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# Scope

This document provides a catalog listing of the accessible data compiled by the Utah CUSP team for the purposes of accelerating CCUS in Utah and the Western USA. The catalog of data covers many of the technical and non-technical tasks that the Utah team has undertaken to achieve the objectives of the CUSP project. The purpose of this catalog is not to necessarily list specific data, but rather the sources of data needed for individual states to address the CUSP objectives. These significant data sources are:

# Data Access

All data presented in this catalog is accessible via online access points (URLs), with the specific URL link(s) listed next to the pertinent data. Many of the data sources are freely available sites and domains, representing the original, unaltered data used for aspects of the CUSP project.

# State of Utah - Catalog of Accessible Information (Data) and Resources

## Regulatory Data

Federal, state, and local regulatory / legal / legislative issues (barriers) that may hinder project deployment are identified and assessed. These issues include UIC regulations, air quality regulations, water quality regulations, leasing rules for federal or state-owned pore space, leasing rules for surface rights and protocols for securing rights-of-way for any necessary CO2 transport infrastructure for the range of private and government-owned land parcels in the storage complex. Strategies to address the regulatory / legal / legislative barriers will be developed.

#### EPA Class VI Rules and Requirements

The primary regulatory issue related to commercial-scale CCS is the EPA Class VI rule. The project assessed requirements for the injection and storage of CO2 underground, including regulatory requirements under the Safe Drinking Water Act.

Table 1. EPA Class VI documents used by project to evaluate regulatory requirements of CO2 injection/storage complex.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| EPA Class VI Guidance Documents (all) | Final Class VI guidance documents, including:   * Implementation Manual for UIC Program Directors * Well Plugging, Post-Injection Site Care, and Site Closure Guidance * Well Plugging, Post-Injection Site Care, and Site Closure Guidance for Owners and Operators * Reporting, Record-keeping and Data Management Guidance for Owners or Operators * Primacy Manual for State Directors * Well Site Characterization Guidance * Area of Review Evaluation and Corrective Action Guidance * Well Testing and Monitoring Guidance * Project Plan Development Guidance * Well Construction Guidance (PDF) * Financial Responsibility Requirements and Guidance * Experimental Technology Well Classification for Pilot Geologic Sequestration Projects | <https://www.epa.gov/uic/final-class-vi-guidance-documents> |
| Area of Review (AoR) Evaluation and Corrective Action Guidance | Summary document prepared by Candace Cady that synthesizes EPA’s UIC Class VI Well Area of Review Evaluation and Corrective Action Guidance documentation. | https://drive.google.com/drive/folders/1y8yM6E8ghMywHdqqvYnrGnBIxXk8b62m |
| Site Characterization Guidance | Summary document prepared by Candace Cady that synthesizes EPA’s UIC Class VI Well Site Characterization guidance documentation. | https://drive.google.com/drive/folders/1y8yM6E8ghMywHdqqvYnrGnBIxXk8b62m |
| Class VI Requirement Matrix | An Excel Spreadsheet containing the line-by-line regulatory requirements of the EPA UIC Class VI rule. | https://docs.google.com/spreadsheets/d/1aldv1TQ-53flM9zC9friZLbJk9OFQ8L9p-d2dfgYRFI/edit#gid=1068589796 |

##### Data Quality & Gaps

The state of Utah does not have primacy on Underground Injection Control (UIC) standards and regulations. Utah defers to EPA Region 8. There are currently no plans to have Utah petition the EPA for UIC primacy.

#### Rights-of-Way

The project is assessing requirements for transport of CO2 from the generation site (power plant) to the injection site(s), either utilizing existing rights-of-way or new ones. A number of general regulatory requirements applicable to CO2 pipelines have been identified.

Table 2. Documents related to applying/obtaining Right-of-Way on Federal lands.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Obtaining a Right-of-Way on Public Lands | General information pertaining to applying for Federal Rights-of-Way access | https://www.blm.gov/sites/blm.gov/files/ObtainingaROWPamphlet\_0.pdf |
| Rights-Of-Way Under the Federal Land Policy Management Act (FLPMA) | Detailed information pertaining to applying for Federal Rights-of-Way access | https://www.gpo.gov/fdsys/granule/CFR-2011-title43-vol2/CFR-2011-title43-vol2-part2800 |
| Application for Transportation and Utility Systems and Facilities on Federal Lands | Application for any CO2 or related system(s) on Federal lands. | https://www.gsa.gov/forms-library/application-transportation-and-utility-systems-and-facilities-federal-lands |
| Utah Utility Accommodation | Utah Administrative code for Rights of Way and Easements. | https://rules.utah.gov/publicat/code/r930/r930-007.htm |

##### Data Quality & Gaps

Regulations concerning rights of way and easements in Utah are generally determined by surface landowner. Federal land ownership is primarily handled by the BLM, whereas state and private land ROWs are administered by the Utah Department of Transportation. **However, specifics concerning pipeline ROW across multiple surface landowners is not well-constrained and needs to be addressed for CCUS planning.**

#### Pore Space & Land Ownership

The project is assessing property law constraints according to pore ownership rules for mineral rights. As of this writing, pore space ownership is linked to surface ownership. Evaluation of the land ownership in the project area was undertaken using GIS maps, shapefiles and geodatabases.

Table 3. GIS map files (shapefiles and geodatabase files) of Utah land ownership.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Utah Statewide Land Ownership | state of Utah Land Ownership GIS Data Layer showing ownership of:   * Private * State * Federal * Tribal | https://gis.utah.gov/data/cadastre/land-ownership/ |

##### Data Quality & Gaps

Land ownership in Utah is reasonably straightforward, separated by federal, state, tribal, local/county and private ownership. Statewide maps and county level parcel databases are maintained to give the user access to very specific ownership details. **The uncertainty is how surface landownership is transferred to subsurface mineral and pore space ownership rights. Where federal land is concerned, surface ownership applies to the mineral/pore space as well. There is precedent to that application of private ownership to mineral rights, but pore space rights are less certain. This aspect of ownership needs more consideration.**

## Economics

This section will identify state incentives/policies that impact project economics (long-term liability, tax incentives, rate base recovery, etc.) and public acceptance (e.g., relation to State Implementation Plans under Clean Power Plan).The team will also identify, quantify and document potential sources of revenue, and develop a sub-plan for obtaining off-take agreements for any major products (power, chemicals, CO2 for enhanced oil recovery as a component of stacked storage, etc.).

Table 4. Files and data associated with the Economic assessment of CCUS in Utah.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| SCO2T dataset | Site cost estimates. | https://drive.google.com/drive/u/0/folders/1TYVfxucWOuLRbIOL13Ql2JWx1sqPmNBi |

##### Data Quality & Gaps

**The economics of CO2 capture are superficially considered by EPA FLIGHT and IEA and other open access databases. However, CO2 capture costs can be inaccurate and as such, they will be addressed in other sections. Other economic data will likely also play a role in the feasibility of and progress toward CCUS in Utah. These may include, but are not limited to: economic health, governmental incentives, cost of electricity, existing infrastructure, labor pool, CO2 transport costs, liability coverage, etc. These additional economic drivers need to be investigated in more detail**

## Liability

The liability requirements associated with statutory and regulatory provisions are being identified and assessed. These include potential liability for violations of the Safe Drinking Water Act (UIC regulations; see Subtask 2.1), the need for state or federal programs, like the Price-Anderson Act (e.g. civilian nuclear facilities), that create pools to cover remediation costs should long-term GCS facilities leak and analysis of insurance markets.

Table 5. Documents related to CCS/CCUS liability requirements.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Report on Utah CarbonSAFE project | Subsection of Utah CarbonSAFE final report with language pertaining to future liability of CCUS projects in Utah | https://docs.google.com/document/d/1TiVTJRhtTpMaSV1g8mVy9AA4YkjycQHm/edit?usp=drive\_web&ouid=113818715297984792574&rtpof=true |

##### Data Quality & Gaps

**Short-term and long-term liability coverage of CO2 capture, transport and storage need to be addressed within the state of Utah.**

## Public & Stakeholder Outreach

A four-step process is being utilized to address concerns and facilitate public acceptance: (1) identify stakeholders with a potential interest in the project or area, (2) identify potential benefits and concerns for each stakeholder group, (3) develop strategies to maximize benefits and mitigate identified concerns, and develop strategies to facilitate stakeholder acceptance. Aninitial Public Outreach and Education effort will be undertaken to gauge public acceptability of an Integrated CCS Project. In response to data gathered from Initial Outreach Efforts an Extended Public Outreach and Education strategy will be developed.

Table 6. CCUS Outreach in Utah

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Utah Geological Survey - Survey Notes | A general interest overview of CCUS in Utah | https://geology.utah.gov/press-release-utah-geological-survey-in-partnership-to-research-underground-storage-of-carbon-dioxide/ |
| Utah Climate Action Network | partnership between government, research institutions, non-profits/foundations, faith-based organizations, the private sector, and individuals working to address climate change in Utah | https://utahclimateactionnetwork.com |

##### Data Quality & Gaps

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## Spatial Data

#### GIS Files

The Utah team will generate versions of GIS-based maps for geological interpretation, land ownership, environmental conditions, pipeline RoWs, etc. The majority of GIS data has been obtained through the Utah Mapping Portal. The specific GIS shapefiles/geodatabases are:

Table 7. GIS files for state of Utah project work.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Geological Maps | Various geological maps and features, including formations, faults and aquifers. | https://gis.utah.gov/data/geoscience/ |
| Roads | Statewide road and highway system data for cartography and address location. Includes local streets, mileposts, and numbered exit data | https://gis.utah.gov/data/transportation/ |
| Topographic Maps | USGS Scanned Topographic Maps of varying resolutions (1:24K, 1:100K, 1:250K, 1:500K) | https://gis.utah.gov/data/usgs-scanned-topographic-maps/ |
| Utilities Overview | Utility locations, including electrical transmission lines for RoW assessements | https://gis.utah.gov/data/utilities/ |
| Water Data | Aquifers, rivers, lakes and other water bodies. | https://gis.utah.gov/data/water/ |
| Cadastral Data | Land Parcels data, PLSS / GCDB data, Land Ownership | https://gis.utah.gov/data/cadastre/ |
| Energy Overview | Electrical Energy generation (coal power plants and outputs) and oil/gas wells and fields. | https://gis.utah.gov/data/energy/ |
| Elevation and Terrain Data | Digital Elevation Models (DEM) | https://gis.utah.gov/data/elevation-and-terrain/ |
| Boundary Data | Utah city (municipal), county, and state boundaries | https://gis.utah.gov/data/boundaries/ |
| Aerial/Satellite Photography | High resolution orthophotography | https://gis.utah.gov/data/aerial-photography/ |
| Greater Sage-Grouse Habitat | Greater Sage-Grouse Habitat Management Areas from the BLM Greater Sage-Grouse Land Use Planning Strategy in the Utah Sub-Region. | https://catalog.data.gov/dataset/ut-2019-map2-2b-biologicallysignificantunits |
| Lidar | Aerial lidar elevation data | https://gis.utah.gov/2020-utah-lidar-acquisition/ |

##### Data Quality & Gaps

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## Geologic Characterization

The geologic, geophysical, and hydrological properties of reservoir formations and all overlying seal formations for candidate sites will be described in detail. These Characterization efforts will rely on leveraging existing data including 2D lines, available well logs, reports, core data and core samples.

#### Legacy Seismic Data

The state of Utah does not possess significant non-commercial, open-access legacy seismic data. Unless specific cooperative agreements are arranged with industry stakeholders, the most likely path to existing seismic acquisition is a commercial data clearinghouse. Seismic Exchange does maintain a large collection of legacy 2D and 3D seismic lines in Utah. All lines are available for purchase.

Table 8. Legacy 2D seismic data purchased by project, for the purpose of identifying subsurface structure(s).

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| 2D Seismic Lines (for purchase) | Legacy 2D seismic lines are available from the Seismic Exchange clearinghouse. | http://gis.seismicexchange.com/1/ |

##### Data Quality & Gaps

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#### Geologic Maps, Cross-Sections and Stratigraphic Columns

The Utah Geological Survey, the United States Geological Survey, and the Geology Departments at the University of Utah and Brigham Young University each have developed a variety of geologic maps, cross-sections and stratigraphic columns. Various public reports and student theses are available from each. Additional focused work can be available from a variety of journals.

Table 9. Geologic maps, cross-sections and stratigraphic columns for the state of Utah

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Utah Geological Survey | General and site-specific information about the geology of the state of Utah | https://geology.utah.gov |
| Utah Geological Survey Publications | Published articles on specific projects within the state of Utah | https://geology.utah.gov/map-pub/publications/ |
|  |  |  |
|  |  |  |
| University of Utah | Student theses on various geological projects in the state of Utah | https://collections.lib.utah.edu/search?q=theses |
| Brigham Young University | Student theses on various geological projects in the state of Utah | https://scholarsarchive.byu.edu/etd/ |
| United States Geological Survey | General and site-specific reports on the geology of the state of Utah and region | https://www.usgs.gov |

##### Data Quality & Gaps

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#### LAS Files

Log ASCII Standard (LAS) files from oil and gas wells in and around the project study areas can be used to generate geological models, correlate geologic units, tie adjacent wells and perform seismic well tie analyses. The useful petrophysical data in the LAS files includes: Gamma Ray, Resistivity, Caliper, Spontaneous Potential, Neutron Porosity and Density Porosity.

Table 10. LAS petrophysical log files used to generate geological model, correlate geologic units and perform well tie analyses.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| LAS Petrophysical Log Files | Petrophysical logs for the oil and gas wells in and around the project site. | https://oilgas.ogm.utah.gov/oilgasweb/live-data-search/lds-well/well-lu.xhtml |

##### Data Quality & Gaps

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#### Well Information

Well information cards contain useful data about well that can be used to aid in interpretation of geology, oil and gas field operators, and other infrastructure/regulatory requirements.

Table 11. Well information files for the state of Utah.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Well Information Cards | Scanned well information cards that show driller’s reports, depth, temperature, casing, water chemistry, regulatory data, etc. | https://oilgas.ogm.utah.gov/oilgasweb/live-data-search/lds-well/well-lu.xhtml |

##### Data Quality & Gaps

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#### Produced Waters Geochemistry

Historical oil and gas production from wells in and around potential sites can be searched for water chemistry that aids the model and simulation effort, as well as the evaluation of reservoirs and aquifers for suitability of CO2 storage activities. The primary resource was the USGS Produced Waters Database.

Table 12. Produced water chemistry for sites state of Utah

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Oil/Gas Produced Water Chemistry | Chemistry of water produced from oil and gas drilling, production and injection operations. | https://www.usgs.gov/centers/gemsc/science/oil-and-gas-waters-project?qt-science\_center\_objects=0#qt-science\_center\_objects |

##### Data Quality & Gaps

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#### Injection Well Volumes

Data from saltwater disposal wells can provide data that is useful as an analog for CO2 injection and also must be considered for pressure effects.

Table 13. Fluid injection volumes for saltwater disposal wells.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Saltwater disposal well data | Volumes of water disposed of, as well as any pertinent information related to permitting of such wells (stress tests, etc). | https://oilgas.ogm.utah.gov/oilgasweb/live-data-search/lds-injection/injection-lu.xhtml |

#### Rock Property and Geochemical Data (Porosity, Permeability, Relative Permeability, Capillary Pressure, etc)

Rock property data may be available from drill core, cuttings and/or outcrop and analogs. Porosity, permeability, relative permeability, wettability and capillary pressure measurement data are sometimes available from oil/gas divisions or published reports.

Table 14. Rock property data.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Utah Core Research Center | Core, cuttings from Utah wells; source of additional information including core analyses | https://geology.utah.gov/about-us/utah-core-research-center/ |
| Utah Geological Survey | Analytical data including geochemical and geochronologic | https://geology.utah.gov/map-pub/data-databases/analytical-data/ |

##### Data Quality & Gaps

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## CO2 Source/Capture Data

Most significant CO2 source and emission data is derived from national databases. Some states may have local databases of CO2 capture assessments.

#### CO2 Sources and Emission Data

Table 15. Federal and state databases of CO2 sources.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| EPA FLIGHT | EPA’s Greenhouse Gas emissions data explorer | https://ghgdata.epa.gov/ghgp/main.do# |
| US EIA | Energy-related carbon dioxide (CO2) emissions for states | https://www.eia.gov/environment/emissions/state/ |
| Utah GHG | Utah Greenhouse Gas Inventory and Reference Case Projections, 1990-2020 | http://www.climatestrategies.us/library/library/download/409 |
| Utah Road Map | Positive solutions on climate and air quality | https://gardner.utah.edu/wp-content/uploads/AQCC-FAQs-Draft.pdf |

##### Data Quality & Gaps

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#### CO2 Capture

There is at least one company in the state that is using CO2 capture technology to investigate large-scale capture within the state and beyond.

Table 16. Companies and organizations within the state of Utah that have investigated CO2 capture options.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| SES Innovation | Utah-based company focused on the development and commercialization of Cryogenic Carbon Capture technology | https://sesinnovation.com/company\_info/newsinfo/ |

##### Data Quality & Gaps

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## CCUS & Geologic Characterization Projects

Several CCUS-related projects or projects that are relevant to CCUS have been conducted in the state of Utah. The data for these projects is now predominantly available in the public sector.

#### USGS SUTRA Model of San Rafael Swell

Whole region simulations of the San Rafael Swell are being developed using the USGS SUTRA tools which incorporate regional sources, sinks, and wastewater injection activities. Output from these simulations can be used for boundary conditions on the smaller-scale simulations which are necessary for project and risk analysis.

Table 17. USGS SUTRA model of the Glen Canyon Group at the Ferron Coal Trend and San Rafael Swell.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| USGS SUTRA Model Data | USGS SUTRA model of the Glen Canyon Group at the Ferron Coal Trend and San Rafael Swell. | https://pubs.usgs.gov/sir/2009/5037/pdf/sir20095037.pdf |

##### Data Quality & Gaps

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#### Utah CarbonSAFE

Reservoir models, simulations and other analyses are occasionally publicly available from sponsored projects.

Table 18. Reservoir models of potential CCUS sites.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| Petrel Reservoir Model | Master Petrel project files of the static reservoir model for the Rocky Mtn CarbonSAFE project. | https://edx.netl.doe.gov/dataset/smart-carbonsafe-model2 |

##### Data Quality & Gaps

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#### SWP Aneth Pilot-scale CO2 injection

Reservoir models, simulations and other analyses are occasionally publicly available from sponsored projects.

Table 19. Reservoir models of potential CCUS sites.

|  |  |  |
| --- | --- | --- |
| Title/Resource | Description | URL/Source |
| SWP Aneth | Data pertaining to the pilot-scale CO2 injection project at the Aneth EOR Field, Utah. |  |

##### Data Quality & Gaps

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