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 well.

PURPOSES

- Remove the well from active use when the well is no longer capable of rehabilitation, or has failed structurally.
- Remove a monitoring well from use when no longer required or capable of providing representative samples, or is providing unreliable samples.
- Eliminate physical hazard to people, animals, and farm machinery; and to 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 groundwater between separate water-bearing zones.
- Eliminate the possibility of repurposing the water well.
- Allow for future alternative use or management of the site.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any vertical water well selected for decommissioning.

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

CRITERIA

Criteria in this standard apply for all purposes.

The investigation, design, and decommissioning of a well must comply with all pertinent governmental regulations, laws, permits, licenses, and registrations.

Data collection. Collect, review and include in the decommissioning plan all as-built construction documents, maintenance records, and other available data for the water well. Well construction reports may be available from the Wisconsin Geological and Natural History Survey.

Document existing conditions as defined in the Plans and Specifications, section of this standard.

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 D 5299. If some or all of the casing resists removal by pulling or overdrilling, it must be ripped, perforated, or cut off at a minimum depth of two feet. The depth must exceed the maximum potential depth for frost penetration or any other near surface soil fracturing process, such as desiccation.

Water wells that are being decommissioned due to contamination by sewage or animal wastes shall be disinfected as an integral part of the decommissioning process. Before sealing, the entire column of well water shall be brought to an available chlorine concentration as specified by local, state, tribal, or federal requirements.

Sealing materials. Ensure that sealing materials conform to characteristics listed in ASTM D 5299. Sealing materials do not require disinfection. Select sealing materials that have an in-place hydraulic conductivity equivalent to or less than the ground surface soil surrounding the well head.

The quality of the water used for mixing with sealing materials must meet or exceed criteria provided in ASTM D 5299.

Fill (plugging) materials. Select materials for fill that are clean, that is free of silt, organic and foreign matter. Select a gradation that will not bridge during emplacement.

Plugging and sealing procedures. Do not emplace sealing and fill materials until after completion of the disinfection process, if conducted.

Emplace layers of sealing materials to restrict vertical movement of water and to prevent comingling of waters from different production zones. Emplace the fill material from the bottom of the well to no less than one foot above the top of the lowest water-bearing zone.

Emplace sealing material no less than one-foot thick above the top of fill material emplaced above the lowest water bearing zone. Emplace an alternating sequence of one-foot thick sealing material and a 10-foot thick fill material throughout the remaining well column.

Plug the entire well bore with suitable fill materials 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, emplace 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 D 5299.

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. Seal the interval between the ground surface and the top of the cut-off casing with materials that conform to guidance in ASTM D 5299. These materials may be an extension of the sealing materials used below this depth.

Mounded and grade the ground surface at the sealed well-head in a manner that prevents ponding of surface runoff of surface flow toward 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 D 5299.

Well Pits. When a well terminating in a pit is decommissioned, the pit shall also be decommissioned except when the pit is a subsurface pump room adjoining a basement. Pits shall be abandoned by perforating the floor, knocking out one wall, and filling the pit with clean native soil less permeable than the soil surrounding the pit.

Dug Wells. Dug wells shall have the cover removed and the top 5 feet of curbing or concrete wall removed. Rock curbing may be caved into the hole as the well is being sealed only if done in a manner to prevent bridging. The well shall be filled using clean clay or silt, clean native soil, approved chipped bentonite, concrete, concrete (sand-cement) grout or neat cement grout if constructed in unconsolidated formations.

Dug wells constructed partially or completely into bedrock shall be filled with neat cement grout, concrete (sand-cement) grout, concrete or approved chipped bentonite to a point at least 2 feet above the top of the bedrock.

The remainder of the well may be abandoned using any of the materials listed above.

CONSIDERATIONS

If feasible, consider adding a metal "target" to the top 3 inches of 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.

PLANS AND SPECIFICATIONS

Ensure plans and specifications for decommissioning a water well are consistent with this standard and 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)
- 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 emplacement of each type, and the emplacement method used
- Detailed documentation of all other information pertinent to site conditions and other problems encountered during decommissioning.

OPERATION AND MAINTENANCE

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

REFERENCES

American Society for Testing and Materials, D 5299, "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.

Wisconsin Administrative Code, Department of Natural Resources, Chapter NR 812, Well Construction and Pump Installation.