

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WELL DECOMMISSIONING

(NO.)

CODE 351

DEFINITION

The sealing and permanent closure of an inactive, abandoned, or unusable water or monitoring well.

PURPOSE

A well is decommissioned to achieve one or more of the following purposes:

- Remove a water or monitoring well from active use when it is no longer needed, it cannot be rehabilitated, or it has failed structurally.
- Remove a monitoring well from use when it is no longer capable of providing representative samples or it is providing unreliable samples.
- Eliminate a physical hazard to people, animals, and farm machinery and prevent entry of animals, debris, or other foreign substances.
- Prevent contamination of groundwater by surface water inflow.
- Restore the natural hydrogeologic conditions, to the extent possible, by preventing vertical or lateral cross-contamination or commingling of groundwaters between separate water-bearing zones.
- Eliminate the possibility of repurposing the well.
- Allow for future alternative use or management of the site

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any water well or monitoring well selected for decommissioning.

CRITERIA

General Criteria Applicable to All Purposes

In California, counties (and some cities) administer and enforce ordinances pertaining to the construction, alteration, maintenance, and destruction of wells, using standards that equal or exceed those developed by the Department of Water Resources (DWR). More stringent requirements set forth by the local enforcing agency supersede those set forth in this standard.

Data collection. Before the well is destroyed, it shall be investigated to determine its condition, details of construction, and whether there are obstructions that will interfere with the process of filling and sealing:

- Collect and review all as-built construction documents, maintenance records, and other available data for the well(s).
- Where well records are incomplete or missing, a site investigation may be required to evaluate the condition of the well. This may include the use of caliper logs, television logs, and/or photography for visual inspection of the well.

Well preparation. Clear the well of all pumping equipment, valves, pipelines, grease, oil, scum, debris, and other foreign material. To the extent practicable, remove all casings, liners, and

screens. Remove casing by either pulling or overdrilling (over-reaming) in accordance with guidance in ASTM D5299, "Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities."

Where permitted by the local regulatory agency, explosives may be used to perforate the casing. Blasting must be undertaken by a blasting specialist licensed by Cal-OSHA, following a Blasting Workplan reviewed and approved by the local regulatory authority. Additional permits for using explosives may be required at the local or county level.

If some or all of the casing resists removal by pulling or overdrilling, it must be ripped, perforated, or cut off below the ground surface.

For the cut-off depth, use the greater of two feet, the maximum potential depth for frost penetration, or the depth of any other near-surface soil fracturing process (such as desiccation).

Sealing materials. Sealing materials must conform to the characteristics listed in ASTM D5299. Select sealing materials that have an in-place hydraulic conductivity equivalent to or less than the ground surface soil surrounding the well head.

Cuttings from drilling or drilling mud shall not be used for any part of the sealing material.

The quality of the water used for mixing with sealing materials must meet or exceed criteria provided in ASTM D5299. California well standards require that water used to prepare sealing mixtures should generally be of drinking water quality, shall be compatible with the type of sealing material used, be free of petroleum and petroleum products, and be free of suspended matter. In some cases water considered nonpotable, with a maximum of 2,000 milligrams per liter chloride and 1,500 mg/l sulfate, can be used for cement-based sealing mixtures.

Sealing materials do not require disinfection.

Fill (plugging) materials. Select fill materials that are free of clay, silt, and organic and foreign matter. Select a soil gradation and a filling process that will not cause bridging during installation.

Plugging and sealing procedures. Place the first layer of fill material in the bottom of the well

and extend upward to a point at least one foot above the top of the lowest water-bearing zone.

Where fill is used in the well column to the surface seal, alternate sections of fill no more than 10 feet thick, with layers of sealing material at least one foot thick. Place sealing material where needed to ensure that waters from different water-bearing units do not commingle, to maintain confining pressures, and seal off zones producing deleterious water, as required by the local regulatory authority. Extend the alternating sequence of fill and sealing material upward through the well column, to the base of the surface seal.

California well standards require a surface seal that extends at least 20 feet from the top of the well; local regulatory agencies may require a deeper surface seal.

Use installation methods that avoid segregation, dilution, or bridging of the fill or sealing material.

For wells greater than 30 inches in diameter, place and compact backfill in a manner that minimizes segregation and bulking and prevents surface subsidence.

Casings grouted-in-place. Use a pressurized grouting procedure that will completely fill and seal all open spaces in the annulus. Acceptable grout sealant includes a combination of cement, sand, or bentonite that conforms to guidance provided in ASTM D5299.

If casings are within a collapsing formation, conduct the grouting procedures concurrently with removal of the casing so that the bottom of the casing remains submerged in the grout.

Well-head seal. Extend the surface seal to the ground surface, allowing the sealing material to flow over the adjacent surface to form a mounded cap.

Where allowed by the local regulating agency, the top of the surface seal cap may be placed at a cut off depth no more than five feet below ground surface, to allow for planned land uses over the well site:

- Excavate around the well casing to a maximum depth of 5 feet below the ground surface and remove the casing from the bottom of the excavation.
- Allow the sealing material to spill over into the excavation to form a cap.
- After the well has been properly filled, including sufficient time for sealing material

in the excavation to set, fill the excavation with native soil.

Grade the ground surface at the well-head in a manner that prevents ponding of surface water at the well-head.

Control of artesian pressure. If a well is under artesian pressure (flowing or not flowing), maintain a sufficiently high grout pressure to counteract the artesian pressure until initial grout set occurs. Use procedures for balancing pressures during grouting operations given in ASTM D5299.

CONSIDERATIONS

If allowed by local regulations, fill materials, such as sand, pea gravel, sand-gravel mix, crushed rock, or agricultural lime, can be used to fill the well provided that the zones of sealing material conform to requirements in ASTM D5299.

If feasible, consider adding a metal “target” to the top 3 inches of the well-head seal so that the decommissioned well may be easily located with a metal detector.

Before sealing the well, consider bringing the entire column of well water to an available chlorine concentration of no less than 50 ppm, or use the greatest concentration specified by government authority. Agitate the well water and keep the solution undisturbed for no less than 12 hours to assure complete disinfection. Disinfection should be completed before placing the sealing and fill materials.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for decommissioning a well that describe the requirements for applying the practice to achieve its intended purposes. Make a record of the installation of this practice that includes the following:

- Location of the decommissioned well by Global Positioning System (GPS), latitude/longitude, township/range, or other georeferencing convention, of such precision that allows the ready location of the site
- Date of completion of well decommissioning
- Name of landowner
- Name, title, and address of person responsible for well decommissioning

- Total depth of well
- Length of casing prior to decommissioning
- Length of casing removed or length of casing cut off below ground level
- Lengths of casing ripped or perforated and the method used
- Inside diameter of well bore or casing
- Type or schedule of casing material (e.g., standard weight steel, or PVC Sch-80)
- A copy of the approved Blasting Workplan, where applicable
- Static water level measured from ground surface prior to decommissioning
- Photographs before and after decommissioning
- Types of materials used for filling and sealing, quantities used, depth intervals for installation of each type of material, and the placement method used
- Detailed documentation of all other information pertinent to site conditions and other problems encountered during decommissioning.

Well destruction reports shall be completed on forms provided (or otherwise approved) by the California Department of Water Resources, and submitted as required by relevant provisions of the California Water Code.

OPERATION AND MAINTENANCE

Inspect the practice site periodically to ensure there is no ground settlement, erosion, or other disturbance. Maintain the site in a manner that prevents ponding or surface runoff toward the site

REFERENCES

American Society for Testing and Materials, D5299, “Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.” ASTM International, 100 Barr Harbour Dr., P.O. Box C-700, West Conshohocken, PA.

California Department of Water Resources, Well Completion Reports, including forms and instructional pamphlets:

http://www.water.ca.gov/groundwater/wells/well_completion_reports.cfm; accessed 5/6/2015.

California Department of Water Resources,
Water Well Standards: Combined Bulletins 74-81 and 74-90,
http://www.water.ca.gov/groundwater/wells/california_well_standards/well_standards_content.cfm
; accessed 5/6/2015.