

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WELL DECOMMISSIONING

(No.)

CODE 351

DEFINITION

The sealing and permanent closure of a water well no longer in use.

PURPOSE

- Prevent entry of animals, debris, or other foreign substances into well or well bore hole;
- Eliminate the physical hazard of an open hole to people, animals, and farm machinery;
- Prevent entry of contaminated surface water into well and migration of contaminants into unsaturated (vadose) zone or saturated zone;
- Prevent commingling of chemically or physically different ground waters between separate water bearing zones;
- Eliminate possibility of well being used for any other purpose;
- Conserve yield and hydrostatic head of aquifers;
- Restore, as far as feasible, hydrogeologic conditions that existed before well was constructed.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any drilled, dug, driven, bored, or otherwise constructed vertical water well determined to have no further beneficial use.

This practice does not apply to water wells that were used for waste disposal.

CRITERIA

Criteria for all purposes shall conform to decommissioning procedures presented in ASTM D5299, Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

Disinfection shall conform to procedures explained in Ground Water and Wells (Driscoll, 1986, pp. 620-623).

Closure options shall be compatible with all applicable federal, state, and local requirements.

Data collection. As-built construction documents, maintenance records and other available data for the abandoned water well shall be collected, reviewed and applied toward the development of a well decommissioning plan. This includes length and diameter of the casing, total well depth, depth to water table, type of liners and screens, and related information. Available drillers records are located in files at the Hydrogeology Division of the Geological Survey of Alabama in Tuscaloosa at 205-349-2852. The existing conditions of the well shall be documented as shown in the "**Plans and Specifications**" section. Data shall be recorded on NRCS Form AL-ENG-45 or AL-ENG-45a.

Well preparation. The well shall be cleared of all pumping equipment, valves, pipelines, casings, liners, screens, grease, oil, scum, debris, and other foreign material as explained in ASTM D5299, part 7.3.8.

Disinfection. Before sealing, the entire column of well water shall be brought to an available

chlorine concentration of 50 ppm or greater, or other solution specified by local or state requirements. After being agitated in the well water, the chemical solution shall be left for no less than 24 hours to assure complete disinfection.

Sealing materials. Properties of sealing materials shall conform to characteristics listed in ASTM D5299, part 6.3. Acceptable sealing materials are provided in ASTM D5299, part 6.4. Sealing materials do not require disinfection.

Water to be mixed with grout shall be compatible with the grouting material, and shall be of a quality that conforms to criteria provided in ASTM D5299, part 7.3.3.

Where the geologic hydraulic conductivity is unknown, sealing material should have a maximum allowable hydraulic conductivity of 10^{-6} gpd/ft².

Fill material. Fill materials can be used in lieu of sealing materials under certain conditions to reduce cost. The use of fill materials to plug a drilled well should be used only after careful examination of the drilling logs. Assistance from a trained geologist may be necessary.

Fill materials can include sand, pea gravel, sand-gravel mix, crushed stone, and agricultural lime, all of which shall be clean and free of organic or other foreign matter. Clay subsoil can be used in certain situations.

The gradation of fill materials shall be such that bridging does not occur during placement. To protect against bridging during placement, the maximum particle size of the fill materials should not exceed 1/10 of the well diameter. Materials greater than 3 inches should not be used regardless of the well diameter. For wells greater than 30 inches in diameter, backfill shall be placed in a manner that minimizes segregation and bulking in order to prevent surface subsidence.

Placement of material. Fill material shall be placed into the well only after the well water has been disinfected. Fill material is placed at a minimum thickness of one foot starting at the top of the lowest water bearing zone and

successively placed at intervals every 10 feet or less throughout the entire well column. All material shall be placed from the bottom of the well upward by methods that avoid segregation, dilution, or bridging of the material.

For wells greater than 30 inches in diameter, backfill shall be placed and compacted in a manner that minimizes segregation and bulking to prevent surface subsidence.

Removal of well casing. If possible, the casing shall be completely removed from the well by either pulling or overdrilling (overreaming) as explained in ASTM D5299, part 7.3.1. Casing that cannot be removed completely shall be ripped, perforated, or cut off at a depth greater than the maximum potential for frost penetration or any other near surface soil fracturing hazard (such as desiccation), or three feet, whichever is greater.

Casings grouted in place. Casings to be grouted in place shall employ a pressurized grouting procedure that will completely fill and seal the open space around the casing.

Perforated or ripped casing shall provide sufficient apportioned open area to assure passage of the grout into the space. The casing shall be perforated or ripped throughout the entire length of a confining layer.

Casings to be removed from a collapsing formation shall be grouted concurrently with removal such that the bottom of the casing remains submerged in the grout.

Surface seal. The interval between the ground surface and the top of cut off casing shall be sealed with sealing materials that conform to ASTM D5299, part 6.3. These materials may be an extension of the sealing materials used below this depth.

The interval between the ground surface and the top of the cut off casing shall be filled with soil material that achieves an in-place hydraulic conductivity equivalent to or less than the surface soil surrounding the well. The ground surface at the sealed well site shall be mounded and graded in a manner that prevents ponding of surface runoff.

Annular space around the outside of the well casing below the cutoff depth shall be grouted as needed. Wells with gravel exposed in the annular space at cutoff depth shall have at least a 3-foot depth of the gravel removed and the annular space backfilled with grout, bentonite chips or other expansive sealer.

Control of elevated formation pressure. If a well penetrates a formation that is under artesian head (confined conditions), or from which a gas is being released under pressure, the grout pressure must be maintained greater than the formation pressure until initial grout set occurs. Procedures for balancing formation pressures during grouting operations shall conform to ASTM D5299, part 7.3.7.

Vegetation. All areas which are disturbed during the decommissioning operation shall be smoothed and dressed at the completion of sealing the well. These areas shall be established with vegetation in accordance with the FOTG Standard for Critical Area Planting (342), unless the area is to be utilized for crop production.

CONSIDERATIONS

This practice may be part of a ground water protection system that includes water and chemical management practices.

To the extent practicable, an abandoned well should be decommissioned in a manner that restores the original hydrogeologic conditions of the well site and does not preclude the use of the site from future land management practices.

All decommissioning procedures and fill and sealing materials need to be selected with due consideration of the site-specific geological, biological, physical and climatic conditions, the chemical composition of the surrounding soil, rock and ground water at the well site, and the well's construction practices. For additional information on local conditions, discuss site conditions with drilling and well servicing contractors. Special equipment may be required; therefore, it is advisable that a qualified contractor perform the work.

In some Karst terrains, where large voids may exist, it may be difficult to plug a well. Another consideration is that large quantities of sealing materials may cut off an underground stream or otherwise alter the hydrogeology.

Checking for contaminants is recommended. Waste oil, pesticides, and garbage are among some of the more common contaminants found in wells. Groundwater remediation (not covered in this standard) may be required. Pumping and removal of contaminants may prevent future widespread groundwater contamination problems. The Alabama Health Department or Alabama Department of Environmental Management should be contacted for guidance on remediation and sealing of contaminated wells.

If allowed by state regulations, fill materials, such as sand, pea gravel, sand-gravel mix, crushed stone, or agricultural lime can be used to plug the well provided that zones of sealing material conform to ASTM D5299, part 6.3).

PLANS AND SPECIFICATIONS

Plans and specifications for decommissioning abandoned water wells shall be consistent with this standard and shall describe the requirements for applying the practice to achieve its intended purposes. A record of the installation of this practice shall be made and shall include the following information:

- Location of the decommissioned well by latitude/longitude, township/range, or other georeference convention, of such precision that it can be readily located in the field, if required, in the future
- 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

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- Length of casing removed or length of casing cut off below ground level
- Inside diameter of well bore or casing
- Type of casing material or schedule (e.g., standard weight steel, or PVC sch-80)
- Static water level measured from ground surface prior to decommissioning
- Types of materials used for filling and sealing, quantities used, depth intervals for emplacement of each type, and emplacement method used.

OPERATION AND MAINTENANCE

The practice site shall be inspected periodically to ensure that the decommissioned well and the adjacent area have not settled or eroded, or are otherwise adversely disturbed. The well site and adjacent ground surfaces shall be maintained in a manner that prevents ponding of surface runoff on the site.

REFERENCES

ASTM D 5299-92

AWWA Standard for Deep Wells -
AWWA A100-97

ADEM Administrative Code

335-7-5-13

EPA-57019-75-001 Manual of Water Well
Construction Practices

ADEM - Water Well Standards Program

Code R. 335-9-1-.06(g)