

CHAPTER 33-18-02
GROUND WATER MONITORING WELL CONSTRUCTION REQUIREMENTS

Section	
33-18-02-01	Purpose
33-18-02-02	Applicability
33-18-02-03	Exclusions
33-18-02-04	Definitions
33-18-02-05	Borehole and Well Locations
33-18-02-06	Drilling Methods
33-18-02-07	Borehole and Monitoring Well Documentation
33-18-02-08	Monitoring Well Construction Materials
33-18-02-09	Monitoring Well Development
33-18-02-10	Borehole and Monitoring Well Abandonment

33-18-02-01. Purpose. The purpose of this chapter is to establish minimum acceptable standards for the design, installation, construction, decommissioning, and documentation of boreholes and ground water monitoring wells.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-02. Applicability. The installation, construction, and decommissioning of boreholes and ground water monitoring wells must be supervised onsite by a certified and licensed contractor.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-18.2, 43-35-19.2

33-18-02-03. Exclusions.

1. Injection wells for the oil and gas industry;
2. Boreholes, piezometers, and monitoring wells for dams;
3. Monitoring well or borehole construction used for mineral exploration addressed under existing federal or state law;
4. Boreholes advanced above an aquifer for the purpose of determining the local stratigraphy; and
5. Special cases, with prior approval of the department.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-04. Definitions. The terms used in this chapter have the same meaning as in North Dakota Century Code chapter 43-35, except that:

1. "Annular-space: annulus" means the space between a casing and a riser or between the riser and the borehole.
2. "Aquifer" means a water-bearing formation that transmits water in sufficient quantities to supply a well for a beneficial use.
3. "Borehole" means an open or cased subsurface hole created by drilling.
4. "Casing" means the pipe installed to maintain the integrity of the borehole. The term casing is used in this chapter only in reference to protective casing; the definition is included to distinguish the term from riser.
5. "Department" means the state department of health.
6. "Monitoring well" means any cased excavation or opening into the ground made by digging, boring, drilling, driving, jetting, or other methods for the purpose of determining the physical, chemical, biological, or radiological properties of groundwater.
7. "Riser" means the pipe extending from the well screen to or above the ground surface.
8. "Shall" or "must" means mandatory compliance with all aspects of the specific provision of this chapter within which the word appears.
9. "Should" means the specific provision in which the word appears is not mandatory but is a recommended desirable procedure or method. Deviation from the provision is subject to site specific consideration by the certified contractor installing the borehole or monitoring well.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-05. Borehole and well locations.

1. Prior to the initiation of assessment activities in response to a contaminant release or when prior departmental approval is required, under existing state statute boreholes and monitoring wells must be installed at practicable locations based on plans and specifications approved by the department.
2. The riser of a monitoring well must terminate at least one foot [0.304 meter] above the ground surface, except:

- a. Monitoring wells should not be located in drainage ditches, floodplains, or floodway. Where this is impractical, the monitoring well should terminate at least two feet [0.609 meter] above the one hundred year flood elevation for the well site. Those risers that do not must be constructed to preclude flood impact to the monitoring well.
- b. A riser for a well constructed in a high traffic area or other limiting site conditions should be mounted flush to grade or below grade with a protective casing to minimize damage, provided that construction must include a watertight seal to preclude surface water from entering the protective casing or riser and that the well is clearly marked as a monitoring well.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-06. Drilling methods.

- 1. This subsection applies to areas not likely having subsurface contamination.
 - a. Whenever feasible, drilling methods should not introduce water or fluids into the borehole and should optimize cuttings control at ground surface. The selected drilling method must reflect the purpose or objective of the borehole or monitoring well.
 - b. During drilling of boreholes, adequate care must be taken to prevent commingling of water from separate aquifers.
 - c. The nominal diameter of a borehole must provide a minimum annular space of 1.9 inches [48 millimeters].
- 2. This subsection applies to areas having potential subsurface contamination. In addition to the requirements of subsection 1, drilling methods in areas of potential subsurface contamination must follow the procedures in this subsection.
 - a. During drilling of boreholes, precautions must be taken to prevent cross-contamination of boreholes.
 - (1) Augers, center plug, and soil sampling equipment must be decontaminated following procedures appropriate for the contaminants of concern, which do not result in the cross-contamination of boreholes or monitoring wells and which do not conflict with the monitoring objective.

- (2) The drilling sequence of boreholes must consider the objective of the site assessment, including factors such as the suspected location of the contaminant, contaminant characteristics, and local site geology.
- b. All potentially contaminated cuttings, as well as development and purge water, must be handled in an environmentally safe manner. When suspected contamination includes hazardous substances as defined and regulated under North Dakota Administrative Code chapter 33-24-02, proper management methods for cuttings and water of each borehole must meet the requirements of North Dakota Century Code chapter 23-20.3 and North Dakota Administrative Code article 33-24.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-07. Borehole and monitoring well documentation.

1. A written log must be kept which records the depth below ground surface of the boundaries of all strata encountered when drilling a borehole. Each stratum encountered must be described using generally accepted geologic terminology.
2. The certified monitoring well contractor must provide a monitoring well completion report to the board of water well contractors on forms available from or acceptable to the board within thirty days after the well has been installed. A completed report must include project and location, date of drilling, logger's name and title, well number or borehole number, drilling method and fluids used, borehole diameter, total depth, decontamination procedures, and a lithologic description as provided by subsection 1. Additional information, the availability of which is dependent upon the drilling method used, should also be provided and includes moisture content, fractures, and depth at which water was first encountered. A completed report must also include certified monitoring well contractor's name and license number; riser material; screen material and screen slot size, length, placement; filter pack materials; riser and screen cleaning and installation procedures; sealing materials, placement and installation procedures; well development procedures; and any installation conditions which affected well construction.
3. When completion reports are required by the department as a matter of fulfillment of its regulatory functions, the reports must include the information required by subsections 1 and 2; a detailed drawing of each well, including dimensions, as part of the well driller's report; and a map drawn to a specified scale showing the locations of all monitoring wells with an accuracy of three feet [0.914 meter]. The map must include

manmade structure boundaries, any pertinent property boundaries, a north arrow, the location coordinates and elevation of all permanent benchmarks, the horizontal position of each monitoring well and its survey coordinates, the vertical elevation of the top riser referenced to the nearest benchmark to an accuracy of 0.01 feet [0.003 meter], and the respective identification number for each well.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-08. Monitoring well construction materials.

1. Riser.
 - a. Specifications. The riser for a monitoring well must retain structural integrity for the duration of the monitoring period under actual subsurface conditions.
 - (1) The riser and couplings must be constructed of materials that neither absorb nor leach chemical constituents that could bias representative ground water samples. The riser and couplings must be compatible, resisting corrosion, with anticipated contaminants. Depending upon the intended use of the well, the riser should have a vented cap, except wells constructed in a potential flooding condition or flush-mounted wells must not have a vented cap.
 - (2) The riser must be capable of withstanding installation and development stresses without damage.
 - b. Assembly and installation.
 - (1) The interior and exterior surfaces of the riser and couplings must be thoroughly cleaned in a manner that does not conflict with the monitoring objective prior to assembly and installation.
 - (2) The individual sections of the riser must be joined in a manner that neither absorbs nor leaches chemical constituents that could bias representative ground water samples.
 - (3) The riser must be centered, as practicable, in the borehole.
2. Screen. A ground water monitoring well must be constructed with a screen.
 - a. Specifications.

- (1) A screen and bottom plug must be constructed of material that is nonreactive with constituents in soil and ground water at the monitoring location.
- (2) The screen must be capable of withstanding installation and well development stresses without damage.
- (3) The screen must be new, machine slotted or continuous wrapped wire-wound. The screen slots must not be hand-cut or wrapped with filter fabric, unless approved prior to installation by the department.
- (4) The screen slot size must retain and prevent at least fifty percent of the grain size of the collapsed formation or ninety percent of the filter pack from entering the screen.
- (5) The screen placement and length must allow for entry of ground water from a predetermined zone appropriate for the collection of representative ground water samples and future fluctuations of the water table.

b. Assembly and installation.

- (1) The screen and bottom plug must be thoroughly cleaned, in a manner which does not conflict with the monitoring objective, prior to assembly and prior to insertion into the borehole.
- (2) The screen must be permanently joined to the well riser in a manner that neither absorbs nor leaches chemical constituents that could bias representative ground water samples.
- (3) The screen must be centered, as practicable, in the borehole.

3. Filter packs.

- a. Specifications. When filter packs are used, they must be compatible with the purpose or objective of the monitoring well and have a specific gravity of two and one-half or greater. The filter pack grain size must minimize formation materials from entering the screen. Collapsed formation may be used as filter pack material if it limits passage of at least fifty percent of the formation to the screen.
- b. Installation. The filter pack should extend upward from the bottom of the screen to at least two feet [0.609 meter] above the top of the screen. Where shallow water tables occur, the required height of filter pack above the top of the screen may be reduced a maximum of one foot [0.304 meter] to allow space for the annulus sealant.

In special cases where the potential for a cross-connection or commingling of different water-bearing zones is documented by the monitoring well contractor requiring less than a one-foot [0.304-meter] filter pack above the screen intake, a reduction in the filter pack to less than one foot [0.304 meter] above the top of the screen to meet site specific conditions is allowed.

4. Filter pack seal. A ground water monitoring well must be installed with a filter pack seal.
 - a. Specifications. The filter pack seal should extend at least two feet [0.609 meter] upward from the top of the filter pack. Where shallow water tables occur, the filter pack seal may be reduced a maximum of one foot [0.304 meter] to allow for annular space sealant. Sodium bentonite chips of size three-eighths-inch [0.95-centimeter] diameter or smaller should be placed in a manner which avoids bridging of the chips. Sodium bentonite chips or pellets must be used for seals placed below the water table, except in circumstances where the sodium bentonite may bias representative ground water samples.
 - b. Installation. Sodium bentonite pellets, chips, or granules used as filter pack seal above a water table must be hydrated after placement.
5. Annulus seal. A ground water monitoring well must be installed with an annulus seal.
 - a. Specifications.
 - (1) The annulus seal should extend from the top of the filter pack seal upward to the ground surface seal, and it should be at least two feet [0.609 meter] in length.
 - (2) Grout material:
 - (a) Should have an equal or lower permeability than the least permeable geologic formation penetrated by the borehole.
 - (b) Should be compatible with formation material, well casing and riser and not capable of contaminating ground water.
 - (c) Should be in a form which can be positively and accurately placed to fill all voids.
 - (d) Should be self-leveling in the annulus and uniform in setup.

- (e) Should, when setup, assist the structural stability of the riser.
 - (f) Should be capable of bonding to the riser and borehole wall to provide a watertight seal.
 - (3) Acceptable grouts above the water table include neat cement, bentonite chips, high solids bentonite grout, or a cement and bentonite clay mixture not exceeding five pounds [2.27 kilograms] of bentonite clay per ninety-four-pound [42.6-kilograms] sack of cement.
 - (4) Bentonite chips or pellets may be used as a seal material in the annulus of shallow monitoring wells provided it is hydrated after each bag is poured into the annulus.
 - b. Installation. The annulus seal must be placed in a manner so as to ensure the proper placement and distribution of the sealant material.
6. Ground surface seal and protective casing.
- a. A protective casing and locking cap is required when the monitoring well is located in an area where the well needs physical protection or is likely to be tampered with.
 - (1) The protective casing should consist of a metal or polyvinyl chloride assembly at least two inches [5.08 centimeters] larger in diameter than the riser and have a locking cap.
 - (2) The protective casing should extend from the bottom of the ground surface seal, and it should extend above the top of the riser at least one inch [2.54 centimeters] but not more than four inches [10.15 centimeters].
 - (3) The locking cap should be secured and locked at all times when the monitoring well is not in use.
 - b. The ground surface seal should consist of concrete or neat cement. If a protective casing is used, the surface seal should be placed around the protective casing and may not be placed between the protective casing and the riser. The ground surface seal should be sloped to promote drainage away from the riser or protective casing.
 - c. Dry bentonite pellets or chips should be placed in the annular space between the protective casing and the riser up to the level corresponding with the top of the ground surface seal.

- d. A weep hole or vent should be used in the protective casing, provided it is placed at least six inches [15.2 centimeters] above the surface of the ground surface seal, but in no case should it be above a vent hole in the riser.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-09. Monitoring well development. All monitoring wells must be developed as follows:

1. The waiting period for monitoring well development after completion of well installation shall allow setup of sealants.
2. The monitoring well must be developed utilizing procedures that are compatible with the monitoring objective and that do not adversely impact well integrity. Development of the monitoring well must include at least three cycles or last for approximately one hour until the water is free of sediments or stabilizes, whichever occurs first. Stabilization occurs when successive measurements of indicator parameters, such as instrument readings for turbidity or specific conductivity, taken from separate well volumes, are within ten percent.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2

33-18-02-10. Borehole and monitoring well abandonment.

1. The department may require by written notification an owner of the site of a borehole or monitoring well to decommission the borehole or monitoring well when necessary to:
 - a. Eliminate physical hazards on the surface;
 - b. Prevent contamination of ground water;
 - c. Prevent intermingling of desirable and undesirable waters; or
 - d. Eliminate unintended use.
2. Any monitoring well which is constructed and installed after March 1, 1997, and which does not meet the requirements of this chapter must be decommissioned within thirty days after written notification by the department.
3. A borehole must be decommissioned within three working days of discontinuance of use according to subsection 5.

4. A monitoring well must be decommissioned in accordance with the requirements of subsection 5 within one year of discontinuance of use unless it may be reasonably anticipated that the well will be reused in the future. If the well is anticipated to be used in the future, the owner of the well is responsible to periodically inspect and maintain the well to ensure that the well remains in compliance with the standards established in this chapter.
5. Decommissioned and plugged boreholes and monitoring wells must have equal or less permeability than the local environment resulting in no greater influence on the local environment than the original geologic formation. Factors, such as topography, hydrogeology, borehole or well construction, and contaminants, must be considered in a decommissioning operation.
 - a. Immediately prior to decommissioning a monitoring well, the water in the well must be disinfected, except water containing hydrocarbons should not be disinfected with a chlorine disinfectant or other reactive compounds.
 - b. Sealant materials cannot be native soil materials. An acceptable sealant for dry boreholes is concrete. Acceptable sealant materials for wet boreholes and monitoring wells include neat cement, bentonite grout, bentonite pellets, and bentonite chips. Sealant materials must:
 - (1) Be durable;
 - (2) Not adversely impact local geologic materials or ground water;
 - (3) Form a bond and seal with the sidewall; and
 - (4) Resist cracking or shrinkage.
 - c. Any settling of the sealant material must be topped off. Sealant material may be terminated two and one-half feet [0.761 meter] below the ground surface in agricultural areas, in which case a native soil plug must be placed on top of the sealant material.
 - d. When monitoring well construction and installation documentation is not available, the well has been damaged down hole or the well is located in a proposed future solid waste treatment or disposal area, all protective casing, riser, screen, seals, and filter pack must be removed by pulling or over drilling.
 - e. Monitoring wells known by available documentation to be constructed with an impermeable annular space seal may be

decommissioned without removing the riser, screen, annular sealant, and filter pack provided:

- (1) The remaining screen and riser are filled with sealant material;
- (2) The ground surface seal and protective casing are removed; and
- (3) The riser must be cut off at a depth to preclude interference with site specific activities, but should be no less than two and one-half feet [0.761 meter] below the surface.

History: Effective March 1, 1997.

General Authority: NDCC 43-35-19.2

Law Implemented: NDCC 43-35-19.2