



# Aquifer Recharge Using Class V Injection Wells in Texas: Implementing TCEQ's New 2020 Rules

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Presented by Lorrie Council & Carol Dye  
Texas Commission on Environmental Quality  
at GWPC Annual Forum September 29, 2020

# Presentation Topics

- 2019 Texas Legislation Related to Aquifer Recharge
- Groundwater Rights in Texas: Historical Highlights Important to Aquifer Recharge
- Groundwater Use in Texas
- Aquifer Recharge as a Beneficial Use in Texas
- Rule Revisions to Implement 2019 Aquifer Recharge Legislation
- Requirements for New Aquifer Recharge Injection Wells
- Previously Authorized Aquifer Recharge Injection Wells

# 2019 Texas Legislation Related to Aquifer Recharge

- H.B. 720: Relating to appropriations of water for recharge of aquifers and use in aquifer storage and recovery (ASR) projects
  - H.B. 1964: Relating to the procedure for action on certain applications for an amendment to a water right
  - H.B. 721: Relating to the duty of the Texas Water Development Board to conduct studies of and prepare and submit reports on ASR and aquifer recharge projects
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# Groundwater Rights in Texas: Historical Highlights Important to Aquifer Recharge

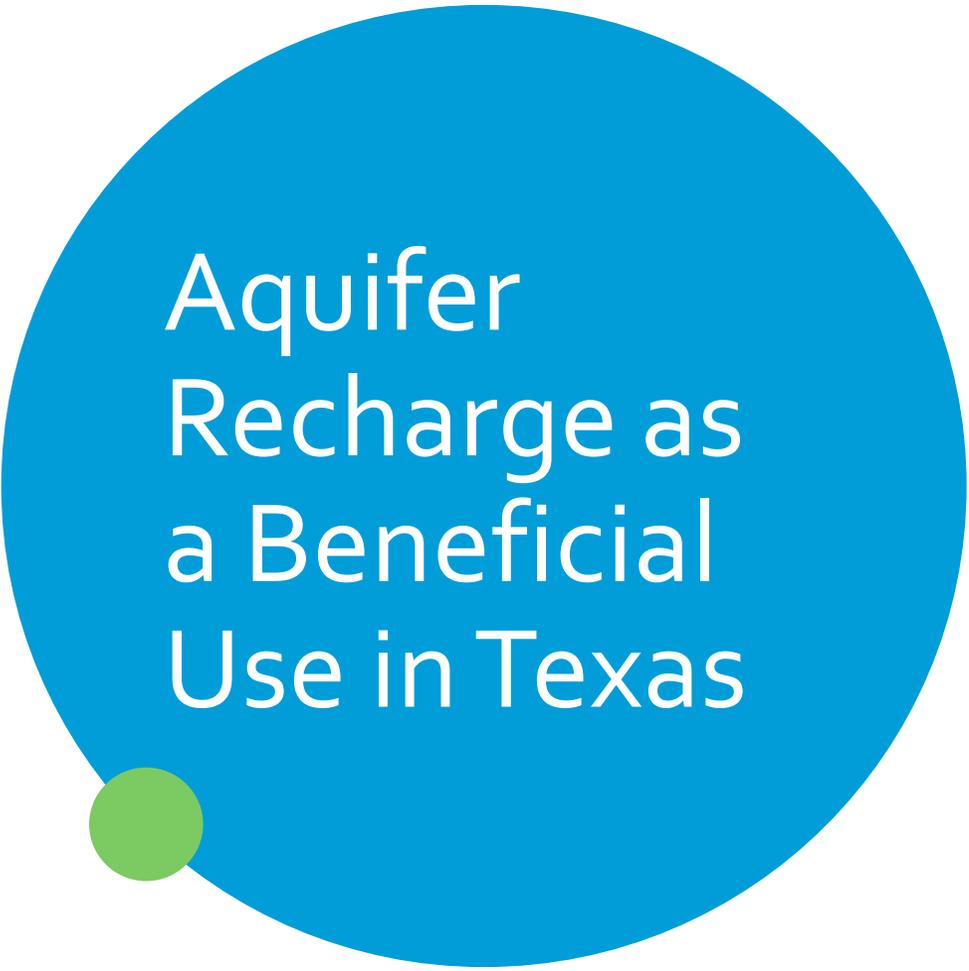
- In 1904, the Texas Supreme Court recognized the Rule of Capture for governance of groundwater in Texas (Houston and Texas Central Railroad Co. v. East).
  - Rule of Capture is the common-law rule applied to Texas groundwater that provides the right of a landowner to capture and use groundwater under their land and do with it what they please, not liable to neighboring landowners, even if they deprive their neighbors of the water's use.
  - The Texas Legislature has modified the Rule of Capture in Texas in the years since then to prevent: 1) willful waste, 2) malicious harm to a neighbor, and 3) land subsidence.
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# Groundwater Use in Texas



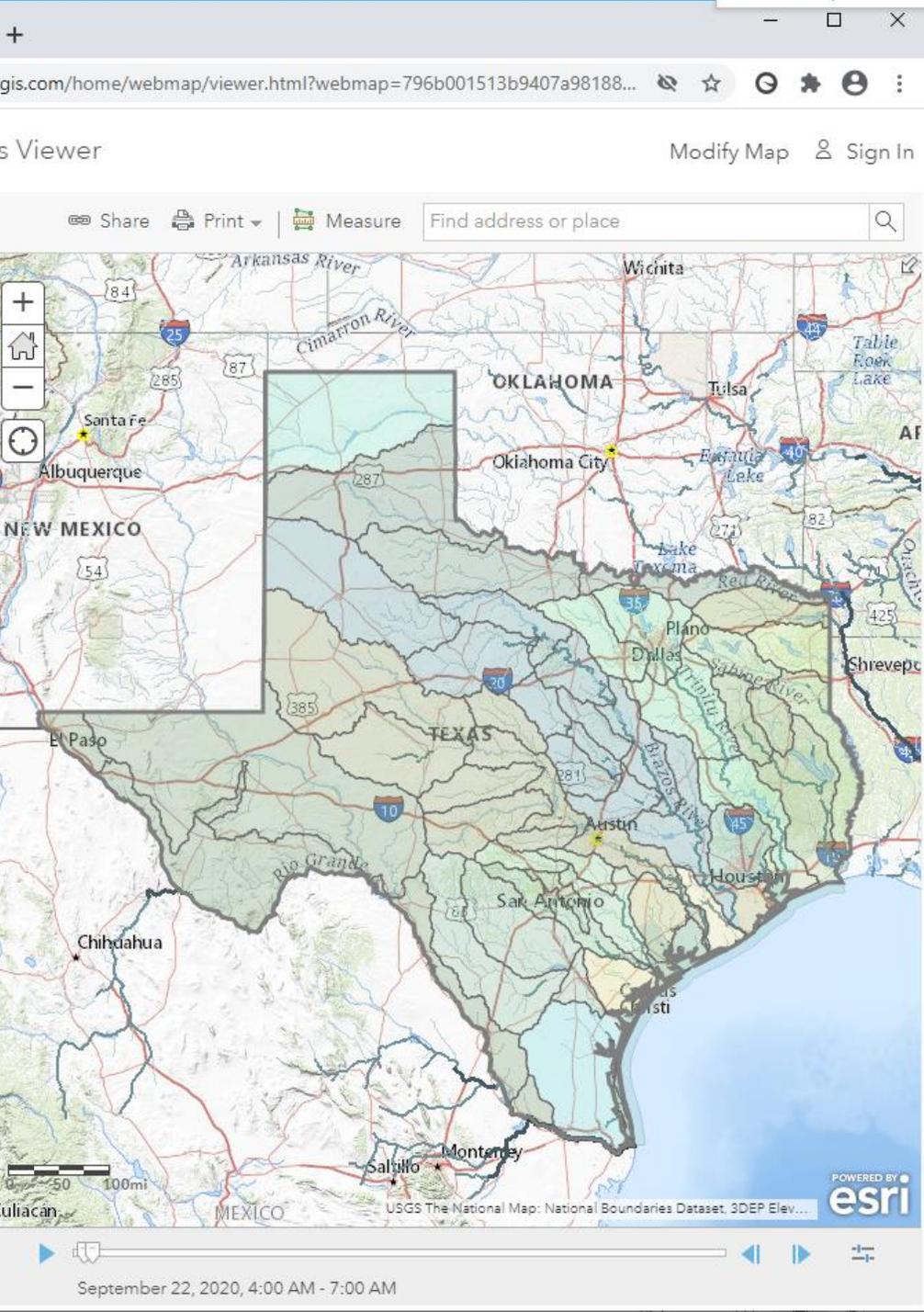
Photo Credit: Alan Cherepon, TCEQ

- The Texas Legislature has created groundwater conservation districts and other special purpose districts over the years to limit the use of groundwater in those districts, in order to preserve groundwater resources and mitigate potential damages, such as land subsidence.
- In Texas, groundwater provides about 60% of the 16.1 million acre-feet of water used in the state (TWDB).
- Persistent drought conditions combined with continued population growth and industrial expansion have fueled the state's focus on water availability and protection of groundwater resources in Texas.
- Texas leads the nation in number of farms and ranches, with 248,416 farms and ranches covering 127 million acres (2017, TDA). 80% of groundwater use in Texas is for agriculture.



# Aquifer Recharge as a Beneficial Use in Texas

- 2015 Texas Legislation H.B. 655 revised the requirements for ASR projects in Texas, providing more clarity on storing water underground in an aquifer, including recoverability of the stored water. ASR is a water management technique.
- 2019 Texas Legislation H.B. 720 provided specific requirements for Aquifer Recharge (AR), recognizing that AR projects are a beneficial use of water under the Texas Water Code and removing permitting barriers for ASR and AR projects using new and amended existing surface water rights



# Rule Revisions to Implement Legislation

H.B. 720 removed permitting barriers for **surface water right applications** in Texas for new appropriations of water rights and amendments to existing water rights to facilitate ASR and AR projects. TCEQ adopted rules that clarify the application and review process and should result in shorter application processing times.

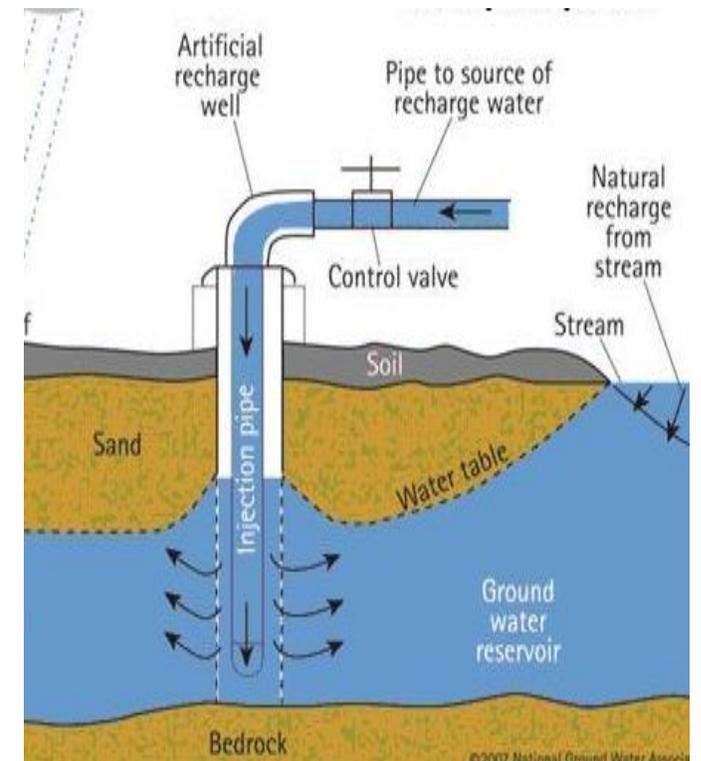
- ASR is an authorization to store state water in an aquifer prior to its later recovery for the authorized beneficial use in the water right.
- AR is a beneficial purpose of use for which the TCEQ can appropriate state water.

# Requirements for New Aquifer Recharge Wells

Aquifer recharge can be accomplished by many methods, including:

- Recharge/infiltration/spreading basins
- Bank infiltration from rivers and lakes
- In-stream and off-stream infiltration
- Unlined stormwater ponds
- Pocket/stormwater wetlands
- Vegetated buffers and swales
- **Injection wells**, including dry wells, saltwater intrusion barrier wells, subsidence mitigation wells, stormwater drainage wells, and improved sinkholes

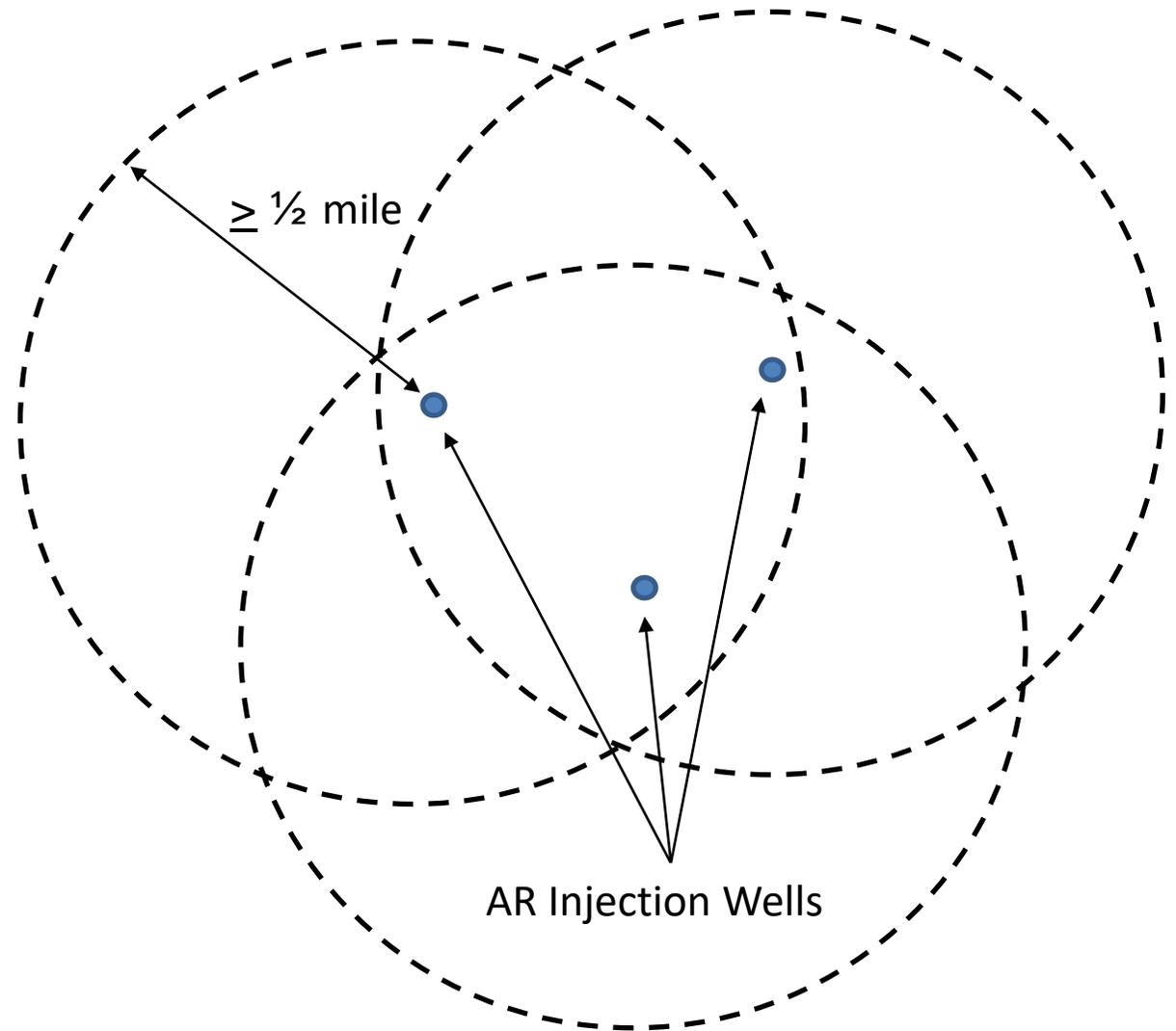
The next several slides provide details of the requirements for AR injection wells under TCEQ's new UIC AR rules.



# AR Area of Review

Title 30 of the Texas Administrative Code,  
chapter 331.263 (30 TAC 331.263)

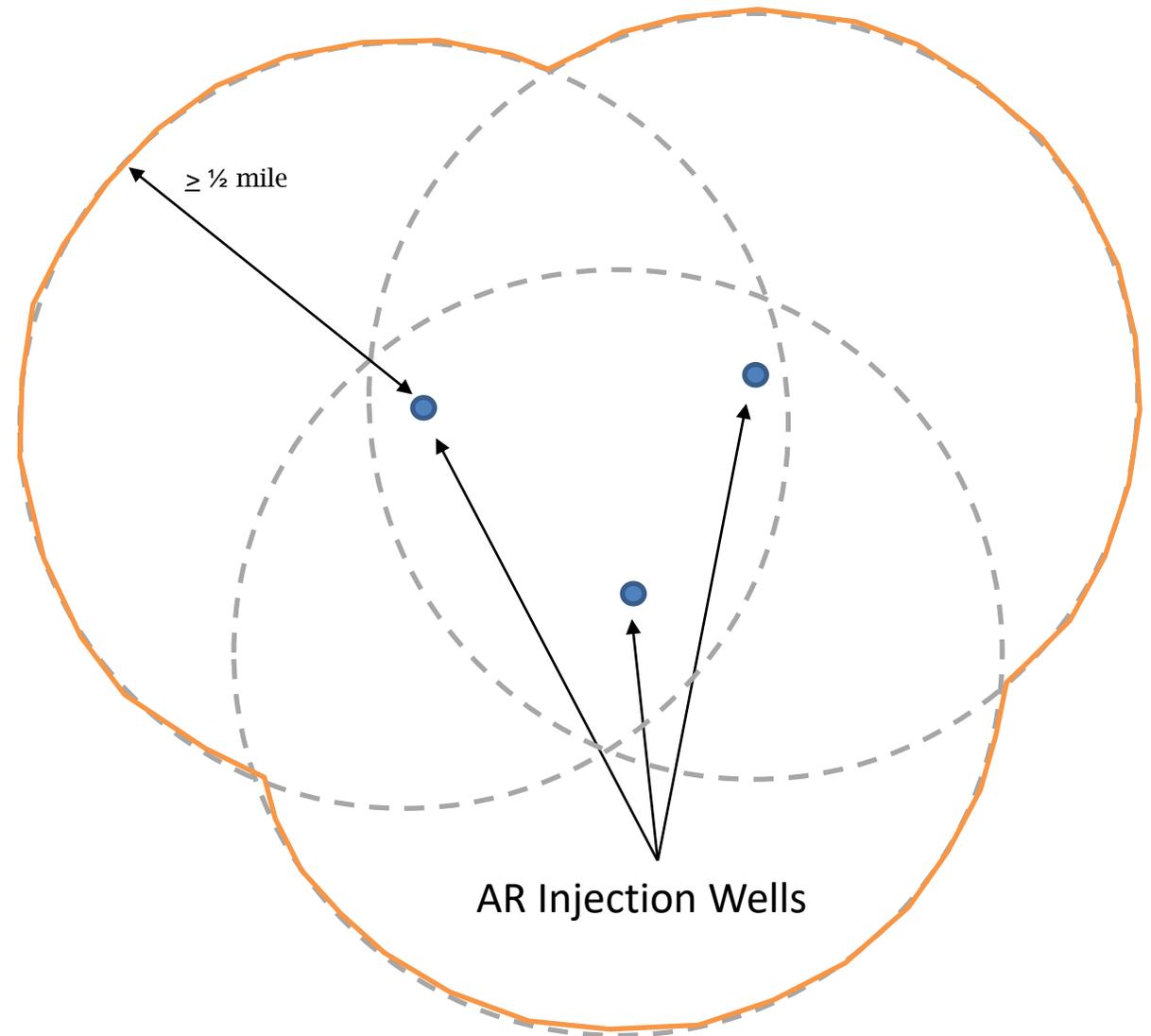
The area of review for an aquifer recharge (AR)  
project is the area determined by a radius of at  
least 1/2 mile from each proposed AR injection  
well.



# AR Area of Review

Area of Review is addressed in 30 TAC 331.263

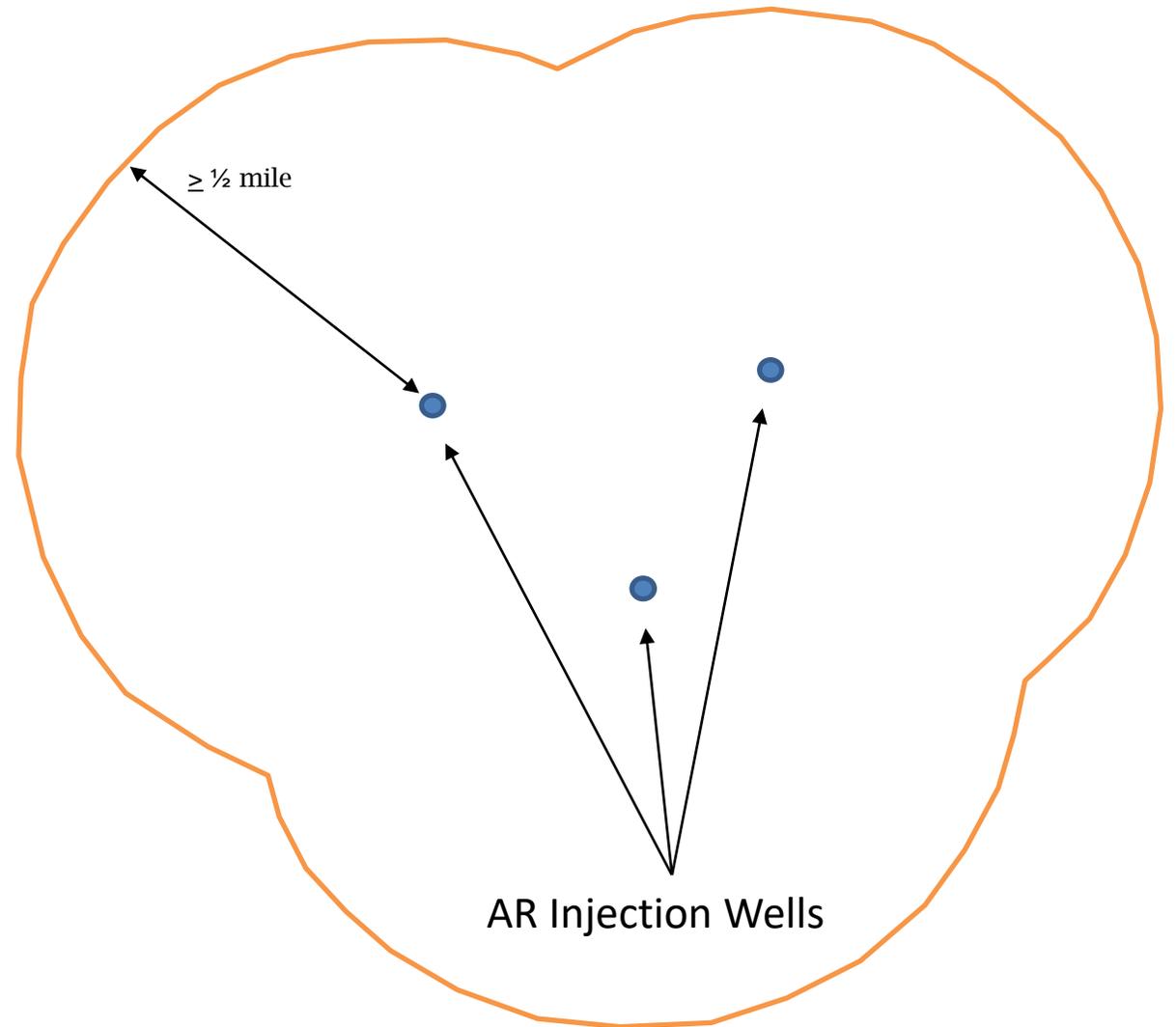
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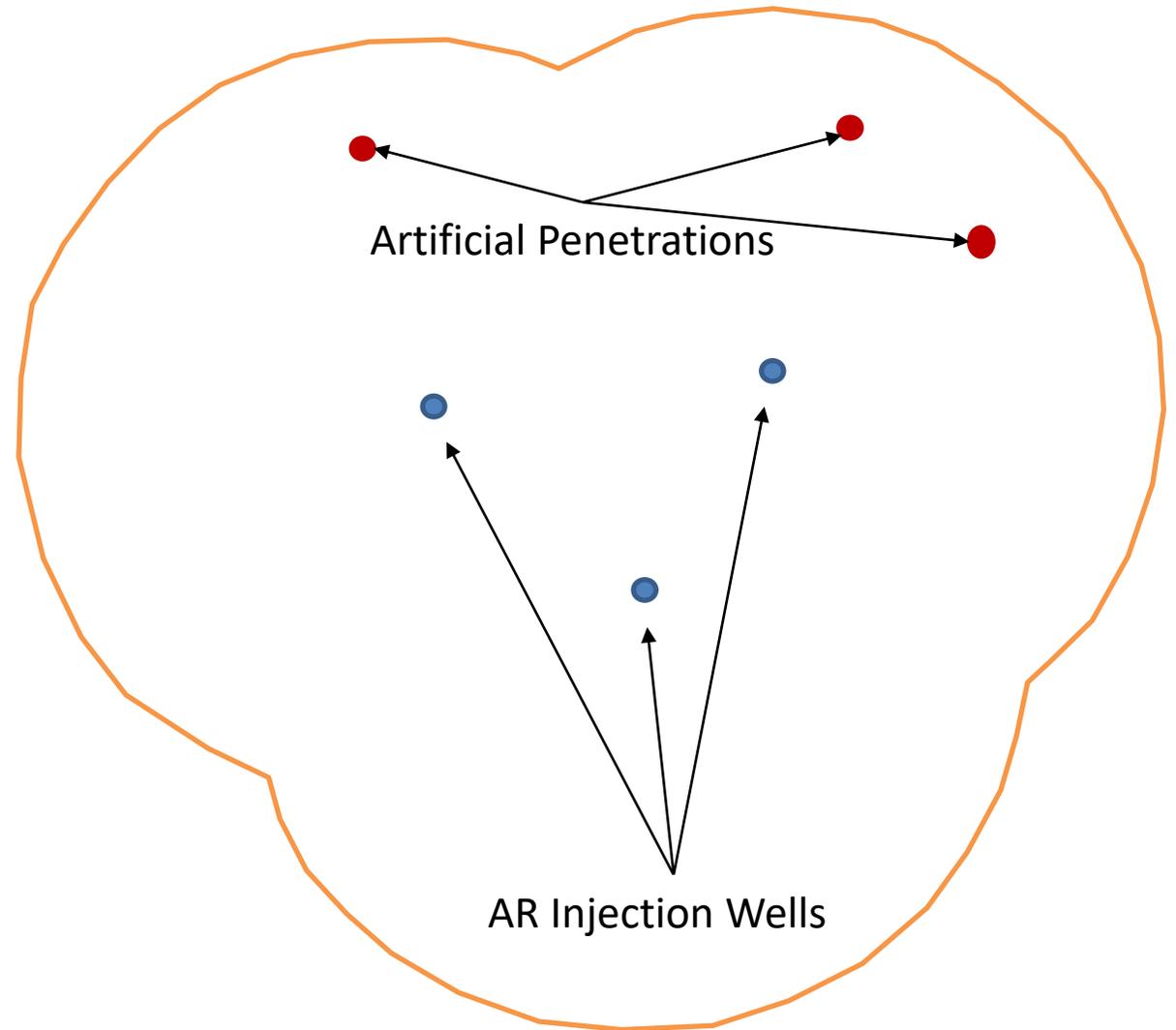
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# AR Area of Review: Features

Must include information on features:

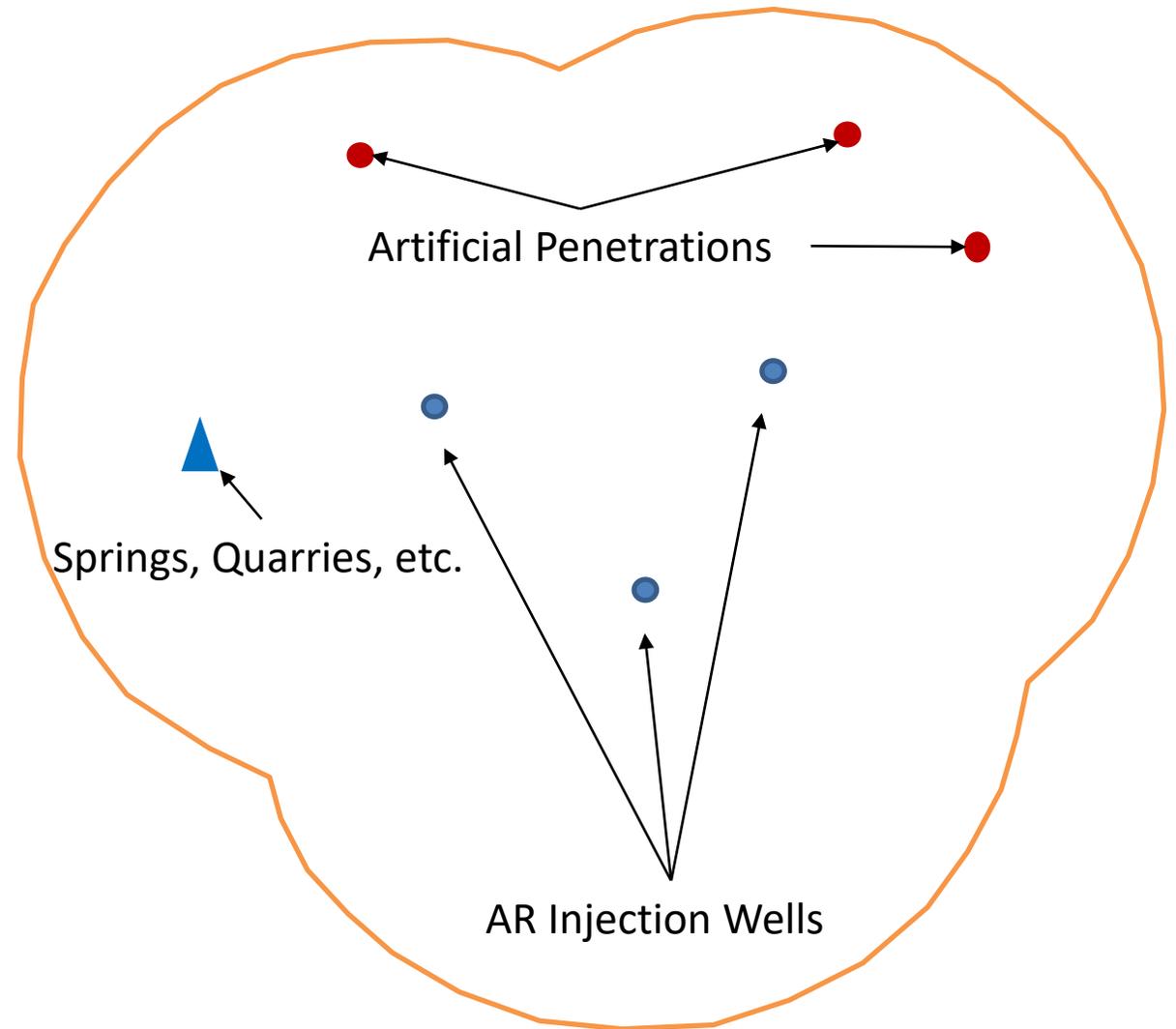
- All artificial penetrations that penetrate the injection interval, for example, water wells, abandoned water wells, oil and gas wells, saltwater injection wells, waste disposal wells, other injection wells  
(30 TAC 331.263(1)(A), 30 TAC 331.263(2))



# AR Area of Review : Features

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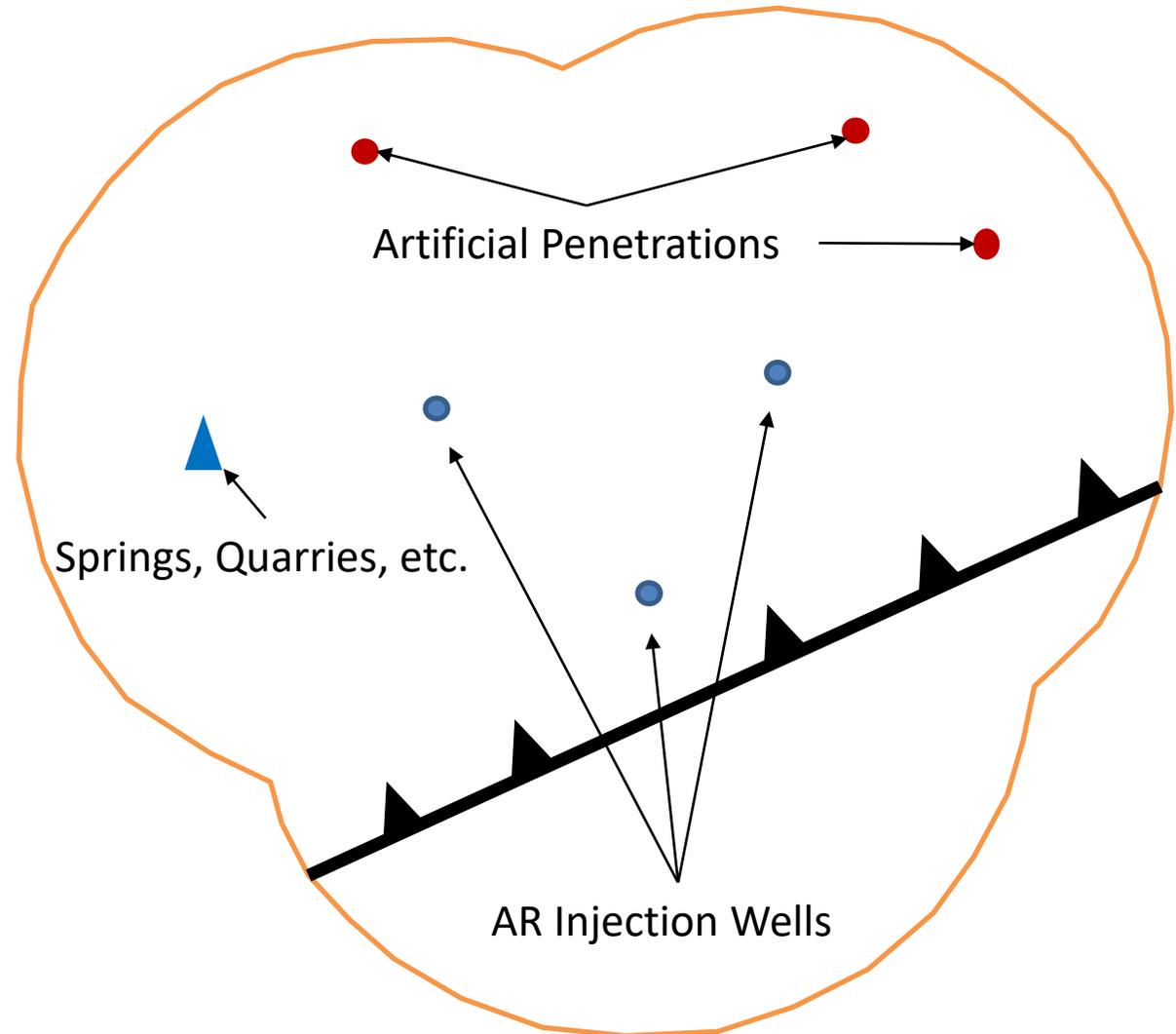
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- Springs, quarries, any other bodies of water, surface or subsurface features that connect to the injection interval  
(30 TAC 331.263(1)(B))



# AR Area of Review : Features

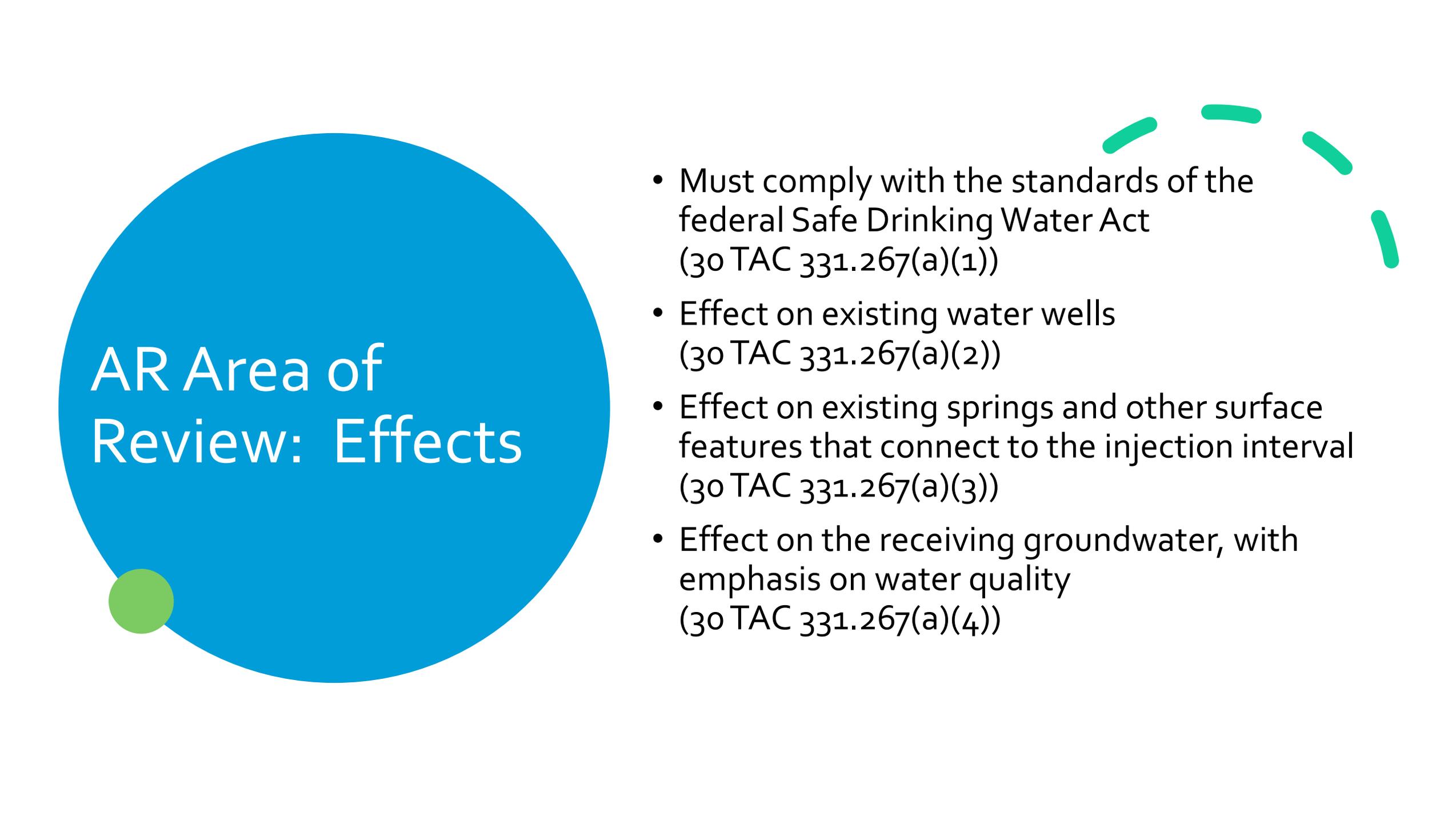
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(30 TAC 331.263(1)(A), 30 TAC 331.263(2))
- Springs, quarries, any other bodies of water, surface or subsurface features that connect to the injection interval  
(30 TAC 331.263(1)(B))
- Site-specific, significant geologic features, such as faults and fractures  
(30 TAC 331.263(3))



# AR Area of Review : Features

- For proposed AR subsidence mitigation projects:
  - land surface elevations (30 TAC 331.263(4))
- For proposed AR improved sinkholes and caves:
  - land use in the drainage basin, and
  - geographic extent of the drainage basin (30 TAC 331.263(5))



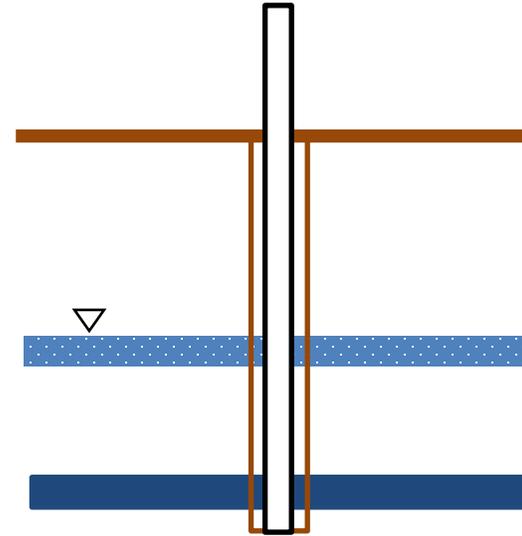
## AR Area of Review: Effects

- Must comply with the standards of the federal Safe Drinking Water Act (30 TAC 331.267(a)(1))
- Effect on existing water wells (30 TAC 331.267(a)(2))
- Effect on existing springs and other surface features that connect to the injection interval (30 TAC 331.267(a)(3))
- Effect on the receiving groundwater, with emphasis on water quality (30 TAC 331.267(a)(4))

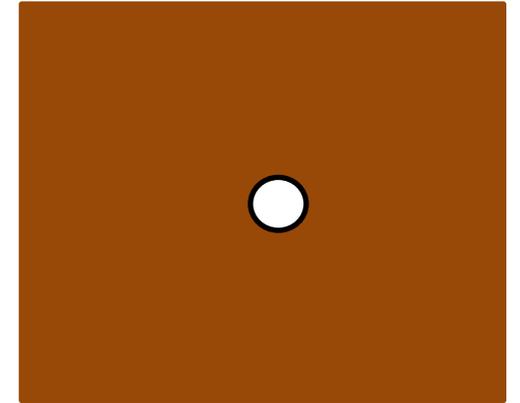
# AR Construction

Aquifer recharge well construction is addressed in 30 TAC 331.132 and 30 TAC 331.264

Cross-Section View



Map View



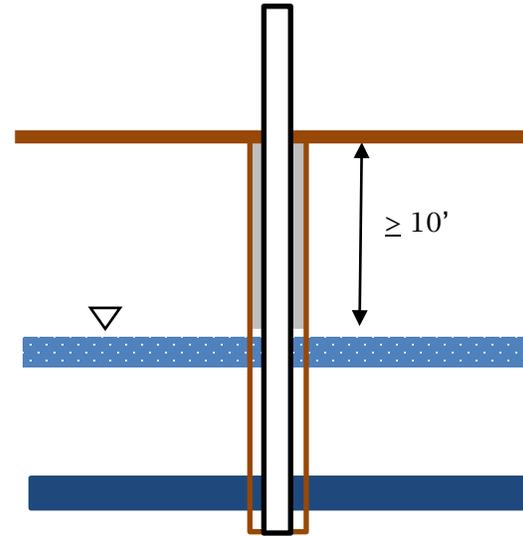
# AR Construction

30 TAC 331.132

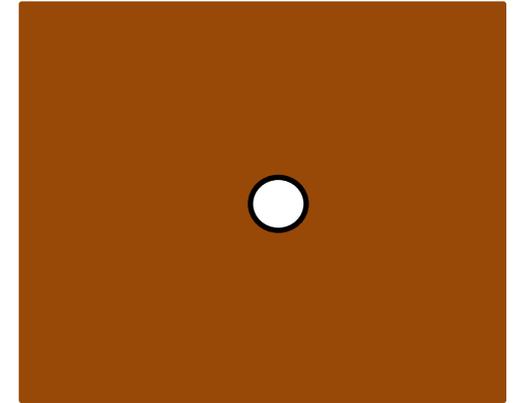
(c) Sealing of casing.

(1) General. Except for closed loop injection wells, the annular space between the borehole and the casing shall be filled with cement slurry from ground level to a depth of not less than ten feet below the land surface or well head. In areas of shallow, unconfined groundwater aquifers, the cement need not be placed below the static water level. In areas of shallow, confined groundwater aquifers having artesian head, the cement need not be placed below the top of the water-bearing strata.

Cross-Section View



Map View



# AR Construction

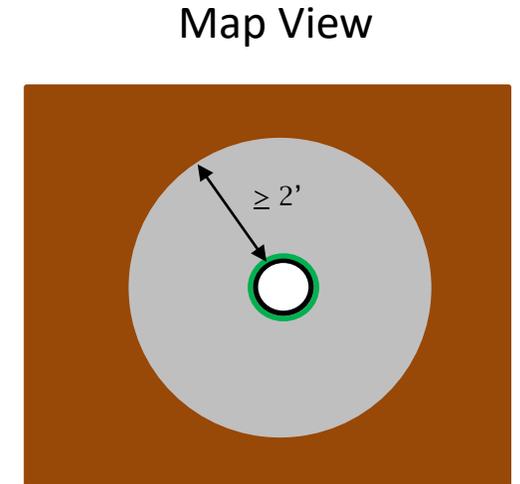
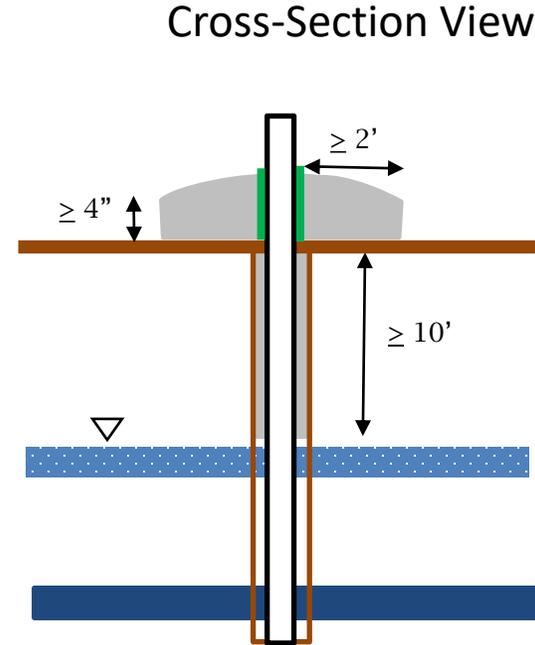
30 TAC 331.132

(d) Surface completion.

(1) With the exception of temporary injection points, subsurface fluid distribution systems, improved sinkholes, and large capacity septic systems, all wells must have a concrete slab or sealing block placed above the cement slurry around the well at the ground surface.

(A) The slab or block shall extend at least two feet from the well in all directions and have a minimum thickness of four inches and shall be separated from the well casing by a plastic or mastic coating or sleeve to prevent bonding of the slab to the casing.

(B) The surface of the slab shall be sloped so that liquid will drain away from the well.

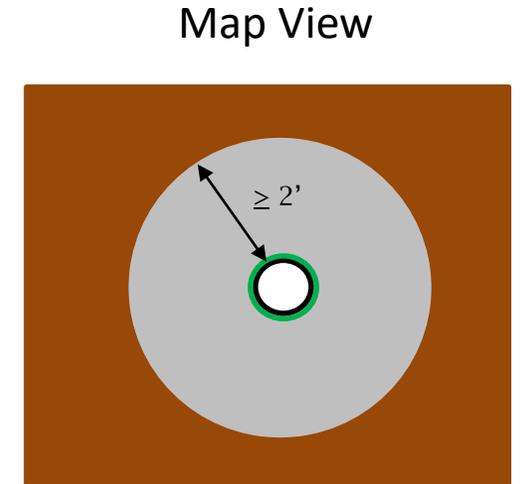
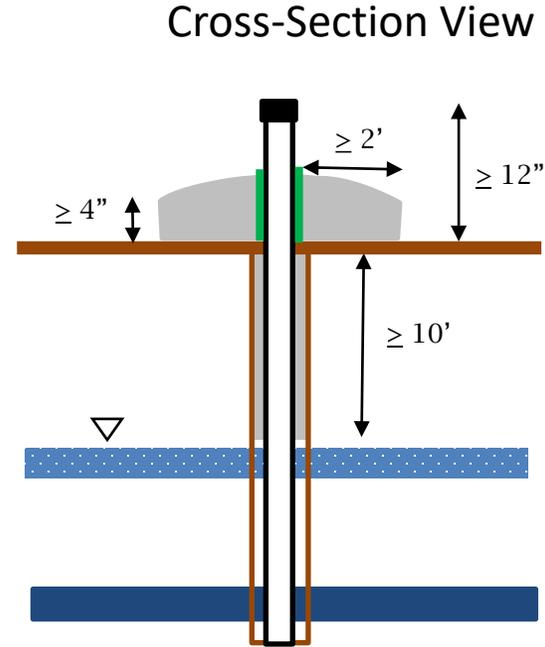


# AR Construction

30 TAC 331.132

(d) Surface completion.

(2) For wells that use casing, the top of the casing shall extend a minimum of 12 inches above the original ground surface. The well casing shall be capped or completed in a manner that will prevent pollutants from entering the well.



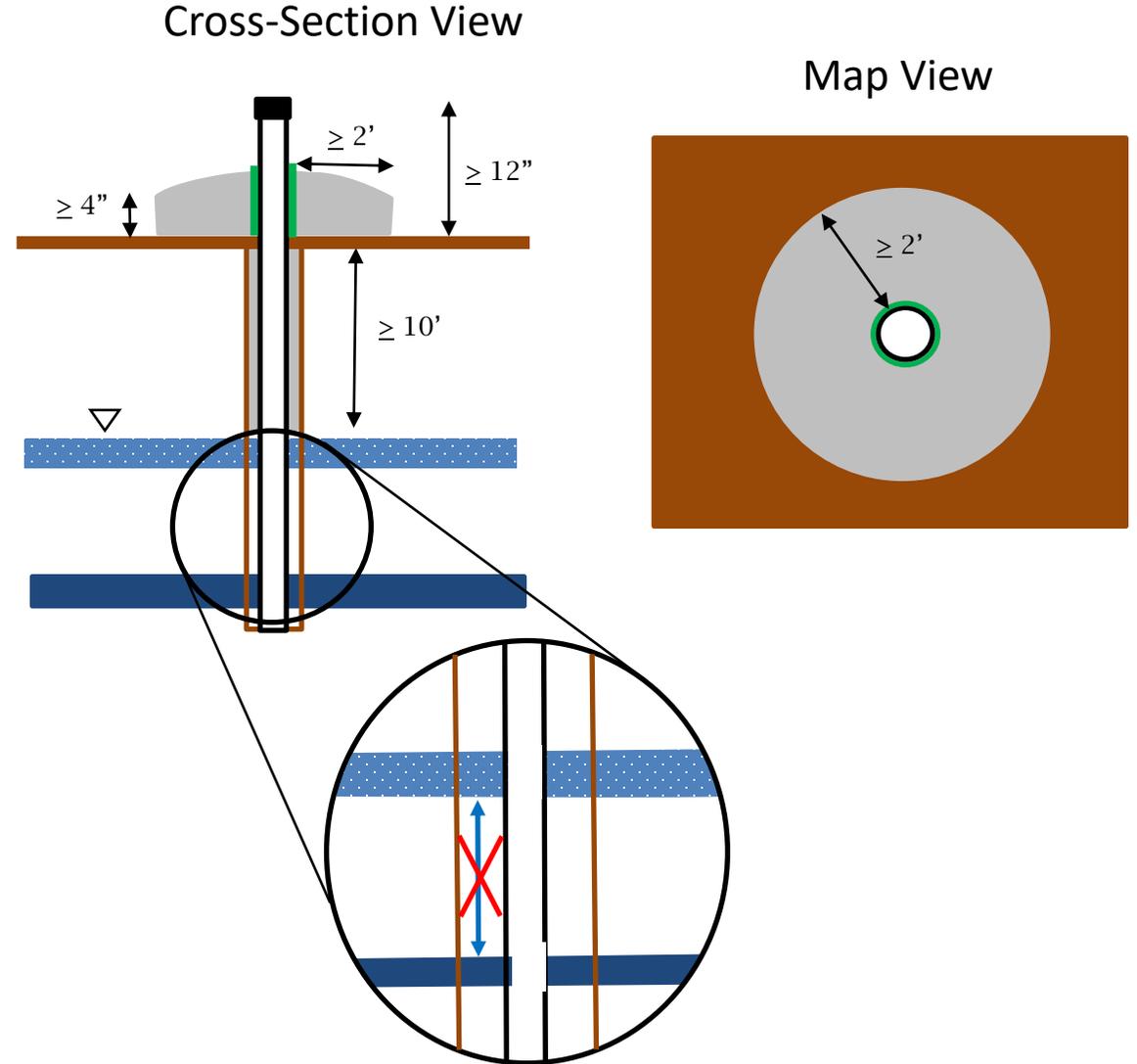
# AR Construction

30 TAC 331.132

(g) Other protection measures.

(1) Commingling prohibited. All wells, especially those that are gravel packed, shall be completed so that aquifers or zones containing waters that are known to differ significantly in chemical quality are not allowed to commingle through the borehole-casing annulus or the gravel pack and cause quality degradation of any aquifer containing fresh water.

(2) Undesirable groundwater. When undesirable groundwater, which is water that is injurious to human health and the environment or water that can cause pollution to land or other waters, is encountered in a Class V well, the well shall be constructed so that the undesirable groundwater is isolated from any underground source of drinking water and is confined to the zone(s) of origin.

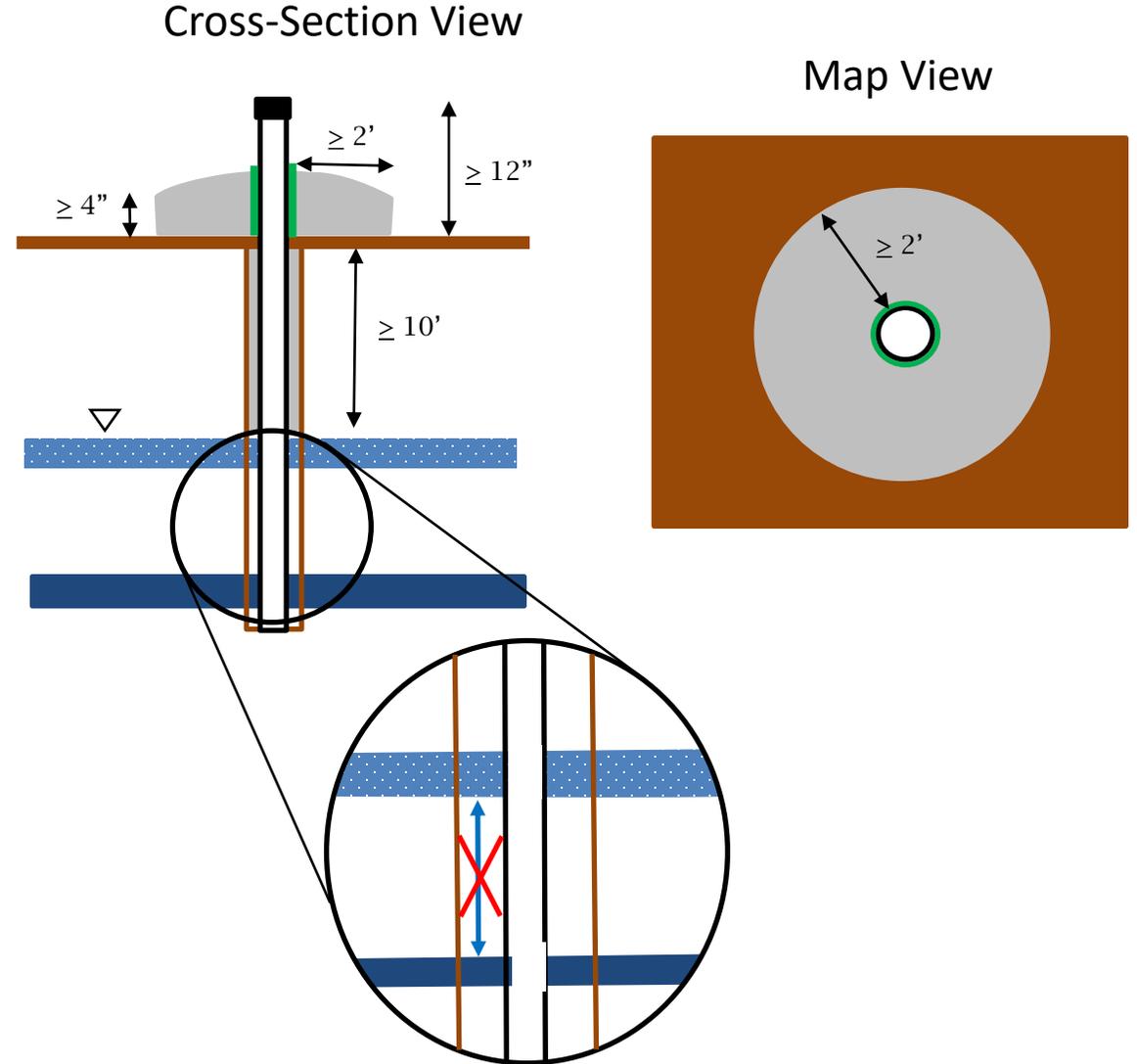


# AR Construction

30 TAC 331.132

(e) Optional use of a steel or polyvinyl chloride (PVC) sleeve. If the use of a steel or PVC sleeve is necessary to prevent possible damage to the casing, the steel sleeve shall be a minimum of  $\frac{3}{16}$  inches in thickness or the PVC sleeve shall be a minimum of Schedule 80 sun-resistant and 24 inches in length, and shall extend 12 inches into the cement slurry.

(f) Well placement in a flood-prone area. All wells shall be located in areas not generally subject to flooding. If a well must be placed in a flood-prone area, it shall be completed with a watertight sanitary well seal to maintain a junction between the casing and injection tubing, and a steel sleeve extending a minimum of 36 inches above ground level and 24 inches below the ground surface shall be used...



30 TAC 331.132(a)... All Class V wells shall be completed in accordance with the specifications contained in this section, unless otherwise authorized by the executive director

# AR Construction

- Notify TCEQ Immediately:
  - If the operator proposes to change the injection interval (30 TAC 331.264(1)(A) and (B))
  - If the operator proposes to change the completion (30 TAC 331.264(1)(B))
  - If the operator proposes to change the screen settings (30 TAC 331.264(1)(B))
- Note injection into an unauthorized zone may not occur without prior written approval from TCEQ (30 TAC 331.264(1)(A))





# AR Construction

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- Construction Materials
    - Casing materials must be resistant to corrosion (30 TAC 331.264(2))
  - Construction, Workover and Closure Supervision
    - All phases must be supervised by qualified individuals who are knowledgeable and experienced in:
      - practical drilling engineering (as applicable) and
      - the special conditions and requirements of injection well and water well construction (30 TAC 331.264(3))

# AR Construction

- Upon completion of AR injection well construction, submit to TCEQ (30 TAC 331.267(b)):
  - As-built drilling and completion data
  - All logging and testing data
  - Formation fluid analyses
  - Injection fluid analyses
  - Injectivity and pumping tests determining well capacity and reservoir characteristics
  - Hydrogeologic modeling
  - Any other required information



# AR Operation

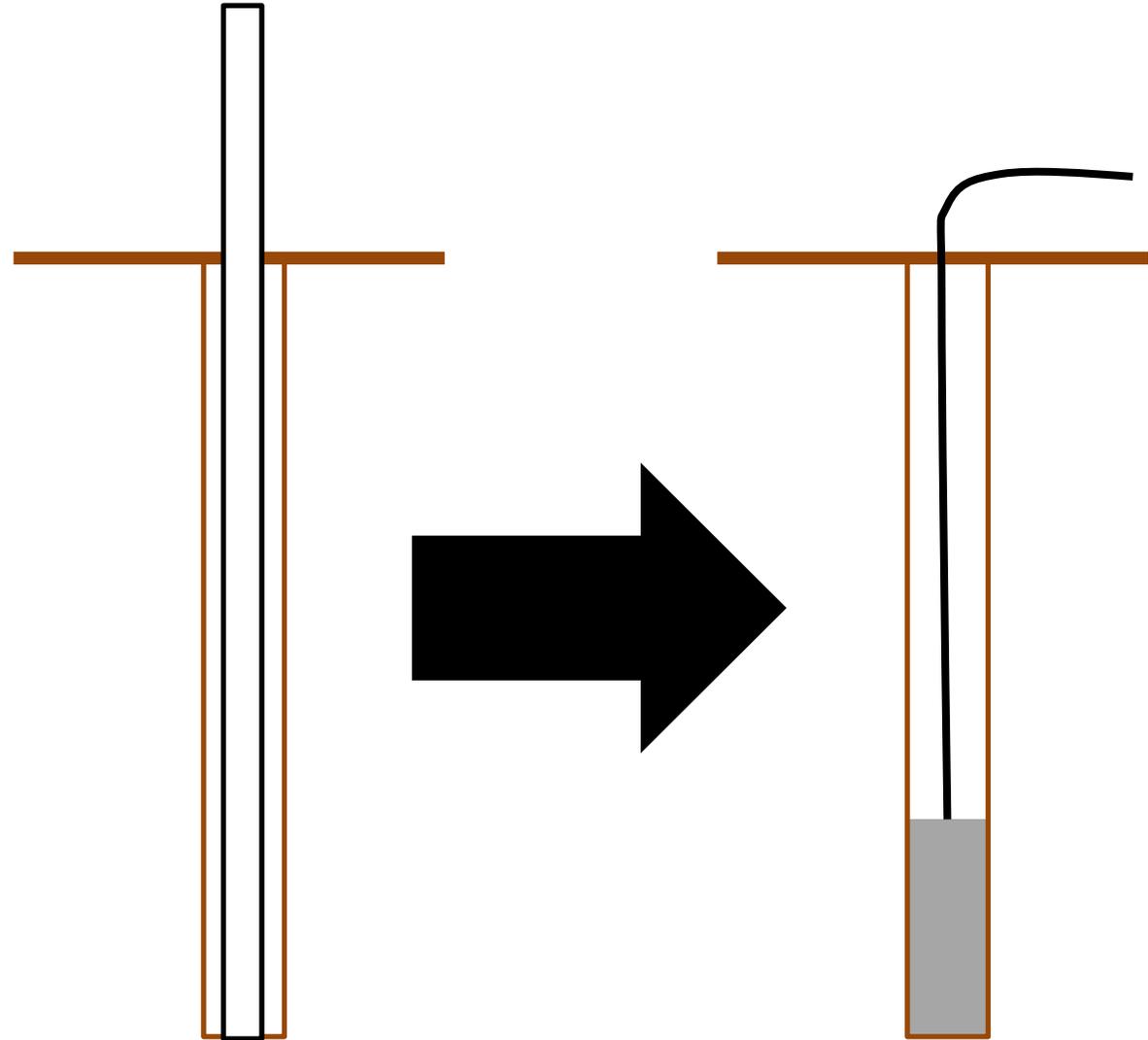
- AR injection wells must not endanger drinking water sources (30 TAC 331.265(a))
- Must measure and not exceed a calculated maximum injection pressure and volume (30 TAC 331.265(b))
- An AR injection well that has ceased operations for more than 2 years must (30 TAC 331.265(c)):
  - Have an MIT, and
  - Give notice to the TCEQ at least 30 days before resumption of operations
- Must maintain mechanical integrity (30 TAC 331.265(d))
- The injected water must be of appropriate quality (30 TAC 331.265(e))
- Must install flow meters (30 TAC 331.265(f))

# AR Monitoring and Reporting

- Written report for each injection well no later than March 1<sup>st</sup>, containing the previous year's (30 TAC 331.266(a)):
  - Volume of water injected for recharge
  - Other information required by TCEQ
- Water-quality testing on water to be injected must be performed (30 TAC 331.266(b)):
  - At least on an annual basis
  - Each time the source changes

# AR Closure

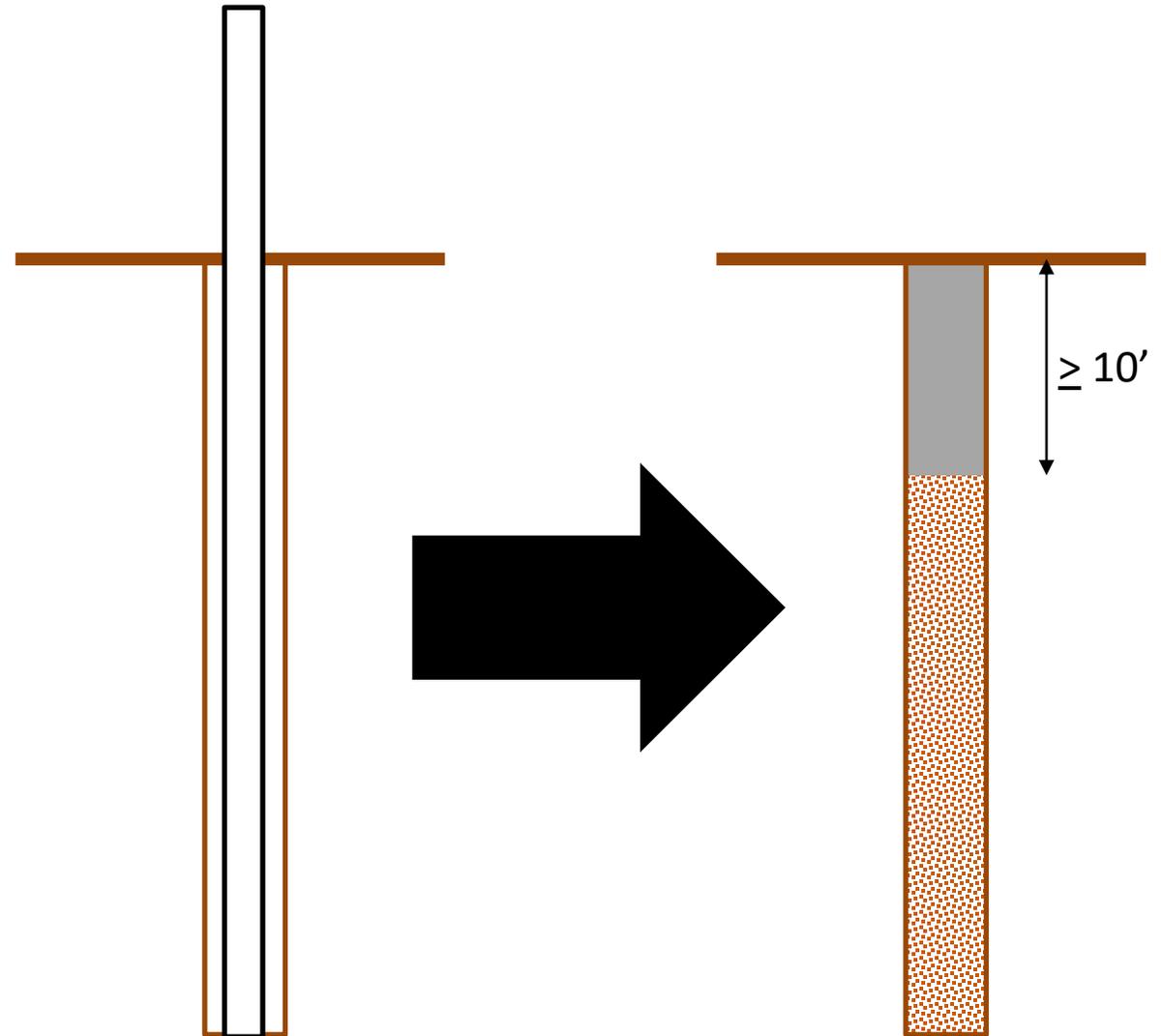
Remove all removable casing and pressure-fill the entire well via tremie pipe with cement from bottom to land surface (30 TAC 331.133(b))



# AR Closure

If the well does **not** go through zones of undesirable groundwater or water that is injurious to human health and the environment, or water that can cause pollution to land or other waters (30 TAC 331.133(c)):

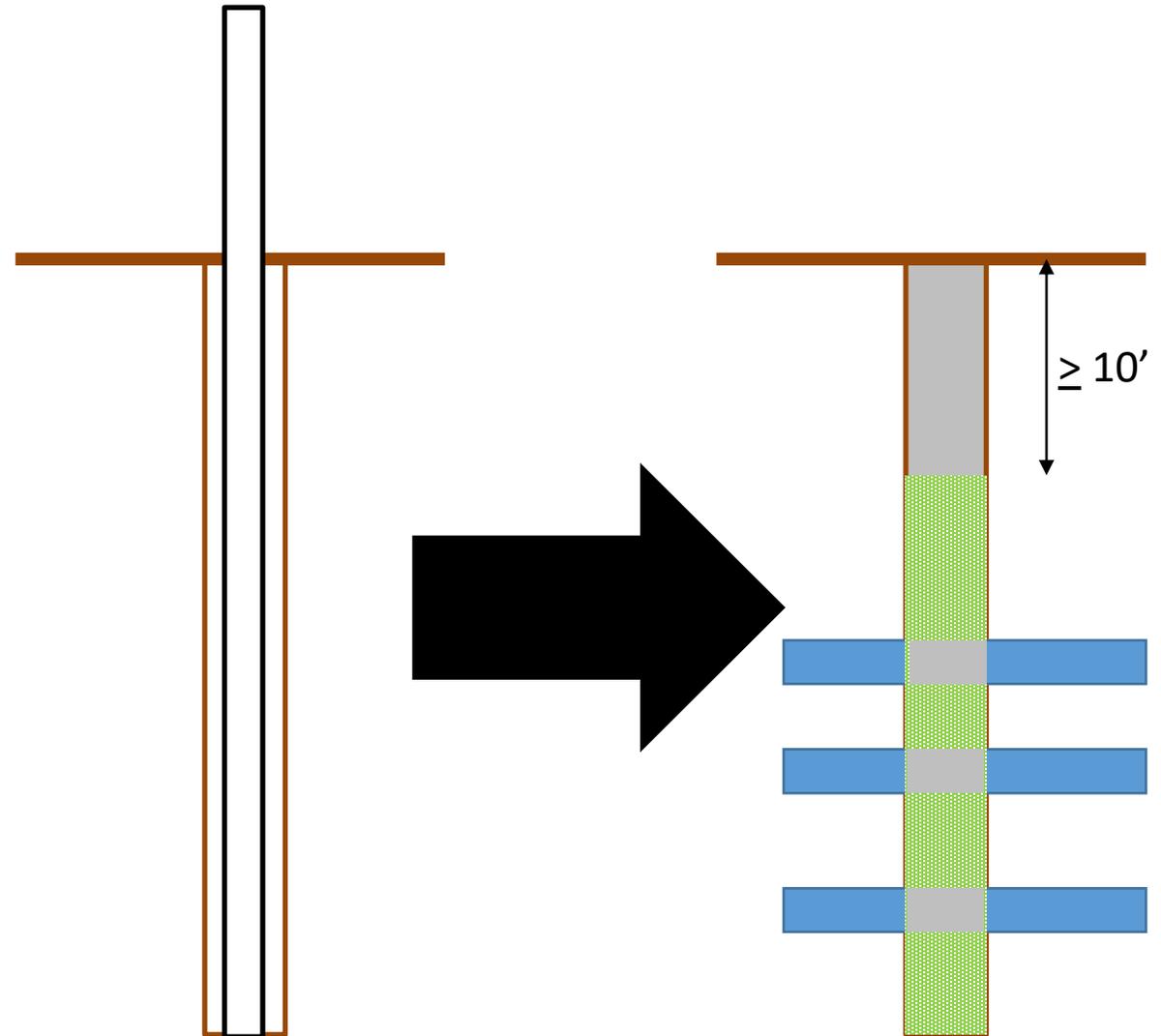
- The well may be:
  - filled with fine sand, clay, or heavy mud,
  - followed by a cement plug extending from land surface to at least 10 feet below land surface



# AR Closure

If the well does go through zones of undesirable groundwater or water that is injurious to human health and the environment, or water that can cause pollution to land or other waters (30 TAC 331.133(d)) :

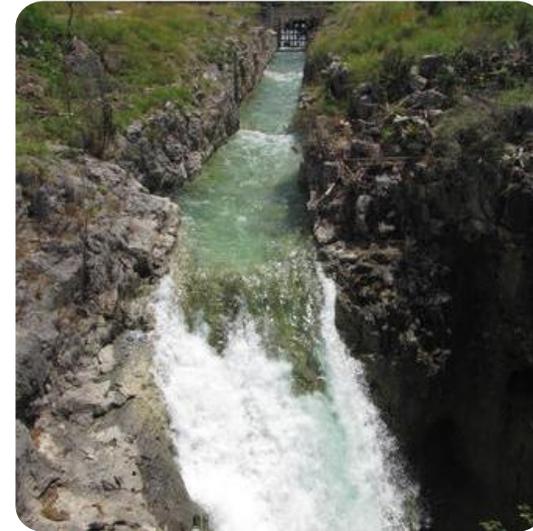
- The zone(s) containing undesirable groundwater or the zone(s) containing the fresh groundwater may be:
  - Isolated with cement plugs,
  - The remainder of the wellbore filled with bentonite grout ( $\geq 9.1$  pounds per gallon),
  - followed by a cement plug extending from land surface to at least 10 feet below land surface



# Previously Authorized Aquifer Recharge Wells

Aquifer recharge is not new in Texas; however, AR has successfully been used on a limited basis. In addition to large, well-documented ASR projects in Kerrville and San Antonio, AR has been used by:

- El Paso, using indirect potable reuse of tertiary-treated wastewater. El Paso Water Utilities recharges the area's primary source of groundwater, the Hueco Bolson Aquifer, using UIC Class V injection wells and surface infiltration basins. In 2010, the aquifer was recharged with 500 million gallons of reclaimed water (EPWU)
- The Edwards Aquifer Authority, using a significantly different type of aquifer recharge project. EAA diverts water from Seco Creek into a large sinkhole in the recharge zone of the Edwards Aquifer in Medina County. Since 1982, annual recharge at the sinkhole has ranged from 0 to 12,915 acre-feet (EAA)



# Previously Authorized Aquifer Recharge Wells, cont.

Prior to the passage of H.B. 720, TCEQ had also authorized a few smaller-scale UIC Class V AR wells, including:

- AR pilot project in a rural southwestern Texas county to evaluate the practicality of recharging a deeper regional aquifer with storm water, with a focus on identifying potential concerns with bacteria present in stormwater
- AR into a brackish-water aquifer in central Texas using water from a rooftop rainwater collection system and injected into a residential well

Previously authorized AR wells in Texas will continue to operate under the provisions of their existing UIC authorizations. New AR well authorizations will operate under TCEQ's new Aquifer Recharge rules found in Title 30 TAC Chapter 331, new Subchapter O.



# Presenter Contact Info:



Lorrie Council, P.G., UIC Program Liaison, TCEQ,  
[lorrie.council@tceq.Texas.gov](mailto:lorrie.council@tceq.Texas.gov) (512) 239-6461

Carol Dye, P.G., UIC Permits Section Manager, TCEQ,  
[carol.dye@tceq.Texas.gov](mailto:carol.dye@tceq.Texas.gov) (512) 239-1504

UIC Permits Section contact  
info: [uic@tceq.Texas.gov](mailto:uic@tceq.Texas.gov) (512) 239-6466

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