Updates to the California Well Standards

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American Construction and Supply, Inc.

Updates to the California Well Standards

- Why we need Well Standards.
- History of California Well Standards.
- California Well Standards Today.
- Cathodic protection well standards.
  - What is a Deep Well Anode?
- Changes forthcoming.

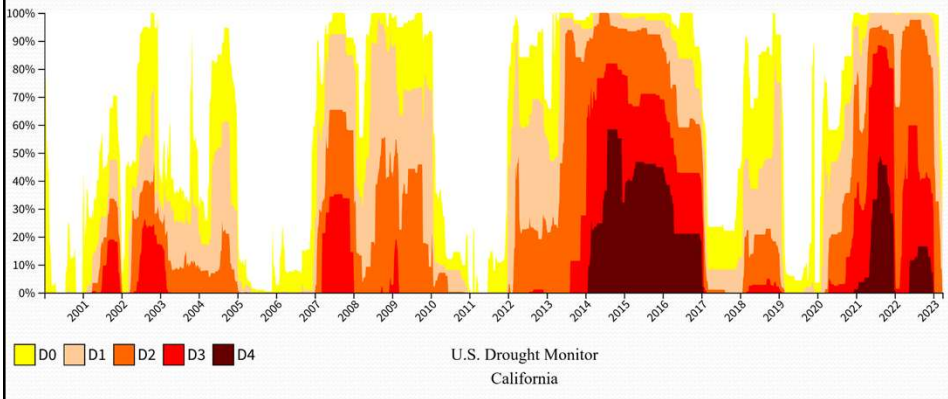
Central Valley Groundwater Overdraft

https://phys.org/news/2019-03-western-droughts-permanent-loss-major.html

Protect Our Groundwater

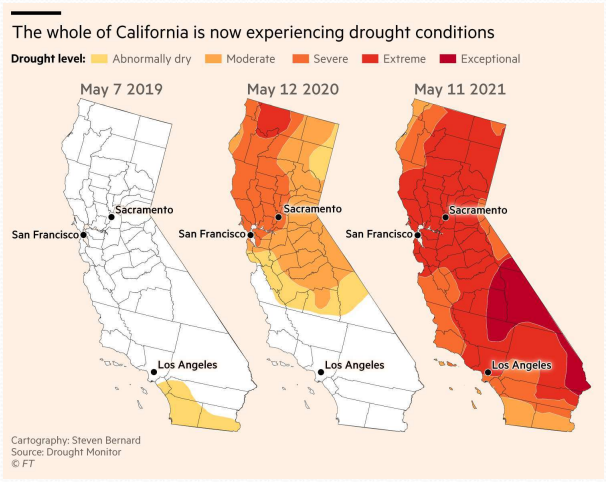
- Morally obligated to maintain and protect our aquifers.
- Renewable resource if properly protected.
- Inadequate well construction degrades water quality.
- Abandoned wells pose a serious threat.
- Properly installed and destroyed wells minimize the risk of degradation.
- Cathodic protection wells are part of the problem if not constructed correctly.

Cyclic Nature of California Rainfall

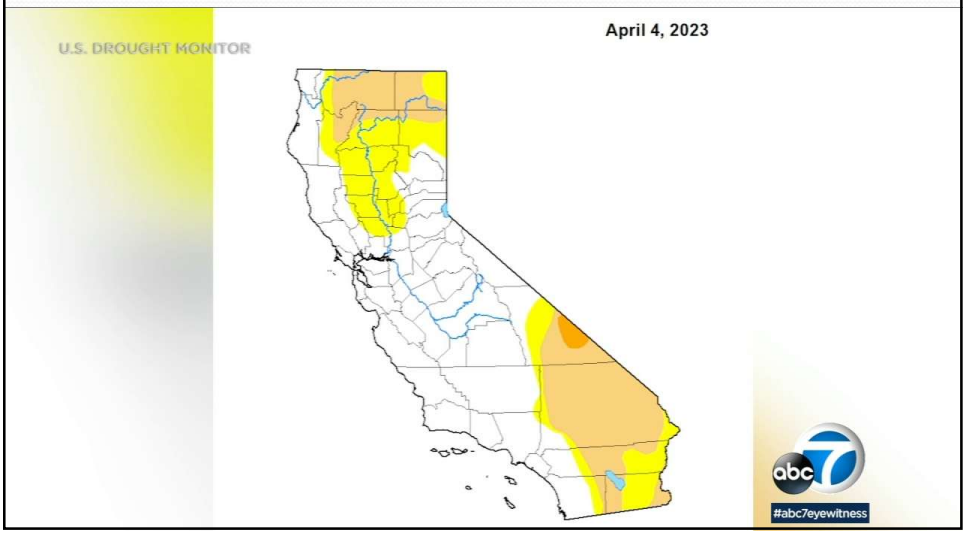


https://www.drought.gov/states/california

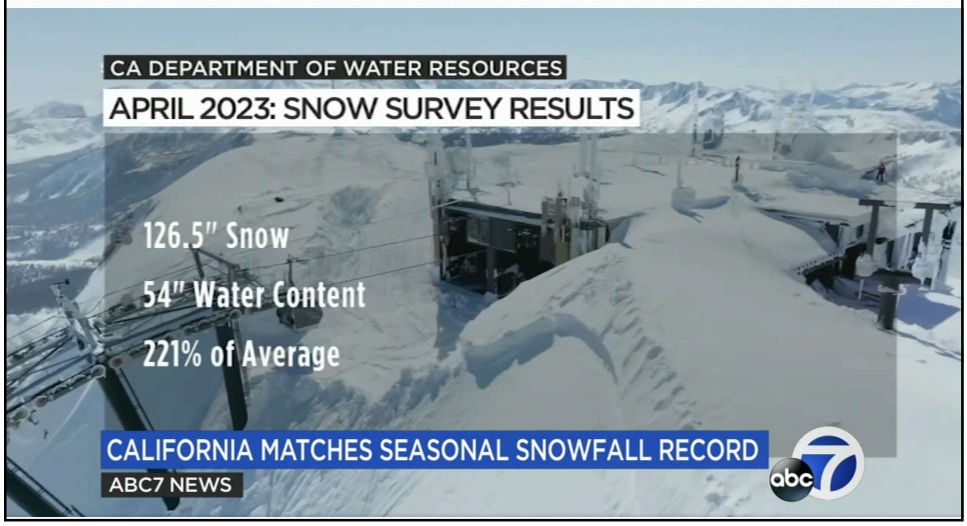
Boom or Bust Cycle



What a Difference a Season Makes!



Record Breaking

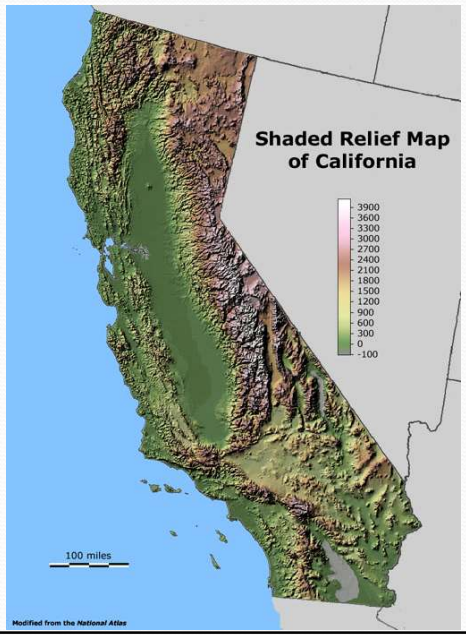


California Well Standards - Bulletin 74

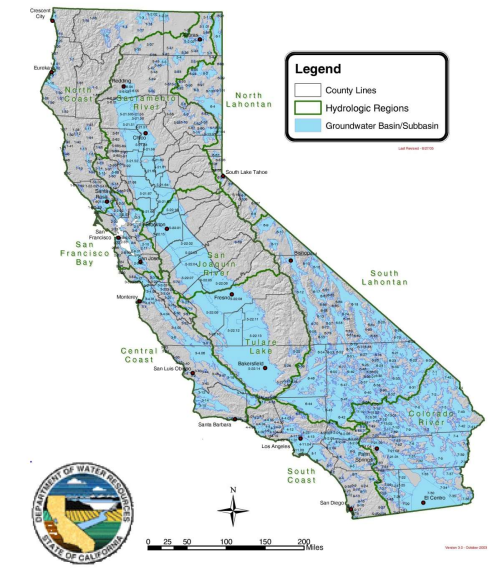
- California began preparing standards to protect groundwater after the enactment of Water Code Section 231 in 1949.
- February 1968: First version of the CA Well Standards were issued in their current form.
- Designed to protect groundwater from surface contamination and commingling of aquifers.
  - Residential, agricultural, petroleum & industrial waste.
- Many California regulations migrate to other states.
- Most states now have well standards.

Groundwater - a Precious Resource

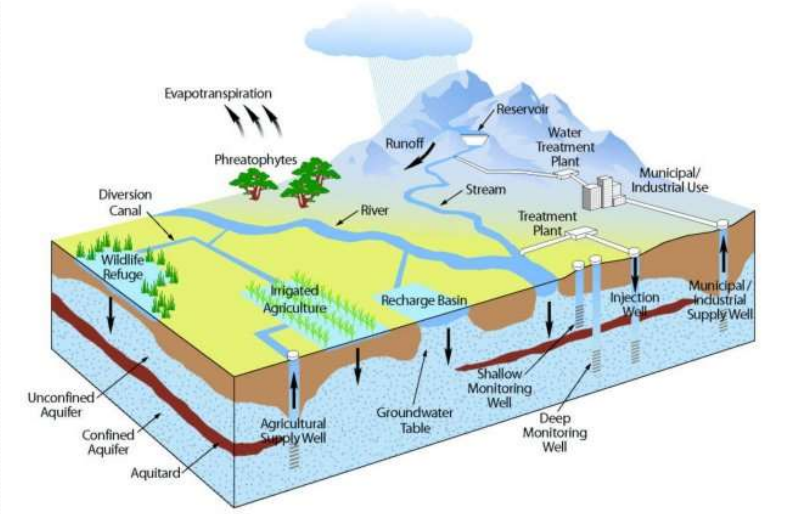
- California's Groundwater Update 2020 (Bulletin 118).
  - State's official publication on the occurrence and nature of groundwater in CA.
    - https://data.cnra.ca.gov/dataset/calgw_update2020
  - Accounts for 41 percent of the state's total annual water supply on an average basis.
  - As much as 58 percent of the total annual water supply in a critically dry year.
  - ~83 percent of Californians depend on groundwater for some portion of their water supply.
  - Many communities are 100 percent reliant on groundwater.

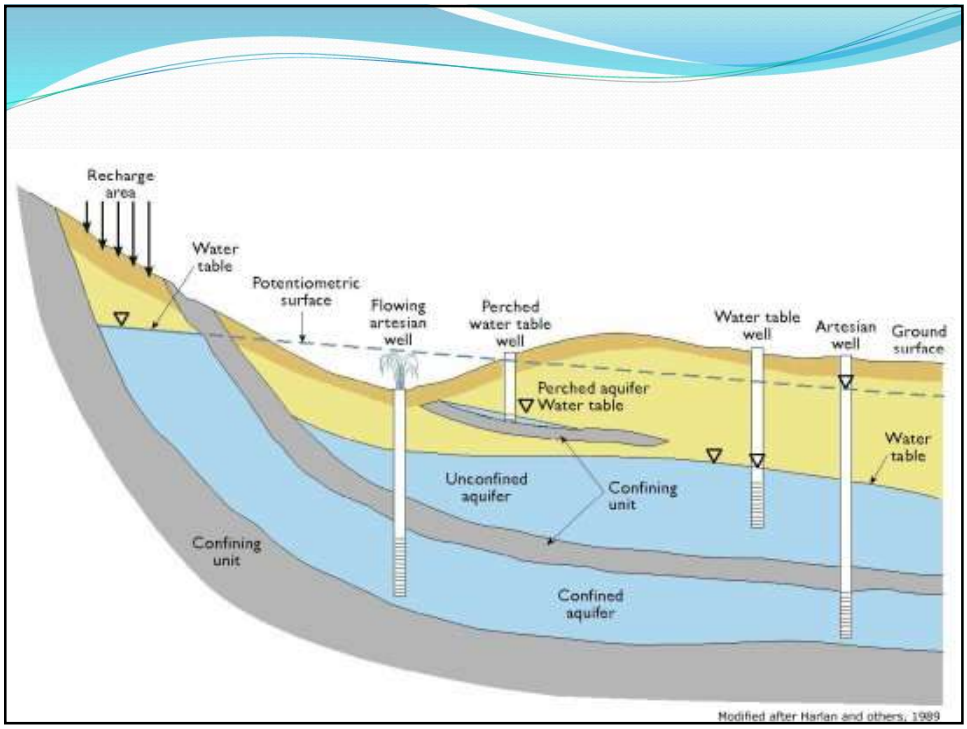


Groundwater Basins in California

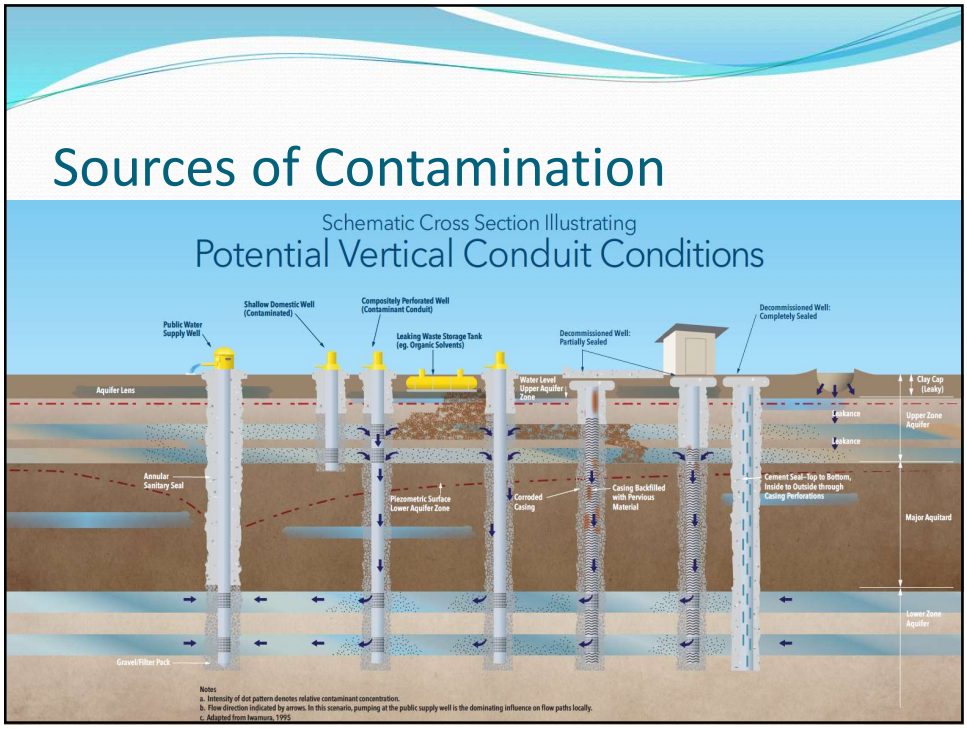


The Hydrologic Cycle



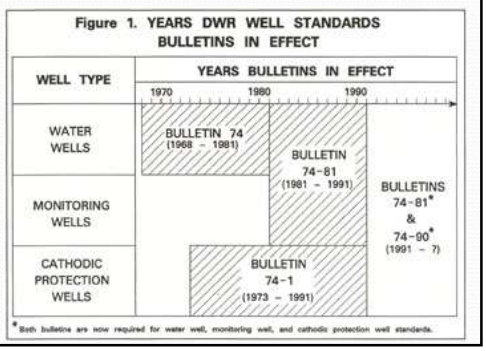


Sources of Contamination



California Well Standards Today

- Current version of well standard is a combination of Bulletin 74-81 and Bulletin 74-90. Confusing format.
  - https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Standards/Combined-Well-Standards
- Superseded 74-1.
- Enforced on local level by County Health Departments, Water Districts, or Cities.

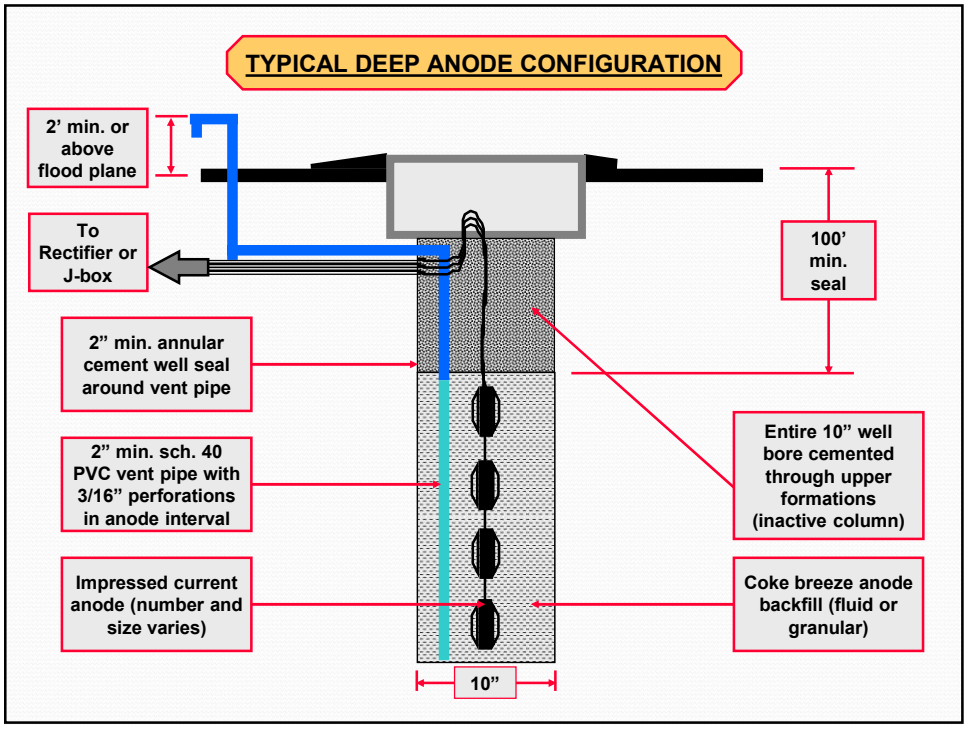


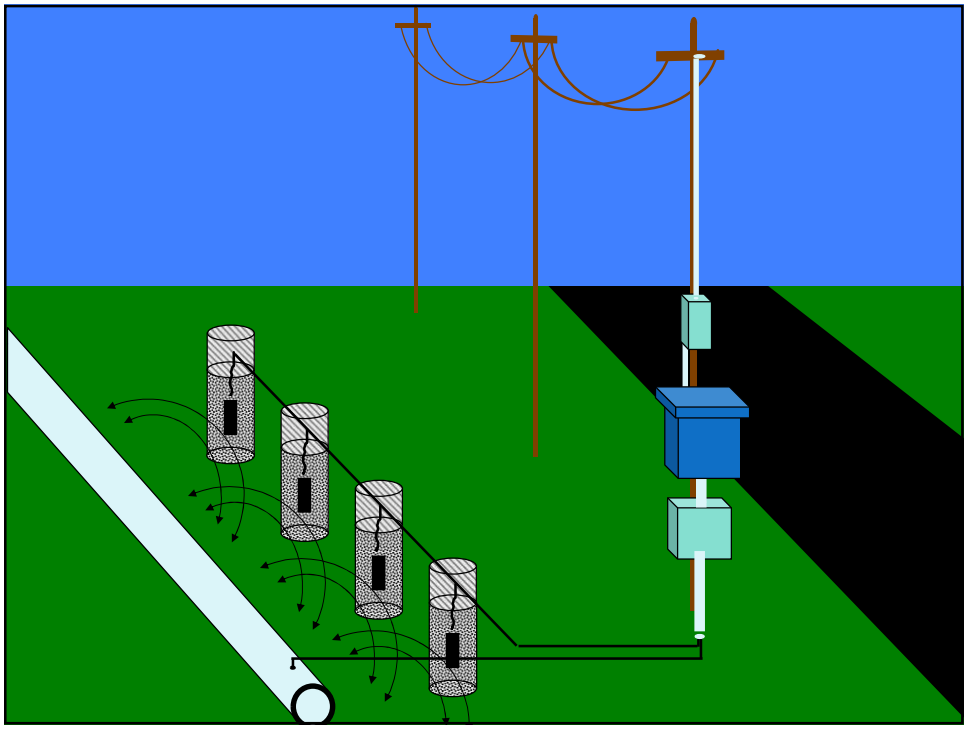
Cathodic Protection Well Standards

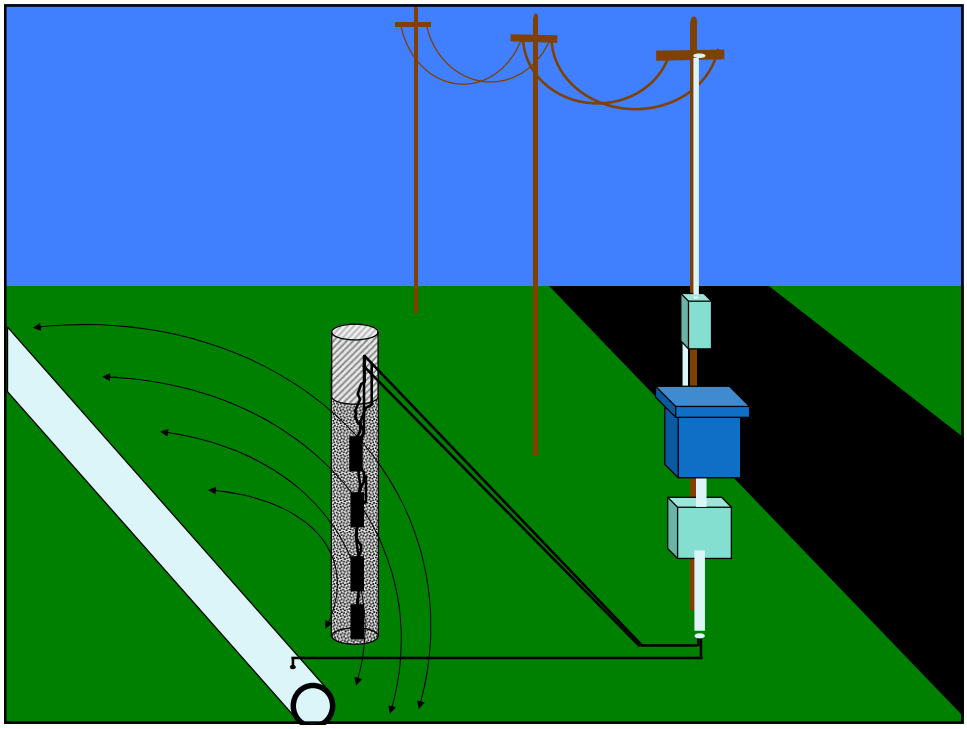
- Water code added cathodic protection in 1968.
- Cathodic protection added to well standards in 1973.
- Bulletin 74-1 in effect until 1991.
- Bulletin 74-90 still in effect.
- Refers to Bulletin 74-81.

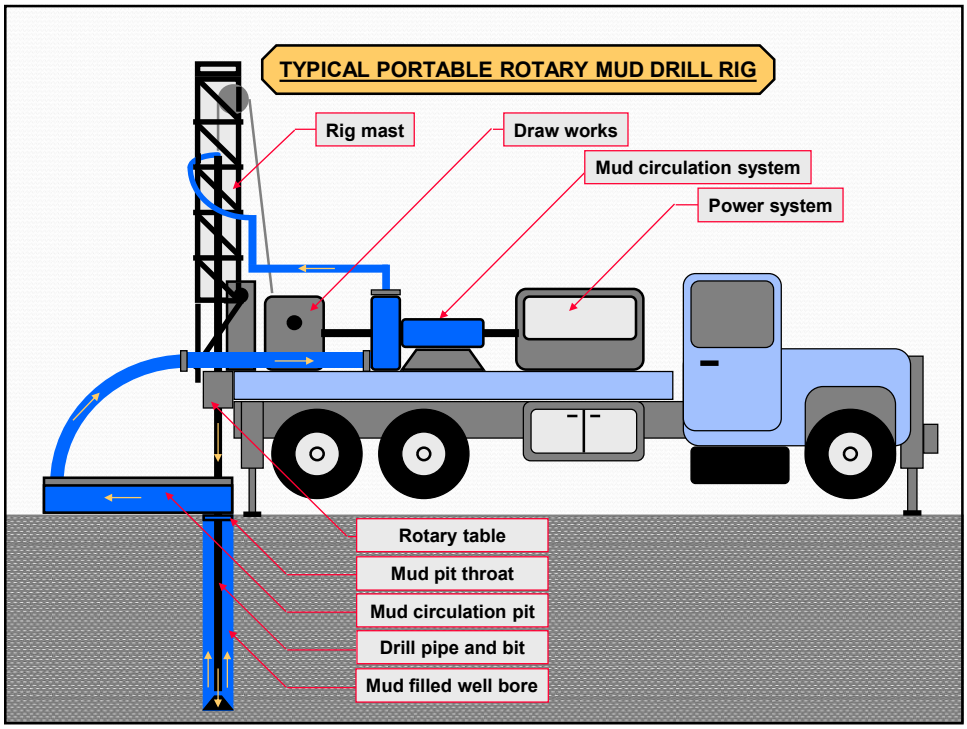
What's a Deep Well Adnoid? 😉

- NACE Definition: One or more anodes installed vertically at a nominal depth of 15 m (50 ft) or more below the earth's surface in a drilled hole for the purpose of supplying cathodic protection.
- Normally use multiple anodes "stacked" in a single well bore, as opposed to single anodes installed in several shallow well bores.
- Anodes deep underground to obtain remote earth.
- Deep anodes distribute CP current over considerable distances. Flashlight affect.








TYPICAL PORTABLE ROTARY MUD DRILL RIG
Rig mast
Draw works
Mud circulation system
Power system
Rotary table
Mud pit throat
Mud circulation pit
Drill pipe and bit
Mud filled well bore

Cathodic Well Standards Today

- Definition of CP well is in California Water Code.
  - CP wells are >50' deep – 49' anodes circumvent code.
- Must obtain permit for every deep anode installation.
  - Permits are obtained on local level.
  - Must have C-57 well driller's specialty license.
- State well standards are minimum requirements.
- Many local regulators exceed minimum standards.
  - Write their own codes and standards.
  - Require permits and seals for anodes <50' deep.
  - Some require permits and seals in 10' anode installations!

Cathodic Well Standards Today

- Allows placement of non-conductive granular material above active column.
- Minimum 20' sanitary seal in annular space between vent pipe and bore hole.
- Minimum 50' sanitary seal in urban areas.
- Minimum radial thickness of seal is 2".
- Seal material must be placed from bottom up through pipe (tremie method). Usually pumped.
- Seal material includes cement, concrete and bentonite.
- Install well head to eliminate risk of surface contaminants.

Updates to California Well Standard

- Well standards are being reviewed and updated.
- Upon completion of the update, DWR will recommend Bulletin 74 to the State Water Resources Control Board.
- DWR is committed to an open and transparent process that seeks participation and collaborative input from stakeholders and the public.
- More information:
  - https://water.ca.gov/well-standards

Well Standard Update Committee

- Bulletin 74 Technical Advisory Committee.
- Nine focus groups.
  - Phase 1:
    - Sealing Materials and Placement
    - Water Well Siting and Design
    - Large Diameter Infiltration/Recharge Wells
    - Non-Vertical Wells Focus Group
    - Well Destructions
  - Phase 2:
    - Water Wells
    - Monitoring Wells
    - Cathodic Protection Wells
    - Geothermal Heat Exchange Wells

Updates Still in Progress

- Members of CP community involved.
- DWR is working to complete the Preliminary Administrative Draft.
- At the current pace, DWR anticipates Public Review to occur next Spring.
- DWR will post updated schedule on their website as soon as the Preliminary Administrative Draft has been distributed for internal reviews.
- Final revisions after public input.

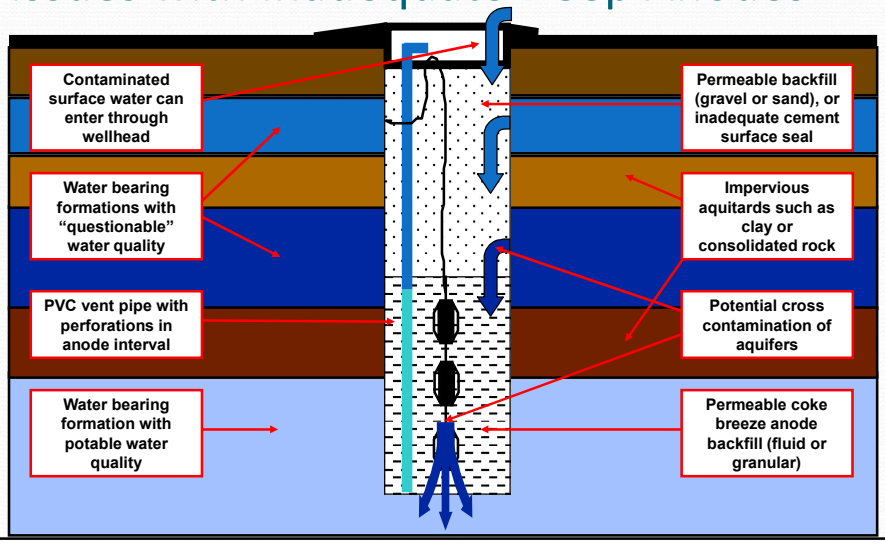
TOP PRIORITY: Aquifer Protection

- Higher standards for surface construction.
- May be required to continue all cement well seals into a substantial clay layer (aquitard), no matter the depth.
- Eliminate porous, non-conductive material (sand or gravel) between active column and well seal.
- May need to seal off strata between aquifers and include separate vent pipes in each active zone.
  - Standard procedure in monitoring well industry.
- May only be allowed to install anodes in one aquifer.
  - Similar to Alameda County Water District requirements.

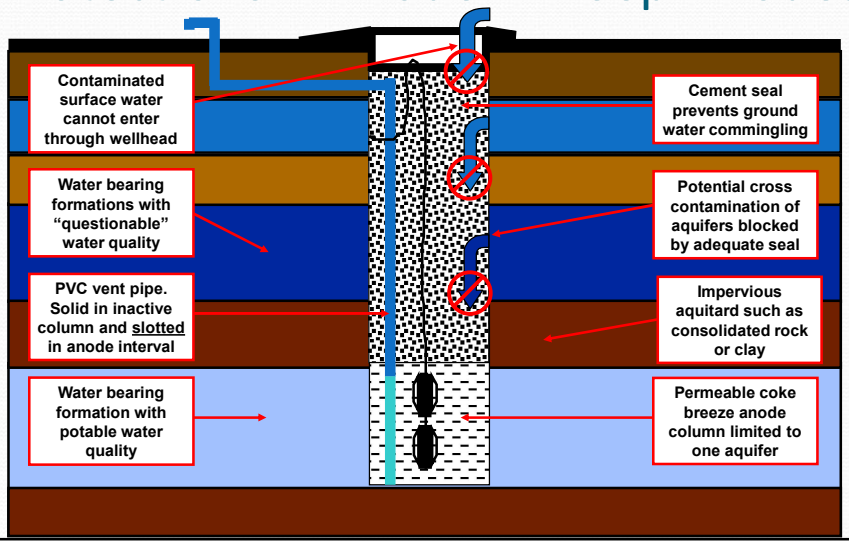
Well Design to Facilitate Destruction

- Vent pipe (casing) is access point for well destruction.
- May require minimum vent pipe diameter of 2".
- Vent pipe perforations should allow cement to pass through vent openings and into coke column.
  - Could eliminate small slots and round holes.
- Pump cement through coke during well destruction.
  - Could eliminate fluid type coke.
- Drill out wells to total depth if vent or coke is inadequate.

Issues with Inadequate Deep Anodes



Protections in Modern Deep Anodes



Well Destructions (Abandonments)

- Prevent contamination from surface waters.
- Present Procedure varies by area:
  - Minimum: Fill upper zone of vent pipe full of cement.
  - Insert smaller pumping tube inside vent pipe.
  - Cement must be pumped from the bottom up.
  - Remove anode system to 5' deep.
  - Install protective concrete cap.
- Some agencies already require over-drilling.

Properly Destroyed Water Well - Present
(image from well standard)

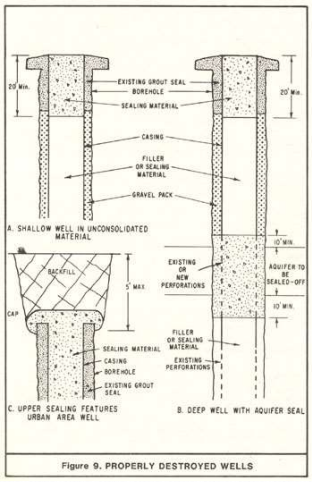
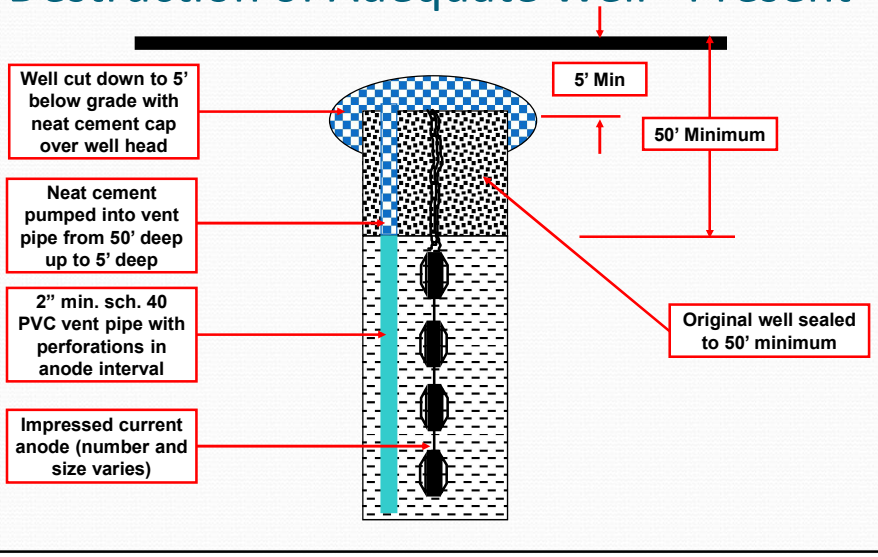
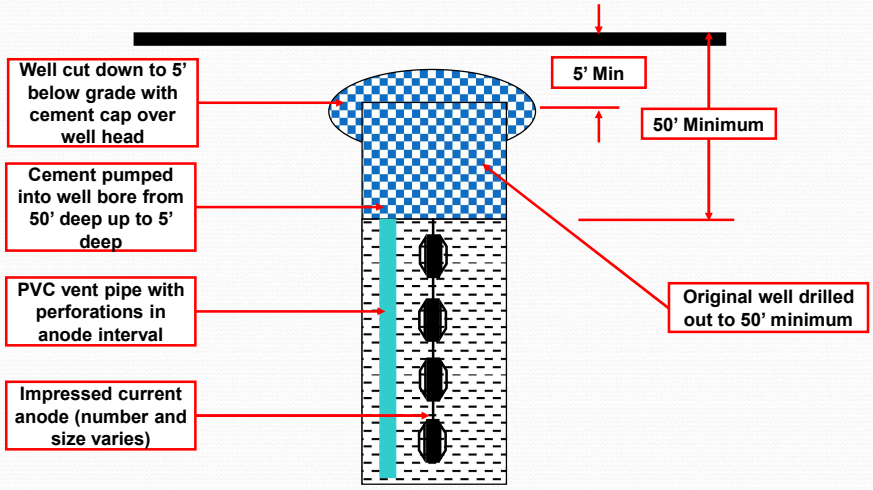


Figure 9. PROPERLY DESTROYED WELLS

Destruction of Adequate Well - Present



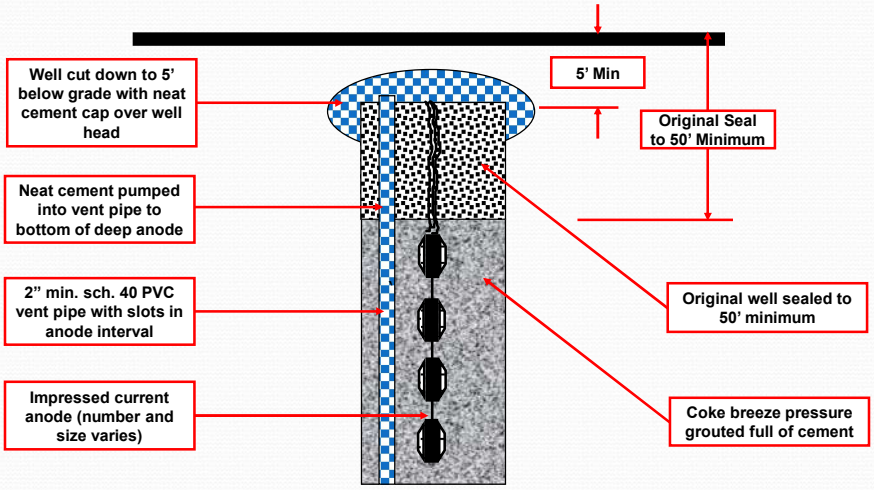
Destruction of Inadequate Well - Present



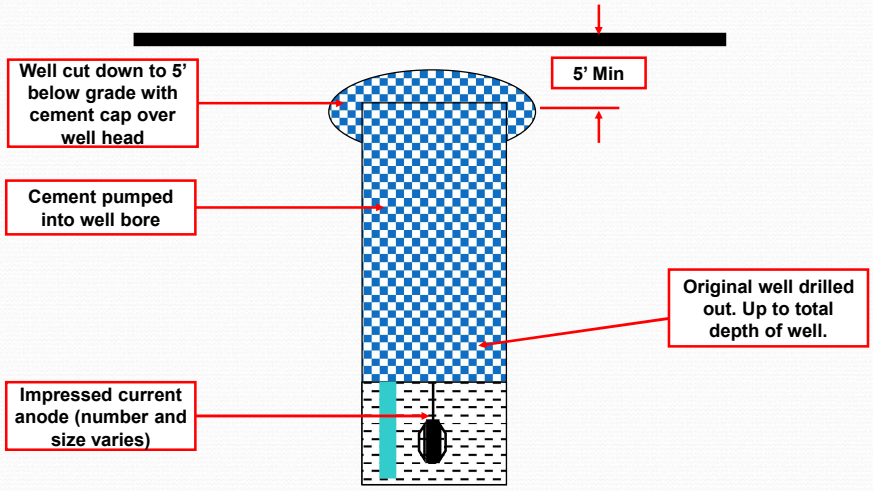
Well Destructions - Future

- The last chance to get it right…
  - More complicated.
  - Prevent commingling.
- Pump cement inside vent pipe to <u>bottom</u> of the deep anode.
  - Insert smaller pumping tube inside vent pipe.
  - Pressurize cement to push it out through vent pipe perforations .
  - Push Cement through coke backfill to seal off active column.
- Drill out wells to total depth if vent or coke is inadequate.

Destruction of Adequate Well - Future



Destruction of Inadequate Well - Future



Get Involved in the Well Standard

- Want to help?
- Sign up for Listerv Notifications.
  - https://water.ca.gov/well-standards
  - Send questions to Bulletin74@water.ca.gov.
  - Public comments once Public Review Draft is released.