Underground Injection Control (UIC) Class VI

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June 9, 2021

EPA

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EPA Class VI Program Background

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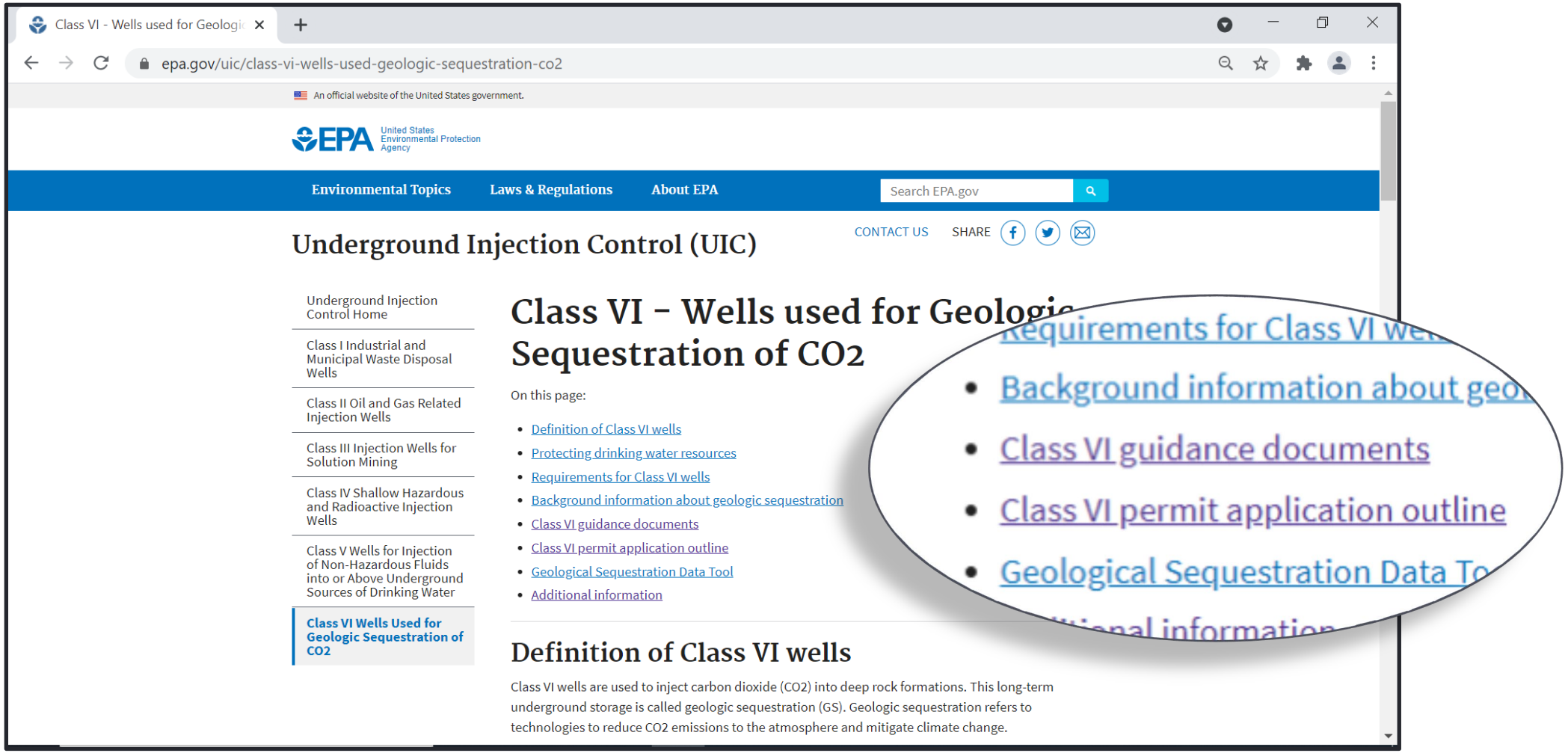
- Class VI wells, used for underground injection of carbon dioxide for the purpose of geologic sequestration (GS), are the newest Underground Injection Control (UIC) well class
- Class VI Final Rule was promulgated in 2010
- Between 2010 and 2020, EPA issued six permits for two project
- Regulators have seen increased interested in Class VI permits due to financial incentives and climate change mitigation strategies
- EPA has and is developing tools to assist permit applicants and permitting programs

EPA UIC Class VI Guidance Documents



https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-co2

EPA UIC Class VI Guidance Documents

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Targeted to Permit Applicants	Targeted to Permitting Authorities
➢ Well Site Characterization ➢ Area of Review and Corrective Action ➢ Testing and Monitoring ➢ Project Plan Development ➢ Well Construction ➢ Financial Responsibility Requirements ➢ Reporting, Record-Keeping and Data Management ➢ Well Plugging, PISC, Site Closure	➢ Implementation Manual for UIC Program Directors ➢ Primacy Manual for State Directors ➢ Key Principles in EPA's Class VI Rule Related to Transition of Class II Enhanced Oil or Gas Recovery Wells to Class VI

EPA UIC Class VI Guidance Documents

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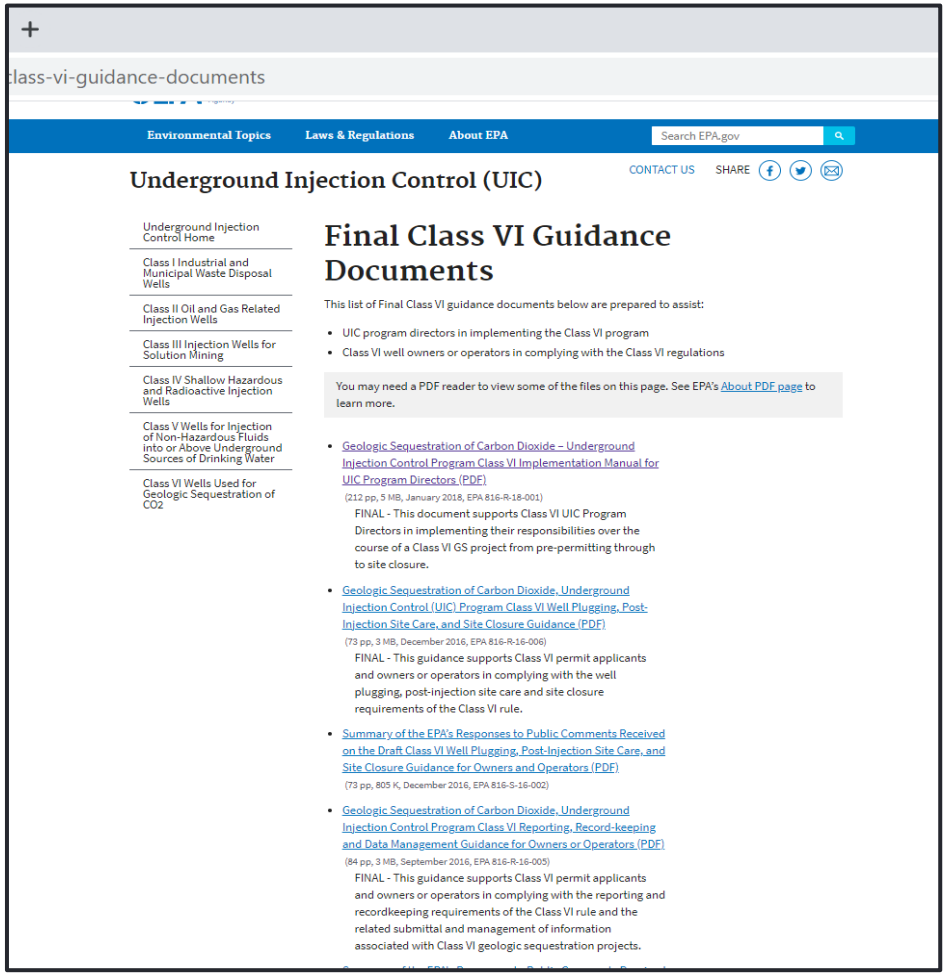
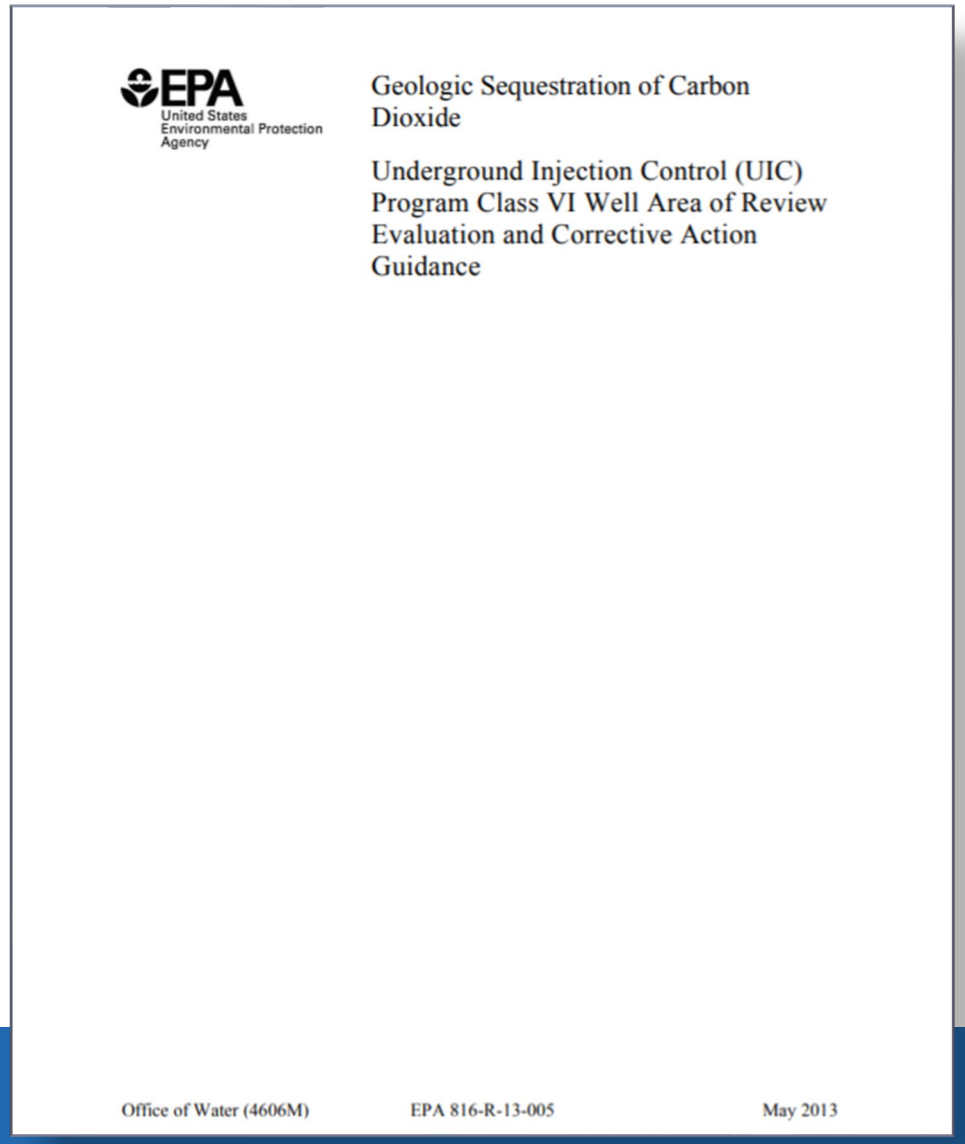
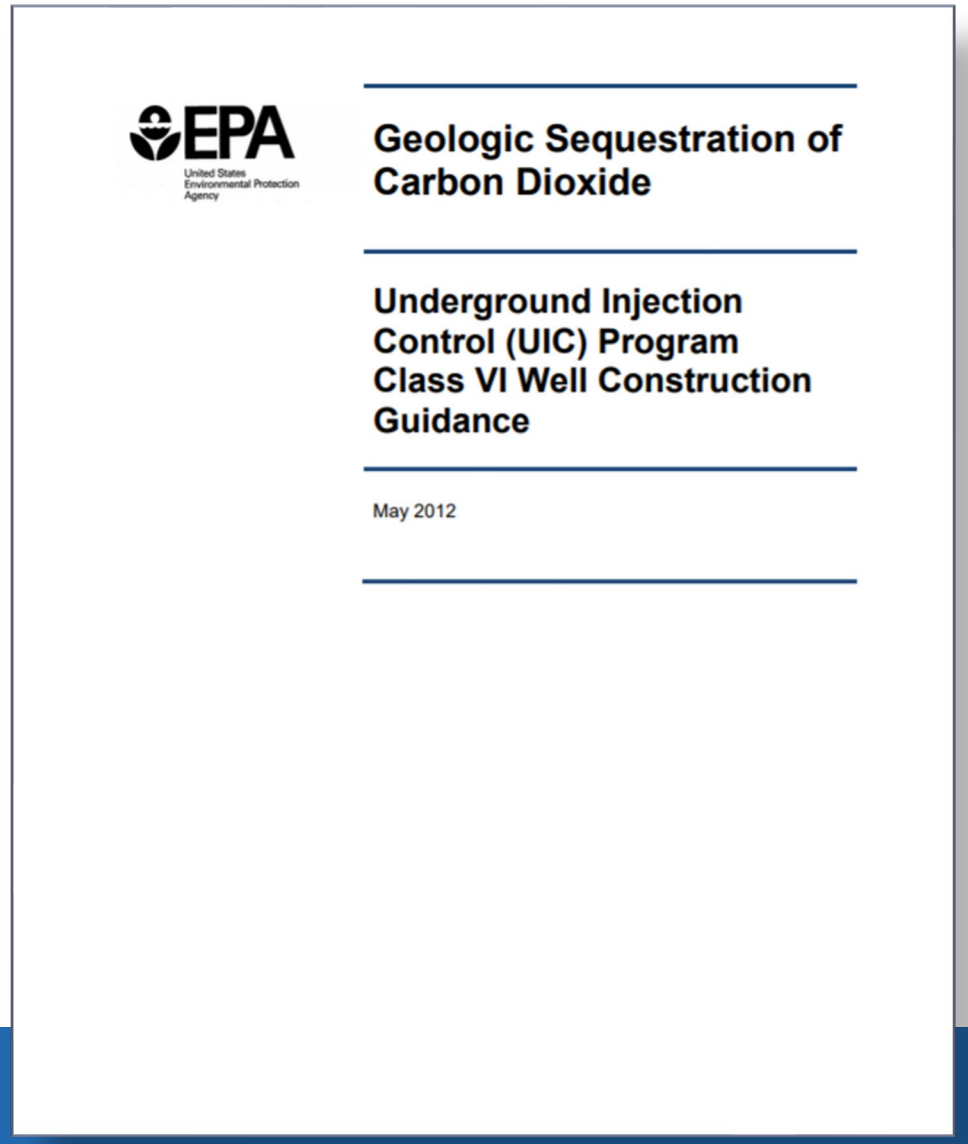
- Class VI Rule is deigned to be flexible to allow accommodation for site-specific needs and risks
- Guidance documents present Class VI Rule requirements, provide recommendations and offer alternatives that go beyond the minimum requirements
- Guidance is not prescriptive and does not cover all possible situations
- Projects should contact permitting authorities early with site-specific questions and considerations



Area of Review (AoR) and Corrective Action



Well Construction



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EPA UIC Program Class VI Well AoR Review and Corrective Action Guidance

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What does the guidance cover?

- Computational modeling process
- Model design requirements
  - Does not require specific modeling software
- How to delineate the area of reviewing using computational modeling results
  - Includes examples and alternatives
- Identifying artificial penetrations and performing corrective action
- Area of review reevaluation triggers and process

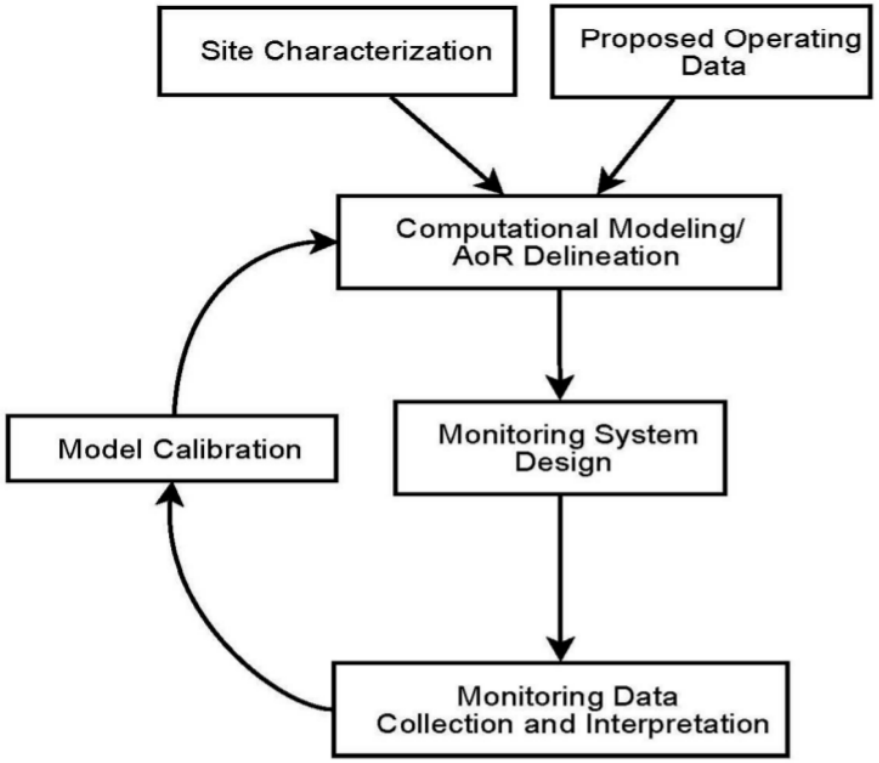

Figure 1-1: Flow Chart of Monitoring and Modeling at a GS Project.

EPA UIC Program Class VI Well Construction Guidance

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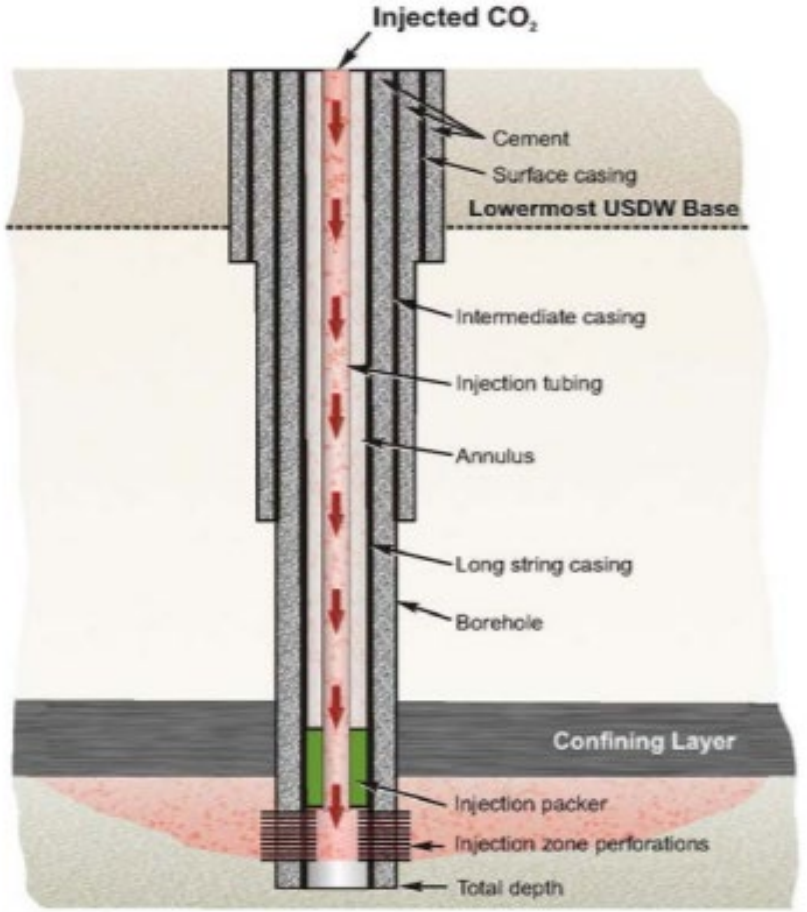
What does the guidance cover?

- Class VI construction requirements

1. Preventing fluid movement
2. Designing for logging and workovers
3. Well plan and design information to submit
4. Designing for down-hole stresses
5. Cementing the casing
6. Selecting tubing and packer
7. Additional construction information to submit
8. Selecting surface and down-hole shut-off devices

- Consideration for conversion of other well types
- Operating requirements of Class VI injection wells
- Recommendations and offers alternatives that go beyond the minimum requirements



Schematic of Class VI Injection Well

Note: Figure not to scale

Update on EPA UIC Class VI Activities

- Streamlining permit application and review process
- Developing new tools for stakeholders
- Supporting interagency CCUS initiative requested by Congress
- Committed to supporting Class VI permit applicants and primacy states

Class VI Project Interest in EPA Implemented Programs

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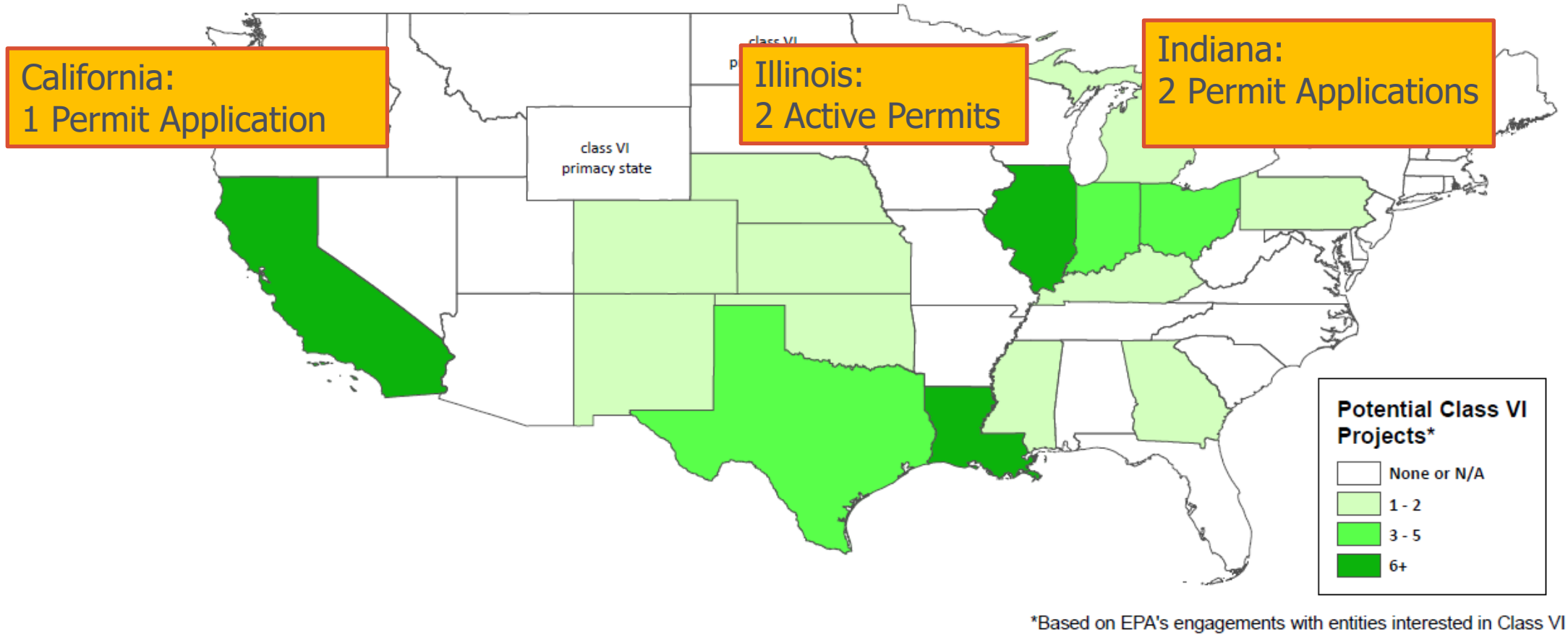
California:
1 Permit Application

Illinois:
2 Active Permits

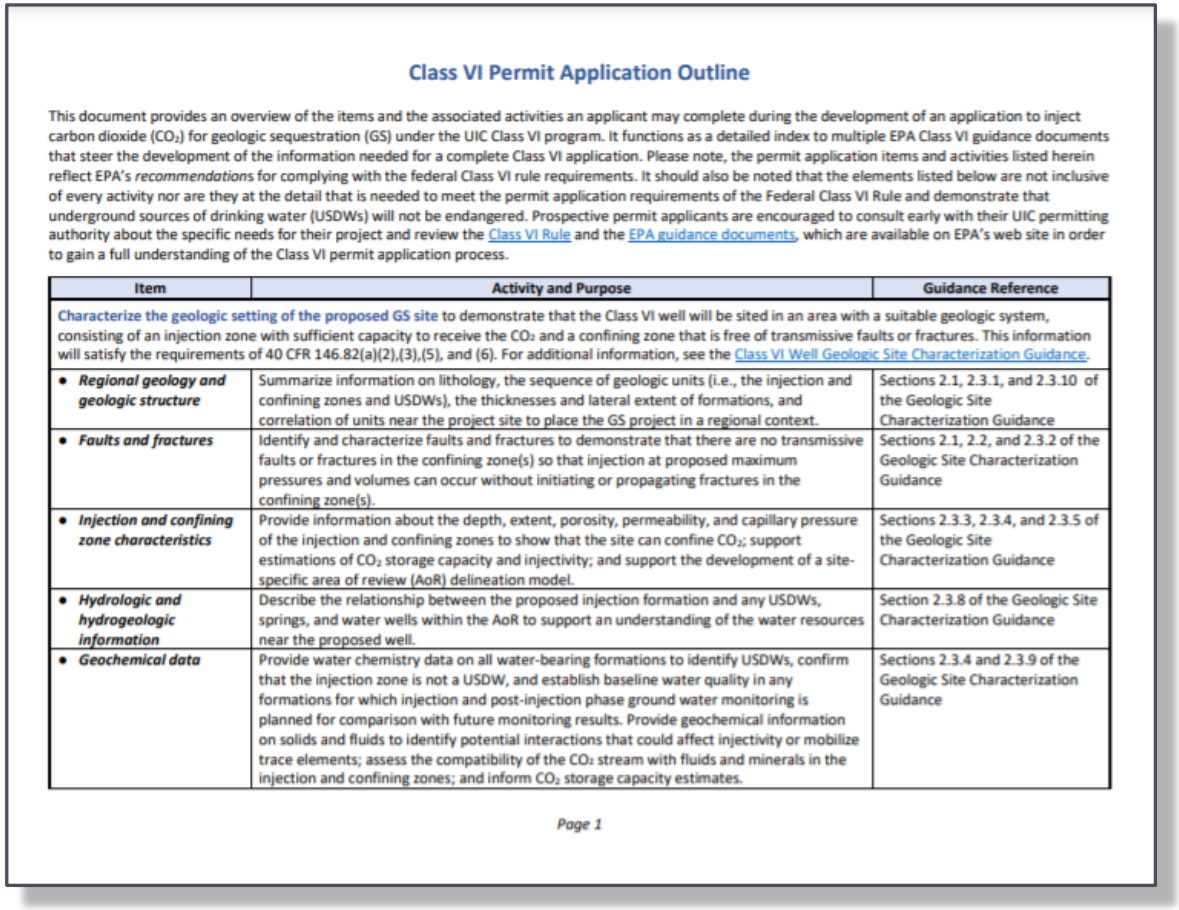
Indiana:
2 Permit Applications



*Based on EPA's engagements with entities interested in Class VI

New Tools on EPA Website

- Class VI Permit Application Outline
- Permits and permit table by state
- GSDT Tutorials



Class VI Permit Application Outline

This document provides an overview of the items and the associated activities an applicant may complete during the development of an application to inject carbon dioxide (CO_2) for geologic sequestration (GS) under the UIC Class VI program. It functions as a detailed index to multiple EPA Class VI guidance documents that steer the development of the information needed for a complete Class VI application. Please note, the permit application items and activities listed herein reflect EPA's *recommendations* for complying with the federal Class VI rule requirements. It should also be noted that the elements listed below are not inclusive of every activity nor are they at the detail that is needed to meet the permit application requirements of the Federal Class VI Rule and demonstrate that underground sources of drinking water (USDWs) will not be endangered. Prospective permit applicants are encouraged to consult early with their UIC permitting authority about the specific needs for their project and review the Class VI Rule and the EPA guidance documents, which are available on EPA's web site in order to gain a full understanding of the Class VI permit application process.

Item	Activity and Purpose	Guidance Reference
Characterize the geologic setting of the proposed GS site to demonstrate that the Class VI well will be sited in an area with a suitable geologic system, consisting of an injection zone with sufficient capacity to receive the CO_2 and a confining zone that is free of transmissive faults or fractures. This information will satisfy the requirements of 40 CFR 146.82(a)(2),(3),(5), and (6). For additional information, see the Class VI Well Geologic Site Characterization Guidance.		
• ***Regional geology and geologic structure***	Summarize information on lithology, the sequence of geologic units (i.e., the injection and confining zones and USDWs), the thicknesses and lateral extent of formations, and correlation of units near the project site to place the GS project in a regional context.	Sections 2.1, 2.3.1, and 2.3.10 of the Geologic Site Characterization Guidance
• ***Faults and fractures***	Identify and characterize faults and fractures to demonstrate that there are no transmissive faults or fractures in the confining zone(s) so that injection at proposed maximum pressures and volumes can occur without initiating or propagating fractures in the confining zone(s).	Sections 2.1, 2.2, and 2.3.2 of the Geologic Site Characterization Guidance
• ***Injection and confining zone characteristics***	Provide information about the depth, extent, porosity, permeability, and capillary pressure of the injection and confining zones to show that the site can confine CO_2; support estimations of CO_2 storage capacity and injectivity; and support the development of a site-specific area of review (AoR) delineation model.	Sections 2.3.3, 2.3.4, and 2.3.5 of the Geologic Site Characterization Guidance
• ***Hydrologic and hydrogeologic information***	Describe the relationship between the proposed injection formation and any USDWs, springs, and water wells within the AoR to support an understanding of the water resources near the proposed well.	Section 2.3.8 of the Geologic Site Characterization Guidance
• ***Geochemical data***	Provide water chemistry data on all water-bearing formations to identify USDWs, confirm that the injection zone is not a USDW, and establish baseline water quality in any formations for which injection and post-injection phase ground water monitoring is planned for comparison with future monitoring results. Provide geochemical information on solids and fluids to identify potential interactions that could affect injectivity or mobilize trace elements; assess the compatibility of the CO_2 stream with fluids and minerals in the injection and confining zones; and inform CO_2 storage capacity estimates.	Sections 2.3.4 and 2.3.9 of the Geologic Site Characterization Guidance

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Geologic Sequestration Data Tool (GSDT) Resources

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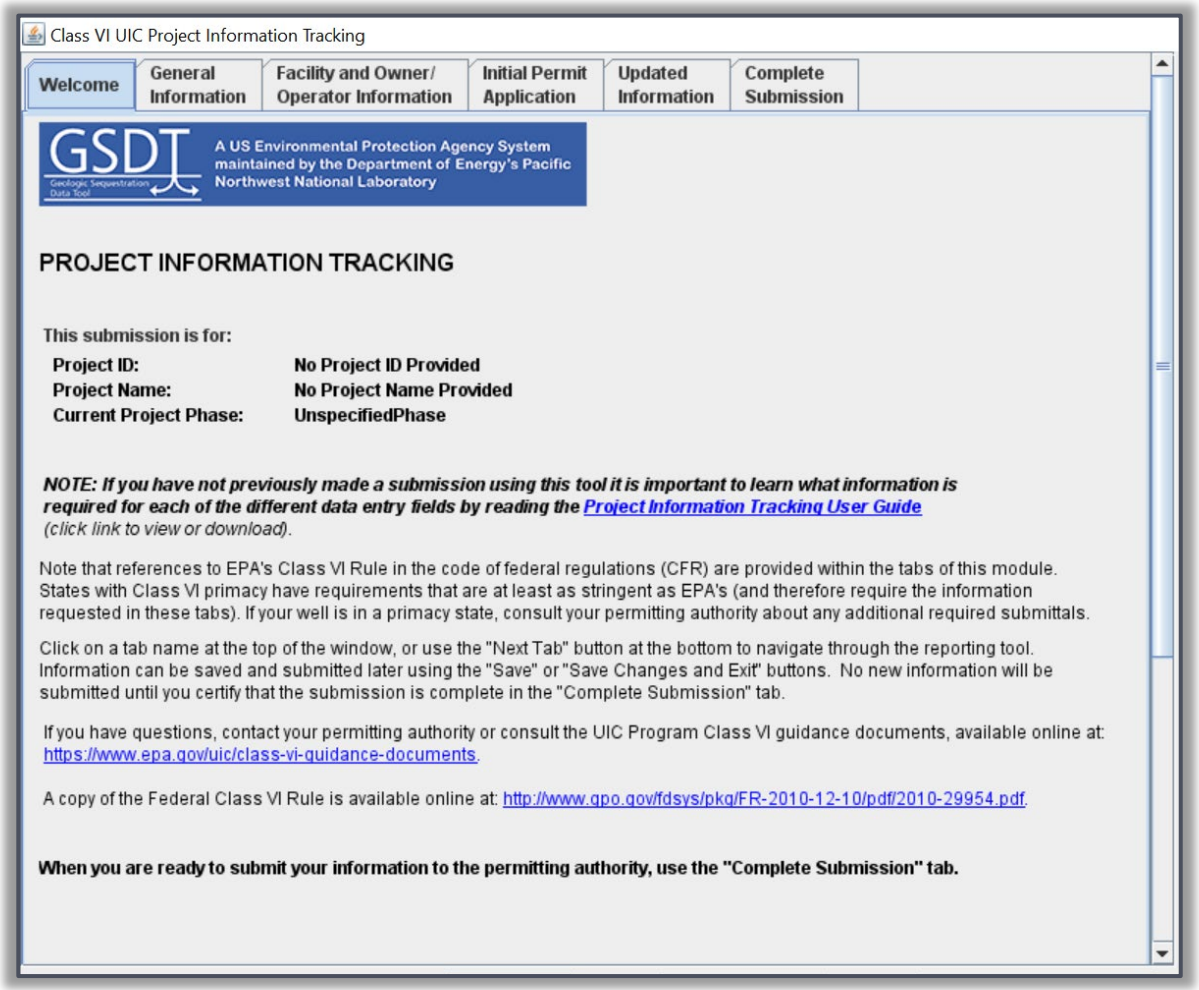
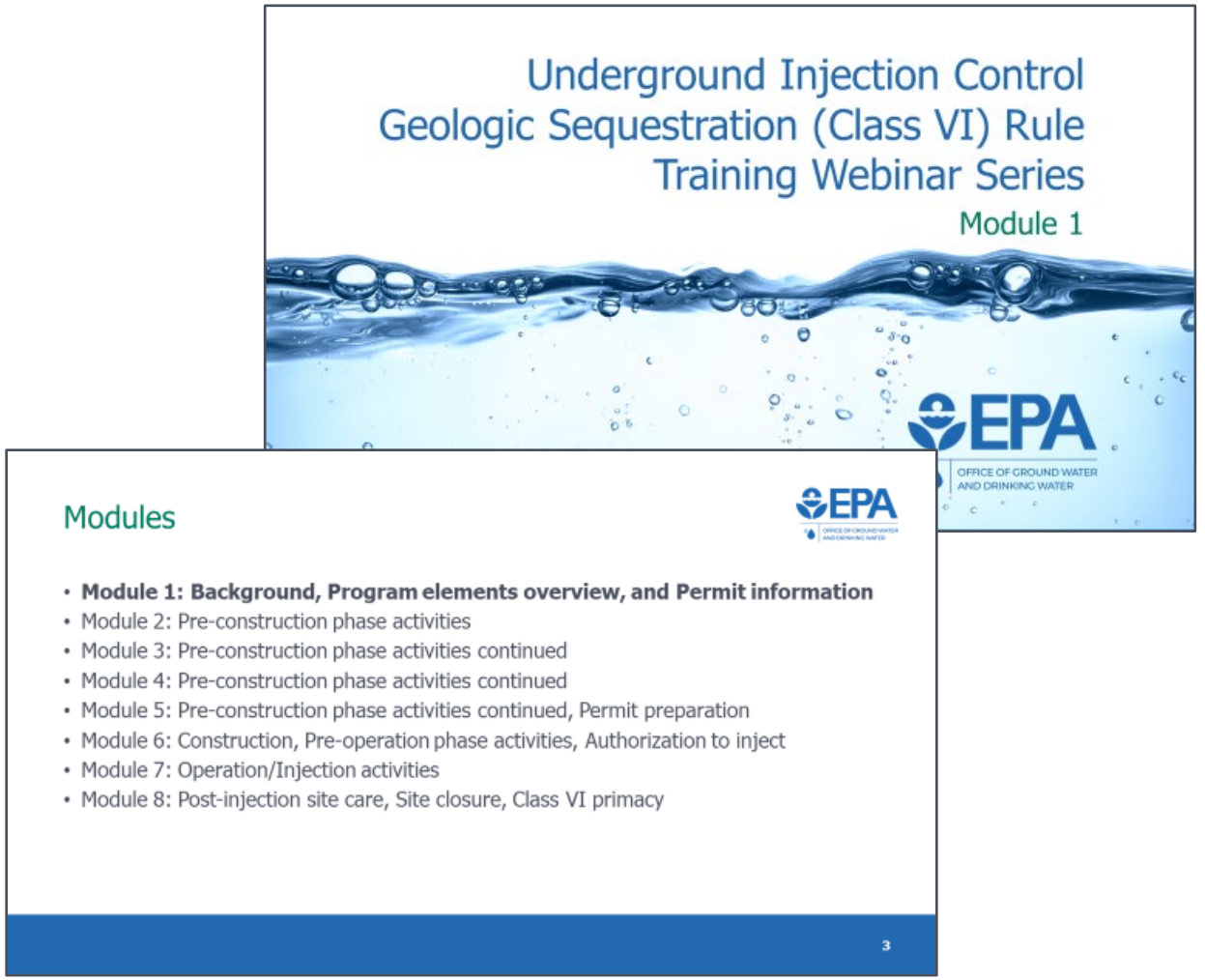
- System acts as a guide to permit application
- Class VI Permit Application Templates
- GSDT system User Guides
- EPA GSDT team available to answer questions at GSDataTool@epa.gov



Tools for States and EPA Employees

- Implementation Training Tutorials
- Permit Review Teams
- GSDT Data Management Capabilities for Permitting Authorities



Under Development at EPA

- Sample Class VI Permit Application
- Modeling Training for Permitting Authorities
- CBI Capabilities and other GSDT Improvements

Other Helpful Resources

- U.S. Department of Energy
  - National Energy Technology Lab (NETL) Energy Data eXchange (EDX) https://edx.netl.doe.gov/group/edx-tools
- U.S. Geological Survey
  - National assessment results
    - Geologic carbon dioxide national storage assessment results, Circular 1386, http://pubs.usgs.gov/circ/1386/
    - Greenhouse gas emissions and sequestration assessment results, Scientific Investigations Report 2018-5131, https://doi.org/10.3133/sir20185131
  - Assessment methodologies also available at http://pubs.usgs.gov

Thank you!

- For more information, go to EPA's Class VI web page at: https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-co2

- Reach out to us with any questions
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