WATER WELL (CODE 351) DECOMMISSIONING

SCOPE

The scope of this specification covers wells less than 25 feet deep, unless a variance is granted by the Montana Board of Water Well Contractors and the State Conservation Engineer.

Groundwater developments or wells less than 25 feet deep are defined as springs (MCA 37-43-102.7b*i*) and are not regulated by the State. These developments are dug by hand or machine and typically lined with stone, metal pipe, or wood structures. These developments also could be driven sand point casings.

Work shall consist of furnishing all equipment, materials, tools, and labor to clean, disinfect, and seal a well.

Wells greater than 25 feet deep

Wells greater than 25 feet deep must be decommissioned by a water well contractor who is licensed by the State of Montana (MCA 37-43-302). The water well contractor is responsible for the design and implementation of the decommissioning.

Flowing wells and filter pack wells (i.e. artificial gravel packed wells) also shall be decommissioned by a licensed water well contractor. The decommissioning of filter pack wells requires approval from the Montana Board of Water Well Contractors prior to implementation of the decommissioning [contact the Board of Water Well Contractors, (406) 444-6643, in Helena].

Wells greater than 25 feet located in agricultural land can be decommissioned by the landowner if a variance is approved by the Montana Board of Water Well Contractors. Wells greater than 25 feet can be decommissioned with NRCS cost-share if an additional variance is obtained from the State Conservation Engineer. The State Conservation Engineer will ensure that an appropriate NRCS inspection plan is prepared prior to implementation of the well decommissioning.

MATERIALS

The following materials are acceptable for use in sealing abandoned wells, if placed according to the conditions described in the "Sealing Procedure."

Fill Materials

Clean sand and gravel may be used to fill large-diameter wells if prior approval is granted by the Montana Board of Water Well Contractors [contact Program Manager, (406) 444-6643, in Helena].

Sealing Materials

HIGH-GRADE COMMERCIAL BENTONITE CHIPS OR PELLETS. Only sodium bentonite with a particle size of 1/4- to 3/4-inch shall be used. Bentonite chips shall be screened over a 1/4-inch mesh to remove fine particles and dust while being placed in the well. Three to 4 gallons of water shall be used to saturate a 50-pound bag of bentonite chips when they are placed above the water table.

BENTONITE SLURRY. This material shall be mixed according to the manufacturer's instructions as a sealing material, and shall in no case contain less than 1.5 pounds of bentonite per gallon of fresh water. The mixed slurry shall weigh not less than 9 pounds per gallon.

HIGH SOLIDS BENTONITE SLURRY. This material is a commercially-prepared blend of bentonite and powdered polymers that inhibit the rate of hydration. It shall be mixed with clean water as directed by the manufacturer to form a slurry with a minimum of 20% solids by weight and a density of 9.4 pounds per gallon.

NEAT CEMENT GROUT. This material is a mixture of 1 bag (94 pounds, or one cubic foot) of Portland cement and not more than 6 gallons of water. Type II cement shall be used. Up to 5%, by weight, of bentonite may be used to improve flow and reduce shrinkage.

CONCRETE GROUT. This material is a mixture of not more than 2 parts sand and 1 part cement and not more than 6 gallons of clear water per 94-pound bag of Portland cement. Type II cement

shall be used. Up to 5%, by weight, of bentonite may be used to improve flow and reduce shrinkage.

SEALING PROCEDURE

1. REMOVE OBSTRUCTIONS

Pumping equipment and any obstacles or debris which may interfere with effective sealing operations shall be removed from the well. The well shall be flushed by pumping in clean water at a rate high enough to lift debris from the well, or by use of compressed air of sufficient volume and pressure to lift water and debris from the well. For large diameter wells, use suitable mechanical equipment.

2. DETERMINE VOLUME

Measure the inside diameter and depth of the well and the depth of water. Using Table 1, determine the total volume of the cased well and the volume of water in the well (static water). If a well log is available, it can be used in determining the total well volume.

The volume of the free-standing water shall be calculated and included in the amount of water that will be used to mix the sealing material. In large diameter wells, a water level reading shall be obtained either before flushing, or 24 hours after flushing.

TABLE 1

Hole diameter (inches)	Volume per foot of depth gal/ft	cu.ft/ft
1-1/4	.07	.01
2	.17	.02
3	.38	.05
4	0.7	0.1
6	1.5	0.2
8	2.6	0.3
10	4.1	0.5
12	5.9	0.8
14	8.0	1.1
16	10.5	1.4
20	16.4	2.2
24	23.6	3.1
36	53.0	7.1
48	94.2	12.6

3. DISINFECTION

The water in the well shall be brought to a 100-ppm chlorine concentration before sealing. One of the following formulas shall be used: 1 gallon 5% chlorine bleach per 500 gallons of water, 1 pint 5% chlorine bleach per 62 gallons of water, or; 1.3 pounds high-test calcium hypochlorite tablets per 1,000 gallons of water.

4. FILL THE WELL WITH SEALING MATERIALS

The entire well depth shall be filled with sealing materials to within 3 feet of the surface. The method used below shall be determined by the water well contractor.

Neat cement, concrete grout, a bentonite slurry, or high solids bentonite grout shall be tremied from the bottom up in one continuous operation. The tremie pipe shall be raised when necessary to overcome the hydraulic head of the grout, and the bottom of the pipe shall be in contact with the grout at all times.

Medium diameter wells may be sealed by use of the same methods and materials described in Small Diameter Wells; or chipped or pelletized bentonite may also be used. The chips shall be added at a rate not to exceed one 50-pound bag in 3 minutes. If there is insufficient water in the well to saturate the bentonite chips, water shall be added in the amount of 4 gallons per 50-pound bag. When the sound of chips hitting the groundwater is no longer heard, water shall be added.

When plugging an open borehole with bentonite chips, the hole shall be sounded a minimum of once after every 10 bags of chips. The depth from the ground surface shall be compared to the calculated depth, and any discrepancies corrected.

Large diameter (> 10” diameter) may be filled with sealing materials as described in the Small and Medium Diameter Well sections.

Alternately, clean fill may be used to a point 1.5 feet below the pre-determined static water level. If this method is to be used, a variance must be approved by the Montana Board of Water Well Contractors. These materials shall be shoveled

into the well casing, and shall not be dumped from a bucket loader or truck box.

A minimum of 3 feet of sealing materials shall then be placed at the water level using methods described in the Small and Medium Diameter Well sections. The placement of sealing materials may extend to within 3 feet of the surface, or the placement of clean fill materials may be resumed.

If the clean fill is extended, 1-foot thick layers of sealing material shall be included at a minimum of 10-foot intervals to a depth of 6 feet below the surface. A minimum of 3 feet of sealing material shall be placed in the casing interval below the planned cut-off point.

High water levels may prevent the placement of the full 3-foot thick top seal. Effort should be made to place as much of the top seal as is allowed by the site conditions.

If the well has been dry for many years, the positive seal at the static water level may be omitted.

5. CUT AND REMOVE TOP OF CASING

Remove a minimum of 3 feet of casing below the ground surface. Under certain site conditions, such as a well located in a basement, the casing does not have to be cut off, but should be sealed at the top of the casing. For spring developments, it is recommended that all casing material be removed from the excavation prior to back filling.

6. FILL REMAINING HOLE

The void area around and above the cut-off casing shall be filled with topsoil, mounded on top so that surface water will not pond on the site. If the site is in a building or other site where soil is not an appropriate fill and the casing has been cut off below the surface, any non-settling material of low permeability may be used.

If the decommissioned well is located in a well pit, the floor shall be perforated and at least one of the pit walls knocked in. The pit and all void spaces shall be filled with topsoil.

7. SUBMIT DOCUMENTATION

A water well log report, Montana Well Log Form 603 R2-04, that fully describes the abandonment procedures, shall be submitted to the State of Montana Department of Natural Resources and the Montana Bureau of Mines and Geology.

8. MEASUREMENT AND PAYMENT

Measurement and payment shall follow the current NRCS Cost List found in Section 1 of the NRCS Field Office Technical Guide.