



MINERAL EXPLORATION WELL/ DRILL HOLE PLUGGING AND ABANDONMENT

Intent

To protect the resource during the mineral exploration process by maintaining and preserving the natural barriers to surface and groundwater movement between aquifers, to seal aquifers or strata penetrated during the exploration process, and to take measures to seal any conduits to and between aquifers. Mineral exploration drilling should not increase the rate of ground or surface water movement.

Sealing of Mineral Exploration Wells/Drill Holes

- Care shall be taken during the drilling operations to seal aquifers or strata penetrated that could impair water quality, interconnect aquifers, or result in cascading water.
- All sealing must be permanent and prevent movement of surface and or groundwater along, around, or through the bore hole.
- Sealing shall prevent the movement of artesian waters within the annular space around the well casing, if applicable, and prevent the contamination or wasting of groundwater.
- If artesian flow is encountered, the Mineral Exploration Permit holder is responsible for stopping the flow and plugging the drill hole. The Washington Division of Geology and Earth Resources should be notified anytime artesian flow is encountered and kept informed as flow is controlled and the hole is plugged. The mineral exploration hole will be plugged so that the natural barriers to groundwater movement are preserved.
- An emergency sealing plan will be included in the Mineral Exploration Plan that is submitted to the Department, this plan will be available to the drilling company before and while exploration drill holes are under construction. The plan should include instructions and contact information for getting equipment and supplies to the drill site in a timely manner and provide reasonable plans for controlling and stopping flow.

Standards for Sealing Materials

The Department recommends the following sealing material:

Cement sealants

- Neat cement consists of either portland cement types I, II, III, or high-alumina cement mixed with not more than 6 gallons of potable water per sack of cement (94 pounds/sack).
- Neat cement grout consists of neat cement with up to 5 percent bentonite clay added, by dry weight of the bentonite. Bentonite is added to improve flow qualities and compensate for shrinkage. The quantity of water used for each batch of cement sealant shall not exceed manufacturer's recommendation.
- Expanding agents, such as aluminum powder, may be used at a rate not exceeding 0.075 ounce (1 level teaspoon) per sack (94 pounds per sack) of dry cement. The powder may not contain polishing agents. High-alumina cement and portland cement of any type must not be mixed together.
- Controlled density fill (CDF) or fly ash shall not be used in any drill hole development or decommissioning.
- All cement sealants shall be mechanically mixed prior to placing in the well or bore hole.

Sealing methods

- When neat cement or neat cement grout is used in sealing, it shall be placed 72 hours before additional drilling takes place, unless special additives are mixed with the neat cement or neat cement grout that cause it to set in a shorter period of time.
- All hydrated sealing materials shall be placed by tremying the mixture from the bottom of the annular space to the surface. Between lifts, the tremie tube may be shortened provided that the end remains withing the sealing material at all times and results in a continuous seal without voids.

- This section may not preclude the use of new sealant materials that have been approved by the Department of Natural Resources.
- Sealing materials shall be impervious to any contaminants encountered and be effective.

Cuttings

- Drill cuttings are not approved for sealing or filling mineral exploration holes. At no time will cuttings be placed in the hole.
- The mineral exploration plan must include a detailed plan showing how the cuttings will be handled. If the cuttings are placed in on site sumps, the exploration plan must include what analysis is being done to ensure that the cuttings don't contain any contaminants. If it is determined that the cuttings are contaminated, the exploration plan must include how contaminants will be disposed of.

Drilling fluid/water requirements

- Only potable water shall be introduced into the borehole while drilling. If chlorine is used to disinfect the water that will be used in the drilling or sealing processes, sufficient chlorine will be added to the standing water to give a residual of 50 ppm free chlorine. Other disinfectants used in the drilling or sealing processes shall be used in quantities that are safe, nonpolluting, and are not a detriment to the potability of the groundwater. All disinfectants used in drilling or sealing processes shall be used in accordance with the manufacturer's recommendations.
- All polymers and additives used in drilling shall be certified by NSF/ANSI approval standards for use in potable water supply wells, or equivalent standards as approved by the Department. The product shall be clearly labeled as meeting these standards.
- Polymers and additives must be designed and manufactured to meet industry standards to be non-degrading and must not act as a medium that will promote growth of microorganisms.