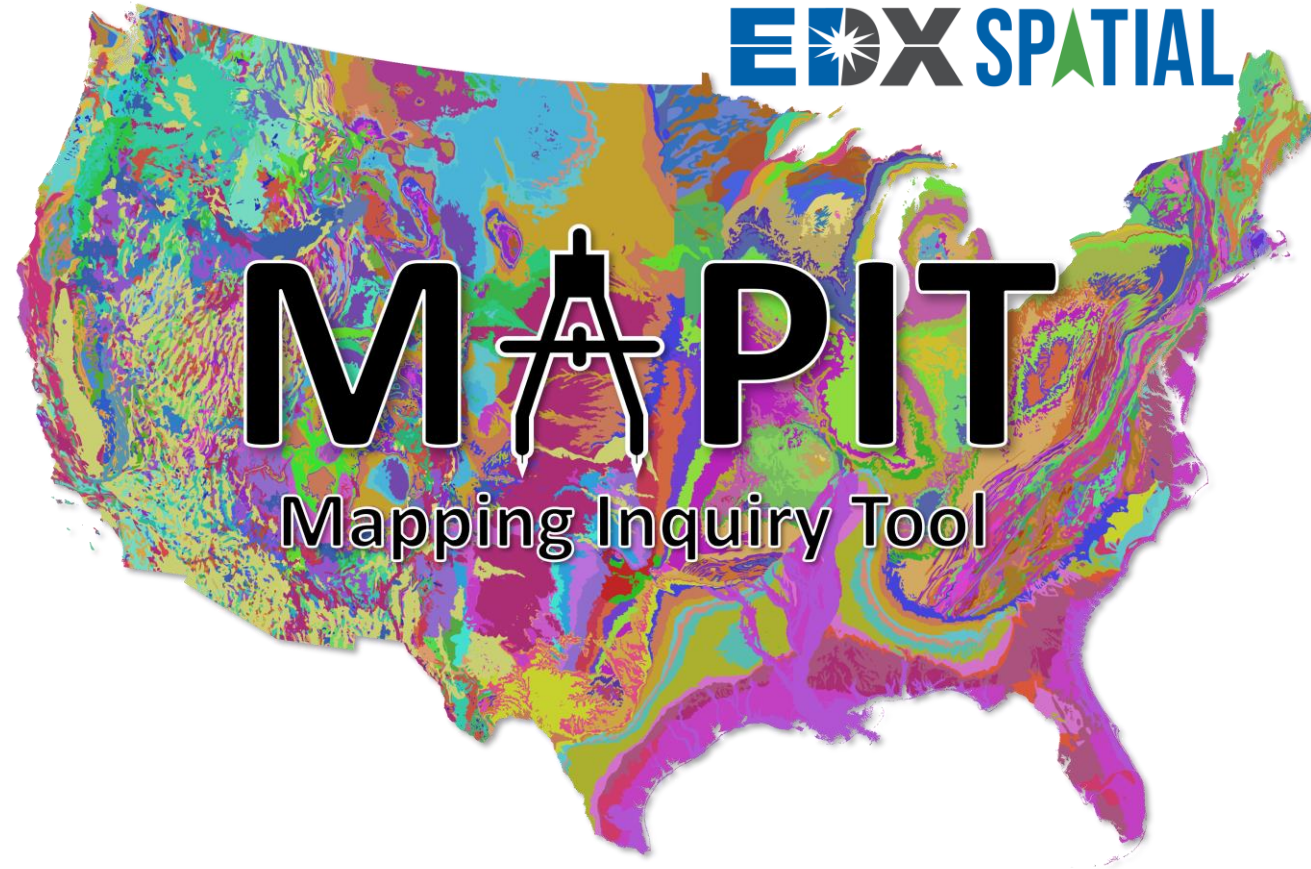
²NETL Support Contractor, 1450 Queen Avenue SW, Albany, OR 97321

³National Energy Technology Laboratory, 626 Cochran Mill Road, Pittsburgh, PA 15236, USA

MapIT Serves as a Powerful, Comprehensive Data Exploration Tool for Diverse Stakeholders

Challenge: Increasing CCS deployment in coming years will require application for Class VI permitting with the U.S. EPA or state regulators to drill injection wells, which requires **vast amounts of data**.

Objective: Develop **comprehensive, user-friendly tool** that provides a way for **regulators, industry, researchers, and other stakeholders** to **find, query, and download** relevant data related to carbon storage projects



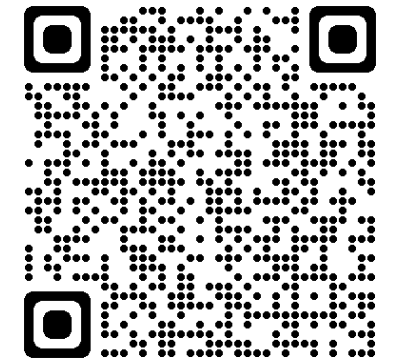
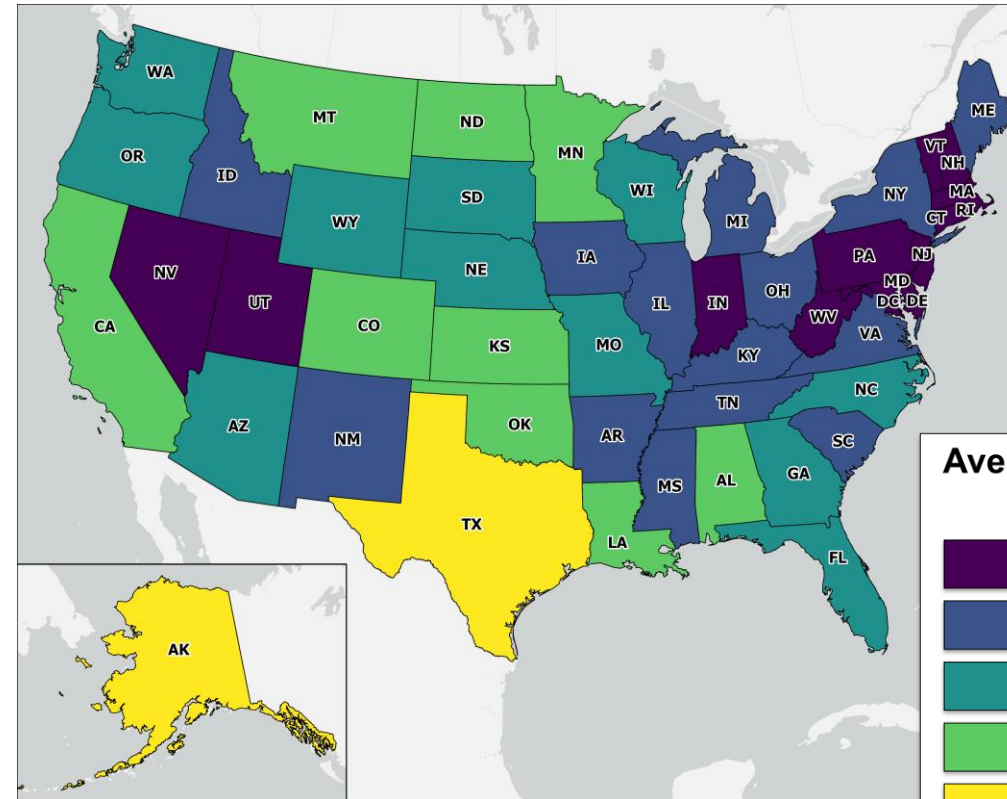
CCS - Carbon capture and storage
EPA - U.S. Environmental Protection Agency

Building a Data Catalog and Database was the First Step in Creating this Powerful Data Exploration Tool

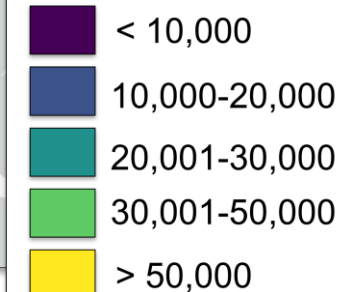
- Data needs were determined through a **review of the U.S. EPA Class VI Permit Guidance**
- Data sources were chosen based on **authority, completeness, and credibility**
- Data Catalog consists of over **600 data resources** with description and **links to original data sources**
 - Database published on **EDX**
 - Data were integrated into **MapIT**



<https://edx.netl.doe.gov/dataset/mapit-database>



Average Number of Individual Features



Data Catalog and Tool are Organized into Groups for Improved Comprehensibility and Exploration

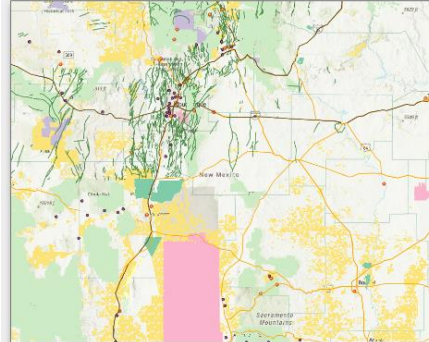


Categories	Data Examples	Authoritative Data Sources
General	Roads, Wells, Environmental and Social Justice, Boundaries	U.S. Department of Energy, U.S. Census Bureau
Geologic Narrative	Depth, Salinity, Pressure	National Energy Technology Lab (NETL)
Faults and Fractures	Faults, Fractures, Geologic Structure	U.S. Geologic Survey (USGS), States
Injection and Confining Zones	Depth to Top, Geologic Contours	USGS, States
Hydrology	Aquifers, Surface Hydrology, Water Wells	USGS, States
Geomechanical and Petrophysical	Well Locations, Well Logs, Well Density	NETL, States
Baseline Geochemical	Sample Locations	USGS

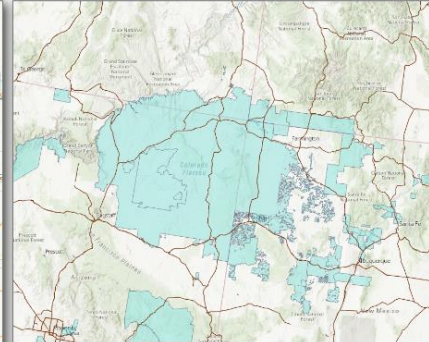
Each Module within MapIT has its own Page to Improve Utility and Increase Accessibility

- Module themes were adapted from the **Class VI Underground Injection Control (UIC)** program documentation
- Breaks data up into **logical categories**
- Improves performance

How To Documentation



All Data



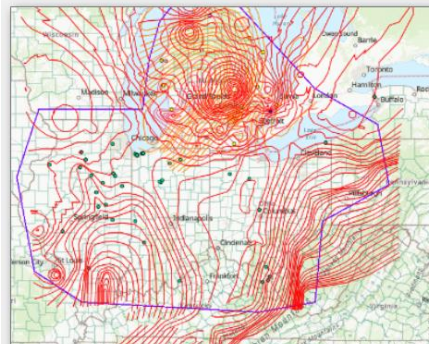
General Map



Geologic Narrative/Site Characterization
Maps and Cross Sections of the AoR and
Region



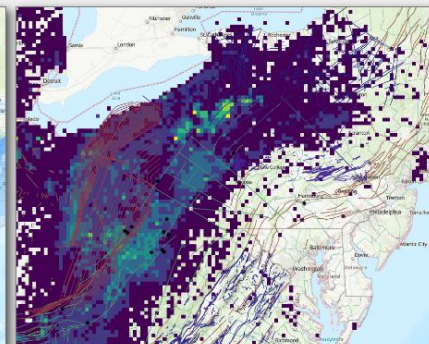
Information on Faults and Fractures



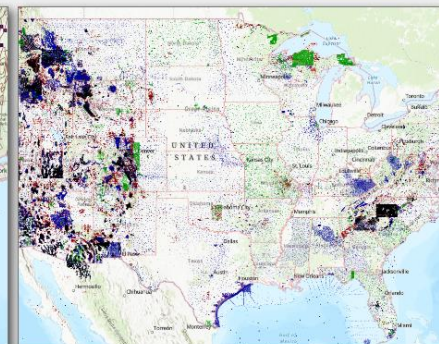
Data on the Injection and Confining
Zones



Hydrologic Information/Maps and Cross
Sections of USDWs



Geomechanical and Petrophysical
Information about the Confining Zone



Baseline Geochemical Data

Standardized Layout Across Sections Creates a User-Friendly Experience that is Easy to Navigate

The screenshot displays the NETL Energy Data eXchange (EDX) Mapping Inquiry Tool (MapIT) interface. The main map area shows a map of the United States with various geographical features and city labels. Overlaid on the map are several callout boxes highlighting key interface elements:

- About:** A green-bordered box on the left side of the map, containing text about the tool's purpose and data sources.
- Map:** A blue-bordered box in the center of the map, highlighting the main map area.
- Near Me:** An orange-bordered box at the bottom left, containing a search bar and a slider for finding locations near the user.
- Legend and Additional Data:** A red-bordered box on the right side, containing a legend and a list of additional data layers.
- Data Search and Filter:** A pink-bordered box on the right side, containing a search bar and a filter dropdown menu.
- Export:** A purple-bordered box at the bottom right, containing a form for exporting the map data.

The Near Me Widget is a Powerful Tool that Allows you to Explore Data within your Area of Interest


The screenshot displays the NETL General Map interface. On the left, the 'Near Me' widget is highlighted with an orange border. It contains a search bar with the text '74633, Burbank, Oklahoma' and a 'Show results within 5 Miles' slider. Below the search bar, a list of data categories is shown with counts: Public Oil and Gas Wells (100), Local Roads (100), Secondary Roads (4), and Tribally-Controlled Lands (1). An orange arrow labeled '1' points to the search bar, and another orange arrow labeled '2' points to a search result on the map. The map itself shows a topographic view of the area around Burbank, Oklahoma, with a yellow circle indicating the search area. A pop-up window for the searched location '74633, Burbank, Oklahoma' is visible. On the right side of the interface, there are panels for 'CarbonSAFE Projects', 'Coal Mines', 'Sand and Gravel Operations', 'Crushed Stone Operations', 'Filter', 'USA Structures', 'Public Oil and Gas Wells', 'Export Map', 'Export Report', and 'Extract Data'. The bottom of the map shows the Esri logo and a list of data sources: Esri, NASA, NGA, USGS, Esri, HERE, Garmin, SafeGraph, GeoTech...

1

2

All queryable data within search area

Custom Widgets Connect Users with Additional USGS Resources – PDFs, Seismic Data, etc.



Mineral Resources / Online Spatial Data

Scientific data near [38.63765,-121.71683]

Search area extends approximately 22.3 km east-west and 28.5 km north-south.

Geographic context

- Counties, states, countries, con
- Yolo
- California
- United States
- North America
- Land
- Map quadrangles, from USGS
- Grays Bend
- Sacramento

Geology of US states

Airborne geophysical surveys

Estimates of undiscovered mineral resources

The continental crust

National geochemical survey database



Geochemistry of stream sediments in the US from the NURE-HSSR database

USGSPubConnect Filter

Please click on the map to load new data from USGS:

A new window will open showing any USGS data near your chosen location.
The latitude and longitude for that point will display below:

Latitude:
Longitude:



Custom Widgets Connect Users with Additional USGS Resources – Earthquakes

USGS

Search Results

41 earthquakes.

☐ Only List Earthquakes Shown on Map

Format: Magnitude | Sort: Newest First

2.5	17 km E of Mineral, CA	2024-06-24 15:51:12 (UTC)	5.3 km
3.3	7 km WNW of Cobb, CA	2024-06-24 12:22:23 (UTC)	2.0 km
2.9	5 km WNW of Walker, CA	2024-06-24 11:51:04 (UTC)	4.1 km
3.6	5 km WSW of Laytonville, CA	2024-06-23 11:38:47 (UTC)	2.2 km
2.5	17 km WSW of Schurz, Nevada	2024-06-23 05:59:21 (UTC)	12.6 km
2.8	17 km ESE of Willows, CA	2024-06-23 04:35:00 (UTC)	24.2 km

Map showing earthquake locations in California. A red line indicates the San Andreas Fault. A modal window is open with the following text:

USGSPubConnect USGSQuakeConnect Filter

Please draw a rectangle on the map to load earthquake data from the USGS Earthquake Catalog website:

A new window will open showing earthquake data over 2.5 magnitude within the past 60 days within your drawn extent.

This can be adjusted in the USGS website that opens.

The extent latitude and longitude will display below:

North:
East:
South:
West:

Buttons: [Black square] [Red trash can]

Scale: 30 km / 20 mi

Coordinates: 40.756°N : 120.075°W

Leaflet | Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


Three Export Options allow Users to Create Maps, Reports, and Extract Data

- **Data export** allows for users to **perform further analysis** in **their own systems**
- **Maps and reports** can be used to showcase project plans and **supports developing narratives** for an area of interest

Export Map

Export Report

Extract Data

 Extract Data

1 Layers to extract

☐ Public Oil and Gas Wells
☐ Coal Mines
☐ Sand and Gravel Operations
☐ Crushed Stone Operations
☐ Prospect and Mine-Related Points - 24k scale

2 Study area

Same as Display

☒ Select features
☐ Clip features

3 Output data format

CSV

4 Output file name

Extract Data Sep 19, 2023, 3:25:53 PM

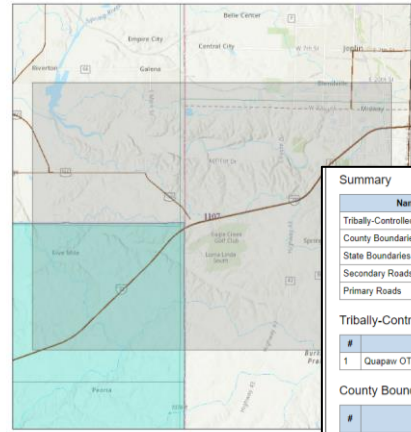
Save result in

☒ Use current

Run Anal

Area of Interest (AOI) Information

Area: 3,139,081,745.62 ft²
Sep 19 2023 15:25:37 Pacific Daylight Time



Export Map

Export Report

Extract Data

Map title:

ArcGIS Web Map

Layout:

Letter ANSI A Landscape

Format:

PDF

Advanced

Print

Report includes map and tables

Summary

Name	Count	Area(ft ²)	Length(ft)
Tribally-Controlled Lands	1	631,823,248.95	N/A
County Boundaries	4	3,139,081,624.36	N/A
State Boundaries	3	3,139,081,785.10	N/A
Secondary Roads	7	N/A	74,903.41
Primary Roads	8	N/A	252,087.03

Tribally-Controlled Lands

#	NAME	Area(ft ²)
1	Quapaw OTSA	631,823,248.95

County Boundaries

#	Name	State	2020 Total Population Estimate	Area(ft ²)
1	Newton County	Missouri	58648	1,716,150,985.50
2	Cherokee County	Kansas	19362	692,905,768.17
3	Ottawa County	Oklahoma	30285	602,519,443.37
4	Jasper County	Missouri	122761	127,105,427.31

State Boundaries

#	State	2020 Population Estimate	Area(ft ²)
1	Missouri	6154913	1,807,537,793.99
2	Kansas	2937880	699,706,150.50
3	Oklahoma	3959353	631,837,840.61

Secondary Roads

#	Name	MAF/TIGER Feature Class Code	Length(ft)
1	US Hwy 400	S1200	37,597.94
2	US Hwy 166	S1200	32,415.34
3	I-44 Lp	S1200	4,890.12

Primary Roads

#	Name	MAF/TIGER Feature Class Code	Length(ft)
1	I-44	S1100	155,506.34
2	Will Rogers Tpke	S1100	68,910.58
3	State Hwy 43	S1100	27,670.12

The Census V Mapping Inquiry Tool (CMI) was funded by the United States Department of Energy, National Energy Technology Laboratory, in part, through a site support contract. Neither the United States Government nor any agency thereof, nor any of their employees, nor the support contractor, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

U.S. DEPARTMENT OF
ENERGY

12

MapIT Helps Solve Data Accessibility, Availability, and Utility Challenges

Value to Stakeholders:

- **Aggregates disparate data** into a single, intuitive location
- **Enhances data discovery and data sharing**
- Directly **links users to original data sources**
- **Dynamic datasets** ensure the most recent data is available
- Enables users to **find, query, and export data**



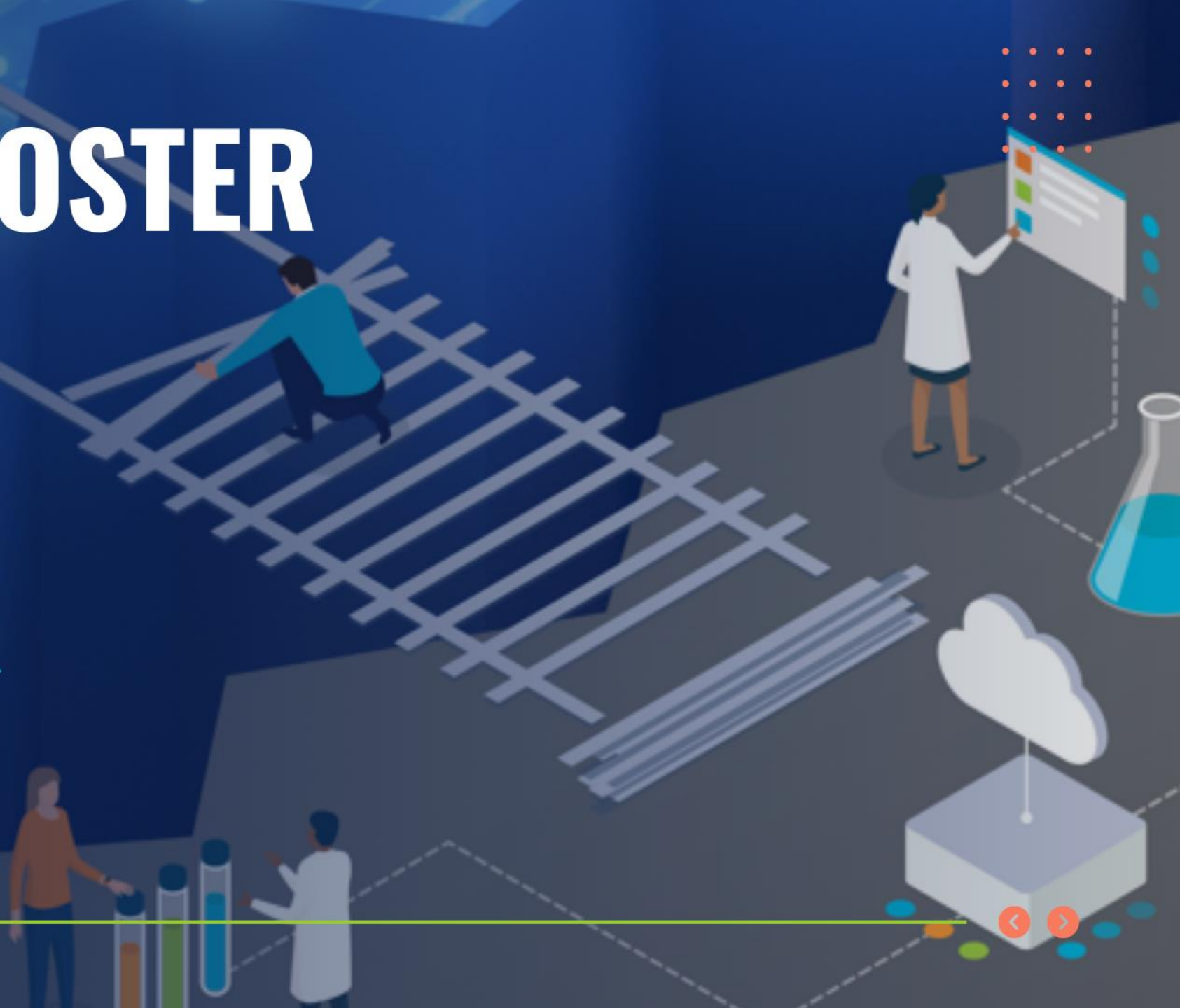
DEMO & POSTER SESSION

TUESDAY, AUGUST 6, 2024
5:45 PM - 7:45PM
BALLROOM GALLERY

Carbon Storage Site
Mapping Inquiry Tool
(MapIT)



CARBON TRANSPORT & STORAGE DATA AND
INNOVATION TO BRIDGE THE DIGITAL DIVIDE



Acknowledgments



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CONTACT:

Cat Schooley, catherine.schooley@netl.doe.gov

Paige Morkner, paige.morkner@netl.doe.gov

