

Underground Injection Control Geologic Sequestration Rule Training Workshop: UIC GS Rule Elements

The major elements of the UIC GS Rule will now be covered.

Organization of Rule Elements

- Information presented in these slides follows the order a UIC Program Director reviews permit & operational information:
 - With permit application
 - Prior to well operation
 - Periodically throughout operational phase

2

The information provided within the major sections of slides are organized according to when the UIC Program Director must review the particular information submitted by the proposed Class VI injection well owner or operator. There are three main review periods for the Director:

1. With the permit application;
2. Prior to authorization of well operation; and
3. Periodically throughout the entire operational phase of a project.

The information reviewed by the UIC Program Director with the Class VI permit application will initially determine whether a site is suitable for GS.

After initial data and information are obtained and submitted by the owner or operator, the UIC Program Director will review the results of formation testing; logging, sampling, and testing of the well and surrounding formations; and mechanical integrity tests to determine whether well operation should be authorized.

Once injection is authorized by the UIC Program Director, subsequent periodic review of various information submitted by the owner/operator is required throughout the life of the GS project to ensure that the on-going injection of carbon dioxide is occurring properly and safely, as planned and initially approved.



Required Class VI Permit Information (40 CFR 146.82)

Permit Information

- UIC Program Director ensures that GS projects are permitted in a manner that does not endanger USDWs by evaluating materials, including:
 - General contact information
 - Map showing injection well for which the permit is sought and the applicable AoR
 - Tabulation of all wells in the AoR which penetrate the injection/confining zones
 - Project plans

40 CFR 146.82(a)(1), 146.82(a)(2), 146.82(a)(4), 146.82(a)(13), 146.82(a)(15)-(17), and 146.82(a)(19)

4

With the required UIC Class VI injection well permit application, the UIC Program Director will receive and must review information submitted under **40 CFR 146.82(a) for approval to construct the Class VI injection well, as well as separate information submitted under 40 CFR 146.82(c) for approval to inject.**

Under 40 CFR 146.82(a) the Director will review a large amount of information, including: the general contact information for the proposed project, a map showing the injection well for which the individual Class VI permit is sought and the applicable AoR, a tabulation of all wells in the AoR which penetrate the injection/confining zones, and the 5 required project plan information (AoR and Corrective Action, Testing and Monitoring, Well Plugging, PISC and Site Closure, and Emergency and Remedial Response). Note that each Class VI injection well must receive an individual permit, even though the UIC Program Director might review information incorporating the cumulative impacts of multiple injection wells

Class VI Permit Information: General Application Information

- Facility name, location, and mailing address, and whether it is located on tribal lands
 - Operator's name, address, and telephone number
 - Proposed permitted activities
 - Authorization and ownership statuses
 - Permit action type and date
 - Up to 4 SIC/NAICS codes
 - Entity status (federal, state, private, public, other)
- + List of contacts generated using the above information (state, tribes, territories within the AoR)

40 CFR 146.82(a)(1) and 146.82(a)(20)

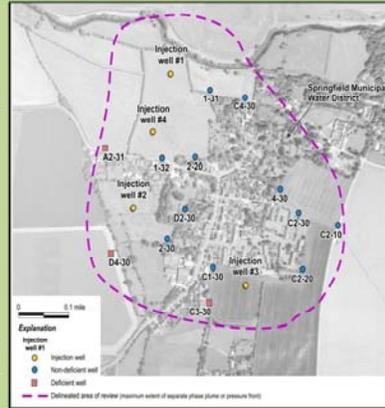
5

General Class VI permit application information that must be provided by the owner or operator includes: facility name, location, and mailing address; operator's name, address, and telephone number; proposed permitted activities; authorization status (i.e., whether the well operator is also the well owner); ownership status; permit action type and date; up to four SIC/NAICS codes; applicant status, such as a federal, state, private, public, or other entity; and whether the facility is located on tribal lands.

The UIC Program Director will receive a list of contacts for states, tribes, and territories within the delineated area of review (AoR). The Director will be able to use this contact information to fulfill public notification requirements. Public notification will be discussed in further detail in a later presentation.

Permit Information: Map

- Show locations and characteristics of all artificial penetrations in the AoR
 - Name, number, and location of specified features
 - Only information that is publicly available



40 CFR 146.82(a)(2)

6

The map of the injection well(s) and accompanying data and information needs to show the location and characteristics of all artificial penetrations (i.e., wells) and natural conduits (faults, fractures) that are located within the AoR. The owner or operator will also need to demonstrate that no penetrations exist that could serve as conduits for fluid movement and that any deficiencies will be addressed through corrective action (i.e., the proper plugging of abandoned wells).

The map must include the number, name (e.g., UIC permit well ID number, if previously assigned), and location of all: injection wells; producing wells; abandoned wells; plugged wells; dry holes; deep stratigraphic boreholes; state or EPA approved subsurface cleanup sites; surface bodies of water; springs, mines (surface and subsurface); quarries; drinking water wells (including the PWSID number); other pertinent surface features (e.g., roads, buildings, boundaries); and faults (known or suspected).

Only information that is publicly available is required for the map. While only information of public record is required, EPA recommends that the owner or operator submit any non-public records with the Class VI permit application that will provide additional, pertinent information about the proposed GS site. The UIC Program Director may ensure that all of the above items are included on the map by verifying the sources of information used by the owner or operator to generate it.

Site Characterization Data

- Site characterization data:
 - Submitted with permit application and reviewed by the UIC Program Director
 - Includes geologic data on both the injection and confining zones, and all USDWs in the area
- Details will be discussed in further detail in the Site Characterization section

40 CFR 146.82(a)(3), 146.82(a)(5), and 146.82(a)(6)

7

Site characterization data submitted with the permit application will also need to be reviewed by the UIC Program Director. This includes geologic data on both the injection and confining zones and information on all USDWs in the area. Details of these submissions are discussed in further detail in the following section on site characterization.

Permit Information: Tabulation of Wells Within the Delineated AoR

- Includes description of each well's:
 - Type
 - Construction
 - Date drilled
 - Location
 - Depth
 - Record of plugging/ completion

Well	Type	Status	Deficient	Completion Date	Total depth (ft)
82-40	Gas	Producing	No	1/8/1995	1,274
82-30	Gas	Producing	No	8/19/1992	1,288
A2-21	Brine	Active	No	8/3/1991	2,013
A2-31	Brine	Active	No	9/9/1992	2,161
A2-31	Gas	Plugged	Yes	9/27/1990	3,585
D4-30	Gas	Plugged	Yes	11/29/1981	4,175

40 CFR 146.82(a)(4)

This table of information on all located wells within the AoR must include: a description of each well's type, construction, date drilled, location, depth, and the record of plugging/completion.

The table may incorporate additional information required by the UIC Program Director. EPA recommends that the number, name, and location of all wells needing corrective action also be included on this list of wells located within the AoR submitted with a Class VI permit application.

Permit Information: Additional Data and Information

- Additional data/information submitted with the permit application will need to be reviewed by the UIC Program Director:
 - Proposed operating data
 - Proposed formation testing program
 - Proposed stimulation program
 - Steps for conducting injection operation

40 CFR 146.82(a)(7) - 146.82(a)(10)

9

The UIC Program Director will also receive the following, additional data and information:

- Proposed operating data.
- Proposed formation testing program.
- Proposed stimulation program.
- Steps for conducting injection operations.

Permit Information: Additional Data and Information (cont'd.)

- Schematics of the proposed well
- Well construction procedures
- Demonstration of alternative PISC timeframe
- Financial responsibility demonstration
- Details of these submissions are discussed in later sessions of the workshop

40 CFR 146.82(a)(11), 146.82(a)(12), 146.82(a)(14), and 146.82(a)(18)

10

- Schematics of the proposed well.
- Injection well construction procedures.
- Demonstration for an alternative post-injection site care timeframe if not proposing to follow the default timeframe of 50 years.
- Financial responsibility demonstration.

Details of these additional submissions will be discussed in further detail later in the workshop.

Permit Information: Project Plans

- Comprehensive, site-specific plans:
 - Area of Review and Corrective Action Plan
 - Testing and Monitoring Plan
 - Injection Well Plugging Plan
 - Post-Injection Site Care and Site Closure Plan
 - Emergency and Remedial Response Plan

40 CFR 146.82(a)(13), 146.82(a)(15),
146.82(a)(16), 146.82(a)(17), and 146.82(a)(19)

11

As previously discussed, the owner or operator will need to submit a series of comprehensive site-specific project plans with a Class VI permit application. UIC Program Directors will need to review: an Area of Review and Corrective Action Plan, a Testing and Monitoring Plan, an Injection Well Plugging Plan, a Post-Injection Site Care and Site Closure Plan, and an Emergency and Remedial Response Plan. If any of the plans are missing or incomplete, the Director will need to contact the owner or operator for a copy of the missing plan, or make sure the owner/operator submits the necessary information to make the plan complete. Also, the Director can require more information if it is needed to adequately assess some component of the operation. For example, given the complexity of the wells to be drilled, a Director may request more information on well drilling. Additional information on these projects plans is provided later in this presentation.

Project Plans: UIC Program Director Review

- All 5 project plans must be reviewed by the UIC Program Director with the permit application
 - Site-specific information should be considered
 - Plans will evolve as site data are collected
 - UIC Program Director has discretion to require more information



12

The UIC Program Director will receive all five project plans with the Class VI permit application and will need to evaluate all of the plans in the context of site characterization data, proposed construction information, and proposed operating data.

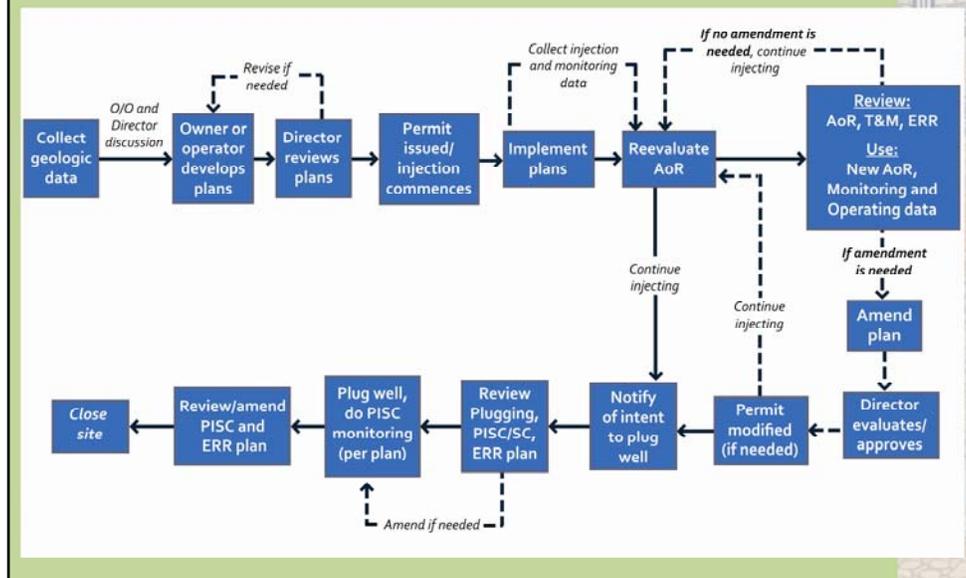
This will ensure that planned activities at the facility meet all UIC GS Rule requirements, are appropriate to the site-specific circumstances, and address all risks to USDWs.

Because it must be submitted with the initial permit application, this information would be collected before the well is drilled.

UIC Program Directors have the discretion to require more information if it is needed to support any of the project plans.

While certain preliminary information would be available at the time of the permit application, EPA recommends that the owner or operator revisit and revise the operational-phase plans as necessary once the well is drilled and logging and testing and AoR modeling have been completed.

Project Plan Development and Updates



A unique component of the GS rule is that operators must periodically review project plans to incorporate operational and monitoring data and the most recent AoR reevaluation. These reviews must take place:

- Within 1 year of the most recent AoR reevaluation;
- Following significant changes to the facility; or,
- When required by the UIC Program Director.

Periodic reviews of the well plugging and post-injection site care plan during the injection phase are recommended.

Development, approval, and implementation of the project-specific plans involve an iterative process. This flow chart presents a general overview of the process of gathering data for, developing, approving, and periodically reviewing and amending the plans throughout the life of a GS project.

The five GS project plans are inter-related. Changes to (or information acquired through the implementation of) one plan may necessitate a review of, or possibly a change to, some or all of the other plans. For example, data collected pursuant to the approved Testing and Monitoring Plan will inform the AoR reevaluation, which may, in turn, indicate that a revision of the Emergency and Remedial Response plan is needed. Plan reviews and amendments may also be triggered if there are indications based on monitoring data (collected per the approved Testing and Monitoring Plan) that the site is not performing as predicted.

Project Plan Updates: An Iterative Process

- **Step 1:** Review AoR reevaluation results and recent monitoring & operational data
- **Step 2:** Owner/operator and UIC Program Director discuss results
- **Step 3:** Amend plans if needed
- **Step 4:** Submit amended plans

14

EPA envisions the updates to the plans will be an iterative process that includes discussions between the owner or operator and the UIC Program Director. The Project Plan Development Guidance will describe a recommended process by which the owner or operator may review and amend each plan:

Step 1: the owner or operator reviews the results of the AoR reevaluation, along with the most recent monitoring and operational data. The purpose of this review is to identify whether an amendment to the Plan is needed. We will focus on the considerations for this review in later slides.

Step 2: Discuss the results with the Director. EPA recommends that the owner or operator and the Director discuss whether an amendment to the Plan is needed, based on the considerations in Step 1. The final decision regarding the need for an amended plan will be made by the Director.

Step 3: Amend the plan if needed. The revised Plan may include the same categories of information that were included in the original plan that was developed before injection commenced, but it must address all available information.

Step 4: Submit the amended plan. The GS Rule requires that the owner or operator submit the amended Plan to the Director for approval within one year of an AoR reevaluation or of any other event that triggers a Plan Review. The amended plan must be approved by the Director and would then be incorporated into the operating permit for that Class VI injection well. If significant changes to the Plan are needed, the Director may need to modify the Class VI permit and initiate public re-notification.

Materials Required Prior to Authorizing Well Operation

- Final AoR delineation
- Updates to geologic and hydrogeologic properties of proposed storage site and injection and confining zones
- Information on the compatibility of the carbon dioxide stream
- Results of formation testing
- Final injection well construction procedures

40 CFR 146.82(c)(1) - 146.82(c)(10)

15

Certain data and information will not be available to the Director until after preliminary testing and related data gathering are conducted. To submit this additional required information, the owner or operator will conduct formation testing; logging, sampling, and testing of the well and surrounding formations; and mechanical integrity testing of the proposed Class VI injection well. Some of this information will be collected after UIC Program Director's approval of the project plans and the approval to construct the Class VI well. The Director will also have to determine whether to authorize operation of a proposed Class VI injection well based on the following additional information required by the UIC GS Rule at 146.82(c):

- Final AoR delineation.
- Any relevant updates to information on the geologic and hydrogeologic properties of the proposed storage site and of the injection and confining zones in particular.
- Information on the compatibility of the carbon dioxide stream with fluids in the injection zone and with the formations comprising the injection and confining zone.
- Results of formation testing.
- Final injection well construction procedures. (continued on next slide)

Materials Required Prior to Authorizing Well Operation (cont'd.)

- Status of corrective action
- All available logging and testing program data
- Demonstration of mechanical integrity
- Updates to the proposed project plans
- Updates to the alternative PISC timeframe demonstration
- Any other information requested by the Director

16

- The status of corrective action on the improperly plugged wells located within AoR.
- All available logging and testing program data.
- Demonstration of mechanical integrity.
- Any necessary updates to the proposed project plans to address new information collected.
- Any updates to the alternative PISC timeframe demonstration; and
- Any other information required by the Director.

Some Class VI Program Permitting Resources

- For more information on site characterization, refer to:
 - Draft UIC Program Class VI Primacy Application and Implementation Manual
 - Draft UIC Program Class VI Well Project Plan Development Guidance
 - Various Draft Class VI technical guidance documents
 - <http://water.epa.gov/type/groundwater/uic/class6/gsclass6wells.cfm>

17

Some Class VI Program permitting resources available are:

- The Draft UIC Program Class VI Primacy Application and Implementation Manual.
- The Draft UIC Program Class VI Well Project Plan Development Guidance.
- Various Class VI technical guidances.
- And EPA's Class VI website at <http://water.epa.gov/type/groundwater/uic/class6/gsclass6wells.cfm>.